

# **Department of Communications**

**EXTENSION OF SERVICES -  
PROPOSED POLICY FOR LOCAL  
TRANSMISSION OF MULTIPLE  
BROADCAST SIGNALS**



Government of Canada  
Department of Communications

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Ministère des Communications

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PROPOSED POLICY AND INTERIM CERTIFICATION GUIDELINES FOR THE  
USE OF BROADCASTING SPECTRUM  
FOR LOCAL TRANSMISSION OF MULTIPLE BROADCAST SIGNALS  
(GAZETTE NOTICE DGTN 007-81/DCTR 017/81  
SEPTEMBER 12, 1981)

DEPARTMENT OF COMMUNICATIONS  
OTTAWA, ONTARIO  
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Proposed Policy and Interim Certification Guidelines for the  
Use of Broadcasting Spectrum  
for Local Transmission of Multiple Broadcast Signals

Purpose

This paper describes a method of transmitting TV signals which should be considered by applicants proposing to provide television service to some geographically small, rural and remote areas. This proposed new method is in addition to those other methods by which television service is currently provided. The purpose of this paper is:

To solicit public comment on a proposed use of broadcasting spectrum for local transmission of multiple broadcast signals.

To present for comment a proposed set of authorization guidelines for these non-protected, low power, multi-channel local transmission broadcasting systems using a block of UHF television channels or, in certain cases, selected VHF channels.

To announce the immediate application of the criteria proposed in this paper on an interim basis subject to confirmation as a result of this review.

While the policy proposed herein is described in terms of television signals, the Department of Communications (DOC) is also prepared to authorize the transmission of multiple sound broadcasting signals using spectrum in the FM broadcasting band should response to this paper support such a requirement and if it appears that such operations would be technically practicable. The discussion that follows is for the large part equally applicable to the transmission of either television or sound broadcasting signals.

## Introduction

Canadians currently receive television signals in two ways. The first method involves the transmission of a signal from a nearby station and its reception by the general public "off-air" using television receivers and receiving antennae. The transmitting stations operate on VHF or UHF and provide a service which is protected although provision is also made for low-powered stations providing a service on a non-protected basis. With the second method, a cable company picks up the "off-air" signal on its antenna installation (or a distant "off-air" signal via microwave or satellite) and then distributes the signal to the home using coaxial cable. Cable companies usually distribute a number of signals, some locally originated, i.e. signals that could be picked up by a home antenna, and other signals that are received from distant locations. This paper describes an optional form of transmission in which several signals from outside the local area are received at a central point, transmitted from a local antenna installation and picked up off-air at the home.

While this proposed off-air broadcasting transmission system is limited by the amount of spectrum which may be made available and requires an incremental expense with the carriage of each additional signal, its possible use in transmitting a limited number of signals to a small group of individuals is perhaps worthy of consideration as an intermediate transmission technology. Due to the relative shortage of broadcasting spectrum, such operations would not be possible in most urban/suburban locations, nor even in rural areas in proximity to such locations.

The authorization of broadcasting transmitting undertakings (including a system such as that proposed here) or broadcast receiving undertakings (cable systems) is essentially a two part process involving both the Department of Communications (DOC) and the Canadian Radio-television and Telecommunications Commission (CRTC). The Department assesses spectrum considerations and the technical parameters under which an undertaking would be allowed to operate, e.g., frequency to be used, radiated power, antenna location, etc. This paper addresses the fundamental policy of usage of portions of the radio spectrum allocated to broadcasting, a scarce national resource, for the foreseen application, as well as some of the technical issues involved.

In a related matter, the CRTC has recently held hearings on the extension of service to underserved communities. Phase I hearings which were held in February 1981 dealt with applications for licences to deliver Canadian broadcasting services by satellite to various communities. The Phase II hearings will address the terrestrial distribution either by cable or by off-air broadcast facilities of whatever satellite delivered programming services are authorized. In addition to other modes of transmission, the Department is prepared to consider applications for the use of multi-channel off-air broadcast systems in satisfying this requirement for terrestrial transmission in such areas. Applicants proposing the use of such systems for local transmission of broadcast services are requested to submit responses in accordance with the draft certification criteria given in this paper to facilitate processing of their applications by the Department.

In terms of DOC's responsibilities, the importance of coordinating the use of spectrum for this purpose should not be underestimated. Even low powered transmissions can cause interference well beyond the nominal coverage areas. If installations are not

properly coordinated, then the potential exists for interference to or from other broadcasting stations in the vicinity. Another danger is that it may prove difficult or even impossible to add additional channels to those utilized in the original system at reasonable cost if care is not taken in selecting the original equipment and the block of channels to be used. The Department's concern in this matter is therefore to ensure that spectrum is used in a way that benefits the Canadian public as a whole, both now and in the future.

Factors Relating to the Possible Use of Low Power Broadcasting Transmitters for Local Transmission of Multiple Broadcast Signals

a) Spectrum Availability

Generally, it is assumed in this paper that, of the bands currently used for television broadcasting, only the UHF broadcasting band from 470 to 806 MHz has sufficient total capacity to permit the practical operation of multi-channel off-air television broadcasting transmission systems. Due to the more extensive use and lower capacity of the VHF television band, it is unlikely that a significant block of channels could be identified and retained for any length of time for the proposed transmission service in many rural and remote areas. It is anticipated that use of the VHF band is more likely to be disrupted by new assignments for conventional off-air television services in the area than would be the case for UHF. Notwithstanding this, the Department is prepared to consider the use of VHF TV channels where there is a reasonable potential for the use of VHF spectrum in the intermediate term without the likelihood of interference problems. This may limit or even preclude the use of VHF spectrum in certain communities.



In many rural and remote areas of Canada, there would appear to be no requirement in the foreseeable future for the use of all of the allocated UHF television spectrum for the establishment of conventional broadcasting undertakings and, in fact, there are no UHF TV channels currently allotted in many rural areas (i.e., planned and reserved for eventual use by broadcasting stations in that locality). In addition, from a radio environment point of view, with respect to the UHF band, many rural and remote localities are well insulated by terrain or distance from other communities. This reduces the possibility of interference between rebroadcast transmitters in adjacent areas and would permit the re-use of UHF channels closer than might otherwise be possible using the full separation distances specified in broadcast procedures for the assignment of conventional television channels.

It is considered advisable to use a block of channels to aid in any expansion of the number of signals transmitted after the initial start-up of the system and to limit the potential for interference to and from conventional broadcasting stations. In order to ensure that such spectrum utilization does not become a limiting factor in the evolution of conventional broadcasting in such areas and also for the convenience of individuals receiving the service, the Department feels it appropriate to require the co-siting of transmitters and the use of second adjacent channels for UHF systems and of first adjacent channels for VHF systems. Co-siting of transmitters is considered essential to allow the use of the above-noted adjacent channels and thus aids in maximizing the use of the spectrum which might otherwise be wasted due to technical constraints.

In certain areas of the country, even with the use of very low powered transmitters, careful coordination will be required to ensure that interference is minimized. This will be of particular concern in mountainous areas where a transmitter placed on top of a mountain could prevent the reuse of a number of UHF or VHF channels over a wide area.

In summary, therefore, in many rural and remote areas of Canada, spectrum availability would not appear to be a factor limiting the use of multiple off-air transmissions as a carriage medium. Notwithstanding the much higher use of the VHF band for television broadcasting, the use of a limited number of VHF channels may also be possible in certain areas. In certain more populous areas or in the vicinity of such areas, existing or forecast conventional off-air broadcasting requirements would constrain the development of such local transmission systems limiting the number of channels which could be used and making more likely the probability of the occurrence of interference even in the intermediate term.

b) Service Coverage

If off-air transmissions are to be used for the transmission of multiple broadcast signals then the received signal quality at any given distance from the transmitter should be comparable to that received from a conventional low power broadcast transmitter. In the case of a typical omni-directional rebroadcasting system with 100 watts transmitter power per channel (10 watts for VHF), signals could be received using an indoor antenna within approximately 2.5 to 3 km from the transmitter site. Between 4 to 5 km from the transmitting site, it should be possible for an individual to receive a signal on an outdoor antenna. A system with even one watt transmitter power and a directional transmitting antenna at a height of 15 metres could also provide an adequate signal to a distance of 1.5 to 4 km depending on whether UHF or VHF channels were used.



c) Availability and Variety of Services

In the case of the UHF band, it would appear that a transmission system could technically transmit quite a large number of signals on second adjacent channels using co-siting if the use of the whole of the UHF TV band were to be authorized in a given community to the exclusion of other neighbouring communities. Realistically, systems in a given area would have to share the spectrum resource, and for this reason, the number of UHF TV channels assigned would have to be limited to a reasonable, equitable level in any community. In any event, the number of broadcasting signals that could be distributed via a cable system is potentially greater than for a UHF rebroadcast system and certainly much greater than for a VHF system. In addition, the distribution of a large number of services would likely be more economical using a cable system. In practical terms, eight would appear to be the maximum number of UHF channels that would be assigned to any one system. The number for a VHF system could only be determined on a case by case basis; however, four is a more likely maximum. In the longer term, as more broadcasting services become available in most rural and remote communities, a cable system would become a more attractive means of distribution. In addition, the possible provision of two-way services is an advantage inherent with a cabled system. On the other hand, off-air transmission allows coverage to a wider, more dispersed community than would be practicable using cable.

d) Regulatory Considerations

Normally, low power (100 watts or less at UHF or 10 watts or less at VHF) TV broadcast transmitters operate on a non-protected, non-interference basis with respect to other broadcasting operations in accordance with Broadcast Procedure 22. However, a few such low power TV broadcast transmitters were authorized as protected stations on a special case basis provided they met the requirements of Broadcast Procedure 5.

In this document it is proposed that for any community, all multi-channel UHF broadcasting transmission systems be limited to a maximum transmitter power for each channel of 100 watts (10 watts for VHF) and as per existing practice, such systems would not be afforded full protection. Interference from or to these systems is not likely to be a problem in rural or remote locations where such operations might be permitted, particularly with careful coordination of broadcast frequency usage. While individuals in rural and remote locations might come to expect interference-free reception from their local broadcast systems, full interference protection would be given only to stations operating on allotted channels, i.e., channels contained in the Television Allotment Plan for Canada or channel allotments which may in future be "dropped in" to this plan in accordance with established separation criteria (a copy of the Plan may be obtained from the Director, Broadcasting Regulation Branch). If the use of a multi-channel, off-air, broadcasting system is restricted to less populated areas, the probability of interference is relatively low. Nevertheless, later in this document, a proposal is made concerning the level of interference protection to such systems which would appear to be appropriate with respect to other classes of broadcasting transmitting undertakings.

Although the certification of more than one multi-channel system in an area might be possible from a technical standpoint, if more than one system is established to serve a community, all transmitters must be co-sited to optimize efficiency of spectrum usage.

e) Scrambling of Signals

The use of scrambled signals is often proposed for local transmission. Since scrambling increases system complexity and cost, and may be capable of causing some degradation of signal quality, the Department favours proposals which do not include the use of scrambled

signals. Any proposal to use scrambling must comply with the appropriate technical specifications as given in provisional Telecommunications Regulation Circulars 59 and 60.

#### Summary

It is the Department's objective to promote the development of high quality telecommunications facilities thereby ensuring the supply of a full range of services to all areas of Canada as technology and economic resources permit. In this regard, any use of spectrum allocated to broadcasting used by multi-channel off-air broadcasting systems should be considered one step in the attainment of the above objective. At the same time, however, it is hoped that this proposed policy will aid in satisfying the legitimate needs of Canadians living in underserved areas of the country and will encourage the timely development and extension of both the Canadian broadcasting system and other telecommunications services into these areas.

From a review of the issues noted in this paper, it would appear that there may be some short-to-intermediate term advantages in some situations in the use of a multi-channel off-air broadcasting system as a means of local transmission of multiple broadcast signals. Appendix I contains proposed certification criteria for such transmission systems. It should be noted that the actual signals carried by the transmission system would, of course, be subject to CRTC authorization.

Comments on this proposed policy are invited. Instructions for the submission of such comments are given in the copy of the Gazette Notice concerning this matter contained in Appendix II.

In the interim, until comments are received and analyzed and a final policy is established in this matter, applicants applying for the use of such multi-channel, off-air transmission systems will be required to satisfy the draft certification criteria given in this paper to facilitate processing of their applications by the Department.

## Appendix I

### PROPOSED TECHNICAL CERTIFICATION CRITERIA

The use of multiple, low-power, broadcasting transmitting undertakings with Priority 2 or 3 protection as defined on page 3 would only be permitted as a multiple signal transmission medium under the guidelines specified below. While it might appear desirable in the opinion of some applicants to obtain Priority 1 (full protection) status for their local transmission systems, this would have to be weighed against the costs and technical complexities of doing so. While it is for the applicant to assess his protection requirements, the protection afforded these low-power, local transmission systems should be adequate in all but exceptional circumstances. In addition, while the applicant may choose to apply for a low-power, multi-channel off-air transmission system he should be aware of its benefits and limitations with respect to other means of transmission in both the short and longer term.

1. While the size of the block of channels per site is still under study, it appears feasible to consider up to 90 MHz as a basic block in the UHF TV band (470 to 806 MHz). Only second adjacent channels would be assigned in any block and therefore no more than 8 television services could be transmitted in any community. The extent of any proposed block of channels for a VHF system would be determined on a case by case basis but only in the most uncongested and remote areas would the assignment of more than 4 VHF channels be considered. (The assignment of even 4 VHF channels might be unlikely in many parts of the country.)
2. Each of the UHF or VHF channels to be assigned in the multi-channel broadcasting systems should bear the necessary distance separations as given in Table 1 or Table 2 respectively to all other channels allotted or assigned in the area. The certification of any such systems which would not provide these minimum distance separations to other broadcasting transmitting undertakings would be assessed on a case by case basis. Applicants would have to support their

case for reduced distance separations with sound engineering principles giving such reasons as the use of actual rather than maximum allowable station parameters and local terrain factors or geographical conditions, etc.

3. The requirements for the establishment of the broadcast transmitting undertakings set out in Broadcast Procedure 22 (B.P. 22) or alternatively B.P. 15 (provisional) must be satisfied.
4. If a scrambler/descrambler system is used, the proposed system must be in accordance with the provisional Telecommunications Regulation Circulars 59 and 60 issued by the Department.
5. The maximum transmitter power of each channel of the system must not exceed 100 watts for a UHF system or 10 watts for a VHF system.
6. The effective radiated power (ERP) of each of the signals transmitted from the system must be equal within normal engineering tolerances and must not exceed 1 kW for UHF or 50 watts for VHF. In addition, the combined effects of the ERP and antenna height of the system should be arranged so that the coverage will not extend beyond the area to be served.
7. The transmitting system must be co-sited. That is to say that either a single, broadband, multi-channel antenna system must be used for the transmission of all signals to be distributed in the community or, if more than one antenna is used for the transmission of the signals, all antennas must be located within a circle of radius 10 metres from the transmitter site.

For a system certified in accordance with the above authorization guidelines, the Department would be prepared to afford a certain level of protection. The Department has already established a hierarchy of television broadcasting undertakings - each one with



different priorities with respect to interference protection. It is proposed to give a multi-channel, off-air, broadcast transmission system a Priority 2 or 3 level of interference protection depending on the authorized power as noted below. These levels of priority are as follows:

Priority 1 - broadcasting or rebroadcasting stations assigned in accordance with Broadcast Procedure 5, and allotments as described in the current Television Allotment and Assignment Plan and any allotments which may in future be "dropped-in" to this Plan in accordance with established separation criteria.

Priority 2 - low power broadcasting or rebroadcasting stations\* operating on non-allotted channels with a transmitter output power of more than 1 watt and up to 100 watts at UHF or up to 10 watts at VHF.

- broadcast systems as described in this paper assigned to use a block of TV channels where the transmitter output power of each channel is greater than 1 watt and up to 100 watts at UHF or up to 10 watts at VHF and where only non-allotted channels are used.

Priority 3 - very low power television broadcasting stations operating with a transmitter output power of 1 watt or less as specified in B.P. 15 (provisional)

- broadcast systems as described in this paper assigned to use a block of TV channels where the transmitter output power of each channel is one watt or less.

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\*Stations whose transmitter power is greater than 100 watts - UHF or 10 watts - VHF must operate on allotted channels.

Priority 4 - UHF rebroadcasting stations used for relay purposes using 100 watts of transmitter power or less (10 watts for VHF) (i.e., whose coverage contour contains no population) and whose assigned channel is not allotted to the community (as proposed in the discussion paper entitled Use of Broadcasting Spectrum Allocations for Fixed Relays in Support of Broadcasting Operations, December 1979).

Stations with Priority 1 would have the greatest protection and those with Priority 4 would have the least. Any station with a higher priority could claim protection from interference from stations with lower priorities regardless of authorization date. Within each level of priority, a station would have protection from all other stations having the same level of priority which might be established after it was authorized. Should the operation of a broadcasting transmitting system established in accordance with these guidelines interfere with the reception within the protected coverage area of existing broadcasting stations with higher priorities or with the same priority but an earlier authorization date, remedial measures would have to be taken by the licensee even to the extent of terminating operations if another suitable set of channels could not be found. These remedial measures would also apply to the protection of future broadcasting stations with higher priorities.

There are 3 classes of priority I UHF and two categories of priority I VHF television broadcasting stations according to the following maximum parameters (or equivalent in the case of UHF):

For UHF

<u>Class</u>	<u>Effective Radiated Power (ERP)</u>	<u>Effective Height Above Average Terrain (EHAAT)</u>
C	1000 kW	300 m
B	100 kW	150 m
A	10 kW	100 m

For VHF

<u>Category</u>	<u>Effective Radiated Power (ERP)</u>	<u>Effective Height Above Average Terrain (EHATT)</u>
Channels 2-6	100 kW	300 m
Channels 7-13	325 kW	300 m

For a low power UHF or VHF rebroadcasting station (100 Watt or 10 Watt maximum transmitter power) proposing to use a block of UHF or VHF television assignments, the channels selected should satisfy the distance separations as shown in Tables 1 and 2 respectively.

TABLE 1

PROPOSED MINIMUM DISTANCE SEPARATIONS (KILOMETRES)\*\*BETWEEN LOW POWER (LP) UHF TELEVISION STATIONS AND OTHER UHF TELEVISION BROADCASTING STATIONS

Class of Station/System		Channel separation r, number of channels above (+) or below (-) the reference channel n										
Channel n to	Channel n + r	-15	-14	-4	0	+4	+14	+15	+8	+7	+3 & +2	+1
LP	to C	47	29	55	207	8	72	72	20	62	18	68
LP	to B	26	20	32	182	8	47	48	12	38	9	47
LP	to A	19	16	16	162	8	27	29	8	21	5	27
LP	to LP	16	15*	8*	120	8*	15*	16	6*	14	4*	14

\* A system of low power (LP) transmitters as would be used for local transmission purposes using second adjacent channels must operate on a co-sited basis. Therefore the channel separations noted (\*) above used by the system would be 0 km.

A system of low power transmitters used for local transmission must be separated from any other similar system by at least 120 km if any of the channels assigned in one system are the same as those assigned in the second system.

A system of lower power transmitters used for local transmission must be separated from any other similar system by at least 16 km if any of the channels assigned in one system are first adjacent channels to any of the assignments in the second system.

\*\* Distances are based on UHF low power operations having 1 kW ERP and 100 metres EHATT and other UHF stations operating with parameters according to the class designations shown on Page 4 Appendix 1.

TABLE 2

PROPOSED MINIMUM DISTANCE SEPARATIONS (KILOMETRES)\*\*

BETWEEN LOW POWER (LP) VHF TELEVISION STATIONS AND OTHER VHF TELEVISION BROADCASTING STATIONS

VHF Low Power Television Stations	Channels 2 - 6		Channels 7 - 13	
	Standard Parameter Television Stations	VHF Low Power Television Stations	Standard Parameter Television Stations	VHF Low Power Television Stations
Co-channel Distance Separation	170	100	150	70
First Adjacent Channel Distance Separation	90	20*	80	10*

\* Distance separation is required if stations are not co-located.

\*\* Distances are based on VHF low power operations having 50 watts ERP and 30 metres EHAAT and standard parameter stations operating with the maximum values given on Page 5 Appendix 1.

NOTICE PUBLISHED IN THE  
CANADA GAZETTE, PART I  
DEPARTMENT OF COMMUNICATIONS

RADIO ACT

Notice No. DGTN-007-81/DGTR-017-81

Release of a paper entitled

Proposed Policy and Interim Certification Guidelines for  
the Use of Broadcasting Spectrum for Local Transmission  
of Multiple Broadcast Signals

By means of this notice, the Department of Communications wishes to announce that it is seeking public comment on a proposed policy and interim certification guidelines for the off-air transmission of multiple broadcast signals in small communities. Generally, in areas where a shortage of broadcasting spectrum is not anticipated in the foreseeable future, the proposed policy specifies criteria which are to be applied immediately on an interim basis subject to confirmation as a result of this review in assessing applications for technical construction and operating certificates (TC&OC's) for systems employing multiple, low-power, non-protected broadcasting transmitters.

In view of the complementary relationship between the proposed policy, which provides another possible option for the local transmission of multiple broadcasting signals, and the current extension of service initiatives of the CRTC (Phase 1 and 2 governing the satellite delivery and local re-transmission of Canadian signals respectively), the attention of applicants for facilities to satisfy the local program delivery requirements of underserved communities, equipment suppliers and other parties interested in these extension of service proceedings, is particularly drawn to the above referenced paper.



The proposed policy deals with the use of non-protected, low-power, co-located transmitters. While allowing the use of both VHF and UHF television channels, it cautions potential applicants on the lower availability of VHF channels in many areas of Canada. The proposed policy also permits the use of scrambling techniques that conform with departmental technical standards.

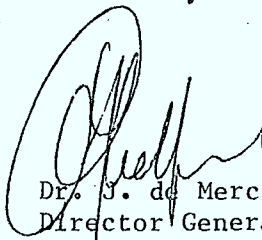
Copies of the paper, entitled Proposed Policy and Interim Certification Guidelines for the Use of Broadcasting Spectrum for Local Transmission of Multiple Broadcast Signals, may be obtained from Information Services, Department of Communications, 300 Slater Street, Ottawa, Ontario K1A 0C8 or from the Department's Regional Offices in Vancouver, Winnipeg, Toronto, Montreal and Moncton.

The Department invites written comments from all interested parties on this paper. Submissions should be addressed to the Director General, National Telecommunications Branch, at the above address and, to ensure consideration, must be postmarked on or before November 27, 1981 or received by other means by the same date. All submissions must cite the Canada Gazette, Part I publication date and the Notice number. Copies of these submissions will be made available for public inspection at the Department of Communications library, Room 1420, 300 Slater Street, Ottawa, and at all of the DOC Regional Offices as listed above.

Dated at Ottawa, this 2 day of Sept 1981.



V. Hill  
Director General  
National Telecommunications  
Branch



Dr. J. de Mercado  
Director General  
Telecommunication Regulatory  
Service