



APPENDIX 1

**Analysis of Fixed Service (FS) Licenses in the
Extended Ku (xKu) Band**

Luc Gadbois, P. Eng

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Overview

The purpose of this analysis is to determine the feasibility of moving all FS licenses in the xKu band (11.45 - 11.7 GHz) to the AP30B band (11.2 – 11.45 GHz). Only the top 500 MHz of the 10.7 – 11.7 GHz were analyzed. Given that the majority of the sites in the upper band communicate with the lower band, the results obtained can be generalized to the full 10.7 – 11.7 GHz.

To perform the analysis, we grouped licenses by distance to each other. The distance between any two licenses was determined by using line-of-sight path loss to achieve an interference to noise ratio (I/N) of -26 dB. All licenses with an I/N greater than -26 dB were grouped together. It should be noted that interference analyses typically use a protection criteria of I/N = -6 dB. We have used -26 dB to ensure a conservative and reliable result.

Summary of Analysis

To simplify the analysis, we subdivided grouping of licenses as follows:

1. First we determined a safe distance for licenses where the angle between azimuth and line of sight is greater than 20 degrees. A distance of 2.3 km was found sufficient to provide an I/N = -6 dB. To be conservative we used 4.6 km. Please see Figure 1 for an example.

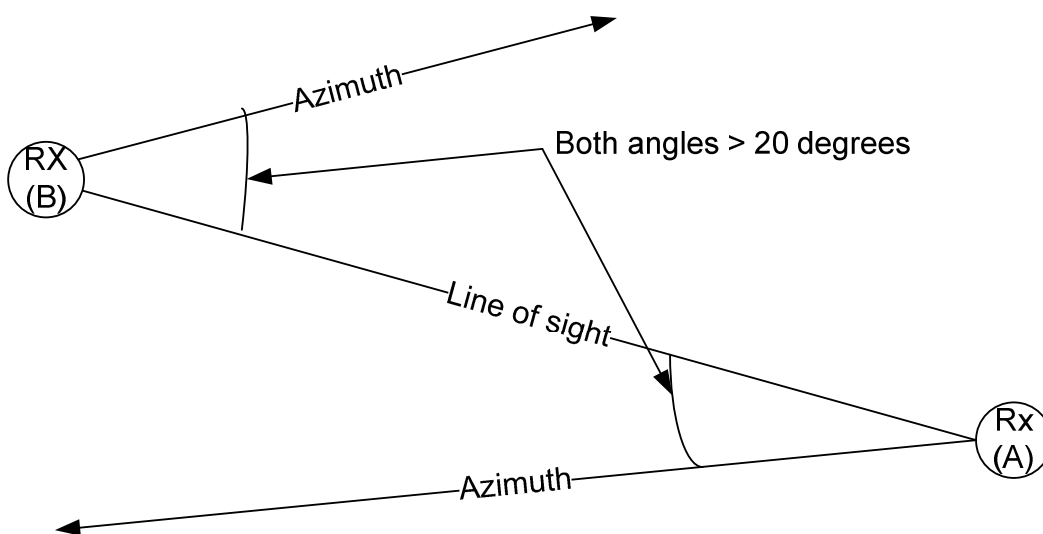


Figure 1 – Illustration of two licenses with more than 20 degrees to line of sight

2. For licenses with an angle less than 20 degrees between azimuth and the line of sight, we determined the value for I/N. If the value was greater than -26 dB, the licenses were placed in the same group. Please see Figure 2 for an illustration.

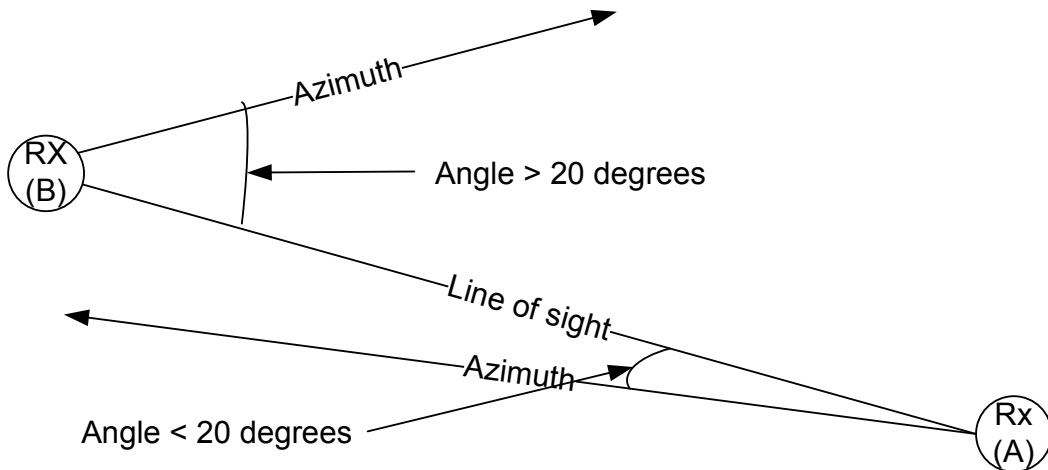


Figure 2 – Illustration of two licenses where at least one angle is less than 20 degrees.

3. If three licenses have a common node, all three licenses were placed in the same group. For instance, licenses A and D in Figure 3 are more than 4.6 km apart but have site C in common; therefore, licenses A, D and C would be placed in the same group.

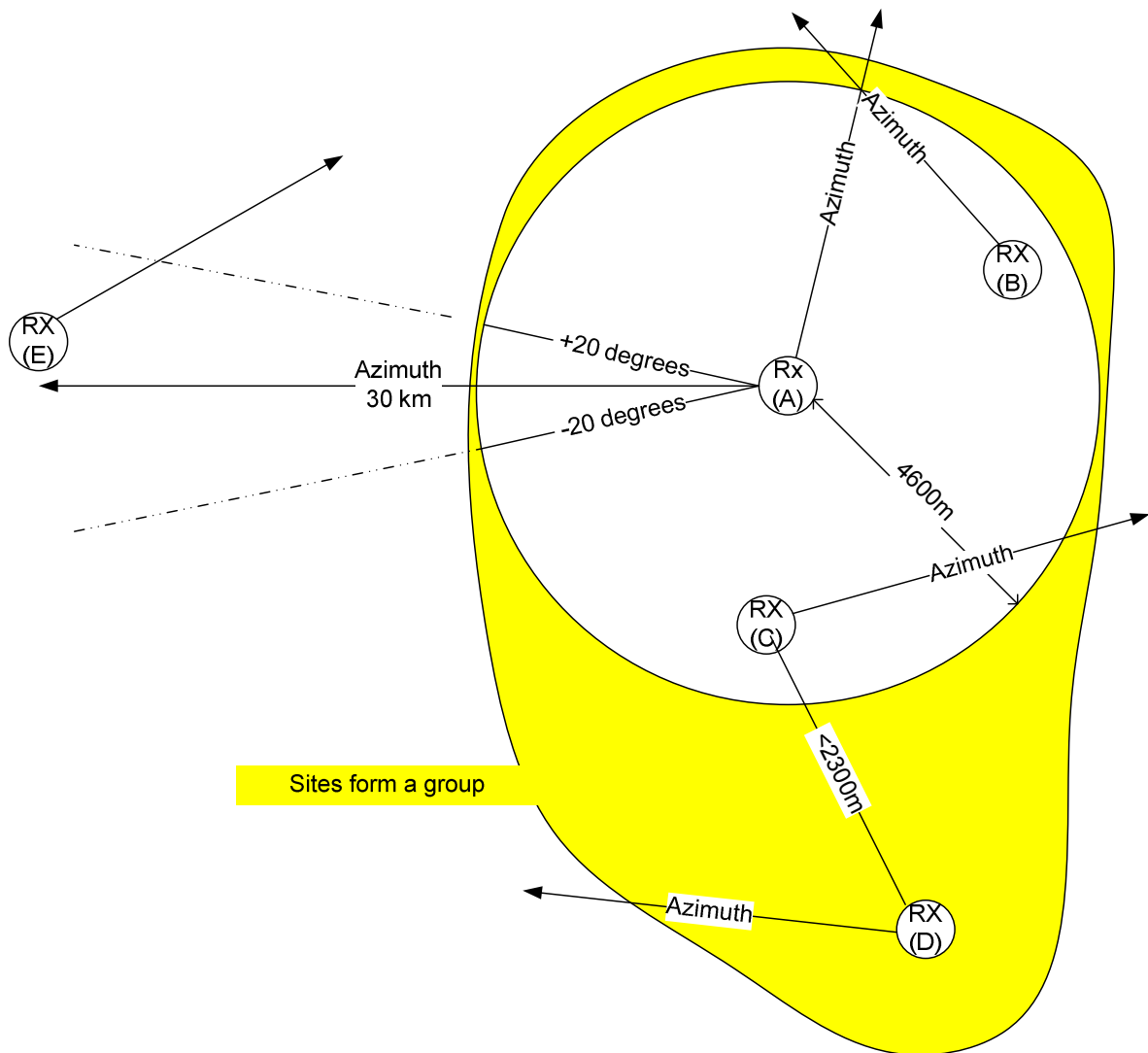


Figure 3 – Diagram to Illustrate Grouping

Once the groups as described above were formed, we assigned frequencies as follows:

1. If the angle between the azimuth of two links originating from the same tower is more than 20 degrees, we assumed the channels could be reused.
2. For all other licenses in the group, a different channel was assigned.

Results

Table 1 is a summary of the bandwidth required by each group. These results take into account the full Industry Canada TAFL database from February 2008 of licenses in the 11.2 – 11.7 GHz band.

Table 1 - Analysis of Extended Ku and AP30B band

Group	Bandwidth Required (MHz)	Notes
83	332.5	Exceed 250 MHz
79	314	Exceed 250 MHz
81	300	Exceed 250 MHz
2	260	Exceed 250 MHz
84	200	OK
56	188	OK
69	179.2	OK
6	170	OK
3	160	OK
21	150	OK
65	140	OK
70	139.2	OK
14	130	OK
16	130	OK
68	130	OK
29	120	OK
74	120	OK
80	120	OK
86	120	OK
97	120	OK
20	100	OK
40	100	OK
33	90	OK
46	90	OK
93	88.8	OK
27	83.75	OK
1	80	OK
18	80	OK
61	80	OK
78	80	OK
85	80	OK
88	80	OK
91	80	OK
103	80	OK
19	70	OK
41	70	OK
92	70	OK
75	62.5	OK
4	60	OK
5	60	OK
7	60	OK
9	60	OK
17	60	OK
22	60	OK
28	60	OK

49	60	OK
51	60	OK
58	60	OK
59	60	OK
62	60	OK
72	60	OK
73	60	OK
77	60	OK
82	60	OK
96	60	OK
45	53.75	OK
10	50	OK
11	50	OK
42	50	OK
31	40	OK
32	40	OK
34	40	OK
35	40	OK
36	40	OK
37	40	OK
44	40	OK
50	40	OK
55	40	OK
67	40	OK
30	33.75	OK
8	30	OK
12	30	OK
15	30	OK
23	30	OK
24	30	OK
25	30	OK
48	30	OK
52	30	OK
53	30	OK
57	30	OK
60	30	OK
94	30	OK
95	30	OK
98	30	OK
100	30	OK
101	30	OK
102	30	OK
104	30	OK
111	30	OK
13	23.75	OK
47	20	OK
71	20	OK
76	20	OK
87	20	OK
89	20	OK
90	20	OK
39	13.75	OK
26	10	OK
38	10	OK
54	10	OK
64	10	OK
66	10	OK
99	10	OK
109	7.5	OK
43	5	OK
110	5	OK
105	3.75	OK
106	3.75	OK
107	3.75	OK
108	3.75	OK

Table 2 provides details of the licenses included in the first few groups identified in Table 1 above.

Latitude	Longitude	Azimuth	Tx frequency	RX frequency	Bw used by site	group	callsign	sitename
49.345	-123.38722	20.3	11545	11055	40	83	CFW352	BOWEN ISLAND BC
49.345	-123.38722	20.4	11385	10895	40	83	CFW352	BOWEN ISLAND BC
49.345	-123.38722	20.4	11465	10975	40	83	CFW352	BOWEN ISLAND BC
49.345	-123.38722	307.6	11265	10775	40	83	CFW352	BOWEN ISLAND BC
49.345	-123.38722	307.6	11345	10855	40	83	CFW352	BOWEN ISLAND BC
49.344444	-123.38667	18.2	11675	11175	30	83	CIJ526	BOWEN ISLAND BC
49.344444	-123.38667	20.5	11585	11095	30	83	CIJ526	BOWEN ISLAND BC
49.344444	-123.38667	20.5	11665	11175	30	83	CIJ526	BOWEN ISLAND BC
49.344444	-123.38667	97	11585	11095	30	83	CIJ526	BOWEN ISLAND BC
49.344444	-123.38667	97	11665	11175	30	83	CIJ526	BOWEN ISLAND BC
49.344444	-123.38667	141	11585	11095	30	83	CIN700	BOWEN ISLAND BC (VHCM REPEATER SITE)
49.344444	-123.38667	296	11585	11095	30	83	CIN700	BOWEN ISLAND BC (VHCM REPEATER SITE)
49.378889	-123.38861	133.3	11623.75	11133.75	2.5	83	CIN891	BOWEN ISLAND BC - MT GARDNER
49.284444	-123.11222	93.3	11605	11115	30	79	CIO311	VANCOUVER BC - 555 WEST HASTINGS
49.284444	-123.11222	127.2	11635	11145	30	79	CIO311	VANCOUVER BC - 555 WEST HASTINGS
49.284444	-123.11222	296.8	11265	10775	30	79	CGA689	VANCOUVER BC 555 W HASTINGS ST
49.284444	-123.11222	297	11425	10935	30	79	CGA689	VANCOUVER BC 555 W HASTINGS ST
49.312222	-123.08306	216.9	11225	10735	30	79	CGA394	NORTH VANCOUVER BC (BC RAIL CENTRE)
49.312222	-123.08306	216.9	11305	10815	30	79	CGA394	NORTH VANCOUVER BC (BC RAIL CENTRE)
49.320833	-123.06806	219.5	11265	10775	37	79	VBI667	NORTH VANCOUVER 230 E 13 ST LION G.
49.320833	-123.06806	219.5	11345	10855	37	79	VBI667	NORTH VANCOUVER 230 E 13 ST LION G.
49.320833	-123.06806	219.5	11425	10935	40	79	VBI667	NORTH VANCOUVER 230 E 13 ST LION G.
49.320833	-123.06806	219.5	11505	11015	40	79	VBI667	NORTH VANCOUVER 230 E 13 ST LION G.
49.320833	-123.06806	219.5	11585	11095	40	79	VBI667	NORTH VANCOUVER 230 E 13 ST LION G.
49.331944	-123.04222	166.1	11305	10815	30	79	XOA693	NORTH VANCOUVER BC 2555 WHITELEY CT
49.695	-123.14389	220.4	11265	10775	40	81	CHF23	SQUAMISH BC (REPEATER SITE)
49.695	-123.14389	220.4	11345	10855	40	81	CHF23	SQUAMISH BC (REPEATER SITE)
49.695	-123.14389	220.4	11425	10935	40	81	CHF23	SQUAMISH BC (REPEATER SITE)
49.695	-123.14389	220.4	11505	11015	40	81	CHF23	SQUAMISH BC (REPEATER SITE)
49.698611	-123.1525	218.2	11225	10735	40	81	CFW239	SQUAMISH CO BC
49.698611	-123.1525	218.2	11305	10815	40	81	CFW239	SQUAMISH CO BC
49.713889	-123.15694	207.1	11585	11095	30	81	CIJ616	SQUAMISH BC
49.713889	-123.15694	207.1	11665	11175	30	81	CIJ616	SQUAMISH BC
44.649444	-63.576944	337.4	11225	10735	40	2	CZA532	HALIFAX NOVA SCOTIA

44.649444	-63.576944	337.4	11225	10735	40	2	CJX564	HALIFAX(BARRINGTON TR) NOVA SCOTIA
44.649444	-63.576944	337.4	11305	10815	40	2	CZA532	HALIFAX NOVA SCOTIA
44.649444	-63.576944	337.4	11385	10895	40	2	CZA532	HALIFAX NOVA SCOTIA
44.649444	-63.576944	337.4	11465	10975	40	2	CZA532	HALIFAX NOVA SCOTIA
44.649444	-63.576944	337.4	11545	11055	40	2	CZA532	HALIFAX NOVA SCOTIA
44.649444	-63.576944	337.4	11545	11055	40	2	CJX564	HALIFAX(BARRINGTON TR) NOVA SCOTIA
44.658333	-63.602778	342.4	11585	11095	30	2	CGJ673	HALIFAX NS (YOUNG ST)
44.658333	-63.602778	342.5	11505	11015	30	2	CGJ673	HALIFAX NS (YOUNG ST)

Conclusions

The analysis of the complete Industry Canada database for the 11.2 - 11.7 GHz band produced 111 groups. Only four groups of licensees (Bowen Island, North Vancouver, Squamish and Halifax), or about eight to ten microwave links from a total of 540, could not be accommodated in the AP30B band. Because of the assumptions noted above in the Overview, the results of this analysis are very conservative. Further analysis using more refined tools may yield fewer links which can not be accommodated in the AP30B band.

Analysis prepared by Luc Gadbois, P.Eng,

Director of Engineering/ Data Networks

Shaw Satellite Services, Inc.

Appendix

The following analysis was used to determine the minimum distance between two towers for the case where the angle between azimuth and line of sight is greater than 20 degrees.

Analysis to determine minimum distance (Source: Ed Harb (Telesat))

System noise temperature	290	K
Receiver Noise Figure	4	dB
Victim Receiver Thermal Noise (10log(kTB)+NF)	-95.2	dBm
Protection Criteria (I/N)	-6	dB
Co-channel Interference Objective	-101.2	dBm

UHX4-107 4 Ft Antenna
20 Deg disc

Frequency (MHz)	11,450.00
Tx Power (dBm)	32
AFSL(dB)	7.7
Tx Gain(dBi)	-2.4
Rx Gain(dBi)	-2.4
Distance (Km)	2.3
Path Loss	120.82
Calc I	-101.32
Interference Objective	-101.2
Margin (dB)	0.1