Telesat



# FEASIBILITY STUDY OF SPECTRUM SHARING BETWEEN LEO/MSS AND GSO/MSS AND FIXED SERVICES AND FPLMTS

**(Final Report)**



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**Prepared by:** Nam Nguyen

George Nedoborski

Ali Grami

Xiaodong Li

**Approved by:** Bahman Azarbar

**Submitted to the Department of Communications by:**
**Communication Systems Engineering Division**
**Telesat Canada**
**1601 Telesat Court, Gloucester, Ontario, K1B-5P4**

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# EXECUTIVE SUMMARY

The worldwide utilization of the frequency range below 3 GHz for fixed and mobile services, which is considered most suitable for mobile applications, is extensive. The sheer number of existing and planned geosynchronous satellite based systems (GSO/MSS) have considerably increased the level of spectrum congestion. In addition to these, the spectrum requirements of several recent proposals in the United States for establishing low earth orbit satellite-based mobile/personal communication systems (LEO/MSS) to operate at 137, 148, 400 and 1610 MHz need to be addressed. There is no doubt that this subject would be discussed in the WARC-92 conference.

As part of the preparatory work for WARC-92, Canada needs to develop its position concerning the technical implications of spectrum sharing between LEO/MSS, GSO/MSS and Fixed services below 3 GHz. DOC has granted Telesat a call up against a standing offer to conduct a study on the feasibility of spectrum sharing between LEO/GSO, LEO/fixed services and LEO/FPLMTS.

In this report, interference analyses are performed for co-frequency same-direction and co-frequency reverse-direction operation modes and for three distinct scenarios : (1) between LEO/MSS systems and GSO/MSS systems; (2) between LEO/MSS systems and terrestrial fixed systems; and (3) between LEO/MSS systems and the future public mobile telephone system (FPLMTS). Sharing options are established based on the interference analysis results.

The LEO/MSS systems chosen for the analysis are Motorola's IRIDIUM system and, for the sake of completeness, the OSC's ORBCOMM system. Since the mandate of the study is to look at the various LEO and GSO systems (a representative cross section) in a co-frequency mode of operation, the system parameters of the ORBCOMM system are modified to represent the operation at L-band in order to allow compatibility analysis against the majority of the operational and planned LEO and GSO systems as known to date. For this frequency conversion, the approach taken in this report is to increase the transmit EIRP levels to offset the reduction in the signal power received by the receiving antenna due to its smaller effective aperture. Note that the antenna size is purposely reduced to keep the gain constant in order to maintain the same coverage area. In so

doing, the ORBCOMM EIRP levels need to be increased by about 20 dB when the frequency is changed from the proposed 137-149.9 MHz to L-band. This leads to a mobile transmit EIRP of about 20 dBW which is an unrealistic figure since it is known that no practical mobile terminal with an antenna gain of 1 to 3 dBi is capable of producing an EIRP of 20 dBW, particularly if a low cost, compact hand-held terminal is the primary characteristics of the business plan. It is expected that if, due to spectrum availability considerations, ORBCOMM is forced to operate at upper UHF or L-band, its link design and system architecture will have to undergo a major modification. Therefore, any conclusions derived from the interference analysis involving ORBCOMM at the higher frequencies with the modified emission characteristics should be interpreted with caution as, in our view, they do not represent a practical system.

Four GSO/MSS systems are chosen for this study, namely MSAT, INMARSAT II and III, ZENON and EUTELSAT II. Interference between the proposed LEO/MSS systems and point-to-point and point-to-multipoint fixed systems operating at 1427-1525 MHz and 1700-2450 MHz bands are also addressed in the report. Finally, the R2 interface (i.e. personal terminals) of the FPLMTS is selected for the analysis.

The general approach of the study is to compute the "C/I margin" which is the "available C/I" minus the "acceptable C/I". By this definition, if the value of the resulting C/I margin is positive, then the interference power is lower than the acceptable level. If the C/I margin is negative, then the interference power is higher than the acceptable level and the required additional protection is equal to the absolute value of the C/I margin. The study is carried out for two arbitrarily chosen "acceptable" interference levels which are the levels that would degrade the carrier-to-noise ratio by 0.5 dB and 1.0 dB. It has been assumed here that the characteristics of the interference is white noise like and would add to the system thermal noise on a power basis. In the analysis for interference from LEO/MSS into the FPLMTS, the interference level is further translated into a reduction in the useful range around the base station.

Before discussing the interference results, it is worthwhile to note that it has been proposed for both IRIDIUM and ORBCOMM satellites to be equipped with radiometers to scan the activity of the shared

frequency band. The satellites could then select the frequency slots with little or no activity and use these frequencies for communications with their mobiles. For convenience, this approach will be called "interference monitoring concept" in this report. There is another approach that can be used by the IRIDIUM satellite to avoid mainlobe-to-mainlobe interference with a GSO satellite when the two satellites illuminate each other over the earth. This approach calls for the IRIDIUM satellite to turn off its outer beam which intercepts the GSO arc and serve the service area of the switched-off beam via an overlapping beam from an adjacent satellite. Both of these approaches seem feasible for LEO/MSS satellites to protect themselves against interference from other systems such as GSO/MSS which share the same frequency band. However it may not be as effective when used by the LEO/MSS satellites to protect the other systems since the LEO/MSS satellites would not know the location of the receivers of the other systems. Another concept for mitigating interference between mobile terminals is geographical separation where mobiles from different systems are to be located sufficiently far apart such that the terrain blockage loss would provide the required protection.

For each of the four GSO/MSS systems mentioned above, the interference analysis is carried out for different GSO/MSS carrier types ranging from marine, land voice and data carrier to aeronautical voice and data carriers. However, due to the vast amount of the resulting data, only the results for interference between a voice-type carrier of the MSAT system, and the IRIDIUM system are provided below as an example. Nonetheless, the discussions and conclusions presented in this summary are derived using the entire spectrum of data and therefore are general and applicable to other GSO/MSS systems and other carrier types. The analysis of compatibility of the IRIDIUM system and GSO/MSS is presented for four cases:

- IRIDIUM uses 1.6 GHz for both uplink and downlink,
- IRIDIUM uses 1.5 GHz for both uplink and downlink,
- IRIDIUM shares the 1.6/1.5 GHz bands with GSO/MSS in the same direction,
- IRIDIUM shares the 1.6/1.5 GHz bands with GSO/MSS in the reverse direction.

Results as well as related conclusions for interference between fixed systems and FPLMTS and the IRIDIUM are also summarized below.

The conclusions derived for the IRIDIUM case, in general, do not hold in the case of ORBCOMM system with modified EIRP levels. This discrepancy is primarily due to the assumed increase in the EIRP levels in our hypothetical system relative to the original levels filed with the FCC in connection with the operation of ORBCOMM system at lower frequencies. However, as mentioned earlier, for ORBCOMM to be able to operate commercially at L- band, the system concept will need to be drastically altered. This design review is expected to lead to an arrangement similar to the IRIDIUM in terms of its emission levels toward GSO systems if the concept is ever implemented at L-band.

## 1. Interference between IRDIUM and GSO/MSS

### 1.1 IRIDIUM Uses the 1.6 GHz Band

| Interferor | Victim | C/I Margin (dB) for C/N Degradation Objective of 0.5 dB | 1.0 dB |
|---|---|---|---|
| IRIDIUM mobile | MSAT satellite | 0.0 | 3.0 |
| IRIDIUM satellite | MSAT satellite | -6.3 | -3.3 |
| MSAT mobile. | IRIDIUM mobile | -57.5 | -54.5 |
| MSAT mobile | IRIDIUM satellite | -35.6 | -32.6 |

Interference from both IRIDIUM constellation of satellites and its associated mobiles into the robust traffic of the GSO satellites (like voice), although not exactly meeting the assumed interference objectives, is sufficiently low to leave hope for sharing. This excludes a few very low level data carriers filed by various systems where the carrier-to-interference ratios are about 5 to 7 dB worse than that for voice case but still at a level which suggests a deeper look into identifying ways and means of additional isolation. For instance, a detailed analysis of the realistic average loading level of IRIDIUM may in fact reveal some additional level of isolation afforded in light of the fact that the satellites will most likely operate at levels below their full spectrum capacity most of the time. In the case of the low level data carriers mentioned earlier, it is worthwhile noting that the resulting low C/N levels cast doubt on the technical viability of such services and lead one to suspect the proposed link budgets.

Notwithstanding this, these carriers are generally in the minority and as a result could be protected through detailed traffic coordination if in fact they happen to be implemented.

The above observations indicate that co-frequency operation of LEO systems **with a transmission signature similar to IRIDIUM** could conceivably be considered as long as only the uplink GSO band is used for LEO transmit/receive operation, and the LEO systems take measures to protect themselves from interference from GSO mobiles. While the mobile to mobile interference could conceivably be mitigated by geographical segregation of the respective mobiles, the interference from GSO mobiles to LEO constellation appears to be the most challenging one to overcome, primarily due to the dynamic nature of such a constellation relative to the earth-fixed frame of reference. Notwithstanding this, it is plausible to assume that with the planned level of on-board sophistication and resident smarts of IRIDIUM satellites, the receive band could be dynamically monitored for identification and utilization of the least interfered with carrier slots.

### 1.2 IRIDIUM Uses the 1.5 GHz Band

| Interferor | Victim | C/I Margin (dB) for C/N Degradation Objective of 0.5 dB | 1.0 dB |
|---|---|---|---|
| IRIDIUM mobile | MSAT mobile | -48.1 | -45.1 |
| IRIDIUM satellite | MSAT mobile | -6.6 | -3.6 |
| MSAT satellite | IRIDIUM satellite | -33.6 | -30.6 |
| MSAT satellite | IRIDIUM mobile | -18.5 | -15.5 |

Similar to the above case where the IRIDIUM uses 1.6 GHz, interference from IRIDIUM mobile to GSO mobile is high but the problem can be alleviated by geographical separation. Interference from IRIDIUM satellite into the mobiles of high-gain spot beam GSO systems such as MSAT, EUTELSAT and ZENON is close to the objective level, except the case of INMARSAT mobiles where interference from IRIDIUM exceeds the objectives set for the study.

Interference from GSO satellites to IRIDIUM mobiles also fall into two distinct categories. The first category is due to the GSO satellites that feed low gain mobiles with a high level of EIRP for voice

communications. Invariably, this case is characterized by GSO satellites with relatively high-gain spot beams (eg. MSAT, ZENON and EUTELSAT). This is not surprising as only such systems could afford low gain mobiles for voice communications. GSO systems falling in the first category will generate excessive interference levels into IRIDIUM mobiles, and there seems to be no means to reduce the high interference levels since the IRIDIUM mobile, unlike its smart satellites, would not be able to protect itself from interference and consequently, co-frequency sharing would not be feasible in this case. The second category embodies GSO systems with either global beam or relatively large spot beams. Understandably, such systems reduce the power demand on the satellite by incorporating medium to high gain mobiles (eg. INMARSAT and USSR networks). Consequently, the interference from GSO satellites with global or large beams to IRIDIUM mobiles is low enough to encourage a more detailed scrutiny of the subject matter for defining conditions which could allow co-frequency operation.

The interference from GSO satellites to the IRIDIUM satellites follow the same pattern, that is, it is too excessive if originated from spot beam based GSO satellites while marginal for global beam systems. Unlike the case of interference from GSO satellite into IRIDIUM mobile, this interference situation can be avoided by making the IRIDIUM satellites switch off the outer edge beams when dominant mainlobe-to-mainlobe interference occurs.

### 1.3 IRIDIUM Uses the 1.6/1.5 GHz Frequency Bands

#### 1.3.1 Same Direction Mode

| Interferor | Victim | C/I Margin (dB) for C/N Degradation Objective of 0.5 dB | 1.0 dB |
|---|---|---|---|
| IRIDIUM mobile | MSAT satellite | 0.0 | 3.0 |
| IRIDIUM satellite | MSAT mobile | -6.6 | -3.6 |
| MSAT mobile | IRIDIUM satellite | -35.6 | -32.6 |
| MSAT satellite | IRIDIUM mobile | -18.5 | -15.5 |

The interference from IRIDIUM satellite and mobile into GSO mobile and satellite, respectively, seems to be marginally acceptable, but the interference from GSO into IRIDIUM is severe. Note that the C/I

margins are based on the assumption that the IRIDIUM still uses the proposed TDMA format for its transmission. However, if IRIDIUM uses separate frequency bands for its uplink and downlink, the proposed TDMA format is unlikely to be maintained. Thus, one should expect more interference into GSO if IRIDIUM transmit slots are more concentrated. For example, if the TDMA format is dropped, i.e. IRIDIUM transmission is continuous, there would be about 13 dB increase in interference from the IRIDIUM into GSO. In light of the above and also in view of the severe interference from GSO satellite into IRIDIUM mobile which cannot be easily mitigated, co-frequency sharing in this case does not appear to be feasible.

### 1.3.2 Reverse Direction Mode

| | | C/I Margin (dB) for C/N Degradation Objective of | |
|---|---|---|---|
| Interferor | Victim | 0.5 dB | 1.0 dB |
| IRIDIUM mobile | MSAT mobile | -48.1 | -45.1 |
| IRIDIUM satellite | MSAT satellite | -6.3 | -3.3 |
| MSAT mobile | IRIDIUM mobile | -57.5 | -54.5 |
| MSAT satellite | IRIDIUM satellite | -33.6 | -30.6 |

In this case, interference would be between IRIDIUM mobile and GSO mobiles and between IRIDIUM satellites and GSO satellite. The mobile-to-mobile interference can be reduced by geographical separation, and the problem of satellite-mainlobe-to-satellite-mainlobe interference can be solved by switching off the IRIDIUM's outer edge beams when such a geometry occurs. The discussion in Section 1.3.1 about the IRIDIUM's TDMA format is also applicable in this case.

Co-frequency sharing between IRIDIUM and GSO could be feasible in the reverse direction mode provided the above measures are taken by the IRIDIUM system to protect itself as well as the GSO/MSS system. However, the disadvantage of this scenario relative to the case described in Section 1.1 is that the IRIDIUM network management system will now have the addtional task of protecting the GSO system. Furthermore, the GSO system is vulnerable to interference from IRIDIUM and solely relies on it for protection. The acceptability of such arrangement to GSO system operators is at best doubtful.

## 2. Interference between IRIDIUM and Fixed Services

The analysis indicates that there will be severe interferences from IRIDIUM into fixed services and vice versa. At the 1.5 GHz band, the worst-case interference results are shown below. Similar results are obtained for 1.7, 1.9 and 2.2 GHz frequency bands.

| Interferor | Victim | C/I Margin (dB) for C/N Degradation Objective of 0.5 dB | 1.0 dB |
|---|---|---|---|
| IRIDIUM satellite | Fixed system | -26.6 | -23.6 |
| IRIDIUM mobile | Fixed system | -64.5 | -61.5 |
| Fixed system | IRIDIUM satellite | -41.3 | -38.3 |
| Fixed system | IRIDIUM mobile | -72.9 | -69.9 |

Based on the results of this study it is concluded that operation between a LEO satellite system and the fixed terrestrial microwave systems on a co-channel/co-geographical basis would be difficult. Taking the interference objectives chosen in this study, unacceptable interference would be experienced by the LEO satellites, by the LEO mobile units, and by the terrestrial fixed system.

Geographical sharing between the mobiles and the fixed systems could be possible if certain geographical areas were designated as LEO mobile-only areas or fixed-only areas, however, sharing issues between the LEO satellites and the fixed system would still be addressed.

Severe mainlobe-to-mainlobe interference between LEO/MSS satellites and fixed systems occurs when the satellites are transmitting or receiving at grazing angle (ie zero degree elevation) since the fixed systems antennas generally point at the horizon in most cases. To reduce interference into fixed system, the LEO satellite can limit or avoid its emission toward the horizon. For the IRIDIUM system, this can be achieved by turning off the outer beams and use the inner beams of another satellite. This scheme would work well for higher latitude regions such as Canada because of the high degree of overlap between the IRIDIUM satellite coverage areas. However, it would not work as well for regions of lower latitude, especially near the equator, where overlapping is lesser.

## 3. Interference between IRIDIUM and FPLMTS

### 3.1 Interference from FPLMTS Terminals into IRIDIUM Satellite

| C/N degradation objective | Maximum allowable FPLMTS simultaneous interferors Indoor | Outdoor |
|---|---|---|
| 0.5 dB | 570 | 90 |
| 1.0 dB | 1200 | 190 |

Interference from FPLMTS terminals into IRIDIUM satellite is severe. For 0.5 dB C/N degradation objective, the maximum number of allowable interferors is only 570 for indoor and 90 for outdoor FPLMTS. We now attempt to show that the above allowable numbers of interferors are indeed very low by calculating the possible number of simultaneously active outdoor FPLMTS terminals for Ottawa and its vicinity which have a total population of about 600,000. Assuming 20% of the population use FPLMTS with a busy hour traffic of 0.02 E per user then there could be up to 2,400 terminals simultaneously active during busy hour. This figure far exceeds the maximum allowable number of 90. In addition, an IRIDIUM beam can cover Ottawa, Montreal and Toronto all together at the same time. Interference monitoring scheme would not work effectively in this case since the activity in the FPLMTS frequency band would be extremely high due to a very large FPLMTS user population with a high degree of frequency reuse within an IRIDIUM beam. As a result, spectrum sharing between LEO/MSS and FPLMTS would be very difficult.

### 3.2 Interference from FPLMTS Terminal into IRIDIUM Mobile

| C/N degradation objective | Minimum allowable distance between FPLMTS terminals and IRIDIUM mobile Indoor | Outdoor |
|---|---|---|
| 0.5 dB | 12.6 km | 14.5 km |
| 1.0 dB | 12.1 km | 13.6 km |

It is assumed that the earth is smooth and the height of the terminals is 1.5 m. The radio horizon for this case is about 5 km.

Therefore, in order to keep the interference down to the acceptable level, the interfering terminal and the victim terminal have to be well beyond the radio horizon of each other, i.e. about 12 to 14 km. In reality, most terrain will not be smooth, as a result the required separation will be dependent on the actual terrain and would likely be larger than the distances indicated above.

### 3.3 Interference from IRIDIUM System into FPLMTS Terminal

Our analysis shows that interference from the IRIDIUM satellite into an FPLMTS terminal slightly reduces the useful range of the indoor FPLMTS from 67 metres to 55 metres and would not effect the outdoor FPLMTS. However, line-of-sight interference from IRIDIUM mobile into an FPLTMS terminal would practically reduce its range to a few metres around its base. In order to reduce the interference from the IRIDIUM mobile, the mobile has to be well beyond the radio horizon of the FPLMTS terminal.

## SUMMARY

Of the scenarios considered above, by far the most promising one appears to be LEO sharing the GSO uplink band (i.e. 1.6 GHz) with the GSO mobile systems. While the mobile-to-mobile interference issue could be considered as a candidate for detailed coordination, the GSO mobile to LEO satellite constellation interference is a challenging task to be tackled.

The following tables summarize the results for the IRIDIUM system (denoted by IRD in the table). The codes used in the column "Sharing Conditions" have the following meaning:

0 Interference in this scenario seems marginally acceptable.
1 Interference in this scenario is severe but additional protection can be provided by geographical separation.
2 Interference in this scenario is severe but the IRIDIUM satellite can turn off the outer beams to alleviate the problem.
3 Interference in this scenario is severe but the IRIDIUM satellite can monitor the activity in the shared frequency band and uses only the least active frequency slot.
x Interference in this scenario is severe and the proposed interference reduction techniques are not likely to be effective.

| IRIDIUM's Frequency | Interference Scenarios From | To | Sharing Condition | Remark |
|---|---|---|---|---|
| 1.6 GHz | IRD mobile | GSO satellite | 0 | Sharing could be feasible if the IRIDIUM system can protect itself. Best scenario. |
| | IRD satellite | GSO satellite | 0 | |
| | GSO mobile | IRD mobile | 1 | |
| | GSO mobile | IRD satellite | 3 | |
| 1.5 GHz | IRD mobile | GSO mobile | 1 | Sharing is not feasible |
| | IRD satellite | GSO mobile | x | |
| | GSO satellite | IRD mobile | x | |
| | GSO satellite | IRD satellite | 2,3 | |
| 1.6/1.5 GHz Same Direction | IRD mobile | GSO satellite | 0 | Sharing is not feasible |
| | IRD satellite | GSO mobile | x | |
| | GSO mobile | IRD satellite | 3 | |
| | GSO satellite | IRD mobile | x | |
| 1.6/1.5 GHz Reverse Direction | IRD mobile | GSO mobile | 1 | Sharing could be feasible if IRIDIUM can provide protection for itself & the GSO system |
| | IRD satellite | GSO satellite | 2 | |
| | GSO mobile | IRD mobile | 1 | |
| | GSO satellite | IRD satellite | 2,3 | |

**Table 1: Summary of Interference between the IRIDIUM System and GSO/MSS System**

| | Interference Scenarios | | Sharing Condition | Remark |
|---|---|---|---|---|
| | From | To | | |
| Share with Fixed System | IRD mobile | Fixed System | 1 | Sharing may be feasible only if IRIDIUM can protect it self and also the fixed system receiver |
| | IRD satellite | Fixed System | x | |
| | Fixed System | IRD mobile | 1 | |
| | Fixed System | IRD satellite | 2,3 | |
| Share with FPLMTS | IRD mobile | FPLMTS | 1 | Sharing is not feasible |
| | IRD satellite | FPLMTS | 0 | |
| | FPLMTS | IRD mobile | 1 | |
| | FPLMTS | IRD satellite | x | |

**Table 2: Summary of Interference between the IRIDIUM System and Fixed System and FPLMTS**

# CHAPTER 1

# INTRODUCTION

The World Administrative Radio Conference on Mobile Services in 1987 (WARC-MOB-87) redefined the spectrum allocation to mobile satellite systems by explicitly recognizing the need for the introduction of land mobile services. Noting the limited availability of spectrum in the 1.5/1.6 GHz range, the conference requested the ITU to convene a limited Allocation Conference in 1992 to seek additional spectrum for the mobile services including satellite based services.

The worldwide utilization of the frequency range below 3 GHz for fixed and mobile services, which is considered most suitable for mobile applications is extensive. The sheer number of existing and planned geosynchronous satellite based systems (GSO/MSS) have considerably increased the level of spectrum congestion. To these, one needs to add several recent proposals in the United States for establishing low earth orbit (LEO) satellite-based mobile/personal communication systems operating at 137, 148, 400, 900 and 1610 MHz. With this outlook, spectrum sharing to the maximum extent is needed to adequately cater to the needs of these competing systems for a share of spectrum in the WARC-92 conference.

As part of the preparatory work for WARC-92, Canada needs to develop its position concerning the technical implications of spectrum sharing between LEO/MSS, GSO/MSS and Fixed services below 3 GHz. DOC has granted Telesat a call up against a standing offer to conduct a study on the feasibility of spectrum sharing between LEO/GSO and LEO/Fixed services.

Chapter 2 summarizes the system characteristics of two LEO MSS systems considered in this study, namely, IRIDIUM and ORBCOMM. The general study assumptions and methodology are discussed in Chapter 3 and Chapter 4 respectively. In Chapter 5, potential interference scenarios between LEO MSS systems and GSO MSS systems are identified, and C/I margins based on 0.5 and 1.0 dB degradation to the thermal C/N value are also presented. Chapter 6 and Chapter 7 provide the analysis of interference between the LEO/MSS and the microwave fixed systems and the future public land mobile telephone system (FPLMTS). Detailed interference calculations are given in Appendix A, B, and C.

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# CHAPTER 2

# LEO MSS SYSTEMS CHARACTERISTICS

This chapter describes the characteristics of Motorola's IRIDIUM and Orbital Communications' ORBCOMM systems. Only systems characteristics and parameters which are deemed to be relevant to this study will be presented.

## 2.1 IRIDIUM System

The IRIDIUM concept was first introduced by Motorola, Inc. in 1989. The design of this system has gone through several revisions since. CCIR document U.S. IWP 8/15 USA-4 provides a general description of this system. The following is a brief description of the system characteristics based on the IRIDIUM's FCC filing.

### 2.1.1 System Overview

IRIDIUM is a digital, satellite-based personal communications system to provide radiodetermination, voice and data services to individual users using handhold terminals throughout the world. The system includes a satellite constellation of 77 satellites in low-earth orbit which are networked together as a packet switched digital communications system utilizing the principle of cellular concept to provide continuous line-of-sight communications from and to any point on the earth's surface. The system also includes space-to-earth gateways which interface into the public switched telephone network (PSTN) and intersatellite links which are provided using Ka bands.

### 2.1.2 Satellite Constellation

The constellation uses 7 circular, polar orbital planes at a latitude of 413 nautical miles (765 km). Each plane consists of 11 satellites equally spaced in this orbit. Satellites in planes 1, 3, 5 and 7 are in phase with one another and are halfway out of phase with those in planes 2, 4 and 6. All satellites travel in the same angular direction in their respective orbital plane, i.e. the satellites will rotate "upward" toward the north pole on one side of the earth, cross the

pole and move "downward" toward the south pole on the other side of the earth. Figure 2.1 shows the view of the earth from a point above the north pole and the seven orbital planes as well as the direction of the satellites movement. The orbital planes are separated by 27.1 degrees with the exclusion of the seam between planes 1 and 7 where the satellites move in the opposite direction. The orbital plane separation in this region is 17.4 degrees.

### 2.1.3 Coverage

The IRIDIUM system is designed to provide coverage over the entire surface of the earth with a minimum elevation angle of 10 degrees. Figure 2.2 illustrated a typical coverage of the IRIDIUM satellite constellation at a given instant of time. The coverage areas of each of the satellites are somewhat evenly distributed over the earth's surface near the equator, but the overlap between the coverage areas increases as the satellites approach the south or north poles.

Each of the IRIDIUM satellites is capable of generating 37 beams within its coverage area. The beam cluster in the satellite coordinates is created by one large centre beam surrounded by three rings of 6, 12 and 18 smaller beams, respectively. The footprints of the beams on the earth's surface called cells are of approximately equal size, about 360 nautical miles or 670 km in diameter. As the coverage areas, hence cells, of the satellites overlap when getting close to the north and south poles, a complex control algorithm is employed to turn on and off the overlapping cells to avoid interference. As a result, at any given time, only 1628 non-overlapping cells covering the entire surface of the earth are active. Note that the 77 satellites can generate a total of 77 x 37 = 2849 cells, i.e. only 57% of the cells are active.

With the exception of the centre beam which is generated by a fixed antenna looking at the nadir direction, the remaining beams are generated by six scanning phased array panels each oriented with a unique electrical boresight to optimize scanning loss associated with each beam generated by that panel. Each phased array panel produces six beams (cells). Cells generated within a satellite and also those formed collectively by 77 satellites are structured in a septet topology and are identified by say labels A through G. Such a structure would ensure cells with the same label have sufficient

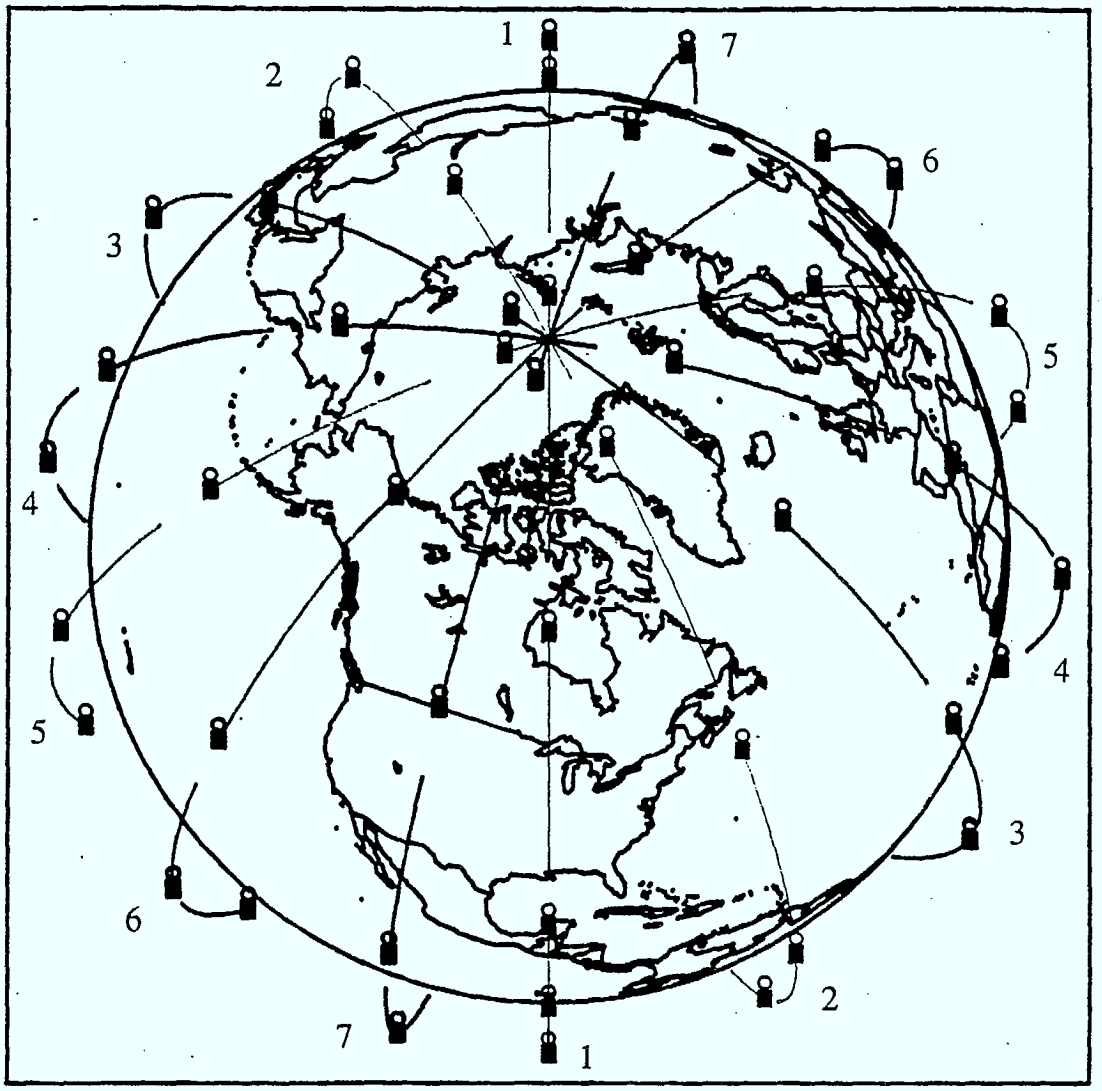


Figure 2.1 - IRIDIUM's Satellites Constellation

27.1 degree separation between orbital planes
Seam between planes 1 and 7 separeted by 17.4 degree

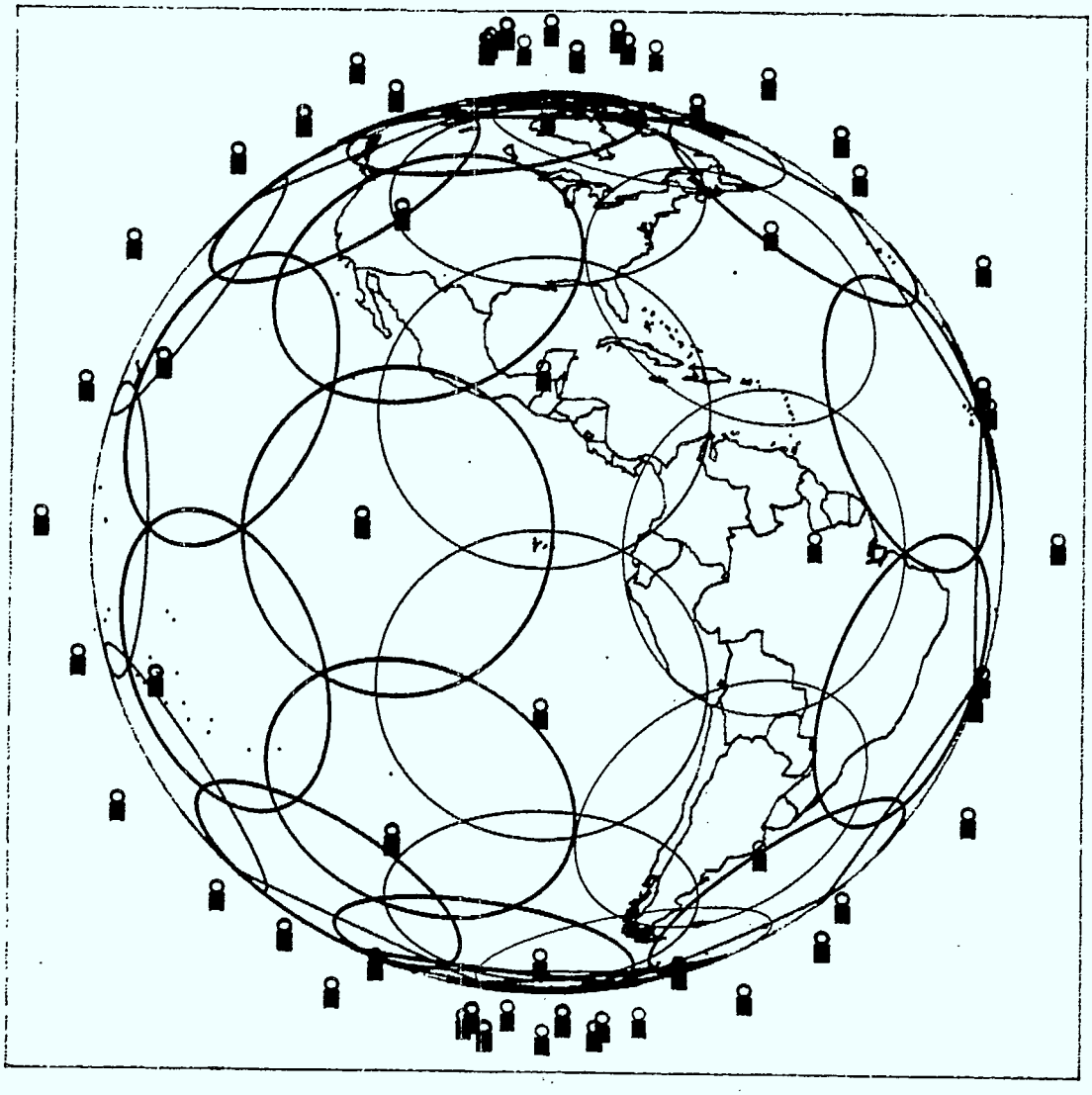

Figure 2.2 IRIDIUM Satellites Coverage (10 degree elevation)

spatial isolation to permit co-frequency operation (reuse). For cells not having sufficient spatial isolation such as, say, adjacent cells B and C, there are two technical alternatives, namely, frequency sub-bandization (frequency division) similar to what is used for terrestrial cellar systems, or time division interleaving. The latter scheme is used in the design of the IRIDIUM system. That is, cells not having sufficient isolation are fed by the entire amount of available spectrum but in a coordinated time sequence. This time coordination is not only within the beam clusters of a single satellite, but also a property maintained throughout the aggregate cell structure of the entire constellation of 77 satellites. Time division multiplexing in conjunction with a septet reuse topology , therefore, result in co-frequency operation of cells with the same label at the same time but over a finite portion of the TDMA frame allotted to that label. It is also to be noted that each phased array panel of a satellite has only one active receive or transmit beam at a given instant of time. The next paragraph will discuss the timing of the signal in more detail. Figure 2.3 illustrates the beam structure of an IRIDIUM satellite. The view of Canada as seen by an IRIDIUM satellite is shown in the figure. The beams as generated by each satellite are elliptical except the centre beam which is circular. One set of six beams produced by a phased array panel is highlighted in the figure. Note that the contours shown in the figure are generated using data provided in the IRIDIUM's FCC filing.

### 2.1.4 Transmission Characteristics

IRIDIUM satellites communicate with user terminals on or near the earth's surface using frequencies in L-band. There are also communications links between satellites at 20 to 30 GHz range and links between satellites and gateways in the 20 to 30 GHz band. This study only addresses the links between satellites and user terminals.

The IRIDIUM system will use digital transmission between satellites and users in a combined time and frequency division multiple access techniques (TDMA and FDMA). The TDMA frame is 60 ms second long and is divide into 14 transmit (i.e. downlink) bursts interleaved with 14 receive (i.e. uplink) bursts, allowing the same frequency band to be used for both uplink and downlink but at non-overlapping time slots. The transmit and receive bursts are 1.3 ms and 2.9 ms long, respectively. The guard time between bursts is

0.042857 ms long. Figure 2.4 shows the timing signal at the satellite. The transmit and receive bursts are time interleaved with a transmit burst corresponding to a receive burst 30 ms later. This would permit the ground terminals to carry out the required processing before a transmission is required from them. The transmit and receive bursts are single channel per carrier (SCPC) signals of 400 kbps and 180 kbps, respectively. This frequency division is not for reuse purposes but rather intended to reduce the complexity of the ground terminals, orderly growth of the system capacity in time without the need for reformatting the time division structure as well as easing international coordination of the spectrum. The FDMA frequency spacing for the transmit and receive signals are 350 kHz and 160 kHz, respectively. The modulation used by IRIDIUM is a version of QPSK.

### 2.1.5 Link Parameters

The satellite-user link parameters which are to be used in our interference analysis are shown in Table 2.1. Only parameters for cell 1 and cell 7 are chosen since these represent the worst case analysis (cells 1 to 6 are generated by the same phased array panel on a given satellite and are not intended to signify cell labelling in a septet frequency reuse structure).

### 2.1.6 L-band Spectrum Requirement

L-band has been identified as a suitable band for the satellite-user link. It is proposed that the IRIDIUM would use the frequency band from 1610 MHz to 1626.5 MHz. Note that IRIDIUM uses the same frequency band for both transmit and receive in the satellite-user link.

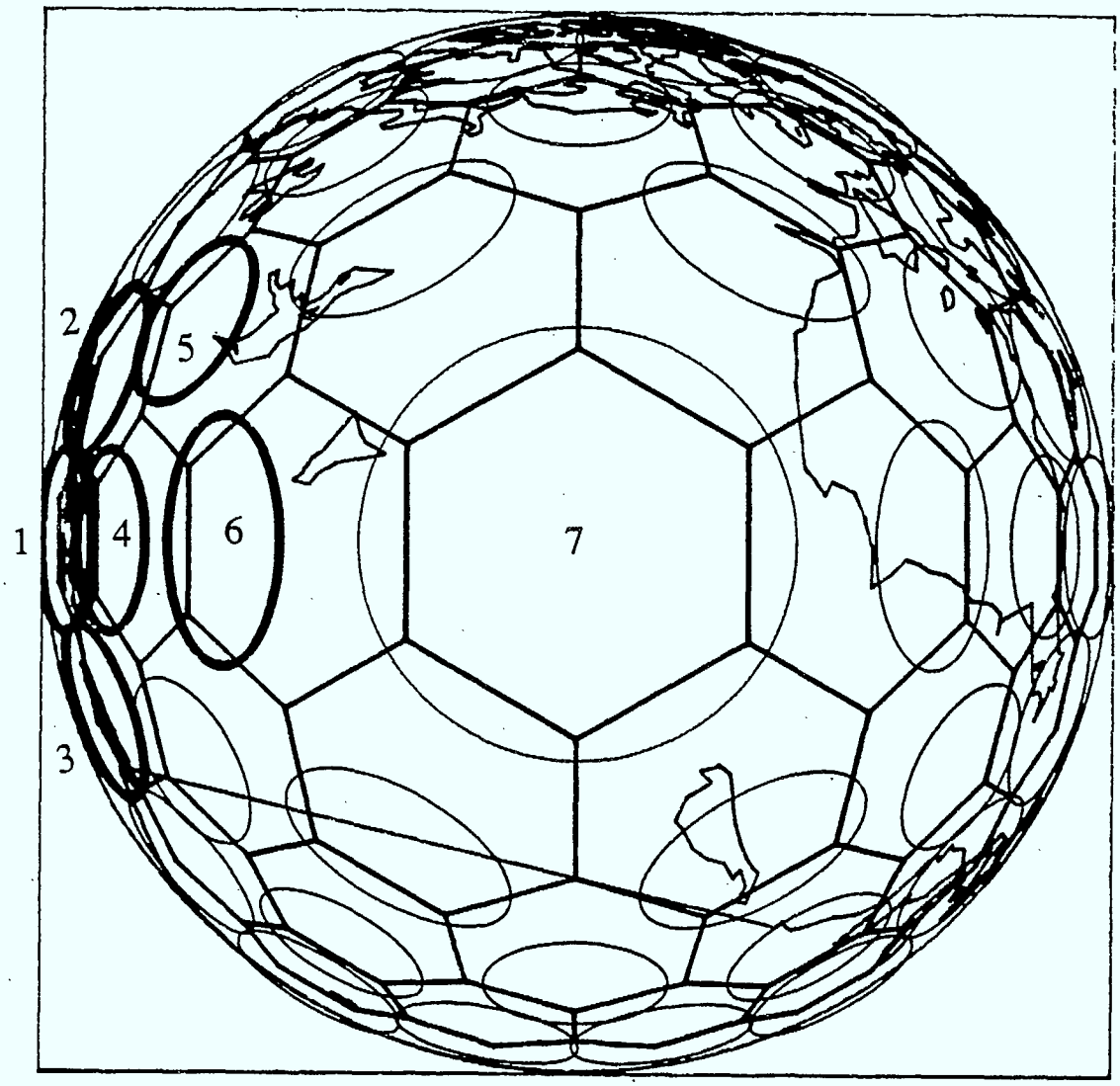


Figure 2.3 IRIDIUM's 37 Beams (4 dB contour) and Cells Structure as Viewed from an IRIDIUM Satellite

*(Note: The figure shows that the 4 dB contours cannot provide complete coverage. The beam sizes used to produce this plot are obtained from the IRIDIUM's FCC Filing)*

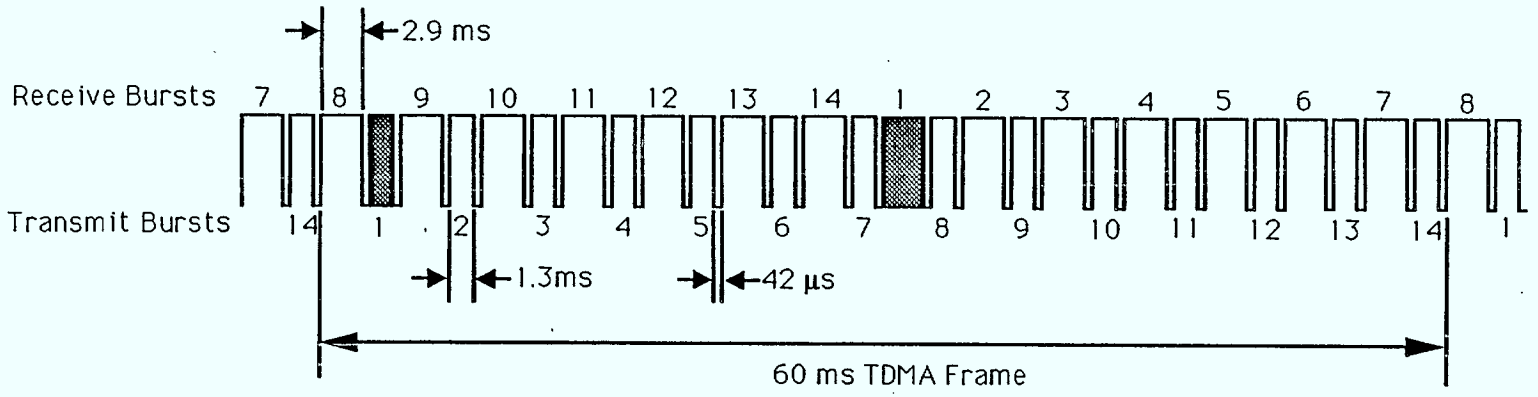




Figure 2.4

IRIDIUM SATELLITE TDMA TIMING FORMAT

| LINK BUDGET FOR THE IRDIUM SYSTEM | | |
|---|---|---|
| | | |
| Cell Number | Cell 1 | Cell 7 |
| | | |
| UPLINK | | |
| Up Power (dBW) | 1.1 | 4.7 |
| ES Tx G (dBi) | 0.3 | 2.3 |
| Up EIRP (dBW) | 1.4 | 7.0 |
| Bandwidth (kHz) | 135.00 | 135.00 |
| EOC Sat Rx Gain (dBi) | 21.2 | 6.9 |
| Sat Rx Noise Temp. (K) | 553.0 | 553.0 |
| Sat G/T (dBi/K) | -6.2 | -20.5 |
| Up Freq (GHz) | 1.620 | 1.620 |
| Range (km) | 2300 | 850 |
| Path Loss (dB) | 163.9 | 155.3 |
| **(C/N)up (dB)** | **8.5** | **8.5** |
| C/N Threshold (dB) | 5.6 | 5.6 |
| | | |
| DOWNLINK | | |
| Dn Power (dBW) | 1.9 | 5.6 |
| EOC Sat Tx Gain (dBi) | 21.2 | 6.9 |
| Dn EIRP (dBW) | 23.1 | 12.5 |
| Bandwidth (kHz) | 300.00 | 300.00 |
| ES Rx Gain (dBi) | 1.0 | 3.0 |
| ES Rx Noise Temp. (K) | 300.0 | 300.0 |
| ES G/T (dBi/K) | -23.8 | -21.8 |
| Dn Freq (GHz) | 1.620 | 1.620 |
| Range (km) | 2300 | 850 |
| Path Loss (dB) | 163.9 | 155.3 |
| **(C/N)dn (dB)** | **9.2** | **9.3** |
| C/N Threshold (dB) | 5.1 | 5.1 |

**TABLE 2.1**: IRIDIUM's Link Parameters

## 2.2 ORBCOMM

The ORBCOMM system was filed to the FCC by Orbital Communications Corporation in early 1990. Following is a brief description of the system characteristics based on ORBCOMM's FCC filing.

### 2.2.1 System Overview

ORBCOMM is a low-earth-orbit satellite system intended to utilize digital communication to provide RDSS and short messaging services for emergency and distress communications as well as data acquisition. The system includes a satellite constellation of 20 satellites that provide near global coverage. Unlike the IRIDIUM, it is not envisaged that ORBCOMM would provide international connectivity, the system is used by administrations for domestic MSS applications where traffic is entirely terminated by the regional gateway(s) operated within an administration.

### 2.2.2 Satellite constellation

There are three equally spaced, circular orbital planes each containing six satellites. The orbital planes would have an inclination of somewhere between 40 to 50 degrees depending on the desired service area ( yet to be determined). The altitude of the satellites is about 950 to 1150 km. Two more satellites at the same altitude but at 90 degree inclination are added to provide intermittent but frequent coverage over the polar regions.

### 2.2.3 Coverage

With the orbital parameters described above, ORBCOMM can cover better than 95% of the earth within the boundaries of 60° latitude with a minimum of 5° elevation angle. Figure 2.5 illustrates the coverage contours at a given instant of time for the system assuming the altitude is 970 km and the inclination is 40 degrees. The figure shows that there are six satellites having nearly complete overlapped coverage areas, however, in general, partial overlap occurs and the percentage of overlap between coverage areas is a function of time. There are also small gaps between coverage areas where the earth's

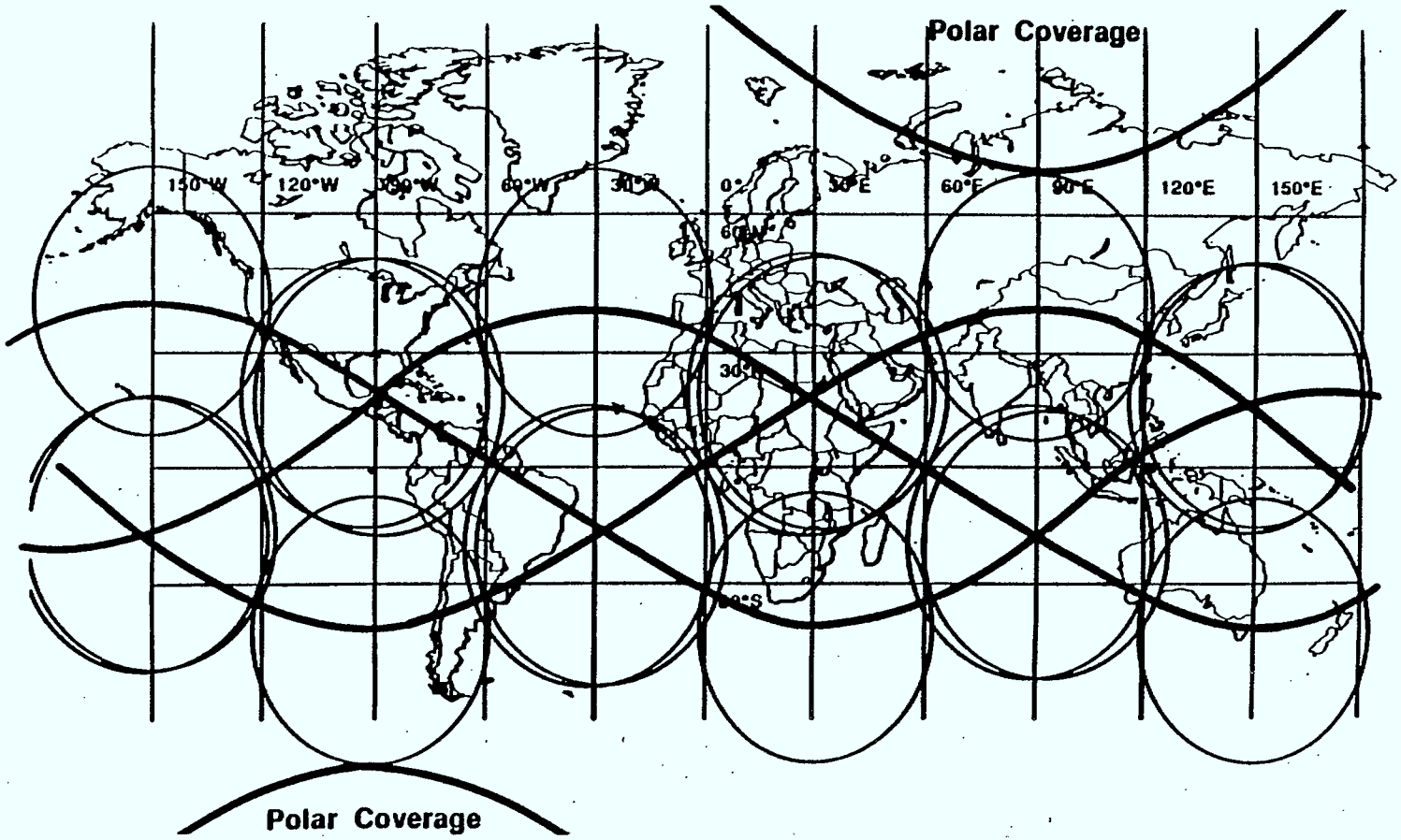


**Figure 2.5 ORBCOMM Satellite Coverage**

surface is not covered by any ORBCOMM satellites, but these gaps would last only a few minute.

The satellite antenna generates a shaped beam to entirely cover its coverage area. The beam has a moderate gain of about 7 dBi in the direction of the horizon and a gain of -3 dBi in the nadir direction. This antenna pattern would offset the increase in path loss due to longer range for users located near the horizon.

### 2.2.4 Transmission Characteristics

ORBCOMM proposes to use SCPC/CSMA (Carrier Sensing Multiple Access) technique for both uplink and downlink. The slotted aloha random access at 30% loading is assumed on the uplink. TDM is used on the downlink. Uplinks to the satellite from user terminals and gateways at 138-139 MHz are 2400 bps BPSK and 56 kbps BPSK, respectively. Downlink from satellite to user terminals and gateways at 148-149.9 MHz are 4800 bps FSK and 56 kbps BPSK, respectively. There is also a separate downlink of 4800 bps at 400 MHz used by the satellites to transmit the time and frequency information to the users. It is to be noted that in the recent FCC Notice of Enquiry, FCC proposes new frequencies in the range 930-931 Mhz (reserved band for digital paging) and 420-421 MHz (Fixed and Mobile) on a co-primary basis with Fixed and Mobile services. The 138-139 and 148-149.9 MHz bands originally proposed by ORBCOMM are considered by FCC only on a secondary basis.

The sharing scheme proposed for ORBCOMM in the uplink is based on frequency interleaving with the existing fixed and mobile services. To increase the isolation achieved through frequency interleaving, a complex on-board scanning receiver is used to predict the least active channel slots seen by the satellite. This information is transmitted, using 4800 bps BPSK signal, to the user terminals which in turn select a least active channel slot as known to the system for transmission. Furthermore, each carrier is proposed to be sub-divided into four subbands to spread the interference.

### 2.2.5 Link Parameters

The satellite-user link parameters which are to be used in our interference analysis are shown in Table 2.2.

### 2.2.6 Spectrum Requirement

The frequency bands proposed for ORBCOMM are 148-149.9 MHz for the uplink and 137-138 MHz for the downlink. ORBCOMM uses only 732 kHz and 370 kHz of the proposed uplink and downlink frequency bands, respectively.

| LINK BUDGET FOR ORBCOMM SYSTEM | | | |
|---|---|---|---|
| | | | |
| | | | |
| Terminal Type | Portable | Mobile | T/F Link |
| | | | |
| UPLINK | | | |
| Up Power (dBW) | 3.0 | 7.0 | |
| ES Tx G (dBi) | -1.0 | 2.0 | |
| Up EIRP (dBW) | 2.0 | 9.0 | |
| Bandwidth (kHz) | 3.60 | 3.60 | |
| EOC Sat Rx Gain (dBi) | | | |
| Sat Rx Noise Temp. (K) | | | |
| Sat G/T (dBi/K) | -25.8 | -25.8 | |
| Up Freq (GHz) | 0.148 | 0.148 | |
| Range (km) | 2750 | 2750 | |
| Path Loss (dB) | 144.7 | 144.7 | |
| Polarization Loss | 3.0 | 3.0 | |
| **(C/N)up (dB)** | **21.6** | **28.6** | |
| C/N Threshold (dB) | 11.6 | 11.6 | |
| | | | |
| DOWNLINK | | | |
| Dn Power (dBW) | 10.0 | 8.3 | 13.0 |
| EOC Sat Tx Gain (dBi) | 6.5 | 6.9 | 5.8 |
| Dn EIRP (dBW) | 16.5 | 15.2 | 18.8 |
| Bandwidth (kHz) | 7.20 | 7.20 | 7.20 |
| ES Rx Gain (dBi) | | | |
| ES Rx Noise Temp. (K) | | | |
| ES G/T (dBi/K) | -36.6 | -30.4 | -32.5 |
| Dn Freq (GHz) | 0.137 | 0.137 | 0.400 |
| Range (km) | 2750 | 2750 | 2750 |
| Path Loss (dB) | 144.0 | 144.0 | 153.3 |
| Polarization Loss | 3.0 | 3.0 | 3.0 |
| **(C/N)dn (dB)** | **22.9** | **27.8** | **20.0** |
| C/N Threshold | 15.2 | 15.2 | 11.6 |

**TABLE 2.2:** ORBCOMM's Link Parameters

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# CHAPTER 3

## GENERAL ASSUMPTIONS

The following are the assumptions which are universally applied to all sections of this study. There are additional assumptions that would be used for specific cases only and these will be stated at the appropriate sections.

1- Since ORBCOMM uses the 148-149.9 MHz and 137-138 MHz frequency bands for its uplink and downlink respectively, it would not cause (or receive) any interference to (or from) the L-band GSO MSS systems. For the purpose of studying the feasibility of sharing the same spectrum amongst various proposed systems, an ORBCOMM-type L-band (abbreviated OL) system, which is assumed to have the same system characteristics as ORBCOMM system except that it is operating at the same bands as the GSO MSS systems, is chosen as one of our target LEO MSS systems. Hence, the system parameters of the ORBCOMM system have to be modified to represent the operation at L-band. The approach taken in this report is to increase the transmit EIRP levels of the ORBCOMM system to offset the reduction in the signal power received by the receiving antenna due to its smaller effective aperture. Note that the antenna size is purposely reduced to keep the gain constant in order to maintain the same coverage area. From now on, this ORBCOMM-type L-band system will be referred to as the OL system.

2- Only voice carriers of the GSO MSS systems are voice activated with activity factor of 40%.

3- It is assumed that all L-band traffic of the INMARSAT systems are to and from mobile terminals over the ocean regions and coastal areas, and that all of the L-band traffic of other systems considered are to and from mobile terminals over the land areas.

4- The discrimination of mobile isotropic antenna is 0 dB in all directions. The discrimination of a mobile terminal's hemispherical antenna toward the horizon is 5 dB and toward any other direction is 0 dB.

5- IRIDIUM and OL systems use only mobiles which have isotropic antennas.

6- In the cases of mobile-mobile (including aeronautical terminals) and mobile-terrestrial station interference, the C/I are computed based on a reference distance between LEO MSS and GSO MSS mobile terminals of 5 km. C/I results for other distance can be easily computed by applying a scaling factor which is equal to the ratio between the desired distance and the 5 km reference distance.

7- It is assumed that full interference power would arrive at the input of the victim receive antenna if it is within the 3dB contour of the interfering transmit antenna beam.

# CHAPTER 4

# METHODOLOGY

The general approach of the study is to compute the "C/I margin" which equals to the "available C/I" minus the "acceptable C/I". By this definition, if the value of the resulting C/I margin is positive, then the interference power is lower than the acceptable level. If the C/I margin is negative, then the interference power is higher than the interference objective level and the additional protection needed is equal to the absolute value of the C/I margin. The analysis is carried out for two arbitrarily chosen objective interference levels which are the levels that would degrade the carrier-to-noise ratio by 0.5 dB and 1.0 dB. It has been assumed here that the characteristics of the interference is white noise like and would add to the system thermal noise on a power basis. In other words, C/(N+I) - C/N = 0.5 or 1.0 dB, thus, C/I - C/N = 9 or 6 dB, respectively. This means the objective C/I value is 9 or 6 dB higher than the link carrier-to-thermal noise ratio for 0.5 or 1.0 dB C/N degradation interference objective.

In the case of the interference between LEO/MSS and terrestrial microwave systems, we reference to the I/N ratio as our interference objectives, which is more convenient, since terrestrial microwave systems could have a variety of C/N ratios. The I/N ratio is directly related to the C/N and C/I, in that C/N - C/I = I/N, where all units are in dB. Consequently, the I/N objective will be identical to the interference objective discussed above. For the case of interference into FPLMTS system, the interference is translated to the reduction in the effective range between the FPLMTS terminal and its base station.

This study will provide a first cut interference analysis between the targeted LEO/MSS systems and the GSO/MSS systems as well as the fixed systems and FPLMTS. The objective of the study is first to provide an indication to the degree of spectrum compatibility of incompatibility of the various systems. Once this is accomplished, technical means for reducing the potential incompatibility are explored to decide whether or not the brute force spectrum segmentation can be avoided. Co-frequency and co-coverage area operation mode will be considered in the study. Frequency interleaving is not considered due to the high speed of the LEO

satellite resulting in relatively large Doppler shift (about 35kHz at L-band). Thus, interleaving would result in inefficient use of spectrum, which certainly not in line with the principles of this study, since guard bands of many times the bandwidth of typical GSO/MSS voice carriers are required. In addition, the IRIDIUM system utilizes wideband digital signals which leave little room for interleaving.

# CHAPTER 5

# ANALYSIS OF INTERFERENCE BETWEEN LEO/MSS AND GSO/MSS

## 5.1 GSO/MSS Systems Characteristics

This section describes the characteristics of the GSO MSS systems to be addressed in this study namely MSAT, INMARSAT II and III, ZENON and EUTELSAT. The information given in this section are obtained mostly from ITU filings and some from open literature. Only systems characteristics and parameters which are deemed to be related to this study will be presented.

### 5.1.1 MSAT

The MSAT system consists of two satellites, the first one is scheduled for launch in mid-1994, to be placed in the geostationary orbit at 106.5° W. It will provide communications services to land, marine and aeronautical mobile terminals operating at L-band with backhaul in the 11/13 GHz frequency bands.

The target service area for the MSAT system includes the land mass of Canada, U.S. continent, Alaska, Puerto Rico and the Hawaiian islands, Mexico including the 200 nautical mile off-shore areas. Figure 5.1 shows the beams configuration for the MSAT system at L-band.

MSAT system uses 1.6315-1.6455 GHz and 1.6465-1.6605 GHz frequency bands for its reverse uplink (i.e. from mobile to satellite) and 1.530-1.544 GHz and 1.545-1.559 GHz bands for its forward downlink (i.e. from satellite to mobile). The mobile terminal antenna pattern is hemispherical and has maximum gain ranging from 3 dBi to 10 dBi. Table 5.1 shows the link budget for various MSAT carriers.

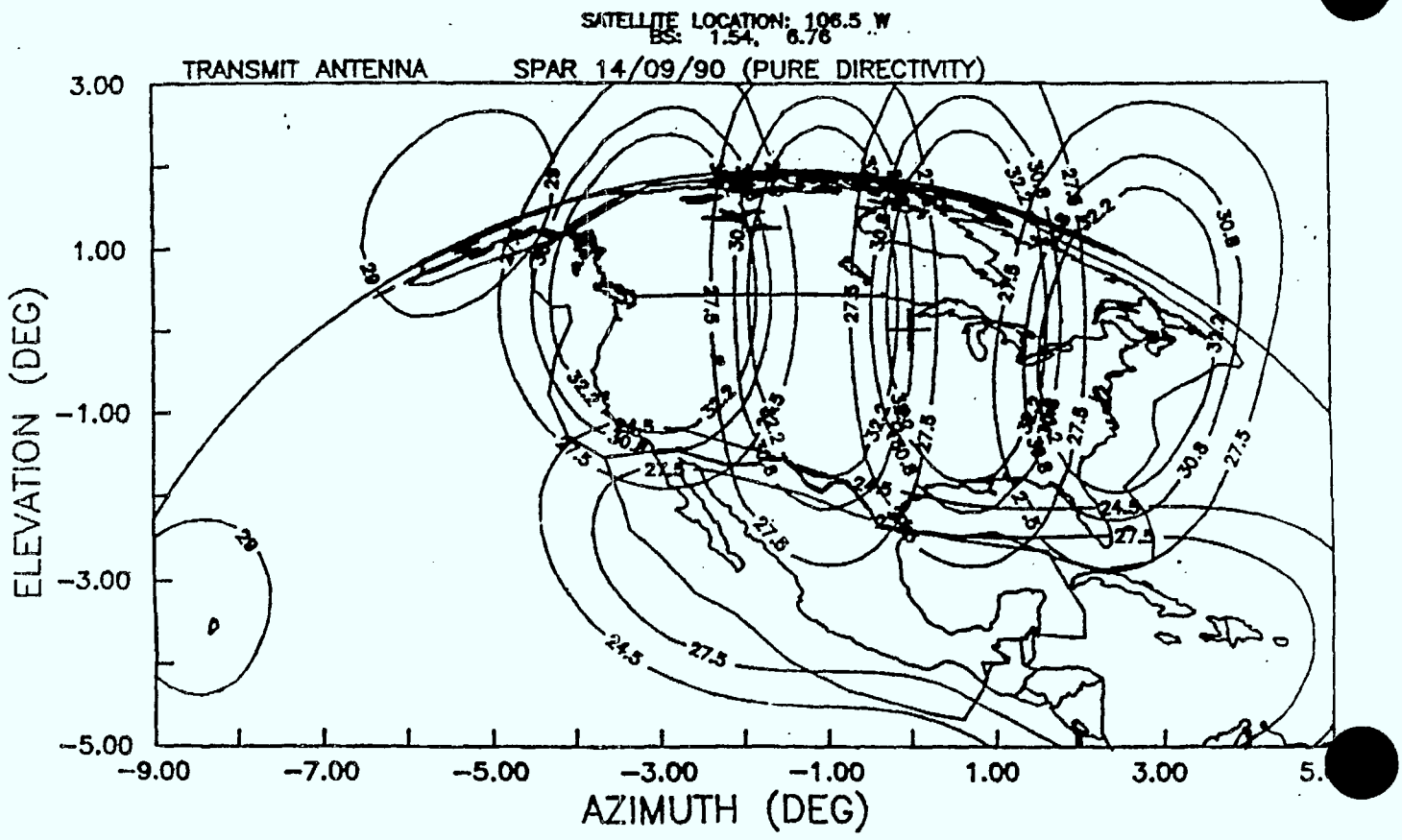



**Figure 5.1 MSAT L-Band Beam Configuration**

| LINK BUDGET FOR MSAT AT L-BAND | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Carrier: | Marine V Ship | Marine V Boat | Marine D 1.2 HG | Marine D 1.2 LG | Land V | Land D 1.2 | Land D 600 | Land D 300 | Aero MRS Com. | Aero MRS Private | Aero MTS Com. | Aero MTS Private | Aero 4.8 Com. | Aero 4.8 Private |
| REVERSE UPLINK | | | | | | | | | | | | | | |
| Up Power (dbW) | 6.2 | 3.5 | 3.0 | -1.7 | 8.2 | 1.3 | -1.7 | -4.7 | 6.2 | 3.5 | 6.2 | 3.5 | 6.2 | 3.5 |
| ES Tx G (dBi) | 8.0 | 8.0 | 8.0 | 3.0 | 8.0 | 3.0 | 3.0 | 3.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| Up EIRP (dBW) | 14.2 | 11.5 | 11.0 | 1.3 | 16.2 | 4.3 | 1.3 | -1.7 | 14.2 | 11.5 | 14.2 | 11.5 | 14.2 | 11.5 |
| Bandwidth (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| EOC Sat Rx Gain (dBi) * | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 |
| Sat Rx Noise Temp. (K) | 660.0 | 660.0 | 660.0 | 660.0 | 660.0 | 660.0 | 660.0 | 660.0 | 660.0 | 660.0 | 660.0 | 660.0 | 660.0 | 660.0 |
| Sat G/T (dBi/K) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Up Freq (GHz) | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 |
| Range (km) | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 |
| Path Loss (dB) | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 |
| **(C/N)up (dB)** | **23.3** | **20.6** | **23.7** | **14.0** | **25.3** | **17.0** | **17.0** | **17.0** | **23.3** | **20.6** | **23.3** | **20.6** | **20.8** | **18.1** |
| FORWARD DOWNLINK | | | | | | | | | | | | | | |
| Dn Power (dBW) | -4.9 | -4.9 | -5.3 | -5.3 | 0.1 | -4.9 | -7.9 | -10.9 | -3.9 | -3.9 | -1.9 | -1.9 | -5.3 | -5.3 |
| EOC Sat Tx Gain (dBi) * | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 | 32.2 |
| Dn EIRP (dBW) | 27.3 | 27.3 | 26.9 | 26.9 | 32.3 | 27.3 | 24.3 | 21.3 | 28.3 | 28.3 | 30.3 | 30.3 | 26.9 | 26.9 |
| Bandwidth (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| ES Rx Gain (dBi) | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 3.0 | 3.0 | 3.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| ES Rx Noise Temp. (K) | 315.0 | 315.0 | 315.0 | 315.0 | 315.0 | 350.0 | 350.0 | 350.0 | 315.0 | 315.0 | 315.0 | 315.0 | 315.0 | 315.0 |
| ES G/T (dBi/K) | -15.0 | -15.0 | -15.0 | -15.0 | -15.0 | -22.4 | -22.4 | -22.4 | -15.0 | -15.0 | -15.0 | -15.0 | -15.0 | -15.0 |
| Dn Freq (GHz) | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 |
| Range (km) | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 |
| Path Loss (dB) | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 |
| **(C/N)dn (dB)** | **18.0** | **18.0** | **21.1** | **21.1** | **23.0** | **14.1** | **14.1** | **14.1** | **19.0** | **19.0** | **21.0** | **21.0** | **15.1** | **15.1** |

* The gain figures are for beams covering Canada and continental U.S.
For beams covering Alaska, Mexicocentral America and Hawaiian Islands, the gain is 3 dB lower.

**TABLE 5.1:** L-band Link Budget for MSAT System

### 5.1.2 INMARSAT

The INMARSAT Mobile-Satellite System is a network of geostationary satellites which provide mobile-satellite services and navigation services in the Atlantic, Indian and Pacific oceans and coastal regions. Nominally, there are four satellites; 2 for the Atlantic and one each for the Pacific and Indian Ocean Regions. The satellites have the capability at 1.5/1.6 GHz to provide commercial, international land, public correspondence and aeronautical mobile services as well as, distress and safety operations and navigation. Feeder links and TT&C operations are provided at C-band.

The INMARSAT second generation systems have only global beam coverage capability whereas the third generation systems have both global beam and spot beam coverage capability. Figures 5.2 and 5.3 show typical global and spot beam coverages at L-band over the Atlantic Ocean region, respectively.

A multitude of earth terminal antennas are employed by the INMARSAT systems ranging from 6° 3dB beamwidth antenna for ship earth stations to near isotropic antenna for Standard C terminals. The earth terminal antenna characteristics will be discussed later.

INMARSAT system uses L-band on the downlink for forward link (1530 to 1559 MHz for INMARSAT III) and on the uplink for reverse link (1626.5 to 1660.5 MHz for INMARSAT III). Tables 5.2 to 5.5 provide the L-band link budgets of various carrier types of this system for both global beam and spot beam and for the maximum and minimum EIRP values. Additional transmission parameters are shown in Table 5.6. The link budgets were derived based on information obtained from the CCIR document IWP/4/1-1619 contributed by INMARSAT.

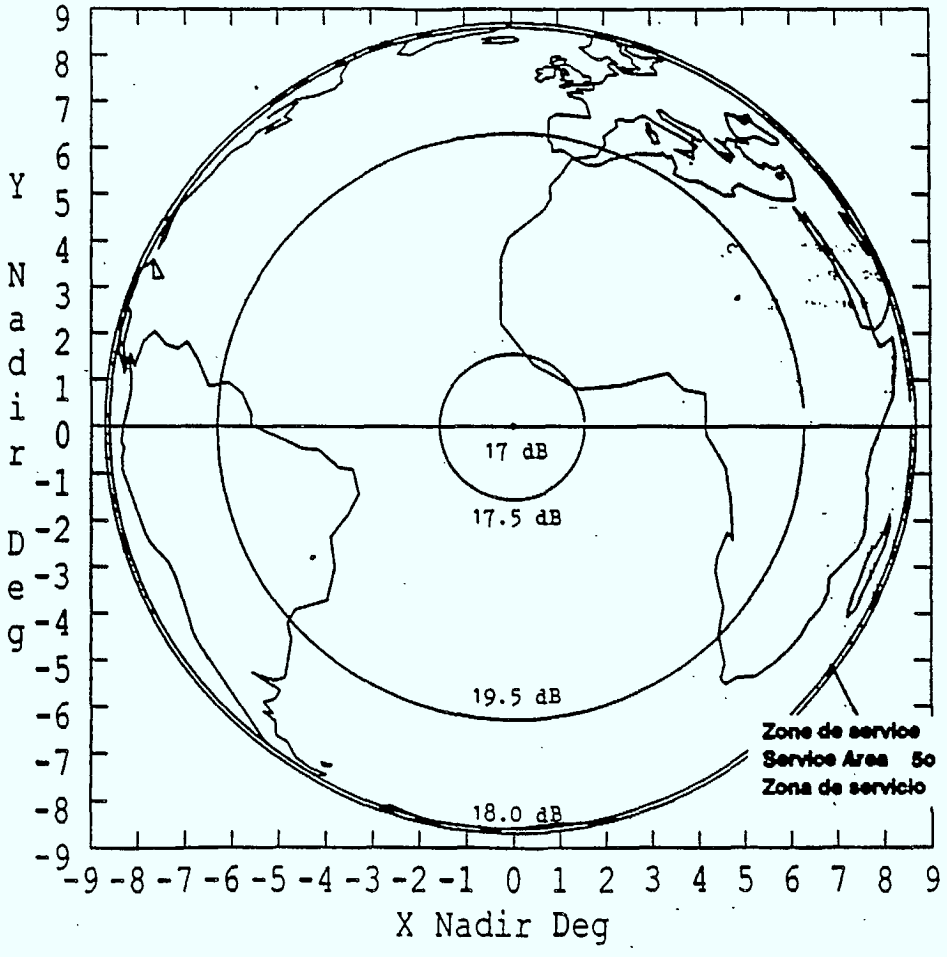



**Figure 5.2 INMARSAT L-Band Global Beam Coverage**

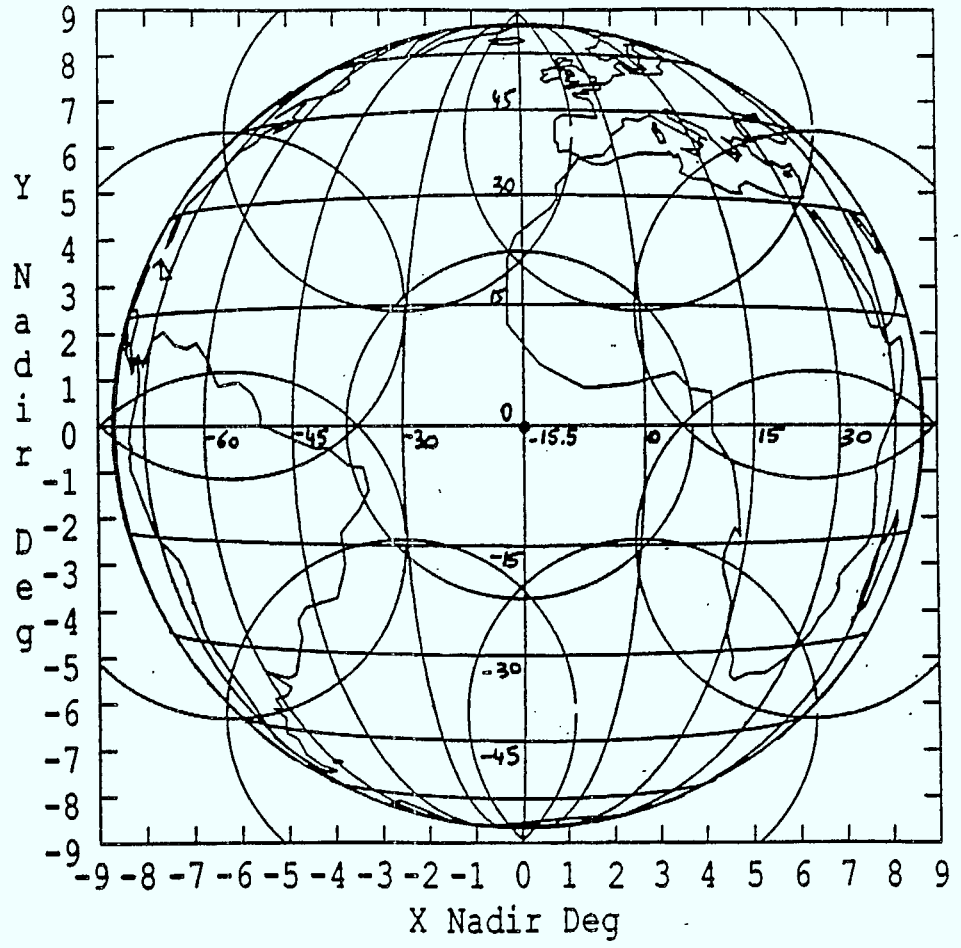



**Figure 5.3 INMARSAT L-Band Spot Beam Coverage**

| LINK BUDGET FOR INMARSAT SYSTEM AT L-BAND | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GLOBAL BEAM, MAXIMUM EIRP | | | | | | | | | | | | | | | | | | | | |
| | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-M L | INM-M L | INM-M L | AERO H | AERO L | AERO H | AERO H | AERO H | AERO H | INM-C |
| Carrier: | VOICE | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| REVERSE UPLINK | | | | | | | | | | | | | | | | | | | | | |
| Up Power (dbW) | 15.0 | 15.0 | 21.0 | 29.5 | 29.5 | 12.0 | 12.0 | 12.0 | 15.0 | 15.0 | 15.0 | 13.0 | 13.0 | 13.0 | 9.9 | 9.3 | 0.3 | 3.3 | 5.3 | 8.7 | 7.8 |
| ES Tx G (dBi) | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 |
| Up EIRP (dBW) | 36.0 | 36.0 | 42.0 | 50.5 | 50.5 | 33.0 | 33.0 | 33.0 | 30.0 | 30.0 | 30.0 | 28.0 | 28.0 | 28.0 | 24.9 | 12.3 | 15.3 | 18.3 | 20.3 | 23.7 | 10.8 |
| Bandwidth (kHz) | 28.00 | 5.76 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| EOC Sat Rx Gain (dBi) | 16.0 | 16.0 | 16.0 | 16.0 | 16.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 16.0 |
| Sat Rx Noise Temp. (K) | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 |
| Sat G/T (dBi/K) | -11.4 | -11.4 | -11.4 | -11.4 | -11.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -11.4 |
| Up Freq (GHz) | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 |
| Range (km) | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 |
| Path Loss (dB) | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 |
| **(C/N)up (dB)** | **20.0** | **26.9** | **22.2** | **18.3** | **19.3** | **22.9** | **22.9** | **22.9** | **24.7** | **24.7** | **25.9** | **22.7** | **22.7** | **23.9** | **15.4** | **15.2** | **15.2** | **15.2** | **17.2** | **17.2** | **10.7** |
| FORWARD DOWNLINK | | | | | | | | | | | | | | | | | | | | | |
| Dn Power (dBW) | 10.4 | 1.5 | 16.4 | 24.9 | 24.9 | 2.8 | 2.1 | -3.7 | 3.8 | 3.0 | 2.2 | 5.8 | 5.0 | 4.2 | 7.4 | 7.8 | -2.2 | 0.8 | 2.8 | 6.2 | 7.3 |
| EOC Sat Tx Gain (dBi) | 17.0 | 17.0 | 17.0 | 17.0 | 17.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 16.0 | 18.0 | 16.0 | 18.0 | 18.0 | 17.0 |
| Dn EIRP (dBW) | 27.4 | 18.5 | 33.4 | 41.9 | 41.9 | 20.8 | 20.1 | 14.3 | 21.8 | 21.0 | 20.2 | 23.8 | 23.0 | 22.2 | 25.4 | 25.8 | 15.8 | 18.8 | 20.8 | 24.2 | 24.3 |
| Bandwidth (kHz) | 28.00 | 1.44 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| ES Rx Gain (dBi) | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 |
| ES Rx Noise Temp. (K) | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 |
| ES G/T (dBi/K) | -4.4 | -4.4 | -4.4 | -4.4 | -4.4 | -4.4 | -4.4 | -4.4 | -10.4 | -10.4 | -10.4 | -10.4 | -10.4 | -10.4 | -10.4 | -22.4 | -10.4 | -10.4 | -10.4 | -10.4 | -22.4 |
| Dn Freq (GHz) | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 |
| Range (km) | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 |
| Path Loss (dB) | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 |
| **(C/N)dn (dB)** | **18.9** | **22.9** | **21.1** | **18.2** | **18.2** | **15.2** | **14.5** | **11.7** | **15.0** | **14.2** | **11.6** | **17.0** | **16.2** | **13.6** | **14.4** | **15.2** | **14.2** | **14.2** | **16.2** | **16.2** | **13.7** |

**TABLE 5.2:** Link Budget for INMARSAT's Global Beam, Maximum EIRP Carriers At L-band

| LINK BUDGET FOR INMARSAT SYSTEM AT L-BAND | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GLOBAL BEAM, MINIMUM EIRP | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-M L | INM-M L | INM-M L | AERO H | AERO L | AERO H | AERO H | AERO H | AERO H | INM-C |
| Carrier: | VOICE | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| | | | | | | | | | | | | | | | | | | | | | |
| REVERSE UPLINK | | | | | | | | | | | | | | | | | | | | | |
| Up Power (dbW) | 15.0 | 15.0 | 21.0 | 29.5 | 29.5 | 8.4 | 7.7 | 7.7 | 7.5 | 6.7 | 1.9 | 7.5 | 6.7 | 1.9 | -3.5 | -4.1 | -13.1 | -10.1 | -8.1 | -4.7 | 7.5 |
| ES Tx G (dBi) | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 |
| Up EIRP (dBW) | 36.0 | 36.0 | 42.0 | 50.5 | 50.5 | 29.4 | 28.7 | 28.7 | 22.5 | 21.7 | 16.9 | 22.5 | 21.7 | 16.9 | 11.5 | -1.1 | 1.9 | 4.9 | 6.9 | 10.3 | 10.5 |
| Bandwidth (kHz) | 28.00 | 5.76 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| EOC Sat Rx Gain (dBi) | 16.0 | 16.0 | 16.0 | 16.0 | 16.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | 16.0 |
| Sat Rx Noise Temp. (K) | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 |
| Sat G/T (dBi/K) | -11.4 | -11.4 | -11.4 | -11.4 | -11.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -8.4 | -11.4 |
| Up Freq (GHz) | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 |
| Range (km) | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 |
| Path Loss (dB) | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 |
| **(C/N)up (dB)** | **20.0** | **26.9** | **22.2** | **18.3** | **18.3** | **19.3** | **18.6** | **18.6** | **17.2** | **16.4** | **12.8** | **17.2** | **16.4** | **12.8** | **2.0** | **1.8** | **1.8** | **1.8** | **3.8** | **3.8** | **10.4** |
| | | | | | | | | | | | | | | | | | | | | | |
| FORWARD DOWNLINK | | | | | | | | | | | | | | | | | | | | | |
| Dn Power (dBW) | 5.9 | -3.0 | 11.9 | 20.4 | 20.4 | -5.7 | -8.4 | -12.2 | -4.7 | -5.5 | -6.3 | -2.7 | -3.5 | -4.3 | -2.9 | -2.5 | -12.5 | -9.5 | -7.5 | -4.1 | 2.8 |
| EOC Sat Tx Gain (dBi) | 17.0 | 17.0 | 17.0 | 17.0 | 17.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | 17.0 |
| Dn EIRP (dBW) | 22.9 | 14.0 | 28.9 | 37.4 | 37.4 | 12.3 | 11.6 | 5.8 | 13.3 | 12.5 | 11.7 | 15.3 | 14.5 | 13.7 | 15.1 | 15.5 | 5.5 | 8.5 | 10.5 | 13.9 | 19.8 |
| Bandwidth (kHz) | 28.00 | 1.44 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| ES Rx Gain (dBi) | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 |
| ES Rx Noise Temp. (K) | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 |
| ES G/T (dBi/K) | -4.4 | -4.4 | -4.4 | -4.4 | -4.4 | -4.4 | -4.4 | -4.4 | -10.4 | -10.4 | -10.4 | -10.4 | -10.4 | -10.4 | -10.4 | -22.4 | -10.4 | -10.4 | -10.4 | -10.4 | -22.4 |
| Dn Freq (GHz) | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 |
| Range (km) | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 |
| Path Loss (dB) | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 |
| **(C/N)dn (dB)** | **14.4** | **18.4** | **16.6** | **13.7** | **13.7** | **6.7** | **6.0** | **3.2** | **6.5** | **5.7** | **3.1** | **8.5** | **7.7** | **5.1** | **4.1** | **4.9** | **3.9** | **3.9** | **5.9** | **5.9** | **9.2** |

**TABLE 5.3:** Link Budget for INMARSAT's Global Beam, Mimimum EIRP Carriers At L-band

| LINK BUDGET FOR INMARSAT SYSTEM AT L-BAND | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPOT BEAM, MAXIMUM EIRP | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-M L | INM-M L | INM-M L | AERO H | AERO L | AERO H | AERO H | AERO H | AERO H | INM-C |
| Carrier: | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| | | | | | | | | | | | | | | | | |
| REVERSE UPLINK | | | | | | | | | | | | | | | | |
| Up Power (dbW) | 8.0 | 8.0 | 12.0 | 9.0 | 9.0 | 15.0 | 7.0 | 7.0 | 13.0 | 3.0 | 2.4 | -6.6 | -3.6 | -1.5 | 1.9 | 7.5 |
| ES Tx G (dBi) | 21.0 | 21.0 | 21.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 |
| Up EIRP (dBW) | 29.0 | 29.0 | 33.0 | 24.0 | 24.0 | 30.0 | 22.0 | 22.0 | 28.0 | 18.0 | 5.4 | 8.4 | 11.4 | 13.5 | 16.9 | 10.5 |
| Bandwidth (kHz) | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| EOC Sat Rx Gain (dBi) | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 23.0 |
| Sat Rx Noise Temp. (K) | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 |
| Sat G/T (dBi/K) | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -4.4 |
| Up Freq (GHz) | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 |
| Range (km) | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 |
| Path Loss (dB) | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 |
| **(C/N)up (dB)** | **26.9** | **26.9** | **30.9** | **26.7** | **26.7** | **33.9** | **24.7** | **24.7** | **31.9** | **16.5** | **16.3** | **16.3** | **16.3** | **18.4** | **18.4** | **17.4** |
| | | | | | | | | | | | | | | | | |
| FORWARD DOWNLINK | | | | | | | | | | | | | | | | |
| Dn Power (dBW) | -3.2 | -4.0 | -9.9 | -2.4 | -3.2 | -4.1 | -0.4 | -3.2 | -2.1 | 1.2 | 1.5 | -8.4 | -5.4 | -3.3 | 0.1 | 4.0 |
| EOC Sat Tx Gain (dBi) | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 23.0 |
| Dn EIRP (dBW) | 23.8 | 23.0 | 17.1 | 24.6 | 23.8 | 22.9 | 26.6 | 23.8 | 24.9 | 28.2 | 28.5 | 18.6 | 21.6 | 23.7 | 27.1 | 27.0 |
| Bandwidth (kHz) | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| ES Rx Gain (dBi) | 21.0 | 21.0 | 21.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 |
| ES Rx Noise Temp. (K) | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 |
| ES G/T (dBi/K) | -4.4 | -4.4 | -4.4 | -10.4 | -10.4 | -10.4 | -10.4 | -10.4 | -10.4 | -10.4 | -22.4 | -10.4 | -10.4 | -10.4 | -10.4 | -22.4 |
| Dn Freq (GHz) | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 |
| Range (km) | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 |
| Path Loss (dB) | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 |
| **(C/N)dn (dB)** | **18.2** | **17.4** | **14.5** | **17.8** | **17.0** | **14.3** | **19.8** | **17.0** | **16.3** | **17.2** | **17.9** | **17.0** | **17.0** | **19.1** | **19.1** | **16.4** |

**TABLE 5.4:** Link Budget for INMARSAT's Spot Beam, Maximum EIRP Carriers At L-band

| LINK BUDGET FOR INMARSAT SYSTEM AT L-BAND | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SPOT BEAM, MINIMUM EIRP | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-M L | INM-M L | INM-M L | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
| Carrier: | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| | | | | | | | | | | | | | | | | |
| REVERSE UPLINK | | | | | | | | | | | | | | | | |
| Up Power (dbW) | 0.4 | -0.4 | -0.4 | -0.6 | -1.5 | -6.4 | -0.6 | -1.5 | -6.4 | -11.5 | -12.1 | -21.1 | -18.1 | -16.0 | -12.6 | 0.9 |
| ES Tx G (dBi) | 21.0 | 21.0 | 21.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 |
| Up EIRP (dBW) | 21.4 | 20.6 | 20.6 | 14.4 | 13.5 | 8.6 | 14.4 | 13.5 | 8.6 | 3.5 | -9.1 | -6.1 | -3.1 | -1.0 | 2.4 | 3.9 |
| Bandwidth (kHz) | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| EOC Sat Rx Gain (dBi) | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 23.0 |
| Sat Rx Noise Temp. (K) | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 |
| Sat G/T (dBi/K) | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -4.4 |
| Up Freq (GHz) | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 |
| Range (km) | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 |
| Path Loss (dB) | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 |
| **(C/N)up (dB)** | **19.3** | **18.5** | **18.5** | **17.1** | **16.2** | **12.5** | **17.1** | **16.2** | **12.5** | **2.0** | **1.8** | **1.8** | **1.8** | **3.9** | **3.9** | **10.8** |
| | | | | | | | | | | | | | | | | |
| FORWARD DOWNLINK | | | | | | | | | | | | | | | | |
| Dn Power (dBW) | -13.2 | -14.0 | -19.9 | -12.4 | -13.2 | -14.1 | -10.4 | -11.2 | -12.1 | -11.2 | -10.9 | -20.8 | -17.8 | -15.7 | -12.3 | -3.0 |
| EOC Sat Tx Gain (dBi) | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 23.0 |
| Dn EIRP (dBW) | 13.8 | 13.0 | 7.1 | 14.6 | 13.8 | 12.9 | 16.6 | 15.8 | 14.9 | 15.8 | 16.1 | 6.2 | 9.2 | 11.3 | 14.7 | 20.0 |
| Bandwidth (kHz) | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| ES Rx Gain (dBi) | 21.0 | 21.0 | 21.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 | 15.0 | 15.0 | 15.0 | 15.0 | 3.0 |
| ES Rx Noise Temp. (K) | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 | 350.0 |
| ES G/T (dBi/K) | -4.4 | -4.4 | -4.4 | -10.4 | -10.4 | -10.4 | -10.4 | -10.4 | -10.4 | -10.4 | -22.4 | -10.4 | -10.4 | -10.4 | -10.4 | -22.4 |
| Dn Freq (GHz) | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 |
| Range (km) | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 |
| Path Loss (dB) | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 |
| **(C/N)dn (dB)** | **8.2** | **7.4** | **4.5** | **7.8** | **7.0** | **4.3** | **9.8** | **9.0** | **6.3** | **4.8** | **5.5** | **4.6** | **4.6** | **6.7** | **6.7** | **9.4** |

**TABLE 5.5:** Link Budget for INMARSAT's Spot Beam, Mimimum EIRP Carriers At L-band

| Carrier (dB) | Bit Rate (kbps) Required | FEC Rate | Mod-ulation | Occ BW (kHz) | Alloc BW (kHz) | C/No |
|---|---|---|---|---|---|---|
| INM-A V | 12 | | FM | 28.0 | 50.0 | 53.0 |
| INM-A TDMF | 1.2 | 1/2 | BPSK | 1.44 | 50.0 | 43.5 |
| INM-A TDMR | 4.8 | 1/2 | BPSK | 5.76 | 50.0 | 48.6 |
| INM-A HSD | 112.0 | 1/2 | QPSK | 67.2 | 100.0 | 58.5 |
| INM-A VHSD | 1536.0 | 1/2 | QPSK | 921.6 | 1100.0 | 67.0 |
| INM-A CTV | 1536.0 | 1/2 | QPSK | 921.6 | 1100.0 | 67.0 |
| INM-B V | 24.0 | 3/4 | OQPSK | 14.4 | 20.0 | 45.9 |
| INM-B D | 24.0 | 1/2 | OQPSK | 14.4 | 20.0 | 45.2 |
| INM-B TDMF | 6.0 | 1/2 | BPSK | 7.2 | 20.0 | 39.4 |
| INM-B TDMR | 24.0 | 1/2 | OQPSK | 14.4 | 20.0 | 45.2 |
| INM-M V | 8.0 | | OQPSK | 4.8 | 10.0 | 41.0 |
| INM-M D | 8.0 | 3/4 | OQPSK | 4.8 | 10.0 | 40.2 |
| INM-M TDMF | 6.0 | 1/2 | BPSK | 7.2 | 10.0 | 39.4 |
| INM-M TDMR | 3.0 | 1/2 | BPSK | 3.6 | 10.0 | 35.4 |
| INM-M L V | 8.0 | | OQPSK | 4.8 | 10.0 | 41.0 |
| INM-M L D | 8.0 | 3/4 | OQPSK | 4.8 | 10.0 | 40.2 |
| INM-M L TDMF | 6.0 | 1/2 | BPSK | 7.2 | 10.0 | 39.4 |
| INM-M L TDMR | 3.0 | 1/2 | BPSK | 3.6 | 10.0 | 35.4 |
| AEROH V | 21.0 | 1/2 | OQPSK | 12.6 | 17.5 | 44.4 |
| AEROL D1 | 0.6 | 1/2 | BPSK | 0.72 | 2.5 | 31.8 |
| AEROH D2 | 1.2 | 1/2 | BPSK | 1.44 | 2.5 | 34.8 |
| AEROH D3 | 2.4 | 1/2 | BPSK | 2.88 | 5.0 | 37.8 |
| AEROH D4 | 4.8 | 1/2 | OQPSK | 2.88 | 5.0 | 39.8 |
| AEROH D5 | 10.5 | 1/2 | OQPSK | 6.3 | 10.0 | 43.2 |
| INM-C D | 0.6 | 1/2 | BPSK | 0.72 | 5.0 | 32.3 |

**TABLE 5.6**: Transmission Parameters for INMARSAT 2 and 3

### 5.1.3 ZENON

The ZENON systems were filed by the French Administration in 1987. This system comprises of three satellite networks, ZENON-A, ZENON-B and ZENON-C located at geostationary longitude of 8°W, 15°W and 19°W, respectively. The ZENON satellite networks are intended to provide aeronautical mobile services.

ZENON systems employ spot beam over its intended service area which is mainly Europe. Figure 5.4 shows the L-band coverage pattern. Like the INMARSAT systems, ZENON uses various types of mobile terminal antennas whose patterns are shown in Figure 5.5.

The network will use the 1.545-1.559 and 1.6465-1.6605 GHz frequency bands for its downlink and uplink with the aeronautical mobile stations, respectively, and the 11/14 GHz frequency band for the feeder links. Telemetry and command carriers may be transmitted in the bands 12/14 GHz or 2 GHz.

The maximum satellite transmit power spectral density is -41.7 dBW/Hz at 1.5 GHz and -42.0 dBW/Hz at 2 GHz and the maximum earth station transmit power spectral densities at 1.6 GHz ranging from -42.9 dBW/Hz to -35.9 dBW/Hz depending on the terminal type. L-band link budgets for various mobile terminals of the ZENON system is given in Table 5.7.

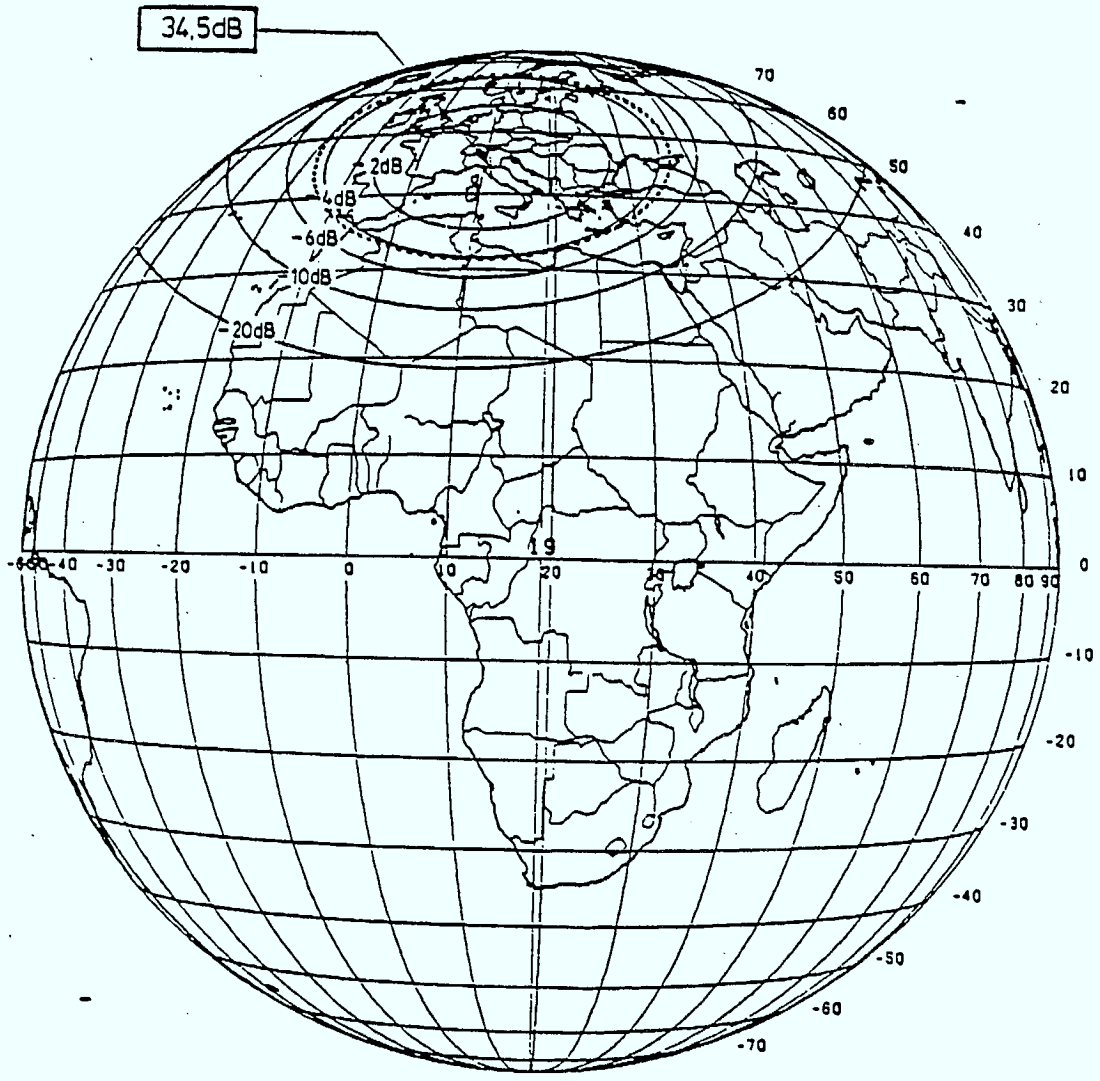
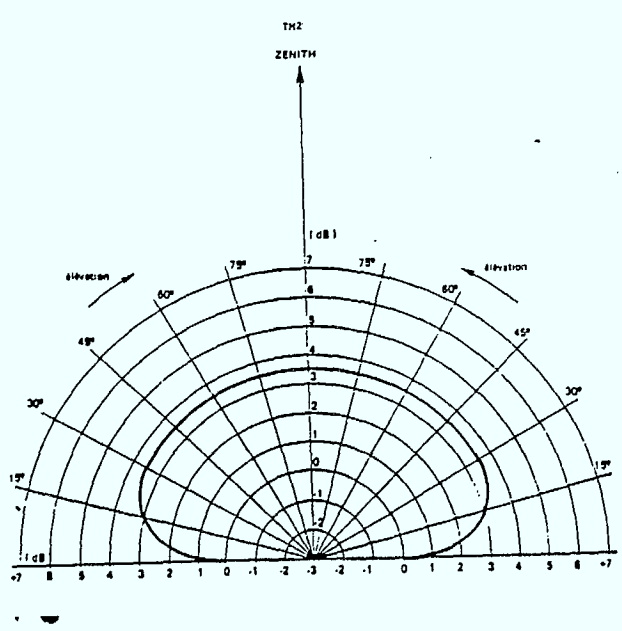
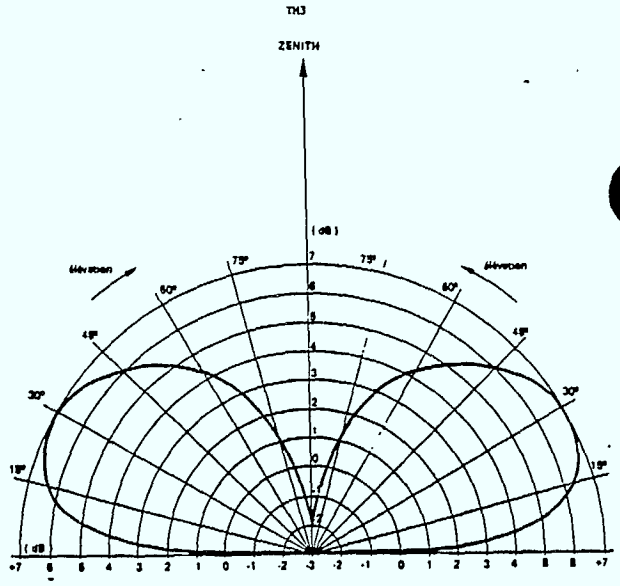
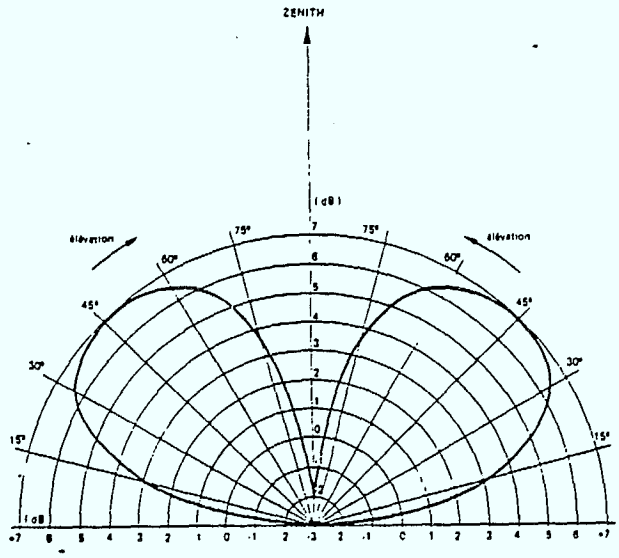
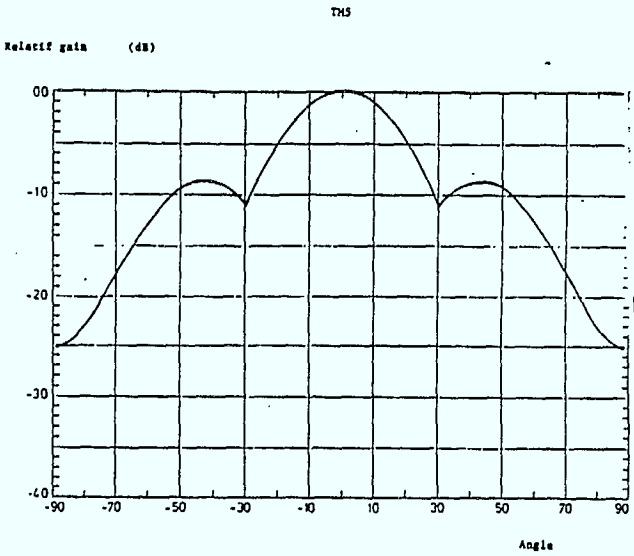



**Figure 5.4 ZENON L-Band Beam Coverage**



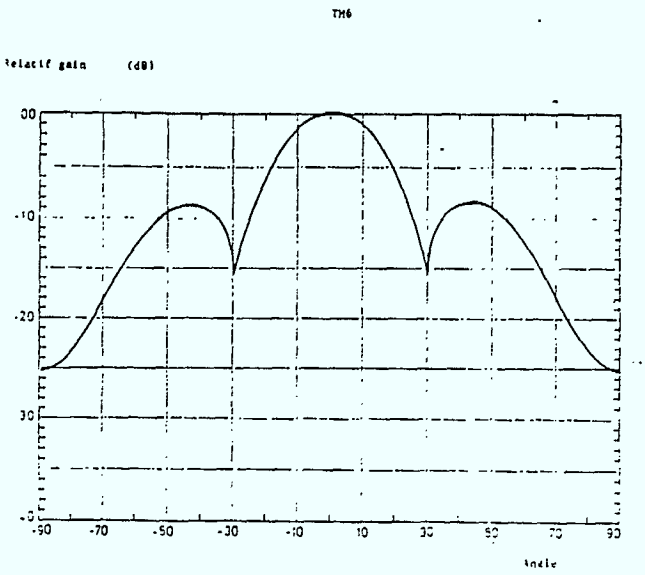




**Figure 5.5**
**Earth Station Antenna Patterns for ZENON Systems**

| L-BAND LINK BUDGET FOR ZENON SYSTEMS | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Earth Station: | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
| | | | | | | |
| REVERSE UPLINK | | | | | | |
| Up Power (dBW) | -42.9 | -44.9 | -45.5 | -33.4 | -33.9 | -35.9 |
| ES Tx G (dBi) | 0.0 | 3.5 | 7.0 | 7.0 | 10.0 | 12.0 |
| Up EIRP (dBW) | -42.9 | -41.4 | -38.5 | -26.4 | -23.9 | -23.9 |
| Bandwidth (kHz) | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| EOC Sat Rx Gain (dBi) | 31.5 | 31.5 | 31.5 | 31.5 | 31.5 | 31.5 |
| Sat Rx Noise Temp. (K) | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 | 550.0 |
| Sat G/T (dBi/K) | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 |
| Up Freq (GHz) | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 | 1.640 |
| Range (km) | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 |
| Path Loss (dB) | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 | 188.7 |
| **(C/N)up (dB)** | **1.1** | **2.6** | **5.5** | **17.6** | **20.1** | **20.1** |
| | | | | | | |
| FORWARD DOWNLINK | | | | | | |
| Dn Power (dBW) | -41.7 | -41.7 | -41.7 | -41.7 | -41.7 | -41.7 |
| EOC Sat Tx Gain (dBi) | 34.5 | 34.5 | 34.5 | 34.5 | 34.5 | 34.5 |
| Dn EIRP (dBW) | -7.2 | -7.2 | -7.2 | -7.2 | -7.2 | -7.2 |
| Bandwidth (kHz) | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |
| ES Rx Gain (dBi) | 0.0 | 3.5 | 7.0 | 7.0 | 10.0 | 12.0 |
| ES Rx Noise Temp. (K) | 500.0 | 350.0 | 320.0 | 300.0 | 300.0 | 300.0 |
| ES G/T (dBi/K) | -27.0 | -21.9 | -18.1 | -17.8 | -14.8 | -12.8 |
| Dn Freq (GHz) | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 | 1.540 |
| Range (km) | 39500 | 39500 | 39500 | 39500 | 39500 | 39500 |
| Path Loss (dB) | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 | 188.2 |
| **(C/N)dn** | **6.2** | **11.3** | **15.2** | **15.4** | **18.4** | **20.4** |

**TABLE 5.7**: L-band Link Budget for the ZENON System.

* Note: The uplink C/N for TM1, TM2, TM3 and the downlink C/N for TM1 seem to be extraordinary low for mobile environment at L-band using conventional modulation techniques. However, for the purposes of this study, it is assumed that the system can operate with these C/N values.

### 5.1.4 EUTELSAT II

The European Telecommunications Satellite Organization EUTELSAT has filed to the ITU for its second generation satellites EUTELSAT II to provide a pan-Europe land mobile satellite services in the L-band in addition to the fixed services at Ku band.

EUTELSAT II's coverage area is over the European continent. Figure 5.6 shows the L-band coverage area. The system uses the frequency bands from 1.6265 to 1.6455 GHz and from 1.6565 to 1.6605 GHz for the uplink at L-band and the bands 1.530-1.544 GHz and 1.555-1.559 GHz for the downlink.

The maximum uplink power spectral density is -22 dBW/Hz at L-band and that for the downlink is -31 dBW/Hz. The mobile antenna pattern is hemispherical and the maximum antenna gain is 3 dBi. Table 5.8 shows the link budget for the EUTELSAT II system at L-band.

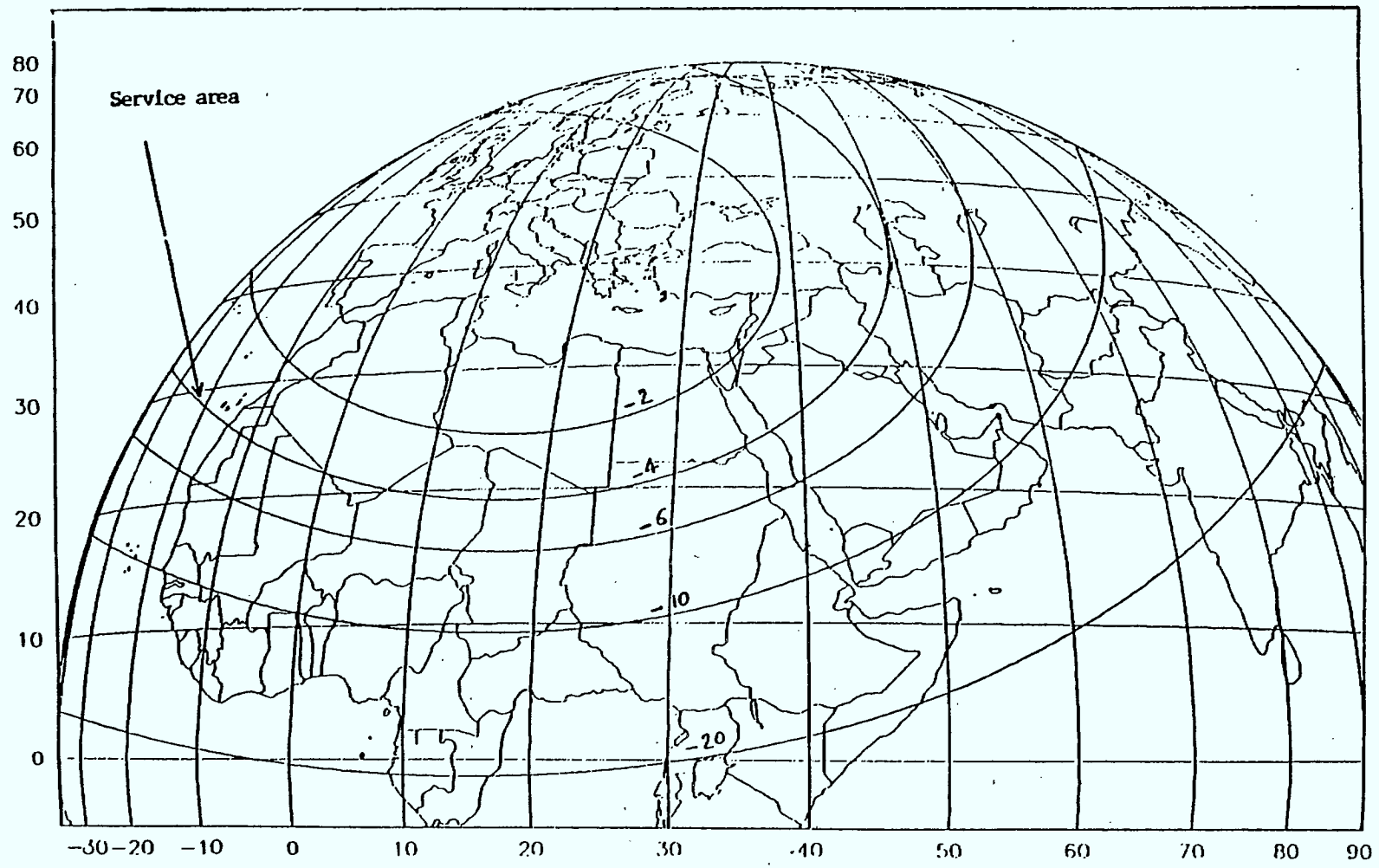



**Figure 5.6 EUTELSAT L-Band Beam Coverage**

| LINK BUDGET FOR EUTELSAT II SYSTEM AT L-BAND | |
|---|---|
| | |
| | |
| REVERSE UPLINK | |
| Up Power (dBW) | -22.0 |
| ES Tx G (dBi) | 3.0 |
| Up EIRP (dBW) | -19.0 |
| Bandwidth (kHz) | 0.001 |
| EOC Sat Rx Gain (dBi) | 24.0 |
| Sat Rx Noise Temp. (K) | 525.0 |
| Sat G/T (dBi/K) | -3.2 |
| Up Freq (GHz) | 1.640 |
| Range (km) | 39500 |
| Path Loss (dB) | 188.7 |
| **(C/N)up (dB)** | **17.7** |
| | |
| FORWARD DOWNLINK | |
| Dn Power (dBW) | -31.0 |
| EOC Sat Tx Gain (dBi) | 24.0 |
| Dn EIRP (dBW) | -7.0 |
| Bandwidth (kHz) | 0.001 |
| ES Rx Gain (dBi) | 3.0 |
| ES Rx Noise Temp. (K) | 350.0 |
| ES G/T (dBi/K) | -22.4 |
| Dn Freq (GHz) | 1.550 |
| Range (km) | 39500 |
| Path Loss (dB) | 188.2 |
| **(C/N)dn (dB)** | **10.9** |

**TABLE 5.8:** Link Budget for the EUTELSAT II System.at L-band.

## 5.2 Approach in Computing C/I

The approach taken in this study is to compute the so-called "aggregate, long-term time averaged carrier-to-interference ratio", denoted by $(C/I)_A$, and based on this C/I value it is determined that whether a LEO MSS system would cause harmful interference to an GSO MSS system or a fixed services system or vice versa. For ease of computing $(C/I)_A$ for various signals, antenna characteristics and geometrical arrangement of wanted and interference systems, it is broken up into four terms as shown in the expression below:

$$(C/I)_A = (C/I)_{1F} - 10\log(DF) - 10\log Q - 10\log(P) \quad \text{Eqn. 5.1}$$

where

$(C/I)_{1F}$ is the single entry, full power C/I. It is computed by the sum of the difference between the EIRP levels and the difference between the path losses of the wanted and interfering signals.

**DF** is a parameter called "discrimination factor" (abbreviated DF) which is the factor which account for the effects of antenna discrimination as well as the multiple interference entry if the interfering system employs frequency reuse (i.e. multiple interferors come from beams using the same frequency). This parameter is computed based on the orbital parameters and the beam patterns of the interfering and wanted systems, hence its value will be different for each interference scenarios. Exact evaluation of DF will be an impractical task as will be shown later. For the purpose of this study, it is reasonable just to approximate DF based on the principles of the equations for DF and the typical geometrical layout for each interference scenario.

**Q** is a parameter which takes into account the difference in bandwidths and spectrum characteristics of the wanted and interfering signals. Evaluation of this parameter can be an elaborated process in which the effects of wanted and interfering signal bandwidths, carrier frequency spacing, amplitude response of receiver

filter and the shape of the interferor spectrum are all taken into account. For the purpose of this study which is aiming at providing a first cut analysis of the sharing between LEO MSS and GSO MSS and fixed services systems, a simplified method is employed to determine the value of Q. It is assumed that the wanted filter is a brickwall filter with bandwidth equal to the occupied bandwidth of the signal; that the interfering signals are equally spaced by its allocated bandwidth; and that the spectral shape of the interfering signal is flat if the signal is not of FM type (e.g. BPSK, QPSK, ACSSB) , otherwise, the interfering signal is unmodulated. Base on these assumptions, Q is can be computed as below.

If the noise (or occupied) bandwidth of the wanted signal (WNBW) is greater than the allocated bandwidth of the interfering signal (IABW) then

$Q = (WNBW) / (IABW)$ for both FM and non-FM interferors

otherwise

$Q = (WNBW) / (INBW)$ for non-FM interferors
$Q = 1$ for FM interferors

INBW is the noise bandwidth of the interfering signal.

**P** is the fraction of the time that the interference exists. This factor would include the voice activity factor of 40% if the interfering signal is voice activated.

Eqn. 5.1 describes just the principle or approach that will be taken throughout this study. It may not be specific enough for reader to relate it to any particular interference scenarios. However, the next section will provide more information to how this equation is used.

## 5.3 Interference from LEO/MSS into GSO/MSS

This section addresses the potential interference mechanisms between the above LEO MSS systems and the GSO MSS systems. This section also formulates the "discrimination factor" (DF) and the "aggregate, long-term time averaged C/I" for each of the interfering scenarios. Cases for co-channel and overlapped coverage areas are discussed here.

### 5.3.1 IRIDIUM to GSO Satellite at 1.6 GHz

If the IRIDIUM uses the GSO's uplink band then the interference into GSO satellite receiver comes from both IRIDIUM satellites and mobile terminals. Base on the TDM signal shown in Figure 2.4 and ignoring the difference in propagation delay, there would be interference from IRIDIUM satellites for 4.3% of the time and from the mobile terminals for 9.7% of the time. At any given instant of time, the GSO satellite receives interference from either the IRIDIUM satellites or the mobiles due to the fact that the interfering signal is TDM. There would be no interference for the rest of the time because of the TDMA format and guard time of the IRIDIUM system.

The IRIDIUM mobile terminals have negligible discrimination toward the GSO satellite. Any mobile terminals which are within the coverage area of the GSO satellite, therefore, interfere with GSO satellite at near full power. Interference from mobiles away from the coverage area will be attenuated by the discrimination of the GSO satellite receive antenna. Let M be the number of mobile terminals that have visibility toward the GSO satellite and use the same frequency with the GSO satellite signal; and $G_{sr}(\theta i)$ be the relative gain (numeric value from 0.0 to 1.0) of the GSO satellite receive antenna toward to the i-th mobile terminal where $q_i$ is the off-axis angle. Then the discrimination factor which is defined as the equivalent number of interference entries can be computed by:

$$DF_{Im} = \sum_{i=1}^{M} G_{sr}(\theta i) \qquad \text{Eqn. 5.2}$$

Although Eqn. 5.2 was derived from the discussion of uplink interference from the IRIDIUM mobile terminals into a GSO satellite's receiver, it can be generalized for other cases. Exact evaluation of Eqn. 5.2 will be a impractical task since the value of $G_{sr}(\theta i)$ is dependent on the exact location of the mobile terminals. Furthermore, DF will be time varying since the interfering sources are moving around (the movement of the mobile terminals can be neglected but the movement of the LEO satellites would be much faster). For the purpose of this study, however, it is reasonable to just approximate DF based on the principles of the equations for DF and the typical geometrical layout for each interference scenario. Computation of DF for all interference scenario considered is given in Appendix A .

Base on a computer program at Telesat, the average number of satellites in the IRIDIUM constellation that are visible to a GSO satellite is 57. Not all of these satellites will cause the same level of interference to the GSO satellite since a large number of the IRIDIUM satellites will have their sidelobes and backlobes toward the GSO satellite, only a very few satellites will have the GSO satellite directly inside their main lobes. In addition, the GSO satellite's receive antenna has its own discrimination, too. Therefore, the discrimination factor in this case is:

$$DF_{Is} = \sum_{i=1}^{M} G_{It}(\phi i)\ G_{sr}(\theta i) \qquad \text{Eqn. 5.3}$$

where

| | |
|---|---|
| M | is the number of IRIDIUM beams illuminating the GSO satellite. |
| $G_{It}(\phi i)$ | is the relative gain of the i-th IRIDIUM satellite transmit antenna toward the GSO satellite. |
| $G_{sr}(\theta i)$ | is the relative gain of the GSO satellite receive antenna toward to the i-th IRIDIUM satellite. |

The aggregate, long-term time averaged uplink interference from the IRIDIUM system into a GSO satellite receiver can be computed as follows:

$$(C/I)_A = -10 \log [10^{-0.1(C/I)_{Is}} + 10^{-0.1(C/I)_{Im}}] \qquad \text{Eqn. 5.4}$$

where

$(C/I)_{Is} = (C/I)_{1FIs} - 10 \log (DF_{Is}) - 10 \log (Q_{Is}) - 10 \log (0.043)$ contains the interference contribution from the IRIDIUM satellites.

$(C/I)_{Im} = (C/I)_{1FIm} - 10 \log (DF_{Im}) - 10 \log (Q_{Im}) - 10 \log (0.097)$ contains the interference contribution from the IRIDIUM mobiles.

$(C/I)_{1FIs}$ and $(C/I)_{1FIm}$ are the single entry, full power C/I values for interference from IRIDIUM satellites and mobiles into GSO satellite.

$Q_{Is}$ and $Q_{Is}$ are to be computed base on the bandwidths of the wanted and interfering signals as described in Section 5.2.

### 5.3.2 IRIDIUM to GSO Mobile at 1.5 GHz

If the IRIDIUM system uses the GSO's downlink frequency band then the GSO system's mobile terminals would experience interference from the IRIDIUM satellites and mobile terminals. Due to the fact that each of the IRIDIUM cell is allocated only two out of 14 bursts per TDM frame, the GSO mobile terminals receives interference from IRIDIUM satellites for 4.3% of the time and from the IRIDIUM mobile terminals for 9.7% of the time and negligible or no interference for 86% of the time.

The discrimination factor for the interference from a IRIDIUM mobile terminal into a GSO mobile terminal is given by:

$10 \log (DF_{Im})$ = - Discrimination of GSO mobile antenna toward horizon.
= **0 dB** for isotropic antenna
= **-5 dB** for hemispherical antenna Eqn. 5.5

Since only one active IRIDIUM satellite is visible to the GSO mobile terminal at a time and in view of the IRIDIUM's septet structure for frequency reuse, the dominant source of interference from the IRIDIUM satellite is the beam illuminating the GSO mobile terminal. Other interferors are more than 2 beamwidths away and hence at

least 20 dB down in level based on the roll off characteristics of the IRIDIUM antenna pattern. Because almost all GSO mobile terminals have isotropic or hemispherical antenna patterns (probably the only exception is the ship earth station antenna in the INMARSAT systems whose 3 dB beamwidth is about 6°), the IRIDIUM satellite will remain in the main beam of the GSO mobile terminal antenna for some time despite its relative speed. This exposure of a few minutes is long enough to cause objectionable interference. Thus the discrimination factor for this case would be 1 (i.e. 0 dB):

$$10 \log (DF_{Is}) = 0 \text{ dB} \qquad \text{Eqn 5.6}$$

The aggregate, long-term time averaged downlink interference from the IRIDIUM system into a GSO mobile terminal can be computed using Eqn. 5.4 with the discrimination factors $DF_{Im}$ and $DF_{Is}$ given by Eqn. 5.5 and Eqn. 5.6.

### 5.3.3 OL System to GSO - Same Direction Mode:

If the ORBCOMM becomes a reality, it would not cause (or receive) any interference to (or from) the L-band GSO MSS systems since it uses the 148-149.9 MHz and 137-138 MHz frequency bands for its uplink and downlink, respectively. However, for the purpose of the interference study, we choose an ORBCOMM-type L-band (abbreviated OL) system for our analysis and from now on this system will be referred as OL system. It is assumed that the OL system has the same system characteristics as the ORBCOMM system, but would use the 1.5/1.6 GHz frequency band for its operation. In order to offset the reduction of received signal level due to the use of smaller receiving antenna aperture, it is assumed that the transmit power level given in Table 2.2 increased by 18 dB and the gain of the antennas increased by 1 dB. Since this system uses separate bands for its operation, interference from the OL system into GSO MSS hence occurs on both uplink and downlink. Two scenarios will be investigated in this study: same direction and reverse direction operation mode.

In this scenario, OL utilizes the 1.6 GHz band for its uplink and 1.5 GHz band for its downlink. Interference on the uplink into the GSO satellite receiver comes from the OL's portable and mobile terminals (called mobile terminals from here on). This case is similar to uplink interference from the IRIDIUM mobile terminals, thus the

discrimination factor can be computed using Eqn. 5.2. Slotted aloha random access technique at 30% loading is used on the OL's uplink. Thus the GSO satellite would experience interference from OL mobile terminals for 30% of the time on average.

Interference on the downlink into the GSO mobile terminals comes from the OL satellites. Similar to the case of downlink interference from the IRIDIUM satellites, there would be only one interference entry and the discrimination factor is 1 (0 dB). The OL downlink signal is a continuous, TDM signal, thus potential interference into GSO mobile terminals exists for all time.

The aggregate, time averaged C/I for this case is given by:

$$(C/I)_A = -10 \log [10^{-0.1(C/I)_{Om}} + 10^{-0.1(C/I)_{Os}}] \qquad \text{Eqn 5.7}$$

where

$(C/I)_{Om} = (C/I)_{1FOm} - 10 \log (DF_{Om}) - 10 \log (Q_{Om}) - 10 \log (0.3)$
is the interference from OL mobile terminals.

$(C/I)_{Os} = (C/I)_{1FOs} - 10 \log (DF_{Os}) - 10 \log (Q_{Os})$
is the interference from the OL satellites.

$DF_{Om}$ and $DF_{Os}$ are given by Eqn. (2) and (6), respectively.

$(C/I)_{1FOm}$ and $(C/I)_{1FOs}$ are the single entry, full power C/I values for interference from OL mobile terminals and satellite into GSO satellite and mobile terminals, respectively.

$Q_{Om}$ and $Q_{Os}$ are to be computed based on the bandwidths of the wanted and interfering signals as described in Section 5.2.

### 5.3.4 OL System to GSO - Reverse Direction Mode

In this case, OL uses the 1.5 GHz band for its uplink and 1.6 GHz band for its downlink. Uplink interference (i.e. into GSO satellite receiver) comes from OL satellites and downlink interference (i.e. into GSO mobile terminals) comes from OL mobile terminals. Analogous to the cases of uplink interference from IRIDIUM satellites and downlink interference from IRIDIUM mobile terminals, this interference scenario can be analyzed using Eqn. 5.7 with the discrimination

factors $DFO_m$ and $DFO_s$ are given by Eqn. 5.5 and 5.3, respectively.

## 5.4 Interference from GSO/MSS into LEO/MSS

If the IRIDIUM system uses 1.6 GHz band, then the GSO mobile terminals are potential interferors to both the IRIDIUM satellites and mobile terminals.and if IRIDIUM uses 1.5 GHz band, the interference comes from the GSO satellite. Since the IRIDIUM satellites use on-board generation technique which isolates the noise on the uplink from that on the downlink, the interference on the links have to be treated separately. As a result, there would be four different cases - (1) interference from GSO mobile terminals into an IRIDIUM mobile terminal, (2) interference from GSO mobile terminals into an IRIDIUM satellite, (3) interference from GSO satellite into an IRIDIUM satellite, (4) interference from GSO satellite into an IRIDIUM mobile terminal. Formulas which to be used to evaluate the carrier-to-interference ratios and brief descriptions of the interference mechanisms for the four cases are given below.

### 5.4.1 GSO Mobile to IRIDIUM at 1.6 GHz

**■ Interference from GSO Mobiles into an IRIDIUM Mobile Terminal**

This case is similar to interference from IRIDIUM mobile terminals into a GSO mobile terminal discussed above. The aggregate, time averaged C/I is given by:

$$(C/I)_{mm} = (C/I)_{1Fmm} - 10 \log (DF_{mm}) - 10 \log (Q_{mm}) - 10 \log (AV) \quad \text{Eqn. 5.8}$$

where

$DF_{mm}$ is the discrimination factor computed in the same manner as in Eqn. (5)

$Q_{mm}$ is to be computed based on the bandwidths of the wanted and interfering signals.

A V = 0.4 if the interfering signal is voice activated, otherwise = 1.

■ **Interference from GSO Mobiles into an IRIDIUM Satellite**

Due to the relatively larger coverage areas of GSO systems as compare to the IRIDIUM spot beam coverage, and due to the fact that any IRIDIUM satellite is not visible to all GSO mobile terminals, then only the GSO mobile terminals which are located within or near an IRIDIUM spot beam coverage would be potential interferors to a communications link in that beam. Assume that we can ignore the discrimination of the victim spot beam antenna toward the interfering GSO mobile terminals (i.e. all GSO mobile terminals are within the victim spot beam; worst case assumption). In addition, it is reasonable to say that the GSO mobile terminal antenna provide no discrimination toward the victim IRIDIUM satellite since almost all GSO mobile terminals antenna are either isotropic or hemispherical. Thus the discrimination factor in this case is 0 dB.

The carrier-to-interference ratio is therefore given by:

$$(C/I)_{ms} = (C/I)_{1Fms} - 10 \log (Q_{ms}) - 10 \log (AV) \quad \text{Eqn. 5.9}$$

$Q_{ms}$ and AV are defined in a similar manner as those in Eqn. 5.8.

### 5.4.2 GSO Satellite to IRIDIUM at 1.5 GHz

■ **Interference from GSO Satellite into an IRIDIUM Satellite**

The worst case interference from a GSO satellite into an IRIDIUM satellite occurs when the GSO satellite is within a receiving beam of the IRIDIUM satellite which also falls within the transmitting beam of the GSO satellite. This scenario can happen due to the spillage of the beam coverage over the limb of the earth. Since the IRIDIUM satellite and hence its coverage on the earth's surface is moving at a speed of about 100 minutes per revolution around the earth, the GSO satellite would be within the IRIDIUM receiving beam only for a short duration. It can be assumed that this duration is approximately equal to the time it takes the IRIDIUM beam which is about 670 km in diameter on the earth's surface to traverse the GSO satellite beam. This time duration is at least about 1.7 minutes which is in the order of that of an average telephone conversation, hence an entire duration of a voice link on the IRIDIUM system can be affected by this worst case interference scenario.

The discrimination factor in this case would be 0 dB. The C/I ratio is given by:

$$(C/I)_{ss} = (C/I)_{1Fss} - 10 \log (Q_{ss}) - 10 \log (AV) \quad \text{Eqn 5.10}$$

$Q_{ss}$ and AV are defined in a similar manner as those in Eqn. 5.8.

■ **Interference from GSO Satellite into an IRIDIUM Mobile**

This case is similar to the case of interference from an IRIDIUM satellite into a GSO mobile terminal in which the discrimination factor is 0 dB. The C/I ratio can be computed using Eqn. 5.9.

### 5.4.3 GSO to OL - Same Direction Mode:

Interference from a GSO MSS system into the OL system would bear the similar rationale of interference from OL into GSO MSS as described in Section 5.3.3 above. For same direction mode, the uplink interference into the OL satellite receiver comes from the GSO mobile terminals and the downlink interference into a OL mobile terminal comes from the GSO satellite. The aggregate C/I ratio is made up of two terms, one is the uplink C/I and one is the downlink C/I, similar to Eqn. 5.7:

$$(C/I)_A = -10 \log [10^{-0.1(C/I)_{Gm}} + 10^{-0.1(C/I)_{Gs}}] \quad \text{Eqn.5.11}$$

where

$(C/I)_{Gm} = (C/I)_{1FGm} - 10 \log (DF_{Gm}) - 10 \log (Q_{Gm})$
is the interference contribution from the GSO mobile terminals.

$(C/I)_{Gs} = (C/I)_{1FGs} - 10 \log (DF_{Gs}) - 10 \log (Q_{Gs})$
is the interference contribution from the GSO satellite.

$Q_{Gm}$ and $Q_{Gs}$ are to be computed based on the bandwidths of the wanted and interfering signals as described in Section 5.2.

The values of the discrimination factors $DF_{Gm}$ and $DF_{Gs}$ for same direction operation mode are both equal to 0 dB since the mobile terminal antennas have no discrimination toward the satellites.

### 5.4.3 GSO to OL - Reverse Direction Mode

For the reverse direction mode, uplink interference comes from GSO satellite and downlink interference comes from GSO mobiles. The C/I ratio can be calculated in the same manner as described in above section. $DFG_m$ is given by Eqn. 5.5 and $DFG_s$ is 0 dB.

## 5.5 Summary of Results

The following tables summarize the results oof the analyses of intersystem interference between LEO/MSS and GSO/MSS. It is to be noted that to control intersystem interference between two independent systems, all modes of interference have to be quantified and cleared by the assumed interference objective before the two systems are declared compatible in terms of sharing the same spectrum. Depending upon the technical design characteristics of the systems under scrutiny and transmit receive arrangements (unidirectional or bidirectional operations), the actual interference modes could be a subset of mobile-to-mobile, mobile-to-satellite(s), satellite(s)-to-mobile and satellite(s)-to-satellite(s). With this introductory note, Table 5.9 lists the carrier-to-interference ratios while Tables 5.10 and 5.11 show the C/I margin for 0.5dB and 1.0dB C/N degradation, respectively. The C/I margin for a communication link with a given C/N ratio and X dB degradation allowance for interference is defined as the difference between the available C/I and the C/I ratio which would degrade the C/N value by XdB (we assume here that the interference has the same statistical characteristics as additive white gaussian noise). If the margin is positive, the available C/I is above the interference objective, and if negative then the absolute value of the margin is the additional protection needed to bring the interference down to the acceptable level. All the calculations involving IRIDIUM system are based on the parameters of Cell 1, since the interference between IRIDIUM's Cell 1 and GSO system is the worst case among all interfering scenario. Of all the IRIDIUM's cells, Cell 1 has the highest transmission power, and is the most outer edge beam which can cause mainlobe-to-mainlobe interference into GSO satellite.

Each table is divided into two parts; the upper part representing interference from LEO/MSS into GSO/MSS and the lower part for interference from GSO/MSS into LEO/MSS. The entries of the two parts are arranged in such a way that there is an one-to-one mapping between the interference from LEO to GSO and vice versa. For example, assuming that the IRIDIUM system uses the same band as the MSAT uplink band, the interference into the MSAT satellite is from the IRIDIUM mobiles and satellites (C/I of 32.3 and 26.0 dB as shown in the shaded area of Table 5.9), whereas the interference into the IRIDIUM satellites and mobiles will be from the MSAT mobiles (C/I of -18.1 and -39.3 dB in the shaded area of Table 5.9).

| INTERFEROR | VICTIM | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MSAT SYSTEM | | INMARSAT (GLOBAL) | | INMARSAT (SPOT) | | ZENON SYSTEM | | EUTELSAT SYSTEM | |
| | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE |
| IRIDIUM MOBILE | -21.1 | 32.3 | -40.1 | 31.7 | -35.5 | 27.7 | -25.9 | 21.2 | -25.1 | 25.7 |
| IRIDIUM SATELLITE | 20.4 | 26.0 | 1.0 | 28.1 | -5.2 | 35.6 | 24.3 | 38.0 | 24.5 | 21.6 |
| ORBCOMM MOBILE | -54.6 | 2.2 | -64.8 | 8.9 | -73.9 | 2.4 | -55.9 | -3.9 | -58.7 | 2.2 |
| ORBCOMM SATELLITE | -21.5 | -13.9 | -38.9 | -7.1 | -45.1 | -14.6 | -25.9 | -20.8 | -26.1 | -15.9 |

**C/I (dB) for Interference from LEO/MSS into GSO/MSS (Voice)**

| VICTIM | INTERFEROR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MSAT SYSTEM | | INMARSAT (GLOBAL) | | INMARSAT (SPOT) | | ZENON SYSTEM | | EUTELSAT SYSTEM | |
| | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE |
| IRIDIUM SATELLITE | -16.1 | -18.1 | 9.6 | -25.0 | 9.3 | -19.3 | -12.7 | 1.8 | -15.9 | 2.6 |
| IRIDIUM MOBILE | -0.3 | -39.3 | 14.6 | -59.1 | 14.3 | -52.1 | 0.1 | -37.9 | -0.2 | -61.1 |
| ORBCOMM SATELLITE | 15.4 | 4.8 | 20.3 | -12.0 | 29.9 | 1.0 | 18.4 | 10.9 | 15.2 | 3.5 |
| ORBCOMM MOBILE | 27.7 | -27.5 | 34.2 | -41.4 | 40.8 | -37.3 | 26.3 | -27.5 | 27.9 | -32.3 |

**C/I (dB) for Interference from GSO/MSS (Voice) into LEO/MSS**

## Table 5.9: C/I Results

Note: The entries of the table are arranged in such a way that there is an one-to-one mapping between the interference from LEO to GSO and vice versa.

| INTERFEROR | VICTIM | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MSAT SYSTEM | | INMARSAT (GLOBAL) | | INMARSAT (SPOT) | | ZENON SYSTEM | | EUTELSAT SYSTEM | |
| | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE |
| IRIDIUM MOBILE | -48.1 | 0.0 | -63.5 | 2.7 | -52.7 | -0.7 | -50.3 | -5.4 | -44.8 | -1.0 |
| IRIDIUM SATELLITE | -6.6 | -6.3 | -22.4 | -0.9 | -22.4 | 7.3 | -0.1 | 11.4 | 4.8 | -5.1 |
| ORBCOMM MOBILE | -81.6 | -30.1 | -88.2 | -20.1 | -91.1 | -25.9 | -80.3 | -30.5 | -78.4 | -24.5 |
| ORBCOMM SATELLITE | -48.5 | -46.2 | -62.3 | -36.1 | -62.3 | -42.9 | -50.3 | -47.4 | -45.8 | -42.6 |

**Margin for Interference from LEO/MSS into GSO/MSS (Voice)**

| VICTIM | | INTERFEROR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MSAT SYSTEM | | INMARSAT (GLOBAL) | | INMARSAT (SPOT) | | ZENON SYSTEM | | EUTELSAT SYSTEM | |
| | (C/N) | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE |
| IRIDIUM SATELLITE | 8.5 | -33.6 | -35.6 | -7.9 | -42.5 | -8.3 | -36.8 | -30.2 | -15.7 | -33.4 | -14.9 |
| IRIDIUM MOBILE | 9.2 | -18.5 | -57.5 | -3.6 | -77.3 | -3.9 | -70.3 | -18.1 | -56.1 | -18.4 | -79.3 |
| ORBCOMM SATELLITE | 21.6 | -15.2 | -25.8 | -10.3 | -42.6 | -0.7 | -29.6 | -12.2 | -19.7 | -15.4 | -27.1 |
| ORBCOMM MOBILE | 22.9 | -4.2 | -59.4 | 2.3 | -73.3 | 8.9 | -69.2 | -5.6 | -59.4 | -4.0 | -64.2 |

**Margin for Interference from GSO/MSS (Voice) into LEO/MSS**

Table 5.10: Margin for 0.5dB C/N Degradation

| INTERFEROR | VICTIM | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MSAT SYSTEM | | INMARSAT (GLOBAL) | | INMARSAT (SPOT) | | ZENON SYSTEM | | EUTELSAT SYSTEM | |
| | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE |
| IRIDIUM MOBILE | -45.1 | 3.0 | -60.5 | 5.7 | -49.7 | 2.3 | -47.3 | -2.4 | -41.8 | 2.0 |
| IRIDIUM SATELLITE | -3.6 | -3.3 | -19.4 | 2.1 | -19.4 | 10.3 | 2.9 | 14.4 | 7.8 | -2.1 |
| ORBCOMM MOBILE | -78.6 | -27.1 | -85.2 | -17.1 | -88.1 | -22.9 | -77.3 | -27.5 | -75.4 | -21.5 |
| ORBCOMM SATELLITE | -45.5 | -43.2 | -59.3 | -33.1 | -59.3 | -39.9 | -47.3 | -44.4 | -42.8 | -39.6 |

**Margin for Interference from LEO/MSS into GSO/MSS (Voice)**

| VICTIM | | INTERFEROR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MSAT SYSTEM | | INMARSAT (GLOBAL) | | INMARSAT (SPOT) | | ZENON SYSTEM | | EUTELSAT SYSTEM | |
| | (C/N) | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE |
| IRIDIUM SATELLITE | 8.5 | -30.6 | -32.6 | -4.9 | -39.5 | -5.3 | -33.8 | -27.2 | -12.7 | -30.4 | -11.9 |
| IRIDIUM MOBILE | 9.2 | -15.5 | -54.5 | -0.6 | -74.3 | -0.9 | -67.3 | -15.1 | -53.1 | -15.4 | -76.3 |
| ORBCOMM SATELLITE | 21.6 | -12.2 | -22.8 | -7.3 | -39.6 | 2.3 | -26.6 | -9.2 | -16.7 | -12.4 | -24.1 |
| ORBCOMM MOBILE | 22.9 | -1.2 | -56.4 | 5.3 | -70.3 | 11.9 | -66.2 | -2.6 | -56.4 | -1.0 | -61.2 |

**Margin for Interference from GSO/MSS (Voice) into LEO/MSS**

Table 5.11: Margin for 1.0dB C/N Degradation

It should be noted that since IRIDIUM system uses the same frequency band for both uplink and downlink then the interference from the IRIDIUM mobile and satellites into either GSO mobile or GSO satellite have to be summed together. Table 5.9 shows both entries in terms of time-averaged C/Is for ease of identifying the interference contribution from a given IRIDIUM mobile terminal and satellites separately. In this example, the carrier-to-total interference from the IRIDIUM system into the MSAT satellite would be 25.2 dB, ie. 32.3 dB "plus" 26.0 dB.

The results shown in the tables are for the worst-case co-channel, overlapped coverage scenario for voice traffic. Furthermore, the analysis was carried out for different GSO/MSS carrier types ranging from marine, land voice and data carrier to aeronautical voice and data carriers. However, due to the vast amount of the resulting data, only the values for a voice-type carrier are provided in this summary. The results for other carrier types, which are in most cases similar to those presented in Tables 5.9 to 5.11, are provided in Appendix B. Thus, the conclusions given below, which are derived from observation of Tables 5.9 to 5.11, are fairly general and can be applied to other carrier types.

Before starting to analyze the results, the following note on the OL system is in order. Since the mandate of the study was to look at the various LEO and GSO systems ( a representative cross section) in a co-frequency operation mode, the system parameters of OL were defined to represent an ORBCOMM-type L-band operation system in order to allow compatibility analysis against a great majority of the operational and planned LEO and GSO systems as known to date. Consequently, in our hypothetical OL system, the EIRP levels are 18 dB higher than ORBCOMM's EIRP levels. As a result, the mobile transmit EIRP of OL system was 20 dBW instead of 2 dBW in the real ORBCOMM system, which is an unrealistic figure since it is known that no practical mobile terminal with an antenna gain of 1 to 3 dBi is capable of producing an EIRP of 20 dBW, particularly if a low cost, compact hand-held terminal is the primary characteristics of the business plan. Therefore, any conclusions derived from the interference analysis involving OL system should be interpreted with caution as, in our view, they do not represent a practical system.

With this cautionary note in mind, we now proceed to analyze the results. We start off , by way of an example, to show how the

interference tables should be interpreted. For this we will concentrate on the intersystem interference between INMARSAT (global beam) system and IRIDIUM system. Let us suppose, for the sake of argument, that the IRIDIUM system will need to use the INMARSAT downlink frequency band (ie. 1.5 GHz band) for its transmit/receive operation in a time multiplexed mode. With this hypothetical assumption of the operational band, the interference from the IRIDIUM mobiles and the satellite constellation will be into the INMARSAT mobile terminals. The C/I ratios for this scenario are listed below:

Interference from IRIDIUM mobile into INMARSAT mobile: -40.1 dB
Interference from IRIDIUM satellite into INMARSAT mobile: 1.0 dB
TOTAL: -40.1 dB

The C/I criteria for 0.5 dB and 1.0 dB C/N degradation are 23.4 dB and 20.4 dB resulting in C/I margins of -63.5 dB and -60.5 dB, respectively (see Tables 5.10 and 5.11). Note that the dominant interference contributor in this case is the IRIDIUM mobile.

On the other hand, interference into the IRIDIUM system will come from the INMARSAT satellite (s). The C/I ratios are:

Interference from INMARSAT satellite into IRIDIUM satellite: 9.6 dB
Interference from INMARSAT satellite into IRIDIUM mobile: 14.6 dB

The interference from INMARSAT into IRIDIUM mobile and satellite are not added together since the IRIDIUM satellite utilizes on-board re-generation which means the interference into the IRIDIUM satellite can be isolated from that into the mobile. The C/I margins are -7.9 dB and -3.6 dB for 0.5 dB C/N degradation and -4.9 dB and -0.6 dB for 1 dB C/N degradation (see Tables 5.10 and 5.11).

It can be seen from the above example that the intersystem interference between INMARSAT and IRIDIUM systems in the 1.5 GHz band exceed the objectives specified for this study. Now let us assume that the IRIDIUM system uses the 1.6 GHz band for its transmit/receive operation in a time multiplexed mode (ie. the actual arrangement proposed by MOTOROLA). With this assumption, the interference from the IRIDIUM mobiles and the satellite constellation will be into the INMARSAT satellite. The C/I ratios for this scenario are listed below:

Interference from IRIDIUM mobile into INMARSAT satellite: 31.7 dB
Interference from IRIDIUM satellite into INMARSAT satellite: 28.1 dB
TOTAL: 26.5 dB

The C/I criteria for 0.5 dB and 1.0 dB C/N degradation are 29.0 dB and 26.0 dB resulting in C/I margins of -2.5 dB and 0.5 dB, respectively (see Tables 5.10 and 5.11).

On the other hand, interference into the IRIDIUM system will come from the INMARSAT mobiles. The C/I ratios are:

Interference from INMARSAT mobile into IRIDIUM satellite: -25.0 dB
Interference from INMARSAT mobile into IRIDIUM mobile: -59.1 dB

The C/I criteria for 0.5 dB C/N degradation are 17.5 dB and 18.2 dB resulting in C/I margins -42.5 dB and -77.3 dB. The C/I criteria for 1.0 dB C/N degradation are 14.5 dB and 15.2 dB resulting in C/I margins of -39.5 dB and -74.3 dB (see Tables 5.10 and 5.11).

## 5.6 Observations and Conclusions

While the interference tables indicate that the systems under study could not clear the assumed objectives, a close examination reveals a few interesting characteristics:

**• High Mobile to Mobile Interference**

By far, the most dominant mode of intersystem interference is mobile to mobile where mobiles of the various systems need to share the spectrum in a reversed transmit/receive arrangement (for example IRIDIUM as proposed versus other planned or operational L-band systems). In view of the fact that the inter-mobile distance assumed in this study is 5 km, the severity of interference for such a distance indicates that a geographical segregation criterion much larger than 5 km will have to be carefully planned, coordinated and adhered to by the operators serving common or adjacent areas if this mode of interference is to be brought down to acceptable levels. Such segregation may not be practicable due to the envisaged wide roaming component of the planned mobile systems and the foreseen difficulty in establishing real time dynamic coordination between various emerging systems on a large scale basis. If after further detailed studies indeed this proves to be a real practical obstacle, then spectrum segmentation will most likely be the only practical approach to deal with this problem.

**• IRIDIUM Uses 1.6 GHz Band**

If IRIDIUM uses the same spectrum as that of the GSO uplink (IRIDIUM's present design concept), the interference from both IRIDIUM constellation of satellites and its associated mobiles into the robust traffic of the GSO satellites (like voice), although not exactly meeting the assumed interference objectives, is sufficiently low to leave hope for sharing. This excludes a few very low level data carriers filed by various systems where the carrier-to-interference ratios are about 5 to 7 dB worse than that for voice case but still at a level which suggests a deeper look into identifying ways and means of additional isolation. For instance, a detailed analysis of the realistic average loading level of IRIDIUM may in fact reveal some additional level of isolation afforded in light of the fact that the satellites will most likely operate at levels below their full spectrum capacity most of the time. In the case of the low level data carriers

mentioned earlier, it is worthwhile noting that the resulting low C/N levels cast doubt on the technical viability of such services and lead one to suspect the proposed link budgets. Notwithstanding this, these carriers are generally in the minority and as a result could be protected through detailed traffic coordination if in fact they happen to be implemented.

In the case of OL, the above trend does not appear to hold. This discrepancy is primarily due to the assumed increase in the EIRP levels in our hypothetical system relative to the original levels in ORBCOMM system filed with the FCC in connection with the operation at lower frequencies. However, as mentioned earlier, for ORBCOMM to be able to operate commercially at L- band, the system concept will need to be drastically altered. This design review is expected to lead to an arrangement similar to the IRIDIUM in terms of its emission levels toward GSO systems if the concept is ever implemented at L-band.

The above observations indicate that co-frequency operation of LEO systems **with a transmission signature similar to IRIDIUM** could conceivably be considered as long as only the uplink GSO band is used for LEO transmit/receive operation, and the LEO systems have to take measures to protect themselves from interference from GSO mobiles. While the mobile to mobile interference could conceivably be mitigated by geographical segregation of the respective mobiles, the interference from GSO mobiles to LEO constellation appears to be the most challenging one to overcome primarily due to the dynamic nature of such a constellation relative to the earth-fixed frame of reference. It is plausible to assume that with the planned level of on-board sophistication and resident smarts of IRIDIUM satellites, the receive band could be dynamically monitored for identification and utilization of the least interfered with carrier slots.

**• IRIDIUM Uses 1.5 GHz Band**

Similar to the above case where the IRIDIUM uses 1.6 GHz, interference from IRIDIUM mobile to GSO mobile is high but the problem can be alleviated by geographical separation. Interference from IRIDIUM satellite into the mobiles of high-gain spot beam GSO systems such as MSAT, EUTELSAT and ZENON is close to the objective level, except the case of

INMARSAT mobiles where interference from IRIDIUM exceeds the objectives set for the study.

Interference from GSO satellites to IRIDIUM mobiles also fall into two distinct categories. The first category is due to the GSO satellites that feed low gain mobiles with a high level of EIRP for voice communications. Invariably, this case is characterized by GSO satellites with relatively high-gain spot beams (eg. MSAT, ZENON and EUTELSAT). This is not surprising as only such systems could afford low gain mobiles for voice communications. GSO systems falling in the first category will generate excessive interference levels into IRIDIUM mobiles, and there seems to be no means to reduce the high interference levels since the IRIDIUM mobile, unlike its smart satellites, would not be able to protect itself from interference, therefore, co-frequency sharing would not be feasible in this case. The second category embodies GSO systems with either global beam or relatively large spot beams. Understandably, such systems reduce the power demand on the satellite by incorporating medium to high gain mobiles (eg. INMARSAT and USSR networks). Consequently, the interference from GSO satellites with global or large beams to IRIDIUM mobiles is low enough to encourage a more detailed scrutiny of the subject matter for defining conditions which could allow co-frequency operation.

The interference from GSO satellites to the IRIDIUM satellites follow the same pattern, that is, it is too excessive if originated from spot beam based GSO satellites while marginal for global systems. Unlike the case of interference from GSO satellite into IRIDIUM mobile, this interference situation can be avoided by making the IRIDIUM satellites switch off the outer edge beams when dominant mainlobe to mainlobe interference occurs.

**• IRIDUM Using 1.6/1.5 GHz Frequency Bands -Same Direction Mode**

The interference from IRIDIUM satellite and mobile into GSO mobile and satellite, respectively, seems to be marginally acceptable, but the interference from GSO into IRIDIUM is severe. Note that the C/I margins are based on the assumption that the IRIDIUM still uses the proposed TDMA format for its transmission. However, if IRIDIUM uses separate frequency band for its uplink and downlink, the proposed TDMA format is

unlikely to be maintained. As a result, one should expect more interference from IRIDIUM to GSO if IRIDIUM transmit slots are more concentrated. For example, if the TDMA format is dropped, i.e. IRIDIUM transmission is continuous, there would be about 13 dB increase in interference from the IRIDIUM into GSO. In the light of this and also the severe interference from GSO satellite into IRIDIUM mobile which cannot be easily mitigated, co-frequency sharing in this case seems not feasible.

**• IRIDUM Uses 1.6/1.5 GHz Frequency Bands - Reverse Direction Mode**

In this case, interference would be between IRIDIUM mobile and GSO mobiles and between IRIDIUM satellites and GSO satellite. The mobile-to-mobile interference can be reduced by geographical separation, and the problem of satellite-mainlobe-to-satellite-mainlobe interference can be solved by switching off the IRIDIUM's outer edge beams when such a geometry occurs. The discussion in the above paragraph about the IRIDIUM's TDMA format is also applicable in this case.

Co-frequency sharing between IRIDIUM and GSO could be feasible in the reverse direction mode provided the above measures are taken by the IRIDIUM system to protect itself as well as the GSO/MSS system. However, the disadvantage of this scenario relative to the case described in Section 1.1 is that the IRIDIUM network management system will now have the addtional task of protecting the GSO system. Furthermore, the GSO system is vulnerable to interference from IRIDIUM and solely relies on it for protection. The acceptability of such arrangement to GSO system operators is at best doubtful.

Of the scenarios considered above, by far the most promising one appears to be LEO sharing the GSO uplink band with the GSO mobile systems. While the mobile-to-mobile interference issue could be considered as a candidate for detailed coordination, the GSO mobile to LEO satellite constellation interference is a challenging task to be tackled.

# CHAPTER 6

# ANALYSIS OF INTERFERENCE BETWEEN LEO/MSS AND MICROWAVE FIXED SYSTEMS

## 6.1 Summary of Systems Characteristics

The terrestrial system characteristics are summarized in the following table:

- **Terrestrial System Characteristics**

| System | Frequency (MHz) | EIRP (dBW) | Noise Temp. (dBK) | Rx Ant. Gain (dBi) | B.W. (MHz) |
|---|---|---|---|---|---|
| A | 1427-1525 | 35 | 34.6 | 20.9 | 3.5 |
| B | 1700-1710 | 35 | 34.6 | 22.1 | 3.5 |
| C | 1710-1900 | 35 | 34.6 | 22.6 | 7.0 |
| D | 1900-2290 | 45 | 34.6 | 23.9 | 29.0 |
| E | 2290-2450 | 45 | 34.6 | 24.9 | 6.0 |

- **IRIDIUM System Characteristics**

| System | EIRP (dBW) | Noise Temp. (dBK) | Rx Ant. Gain (dBi) | B.W. (kHz) | |
|---|---|---|---|---|---|
| | | | | Uplink | Downlink |
| Satellite | 23.1 | 27.4 | 21.2 | 135 | 300 |
| Mobile | 1.4 | 24.8 | 0.0 | 135 | 300 |

- **OL System Characteristics**

| System | EIRP (dBW) | Noise Temp. (dBK) | Rx Ant. Gain (dBi) | B.W. (kHz) | |
|---|---|---|---|---|---|
| | | | | Uplink | Downlink |
| Satellite | 34.5 | 32.8 | 7 | 3.6 | 7.2 |
| Mobile | 20.0 | 36.6 | 0 | 3.6 | 7.2 |

(Note: OL system is an ORBCOMM-type L-band system. It has the same system characteristics as ORBCOMM system except that it uses L-band, and its transmit power level is 18 dB higher than that of ORBCOMM)

## 6.2 Approach to Interference Analysis

### 6.2.1 General

The general approach was to establish worst-case interference levels assuming co-channel/line-of-sight operation between the LEO and the terrestrial fixed microwave systems. Then these worst case levels were adjusted to account for different bandwidths, antenna discrimination, number of possible interferors, etc. This necessitated the selection of some arbitrary interference objectives, however, once the actual interference objectives are established the results of this study can be scaled by the difference of the actual interference objectives and our arbitrary chosen interference objectives.

### 6.2.2 Methodology

First we determined the reference worst-case interference levels assuming both systems commonly shared the frequency bands and operated in a co-channel mode. A number of assumptions were made with respect to the IRIDIUM and OL systems to establish our references. These assumptions are described in Chapter 3.

As previously stated no fixed systems currently operate in the bands for the proposed IRIDIUM and ORBCOM systems therefore for the purposes of hypothetical study we assumed the technical parameters for fixed systems as given in Section 6.1. Having established our worst-case interference levels these were then compared against our objective interference levels and the difference was established as our reference for any further analysis.

Our arbitrarily chosen interference objectives were taken as a 0.5 and a 1.0 dB reduction in the system's C/N ratio due to the noise caused by the interference. We assume that the interference was white noise like and would add to the system noise on a pure power basis. Furthermore, since terrestrial microwave systems could have a variety of C/N ratios we decide to reference to the I/N ratio since it is directly related to the C/N & C/I as is shown below:

$$\begin{aligned} C/N - C/I &= C - N - (C - I) \; ; \qquad C,I,N \text{ are in dB} \\ &= C - N - C + I \\ &= I - N \\ &= I/N. \end{aligned}$$

It can be shown that given our interference objective is:

$$C/(N+I) = C/N - (0.5 \text{ or } 1.0) \text{ dB},$$

this translates to:

$$C/N - C/I = -9.0 \text{ dB for the 0.5 dB change, and}$$
$$= -6.0 \text{ dB for the 1.0 dB change.}$$

Thus, although C/I will not be computed in this case but the results can be expressed as C/I margins since the I/N objectives are exactly the same as the C/I objectives.

Once our references were established for the co-channel case then further analyses was carried out to include the affects of different channel bandwidths, antenna discriminations, etc. Note that the C/I margin result shown below do not take the TDMA format of IRIDIUM into account, thus the interference level from IRIDIUM presented below is at the maximum level, not the time-averaged level. However, as will be discussed in Section 6.5 below, because of the large additional protection required for fixed system from IRIDIUM, even if the the average interference power is considered, it is still not sufficient to make spectrum sharing feasible.

## 6.3. Interference between IRIDIUM and Fixed Systems

For our hypothetical study we assumed interference into the terrestrial microwave system can occur from the IRIDIUM satellites or from the mobiles accessing the IRIDIUM satellite system. To establish our reference case, for the mobiles, we assumed that the mobiles would operate 5 km from the terrestrial station's boresight. To establish our reference case, for IRIDIUM's satellites, we assumed that the IRIDIUM satellite and the terrestrial microwave system would align only where the elevation angle from the terrestrial system to the satellite would be zero (0°) degrees. This is a valid assumption since the elevation angles for a terrestrial system is usually very close to 0° unless there is extenuating circumstances such as a short hop to a mountain top but even here the elevation angles will be relatively small therefore our results will generally be valid.

For the purposes of our analysis we assumed that the terrestrial microwave systems utilize the 2 frequency plan which implies that they will transmit the same frequency from a repeater station on every second hop and in both directions from that hop. Figure 6.1 shows a sketch giving this configuration

As also can be seen, in the Figure, the assumed hop length is 50 km, therefore, we know that any frequency we are interested in will reoccur every 100 km. Therefore, the maximum number of terrestrial stations (on one terrestrial system) visible to a LEO satellite can be estimated by dividing the satellite beamwidths by this 100 km factor. This, in fact, was what was done in the study.

The Q-factor and the DF factor are described in Section C.1 of Appendix C .Section C.2 of Appendix C contains the results of the worst-case analysis. The distances are as given by the geometric overview in Section C.3 of Appendix C. The results are summarize in Table 6.1.

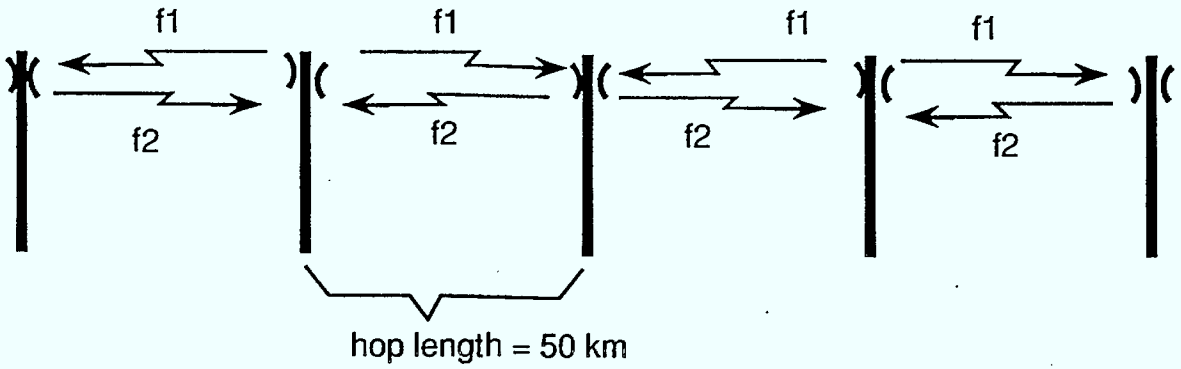



**Figure 6.1 Terrestrial Microwave Repeater Configuration**

| SCENARIO | | SYS. | C/I MARGIN | C/I MARGIN |
|---|---|---|---|---|
| From | To | | 0.5 dB | 1.0 dB |
| | | | | |
| IRID. Satellite | Terr. System | A | -26.6 | -23.6 |
| | | B | -26.3 | -23.3 |
| | | C | -26.7 | -23.7 |
| | | D | -27.1 | -24.1 |
| | | E | -26.5 | -23.5 |
| | | | | |
| Terr. System | IRID. Satellite | A | -41.3 | -38.3 |
| | | B | -39.8 | -36.8 |
| | | C | -36.7 | -33.7 |
| | | D | -39.7 | -36.7 |
| | | E | -44.9 | -41.9 |
| | | | | |
| IRID. Mobile | Terr. System | A | -64.5 | -61.5 |
| | | B | -64.2 | -61.2 |
| | | C | -64.7 | -61.7 |
| | | D | -65.0 | -62.0 |
| | | E | -64.4 | -61.4 |
| | | | | |
| Terr. System | IRID. Mobile | A | -72.9 | -69.9 |
| | | B | -71.4 | -68.4 |
| | | C | -68.3 | -65.3 |
| | | D | -71.2 | -68.2 |
| | | E | -76.4 | -73.4 |

**Table 6.1: C/I Margin for IRIDIUM and Terrestrial Systems**

## 6.4 Interference between OL System and Fixed Systems

Similar scenarios were assumed for the OL case as was in the IRIDIUM case, however, the OL system has a much wider beamwidth (6600 km) and consequently is exposed to more terrestrial stations in a given terrestrial microwave system.

In reality, the ORBCOM system is proposed to operate in the region of 140 MHz so for our hypothetical study we have to upscale some of the parameters if we were to assume our hypothetical OL system to operate in the 1 to 3 GHz range. The technical details assumed are found in Section 6.1.

The detailed results of our worst-case analysis, geometric considerations and the Q & DF factor results can be found in Appendix C. Table 6.2 summarizes the results.

| SCENARIO | | SYS. | C/I MARGIN | C/I MARGIN |
|---|---|---|---|---|
| From | To | | 0.5 dB | 1.0 dB |
| | | | | |
| OL Satellite | Terr. System | A | -53.1 | -50.1 |
| | | B | -52.8 | -49.8 |
| | | C | -53.3 | -50.3 |
| | | D | -53.7 | -50.7 |
| | | E | -53.0 | -50.0 |
| | | | | |
| Terr. System | OL Satellite | A | -25.2 | -22.2 |
| | | B | -23.7 | -20.7 |
| | | C | -20.6 | -17.6 |
| | | D | -23.5 | -20.5 |
| | | E | -28.7 | -25.7 |
| | | | | |
| OL Mobile | Terr. System | A | -98.9 | -95.9 |
| | | B | -98.5 | -95.5 |
| | | C | -99.0 | -96.0 |
| | | D | -99.4 | -96.4 |
| | | E | -98.8 | -95.8 |
| | | | | |
| Terr. System | OL Mobile | A | -61.1 | -58.1 |
| | | B | -59.6 | -56.6 |
| | | C | -56.5 | -53.5 |
| | | D | -59.4 | -56.4 |
| | | E | -64.6 | -61.6 |

**Table 6.2: C/I Margin for OL and Terrestrial Systems**

## 6.5 Discussion

Firstly, the assumed allowable interference levels chosen in this study are not overly pessimistic and consequently any actual acceptable interference would not differ too greatly to what we have used in this study.

This study necessarily made worst-case assumptions and judging from the results consequently painted a bleak picture. In particular the mobile/terrestrial results show high levels of unacceptable interference. It should be kept in mind that the separation distance in our study was only 5 km and assumed line-of-sight boresight to boresight conditions. In reality, local blockage, terrain blockage, and the terrestrial system's antenna discrimination will come into play which may permit spectrum sharing with some minimum geographical separation. As will be shown in the next chapter where interference between LEO/MSS and FPLMTS is evaluated, of the mobile and terrestrial station are beyond the radio horizon of each other, the terrain blockage could be sufficient to facilitate sharing.

The satellite to terrestrial condition and vice versa would not enjoy the same terrain blockage benefits as could the mobile to terrestrial scenario but would enjoy the benefits of the terrestrial station's antenna discrimination. This factor was accounted for in the study.

The Q-factors tended to be high because of the large bandwidth differences between the proposed LEO systems and the terrestrial systems operating in the 1 to 3 GHz band. On the other hand, the DF factors tended to be almost nonexistent due to the omni-directional antennas used on the mobiles and due to the LEO satellite beams illumination of the earth. Where there was any antenna discrimination as in the terrestrial system into the OL system case significant reductions in interference power were noted.

The OL system shows up worse as compared to the IRIDIUM system. This is due to two reasons: one being the difference in the carrier bandwidths between these two systems and the second reason being due to the upscaling of some of the ORBCOMM's operating parameters to adjust from the proposed operating band to the 1 to 3 GHz band in our hypothetical system. Removing these two factors show that the two systems would experience and cause similar interference despite the difference in beamwidths. This would lead one to conclude that the LEO system's beamwidth is really not a major factor in LEO/fixed

terrestrial interference.

Another factor that must be taken into consideration is a **time** factor. Interference into a given mobile or a given terrestrial microwave receiver will not occur 100 % of the time. Mobiles will move and the LEO satellites are in constant motion thus the interference experienced by a given receiver will vary with respect to time, although, because of the almost continuous coverage proposed by the IRIDIUM and the ORBCOM systems this would not be a factor for a given terrestrial station receiving interference from a LEO satellite. To a lesser degree propagation conditions change with respect to time thus changing the actual interference levels into a given receiver. Most communication systems that share spectrum allot interference based on percentage of time to account for these factors. In general, the time factor affects the interference objective and not the interference level being experienced by a system therefore it is not addressed as part of this study.

This study assumed that a least one of a terrestrial microwave system's microwave hops will face directly at the LEO satellite at one given moment in time. It is highly probable that in a given terrestrial microwave system no hop will directly face a given LEO satellite. This will depend on the particular geometry of the given terrestrial system to the given LEO satellite. Conversely, although no more than one hop of a given terrestrial microwave system is envisaged as pointing directly at a LEO satellite at one time it is quite possible especially in the US that more than one terrestrial microwave system will affect a given LEO satellite.

Because the IRIDIUM system proposes to transmit and receive on the same frequency and use a TDMA/FDMA access technique the interference level would vary at any given terrestrial station. Thus the average interference power would drop by about 10 dB for interference from mobiles and 13 dB for interference from satellite, as compared to this study, however, because of the large differences between the objectives and the calculated interference levels, the reduction mentioned above is not sufficient a factor to make spectrum sharing feasible.

With regard to point-to-multipoint systems the results given here would be applicable to the star points. The node would experience less interference because its antenna gain would be reduced because of its omnidirectional nature, however, it would not have any antenna discrimination to the satellite and therefore any node of a point-to-multipoint system will always receive interference from a LEO satellite albeit it will be lower in level. Of course, if antennas are chosen that only illuminate the horizon (i.e. doughnut shaped.) then it would only be affected as the LEO satellite appeared on the horizon.

## 6.6 Conclusions

Based on this hypothetical study it is concluded that operation between a LEO satellite system and the fixed terrestrial microwave systems on a co-channel/co-geographical basis would be difficult. Taking the interference objectives chosen in this study unacceptable interference would be experienced by the LEO satellites, by the LEO mobile units, and by the terrestrial fixed system.

Geographical sharing between the mobiles and the fixed systems could be possible if certain geographical areas were designated as LEO mobile-only areas or fixed-only areas, however, sharing between the LEO satellites and the fixed system would not be possible.

Severe mainlobe-to-mainlobe interference between LEO/MSS satellites and fixed systems occurs when the satellites are transmitting or receiving at grazing angle (ie zero degree elevation) since the fixed systems antennas point at the horizon in most cases. To reduce interference into fixed system, the LEO satellite can limit or avoid its emission toward the horizon. For the IRIDIUM system, this can be achieved by turning off the outer beams and use the inner beams of another satellite. This scheme would work well for higher latitude regions such as Canada because of the high degree of overlap between the IRIDIUM satellite coverage areas. However, it would not work as well for regions of lower latitude, especially near the equator, where overlapping is lesser.

It is also concluded that the beam size of the LEO satellite is not a major factor in the issue because if a LEO satellite is in the boresight of one terrestrial microwave station it will not be in the boresight of any other stations in the same terrestrial system because of the linear distribution of the terrestrial system.

# CHAPTER 7

# ANALYSIS OF INTERFERENCE BETWEEN LEO/MSS AND FPLMTS

## 7.1 Summary of FPLMTS Systems Characteristics and Spectrum Requirements

The purpose of the Future Public Land Mobile Telecommunication Systems (FPLMTS) is to integrate all forms of public-carrier mobile communications. In this section, some of the salient features of the FPLMTS are briefly discussed.

FPLMTS will offer voice and non-voice services (e.g. telephony, facsimile, data, etc.) available in the PSTN/ISDN and other public networks and provide access to these networks. For voice services, the quality of speech in FPLMTS should be compatible to that of the PSTN/ISDN as much as possible. This quality and delay may be achieved in an economic way in the foreseeable future with speech codecs of approximately 8 kbps or more. It is likely that in initial implementations data rates greater than 64 kbps will be restricted to indoor environments.

### 7.1.1 Personal Mobiles

A personal station is a dominant feature of FPLMTS. The FPLMTS concept involves two segments, the vehicular mobile, and the indoor and outdoor personal portable. The discussion in this document is restricted to the personal portable segment of the system, known as the R2 interface. The portable stations may move around within the coverage area of a cell and move from cell to cell. Typical speeds of motion are at pedestrian speeds. The ratio of portables to a base-station may vary between about 60:1 in an urban office building to 1:1 in a rural residential area. The following table lists some of the typical radio parameters for the personal segment:

| | Indoor | Outdoor | |
|---|---|---|---|
| EIRP/Equivalent traffic channel | -25 | -17 | dBW |
| Equivalent Channel Bandwidth | 50 | 50 | kHz |
| Busy Hour Average Traffic | 20000 | 1500 | $E/km^2$ |
| Estimated Power Flux Density | -60 | -60 | $dBW/km^2/Hz$ |

### 7.1.2 Path Losses and a Typical Link Budget

The path loss either for indoor or outdoor is a function of range, the distance between the FPLMTS terminal and its base station. The path loss suitable for an indoor office environment for ranges beyond a few metres and the line-of-sight free space path loss for outdoor, based on the CCIR/IWP-8/13 documents, are respectively as follows:

Indoor: $L_i(r) = 21.0 + 35 \text{ Log}(r)$ (dB)

Outdoor: $L_o(r) = 38.5 + 20 \text{ Log}(r)$ (dB)

and r is the range in metres. The maximum range is 67 metres for indoor and 81 metres for outdoor, correspondingly, the maximum path loss for indoor is 85 dB and that for outdoor is 81 dB. Note that the actual propagation in a cluttered outdoor environment (near buildings) more closely resembles the indoor propagation formula than the free space formula.

The following typical link budget shows that personal portable systems are expected to be interference limited rather than noise limited.

| | Indoor | Outdoor | |
|---|---|---|---|
| Range | 25 | 125 | m |
| Transmit Power | -25 | -17 | dBW |
| Base Antenna Gain | 0 | 0 | dBi |
| Portable Antenna Gain | 0 | 0 | dBi |
| Path Loss | 70 | 80 | dB |
| Shadowing Margin | 14 | 14 | dB |
| Fade Margin | 15 | 15 | dB |
| Minimum Carrier Level (C) | -124 | -126 | dBW |
| Required C/(N+I) | 13 | 13 | dB |
| Maximum (N+I) | -137 | -139 | dBW |
| Thermal Noise (N) | -152 | -152 | dBW |
| Maximum Allowable Interference (I) | -137 | -139 | dBW |

Note that it has been assumed that the antenna gain at the base station is 0 dBi. Such an assumption may not be quite realistic, however in the CCIR/IWP-8/13 documents this value was cited. As mentioned earlier, this link budget represents a typical link from the mobile to the base and forms a basis upon which interference

analysis would be performed.

### 7.1.3 Allowable Interference

The assumed thermal noise (N) and the required carrier to the sum of the noise and interference C/(N+I) for the FPLMTS terminal are -152 dBW and 13 dB respectively. Moreover, the minimum received carrier level (C) for the indoor is -75 - 35 log (r), where r < 67 metres is the distance between the FPLMTS terminal and its base station and that for the outdoor is -84.5 - 20 log (r), where r < 133. Assuming 10% of the total interference budget is allocated to external interference sources (in this study, we assume that the external interference source is the LEO/MSS system), the allowable interference (I), as a function of r, for the indoor and outdoor would be respectively as follows:

Indoor: $I_{allowable} = -98.0 + 10 \log (r^{-3.5} \cdot 10^{-6.4})$ (dBW) Eqn.7.1a

Outdoor: $I_{allowable} = -107.5 + 10 \log (r^{-2.0} \cdot 10^{-5.45})$ (dBW) Eqn.7.1b

Figure 7.1 shows the relationship between r and $I_{allowable}$ (i.e. 10% of the maximum allowable interference) for both the indoor and outdoor environments. The following table presents the interference for various ranges:

| | Range (m) | Total Inter. (dBW) | Allowable Inter. (dBW) |
|---|---|---|---|
| Indoor: | 10 | -123 | -133 |
| | 25 | -137 | -147 |
| | 50 | -148 | -158 |
| | 67 (max.) | -169 | -179 |
| Outdoor: | 25 | -125 | -135 |
| | 50 | -131 | -141 |
| | 100 | -137 | -147 |
| | 133 (max.) | -140 | -150 |

The external interference, i.e. 10% of the maximum allowable interference, will be used as the allowable interference in the following sections.

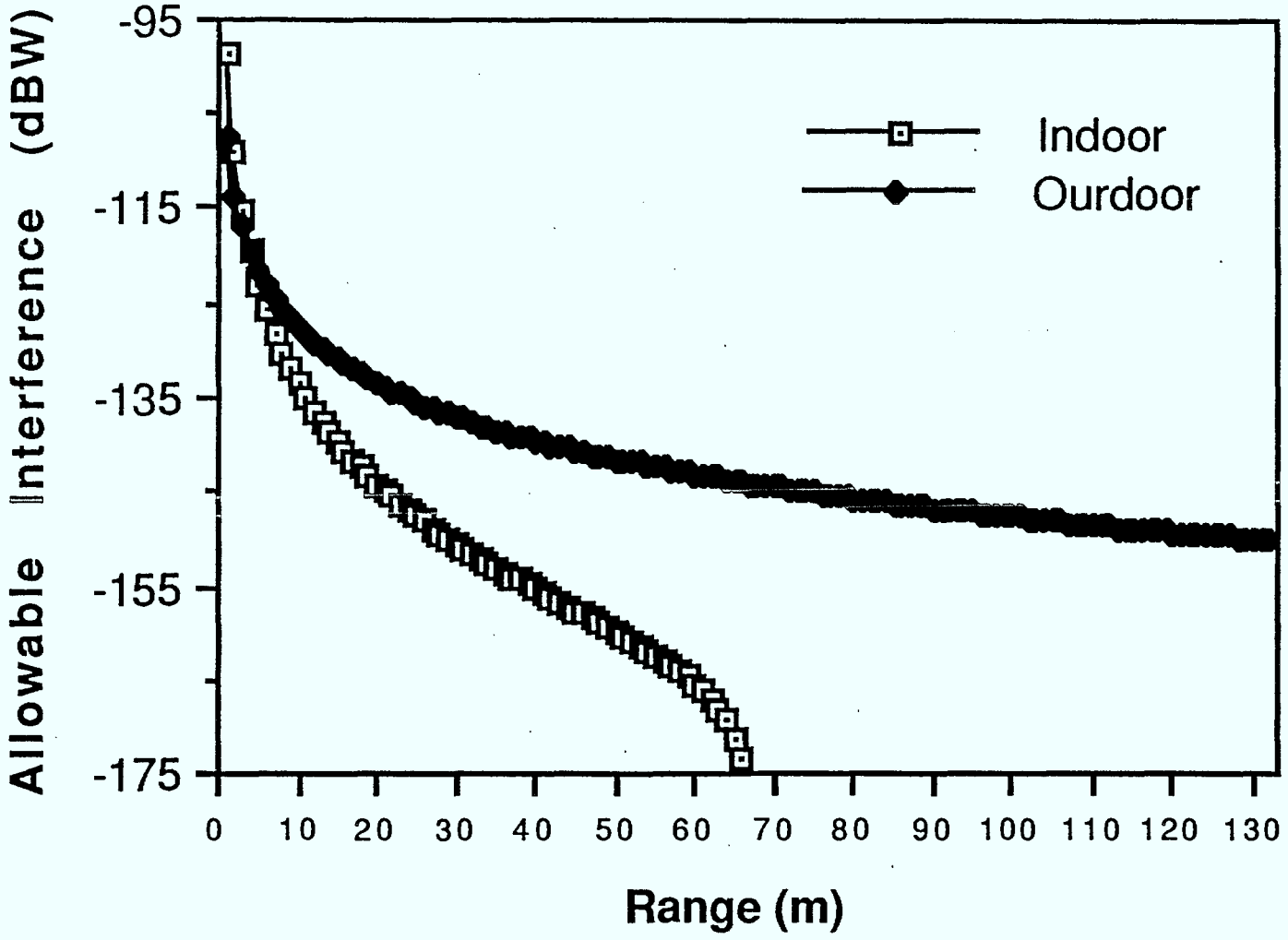



**Figure 7.1 - Allowable interference into FPLMTS terminal**

## 7.2 Approach to Interference Analysis

### 7.2.1 Spectrum Requirements

It has been proposed that the IRIDIUM system would use the frequency band from 1610 MHz to 1626.5 MHz; moreover, it would use the same frequency band for both transmit and receive in the satellite-user link. Furthermore, the frequency bands proposed for ORBCOMM system are 148-148.9 MHz for the uplink and 137-138 MHz for the downlink. It has also been suggested that the FPLMTS would be operating at a nominal 2 GHz. If all these systems, when implemented, would operate in the above-mentioned frequencies, then there would be no interference among them. However, in this study, in order to assess the potential interference between LEO systems and the FPLMTS system, we assume that the operating frequency of the IRIDIUM system and an variation of the ORBCOMM system (ie. the OL system) would be also 2 GHz. As a result of increases in the operating frequencies of the LEOs and to maintain the same coverage, the antenna size has to be reduced. Consequently, the received signal level is reduced. In order to offset the reduction, we assume that the transmit EIRP levels would be increased by the same amount, therefore the LEOs operating at the nominal 2 GHz would be then capable of delivering the same amount of power to a receiver as when the LEOs operating at the originally-planned frequencies would be capable of.

### 7.2.2 Methodology

We first evaluate the allowable interference into the wanted system, i.e. based on the acceptable C/(N+I), I is evaluated. The acceptable C/(N+I) in the case of FPLMTS system is 13.0 dB, upon which the allowable interference into FPLMTS terminal for both indoor and outdoor environments, as a function of the range between the FPLMTS terminal and its base station, is evaluated. In the case of LEO systems, we assume that the maximum allowable interference would degrade C/N by 0.5 dB or 1 dB. The allowable interference for both the IRIDIUM and OL satellites and mobiles are tabulated in Table 7.1.

As the second step, we evaluate the potential interference from the interfering system. Based on the received interfering signal level at

the wanted system and the effects of the bandwidth overlapping, antenna discrimination, and transmission time, the potential interference is calculated. As long as the potential interference does not exceed the allowable interference, the wanted system would perform as required. But as it would be shown in the following sections, the potential interference, in general, is significantly more than the allowable interference, thus resulting in a degradation in performance.

Note that both the potential and allowable interference are parametric. In fact, the parameters of interests are as follows:

i) r, the range between the FPLMTS terminal and its base station,
ii) d the distance between the FPLMTS terminal and the LEO mobile,
iii) m the number of interfering LEO mobiles, and
iv) n the number of interfering FPLMTS terminals.

As a result, the effects of various parameters on the required performance will be also assessed. In conclusion, reasonable values for these parameters which can give rise to the required performance will be determined.

Before carrying out the interference analysis, it should be noted that the general assumptions shown in Chapter 3 also apply in this chapter. In addition, the following assumptions apply:

1) In the case of interference between LEO/MSS mobile and FPLMTS terminal, the terrain blockage loss is calculated with the assumption that the earth surface is smooth and that the height of the LEO mobile and FPLMTS terminal is 1.5 m and that the k-factor is 4/3. As a result, there will be (radio) line-of-sight between the LEO mobile and FPLMTS terminal if they are separated by less than 10 km. The terrain blockage loss over a smooth earth is given in Appendix D.

2) Interference to or from the indoor FPLMTS terminal is not attenuated by the building in which the terminal is located as well as surrounded buildings. This assumption is not unrealistic since these are situations that the terminal is located near a window or an opening in the building which has a line-of-sight toward the LEO/MSS mobile and/or satellite.

| | C/N Degradation | |
|---|---|---|
| | 0.5 dB | 1.0 dB |
| **Allowable interference into IRIDIUM satellite** | | |
| Required C/N (dB) | 8.5 | 8.5 |
| Acceptable C/(N+I) (dB) | 8.0 | 7.5 |
| Minimum C (dBW) | -141.3 | -141.3 |
| Maximum I (dBW) | -158.9 | -155.7 |
| **Allowable interference into IRIDIUM mobile** | | |
| Required C/N (dB) | 9.2 | 9.2 |
| Acceptable C/(N+I) (dB) | 8.7 | 8.2 |
| Minimum C (dBW) | -139.8 | -139.8 |
| Maximum I (dBW) | -158.1 | -154.9 |
| **Allowable interference into ORBCOMM satellite** | | |
| Required C/N (dB) | 21.6 | 21.6 |
| Acceptable C/(N+I) (dB) | 21.1 | 20.6 |
| Minimum C (dBW) | -138.7 | -138.7 |
| Maximum I (dBW) | -169.4 | -166.2 |
| **Allowable interference into ORBCOMM mobile** | | |
| Required C/N (dB) | 22.9 | 22.9 |
| Acceptable C/(N+I) (dB) | 22.4 | 21.9 |
| Minimum C (dBW) | -131.5 | -131.5 |
| Maximum I (dBW) | -163.5 | -160.3 |

Table 7.1 Allowable Interference into LEO Systems

## 7.3 Interference between IRIDIUM and FPLMTS

The interference from the IRIDIUM system into the FPLMTS terminal can be from both the IRIDIUM satellite and the IRIDIUM mobile. As a result, the interferences contributed by both the IRIDIUM satellite and the IRIDIUM mobile must be calculated and then added. On the other hand, the interference from the FPLMTS terminal, at a given time, is into both the IRIDIUM satellite and the IRIDIUM mobile.

Since only one active IRIDIUM satellite is visible to an FPLMTS terminal at any given time, the dominant interfering beam from the IRIDIUM satellite belongs to the beam illuminating the FPLMTS terminal, the other interfering beams are more than one beamwidth away (20 dB down in level) and their effects may be totally disregarded. Moreover, in order to consider the worst case scenario, it is assumed that the FPLMTS terminal be located at the centre of the IRIDIUM satellite's dominant transmit beam, which in turn yields the discrimination factor of one. In other words, neither of the IRIDIUM satellite's antenna and FPLMTS terminal's antenna have any discrimination towards one another. Furthermore, the discrimination factor between the IRIDIUM mobile and the FPLMTS terminal, which both have omni-directional antennas, is one as well.

As discussed earlier, due to the time-division duplex characteristics of the IRIDIUM system and the fact that each of the IRIDIUM cell is allocated only 2 out of 14 bursts per TDM frame, the FPLMTS terminals receive interference from the IRIDIUM satellite for 4.3% of the time and from the IRIDIUM mobile mobile for 9.7% of the time, and negligible or no interference for 86% of the time. However, the interference from FPLMTS terminal into the IRIDIUM system exists at all times. Furthermore, the bandwidth of the IRIDIUM uplink signal is 135 kHz and that of the downlink is 300 kHz, and the bandwidth of the FPLMTS signal is 50 kHz. The potential interference between the FPLMTS system and IRIDIUM mobile is given in Table 7.2.

## Potential interference from IRIDIUM satellite into FPLMTS terminal

| | | Indoor FPLMTS terminal | Outdoor FPLMTS terminal |
|---|---|---|---|
| 10 log Q | (dB) | -7.8 | -7.8 |
| 10 log DF | (dB) | 0.0 | 0.0 |
| 10 log P | (dB) | -13.7 | -13.7 |
| EIRP | (dBW) | 25.0 | 25.0 |
| Losses | (dB) | 165.8 | 165.8 |
| Potential interference | (dBW) | -162.3 | -162.3 |

## Potential interference from IRIDIUM mobile into FPLMTS terminal

| | | Indoor FPLMTS terminal | Outdoor FPLMTS terminal |
|---|---|---|---|
| 10 log Q | (dB) | -4.3 | -4.3 |
| 10 log DF | (dB) | 10 log m | 10 log m |
| 10 log P | (dB) | -10.1 | -10.1 |
| EIRP | (dBW) | 3.3 | 3.3 |
| Losses | (dB) | f(d) | f(d) |
| Potential interference | (dBW) | 10 log m - 11.1 - f(d) | 10 log m - 11.1 - f(d) |

## Potential interference from FPLMTS terminal into IRIDIUM satellite

| | | Indoor FPLMTS terminal | Outdoor FPLMTS terminal |
|---|---|---|---|
| 10 log Q | (dB) | 4.3 | 4.3 |
| 10 log DF | (dB) | 10 log n | 10 log n |
| 10 log P | (dB) | 0.0 | 0.0 |
| EIRP | (dBW) | -25.0 | -17.0 |
| Losses | (dB) | 165.8 | 165.8 |
| Potential interference | (dBW) | 10 log n - 186.5 | 10 log n - 178.5 |

## Potential interference from FPLMTS terminal into IRIDIUM mobile

| | | Indoor FPLMTS terminal | Outdoor FPLMTS terminal |
|---|---|---|---|
| 10 log Q | (dB) | 7.8 | 7.8 |
| 10 log DF | (dB) | 10 log n | 10 log n |
| 10 log P | (dB) | 0.0 | 0.0 |
| EIRP | (dBW) | -25.0 | -17.0 |
| Losses | (dB) | f(d) | f(d) |
| Potential interference | (dBW) | 10 log n - 17.2 - f(d) | 10 log n - 9.2 - f(d) |

f(d) in dB is the loss between an IRIDIUM mobile and an FPLMTS terminal,
d is in kilometers, EIRPs and losses are at 2 GHz,
n is the number of FPLMTS terminals, and m is the number of IRIDIUM mobiles.

Table 7.2 Potential interference between FPLMTS and IRIDIUM systems

### 7.3.1 Interference from IRIDIUM System

If we add the the potential interference from the IRIDIUM satellite to that from m IRIDIUM mobiles, the overall potential interference from the IRIDIUM system into the FPLMTS terminal would be as follows:

$$I_{potential} = 10 \log [10^{-16.23} + m(10^{-1.11-f(d)/10})] \quad (dBW) \qquad \text{Eqn.7.2}$$

Note that d and m must be chosen in such a way that the potential interference would be less than the allowable interference (Eqn.7.1). Figure 7.2 shows the overall potential interference from the IRIDIUM satellite and an IRIDIUM mobile into an FPLMTS terminal as a function of d. Moreover, Figure 7.3 shows the relationship between r and d when the potential interference is equal to the allowable interference. The region below the curve signifies the desirable cases, i.e. when the potential interference is less than the allowable interference. Note that in the case of indoor environment, regardless of the distance between the FPLMTS terminal and the IRIDIUM mobile, the FPLMTS terminal cannot be more than 55 metres away from its base. The reason lies in the fact that the larger the distance between the FPLMTS terminal and its base is, the more dominant the interference from IRIDIUM satellite into the FPLMTS terminal would be. In fact, once r is 55 metres, the interference from the IRIDIUM satellite itself is more than the allowable interference into the FPLMTS terminal.

### 7.3.2 Interference from FPLMTS Terminals

If we set the potential interference from n indoor FPLMTS terminals or n outdoor FPLMTS terminals into the IRIDIUM satellite equal to the allowable interference into the IRIDIUM satellite, then n the maximum allowable number of FPLMTS terminals for the two different allowable interferences would be as follows:

| C/N-C/(N+I) | Maximum number of indoor interferors | Maximum number of outdoor interferors |
|---|---|---|
| 0.5 dB | 570 | 90 |
| 1.0 dB | 1200 | 190 |

Furthermore, we set the potential interference from an FPLMTS terminal into the IRIDIUM mobile equal to the allowable interference into the IRIDIUM mobile, then d, the minimum distance between the IRIDIUM mobile and an FPLMTS terminal, for the two different allowable interferences would be as shown below. Note that it is assumed here that the earth's surface is smooth and the antenna height of the IRIDIUM mobile and that of the FPLMTS terminal are 1.5 metres.

| C/N-C/(N+I) | Minimum distance (indoor FPLMTS) | Minimum distance (outdoor FPLMTS) |
|---|---|---|
| 0.5 dB | 12.6 km | 14.5 km |
| 1.0 dB | 12.1 km | 13.6 km |

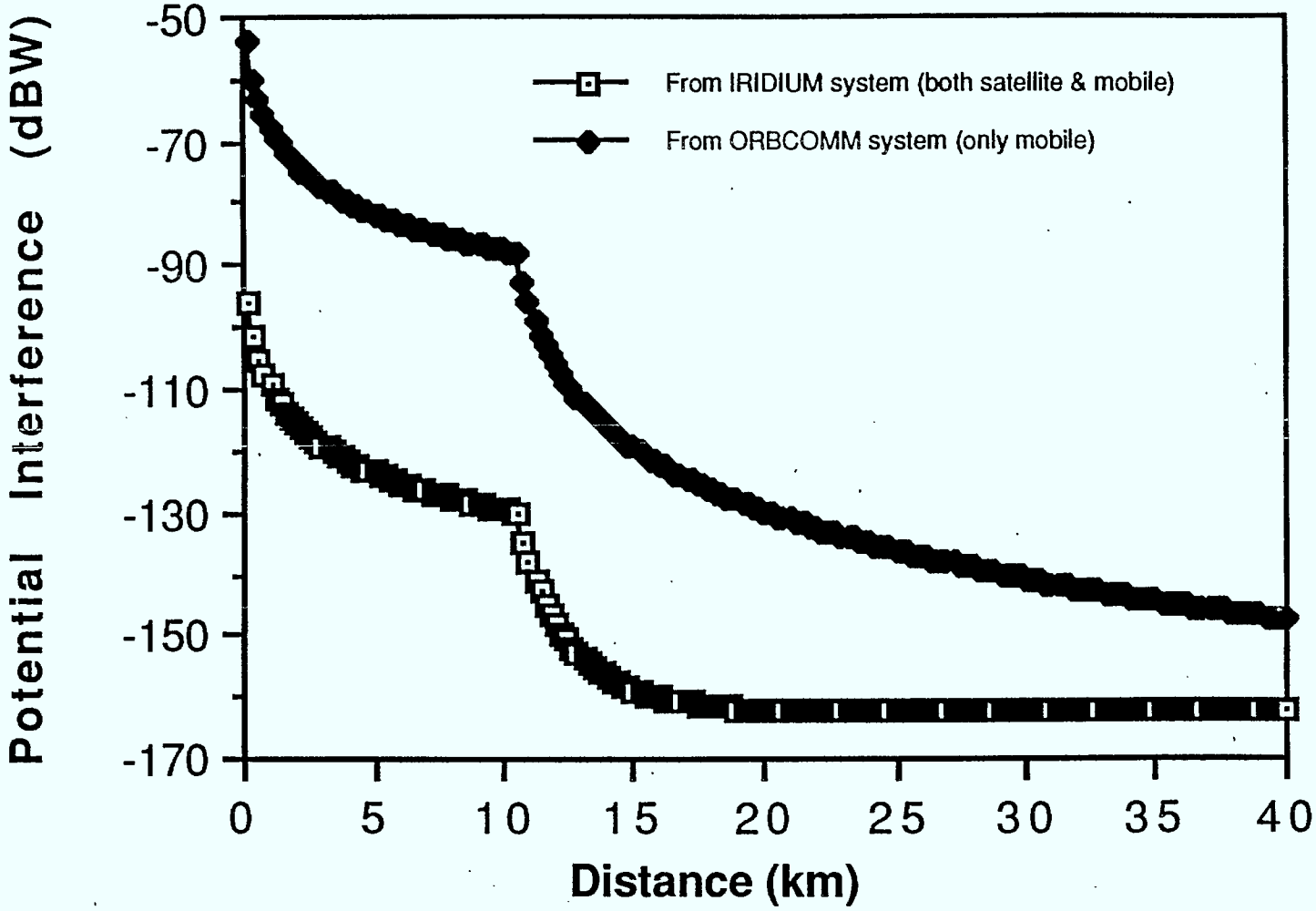



**Figure 7.2 - Potential interference into FPLMTS terminal**

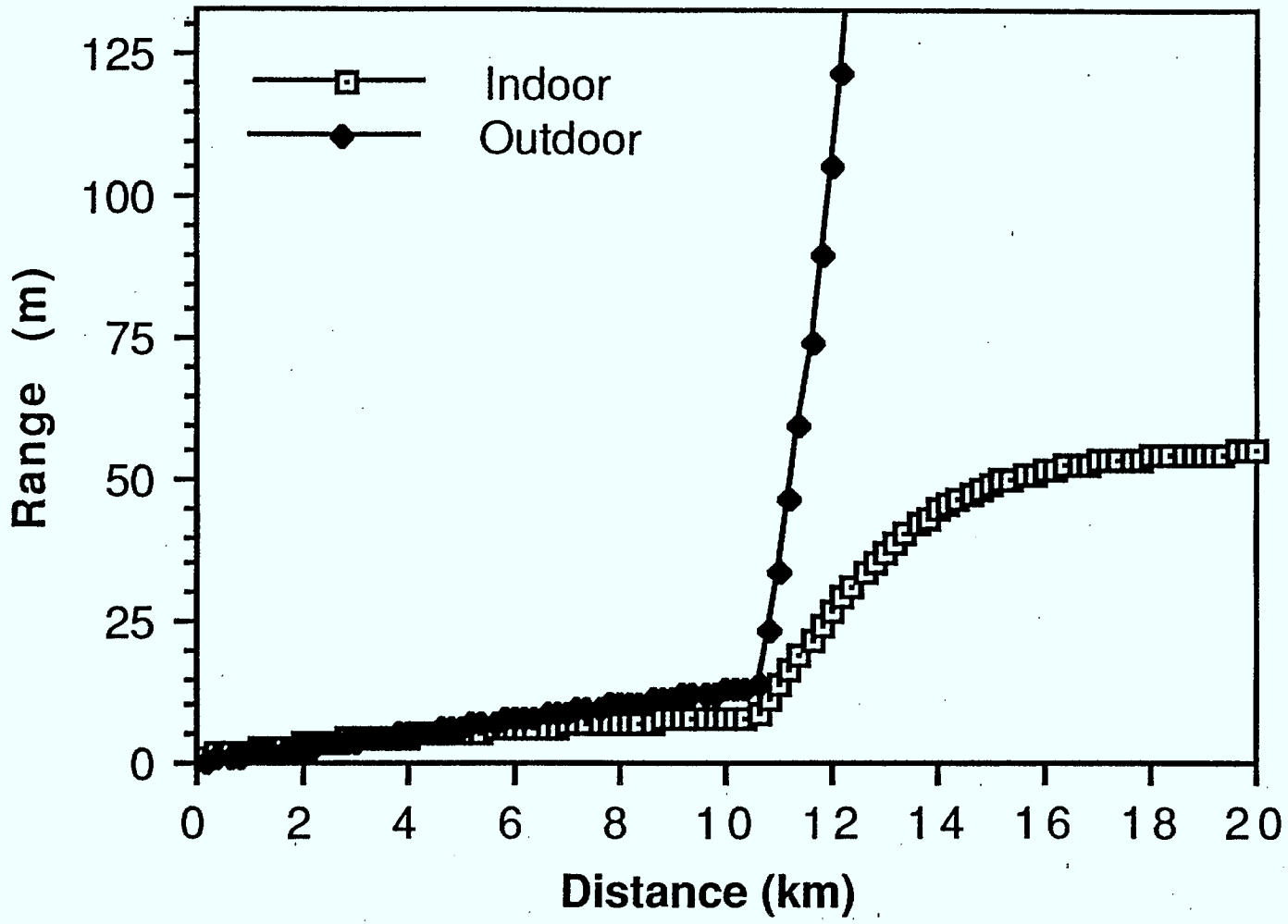



**Figure 7.3 - Allowable range between an FPLMTS terminal and its base versus allowable distance between an FPLMTS terminal and an IRIDIUM mobile**

## 7.4 Interference between OL and FPLMTS

As mentioned earlier, the uplink frequency band and the downlink frequency band of the OL system are different. As a result, there are two mutually exclusive scenarios:

i) the uplink operating frequency of the OL system is the same as the operating frequency of the FPLMTS terminals (e.g. 2 GHz), as a result, the interference would be between the OL mobile and the FPLMTS terminal, and
ii) the downlink operating frequency of the OL system is the same as the operating frequency of the FPLMTS terminals (e.g. 2 GHz), as a result, the interference would be between the OL satellite and the FPLMTS terminal.

Both the OL and FPLMTS terminals employ omni-directional antennas, hence the DF factor is 1.0. The OL uplink signal employs the slotted ALOHA random access technique at 30% loading, hence the P factor is 0.3, whereas the OL downlink signal is a continuous TDM signal, thus the potential interference from the OL satellite into the FPLMTS terminal exists at all times. Moreover, the bandwidth of the OL uplink signal is 3.6 kHz and that of the downlink signal is 7.2 kHz. Note that the interference from FPLMTS signal, whose bandwidth is 50 kHz, into the OL system exists as all times. The potential interference between the FPLMTS system and OL system is given in Table 7.3.

### 7.4.1 Interference from OL System

If we set the potential interference from the OL satellite into either an indoor FPLMTS terminal or an outdoor FPLMTS terminal equal to the allowable interference given in Eqn.7.1 , then r, the distance between the FPLMTS terminal and its base, must be less than 4 metres for an indoor environment and less than 3.80 metres for an outdoor environment, which is obviously quite an unrealistic requirement. This is probably due to the increase in EIRP that we have to assumed for the OL system.

The potential interference from m OL mobiles, each of which is d metres away from the FPLMTS terminal, into either an indoor FPLMTS terminal or an outdoor FPLMTS terminal is as follows:

$$I_{potential} = 10 \log m + 30.8 - f(d) \quad \text{(dBW)} \quad \text{Eqn. 7.3}$$

Note that d and m must be chosen in such a way that the potential interference would be less than the allowable interference (Eqn. 7.1). Figure 7.2 shows the potential interference from an OL mobile into an FPLMTS terminal as a function of d. Moreover, Figure 4 shows the relationship between r and d when the potential interference is equal to the allowable interference. The region below the curve signifies the desirable cases, i.e. when the potential interference is less than the allowable interference.

### 7.4.2 Interference from FPLMTS Terminals

If we set the potential interference from n indoor FPLMTS terminals or n outdoor FPLMTS terminals into the OL satellite equal to the allowable interference into the OL satellite, then n the maximum allowable number of FPLMTS terminals for the two different allowable interferences would be as follows:

| C/N-C/(N+I) | Number of indoor terminals | Number of outdoor terminals |
|---|---|---|
| 0.5 dB | 5370 | 850 |
| 1.0 dB | 11220 | 1770 |

If we set the potential interference from an FPLMTS terminal into the IRIDIUM mobile equal to the allowable interference into the OL mobile, then d, the minimum distance between the OL mobile and an FPLMTS terminal, for the two different interference objectives would be as follows:

| C/N-C/(N+I) | Minimum distance (indoor FPLMTS) | Minimum distance (outdoor FPLMTS) |
|---|---|---|
| 0.5 dB | 11.0 km | 11.7 km |
| 1.0 dB | 10.8 km | 11.4 km |

## Potential interference from ORBCOMM satellite into FPLMTS terminal

| | Indoor FPLMTS terminal | Outdoor FPLMTS terminal |
|---|---|---|
| 10 log Q (dB) | 8.4 | 8.4 |
| 10 log DF (dB) | 0.0 | 0.0 |
| 10 log P (dB) | 0.0 | 0.0 |
| EIRP (dBW) | 39.8 | 39.8 |
| Losses (dB) | 167.3 | 167.3 |
| Potential interference (dBW) | -119.1 | -119.1 |

## Potential interference from ORBCOMM mobile into FPLMTS terminal

| | Indoor FPLMTS terminal | Outdoor FPLMTS terminal |
|---|---|---|
| 10 log Q (dB) | 11.4 | 11.4 |
| 10 log DF (dB) | 10 log m | 10 log m |
| 10 log P (dB) | -5.2 | -5.2 |
| EIRP (dBW) | 24.6 | 24.6 |
| Losses (dB) | f(d) | f(d) |
| Potential interference (dBW) | 10 log m + 30.8 - f(d) | 10 log m + 30.8 - f(d) |

## Potential interference from FPLMTS terminal into ORBCOMM satellite

| | Indoor FPLMTS terminal | Outdoor FPLMTS terminal |
|---|---|---|
| 10 log Q (dB) | -11.4 | -11.4 |
| 10 log DF (dB) | 10 log n | 10 log n |
| 10 log P (dB) | 0.0 | 0.0 |
| EIRP (dBW) | -25.0 | -17.0 |
| Polarization Loss (dB) | 3.0 | 3.0 |
| Losses (dB) | 167.3 | 167.3 |
| Potential interference (dBW) | 10 log n - 206.7 | 10 log n - 198.7 |

## Potential interference from FPLMTS terminal into ORBCOMM mobile

| | Indoor FPLMTS terminal | Outdoor FPLMTS terminal |
|---|---|---|
| 10 log Q (dB) | -8.4 | -8.4 |
| 10 log DF (dB) | 10 log n | 10 log n |
| 10 log P (dB) | 0.0 | 0.0 |
| EIRP (dBW) | -25.0 | -17.0 |
| Polarization Loss (dB) | 3.0 | 3.0 |
| Losses (dB) | f(d) | f(d) |
| Potential interference (dBW) | 10 log n - 36.4 - f(d) | 10 log n - 28.4 - f(d) |

f(d) in dB is the loss between an ORBCOMM mobile and an FPLMTS terminal,
d is in kilometers, EIRPs and losses are at 2 GHz,
n is the number of FPLMTS terminals, and m is the number of ORBCOMM mobiles.

Table 7.3 Potential interference between FPLMTS and ORBCOMM systems

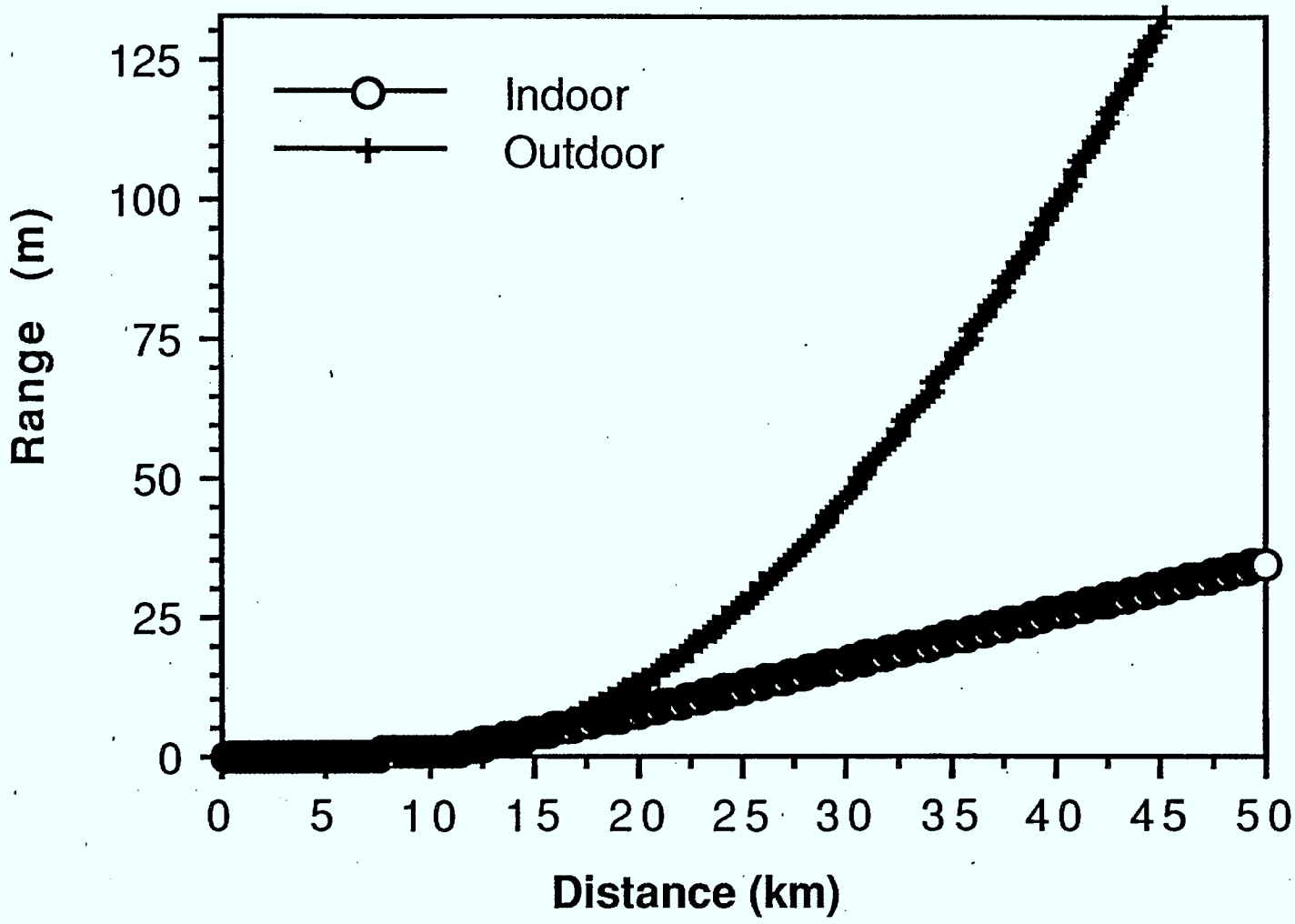



**Figure 7.4 - Allowable range between an FPLMTS terminal and its base versus allowable distance between an FPLMTS terminal and an ORBCOMM mobile**

## 7.5 Discussions

In order to shed some insight into the foregoing analysis, some typical examples are looked into in detail. As an example, we assume that the allowable interference into an FPLMTS terminal is -147 dBW, such an interference can be allowed when r, the distance between the FPLMTS terminal and its base station is less than 25 metres in an indoor environment and less than about 100 metres in an outdoor environment, see Eqn. 7.1. The following table presents the minimum allowable distance between an IRIDIUM mobile and an FPLMTS terminal for various number of IRIDIUM mobiles, when the allowable interference into an FPLMTS terminal is -147 dBW:

| Number of mobiles | Minimum distance (km) |
|---|---|
| 1 | 11.8 |
| 10 | 13.7 |
| 100 | 17.4 |
| 1000 | 24.0 |
| 10000 | 35.8 |

As the number of mobiles is increased, the minimum distance must be increased as well. Note that for the case of OL system, the required distances would be even greater than those shown above and that the radio horizon between the LEO mobile and FPLMTS terminal is about 10 km. It has been shown that the interference between LEO mobile and FPLMTS terminal can be reduced to meet the interference objectives set for this study by having the LEO mobile and FPLMTS terminal located beyond each other radio line of sight. The actual distance required depends on the roughness of the terrain, and the number of interferors. Nevertheless, as a rule of thumb, a distance of 20 to 30 km would be a good guess for a reasonably flat terrain.

Since the interference from the IRIDIUM system is from both the satellite and the mobile, there is a limit (55 metres) beyond which an indoor FPLMTS terminal cannot be any farther away from its base. The reason lies in the fact that beyond this limit the interference from the IRIDIUM satellite itself would be higher than the allowable interference into the indoor FPLMTS terminal.

Interference from FPLMTS terminals into IRIDIUM satellite is severe. For 0.5 dB C/N degradation objective, the maximum number of allowable interferors is only 570 for indoor and 90 for outdoor

FPLMTS. We now attempt to show that the above allowable numbers of interferors are indeed very low by calculating the possible number of simultaneously active outdoor FPLMTS terminals for Ottawa and its vicinity which have a total population of about 600,000. Assuming 20% of the population use FPLMTS with an busy hour traffic of 0.02 E per user then there could be up to 2,400 terminals simultaneously active during busy hour. This figure far exceeds the maximum allowable number of 90. In addition, an IRIDIUM beam can cover Ottawa, Montreal and Toronto all together at the same time. Interference monitoring scheme would not work effectively in this case since the activity in the FPLMTS frequency band would be extremely high due to a very large FPLMTS user population with a high degree of frequency reuse within an IRIDIUM beam.

Interference from OL system into the FPLMTS terminals is more severe than that of the IRIDIUM system into the FPLMTS terminals, probably due to the increased EIRP level.

## 7.6 Conclusions

In this chapter, a feasibility study of spectrum sharing between LEO systems (IRIDIUM and OL systems) and FPLMTS terminals was conducted. In order to be able to perform a first-cut analysis, we assumed all systems would be operating at the nominal 2 GHz, a frequency which has been proposed for the operation of FPLMTS system. We can conclude that if the operating frequency of the LEO and FPLMTS systems is the same, e.g. 2 GHz, then the interference from one system into another would be quite severe.

The results of the analysis indicate that the effects of LEO systems on FPLMTS terminals are more severe than the effects of FPLMTS terminals on LEO systems. Furthermore, as a general rule of thumb, an interfering mobile must be beyond the radio horizon of a wanted terminal in order to reduce mobile-to-mobile interference down to the objectives set for this study. On the other hand, there seems to be no technical means to alleviate the severe interference from FPLMTS terminals into the LEO satellite in a co-frequency sharing scenario.

## REFERENCES


1. Frequency Sharing Criteria for A Low Earth Orbiting Mobile Satellite System Using VHF Spectrum, CCIR IWP 8/14, May, 1990.

2. MOTOROLA's IRIDIUM FCC Filing, December, 1990.

3. OCC's ORBCOMM FCC Filing, Feburuary, 1990.

4. Point-To-Multipoint Systems Utilizing Time Division Multiple Access Techniques. CCIR XVIIth Plenary Assembly Dusseldorf, 1990, Report 1057 (MOD F).

5. Report on Sharing Criteria between FPLMTS and Other Services, CCIR Interim Working Party 8/13. Harrogate, U.K. July 1990.

6. Report of IWP 8/13 to IWP 8/15 WARC 92 Preparation, CCIR Interim Working Party 8/13. Harrogate, U.K, July 1990.

7. Radio-Frequency Channel Arrangements for Low and Medium Capacity Analogue or Digital Radio Relay Systems Operating in the 2 GHz Band, CCIR XVIIth Plenary Assembly Dusseldorf, 1990, Draft Recommendation 283-4* (MOD F).

8. Radio Frequency Channel Appragements for Analogue and Digital Point-To-Multipoint Radio Systems Operating in Frequency Bands in the Range 1.427 to 2.690 GHz, CCIR XVIIth Plenary Assembly Dusseldorf, 1990, Draft Recommendation AJ/9

9. Standard Radio System Plan (Technical Requirements for Fixed Line-of-Sight Radio Systems Operating in the 1427-1525 MHz Band), Department of Communications, Government of Canada. SRSP-311, Issue 1, 1979.

10. Standard Radio System Plan (Technical Requirements for Line-of-Sight Radio Systems Operating in the Fixed Service in the Band 1710-1900 MHz), Department of Communications, Government of Canada. SRSP-301.71 Issue 3, 1988.

11. Standard Radio System Plan (Technical Requirements for Line-of-Sight Radio Systems Operating in the Fixed Service in the Band 1900-2290 MHz), Department of Communications, Government of Canada, SRSP-301.9 Issue 2, 1985.

12. Standard Radio System Plan (Technical Requirements for Line-of-Sight Radio Systems Operating in the Fixed Service in the Band 2290-2450 MHz), Department of Communications, Government of Canada, SRSP-302.2 Issue 1, March, 1990.

13. Standard Radio System Plan (Technical Requirements for Line-of-Sight Radio Systems Operating in the Fixed Service in the Band 1710-1900 MHz), Department of Communications, Government of Canada, SRSP-303 Issue 2.

14. User's Document of ASIAP (Adjacent Satellite Interference Analysis Program), Communication Systems Engineering Division, Telesat Canada, 1990.

# APPENDIX A

# CALCULATION OF THE DISCRIMINATION FACTOR

The discrimination Factor (DF) is a parameter which accounts for the effects of antenna discrimination as well as the multiple interference entry if the interfering system employs frequency reuse (i.e. multiple interferors come from beams using the same frequency band). It is computed based on the orbital parameters and the beam patterns of the interfering and wanted systems, hence its value varies for different interference scenarios. Exact evaluation of DF will be an impractical task since in most case DF varies with time as the LEO satellite traverse its orbit and hence its coverage moves. For the purpose of this study, it is reasonable just to approximate DF based on the principle (ie. definition) of DF and the typical geometrical layout for each interference scenario. Table A.1 and A.2 show the values of DF based on the worst-case interference scenarios for all LEO/MSS and GSO/MSS systems considered in this study. The rationale which are used to estimate DF for interference between the MSAT system and the IRIDIUM and OL systems are also given in this appendix for reference. The reasoning for other GSO/MSS systems would be similar to that for MSAT and therefore not given here.

## A.1. Interference between IRIDIUM and MSAT

### A.1.1 Interference from IRIDIUM to MSAT

#### A.1.1.1 Interference from IRIDIUM Mobiles to MSAT Satellite

The IRIDIUM mobile terminals have negligible discrimination toward the MSAT satellite. Any mobile terminals which are within the coverage area of the MSAT satellite will interfere with MSAT satellite at nearly full power. Interference from mobiles away from the coverage area will be attenuated by the discrimination of the MSAT satellite receive antenna. A typical worst-case interference scenario is illustrated in Figure A.1 which shows 3 dB antenna contours of both IRIDIUM satellite and MSAT satellite. The IRIDIUM projects 37 spot beams (cells) on the surface of the earth. The 7-cell frequency reuse pattern denotes the beams as A through G. The cells of the same letter use the same frequency and will be turned on and off simultaneously. The MSAT's West-Centre beam was arbitrary chosen as a victim beam in Figure A.1, however, the discussion below would hold for other continental beams. The figure shows that the maximum number of IRIDIUM's cell of the same label that can fall within the MSAT victim beam is three, these cells are labeled E. Of course the geometrical arrangement in Figure A.1 is valid for only one instant of time, the IRIDIUM cells will move towards the north pole as time goes on. Nevertheless, the three cells of

| INTERFEROR | VICTIM | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MSAT SYSTEM | | INMARSAT (SPOT) | | INMARSAT (GLOBAL) | | ZENON SYSTEM | | EUTELSAT SYSTEM | |
| | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE |
| IRIDIUM MOBILE | 3.40 | -5.00 | 6.60 | -5.00 | 14.30 | -5.00 | 6.80 | -5.00 | 9.70 | -5.00 |
| IRIDIUM SATELLITE | -1.60 | 0.00 | 4.60 | 0.00 | 9.30 | 0.00 | 0.60 | 0.00 | 5.20 | 0.00 |
| ORBCOMM MOBILE | 0.00 | -5.00 | 0.00 | -5.00 | 5.20 | -5.00 | 0.00 | -5.00 | 0.00 | -5.00 |
| ORBCOMM SATELLITE | 0.00 | 0.00 | 0.80 | 0.00 | 5.00 | 0.00 | -0.50 | 0.00 | 1.50 | 0.00 |

**TABLE A.1 DF FACTOR FOR INTERFERENCE FROM LEO TO GSO SYSTEM**

| VICTIM | INTERFEROR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | MSAT SYSTEM | | INMARSAT (SPOT) | | INMARSAT (GLOBAL) | | ZENON SYSTEM | | EUTELSAT SYSTEM | |
| | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE | SATELLITE | MOBILE |
| IRIDIUM MOBILE | 0.00 | -5.00 | 0.00 | -5.00 | 0.00 | -5.00 | 0.00 | -5.00 | 0.00 | -5.00 |
| IRIDIUM SATELLITE | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -3.00 | 0.00 | 0.00 | 0.00 |
| ORBCOMM MOBILE | 0.00 | -5.00 | 0.00 | -5.00 | 0.00 | -5.00 | 0.00 | -5.00 | 0.00 | -5.00 |
| ORBCOMM SATELLITE | 0.00 | 3.00 | 0.00 | 0.00 | 0.00 | 0.00 | -3.00 | 0.00 | 0.00 | 0.00 |

**TABLE A.2 DF FACTOR FOR INTERFERENCE FROM GSO TO LEO SYSTEM**

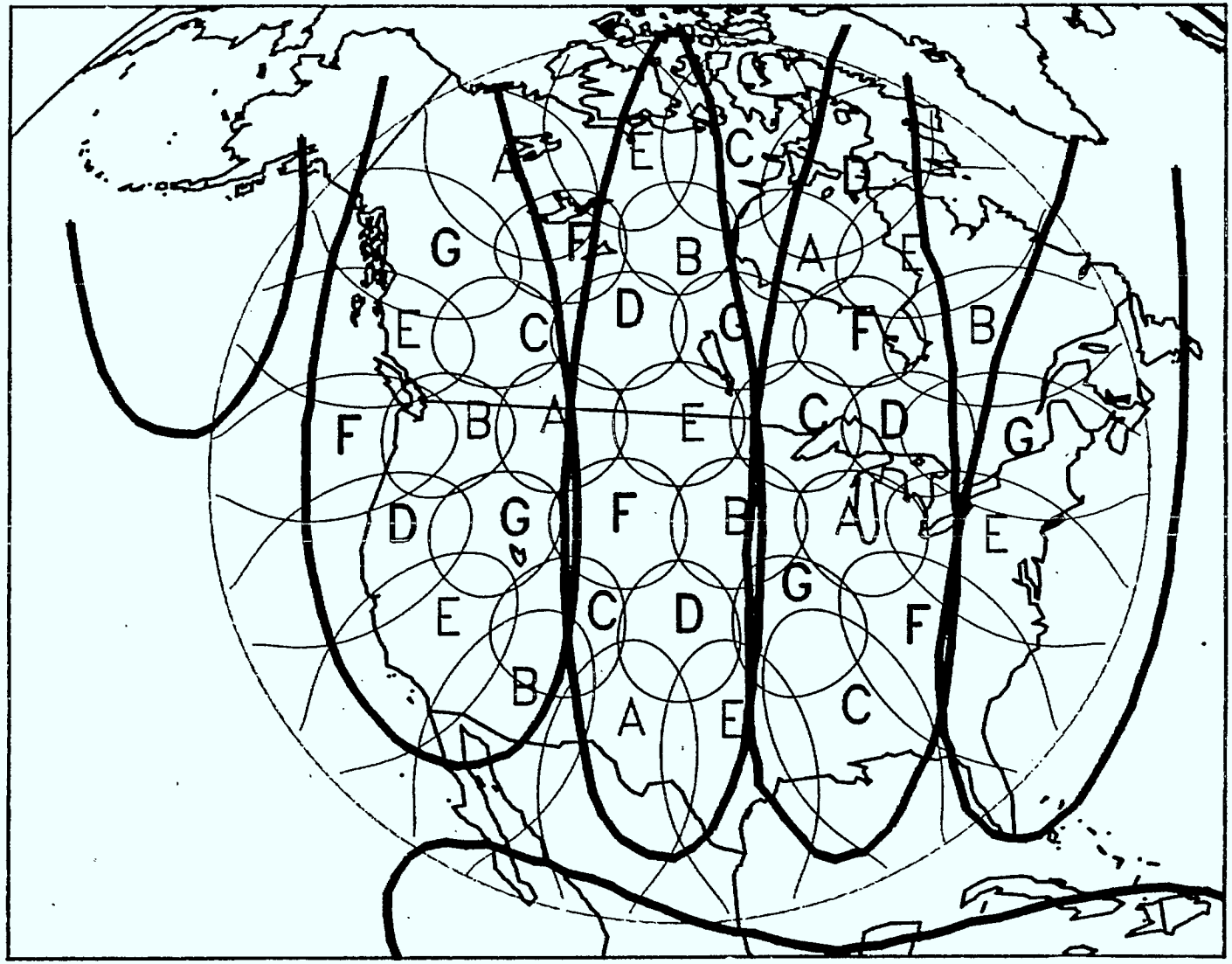



Fig A.1 MSAT Satellite Coverage and IRIDIUM Satellite Coverage

the same label can remain inside the MSAT beam for about 1.6 minutes as estimated from the speed of the IRIDIUM satellite of 400km/min and the cell size of about 640km. This time duration is long enough to cause objectionable interference into am MSAT communication link. Interference contribution from other E-cells outside the 3dB beamwidth of the MSAT beam would be small and can be ignored. Assuming that one IRIDIUM mobile is located at the boresight of the victim beam and the other two IRIDIUM mobiles are located at the 2 dB contours then the discrimination factor for this scenario is given by:

$DF_{Im} = 1.0 + 0.6+0.6 = 2.2$

or $10\log(DF_{Im}) = 3.4$ dB

### A.1.1.2 Interference from IRIDIUM Satellite to MSAT Satellite

The MSAT satellite can "see" up to 57 IRIDIUM satellites but only a few of these are the main interference contributors to MSAT. Based on the IRIDIUM's satellite constellation arrangement and the size of the MSAT beams, about three of these satellites are within any one of the MSAT (continental) main beams. As the IRIDIUM satellites move around its orbits then at some given instant of time an IRIDIUM satellite and the MSAT satellite would be inside one other's mainlobes as depicted in Figure A.2. When this happens, there will be significant interference from the IRDIUM satellite into the MSAT satellite and vice versa. Based on simulation using a computer program at Telesat, at a given instant of time, only one IRIDIUM satellite can be inside a main beam of MSAT and have its main beam directed at the MSAT satellite, and this scenario can last up to 30 seconds. The other two IRIDIUM satellites which are inside a MSAT main beam would have their backlobes towards MSAT. Due to the 7-cell frequency reuse, there can be up to 7 cells from each of the IRIDIUM satellites causing interference into MSAT satellite at the same time. Since the IRIDIUM antennas have gain ranging from 12 dBi to 25 dBi, hence the backlobe discrimination of these antennas toward the MSAT satellite will vary too. Assuming the backlobes of these antennas have 15 dB discrimination on an average then the contribution of each cell would be equivalent to 3.1% of a single entry, full power interference level. The rest of the visible IRIDIUM satellites would be far away from the MSAT beams and have their sidelobes or backlobes towards the MSAT satellite. Interference contribution from these satellites are negligible. The $DF_{Is}$ parameter will be calculated as following:

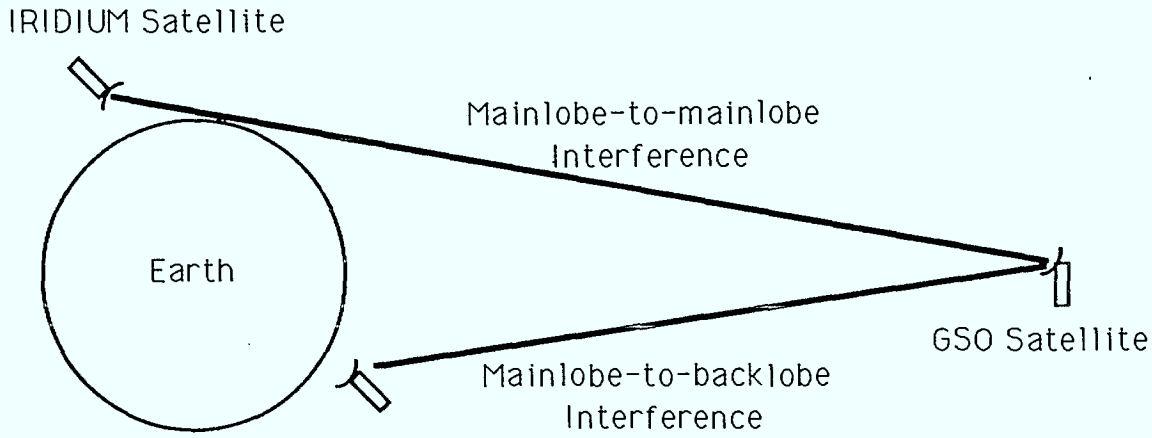



**Figure A.2: Interference between GSO Satellite and IRIDIUM Satellite**

Contribution from mainlobe-to-mainlobe interference: 1.0
Contribution from mainlobe-to-backlobe interference: 0.031x7x2=0.44

Total: $DF_{Is}$ = 1.44
or $10\log(DF_{Is})$ = 1.6 dB

### A.1.1.3 Interference from IRIDIUM Mobile to MSAT Mobile

It is assumed that the IRIDIUM mobile terminals and MSAT mobile terminals are 5 km apart. The discrimination factor is determined by the MSAT mobile antenna discrimination toward the horizon. The value of DF is given by:

$10\log(DF_{Im})$ = - Discrimination of MSAT mobile antenna toward horizon.
= 0 dB for omni-directional antenna
= -5 dB for hemispherical antenna

### A.1.1.4 Interference from IRIDIUM Satellite to MSAT Mobile

Since only one active IRIDIUM satellite is visible to the MSAT mobile terminal at a time, the dominant interferor from the IRIDIUM satellite belongs to the beam illuminating the MSAT mobile terminal, other interferors are more than one beamwidth away and hence at least 20 dB down in level based on the the rolloff characteristics of the IRIDIUM antenna pattern. In the case that MSAT mobile is located at the centre of IRIDIUM satellite transmit beam, the discrimination factor is 0 dB, that is, neither the IRIDIUM satellite transmit antenna nor the MSAT receive antenna has discrimination toward each other.

## A.1.2 Interference from MSAT to IRIDIUM

### A.1.2.1 Interference from MSAT Mobile to IRIDIUM Satellite

MSAT mobile terminals that are located within or near an IRIDIUM spot beam coverage would be potential interferors to a communications link in that beam. Since MSAT mobile terminal antenna is hemispherical, it will interfere with IRIDIUM satellite at full power level, the discrimination factor in this case is 0 dB.

The worst case interference occurs when all MSAT mobile terminals are within the victim spot beam. But it would be unlikely that all MSAT mobiles are concentrated in one IRIDIUM cell since an MSAT (continental) beam is about ten times larger than a cell and the MSAT

mobiles would be distributed to various parts of the beam. Assume that 40% of the MSAT mobiles are located within an IRIDIUM cell then a factor of 4 dB has to be subtracted from the Q parameter for this case.

### A.1.2.2 Interference from MSAT Satellite to IRIDIUM Satellite

If the IRIDIUM system uses the 1.5 GHz band, the interference into it will come from the MSAT satellite. This interference scenario is similar to that of IRIDIUM satellite to MSAT satellite (section A.1.1.2), but the victim satellite and the interferor switch roles and there is only one mainlobe-to-mainlobe interferor. Hence the discrimination factor $DF_{ls}$ is 0 dB in this case.

### A.1.2.3 Interference from MSAT Mobile to IRIDIUM Mobile

Similar to the discussion in section A.1.1.2, the discrimination factor is:

$10\log(DF_{lm})$ = - Discrimination of MSAT mobile antenna toward horizon.
= 0 dB for omni-directional antenna
= -5.0 dB for hemispherical antenna

### A.1.2.4 Interference from MSAT Satellite to IRIDIUM Mobile

The worst case is when IRIDIUM mobile terminals are at the centre of MSAT satellite transmit antenna beam, the discrimination factor is then equal to 0 dB.

## A.2. Interference between OL and MSAT

### A.2.1 Interference from OL to MSAT

It is assumed that the OL system would use the 1.5/1.6 GHz frequency band for its operation in this study. Two scenarios will be discussed in the following sections - same band operation and reverse band operation.

#### A.2.1.1 Interference from OL Mobile to MSAT Satellite - Same Band Operation

In this scenario, the OL system utilizes 1.6 GHz band for its uplink. Interference on the uplink into the MSAT satellite receiver comes from the ORBCOMM's mobile terminals. Unlike IRDIUM satellites which have spot beam coverage and utilize the 7-cell frequency reuse pattern, the OL satellites have global beam coverage, and the bandwidth of an ORBCOMM's carrier of 3.6 kHz is close to the that of a MSAT's carrier. It is therefore reasonable to assume that only one OL mobile interfere with a MSAT's carrier at a time. The worst-case interference occurs when the interfering OL mobile terminal is located at the centre of MSAT satellite's receive beam. DF is 0 dB in this case.

#### A.2.1.2 Interference from OL Satellites to MSAT Mobile - Same Band Operation

MSAT mobile terminals would receive interference from the OL satellite transmit antennas in the same band operation scenario. When the MSAT mobile terminal is inside the OL satellite transmit beam then the value of DF is 0 dB.

#### A.2.1.3 Interference from OL Satellite to MSAT Satellite - Reverse Band Operation

In this interference scenario, OL uses 1.5 GHz band for its uplink, and 1.6 GHz band for its downlink. The uplink interference into MSAT satellite comes from OL satellite, and the downlink interference towards MSAT mobile terminals comes from the OL mobile terminals. Similar to the IRIDIUM case, there would be mainlobe-to-mainlobe interference into the MSAT satellite. Computer simulation shows that the OL satellites on non-polar ($50^{o}$ inclination) orbital planes would cause mainlobe-to-mainlobe interference into the Hawaii and Alaska beams,

and mainlobe-to-mainlobe interference into MSAT continental beams comes from the two OL satellites on polar orbit. The simulation also shows that the mainlobe-to-mainlobe interference can last from 20 to 150 seconds. The value of DF is 0 dB in this case.

#### A.2.1.4 Interference from OL Mobile to MSAT Mobile - Reverse Band Operation

Similar to the case of interference from IRIDIUM mobile to MSAT mobile, the discrimination factor is given by:

10log(DF) = -Discrimination of MSAT mobile antenna toward horizon.
= 0 dB for omni-directional antenna
= -5 dB for hemispherical antenna

### A.2.2. Interference from MSAT to OL

#### A.2.2.1 Interference from MSAT Mobile to OL Satellite - Same Band Operation

Due to its large beam size, an OL satellite may receive interference from MSAT mobile terminals located in two MSAT beams which use the same frequency band as shown in Figure A.3. The DF value in this case will is given by:

| | | |
|---|---|---|
| Contribution from the west beam | = | 1.0 |
| Contribution from the east beam | = | 1.0 |
| Total | = | 2.0 |

or 10log(DF) = 3 dB.

#### A.2.2.2 Interference from MSAT Satellite to OL Mobile - Same Band Operation

The worst-case scenario occurs when the OL mobile terminal is located inside the 3 dB contour of MSAT satellite transmit beam. Interference contribution from the other beam which use the same frequency band is negligible. The value of DF is then equal to 0 dB.

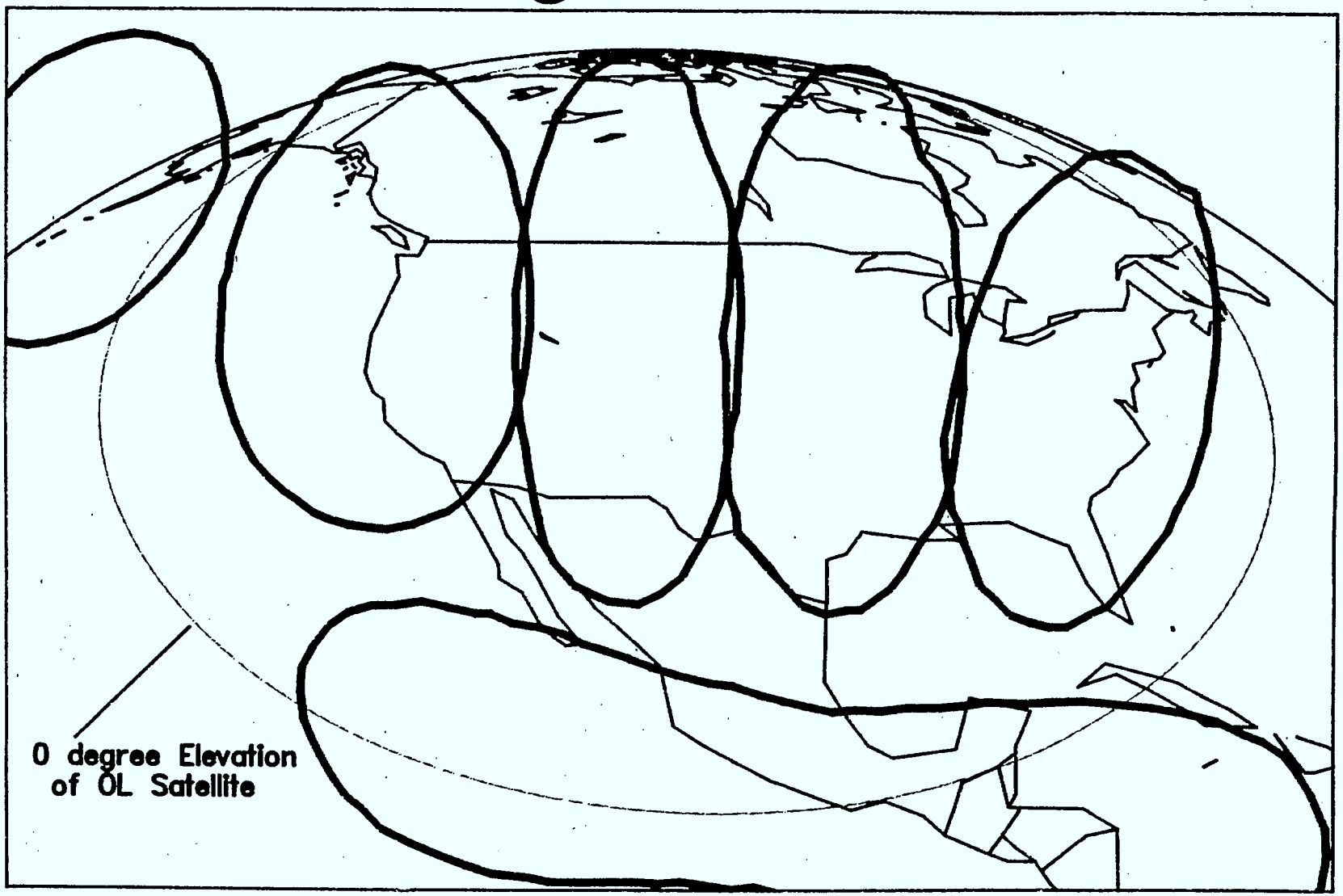



Figure A.3 MSAT Satellite Coverage and OL Satellite Coverage

### A.2.2.3 Interference from MSAT Satellite to OL Satellite - Reverse Band Operation

Here we consider the mainlobe-to-mainlobe interference case which has the DF value of 0 dB. Computer simulation indicates that this scenario may last from 20 to 150 seconds.

### A.2.2.4 Interference from MSAT Mobile to OL Mobile - Reverse Band Operation

This again is the case of mobile-to-mobile interference, the discrimination factor is given by:

10log(DF) = - Discrimination of MSAT mobile antenna toward horizon.
= 0 dB for omni-directional antenna
= -5 dB for hemispherical antenna

# APPENDIX B

# DETAILED CALCULATIONS OF INTERFERENCE BETWEEN LEO/MSS AND GSO/MSS

This appendix provide the interference calculations in detail. Microsoft Excel spread sheet was used to create the tables. Each table has a title on the upper left corner which identifies the interferor as well as the victim.

The abbreviations and notations used in the tables are described as follow:

| | |
|---|---|
| WEIRP | EIRP level of victim's transmitter |
| IEIRP | EIRP level of interferor's transmitter |
| dEIRP | equals to WEIRP-IEIRP |
| WRANGE | distance between victim's transmitter and receiver |
| IRANGE | distance from interferor's transmitter to victim's receiver |
| dPL | equals to the difference between the path loss from the victim's transmitter to the victim's receiver and that from the interferor's transmitter and the victim's receiver |
| $(C/I)_{1F}$ | single entry, full power carrier-to-interference power |
| WNBW | equivalent noise bandwidth of the victim's receiver |
| IABW | allocated bandwidth of the interferor |
| 10log(Q) | Q parameter expressed in dB |
| 10log(DF) | discrimination factor expressed in dB |
| P | fraction of time that interference exists |
| Margin 0.5dB | margin in dB above (positive) or below (negative) the C/I value which degrades the C/N by 0.5 dB |
| Margin 1.0dB | same as above but for 1.0 dB C/N degradation |

# INTERFERENCE FROM LEO/MSS INTO GSO/MSS

## IRIDIUM MOBILE (CELL 1) TO MSAT MOBILE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 27.30 | 27.30 | 26.90 | 26.90 | 32.30 | 27.30 | 24.30 | 21.30 | 28.30 | 28.30 | 30.30 | 30.30 | 26.90 | 26.90 |
| IEIRP (dBW) | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 |
| dEIRP (dB) | 25.90 | 25.90 | 25.50 | 25.50 | 30.90 | 25.90 | 22.90 | 19.90 | 26.90 | 26.90 | 28.90 | 28.90 | 25.50 | 25.50 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 |
| (C/I)1F (dB) | -52.05 | -52.05 | -52.45 | -52.45 | -47.05 | -52.05 | -55.05 | -58.05 | -51.05 | -51.05 | -49.05 | -49.05 | -52.45 | -52.45 |
| WNBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| INBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| IABW (kHz) | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 |
| 10log(Q) (dB) † | -16.53 | -16.53 | -20.10 | -20.10 | -16.53 | -20.10 | -23.11 | -26.12 | -16.53 | -16.53 | -16.53 | -16.53 | -14.06 | -14.06 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 10log(P) (dB) | -10.13 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 |
| (C/I)m (dB) | -20.39 | -20.52 | -17.35 | -17.35 | -15.52 | -16.95 | -16.94 | -16.93 | -19.52 | -19.52 | -17.52 | -17.52 | -23.39 | -23.39 |

† If 10logQ is positive then it is set to 0 dB since we assume there is only one interfering mobile

## IRIDIUM SATELLITE (CELL 1) TO MSAT MOBILE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 27.30 | 27.30 | 26.90 | 26.90 | 32.30 | 27.30 | 24.30 | 21.30 | 28.30 | 28.30 | 30.30 | 30.30 | 26.90 | 26.90 |
| IEIRP (dBW) | 23.13 | 23.13 | 23.13 | 23.13 | 23.13 | 23.13 | 23.13 | 23.13 | 23.13 | 23.13 | 23.13 | 23.13 | 23.13 | 23.13 |
| dEIRP (dB) | 4.17 | 4.17 | 3.77 | 3.77 | 9.17 | 4.17 | 1.17 | -1.83 | 5.17 | 5.17 | 7.17 | 7.17 | 3.77 | 3.77 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| dPL (dB) | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 |
| (C/I)1F (dB) | -20.53 | -20.53 | -20.93 | -20.93 | -15.53 | -20.53 | -23.53 | -26.53 | -19.53 | -19.53 | -17.53 | -17.53 | -20.93 | -20.93 |
| WNBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| INBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| IABW (kHz) | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 |
| 10log(Q) (dB) | -20.00 | -20.00 | -23.57 | -23.57 | -20.00 | -23.57 | -26.58 | -29.59 | -20.00 | -20.00 | -20.00 | -20.00 | -17.53 | -17.53 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 10log(P) (dB) | -13.67 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 |
| (C/I)s (dB) | 13.14 | 13.45 | 16.62 | 16.62 | 18.45 | 17.02 | 17.03 | 17.04 | 14.45 | 14.45 | 16.45 | 16.45 | 10.58 | 10.58 |

AGGREGATE, LONG-TERM INTERFERENCE

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (C/I)A (dB) | -20.39 | -20.52 | -17.36 | -17.36 | -15.52 | -16.96 | -16.95 | -16.94 | -19.52 | -19.52 | -17.52 | -17.52 | -23.39 | -23.39 |
| (C/N) (dB) | 18.00 | 18.00 | 21.10 | 21.10 | 23.00 | 14.10 | 14.10 | 14.10 | 19.00 | 19.00 | 21.00 | 21.00 | 15.10 | 15.10 |
| Margin 0.5dB | -47.39 | -47.52 | -47.46 | -47.46 | -47.52 | -40.06 | -40.05 | -40.04 | -47.52 | -47.52 | -47.52 | -47.52 | -47.49 | -47.49 |
| Margin 1.0dB | -44.39 | -44.52 | -44.46 | -44.46 | -44.52 | -37.06 | -37.05 | -37.04 | -44.52 | -44.52 | -44.52 | -44.52 | -44.49 | -44.49 |

## IRIDIUM MOBILE (CELL 7) TO MSAT MOBILE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 27.30 | 27.30 | 26.90 | 26.90 | 32.30 | 27.30 | 24.30 | 21.30 | 28.30 | 28.30 | 30.30 | 30.30 | 26.90 | 26.90 |
| IEIRP (dBW) | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| dEIRP (dB) | 20.30 | 20.30 | 19.90 | 19.90 | 25.30 | 20.30 | 17.30 | 14.30 | 21.30 | 21.30 | 23.30 | 23.30 | 19.90 | 19.90 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 |
| (C/I)1F (dB) | -57.65 | -57.65 | -58.05 | -58.05 | -52.65 | -57.65 | -60.65 | -63.65 | -56.65 | -56.65 | -54.65 | -54.65 | -58.05 | -58.05 |
| WNBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| INBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| IABW (kHz) | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 |
| 10log(Q) (dB) † | -16.53 | -16.53 | -20.10 | -20.10 | -16.53 | -20.10 | -23.11 | -26.12 | -16.53 | -16.53 | -16.53 | -16.53 | -14.06 | -14.06 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 10log(P) (dB) | -10.13 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 |
| (C/I)m (dB) | -25.99 | -26.12 | -22.95 | -22.95 | -21.12 | -22.55 | -22.54 | -22.53 | -25.12 | -25.12 | -23.12 | -23.12 | -28.99 | -28.99 |

† If 10logQ is positive then it is set to 0 dB since we assume there is only one interfering mobile

## IRIDIUM SATELLITE (CELL 7) TO MSAT MOBILE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 27.30 | 27.30 | 26.90 | 26.90 | 32.30 | 27.30 | 24.30 | 21.30 | 28.30 | 28.30 | 30.30 | 30.30 | 26.90 | 26.90 |
| IEIRP (dBW) | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 |
| dEIRP (dB) | 14.80 | 14.80 | 14.40 | 14.40 | 19.80 | 14.80 | 11.80 | 8.80 | 15.80 | 15.80 | 17.80 | 17.80 | 14.40 | 14.40 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| dPL (dB) | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 |
| (C/I)1F (dB) | -18.54 | -18.54 | -18.94 | -18.94 | -13.54 | -18.54 | -21.54 | -24.54 | -17.54 | -17.54 | -15.54 | -15.54 | -18.94 | -18.94 |
| WNBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| INBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| IABW (kHz) | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 |
| 10log(Q) (dB) | -20.00 | -20.00 | -23.57 | -23.57 | -20.00 | -23.57 | -26.58 | -29.59 | -20.00 | -20.00 | -20.00 | -20.00 | -17.53 | -17.53 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 10log(P) (dB) | -13.67 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 |
| (C/I)s (dB) | 15.12 | 15.44 | 18.80 | 18.60 | 20.44 | 19.00 | 19.01 | 19.02 | 16.44 | 16.44 | 18.44 | 18.44 | 12.56 | 12.56 |

AGGREGATE, LONG-TERM INTERFERENCE

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (C/I)A (dB) | -25.99 | -26.12 | -22.98 | -22.96 | -21.12 | -22.56 | -22.54 | -22.53 | -25.12 | -25.12 | -23.12 | -23.12 | -28.99 | -28.99 |
| (C/N) (dB) | 18.00 | 18.00 | 21.10 | 21.10 | 23.00 | 14.10 | 14.10 | 14.10 | 19.00 | 19.00 | 21.00 | 21.00 | 15.10 | 15.10 |
| Margin 0.5dB | -52.99 | -53.12 | -53.06 | -53.06 | -53.12 | -45.66 | -45.64 | -45.63 | -53.12 | -53.12 | -53.12 | -53.12 | -53.09 | -53.09 |
| Margin 1.0dB | -49.99 | -50.12 | -50.06 | -50.06 | -50.12 | -42.66 | -42.64 | -42.63 | -50.12 | -50.12 | -50.12 | -50.12 | -50.09 | -50.09 |

## IRIDIUM MOBILE TO MSAT SATELLITE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 14.20 | 11.50 | 11.00 | 1.30 | 16.20 | 4.30 | 1.30 | -1.70 | 14.20 | 11.50 | 14.20 | 11.50 | 14.20 | 11.50 |
| IEIRP (dBW) | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| dEIRP (dB) | 7.20 | 4.50 | 4.00 | -5.70 | 9.20 | -2.70 | -5.70 | -8.70 | 7.20 | 4.50 | 7.20 | 4.50 | 7.20 | 4.50 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | 7.20 | 4.50 | 4.00 | -5.70 | 9.20 | -2.70 | -5.70 | -8.70 | 7.20 | 4.50 | 7.20 | 4.50 | 7.20 | 4.50 |
| WNBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| INBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| IABW (kHz) | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 |
| 10log(Q) (dB) | -16.53 | -16.53 | -20.10 | -20.10 | -16.53 | -20.10 | -23.11 | -26.12 | -16.53 | -16.53 | -16.53 | -16.53 | -14.06 | -14.06 |
| 10log(DF)(dB) | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 | 3.40 |
| P | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 10log(P) (dB) | -10.13 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 |
| (C/I)m (dB) | 30.46 | 27.63 | 30.70 | 21.00 | 32.33 | 24.00 | 24.01 | 24.02 | 30.33 | 27.63 | 30.33 | 27.63 | 27.86 | 25.16 |

## IRIDIUM SATELLITE TO MSAT SATELLITE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 14.20 | 11.50 | 11.00 | 1.30 | 16.20 | 4.30 | 1.30 | -1.70 | 14.20 | 11.50 | 14.20 | 11.50 | 14.20 | 11.50 |
| IEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| dEIRP (dB) | -8.90 | -11.60 | -12.10 | -21.80 | -6.90 | -18.80 | -21.80 | -24.80 | -8.90 | -11.60 | -8.90 | -11.60 | -8.90 | -11.60 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 |
| dPL (dB) | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 |
| (C/I)1F (dB) | -8.41 | -11.11 | -11.61 | -21.31 | -6.41 | -18.31 | -21.31 | -24.31 | -8.41 | -11.11 | -8.41 | -11.11 | -8.41 | -11.11 |
| WNBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| INBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| IABW (kHz) | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 |
| 10log(Q) (dB) | -20.00 | -20.00 | -23.57 | -23.57 | -20.00 | -23.57 | -26.58 | -29.59 | -20.00 | -20.00 | -20.00 | -20.00 | -17.53 | -17.53 |
| 10log(DF)(dB) | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 | 1.60 |
| P | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 10log(P) (dB) | -13.67 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 |
| (C/I)s (dB) | 23.68 | 21.27 | 24.34 | 14.64 | 25.97 | 17.64 | 17.65 | 17.66 | 23.97 | 21.27 | 23.97 | 21.27 | 21.50 | 18.80 |

## AGGREGATE, LONG-TERM INTERFERENCE

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (C/I)A (dB) | 22.83 | 20.37 | 23.43 | 13.73 | 25.07 | 16.73 | 16.74 | 16.75 | 23.07 | 20.37 | 23.07 | 20.37 | 20.60 | 17.90 |
| (C/N) (dB) | 23.30 | 20.60 | 23.70 | 14.00 | 25.30 | 17.00 | 17.00 | 17.00 | 23.30 | 20.60 | 23.30 | 20.60 | 20.80 | 18.10 |
| Margin 0.5dB | -9.47 | -9.23 | -9.27 | -9.27 | -9.23 | -9.27 | -9.26 | -9.25 | -9.23 | -9.23 | -9.23 | -9.23 | -9.20 | -9.20 |
| Margin 1.0dB | -6.47 | -6.23 | -6.27 | -6.27 | -6.23 | -6.27 | -6.26 | -6.25 | -6.23 | -6.23 | -6.23 | -6.23 | -6.20 | -6.20 |

## IRIDIUM MOBILE (CELL 1) TO INMARSAT MOBILE (GLOBAL BEAM)

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AERO-H | AERO-L | AERO-H | AERO-H | AERO-H | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 22.90 | 14.00 | 28.90 | 37.40 | 37.40 | 12.30 | 11.60 | 5.80 | 13.30 | 12.50 | 11.70 | 15.30 | 14.50 | 13.70 | 15.10 | 15.50 | 5.50 | 9.50 | 10.50 | 13.90 | 19.80 |
| IEIRP (dBW) | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 |
| dEIRP (dB) | 21.50 | 12.60 | 27.50 | 36.00 | 36.00 | 10.90 | 10.20 | 4.40 | 11.90 | 11.10 | 10.30 | 13.90 | 13.10 | 12.30 | 13.70 | 14.10 | 4.10 | 7.10 | 9.10 | 12.50 | 18.40 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 |
| (C/I)1F (dB) | -56.45 | -65.35 | -50.45 | -41.95 | -41.95 | -67.05 | -67.75 | -73.55 | -66.05 | -66.85 | -67.65 | -64.05 | -64.85 | -65.65 | -64.25 | -83.85 | -73.65 | -70.85 | -68.85 | -65.45 | -59.55 |
| WNBW (kHz) | 26.00 | 1.44 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.96 | 6.30 | 0.72 |
| INBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| IABW (kHz) | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 |
| 10log(O) (dB) † | -6.63 | -19.72 | -3.03 | 0.00 | 0.00 | -9.72 | -9.72 | -12.73 | -14.49 | -14.49 | -12.73 | -14.49 | -14.49 | -12.73 | -10.30 | -22.73 | -19.72 | -16.71 | -16.71 | -13.31 | -22.73 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 10log(P) (dB) | -10.13 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 |
| (C/I)m (dB) | -34.49 | -30.63 | -32.42 | -26.95 | -26.95 | -42.33 | -43.03 | -45.82 | -36.56 | -37.36 | -39.92 | -34.56 | -35.36 | -37.92 | -38.95 | -26.12 | -39.13 | -39.14 | -37.14 | -37.14 | -21.82 |

† If 10logO is positive then it is set to 0dB since we assume there is only one interfering mobile

## IRIDIUM SATELLITE (CELL 1) TO INMARSAT MOBILE (GLOBAL BEAM)

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AERO-H | AERO-L | AERO-H | AERO-H | AERO-H | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 22.90 | 14.00 | 28.90 | 37.40 | 37.40 | 12.30 | 11.60 | 5.60 | 13.30 | 12.50 | 11.70 | 15.30 | 14.50 | 13.70 | 15.10 | 15.50 | 5.50 | 6.50 | 10.50 | 13.90 | 19.80 |
| IEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| dEIRP (dB) | -0.20 | -9.10 | 5.80 | 14.30 | 14.30 | -10.80 | -11.50 | -17.30 | -9.80 | -10.60 | -11.40 | -7.80 | -8.60 | -9.40 | -8.00 | -7.60 | -17.60 | -14.60 | -12.60 | -9.20 | -3.30 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| dPL (dB) | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 |
| (C/I)1F (dB) | -24.90 | -33.80 | -18.90 | -10.40 | -10.40 | -35.50 | -36.20 | -42.00 | -34.50 | -35.30 | -36.10 | -32.50 | -33.30 | -34.10 | -32.70 | -32.30 | -42.30 | -39.30 | -37.30 | -33.90 | -28.00 |
| WNBW (kHz) | 26.00 | 1.44 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 7.20 | 4.90 | 4.90 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| IABW (kHz) | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 |
| 10log(O) (dB) | -10.30 | -23.19 | -6.50 | 3.11 | 3.11 | -13.19 | -13.19 | -16.20 | -17.96 | -17.96 | -16.20 | -17.96 | -17.96 | -16.20 | -13.77 | -26.20 | -23.19 | -20.18 | -20.18 | -16.78 | -26.20 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 10log(P) (dB) | -13.67 | -13.98 | -13.96 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 |
| (C/I)s (dB) | -0.93 | 3.37 | 1.58 | 0.47 | 0.47 | -8.33 | -9.03 | -11.82 | -2.56 | -3.36 | -5.92 | -0.56 | -1.36 | -3.92 | -4.95 | 7.88 | -5.13 | -5.14 | -3.14 | -3.14 | 12.18 |

AGGREGATE, LONG-TERM INTERFERENCE

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (C/I)A (dB) | -34.49 | -30.63 | -32.42 | -26.86 | -26.96 | -42.33 | -43.03 | -45.82 | -36.56 | -37.36 | -39.92 | -34.56 | -35.36 | -37.92 | -38.95 | -26.12 | -39.13 | -39.14 | -37.14 | -37.14 | -21.82 |
| (C/N) (dB) | 14.40 | 18.40 | 16.60 | 13.70 | 13.70 | 6.70 | 6.00 | 3.20 | 6.50 | 5.70 | 3.10 | 8.50 | 7.70 | 5.10 | 4.10 | 4.90 | 3.90 | 3.90 | 5.90 | 5.90 | 9.20 |
| Margin 0.5dB | -57.89 | -58.03 | -58.02 | -49.66 | -49.66 | -58.03 | -59.03 | -58.02 | -52.06 | -52.06 | -52.02 | -52.06 | -52.06 | -52.02 | -52.05 | -40.02 | -52.03 | -52.04 | -52.04 | -52.04 | -40.02 |
| Margin 1.0dB | -54.89 | -55.03 | -55.02 | -46.66 | -46.66 | -55.03 | -55.03 | -55.02 | -49.06 | -49.06 | -49.02 | -49.06 | -49.06 | -49.02 | -49.05 | -37.02 | -49.03 | -49.04 | -49.04 | -49.04 | -37.02 |

## IRIDIUM MOBILE (CELL 7) TO INMARSAT MOBILE (GLOBAL BEAM)

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 22.90 | 14.00 | 28.90 | 37.40 | 37.40 | 12.30 | 11.60 | 5.80 | 13.30 | 12.50 | 11.70 | 15.30 | 14.50 | 13.70 | 15.10 | 15.50 | 5.50 | 8.50 | 10.50 | 13.90 | 19.80 |
| IEIRP (dBW) | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| dEIRP (dB) | 15.90 | 7.00 | 21.90 | 30.40 | 30.40 | 5.30 | 4.60 | -1.20 | 6.30 | 5.50 | 4.70 | 8.30 | 7.50 | 6.70 | 8.10 | 8.50 | -1.50 | 1.50 | 3.50 | 6.80 | 12.80 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 38500.00 | 39500.00 | 38500.00 | 39500.00 | 39500.00 | 38500.00 | 38500.00 | 39500.00 | 38500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 38500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 77.95 | 77.95 | 77.95 | 77.95 | 77.85 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 |
| (C/I)1F (dB) | -62.05 | -70.95 | -58.05 | -47.55 | -47.55 | -72.65 | -73.35 | -79.15 | -71.85 | -72.45 | -73.25 | -69.65 | -70.45 | -71.25 | -69.85 | -68.45 | -79.45 | -76.45 | -74.45 | -71.05 | -65.15 |
| WNBW (kHz) | 28.00 | 1.44 | 67.20 | 921.60 | 921.80 | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 8.30 | 0.72 |
| INBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| IABW (kHz) | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 |
| 10log(O) (dB) † | -6.83 | -19.72 | -3.03 | 0.00 | 0.00 | -9.72 | -9.72 | -12.73 | -14.49 | -14.49 | -12.73 | -14.49 | -14.49 | -12.73 | -10.30 | -22.73 | -19.72 | -16.71 | -16.71 | -13.31 | -22.73 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 10log(P) (dB) | -10.13 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 |
| (C/I)m (dB) | -40.09 | -38.23 | -38.02 | -32.55 | -32.55 | -47.93 | -48.63 | -51.42 | -42.16 | -42.96 | -45.52 | -40.16 | -40.96 | -43.52 | -44.55 | -31.72 | -44.73 | -44.74 | -42.74 | -42.74 | -27.42 |

† If 10logO is positive then it is set to 0dB since we assume there is only one interfering mobile

## IRIDIUM SATELLITE (CELL 7) TO INMARSAT MOBILE (GLOBAL BEAM)

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 22.90 | 14.00 | 28.90 | 37.40 | 37.40 | 12.30 | 11.60 | 5.80 | 13.30 | 12.50 | 11.70 | 15.30 | 14.50 | 13.70 | 15.10 | 15.50 | 5.50 | 8.50 | 10.50 | 13.90 | 19.80 |
| IEIRP (dBW) | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 |
| dEIRP (dB) | 10.40 | 1.50 | 18.40 | 24.90 | 24.90 | -0.20 | -0.90 | -8.70 | 0.80 | 0.00 | -0.80 | 2.80 | 2.00 | 1.20 | 2.60 | 3.00 | -7.00 | -4.00 | -2.00 | 1.40 | 7.30 |
| WRANGE (km) | 39500.00 | 38500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| dPL (dB) | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 |
| (C/I)1F (dB) | -22.84 | -31.84 | -18.94 | -8.44 | -8.44 | -33.54 | -34.24 | -40.04 | -32.54 | -33.34 | -34.14 | -30.54 | -31.34 | -32.14 | -30.74 | -30.34 | -40.34 | -37.34 | -35.34 | -31.94 | -26.04 |
| WNBW (kHz) | 28.00 | 1.44 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 8.30 | 0.72 |
| INBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| IABW (kHz) | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 |
| 10log(O) (dB) | -10.30 | -23.19 | -6.50 | 3.11 | 3.11 | -13.19 | -13.19 | -16.20 | -17.96 | -17.96 | -16.20 | -17.96 | -17.96 | -16.20 | -13.77 | -26.20 | -23.19 | -20.18 | -20.18 | -16.78 | -26.20 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 10log(P) (dB) | -13.87 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 |
| (C/I)s (dB) | 1.82 | 5.32 | 3.53 | 2.42 | 2.42 | -8.38 | -7.08 | -9.87 | -8.81 | -1.41 | -3.97 | 1.39 | 0.59 | -1.97 | -3.00 | 8.83 | -3.18 | -3.19 | -1.19 | -1.19 | 14.13 |

AGGREGATE, LONG-TERM INTERFERENCE

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (C/I)A (dB) | -40.09 | -38.23 | -38.02 | -32.55 | -32.55 | -47.93 | -48.63 | -51.42 | -42.16 | -42.96 | -45.52 | -40.16 | -40.96 | -43.52 | -44.55 | -31.72 | -44.73 | -44.74 | -42.74 | -42.74 | -27.42 |
| (C/N) (dB) | 14.40 | 18.40 | 16.60 | 13.70 | 13.70 | 6.70 | 6.00 | 3.20 | 6.50 | 5.70 | 3.10 | 8.50 | 7.70 | 5.10 | 4.10 | 4.90 | 3.90 | 3.90 | 5.90 | 5.90 | 9.20 |
| Margin 0.5dB | -63.49 | -63.63 | -63.62 | -55.25 | -55.25 | -63.63 | -63.63 | -63.62 | -57.66 | -57.66 | -57.62 | -57.66 | -57.66 | -57.62 | -57.65 | -45.62 | -57.63 | -57.64 | -57.64 | -57.64 | -45.62 |
| Margin 1.0dB | -60.49 | -60.63 | -60.62 | -52.25 | -52.25 | -60.63 | -60.63 | -60.62 | -54.66 | -54.66 | -54.62 | -54.66 | -54.66 | -54.62 | -54.65 | -42.62 | -54.63 | -54.64 | -54.64 | -54.64 | -42.62 |

## IRIDIUM MOBILE (CELL 7) TO INMARSAT SATELLITE (GLOBAL BEAM)

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 36.00 | 36.00 | 42.00 | 50.50 | 50.50 | 29.40 | 28.70 | 28.70 | 22.50 | 21.70 | 16.90 | 22.50 | 21.70 | 16.90 | 11.50 | -1.10 | 1.90 | 4.90 | 6.90 | 10.30 | 10.50 |
| IEIRP (dBW) | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| dEIRP (dB) | 29.00 | 29.00 | 35.00 | 43.50 | 43.50 | 22.40 | 21.70 | 21.70 | 15.50 | 14.70 | 9.90 | 15.50 | 14.70 | 9.90 | 4.50 | -8.10 | -5.10 | -2.10 | -0.10 | 3.30 | 3.50 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | 29.00 | 29.00 | 35.00 | 43.50 | 43.50 | 22.40 | 21.70 | 21.70 | 15.50 | 14.70 | 9.90 | 15.50 | 14.70 | 9.90 | 4.50 | -8.10 | -5.10 | -2.10 | -0.10 | 3.30 | 3.50 |
| WNBW (kHz) | 28.00 | 5.76 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| IABW (kHz) | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 |
| 10log(O) (dB) | -6.83 | -13.70 | -3.03 | 6.58 | 6.58 | -9.72 | -9.72 | -9.72 | -14.49 | -14.49 | -15.74 | -14.49 | -14.49 | -15.74 | -10.30 | -22.73 | -19.72 | -16.71 | -16.71 | -13.31 | -22.73 |
| 10log(DF) (dB) | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 | 14.30 |
| P | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 10log(P) (dB) | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 |
| (C/I)m (dB) | 31.66 | 38.53 | 33.86 | 32.75 | 32.75 | 27.95 | 27.25 | 27.25 | 25.82 | 25.02 | 21.47 | 25.82 | 25.02 | 21.47 | 10.63 | 10.46 | 10.45 | 10.44 | 12.44 | 12.44 | 22.06 |

## IRIDIUM SATELLITE (CELL 1) TO INMARSAT SATELLITE (GLOBAL BEAM)

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 36.00 | 36.00 | 42.00 | 50.50 | 50.50 | 29.40 | 28.70 | 28.70 | 22.50 | 21.70 | 16.90 | 22.50 | 21.70 | 16.90 | 11.50 | -1.10 | 1.90 | 4.90 | 6.90 | 10.30 | 10.50 |
| IEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| dEIRP (dB) | 12.90 | 12.90 | 18.90 | 27.40 | 27.40 | 6.30 | 5.60 | 5.60 | -0.60 | -1.40 | -6.20 | -0.60 | -1.40 | -6.20 | -11.60 | -24.20 | -21.20 | -18.20 | -16.20 | -12.80 | -12.80 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41600.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 |
| dPL (dB) | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 |
| (C/I)1F (dB) | 13.39 | 13.39 | 19.39 | 27.89 | 27.89 | 6.79 | 6.09 | 6.09 | -0.11 | -0.91 | -5.71 | -0.11 | -0.91 | -5.71 | -11.11 | -23.71 | -20.71 | -17.71 | -15.71 | -12.31 | -12.11 |
| WNBW (kHz) | 28.00 | 5.76 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| IABW (kHz) | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 460.00 | 460.00 | 460.00 | 460.00 | 460.00 | 460.00 | 450.00 |
| 10log(O) (dB) | -10.30 | -17.17 | -8.50 | 3.11 | 3.11 | -13.19 | -13.19 | -13.19 | -17.98 | -17.98 | -19.21 | -17.98 | -17.98 | -19.21 | -13.77 | -26.20 | -23.19 | -20.18 | -20.18 | -16.76 | -26.20 |
| 10log(DF)(dB) | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 |
| P | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 10log(P) (dB) | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 |
| (C/I)a (dB) | 28.06 | 34.93 | 30.25 | 29.14 | 26.14 | 24.34 | 23.64 | 23.64 | 22.22 | 21.42 | 17.87 | 22.22 | 21.42 | 17.87 | 7.02 | 6.85 | 6.84 | 6.83 | 6.83 | 6.83 | 18.45 |

**AGGREGATE, LONG-TERM INTERFERENCE**

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (C/I)A (dB) | 26.49 | 33.35 | 28.66 | 27.57 | 27.57 | 22.77 | 22.07 | 22.07 | 20.64 | 19.84 | 18.29 | 20.64 | 19.84 | 18.29 | 9.45 | 9.26 | 9.27 | 9.26 | 7.26 | 7.26 | 16.88 |
| (C/N) (dB) | 20.00 | 26.90 | 22.20 | 19.30 | 18.30 | 19.30 | 18.60 | 18.60 | 17.20 | 16.40 | 12.80 | 17.20 | 16.40 | 12.80 | 2.00 | 1.80 | 1.80 | 1.80 | 3.80 | 3.80 | 10.40 |
| Margin 0.5dB | -2.51 | -2.55 | -2.52 | -0.73 | -0.73 | -5.53 | -5.53 | -5.53 | -5.56 | -5.56 | -5.51 | -5.56 | -5.56 | -5.51 | -5.55 | -5.52 | -5.53 | -5.54 | -5.54 | -5.54 | -2.52 |
| Margin 1.0dB | 0.49 | 0.45 | 0.48 | 2.27 | 2.27 | -2.53 | -2.53 | -2.53 | -2.56 | -2.56 | -2.51 | -2.56 | -2.56 | -2.51 | -2.55 | -2.52 | -2.53 | -2.54 | -2.54 | -2.54 | 0.48 |

## IRIDIUM MOBILE (CELL 1) TO INMARSAT MOBILE (SPOT BEAM)

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 13.80 | 13.00 | 7.10 | 14.60 | 13.80 | 12.90 | 16.60 | 15.80 | 14.90 | 15.80 | 16.10 | 6.20 | 9.20 | 11.30 | 14.70 | 20.00 |
| IEIRP (dBW) | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 |
| dEIRP (dB) | 12.40 | 11.60 | 5.70 | 13.20 | 12.40 | 11.50 | 15.20 | 14.40 | 13.50 | 14.40 | 14.70 | 4.80 | 7.80 | 9.90 | 13.30 | 18.60 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 |
| (C/I)1F (dB) | -65.55 | -66.35 | -72.25 | -64.75 | -65.55 | -66.45 | -62.75 | -63.55 | -64.45 | -63.55 | -63.25 | -73.15 | -70.15 | -68.05 | -64.65 | -59.35 |
| WNBW (kHz) | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| IABW (kHz) | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 |
| 10log(O) (dB) | -9.72 | -9.72 | -12.73 | -14.49 | -14.49 | -12.73 | -14.49 | -14.49 | -12.73 | -10.30 | -22.73 | -19.72 | -16.71 | -16.71 | -13.31 | -22.73 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 10log(P) (dB) | -10.13 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 |
| (C/I)m (dB) | -40.70 | -41.63 | -44.52 | -35.26 | -36.06 | -38.72 | -33.26 | -34.06 | -36.72 | -38.25 | -25.52 | -38.43 | -38.44 | -36.34 | -36.34 | -21.62 |

## IRIDIUM SATELLITE (CELL 1) TO INMARSAT MOBILE (SPOT BEAM)

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 13.80 | 13.00 | 7.10 | 14.60 | 13.80 | 12.90 | 16.60 | 15.80 | 14.90 | 15.80 | 16.10 | 6.20 | 9.20 | 11.30 | 14.70 | 20.00 |
| IEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| dEIRP (dB) | -9.30 | -10.10 | -16.00 | -8.50 | -9.30 | -10.20 | -6.50 | -7.30 | -8.20 | -7.30 | -7.00 | -16.90 | -13.90 | -11.80 | -8.40 | -3.10 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| dPL (dB) | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 |
| (C/I)1F (dB) | -34.00 | -34.80 | -40.70 | -33.20 | -34.00 | -34.90 | -31.20 | -32.00 | -32.90 | -32.00 | -31.70 | -41.60 | -38.60 | -36.50 | -33.10 | -27.80 |
| WNBW (kHz) | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| IABW (kHz) | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 |
| 10log(O) (dB) | -13.19 | -13.19 | -16.20 | -17.96 | -17.96 | -16.20 | -17.96 | -17.96 | -16.20 | -13.77 | -26.20 | -23.19 | -20.18 | -20.18 | -16.78 | -26.20 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 10log(P) (dB) | -13.67 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.96 | -13.98 | -13.98 | -13.98 |
| (C/I)s (dB) | -7.14 | -7.63 | -10.52 | -1.26 | -2.06 | -4.72 | 0.74 | -0.06 | -2.72 | -4.25 | 8.48 | -4.43 | -4.44 | -2.34 | -2.34 | 12.38 |

**AGGREGATE, LONG-TERM INTERFERENCE**

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (C/I)A (dB) | -40.70 | -41.63 | -44.52 | -35.26 | -36.06 | -38.72 | -33.26 | -34.06 | -36.72 | -38.25 | -25.52 | -38.43 | -38.44 | -36.34 | -36.34 | -21.62 |
| (C/N) (dB) | 8.20 | 7.40 | 4.50 | 7.80 | 7.00 | 4.30 | 9.80 | 9.00 | 6.30 | 4.80 | 5.50 | 4.60 | 4.60 | 6.70 | 6.70 | 9.40 |
| Margin 1.0dB | -54.90 | -55.03 | -55.02 | -49.06 | -49.06 | -49.02 | -49.06 | -49.06 | -49.02 | -49.05 | -37.02 | -49.03 | -49.04 | -49.04 | -49.04 | -37.02 |

## IRIDIUM MOBILE (CELL 7) TO INMARSAT MOBILE (SPOT BEAM)

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 13.80 | 13.00 | 7.10 | 14.60 | 13.80 | 12.90 | 16.60 | 15.80 | 14.90 | 15.80 | 16.10 | 6.20 | 9.20 | 11.30 | 14.70 | 20.00 |
| IEIRP (dBW) | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| dEIRP (dB) | 6.80 | 6.00 | 0.10 | 7.60 | 6.80 | 5.90 | 9.60 | 8.80 | 7.90 | 8.80 | 9.10 | -0.80 | 2.20 | 4.30 | 7.70 | 13.00 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 |
| (C/I)1F (dB) | -71.15 | -71.95 | -77.85 | -70.35 | -71.15 | -72.05 | -68.35 | -69.15 | -70.05 | -69.15 | -68.85 | -78.75 | -75.75 | -73.65 | -70.25 | -64.95 |
| WNBW (kHz) | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| IABW (kHz) | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 |
| 10log(Q) (dB) | -9.72 | -9.72 | -12.73 | -14.49 | -14.49 | -12.73 | -14.49 | -14.49 | -12.73 | -10.30 | -22.73 | -19.72 | -16.71 | -16.71 | -13.31 | -22.73 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 10log(P) (dB) | -10.13 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 |
| (C/I)m (dB) | -46.30 | -47.23 | -50.12 | -40.86 | -41.66 | -44.32 | -38.86 | -39.66 | -42.32 | -43.85 | -31.12 | -44.03 | -44.04 | -41.94 | -41.94 | -27.22 |

## IRIDIUM SATELLITE (CELL 7) TO INMARSAT MOBILE (SPOT BEAM)

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 13.80 | 13.00 | 7.10 | 14.60 | 13.80 | 12.90 | 16.60 | 15.80 | 14.90 | 15.80 | 16.10 | 6.20 | 9.20 | 11.30 | 14.70 | 20.00 |
| IEIRP (dBW) | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 |
| dEIRP (dB) | 1.30 | 0.50 | -5.40 | 2.10 | 1.30 | 0.40 | 4.10 | 3.30 | 2.40 | 3.30 | 3.60 | -6.30 | -3.30 | -1.20 | 2.20 | 7.50 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| dPL (dB) | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 | 33.34 |
| (C/I)1F (dB) | -32.04 | -32.84 | -38.74 | -31.24 | -32.04 | -32.94 | -29.24 | -30.04 | -30.94 | -30.04 | -29.74 | -39.64 | -36.64 | -34.54 | -31.14 | -25.84 |
| WNBW (kHz) | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| IABW (kHz) | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 |
| 10log(Q) (dB) | -13.19 | -13.19 | -16.20 | -17.96 | -17.96 | -16.20 | -17.96 | -17.96 | -18.20 | -13.77 | -26.20 | -23.19 | -20.18 | -20.18 | -16.78 | -26.20 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 10log(P) (dB) | -13.67 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 |
| (C/I)s (dB) | -5.19 | -5.68 | -8.57 | 0.69 | -0.11 | -2.77 | 2.69 | 1.89 | -0.77 | -2.30 | 10.43 | -2.48 | -2.49 | -0.39 | -0.39 | 14.33 |

**AGGREGATE, LONG-TERM INTERFERENCE**

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (C/I)A (dB) | -46.30 | -47.23 | -50.12 | -40.86 | -41.66 | -44.32 | -38.86 | -39.66 | -42.32 | -43.85 | -31.12 | -44.03 | -44.04 | -41.94 | -41.94 | -27.22 |
| (C/N) (dB) | 8.20 | 7.40 | 4.50 | 7.80 | 7.00 | 4.30 | 9.80 | 9.00 | 6.30 | 4.80 | 5.50 | 4.60 | 4.60 | 6.70 | 6.70 | 9.40 |
| Margin 0.5dB | -63.50 | -63.63 | -63.62 | -57.66 | -57.66 | -57.62 | -57.66 | -57.66 | -57.62 | -57.65 | -45.62 | -57.63 | -57.64 | -57.64 | -57.64 | -45.62 |
| Margin 1.0dB | -60.50 | -60.63 | -60.62 | -54.66 | -54.66 | -54.62 | -54.66 | -54.66 | -54.62 | -54.65 | -42.62 | -54.63 | -54.64 | -54.64 | -54.64 | -42.62 |

## IRIDIUM MOBILE (CELL 7) TO INMARSAT SATELLITE (SPOT BEAM)

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOCIE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 21.40 | 20.60 | 20.60 | 14.40 | 13.50 | 8.60 | 14.40 | 13.50 | 8.60 | 3.50 | -9.10 | -6.10 | -3.10 | -1.00 | 2.40 | 3.90 |
| IEIRP (dBW) | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| dEIRP (dB) | 14.40 | 13.60 | 13.60 | 7.40 | 6.50 | 1.60 | 7.40 | 6.50 | 1.60 | -3.50 | -16.10 | -13.10 | -10.10 | -8.00 | -4.60 | -3.10 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | 14.40 | 13.60 | 13.60 | 7.40 | 6.50 | 1.60 | 7.40 | 6.50 | 1.60 | -3.50 | -16.10 | -13.10 | -10.10 | -8.00 | -4.60 | -3.10 |
| WNBW (kHz) | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| IABW (kHz) | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 |
| 10log(Q) (dB) | -9.72 | -9.72 | -9.72 | -14.49 | -14.49 | -15.74 | -14.49 | -14.49 | -15.74 | -10.30 | -22.73 | -19.72 | -16.71 | -16.71 | -13.31 | -22.73 |
| 10log(DF) (dB) | 6.60 | 6.60 | 6.60 | 6.60 | 6.60 | 6.60 | 6.60 | 6.60 | 6.60 | 6.60 | 6.60 | 6.60 | 6.60 | 6.60 | 6.50 | 6.60 |
| P | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.097 | 0.097 |
| 10log(P) (dB) | -10.13 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.13 | -10.13 |
| **(C/I)m (dB)** | **27.65** | **26.72** | **26.72** | **25.29** | **24.39** | **20.74** | **25.29** | **24.39** | **20.74** | **10.20** | **10.03** | **10.02** | **10.01** | **12.11** | **12.24** | **23.16** |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

## IRIDIUM SATELLITE (CELL 1) TO INMARSAT SATELLITE (SPOT BEAM)

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOCIE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 36.00 | 36.00 | 42.00 | 50.50 | 50.50 | 29.40 | 28.70 | 28.70 | 22.50 | 21.70 | 16.90 | 22.50 | 21.70 | 16.90 | 11.50 | -1.10 |
| IEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| dEIRP (dB) | 12.90 | 12.90 | 18.90 | 27.40 | 27.40 | 6.30 | 5.50 | 5.60 | -0.60 | -1.40 | -6.20 | -0.60 | -1.40 | -6.20 | -11.60 | -24.20 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 |
| dPL (dB) | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 |
| (C/I)1F (dB) | 13.39 | 13.39 | 19.39 | 27.89 | 27.89 | 6.79 | 6.09 | 6.09 | -0.11 | -0.91 | -5.71 | -0.11 | -0.91 | -5.71 | -11.11 | -23.71 |
| WNBW (kHz) | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 |
| 10log(Q) (dB) | -13.19 | -13.19 | -13.19 | -17.96 | -17.96 | -19.21 | -17.96 | -17.96 | -19.21 | -13.77 | -26.20 | -23.19 | -20.18 | -20.18 | -16.78 | -26.20 |
| 10log(DF)(dB) | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 | 4.60 |
| P | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.043 | 0.043 |
| 10log(P) (dB) | -13.67 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.67 | -13.67 |
| **(C/I)a (dB)** | **35.64** | **35.96** | **41.96** | **55.23** | **55.23** | **35.38** | **33.43** | **33.43** | **28.48** | **22.24** | **29.87** | **32.46** | **28.65** | **23.85** | **14.73** | **11.55** |

**AGGREGATE, LONG-TERM INTERFERENCE**

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **(C/I)A (dB)** | **27.01** | **26.23** | **26.59** | **25.29** | **24.39** | **20.59** | **24.67** | **23.88** | **20.06** | **9.94** | **9.99** | **10.00** | **9.95** | **11.83** | **10.30** | **11.26** |
| **(C/N) (dB)** | **19.30** | **18.50** | **18.50** | **17.10** | **16.20** | **12.50** | **17.10** | **16.20** | **12.50** | **2.00** | **1.80** | **1.80** | **1.80** | **3.90** | **3.90** | **10.80** |
| **Margin 0.5dB** | **-1.29** | **-1.27** | **-0.91** | **-0.81** | **-0.81** | **-0.91** | **-1.43** | **-1.32** | **-1.44** | **-1.06** | **-0.81** | **-0.80** | **-0.85** | **-1.07** | **-2.60** | **-8.54** |
| **Margin 1.0dB** | **1.71** | **1.73** | **2.09** | **2.19** | **2.19** | **2.09** | **1.57** | **1.68** | **1.56** | **1.94** | **2.19** | **2.20** | **2.15** | **1.93** | **0.40** | **-5.54** |

## IRIDIUM MOBILE (CELL 1) TO ZENON MOBILE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 |
| IEIRP (dBW) | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 |
| dEIRP (dB) | 30.40 | 30.40 | 30.40 | 30.40 | 30.40 | 30.40 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 |
| (C/I)1F (dB) | -47.55 | -47.55 | -47.55 | -47.55 | -47.55 | -47.55 |
| WNBW (KHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| INBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| IABW (kHz) | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 |
| 10log(Q) (dB) | -12.27 | -12.27 | -12.27 | -12.27 | -12.27 | -12.27 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 10log(P) (dB) | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 |
| **(C/I)m (dB)** | **-20.28** | **-20.28** | **-20.28** | **-20.28** | **-20.28** | **-20.28** |

## IRIDIUM SATELLITE (CELL 1) TO ZENON MOBILE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 |
| IEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| dEIRP (dB) | 8.70 | 8.70 | 8.70 | 8.70 | 8.70 | 8.70 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| dPL (dB) | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 |
| (C/I)1F (dB) | -16.00 | -16.00 | -16.00 | -16.00 | -16.00 | -16.00 |
| WNBW (KHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| INBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| IABW (kHz) | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 |
| 10log(Q) (dB) | -15.74 | -15.74 | -15.74 | -15.74 | -15.74 | -15.74 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 10log(P) (dB) | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 |
| **(C/I)s (dB)** | **13.72** | **13.72** | **13.72** | **13.72** | **13.72** | **13.72** |

## AGGREGATE, LONG-TERM INTERFERENCE

| | | | | | | |
|---|---|---|---|---|---|---|
| **(C/I)A (dB)** | **-20.28** | **-20.28** | **-20.28** | **-20.28** | **-20.28** | **-20.28** |
| **(C/N) (dB)** | **6.20** | **11.30** | **15.20** | **15.40** | **18.40** | **20.40** |
| **Margin 0.5dB** | **-35.48** | **-40.58** | **-44.48** | **-44.68** | **-47.68** | **-49.68** |
| **Margin 1.0dB** | **-32.48** | **-37.58** | **-41.48** | **-41.68** | **-44.68** | **-46.68** |

## IRIDIUM MOBILE (CELL 7) TO ZENON MOBILE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 |
| IEIRP (dBW) | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| dEIRP (dB) | 24.80 | 24.80 | 24.80 | 24.80 | 24.80 | 24.80 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 |
| (C/I)1F (dB) | -53.15 | -53.15 | -53.15 | -53.15 | -53.15 | -53.15 |
| WNBW (KHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| INBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| IABW (kHz) | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 |
| 10log(Q) (dB) | -12.27 | -12.27 | -12.27 | -12.27 | -12.27 | -12.27 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 10log(P) (dB) | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 | -10.00 |
| **(C/I)m (dB)** | **-25.88** | **-25.88** | **-25.88** | **-25.88** | **-25.88** | **-25.88** |

## IRIDIUM SATELLITE (CELL 7) TO ZENON MOBILE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 |
| IEIRP (dBW) | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 |
| dEIRP (dB) | 19.30 | 19.30 | 19.30 | 19.30 | 19.30 | 19.30 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| dPL (dB) | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 | 24.70 |
| (C/I)1F (dB) | -5.40 | -5.40 | -5.40 | -5.40 | -5.40 | -5.40 |
| WNBW (KHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| INBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| IABW (kHz) | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 |
| 10log(Q) (dB) | -15.74 | -15.74 | -15.74 | -15.74 | -15.74 | -15.74 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 10log(P) (dB) | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 | -13.98 |
| **(C/I)s (dB)** | **24.32** | **24.32** | **24.32** | **24.32** | **24.32** | **24.32** |

## AGGREGATE, LONG-TERM INTERFERENCE

| | | | | | | |
|---|---|---|---|---|---|---|
| **(C/I)A (dB)** | **-25.88** | **-25.88** | **-25.88** | **-25.88** | **-25.88** | **-25.88** |
| **(C/N) (dB)** | **6.20** | **11.30** | **15.20** | **15.40** | **18.40** | **20.40** |
| **Margin 0.5dB** | **-41.08** | **-46.18** | **-50.08** | **-50.28** | **-53.28** | **-55.28** |
| **Margin 1.0dB** | **-38.08** | **-43.18** | **-47.08** | **-47.28** | **-50.28** | **-52.28** |

## IRIDIUM MOBILE TO ZENON SATELLITE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | -3.90 | -2.40 | 0.50 | 12.60 | 15.10 | 15.10 |
| IEIRP (dBW) | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| dEIRP (dB) | -10.90 | -9.40 | -6.50 | 5.60 | 8.10 | 8.10 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | -10.90 | -9.40 | -6.50 | 5.60 | 8.10 | 8.10 |
| WNBW (KHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| INBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| IABW (kHz) | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 | 202.50 |
| 10log(Q) (dB) | -12.27 | -12.27 | -12.27 | -12.27 | -12.27 | -12.27 |
| 10log(DF)(dB) | 6.80 | 6.80 | 6.80 | 6.80 | 6.80 | 6.80 |
| P | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 10log(P) (dB) | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 | -10.13 |
| **(C/I)m (dB)** | **4.70** | **6.20** | **9.10** | **21.20** | **23.70** | **23.70** |

## IRIDIUM SATELLITE TO ZENON SATELLITE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 |
| IEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| dEIRP (dB) | 8.70 | 8.70 | 8.70 | 8.70 | 8.70 | 8.70 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 |
| dPL (dB) | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 | -0.49 |
| (C/I)1F (dB) | 9.19 | 9.19 | 9.19 | 9.19 | 9.19 | 9.19 |
| WNBW (KHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| INBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| IABW (kHz) | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 | 450.00 |
| 10log(Q) (dB) | -15.74 | -15.74 | -15.74 | -15.74 | -15.74 | -15.74 |
| 10log(DF)(dB) | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 |
| P | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| 10log(P) (dB) | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 | -13.67 |
| **(C/I)s (dB)** | **38.00** | **38.00** | **38.00** | **38.00** | **38.00** | **38.00** |

## AGGREGATE, LONG-TERM INTERFERENCE

| | | | | | | |
|---|---|---|---|---|---|---|
| **(C/I)A (dB)** | **4.70** | **6.20** | **9.10** | **21.11** | **23.55** | **23.55** |
| **(C/N) (dB)** | **1.10** | **2.60** | **5.50** | **17.60** | **20.10** | **20.10** |
| **Margin 0.5dB** | **-5.40** | **-5.40** | **-5.40** | **-5.49** | **-5.55** | **-5.55** |
| **Margin 1.0dB** | **-2.40** | **-2.40** | **-2.40** | **-2.49** | **-2.55** | **-2.55** |

## IRIDIUM MOBILE (CELL 1) TO EUTELSAT MOBILE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 29.00 |
| IEIRP (dBW) | 1.40 |
| dEIRP (dB) | 27.60 |
| WRANGE (km) | 39500.00 |
| IRANGE (km) | 5.00 |
| dPL (dB) | 77.95 |
| (C/I)1F (dB) | -50.35 |
| WNBW (KHz) | 4.00 |
| INBW (kHz) | 135.00 |
| IABW (kHz) | 202.50 |
| 10log(Q) (dB) | -15.28 |
| 10log(DF)(dB) | -5.00 |
| P | 0.10 |
| 10log(P) (dB) | -10.00 |
| **(C/I)m (dB)** | **-20.07** |

## IRIDIUM SATELLITE (CELL 1) TO EUTELSAT MOBILE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 29.00 |
| IEIRP (dBW) | 23.10 |
| dEIRP (dB) | 5.90 |
| WRANGE (km) | 39500.00 |
| IRANGE (km) | 2300.00 |
| dPL (dB) | 24.70 |
| (C/I)1F (dB) | -18.80 |
| WNBW (KHz) | 4.00 |
| INBW (kHz) | 300.00 |
| IABW (kHz) | 450.00 |
| 10log(Q) (dB) | -18.75 |
| 10log(DF)(dB) | 0.00 |
| P | 0.04 |
| 10log(P) (dB) | -13.98 |
| **(C/I)s (dB)** | **13.93** |

## AGGREGATE, LONG-TERM INTERFERENCE

| | |
|---|---|
| **(C/I)A (dB)** | **-20.07** |
| **(C/N) (dB)** | **10.90** |
| **Margin 0.5dB** | **-39.97** |
| **Margin 1.0dB** | **-36.97** |

## IRIDIUM MOBILE (CELL 7) TO EUTELSAT MOBILE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 29.00 |
| IEIRP (dBW) | 7.00 |
| dEIRP (dB) | 22.00 |
| WRANGE (km) | 39500.00 |
| IRANGE (km) | 5.00 |
| dPL (dB) | 77.95 |
| (C/I)1F (dB) | -55.95 |
| WNBW (KHz) | 4.00 |
| INBW (kHz) | 135.00 |
| IABW (kHz) | 202.50 |
| 10log(Q) (dB) | -15.28 |
| 10log(DF)(dB) | -5.00 |
| P | 0.10 |
| 10log(P) (dB) | -10.00 |
| **(C/I)m (dB)** | **-25.67** |

## IRIDIUM SATELLITE (CELL 7) TO EUTELSAT MOBILE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 29.00 |
| IEIRP (dBW) | 12.50 |
| dEIRP (dB) | 16.50 |
| WRANGE (km) | 39500.00 |
| IRANGE (km) | 2300.00 |
| dPL (dB) | 24.70 |
| (C/I)1F (dB) | -8.20 |
| WNBW (KHz) | 4.00 |
| INBW (kHz) | 300.00 |
| IABW (kHz) | 450.00 |
| 10log(Q) (dB) | -18.75 |
| 10log(DF)(dB) | 0.00 |
| P | 0.04 |
| 10log(P) (dB) | -13.98 |
| **(C/I)s (dB)** | **24.53** |

## AGGREGATE, LONG-TERM INTERFERENCE

| | |
|---|---|
| **(C/I)A (dB)** | **-25.67** |
| **(C/N) (dB)** | **10.90** |
| **Margin 0.5dB** | **-45.57** |
| **Margin 1.0dB** | **-42.57** |

## IRIDIUM MOBILE TO EUTELSAT SATELLITE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 17.00 |
| IEIRP (dBW) | 7.00 |
| dEIRP (dB) | 10.00 |
| WRANGE (km) | 39500.00 |
| IRANGE (km) | 39500.00 |
| dPL (dB) | 0.00 |
| (C/I)1F (dB) | 10.00 |
| WNBW (KHz) | 4.00 |
| INBW (kHz) | 135.00 |
| IABW (kHz) | 202.50 |
| 10log(Q) (dB) | -15.28 |
| 10log(DF)(dB) | 9.70 |
| P | 0.10 |
| 10log(P) (dB) | -10.13 |
| **(C/I)m (dB)** | **25.72** |

## IRIDIUM SATELLITE TO EUTELSAT SATELLITE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 17.00 |
| IEIRP (dBW) | 23.10 |
| dEIRP (dB) | -6.10 |
| WRANGE (km) | 39500.00 |
| IRANGE (km) | 41800.00 |
| dPL (dB) | -0.49 |
| (C/I)1F (dB) | -5.61 |
| WNBW (KHz) | 4.00 |
| INBW (kHz) | 300.00 |
| IABW (kHz) | 450.00 |
| 10log(Q) (dB) | -18.75 |
| 10log(DF)(dB) | 5.20 |
| P | 0.04 |
| 10log(P) (dB) | -13.67 |
| **(C/I)s (dB)** | **21.61** |

## AGGREGATE, LONG-TERM INTERFERENCE

| | |
|---|---|
| **(C/I)A (dB)** | **20.18** |
| **(C/N) (dB)** | **17.70** |
| **Margin 0.5dB** | **-6.52** |
| **Margin 1.0dB** | **-3.52** |

## ORBCOMM MOBILE TO MSAT MOBILE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 27.30 | 27.30 | 26.90 | 26.90 | 32.30 | 27.30 | 24.30 | 21.30 | 28.30 | 28.30 | 30.30 | 30.30 | 26.90 | 26.90 |
| IEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| dEIRP (dB) | 7.30 | 7.30 | 6.90 | 6.90 | 12.30 | 7.30 | 4.30 | 1.30 | 8.30 | 8.30 | 10.30 | 10.30 | 6.90 | 6.90 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 |
| (C/I)1F (dB) | -70.65 | -70.65 | -71.05 | -71.05 | -65.65 | -70.65 | -73.65 | -76.65 | -69.65 | -69.65 | -67.65 | -67.65 | -71.05 | -71.05 |
| WNBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| INBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| IABW (kHz) | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 |
| 10log(Q)(dB) † | -0.79 | -0.79 | -4.36 | -4.36 | -0.79 | -4.36 | -7.37 | -10.38 | -0.79 | -0.79 | -0.79 | -0.79 | 0.00 | 0.00 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| 10log(P) (dB) | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 |
| (C/I)m (dB) | -59.63 | -59.63 | -56.47 | -56.47 | -54.63 | -56.07 | -56.08 | -56.05 | -58.63 | -58.63 | -56.63 | -56.63 | -60.82 | -60.82 |
| (C/N) (dB) | 18.00 | 18.00 | 21.10 | 21.10 | 23.00 | 14.10 | 14.10 | 14.10 | 19.00 | 19.00 | 21.00 | 21.00 | 15.10 | 15.10 |
| Margin 0.5dB | -86.63 | -86.63 | -86.57 | -86.57 | -86.63 | -79.17 | -79.16 | -79.15 | -86.63 | -86.63 | -86.63 | -86.63 | -84.92 | -84.92 |
| Margin 1.0dB | -83.63 | -83.63 | -83.57 | -83.57 | -83.63 | -76.17 | -76.16 | -76.15 | -83.63 | -83.63 | -83.63 | -83.63 | -81.92 | -81.92 |

† If 10logQ is positive then it is set to 0dB since we assume there is only one interfering mobile

## ORBCOMM SATELLITE TO MSAT SATELLITE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 14.20 | 11.50 | 11.00 | 1.30 | 16.20 | 4.30 | 1.30 | -1.70 | 14.20 | 11.50 | 14.20 | 11.50 | 14.20 | 11.50 |
| IEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| dEIRP (dB) | -20.30 | -23.00 | -23.50 | -33.20 | -18.30 | -30.20 | -33.20 | -36.20 | -20.30 | -23.00 | -20.30 | -23.00 | -20.30 | -23.00 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42550.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 |
| dPL (dB) | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.65 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 |
| (C/I)1F (dB) | -19.72 | -22.42 | -22.92 | -32.62 | -17.72 | -29.55 | -32.62 | -35.62 | -19.72 | -22.42 | -19.72 | -22.42 | -19.72 | -22.42 |
| WNBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| INBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| IABW (kHz) | 10.80 | 10.80 | 10.80 | 10.60 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 |
| 10log(Q) (dB) | -3.80 | -3.80 | -7.37 | -7.37 | -3.80 | -7.37 | -10.36 | -13.39 | -3.80 | -3.80 | -3.80 | -3.80 | -1.33 | -1.33 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)s (dB) | -15.91 | -18.61 | -15.55 | -25.25 | -13.91 | -22.19 | -22.24 | -22.23 | -15.91 | -18.61 | -15.91 | -18.61 | -18.38 | -21.08 |
| (C/N) (dB) | 23.30 | 20.60 | 23.70 | 14.00 | 25.30 | 17.00 | 17.00 | 17.00 | 23.30 | 20.60 | 23.30 | 20.60 | 20.60 | 18.10 |
| Margin 0.5dB | -48.21 | -48.21 | -48.25 | -48.25 | -48.21 | -48.19 | -48.24 | -48.23 | -48.21 | -48.21 | -48.21 | -48.21 | -48.18 | -48.18 |
| Margin 1.0dB | -45.21 | -45.21 | -45.25 | -45.25 | -45.21 | -45.19 | -45.24 | -45.23 | -45.21 | -45.21 | -45.21 | -45.21 | -45.18 | -45.18 |

## ORBCOMM MOBILE TO MSAT SATELLITE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 14.20 | 11.50 | 11.00 | 1.30 | 16.20 | 4.30 | 1.30 | -1.70 | 14.20 | 11.50 | 14.20 | 11.50 | 14.20 | 11.50 |
| IEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| dEIRP (dB) | -5.80 | -8.50 | -9.00 | -18.70 | -3.80 | -15.70 | -18.70 | -21.70 | -5.80 | -8.50 | -5.80 | -8.50 | -5.80 | -8.50 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | -5.80 | -8.50 | -9.00 | -18.70 | -3.80 | -15.70 | -18.70 | -21.70 | -5.80 | -8.50 | -5.80 | -8.50 | -5.80 | -8.50 |
| WNBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| INBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| IABW (kHz) | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 |
| 10log(Q) (dB) | -0.79 | -0.79 | -4.36 | -4.36 | -0.79 | -4.36 | -7.37 | -10.38 | -0.79 | -0.79 | -0.79 | -0.79 | 0.00 | 0.00 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| 10log(P) (dB) | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 |
| **(C/I)m (dB)** | **0.22** | **-2.48** | **0.59** | **-9.11** | **2.22** | **-6.11** | **-6.10** | **-6.09** | **0.22** | **-2.48** | **0.22** | **-2.48** | **-0.57** | **-3.27** |
| **(C/N) (dB)** | **23.30** | **20.60** | **23.70** | **14.00** | **25.30** | **17.00** | **17.00** | **17.00** | **23.30** | **20.60** | **23.30** | **20.60** | **20.80** | **18.10** |
| **Margin 0.5dB** | **-32.08** | **-32.08** | **-32.11** | **-32.11** | **-32.08** | **-32.11** | **-32.10** | **-32.09** | **-32.08** | **-32.08** | **-32.08** | **-32.08** | **-30.37** | **-30.37** |
| **Margin 1.0dB** | **-29.08** | **-29.08** | **-29.11** | **-29.11** | **-29.08** | **-29.11** | **-29.10** | **-29.09** | **-29.08** | **-29.08** | **-29.08** | **-29.08** | **-27.37** | **-27.37** |

## ORBCOMM SATELLITE TO MSAT MOBILE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 27.30 | 27.30 | 26.90 | 26.90 | 32.30 | 27.30 | 24.30 | 21.30 | 28.30 | 28.30 | 30.30 | 30.30 | 26.90 | 26.90 |
| IEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| dEIRP (dB) | -7.20 | -7.20 | -7.60 | -7.60 | -2.20 | -7.20 | -10.20 | -13.20 | -6.20 | -6.20 | -4.20 | -4.20 | -7.60 | -7.60 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| dPL (dB) | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 |
| (C/I)1F (dB) | -30.35 | -30.35 | -30.75 | -30.75 | -25.35 | -30.35 | -33.35 | -36.35 | -29.35 | -29.35 | -27.35 | -27.35 | -30.75 | -30.75 |
| WNBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| INBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| IABW (kHz) | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 |
| 10log(Q) (dB) | -3.80 | -3.80 | -7.37 | -7.37 | -3.80 | -7.37 | -10.38 | -13.39 | -3.80 | -3.80 | -3.80 | -3.80 | -1.33 | -1.33 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)a (dB)** | **-26.54** | **-26.54** | **-23.38** | **-23.38** | **-21.54** | **-22.98** | **-22.97** | **-22.96** | **-25.54** | **-25.54** | **-23.54** | **-23.54** | **-29.41** | **-29.41** |
| **(C/N) (dB)** | **18.00** | **18.00** | **21.10** | **21.10** | **23.00** | **14.10** | **14.10** | **14.10** | **19.00** | **19.00** | **21.00** | **21.00** | **15.10** | **15.10** |
| **Margin 0.5dB** | **-53.54** | **-53.54** | **-53.48** | **-53.48** | **-53.54** | **-46.08** | **-46.07** | **-46.06** | **-53.54** | **-53.54** | **-53.54** | **-53.54** | **-53.51** | **-53.51** |
| **Margin 1.0dB** | **-50.54** | **-50.54** | **-50.48** | **-50.48** | **-50.54** | **-43.08** | **-43.07** | **-43.06** | **-50.54** | **-50.54** | **-50.54** | **-50.54** | **-50.51** | **-50.51** |

## ORBCOMM MOBILE TO INMARSAT MOBILE (GLOBAL BEAM)

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AERO-H | AERO-L | AERO-H | AERO-H | AERO-H | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 22.90 | 14.00 | 26.90 | 37.40 | 37.40 | 12.30 | 11.60 | 5.80 | 13.30 | 12.50 | 11.70 | 15.30 | 14.50 | 13.70 | 15.10 | 15.50 | 5.50 | 8.50 | 10.50 | 13.90 | 19.80 |
| IEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| dEIRP (dB) | 2.90 | -8.00 | 8.90 | 17.40 | 17.40 | -7.70 | -8.40 | -14.20 | -6.70 | -7.50 | -8.30 | -4.70 | -5.50 | -6.30 | -4.90 | -4.50 | -14.50 | -11.50 | -9.50 | -6.10 | -0.20 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 |
| (C/I)1F (dB) | -75.05 | -83.95 | -69.05 | -60.55 | -60.55 | -85.65 | -86.35 | -92.15 | -84.65 | -85.45 | -86.25 | -82.65 | -83.45 | -84.25 | -82.85 | -82.45 | -92.45 | -89.45 | -87.45 | -84.05 | -78.15 |
| WNBW (kHz) | 28.00 | 1.44 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 7.20 | 4.80 | 4.60 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| IABW (kHz) | 6.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 |
| 10log(O) (dB) † | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -6.99 | -3.98 | -0.97 | -0.97 | 0.00 | -6.99 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -15.00 |
| P | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| 10log(P) (dB) | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 |
| (C/I)o (dB) | -64.82 | -69.74 | -58.82 | -58.32 | -60.32 | -75.42 | -76.12 | -81.92 | -74.42 | -75.22 | -76.02 | -72.42 | -73.22 | -74.02 | -72.62 | -85.23 | -78.24 | -78.25 | -76.25 | -73.82 | -50.93 |
| (C/N) (dB) | 14.40 | 18.40 | 16.60 | 13.70 | 13.70 | 6.70 | 6.00 | 3.20 | 6.50 | 5.70 | 3.10 | 8.50 | 7.70 | 5.10 | 4.10 | 4.80 | 3.90 | 3.90 | 5.90 | 5.90 | 8.20 |
| Margin 0.5dB | -86.22 | -87.14 | -84.42 | -73.02 | -73.02 | -81.12 | -81.12 | -84.12 | -80.82 | -80.92 | -80.12 | -80.92 | -80.82 | -80.12 | -85.72 | -78.13 | -81.14 | -81.15 | -81.15 | -68.72 | -69.13 |
| Margin 1.0dB | -85.22 | -84.14 | -81.42 | -70.02 | -70.02 | -80.12 | -80.12 | -81.12 | -86.92 | -86.92 | -85.12 | -86.92 | -86.92 | -85.12 | -82.72 | -76.13 | -80.14 | -86.15 | -80.15 | -85.72 | -66.13 |

† If 10logO is positive then it is set to 0dB since we assume there is only one interfering mobile

## ORBCOMM SATELLITE TO INMARSAT SATELLITE (GLOBAL BEAM)

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AERO-H | AERO-L | AERO-H | AERO-H | AERO-H | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 36.00 | 36.00 | 42.00 | 50.50 | 50.50 | 29.40 | 28.70 | 28.70 | 22.50 | 21.70 | 16.90 | 22.50 | 21.70 | 16.90 | 11.50 | -1.10 | 1.90 | 4.90 | 6.90 | 10.30 | 10.50 |
| IEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| dEIRP (dB) | 1.50 | 1.50 | 7.50 | 16.00 | 16.00 | -5.10 | -5.80 | -5.80 | -12.00 | -12.80 | -17.60 | -12.00 | -12.80 | -17.60 | -23.00 | -35.60 | -32.60 | -29.60 | -27.60 | -24.20 | -24.00 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 |
| dPL (dB) | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 |
| (C/I)1F (dB) | 2.08 | 2.08 | 8.08 | 16.58 | 16.58 | -4.52 | -8.38 | -5.22 | -11.42 | -12.22 | -17.02 | -11.42 | -12.22 | -17.02 | -22.42 | -35.02 | -32.02 | -29.02 | -27.02 | -23.62 | -23.42 |
| WNBW (kHz) | 28.00 | 5.76 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.80 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| IABW (kHz) | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 |
| 10log(O) (dB) | 4.14 | -0.97 | 7.94 | 19.31 | 19.31 | 1.25 | 1.25 | 1.25 | -1.76 | -1.76 | -3.01 | -1.76 | -1.76 | -3.01 | 0.67 | -10.00 | -6.99 | -3.98 | -3.98 | -0.58 | -10.00 |
| 10log(DF)(dB) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)m (dB) | -7.05 | -1.85 | -4.85 | -7.73 | -7.73 | -10.76 | -12.63 | -11.46 | -14.65 | -15.45 | -19.01 | -14.65 | -15.45 | -19.01 | -28.08 | -30.02 | -30.03 | -30.04 | -28.04 | -28.04 | -18.42 |
| (C/N) (dB) | 20.00 | 26.80 | 22.20 | 19.30 | 19.30 | 19.30 | 18.60 | 18.60 | 17.20 | 16.40 | 12.80 | 17.20 | 16.40 | 12.80 | 2.00 | 1.80 | 1.80 | 1.80 | 3.80 | 3.80 | 10.40 |
| Margin 0.5dB | -36.05 | -37.85 | -36.05 | -36.03 | -36.03 | -38.06 | -40.23 | -39.06 | -40.85 | -40.85 | -40.81 | -40.85 | -40.85 | -40.81 | -39.08 | -40.82 | -40.83 | -40.84 | -40.84 | -40.84 | -37.82 |
| Margin 1.0dB | -33.05 | -34.85 | -33.05 | -33.03 | -33.03 | -36.06 | -37.23 | -38.06 | -37.85 | -37.85 | -37.81 | -37.85 | -37.85 | -37.81 | -36.08 | -37.82 | -37.83 | -37.84 | -37.84 | -37.84 | -34.82 |

## ORBCOMM MOBILE TO INMARSAT SATELLITE (GLOBAL BEAM)

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 36.00 | 36.00 | 42.00 | 50.50 | 50.50 | 29.40 | 28.70 | 28.70 | 22.50 | 21.70 | 16.90 | 22.50 | 21.70 | 16.90 | 11.50 | -1.10 | 1.90 | 4.90 | 6.90 | 10.30 | 10.50 |
| IEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| dEIRP (dB) | 16.00 | 16.00 | 22.00 | 30.50 | 30.50 | 9.40 | 8.70 | 8.70 | 2.50 | 1.70 | -3.10 | 2.50 | 1.70 | -3.10 | -8.50 | -21.10 | -18.10 | -15.10 | -13.10 | -9.70 | -9.50 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | 16.00 | 16.00 | 22.00 | 30.50 | 30.50 | 9.40 | 8.70 | 8.70 | 2.50 | 1.70 | -3.10 | 2.50 | 1.70 | -3.10 | -8.50 | -21.10 | -18.10 | -15.10 | -13.10 | -9.70 | -9.50 |
| WNBW (kHz) | 28.00 | 5.76 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.50 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| IABW (kHz) | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 |
| 10log(O) (dB) | 7.15 | 0.28 | 10.95 | 22.32 | 22.32 | 4.26 | 4.26 | 4.26 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.68 | -6.99 | -3.98 | -0.97 | -0.97 | 0.67 | -6.99 |
| 10log(DF)(dB) | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 | 5.20 |
| P | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| 10log(P) (dB) | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 |
| (C/I)m (dB) | 8.88 | 15.75 | 11.08 | 8.21 | 8.21 | 5.17 | 4.47 | 4.47 | 2.53 | 1.73 | -3.07 | 2.53 | 1.73 | -3.07 | -12.15 | -14.08 | -14.09 | -14.10 | -12.10 | -10.34 | -2.48 |
| (C/N) (dB) | 20.00 | 26.80 | 22.20 | 19.30 | 19.30 | 19.30 | 18.60 | 18.60 | 17.20 | 16.40 | 12.80 | 17.20 | 16.40 | 12.80 | 2.00 | 1.80 | 1.80 | 1.80 | 3.80 | 3.80 | 10.40 |
| Margin 0.5dB | -20.12 | -20.15 | -20.12 | -20.08 | -20.09 | -23.13 | -23.13 | -23.13 | -23.67 | -23.67 | -24.87 | -23.67 | -23.67 | -24.87 | -23.15 | -24.88 | -24.89 | -24.90 | -24.90 | -23.14 | -21.88 |
| Margin 1.0dB | -17.12 | -17.15 | -17.12 | -17.09 | -17.09 | -20.13 | -20.13 | -20.13 | -20.67 | -20.67 | -21.87 | -20.67 | -20.67 | -21.87 | -20.15 | -21.88 | -21.89 | -21.90 | -21.90 | -20.14 | -18.88 |

## ORBCOMM SATELLITE TO INMARSAT MOBILE (GLOBAL BEAM)

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 22.90 | 14.00 | 28.90 | 37.40 | 37.40 | 12.30 | 11.60 | 5.80 | 13.30 | 12.50 | 11.70 | 15.30 | 14.50 | 13.70 | 15.10 | 15.50 | 5.50 | 8.50 | 10.50 | 13.90 | 19.80 |
| IEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| dEIRP (dB) | -11.60 | -20.50 | -5.80 | 2.90 | 2.90 | -22.20 | -22.90 | -28.70 | -21.20 | -22.00 | -22.80 | -19.20 | -20.00 | -20.80 | -19.40 | -19.00 | -29.00 | -26.00 | -24.00 | -20.60 | -14.70 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| dPL (dB) | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 |
| (C/I)1F (dB) | -34.75 | -43.85 | -28.75 | -20.25 | -20.25 | -45.35 | -46.05 | -51.85 | -44.35 | -45.15 | -45.95 | -42.35 | -43.15 | -43.95 | -42.55 | -42.15 | -52.15 | -49.15 | -47.15 | -43.75 | -37.85 |
| WNBW (kHz) | 28.00 | 1.44 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| IABW (kHz) | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 |
| 10log(O) (dB) | 4.14 | -8.99 | 7.94 | 19.31 | 19.31 | 1.25 | 1.25 | 0.00 | -1.76 | -1.76 | 0.00 | -1.76 | -1.76 | 0.00 | 0.67 | -10.00 | -8.99 | -3.98 | -3.98 | -0.58 | -10.00 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)s (dB) | -38.88 | -38.66 | -38.88 | -39.56 | -39.56 | -46.59 | -47.29 | -51.85 | -42.58 | -43.38 | -45.95 | -40.58 | -41.38 | -43.95 | -43.21 | -32.15 | -45.16 | -45.17 | -43.17 | -43.17 | -27.85 |
| (C/N) (dB) | 14.40 | 18.40 | 18.60 | 13.70 | 13.70 | 6.70 | 6.00 | 3.20 | 6.50 | 5.70 | 3.10 | 8.50 | 7.70 | 5.10 | 4.10 | 4.90 | 3.90 | 3.90 | 5.90 | 5.90 | 9.20 |
| Margin 0.5dB | -62.28 | -64.06 | -62.28 | -62.26 | -62.26 | -62.29 | -62.29 | -64.05 | -58.08 | -58.08 | -58.05 | -58.08 | -58.08 | -58.05 | -56.31 | -46.05 | -58.06 | -58.07 | -58.07 | -58.07 | -48.05 |
| Margin 1.0dB | -59.28 | -61.06 | -59.28 | -59.26 | -59.26 | -59.29 | -59.29 | -61.05 | -55.08 | -55.08 | -55.05 | -55.08 | -55.08 | -55.05 | -53.31 | -43.05 | -55.06 | -55.07 | -55.07 | -55.07 | -43.05 |

| ORBCOMM MOBILE TO INMARSAT MOBILE (SPOT BEAM) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AERO-H | AERO-L | AERO-H | AERO-H | AERO-H | AERO-H | INM-C |
| | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 13.80 | 13.00 | 7.10 | 14.60 | 13.80 | 12.90 | 16.60 | 15.80 | 14.90 | 15.80 | 16.10 | 6.20 | 9.20 | 11.30 | 14.70 | 20.00 |
| IEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| dEIRP (dB) | -6.20 | -7.00 | -12.90 | -5.40 | -6.20 | -7.10 | -3.40 | -4.20 | -5.10 | -4.20 | -3.90 | -13.80 | -10.80 | -8.70 | -5.30 | 0.00 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 |
| (C/I)1F (dB) | -84.15 | -84.95 | -90.85 | -83.35 | -84.15 | -85.05 | -81.35 | -82.15 | -83.05 | -82.15 | -81.85 | -91.75 | -88.75 | -86.65 | -83.25 | -77.95 |
| WNBW (kHz) | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| IABW (kHz) | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 |
| 10log(Q) (dB) † | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -6.99 | -3.98 | -0.97 | -0.97 | 0.00 | -6.99 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| 10log(P) (dB) | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 |
| **(C/I)e (dB)** | **-73.92** | **-74.72** | **-80.62** | **-73.12** | **-73.92** | **-74.82** | **-71.12** | **-71.92** | **-72.82** | **-71.92** | **-84.63** | **-77.54** | **-77.55** | **-75.45** | **-73.02** | **-60.73** |
| **(C/N) (dB)** | **8.20** | **7.40** | **4.50** | **7.90** | **7.00** | **4.30** | **9.80** | **9.00** | **6.30** | **4.80** | **5.50** | **4.60** | **4.60** | **6.70** | **6.70** | **9.40** |
| **Margin 0.5dB** | **-91.12** | **-91.12** | **-84.12** | **-88.92** | **-89.92** | **-88.12** | **-89.92** | **-89.92** | **-88.12** | **-85.72** | **-79.13** | **-91.14** | **-91.15** | **-91.15** | **-88.72** | **-79.13** |
| **Margin 1.0dB** | **-88.12** | **-88.12** | **-91.12** | **-86.92** | **-86.92** | **-85.12** | **-86.92** | **-86.92** | **-85.12** | **-82.72** | **-76.13** | **-88.14** | **-88.15** | **-88.15** | **-85.72** | **-76.13** |

† If 10logQ is positive then it is set to 0dB since we assume there is only one interfering mobile

## ORBCOMM SATELLITE TO INMARSAT SATELLITE (SPOT BEAM)

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AERO-H | AERO-L | AERO-H | AERO-H | AERO-H | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 21.40 | 20.60 | 20.60 | 14.40 | 13.50 | 8.60 | 14.40 | 13.50 | 8.60 | 3.50 | -9.10 | -6.10 | -3.10 | -1.00 | 2.40 | 3.90 |
| IEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| dEIRP (dB) | -13.10 | -13.90 | -13.90 | -20.10 | -21.00 | -25.90 | -20.10 | -21.00 | -25.90 | -31.00 | -43.60 | -40.60 | -37.60 | -35.50 | -32.10 | -30.60 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 |
| dPL (dB) | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 |
| (C/I)1F (dB) | -12.52 | -13.32 | -13.32 | -19.52 | -20.42 | -25.32 | -20.68 | -20.42 | -25.32 | -30.42 | -43.02 | -40.02 | -37.02 | -34.92 | -31.52 | -30.02 |
| WNBW (kHz) | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| IABW (kHz) | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 |
| 10log(Q) (dB) | 1.25 | 1.25 | 1.25 | -1.76 | -1.76 | -3.01 | -1.76 | -1.76 | -3.01 | 0.67 | -10.00 | -6.99 | -3.98 | -3.98 | -0.58 | -10.00 |
| 10log(DF)(dB) | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)m (dB)** | **-14.56** | **-15.36** | **-15.36** | **-18.55** | **-19.45** | **-23.11** | **-19.72** | **-19.45** | **-23.11** | **-31.88** | **-33.82** | **-33.83** | **-33.84** | **-31.74** | **-31.74** | **-20.82** |
| (C/N) (dB) | 19.30 | 18.50 | 18.50 | 17.10 | 16.20 | 12.50 | 17.10 | 16.20 | 12.50 | 2.00 | 1.80 | 1.80 | 1.80 | 3.90 | 3.90 | 10.80 |
| **Margin 0.5dB** | **-42.86** | **-42.86** | **-42.86** | **-44.65** | **-44.65** | **-44.61** | **-45.82** | **-44.65** | **-44.61** | **-42.88** | **-44.62** | **-44.63** | **-44.64** | **-44.64** | **-44.64** | **-40.62** |
| **Margin 1.0dB** | **-39.86** | **-39.86** | **-39.86** | **-41.65** | **-41.65** | **-41.61** | **-42.82** | **-41.65** | **-41.61** | **-39.88** | **-41.62** | **-41.63** | **-41.64** | **-41.64** | **-41.64** | **-37.62** |

| ORBCOMM MOBILE TO INMARSAT SATELLITE (SPOT BEAM) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
| | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 21.40 | 20.60 | 20.60 | 14.40 | 13.50 | 8.60 | 14.40 | 13.50 | 8.60 | 3.50 | -9.10 | -6.10 | -3.10 | -1.00 | 2.40 | 3.90 |
| IEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| dEIRP (dB) | 1.40 | 0.60 | 0.60 | -5.60 | -6.50 | -11.40 | -5.60 | -6.50 | -11.40 | -16.50 | -29.10 | -26.10 | -23.10 | -21.00 | -17.60 | -16.10 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | 1.40 | 0.60 | 0.60 | -5.60 | -6.50 | -11.40 | -5.60 | -6.50 | -11.40 | -16.50 | -29.10 | -26.10 | -23.10 | -21.00 | -17.60 | -16.10 |
| WNBW (kHz) | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| INBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| IABW (kHz) | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 |
| 10log(Q) (dB) | 4.26 | 4.26 | 4.26 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.68 | -6.99 | -3.98 | -0.97 | -0.97 | 0.67 | -6.99 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| 10log(P) (dB) | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 |
| (C/I)m (dB) | 2.37 | 1.57 | 1.57 | -0.37 | -1.27 | -6.17 | -0.37 | -1.27 | -6.17 | -14.95 | -16.88 | -16.89 | -16.90 | -14.80 | -13.04 | -3.88 |
| (C/N) (dB) | 19.30 | 18.50 | 18.50 | 17.10 | 16.20 | 12.50 | 17.10 | 16.20 | 12.50 | 2.00 | 1.80 | 1.80 | 1.80 | 3.90 | 3.90 | 10.80 |
| Margin 0.5dB | -25.93 | -25.93 | -25.93 | -26.47 | -26.47 | -27.67 | -26.47 | -26.47 | -27.67 | -25.95 | -27.68 | -27.69 | -27.70 | -27.70 | -25.94 | -23.68 |
| Margin 1.0dB | -22.93 | -22.93 | -22.93 | -23.47 | -23.47 | -24.67 | -23.47 | -23.47 | -24.67 | -22.95 | -24.68 | -24.69 | -24.70 | -24.70 | -22.94 | -20.68 |

## ORBCOMM SATELLITE TO INMARSAT MOBILE (SPOT BEAM)

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 13.80 | 13.00 | 7.10 | 14.60 | 13.80 | 12.90 | 16.60 | 15.80 | 14.90 | 15.60 | 16.10 | 6.20 | 9.20 | 11.30 | 14.70 | 20.00 |
| IEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| dEIRP (dB) | -20.70 | -21.50 | -27.40 | -19.90 | -20.70 | -21.60 | -17.90 | -18.70 | -19.60 | -18.70 | -18.40 | -28.30 | -25.30 | -23.20 | -19.80 | -14.50 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| (C/I)1F (dB) | -43.85 | -44.65 | -50.55 | -43.05 | -43.85 | -44.75 | -41.05 | -41.85 | -42.75 | -41.85 | -41.55 | -51.45 | -48.45 | -46.35 | -42.95 | -37.65 |
| INBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| IABW (kHz) | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 |
| 10log(Q) (dB) | 1.25 | 1.25 | 0.00 | -1.76 | -1.76 | 0.00 | -1.76 | -1.76 | 0.00 | 0.67 | -10.00 | -6.99 | -3.98 | -3.98 | -0.58 | -10.00 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)a (dB) | -45.09 | -45.89 | -50.55 | -41.28 | -42.08 | -44.75 | -39.28 | -40.08 | -42.75 | -42.51 | -31.55 | -44.46 | -44.47 | -42.37 | -42.37 | -27.85 |
| (C/N) (dB) | 8.20 | 7.40 | 4.50 | 7.80 | 7.00 | 4.30 | 9.80 | 9.00 | 6.30 | 4.80 | 5.50 | 4.60 | 4.80 | 6.70 | 6.70 | 9.40 |
| Margin 0.5dB | -62.29 | -62.29 | -64.05 | -58.08 | -58.08 | -58.05 | -58.08 | -58.08 | -58.05 | -58.31 | -46.05 | -58.06 | -58.07 | -58.07 | -58.07 | -46.05 |
| Margin 1.0dB | -59.29 | -59.29 | -61.05 | -55.08 | -55.08 | -55.05 | -55.08 | -55.08 | -55.05 | -53.31 | -43.05 | -55.06 | -55.07 | -55.07 | -55.07 | -43.05 |

## ORBCOMM MOBILE TO ZENON MOBILE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 |
| IEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| dEIRP (dB) | 11.80 | 11.80 | 11.80 | 11.80 | 11.80 | 11.80 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 | 77.95 |
| (C/I)1F (dB) | -66.15 | -66.15 | -66.15 | -66.15 | -66.15 | -66.15 |
| WNBW (kHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| INBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| IABW (kHz) | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 |
| 10log(Q)(dB) † | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| 10log(P) (dB) | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 |
| **(C/I)m (dB)** | **-55.92** | **-55.92** | **-55.92** | **-55.92** | **-55.92** | **-55.92** |
| **(C/N) (dB)** | **6.20** | **11.30** | **15.20** | **15.40** | **18.40** | **20.40** |
| **Margin 0.5dB** | **-71.12** | **-76.22** | **-80.12** | **-80.32** | **-83.32** | **-85.32** |
| **Margin 1.0dB** | **-68.12** | **-73.22** | **-77.12** | **-77.32** | **-80.32** | **-82.32** |

† If 10logQ is positive then it is set to 0dB since
we assume there is only one interfering mobile

## ORBCOMM SATELLITE TO ZENON SATELLITE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | -3.90 | -2.40 | 0.50 | 12.60 | 15.10 | 15.10 |
| IEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| dEIRP (dB) | -38.40 | -36.90 | -34.00 | -21.90 | -19.40 | -19.40 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42550.00 |
| dPL (dB) | -0.58 | -0.58 | -0.58 | -0.58 | -0.58 | -0.65 |
| (C/I)1F (dB) | -37.82 | -36.32 | -33.42 | -21.32 | -18.82 | -18.75 |
| WNBW (kHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| INBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| IABW (kHz) | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 |
| 10log(Q) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10log(DF)(dB) | -0.50 | -0.50 | -0.50 | -0.50 | -5.00 | -0.50 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)s (dB)** | **-37.32** | **-35.82** | **-32.92** | **-20.82** | **-13.82** | **-18.25** |
| **(C/N) (dB)** | **1.10** | **2.60** | **5.50** | **17.60** | **20.10** | **20.10** |
| **Margin 0.5dB** | **-47.42** | **-47.42** | **-47.42** | **-47.42** | **-42.92** | **-47.35** |
| **Margin 1.0dB** | **-44.42** | **-44.42** | **-44.42** | **-44.42** | **-39.92** | **-44.35** |

## ORBCOMM MOBILE TO ZENON SATELLITE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | -3.90 | -2.40 | 0.50 | 12.60 | 15.10 | 15.10 |
| IEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| dEIRP (dB) | -23.90 | -22.40 | -19.50 | -7.40 | -4.90 | -4.90 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | -23.90 | -22.40 | -19.50 | -7.40 | -4.90 | -4.90 |
| WNBW (kHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| INBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| IABW (kHz) | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 |
| 10log(Q) (dB) | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 | 1.71 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| 10log(P) (dB) | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 | -5.23 |
| **(C/I)m (dB)** | **-20.38** | **-18.88** | **-15.98** | **-3.88** | **-1.38** | **-1.38** |
| **(C/N) (dB)** | **1.10** | **2.60** | **5.50** | **17.60** | **20.10** | **20.10** |
| **Margin 0.5dB** | **-30.48** | **-30.48** | **-30.48** | **-30.48** | **-30.48** | **-30.48** |
| **Margin 1.0dB** | **-27.48** | **-27.48** | **-27.48** | **-27.48** | **-27.48** | **-27.48** |

## ORBCOMM SATELLITE TO ZENON MOBILE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 |
| IEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| dEIRP (dB) | -2.70 | -2.70 | -2.70 | -2.70 | -2.70 | -2.70 |
| WRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| IRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| dPL (dB) | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 | 23.15 |
| (C/I)1F (dB) | -25.85 | -25.85 | -25.85 | -25.85 | -25.85 | -25.85 |
| WNBW (kHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| INBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| IABW (kHz) | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 | 10.80 |
| 10log(Q) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)s (dB)** | **-25.85** | **-25.85** | **-25.85** | **-25.85** | **-25.85** | **-25.85** |
| **(C/N) (dB)** | **6.20** | **11.30** | **15.20** | **15.40** | **18.40** | **20.40** |
| **Margin 0.5dB** | **-41.05** | **-46.15** | **-50.05** | **-50.25** | **-53.25** | **-55.25** |
| **Margin 1.0dB** | **-38.05** | **-43.15** | **-47.05** | **-47.25** | **-50.25** | **-52.25** |

## ORBCOMM MOBILE TO EUTELSAT MOBILE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 29.00 |
| IEIRP (dBW) | 20.00 |
| dEIRP (dB) | 9.00 |
| WRANGE (km) | 39500.00 |
| IRANGE (km) | 5.00 |
| dPL (dB) | 77.95 |
| (C/I)1F (dB) | -68.95 |
| WNBW (kHz) | 4.00 |
| INBW (kHz) | 3.60 |
| IABW (kHz) | 5.40 |
| 10log(Q) (dB) † | 0.00 |
| 10log(DF)(dB) | -5.00 |
| P | 0.30 |
| 10log(P) (dB) | -5.23 |
| **(C/I)m (dB)** | **-58.72** |
| **(C/N) (dB)** | **10.90** |
| **MargIn 0.5dB** | **-78.62** |
| **MargIn 1.0dB** | **-75.62** |

† if 10logQ is positive then it is set to 0 dB since we assume there is only one interfering mobile

## ORBCOMM SATELLITE TO EUTELSAT SATELLITE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 17.00 |
| IEIRP (dBW) | 34.50 |
| dEIRP (dB) | -17.50 |
| WRANGE (km) | 39500.00 |
| IRANGE (km) | 42250.00 |
| dPL (dB) | -0.58 |
| (C/I)1F (dB) | -16.92 |
| WNBW (kHz) | 4.00 |
| INBW (kHz) | 7.20 |
| IABW (kHz) | 10.80 |
| 10log(Q) (dB) | -2.55 |
| 10log(DF)(dB) | 1.50 |
| P | 1.00 |
| 10log(P) (dB) | 0.00 |
| **(C/I)s (dB)** | **-15.86** |
| **(C/N) (dB)** | **17.70** |
| **MargIn 0.5dB** | **-42.56** |
| **MargIn 1.0dB** | **-39.56** |

## ORBCOMM MOBILE TO EUTELSAT SATELLITE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 17.00 |
| IEIRP (dBW) | 20.00 |
| dEIRP (dB) | -3.00 |
| WRANGE (km) | 39500.00 |
| IRANGE (km) | 39500.00 |
| dPL (dB) | 0.00 |
| (C/I)1F (dB) | -3.00 |
| WNBW (kHz) | 4.00 |
| INBW (kHz) | 3.60 |
| IABW (kHz) | 5.40 |
| 10log(Q) (dB) | 0.00 |
| 10log(DF)(dB) | 0.00 |
| P | 0.30 |
| 10log(P) (dB) | -5.23 |
| **(C/I)m (dB)** | **2.23** |
| **(C/N) (dB)** | **17.70** |
| **Margin 0.5dB** | **-24.47** |
| **Margin 1.0dB** | **-21.47** |

## ORBCOMM SATELLITE TO EUTELSAT MOBILE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 29.00 |
| IEIRP (dBW) | 34.50 |
| dEIRP (dB) | -5.50 |
| WRANGE (km) | 39500.00 |
| IRANGE (km) | 2750.00 |
| dPL (dB) | 23.15 |
| (C/I)1F (dB) | -28.65 |
| WNBW (kHz) | 4.00 |
| INBW (kHz) | 7.20 |
| IABW (kHz) | 10.80 |
| 10log(Q) (dB) | -2.55 |
| 10log(DF)(dB) | 0.00 |
| P | 1.00 |
| 10log(P) (dB) | 0.00 |
| **(C/I)s (dB)** | **-26.09** |
| **(C/N) (dB)** | **10.90** |
| **Margin 0.5dB** | **-45.99** |
| **Margin 1.0dB** | **-42.99** |

# INTERFERENCE FROM GSO/MSS INTO LEO/MSS

## MSAT MOBILE TO IRIDIUM MOBILE (CELL 1)

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| IEIRP (dBW) | 14.20 | 11.50 | 11.00 | 1.30 | 16.20 | 4.30 | 1.30 | -1.70 | 14.20 | 11.50 | 14.20 | 11.50 | 14.20 | 11.50 |
| dEIRP (dB) | 8.90 | 11.60 | 12.10 | 21.80 | 6.90 | 18.80 | 21.80 | 24.80 | 8.90 | 11.60 | 8.90 | 11.60 | 8.90 | 11.60 |
| WRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 |
| (C/I)1F (dB) | -44.36 | -41.66 | -41.16 | -31.46 | -46.36 | -34.46 | -31.46 | -28.46 | -44.36 | -41.66 | -44.36 | -41.66 | -44.36 | -41.66 |
| WNBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| IABW (kHz) | 5.00 | 5.00 | 2.50 | 2.50 | 5.00 | 2.50 | 2.50 | 2.50 | 5.00 | 5.00 | 5.00 | 5.00 | 10.00 | 10.00 |
| 10log(Q)(dB) † | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.40 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 0.40 | 0.40 | 0.40 | 0.40 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | -3.98 | -3.98 | -3.98 | -3.98 | 0.00 | 0.00 |
| (C/I)m (dB) | -35.38 | -32.68 | -36.16 | -26.46 | -37.38 | -29.46 | -26.46 | -23.46 | -35.38 | -32.68 | -35.38 | -32.68 | -39.36 | -36.66 |
| (C/N) (dB) | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 |
| Margin 0.5dB | -53.58 | -50.88 | -54.36 | -44.66 | -55.58 | -47.66 | -44.66 | -41.66 | -53.58 | -50.88 | -53.58 | -50.88 | -57.56 | -54.86 |
| Margin 1.0dB | -50.58 | -47.88 | -51.36 | -41.66 | -52.58 | -44.66 | -41.66 | -38.66 | -50.58 | -47.88 | -50.58 | -47.88 | -54.56 | -51.86 |

† If 10logQ is positive then it is set to 0 dB since we assume there is only one interfering mobile

## MSAT SATELLITE TO IRIDIUM MOBILE (CELL 1)

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| IEIRP (dBW) | 27.30 | 27.30 | 26.90 | 26.90 | 32.30 | 27.30 | 24.30 | 21.30 | 28.30 | 28.30 | 30.30 | 30.30 | 26.90 | 26.90 |
| dEIRP (dB) | -4.20 | -4.20 | -3.80 | -3.80 | -9.20 | -4.20 | -1.20 | 1.80 | -5.20 | -5.20 | -7.20 | -7.20 | -3.80 | -3.80 |
| WRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 |
| (C/I)1F (dB) | 20.50 | 20.50 | 20.90 | 20.90 | 15.50 | 20.50 | 23.50 | 26.50 | 19.50 | 19.50 | 17.50 | 17.50 | 20.90 | 20.90 |
| WNBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| IABW (kHz) | 5.00 | 5.00 | 2.50 | 2.50 | 5.00 | 2.50 | 2.50 | 2.50 | 5.00 | 5.00 | 5.00 | 5.00 | 10.00 | 10.00 |
| 10log(Q) (dB) | 17.78 | 17.78 | 20.79 | 20.79 | 17.78 | 20.79 | 20.79 | 20.79 | 17.78 | 17.78 | 17.78 | 17.78 | 14.77 | 14.77 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 0.40 | 0.40 | 0.40 | 0.40 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | -3.98 | -3.98 | -3.98 | -3.98 | 0.00 | 0.00 |
| (C/I)s (dB) | 6.70 | 6.70 | 0.11 | 0.11 | 1.70 | -0.29 | 2.71 | 5.71 | 5.70 | 5.70 | 3.70 | 3.70 | 6.13 | 6.13 |
| (C/N) (dB) | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 |
| Margin 0.5dB | -11.50 | -11.50 | -18.09 | -18.09 | -16.50 | -18.49 | -15.49 | -12.49 | -12.50 | -12.50 | -14.50 | -14.50 | -12.07 | -12.07 |
| Margin 1.0dB | -8.50 | -8.50 | -15.09 | -15.09 | -13.50 | -15.49 | -12.49 | -9.49 | -9.50 | -9.50 | -11.50 | -11.50 | -9.07 | -9.07 |

## MSAT MOBILE TO IRIDIUM MOBILE (CELL 7)

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 |
| IEIRP (dBW) | 14.20 | 11.50 | 11.00 | 1.30 | 16.20 | 4.30 | 1.30 | -1.70 | 14.20 | 11.50 | 14.20 | 11.50 | 14.20 | 11.50 |
| dEIRP (dB) | -1.70 | 1.00 | 1.50 | 11.20 | -3.70 | 8.20 | 11.20 | 14.20 | -1.70 | 1.00 | -1.70 | 1.00 | -1.70 | 1.00 |
| WRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 |
| (C/I)1F (dB) | -46.31 | -43.61 | -43.11 | -33.41 | -48.31 | -36.41 | -33.41 | -30.41 | -46.31 | -43.61 | -46.31 | -43.61 | -46.31 | -43.61 |
| WNBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| IABW (kHz) | 5.00 | 5.00 | 2.50 | 2.50 | 5.00 | 2.50 | 2.50 | 2.50 | 5.00 | 5.00 | 5.00 | 5.00 | 10.00 | 10.00 |
| 10log(Q)(dB) † | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.40 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 0.40 | 0.40 | 0.40 | 0.40 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | -3.98 | -3.98 | -3.98 | -3.98 | 0.00 | 0.00 |
| **(C/I)m (dB)** | **-37.33** | **-34.63** | **-38.11** | **-28.41** | **-39.33** | **-31.41** | **-28.41** | **-25.41** | **-37.33** | **-34.63** | **-37.33** | **-34.63** | **-41.31** | **-38.61** |
| **(C/N) (dB)** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** |
| **Margin 0.5dB** | **-55.63** | **-52.93** | **-56.41** | **-46.71** | **-57.63** | **-49.71** | **-46.71** | **-43.71** | **-55.63** | **-52.93** | **-55.63** | **-52.93** | **-59.61** | **-56.91** |
| **Margin 1.0dB** | **-52.63** | **-49.93** | **-53.41** | **-43.71** | **-54.63** | **-46.71** | **-43.71** | **-40.71** | **-52.63** | **-49.93** | **-52.63** | **-49.93** | **-56.61** | **-53.91** |

† If 10logQ is positive then it is set to 0 dB since we assume there is only one interfering mobile

## MSAT SATELLITE TO IRIDIUM MOBILE (CELL 7)

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 |
| IEIRP (dBW) | 27.30 | 27.30 | 26.90 | 26.90 | 32.30 | 27.30 | 24.30 | 21.30 | 28.30 | 28.30 | 30.30 | 30.30 | 26.90 | 26.90 |
| dEIRP (dB) | -14.80 | -14.80 | -14.40 | -14.40 | -19.80 | -14.80 | -11.80 | -8.80 | -15.80 | -15.80 | -17.80 | -17.80 | -14.40 | -14.40 |
| WRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 |
| (C/I)1F (dB) | 18.54 | 18.54 | 18.94 | 18.94 | 13.54 | 18.54 | 21.54 | 24.54 | 17.54 | 17.54 | 15.54 | 15.54 | 18.94 | 18.94 |
| WNBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| IABW (kHz) | 5.00 | 5.00 | 2.50 | 2.50 | 5.00 | 2.50 | 2.50 | 2.50 | 5.00 | 5.00 | 5.00 | 5.00 | 10.00 | 10.00 |
| 10log(Q) (dB) | 17.78 | 17.78 | 20.79 | 20.79 | 17.78 | 20.79 | 20.79 | 20.79 | 17.78 | 17.78 | 17.78 | 17.78 | 14.77 | 14.77 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 0.40 | 0.40 | 0.40 | 0.40 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | -3.98 | -3.98 | -3.98 | -3.98 | 0.00 | 0.00 |
| **(C/I)s (dB)** | **4.74** | **4.74** | **-1.85** | **-1.85** | **-0.26** | **-2.25** | **0.75** | **3.75** | **3.74** | **3.74** | **1.74** | **1.74** | **4.17** | **4.17** |
| **(C/N) (dB)** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** | **9.30** |
| **Margin 0.5dB** | **-13.56** | **-13.56** | **-20.15** | **-20.15** | **-18.56** | **-20.55** | **-17.55** | **-14.55** | **-14.56** | **-14.56** | **-16.56** | **-16.56** | **-14.13** | **-14.13** |
| **Margin 1.0dB** | **-10.56** | **-10.56** | **-17.15** | **-17.15** | **-15.56** | **-17.55** | **-14.55** | **-11.55** | **-11.56** | **-11.56** | **-13.56** | **-13.56** | **-11.13** | **-11.13** |

## MSAT MOBILE TO IRIDIUM SATELLITE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 |
| IEIRP (dBW) | 14.20 | 11.50 | 11.00 | 1.30 | 16.20 | 4.30 | 1.30 | -1.70 | 14.20 | 11.50 | 14.20 | 11.50 | 14.20 | 11.50 |
| dEIRP (dB) | -12.80 | -10.10 | -9.60 | 0.10 | -14.80 | -2.90 | 0.10 | 3.10 | -12.80 | -10.10 | -12.80 | -10.10 | -12.80 | -10.10 |
| WRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| IRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | -12.80 | -10.10 | -9.60 | 0.10 | -14.80 | -2.90 | 0.10 | 3.10 | -12.80 | -10.10 | -12.80 | -10.10 | -12.80 | -10.10 |
| WNBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 1351.00 | 135.00 | 135.00 | 135.00 |
| INBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| IABW (kHz) | 5.00 | 5.00 | 2.50 | 2.50 | 5.00 | 2.50 | 2.50 | 2.50 | 5.00 | 5.00 | 5.00 | 5.00 | 10.00 | 10.00 |
| 10log(Q) (dB) | 7.32 | 7.32 | 10.33 | 10.33 | 7.32 | 10.33 | 10.33 | 10.33 | 7.32 | 7.32 | 17.33 | 7.32 | 4.31 | 4.31 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 0.40 | 0.40 | 0.40 | 0.40 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | -3.98 | -3.98 | -3.98 | -3.98 | 0.00 | 0.00 |
| **(C/I)m (dB)** | **-16.14** | **-13.44** | **-19.93** | **-10.23** | **-18.14** | **-13.23** | **-10.23** | **-7.23** | **-16.14** | **-13.44** | **-26.15** | **-13.44** | **-17.11** | **-14.41** |
| **(C/N) (dB)** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** |
| **Margin 0.5dB** | **-33.64** | **-30.94** | **-37.43** | **-27.73** | **-35.64** | **-30.73** | **-27.73** | **-24.73** | **-33.64** | **-30.94** | **-43.65** | **-30.94** | **-34.61** | **-31.91** |
| **Margin 1.0dB** | **-30.64** | **-27.94** | **-34.43** | **-24.73** | **-32.64** | **-27.73** | **-24.73** | **-21.73** | **-30.64** | **-27.94** | **-40.65** | **-27.94** | **-31.61** | **-28.91** |

## MSAT SATELLITE TO IRIDIUM SATELLITE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 |
| IEIRP (dBW) | 27.30 | 27.30 | 26.90 | 26.90 | 32.30 | 27.30 | 24.30 | 21.30 | 28.30 | 28.30 | 30.30 | 30.30 | 26.90 | 26.90 |
| dEIRP (dB) | -25.90 | -25.90 | -25.50 | -25.50 | -30.90 | -25.90 | -22.90 | -19.90 | -26.90 | -26.90 | -28.90 | -28.90 | -25.50 | -25.50 |
| WRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| IRANGE (km) | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 |
| dPL (dB) | -25.19 | -25.19 | -25.19 | -25.19 | -25.19 | -25.19 | -25.19 | -25.19 | -25.19 | -25.19 | -25.19 | -25.19 | -25.19 | -25.19 |
| (C/I)1F (dB) | -0.71 | -0.71 | -0.31 | -0.31 | -5.71 | -0.71 | 2.29 | 5.29 | -1.71 | -1.71 | -3.71 | -3.71 | -0.31 | -0.31 |
| WNBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| INBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| IABW (kHz) | 5.00 | 5.00 | 2.50 | 2.50 | 5.00 | 2.50 | 2.50 | 2.50 | 5.00 | 5.00 | 5.00 | 5.00 | 10.00 | 10.00 |
| 10log(Q) (dB) | 14.31 | 14.31 | 17.32 | 17.32 | 14.31 | 17.32 | 17.32 | 17.32 | 14.31 | 14.31 | 14.31 | 14.31 | 11.30 | 11.30 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 0.40 | 0.40 | 0.40 | 0.40 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | -3.98 | -3.98 | -3.98 | -3.98 | 0.00 | 0.00 |
| **(C/I)s (dB)** | **-11.05** | **-11.05** | **-17.63** | **-17.63** | **-16.05** | **-18.03** | **-15.03** | **-12.03** | **-12.05** | **-12.05** | **-14.05** | **-14.05** | **-11.61** | **-11.61** |
| **(C/N) (dB)** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** |
| **Margin 0.5dB** | **-28.55** | **-28.55** | **-35.13** | **-35.13** | **-33.55** | **-35.53** | **-32.53** | **-29.53** | **-29.55** | **-29.55** | **-31.55** | **-31.55** | **-29.11** | **-29.11** |
| **Margin 1.0dB** | **-25.55** | **-25.55** | **-32.13** | **-32.13** | **-30.55** | **-32.53** | **-29.53** | **-26.53** | **-26.55** | **-26.55** | **-28.55** | **-28.55** | **-26.11** | **-26.11** |

## MSAT MOBILE TO ORBCOMM MOBILE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| IEIRP (dBW) | 14.20 | 11.50 | 11.00 | 1.30 | 16.20 | 4.30 | 1.30 | -1.70 | 14.20 | 11.50 | 14.20 | 11.50 | 14.20 | 11.50 |
| dEIRP (dB) | 20.30 | 23.00 | 23.50 | 33.20 | 18.30 | 30.20 | 33.20 | 36.20 | 20.30 | 23.00 | 20.30 | 23.00 | 20.30 | 23.00 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 |
| (C/I)1F (dB) | -34.51 | -31.81 | -31.31 | -21.61 | -36.51 | -24.61 | -21.61 | -18.61 | -34.51 | -31.81 | -34.51 | -31.81 | -34.51 | -31.81 |
| WNBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| INBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| IABW (kHz) | 5.00 | 5.00 | 2.50 | 2.50 | 5.00 | 2.50 | 2.50 | 2.50 | 5.00 | 5.00 | 5.00 | 5.00 | 10.00 | 10.00 |
| 10log(Q)(dB) † | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.40 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 0.40 | 0.40 | 0.40 | 0.40 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | -3.98 | -3.98 | -3.98 | -3.98 | 0.00 | 0.00 |
| **(C/I)m (dB)** | **-25.53** | **-22.83** | **-26.31** | **-16.61** | **-27.53** | **-19.61** | **-16.61** | **-13.61** | **-25.53** | **-22.83** | **-25.53** | **-22.83** | **-29.51** | **-26.81** |
| **(C/N) (dB)** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** |
| **Margin 0.5dB** | **-57.43** | **-54.73** | **-58.21** | **-48.51** | **-59.43** | **-51.51** | **-48.51** | **-45.51** | **-57.43** | **-54.73** | **-57.43** | **-54.73** | **-61.41** | **-58.71** |
| **Margin 1.0dB** | **-54.43** | **-51.73** | **-55.21** | **-45.51** | **-56.43** | **-48.51** | **-45.51** | **-42.51** | **-54.43** | **-51.73** | **-54.43** | **-51.73** | **-58.41** | **-55.71** |

† If 10logQ is positive then it is set to 0dB since we assume there is only one interfering mobile

## MSAT SATELLITE TO ORBCOMM SATELLITE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| IEIRP (dBW) | 27.30 | 27.30 | 26.90 | 26.90 | 32.30 | 27.30 | 24.30 | 21.30 | 28.30 | 28.30 | 30.30 | 30.30 | 26.90 | 26.90 |
| dEIRP (dB) | -7.30 | -7.30 | -6.90 | -6.90 | -12.30 | -7.30 | -4.30 | -1.30 | -8.30 | -8.30 | -10.30 | -10.30 | -6.90 | -6.90 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 |
| dPL (dB) | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 |
| (C/I)1F (dB) | 16.43 | 16.43 | 16.83 | 16.83 | 11.43 | 16.43 | 19.43 | 22.43 | 15.43 | 15.43 | 13.43 | 13.43 | 16.83 | 16.83 |
| WNBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| INBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| IABW (kHz) | 5.00 | 5.00 | 2.50 | 2.50 | 5.00 | 2.50 | 2.50 | 2.50 | 5.00 | 5.00 | 5.00 | 5.00 | 10.00 | 10.00 |
| 10log(Q) (dB) | 0.00 | 0.00 | 1.58 | 1.58 | 0.00 | 1.58 | 1.58 | 1.58 | 0.00 | 0.00 | 0.00 | 0.00 | -1.68 | -1.68 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 |
| 10log(P) (dB) | -3.98 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | -3.98 | -3.98 | -3.98 | -3.98 | -3.98 | -3.98 |
| **(C/I)e (dB)** | **20.41** | **20.41** | **15.25** | **15.25** | **15.41** | **14.85** | **17.85** | **20.85** | **19.41** | **19.41** | **17.41** | **17.41** | **22.49** | **22.49** |
| **(C/N) (dB)** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** |
| **Margin 0.5dB** | **-10.19** | **-10.19** | **-15.35** | **-15.35** | **-15.19** | **-15.75** | **-12.75** | **-9.75** | **-11.19** | **-11.19** | **-13.19** | **-13.19** | **-8.11** | **-8.11** |
| **Margin 1.0dB** | **-7.19** | **-7.19** | **-12.35** | **-12.35** | **-12.19** | **-12.75** | **-9.75** | **-6.75** | **-8.19** | **-8.19** | **-10.19** | **-10.19** | **-5.11** | **-5.11** |

## MSAT MOBILE TO ORBCOMM SATELLITE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| IEIRP (dBW) | 14.20 | 11.50 | 11.00 | 1.30 | 16.20 | 4.30 | 1.30 | -1.70 | 14.20 | 11.50 | 14.20 | 11.50 | 14.20 | 11.50 |
| dEIRP (dB) | 5.80 | 8.50 | 9.00 | 18.70 | 3.80 | 15.70 | 18.70 | 21.70 | 5.80 | 8.50 | 5.80 | 8.50 | 5.80 | 8.50 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | 5.80 | 8.50 | 9.00 | 18.70 | 3.80 | 15.70 | 18.70 | 21.70 | 5.80 | 8.50 | 5.80 | 8.50 | 5.80 | 8.50 |
| WNBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| INBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| IABW (kHz) | 5.00 | 5.00 | 2.50 | 2.50 | 5.00 | 2.50 | 2.50 | 2.50 | 5.00 | 5.00 | 5.00 | 5.00 | 10.00 | 10.00 |
| 10log(Q) (dB) | 0.00 | 0.00 | 1.58 | 1.58 | 0.00 | 1.58 | 1.58 | 1.58 | 0.00 | 0.00 | 0.00 | 0.00 | -1.68 | -1.68 |
| 10log(DF)(dB) | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| P | 0.40 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 0.40 | 0.40 | 0.40 | 0.40 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | -3.98 | -3.98 | -3.98 | -3.98 | 0.00 | 0.00 |
| **(C/I)s (dB)** | **6.78** | **9.48** | **4.42** | **14.12** | **4.78** | **11.12** | **14.12** | **17.12** | **6.78** | **9.48** | **6.78** | **9.48** | **4.48** | **7.18** |
| **(C/N) (dB)** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** |
| **Margin 0.5dB** | **-23.82** | **-21.12** | **-26.18** | **-16.48** | **-25.82** | **-19.48** | **-16.48** | **-13.48** | **-23.62** | **-21.12** | **-23.82** | **-21.12** | **-26.12** | **-23.42** |
| **Margin 1.0dB** | **-20.82** | **-18.12** | **-23.18** | **-13.48** | **-22.82** | **-16.48** | **-13.48** | **-10.48** | **-20.82** | **-18.12** | **-20.82** | **-18.12** | **-23.12** | **-20.42** |

## MSAT SATELLITE TO ORBCOMM MOBILE

| CARRIER | Marine V | Marine V | Marine D | Marine D | Land V | Land D | Land D | Land D | Aero MRS | Aero MRS | Aero MTS | Aero MTS | Aero 4.8 | Aero 4.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ship | Boat | 1.2 HG | 1.2 LG | | 1.2 | 600 | 300 | Com. | Private | Com. | Private | Com. | Private |
| WEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| IEIRP (dBW) | 27.30 | 27.30 | 26.90 | 26.90 | 32.30 | 27.30 | 24.30 | 21.30 | 28.30 | 28.30 | 30.30 | 30.30 | 26.90 | 26.90 |
| dEIRP (dB) | 7.20 | 7.20 | 7.60 | 7.60 | 2.20 | 7.20 | 10.20 | 13.20 | 6.20 | 6.20 | 4.20 | 4.20 | 7.60 | 7.60 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 |
| (C/I)1F (dB) | 30.35 | 30.35 | 30.75 | 30.75 | 25.35 | 30.35 | 33.35 | 36.35 | 29.35 | 29.35 | 27.35 | 27.35 | 30.75 | 30.75 |
| WNBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| INBW (kHz) | 3.00 | 3.00 | 1.32 | 1.32 | 3.00 | 1.32 | 0.66 | 0.33 | 3.00 | 3.00 | 3.00 | 3.00 | 5.30 | 5.30 |
| IABW (kHz) | 5.00 | 5.00 | 2.50 | 2.50 | 5.00 | 2.50 | 2.50 | 2.50 | 5.00 | 5.00 | 5.00 | 5.00 | 10.00 | 10.00 |
| 10log(Q) (dB) | 1.58 | 1.58 | 4.59 | 4.59 | 1.58 | 4.59 | 4.59 | 4.59 | 1.58 | 1.58 | 1.58 | 1.58 | 0.00 | 0.00 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 |
| 10log(P) (dB) | -3.98 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | -3.98 | -3.98 | -3.98 | -3.98 | -3.98 | -3.98 |
| **(C/I)m (dB)** | **32.74** | **32.74** | **26.15** | **26.15** | **27.74** | **25.75** | **28.75** | **31.75** | **31.74** | **31.74** | **29.74** | **29.74** | **34.72** | **34.72** |
| **(C/N) (dB)** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** |
| **Margin 0.5dB** | **0.84** | **0.84** | **-5.75** | **-5.75** | **-4.16** | **-6.15** | **-3.15** | **-0.15** | **-0.16** | **-0.16** | **-2.16** | **-2.16** | **2.82** | **2.82** |
| **Margin 1.0dB** | **3.84** | **3.84** | **-2.75** | **-2.75** | **-1.16** | **-3.15** | **-0.15** | **2.85** | **2.84** | **2.84** | **0.84** | **0.84** | **5.82** | **5.82** |

## INMARSAT MOBILE (GLOBAL BEAM) TO IRIDIUM MOBILE (CELL 1)

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| IEIRP (dBW) | 36.00 | 36.00 | 42.00 | 50.50 | 50.50 | 33.00 | 33.00 | 33.00 | 30.00 | 30.00 | 30.00 | 28.00 | 28.00 | 28.00 | 24.90 | 12.30 | 15.30 | 18.30 | 20.30 | 23.70 | 10.80 |
| dEIRP (dB) | -12.90 | -12.90 | -18.90 | -27.40 | -27.40 | -9.90 | -9.90 | -9.90 | -6.90 | -6.90 | -6.90 | -4.90 | -4.90 | -4.90 | -1.80 | 10.80 | 7.80 | 4.80 | 2.80 | -0.60 | 12.30 |
| WRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 |
| (C/I)1F (dB) | -66.16 | -66.16 | -72.16 | -80.66 | -80.66 | -63.16 | -63.16 | -63.16 | -60.16 | -60.16 | -60.16 | -58.16 | -58.16 | -58.16 | -55.06 | -42.46 | -45.46 | -48.46 | -50.46 | -53.86 | -40.96 |
| WNBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 28.00 | 5.76 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 50.00 | 50.00 | 100.00 | 1100.00 | 1100.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(O) (dB) † | 0.00 | 0.00 | 0.00 | -4.87 | -4.87 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)m (dB) | -57.18 | -61.16 | -67.16 | -70.78 | -70.78 | -54.18 | -58.16 | -58.16 | -51.18 | -55.16 | -55.16 | -49.18 | -53.16 | -53.16 | -46.08 | -37.46 | -40.46 | -43.46 | -45.46 | -48.86 | -35.96 |
| (C/N) (dB) | 9.20 | 9.20 | 8.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 8.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 |
| Margin 0.5dB | -75.38 | -79.36 | -85.36 | -88.98 | -88.98 | -72.38 | -76.36 | -76.36 | -69.38 | -73.36 | -73.36 | -67.38 | -71.36 | -71.36 | -64.28 | -55.66 | -58.66 | -61.66 | -63.66 | -67.06 | -54.16 |
| Margin 1.0dB | -72.38 | -76.36 | -82.36 | -85.98 | -85.98 | -69.38 | -73.36 | -73.36 | -66.38 | -70.36 | -70.36 | -64.38 | -68.36 | -68.36 | -61.28 | -52.66 | -55.66 | -58.66 | -60.66 | -64.06 | -51.16 |

† If 10logO is positive then it is set to 0dB since we assume there is only one interfering mobile

## INMARSAT SATELLITE (GLOBAL BEAM) TO IRIDIUM MOBILE (CELL 1)

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| IEIRP (dBW) | 27.40 | 18.50 | 33.40 | 41.90 | 41.90 | 20.80 | 20.10 | 14.30 | 21.80 | 21.00 | 20.20 | 23.80 | 23.00 | 22.20 | 25.40 | 25.60 | 15.80 | 18.80 | 20.80 | 24.20 | 24.30 |
| dEIRP (dB) | -4.30 | 4.60 | -10.30 | -18.80 | -18.80 | 2.30 | 3.00 | 8.80 | 1.30 | 2.10 | 2.90 | -0.70 | 0.10 | 0.90 | -2.30 | -2.70 | 7.30 | 4.30 | 2.30 | -1.10 | -1.20 |
| WRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 |
| (C/I)1F (dB) | 20.40 | 29.30 | 14.40 | 5.90 | 5.90 | 27.00 | 27.70 | 33.50 | 26.00 | 26.80 | 27.60 | 24.00 | 24.80 | 25.60 | 22.40 | 22.00 | 32.00 | 29.00 | 27.00 | 23.60 | 23.50 |
| WNBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 28.00 | 1.44 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 50.00 | 50.00 | 100.00 | 1100.00 | 1100.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(O) (dB) | 7.78 | 7.78 | 4.77 | -4.87 | -4.87 | 11.76 | 11.76 | 11.76 | 11.76 | 11.76 | 14.77 | 14.77 | 14.77 | 14.77 | 12.34 | 20.79 | 20.79 | 17.76 | 17.78 | 14.77 | 20.79 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)e (dB) | 16.60 | 21.52 | 9.63 | 10.77 | 10.77 | 19.22 | 15.94 | 21.74 | 18.22 | 15.04 | 12.83 | 13.21 | 10.03 | 10.83 | 14.04 | 1.21 | 11.21 | 11.22 | 9.22 | 8.83 | 2.71 |
| (C/N) (dB) | 9.20 | 9.20 | 8.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 8.20 | 9.20 | 9.20 | 9.20 | 9.20 | 8.20 |
| Margin 0.5dB | -1.60 | 3.32 | -8.57 | -7.43 | -7.43 | 1.02 | -2.26 | 3.54 | 0.02 | -3.16 | -5.37 | -4.99 | -8.17 | -7.37 | -4.16 | -16.99 | -6.99 | -6.98 | -8.98 | -9.37 | -15.49 |
| Margin 1.0dB | 1.40 | 6.32 | -5.57 | -4.43 | -4.43 | 4.02 | 0.74 | 6.54 | 3.02 | -0.16 | -2.37 | -1.99 | -5.17 | -4.37 | -1.16 | -13.99 | -3.99 | -3.98 | -5.98 | -6.37 | -12.49 |

## INMARSAT MOBILE (GLOBAL BEAM) TO IRIDIUM MOBILE (CELL 7)

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AERO-H | AERO-L | AERO-H | AERO-H | AERO-H | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 |
| IEIRP (dBW) | 36.00 | 36.00 | 42.00 | 50.50 | 50.50 | 33.00 | 33.00 | 33.00 | 30.00 | 30.00 | 30.00 | 28.00 | 28.00 | 28.00 | 24.90 | 12.30 | 15.30 | 18.30 | 20.30 | 23.70 | 10.80 |
| dEIRP (dB) | -23.50 | -23.50 | -29.50 | -38.00 | -38.00 | -20.50 | -20.50 | -20.50 | -17.50 | -17.50 | -17.50 | -15.50 | -15.50 | -15.50 | -12.40 | 0.20 | -2.80 | -5.80 | -7.80 | -11.20 | 1.70 |
| WRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 |
| (C/I)1F (dB) | -68.11 | -68.11 | -74.11 | -82.61 | -82.61 | -65.11 | -65.11 | -65.11 | -62.11 | -62.11 | -62.11 | -60.11 | -48.80 | -48.80 | -57.01 | -44.41 | -47.41 | -50.41 | -52.41 | -55.81 | -42.91 |
| WNBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 28.00 | 5.76 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 50.00 | 50.00 | 100.00 | 1100.00 | 1100.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(O) (dB) † | 0.00 | 0.00 | 0.00 | -4.87 | -4.87 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)m (dB) | -59.13 | -63.11 | -69.11 | -72.73 | -72.73 | -56.13 | -60.11 | -60.11 | -53.13 | -57.11 | -57.11 | -51.13 | -43.80 | -43.80 | -48.03 | -39.41 | -42.41 | -45.41 | -47.41 | -50.81 | -37.91 |
| (C/N) (dB) | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 |
| Margin 0.5dB | -77.43 | -81.41 | -87.41 | -81.03 | -91.03 | -74.43 | -78.41 | -78.41 | -71.43 | -75.41 | -75.41 | -69.43 | -62.10 | -62.10 | -66.33 | -57.71 | -60.71 | -63.71 | -65.71 | -69.11 | -56.21 |
| Margin 1.0dB | -74.43 | -78.41 | -84.41 | -88.03 | -86.03 | -71.43 | -75.41 | -75.41 | -68.43 | -72.41 | -72.41 | -66.43 | -59.10 | -59.10 | -63.33 | -54.71 | -57.71 | -60.71 | -62.71 | -66.11 | -53.21 |

† If 10logO is positive then it is set to 0dB since we assume there is only one interfering mobile

## INMARSAT SATELLITE (GLOBAL BEAM) TO IRIDIUM MOBILE (CELL 7)

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AERO-H | AERO-L | AERO-H | AERO-H | AERO-H | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 |
| IEIRP (dBW) | 27.40 | 18.50 | 33.40 | 41.90 | 41.90 | 20.80 | 20.10 | 14.30 | 21.80 | 21.00 | 20.20 | 23.80 | 23.00 | 22.20 | 25.40 | 25.80 | 15.80 | 18.80 | 20.80 | 24.20 | 24.30 |
| dEIRP (dB) | -14.90 | -6.00 | -20.90 | -29.40 | -29.40 | -8.30 | -7.60 | -1.80 | -9.30 | -8.50 | -7.70 | -11.30 | -10.50 | -9.70 | -12.90 | -13.30 | -3.30 | -6.30 | -8.30 | -11.70 | -11.80 |
| WRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 |
| (C/I)1F (dB) | 18.44 | 27.34 | 12.44 | 3.94 | 3.94 | 25.04 | 25.74 | 31.54 | 24.04 | 24.84 | 25.64 | 22.04 | 22.84 | 23.64 | 20.44 | 20.04 | 30.04 | 27.04 | 25.04 | 21.64 | 21.54 |
| WNBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 28.00 | 1.44 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 50.00 | 50.00 | 100.00 | 1100.00 | 1100.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(O) (dB) | 7.78 | 7.78 | 4.77 | -4.87 | -4.87 | 11.76 | 11.76 | 11.76 | 11.76 | 11.76 | 14.77 | 14.77 | 14.77 | 14.77 | 12.34 | 20.79 | 20.79 | 17.78 | 17.78 | 14.77 | 20.79 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)a (dB) | 14.64 | 19.56 | 7.67 | 8.82 | 8.82 | 17.26 | 13.98 | 19.78 | 16.26 | 13.08 | 10.97 | 11.25 | 8.07 | 8.97 | 12.08 | -0.75 | 9.25 | 9.26 | 7.26 | 6.87 | 0.75 |
| (C/N) (dB) | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 |
| Margin 0.5dB | -3.66 | 1.26 | -10.63 | -9.48 | -9.48 | -1.04 | -4.32 | 1.48 | -2.04 | -5.22 | -7.43 | -7.05 | -10.23 | -9.43 | -6.22 | -19.05 | -9.05 | -9.04 | -11.04 | -11.43 | -17.55 |
| Margin 1.0dB | -0.66 | 4.26 | -7.63 | -6.48 | -6.48 | 1.96 | -1.32 | 4.48 | 0.96 | -2.22 | -4.43 | -4.05 | -7.23 | -6.43 | -3.22 | -16.05 | -6.05 | -6.04 | -8.04 | -8.43 | -14.55 |

## INMARSAT MOBILE (GLOBAL) TO IRIDIUM SATELLITE

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| IEIRP (dBW) | 36.00 | 36.00 | 42.00 | 50.50 | 50.50 | 33.00 | 33.00 | 33.00 | 30.00 | 30.00 | 30.00 | 28.00 | 28.00 | 28.00 | 24.90 | 12.30 | 15.30 | 18.30 | 20.30 | 23.70 | 10.80 |
| dEIRP (dB) | -29.00 | -29.00 | -35.00 | -43.50 | -43.50 | -26.00 | -26.00 | -26.00 | -23.00 | -23.00 | -23.00 | -21.00 | -21.00 | -21.00 | -17.90 | -5.30 | -8.30 | -11.30 | -13.30 | -16.70 | -3.80 |
| WRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| IRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | -29.00 | -29.00 | -35.00 | -43.50 | -43.50 | -26.00 | -26.00 | -26.00 | -23.00 | -23.00 | -23.00 | -21.00 | -21.00 | -21.00 | -17.90 | -5.30 | -8.30 | -11.30 | -13.30 | -16.70 | -3.80 |
| WNBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| INBW (kHz) | 28.00 | 5.76 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 50.00 | 50.00 | 100.00 | 1100.00 | 1100.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(O) (dB) † | 0.00 | 0.00 | 0.00 | -8.34 | -8.34 | 1.30 | 1.30 | 1.30 | 1.30 | 1.30 | 4.31 | 4.31 | 4.31 | 4.31 | 1.88 | 10.33 | 10.33 | 7.32 | 7.32 | 4.31 | 10.33 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)m (dB) | -25.02 | -29.00 | -35.00 | -35.16 | -35.16 | -23.32 | -27.30 | -27.30 | -20.32 | -24.30 | -27.31 | -21.33 | -25.31 | -25.31 | -15.80 | -15.63 | -18.63 | -18.62 | -20.62 | -21.01 | -14.13 |
| (C/N) (dB) | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 |
| Margin 0.5dB | -42.52 | -46.50 | -52.50 | -52.66 | -52.66 | -40.82 | -44.80 | -44.80 | -37.82 | -41.80 | -44.81 | -38.83 | -42.81 | -42.81 | -33.30 | -33.13 | -36.13 | -36.12 | -38.12 | -38.51 | -31.63 |
| Margin 1.0dB | -39.52 | -43.50 | -49.50 | -49.66 | -49.66 | -37.82 | -41.80 | -41.80 | -34.82 | -38.80 | -41.81 | -35.83 | -39.81 | -39.81 | -30.30 | -30.13 | -33.13 | -33.12 | -35.12 | -35.51 | -28.63 |

† Assume that only 20% of INMARSAT mobiles are within the victim IRIDIUM beam

## INMARSAT SATELLITE (GLOBAL) TO IRIDIUM SATELLITE

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| IEIRP (dBW) | 27.40 | 18.50 | 33.40 | 41.90 | 41.90 | 20.80 | 20.10 | 14.30 | 21.80 | 21.00 | 20.20 | 23.80 | 23.00 | 22.20 | 25.40 | 25.80 | 15.80 | 18.80 | 20.80 | 24.20 | 24.30 |
| dEIRP (dB) | -20.40 | -11.50 | -28.40 | -34.90 | -34.90 | -13.80 | -13.10 | -7.30 | -14.80 | -14.00 | -13.20 | -16.80 | -16.00 | -15.20 | -16.40 | -18.80 | -8.80 | -11.80 | -13.80 | -17.20 | -17.30 |
| WRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| IRANGE (km) | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 |
| dPL (dB) | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 |
| (C/I)1F (dB) | 13.44 | 22.34 | 7.44 | -1.06 | -1.06 | 20.04 | 20.74 | 26.54 | 19.04 | 19.84 | 20.64 | 17.04 | 17.84 | 18.64 | 15.44 | 15.04 | 25.04 | 22.04 | 20.04 | 16.64 | 16.54 |
| WNBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 28.00 | 1.44 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 50.00 | 50.00 | 100.00 | 1100.00 | 1100.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(O) (dB) | 7.78 | 7.78 | 4.77 | -4.87 | -4.87 | 11.76 | 11.76 | 11.76 | 11.76 | 11.76 | 14.77 | 14.77 | 14.77 | 14.77 | 12.34 | 20.79 | 20.79 | 17.78 | 17.78 | 14.77 | 20.79 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)s (dB) | 9.63 | 14.55 | 2.66 | 3.81 | 3.81 | 12.25 | 8.97 | 14.77 | 11.25 | 8.07 | 5.86 | 6.24 | 3.06 | 3.86 | 7.07 | -5.76 | 4.24 | 4.25 | 2.25 | 1.86 | -4.26 |
| (C/N) (dB) | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 | 8.50 |
| Margin 0.5dB | -7.87 | -2.95 | -14.84 | -13.69 | -13.69 | -5.25 | -8.53 | -2.73 | -6.25 | -9.43 | -11.64 | -11.26 | -14.44 | -13.64 | -10.43 | -23.26 | -13.26 | -13.25 | -15.25 | -15.64 | -21.76 |
| Margin 1.0dB | -4.87 | 0.05 | -11.84 | -10.69 | -10.69 | -2.25 | -5.53 | 0.27 | -3.25 | -6.43 | -8.64 | -8.26 | -11.44 | -10.64 | -7.43 | -20.26 | -10.26 | -10.25 | -12.25 | -12.64 | -18.76 |

## INMARSAT MOBILE (GLOBAL BEAM) TO ORBCOMM MOBILE

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| IEIRP (dBW) | 36.00 | 36.00 | 42.00 | 50.50 | 50.50 | 33.00 | 33.00 | 33.00 | 30.00 | 30.00 | 30.00 | 28.00 | 28.00 | 28.00 | 24.90 | 12.30 | 15.30 | 18.30 | 20.30 | 23.70 | 10.80 |
| dEIRP (dB) | -1.50 | -1.50 | -7.50 | -16.00 | -16.00 | 1.50 | 1.50 | 1.50 | 4.50 | 4.50 | 4.50 | 6.50 | 6.50 | 6.50 | 9.60 | 22.20 | 19.20 | 16.20 | 14.20 | 10.80 | 23.70 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 |
| (C/I)1F (dB) | -56.31 | -58.31 | -62.31 | -70.81 | -70.81 | -53.31 | -53.31 | -53.31 | -50.31 | -50.31 | -50.31 | -48.31 | -48.31 | -48.31 | -45.21 | -32.61 | -35.61 | -38.61 | -40.61 | -44.01 | -31.11 |
| WNBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| INBW (kHz) | 28.00 | 5.78 | 57.20 | 921.60 | 921.60 | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.80 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 50.00 | 50.00 | 100.00 | 1100.00 | 1100.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(O) (dB) † | -5.90 | 0.00 | -9.70 | -21.07 | -21.07 | -3.01 | -3.01 | -3.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -2.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)m (dB) | -41.43 | -51.31 | -67.51 | -44.74 | -44.74 | -41.32 | -45.30 | -45.30 | -41.33 | -45.31 | -45.31 | -39.33 | -43.31 | -43.31 | -33.80 | -27.61 | -30.61 | -33.61 | -35.61 | -39.01 | -26.11 |
| (C/N) (dB) | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 |
| Margin 0.5dB | -73.33 | -83.21 | -79.51 | -76.64 | -76.64 | -73.22 | -77.20 | -77.20 | -73.23 | -77.21 | -77.21 | -71.23 | -75.21 | -75.21 | -65.70 | -58.51 | -62.51 | -65.51 | -67.51 | -70.91 | -58.01 |
| Margin 1.0dB | -70.33 | -80.21 | -76.51 | -73.64 | -73.64 | -70.22 | -74.20 | -74.20 | -70.23 | -74.21 | -74.21 | -68.23 | -72.21 | -72.21 | -62.70 | -56.51 | -59.51 | -62.51 | -64.51 | -67.91 | -55.01 |

† If 10logO is positive then it is set to 0dB since we assume there is only one interfering mobile

## INMARSAT SATELLITE (GLOBAL BEAM) TO ORBCOMM SATELLITE

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| IEIRP (dBW) | 27.40 | 18.50 | 33.40 | 41.90 | 41.90 | 20.80 | 20.10 | 14.30 | 21.80 | 21.00 | 20.20 | 23.80 | 23.00 | 22.20 | 25.40 | 25.80 | 15.80 | 18.80 | 20.80 | 24.20 | 24.30 |
| dEIRP (dB) | -7.40 | 1.50 | -13.40 | -21.90 | -21.90 | -0.80 | -0.10 | 5.70 | -1.80 | -1.00 | -0.20 | -3.80 | -3.00 | -2.20 | -5.40 | -5.80 | 4.20 | 1.20 | -0.80 | -4.20 | -4.30 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 |
| dPL (dB) | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 |
| (C/I)1F (dB) | 18.33 | 25.23 | 10.33 | 1.83 | 1.83 | 22.93 | 23.83 | 29.43 | 21.93 | 22.73 | 23.53 | 19.93 | 20.73 | 21.53 | 18.33 | 17.93 | 27.93 | 24.93 | 22.93 | 19.53 | 19.43 |
| WNBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| INBW (kHz) | 28.00 | 1.44 | 57.20 | 921.60 | 921.60 | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 50.00 | 50.00 | 100.00 | 1100.00 | 1100.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(O) (dB) | 0.00 | 0.00 | -12.71 | -24.08 | -24.08 | -8.02 | -6.02 | -3.01 | -1.25 | -1.25 | -3.01 | -1.25 | -1.25 | -3.01 | -5.44 | 1.58 | 1.58 | 0.00 | 0.00 | -2.43 | 1.58 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)o (dB) | 20.31 | 25.23 | 23.04 | 25.91 | 25.91 | 32.93 | 29.85 | 32.44 | 27.16 | 23.98 | 26.54 | 25.16 | 21.98 | 24.54 | 27.75 | 16.35 | 26.35 | 24.93 | 22.93 | 21.96 | 17.85 |
| Margin 0.5dB | -10.29 | -5.37 | -7.58 | -4.69 | -4.69 | 2.33 | -0.95 | 1.94 | -3.44 | -6.62 | -4.06 | -5.44 | -8.62 | -6.06 | -2.85 | -14.25 | -4.25 | -5.87 | -7.87 | -8.84 | -12.75 |
| Margin 1.0dB | -7.29 | -2.37 | -4.58 | -1.69 | -1.69 | 5.33 | 2.05 | 4.84 | -0.44 | -3.62 | -1.06 | -2.44 | -5.62 | -3.06 | 0.15 | -11.25 | -1.25 | -2.87 | -4.87 | -5.84 | -9.75 |

## INMARSAT MOBILE (GLOBAL BEAM) TO ORBCOMM SATELLITE

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AERO-H | AERO-L | AERO-H | AERO-H | AERO-H | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| IEIRP (dBW) | 36.00 | 36.00 | 42.00 | 50.50 | 50.50 | 33.00 | 33.00 | 33.00 | 30.00 | 30.00 | 30.00 | 28.00 | 28.00 | 28.00 | 24.90 | 12.30 | 15.30 | 18.30 | 20.30 | 23.70 | 10.80 |
| dEIRP (dB) | -16.00 | -16.00 | -22.00 | -30.50 | -30.50 | -13.00 | -13.00 | -13.00 | -10.00 | -10.00 | -10.00 | -8.00 | -8.00 | -8.00 | -4.90 | 7.70 | 4.70 | 1.70 | -0.30 | -3.70 | 9.20 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | -16.00 | -16.00 | -22.00 | -30.50 | -30.50 | -13.00 | -13.00 | -13.00 | -10.00 | -10.00 | -10.00 | -6.00 | -8.00 | -8.00 | -4.90 | 7.70 | 4.70 | 1.70 | -0.30 | -3.70 | 9.20 |
| WNBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| INBW (kHz) | 28.00 | 5.76 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.60 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 50.00 | 50.00 | 100.00 | 1100.00 | 1100.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(O) (dB) | 0.00 | -2.04 | -12.71 | -24.08 | -24.06 | -6.02 | -6.02 | -6.02 | -1.25 | -1.25 | 0.00 | -1.25 | -1.25 | 0.00 | -5.44 | 1.56 | 1.58 | 0.00 | 0.00 | -2.43 | 1.58 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.96 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.96 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)m (dB) | -12.02 | -13.96 | -9.29 | -6.42 | -6.42 | -3.00 | -6.98 | -6.98 | -4.77 | -8.75 | -18.00 | -2.77 | -6.75 | -8.00 | 4.52 | 8.12 | 3.12 | 1.70 | -0.30 | -1.27 | 7.62 |
| (C/N) (dB) | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 | 21.60 |
| Margin 0.5dB | -42.62 | -44.56 | -39.88 | -37.02 | -37.02 | -33.60 | -37.58 | -37.58 | -35.37 | -39.35 | -40.60 | -33.37 | -37.35 | -36.60 | -26.08 | -24.48 | -27.48 | -28.90 | -30.90 | -31.87 | -22.98 |
| Margin 1.0dB | -39.62 | -41.56 | -36.88 | -34.02 | -34.02 | -30.60 | -34.58 | -34.58 | -32.37 | -36.35 | -37.60 | -30.37 | -34.35 | -35.60 | -23.08 | -21.48 | -24.48 | -25.90 | -27.90 | -28.87 | -19.98 |

## INMARSAT SATELLITE (GLOBAL BEAM) TO ORBCOMM MOBILE

| CARRIER | INM-A | INM-A | INM-A | INM-A | INM-A | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AERO-H | AERO-L | AERO-H | AERO-H | AERO-H | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE(FM) | TDM | HSD | VHSD | CTV | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA 1 | DATA 2 | DATA 3 | DATA 4 | DATA 5 | DATA |
| WEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| IEIRP (dBW) | 27.40 | 18.50 | 33.40 | 41.90 | 41.90 | 20.80 | 20.10 | 14.30 | 21.80 | 21.00 | 20.20 | 23.80 | 23.00 | 22.20 | 25.40 | 25.80 | 15.80 | 18.80 | 20.80 | 24.20 | 24.30 |
| dEIRP (dB) | 7.10 | 16.00 | 1.10 | -7.40 | -7.40 | 13.70 | 14.40 | 20.20 | 12.70 | 13.50 | 14.30 | 10.70 | 11.50 | 12.30 | 9.10 | 8.70 | 18.70 | 15.70 | 13.70 | 10.30 | 10.20 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 |
| (C/I)1F (dB) | 30.25 | 39.15 | 24.25 | 15.75 | 15.75 | 36.85 | 37.55 | 43.35 | 35.85 | 36.65 | 37.45 | 33.85 | 34.65 | 35.45 | 32.25 | 31.85 | 41.85 | 38.85 | 36.85 | 33.45 | 33.35 |
| WNBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| INBW (kHz) | 28.00 | 1.44 | 67.20 | 921.60 | 921.60 | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.60 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 42.00 | 2.16 | 100.80 | 1382.40 | 1382.40 | 21.60 | 21.60 | 10.80 | 7.20 | 7.20 | 10.80 | 7.20 | 7.20 | 10.80 | 18.90 | 1.08 | 2.16 | 4.32 | 4.32 | 9.45 | 1.08 |
| 10log(O) (dB) | 0.00 | 5.23 | -9.70 | -21.07 | -21.07 | -3.01 | -3.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -2.43 | 8.24 | 5.23 | 2.22 | 2.22 | 0.00 | 8.24 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)a (dB) | 34.22 | 33.82 | 33.85 | 36.82 | 36.82 | 43.83 | 40.56 | 43.35 | 39.62 | 36.65 | 37.45 | 37.62 | 34.65 | 35.45 | 38.65 | 23.61 | 36.62 | 36.63 | 34.63 | 33.45 | 25.11 |
| (C/N) (dB) | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 | 22.80 |
| Margin 0.5dB | -31.99 | -31.90 | -31.98 | -31.98 | -31.98 | -31.90 | -31.90 | -31.90 | -31.90 | -31.90 | -31.90 | -31.90 | -31.90 | -31.90 | -31.90 | -31.90 | -31.90 | -31.90 | -31.90 | -31.90 | -31.90 |
| Margin 1.0dB | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 | -28.90 |

## INMARSAT MOBILE (SPOT BEAM) TO IRIDIUM MOBILE (CELL 1)

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| IEIRP (dBW) | 29.00 | 29.00 | 33.00 | 24.00 | 24.00 | 30.00 | 22.00 | 22.00 | 28.00 | 18.00 | 5.40 | 8.40 | 11.40 | 13.50 | 16.90 | 10.50 |
| dEIRP (dB) | -5.90 | -5.90 | -9.90 | -0.90 | -0.90 | -6.90 | 1.10 | 1.10 | -4.90 | 5.10 | 17.70 | 14.70 | 11.70 | 9.60 | 6.20 | 12.60 |
| WRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 |
| (C/I)1F (dB) | -59.16 | -59.16 | -63.16 | -54.16 | -54.16 | -60.16 | -52.16 | -52.16 | -58.16 | -48.16 | -35.56 | -38.56 | -41.56 | -43.66 | -47.06 | -40.66 |
| WNBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(Q) (dB) † | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)m (dB) | -50.18 | -54.16 | -58.16 | -45.18 | -49.16 | -55.16 | -43.18 | -47.16 | -53.16 | -39.18 | -30.56 | -33.56 | -36.56 | -38.66 | -42.06 | -35.66 |
| (C/N) (dB) | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 |
| Margin 0.5dB | -68.38 | -72.36 | -76.36 | -63.38 | -67.36 | -73.36 | -61.38 | -65.36 | -71.36 | -57.38 | -48.76 | -51.76 | -54.76 | -56.86 | -60.26 | -53.86 |
| Margin 1.0dB | -65.38 | -69.36 | -73.36 | -60.38 | -64.36 | -70.36 | -58.38 | -62.36 | -68.36 | -54.38 | -45.76 | -48.76 | -51.76 | -53.86 | -57.26 | -50.86 |

† If 10logQ is positive then it is set to 0dB since we assume there is only one interfering mobile

## INMARSAT SATELLITE (SPOT BEAM) TO IRIDIUM MOBILE (CELL 1)

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| IEIRP (dBW) | 23.80 | 23.00 | 17.10 | 24.60 | 23.80 | 22.90 | 26.60 | 23.80 | 24.90 | 28.20 | 28.50 | 18.60 | 21.60 | 23.70 | 27.10 | 27.00 |
| dEIRP (dB) | -0.70 | 0.10 | 6.00 | -1.50 | -0.70 | 0.20 | -3.50 | -0.70 | -1.80 | -5.10 | -5.40 | 4.50 | 1.50 | -0.60 | -4.00 | -3.90 |
| WRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 |
| (C/I)1F (dB) | 24.00 | 24.80 | 30.70 | 23.20 | 24.00 | 24.90 | 21.20 | 24.00 | 22.90 | 19.60 | 19.30 | 29.20 | 26.20 | 24.10 | 20.70 | 20.80 |
| WNBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(Q) (dB) | 11.76 | 11.76 | 11.76 | 14.77 | 14.77 | 14.77 | 14.77 | 14.77 | 14.77 | 12.34 | 20.79 | 20.79 | 17.78 | 17.78 | 14.77 | 20.79 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)s (dB) | 16.22 | 13.04 | 18.94 | 12.41 | 9.23 | 10.13 | 10.41 | 9.23 | 8.13 | 11.24 | -1.49 | 8.41 | 8.42 | 6.32 | 5.93 | 0.01 |
| (C/N) (dB) | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 |
| Margin 0.5dB | -1.98 | -5.16 | 0.74 | -5.79 | -8.97 | -8.07 | -7.79 | -8.97 | -10.07 | -6.96 | -19.69 | -9.79 | -9.78 | -11.88 | -12.27 | -18.19 |
| Margin 1.0dB | 1.02 | -2.16 | 3.74 | -2.79 | -5.97 | -5.07 | -4.79 | -5.97 | -7.07 | -3.96 | -16.69 | -6.79 | -6.78 | -8.88 | -9.27 | -15.19 |

## INMARSAT MOBILE (SPOT BEAM) TO IRIDIUM MOBILE (CELL 7)

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AERO-H | AERO-L | AERO-H | AERO-H | AERO-H | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 |
| IEIRP (dBW) | 29.00 | 29.00 | 33.00 | 24.00 | 24.00 | 30.00 | 22.00 | 22.00 | 28.00 | 18.00 | 5.40 | 8.40 | 11.40 | 13.50 | 16.90 | 10.50 |
| dEIRP (dB) | -16.50 | -16.50 | -20.50 | -11.50 | -11.50 | -17.50 | -9.50 | -9.50 | -15.50 | -5.50 | 7.10 | 4.10 | 1.10 | -1.00 | -4.40 | 2.00 |
| WRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 |
| (C/I)1F (dB) | -61.11 | -61.11 | -65.11 | -56.11 | -56.11 | -62.11 | -54.11 | -54.11 | -60.11 | -50.11 | -37.51 | -40.51 | -43.51 | -45.61 | -49.01 | -42.61 |
| WNBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(O) (dB) † | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10log(DF) (dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)m (dB) | -52.13 | -56.11 | -60.11 | -47.13 | -51.11 | -57.11 | -45.13 | -49.11 | -55.11 | -41.13 | -32.51 | -35.51 | -38.51 | -40.61 | -44.01 | -37.61 |
| (C/N) (dB) | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 |
| Margin 0.5dB | -70.43 | -74.41 | -78.41 | -65.43 | -69.41 | -75.41 | -63.43 | -67.41 | -73.41 | -59.43 | -50.81 | -53.81 | -56.81 | -58.91 | -62.31 | -55.91 |
| Margin 1.0dB | -67.43 | -71.41 | -75.41 | -62.43 | -66.41 | -72.41 | -60.43 | -64.41 | -70.41 | -56.43 | -47.81 | -50.81 | -53.81 | -55.91 | -59.31 | -52.91 |

† If 10logO is positive then it is set to 0dB since we assume there is only one interfering mobile

## INMARSAT SATELLITE (SPOT BEAM) TO IRIDIUM MOBILE (CELL 7)

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AERO-H | AERO-L | AERO-H | AERO-H | AERO-H | AERO-H | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 |
| IEIRP (dBW) | 23.80 | 23.00 | 17.10 | 24.60 | 23.80 | 22.90 | 26.60 | 23.80 | 24.90 | 28.20 | 28.50 | 18.60 | 21.60 | 23.70 | 27.10 | 27.00 |
| dEIRP (dB) | -11.30 | -10.50 | -4.60 | -12.10 | -11.30 | -10.40 | -14.10 | -11.30 | -12.40 | -15.70 | -16.00 | -6.10 | -9.10 | -11.20 | -14.60 | -14.50 |
| WRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 |
| (C/I)1F (dB) | 22.04 | 22.84 | 28.74 | 21.24 | 22.04 | 22.94 | 19.24 | 22.04 | 20.94 | 17.64 | 17.34 | 27.24 | 24.24 | 22.14 | 18.74 | 18.84 |
| WNBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(O) (dB) | 11.76 | 11.76 | 11.76 | 14.77 | 14.77 | 14.77 | 14.77 | 14.77 | 14.77 | 12.34 | 20.79 | 20.79 | 17.78 | 17.78 | 14.77 | 20.79 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)s (dB) | 14.26 | 11.08 | 16.98 | 10.45 | 7.27 | 8.17 | 8.45 | 7.27 | 6.17 | 9.28 | -3.45 | 6.45 | 6.46 | 4.36 | 3.97 | -1.95 |
| (C/N) (dB) | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 |
| Margin 0.5dB | -4.04 | -7.22 | -1.32 | -7.85 | -11.03 | -10.13 | -9.85 | -11.03 | -12.13 | -9.02 | -21.75 | -11.85 | -11.84 | -13.94 | -14.33 | -20.25 |
| Margin 1.0dB | -1.04 | -4.22 | 1.68 | -4.85 | -8.03 | -7.13 | -6.85 | -8.03 | -9.13 | -6.02 | -18.75 | -8.85 | -8.84 | -10.94 | -11.33 | -17.25 |

## INMARSAT MOBILE (SPOT) TO IRIDIUM SATELLITE

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOCIE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| IEIRP (dBW) | 29.00 | 29.00 | 33.00 | 24.00 | 24.00 | 30.00 | 22.00 | 22.00 | 28.00 | 18.00 | 54.00 | 8.40 | 11.40 | 13.50 | 16.90 | 10.50 |
| dEIRP (dB) | -22.00 | -22.00 | -26.00 | -17.00 | -17.00 | -23.00 | -15.00 | -15.00 | -21.00 | -11.00 | -47.00 | -1.40 | -4.40 | -6.50 | -9.90 | -3.50 |
| WRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| IRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | -22.00 | -22.00 | -26.00 | -17.00 | -17.00 | -23.00 | -15.00 | -15.00 | -21.00 | -11.00 | -47.00 | -1.40 | -4.40 | -6.50 | -9.90 | -3.50 |
| WNBW (kHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| INBW (kHz) | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(Q) (dB) † | 1.30 | 1.30 | 1.30 | 4.31 | 4.31 | 4.31 | 4.31 | 4.31 | 4.31 | 1.88 | 10.33 | 10.33 | 7.32 | 7.32 | 4.31 | 10.33 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)m (dB)** | **-19.32** | **-23.30** | **-27.30** | **-17.33** | **-21.31** | **-27.31** | **-15.33** | **-19.31** | **-25.31** | **-8.90** | **-57.33** | **-11.73** | **-11.72** | **-13.82** | **-14.21** | **-13.83** |
| **(C/N) (dB)** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** |
| **Margin 0.5dB** | **-36.82** | **-40.80** | **-44.80** | **-34.83** | **-38.81** | **-44.81** | **-32.83** | **-36.81** | **-42.81** | **-26.40** | **-74.83** | **-29.23** | **-29.22** | **-31.32** | **-31.71** | **-31.33** |
| **Margin 1.0dB** | **-33.82** | **-37.80** | **-41.80** | **-31.83** | **-35.81** | **-41.81** | **-29.83** | **-33.81** | **-39.81** | **-23.40** | **-71.83** | **-26.23** | **-26.22** | **-28.32** | **-28.71** | **-28.33** |

† Assume that only 20% of INMARSAT mobiles are within the victim IRIDIUM beam

## INMARSAT SATELLITE (SPOT) TO IRIDIUM SATELLITE

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOCIE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| IEIRP (dBW) | 23.80 | 23.00 | 17.10 | 24.60 | 23.80 | 22.90 | 26.60 | 23.80 | 24.90 | 28.20 | 28.50 | 18.60 | 21.60 | 23.70 | 27.10 | 27.00 |
| dEIRP (dB) | -16.80 | -16.00 | -10.10 | -17.60 | -16.80 | -15.90 | -19.60 | -16.80 | -17.90 | -21.20 | -21.50 | -11.60 | -14.60 | -16.70 | -20.10 | -20.00 |
| WRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 650.00 |
| IRANGE (km) | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 |
| dPL (dB) | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 | -33.84 |
| (C/I)1F (dB) | 17.04 | 17.84 | 23.74 | 16.24 | 17.04 | 17.94 | 14.24 | 17.04 | 15.94 | 12.64 | 12.34 | 22.24 | 19.24 | 17.14 | 13.74 | 13.84 |
| WNBW (kHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(Q) (dB) | 11.76 | 11.76 | 11.76 | 14.77 | 14.77 | 14.77 | 14.77 | 14.77 | 14.77 | 12.34 | 20.79 | 20.79 | 17.78 | 17.78 | 14.77 | 20.79 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)s (dB)** | **9.25** | **6.07** | **11.97** | **5.44** | **2.26** | **3.16** | **3.44** | **2.26** | **1.16** | **4.27** | **-8.46** | **1.44** | **1.45** | **-0.65** | **-1.04** | **-6.96** |
| **(C/N) (dB)** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** |
| **Margin 0.5dB** | **-8.25** | **-11.43** | **-5.53** | **-12.06** | **-15.24** | **-14.34** | **-14.06** | **-15.24** | **-16.34** | **-13.23** | **-25.96** | **-16.06** | **-16.05** | **-18.15** | **-18.54** | **-24.46** |
| **Margin 1.0dB** | **-5.25** | **-8.43** | **-2.53** | **-9.06** | **-12.24** | **-11.34** | **-11.06** | **-12.24** | **-13.34** | **-10.23** | **-22.96** | **-13.06** | **-13.05** | **-15.15** | **-15.54** | **-21.46** |

## INMARSAT MOBILE (SPOT BEAM) TO ORBCOMM MOBILE

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| IEIRP (dBW) | 29.00 | 29.00 | 33.00 | 24.00 | 24.00 | 30.00 | 22.00 | 22.00 | 28.00 | 18.00 | 5.40 | 8.40 | 11.40 | 13.50 | 16.90 | 10.50 |
| dEIRP (dB) | 5.50 | 5.50 | 1.50 | 10.50 | 10.50 | 4.50 | 12.50 | 12.50 | 6.50 | 16.50 | 29.10 | 26.10 | 23.10 | 21.00 | 17.60 | 24.00 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 |
| (C/I)1F (dB) | -49.31 | -49.31 | -53.31 | -44.31 | -44.31 | -50.31 | -42.31 | -42.31 | -48.31 | -38.31 | -25.71 | -28.71 | -31.71 | -33.81 | -37.21 | -30.81 |
| WNBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| INBW (kHz) | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(Q) (dB) † | -3.01 | -3.01 | -3.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -2.43 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)e (dB)** | **-37.32** | **-41.30** | **-45.30** | **-35.33** | **-39.31** | **-45.31** | **-33.33** | **-37.31** | **-43.31** | **-26.90** | **-20.71** | **-23.71** | **-26.71** | **-28.81** | **-32.21** | **-25.81** |
| **(C/N) (dB)** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** |
| **Margin 0.5dB** | **-69.22** | **-73.20** | **-77.20** | **-67.23** | **-71.21** | **-77.21** | **-65.23** | **-69.21** | **-75.21** | **-58.80** | **-52.61** | **-55.61** | **-58.61** | **-60.71** | **-64.11** | **-57.71** |
| **Margin 1.0dB** | **-66.22** | **-70.20** | **-74.20** | **-64.23** | **-68.21** | **-74.21** | **-62.23** | **-66.21** | **-72.21** | **-55.80** | **-49.61** | **-52.61** | **-55.61** | **-57.71** | **-61.11** | **-54.71** |

† If 10logQ is positive then it is set to 0dB since we assume there is only one interfering mobile

## INMARSAT SATLLITE (SPOT BEAM) TO ORBCOMM SATELLITE

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| IEIRP (dBW) | 23.80 | 23.00 | 17.10 | 24.60 | 23.80 | 22.90 | 26.60 | 23.80 | 24.90 | 28.20 | 28.50 | 18.60 | 21.60 | 23.70 | 27.10 | 27.00 |
| dEIRP (dB) | -3.80 | -3.00 | 2.90 | -4.60 | -3.80 | -2.90 | -6.60 | -3.80 | -4.90 | -8.20 | -8.50 | 1.40 | -1.60 | -3.70 | -7.10 | -7.00 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 |
| dPL (dB) | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 |
| (C/I)1F (dB) | 19.93 | 20.73 | 26.63 | 19.13 | 19.93 | 20.83 | -30.33 | 19.93 | 18.83 | 15.53 | 15.23 | 25.13 | 22.13 | 20.03 | 16.63 | 16.73 |
| WNBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| INBW (kHz) | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(Q) (dB) | -6.02 | -6.02 | -3.01 | -1.25 | -1.25 | -3.01 | -1.25 | -1.25 | -3.01 | -5.44 | 1.58 | 1.58 | 0.00 | 0.00 | -2.43 | 1.58 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)m (dB)** | **29.93** | **26.75** | **29.64** | **24.36** | **21.18** | **23.84** | **-25.10** | **21.18** | **21.84** | **24.95** | **13.65** | **23.55** | **22.13** | **20.03** | **19.06** | **15.15** |
| **(C/N) (dB)** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** |
| **Margin 0.5dB** | **-0.67** | **-3.85** | **-0.96** | **-6.24** | **-9.42** | **-6.76** | **-55.70** | **-9.42** | **-8.76** | **-5.65** | **-16.95** | **-7.05** | **-8.47** | **-10.57** | **-11.54** | **-15.45** |
| **Margin 1.0dB** | **2.33** | **-0.85** | **2.04** | **-3.24** | **-6.42** | **-3.76** | **-52.70** | **-6.42** | **-5.76** | **-2.65** | **-13.95** | **-4.05** | **-5.47** | **-7.57** | **-8.54** | **-12.45** |

## INMARSAT MOBILE (SPOT BEAM) TO ORBCOMM SATELLITE

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOCIE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| IEIRP (dBW) | 29.00 | 29.00 | 33.00 | 24.00 | 24.00 | 30.00 | 22.00 | 22.00 | 28.00 | 18.00 | 54.00 | 8.40 | 11.40 | 13.50 | 16.90 | 10.50 |
| dEIRP (dB) | -9.00 | -9.00 | -13.00 | -4.00 | -4.00 | -10.00 | -2.00 | -2.00 | -8.00 | 2.00 | -34.00 | 11.60 | 8.60 | 6.50 | 3.10 | 9.50 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | -9.00 | -9.00 | -13.00 | -4.00 | -4.00 | -10.00 | -2.00 | -2.00 | -8.00 | 2.00 | -34.00 | 11.60 | 8.60 | 6.50 | 3.10 | 9.50 |
| WNBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| INBW (kHz) | 14.40 | 14.40 | 14.40 | 4.80 | 4.80 | 3.60 | 4.80 | 4.80 | 3.60 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(Q) (dB) | -6.02 | -6.02 | -6.02 | -1.25 | -1.25 | 0.00 | -1.25 | -1.25 | 0.00 | -5.44 | 1.58 | 1.58 | 0.00 | 0.00 | -2.43 | 1.58 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)m (dB)** | **1.00** | **-2.98** | **-6.98** | **1.23** | **-2.75** | **-10.00** | **3.23** | **-0.75** | **-8.00** | **11.42** | **-35.58** | **10.02** | **8.60** | **6.50** | **5.53** | **7.92** |
| **(C/N) (dB)** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** |
| **Margin 0.5dB** | **-29.60** | **-33.58** | **-37.58** | **-29.37** | **-33.35** | **-40.60** | **-27.37** | **-31.35** | **-38.60** | **-19.18** | **-66.18** | **-20.58** | **-22.00** | **-24.10** | **-25.07** | **-22.68** |
| **Margin 1.0dB** | **-26.60** | **-30.58** | **-34.58** | **-26.37** | **-30.35** | **-37.60** | **-24.37** | **-28.35** | **-35.60** | **-16.18** | **-63.18** | **-17.58** | **-19.00** | **-21.10** | **-22.07** | **-19.68** |

## INMARSAT SATELLITE (SPOT BEAM) TO ORBCOMM MOBILE

| CARRIER | INM-B | INM-B | INM-B | INM-M | INM-M | INM-M | INM-ML | INM-ML | INM-ML | AEROH | AEROL | AEROH | AEROH | AEROH | AEROH | INM-C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | VOICE | DATA | TDM | VOCIE | DATA | TDM | VOICE | DATA | TDM | VOICE | DATA1 | DATA2 | DATA3 | DATA4 | DATA5 | DATA |
| WEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| IEIRP (dBW) | 23.80 | 23.00 | 17.10 | 24.60 | 23.80 | 22.90 | 26.60 | 23.80 | 24.90 | 28.20 | 28.50 | 18.60 | 21.60 | 23.70 | 27.10 | 27.00 |
| dEIRP (dB) | 10.70 | 11.50 | 17.40 | 9.90 | 10.70 | 11.60 | 7.90 | 10.70 | 9.60 | 6.30 | 6.00 | 15.90 | 12.90 | 10.80 | 7.40 | 7.50 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 |
| (C/I)1F (dB) | 33.85 | 34.65 | 40.55 | 33.05 | 33.85 | 34.75 | 31.05 | 33.85 | 32.75 | 29.45 | 29.15 | 39.05 | 36.05 | 33.95 | 30.55 | 30.65 |
| WNBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| INBW (kHz) | 14.40 | 14.40 | 7.20 | 4.80 | 4.80 | 7.20 | 4.80 | 4.80 | 7.20 | 12.60 | 0.72 | 1.44 | 2.88 | 2.88 | 6.30 | 0.72 |
| IABW (kHz) | 20.00 | 20.00 | 20.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 10.00 | 17.50 | 2.50 | 2.50 | 5.00 | 5.00 | 10.00 | 2.50 |
| 10log(Q) (dB) | -3.01 | -3.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -2.43 | 4.59 | 4.59 | 1.58 | 1.58 | 0.00 | 4.59 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 0.40 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | -3.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)a (dB)** | **40.83** | **37.66** | **40.55** | **37.02** | **33.85** | **34.75** | **35.02** | **33.85** | **32.75** | **35.86** | **24.55** | **34.45** | **34.46** | **32.36** | **30.55** | **26.05** |
| **(C/N) (dB)** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** |
| **Margin 0.5dB** | **10.23** | **7.06** | **9.95** | **8.42** | **6.25** | **7.15** | **7.42** | **6.25** | **5.15** | **8.26** | **-3.05** | **8.85** | **8.86** | **4.76** | **2.95** | **-1.55** |
| **Margin 1.0dB** | **13.23** | **10.06** | **12.95** | **8.42** | **6.25** | **7.15** | **7.42** | **6.25** | **5.15** | **8.26** | **-3.05** | **8.85** | **8.86** | **4.76** | **2.95** | **-1.55** |

## ZENON MOBILE TO IRIDIUM MOBILE (Cell 1)

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| IEIRP (dBW) | -3.90 | -2.40 | 0.50 | 12.60 | 15.10 | 15.10 |
| dEIRP (dB) | 27.00 | 25.50 | 22.60 | 10.50 | 8.00 | 8.00 |
| WRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 | 53.26 |
| (C/I)1F (dB) | -26.26 | -27.76 | -30.66 | -42.76 | -45.26 | -45.26 |
| WNBW (KHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| IABW (kHz) | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 |
| 10log(Q)(dB) † | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)m (dB) | -21.26 | -22.76 | -25.66 | -37.76 | -40.26 | -40.26 |
| (C/N) (dB) | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 |
| Margin 0.5dB | -39.46 | -40.96 | -43.86 | -55.96 | -58.46 | -58.46 |
| Margin 1.0dB | -36.46 | -37.96 | -40.86 | -52.96 | -55.46 | -55.46 |

† if 10logQ is positive then it is set to 0 dB since we assume there is only one interfering mobile

## ZENON SATELLITE TO IRIDIUM MOBILE (Cell 1)

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 | 23.10 |
| IEIRP (dBW) | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 |
| dEIRP (dB) | -8.70 | -8.70 | -8.70 | -8.70 | -8.70 | -8.70 |
| WRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 | -24.70 |
| (C/I)1F (dB) | 16.00 | 16.00 | 16.00 | 16.00 | 16.00 | 16.00 |
| WNBW (KHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| IABW (kHz) | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 |
| 10log(Q) (dB) | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)s (dB) | 2.02 | 2.02 | 2.02 | 2.02 | 2.02 | 2.02 |
| (C/N) (dB) | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 | 9.20 |
| Margin 0.5dB | -16.18 | -16.18 | -16.18 | -16.18 | -16.18 | -16.18 |
| Margin 1.0dB | -13.18 | -13.18 | -13.18 | -13.18 | -13.18 | -13.18 |

## ZENON MOBILE TO IRIDIUM MOBILE (Cell 7)

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 |
| IEIRP (dBW) | -3.90 | -2.40 | 0.50 | 12.60 | 15.10 | 15.10 |
| dEIRP (dB) | 16.40 | 14.90 | 12.00 | -0.10 | -2.60 | -2.60 |
| WRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 | 44.61 |
| (C/I)1F (dB) | -28.21 | -29.71 | -32.61 | -44.71 | -47.21 | -47.21 |
| WNBW (KHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| IABW (kHz) | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 |
| 10log(Q)(dB) † | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)m (dB) | -23.21 | -24.71 | -27.61 | -39.71 | -42.21 | -42.21 |
| (C/N) (dB) | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 |
| Margin 0.5dB | -41.51 | -43.01 | -45.91 | -58.01 | -60.51 | -60.51 |
| Margin 1.0dB | -38.51 | -40.01 | -42.91 | -55.01 | -57.51 | -57.51 |

† if 10logQ is positive then it is set to 0 dB since
we assume there is only one interfering mobile

## ZENON SATELLITE TO IRIDIUM MOBILE (Cell 7 )

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 | 12.50 |
| IEIRP (dBW) | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 |
| dEIRP (dB) | -19.30 | -19.30 | -19.30 | -19.30 | -19.30 | -19.30 |
| WRANGE (km) | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 | 850.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 | -33.34 |
| (C/I)1F (dB) | 14.04 | 14.04 | 14.04 | 14.04 | 14.04 | 14.04 |
| WNBW (KHz) | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 | 300.00 |
| INBW (kHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| IABW (kHz) | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 |
| 10log(Q) (dB) | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 | 13.98 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)s (dB) | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 |
| (C/N) (dB) | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 | 9.30 |
| Margin 0.5dB | -18.24 | -18.24 | -18.24 | -18.24 | -18.24 | -18.24 |
| Margin 1.0dB | -15.24 | -15.24 | -15.24 | -15.24 | -15.24 | -15.24 |

## ZENON MOBILE TO IRIDIUM SATELLITE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 |
| IEIRP (dBW) | -3.90 | -2.40 | 0.50 | 12.60 | 15.10 | 15.10 |
| dEIRP (dB) | 5.30 | 3.80 | 0.90 | -11.20 | -13.70 | -13.70 |
| WRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| IRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | 5.30 | 3.80 | 0.90 | -11.20 | -13.70 | -13.70 |
| WNBW (KHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| INBW (kHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| IABW (kHz) | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 |
| 10log(Q) (dB) | 3.52 | 3.52 | 3.52 | 3.52 | 3.52 | 3.52 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)m (dB)** | **1.78** | **0.28** | **-2.62** | **-14.72** | **-17.22** | **-17.22** |
| **(C/N) (dB)** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** |
| **Margin 0.5dB** | **-15.72** | **-17.22** | **-20.12** | **-32.22** | **-34.72** | **-34.72** |
| **Margin 1.0dB** | **-12.72** | **-14.22** | **-17.12** | **-29.22** | **-31.72** | **-31.72** |

## ZENON SATELLITE TO IRIDIUM SATELLITE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 |
| IEIRP (dBW) | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 |
| dEIRP (dB) | -30.40 | -30.40 | -30.40 | -30.40 | -30.40 | -30.40 |
| WRANGE (km) | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 | 2300.00 |
| IRANGE (km) | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 | 41800.00 |
| dPL (dB) | -25.19 | -25.19 | -25.19 | -25.19 | -25.19 | -25.19 |
| (C/I)1F (dB) | -5.21 | -5.21 | -5.21 | -5.21 | -5.21 | -5.21 |
| WNBW (KHz) | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 | 135.00 |
| INBW (kHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| IABW (kHz) | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 |
| 10log(Q) (dB) | 10.51 | 10.51 | 10.51 | 10.51 | 10.51 | 10.51 |
| 10log(DF)(dB) | -3.00 | -3.00 | -3.00 | -3.00 | -3.00 | -3.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)s (dB)** | **-12.72** | **-12.72** | **-12.72** | **-12.72** | **-12.72** | **-12.72** |
| **(C/N) (dB)** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** | **8.50** |
| **Margin 0.5dB** | **-30.22** | **-30.22** | **-30.22** | **-30.22** | **-30.22** | **-30.22** |
| **Margin 1.0dB** | **-27.22** | **-27.22** | **-27.22** | **-27.22** | **-27.22** | **-27.22** |

## ZENON MOBILE TO ORBCOMM MOBILE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| IEIRP (dBW) | -3.90 | -2.40 | 0.50 | 12.60 | 15.10 | 15.10 |
| dEIRP (dB) | 38.40 | 36.90 | 34.00 | 21.90 | 19.40 | 19.40 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 |
| dPL (dB) | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 | 54.81 |
| (C/I)1F (dB) | -16.41 | -17.91 | -20.81 | -32.91 | -35.41 | -35.41 |
| WNBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| INBW (kHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| IABW (kHz) | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 |
| 10log(Q)(dB) | -0.46 | -0.46 | -0.46 | -0.46 | -0.46 | -0.46 |
| 10log(DF)(dB) | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 | -5.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)m (dB)** | **-10.95** | **-12.45** | **-15.35** | **-27.45** | **-29.95** | **-29.95** |
| **(C/N) (dB)** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** |
| **Margin 0.5dB** | **-42.85** | **-44.35** | **-47.25** | **-59.35** | **-61.85** | **-61.85** |
| **Margin 1.0dB** | **-39.85** | **-41.35** | **-44.25** | **-56.35** | **-58.85** | **-58.85** |

## ZENON SATELLITE TO ORBCOMM SATELLITE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| IEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| IEIRP (dBW) | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 |
| dEIRP (dB) | -11.80 | -11.80 | -11.80 | -11.80 | -11.80 | -11.80 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 | 42250.00 |
| dPL (dB) | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 | -23.73 |
| (C/I)1F (dB) | 11.93 | 11.93 | 11.93 | 11.93 | 11.93 | 11.93 |
| WNBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| INBW (kHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| IABW (kHz) | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 |
| 10log(Q) (dB) | -3.47 | -3.47 | -3.47 | -3.47 | -3.47 | -3.47 |
| 10log(DF)(dB) | -3.00 | -3.00 | -3.00 | -3.00 | -3.00 | -3.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)s (dB)** | **18.40** | **18.40** | **18.40** | **18.40** | **18.40** | **18.40** |
| **(C/N) (dB)** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** |
| **Margin 0.5dB** | **-12.20** | **-12.20** | **-12.20** | **-12.20** | **-12.20** | **-12.20** |
| **Margin 1.0dB** | **-9.20** | **-9.20** | **-9.20** | **-9.20** | **-9.20** | **-9.20** |

| ZENON MOBILE TO ORBCOMM SATELLITE | | | | | | |
|---|---|---|---|---|---|---|
| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
| | | | | | | |
| WEIRP (dBW) | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 | 20.00 |
| IEIRP (dBW) | -3.90 | -2.40 | 0.50 | 12.60 | 15.10 | 15.10 |
| dEIRP (dB) | 23.90 | 22.40 | 19.50 | 7.40 | 4.90 | 4.90 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| dPL (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (C/I)1F (dB) | 23.90 | 22.40 | 19.50 | 7.40 | 4.90 | 4.90 |
| WNBW (kHz) | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 | 3.60 |
| INBW (kHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| IABW (kHz) | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 |
| 10log(Q) (dB) | -3.47 | -3.47 | -3.47 | -3.47 | -3.47 | -3.47 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)m (dB)** | **27.37** | **25.87** | **22.97** | **10.87** | **8.37** | **8.37** |
| **(C/N) (dB)** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** | **21.60** |
| **Margin 0.5dB** | **-3.23** | **-4.73** | **-7.63** | **-19.73** | **-22.23** | **-22.23** |
| **Margin 1.0dB** | **-0.23** | **-1.73** | **-4.63** | **-16.73** | **-19.23** | **-19.23** |

## ZENON SATELLITE TO ORBCOMM MOBILE

| CARRIER | TM1 | TM2 | TM3 | TM4 | TM5 | TM6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| WEIRP (dBW) | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 | 34.50 |
| IEIRP (dBW) | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 | 31.80 |
| dEIRP (dB) | 2.70 | 2.70 | 2.70 | 2.70 | 2.70 | 2.70 |
| WRANGE (km) | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 | 2750.00 |
| IRANGE (km) | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 | 39500.00 |
| dPL (dB) | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 | -23.15 |
| (C/I)1F (dB) | 25.85 | 25.85 | 25.85 | 25.85 | 25.85 | 25.85 |
| WNBW (kHz) | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 | 7.20 |
| INBW (kHz) | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| IABW (kHz) | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 | 12.00 |
| 10log(Q) (dB) | -0.46 | -0.46 | -0.46 | -0.46 | -0.46 | -0.46 |
| 10log(DF)(dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| P | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| 10log(P) (dB) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(C/I)s (dB)** | **26.30** | **26.30** | **26.30** | **26.30** | **26.30** | **26.30** |
| **(C/N) (dB)** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** | **22.90** |
| **Margin 0.5dB** | **-5.60** | **-5.60** | **-5.60** | **-5.60** | **-5.60** | **-5.60** |
| **Margin 1.0dB** | **-2.60** | **-2.60** | **-2.60** | **-2.60** | **-2.60** | **-2.60** |

## EUTELSAT MOBILE TO IRIDIUM MOBILE (CELL 1)

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 23.10 |
| IEIRP (dBW) | 17.00 |
| dEIRP (dB) | 6.10 |
| WRANGE (km) | 2300.00 |
| IRANGE (km) | 5.00 |
| dPL (dB) | 53.26 |
| (C/I)1F (dB) | -47.16 |
| WNBW (KHz) | 300.00 |
| INBW (kHz) | 4.00 |
| IABW (kHz) | 6.00 |
| 10log(Q) (dB) † | 0.00 |
| 10log(DF)(dB) | -5.00 |
| P | 1.00 |
| 10log(P) (dB) | 0.00 |
| (C/I)m (dB) | -42.16 |
| (C/N) (dB) | 9.20 |
| Margin 0.5dB | -60.36 |
| Margin 1.0dB | -57.36 |

† if 10logQ is positive then it is set to 0 dB since we assume there is only one interfering mobile

## EUTELSAT SATELLITE TO IRIDIUM MOBILE (CELL 1)

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 23.10 |
| IEIRP (dBW) | 29.00 |
| dEIRP (dB) | -5.90 |
| WRANGE (km) | 2300.00 |
| IRANGE (km) | 39500.00 |
| dPL (dB) | -24.70 |
| (C/I)1F (dB) | 18.80 |
| WNBW (KHz) | 300.00 |
| INBW (kHz) | 4.00 |
| IABW (kHz) | 6.00 |
| 10log(Q) (dB) | 16.99 |
| 10log(DF)(dB) | 0.00 |
| P | 1.00 |
| 10log(P) (dB) | 0.00 |
| (C/I)s (dB) | 1.81 |
| (C/N) (dB) | 9.20 |
| Margin 0.5dB | -16.39 |
| Margin 1.0dB | -13.39 |

## EUTELSAT MOBILE TO IRIDIUM MOBILE (CELL 7)

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 12.50 |
| IEIRP (dBW) | 17.00 |
| dEIRP (dB) | -4.50 |
| WRANGE (km) | 850.00 |
| IRANGE (km) | 5.00 |
| dPL (dB) | 44.61 |
| (C/I)1F (dB) | -49.11 |
| WNBW (KHz) | 300.00 |
| INBW (kHz) | 4.00 |
| IABW (kHz) | 6.00 |
| 10log(Q) (dB) † | 16.99 |
| 10log(DF)(dB) | -5.00 |
| P | 1.00 |
| 10log(P) (dB) | 0.00 |
| **(C/I)m (dB)** | **-61.10** |
| **(C/N) (dB)** | **9.30** |
| **Margin 0.5dB** | **-79.40** |
| **Margin 1.0dB** | **-76.40** |

† if 10logQ is positive then it is set to 0 dB since we assume there is only one interfering mobile

## EUTELSAT SATELLITE TO IRIDIUM MOBILE (CELL 7)

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 12.50 |
| IEIRP (dBW) | 29.00 |
| dEIRP (dB) | -16.50 |
| WRANGE (km) | 850.00 |
| IRANGE (km) | 39500.00 |
| dPL (dB) | -33.34 |
| (C/I)1F (dB) | 16.84 |
| WNBW (KHz) | 300.00 |
| INBW (kHz) | 4.00 |
| IABW (kHz) | 6.00 |
| 10log(Q) (dB) | 16.99 |
| 10log(DF)(dB) | 0.00 |
| P | 1.00 |
| 10log(P) (dB) | 0.00 |
| **(C/I)s (dB)** | **-0.15** |
| **(C/N) (dB)** | **9.30** |
| **Margin 0.5dB** | **-18.45** |
| **Margin 1.0dB** | **-15.45** |

## EUTELSAT MOBILE TO IRIDIUM SATELLITE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 1.40 |
| IEIRP (dBW) | 17.00 |
| dEIRP (dB) | -15.60 |
| WRANGE (km) | 2300.00 |
| IRANGE (km) | 39500.00 |
| dPL (dB) | -24.70 |
| (C/I)1F (dB) | 9.10 |
| WNBW (KHz) | 135.00 |
| INBW (kHz) | 4.00 |
| IABW (kHz) | 6.00 |
| 10log(Q) (dB) | 6.53 |
| 10log(DF)(dB) | 0.00 |
| P | 1.00 |
| 10log(P) (dB) | 0.00 |
| **(C/I)m (dB)** | **2.57** |
| **(C/N) (dB)** | **8.50** |
| **Margin 0.5dB** | **-14.93** |
| **Margin 1.0dB** | **-11.93** |

## EUTELSAT SATELLITE TO IRIDIUM SATELLITE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 1.40 |
| IEIRP (dBW) | 29.00 |
| dEIRP (dB) | -27.60 |
| WRANGE (km) | 2300.00 |
| IRANGE (km) | 41800.00 |
| dPL (dB) | -25.19 |
| (C/I)1F (dB) | -2.41 |
| WNBW (KHz) | 135.00 |
| INBW (kHz) | 4.00 |
| IABW (kHz) | 6.00 |
| 10log(Q) (dB) | 13.52 |
| 10log(DF)(dB) | 0.00 |
| P | 1.00 |
| 10log(P) (dB) | 0.00 |
| **(C/I)s (dB)** | **-15.93** |
| **(C/N) (dB)** | **8.50** |
| **Margin 0.5dB** | **-33.43** |
| **Margin 1.0dB** | **-30.43** |

## EUTELSAT MOBILE TO ORBCOMM MOBILE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 34.50 |
| IEIRP (dBW) | 17.00 |
| dEIRP (dB) | 17.50 |
| WRANGE (km) | 2750.00 |
| IRANGE (km) | 5.00 |
| dPL (dB) | 54.81 |
| (C/I)1F (dB) | -37.31 |
| WNBW (kHz) | 7.20 |
| INBW (kHz) | 4.00 |
| IABW (kHz) | 6.00 |
| 10log(Q) (dB) † | 0.00 |
| 10log(DF)(dB) | -5.00 |
| P | 1.00 |
| 10log(P) (dB) | 0.00 |
| **(C/I)m (dB)** | **-32.31** |
| **(C/N) (dB)** | **22.90** |
| **Margin 0.5dB** | **-64.21** |
| **Margin 1.0dB** | **-61.21** |

† if 10logQ is positive then it is set to 0 dB since we assume there is only one interfering mobile

## EUTELSAT SATELLITE TO ORBCOMM SATELLITE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 20.00 |
| IEIRP (dBW) | 29.00 |
| dEIRP (dB) | -9.00 |
| WRANGE (km) | 2750.00 |
| IRANGE (km) | 42250.00 |
| dPL (dB) | -23.73 |
| (C/I)1F (dB) | 14.73 |
| WNBW (kHz) | 3.60 |
| INBW (kHz) | 4.00 |
| IABW (kHz) | 6.00 |
| 10log(Q) (dB) | -0.46 |
| 10log(DF)(dB) | 0.00 |
| P | 1.00 |
| 10log(P) (dB) | 0.00 |
| **(C/I)s (dB)** | **15.19** |
| **(C/N) (dB)** | **21.60** |
| **Margin 0.5dB** | **-15.41** |
| **Margin 1.0dB** | **-12.41** |

## EUTELSAT MOBILE TO ORBCOMM SATELLITE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 20.00 |
| IEIRP (dBW) | 17.00 |
| dEIRP (dB) | 3.00 |
| WRANGE (km) | 2750.00 |
| IRANGE (km) | 2750.00 |
| dPL (dB) | 0.00 |
| (C/I)1F (dB) | 3.00 |
| WNBW (kHz) | 3.60 |
| INBW (kHz) | 4.00 |
| IABW (kHz) | 6.00 |
| 10log(Q) (dB) | -0.46 |
| 10log(DF)(dB) | 0.00 |
| P | 1.00 |
| 10log(P) (dB) | 0.00 |
| **(C/I)m (dB)** | **3.46** |
| (C/N) (dB) | **21.60** |
| **Margin 0.5dB** | **-27.14** |
| **Margin 1.0dB** | **-24.14** |

## EUTELSAT SATELLITE TO ORBCOMM MOBILE

| CARRIER | |
|---|---|
| | |
| WEIRP (dBW) | 34.50 |
| IEIRP (dBW) | 29.00 |
| dEIRP (dB) | 5.50 |
| WRANGE (km) | 2750.00 |
| IRANGE (km) | 39500.00 |
| dPL (dB) | -23.15 |
| (C/I)1F (dB) | 28.65 |
| WNBW (kHz) | 7.20 |
| INBW (kHz) | 4.00 |
| IABW (kHz) | 6.00 |
| 10log(Q) (dB) | 0.79 |
| 10log(DF)(dB) | 0.00 |
| P | 1.00 |
| 10log(P) (dB) | 0.00 |
| **(C/I)s (dB)** | **27.85** |
| (C/N) (dB) | **22.90** |
| **Margin 0.5dB** | **-4.05** |
| **Margin 1.0dB** | **-1.05** |

# APPENDIX C

# DETAILED CALCULATION OF INTERFERENCE BETWEEN LEO MSS SYSTEM AND TERRESTRIAL MICROWAVE FIXED SYSTEM

This appendix provide the interference calculations in detail. Microsoft Excel spread sheet was used to create the tables.

## C.1 Definitions and Formulas

Satellite/Earth Path Loss:

$92.4 + 20\text{Log}(f_{GHz}) + 20\text{Log}(D_{km})$

Mobile(Portable)/Terrestrial System Path Loss:

$92.4 + 20\text{Log}(f_{GHz}) + 20\text{Log}(D_{km})$

Interference Reference Objectives:

Taken as the C/I that causes a 0.5 dB and a 1.0 dB Degradation in the System's overall C/N ratio.

Q-Factor

$$Q = \text{Bandwidth Ratio} = 10\ \text{Log}\left(\frac{\text{Victim B.W.}}{\text{Interferer B.W.}}\right)$$

DF-Factor

DF= Number of Interferers & Antenna Discrimination & Distance Factors.

Number of Interferers = 6 for the IRIDIUM Case
= 66 for the OL Case.

Note:- this is for the terrestrial system into the satellite case only. Antenna Discrimination is taken as 0 dB for the IRIDIUM case and is calculated for the OL case (See C.3) assuming the L2 GHz antenna pattern given in Ref[13].

Distance Factor accounts for the fact that the distance to each terrestrial microwave station from a given satellite will vary according to the relative distance between affected stations and consequently the interference level would vary on a 20 Log Dkm basis. For this study the IRIDIUM distance factor is 0 dB whereas the

OL's factor is calculated and is included in the DF factor. (See C.3.)

$$\text{Distance Ratio} = \left( \frac{\text{sat/terr. distance to n'th station}}{\text{Max. distance to any terr. station}} \right)$$

Difference Calculation:

Diff = I objective - I calculated

Diff(Q+DF) = Diff - Q-factor - DF factor

## C.2 Worst Case Analysis

The worst case interference analysis between the IRIDIUM system and terrestrial system and between the OL system and terrestrial system are summarized in Table C.1 and Table C.2.

| Terrestrial Systems Under Study | | | Lowest Freq. in GHz | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| System A | 1427 to 1525 MHz | | 1.427 | | | | | | | | | | | | |
| System B | 1700 to 1710 MHz | | 1.7 | | | | | | | | | | | | |
| System C | 1710 to 1900 MHz | | 1.71 | | | | | | | | | | | | |
| System D | 1900 to 2290 MHz | | 1.9 | | | | | | | | | | | | |
| System E | 2290 to 2450 MHz | | 2.29 | | | | | | | | | | | | |
| *IRIDIUM SATELLITE/IRIDIUM MOBILE versus TERRESTRIAL SYSTEMS STUDY* | | | | | | | | | | | | | | | |
| SCENARIO | SYS. | EIRP dBW | DIST. km | PATH LOSS dB | GBX dBi | I dBW | T dBK | B.W. MHz | N dBW | I/N (Calc.) dB | I/N (Obj.1) dB | I/N (Obj.2) dB | Q-Factor dB | DF dB | C/I MARGIN 0.5 dB | C/I MARGIN 1.0 dB |
| IRID Sat/Terr | A | 23.1 | 3216.0 | 165.6 | 20.9 | -121.6 | 34.6 | 3.5 | -128.6 | 6.9 | -9.0 | -6.0 | 10.7 | 0 | -26.6 | -23.6 |
| | B | 23.1 | 3216.0 | 167.2 | 22.1 | -122.0 | 34.6 | 3.5 | -128.6 | 6.6 | -9.0 | -6.0 | 10.7 | 0 | -26.3 | -23.3 |
| | C | 23.1 | 3216.0 | 167.2 | 22.6 | -121.5 | 34.6 | 7.0 | -125.5 | 4.0 | -9.0 | -6.0 | 13.7 | 0 | -26.7 | -23.7 |
| | D | 23.1 | 3216.0 | 168.1 | 23.9 | -121.1 | 34.6 | 29.0 | -119.4 | -1.7 | -9.0 | -6.0 | 19.9 | 0 | -27.1 | -24.1 |
| | E | 23.1 | 3216.0 | 169.7 | 24.9 | -121.7 | 34.6 | 6.0 | -126.2 | 4.5 | -9.0 | -6.0 | 13.0 | 0 | -26.5 | -23.5 |
| | | | | | | | | | | | | | | | | |
| Terr/IRID Sat | A | 35 | 3218.0 | 165.8 | 21.2 | -109.4 | 27.4 | 0.135 | -149.9 | 40.5 | -9.0 | -6.0 | -14.1 | 6 | -41.3 | -38.3 |
| | B | 35 | 3216.0 | 167.2 | 21.2 | -111.0 | 27.4 | 0.135 | -149.9 | 38.9 | -9.0 | -6.0 | -14.1 | 6 | -39.6 | -36.6 |
| | C | 35 | 3216.0 | 167.2 | 21.2 | -111.0 | 27.4 | 0.135 | -149.9 | 38.9 | -9.0 | -6.0 | -17.1 | 6 | -36.7 | -33.7 |
| | D | 45 | 3216.0 | 168.1 | 21.2 | -101.9 | 27.4 | 0.135 | -149.9 | 48.0 | -9.0 | -6.0 | -23.3 | 6 | -39.7 | -36.7 |
| | E | 45 | 3216.0 | 169.7 | 21.2 | -103.5 | 27.4 | 0.135 | -149.9 | 46.4 | -9.0 | -6.0 | -16.5 | 6 | -44.9 | -41.9 |
| | | | | | | | | | | | | | | | | |
| IRID Mob/Terr | A | 1.4 | 5 | 109.5 | 20.9 | -87.2 | 34.6 | 3.5 | -128.6 | 41.4 | -9.0 | -6.0 | 14.1 | 0 | -64.5 | -61.5 |
| | B | 1.4 | 5 | 111.0 | 22.1 | -87.5 | 34.6 | 3.5 | -128.6 | 41.1 | -9.0 | -6.0 | 14.1 | 0 | -64.2 | -61.2 |
| | C | 1.4 | 5 | 111.0 | 22.6 | -87.0 | 34.6 | 7.0 | -125.5 | 38.5 | -9.0 | -6.0 | 17.1 | 0 | -64.7 | -61.7 |
| | D | 1.4 | 5 | 112.0 | 23.9 | -86.7 | 34.6 | 29.0 | -119.4 | 32.7 | -9.0 | -6.0 | 23.3 | 0 | -65.0 | -62.0 |
| | E | 1.4 | 5 | 113.6 | 24.9 | -87.3 | 34.6 | 6.0 | -126.2 | 38.9 | -9.0 | -6.0 | 16.5 | 0 | -64.4 | -61.4 |
| | | | | | | | | | | | | | | | | |
| Terr/IRID Mob | A | 35 | 5 | 109.5 | 0 | -74.5 | 24.8 | 0.3 | -149.0 | 74.6 | -9.0 | -6.0 | -10.7 | 0 | -72.9 | -69.9 |
| | B | 35 | 5 | 111.0 | 0 | -76.0 | 24.8 | 0.3 | -149.0 | 73.0 | -9.0 | -6.0 | -10.7 | 0 | -71.4 | -68.4 |
| | C | 35 | 5 | 111.0 | 0 | -76.0 | 24.8 | 0.3 | -149.0 | 73.0 | -9.0 | -6.0 | -13.7 | 0 | -68.3 | -65.3 |
| | D | 45 | 5 | 112.0 | 0 | -67.0 | 24.8 | 0.3 | -149.0 | 82.1 | -9.0 | -6.0 | -19.9 | 0 | -71.2 | -68.2 |
| | E | 45 | 5 | 113.6 | 0 | -68.6 | 24.8 | 0.3 | -149.0 | 80.5 | -9.0 | -6.0 | -13.0 | 0 | -76.4 | -73.4 |

Table C.1 IRIDIUM/Terrestrial System Worst Case Interference Analysis

| Terrestrial Systems Under Study | | Lowest Freq. in GHz |
|---|---|---|
| System A | 1427 to 1525 MHz | 1.427 |
| System B | 1700 to 1710 MHz | 1.7 |
| System C | 1710 to 1900 MHz | 1.71 |
| System D | 1900 to 2290 MHz | 1.9 |
| System E | 2290 to 2450 MHz | 2.29 |

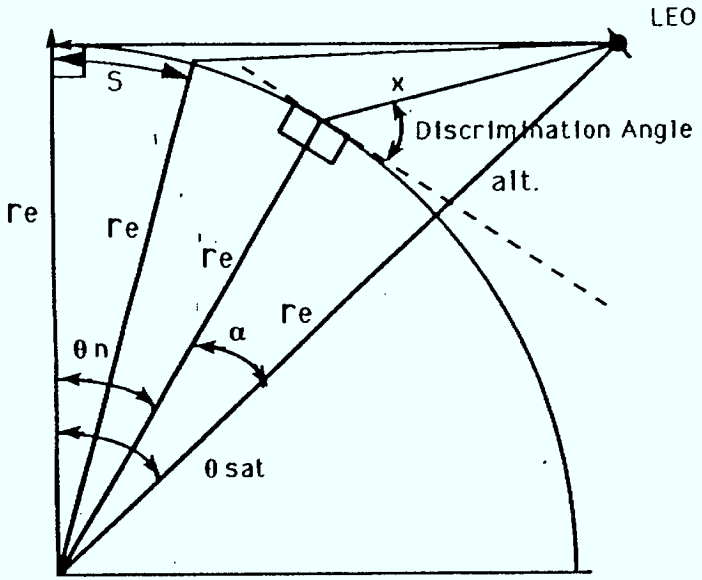
***OL SATELLITE/OL PORTABLE versus TERRESTRIAL SYSTEMS STUDY***

| SCENARIO | SYS. | EIRP | DIST. | PATH LOSS | OFK | I | T | B.W. | N | I/N (Calc.) | I/N (Obj.)1 | I/N (Obj.)2 | Q-Factor | DF | C/I MARGIN | C/I MARGIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | dBW | km | dB | dBi | dBW | dBK | MHz | dBW | dB | dB | dB | dB | dB | 0.5 dB | 1.0 dB |
| OL Sat/Terr | A | 34.5 | 3628.7 | 166.7 | 20.9 | -111.3 | 34.6 | 3.5 | -128.6 | 17.3 | -9.0 | -6.0 | 26.9 | 0 | -53.1 | -50.1 |
| | B | 34.5 | 3628.7 | 166.2 | 22.1 | -111.6 | 34.6 | 3.5 | -128.6 | 17.0 | -9.0 | -6.0 | 26.9 | 0 | -52.8 | -49.8 |
| | C | 34.5 | 3628.7 | 168.3 | 22.6 | -111.2 | 34.6 | 7.0 | -125.5 | 14.4 | -9.0 | -6.0 | 29.9 | 0 | -53.3 | -50.3 |
| | D | 34.5 | 3628.7 | 169.2 | 23.9 | -110.8 | 34.6 | 29.0 | -119.4 | 8.6 | -9.0 | -6.0 | 36.1 | 0 | -53.7 | -50.7 |
| | E | 34.5 | 3628.7 | 170.8 | 24.9 | -111.4 | 34.6 | 6.0 | -126.2 | 14.8 | -9.0 | -6.0 | 29.2 | 0 | -53.0 | -50.0 |
| | | | | | | | | | | | | | | | | |
| Terr/OL Sat | A | 35 | 3628.7 | 166.7 | 7 | -124.7 | 32.8 | 0.0036 | -160.2 | 35.6 | -9.0 | -6.0 | -29.9 | 10.5 | -25.2 | -22.2 |
| | B | 35 | 3628.7 | 166.2 | 7 | -126.2 | 32.8 | 0.0036 | -160.2 | 34.0 | -9.0 | -6.0 | -29.9 | 10.5 | -23.7 | -20.7 |
| | C | 35 | 3628.7 | 168.3 | 7 | -126.3 | 32.8 | 0.0036 | -160.2 | 34.0 | -9.0 | -6.0 | -32.9 | 10.5 | -20.6 | -17.6 |
| | D | 45 | 3628.7 | 169.2 | 7 | -117.2 | 32.8 | 0.0036 | -160.2 | 43.1 | -9.0 | -6.0 | -39.1 | 10.5 | -23.5 | -20.5 |
| | E | 45 | 3628.7 | 170.8 | 7 | -118.8 | 32.8 | 0.0036 | -160.2 | 41.4 | -9.0 | -6.0 | -32.2 | 10.5 | -28.7 | -25.7 |
| | | | | | | | | | | | | | | | | |
| OL Port/Terr | A | 20 | 5 | 109.5 | 20.9 | -68.6 | 34.8 | 3.5 | -128.6 | 60.0 | -9.0 | -6.0 | 29.9 | 0 | -98.9 | -95.9 |
| | B | 20 | 5 | 111.0 | 22.1 | -68.9 | 34.6 | 3.5 | -128.6 | 59.7 | -9.0 | -6.0 | 29.9 | 0 | -98.5 | -95.5 |
| | C | 20 | 5 | 111.0 | 22.6 | -68.4 | 34.6 | 7.0 | -125.5 | 57.1 | -9.0 | -6.0 | 32.9 | 0 | -99.0 | -96.0 |
| | D | 20 | 5 | 112.0 | 23.9 | -68.1 | 34.6 | 29.0 | -119.4 | 51.3 | -9.0 | -6.0 | 39.1 | 0 | -99.4 | -96.4 |
| | E | 20 | 5 | 113.6 | 24.9 | -68.7 | 34.6 | 6.0 | -126.2 | 57.5 | -9.0 | -6.0 | 32.2 | 0 | -98.8 | -95.8 |
| | | | | | | | | | | | | | | | | |
| Terr/OL Port | A | 35 | 5 | 109.5 | 0 | -74.5 | 36.6 | 0.0072 | -153.4 | 79.0 | -9.0 | -6.0 | -26.9 | 0 | -61.1 | -58.1 |
| | B | 35 | 5 | 111.0 | 0 | -76.0 | 36.6 | 0.0072 | -153.4 | 77.4 | -9.0 | -6.0 | -26.9 | 0 | -59.6 | -56.6 |
| | C | 35 | 5 | 111.0 | 0 | -76.0 | 36.6 | 0.0072 | -153.4 | 77.4 | -9.0 | -6.0 | -29.9 | 0 | -56.5 | -53.5 |
| | D | 45 | 5 | 112.0 | 0 | -67.0 | 36.6 | 0.0072 | -153.4 | 86.5 | -9.0 | -6.0 | -36.1 | 0 | -59.4 | -56.4 |
| | E | 45 | 5 | 113.6 | 0 | -68.6 | 36.6 | 0.0072 | -153.4 | 84.9 | -9.0 | -6.0 | -29.2 | 0 | -64.6 | -61.6 |

Table C.2 OL/Terrestrial System Worst Case Interference Analysis

## C.3 Antenna Off-Axis Angle Calculations

Figure C.1 shows the geometrical scenario of LEO satellite and terrestrial system. The terrestrial station antenna off-axis angles towards IRIDIUM satellite and OL satellite are provided in Table C.3 and Table C.4, respectively.




θ sat=Cos-1(re/(re+alt))

θ n= nS/re

α = θ sat - θ n

x2=re2+(re+alt)2-2*re(re+alt)Cosα

Disc. Angle= Sin-1(Sinα [(re+alt)/x])-90

re = 6371.64 km
alt = 765 km IRIDIUM & 960 km ORBCOM
S = 100 km

Figure C.1 Geometrical Scenario of LEO Satellite and Terrestrial System

***This worksheet calculates the Terrestrial Station Discrimination Angle assuming certain LEO operating altitude and sepatation distance between terrestrial sites.***

| | |
|---|---|
| LEO altitude = | 765 km |
| Terrestrial Station Separation Distance = | 100 km |
| LEO Cell Diameter = | 670 km |
| Number of Sites = | 6 |
| earth radius = | 6378.15 km |

| CONVERSION FACTORS | |
|---|---|
| Rad to ° | 57.2957795 |
| ° to Rad | 0.01745329 |
| re+LEO Alt | 7143.15 km |

| n | Theta(n) | Theta(Sat) | alpha | dist to sat | Discr. Angle (in °) | ant discr. | Ant. Discr. ratio |
|---|---|---|---|---|---|---|---|
| 1 | 0.0157 | 0.4670 | 0.4514 | 3116.2 | ***0.9127*** ° | 0.0000 | 1.0000 |
| 2 | 0.0314 | 0.4670 | 0.4357 | 3016.2 | ***1.8562*** ° | 0.0000 | 1.0000 |
| 3 | 0.0470 | 0.4670 | 0.4200 | 2916.3 | ***2.8335*** ° | 0.0000 | 1.0000 |
| 4 | 0.0627 | 0.4670 | 0.4043 | 2816.5 | ***3.8483*** ° | 2.4238 | 0.5723 |
| 5 | 0.0784 | 0.4670 | 0.3886 | 2716.8 | ***4.9047*** ° | 5.4419 | 0.2856 |
| 6 | 0.0941 | 0.4670 | 0.3730 | 2617.2 | ***6.0073*** ° | 8.5922 | 0.1383 |

Power Multipling Factor, in dB. 6.01648705

Table C.3 Terrestrial System Antenna Discrimination Towards IRIDIUM Satellite

*This worksheet calculates the Tarrestrial Station Discrimination Angle assuming certain LEO operating altitude and sepatation distance between terrestrial sites.*

| | |
|---|---|
| LEO altitude = | 960 km |
| Terrestrial Station Separation Distance = | 100 km |
| LEO Cell Diameter = | 6598.34 km |
| Number of Sites = | 66 |
| earth radius = | 6378.15 km |

| CONVERSION FACTORS | |
|---|---|
| Rad to ° | 57.2957795 |
| ° to Rad | 0.01745329 |
| re+LEO Alt | 7338.15 |

| n | Theta(n) | Theta(Sat) | alpha | dist to sat | Discr. Angle (in °) | ant discr. | DISCR. AS RATIO | Distance Ratio |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.0157 | 0.5173 | 0.5016 | 3528.7 | *0.9110* ° | 0.0000 | 1.0000 | 0.9725 |
| 2 | 0.0314 | 0.5173 | 0.4859 | 3428.8 | *1.8490* ° | 0.0000 | 1.0000 | 0.9449 |
| 3 | 0.0470 | 0.5173 | 0.4702 | 3328.8 | *2.8164* ° | 0.0000 | 1.0000 | 0.9174 |
| 4 | 0.0627 | 0.5173 | 0.4545 | 3229.0 | *3.8157* ° | 2.3307 | 0.5847 | 0.8899 |
| 5 | 0.0784 | 0.5173 | 0.4389 | 3129.3 | *4.8502* ° | 5.2863 | 0.2961 | 0.8624 |
| 6 | 0.0941 | 0.5173 | 0.4232 | 3029.7 | *5.9232* ° | 8.3520 | 0.1462 | 0.8349 |
| 7 | 0.1097 | 0.5173 | 0.4075 | 2930.4 | *7.0385* ° | 11.5386 | 0.0702 | 0.8076 |
| 8 | 0.1254 | 0.5173 | 0.3918 | 2831.3 | *8.2005* ° | 14.8587 | 0.0327 | 0.7802 |
| 9 | 0.1411 | 0.5173 | 0.3762 | 2732.4 | *9.4142* ° | 18.3263 | 0.0147 | 0.7530 |
| 10 | 0.1568 | 0.5173 | 0.3605 | 2634.0 | *10.6851* ° | 20.0685 | 0.0098 | 0.7259 |
| 11 | 0.1725 | 0.5173 | 0.3448 | 2535.9 | *12.0198* ° | 20.2020 | 0.0095 | 0.6989 |
| 12 | 0.1881 | 0.5173 | 0.3291 | 2438.4 | *13.4254* ° | 20.3425 | 0.0092 | 0.6720 |
| 13 | 0.2038 | 0.5173 | 0.3134 | 2341.4 | *14.9105* ° | 20.4911 | 0.0089 | 0.6453 |
| 14 | 0.2195 | 0.5173 | 0.2978 | 2245.2 | *16.4848* ° | 20.6485 | 0.0086 | 0.6187 |
| 15 | 0.2352 | 0.5173 | 0.2821 | 2149.7 | *18.1594* ° | 20.8159 | 0.0083 | 0.5924 |
| 16 | 0.2509 | 0.5173 | 0.2664 | 2055.2 | *19.9474* ° | 20.9947 | 0.0080 | 0.5664 |
| 17 | 0.2665 | 0.5173 | 0.2507 | 1961.8 | *21.8636* ° | 21.1864 | 0.0076 | 0.5406 |
| 18 | 0.2822 | 0.5173 | 0.2350 | 1869.6 | *23.9255* ° | 21.3926 | 0.0073 | 0.5152 |
| 19 | 0.2979 | 0.5173 | 0.2194 | 1779.0 | *26.1531* ° | 21.6153 | 0.0069 | 0.4903 |
| 20 | 0.3136 | 0.5173 | 0.2037 | 1690.2 | *28.5695* ° | 21.8570 | 0.0065 | 0.4658 |
| 21 | 0.3292 | 0.5173 | 0.1880 | 1603.5 | *31.2014* ° | 22.1201 | 0.0061 | 0.4419 |
| 22 | 0.3449 | 0.5173 | 0.1723 | 1519.3 | *34.0791* ° | 22.4079 | 0.0057 | 0.4187 |
| 23 | 0.3606 | 0.5173 | 0.1567 | 1438.0 | *37.2363* ° | 22.7236 | 0.0053 | 0.3963 |
| 24 | 0.3763 | 0.5173 | 0.1410 | 1360.2 | *40.7105* ° | 23.0711 | 0.0049 | 0.3749 |
| 25 | 0.3920 | 0.5173 | 0.1253 | 1286.6 | *44.5409* ° | 23.4541 | 0.0045 | 0.3546 |
| 26 | 0.4076 | 0.5173 | 0.1096 | 1218.0 | *48.7669* ° | 23.8767 | 0.0041 | 0.3356 |
| 27 | 0.4233 | 0.5173 | 0.0939 | 1155.1 | *53.4235* ° | 24.3424 | 0.0037 | 0.3183 |
| 28 | 0.4390 | 0.5173 | 0.0783 | 1099.1 | *58.5360* ° | 24.8536 | 0.0033 | 0.3029 |
| 29 | 0.4547 | 0.5173 | 0.0626 | 1051.1 | *64.1111* ° | 25.4111 | 0.0029 | 0.2897 |
| 30 | 0.4704 | 0.5173 | 0.0469 | 1012.2 | *70.1278* ° | 26.0128 | 0.0025 | 0.2789 |
| 31 | 0.4860 | 0.5173 | 0.0312 | 983.5 | *76.5288* ° | 26.6529 | 0.0022 | 0.2710 |
| 32 | 0.5017 | 0.5173 | 0.0155 | 965.9 | *83.2163* ° | 27.3216 | 0.0019 | 0.2662 |
| 33 | 0.5174 | 0.5173 | -0.0001 | 960.0 | *90.0571* ° | 28.0171 | 0.0016 | 0.2646 |

| | |
|---|---|
| Power Multipling Factor, in dB. | 7.46973155 |

This is the power factor of one-half the terrestrial system, therefore we must add 3 dB to get the power factor of the entire terrestrial system **I.e. The Power Multipling Factor is approximately 10.5 dB.**

Table C.4 Terrestrial System Antenna Disrcimination Toward OL Satellite

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# APPENDIX D

# BASIC PATH LOSS OVER SMOOTH EARTH

| | A | B | Q | R |
|---|---|---|---|---|
| 1 | **BASIC PATH LOSS FOR SMOOTH EARTH AS A FUNCTION** | | | |
| 2 | **OF DISTANCE BETWEEN TRANSMITTER AND RECEIVER** | | | |
| 3 | | | | |
| 4 | Frequency (GHz) | 1.6 | Horizon Dist.(km) | |
| 5 | Tx Height (m) | 1.5 | 5.1 | |
| 6 | Rx Height (m) | 1.5 | 5.1 | |
| 8 | Start Dist. (km) | 10.0 | | |
| 9 | Increment (km) | 1.0 | | |
| 10 | | | | |
| 11 | Distance (km) | Free Space Loss | Terrain Blockage Loss (dB) | Basic Path Loss (dB) |
| 12 | 10.0 | 116.6 | 0.0 | 116.6 |
| 13 | 11.0 | 117.4 | 6.8 | 124.2 |
| 14 | 12.0 | 118.2 | 16.1 | 134.3 |
| 15 | 13.0 | 118.9 | 21.3 | 140.2 |
| 16 | 14.0 | 119.5 | 24.8 | 144.3 |
| 17 | 15.0 | 120.1 | 27.5 | 147.6 |
| 18 | 16.0 | 120.7 | 29.7 | 150.3 |
| 19 | 17.0 | 121.2 | 31.4 | 152.6 |
| 20 | 18.0 | 121.7 | 33.0 | 154.6 |
| 21 | 19.0 | 122.2 | 34.1 | 156.3 |
| 22 | 20.0 | 122.6 | 35.3 | 157.9 |
| 23 | 21.0 | 123.0 | 36.3 | 159.3 |
| 24 | 22.0 | 123.4 | 37.3 | 160.7 |
| 25 | 23.0 | 123.8 | 38.1 | 161.9 |
| 26 | 24.0 | 124.2 | 38.9 | 163.1 |
| 27 | 25.0 | 124.5 | 39.7 | 164.2 |
| 28 | 26.0 | 124.9 | 40.3 | 165.2 |
| 29 | 27.0 | 125.2 | 41.1 | 166.3 |
| 30 | 28.0 | 125.5 | 41.7 | 167.2 |
| 31 | 29.0 | 125.8 | 42.3 | 168.1 |
| 32 | 30.0 | 126.1 | 42.8 | 168.9 |
| 33 | 31.0 | 126.4 | 43.3 | 169.7 |
| 34 | 32.0 | 126.7 | 43.8 | 170.4 |
| 35 | 33.0 | 127.0 | 44.2 | 171.2 |
| 36 | 34.0 | 127.2 | 44.6 | 171.8 |

| | A | B | Q | R |
|---|---|---|---|---|
| 1 | **BASIC PATH LOSS FOR SMOOTH EARTH AS A FUNCTION** | | | |
| 2 | **OF DISTANCE BETWEEN TRANSMITTER AND RECEIVER** | | | |
| 3 | | | | |
| 4 | Frequency (GHz) | 2.0 | Horizon Dist.(km) | |
| 5 | Tx Height (m) | 1.5 | 5.1 | |
| 6 | Rx Height (m) | 1.5 | 5.1 | |
| 8 | Start Dist. (km) | 10.0 | | |
| 9 | Increment (km) | 1.0 | | |
| 10 | | | | |
| 11 | Distance (km) | Free Space Loss | Terrain Blockage Loss (dB) | Basic Path Loss (dB) |
| 12 | 10.0 | 118.5 | 0.0 | 118.5 |
| 13 | 11.0 | 119.3 | 7.7 | 127.1 |
| 14 | 12.0 | 120.1 | 17.1 | 137.2 |
| 15 | 13.0 | 120.8 | 22.3 | 143.1 |
| 16 | 14.0 | 121.4 | 25.8 | 147.3 |
| 17 | 15.0 | 122.0 | 28.5 | 150.5 |
| 18 | 16.0 | 122.6 | 30.5 | 153.1 |
| 19 | 17.0 | 123.1 | 32.2 | 155.3 |
| 20 | 18.0 | 123.6 | 33.7 | 157.3 |
| 21 | 19.0 | 124.1 | 35.0 | 159.1 |
| 22 | 20.0 | 124.5 | 36.2 | 160.7 |
| 23 | 21.0 | 125.0 | 37.2 | 162.2 |
| 24 | 22.0 | 125.4 | 38.1 | 163.5 |
| 25 | 23.0 | 125.8 | 39.0 | 164.8 |
| 26 | 24.0 | 126.1 | 39.8 | 165.9 |
| 27 | 25.0 | 126.5 | 40.5 | 167.0 |
| 28 | 26.0 | 126.8 | 41.2 | 168.1 |
| 29 | 27.0 | 127.1 | 41.9 | 169.0 |
| 30 | 28.0 | 127.5 | 42.5 | 170.0 |
| 31 | 29.0 | 127.8 | 43.1 | 170.8 |
| 32 | 30.0 | 128.1 | 43.6 | 171.7 |
| 33 | 31.0 | 128.3 | 44.3 | 172.6 |
| 34 | 32.0 | 128.6 | 44.7 | 173.4 |
| 35 | 33.0 | 128.9 | 45.2 | 174.1 |
| 36 | 34.0 | 129.2 | 45.6 | 174.8 |

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