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SOURCE¹:GlobespanVirata, Inc.

TITLE: Extended Upstream Reduced Overlap ROL System Spectral Compatibility

ABSTRACT

The present contribution evaluates the spectral compatibility of a high speed system that combines an extended Upstream channel up to ~276KHz and a Reduced Overlap ROL Quad Spectrum Downstream that starts at ~138KHz.

Maximum Expected Performance are provided for information.

Based on the results obtained in the contribution and according to the 2003 refined Soumusho Spectral compatibility rules, we recommend that Extended Upstream Reduced Overlap ROL System can be deployed in the same quad as protected systems up to ~3.25km.

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1 Introduction

The present contribution evaluates the spectral compatibility of an high speed system that combines an extended Upstream channel up to ~276KHz and a Reduced Overlap ROL Quad Spectrum Downstream that starts at ~138KHz.

Section 2 details Upstream and Downstream masks features. Section 3 gives maximum expected performance Spectral. Compatibility tables are provided in section 4.

2 Extended Upstream ROL Mask Definition

2.1 Downstream: Quad Spectrum ROL

Figure 1 and table 2-1 give the features of the Reduced Overlap Quad Spectrum Mask.

Figure 1. Quad Spectrum Reduced Overlap Mask, Plot based on Peak Values

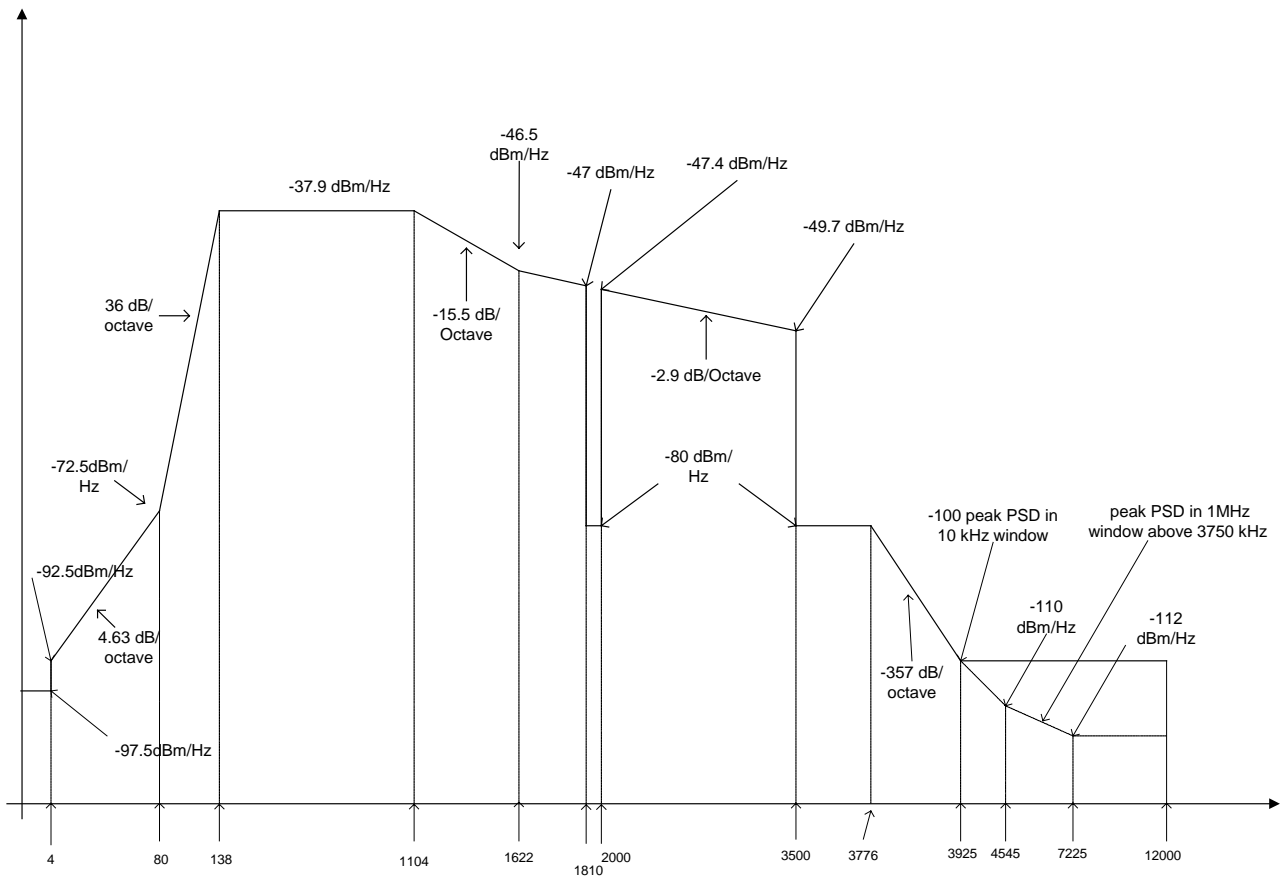


Table 2-1. Quad Spectrum Reduced Overlap Mask Peak Values

(kHz)	PSD(dBm/Hz)
0	-97.5
4	-97.5
4	-92.5
80	-72.5
138	-37.9
1104	-37.9
1622	-46.5
1810	-47.0
1810	-80.0
2000	-80.0
2000	-47.4
3500	-49.7
3500	-80.0
3776	-80.0
3925	-100
4545	-110
7225	-112
12000	-112

2.2 *Extended Upstream Mask*

Figure 2 and table 2-2 give the features of the Extended Upstream Mask.

Figure 2. Extended Upstream Mask Plot based on Peak Values

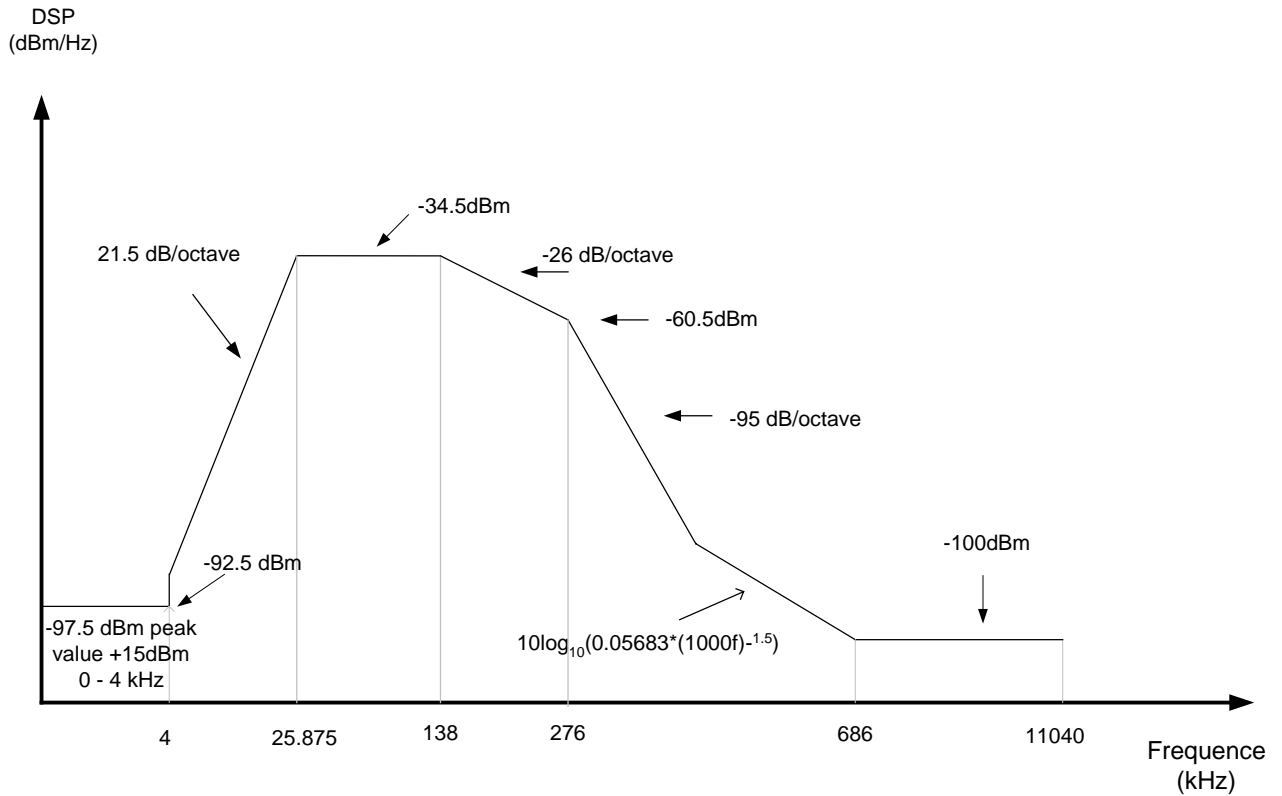


Table 2-2. Extended values

Frequency (kHz)	PSD (dBm/Hz) Peak values
0<f<4	-97.5
4<f<25.875	"-92.5 + 21.5.log2.(f/4)"
25.875<f<138	-34.5
138<f<276	"-34.5 - 26.log2.(f/138)"
276<f<f_int	"-60.5 - 95.log2.(f/276)"
f_int<f<686	10log10(0.05683*(1000f)^(-1.5))
f>686	-100

Upstream Mask, Peak

3 Spectral Compatibility Tables

3.1 Reference Tables

Table 3-1 displays reference performance of protected systems.

Table 3-1. Protected Systems Reference table

Dist	TCM-ISDN		G.992.1 Annex A		G.992.2 Annex A		G.992.1 Annex C			G.992.2 Annex C				
	DS	US	(FDM)		DBM			FBM		DBM		FBM		
0.5	144	144	7104	832	3008	832	7104	832	2624	288	3008	832	1088	288
0.75	144	144	6784	832	2944	832	6912	832	2592	288	2944	832	1088	288
1	144	144	5952	832	2624	832	6368	832	2528	288	2752	832	1088	288
1.25	144	144	4896	800	2272	800	5696	800	2496	288	2528	800	1088	288
1.5	144	144	3840	768	1824	768	5024	800	2432	288	2272	800	1088	288
1.75	144	144	2496	736	1440	736	4192	768	2400	288	2016	768	1088	288
2	144	144	1696	704	960	704	3680	736	2336	288	1696	736	1088	288
2.25	144	144	1088	640	640	640	3296	704	2240	288	1504	704	1088	288
2.5	144	144	704	576	352	576	3008	672	2080	288	1312	672	1056	288
2.75	144	144	480	512	160	512	2720	640	1856	288	1216	640	1056	288
3	144	144	320	448	96	448	2368	576	1536	288	1184	576	1024	288
3.25	144	144	224	352	64	352	1984	512	1280	288	1152	512	992	288
3.5	144	0	128	288	32	288	1632	480	1056	288	1120	480	928	288
3.75	0	0	64	224	32	224	1344	448	832	256	1088	448	832	256
4	0	0	32	192	0	192	1088	416	640	256	1024	416	704	256
4.25	0	0	0	160	0	160	928	416	480	256	928	416	576	256
4.5	0	0	0	128	0	128	768	384	352	224	832	384	416	224
4.75	0	0	0	96	0	96	608	352	224	224	704	352	288	224
5	0	0	0	64	0	64	416	352	128	224	544	352	192	224

3.2 Extended Upstream ROL System Spectral Compatibility Impact Tables

Table 3-2 gives the performance of protected systems in the presence of 5 extended Upstream ROL systems, as disturbers (1 Intra-Quad plus 4 Inter-Quad).

Table 3-2. Extended Upstream ROL System Spectral Compatibility Impact.

Dist	TCM-ISDN		G.992.1 Annex A		G.992.2 Annex A		G.992.1 Annex C		G.992.2 Annex C		G.992.2 Annex C		G.992.2 Annex C	
	DS	US	(FDM)		DS	US	DBM		FBM		DBM		FBM	
0.5	144	144	7104	832	3008	832	7104	832	2624	288	3008	832	1088	288
0.75	144	144	7104	832	3008	832	7104	832	2624	288	3008	832	1088	288
1	144	144	7008	832	3008	832	7008	832	2592	288	3008	832	1088	288
1.25	144	144	6912	832	3008	832	6912	832	2560	288	3008	832	1088	288
1.5	144	144	6816	832	2976	832	6816	832	2528	288	2976	832	1088	288
1.75	144	144	6720	832	2976	832	6720	832	2464	288	2976	832	1088	288
2	144	144	6528	832	2912	832	6528	832	2400	288	2912	832	1088	288
2.25	144	144	6304	832	2848	832	6304	832	2336	288	2848	832	1056	288
2.5	144	144	5984	832	2752	832	5984	832	2208	288	2752	832	1024	288
2.75	144	144	5472	800	2624	800	5472	800	2016	288	2624	800	960	288
3	144	144	4736	800	2496	800	4736	800	1728	288	2496	800	928	288
3.25	144	144	3776	800	2336	800	3776	800	1376	288	2336	800	864	288
3.5	0	144	2912	768	2144	768	2912	768	1088	288	2144	768	768	288
3.75	0	0	2176	736	1856	736	2176	736	800	256	1856	736	672	256
4	0	0	1536	736	1504	736	1536	736	576	256	1504	736	544	256
4.25	0	0	1088	704	1184	704	1088	704	384	256	1184	704	448	256
4.5	0	0	704	672	896	672	704	672	256	224	896	672	320	224
4.75	0	0	416	640	576	640	416	640	128	224	576	640	192	224
5	0	0	192	608	320	608	192	608	64	224	320	608	96	224

3.3 Delta Reference - Extended Upstream ROL Spectral Compatibility Impact Tables

Table 3-2 gives the difference between Reference performance of protected systems and their performance in the presence of 5 Extended Upstream ROL systems disturbers. According to table 3-3, Extended Upstream ROL System has no impact with TCM-ISDN up to ~3.25km.

Table 3-3. Reference performance minus Performance with Extended Upstream ROL system

Dist	TCM-ISDN		G.992.1 Annex A		G.992.2 Annex A		G.992.1 Annex C		G.992.2 Annex C		G.992.2 Annex C		G.992.2 Annex C	
	DS	US	(FDM)		DS	US	DBM		FBM		DBM		FBM	
0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.75	0	0	-320	0	-64	0	-192	0	-32	0	-64	0	0	0
1	0	0	-1056	0	-384	0	-640	0	-64	0	-256	0	0	0
1.25	0	0	-2016	-32	-736	-32	-1216	-32	-64	0	-480	-32	0	0
1.5	0	0	-2976	-64	-1152	-64	-1792	-32	-96	0	-704	-32	0	0
1.75	0	0	-4224	-96	-1536	-96	-2528	-64	-64	0	-960	-64	0	0
2	0	0	-4832	-128	-1952	-128	-2848	-96	-64	0	-1216	-96	0	0
2.25	0	0	-5216	-192	-2208	-192	-3008	-128	-96	0	-1344	-128	32	0
2.5	0	0	-5280	-256	-2400	-256	-2976	-160	-128	0	-1440	-160	32	0
2.75	0	0	-4992	-288	-2464	-288	-2752	-160	-160	0	-1408	-160	96	0
3	0	0	-4416	-352	-2400	-352	-2368	-224	-192	0	-1312	-224	96	0
3.25	0	0	-3552	-448	-2272	-448	-1792	-288	-96	0	-1184	-288	128	0
3.5	144	-144	-2784	-480	-2112	-480	-1280	-288	-32	0	-1024	-288	160	0
3.75	0	0	-2112	-512	-1824	-512	-832	-288	32	0	-768	-288	160	0
4	0	0	-1504	-544	-1504	-544	-448	-320	64	0	-480	-320	160	0
4.25	0	0	-1088	-544	-1184	-544	-160	-288	96	0	-256	-288	128	0
4.5	0	0	-704	-544	-896	-544	64	-288	96	0	-64	-288	96	0
4.75	0	0	-416	-544	-576	-544	192	-288	96	0	128	-288	96	0
5	0	0	-192	-544	-320	-544	224	-256	64	0	224	-256	96	0

4 Maximum Expected Performance

Figures 3 and 4 provides maximum expected performance of the extended Upstream Reduced overlap ROL System: -140dBm/Hz white noise only is considered. The other simulation conditions are as follows: Bit loading between 2 and 15 bits; 70dB of echo rejection; 5dB of Net Coding Gain; 6dB margin Upstream and Downstream Channels.

Figure 3. Extended Upstream ROL Maximum Expected performance (-140dBm/Hz Noise Only),
Downstream Channel rate versus reach

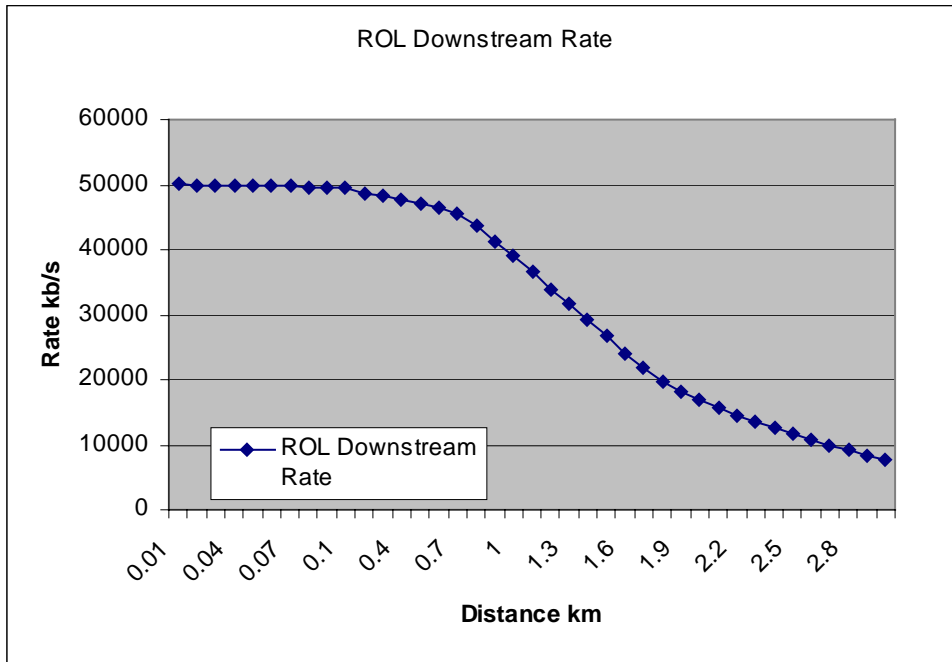
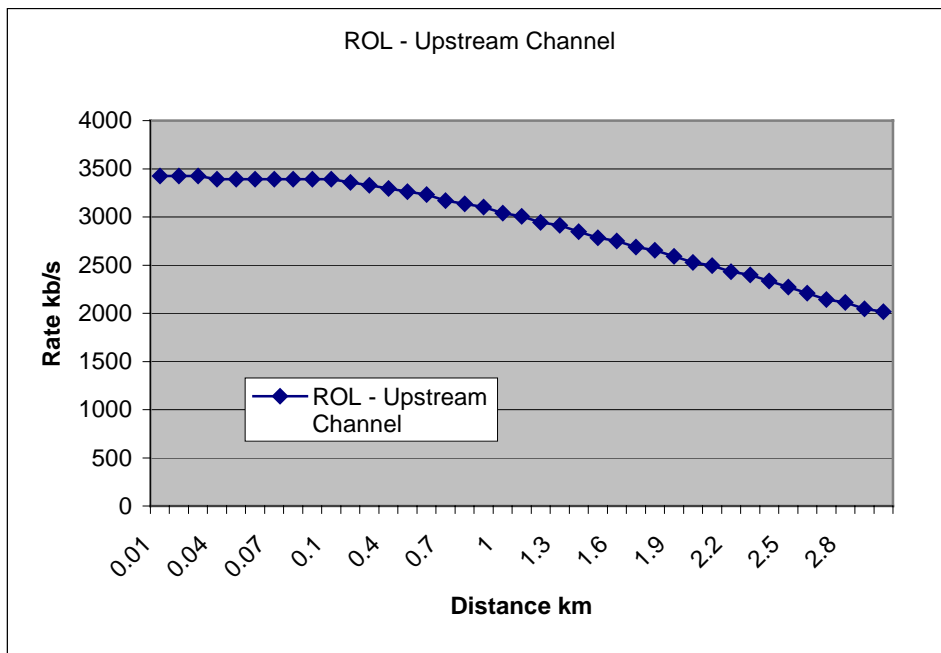


Figure 4. Extended Upstream ROL Maximum Expected performance (-140dBm/Hz Noise Only),
Upstream Channel rate versus reach



5 Conclusions & Recommendations.

According to the 2003 refined Soumusho Spectral compatibility rules, we recommend that Extended Upstream ROL System can be deployed in the same quad as protected systems up to ~3.25km.