

AN ANALYSIS OF:
PROPOSED LOW POWER FM BROADCASTING STANDARDS

Prepared for:

Department of Communications
Government of Canada
Ottawa, Ontario

Prepared by:

Benj. F. Dawson III, P. Eng.
Hatfield & Dawson
Consulting Engineers

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SUMMARY OF LPFM RECOMMENDATIONS

DGTR NOTICE No. 020-76 CONTAINS A SUMMARIZATION OF PERTINENT ALLOCATIONS POLICIES CONTAINED IN THE PROPOSED LPFM APPLICATION PROCEDURES. THE FOLLOWING RECOMMENDATIONS, DERIVED FROM OUR REPORT, ARE APPLICABLE TO THOSE POINTS, AS WELL AS TO SOME RELATED ITEMS.

1. ALTHOUGH THE MILEAGE SPACING CRITERIA SET OUT FOR THE LPFM CLASS ARE BASED IN GENERAL ON PROTECTION TO THE 3 MV/M CONTOUR OF THE LPFM STATION, THE STANDARDS DO NOT PROVIDE FOR ACTUAL PROTECTION AGAINST INTERFERENCE IN THE EVENT OF CHANGES IN REGULARLY ALLOCATED FM STATIONS. BASED ON THE SUPPORTING DATA IN OUR REPORT OF NOVEMBER 1976, IT IS FELT THAT LPFM STATIONS WHICH ORIGINATE SUBSTANTIAL AMOUNTS OF LOCAL PROGRAMMING SHOULD BE GIVEN INTERFERENCE PROTECTION, TO AT LEAST THE 3 MV/M CONTOUR.

2. THE DRAFT PROCEDURE GENERALLY LIMITS LPFM STATIONS TO A MAXIMUM ERP OF 50 WATTS, AND A MAXIMUM EHAAT OF 60 METERS. ESPECIALLY IN URBAN AREAS, TYPICAL OF CANADA ZONE I, IT IS FELT THAT EITHER A "SUPER-LPFM" OR A "SUB-CLASS A" ALLOCATION OF 250 WATTS AT 90 METERS, WILL BE REQUIRED TO PROVIDE MEANINGFUL SERVICE IN AREAS OF HIGH NOISE LEVEL. IF, UPON CAREFUL EXAMINATION, IT IS CONCEIVED TO BE IMPOSSIBLE TO MAKE A GENERAL RULE OF ALLOWING ALLOCATIONS OF THIS SORT IN THE CHANNEL 221-300 PORTION OF THE BAND, THEN INDIVIDUAL EXCEPTIONS SHOULD BE ALLOWED, AND A STANDARD OF THIS LEVEL SHOULD BE INCORPORATED IN THE ALLOCATION RULES FOR CHANNELS 201-220, AS DISCUSSED BELOW.

3. As suggested in the report, the material included as Figure 2 in the report, taken from an earlier draft of BP-14, should be included in the final version.

4. As the report outlines, the Department has the necessary resources to conduct computer-derived channel searches for the LPPM channels available in a given location, and has done so in the past, upon request of an interested party. It is strongly recommended that a method for handling such requests be instituted. Since the procedure and the application form both presume the applicant's ability to prepare the application without the use of a consultant in simple allocation cases, the availability of a channel search conducted by the Department's program would undoubtedly cut down the number of faulty applications. Adoption of such a practice would be little different than the Department's current methods of channel selection for applicants in land mobile and microwave services.

5. As outlined in paragraph 3c of the report, there is no apparent reason why the use of channels 201-220 needs to be restricted to non-commercial and non-profit entities. Therefore technical standards should be adopted for the use of these channels as soon as possible. As outlined in (3) above, however, these need not be the same allocation standards as those in use for channels 221-300. It is recommended that additional classes which are assured of protected status be allocated, including 50 watt-60 meter, and 250 watt-90 meter classes, and that the necessity for class C and C₁ assignments in this band be carefully examined. Use of 201-220 for LPPM purposes necessitates a developed high power policy

FOR THESE CHANNELS AS WELL, IF CONFUSION AND ALLOCATION INEFFICIENCY
IS NOT TO RESULT.

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Figure 1: Required Signal to Interference Ratios

Figure 2: Portions of Earlier Draft of Proposed BP-14

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REPORT ON LPFM BROADCASTING STANDARDS:

This report has been prepared to carry out the requirements of a contract, OST-76-00066, issued by the Department of Communications to Hatfield and Dawson, Consulting Engineers. The Statement of Work for the contract includes:

1. An assessment of the applicability of the Department of Communications Proposed Broadcast Procedure 14, "Requirements for the Establishment of Low-Power FM Broadcasting Stations" and associated application form with respect to the needs and resources of community and student groups as well as low-power relay applications.

2. Consideration of the problems encountered by nonprofit community and student organizations in establishing and operating FM broadcasting undertakings in order to determine whether the Department of Communications low-power FM broadcasting standards might insure the economic availability of radio broadcasting as a means of distribution for nonprofessional local programming.

3. An examination of the limitations of the Canada-United States of America Agreement for the Allocation of FM Channels of October 15, 1947, as well as related working arrangements with special

emphasis on community and student broadcasting and the status of FM channels 201 to 221.

4. A synthesis of the research materials and assessments in the form of a final report with appropriate recommendations.

1. Although there is a consistent history of the use of AM channels, especially the six Class IV local channels for low-power program repeaters, the history of low-power FM operations in Canada is more recent. This probably occurs as a reflection of the low circulation of FM set useage until recently. Recent analysis, by CRTC and others, indicates that FM set availability is now at a level such as to make FM broadcasting the preferred method for low-power relay and program origination operation.¹ So far as we are aware, all existing low-power FM operations in Canada, whether program repeaters (CBC or private), or program originating undertakings, have been conducted on FM channels which could, either easily or by some "stretching," fit the accepted FM allocations policy for at least Class A allocation. Examples of various models which are currently in operation include the CFFM-FM 1 through 5 regional system in British Columbia; various individual CBC low-power repeater stations in British Columbia,

¹ CRTC Public Announcement, p. 5.

Newfoundland, NWT, and elsewhere; various remote community operated stations, the first of which is believed to have been CKQN-FM Baker Lake, NWT (CRTC 72-317); and low-power urban undertakings CINQ-FM and CKWR-FM. Although some of these examples operate with parameters (HAAT and ERP) greater than that which would normally be permitted under the Department's proposed LPFM standards, they all fit the LPFM model well in other respects. The development of undertakings of this type has followed a pattern, especially recently, that indicates a substantial growth in demand for new broadcasting undertakings which may be made to fit within the proposed standards technically.²

In this regard, the experience of the United States is useful. Generally, U.S. "LPFM's" are of two types: Class D educational (noncommercial and nonprofit) assignments (restricted to 10 watts transmitter power, and channel 201-220 only except in Alaska); and "FM translators," which are limited to rebroadcast by heterodyne methods of FM stations (10 watts transmitter power except 1.0 watts in U.S. Zone I-A and East of the Mississippi River, and in general limited to channels reserved for Class A operation). Further distinctions arise from the U.S. policy that Class D assignments are protected to their 1 mv/m contour (unless waived by the applicant at the

² See, for example, correspondence between Radio Waterloo (University of Waterloo) and DOC, August, 1976 (DOC file 6206-961 (DBC-E)).

time of the original licensing), while translator assignments are not given interference protection, except from other translators on an ad hoc basis.

U.S. Class D assignments have experienced growth that has been very rapid in recent years. "Translator" growth has also been rapid in the few years that they have been allowed, especially in rural areas. In view of the population distribution pattern in Canada there is no reason not to expect similar growth within the limitations of the allocations and licensing patterns that are determined by DOC and CRTC.

2. Examination of the "low-power FM" undertakings currently in operation indicates that there are two basic groupings which can be made. They can be divided first into those which are "repeaters" (by off-air pickup or audio feed) of other stations or networks, and those which exist primarily for locally originated programming. Secondly, they can be divided between those which serve rural areas, and those which serve urban enclaves or small to medium cities. It is worthwhile to examine these distinctions to determine if they should have a bearing on allocations policy. Contained within the CRTC proposed FM Radio Policy Statement is a strong disposition toward the encouragement of FM broadcast undertakings for first service to small communities as well as the licensing of such undertakings to student and community groups.³

³ A Proposal for an FM Radio Policy in the Private Sector, CRTC, April 19, 1973. See especially paragraph 5, p. 10, and Sections XIII and XIV.

Further emphasis of this point is contained in the Helm report, prepared for CRTC: "It is felt that the existing variety of models should provide the material on which to base a solid rationale for a fully developed policy ..."⁴ The Helm report proposes final policy consideration by CRTC in March, 1978, at a point when other FM related matters are scheduled for review. With respect to low-power repeater operations, the CRTC Public Announcement of July 13, 1976 envisions LPFM undertakings as suitable for remote areas where there are now less than two Canadian signals reliably receivable day and night.⁵ It would seem likely, however, that demand will be made for LPFM repeaters in some situations which do not precisely match CRTC's proposed criteria. An example discussed at some length by the author with two private consultants is the use of an LPFM for coverage fill-in in the deep null area of an AM directional pattern. The requirement for extremely deep nulls, especially in the nighttime patterns of many AM stations in Canada, is well known. Both urban growth patterns and basic AM allocations engineering difficulties often produce situations in which substantial populations reside outside the useable signal area of nearby AM stations. In some cases these populated areas are socially and economically a part of the urban center for which the AM station is licensed. What is being

⁴ Background Paper on Community Broadcasting in Canada, CRTC Internal Paper, p. 2.

⁵ CRTC Policy Statement, Private Low Power Rebroadcasting Stations for Remote Areas, paragraphs II-B and II-C.

suggested here is that despite the limitations imposed by paragraphs II-B and II-C of the CRTC LPFM policy, there is a virtual certainty that the broadcasting industry will desire to liberalize those proposed standards. Accession to this demand will, if it is judged by CRTC to be desirable public policy, produce program repeater LPFM's in areas where FM spectrum space is rapidly growing scarce.

3.a. As is the case with standards of allocation for low-power television, the draft standards for LPFM do not contemplate that interference protection be given to LPFM's from "regular" FM broadcast assignments. There is no doubt that assignment of LPFM's which would create interference to existing FM service would be poor policy. Definition of what constitutes existing FM service is not easy, however. The Department's proposed policy utilizes the same procedures as the existing high-power "regular" or "standard" allotments pattern, with high-power allotments and assignments protected to the 0.5 mv/m F50:50 maximum facilities contour, although exceptions are contemplated.⁶ It would probably be useful if the Broadcast Procedure 14 as finally adopted spelled out these exceptions in some detail.

One suggestion would be to state specifically that in the absence of other available channels LPFM's will be allowed to operate with less than "standard" spacing if they

⁶ Draft BP-14, paragraphs 4.3 and 5.2.

protect the actual predicted 0.5 mv/m contour of existing assignments. (In regions of dense allocation, especially Zone I, the normally protected 500 uv/m contour of some assignments will be located in urban areas with high noise levels. Under these circumstances there does not appear to be good cause for protection to the 500 uv/m contour of existing stations.) Another set of criteria which could usefully be spelled out in some detail is the exact terms under which assignments within 20 miles of the U.S. can be made. Both LPFM operations which provide program origination and those which act as program repeaters in rural and remote areas are likely to suffer few allocations difficulties. This is especially true if the proposed CRTC "first or second Canadian signal" rule is followed. It would seem advisable in remote areas wherever possible to assign LPFM's to channels which meet at least Class A spacing criteria (and to include the allocations in the allotment plan), as has been done with all the existing archetypical LPFM's. This would be of benefit in view of the point made in the Draft Procedure that LPFM's, unlike most LPAM's, can fairly easily change facilities to higher power operation.⁷

Consideration should probably be given to two relaxations of allocations standards as proposed in the Draft BP-14, where no other channel is available. The first of these is

⁷ Draft BP-14, paragraph 1.3.4.

waiver of the mileage separations for 10.6 and 10.8 MHz spacings. The area within the 25 mv/m contour of an LPFM will be quite small, and therefore the impact of the "IF beat" generation (which does not affect all sets) may well be masked by other local noise and desensitization. Secondly, consideration should be given to assignment of LPFM's at less than 800 kHz. spacing from high-power assignments in the same area where no other channel is available. At 600 kHz. spacing, a showing that the 100/1 ratio of signals undesired to desired (with respect to the high-power stations) is not exceeded in a populated area or within 30 above ground level should be required if this spacing is allowed as an exception. Consideration might also be given to assignments 700 kHz. spaced, if no other channel is available.⁸ There also appears to be no reasonable reason why LPFM's should be restricted to 50 watts ERP if use of a single higher power LPFM would obviate use of more than one standard LPFM. This is an especially useful concept for urban LPFM's, where noise levels are high, and where AM directional antennas may create large unserved populations. Consideration should be given in these cases to the creation of a power class between LPFM and Class A.

b. The mileage spacings suggested for LPFM's in the Draft Procedure are predicated on service to the 3 mv/m F50:50 contour. This seems a reasonable standard, although

⁸ See Figure 1 from FCC OCE Report RS 75-08, attached.

there does not appear to be any particular reason why an assignment could not suffer higher levels of interference if it provided some useful coverage and no more efficient channel could be found for it. The draft BP-14, like the Department's low-power television standards, considers LPFM's to be a secondary service, and as such to not be entitled to protection against subsequent changes in the allocation scheme or in individual assignments of higher power stations. Presumably this nonprotected status for LPFM's was derived by analogy with the television model. Considerable discussion was held with Department personnel regarding this matter. The major argument for nonprotection of LPFM's would appear to be that in so doing the general FM allocation scheme and procedures for changes are not altered. This has the effect of minimizing the impact of LPFM application processing on the workload of the Department. This last point is an important one. The Department staff's ability to respond quickly and competently to public and broadcast industry demands and pressures, as well as to those which originate from other areas of government, must not be allowed to deteriorate. Already the increase in activity in FM licensing has placed strains on staff which leads to the inescapable conclusion that further workload will affect the level of service. Deterioration of that level of service is clearly poor public policy. Nevertheless, it would be worthwhile to examine the question of interference protection

to some LPFM's. In particular, those LPFM's which are licensed to serve as local, community program origination undertakings may well deserve some protection of their service contours. As noted above, local, community program originating undertakings can serve an important role in meeting the objectives of the CRTC's FM policy. If nonprofit groups are to expend the time, energy, and money to go through the application process and construct LPFM facilities, it would be unfortunate if their efforts were to be rewarded later by extinction. It can be argued that the basic licensing policies of the CRTC will protect any undertaking providing socially useful service, but it should be clearly understood that basic technical allocations policy cannot be divorced from this kind of social policy question. The easiest and most visible method of protection of the future life of program originating LPFM's is for the allocations policy to contain an element of predisposition toward service area protection. There can be two levels technically in this regard: first, that existing LPFM's which meet some minimum standard as to unique local service be allowed to retain their channel assignment if they desire, even if their operation would cause interference to a subsequently authorized high-power facility; and second, that subsequent changes in the allocation table in order to be acceptable be required to include a technically acceptable allocation for any such LPFM which would have its previous

channel displaced. Absent such a showing, an applicant for TCOC involving a reallocation which precluded an existing program originating LPFM ought to have some method of having his proposal weighed against the LPFM in social utility terms, but a precise mechanism for this needs to be determined. The important point in this discussion is that a program originating LPFM in a small community, on a campus, or in an urban enclave may well be a more socially desirable broadcasting undertaking than a medium or even high-power facility proposed somewhere else.

The basic argument for having any allocations policy at all is that it is inefficient, economically unsound, and socially undesirable for broadcasting stations to be erected which do not have some basic portion of their service area protected against encroachment. Both AM and FM allocations standards in North America are interference limited, rather than noise limited, as a means of ensuring an adequate number of local programming sources in most communities. The argument here is that even LPFM programming originating stations ought not to be excluded merely because they are small. In remote areas, of course, this protection can be carried out by providing at least Class A channel status to LPFM allocations, as has been done in the past.

c. The increasing demand for FM spectrum space, especially in larger urban centers, has caused increasing

allocations problems. These have in some cases been exacerbated by the second harmonic relationship between the FM band and high VHF channels, and by the proximity of the FM band to assorted aeronautical radio services. As a consequence, previous restrictions on the use of the 88-92 MHz. portion of the FM band are in the process of examination by the Department. The proposed LPFM standards of BP-14 carry through restrictions on the use of channels 201-220 to noncommercial stations.⁹ Given the nature of legal controls on programming, advertising, and ownership of both new proposals and existing broadcasting undertakings which are exercised by the Canadian regulatory agencies, this kind of restriction appears to be unnecessary. The basic public policy issues which led to the reservation of channels 201-220 for noncommercial use in Canada appear to have been derived from the similar reservation by the FCC in the U.S. The circumstances of FM licensing in the U.S. and Canada are entirely different, however. In the first place, there does not appear to be the kind of distinction made by CRTC between commercial and noncommercial licensees that the FCC makes in the U.S. Past CRTC decisions allowing the implementation of FM undertakings by organizations not designed for profit have made a distinction between profit-making and nonprofit-making licensees, rather than between commercial and noncommercial licensees. Further, with admirable foresight, the FCC appears to have realized that in the

⁹ Draft BP-14, paragraph 4.1.

"demand-licensing" situation that exists in the U.S., a lack of reservation of specific channels for noncommercial (and nonprofit) use would have resulted in few or no channels being used noncommercially. The "lag" between commercial demand and noncommercial demand was recognized by the FCC based in part on the history of noncommercial "educational" AM stations in the U.S. It is important to understand that, in essence, a U.S. applicant who is legally and financially qualified, who meets minimum standards of program service, and who submits a technically correct application cannot be denied a license, as a matter of law.

These considerations simply do not hold in Canada. Consequently, one can confidently expect CRTC, in its broadcast licensing activities, to ensure that an appropriate number of licenses are granted to nontraditional types of licensee entities, who may generally be expected to propose nontraditional programming concepts. Ergo, the distinction between allowable uses for channels 201-220 and 221-300 needs to be eliminated, for both high-power and LPFM uses. Further, it would appear unwise to commence LPFM licensing in the absence of any developed high-power policy for channels 201-220, since it might well prejudice flexibility.

The remaining serious problem which must be dealt with in any serious discussion of use of channels 201-220 is the channel 6 adjacency problem. We are aware of three studies

regarding this matter: the FCC OCE Report R-6702, the DOC Report BTRB-2, and a report prepared by W. J. Kessler for the Corporation for Public Broadcasting for submission to the FCC in Docket 19183. All of these studies proceed toward their conclusions from a data base derived from measurements made on a sample of typical television receivers. This is realistic only if one presumes that receivers will never get better, and if one dismisses allocations policy as a tool for improving the quality of goods in the marketplace. Even within the restrictions of present receivers, however, it is certainly possible to make good use of channels 201-220. And, in areas where high-power use is truly impossible because of channel 6 reception, 201-220 offer allocations space for both LPFM's and even Class A assignments at less than maximum facilities. In some instances in the U.S. use of 201-220 in even grade B signal areas has been possible by a combination of judicious transmitter siting and receiver filter installation on some receivers.

d. Discussions are scheduled soon between representatives of the FCC and DOC with regard to the Canada/U.S. FM Agreement and related Working Arrangement. The U.S. is likely to request the use of its modified F50:50 curves for height derating calculation in the treaty area. It is not known if the U.S. will be interested in discussion of shortening transborder mileage spacings, based on the new curves.

One suggestion which might be of benefit in some cases would be for an additional class of allocation at some intermediate point between LPFM and maximum Class A parameters. This could, if feasible, provide a useful means for urban LPFM-type stations to counteract the effects of high urban noise levels and receiver desensitization from high-power stations. In some cases it might also prove useful since a single intermediate power facility might be able to be used as a repeater replacing several LPFM's. The benefit of this would be the lesser spectrum impact of the single intermediate assignment. If it is not feasible to assign this class of station in the channel 221-300 portion of the band, serious thought should be given to such a classification in the 201-220 portion. This may be especially appropriate in view of the pending Rulemaking before the FCC with regard to channels 201-220, in which the Commission's Notice of Inquiry states in part:

"... it may well be unrealistic, unnecessary and in fact wasteful to provide protection to maximum facilities. In such a situation we could either lower the limits themselves by any number of means or just not protect to the level of maximum facilities."

"Nor is it clear that the classes should be based on the zone system that exists for commercial stations. In Zone I ... and Zone I-A ... channels are labeled Class B which elsewhere are Class C. Even if a zone system is appropriate it does not follow that the borders must parallel those used for the commercial zones. It may well be that once we have more information in hand we will discover that a different set of classes of stations should be established."

"We could establish a class of stations between the present Class A and Class B."¹⁰

Another suggestion, in view of suggestions from several individuals within and without the Department, would be to allocate only channels up to the Class B limits, either in Canada Zone I, or in the country generally. Further, consideration might be given to generally lowering the protected contour distances of FM allocations in Zone I to be equivalent to the 1 mv/m rather than the 500 uv/m, or even to adopting a new set of F50:50 curves incorporating some terrain factors, for the purpose of predicting the interference potential of new LPFM assignments.¹¹

4. The Draft BP-14 and related application form are fairly detailed. This serves the very useful purpose of actually simplifying both the applicant's and the Department's work in preparation and processing of the application. Earlier drafts of BP-14 were even somewhat more detailed. It would probably be useful if the Procedure were to outline in even greater detail the exceptions that are going to be allowed. An earlier draft of the Proposed Broadcast Procedure 14 contained a fairly detailed explanation of "shortspacing" allocation procedure, which was not carried through to the final draft. This explanation is reproduced here as an Appendix,

¹⁰ Notice of Inquiry, FCC 76-240; Docket 20735, RM-1974, RM-2655. Federal Register, April 23, 1976, p. 16975.

¹¹ The protected contour distances are contained in Broadcast Procedure 13, at paragraph 3(e).

and it is suggested that it be included as a part of the channel search procedure of Appendix A of the Final BP-14. Further, graphic examples of one or two of the types of interference studies might be useful. As circulated, the Draft application form is much more detailed than most of the Department's applications for other services. This serves the very useful purpose of guiding the applicant as to technical requirements, and ensuring that the Department officials who process the application have as much material as possible from the beginning.

It is our understanding that regional offices of the Department, in processing applications for land mobile systems, follow a set procedure for determining the distinction between "simple" and "complex" systems, and notify an applicant if a proposed system is considered to be "complex" and therefore requires the services of an experienced engineering consultant. This rule applies whether the application is for a private system, or for a public agency such as a municipal utility, policy agency, or provincial government agency. As drafted, the proposed LPFM application form does not require the submission of a technical brief to justify the method of channel selection used or to show the service and interference considerations which pertain to the application. In this regard, the Department's resources for FM channel allocation studies, using a computer program, make it an easy task to conduct a

search for channels which meet the proposed spacing requirements. Indeed, the Department has already done so in at least one instance.¹² If some reliable method of minimizing frivolous requests, such as the imposition of a small fee, can be used then a policy of making such channel studies on request might well be one method of keeping down the number of technically deficient applications. Applications made using such Department-conducted channel searches, and therefore not requiring submission of a technical brief, will also be as inexpensive as possible to the applicant entity. These are especially important considerations for LPFM applicants who propose program origination, and thus do not serve the interests of a larger broadcaster in extending service. The latter can probably expect sympathetic interest and possible financial support from the larger broadcast station which is being retransmitted. Program origination applicants, however, must by necessity look to within the community proposed to be served for most if not all of their financial support. Therefore, the complexity and costs of applications should be as low as possible. Because of the necessary increase in the Department's workload that will result from the establishment of the LPFM class, technical submissions should be as simple as the allocations situation allows in each case. These two considerations are both met by having a complete, well-detailed Broadcast Procedure and an extensive application form.

¹² See correspondence, DOC file 6206-961 (DBC-E).

5.a. Because of the nature of FM receiver behavior, and because of multipath considerations in urban environments, LPFM's providing service to urban areas probably should be discouraged from stereo operation.

b. Similar considerations apply to SCMO operation. SCMO operation, particularly operation where the individual receiver installation is not under the control of the broadcaster (such as print-handicapped programming, ethnic programming, etc.), requires high values of signal strength. Where background music operators and users of SCMO for broadcast network relay purposes can invest in fairly extensive antenna installations and can justify high quality receivers, SCMO channel broadcasting to a general audience receivership does not allow this control over receiver/antenna installation. SCMO operation by LPFM's appears to be impractical, then, in most if not all cases.

c. The Department has followed a policy of allowing relaxed equipment standards for LPTV stations, and some interest was expressed in such relaxation for LPFM's as well. There are not really any technical standards that can be relaxed for LPFM's, since aural services do not have the kind of complicated timing and level standards that television does. Commercially manufactured repeater (heterodyne) type LPFM transmitters are a fairly recent development, and manufacturers of all equipment available can be expected to request

Department approval of their products. Some LPFM applicants, when proposing operation with audio program source(s) (from receivers, telephone or other links, or locally originated), may be desirous of using the "exciter" section of higher power transmitters previously type approved. With the advent of widespread stereo and solid state equipment there is a certain amount of this on the surplus market. The Department should consider a policy of allowing this type of equipment to be used, perhaps with the requirement that an output low pass (harmonic) filter be used, and that the applicant provide the specifications of the filter in the application. Filters of this type (125 MHz. 60-80 db. low pass filters for 20 watts or thereabouts) are available for well under a hundred dollars. There should be an expectation, but not an absolute requirement, that the audio standards of RSS 153 be met.

d. Hetrodyne repeater LPFM transmitters currently in use in the U.S. are required to meet a requirement that they cease to radiate in the absence of an input signal. This seems to be a reasonable requirement. Those fed by wire line or nonbroadcast radio link can be similarly designed so as to cease radiation in the absence of (1) RF signal from the receiver of the associated radio line, or (2) audio signal for some specified time from a wire line link. The application form itself should include a request for the name, address and telephone number of one or more responsible parties who can be

contacted on short notice by Department officials in instances where a malfunction of an LPFM requires immediate corrective action to eliminate interference. Licensees should also be required to update this information when necessary, and should be required to ensure that the information is provided to local Department offices. The standards of BP-8 appear to be the minimum reasonable for those LPFM's which are not repeater stations.

6.a. After discussion of the matter with one regional and one local Department official, it does not appear unreasonable that the Department's field personnel conduct an inspection of each LPFM, and ensure that it is installed in accordance with the terms of its TCOC. It is our understanding that this is done with the majority of nonbroadcast installations, and it would not appear (at least in the opinion of the field personnel contacted) to be an undue burden on the field offices.

b. In connection with (a), it would be an excellent practice to prepare a manual of inspection for the Department's inspections.

c. A concern voiced by Canadian Radio-Television and Telecommunications Commission personnel is the problem of service and technical standards by volunteer-operated stations. By requiring initial inspection of LPFM's by Department personnel, and by the issuance of a field manual, this problem can be alleviated somewhat.

7. There seems no doubt, as alluded at several points in this report, that the commencement of licensing for LPFM class stations will contribute to the Department's headquarters workload. And, this increase in staff responsibility will occur just as the increase in FM applications from both private broadcasters and the Canadian Broadcasting Corporation's Accelerated Coverage Program (ACP) is also reaching the Department. Already this expansion of FM licensing has created increases in processing time per application. If allowed to continue unabated these pressures could contribute to the deplorable state of affairs which exists at FCC (due to serious understaffing), where it is not unknown for acceptance for filing of simple FM applications (a stage roughly equivalent to issuance of a TCOC) to take 12 or even 18 months from date of filing. Such a situation is clearly not in the public interest, is contrary to the Department's historical policy of expeditious action wherever possible, and is ruinous to staff morale. Promulgation of LPFM standards and readiness to accept applications for LPFM's should include the requisite staff additions to handle the work required.

REQUIRED SIGNAL TO INTERFERENCE RATIOS
for 700 kHz. channel spacing

From FCC OCE Report RS75-08

- 20 -

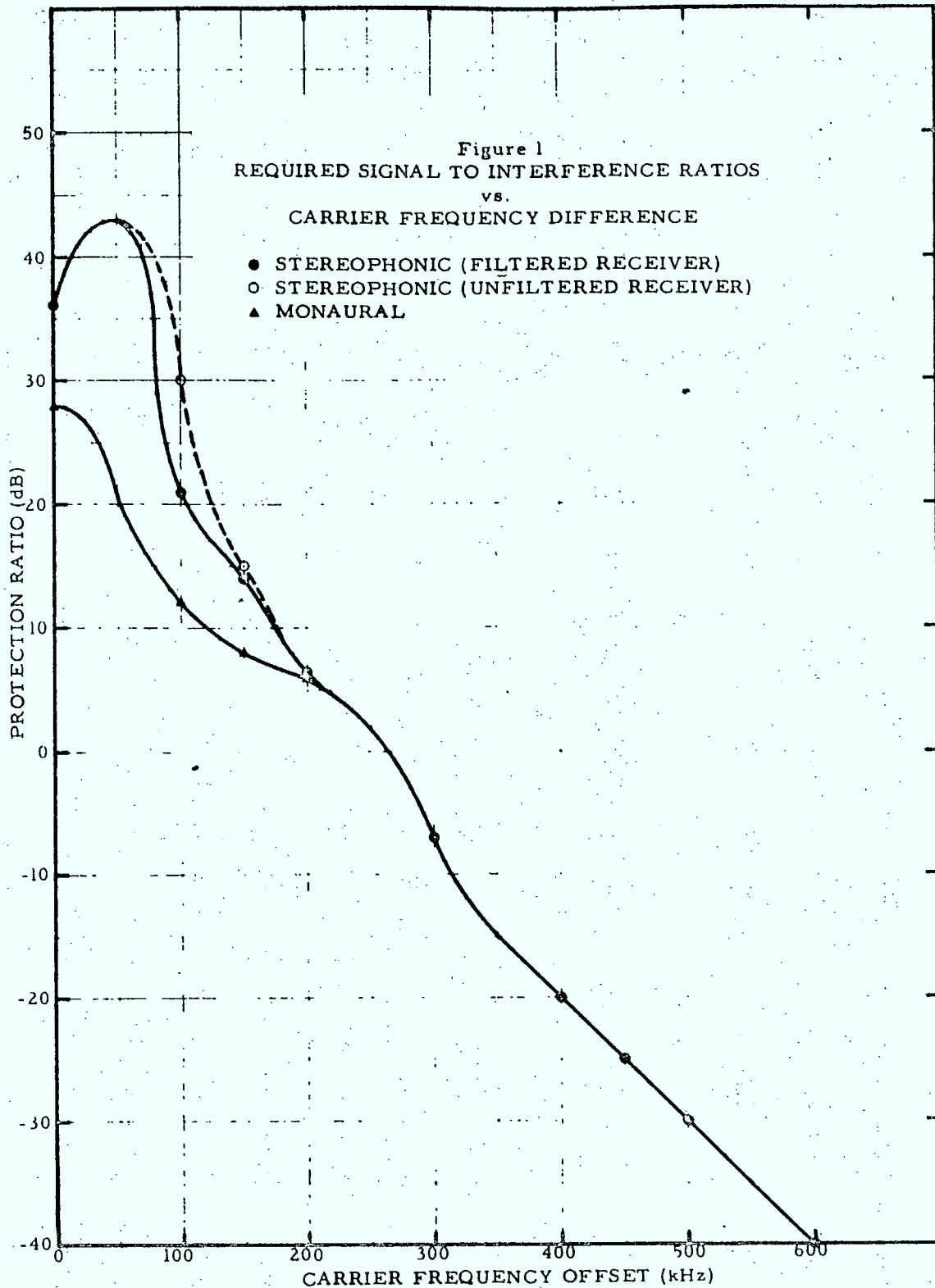


FIGURE 2

The channel search should be conducted in accordance with the following, listed in order of preference:

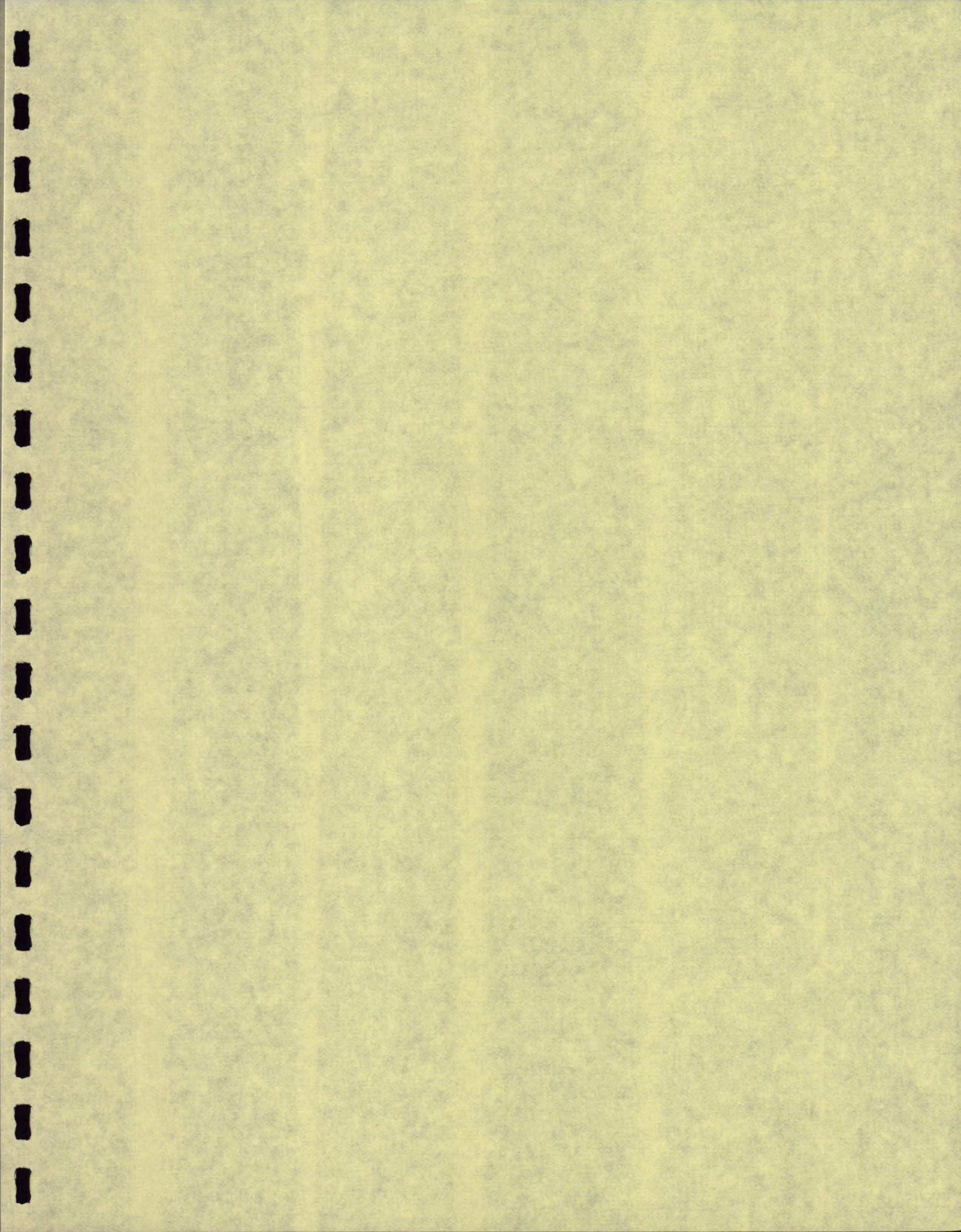
- (a) that the consultant demonstrate that interference would not be caused to U.S. stations over U.S. territory;
- (b) that an LPFM channel be found which does not cause theoretical interference to the protected service areas of regular Canadian allotments;
- (c) that, upon demonstration of the unavailability of a suitable LPFM channel in accordance with (b) above, a channel be found which only violates Table 1 to a minor extent with respect to an allotment which is not assigned. Regular stations which may be established at a later date on these allotments would have to accept a possible area of theoretical interference in the vicinity of the LPFM;
- (d) that, upon demonstration of the unavailability of a suitable LPFM channel as in (c) above, a channel be found for which it is demonstrated that the LPFM would not cause theoretical interference to the existing 0.5 mV/m contour of the regular stations. (This is possible if the regular station is using less than maximum allowable parameters.) The 0.5 mV/m contour is

given on coverage maps available from the Department. In the event the regular station later increases operating parameters, it would have to accept a possible area of interference from the LPFM;

- (e) that, upon demonstration of the unavailability of a suitable LPFM channel in accordance with (d) above, the proposed LPFM operator obtain mutual agreement with the regular station operator. The extent of the theoretical interference zone to the regular station coverage would have to be demonstrated;
- (f) if mutual agreement in accordance with (e) above cannot be obtained, the LPFM applicant may request that the Department and CRTC permit, as a special case, that the incoming LPFM cause a small degree of theoretical interference to the established regular station. The extent of this interference zone would have to be demonstrated.

BIBLIOGRAPHY

1. A Background Paper on Community Broadcasting in Canada, M. Helm (CRTC Internal Report)
2. Draft, Broadcast Procedure 14
3. Draft, Application for a Technical Construction and Operating Certificate for a New Low Power FM Station
4. Annual Report, CRTC; 1973-1974, 1974-1975
5. CRTC Public Announcement, Private Low-Power Radio Rebroadcasting Stations for Remote Areas; 13 July, 1976.
6. Calculations for Educational FM Channel Assignments in Areas Served by TV Channel 6, FCC OCE Report R-6702; 6/14/67
7. Engineering Statement: Docket 19183, in Comments of the Corporation for Public Broadcasting and National Public Radio, Inc.; December 1, 1971. (Comments in Docket 19183, before the FCC)
8. Canadian FM Assignments to October 15, 1976. (Internal Doc. List, from DBC)
9. A Proposal for an FM Radio Policy in the Private Sector, CRTC: 4/19/73
10. FM Broadcast Channel Frequency Spacing, FCC OCE Report RS75-08; 12/75.
11. Notice of Inquiry, FCC 76-240; April 23, 1976.
12. Interference Rejection Ratio Measurements on TV Sets ..., DOC Tech. Report BTRB-2; August, 1969.





Government
of Canada

Department of Communications

Gouvernement
du Canada

Ministère des Communications

BP - 14

ISSUE I

BROADCAST PROCEDURE

REQUIREMENTS FOR THE ESTABLISHMENT OF LOW POWER FM BROADCASTING STATIONS

EFFECTIVE DATE :

RELEASE DATE :

TELECOMMUNICATION REGULATORY SERVICE

BROADCAST PROCEDURE 14

REQUIREMENTS FOR THE ESTABLISHMENT OF LOW POWER FM BROADCASTING STATIONS

1. INTRODUCTION

1.1 Purpose

Pursuant to the Radio Act and Regulations made thereunder, this Procedure outlines the requirements to be followed in applying for Technical Construction and Operating Certificates for the establishment of Low Power Frequency Modulation (LPM) broadcasting stations using standard FM channels on an unprotected, non-interfering basis. This Procedure is intended to be used in conjunction with the document "Application for a Technical Construction and Operating Certificate for a Low Power FM (Frequency Modulation) Broadcasting Station" attached as Appendix B.

1.2 International Co-ordination

Under an informal arrangement between the Federal Communications Commission and the Department of Communications, all proposed low power FM assignments in Canada within 32 km of the common border are notified to the United States and acceptance of such assignments is obtained before authorization to implement the proposed station is granted.

2. LIMITING CONDITIONS

2.1 Power

The Effective Radiated Power (ERP) shall not exceed 50 watts in any direction. ERP is equal to the power supplied to the antenna multiplied by the relative gain (dipole) of the antenna in a given direction.

2.2 Antenna

Normally the maximum antenna height is 60 metres when the ERP is 50 watts. Should the antenna height exceed 60 metres, the ERP and height when plotted on Figure 1 should fall below or to the left of the curve. The implication of the term antenna height used in this Procedure is given by Section 7.

2.3 Transmitter

2.3.1 The transmitter shall be a model which has been type-approved under Radio Standards Specification 153.

2.3.2 Where an applicant for a rebroadcasting station proposes the use of a heterodyne translator, i.e. a device which receives on one frequency and transmits on another without demodulation, until such time as a specification may be issued for the type-approval of such equipment, submission must be made under Radio Standards Procedure 103 to establish its technical acceptability.

3. STATUS WITH REGARD TO PROTECTION TO AND FROM OTHER STATIONS

3.1 LPFM stations will have status comparable to that of a secondary service. In other words, except as provided for in Section 5., LPFM stations must not create interference to standard FM broadcasting stations, whether established before or after them. Conversely, an LPFM station is not entitled to protection from normally functioning standard FM stations, but only from other LPFM stations.

3.2 Protection to and from existing stations and allotments is normally ensured by adherence to the separation requirements set forth in Section 4.

3.3 The Department may require an LPFM station to take remedial action if the calculated protection to the protected contour of an existing regular station is not provided or if a change in channel allotments results in the prediction of interference to the new allotment from the LPFM station. In the latter case, it is expected that the applicant for the new allotted channel, if proposing to occupy the channel at or near its maximum parameters, will consider the interference impact to the LPFM station. Normally it is expected that only a frequency change by the LPFM station would be necessary, but cessation of operation by the LPFM station would be required if no other suitable remedial action is practicable. An LPFM station would not be expected to cease operation to protect a new unused allotment.

3.4 Should a new standard station or one which has changed parameters cause interference to an LPFM station but not receive any, the latter may either accept the interference or make application to change its operation to alleviate the interference.

4. CHOICE OF FREQUENCY

4.1 Frequencies in the band 88 to 108 MHz are assigned on the basis of 200 kHz channel separations with carrier frequencies every odd 100 kHz. For convenience these channels are numbered consecutively from 201 to 300.

4.2 A frequency must be chosen which meets the distance separations from existing stations and allotments as shown in Table 1 below:

TABLE 1: Minimum Separations (km) from Existing Stations and Allotments

Frequency Relationship (difference)	Class of Station				
	A	B	C1	C	LPFM
Co-channel	64	103	132	158	18
1st adjacent (0.2 MHz)	45	77	105	122	11
2nd adjacent (0.4 MHz)	35	68	95	113	6
3rd adjacent (0.6 MHz)	33	65	93	110	5
53rd or 54th adjacent (10.6 or 10.8 MHz)	5	13	21	25	2
Other Frequency Separations	No limitations *				

*While there is at present no limitation on channels separated by 800 kHz, applicants are reminded that under certain conditions this frequency relationship has been involved in reception difficulties.

Tables of allotments in Canada and in the U.S.A. and a list of Canadian FM assignments are available from the Department.

4.3 The separations in Table 1 are based on giving protection to the protected service areas of regular allotments as defined in Broadcast Procedures 4 and 13 and in return receiving protection from other LPFMs to at least the 3 millivolt per meter (mV/m) contour. A 3 mV/m contour is considered to be the signal strength required to provide satisfactory service in a metropolitan area. For a low noise environment or where an outdoor antenna is used, 0.5 mV/m may provide satisfactory service to a rural or a low

density residential area. The following Table 2 shows the required separations for an LPFM station to provide service up to the 0.5 mV/m contour. Applicants are encouraged to select channels which provide the separations given in Table 2 whenever possible.

TABLE 2: Separations (km) required to provide 0.5 mV/m coverage.

Frequency Relationship (difference)	Class of Station				
	A	B	C1	C	LPFM
Co-channel	119	198	220	222	42
1st adjacent (0.2 MHz)	58	114	142	167	23
2nd adjacent (0.4 MHz)	35	68	95	113	11
3rd adjacent (0.6 MHz)	33	65	93	110	10

4.4 These separations are based on an ERP of 50 watts and an antenna height of 60 metres for LPFM stations and maximum permissible parameters for other stations.

4.5 One systematic method of determining which channels are available is outlined in Appendix A.

5. SEPARATIONS LESS THAN THE MINIMUM

5.1 If it is impossible to find a frequency which meets all the minimum separations, a submission based on separations, none of which are more than 8 km short of the distances in Table 1, may be considered acceptable. The required separations between LPFM stations are already minimal and proposals to shorten them may be considered

only when mutual consent of all stations involved and Departmental approval is obtained. For these submissions a broadcast engineering consultant shall conduct a detailed channel search as well as determine and plot on a map the theoretical interference zones as well as the interference-free coverage of the proposed LPFM station.

6. QUALITY OF A REBROADCAST SIGNAL

- 6.1 An applicant for a rebroadcasting LPFM station must provide assurance that the programme material which he proposes to retransmit will be of acceptable technical quality.
- 6.2 If the programme material is to be picked up "off-air" or by a radio link, an analysis of the propagation path over which the signal is to be received and an estimate of the signal-to-noise ratio of the received signal which will be exceeded 99% of the time must be provided.
- 6.3 Paragraph 6.2 does not apply during night-time if the signal received "off-air" is transmitted by an AM station. In such cases an estimate of the quality obtainable under night-time conditions will be sufficient.
- 6.4 If the programme material is to be provided by some other means, an estimate of the signal-to-noise ratio is required. (For radio programme links, application should be made to the appropriate Regional office.)
- 6.5 If more than one rebroadcasting station is involved, the signal-to-noise ratios at the preceding stations in the chain must be taken into consideration.

7. COVERAGE PREDICTIONS

Estimates must be made of the predicted coverage, and submitted with the application. Based on the F(50,50) field strength curve (see Fig. 1, Broadcast Procedure 4), Figures 2 and 3 are to be used to estimate service areas as follows:

- 7.1 The distances to the 3 and the 0.5 mV/m contours should be determined from Figures 2 and 3.
- 7.2 Where the ground level elevation at the antenna site is within approximately 20 metres of the ground level elevation of the area served and the antenna is omni-directional, only one determination need be made for each contour.

- 7.3 When the ground level elevation at the antenna site differs from the elevation of the area served by more than the amount specified in 7.2, the distances to each contour should be determined in at least four directions including one in the direction of the principal community to be served, using the difference between the elevation of the antenna and the average ground level elevation in the pertinent direction as "transmitting antenna height" for Figures 2 and 3. The elevations may be chosen by picking representative points from a contour map.
- 7.4 When a directional (in the horizontal plane) antenna is proposed, the distances to each contour should be determined in at least four directions, including one in the direction of the principal community to be served, using the effective radiated power (ERP) in the pertinent direction in each case. When paragraph 7.3 above is also applicable both ERP and transmitting antenna height must be determined in each of the four or more directions.
- 7.5 Suitable point-to-point type field strength calculations may be used to replace or supplement the above sections 7.1 and 7.3 if the irregularity of the terrain justifies the use of such techniques.
- 7.6 The coverage predictions should be presented in written or tabular form and on a suitably detailed map with the transmitting site clearly marked and the 3 and 0.5 mV/m contours labelled. The map referred to in 8.3 would be suitable, supplemented by a map of the adjacent area if necessary. The method of calculating the Effect Height Above Average Terrain as shown in Appendix II of Broadcast Procedure 4 is simplified in this section for LPFM coverage areas.

8. APPLICATION PROCEDURE AND SUBSEQUENT ACTION

- 8.1 All necessary forms may be obtained from any regional office (Vancouver, Winnipeg, Toronto, Montreal or Moncton) or Departmental headquarters in Ottawa.
- 8.2 Application for a Technical Construction and Operating Certificate (TCOC) for an LPFM station should be made on Form 99-20, copy attached. The Canadian Radio-television and Telecommunications Commission (CRTC) has an application form for a broadcasting licence. The two applications should be filed simultaneously.
- 8.3 Form 16-651 must be filed to obtain clearance for the erection of an antenna. This form should be filed before, or at the latest at the same time as, the application as it must be successfully coordinated with Transport Canada before the application can be considered technically acceptable. This form should be accompanied by a map, scale 1:50,000 showing the antenna site. Such maps, if available, are obtainable from a Government of Canada Bookstore.

Maps of this scale are not available for all areas. In such cases a map of smaller scale, up to 1:250,000 could be used. The map should be of good quality, so that clear copies could be made from it.

- 8.4 The technical portion of the application will not be examined until all the necessary forms have been received. A submission cannot be considered technically acceptable until form 16-651 has also been approved by Transport Canada.
- 8.5 Retention of a Broadcast Engineering Consultant
- 8.5.1 Form 16-653 must be filed if a broadcast engineering consultant is to be retained. A list of consultants who subscribe to the Department's broadcast information service is available from all Departmental offices.
- 8.5.2 It should be noted that when a technical submission has been found to be incomplete, in that important information has been omitted and/or inaccurate technical data has been found, lengthy delays in processing the application have resulted. Such omissions and inaccuracies are often due to an unfamiliarity with the Department's Rules and Procedures. Broadcast engineering consultants maintain a library of all pertinent information in reference to design and allocation studies, and subscribe to the Department's service which provides them with the current allocation material, as well as the Rules and Procedures. Therefore, because of the afore-mentioned difficulties, it is often in the best interest of an applicant to obtain the services of a broadcast engineering consultant to advise in the matter of preparing applications for establishing LPFM stations.
- 8.5.3 It is, of course, the responsibility of the individual or firm, in so far as the practice of engineering is concerned, to comply with the appropriate legislation in the Province concerned.
- 8.6 Estimates must be made of the predicted coverage, and submitted with the application. Section 7 describes the method for predicting coverage.
- 8.7 Departmental officers are available if required to provide assistance. During examination of applications, if there is any missing, incomplete, or incorrect information, the applicant will be notified. If the necessary information is not supplied after a reasonable period of time, the application may be returned.
- 8.8 If a submission is found to be technically unacceptable, it will be held in abeyance for a reasonable period of time awaiting possible revisions before being returned.

- 8.9 The CRTC is kept informed of the Department's decisions regarding technical acceptability. Considering also its own application requirements, the CRTC decides whether to proceed with the application for a broadcasting licence.
- 8.9.1 If the application for a broadcasting licence is approved by the CRTC, and the Department has found the application for a Technical Construction and Operating Certificate to be technically acceptable, the applicant is given permission to commence construction of the station. A time limit of one year, which may be extended for good reason, is allowed for the construction. Periodic progress reports are prepared by Departmental district offices. If the applicant is unduly slow in proceeding with the construction of the station, permission to construct may be withdrawn.
- 8.9.2 If the application is denied by the CRTC, the submission is returned to the applicant.
- 8.10 When the construction is complete, the person responsible shall certify to the Department that the station is ready to commence operation in accordance with the technical submission and request permission to commence operation. Permission to commence broadcasting must also be sought from the CRTC.
- 8.11 Commencement of Operation
- 8.11.1 If the person certifying that the station is ready to commence operation is a broadcast engineering consultant, the Department will grant permission to commence operation at the same time as the CRTC grants permission to commence scheduled programming.
- 8.11.2 If the person certifying that the station is ready to commence operation is not a broadcast engineering consultant, the licensee will arrange with the Regional Office to have the installation inspected at a time consistent with inspection schedules for the area. Following a satisfactory report, the Department will grant permission to commence operation, providing CRTC approval for scheduled operation is obtained.

Issued under the Authority of
the Minister of Communications

Gilles Courtemanche
Director
Broadcasting Regulation Branch
Telecommunication Regulatory Service

APPENDIX A

SYSTEMATIC METHOD FOR DETERMINING

LPFM CHANNEL AVAILABILITY

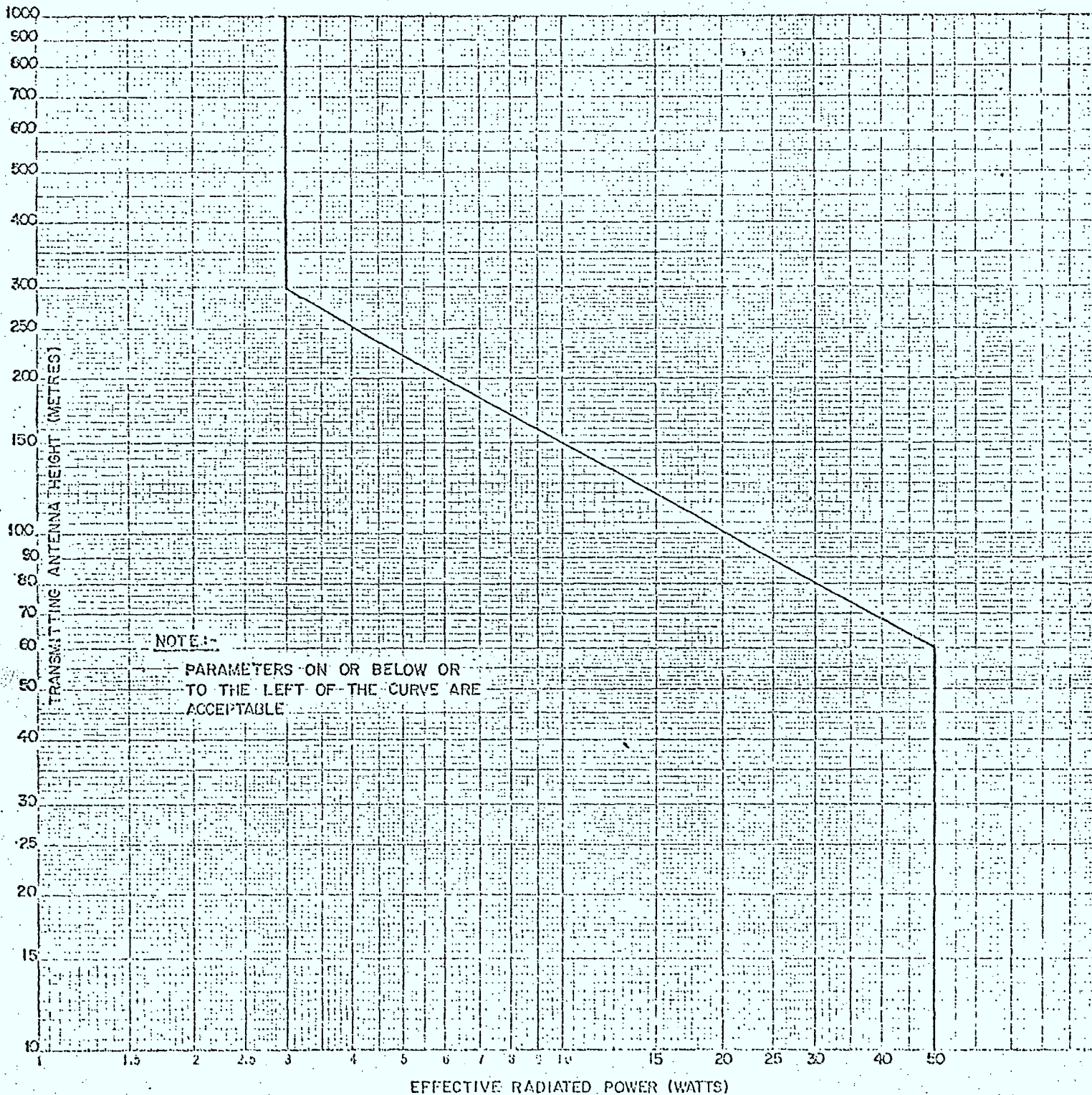
The following presents a systematic method for making a channel search.

- (a) List the numbers 201 to 300. Channels 201 to 220 should not be considered if there is reception of TV channel 6 in the proposed coverage area, or if there is a channel 6 allotment within 95 km of the LPFM transmitting site. If there is a limitation on the parameters of a channel 6 allotment, this distance may be somewhat reduced. Departmental advice can be sought in this regard.
- (b) On a suitable map, draw a circle centred at the proposed antenna site with a radius of 158 km (3.0 mV/m) if Table 1 is used, or 222 km if Table 2 is used.
- (c) Using the Canadian FM Allotment Plan for Commercial Channels starting at channel 221 and, if applicable, the Canadian FM Allotment Plan for Non-commercial Educational Channels starting at channel 201 and working up, check for centres located within the circle in (b). Measure on the map the distance to these centres and, using either Table 1 or Table 2, eliminate those channels which allotments to that centre would preclude; e.g. a centre 90 km distant has an allotment listed as 250B. From Table 1 under Class B, the required separation for co-channel operation is 103 km, but for first adjacent channels it is only 77 km. Thus channel 250 is eliminated from the list in (a). If 0.5 mV/m coverage is wanted, from Table 2, the required separation for first adjacent channels is 114 km. Thus channels 249, 250 and 251 cannot be used in this example.
- (d) If there are available channels after eliminating those affected by Canadian allotments, check whether the circle in (b) encloses any U.S. territory. Using the list "U.S. FM Allocations Within 190 Miles of the Canada-U.S. Border, Sorted by Channels," check again using either Table 1 or Table 2 as desired. Note that, depending on distance from the border, it may be necessary to check more than co-channel. If there are still available channels, select one and enter it under Section 5 of Appendix B as part of the required technical data.
- (e) If no channels are available using Table 2, repeat from Step (b) using Table 1.

- (f) If no channels are available, and Table 1 was used, check whether any channel was eliminated by being less than 8 km short of any required separations, excluding those to other LPFM stations. A proposal based on such a channel might be considered acceptable under these circumstances.
- (g) If there are still no channels available, the services of a broadcast engineering consultant may be retained to do a channel study; or, alternatively, advice may be sought from Departmental officers on the selection of a frequency.

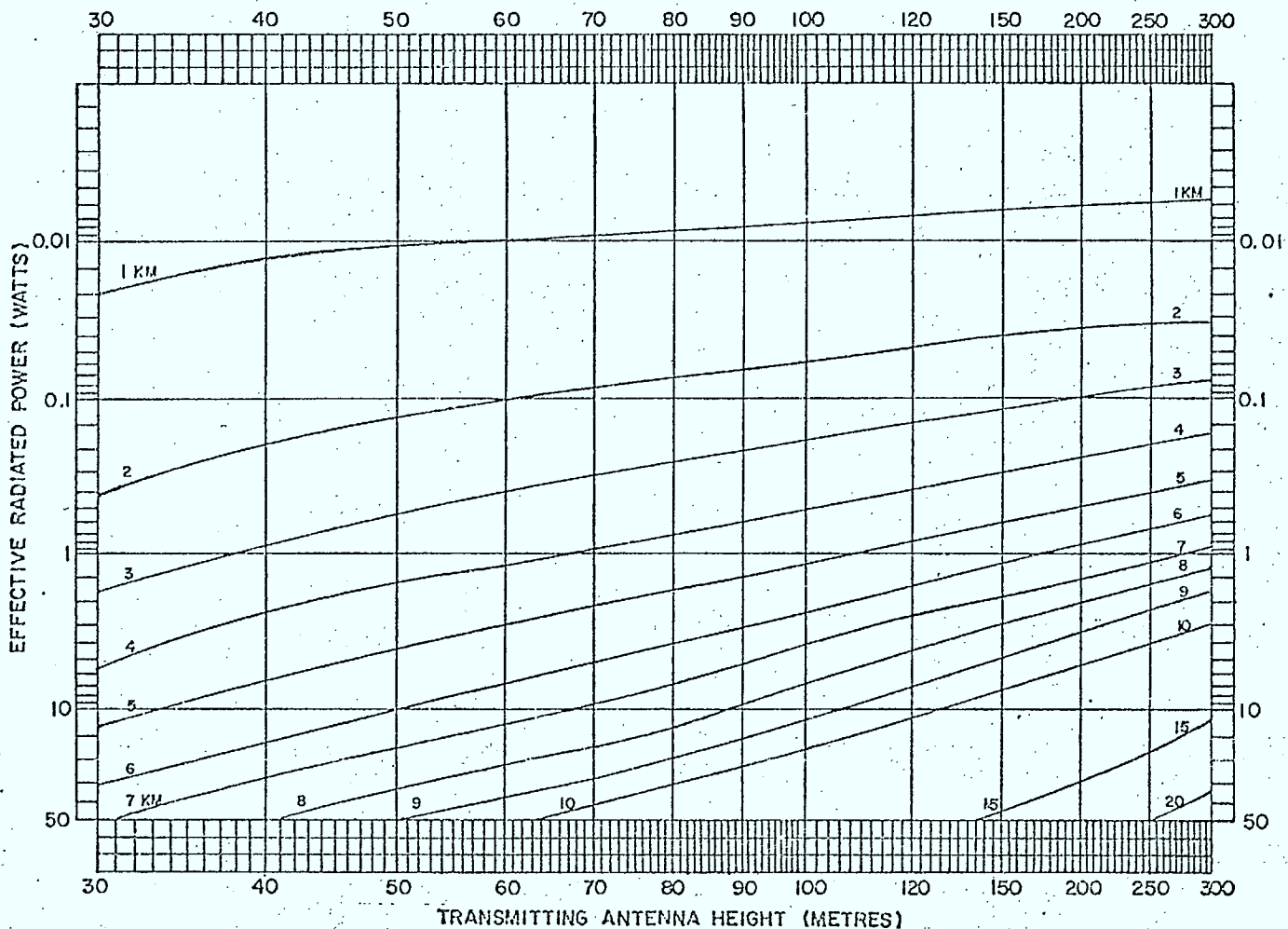
FIGURE 1

PARAMETERS EQUIVALENT TO AN EFFECTIVE RADIATED
POWER OF 50 WATTS AT A TRANSMITTING ANTENNA HEIGHT OF 60 METRES



KLUPPEL & LESSER CO.

FIGURE 2
0.5 MILLIVOLT PER METRE CONTOUR CALCULATOR

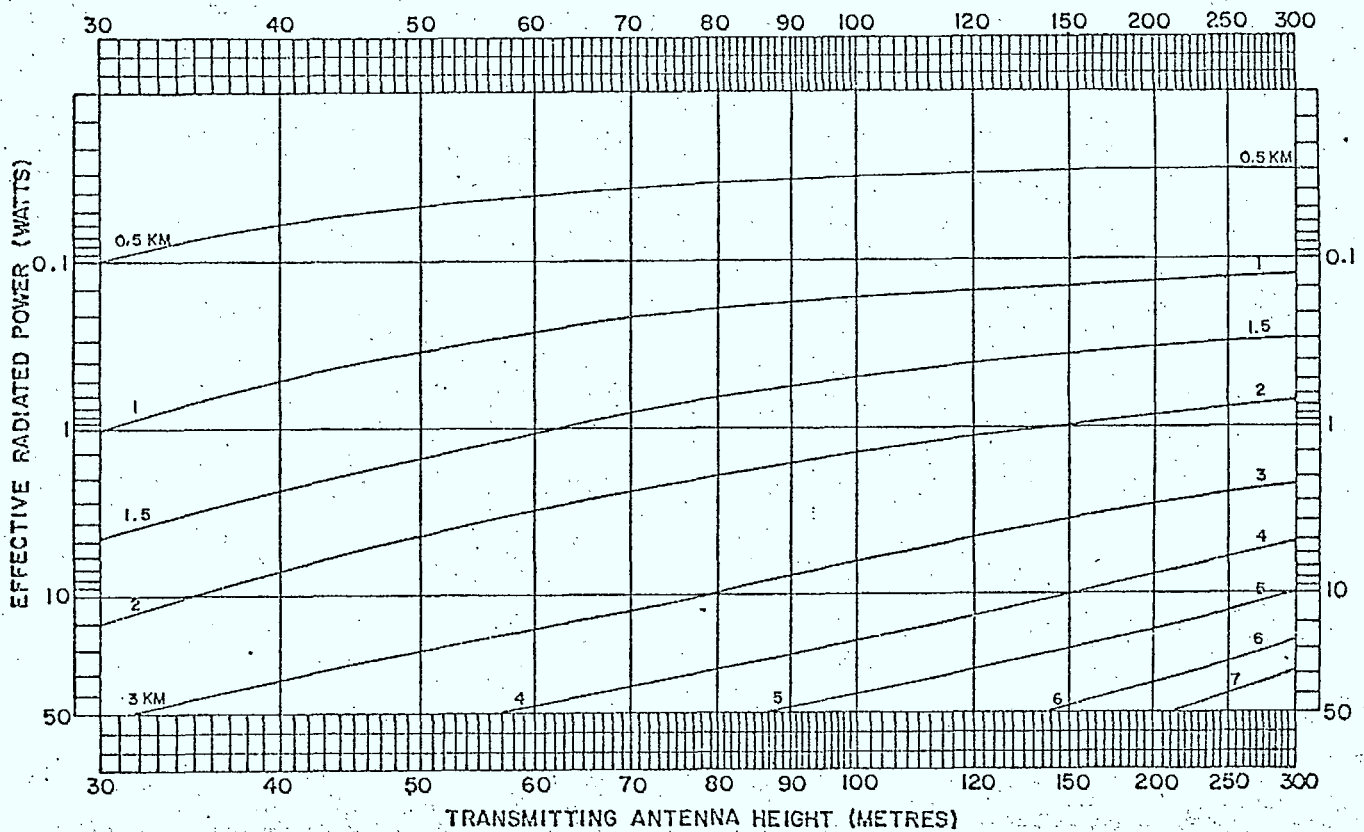


Use of Figure 2

1. Draw a vertical line corresponding to the transmitting antenna height in metres using the scales at the top and bottom of the figure.
2. Draw a horizontal line corresponding to the effective radiated power in watts using a scale at the side of the figure.
3. The location of the point of intersection of these lines relative to the curves labelled in kilometres gives the distance to the contour. Interpolate between curves if necessary in a vertical direction.

Example: Height 40 m, Power 10 watts. These lines intersect a little less than half-way between the 5 and 6 km curves, thus the distance to the 0.5 mV/m contour is approximately 5.4 km.

FIGURE 3
3 MILLIVOLT PER METRE CALCULATOR



Use of Figure 3

1. Draw a vertical line corresponding to the transmitting antenna height in metres using the scales at the top and bottom of the figure.
2. Draw a horizontal line corresponding to the effective radiated power in watts using a scale at the side of the figure.
3. The location of the point of intersection of these lines relative to the curves labelled in kilometres gives the distance to the contour. Interpolate between curves if necessary in a vertical direction.

2. STATION LOCATION

- a) Town(s) to be served
- b) Approximate ground elevation of town centre above mean sea level.
_____ metres.

3. STUDIO LOCATION (Address)

4. PROPOSED HOURS OF OPERATION

.....

TECHNICAL DATA

5. FREQUENCY

- a) _____ MHz or b) Channel _____

6. SITE (Transmitting Antenna Location)

- a) Geographical Co-ordinates (Degrees, minutes, seconds)
 _____ ° _____ ' _____ " North Latitude _____ ° _____ ' _____ " West Longitude
- b) Ground elevation above mean sea level (from a topographic map or survey) _____ m.

7. TRANSMITTER - The transmitter must be type-approved under Radio Standards Specification 153, or in the case of heterodyne translators, technically acceptable under Radio Standards Procedure 103, if a Radio Standards Specification has not been issued. The Department can supply information concerning approved equipment.

- a) Rated power _____ watts.
- b) Power to be used _____ watts.

8. TRANSMITTING ANTENNA

- a) Make and model _____

Omnidirectional Directional

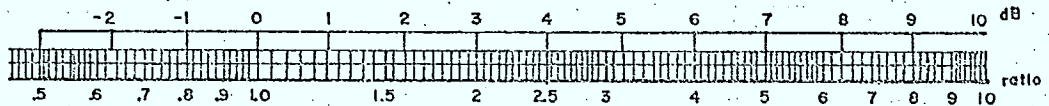
b) Polarization

Horizontal Vertical Circular

c) Gain (Power ratio) _____

See the following notes for assistance in completing this item.

- (1) In the case of a directional antenna, give the maximum power gain.
- (2) In the case of a directional antenna, the radiation pattern must be drawn on the attached Chart 1 or submitted on a separate sheet.
- (3) If the gain is given by the manufacturer in dB, the following scale may be used to convert to power ratio.



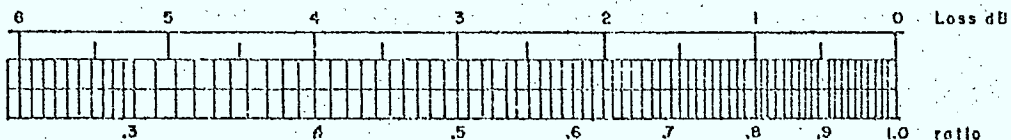
- (4) The antenna power gain must be stated relative to a half-wave dipole.
- (5) If antennas with different gains are used for horizontal and vertical polarization, make a double entry under 8.a), 8.c) and 10 following the entry for horizontal polarization with H and that for vertical polarization with V.

d) Height above ground of antenna centre _____ m
Use the higher value if two antennas are proposed.

9. TRANSMISSION LINE (from transmitter to antenna)

- a) Make and type number _____
- b) Type (e.g. foam core heliax) _____
- c) Diameter _____
- d) Loss per unit length _____ dB/
- e) Length _____ (same units as in d))
- f) Total loss (d) X e)) _____ dB
- g) Transmission line efficiency _____

The following scale may be used to convert the value in f) from dB to transmission line efficiency ratio:



10. EFFECTIVE RADIATED POWER (ERP)

This value must not exceed 50 watts.

Transmitter Power (7.d) X Antenna Power Gain (8.c) X Transmission Line Efficiency (9.g) _____ watts.

Note: If antennas with different gains are used for horizontal and vertical polarization, see Note (5) under 8.c).

11. MONITORS

Describe briefly the means used to monitor frequency, modulation, power and off-air audio signal quality. Facilities should be available to monitor stereophonic or other signals if transmitted.

Monitoring requirements are prescribed in detail in Broadcast Procedure 8. If it is proposed to operate with the transmitter unattended, submission must be made in accordance with Broadcast Procedure 8.

12. STEREOPHONIC BROADCASTING

An applicant for a low power FM broadcasting station may also apply to broadcast in the stereophonic mode. If so, the following information about the equipment proposed for this use must be supplied:

a) Modifications to transmitter, if any _____

b) Programme source(s). Check as many as are applicable.

- Recorded material, tapes or disks.
- Live microphone pick-up.
- Other, e.g. rebroadcast of another stereophonic signal.
Specify _____

Note: This section is a replacement for the technical submission normally required under Broadcast Procedure 6. However, the applicant is still required to meet the technical standards of Broadcast Procedure 6.

13. REBROADCASTING STATION

This section must be filled in only by applicants who intend to re-transmit the programming of another broadcasting station during all or part of the hours of operation.

- a) Source of material (call sign and location of station)

- b) Means of reception of signal
 Off-air Land Line Non-broadcast radio link
 Other, specify _____
- c) For off-air reception of an FM station
 (i) Estimate of the signal strength expected during at least 99% of the time. _____ microvolts per metre
 (ii) A path profile must be attached.
- d) For off-air reception of an AM station (535-1605 kHz band).
 (i) Field strength at proposed reception point according to Proof of Performance, extrapolated if necessary.
 Day _____ mV/m Night _____ mV/m
 (ii) Measured field strength at proposed reception point
 Day _____ mV/m Night _____ mV/m
 (iii) Night limit (unless a Class IV station) _____ mV/m
 (iv) Estimated quality obtainable at input to transmitter during night-time.
- e) For rebroadcasting stations using all programme sources except those received "off-air" from an AM station during night-time. Estimated signal-to-noise ratio (99% reliability) at input to transmitter _____ dB, including noise from preceding rebroadcasting stations, network links, etc.
- f) Is the receiving antenna located on the same tower as the transmitting antenna?
 (i) Yes. Height of receiving antenna above ground level _____ m
 (ii) No. (a) At what distance from transmitting tower _____ m
 (b) Height above ground level of antenna _____ m
 (c) Ground level elevation above mean sea level _____ m
 (d) Means of feed to transmitting system, e.g. land line, coaxial cable _____

14. BLOCK DIAGRAM OF SYSTEM

Enter information regarding equipment proposed in spaces provided.

Place an X through a box if that piece of equipment is not proposed.

Connect boxes by lines as appropriate.

Receiving Antenna

Make

Model

Gain

Transmission Line

Make

Type

Diameter

Length

Programme Sources

Microphone

Tape

Turntable

Off-air Receiver
 Make
 Model

Other
 (Specify)

Console

Stereo Gen
 Make *
 Model*

Monitors

Freq.
 Make *
 Model*

Transmitter
 Make *
 Model*
 Type-Approval No.*

Translator
 Make *
 Model*
 Tech. Acceptability No.*

Modulation
 Make *
 Model*

Power
 Make *
 Model*

Aural
 Make *
 Model*

Other

Transmission Line

Make

Type

Diameter

Length

Transmitting Antenna

Make

Model

Gain

*Applicants who are not able to supply this information at the time of application must provide this information to the Department and receive the Department's approval prior to commencement of construction of the station.

15. COVERAGE DATA

- a) Provide an estimate of the coverage area in accordance with Section 7 of Broadcast Procedure 14 using the following table or by stating the areas or communities within the predicted 3 millivolt per metre (mV/m) or 0.5 mV/m contours.

Azimuth Degrees from True North	ERP Watts	Distance (km) to Contour	
		3 mV/m	0.5 mV/m
*			

*Leave azimuth column blank if only one determination of each contour is required.

- b) Attach a map showing the predicted 3 and 0.5 mV/m contours.

16. DECLARATION

I, _____ (the said applicant)

(on behalf of the said applicant) do solemnly declare that:

- (a) the statements made in this application are, to the best of my knowledge and belief, true in all aspects;
- (b) that the provisions of the Radio Act, and the Regulations made thereunder have been examined and the applicant has a full knowledge of the responsibilities placed upon him by the said Act and Regulations, in particular the responsibility to agree to change the frequency of his LPFM station or to cease operation or take other suitable remedial action at the Department's order should interference be caused to the reception of a standard FM station. AND I make this solemn declaration believing it to be true and knowing that it is of the same force and effect as if made under oath and by virtue of the Canada Evidence Act. (If on behalf of an incorporated company, this declaration must be signed by an officer authorized on that behalf.)

DECLARED before me at

in the County of

this day of

.....

A Notary Public, Justice of the Peace,
Commissioner for taking Affidavits, etc.

.....

Signature of Applicant

Title:

Date:

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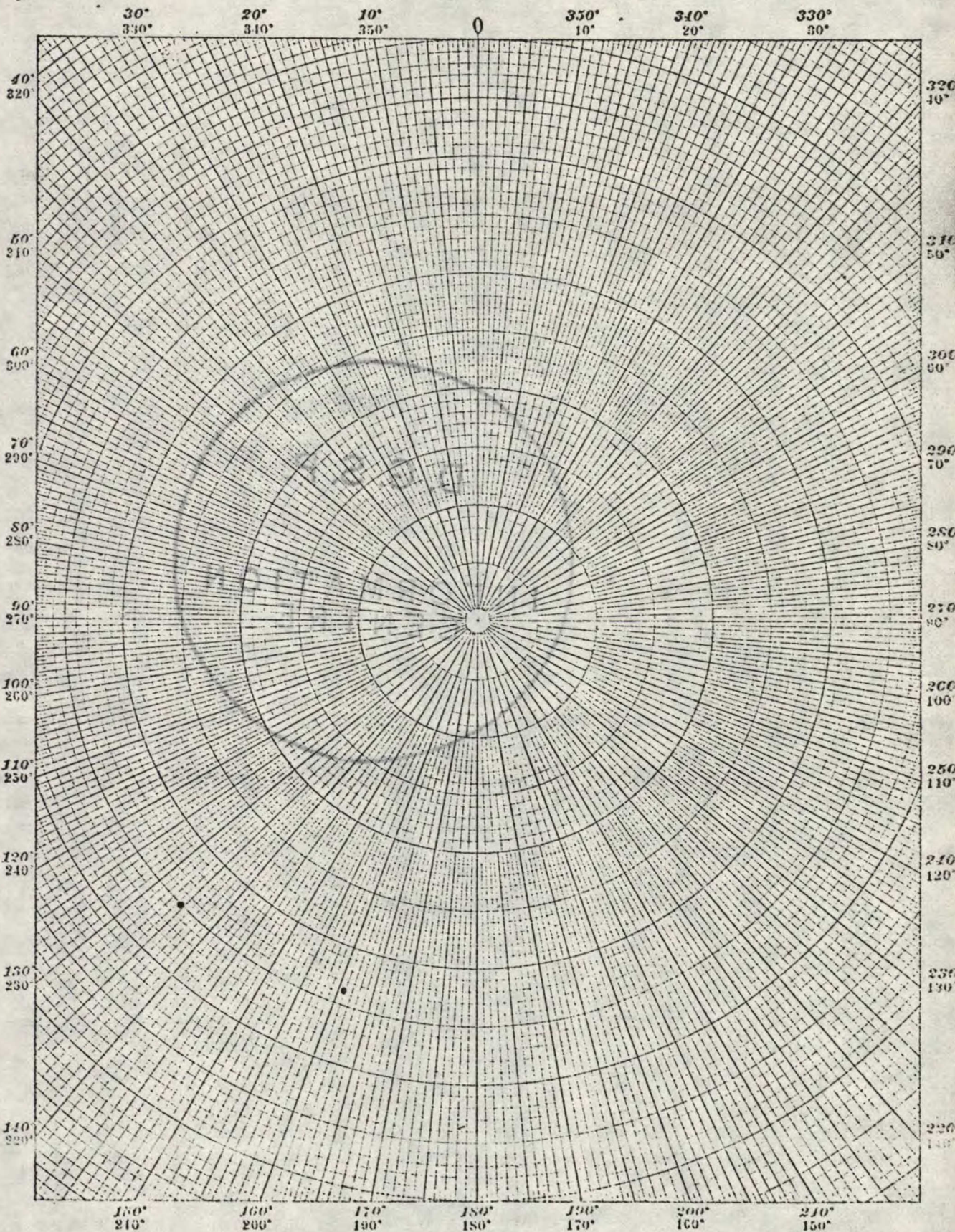


CHART 1

