ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.993.2
Amendment 4
(08/2013)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA,
DIGITAL SYSTEMS AND NETWORKS

Digital sections and digital line system – Metallic access
networks

Very high speed digital subscriber line
transceivers 2 (VDSL2)

**Amendment 4 – European limit PSD mask B8-18
for band plan 998E17**

Recommendation ITU-T G.993.2 (2011) –
Amendment 4

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Recommendation ITU-T G.993.2

Very high speed digital subscriber line transceivers 2 (VDSL2)

Amendment 4

European limit power spectral density (PSD) mask B8-18 for band plan 998E17

Summary

Amendment 4 to Recommendation ITU-T G.993.2 (2011) covers the following functionalities:

1. accuracy of test parameters (clarification);

2. size of INP_min field for use with ITU-T G.998.4 (corrigendum);

3. European limit power spectral density (PSD) mask B8-18 for band plan 998E17 (new functionality).

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T G.993.2	2006-02-17	15
1.1	ITU-T G.993.2 (2006) Cor. 1	2006-12-14	15
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1.3	ITU-T G.993.2 (2006) Amd. 1 Cor. 1	2007-07-29	15
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1.10	ITU-T G.993.2 (2006) Amd. 6	2010-11-29	15
1.11	ITU-T G.993.2 (2006) Cor. 4	2011-04-13	15
1.12	ITU-T G.993.2 (2006) Amd. 7	2011-06-22	15
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2.2	ITU-T G.993.2 (2011) Cor. 1	2012-06-13	15
2.3	ITU-T G.993.2 (2011) Amd. 2	2012-12-07	15
2.4	ITU-T G.993.2 (2011) Amd. 3	2013-04-22	15
2.5	ITU-T G.993.2 (2011) Amd. 4	2013-08-29	15

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

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In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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Recommendation ITU-T G.993.2

Very high speed digital subscriber line transceivers 2 (VDSL2)

Amendment 4

European limit power spectral density (PSD) mask B8-18 for band plan 998E17

1) Accuracy of test parameters (clarification)

Amend clause 11.4.1.2 as follows:

11.4.1.2   Accuracy of test parameters

This clause defines accuracy requirements for test parameters defined in clause 11.4.1.1. The accuracy requirement is expressed as a tolerance relative to a reference value. Both the reference value and the allowed tolerance are defined in this clause.

The accuracy requirements of test parameters are optional. A VTU may comply with the accuracy requirements for all or a subset of the test parameters. For subcarriers and subcarrier groups to which accuracy requirements do not apply (see clauses 11.4.1.2.1 to 11.4.1.2.8), the VTU shall report test parameters as defined in clause 11.4.1.1 but the accuracy of these reported values may not comply with the accuracy requirements further defined in this clause.

NOTE – The measurement of test parameter reference values involves the use of test equipment. The accuracy requirements defined in this clause do not take into account test equipment tolerance. Test equipment tolerance is out of the scope of this Recommendation and is to be added to the tolerances defined in this clause.

2)   Size of INP_min field for use with ITU-T G.998.4

Amend clause 12.3.5.2.1.2 as follows:

12.3.5.2.1.2   O-TPS

…

If the bearer channel is operated without physical layer retransmission as defined in Recommendation ITU-T G.998.4, then Tthe field "Impulse noise protection and dynamic interleaver reconfiguration" shall be coded as follows:

- Bits 0-5 shall contain the required INP_min_n value expressed in DMT symbols.

- The valid values are $0 \leq INP\_min_n \leq 16$.

- The value $INP\_min_n = 0$ is a special value indicating that no minimum level of impulse noise protection is required.

- Bit 6 shall be set to 1 to indicate that the bearer should be mapped in a latency path that supports dynamic interleaver reconfiguration. When no latency paths support dynamic interleaver reconfiguration or when the bearer chooses not to use it, the value of this bit shall be ZERO.

  NOTE 1 – For both upstream and downstream transmission, the number of bearer channels that set the value of bit 6 to ONE cannot be higher than the number of latency paths that support interleaver reconfiguration.

- Bit 7: INP_no_erasure_required (see clause 9.6)
  - When set to ONE, it indicates that the VTU-R receiver shall set $INP_p = INP\_no\_erasure_p$.
  - When set to ZERO, it indicates that the VTU-R receiver is not required to set $INP_p = INP\_no\_erasure_p$.

If the bearer channel is operated with physical layer retransmission, as defined in Recommendation ITU-T G.998.4, then the field "Impulse noise protection and dynamic interleaver reconfiguration" shall be coded as follows:

- Bits 0-6 shall contain the required INP_min_n value expressed in DMT symbols.
- Bit 7 shall be reserved for use by ITU-T and shall be set to ZERO.

NOTE 2 – Improper setting of one or more of the following parameters – maximum net data rate, downstream maximum SNR margin, impulse noise protection, maximum interleaving delay (in SNRM_MODE=1), TXREFVN (in SNRM_MODE=2 and SNRM_MODE=4), RXREFVN (in SNRM_MODE=3 and SNRM_MODE=4), and TXREFVNSF and RXREFVNSF (in SNRM_MODE=4) can result in high levels of transmit power that can lead to high crosstalk experienced by DSLs on other pairs in the same binder. Specifically, high values of maximum net data rate, downstream maximum SNR margin, impulse noise protection, low values of maximum interleaving delay (in SNRM_MODE=1), and high values of TXREFVN (in SNRM_MODE=2 and SNRM_MODE=4), RXREFVN (in SNRM_MODE=3 and SNRM_MODE=4), and TXREFVNSF and RXREFVNSF (in SNRM_MODE=4) are of concern.

…

3)   Replace Annex B

Replace Annex B with the following text:

Annex B

Region B (Europe)

(This annex forms an integral part of this Recommendation.)

B.1   Band plans

This annex defines the various band plans required for European deployment of VDSL2 systems operating at a maximum frequency of 30 MHz. These are based on [ITU-T G.993.1] band plans A and B (also referred to as plan 998 and plan 997, respectively). The various band plans are defined in Table B.1 below and can be summarized as follows:

Plan 997   The original plan 997 (f_{max} = 12 MHz).

Plan 997E17   Plan 997 directly extended to f_{max} = 17.664 MHz.

Plan 997E30   Plan 997 directly extended to f_{max} = 30 MHz.

NOTE – Plan 997E17 and plan 997 are truncated versions of plan 997E30.

Plan 998   The original plan 998 (f_{max} = 12 MHz).

Plan 998E17   Plan 998 directly extended to f_{max} = 17.664 MHz.

Plan 998E30   Plan 998 directly extended to f_{max} = 30 MHz.

NOTE – Plan 998E17 and plan 998 are truncated versions of plan 998E30.

Plan 998ADE17   Plan 998 extended to f_{max} = 17.664 MHz (downstream transmission only above 12 MHz)

Plan 998ADE30   Plan 998 extended to f_{max} = 30 MHz.

NOTE – Plan 998ADE17 and plan 998 are truncated versions of plan 998ADE30.

Plan HPE17   Band plan for operation between 7.05 MHz and 17.664 MHz.

Plan HPE30   Band plan for operation between 7.05 MHz and 30 MHz.

   NOTE – Plan HPE17 is a truncated version of plan HPE30.

Plan HPE1230   Band plan for operation between 12 MHz and 30 MHz.

   NOTE – Plan HPE1230 is a truncated version of plan HPE30.

Plan HPE1730   Band plan for operation between 17.664 MHz and 30 MHz.

   NOTE – Plan HPE1730 is a truncated version of plan HPE30.

Plan HPEADE1230   Band plan for operation between 12 MHz and 30 MHz.

   NOTE – Plan HPEADE1230 is a truncated version of plan 998ADE30.

Plan HPEADE1730   Band plan for operation between 17.664 MHz and 30 MHz.

   NOTE – Plan HPEADE1730 is a truncated version of plan 998ADE30.

Different variants are defined for band plans 997, 998, 998E17, 998E30, 998ADE17 and 998ADE30 to accommodate different underlying services (POTS and ISDN), and different US0 bandwidths.

Table B.1 – Band-edge frequencies for European VDSL2 band plans

Band plan	Band-edge frequencies (as defined in the generic band plan in clause 7.1.2)										
	f_{0L} kHz	f_{0H} kHz	f_1 kHz	f_2 kHz	f_3 kHz	f_4 kHz	f_5 kHz	f_6 kHz	f_7 kHz	f_8 kHz	f_9 kHz
	US0		DS1		US1	DS2	US2	DS3	US3	DS4	US4
997	25	138	138	3 000	5 100	7 050	12 000	N/A	N/A	N/A	N/A
	25	276	276								
997E17	25	138	138	3 000	5 100	7 050	12 000	14 000	17 664	N/A	N/A
997E30	N/A	N/A	138	3 000	5 100	7 050	12 000	14 000	19 500	27 000	30 000
	US0		DS1		US1	DS2	US2	US3	DS3	US4	DS4
998	25	138	138	3 750	5 200	8 500	12 000	N/A	N/A	N/A	N/A
	25	276	276								
	120	276	276								
	N/A	N/A	138								
998E17	N/A	N/A	138	3 750	5 200	8 500	12 000	14 000	17 664	N/A	N/A
	N/A	N/A	276								
	<u>25</u>	<u>138</u>	<u>138</u>								
998E30	N/A	N/A	138	3 750	5 200	8 500	12 000	14 000	21 450	24 890	30 000
	N/A	N/A	276								

Table B.1 – Band-edge frequencies for European VDSL2 band plans

Band plan	Band-edge frequencies (as defined in the generic band plan in clause 7.1.2)										
	f_{0L} kHz	f_{0H} kHz	f_1 kHz	f_2 kHz	f_3 kHz	f_4 kHz	f_5 kHz	f_6 kHz	f_7 kHz	f_8 kHz	f_9 kHz
	US0		DS1		US1	DS2	US2	DS3		US3	
998ADE17	25	138	138	3 750	5 200	8 500	12 000	17 664	N/A		
	120	276	276								
	25	276	276								
	N/A	N/A	276								
998ADE30	N/A	N/A	138	3 750	5 200	8 500	12 000	24 890	30 000		
	N/A	N/A	276								
						DS2	US2	US3	DS3	US4	DS4
HPE17	N/A	N/A	N/A	N/A	7 050	10 125	12 000	14 000	17 664	N/A	N/A
HPE30	N/A	N/A	N/A	N/A	7 050	10 125	12 000	14 000	21 450	24 890	30 000
HPE1230	N/A	N/A	N/A	N/A	N/A	N/A	12 000	14 000	21 450	24 890	30 000
HPE1730	N/A	N/A	N/A	N/A	N/A	N/A	NA	17 664	21 450	~~24 980~~ 24 890	30 000
	US0		DS1		US1	DS2	US2	DS3		US3	
HPEADE1230	N/A	N/A	N/A	N/A	N/A	N/A	12 000	24 890	30 000		
HPEADE1730	N/A	N/A	N/A	N/A	N/A	N/A	17 664	24 890	30 000		
NOTE 1 – N/A in the columns f0L and f0H designates a band plan variant that does not use US0.											
NOTE 2 – The capability to support US0 together with profile 17a is required for European VDSL2.											

The f_i in Table B.1 are defined as follows:

* f_{0L} and f_{0H}: define lower and upper frequency of US0;
* f_1 to f_5 are the boundary frequencies of the bands DS1, US1, DS2, US2 as defined for VDSL1 for 997 and 998;
* f_5 to f_9 are the boundary frequencies for the bands US3, DS3, US4 and DS4 (extended bands);
*   The extension of an existing band is considered as a separate band (e.g., 998E17: US3 12 MHz-14 MHz).

B.2   Limit PSD mask options

The limit PSD mask options defined in this annex are shown in Tables B.2, B.3, and B4, for various band plans.

Table B.2 – European limit PSD mask options for band plan 997 (and its extensions)

Short name	Limit PSD mask (long name)	Frequency	
		US0 type A/M (Note)	Highest used upstream or downstream frequency (kHz)
B7-1	997-M1c-A-7	A	7 050
B7-3	997-M1x-M	M	12 000
B7-9	997E17-M2x-A	A	17 664
B7-10	997E30-M2x-NUS0	N/A	30 000
NOTE – The US0 types stand for: • US0 type A corresponds to Annex A of [ITU-T G.992.5]; • US0 type M corresponds to Annex M of [ITU-T G.992.3] or of [ITU-T G.992.5]; • US0 type N/A designates a band plan variant that does not use US0.			

Table B.3 – European limit PSD mask options for band plan 998 (and its extensions)

Short name	Limit PSD mask (long name)	Frequency	
		US0 type A/B/M (Note)	Highest used upstream or downstream frequency (kHz)
B8-4	998-M2x-A	A	12 000
B8-5	998-M2x-M	M	12 000
B8-6	998-M2x-B	B	12 000
B8-7	998-M2x-NUS0	N/A	12 000
B8-8	998E17-M2x-NUS0	N/A	17 664
B8-9	998E17-M2x-NUS0-M	N/A	17 664
B8-10	998ADE17-M2x-NUS0-M	N/A	17 664
B8-11	998ADE17-M2x-A	a	17 664
B8-12	998ADE17-M2x-B	B	17 664

Table B.3 – European limit PSD mask options for band plan 998 (and its extensions)

Short name	Limit PSD mask (long name)	Frequency	
		US0 type A/B/M (Note)	Highest used upstream or downstream frequency (kHz)
B8-13	998E30-M2x-NUS0	N/A	30 000
B8-14	998E30-M2x-NUS0-M	N/A	30 000
B8-15	998ADE30-M2x-NUS0-M	N/A	30 000
B8-16	998ADE30-M2x-NUS0-A	N/A	30 000
B8-17	998ADE17-M2x-M	M	17 664
B8-18	998E17-M2x-A	A	17 664

NOTE – The US0 types stand for:
- US0 type A corresponds to Annex A of [ITU-T G.992.5];
- US0 type B corresponds to Annex B of [ITU-T G.992.5];
- US0 type M corresponds to Annex M of [ITU-T G.992.3] or of [ITU-T G.992.5];
- US0 type N/A designates a band plan variant that does not use US0;
- 998ADExx-M2x-NUS0-M designate the variants in which DS1 starts at 276 kHz instead of 138 kHz.

Table B.4 – European limit PSD mask options for HPE band plans

Short name	Limit PSD mask (long name)	Frequency	
		US0 type A/B/M (Note)	Highest used upstream or downstream frequency (kHz)
BH-1	HPE17-M1-NUS0	N/A	17 664
BH-2	HPE30-M1-NUS0	N/A	30 000
BH-3	HPE1230-NUS0	N/A	30 000
BH-4	HPE1730-NUS0	N/A	30 000
BH-5	HPEADE1230-NUS0	N/A	30 000
BH-6	HPEADE1730-NUS0	N/A	30 000

NOTE 1 – US0 type N/A designates a band plan variant that does not use US0.
NOTE 2 – Band plans BH-1 and BH-2 were referred to as band plans B7-7 and B7-8 respectively in previous versions of ITU-T G.993.2.

B.2.1 General requirements in the band below 4 kHz

The noise in the voice band measured with psophometric weighting according to [ITU-T O.41] clause 3.3 shall not exceed –68 dBm. The psophometer shall be used in bridging mode and shall be calibrated for 600 ohm termination.

B.2.2 VTU-R limit PSD masks for band plan 997 (and its extensions)

The VTU-R limit PSD masks for band plan 997 (and its extensions) are shown in Table B.5.

Table B.5 – VTU-R limit PSD masks for band plan 997 (and its extensions)

Name	B7-1	B7-3	B7-9	B7-10
Long name	997-M1-c-A-7	997-M1-x-M	997E17-M2x-A	997E30-M2x-NUS0
kHz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz
0	–97.5	–97.5	–97.5	–100
4	–97.5	–97.5	–97.5	–100
4	–92.5	–92.5	–97.5	–100
25.875	–34.5	–37.5	–34.5	–100
50	–34.5	–37.5	–34.5	–100
80	–34.5	–37.5	–34.5	–100
120	–34.5	–37.5	–34.5	–100
138	–34.5	–37.5	–34.5	–100
225	Interp	–37.5	Interp	–100
243	−93.2	–37.5	–93.2	–100
276	Interp	–37.5	Interp	–100
493.41	Interp	–97.9	Interp	–100
686	–100	–100	–100	–100
2 825	–100	–100	–100	–100
3 000	–80	–80	–80	–80
3 000	–56.5	–56.5	–50.3	–50.3
3 575	–56.5	–56.5	Interp	Interp
3 750	–56.5	–56.5	Interp	Interp
5 100	–56.5	–56.5	–52.6	–52.6
5 100	–80	–80	–80	–80
5 275	–100	–100	–100	–100
6 875	–100	–100	–100	–100
7 050	–100	–80	–80	–80
7 050	–100	–56.5	–54	–54
8 325	–100	–56.5	Interp	Interp
9 950	–100	–56.5	Interp	Interp
10 125	–100	–56.5	–55.5	–55.5
10 125	–100	–56.5	–55.5	–55.5
11 825	–100	–56.5	–55.5	–55.5
12 000	–100	–56.5	–55.5	–55.5
12 000	–100	–80	–80	–80
12 175	–100	–100	–100	–100
13 825	–100	–100	–100	–100
14 000	–100	–100	–80	–80
14 000	–100	–100	–56.5	–56.5
14 175	–100	–100	Interp	Interp
17 664	–100	–100	–56.5	–56.5
19 500	–100	–100	–80	–56.5
19 500	–100	–100	–80	–80

Table B.5 – VTU-R limit PSD masks for band plan 997 (and its extensions)

Name	B7-1	B7-3	B7-9	B7-10
Long name	997-M1-c-A-7	997-M1-x-M	997E17-M2x-A	997E30-M2x-NUS0
kHz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz
19 675	–100	–100	–100	–100
21 275	–100	–100	–100	–100
21 450	–100	–100	–100	–100
21 450	–100	–100	–100	–100
24 890	–100	–100	–100	–100
24 890	–100	–100	–100	–100
25 065	–100	–100	–100	–100
26 825	–100	–100	–100	–100
27 000	–100	–100	–100	–80
27 000	–100	–100	–100	–56.5
30 000	–100	–100	–100	–56.5
30 000	–110	–110	–110	–80
30 175	–110	–110	–110	–110
≥ 30 175	–110	–110	–110	–110

NOTE – The PSD values between breakpoints including the values marked by "Interp" shall be obtained by interpolation between adjacent breakpoints as follows:
– below 2 825 kHz on a dB/log(f) basis; and
– above 2 825 kHz on a dB/f basis.

B.2.3   VTU-O limit PSD masks for band plan 997 (and its extensions)

The VTU-O limit PSD masks for band plan 997 (and its extensions) are shown in Table B.6.

Table B.6 – VTU-O limit PSD masks for band plan 997 (and its extensions)

Name	B7-1	B7-3	B7-9	B7-10
Long name	997-M1c-A-7	997-M1x-M	997E17-M2x-A	997E30-M2x-NUS0
kHz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz
0	–97.5	–97.5	–97.5	–97.5
4	–97.5	–97.5	–97.5	–97.5
4	–92.5	–92.5	–92.5	–92.5
80	–72.5	–92.5	–72.5	–72.5
101.2	Interp	–92.5	Interp	Interp
138	–49.5	Interp	–44.2	–44.2
138	–49.5	Interp	–36.5	–36.5
227.11	–49.5	–62	–36.5	–36.5
276	–49.5	–48.5	–36.5	–36.5
276	–49.5	–36.5	–36.5	–36.5
1 104	–49.5	–36.5	–36.5	–36.5
1 622	–49.5	–46.5	–46.5	–46.5

Table B.6 – VTU-O limit PSD masks for band plan 997 (and its extensions)

Name	B7-1	B7-3	B7-9	B7-10
Long name	997-M1c-A-7	997-M1x-M	997E17-M2x-A	997E30-M2x-NUS0
kHz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz
2 208	–49.5	–48	Interp	Interp
2 236	–49.5	Interp	Interp	Interp
2 249	–49.5	–49.5	Interp	Interp
2 423	–56.5	Interp	Interp	Interp
2 500	–56.5	–56.5	Interp	Interp
3 000	–56.5	–56.5	–49.6	–49.6
3 000	–80	–80	–80	–80
3 175	–100	–100	–100	–100
4 925	–100	–100	–100	–100
5 100	–80	–80	–80	–80
5 100	–56.5	–56.5	–52.6	–52.6
5 200	–56.5	–56.5	Interp	Interp
6 875	–56.5	–56.5	Interp	Interp
7 050	–56.5	–56.5	–54	–54
7 050	–80	–80	–80	–80
7 225	–100	–100	–100	–100
10 125	–100	–100	–100	–100
10 125	–100	–100	–100	–100
10 300	–100	–100	–100	–100
11 825	–100	–100	–100	–100
12 000	–100	–100	–80	–80
12 000	–100	–100	–56.5	–56.5
13 825	–100	–100	–56.5	–56.5
14 000	–100	–100	–56.5	–56.5
14 000	–100	–100	–80	–80
14 175	–100	–100	–100	–100
17 489	–100	–100	-100	–100
17 664	–100	–100	–100	–100
17 664	–100	–100	–100	–100
19 325	–100	–100	–100	–100
19 500	–100	–100	–100	–80
19 500	–100	–100	–100	–56.5
21 000	–100	–100	–100	–56.5
21 450	–100	–100	–100	–56.5
21 450	–100	–100	–100	–56.5
21 625	–100	–100	–100	–56.5
24 715	–100	–100	–100	–56.5
24 890	–100	–100	–100	–56.5
24 890	–100	–100	–100	–56.5

Table B.6 – VTU-O limit PSD masks for band plan 997 (and its extensions)

Name	B7-1	B7-3	B7-9	B7-10
Long name	**997-M1c-A-7**	**997-M1x-M**	**997E17-M2x-A**	**997E30-M2x-NUS0**
kHz	**dBm/Hz**	**dBm/Hz**	**dBm/Hz**	**dBm/Hz**
27 000	–100	–100	–100	–56.5
27 000	–100	–100	–100	–80
27 175	–100	–100	–100	–100
30 000	–100	–100	–100	–100
30 000	–110	–110	–110	–110
30 175	–110	–110	–110	–110
$\geq$ 30 175	–110	–110	–110	–110

NOTE – The PSD values between breakpoints including the values marked by "Interp" shall be obtained by interpolation between adjacent breakpoints as follows:
– below f_1 on a dB/log(f) basis; and
– above f_1 on a dB/f basis,
where f_1 is defined in Table B.1 as either 138 or 276 kHz.

B.2.4 VTU-R limit PSD masks for band plan 998 (and its extensions)

The VTU-R limit PSD masks for band plan 998 (and its extensions) are shown in Table B.7.

Table B.7 – VTU-R limit PSD masks for band plan 998 (and its extensions)

Name	B8-4	B8-5	B8-6	B8-7	B8-8	B8-9	B8-10	B8-11	B8-12	B8-13	B8-14	B8-15	B8-16	B8-17	B8-18
Long name	998-M2x-A	998-M2x-M	998-M2x-B	998-M2x-NUS0	998 E17-M2x-NUS0	998 E17-M2x-NUS0-M	998 ADE17-M2x-NUS0-M	998 ADE17-M2x-A	998 ADE17-M2x-B	998 E30-M2x-NUS0	998 E30-M2x-NUS0-M	998 ADE30-M2x-NUS0-M	998 ADE30-M2x-NUS0-A	998 ADE17-M2x-M	998 E17-M2x-A
kHz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz
0	–97.5	–97.5	–97.5	–100	–100	–100	–100	–97.5	–97.5	–100	–100	–100	–100	–97.5	–97.5
4	–97.5	–97.5	–97.5	–100	–100	–100	–100	–97.5	–97.5	–100	–100	–100	–100	–97.5	–97.5
4	–92.5	–92.5	–92.5	–100	–100	–100	–100	–92.5	–92.5	–100	–100	–100	–100	–92.5	–92.5
25.875	–34.5	–37.5	–92.5	–100	–100	–100	–100	–34.5	–92.5	–100	–100	–100	–100	–37.5	–34.5
50	–34.5	–37.5	–90	–100	–100	–100	–100	–34.5	–90	–100	–100	–100	–100	–37.5	–34.5
80	–34.5	–37.5	–81.8	–100	–100	–100	–100	–34.5	–81.8	–100	–100	–100	–100	–37.5	–34.5
120	–34.5	–37.5	–34.5	–100	–100	–100	–100	–34.5	–34.5	–100	–100	–100	–100	–37.5	–34.5
138	–34.5	–37.5	–34.5	–100	–100	–100	–100	–34.5	–34.5	–100	–100	–100	–100	–37.5	–34.5
225	Interp	–37.5	–34.5	–100	–100	–100	–100	Interp	–34.5	–100	–100	–100	–100	–37.5	Interp
243	–93.2	–37.5	–34.5	–100	–100	–100	–100	–93.2	–34.5	–100	–100	–100	–100	–37.5	–93.2
276	Interp	–37.5	–34.5	–100	–100	–100	–100	Interp	–34.5	–100	–100	–100	–100	–37.5	Interp
307	Interp	Interp	Interp	–100	–100	–100	–100	Interp	Interp	–100	–100	–100	–100	Interp	Interp
493.41	Interp	–97.9	Interp	–100	–100	–100	–100	Interp	Interp	–100	–100	–100	–100	–97.9	Interp
508.8	Interp	Interp	–98	–100	–100	–100	–100	Interp	–98	–100	–100	–100	–100	Interp	Interp
686	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100
3 575	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100
3 750	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80
3 750	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2

Table B.7 – VTU-R limit PSD masks for band plan 998 (and its extensions)

Name	B8-4	B8-5	B8-6	B8-7	B8-8	B8-9	B8-10	B8-11	B8-12	B8-13	B8-14	B8-15	B8-16	B8-17	B8-18
Long name	998-M2x-A	998-M2x-M	998-M2x-B	998-M2x-NUS0	998 E17-M2x-NUS0	998 E17-M2x-NUS0-M	998 ADE17-M2x-NUS0-M	998 ADE17-M2x-A	998 ADE17-M2x-B	998 E30-M2x-NUS0	998 E30-M2x-NUS0-M	998 ADE30-M2x-NUS0-M	998 ADE30-M2x-NUS0-A	998 ADE17-M2x-M	998 E17-M2x-A
kHz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz
5 100	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp
5 200	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7
5 200	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80
5 375	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100
8 325	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100
8 500	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80
8 500	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8
10 000	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5
12 000	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5	−55.5
12 000	−80	−80	−80	−80	−56.5	−56.5	−80	−80	−80	−56.5	−56.5	−80	−80	−80	−56.5
12 175	−100	−100	−100	−100	−56.5	−56.5	−100	−100	−100	−56.5	−56.5	−100	−100	−100	−56.5
14 000	−100	−100	−100	−100	−56.5	−56.5	−100	−100	−100	−56.5	−56.5	−100	−100	−100	−56.5
14 000	−100	−100	−100	−100	−80	−80	−100	−100	−100	−80	−80	−100	−100	−100	−80
14 175	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100
21 275	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100
21 450	−100	−100	−100	−100	−100	−100	−100	−100	−100	−80	−80	−100	−100	−100	−100
21 450	−100	−100	−100	−100	−100	−100	−100	−100	−100	−56.5	−56.5	−100	−100	−100	−100
24 715	−100	−100	−100	−100	−100	−100	−100	−100	−100	−56.5	−56.5	−100	−100	−100	−100
24 890	−100	−100	−100	−100	−100	−100	−100	−100	−100	−56.5	−56.5	−80	−80	−100	−100
24 890	−100	−100	−100	−100	−100	−100	−100	−100	−100	−80	−80	−56.5	−56.5	−100	−100

Table B.7 – VTU-R limit PSD masks for band plan 998 (and its extensions)

Name	B8-4	B8-5	B8-6	B8-7	B8-8	B8-9	B8-10	B8-11	B8-12	B8-13	B8-14	B8-15	B8-16	B8-17	B8-18
Long name	998-M2x-A	998-M2x-M	998-M2x-B	998-M2x-NUS0	998 E17-M2x-NUS0	998 E17-M2x-NUS0-M	998 ADE17-M2x-NUS0-M	998 ADE17-M2x-A	998 ADE17-M2x-B	998 E30-M2x-NUS0	998 E30-M2x-NUS0-M	998 ADE30-M2x-NUS0-M	998 ADE30-M2x-NUS0-A	998 ADE17-M2x-M	998 E17-M2x-A
kHz	dBm/ Hz	dBm/ Hz	dBm/ Hz	dBm/ Hz	dBm/ Hz	dBm/ Hz	dBm/ Hz	dBm/ Hz	dBm/ Hz	dBm/ Hz	dBm/ Hz	dBm/ Hz	dBm/ Hz	dBm/ Hz	dBm/ Hz
25 065	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−56.5	−56.5	−100	−100
30 000	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−56.5	−56.5	−100	−100
30 000	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−80	−80	−110	−110
30 175	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110
≥ 30 175	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110

NOTE – The PSD values between breakpoints including the values marked by "Interp" shall be obtained by interpolation between adjacent breakpoints as follows:
– below 3 575 kHz on a dB/log(*f*) basis; and
– above 3 575 kHz on a dB/*f* basis.

B.2.5 VTU-O limit PSD masks for band plan 998 (and its extensions)

The VTU-O limit PSD masks for band plan 998 (and its extensions) are shown in Table B.8.

Table B.8 – VTU-O limit PSD masks for band plan 998 (and its extensions)

Name	B8-4	B8-5	B8-6	B8-7	B8-8	B8-9	B8-10	B8-11	B8-12	B8-13	B8-14	B8-15	B8-16	B8-17	B8-18
Long name	998-M2x-A	998-M2x-M	998-M2x-B	998-M2x-NUS0	998 E17-M2x-NUS0	998 E17-M2x-NUS0-M	998 ADE17-M2x-NUS0-M	998 ADE17-M2x-A	998 ADE17-M2x-B	998 E30-M2x-NUS0	998 E30-M2x-NUS0-M	998 ADE30-M2x-NUS0-M	998 ADE30-M2x-NUS0-A	998 ADE17-M2x-M	998 E17-M2x-A
kHz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz
0	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5
4	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5	–97.5
4	–92.5	–92.5	–92.5	–92.5	–92.5	–92.5	–92.5	–92.5	–92.5	–92.5	–92.5	–92.5	–92.5	–92.5	–92.5
80	–72.5	–92.5	–92.5	–72.5	–72.5	–92.5	–92.5	–72.5	–92.5	–72.5	–92.5	–92.5	–72.5	–92.5	–72.5
101.2	Interp	–92.5	–92.5	Interp	Interp	–92.5	–92.5	Interp	–92.5	Interp	–92.5	–92.5	Interp	–92.5	Interp
138	–44.2	Interp	Interp	–44.2	–44.2	Interp	Interp	–44.2	Interp	–44.2	Interp	Interp	–44.2	Interp	–44.2
138	–36.5	Interp	Interp	–36.5	–36.5	Interp	Interp	–36.5	Interp	–36.5	Interp	Interp	–36.5	Interp	–36.5
227.11	–36.5	–62	–62	–36.5	–36.5	–62	–62	–36.5	–62	–36.5	–62	–62	–36.5	–62	–36.5
276	–36.5	–48.5	–48.5	–36.5	–36.5	–48.5	–48.5	–36.5	–48.5	–36.5	–48.5	–48.5	–36.5	–48.5	–36.5
276	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5
1 104	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5	–36.5
1 622	–46.5	–46.5	–46.5	–46.5	–46.5	–46.5	–46.5	–46.5	–46.5	–46.5	–46.5	–46.5	–46.5	–46.5	–46.5
2 208	–48	–48	–48	–48	–48	–48	–48	–48	–48	–48	–48	–48	–48	–48	–48
2 249	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp
2 500	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp
3 750	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2	–51.2
3 750	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80
3 925	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100
5 025	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100	–100
5 200	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80	–80

Table B.8 – VTU-O limit PSD masks for band plan 998 (and its extensions)

Name	B8-4	B8-5	B8-6	B8-7	B8-8	B8-9	B8-10	B8-11	B8-12	B8-13	B8-14	B8-15	B8-16	B8-17	B8-18
Long name	998-M2x-A	998-M2x-M	998-M2x-B	998-M2x-NUS0	998 E17-M2x-NUS0	998 E17-M2x-NUS0-M	998 ADE17-M2x-NUS0-M	998 ADE17-M2x-A	998 ADE17-M2x-B	998 E30-M2x-NUS0	998 E30-M2x-NUS0-M	998 ADE30-M2x-NUS0-M	998 ADE30-M2x-NUS0-A	998 ADE17-M2x-M	998 E17-M2x-A
kHz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz
5 200	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7	−52.7
7 050	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp
7 225	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp	Interp
8 500	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8	−54.8
8 500	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80	−80
8 675	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100
11 825	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100
12 000	−100	−100	−100	−100	−100	−100	−80	−80	−80	−100	−100	−80	−80	−80	−100
12 000	−100	−100	−100	−100	−100	−100	−56.5	−56.5	−56.5	−100	−100	−56.5	−56.5	−56.5	−100
13 825	−100	−100	−100	−100	−100	−100	−56.5	−56.5	−56.5	−100	−100	−56.5	−56.5	−56.5	−100
14 000	−100	−100	−100	−100	−80	−80	−56.5	−56.5	−56.5	−80	−80	−56.5	−56.5	−56.5	−80
14 000	−100	−100	−100	−100	−56.5	−56.5	−56.5	−56.5	−56.5	−56.5	−56.5	−56.5	−56.5	−56.5	−56.5
17 664	−100	−100	−100	−100	−56.5	−56.5	−56.5	−56.5	−56.5	−56.5	−56.5	−56.5	−56.5	−56.5	−56.5
21 000	−100	−100	−100	−100	−80	−80	−80	−80	−80	−56.5	−56.5	−56.5	−56.5	−80	−80
21 450	−100	−100	−100	−100	−100	−100	−100	−100	−100	−56.5	−56.5	−56.5	−56.5	−100	−100
21 450	−100	−100	−100	−100	−100	−100	−100	−100	−100	−80	−80	−56.5	−56.5	−100	−100
21 625	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−56.5	−56.5	−100	−100
24 715	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−100	−56.5	−56.5	−100	−100
24 890	−100	−100	−100	−100	−100	−100	−100	−100	−100	−80	−80	−56.5	−56.5	−100	−100
24 890	−100	−100	−100	−100	−100	−100	−100	−100	−100	−56.5	−56.5	−80	−80	−100	−100

Table B.8 – VTU-O limit PSD masks for band plan 998 (and its extensions)

Name	B8-4	B8-5	B8-6	B8-7	B8-8	B8-9	B8-10	B8-11	B8-12	B8-13	B8-14	B8-15	B8-16	B8-17	B8-18
Long name	998-M2x-A	998-M2x-M	998-M2x-B	998-M2x-NUS0	998 E17-M2x-NUS0	998 E17-M2x-NUS0-M	998 ADE17-M2x-NUS0-M	998 ADE17-M2x-A	998 ADE17-M2x-B	998 E30-M2x-NUS0	998 E30-M2x-NUS0-M	998 ADE30-M2x-NUS0-M	998 ADE30-M2x-NUS0-A	998 ADE17-M2x-M	998 E17-M2x-A
kHz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz
25 065	−100	−100	−100	−100	−100	−100	−100	−100	−100	−56.5	−56.5	−100	−100	−100	−100
30 000	−100	−100	−100	−100	−100	−100	−100	−100	−100	−56.5	−56.5	−100	−100	−100	−100
30 000	−110	−110	−110	−110	−110	−110	−110	−110	−110	−80	−80	−110	−110	−110	−110
30 175	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110
≥ 30 175	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110	−110

NOTE – The PSD values between breakpoints including the values marked by "Interp" shall be obtained by interpolation between adjacent breakpoints as follows:

– below f_1 on a dB/log(f) basis; and

– above f_1 on a dB/f basis,

where f_1 is defined in Table B.1 as either 138 kHz or 276 kHz.

B.2.6 VTU-R limit PSD masks for HPE band plans

The VTU-R limit PSD masks for HPE band plans are shown in Table B.9.

Table B.9 – VTU-R limit PSD masks for HPE band plans

Name	BH-1	BH-2	BH-3	BH-4	BH-5	BH-6
Long name	HPE17-M1-NUS0	HPE30-M1-NUS0	HPE1230-M1-NUS0	HPE1730-M1-NUS0	HPEADE1230-NUS0	HPEADE1730-NUS0
kHz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz
0	−100	−100	−100	−100	−100	−100
4	−100	−100	−100	−100	−100	−100
4	−100	−100	−100	−100	−100	−100
25.875	−100	−100	−100	−100	−100	−100
50	−100	−100	−100	−100	−100	−100
80	−100	−100	−100	−100	−100	−100
120	−100	−100	−100	−100	−100	−100
138	−100	−100	−100	−100	−100	−100
225	−100	−100	−100	−100	−100	−100
243	−100	−100	−100	−100	−100	−100
276	−100	−100	−100	−100	−100	−100
493.41	−100	−100	−100	−100	−100	−100
686	−100	−100	−100	−100	−100	−100
2 825	−100	−100	−100	−100	−100	−100
3 000	−100	−100	−100	−100	−100	−100
3 000	−100	−100	−100	−100	−100	−100
3 575	−100	−100	−100	−100	−100	−100
3 750	−100	−100	−100	−100	−100	−100
5 100	−100	−100	−100	−100	−100	−100
5 100	−100	−100	−100	−100	−100	−100
5 275	−100	−100	−100	−100	−100	−100
6 875	−100	−100	−100	−100	−100	−100
7 050	−100	−100	−100	−100	−100	−100
7 050	−100	−100	−100	−100	−100	−100
8 325	−100	−100	−100	−100	−100	−100
9 950	−100	−100	−100	−100	−100	−100
10 125	−80	−80	−100	−100	−100	−100
10 125	−56.5	−56.5	−100	−100	−100	−100
11 825	−56.5	−56.5	−100	−100	−100	−100
12 000	−56.5	−56.5	−80	−100	−100	−100
12 000	−56.5	−56.5	−56.5	−100	−100	−100
12 175	−56.5	−56.5	−56.5	−100	−100	−100
13 825	−56.5	−56.5	−56.5	−100	−100	−100
14 000	−56.5	−56.5	−56.5	−100	−100	−100

Table B.9 – VTU-R limit PSD masks for HPE band plans

Name	BH-1	BH-2	BH-3	BH-4	BH-5	BH-6
Long name	HPE17-M1-NUS0	HPE30-M1-NUS0	HPE1230-M1-NUS0	HPE1730-M1-NUS0	HPEADE1230-NUS0	HPEADE1730-NUS0
kHz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz
14 000	−80	−80	−80	−100	−100	−100
14 175	−100	−100	−100	−100	−100	−100
17 664	−100	−100	−100	−100	−100	−100
19 500	−100	−100	−100	−100	−100	−100
19 500	−100	−100	−100	−100	−100	−100
19 675	−100	−100	−100	−100	−100	−100
21 275	−100	−100	−100	−100	−100	−100
21 450	−100	−80	−80	−80	−100	−100
21 450	−100	−56.5	−56.5	−56.5	−100	−100
24 715	−100	−56.5	−56.5	−56.5	−100	−100
24 890	−100	−56.5	−56.5	−56.5	−80	−80
24 890	−100	−80	−80	−80	−56.5	−56.5
25 065	−100	−100	−100	−100	−56.5	−56.5
26 825	−100	−100	−100	−100	−56.5	−56.5
27 000	−100	−100	−100	−100	−56.5	−56.5
27 000	−100	−100	−100	−100	−56.5	−56.5
30 000	−100	−100	−100	−100	−56.5	−56.5
30 000	−110	−110	−110	−110	−80	−80
30 175	−110	−110	−110	−110	−110	−110
≥ 30 175	−110	−110	−110	−110	−110	−110
NOTE – The PSD values between breakpoints shall be obtained by interpolation between adjacent breakpoints on a dB/*f* basis.						

B.2.7 VTU-O limit PSD masks for HPE band plans

The VTU-O limit PSD masks for HPE band plans are shown in Table B.10.

Table B.10 – VTU-O limit PSD masks for HPE band plans

Name	BH-1	BH-2	BH-3	BH-4	BH-5	BH-6
Long name	HPE17-M1-NUS0	HPE30-M1-NUS0	HPE1230-M1-NUS0	HPE1730-M1-NUS0	HPEADE1230-NUS0	HPEADE1730-NUS0
kHz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz
0	−97.5	−97.5	−97.5	−97.5	−97.5	−97.5
4	−97.5	−97.5	−97.5	−97.5	−97.5	−97.5
4	−97.5	−97.5	−97.5	−97.5	−92.5	−92.5
80	−97.5	−97.5	−97.5	−97.5	−92.5	−92.5
101.2	−97.5	−97.5	−97.5	−97.5	−92.5	−92.5

Table B.10 – VTU-O limit PSD masks for HPE band plans

Name	BH-1	BH-2	BH-3	BH-4	BH-5	BH-6
Long name	HPE17-M1-NUS0	HPE30-M1-NUS0	HPE1230-M1-NUS0	HPE1730-M1-NUS0	HPEADE1230-NUS0	HPEADE1730-NUS0
kHz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz
138	−100	−100	−100	−100	−100	−100
138	−100	−100	−100	−100	−100	−100
227.11	−100	−100	−100	−100	−100	−100
276	−100	−100	−100	−100	−100	−100
276	−100	−100	−100	−100	−100	−100
1 104	−100	−100	−100	−100	−100	−100
1 622	−100	−100	−100	−100	−100	−100
2 208	−100	−100	−100	−100	−100	−100
2 236	−100	−100	−100	−100	−100	−100
2 249	−100	−100	−100	−100	−100	−100
2 423	−100	−100	−100	−100	−100	−100
2 500	−100	−100	−100	−100	−100	−100
3 000	−100	−100	−100	−100	−100	−100
3 000	−100	−100	−100	−100	−100	−100
3 175	−100	−100	−100	−100	−100	−100
4 925	−100	−100	−100	−100	−100	−100
5 100	−100	−100	−100	−100	−100	−100
5 100	−100	−100	−100	−100	−100	−100
5 200	−100	−100	−100	−100	−100	−100
6 875	−100	−100	−100	−100	−100	−100
7 050	−80	−80	−100	−100	−100	−100
7 050	−56.5	−56.5	−100	−100	−100	−100
7 225	−56.5	−56.5	−100	−100	−100	−100
10 125	−56.5	−56.5	−100	−100	−100	−100
10 125	−80	−80	−100	−100	−100	−100
10 300	−100	−100	−100	−100	−100	−100
11 825	−100	−100	−100	−100	−100	−100
12 000	−100	−100	−100	−100	−80	−100
12 000	−100	−100	−100	−100	−56.5	−100
13 825	−100	−100	−100	−100	−56.5	−100
14 000	−80	−80	−80	−100	−56.5	−100
14 000	−56.5	−56.5	−56.5	−100	−56.5	−100
14 175	−56.5	−56.5	−56.5	−100	−56.5	−100
17 489	−56.5	−56.5	−56.5	−100	−56.5	−100
17 664	−56.5	−56.5	−56.5	−80	−56.5	−80
17 664	−56.5	−56.5	−56.5	−56.5	−56.5	−56.5
19 325	Interp	−56.5	−56.5	−56.5	−56.5	−56.5

Table B.10 – VTU-O limit PSD masks for HPE band plans

Name	BH-1	BH-2	BH-3	BH-4	BH-5	BH-6
Long name	HPE17-M1-NUS0	HPE30-M1-NUS0	HPE1230-M1-NUS0	HPE1730-M1-NUS0	HPEADE1230-NUS0	HPEADE1730-NUS0
kHz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz	dBm/Hz
19 500	Interp	−56.5	−56.5	−56.5	−56.5	−56.5
19 500	Interp	−56.5	−56.5	−56.5	−56.5	−56.5
21 000	−80	−56.5	−56.5	−56.5	−56.5	−56.5
21 450	−100	−56.5	−56.5	−56.5	−56.5	−56.5
21 450	−100	−80	−80	−80	−56.5	−56.5
21 625	−100	−100	−100	−100	−56.5	−56.5
24 715	−100	−100	−100	−100	−56.5	−56.5
24 890	−100	−80	−80	−80	−56.5	−56.5
24 890	−100	−56.5	−56.5	−56.5	−80	−80
25 065	−100	−56.5	−56.5	−56.5	−100	−100
27 000	−100	−56.5	−56.5	−56.5	−100	−100
27 000	−100	−56.5	−56.5	−56.5	−100	−100
27 175	−100	−56.5	−56.5	−56.5	−100	−100
30 000	−100	−56.5	−56.5	−56.5	−100	−100
30 000	−110	−80	−80	−80	−110	−110o
30 175	−110	−110	−110	−110	−110	−110
≥ 30 175	−110	−110	−110	−110	−110	−110

NOTE – The PSD values between breakpoints including the values marked by "Interp" shall be obtained by interpolation between adjacent breakpoints as follows:
– below 138 kHz on a dB/log(f) basis; and
– above 138 kHz on a dB/f basis.

B.3   UPBO reference PSDs

UPBO parameters 'a' and 'b' are set by network management.

NOTE – The parameters 'a' and 'b' are expected to be uniform across all lines sharing a section of cable plant.

B.4   Template PSD

B.4.1   Definition

The template PSD is set to 3.5 dB below the PSD mask in frequency bands in which the PSD is at or above −96.5 dBm/Hz. Elsewhere the template is set to −100 dBm/Hz below 4 MHz, −110 dBm/Hz between 4 MHz and f_3, or −112 dBm/Hz between f_3 and 30 MHz, where f_3 is defined in Table B.1. These values are chosen to satisfy the requirements of clause 7.2.2.

B.4.2   Narrow-band PSD verification

Narrow-band compliance with the PSD masks in this annex shall be verified by power measurements using a 10-kHz measurement bandwidth centred on the frequency in question above 4 kHz, and in a 100-Hz measurement bandwidth in the band up to 4 kHz.

B.4.3 Use in simulation (informative)

The Template PSD may be used in simulations of VDSL2 performance as representative of an average transmitter conformant with the associated limit PSD mask.

B.5 Compliance

Compliance requires conformance with at least one limit PSD mask.

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