

FEDERAL COMMUNICATIONS COMMISSION  
WASHINGTON, D.C. 20554

August 15, 1990

In reply refer to:  
31220-C

Mr. Michael Binder  
Assistant Deputy Minister, Research and Spectrum  
Department of Communications  
300 Slater Street  
Ottawa, Ontario K1A 0C8  
Canada

Dear Mr. Binder:

The Department of Communications (DOC) of Canada has assisted the Federal Communications Commission (FCC) of the United States of America in developing a sharing arrangement for the land mobile service in the 896-901 MHz and 935-940 MHz bands. Discussions have taken place between representatives from both countries.

On behalf of Ralph A. Haller, the Chief of the Private Bureau, I would like to forward for your consideration an arrangement which we believe will satisfy both countries' spectrum needs in the 896-901 MHz and 935-940 MHz bands. This arrangement would be applied provisionally until the definitive entry into force of a replacement for the *Agreement Concerning the Coordination and Use of Radio Frequencies Above Thirty Megacycles per Second*, with Annex (*Above 30 MHz Agreement*), as amended.<sup>1</sup> We are prepared to undertake such a revision as part of an overall review and update of the *Above 30 MHz Agreement*.

- 
1. Exchange of Notes at Ottawa, October 24, 1962. Entered into force October 24, 1962. USA: *Treaties and Other International Acts Series* (TIAS) 5205; CAN: *Canada Treaty Series* (CTS) 1962 No. 15.

*Agreement Revising the Technical Annex to the Agreement of October 24, 1962* (TIAS 5205 / CTS 1962 No. 15). Effected by Exchange of Notes at Ottawa, June 16 and 24, 1965. Entered into force June 24, 1965. USA: TIAS 5833 / CAN: CTS 1962 No. 15.

Please confirm your acceptance of the attached arrangement as an understanding between our two agencies until revision of the *Above 30 MHz Agreement* can be concluded.

Sincerely,

Bruce A. Franca  
Deputy Chief Engineer

Enclosure

## Confirmation of Acceptance

The attached *Arrangement Between the Department of Communications of Canada and the Federal Communications Commission of the United States of America Concerning the Use of the Bands 896 to 901 MHz and 935 to 940 MHz Along the United States-Canada Border* is accepted as an understanding between our two agencies. This Arrangement will become effective on 17 September 1990 and is to be applied provisionally until the definitive entry into force of a replacement for the *Agreement Concerning the Coordination and Use of Radio Frequencies Above Thirty Megacycles per Second*, with Annex, as amended.

---

Michael Binder  
Assistant Deputy Minister  
Research and Spectrum  
Department of Communications

---

Ralph A. Haller  
Chief, Private Radio Bureau  
Federal Communications Commission

Date: September 17, 1990

Date: August 15, 1990

Our file: 4545-2

September 17, 1990

Mr. Bruce A. Franca  
Deputy Chief Engineer  
Federal Communications Commission  
2025 M Street  
Washington, D.C.  
20554

Dear Mr. Franca:

Thank you for your two letters dated August 15, 1990 and the two attached spectrum sharing arrangements between DOC and FCC for the land mobile service in the bands 821-824 MHz/866-869 MHz and 896-901 MHz/935-940 MHz.

I am pleased to accept these arrangements as an understanding between our two Agencies until the revision of the *Above 30 MHz Agreement* is concluded as noted in your letters.

I would like to take this opportunity to thank you and the other FCC officials who assisted in the development of these arrangements and look forward to continued cooperation, effort and understanding for future activities between our two Agencies.

Please find enclosed one copy each of the two arrangements and our Confirmation of Acceptance.

Yours sincerely,

Michael Binder  
Assistant Deputy Minister  
Research and Spectrum

**ARRANGEMENT BETWEEN THE DEPARTMENT OF COMMUNICATIONS OF CANADA AND THE  
FEDERAL COMMUNICATIONS COMMISSION OF THE UNITED STATES OF AMERICA  
CONCERNING THE USE OF THE BANDS 896 TO 901 MHz AND 935 TO 940 MHz  
ALONG THE CANADA-UNITED STATES BORDER**

1. *Scope*

- 1.1 This arrangement between the Department of Communications of Canada (DOC) and the Federal Communications Commission of the United States (FCC), herein referred to as the Agencies, covers the establishment and operation of land mobile radio services operating in the bands 896-901 MHz and 935-940 MHz along the Canada-United States border.
- 1.2 This Arrangement is subject to review at any time at the request of either Agency.
- 1.3 Special coordination arrangements may be initiated under this Interim Arrangement by either Agency and implemented subject to the approval of both Agencies.
- 1.4 This Arrangement will be applied provisionally until the definitive entering into force of a replacement for the *Agreement Concerning the Coordination and Use of Radio Frequencies Above Thirty Megacycles per Second*, with Annex<sup>2</sup>, as amended.<sup>3</sup>

2. *General Sharing Arrangements*

The frequency bands covered by this Arrangement are to be shared along the border as indicated below.

2.1 a) Canada

Canada has the unrestricted geographic use of the frequency bands 898.50625 to 901.000 MHz and 937.50625 to 940.000 MHz in the Sharing Zones within Canada except as specified in paragraph 3.

- 
2. Exchange of Notes at Ottawa, October 24, 1962. Entered into force October 24, 1962. USA: *Treaties and Other International Acts Series (TIAS) 5205/Can: Canada Treaty Series (CTS) 1962 No. 15.*
  3. *Agreement Revising the Technical Annex to the Agreement of October 24, 1962* (TIAS 5205 / CTS 1962 No. 15). Effected by Exchange of Notes at Ottawa, June 16 and 24, 1965. Entered into force June 24, 1965. USA: TIAS 5833 / CAN: CTS 1962 No. 15, as amended June 24, 1965.

b) United States

The United States has the unrestricted geographic use of the frequency bands 896.000 to 898.50625 MHz and 935.000 to 937.50625 MHz in the Sharing Zones within the United States except as specified in paragraph 3.

c) Shared Channels:

Both countries agree that the following paired channels are to be available for implementation of an Advanced Train Control System (ATCS):

896.8875/935.8875 MHz  
896.9375/935.9375 MHz  
896.9875/935.9875 MHz  
897.8875/936.8875 MHz  
897.9375/936.9375 MHz  
897.9875/936.9875 MHz.

The Agencies agree in principle to allow the Association of American Railways (AAR) and the Railway Association of Canada (RAC) appropriate operating agencies in the United States and Canada to work out details of their use of frequencies designated for ATCS in border areas. Within the sharing zones, any non-ATCS usage would require coordination with ATCS usage in the other country.

d) Because of the unequal distribution of the ATCS reserved frequencies, the following paired channels will be available to the United States within the sharing zones except where otherwise mentioned:

900.9750/939.9750 MHz  
900.9875/939.9875 MHz

2.2 There are three Sharing Zones:

a) Sharing Zone I:

This Sharing Zone is the area adjacent to the United States-Canada border East of longitude 121° 30' W. and extending a distance of 100 km within either country. Within this zone, the Agencies may use their allotted portions of spectrum subject to the Effective Radiated Power (ERP) and Effective Antenna Height (EAH) limits of Annex A, Table A1.

In the Great Lakes area there are significant land areas that are within 100 km of the international borders between the United States and Canada, but further than 100 km of any land mass of the other country. These areas contain several significant population centers that would benefit from additional spectrum if the lake shores were considered for purposes of sharing. With this in mind, the following cities shall be considered as falling outside of

Sharing Zone I: in the United States, Akron, Ohio; Youngstown, Ohio; Syracuse, New York; and in Canada, Kitchener-Waterloo, Ontario; Peterborough, Ontario.<sup>4</sup>

*b)* Sharing Zone II:

This Sharing Zone is the area adjacent to the United States-Canada border between 121° 30' and 127° W. longitude and extending a distance of 140 km within either country. Within this zone, the Agencies may use their allotted portions of spectrum subject to the Effective Radiated Power (ERP) and Antenna Height Above Mean Sea Level (AMSL) limits of Annex A, Table A2.

*c)* Sharing Zone III:

This Sharing Zone is the area adjacent to the Alaska-British Columbia/Yukon Territory border and extending a distance of 100 km within either country. Within this zone, the Agencies may use their allotted portions of spectrum subject to the Effective Radiated Power (ERP) and Effective Antenna Height (EAH) limits of Annex A, Table A1.

**2.3 Protection Zone:**

The Protection Zones are the areas adjacent to Sharing Zones I and III and extending from 100 to 140 km away from the United States-Canada border within both countries. There is no Protection Zone associated with Sharing Zone II.

**2.4 Each Agency has full use of the 896-901 MHz and 935-940 MHz bands within the Protection Zone in their respective country subject to the condition that base stations not exceed the maximum Effective Radiated Power (ERP) and Effective Antenna Height (EAH) limits given in Annex A, Table A1.**

**2.5 Two Frequency Channelling Arrangements**

Everywhere within the Sharing and Protection Zones, the Agencies will use the spectrum on the basis of two frequency channelling plan with mobile station transmitters in the 896-901 MHz band and base station transmitters in the 935-940 MHz band. A mobile station may also transmit on any frequency assigned to its associated base station.

**2.6 Use of the 896-901 MHz and 935-940 MHz Bands Outside of the Sharing and Protection Zones**

Beyond 140 km from the border, the Agencies have unrestricted use of these bands.

---

4. These cities are defined in Annex A, Table B as an area with the given center coordinates and encompassing a circle of 30 km radius.

### 3. *Special Sharing Arrangements*

3.1 In recognition of particular demographic circumstances, the Agencies agree on the unequal division of spectrum between Canada and the United States in the following two sectors:

a) Sector 1:

Sector 1 is defined to be the portion of Sharing Zone I in the United States and Canada, bounded on the West by 85° W. longitude and on the East in Canada by 81° W. longitude and in the United States by 80° 30' W. longitude.

In this Sector, the United States has the unrestricted geographic use of the bands 896.000 to 900.25625 MHz and 935.000 to 939.25625 MHz and Canada has the unrestricted geographic use of the bands 900.25625 to 901.000 MHz with frequencies 900.9750 and 900.9875 MHz available and 939.25625 to 940.000 MHz and with frequencies 939.9750 and 939.9875 MHz available.

b) Sector 2:

Sector 2 is defined to be the portion of Sharing Zone I in the United States and Canada bounded on the West in Canada by 81° W. and in the United States by 80° 30' W. longitude and on the East by 71° W. longitude.

In this Sector, the United States has the unrestricted geographic use of the bands 896.000 to 897.50625 MHz and 935.000 to 936.50625 MHz and Canada has the unrestricted geographic use of the bands 897.50625 to 901.000 MHz with frequencies 900.9750 and 900.9875 MHz available and 936.50625 to 940.000 MHz with frequencies 939.9750 and 939.9875 MHz available.

### 3.2 Coordination Necessitated by the Special Sharing Arrangements

Where, as a result of these special sharing arrangements, portions of the allotted bands of both countries overlap, proposed frequency assignments in the overlapping portions will be coordinated between the two Agencies in accordance with the procedures specified in Arrangement A annexed to the *Agreement Concerning the Coordination and Use of Radio Frequencies Above Thirty Megacycles per Second*, as amended 24 June 1965.

3.2.1 Coordination is required for assignments in the 897.50625 to 898.50625 MHz and 936.50625 to 937.50625 MHz bands in the following area:

- a) the geographical area in Canada enclosed by the United States-Canada border, the meridian 71° W.; and the line beginning at the intersection of 72° W. and the United States-Canada border, thence running North along meridian 72° W. to the intersection of 45° 45' N., thence running East along 45° 45' N. to the meridian 71° W., and

- b) the geographical area in the United States enclosed by the United States-Canada border, the meridian 71° W.; and the line beginning at the intersection of 44° 25' N., 71° W., thence running by great circle arc to the intersection of 45° N., 70° W., thence North along meridian 70° W. to the intersection of 45° 45' N., thence running West along 45° 45' N. to the intersection of the United States-Canada border.

The Agencies will channel and use the bands for assignments with 11 kHz or less necessary bandwidth on center frequencies spaced 12.5 kHz apart. The FCC will assign frequencies from 897.5125 to 898.0000 MHz and 936.5125 to 937.0000 MHz inclusive. The DOC will assign frequencies from 898.0125 to 898.5000 MHz and 937.0125 to 937.5000 MHz inclusive.

3.2.2 Coordination is required for assignments in the bands 897.50625 to 900.25625 MHz and 936.50625 to 939.25625 MHz in the following overlap areas:

- a) the geographical area in Canada enclosed by the meridian of 81° W. longitude, the arc of a circle of 100 km radius centered at 41° 58' N. latitude and 80° 30' W. longitude at the southern shore of Lake Erie and drawn clockwise from the northerly intersection with 81° W. longitude to intersect the United States-Canada border East of 80° 30' W., and the United States-Canada border;
- b) the geographical area in the United States enclosed by the meridian of 81° W. longitude, the arc of a circle of 100 km radius centered at 42° 39' 30" N. latitude and 81° W. longitude at the northern shore of Lake Erie and drawn clockwise from the southerly intersection with 80° 30' W. longitude to intersect the United States-Canada border West of 81° W., and the United States-Canada border.

Within an area of 30 km radius from the center city coordinates of London, Ontario, 42° 59' N. 81° 14' W., Canada shall have the full use of the bands 897.50625 to 901.000 MHz and 936.50625 to 940.000 MHz on an uncoordinated basis.

The Agencies will channel and use the bands for assignments with 11 kHz or less necessary bandwidth on center frequencies spaced 12.5 kHz apart. The FCC will assign frequencies from 897.5125 to 898.8750 MHz and 936.5125 to 937.8750 MHz inclusive. The DOC will assign frequencies from 898.8875 to 900.2500 and 937.8875 to 939.2500 MHz inclusive.

### 3.3 Arrangement in Sharing Zone II

- a) Frequencies in Sharing Zone II will be shared in accordance with the provisions of Section 2 of this Arrangement.
- b) In addition, each Agency may assign frequencies in the other country's block based upon the following conditions:
  - 1) Signals from these assignments will not exceed a predicted power flux density (PFD) of  $-107 \text{ dBW/m}^2$  at the border. The prediction of the PFD is calculated based upon a modified Longley-Rice point-to-point propagation model with time and location variables of 10%,<sup>5</sup> and 3 arc-second digitized terrain data.<sup>6</sup>
  - 2) Authorizations for stations using these frequencies will include a clause on the authorization documents issued by each Agency stating that any such authorization is subject to the condition that in the event the actual signals exceed  $-107 \text{ dBW/m}^2$  at or beyond the border, the Agency granting the authorization will take immediate action to eliminate any interference. This action could include revocation of the authorization.

- 
5. G.A. Hufford, A.G. Longley, and W.A. Kissick, *A Guide to the Use of the ITS Irregular Terrain Model in the Area Prediction Mode*, NTIA Report 82-100. [Available from U.S. Department of Commerce, National Technical and Information Service (NTIS), Springfield, VA 22161, Accession number PB 82-217977.]

A.G. Longley and P.L. Rice, *Prediction of Tropospheric Radio Transmission Loss Over Irregular Terrain - A Computer Method 1968*, ESSA Technical Report ERL 79-ITS 67. [Available from NTIS, Accession number AD-676-874.]

P.L. Rice, A.G. Longley, K.A. Norton, and A.P. Barsis, *Transmission Loss Predictions for Tropospheric Communication Circuits*, National Bureau of Standards Technical Note 101, Volumes I and II. [Available from NTIS, Accession numbers AD-687-820 and AD-687-821.]

6. For data covering the United States: *Level I - Digital Terrain Elevation Data*, United States Defense Mapping Agency. These data are available from the: United States Geological Survey; 507 National Center; Reston, VA 22093; USA, as *Digital Elevation Model Data* in  $1^\circ \times 1^\circ$  units. Two of these units are required to cover each  $1^\circ \times 2^\circ$  map (1:250,000-scale quadrangle) from which the data were produced.

For data covering Canada: *Level I - Digital Terrain Elevation Data*. These data are available from: Department of Energy, Mines and Resources; Canada Centre for Mapping; Topographical Mapping Division; 615 Booth Street; Ottawa, Ontario K1A 0E9; Canada.

- 3) Such authorizations will not be entitled to protection from stations in the country that has the primary use of the authorized frequency.

#### 4. *Use of Frequencies Allotted to One Agency by the Other Agency*

Frequencies primarily allotted for unrestricted use of one Agency may be assigned by the other Agency for use within the sharing zones in its country under the following conditions:

- a) The maximum power flux density (PFD) at the border of the primary user's country does not exceed the limits specified in Annex A, Tables C1 and C2 (the spreading loss shall be calculated using the free space formula taking into account any antenna discrimination in the direction of the border).
- b) Authorizations for stations using these frequencies will include a clause on the authorization documents issued by each Agency stating that any such authorization is subject to the condition that in the event the actual signals do not meet the values in Tables C1 or C2 at or beyond the border, the Agency granting the authorization will take immediate action to eliminate any interference. This action could include revocation of the authorization.
- c) Such authorizations will not be entitled to protection from stations in the country that has the primary use of the authorized frequency.

#### 5. *Exchange of Assignment Information*

The Agencies shall exchange information indicating their assigned frequencies every three months. As far as practical, proposed or planned assignments should be included at a minimum of once per year. Each Agency shall supply the information called for in Appendix 3 to Arrangement A of the *Agreement Concerning the Coordination and Use of Radio Frequencies Above Thirty Megacycles per Second*, with Annex, as amended.

- a. Licensee identifier
- b. Class of station
- c. Number of stations - Base and Mobile
- d. Frequency
- e. Location and coordinates
- f. Locality or area of reception
- g. Class of emission and necessary bandwidth
- h. Power (mean) delivered to the antenna
- i. Antenna gain (dB) and azimuth, when available
- j. Antenna elevation above mean sea level (MSL)

## ANNEX A

### LIMITS OF EFFECTIVE RADIATED POWER AND ANTENNA HEIGHT

Effective Radiated Power (ERP) is defined as the product of the power supplied to the antenna and its gain relative to a half-wave dipole in a given direction.

For base stations in the Protection Zones and Sharing Zones I and III, Table A1 lists the limits of Effective Radiated Power (ERP) corresponding to the Effective Antenna Height (EAH) ranges shown. In this case, Effective Antenna Height is calculated by subtracting the Assumed Average Terrain Elevation given in Table A3 from the antenna height above mean sea level.

**Table A1**

Effective Antenna Height (EAH)		ERP Watts (Maximum)
Metres	Feet	
0 - 152	0 - 500	500
153 - 305	501 - 1000	125
306 - 457	1001 - 1500	40
458 - 609	1501 - 2000	20
610 - 762	2001 - 2500	10
763 - 914	2501 - 3000	10
915 - 1066	3001 - 3500	6
1067 - 1219	3501 - 4000	5
Above 1219	Above 4000	5

Limits of Effective Radiated Power (ERP) Corresponding to Effective Antenna Heights of Base Stations in the Protection Zones and Sharing Zones I and III.

For base stations in Sharing Zone II, Table A2 lists the limits of Effective Radiated Power (ERP) corresponding to the antenna height above mean sea level ranges shown.

**Table A2**

Antenna Height Above Mean Sea Level		ERP Watts (Maximum)
Metres	Feet	
0 - 503	0 - 1650	500
504 - 609	1651 - 2000	350
610 - 762	2001 - 2500	200
763 - 914	2501 - 3000	140
915 - 1066	3001 - 3500	100
1067 - 1219	3501 - 4000	75
1220 - 1371	4001 - 4500	70
1372 - 1523	4501 - 5000	65
Above 1523	Above 5000	5

**Limits of Effective Radiated Power (ERP) Corresponding to Antenna Heights Above Mean Sea Level of Base Stations in Sharing Zone II.**

Table A3 lists the values of Assumed Average Terrain Elevations (AATE) within the Sharing and Protection Zones on both sides of the United States-Canada border.

Where EAH = Antenna Height Above Mean Sea Level - AATE

Table A3

Longitude ( $\phi$ ) (°West)	Latitude ( $\Omega$ ) (°North)	Assumed Average Terrain Elevation			
		United States		Canada	
		Feet	Metres	Feet	Metres
$65 \leq \phi < 69$	$\Omega < 45$	0	0	0	0
"	$45 \leq \Omega < 46$	300	91	300	91
"	$\Omega \geq 46$	1000	305	1000	305
$69 \leq \phi < 73$	all	2000	609	1000	305
$73 \leq \phi < 74$	"	500	152	500	152
$74 \leq \phi < 78$	"	250	76	250	76
$78 \leq \phi < 80$	$\Omega < 43$	250	76	250	76
"	$\Omega \geq 43$	500	152	500	152
$80 \leq \phi < 90$	all	600	183	600	183
$90 \leq \phi < 98$	"	1000	305	1000	305
$98 \leq \phi < 102$	"	1500	457	1500	457
$102 \leq \phi < 108$	"	2500	762	2500	762
$108 \leq \phi < 111$	"	3500	1066	3500	1066
$111 \leq \phi < 113$	"	4000	1219	3500	1066
$113 \leq \phi < 114$	"	5000	1524	4000	1219
$114 \leq \phi < 121.5$	"	3000	914	3000	914
$121.5 \leq \phi < 127$	"	0	0	0	0
$\phi \geq 127$	$54 \leq \Omega < 56$	0	0	0	0
"	$56 \leq \Omega < 58$	500	152	1500	457
"	$58 \leq \Omega < 60$	0	0	2000	609
"	$60 \leq \Omega < 62$	4000	1219	2500	762
"	$62 \leq \Omega < 64$	1600	488	1600	488
"	$64 \leq \Omega < 66$	1000	305	2000	609
"	$66 \leq \Omega < 68$	750	228	750	228
"	$68 \leq \Omega < 69.5$	1500	457	500	152
"	$\Omega \geq 69.5$	0	0	0	0

Values of Assumed Average Terrain Elevation within the Sharing and Protection Zones on Both Sides of the United States-Canada Border

**Table B**

Location	Coordinates	
	Latitude	Longitude
Akron, Ohio	41° 05' 00" N.	81° 30' 40" W.
Youngstown, Ohio	41° 05' 57" N.	80° 39' 02" W.
Syracuse, New York	43° 03' 04" N.	76° 09' 14" W.
Kitchener-Waterloo, Ontario	43° 27' 30" N.	80° 30' 00" W.
Peterborough, Ontario	44° 18' 00" N.	78° 19' 00" W.

Center coordinates of cities in the United States and Canada that for the purposes of this agreement shall be considered as falling outside of Sharing Zone I.

**Table C1**

Effective Antenna Height (EAH)		PFD dBW/m <sup>2</sup> (Maximum)
Metres	Feet	
0 - 152	0 - 500	-84
153 - 305	501 - 1000	-90
306 - 457	1001 - 1500	-95
458 - 609	1501 - 2000	-98
610 - 762	2001 - 2500	-101
763 - 914	2501 - 3000	-101
915 - 1066	3001 - 3500	-103
1067 - 1219	3501 - 4000	-104
Above 1219	Above 4000	-104

Limits of Power Flux Density (PFD) Corresponding to Effective Antenna Heights of Base Stations in Sharing Zones I and III.

**Table C2**

Antenna Height Above Mean Sea Level		PFD dBW/m <sup>2</sup> (Maximum)
Metres	Feet	
0 - 503	0 - 1650	-87
504 - 609	1651 - 2000	-88.5
610 - 762	2001 - 2500	-91
763 - 914	2501 - 3000	-92.5
915 - 1066	3001 - 3500	-94
1067 - 1219	3501 - 4000	-95
1220 - 1371	4001 - 4500	-95.5
1372 - 1523	4501 - 5000	-96
Above 1523	Above 5000	-107

**Limits of Power Flux Density (PFD) Corresponding to Antenna Heights Above Sea Level of Base Stations in Sharing Zones II.**