

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 821-824 MHz and 866-869 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 821-824 MHz and 866-869 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.¹ 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 821 to 824 MHz and 866 to 869 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 821 TO 824 MHz AND 866 TO 869 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 821-824 MHz and 866-869 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 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 Annex², as amended³.

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 821.000 to 822.500 MHz and 866.000 to 867.500 MHz in the Sharing Zones within Canada except as specified in paragraph 3.

-
2. Exchange of Notes at Ottawa, October 24, 1962. Entering 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 use of the frequency bands 822.500 to 824.000 MHz and 867.500 to 869.000 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 as public safety mutual aid channels:⁴

821.0125 MHz calling	866.0125 MHz calling
821.5125 MHz	866.5125 MHz
822.0125 MHz	867.0125 MHz
822.5125 MHz	867.5125 MHz
823.0125 MHz	868.0125 MHz

These channels are available to both countries in all areas. Usage of these channels in the border area may be locally coordinated in accordance with general sharing principles. These channels are to be 25 kHz wide, and within the Sharing and Protection Zones neither country shall assign any frequencies closer than 25 kHz to any of these mutual aid channels.

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 border between the United States and Canada, but further than 100 km from any land mass of the other country. These areas contain several significant population centres 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

4. Mutual aid channels are to be used only for coordination of tactical communications between different public safety agencies, or for other similar emergency communications.

Zone I: in the United States, Akron, Ohio; Youngstown, Ohio; Syracuse, New York; and in Canada, Kitchener-Waterloo, Ontario; Peterborough, Ontario.⁵

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 821-824 MHz and 866-869 MHz bands within the Protection Zone in its 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 a two frequency channelling plan with mobile station transmitters in the 821-824 MHz band and base station transmitters in the 866-869 MHz band. A mobile station may also transmit on any frequency assigned to its associated base station.

2.6 Use of 821-824 MHz and 866-869 MHz Bands Outside of the Sharing and Protection Zones

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

5. These cities are defined in Annex A, Table B as an area with the given centre 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 821.450 to 824.000 MHz and 866.450 to 869.000 MHz and Canada has the unrestricted geographic use of the bands 821.000 to 821.450 MHz and 866.000 to 866.450 MHz. These frequencies represent band edges; assignable frequencies must be chosen to ensure there is no harmful interference to assignments beyond the bands edges.

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 823.100 to 824.000 MHz and 868.100 to 869.000 MHz and Canada has the unrestricted geographic use of the bands 821.000 to 823.100 MHz and 866.000 to 868.100 MHz. These frequencies represent band edges; assignable frequencies must be chosen to ensure there is no harmful interference to assignments beyond the bands edges.

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*, with Annex, as amended 24 June 1965.

3.2.1 Coordination is required for assignments in the bands 822.500 to 823.100 MHz and 867.500 to 868.100 MHz bands in the following areas:

- 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 $45^{\circ} 45'$ N., thence running East along $45^{\circ} 45'$ 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 $44^{\circ} 25'$ 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 $45^{\circ} 45'$ N., thence running West along $45^{\circ} 45'$ N. to the intersection of the United States-Canada border.

The Agencies will channel and use the bands for assignments with 14 kHz or less necessary bandwidth on centre frequencies spaced 25 kHz apart. The FCC will assign frequencies from 822.5375 to 823.0875 MHz and 867.5375 to 868.0875 MHz inclusive. The DOC will assign frequencies from 822.5500 to 823.0750 MHz and 867.5500 to 868.0750 MHz inclusive.

3.2.2 Coordination is required for assignments in the bands 821.450 to 823.100 MHz and 866.450 to 868.100 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 $41^{\circ} 58'$ N. latitude and $80^{\circ} 30'$ 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 $80^{\circ} 30'$ 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 $42^{\circ} 39' 30''$ N. latitude and 81° W. longitude at the northern shore of Lake Erie and drawn clockwise from the southerly intersection with $80^{\circ} 30'$ 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 centre city coordinates of London, Ontario, $42^{\circ} 59'$ N. $81^{\circ} 14'$ W., Canada shall have the full use of the bands 821.000 to 823.100 MHz and 866.000 to 868.100 MHz on an uncoordinated basis.

The Agencies will channel and use the bands for assignments with 14 kHz or less necessary bandwidth on centre frequencies spaced 25 kHz apart. The FCC will assign frequencies from 821.4625 to 823.0875 and 866.4625 to 868.0875 MHz inclusive. The DOC will assign frequencies from 821.4750 to 823.0750 MHz and 866.4750 to 868.0750 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 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 variabilities of 10%⁶, and standard 3 arc-second digitized terrain data.⁷
 - 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 dBW/m^2 at or beyond the border, the Agency granting the authorization will take immediate action to eliminate any harmful interference. This action could include revocation of the authorization.

6. 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 81-100. [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.]

7. 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 $1^\circ \times 2^\circ$ 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 exceed the values in Tables C1 or C2 at or beyond the border, the Agency granting the authorization will take immediate action to eliminate any harmful 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 (M.S.L.)

ANNEXE 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 (ϕ) (°West)	Latitude (Ω) (°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
"	$54 \leq \Omega < 56$	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 ² (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
Metres	Feet	dBW/m ² (Maximum)
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.