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Standard Radio System Plan

Technical Requirements for Land Mobile and Fixed Radio Services Operating in the Band 220-222 MHz

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Preface

Standard Radio System Plan SRSP-512, issue 2, *Technical Requirements for Land Mobile and Fixed Radio Services Operating in the Band 220-222 MHz*, replaces SRSP-512, issue 1, *Technical Requirements for Land Mobile and Fixed Radio Services Operating in the Band 220-222 MHz*.

The following are the main changes:

1. The addition of channel definitions and parameters related to Positive Train Control (PTC).
2. The replacement of details concerning cross-border coordination requirements with references to the applicable international agreements.
3. Other editorial updates and improvements have been made throughout the document.

Issued under the authority of

the Minister of Industry

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Wen Kwan
Director General
Engineering, Planning and Standards Branch

Contents

1. Intent

1. This Standard Radio System Plan (SRSP) outlines the minimum technical requirements to ensure efficient spectrum utilization for land mobile and multipoint communications systems operating in the band 220-222 MHz.

2. General

2. Radio systems conforming to the requirements contained in this SRSP will take priority in licensing and coordination over non-standard systems proposed for operation in this frequency band. However, the adoption of more spectrally efficient technologies is strongly encouraged. Alternative channelization approaches may be considered if they lead to improved spectrum efficiency. Such systems would be granted authorization on a standard basis.

3. This SRSP is intended to support the design of radio systems by specifying characteristics related only to efficient spectrum use. It is not to serve as a comprehensive guide for equipment design and/or selection.

4. Even if a system meets the requirements of this SRSP, Innovation, Science and Economic Development Canada (ISED) may still require adjustments to radio or auxiliary equipment at any radio stations or systems whenever harmful interference is caused to any radio station or system. According to the *Radiocommunication Act*, "harmful interference" refers to an adverse effect of electromagnetic energy from any emission, radiation or induction that (a) endangers the use or functioning of a safety-related radiocommunication system; or (b) significantly degrades or obstructs, or repeatedly interrupts, the use or functioning of radio apparatus or radio-sensitive equipment.

5. Coordination between licensees may be required when interference occurs between systems. Such potential conflicts should be prevented or resolved through mutual arrangements between the affected parties following consultation and coordination. Licensees should consult ISED for the most up-to-date list of licensees in the area.

6. If parties are unable to resolve potential conflicts between radio systems, they should notify ISED. Following consultations with the involved parties, ISED will determine the necessary modifications and set a timeline for their implementation to address the conflict.

7. Guidelines for the operation of non-standard systems are outlined in Spectrum Utilization Policy SP Gen, *General Information Related to Spectrum Utilization and Radio Systems Policies*.

8. Equipment used for land mobile or fixed systems operating in the band 220-222 MHz shall be certified in accordance with the current version of Radio Standard Specification RSS-119, *Land Mobile and Fixed Equipment Operating in the Frequency Range 27.41-960 MHz*.

9. ISED reserves the right to limit protection to licensed radio receivers only to the extent of the bandwidth of the transmitters whose emissions they are licensed to receive. Licensees and/or applicants should use receiver selectivity characteristics or filters that improve the

receiver's ability to reject harmful interference. See Guidelines GL-09, Guidelines on External Filtering for Land Mobile Radio Systems, for additional details.

10. Systems which employ a base station as an automatic repeater station shall transmit on frequencies identified as base transmit frequencies. Subscriber dispatcher stations (often referred to as control stations) operating through an automatic repeater station shall transmit on frequencies identified as mobile transmit frequencies.

11. Applications for new licences or amendments will require the submission of administrative, operational and technical information to ISED. Licence applications can be made on the Radiocommunication Licensing Services webpage under the section, *Apply for a Licence*. For additional guidance, see Radio Standards Procedure *RSP-101, Licence Application Submission Procedure for Planned Radio Stations Below 960 MHz*. Upon request from ISED, applicants and licensees shall provide additional information of their radio systems, such as technical parameters.

3. Related documents

12. The current issues of the following documents are applicable, and available on the Spectrum management and telecommunications website.

GCA	*General coordination agreement between Canada and the United States of America on the use of the radio frequency spectrum by terrestrial radiocommunication stations and earth stations*
TRAA	*Interim Sharing Arrangement between the Canadian Department of Industry, the National Telecommunications and Information Administration, and the Federal Communications Commission Concerning the Use of the Band 220 to 222 MHz along the United States-Canada Border*
	Statement of Intent of the Federal Communications Commission of the United States of America and the Department of Industry of Canada related to the Sharing and Use of Portions of the Frequency Band 220-222 MHz for Positive Train Control Systems along the United States–Canada Border
CTFA	*Canadian Table of Frequency Allocations*
RP-Gen	*General Spectrum Policy Principles and Other Information Related to Spectrum Utilization and Radio System Policies*
RP-003	*Policy Guidelines for Mobile Radio Trunked Systems*
RP-004	*Policy for the Licensing of Very Low Capacity Point to Point Links in the Band 30-890 MHz*
RP-25	*Policy Principles for Public Safety Radio Interoperability*

SP-Gen	*General Information Related to Spectrum Utilization and Radio Systems Policies*
SP 30-896 MHz, Part II	*Spectrum Utilization Policy for the Mobile, Broadcasting and Amateur Services in the Frequency Range 30-896 896 MHz*
SP 1.7 GHz	*Spectrum Allocation and Utilization Policy Regarding the Use of Certain Frequency Bands Below 1.7 GHz for a Range of Radio Applications*
RSS-Gen	*General Requirements and Information for the Certification of Radiocommunication Equipment*
RSS-102	*Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)*
RSS-119	*Land Mobile and Fixed Radio Transmitters and Receivers Operating in the Frequency Range 27.4-960.0 MHz*
RSP-100	*Radio Equipment Certification Procedure*
RSP-101	*Application Procedure for Planned Radio Stations Operating on Frequencies below 960 MHz*
CPC-2-0-03	*Environmental Process, Radiofrequency Fields and Land-Use Consultation*
TB-8	*Compendium of Interoperability Voice/Data Channels That Can Be Used Nationwide in Canada and for Canada-United States Interoperability Operations*
GL-04	*Channel Loading Guidelines*
GL-09	*Guidelines on External Filtering for Land Mobile Radio Systems*

CPC - Client Procedures Circular
GL - Guidelines
RP - Radio Systems Policy
RSP - Radio Standards Procedure
RSS - Radio Standards Specification
SP - Spectrum Utilization Policy
SRSP - Standard Radio System Plan
TB – Technical Bulletin
TRAA - Terrestrial Radiocommunication Agreements and Arrangement

4. International coordination

13. Usage in the border area is subject to international agreements with the United States (U.S.) as per the Interim Sharing Arrangement and the Statement of Intent. All channel usage in the Canada-United States border area will be assigned based on the technical and operational requirements and at the discretion of the regional office, depending on local requirements. Within the border area, there are distinct channel designations (i.e. primary, secondary, and shared) for each country, with corresponding conditions of use and protections, and with coordination requirements applied when cross-border interference may occur or shared spectrum is used.

14. The international agreements are subject to change from time to time. Conditions may be added during the term of the licence if required to align with the provisions of international agreements between the Government of the United States and the Government of Canada.

5. Channelling plan

15. Frequency assignments shall be in accordance with the channel designation plan shown in Table A1 in Annex A.

16. This band is to be used on the basis of a two-frequency channel plan. For land mobile service operations, the base station transmitters will normally operate in the band 220-221 MHz and the mobile station transmitters will normally operate in the band 221-222 MHz. A mobile station may also transmit on its associated base station frequency when operating in a simplex mode, provided that power limits for such transmissions are maintained in accordance with section 8.1.

17. The lower edge of channel 1 starts at 220 MHz and is spaced 5 kHz apart from the next channel, for a total of 200 channels. The centre frequency of the channel corresponding to the channel number can be determined by the following formula, where n is the channel number:

$$F = 220.0025 + (n–1) \times (0.005) \qquad \text{where } n = 1 \text{ to } 200$$

18. Only base station frequencies are represented by this equation in MHz. Paired mobile station frequencies are 1 MHz higher.

19. The standard channel width for this spectrum is 5 kHz and assignments of centre frequencies begin 2.5 kHz from the band edge. Systems requiring aggregation of two or more 5 kHz channels may be assigned multiple channels in increments of 5 kHz. Channels may be aggregated and priority of assignment will be given to the most spectrally efficient technologies.

20. To improve spectrum efficiency of wide-area systems or networks that re-use frequencies licensed to one holder, the assignment of frequencies to each particular site does not have to follow the allocation structure defined herein. Each frequency that may be used on a particular site must be approved by the regional office, as it will impact on the geographic

re-assignment of that particular frequency, unless an arrangement has been made for the use of the frequencies within a specified geographical area.

21. Frequencies designated for duplex operation may be assigned for simplex operation where conditions warrant.

22. As outlined in Table A2 of Annex A ISED has listed, as a guideline, twenty 5-channel groups for system deployments in this band. Channel groups can be derived in groups of up to five channels spaced 150 kHz apart. However, assignments for use are at the discretion of the regional office depending on local requirements.

6. The use of the band 220-222 MHz

23. This band is used for radio applications such as public safety, railway, and utility telemetry operations. Other fixed and mobile radio applications will be permitted at the discretion of the regional office once the public safety, railway, and utility telemetry requirements have been addressed.

6.1 Conventional mobile radio systems

24. Conventional radio systems are defined as radio systems in which one or more radio frequency channels are assigned to mobile and base stations but are not used as a trunk group.

25. Assignments for conventional systems can be made from the available spectrum in a given area. In general, assignments will be made commencing at the upper end of the band and working downward.

6.2 Simplex systems

26. Simplex frequency operation utilizing the base/repeater and mobile transmit frequencies beyond the service area of a paired frequency system may be permitted on a case-by-case basis as an adjunct to the paired frequency system.

27. Simplex operation may be permitted within the authorized service area at the discretion of the system operator and will be on a no-interference, no-protection (NINP) basis. The NINP restriction does not apply to the use of public safety mutual aid channels, identified in section 6.3, operating in simplex mode.

6.3 Public safety and mutual aid channels

28. Within the 220-222 MHz band, a number of channels are designated for use by public safety services. Public safety services (Categories 1 and 2) involving the preservation of life and protection of property will continue to have access to exclusive channels and any potential sharing of channels by public safety services will be with other public safety services. Refer to Radio Systems Policy RP-25, Policy Principles for Public Safety Radio Interoperability for hierarchy and definition of categories of safety service providers.

29. The following channels are available to public safety organizations in both Canada and the United States on a shared basis for the purpose of public safety and mutual aid within 120 km of the Canada/United States border.

Table 1 Public Safety and Mutual Aid Channels

Channel	Centre Frequency (MHz)
161	220.8025
162	220.8075
163	220.8125
164	220.8175
165	220.8225
166	220.8275
167	220.8325
168	220.8375
169	220.8425
170	220.8475
181	220.9025
182	220.9075
183	220.9125
184	220.9175
185	220.9225

Note: Only base station frequencies are listed. Paired mobile station frequencies are 1 MHz higher.

30. The public safety mutual aid channels in table 1 are available on a non-restricted basis everywhere in Canada. Further, they are available to both the United States and Canada on a shared basis within the border area. These channels are to be used only for coordination of tactical communications between different public safety agencies, or for other similar emergency communications. The use of these channels in the border area may be locally coordinated in accordance with section 4.

6.4 Multipoint communications systems (MCS)

31. Multipoint Communications Systems operation can be authorized in this band. Two types of operation are permitted for MCS:

    a. one way (from master station to remote sites or from remote sites to master station); and

    b. two way (from master station to remote sites and from remote sites to master station).

32. MCS systems consist of a fixed central radio station (master station) communicating on a one or two-way basis with associated remote sites (stations). Master stations control, activate or interrogate multiple (two or more) remote sites (stations) and/or receive from multiple remote sites (stations). Remote sites (stations) are either controlled, activated, or

interrogated by, and may respond to, a master station or transmit one way to a master station.

33. Assignments are licensed from available spectrum in a geographic area.

34. Master stations shall be licensed to transmit in the lower part of the band (220-221 MHz) and the remote stations in the upper part of the band (221-222 MHz).

35. Mobile master station operation may be permitted with adequate justification and without expanding the service area and on a no-interference, no-protection basis.

36. Mobile remote stations would only be permitted ancillary to fixed remote stations. Such mobile remote stations would only be permitted to communicate with fixed MCS master stations and cannot expect the same degree of protection as fixed stations due to their varying operating environment.

37. For MCS, a directional antenna should be used for remote stations. A minimum front-to-back ratio of 15 dB will be assumed when a directional antenna is used. This ratio will be the basis of the geographical distance between two master stations and carrier to interference (C/I) calculations. These assumptions are not applicable for MCS mobile remote antennas.

38. Communications between master stations may be authorized on a case-by-case basis.

6.5 Intelligent transportation systems/intelligent vehicle highway systems channels (ITS/IVHS)

39. ISED is keeping the following channels in reserve for the future implementation of ITS/IVHS:

Table 2 Intelligent transportation system and intelligent vehicle highway system channels

Channel	Centre Frequency (MHz)
111	220.5525
113	220.5625
115	220.5725
117	220.5825
119	220.5925

Note: Only base station frequencies are listed. Paired mobile station frequencies are 1 MHz higher.

6.6 Low-power Channels

40. The following are low-power channels and shall be available on a no interference, no protection basis.

Table 3 Low-power channels

Channel	Centre Frequency (MHz)
196	220.9775
197	220.9825
198	220.9875
199	220.9925
200	220.9975

Note: Only base station frequencies are listed. Paired mobile station frequencies are 1 MHz higher.

6.7 Positive Train Control (PTC) and channels designated to the Railway Association of Canada

41. Channels in the band 220-222 MHz are available for use for Positive Train Control (PTC) and Remote Control Locomotive (RCL) in 25 kHz channels (aggregating five 5 kHz channels), except for those channels otherwise designated for ITS/IVHS or public safety use. For reference, the PTC/RCL channel definitions are listed in Table 4. These PTC/RCL channel definitions are for reference only and do not imply exclusivity of access to all these channels by the Railway Association of Canada, except for the channels in Table 5 within a certain geographical area. In general, assignments can be made for non-PTC operations on these channels only if there are no other channels available in a given area for non-PTC.

Table 4 PTC/RCL channel definitions

Channel Numbers	PTC/RCL Designation	
	220 MHz Band	221 MHz Band
21-25	PTC 101	PTC 141
26-30	PTC 102	PTC 142
51-55	PTC 107	PTC 147
56-60	PTC 108	PTC 148
81-85	PTC 113	PTC 153
86-90	PTC 114	PTC 154
141-145	PTC 125	PTC 165
146-150	PTC 126	PTC 166
151-155	PTC 127	PTC 167
156-160	PTC 128	PTC 168
171-175	PTC 131	PTC 171
176-180	PTC 132	PTC 172
186-190	PTC 134	PTC 174
191-195	PTC 135	PTC 175

Channel Numbers	PTC/RCL Designation	
196-200	RCL 136	RCL 176

Note: Refer to table A1 for corresponding centre frequencies.

42. The channels in Table 5 are available for the exclusive use by the Railway Association of Canada within the geographical area consisting of a corridor bounded by 70 km on each side of railway lines. Railway Association of Canada frequencies may be used for fixed and land mobile services beyond this geographical area according to this SRSP, provided that the Railway Association of Canada is protected within their geographical area of operation bounding the railway lines.

Table 5 Railway channels

Channel	Centre Frequency (MHz)
21	220.1025
22	220.1075
23	220.1125
24	220.1175
25	220.1225

Note: Only base station frequencies are listed. Paired mobile station frequencies are 1 MHz higher.

43. These channels in aggregate correspond to the PTC channels PTC101 and PTC141 and are identified for the Railway Association of Canada in order to be interoperable with those of the Association of American Railroads (AAR) in the United States.

6.8 Canadian radio amateur use

44. SP 1.7 GHz - *Spectrum Allocation and Utilization Policy Regarding the Use of Certain Frequency Bands Below 1.7 GHz for a Range of Radio Applications*, issued June 2009, includes allocation changes in the band 220-222 MHz. The amateur service allocation has been reduced from primary to secondary radio service status to support public safety agencies for emergency and disaster relief communications, and fixed and mobile services are allocated on a primary basis.

45. For radio amateur secondary use in the band 220-221 MHz, channels are permitted to be aggregated. The maximum effective radiated power (e.r.p.) allowable per 5 kHz, in any one 5 kHz segment, shall be the applicable maximum e.r.p. depending on antenna height above average terrain described in Table 6.

46. For radio amateur secondary use in the band 221-222 MHz, the maximum e.r.p. allowable shall be 50 watts per 5 kHz in any one 5 kHz segment, and up to the applicable maximum e.r.p. depending on antenna height above average terrain described in Table 6. Such transmissions from antennas that are higher than 7 metres above average terrain will be permitted if the effective radiated power is reduced below 50 watts per 5 kHz by 20 log10(h/7) dB, where h is the height of the antenna above average terrain, in metres.

7. Channel sharing and loading guidelines

47. This section outlines the technical criteria for channel sharing, channel loading guidelines, and technical limits for assignments in the 220-222 MHz band.

7.1 Channel sharing

48. The assignment of a frequency or frequencies to a holder of a radio authorization does not confer a monopoly on the use of the frequency or frequencies, nor shall a radio authorization be construed as conferring any right of continued tenure in respect of the frequency or frequencies (see section 40 of the *Radiocommunication Regulations*).

7.2 Loading guidelines

49. ISED will apply the guidelines found in *GL-04 Channel Loading Guidelines* in determining loading of communications channels, and thus, of radio channels.

50. In the frequency assignment process, these guidelines may be utilized in conjunction with current observed channel occupancy data (obtained with automatic occupancy measuring equipment) to determine whether additional channels are required. Such observations will also be used to assess the general loading criteria and the inherent trade-off between sound spectrum management and acceptable grades of service.

51. ISED is using this approach to make frequency assignments but may also take into account other considerations when assessing the number of radio channels to be assigned to a system. Applicants are encouraged to provide as much traffic related data as possible with their application.

8. Technical criteria

52. This section outlines the power, antenna height, and station location limits for assignments in the 220 – 222 MHz band.

8.1 Radiated power and antenna heights limits

53. Effective Radiated Power (e.r.p.) and Height Above Average Terrain (HAAT) limits, shall be limited to that necessary to provide the required service as determined by the system requirements and will be subject to the limitations below**.**

Table 6 Maximum e.r.p. and antenna height limits

Antenna Height Above Average Terrain (metres)	e.r.p. (watts)
Up to 300	125
Above 300 to 450	60
Above 450 to 600	30
Above 600 to 750	20
Above 750 to 900	15
Above 900 to 1,050	10
Above 1,050	5

54. **Low-power channels:** Stations transmitting on the lower frequencies of channels 196 through 200 are limited to a maximum e.r.p. of 2 watts and a maximum antenna height of 6.1 metres above ground.

55. **Station location limitations:** The maximum e.r.p. for stations located 6 kilometres or less from the Canada/US border transmitting on the lower frequencies of channels 161 through 195 must be in accordance with Table 7 below unless otherwise provided for by special authorization. This table does not apply to the low-power channels (196-200).

Table 7 Station location limitations

Distance from border (km)	e.r.p. (watts)
Less than 0.3	Operations not permitted
0.3 - 0.5	5
0.5 - 0.6	10
0.6 - 0.8	20
0.8 - 2.0	25
2.0 - 4.0	50
4.0 - 5.0	100
beyond 5.0	125

56. The maximum e.r.p. for these stations cannot be greater than the maximum e.r.p. determined by their antenna height above average terrain.

57. In the band 221-222 MHz, the maximum e.r.p. allowable for mobile units shall be 50 watts. Portable units are considered mobile units. Fixed stations transmitting in this band are permitted up to 50 watts e.r.p. using an antenna with a maximum height of 7 metres above average terrain. Transmissions from antennas that are higher than 7 metres above average terrain will be permitted if the e.r.p. is reduced below 50 watts e.r.p. by 20 $\log_{10}(h/7)$ dB, where h is the height of the antenna above average terrain, in metres.

8.2 Geographic separation between co-channel systems

58. Normally, in urban areas and areas of intensive mobile use, for stations of different networks, the minimum geographic separation between co-channel base stations will be calculated based on a non-overlap of the 36 dBµV/m protected contour of the existing station and the 19 dBµV/m interference contour of the proposed station. These criteria are not applicable to systems sharing the same channel at different times (vertical loading).

59. For public safety systems, a carrier to interference ratio (C/I) of 20 dB will be used to calculate the interference contour of the new station. The protected contour of the existing public safety base station will be 36 dBµV/m, but the interference contour of the new station will be 16 dBµV/m.

60. The protected contour of the existing station is calculated based on a probability of service of 50% of the time for 50% of the locations at the edge of the contour.

61. The interference contour is calculated using the probability that the signal level used is not exceeded more than 10% of the time for 50% of the locations at the edge of the contour (i.e. 90% of the time, it is below the threshold for 50% of the locations).

62. It is recognized that coverage requirements are a function of operational characteristics and the technology deployed. ISED may accept, on a case-by-case basis, the use of different methodologies to evaluate separation between co-channel base stations.

63. Applicants are invited to include adequate technical details in support of their proposed wireless networks to allow a compatibility analysis with existing and future assignments. These analyses should be prepared using terrain based propagation models.

64. These details should include, but not be limited to, the required service area, the predicted radio coverage, and the design parameters used, including the minimum carrier to interference ratio.

Annex A - Channel designations and preferred channel groupings

Table A1 - Channel designations in the band 220-222 MHz

Note: Only base station frequencies are listed in MHz. Paired mobile station frequencies are 1 MHz higher

Channel Number	Centre Frequency	Channel Number	Centre Frequency	Channel Number	Centre Frequency	Channel Number	Centre
1	220.0025	51	220.2525	101	220.5025	151	220.7525
2	220.0075	52	220.2575	102	220.5075	152	220.7575
3	220.0125	53	220.2625	103	220.5125	153	220.7625
4	220.0175	54	220.2675	104	220.5175	154	220.7675
5	220.0225	55	220.2725	105	220.5225	155	220.7725
6	220.0275	56	220.2775	106	220.5275	156	220.7775
7	220.0325	57	220.2825	107	220.5325	157	220.7825
8	220.0375	58	220.2875	108	220.5375	158	220.7875
9	220.0425	59	220.2925	109	220.5425	159	220.7925
10	220.0475	60	220.2975	110	220.5475	160	220.7975
11	220.0525	61	220.3025	111	220.5525	161	220.8025
12	220.0575	62	220.3075	112	220.5575	162	220.8075
13	220.0625	63	220.3125	113	220.5625	163	220.8125
14	220.0675	64	220.3175	114	220.5675	164	220.8175
15	220.0725	65	220.3225	115	220.5725	165	220.8225
16	220.0775	66	220.3275	116	220.5775	166	220.8275
17	220.0825	67	220.3325	117	220.5825	167	220.8325
18	220.0875	68	220.3375	118	220.5875	168	220.8375
19	220.0925	69	220.3425	119	220.5925	169	220.8425
20	220.0975	70	220.3475	120	220.5975	170	220.8475
21	220.1025	71	220.3525	121	220.6025	171	220.8525
22	220.1075	72	220.3575	122	220.6075	172	220.8575
23	220.1125	73	220.3625	123	220.6125	173	220.8625
24	220.1175	74	220.3675	124	220.6175	174	220.8675
25	220.1225	75	220.3725	125	220.6225	175	220.8725
26	220.1275	76	220.3775	126	220.6275	176	220.8775
27	220.1325	77	220.3825	127	220.6325	177	220.8825
28	220.1375	78	220.3875	128	220.6375	178	220.8875
29	220.1425	79	220.3925	129	220.6425	179	220.8925
30	220.1475	80	220.3975	130	220.6475	180	220.8975
31	220.1525	81	220.4025	131	220.6525	181	220.9025
32	220.1575	82	220.4075	132	220.6575	182	220.9075
33	220.1625	83	220.4125	133	220.6625	183	220.9125
34	220.1675	84	220.4175	134	220.6675	184	220.9175
35	220.1725	85	220.4225	135	220.6725	185	220.9225
36	220.1775	86	220.4275	136	220.6775	186	220.9275
37	220.1825	87	220.4325	137	220.6825	187	220.9325
38	220.1875	88	220.4375	138	220.6875	188	220.9375
39	220.1925	89	220.4425	139	220.6925	189	220.9425
40	220.1975	90	220.4475	140	220.6975	190	220.9475
41	220.2025	91	220.4525	141	220.7025	191	220.9525
42	220.2075	92	220.4575	142	220.7075	192	220.9575
43	220.2125	93	220.4625	143	220.7125	193	220.9625
44	220.2175	94	220.4675	144	220.7175	194	220.9675
45	220.2225	95	220.4725	145	220.7225	195	220.9725
46	220.2275	96	220.4775	146	220.7275	196	220.9775
47	220.2325	97	220.4825	147	220.7325	197	220.9825
48	220.2375	98	220.4875	148	220.7375	198	220.9875
49	220.2425	99	220.4925	149	220.7425	199	220.9925
50	220.2475	100	220.4975	150	220.7475	200	220.9975

Table A2 - Preferred channel groupings

Channel	Centre Frequency (MHz)
Group 1	
1	220.0025
31	220.1525
61	220.3025
91	220.4525
121	220.6025

Channel	Centre Frequency (MHz)
Group 2	
2	220.0075
32	220.1575
62	220.3075
92	220.4575
122	220.6075

Channel	Centre Frequency (MHz)
Group 3	
3	220.0125
33	220.1625
63	220.3125
93	220.4625
123	220.6125

Channel	Centre Frequency (MHz)
Group 4	
4	220.0175
34	220.1675
64	220.3175
94	220.4675
124	220.6175

Channel	Centre Frequency (MHz)
Group 5	
5	220.0225
35	220.1725
65	220.3225
95	220.4725
125	220.6225

Group 6	
6	220.0275
36	220.1775
66	220.3275
96	220.4775
126	220.6275

Group 7	
7	220.0325
37	220.1825
67	220.3325
97	220.4825
127	220.6325

Group 8	
8	220.0375
38	220.1875
68	220.3375
98	220.4875
128	220.6375

Group 9	
9	220.0425
39	220.1925
69	220.3425
99	220.4925
129	220.6425

Group 10	
10	220.0475
40	220.1975
70	220.3475
100	220.4975
130	220.6475

Group 11	
11	220.0525
41	220.2025
71	220.3525
101	220.5025
131	220.6525

Group 12	
12	220.0575
42	220.2075
72	220.3575
102	220.5075
132	220.6575

Group 13	
13	220.0625
43	220.2125
73	220.3625
103	220.5125
133	220.6625

Group 4	
14	220.0675
44	220.2175
74	220.3675
104	220.5175
134	220.6675

Group 15	
15	220.0725
45	220.2225
75	220.3725
105	220.5225
135	220.6725

Group 16	
16	220.0775
46	220.2275
76	220.3775
106	220.5275
136	220.6775

Group 17	
17	220.0825
47	220.2325
77	220.3825
107	220.5325
137	220.6825

Group 18	
18	220.0875
48	220.2375
78	220.3875
108	220.5375
138	220.6875

Group 19	
19	220.0925
49	220.2425
79	220.3925
109	220.5425
139	220.6925

Group 20	
20	220.0975
50	220.2475
80	220.3975
110	220.5475
140	220.6975