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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

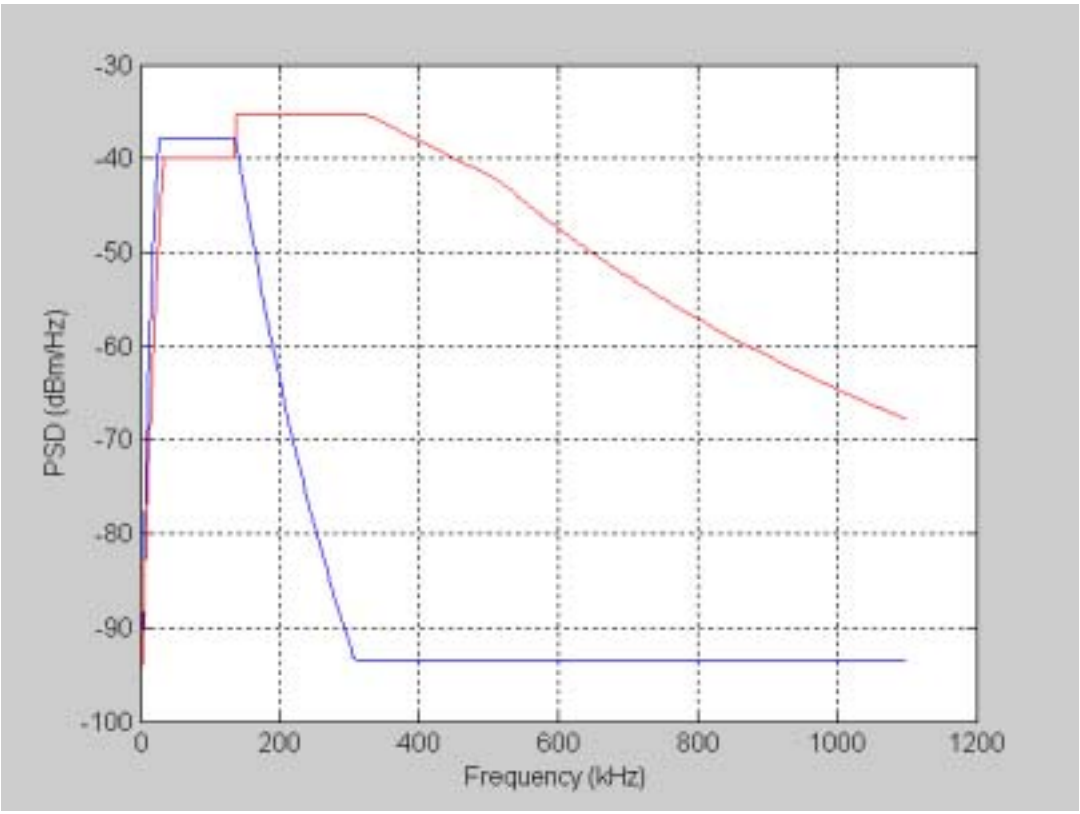


Table 2-1 gives JLDSL Downstream Wide mask peak values.

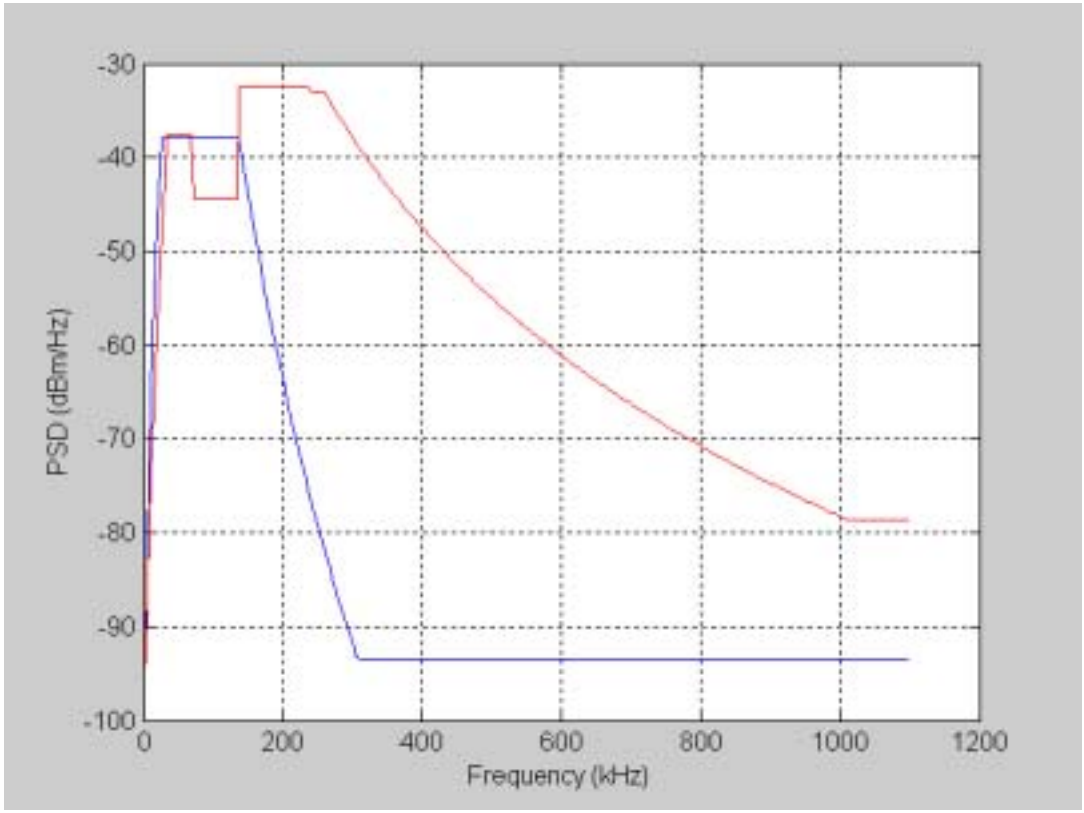
Table 2-1. JLDSL Downstream Wide Mask Peak Values

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
$4<f \leq 5$	$-92.5+18.64 \times \log_2(f/4)$
$5<f\leq 5.25$	-86.5
$5.25<f\leq 16$	$-86.5+15.25 \times \log_2(f/5.25)$
$16<f \leq 32$	$-62+25.5 \times \log_2(f/16)$
$32<f \leq 138$	-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 $(-36.5 – 36 \times \log_2 \times (f/1104) + 60)$ 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.

Table 2-2. 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
$4<f \leq 5$	$-92.5+18.64 \times \log_2(f/4)$
$5<f\leq5.25$	-86.5
$5.25<f\leq16$	$-86.5+15.25 \times \log_2(f/5.25)$
$16<f \leq 32$	$-62+25.5 \times \log_2(f/16)$
$32<f \leq 73.3125$	-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.

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	144	144	832	832	832	832	832	832	832	832	288	288	288	288
0.75	144	144	832	832	832	832	832	832	832	832	288	288	288	288
1.0	144	144	832	832	832	832	832	832	832	832	288	288	288	288
1.25	144	144	800	832	800	832	800	832	800	832	288	288	288	288
1.5	144	144	768	832	768	832	800	832	800	832	288	288	288	288
1.75	144	144	736	800	736	800	768	800	768	800	288	288	288	288
2.0	144	144	704	768	704	768	736	800	736	800	288	288	288	288
2.25	144	144	640	736	640	736	704	768	704	768	288	288	288	288
2.5	144	144	576	672	576	672	672	736	672	736	288	288	288	288
2.75	144	144	512	608	512	608	640	672	640	672	288	288	288	288
3.0	144	144	448	544	448	544	576	640	576	640	288	288	288	288
3.25	144	144	352	480	352	480	512	608	512	608	288	288	288	288
3.5	0	144	288	384	288	384	480	544	480	544	288	288	288	288
3.75	0	144	224	288	224	288	448	480	448	480	256	288	256	288
4.0	0	144	192	224	192	224	416	448	416	448	256	288	256	288
4.25	0	144	160	160	160	160	416	416	416	416	256	288	256	288
4.5	0	144	128	128	128	128	384	384	384	384	224	288	224	288
4.75	0	144	96	96	96	96	352	352	352	352	224	288	224	288
5.0	0	144	64	64	64	64	352	352	352	352	224	288	224	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	144	144	7104	7104	3008	3008	7104	7104	3008	3008	2624	2624	1088	1088
0.75	144	144	6784	7104	2944	3008	6912	7104	2944	3008	2592	2624	1088	1088
1.0	144	144	5952	7104	2624	3008	6368	7104	2752	3008	2528	2624	1088	1088
1.25	144	144	4896	7104	2272	3008	5696	7104	2528	3008	2496	2624	1088	1088
1.5	144	144	3840	7072	1824	2976	5024	7072	2272	2976	2432	2624	1088	1088
1.75	144	144	2496	7072	1440	2976	4192	7072	2016	2976	2400	2624	1088	1088
2.0	144	144	1696	7040	960	2976	3680	7072	1696	2976	2336	2624	1088	1088
2.25	144	144	1088	6784	640	2944	3296	6880	1504	2976	2240	2624	1088	1088
2.5	144	144	704	6176	352	2912	3008	6464	1312	2944	2080	2560	1056	1088
2.75	144	144	480	5344	160	2880	2720	5792	1216	2912	1856	2400	1056	1088
3.0	144	144	320	4384	96	2848	2368	4928	1184	2880	1536	2112	1024	1088
3.25	144	144	224	3520	64	2752	1984	4096	1152	2848	1280	1760	992	1088
3.5	144	144	128	2848	32	2592	1632	3328	1120	2720	1056	1440	928	1088
3.75	0	144	64	2304	32	2240	1344	2720	1088	2496	832	1216	832	992
4.0	0	144	32	1792	0	1952	1088	2208	1024	2240	640	992	704	960
4.25	0	144	0	1376	0	1600	928	1728	928	1920	480	832	576	864
4.5	0	144	0	992	0	1216	768	1344	832	1536	352	704	416	800
4.75	0	144	0	672	0	832	608	1024	704	1216	224	576	288	672
5.0	0	144	0	416	0	544	416	768	544	896	128	480	192	544

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	144	144	832	832	832	832	832	832	832	832	288	288	288	288
0.75	144	144	832	832	832	832	832	832	832	832	288	288	288	288
1.0	144	144	832	832	832	832	832	832	832	832	288	288	288	288
1.25	144	144	800	832	800	832	800	832	800	832	288	288	288	288
1.5	144	144	768	832	768	832	800	832	800	832	288	288	288	288
1.75	144	144	736	832	736	832	768	832	768	832	288	288	288	288
2.0	144	144	704	832	704	832	736	832	736	832	288	288	288	288
2.25	144	144	640	800	640	800	704	800	704	800	288	288	288	288
2.5	144	144	576	736	576	736	672	768	672	768	288	288	288	288
2.75	144	144	512	672	512	672	640	736	640	736	288	288	288	288
3.0	144	144	448	608	448	608	576	672	576	672	288	288	288	288
3.25	144	144	352	512	352	512	512	640	512	640	288	288	288	288
3.5	0	144	288	448	288	448	480	576	480	576	288	288	288	288
3.75	0	144	224	384	224	384	448	544	448	544	256	288	256	288
4.0	0	144	192	288	192	288	416	480	416	480	256	288	256	288
4.25	0	144	160	192	160	192	416	416	416	416	256	288	256	288
4.5	0	144	128	128	128	128	384	384	384	384	224	288	224	288
4.75	0	144	96	96	96	96	352	352	352	352	224	288	224	288
5.0	0	144	64	64	64	64	352	320	352	320	224	288	224	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	144	144	7104	7104	3008	3008	7104	7104	3008	3008	2,624	2624	1,088	1088
0.75	144	144	6784	7104	2944	3008	6912	7104	2944	3008	2,592	2624	1,088	1088
1.0	144	144	5952	7104	2624	3008	6368	7104	2752	3008	2,528	2624	1,088	1088
1.25	144	144	4896	7104	2272	3008	5696	7104	2528	3008	2,496	2624	1,088	1088
1.5	144	144	3840	7072	1824	2976	5024	7072	2272	2976	2,432	2624	1,088	1088
1.75	144	144	2496	7072	1440	2976	4192	7072	2016	2976	2,400	2624	1,088	1088
2.0	144	144	1696	7040	960	2976	3680	7072	1696	2976	2,336	2624	1,088	1088
2.25	144	144	1088	6784	640	2944	3296	6880	1504	2976	2,240	2624	1,088	1088
2.5	144	144	704	6176	352	2912	3008	6464	1312	2944	2,080	2560	1,056	1088
2.75	144	144	480	5376	160	2880	2720	5824	1216	2912	1,856	2400	1,056	1088
3.0	144	144	320	4416	96	2848	2368	4960	1184	2880	1,536	2144	1,024	1088
3.25	144	144	224	3616	64	2752	1984	4128	1152	2848	1,280	1824	992	1088
3.5	144	144	128	2944	32	2592	1632	3392	1120	2752	1,056	1504	928	1088
3.75	0	144	64	2368	32	2336	1344	2784	1088	2560	832	1248	832	1056
4.0	0	144	32	1856	0	2016	1088	2240	1024	2272	640	1056	704	992
4.25	0	144	0	1408	0	1632	928	1760	928	1952	480	864	576	896
4.5	0	144	0	992	0	1216	768	1344	832	1536	352	704	416	800
4.75	0	144	0	672	0	832	608	992	704	1216	224	576	288	672
5.0	0	144	0	416	0	544	416	736	544	896	128	480	192	544

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.