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TITLE: JLDSL Spectral Compatibility

ABSTRACT

The present contribution evaluates the Spectral Compatibility of the two JLDSL modes based on two different Downstream masks identified as JLDSL Wide and Narrow, and the same g.992.1 Upstream mask.

Spectral Compatibility is evaluated according to the 2003 Soumusho updated rules.

Both JLDSL modes of operation are spectrally compatible with protected systems in Japan, known as TCM-ISDN, Annex A g.992.1 & g.992.2, Annex C DBM g.992.1 & g.992.2, Annex C FBM g.992.1& g.992.2.

The present contribution recommends to allowing the deployment of both JLDSL modes in the same quad as protected systems without any range limitation.

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1 Introduction

The present contribution evaluates the Spectral Compatibility of the two JLDSL modes based on two different Downstream masks identified as JLDSL Wide and Narrow, and the same g.992.1 Upstream mask.

Spectral Compatibility is evaluated according to the 2003 Soumusho updated rules.

Section 2 details both JDSL mode of operation Masks. Section 3 provides both JDSL modes of operation spectral compatibility tables.

2 JLDSL Masks Definition

2.1 JLDSL Upstream

Both JLDSL modes of operation make use of a single Upstream Mask identical to g.992.1 Upstream Mask.

2.2 JLDSL Downstream

JLDSL modes are based on two different Downstream masks identified as JLDSL Downstream Wide and Narrow.

JLDSL-LR Long Range Downstream Mask.

Figure 1 displays JLDSL Downstream Wide and g.992.1 Upstream Nominal Masks.

Figure 1. JLDSL Downstream Wide Mask Plot and g.992.1 Upstream,Nominal Values

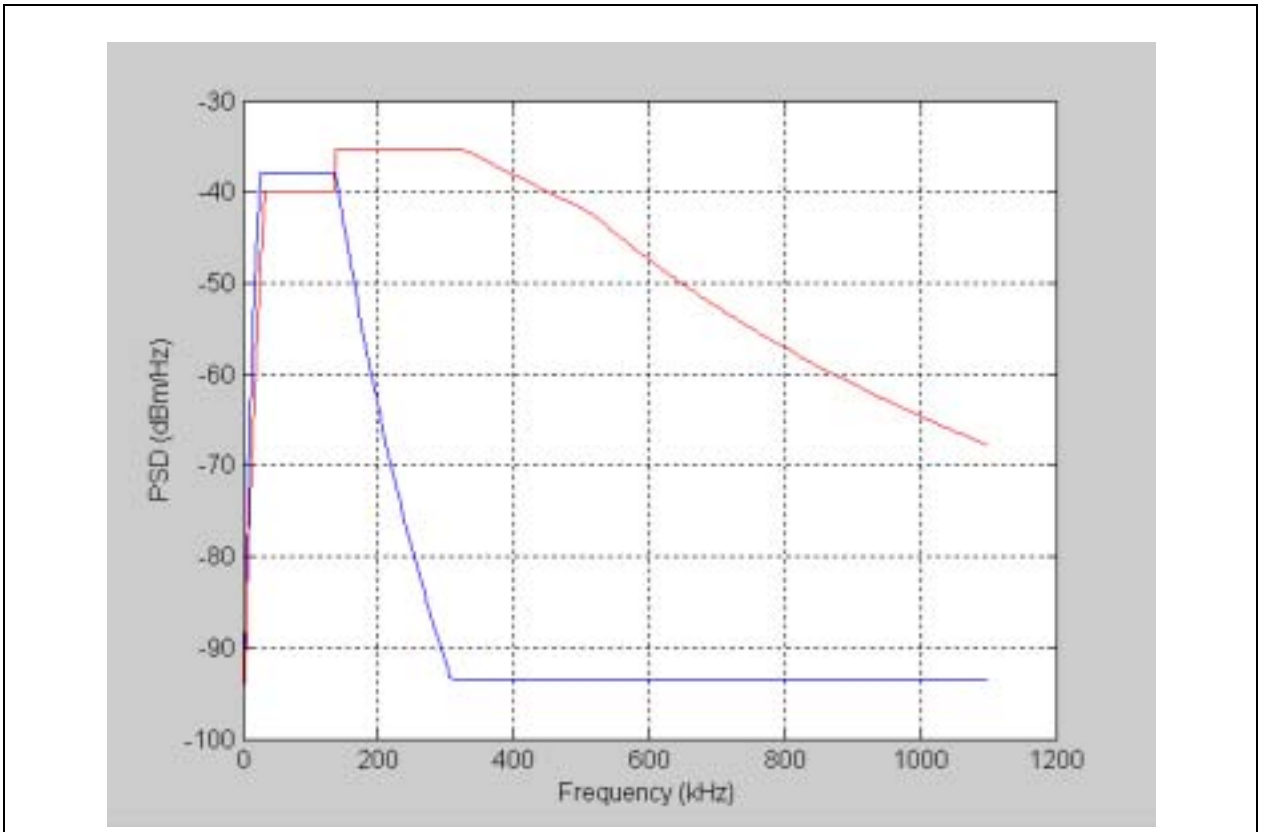


Table 2-1 gives JLDSL Downstream Wide mask peak values.

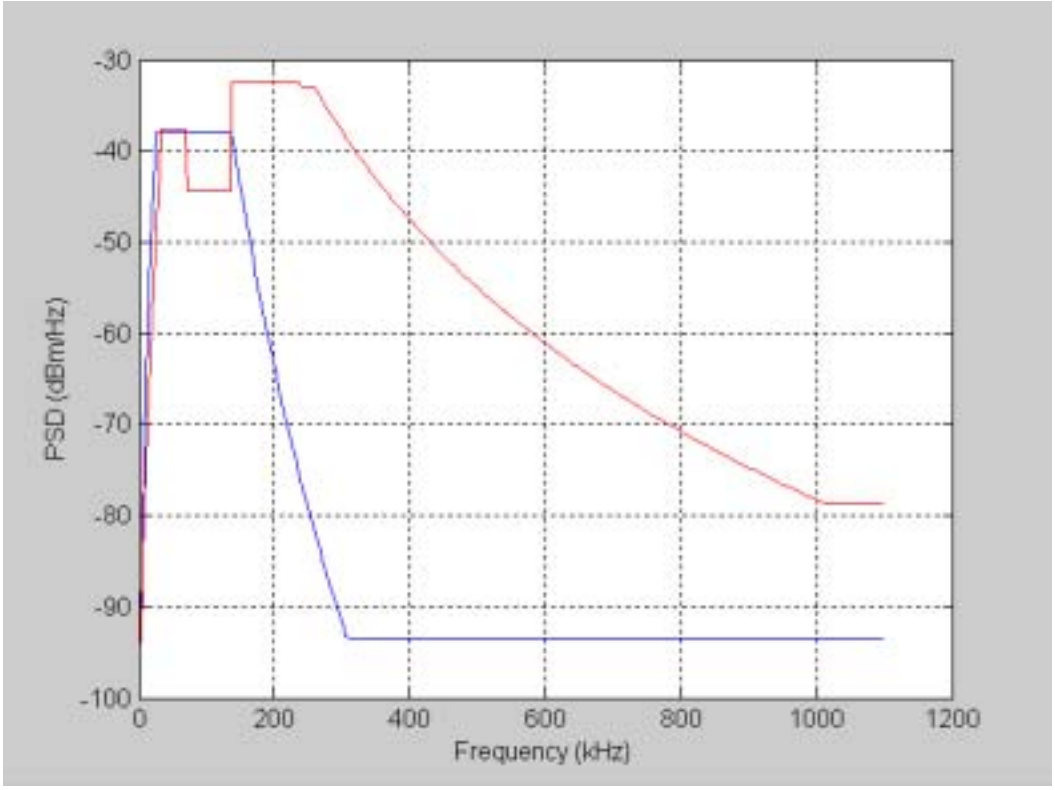
Table 2-1. JLDSL Downstream Wide Mask Peak Values

Frequency f (KHz)	PSD (dBm/Hz) Peak values
$0<f \leq 4$	-97.5, with max power in the in 0-4 kHz band of +15 dBrn
$4<f \leq 5$	$-92.5+18.64\log_2(f/4)$
$5<f\leq 5.25$	-86.5
$5.25<f\leq 16$	$-86.5+15.25\log_2(f/5.25)$
$16<f \leq 32$	$-62+25.5\log_2(f/16)$
$32<f \leq 138$	-36.5
$138 < f \leq 323.4375$	-31.8
$323.4375< f \leq 517.5$	$-31.8- 0.0371\times (f-323.4375)$
$258.75 < f \leq 1800$	$\max(-39 - 23.27 \times \log_2 (f/517.5),-65)$
$1800 < f \leq 2290$	$-65 - 72 \times \log_2 (f/1800)$
$2290 < f \leq 3093$	–90
$3093 < f \leq 4545$	–90 peak, with max power in the $[f, f + 1$ MHz] window of $(-36.5 – 36 \times \log_2 (f/1104) + 60)$ dBm
$4545 < f \leq 11\ 040$	–90 peak, with max power in the $[f, f + 1$ MHz] window of –50 dBm

NOTE 1 – All PSD measurements are in 100 Ω; the POTS band total power measurement is in 600 Ω.
NOTE 2 – The breakpoint frequencies and PSD values are exact; the indicated slopes are approximate.
NOTE 3 – Above 25.875 kHz, the peak PSD shall be measured with a 10 kHz resolution bandwidth.
NOTE 4 – The power in a 1 MHz sliding window is measured in a 1 MHz bandwidth, starting at the measurement frequency.
NOTE 5 – The step in the PSD mask at 4 kHz is to protect V.90 performance. Originally, the PSD mask continued the 21 dB/octave slope below 4 kHz hitting a floor of –97.5 dBm/Hz at 3400 Hz. It was recognized that this might impact V.90 performance, and so the floor was extended to 4 kHz.
NOTE 6 – All PSD and power measurements shall be made at the U-C interface (see Figure 5-4 and Figure 5-5); the signals delivered to the PSTN are specified in Annex E.
NOTE 7 – frequencies are in kHz in the formulas.

JLDSL Downstream Narrow Mask.

Figure 2 displays JLDSL Downstream Narrow and g.992.1 Upstream Nominal Masks.



Blue line: upstream; red line: downstream

Table 2-2 gives JLDSL Downstream Narrow mask peak values.

Frequency f (KHz)	PSD (dBm/Hz) Peak values
$0<f \leq 4$	-97.5, with max power in the in 0-4 kHz band of +15 dBrn
$4<f \leq 5$	$-92.5+18.64\log_2(f/4)$
$5<f\leq 5.25$	-86.5
$5.25<f\leq 16$	$-86.5+15.25\log_2(f/5.25)$
$16<f \leq 32$	$-62+25.5\log_2(f/16)$
$32<f \leq 73.3125$	-34
$73.3125<f \leq 138$	-40.9
$138 < f \leq 237.1875$	-28.9
$237.1875< f \leq 258.75$	-29.5
$258.75 < f \leq 1800$	$\max(-29.5 - 23.27 \times \log_2 (f/258.75),-65)$
$1800 < f \leq 2290$	$-65 - 72 \times \log_2 (f/1800)$
$2290 < f \leq 3093$	–90
$3093 < f \leq 4545$	–90 peak, with max power in the $[f, f + 1$ MHz] window of $(-36.5 – 36 \times \log_2 (f/1104) + 60)$ dBm
$4545 < f \leq 11\ 040$	–90 peak, with max power in the $[f, f + 1$ MHz] window of –50 dBm

NOTE 1 – All PSD measurements are in 100 Ω; the POTS band total power measurement is in 600 Ω.
NOTE 2 – The breakpoint frequencies and PSD values are exact; the indicated slopes are approximate.
NOTE 3 – Above 25.875 kHz, the peak PSD shall be measured with a 10 kHz resolution bandwidth.
NOTE 4 – The power in a 1 MHz sliding window is measured in a 1 MHz bandwidth, starting at the measurement frequency.
NOTE 5 – The step in the PSD mask at 4 kHz is to protect V.90 performance. Originally, the PSD mask continued the 21 dB/octave slope below 4 kHz hitting a floor of –97.5 dBm/Hz at 3400 Hz. It was recognized that this might impact V.90 performance, and so the floor was extended to 4 kHz.
NOTE 6 – All PSD and power measurements shall be made at the U-C interface (see Figure 5-4 and Figure 5-5); the signals delivered to the PSTN are specified in Annex E.
NOTE 7 – frequencies are in kHz in the formulas.

Table 2-2. JLDSL Downstream Wide Mask Peak Values

3 JLDSL Spectral Compatibility

3.1 JLDSL Mode #1 Spectral Compatibility

JLDSL mode #1 combines g.992.1 Upstream Mask and the Wide Downstream Mask defined in section 2.2.

Table 3-1 gives the spectral compatibility Impact of JLDSL Mode #1 with Upstream channels of protected systems. Table 3-1 gives also the reference numbers. We derive from table 3-1 that JLDSL mode#1 is always spectrally compatible with the upstream channels of protected systems.

Table 3-1. JLDSL Mode #1 Upstream Spectral Compatibility vs Reference numbers

	TCM_ISDN		A		A_lite		C_DBM		C_DBM_lite		C_FBM		C_FBM_lite	
km	ref	actual	ref	actual	ref	actual	ref	actual	ref	actual	ref	actual	ref	actual
0.5	61	68	832	832	832	832	832	832	832	832	288	288	288	288
0.75	58	66	832	832	832	832	832	832	832	832	288	288	288	288
1.0	55	65	832	832	832	832	832	832	832	832	288	288	288	288
1.25	52	64	800	832	800	832	800	832	800	832	288	288	288	288
1.5	49	63	768	832	768	832	800	832	800	832	288	288	288	288
1.75	46	63	736	800	736	800	768	800	768	800	288	288	288	288
2.0	43	62	704	768	704	768	736	800	736	800	288	288	288	288
2.25	41	62	640	736	640	736	704	768	704	768	288	288	288	288
2.5	38	61	576	672	576	672	672	736	672	736	288	288	288	288
2.75	35	61	512	608	512	608	640	672	640	672	288	288	288	288
3.0	32	60	448	544	448	544	576	640	576	640	288	288	288	288
3.25	29	60	352	480	352	480	512	608	512	608	256	288	256	288
3.5	26	60	288	384	288	384	480	544	480	544	256	288	256	288
3.75	23	59	224	288	224	288	448	480	448	480	256	288	256	288
4.0	20	59	192	224	192	224	416	448	416	448	256	288	256	288
4.25	17	58	160	160	160	160	416	416	416	416	224	288	224	288
4.5	14	57	128	128	128	128	384	384	384	384	224	288	224	288
4.75	11	56	96	96	96	96	352	352	352	352	224	288	224	288
5.0	8	55	64	64	64	64	352	352	352	352	192	288	192	288

Table 3-2 gives the spectral compatibility Impact of JLDSL Mode #1 with Downstream channels of protected systems. Table 3-2 gives also the reference numbers. We derive from table 3-2 that JLDSL mode#1 is always spectrally compatible with the Downstream channels of protected systems.

Table 3-2. JLDSL Mode #1 Downstream Spectral Compatibility vs Reference numbers

	TCM_ISDN		A		A_lite		C_DBM		C_DBM_lite		C_FBM		C_FBM_lite	
km	ref	actual	ref	actual	ref	actual	ref	km	ref	actual	ref	actual	ref	actual
0.5	60	65	7104	7104	3008	3008	7104	7104	3008	3008	2624	2624	1088	1088
0.75	57	63	6784	7104	2784	3008	6912	7104	2848	3008	2624	2624	1088	1088
1.0	55	62	5952	7104	2400	3008	6368	7104	2624	3008	2624	2624	1088	1088
1.25	52	61	4896	7104	2016	3008	5696	7104	2368	3008	2624	2624	1088	1088
1.5	50	60	3840	7072	1632	2976	5024	7072	2144	2976	2624	2624	1088	1088
1.75	47	59	2496	7072	1184	2976	4192	7072	1856	2976	2624	2624	1088	1088
2.0	45	59	1696	7040	736	2944	3680	7072	1568	2976	2528	2624	1088	1088
2.25	43	58	1088	6784	448	2944	3296	6880	1376	2944	2464	2624	1088	1088
2.5	40	58	704	6176	224	2880	3008	6464	1248	2912	2368	2560	1088	1088
2.75	38	57	480	5344	128	2784	2720	5792	1184	2880	2240	2400	1088	1088
3.0	35	57	320	4384	96	2688	2368	4928	1152	2816	1984	2112	1056	1056
3.25	32	57	224	3520	64	2528	1984	4096	1152	2720	1696	1760	1024	1024
3.5	30	56	128	2848	32	2304	1632	3328	1120	2560	1408	1440	992	992
3.75	27	56	64	2304	0	2048	1344	2720	1056	2336	1152	1216	928	960
4.0	25	56	32	1792	0	1728	1088	2208	960	2048	928	992	832	896
4.25	22	55	0	1376	0	1376	928	1728	896	1696	768	832	736	800
4.5	20	55	0	992	0	992	768	1344	768	1344	576	704	576	704
4.75	17	54	0	672	0	672	608	1024	608	1024	448	576	448	576
5.0	15	53	0	416	0	416	512	768	512	768	320	480	320	480

3.2 JLDSL Mode #2 Spectral Compatibility

JLDSL mode #2 combines g.992.1 Upstream Mask and the Narrow Downstream Mask defined in section 2.2.

Table 3-3 gives the spectral compatibility Impact of JLDSL Mode #2 with Upstream channels of protected systems. Table 3-3 gives also the reference numbers. We derive from table 3-3 that JLDSL mode#2 is always spectrally compatible with the upstream channels of protected systems.

Table 3-3. JLDSL Mode #2 Upstream Spectral Compatibility vs Reference numbers

	TCM_ISDN		A		A_lite		C_DBM		C_DBM_lite		C_FBM		C_FBM_lite	
km	ref	actual	ref	actual	ref	actual	ref	actual	ref	actual	ref	actual	ref	actual
0.5	61	68	832	832	832	832	832	832	832	832	288	288	288	288
0.75	58	66	832	832	832	832	832	832	832	832	288	288	288	288
1.0	55	65	832	832	832	832	832	832	832	832	288	288	288	288
1.25	52	64	800	832	800	832	800	832	800	832	288	288	288	288
1.5	49	63	768	832	768	832	800	832	800	832	288	288	288	288
1.758	46	63	736	832	736	832	768	832	768	832	288	288	288	288
2.0	43	62	704	832	704	832	736	832	736	832	288	288	288	288
2.25	41	62	640	800	640	800	704	800	704	800	288	288	288	288
2.5	38	61	576	736	576	736	672	768	672	768	288	288	288	288
2.75	35	61	512	672	512	672	640	736	640	736	288	288	288	288
3.0	32	60	448	608	448	608	576	672	576	672	288	288	288	288
3.25	29	60	352	512	352	512	512	640	512	640	256	288	256	288
3.5	26	60	288	448	288	448	480	576	480	576	256	288	256	288
3.75	23	59	224	384	224	384	448	544	448	544	256	288	256	288
4.0	20	59	192	288	192	288	416	480	416	480	256	288	256	288
4.25	17	58	160	192	160	192	416	416	416	416	224	288	224	288
4.5	14	57	128	128	128	128	384	384	384	384	224	288	224	288
4.75	11	56	96	96	96	96	352	352	352	352	224	288	224	288
5.0	8	55	64	64	64	64	352	320	352	320	192	288	192	288

Table 3-4 gives the spectral compatibility Impact of JLDSL Mode #2 with Downstream channels of protected systems. Table 3-4 gives also the reference numbers. We derive from table 3-4 that JLDSL mode#2 is always spectrally compatible with the Downstream channels of protected systems.

Table 3-4. JLDSL Mode #2 Downstream Spectral Compatibility vs Reference numbers

	TCM_ISDN		A		A_lite		C_DBM		C_DBM_lite		C_FBM		C_FBM_lite	
km	ref	actual	ref	actual	ref	actual	ref	km	ref	actual	ref	actual	ref	actual
0.5	60	63	7104	7104	3008	3008	7104	7104	3008	3008	2624	2624	1088	1088
0.75	57	61	6784	7104	2784	3008	6912	7104	2848	3008	2624	2624	1088	1088
1.0	55	60	5952	7104	2400	3008	6368	7104	2624	3008	2624	2624	1088	1088
1.25	52	59	4896	7104	2016	3008	5696	7104	2368	3008	2624	2624	1088	1088
1.5	50	58	3840	7072	1632	2976	5024	7072	2144	2976	2624	2624	1088	1088
1.758	47	57	2496	7072	1184	2976	4192	7072	1856	2976	2624	2624	1088	1088
2.0	45	57	1696	7040	736	2944	3680	7072	1568	2976	2528	2624	1088	1088
2.25	43	56	1088	6784	448	2912	3296	6880	1376	2944	2464	2624	1088	1088
2.5	40	56	704	6176	224	2880	3008	6464	1248	2912	2368	2560	1088	1088
2.75	38	55	480	5376	128	2784	2720	5824	1184	2880	2240	2400	1088	1088
3.0	35	55	320	4416	96	2752	2368	4960	1152	2848	1984	2144	1056	1088
3.25	32	55	224	3616	64	2624	1984	4128	1152	2784	1696	1824	1024	1088
3.5	30	54	128	2944	32	2432	1632	3392	1120	2624	1408	1504	992	1056
3.75	27	54	64	2368	0	2144	1344	2784	1056	2400	1152	1248	928	1024
4.0	25	54	32	1856	0	1824	1088	2240	960	2080	928	1056	832	928
4.25	22	53	0	1408	0	1408	928	1760	896	1728	768	864	736	832
4.5	20	53	0	992	0	992	768	1344	768	1344	576	704	576	704
4.75	17	52	0	672	0	672	608	992	608	992	448	576	448	576
5.0	15	52	0	416	0	416	512	736	512	736	320	480	320	480

4 Conclusions & Recommendations

The contribution proves that both JLDSL modes of operation are spectrally compatible with protected systems in Japan, known as TCM-ISDN, Annex A g.992.1 & g.992.2, Annex C DBM g.992.1 & g.992.2, Annex C FBM g.992.1& g.992.2.

The present contribution recommends to allowing the deployment of both JLDSL modes in the same quad as protected systems without any range limitation.