COMMUNICATIONS ALLIANCE LTD

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DR C658:2025

NEXT-GENERATION BROADBAND SYSTEMS DEPLOYMENT IN CUSTOMER CABLING

PART 3

REQUIREMENTS FOR DEPLOYMENT CLASS SYSTEMS

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INTRODUCTORY STATEMENT

This Part of the Code should be read in association with Part 1 that describes rules for compliance and Part 2 that provides the full detail of the technical approach to spectrum management that will protect Deployment Class Systems and Legacy Systems that use Shared Cable Bundles in Buildings or Campuses from Unacceptable Interference.

Part 3 includes the definitions of the Deployment Class Systems and their parameters, along with Coexistence Masks that must be satisfied by Non-Deployment Class Systems in order to coexist with the specified Deployment Class System.

TABLE OF CONTENTS

1 GENERAL

1.1 Outline of Part 3

Part 3 provides a list of defined Deployment Classes and a set of Appendices, each containing a detailed specification for a Deployment Class. It also describes the path to deemed compliance by these Deployment Class Systems.

1.2 PSD Mask breakpoints to take precedence over graphs

In this document, if any of the PSD Masks described in Tables by their series of {Frequency, Power} breakpoints differ from the corresponding graphic representation of the same PSD Mask, the figures in the relevant table should be taken to be the correct version.

2 LIST OF DEPLOYMENT CLASS SYSTEMS

2.1 General

2.1.1 Deployment Class Systems defined under this Code are listed in Table 1 with detailed descriptions provided in the Appendices.

TABLE 1

List of Deployment Class Systems

Long name of Deployment Class System	Short name of Deployment Class System	Overarching International Standard upon which Deployment Class System is based (See note 2)
VDSL2 B8-11 Non-Vectored	V811u	ITU-T G.993.2
VDSL2 B8-11 Vectored	V811v	ITU-T G.993.2
VDSL2 B8-11 Spectral Separation Low Split Non-Vectored	V811Lu	ITU-T G.993.2
VDSL2 B8-11 Spectral Separation Low Split Vectored	V811Lv	ITU-T G.993.2
VDSL2 B8-11 Spectral Separation High Split Non-Vectored	V811Hu	ITU-T G.993.2
VDSL2 B8-11 Spectral Separation High Split Vectored	V811Hv	ITU-T G.993.2
G.fast Spectrally Masked above VDSL2	G.fast-SM	ITU-T G.9700 ITU-T G.9701

NOTES:

1. Additional Deployment Class Systems may be incorporated into future versions of this Code. Industry stakeholders interested to incorporate additional Deployment Class Systems are invited to contribute proposals to Communications Alliance for Code Review at any time.

2. The split spectrum VDSL2 systems are defined with PSD Masks which are set out in this Code. These PSD Masks are compatible with the ITU-T G993.2 B8-11 PSD Mask definitions.

3 DEEMED COMPLIANCE

This part of the code provides a path for deemed compliance of Deployment Class Systems that are based on international standards.

3.1 Deemed Coexistence Tables

3.1.1 The intention of the deemed coexistence tables is to simplify the process for a System Provider to demonstrate that a System is not causing unacceptable interference to another System. Reliance upon the deemed coexistence tables depends upon satisfaction of two threshold requirements:

(a) that the Deployment Class System in question has been deployed in full accordance with the rules applicable to that System, and

(b) that it is configured and operated in full accordance with the applicable deployment conditions.

3.1.2 The rules governing deemed coexistence of Deployment Class Systems are presented in Part 1 of this Code. The methods used to determine the tables and parameter translations below are described in Part 2 of this Code.

3.1.3 Deemed coexistence situations for Deployment Class Systems are listed in Table 2 and Table 3 of Part 1 of the Code for systems that are Deployed at the same NRP or at different NRPs respectively. Those tables include a summary of any conformance requirements.

4 REFERENCES

Publication	Title
Industry Codes	
C559:2012	Unconditioned Local Loop Service (ULLS) Network Deployment http://commsalliance.com.au/Documents/all/codes/c559
International Telecommunications Union Recommendations	
G.993.2 (02/2019)	Very high speed digital subscriber line transceivers 2 (VDSL2) https://www.itu.int/ITU-T/recommendations/rec.aspx?id=13747
G.993.5 (02/2019) Cor. 1 (03/2020)	Self-FEXT cancellation (Vectoring) for use with VDSL2 transceivers https://www.itu.int/ITU-T/recommendations/rec.aspx?id=13748
G.9700 (07/2019)	Fast access to subscriber terminals (G.fast) – Power spectral density specification https://www.itu.int/ITU-T/recommendations/rec.aspx?id=13832
G.9701 (03/2019) Cor. 4 (06/2023)	Fast access to subscriber terminals (G.fast) – Physical layer specification https://www.itu.int/ITU-T/recommendations/rec.aspx?id=13772
Legislation	
Telecommunications Act 1997 *http://www.comlaw.gov.au/Series/C2004A05145*	

APPENDIX

A The family of V811 VDSL2 Deployment Class Systems

The family of V811 Deployment Class Systems includes the following Systems:

V811v	V811Lv	V811Hv
V811u	V811Lu	V811Hu

All members of the V811 Deployment Class are VDSL2 Systems, conforming to the ITU-T G.993.2 B8-11 band plan to 17.664 MHz.

A1 Operating Frequency Range

A.1.1 The VDSL2 band is divided into subcarriers spaced at 4.3125 kHz which are identified using integer indices. The integer indices correspond to VDSL2 tones operating at integer multiples of the subcarrier spacing.

The family of V811 Deployment Class Systems operates in the frequency range 25.875 kHz to 17664 kHz inclusive as outlined in TABLE 2.

TABLE 2

Operating frequency range bands

Band Name	Lower Frequency Edge (kHz)	Lower Frequency Edge Carrier Index	Upper Frequency Edge (kHz)	Upper Frequency Edge Carrier Index
Upstream 0	25.875	6	138	32
Downstream 1	142.3125	33	3750	869
Upstream 1	3750	870	5200	1205
Downstream 2	5200	1206	8500	1971
Upstream 2	8500	1972	12000	2782
Downstream 3	12000	2783	17664	4096

A2 Upstream Power Backoff

A.2.1 All members of the family of V811 Deployment Class Systems must apply Upstream Power Back Off (UPBO) as defined in ITU-T G993.2 clause 7.2.1.3.

NOTE: The purpose of this requirement is to avoid the effects of mid-point-injection, by ensuring that modems positioned at different attenuations relative to the DSLAMs transmit using a PSD Mask which ensures that the signal level received by the DSLAMs is approximately consistent for all modems, regardless of the path attenuation differences across the population of modems.

A.2.2 All members of the family of V811 Deployment Class Systems must estimate electrical length using the ELE-M1 method as defined in ITU-T G993.2 clause 7.2.1.3.2.1, and must apply the following settings:

AELE-MODE = 3
RXTHRSHDS = -130 dBm/Hz
RXTHRSHUS = -115 dBm/Hz
UPBOELMT = 2%
UPBOKLF = 0

NOTE: The purpose of this requirement is to ensure consistency in electrical length estimation both in the presence of impulse noise and with the presence of in-premises wiring impediments. Inconsistency of electrical length estimation will result in a high probability for unequal crosstalk in the upstream direction, which would have significant potential to degrade upstream performance and compromise the ability of a System's design to achieve Full Coverage.

A.2.3 UPBO Parameter Values

(i) All members of the family of V811 Deployment Class Systems must communicate UPBO parameters to CE for the US1 and US2 bands, and must require all CE to apply those UPBO settings.

(ii) All Providers of a member of the family of V811 Deployment Class Systems must publish the UPBO parameter settings that are in operation in each System, in accordance with this Code.

(iii) Higher Priority coexisting V811u, V811Lu and V811Hu Systems that share upstream spectrum at frequencies above 138 kHz with a lower priority Deployment Class System must be configured with the applicable set of UPBO parameter values from Table 3. (See Note 2)

(iv) Lower priority coexisting Systems that share upstream spectrum at frequencies above 138 kHz with a Higher Priority V811u, V811Lu or V811Hu Deployment Class System must be configured with the applicable set of UPBO parameter values from Table 3 as used by the Higher Priority Deployment Class System.

(v) The applicable set of UPBO parameter values is the set which corresponds to the maximum path attenuation between (a) the external interface port of the DSLAM and (b) any CE device that could potentially be served from that DSLAM, as shown in Figure 13 of Part 2 of the Code.

(vi) The maximum cable attenuation is defined in Figure 13 and Equation 8 of Part 2 of the Code.

NOTES:

1. The purpose of this requirement is to ensure consistency in the received PSD levels at the input terminals of DSLAMs sharing a Cable Bundle. Inconsistency between the UPBO settings applied to different Systems will result in a high probability for unequal crosstalk in the upstream direction between Systems sharing a Cable Bundle. Unequal levels of crosstalk would have significant potential to degrade upstream performance and compromise the ability of a System's design to meet Full Coverage requirements.

2. When there are no other members of the family of V811 Deployment Class Systems sharing a Cable Bundle, section A.2.3 does not impose any constraints upon the UPBO parameter values that are used. If another member of the family of V811 Deployment Class Systems is deployed to a Shared Cable Bundle, all Systems must implement UPBO parameter values in accordance with section A.2.3 and this Code.

3. Assuming the same cable type has been deployed throughout the Shared Cable domain, the maximum path attenuation will correspond to the longest cable path from the DSLAM to the most distant modem,

TABLE 3

UPBO Parameter Settings for shared spectrum coexistence situations involving V811u, V811Lu and V811Hu Highest Priority Systems

Max path atten	Reference Lengths for CAD55 (m)		Reference Lengths for CAT5/6 (m)		UPBO Parameter Settings for V811u, V811Lu and V811Hu Systems				
(dB @ 3.75 MHz)	US1	US2	US1	US2	A1	B1	A2	B2	$kl0_{REF}$
7.4	254.8	230	252.6	228.1	59.42	2.12	70.25	0.01	0
9.3	303.8	276.1	301.2	273.8	64.24	0.51	72.65	0.01	0
11.1	331.7	337.7	328.9	334.9	65.11	0.56	65.38	3.6	0
13	422.2	405.4	418.7	402	51.13	9.38	57.41	7.54	0
14.8	507.3	468.5	503	464.6	61.35	5.63	63.2	6.68	0
16.7	510.2	497.5	505.9	493.3	62.44	5.12	65.82	6.3	0
18.6	616.6	582.9	611.5	578	62.4	7.04	64.81	8.17	0
20.4	647	633.7	641.6	628.4	59.57	9.04	62.84	9.75	0
22.3	733.7	702.3	727.5	696.4	55.08	12.9	67.93	9.23	0
24.1	761.3	697.9	754.9	692	60.48	10.61	57.37	12.77	0
26	760.6	715.4	754.3	709.4	50.6	15.69	65.14	10.42	0
27.8	828.6	731.7	821.6	725.6	50.72	16.84	68.03	9.72	0
29.7	881.9	708.3	874.5	702.3	51.17	17.56	61.91	11.4	0
31.5	929.8	722.7	921.9	716.7	51.7	18.14	66.98	9.92	0

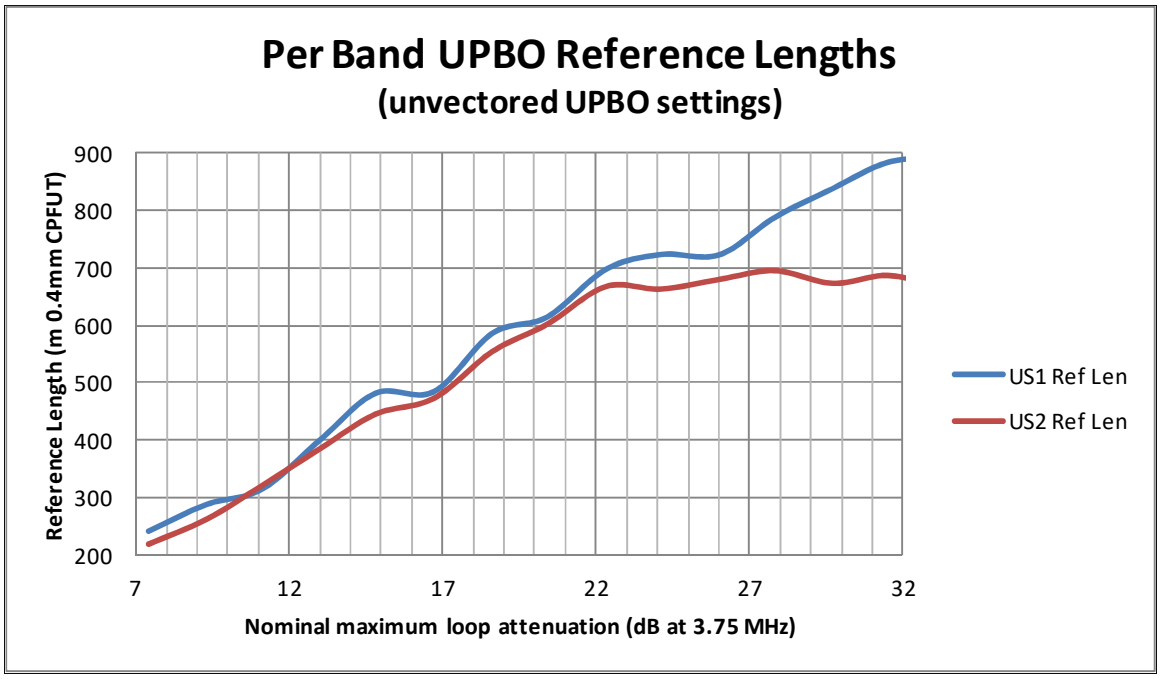

FIGURE 1
Per Band UPBO Reference Lengths

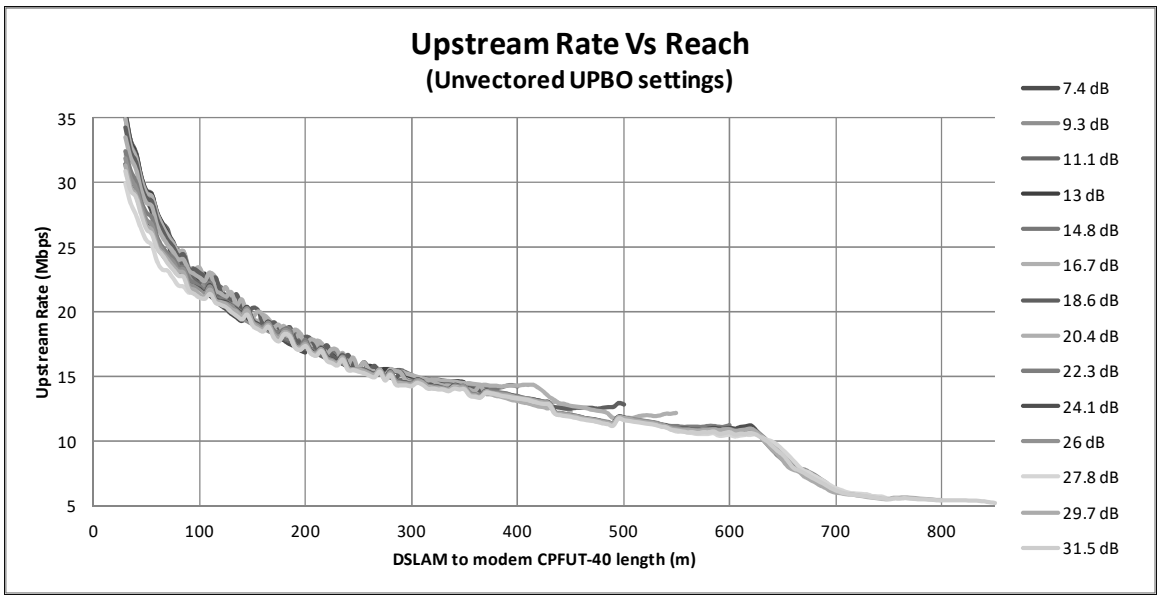

FIGURE 2
Upstream Rate vs Reach (Unvectored UPBO settings)

NOTES:

1. Upstream Rate vs Reach simulation assumes 99th percentile crosstalk and attenuation, no Vectoring, UPBO settings from TABLE 4, QLN -134dBm/Hz, 8 interferers evenly spread over +/- 100m shared cable relative to the victim, CA crosstalk model, each system connected to

Shared Cable Bundle via a dedicated drop cable of 20m in which no crosstalk takes place, 6dB noise margin, Layer 2 equivalent rates.

2. The simulation suggests distribution areas with maximum DSLAM to modem attenuation exceeding the equivalent of 850m 0.4mm CPFUT are unable to assure a minimum upstream Layer 2 rate of 5 Mbit/s if non-Vectored.

A3 Downstream Shaping

A.3.1 Downstream shaping is defined in Section 6 Part 2 for the protection of legacy systems during the legacy system co-existence period and when a DCS at a higher NRP exists.

A4 Interpolation of frequencies between PSD Mask breakpoints

A.4.1 Logarithmic interpolation of the attenuation in dB, as described in Equation 1, must be used when the frequency is less than 138kHz for downstream or 3.575 MHz for upstream.

EQUATION 1

Logarithmic interpolation of frequencies between PSD Mask breakpoints

Formulae	Notes
$$slope = \left(\frac{Mask\left(f_{upper}\right) - Mask\left(f_{lower}\right)}{\log_{10} f_{upper} - \log_{10} f_{lower}} \right)$$ **(1)** $$Mask(f) = Mask(f_{lower}) + slope \times (\log_{10} f - \log_{10} f_{lower})$$	Used for log interpolation

A.4.2 Linear interpolation of the attenuation in dB, as described in Equation 2, must be used when the frequency is greater than or equal to 138kHz for downstream or 3.575 MHz for upstream,

EQUATION 2

Linear interpolation of frequencies between PSD Mask breakpoints

Formulae	Notes
$$slope = \left(\frac{Mask\left(f_{upper}\right) - Mask\left(f_{lower}\right)}{f_{upper} - f_{lower}} \right)$$ **(2)** $$Mask(f) = Mask(f_{lower}) + slope \times (f - f_{lower})$$	Used for linear interpolation

A5 Template PSDs

A.5.1 Derivation of a Template PSD Mask from a Limit PSD Mask

A Template PSD Mask derived from a Limit PSD Mask represents a nominal average transmitter power, including for the purpose of simulations, defined with similar intention to the meaning of Template PSD used in section B.4.1 of ITU-T G.993.2. Using Template PSD Mask in simulations avoids the need to explicitly factor Gi (Gain) calculations.

PSD Masks in the family of V811 Deployment Classes which are called Limit PSD Masks represent the absolute maximum PSD which a compliant member of the family of V811 Deployment Class Systems may emit in bands defined by the Limit Mask, when measured using a detector with a bandwidth of 10 kHz.

Generally, this means if a System which is a member of the family of V811 Deployment Classes supports configuration of Limit PSD Masks, then the corresponding Limit PSD Mask may be configured directly into that System without modification of any of the Limit PSD Mask's break points. Alternately, if the System supports configuration of Template Masks, then the break point levels for the Template PSD Mask should be modified as described below.

The template PSD is determined in accordance with G993.2 clause B4.1. Restated, the Template PSD level is set to:

(a) 3.5 dB below the minimum of {Limit PSD Mask, MIB PSD Mask} in the passband of the transmitter provided that the minimum of {Limit PSD Mask, MIB PSD Mask} is equal to or greater than -96.5 dBm/Hz, otherwise

(b) the minimum of {Limit PSD Mask, MIB PSD Mask} in the passband of the transmitter, otherwise

(c) -100 dBm/Hz in the stopband at frequencies below 4 MHz, otherwise

(d) -110 dBm/Hz in the stopband at frequencies between 4 MHz and 5.2 MHz, otherwise

(e) -112 dBm/Hz in the stopband at frequencies above 5.2 MHz.

NOTES:

1. A MIB PSD Mask is generally used when Downstream Power Backoff is required, and is set to the DPBO Mask.

2. Some System implementations may not support configuration of stopband breakpoints when defining the PSD Mask. System vendors should be consulted to determine the correct method for configuring PSD Mask breakpoints.

A6 Coexistence Masks

Each defined Deployment Class System includes Coexistence Masks that are based on the Template PSD Masks for the Deployment Class System, adjusted for Vectoring where required (see Part 1, 5.1.7). The Upstream Coexistence Mask shown is an unreferred Coexistence Mask that corresponds to a line that equals or exceeds the UPBO reference attenuation.

As described in Part 2, Clause 8.2.10, these Coexistence Masks must be applied as limit masks to Non-Deployment Class Systems, unless, as described in part 2 Clause 8.2.11, the Non-Deployment Class System is of the same technology and meets the same International Standard as the Higher Priority Deployment Class System being protected. In that case the Coexistence Masks must be interpreted as Template Masks for the NDCS that is required to comply with Limit Masks that are 3.5 dB higher in band than the Template Masks and which match the Deployment Class Systems' Limit Masks rather than Template Masks out of band.

A7 PSD Notching

Systems must support PSD notching defined in TABLE 4 for the specified amateur radio bands. Notching may be normally turned off but must be able to be turned on for any selected band(s) by the network provider in order to avoid interference.

TABLE 4

Frequency limits between which the transmit PSD Mask must not exceed -80 dBm/Hz when notching is required for that amateur radio band

Amateur Radio Band Description	Lower Frequency (MHz)	Lower Frequency Carrier Index to be notched	Upper Frequency (MHz)	Upper Frequency Carrier Index to be notched
80 metre (a)	3.5	811	3.7	858
80 metre (b)	3.776	875	3.8	882
40 metre	7.0	1623	7.3	1693
20 metre	14.0	3246	14.35	3328

A.7.1 When a potential interference issue is brought to the attention of a VDSL2 System Operator, that System Operator shall investigate whether their VDSL2 System is the source of the interference.

A.7.2 A VDSL2 System may be Deployed with notching disabled (turned off) by default.

A.7.3 PSD Notching shall be able to be turned on for any selected band(s) being used by the VDSL2 System in order to:

(a) determine if the VDSL2 system is causing interference in the notched band; and

(b) avoid ongoing transmissions in that band which were the source of interference in that band.

NOTE: This means that PSD Notching may need to be temporarily applied in one or more specific bands to ascertain whether a VDSL2 System is causing interference in the specific band(s). PSD Notching does not need to continue to be applied in a specific band if the VDSL2 System is found not to be the source of the interference in that band.

A.7.4 Where PSD Notching is found to be necessary to avoid causing interference in a band, all carrier indices in the affected band should be notched.

A8 Testing Requirements

A.8.1 For every Deployed System, System Providers are responsible to ensure that the parameters and sub-parameters described in Table 5 have been tested and found to comply with the requirements.

A.8.2 For all Systems, the termination impedance applicable to all elements in TABLE 5 is 100 Ω, in accordance with ITU-T G993.2 clause 7.3.

A.8.3 Only the following PSD Masks from ITU-T G993.2 Tables B.2 and B.3 may be used. Network equipment may support any or all of these PSD Masks:

(a) 997 band plans B7-9, B7-10,

(b) 998 band plans B8-4, B8-11, B8-16, B8-19, and B8-20.

NOTE: The purpose of Table 5 is to set out specific additional parameters for which System Providers must be able to demonstrate compliance. Normally, these parameters will be verified by equipment manufacturers during their product development and verification processes. Provided the System Provider is in a position to substantiate the test results upon request, it is not otherwise anticipated System Providers would be required to undertake the necessary testing themselves prior to Deployment of a System.

TABLE 5

Test requirements for Systems based on VDSL2 technology

Parameter	Sub-parameter	Value applicable to the family of V811 Deployment Class Systems	Value applicable to other Systems coexisting with a member of the family of V811 Deployment Class Systems (See Note 2)
Maximum aggregate downstream power	Level	+14.5 dBm	G.993.2 clause 6.2.1 Limited to maximum of +14.5 dBm in spectrum that overlaps with B8-11
Maximum aggregate upstream power	Level	+14.5 dBm	G.993.2 clause 6.2.3 Limited to maximum of +14.5 dBm in spectrum that overlaps with B8-11
	Frequency range	138 to 30000 kHz	138 to 30000 kHz
	Averaging time	≥ 10 s	≥ 10 s
PSD Masks		PSD Masks are defined in accordance with the descriptions provided in the detailed definitions of each Deployment Class System, and are derived from PSD Masks defined in G993.2	Support a band plan in G.993.2 Table B-1, with PSD Mask from B-2 or B-3 as defined in Table B5 or B7. (Note 2) Maximum power in the 0 to 4kHz band is relaxed to -68dBmp wrt 600Ω All Non-Deployment Class Systems to have MIB PSD Masks applied, if required, to comply with the Coexistence Mask requirements for Deployment Class Systems sharing Shared Cable Bundles.
Line code		Not applicable	G.993.2
Longitudinal Conversion Loss	Level	>38 dB, f<12 MHz, >38 - 20log(f/12), f>12MHz f in MHz	G.993.2 Clause 7.4 [11]
	Frequency range	30kHz to 30000kHz	G.993.2 Clause 7.4 [11]
Longitudinal output voltage	Level	-50 dBV in any 4 kHz band	-50 dBV in any 4 kHz band
	Frequency range	As per longitudinal balance	As per longitudinal balance

A9 V811u Deployment Class

A.9.1 General

This section defines a general non-Vectored VDSL2 Deployment Class (V811u).

This Deployment Class must meet the PSD Mask requirements for the B8-11 system of band plan 998 defined in ITU-T G.993.2.

V811u deemed co-existence options are listed in Table 2 Part 1 along with conformance parameters which include a common set of UPBO settings and any DPBO required by the rules of Part 1 of this Code.

A.9.2 Coexistence Mask band

The V811u Coexistence Masks are defined for frequencies up to and including 17.664 MHz.

A.9.3 Limit PSD Masks

For V811u Deployment Class Systems the:

(i) Downstream (DSLAM towards CE) Limit PSD Mask is defined in Table 6 and illustrated in Figure 3.

(ii) Upstream (CE towards DSLAM) Limit PSD Mask breakpoints is defined in Table 7 and illustrated in Figure 4.

TABLE 6

V811u Downstream Limit PSD Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	3750	-51.2	11825	-100
4	-97.5	3750	-80	12000	-80
4	-92.5	3925	-100	12000	-56.5
80	-72.5	5025	-100	17664	-56.5
138	-44.2	5200	-80	21000	-80
138	-36.5	5200	-52.7	21450	-100
1104	-36.5	8500	-54.8	30000	-100
1622	-46.5	8500	-80	30000	-110
2208	-48	8675	-100	212000	-110

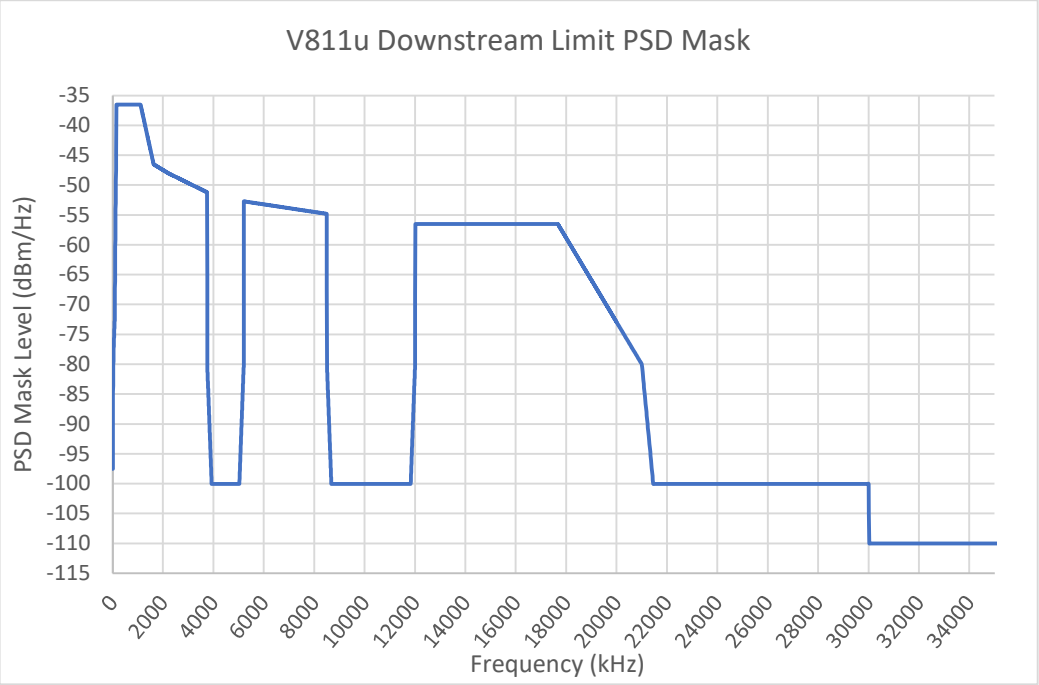

FIGURE 3

V811u Downstream Limit PSD Mask

TABLE 7
V811u Upstream Limit PSD Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	3750	-80	10000	-55.5
4	-97.5	3750	-51.2	12000	-55.5
4	-92.5	5200	-52.7	12000	-80
25.875	-34.5	5200	-80	12175	-100
138	-34.5	5375	-100	30000	-100
243	-93.2	8325	-100	30000	-110
686	-100	8500	-80	212000	-110
3575	-100	8500	-54.8		

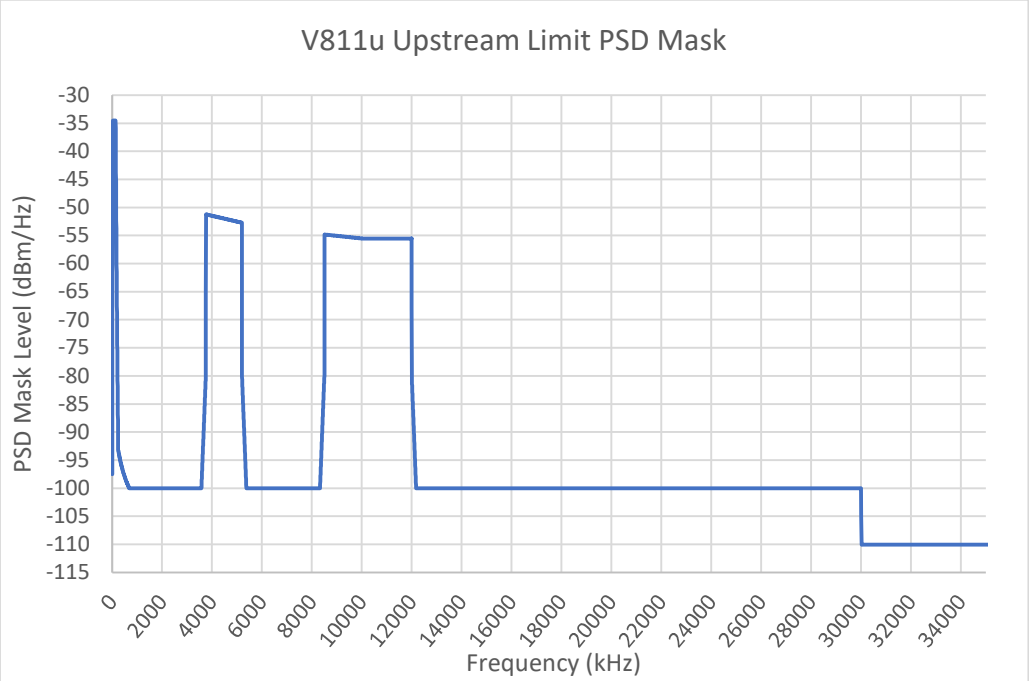

FIGURE 4
V811u Upstream Limit PSD Mask

A.9.4 V811u Unreferred Coexistence Masks

For V811u Deployment Class Systems the:

(i) Downstream (DSLAM towards CE) Unreferred Coexistence Mask is defined in Table 8 and illustrated in Figure 5.

(ii) Upstream (CE towards DSLAM) Unreferred Coexistence Mask is defined in Table 9 and illustrated in Figure 6.

TABLE 8

V811u Downstream Unreferred Coexistence Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	2208	-51.5	5200	-56.2
4	-97.5	3750	-54.7	8500	-58.3
4	-92.5	3750	-80	8500	-80
80	-72.5	3925	-100	8675	-112
138	-44.2	4000	-100	11825	-112
138	-40	4000	-110	12000	-80
1104	-40	5025	-110	12000	-60
1622	-50	5200	-80	17664	-60

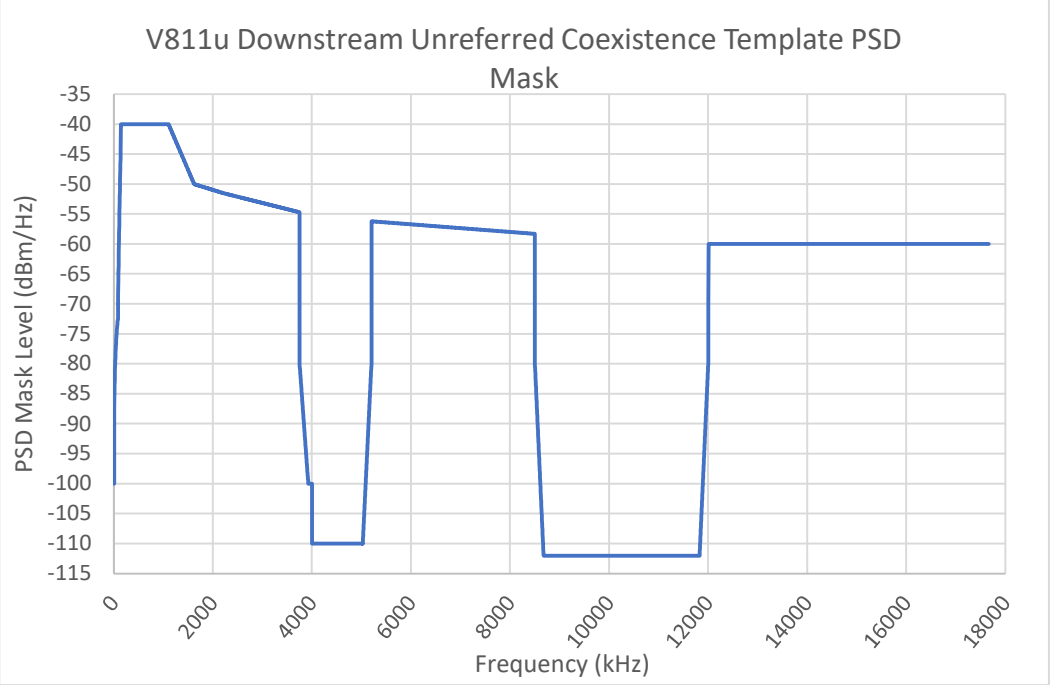

FIGURE 5

V811u Downstream Unreferred Coexistence Template PSD Mask

TABLE 9

V811u Upstream Unreferred Coexistence Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	3575	-100	8500	-80
4	-97.5	3750	-80	8500	-58.3
4	-92.5	3750	-54.7	10000	-59
25.875	-38	5200	-56.2	12000	-59
138	-38	5200	-80	12000	-80
243	-93.2	5375	-112	12175	-112
686	-100	8325	-112	17664	-112

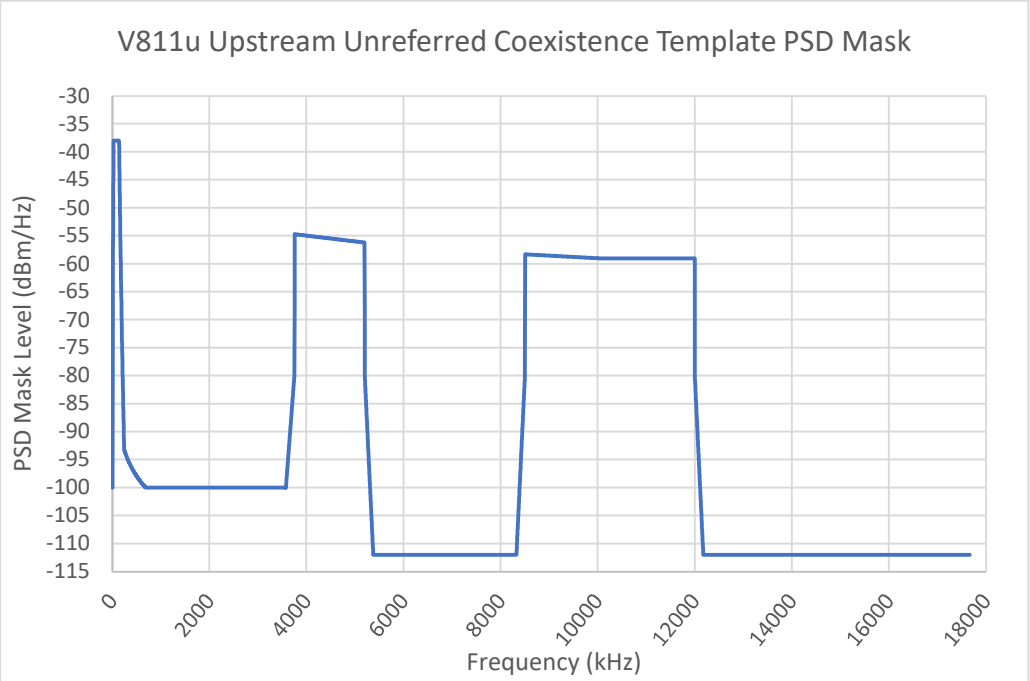

FIGURE 6

V811u Downstream Unreferred Coexistence Template PSD Mask

A.9.5 Comparison of V811u PSD Masks

For an illustrative comparison of the V811u Limit PSD Mask and Unreferred Coexistence Template PSD Mask refer to:

(a) Figure 7 for a comparison of Downstream PSD Masks; and

(b) Figure 8 for a comparison of Upstream PSD Masks.

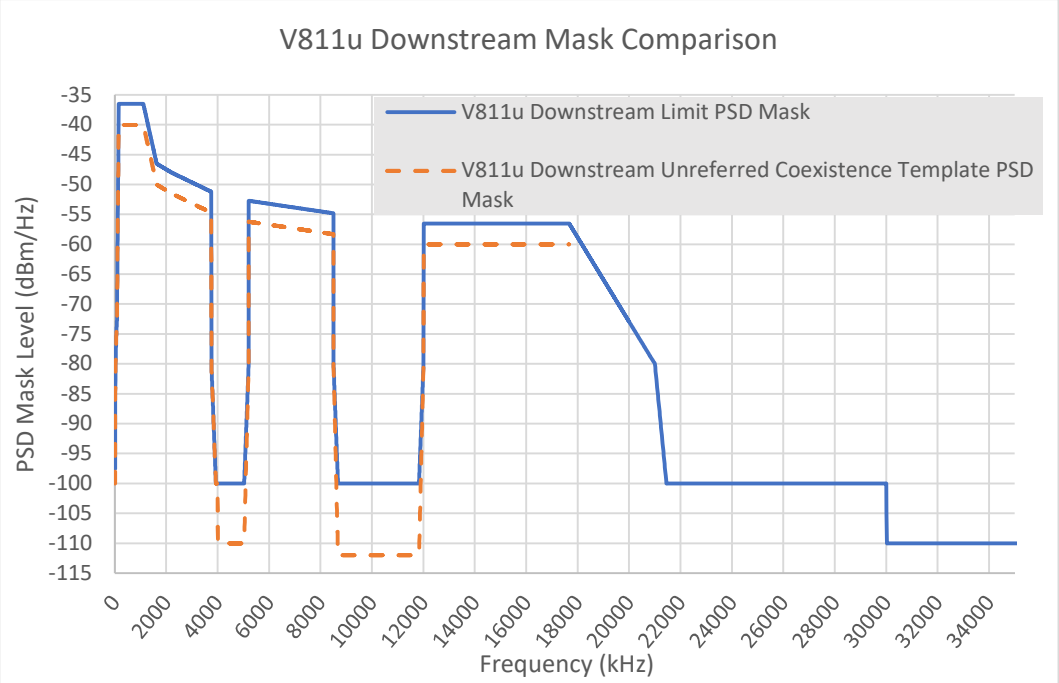

FIGURE 7

Comparison of V811u Downstream PSD Masks

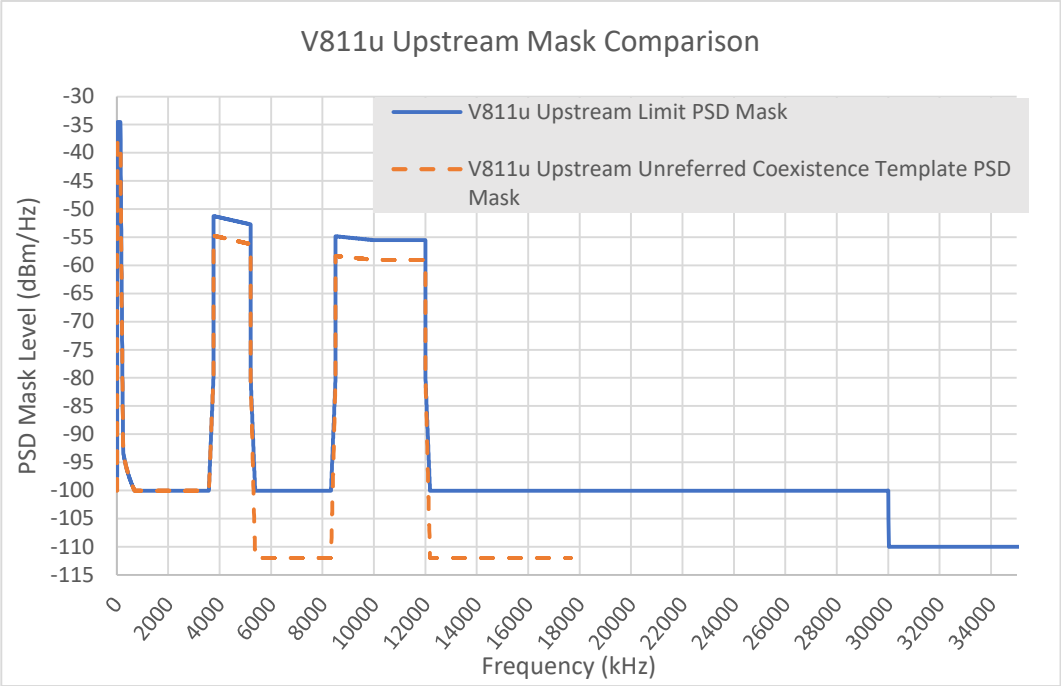

FIGURE 8

Comparison of V811u Upstream PSD Masks

A10 V811v Deployment Class

A.10.1 General

This section defines a general Vectored VDSL2 Deployment Class (V811v) for Systems that can perform full Vectoring of all bands except US0, according to the requirements of ITU-T G.993.5.

Systems of each of these Deployment Classes must meet the PSD Mask requirements for the B8-11 system of band plan 998 defined in ITU-T G.993.2.

V811v deemed co-existence options are listed in Table 3 Part 1.

A.10.2 Coexistence Mask band

The V811v Coexistence Masks are defined in frequencies up to and including 17.664 MHz.

A.10.3 First Vectored Tone

The US0 band is non-Vectored in the V811v Deployment Class.

All tones in the DS1, DS2, DS3, US1, and US2 bands are Vectored in the V811v Deployment Class.

A.10.4 V811v Limit PSD Masks

For V811v Deployment Class Systems the:

(i) Downstream (DSLAM towards CE) Limit PSD Mask is defined in Table 10 and illustrated in Figure 9.

(ii) Upstream (CE towards DSLAM) Limit PSD Mask is defined in Table 11 and illustrated in Figure 10.

TABLE 10

V811v Downstream Limit PSD Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	3750	-51.2	11825	-100
4	-97.5	3750	-80	12000	-80
4	-92.5	3925	-100	12000	-56.5
80	-72.5	5025	-100	17664	-56.5
138	-44.2	5200	-80	21000	-80
138	-36.5	5200	-52.7	21450	-100
1104	-36.5	8500	-54.8	30000	-100
1622	-46.5	8500	-80	30000	-110
2208	-48	8675	-100	212000	-110

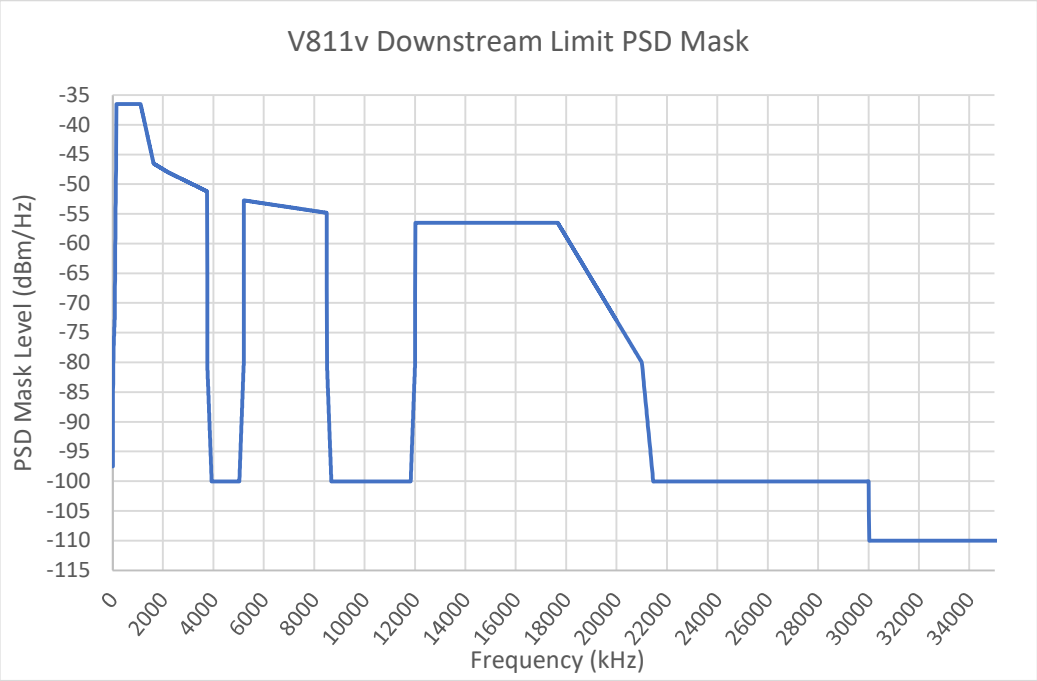

FIGURE 9

V811v Downstream Limit PSD Mask

TABLE 11
V811v Upstream Limit PSD Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	3750	-80	10000	-55.5
4	-97.5	3750	-51.2	12000	-55.5
4	-92.5	5200	-52.7	12000	-80
25.875	-34.5	5200	-80	12175	-100
138	-34.5	5375	-100	30000	-100
243	-93.2	8325	-100	30000	-110
686	-100	8500	-80	212000	-110
3575	-100	8500	-54.8		

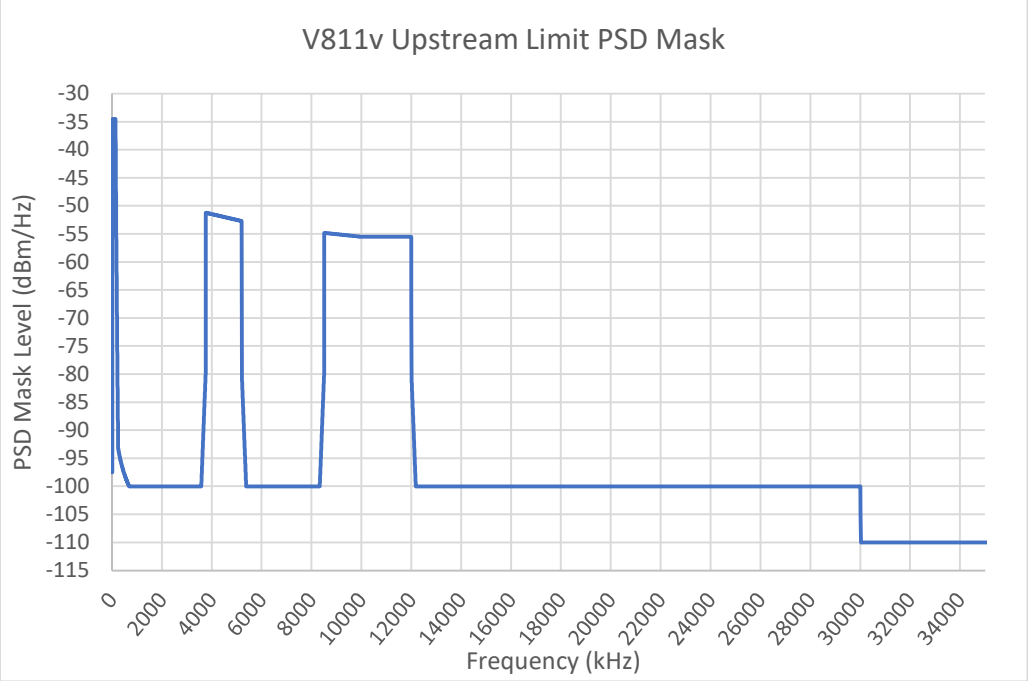

FIGURE 10
V811v Upstream Limit PSD Mask

A.10.5 V811v Unreferred Coexistence Masks

For V811v Deployment Class Systems the:

(i) Downstream (DSLAM towards CE) Unreferred Coexistence Mask is defined in Table 12 and illustrated in Figure 11.

(ii) Upstream (CE towards DSLAM) Unreferred Coexistence Mask is defined in Table 13 and illustrated in Figure 12.

TABLE 12

V811v Downstream Unreferred Coexistence Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	2208	-76.5	5200	-81.2
4	-97.5	3750	-79.7	8500	-83.3
4	-92.5	3750	-80	8500	-80
80	-72.5	3925	-100	8675	-112
138	-44.2	4000	-100	11825	-112
138	-65	4000	-110	12000	-85
1104	-65	5025	-110	17664	-85
1622	-75	5200	-80		

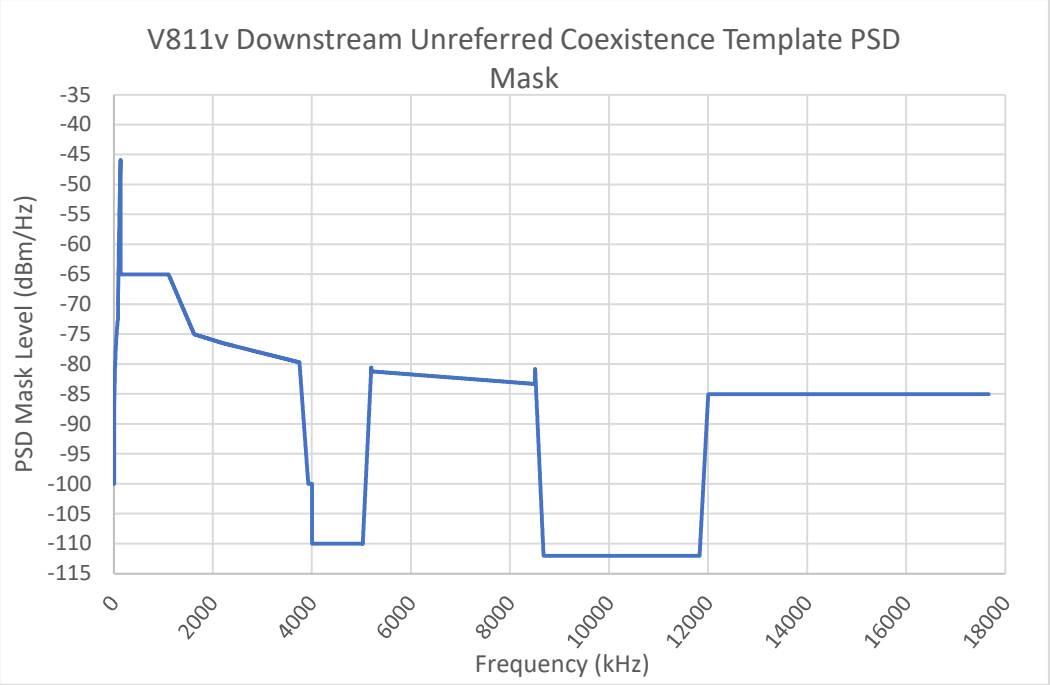

FIGURE 11

V811v Downstream Unreferred Coexistence Template PSD Mask

TABLE 13

V811v Upstream Unreferred Coexistence Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	3575	-100	8500	-80
4	-97.5	3750	-80	8500	-83.3
4	-92.5	3750	-79.7	10000	-84
25.875	-38	5200	-81.2	12000	-84
138	-38	5200	-80	12000	-80
243	-93.2	5375	-112	12175	-112
686	-100	8325	-112	17664	-112

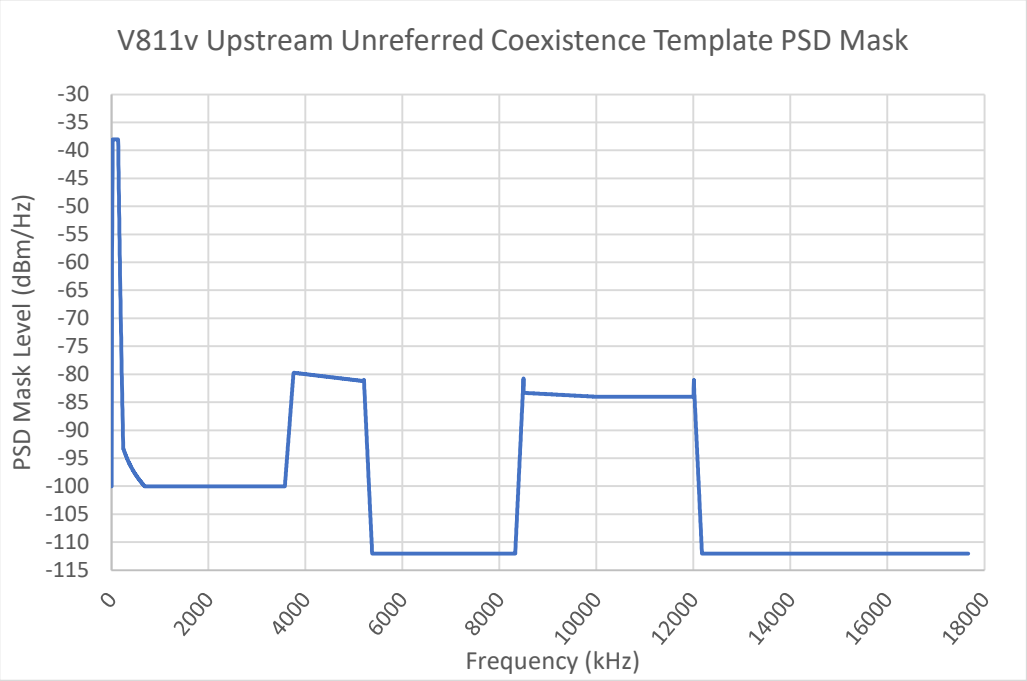

FIGURE 12

V811v Upstream Unreferred Coexistence Template PSD Mask

A.10.6 Comparison of V811v PSD Masks

For an illustrative comparison of the V811v Limit PSD Mask and Unreferred Coexistence Template PSD Mask refer to:

(c) Figure 13 for a comparison of Downstream PSD Masks; and

(d) Figure 14 for a comparison of Upstream PSD Masks.

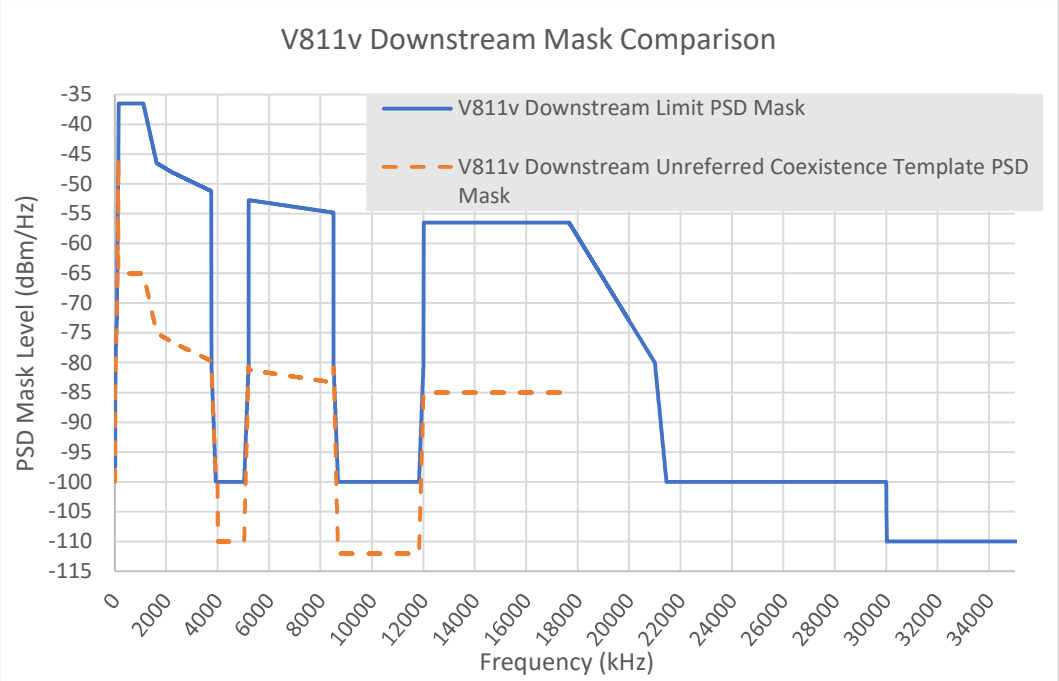

FIGURE 13

Comparison of V811v Downstream PSD Masks

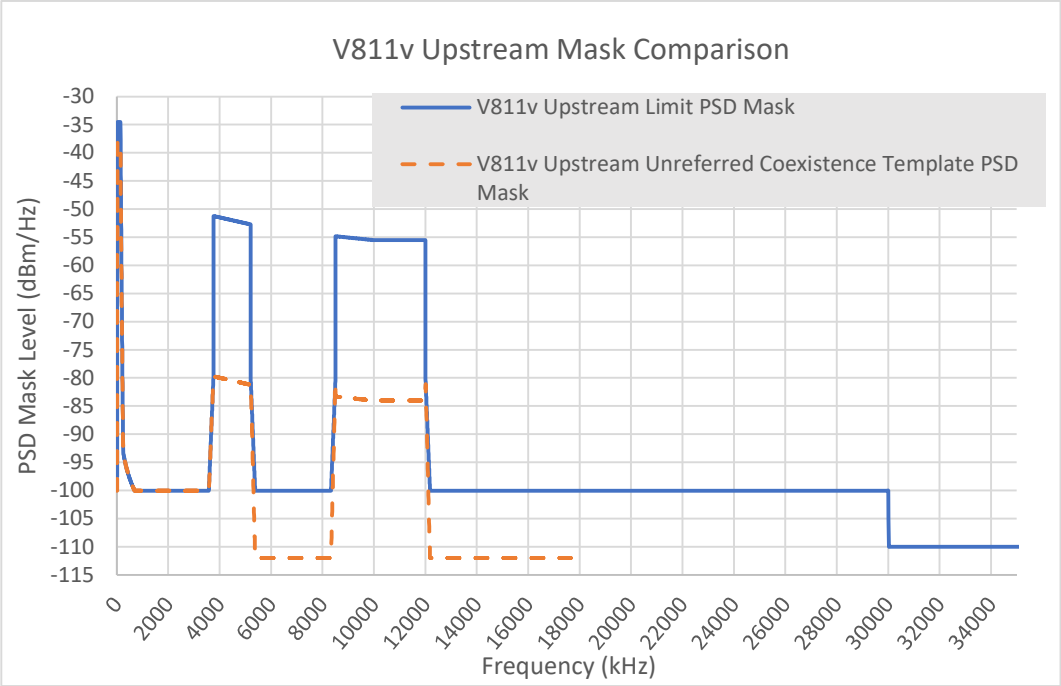

FIGURE 14

Comparison of V811v Upstream PSD Masks

A11 V811Lu Deployment Class

A.11.1 General

This section defines a spectrally divided non-Vectored VDSL2 Deployment Class (V811Lu).

The V811Lu 'low-split' Deployment Class Systems has been developed to complement the V811Hu and V811Hv 'high-split' Deployment Class Systems. The split spectrum arrangement inherent in these Deployment Class Systems is intended to facilitate harmonious System coexistence When required by the Sharing Resolution Process.

The V811L system would normally be Deployed in conjunction with a V811H system to the same Shared Cable Bundle.

Systems of each of these Deployment Classes must meet the PSD Mask requirements for the B8-11 system of band plan 998 defined in ITU-T G.993.2.

V811Lu deemed co-existence options are listed in Tables 2 and 3 of Part 1 along with conformance parameters which may include a common UPBO set of settings where the upstream spectrum overlaps and any DPBO required by the rules of Part 1 of this Code.

A.11.2 Coexistence Mask band

The V811Lu Coexistence Masks are defined in frequencies up to and including 17.664 MHz.

A.11.3 Limit PSD Masks

For V811Lu Deployment Class Systems the:

(i) Downstream (DSLAM towards CE) Limit PSD Mask is defined in Table 14 and illustrated in Figure 15.

(ii) Upstream (CE towards DSLAM) Limit PSD Mask is defined in Table 15 and illustrated in Figure 16.

TABLE 14

V811Lu Downstream Limit PSD Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	2833.3125	-112.5	11825	-100
4	-97.5	3750	-112.5	12000	-80
4	-92.5	3750	-100	12000	-56.5
80	-72.5	5025	-100	12877.125	-56.5
138	-44.2	5200	-80	12907.3125	-76.5
138	-36.5	5200	-52.7	12937.5	-80
1104	-36.5	7956.5625	-54.4541	13131.5625	-112.5
1622	-46.5	7986.75	-74.4541	17664	-112.5
2208	-48	8038.5	-80	17664	-100
2509.875	-48.7742	8232.5625	-112.5	30000	-100
2540.0625	-68.7742	8500	-112.5	30000	-110
2639.25	-80	8500	-100	212000	-110

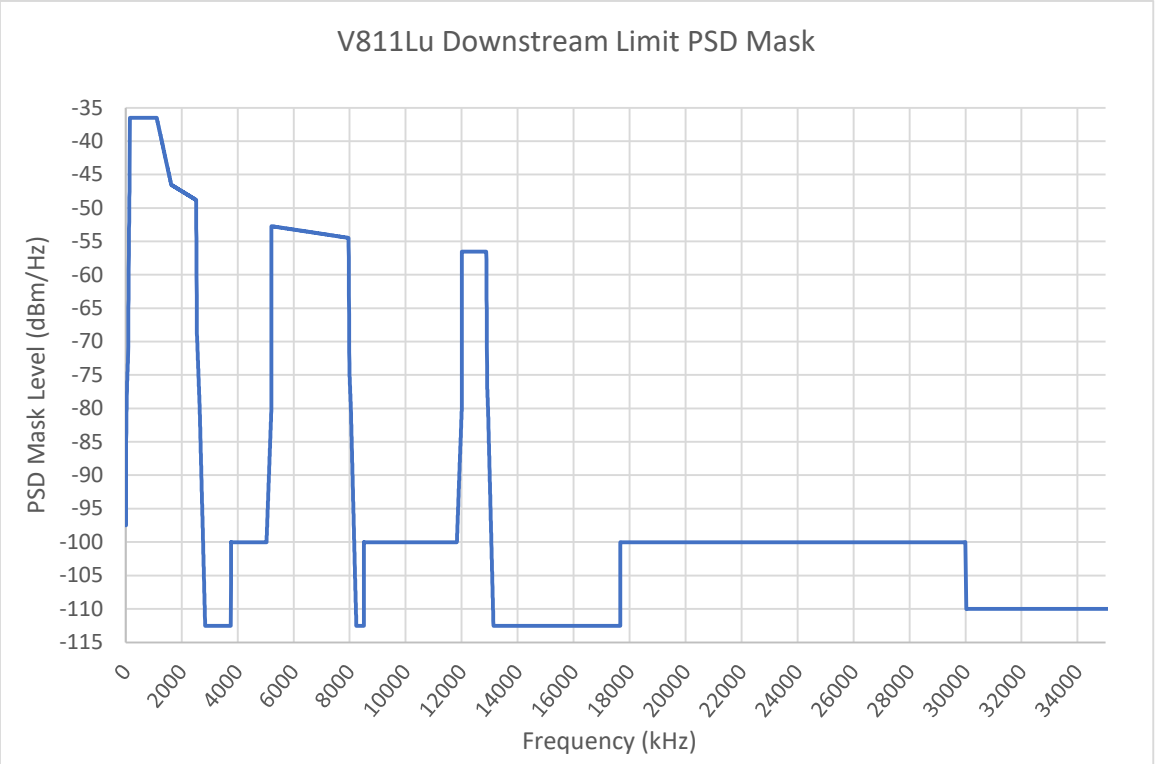

FIGURE 15
V811Lu Downstream Limit PSD Mask

TABLE 15
V811Lu Upstream Limit PSD Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	3750	-51.2	9440.0625	-80
4	-97.5	5200	-52.7	9634.125	-112.5
4	-92.5	5200	-80	12000	-112.5
25.875	-34.5	5375	-100	12000	-100
138	-34.5	8325	-100	30000	-100
243	-93.2	8500	-80	30000	-110
686	-100	8500	-54.8	212000	-110
3575	-100	9366.75	-55.2043		
3750	-80	9396.9375	-75.2043		

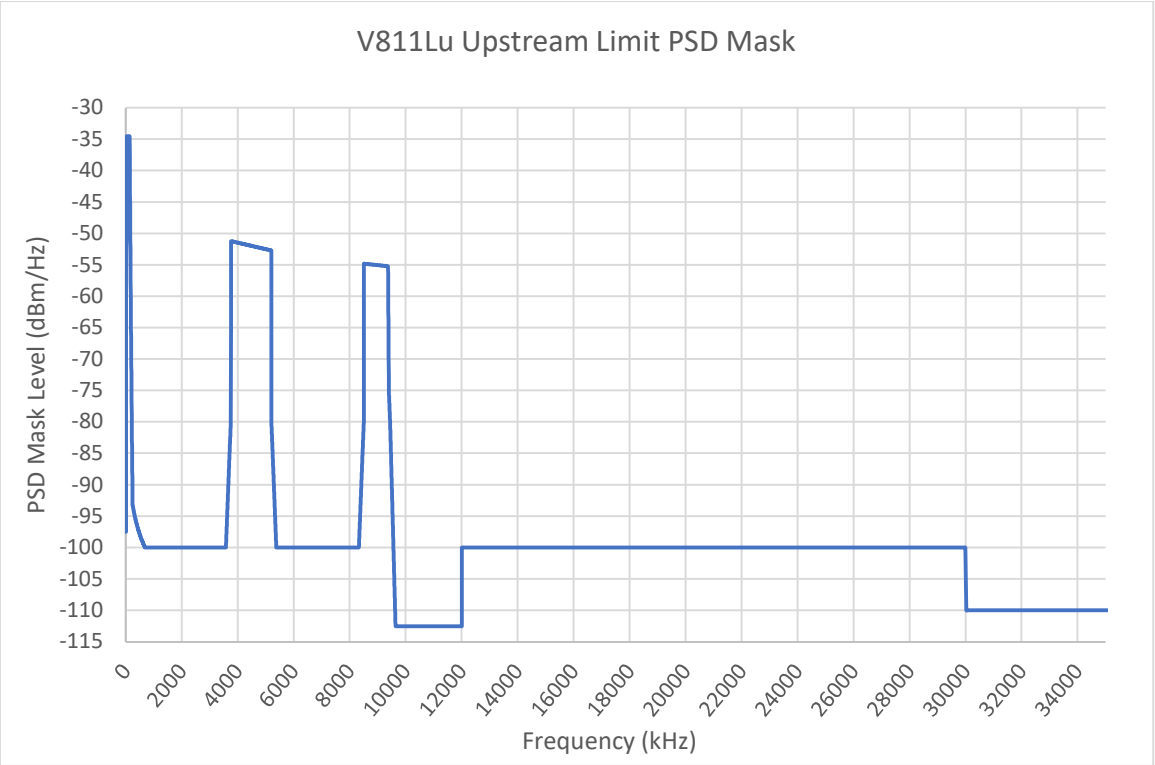

FIGURE 16
V811Lu Upstream Limit PSD Mask

A.11.4 V811Lu Unreferred Coexistence Masks

For V811Lu Deployment Class Systems the:

(i) Downstream (DSLAM towards CE) Unreferred Coexistence Mask is defined in Table 16 and illustrated in Figure 17.

(ii) Upstream (CE towards DSLAM) Unreferred Coexistence Mask is defined in Table 17 and illustrated in Figure 18.

TABLE 16

V811Lu Downstream Unreferred Coexistence Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	2833.3125	-112.5	8500	-112.5
4	-97.5	3750	-112.5	8500	-112
4	-92.5	3750	-100	11825	-112
80	-72.5	4000	-100	12000	-80
138	-44.2	4000	-110	12000	-60
138	-40	5025	-110	12877.125	-60
1104	-40	5200	-80	12907.3125	-80
1622	-50	5200	-56.2	12937.5	-83.5
2208	-51.5	7956.5625	-57.9541	13131.5625	-112.5
2509.875	-52.2742	7986.75	-77.9541	17664	-112.5
2540.0625	-72.2742	8038.5	-83.5		
2639.25	-83.5	8232.5625	-112.5		

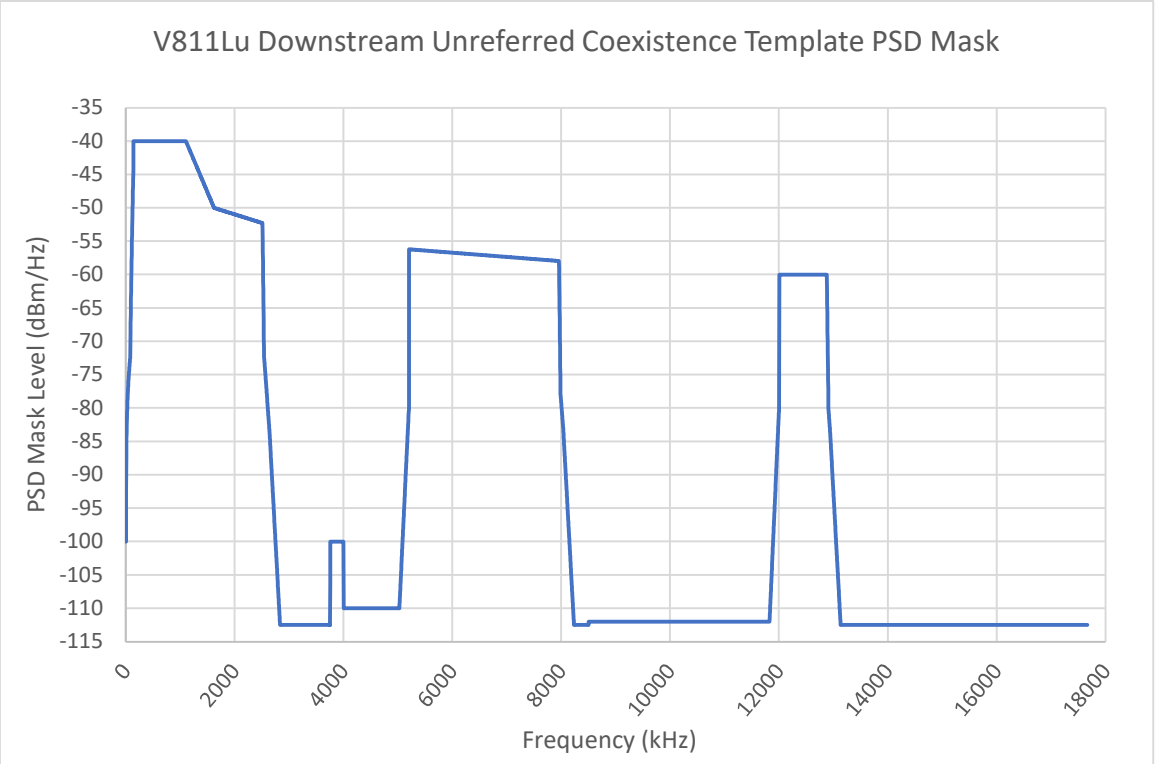

FIGURE 17

V811Lu Downstream Unreferred Coexistence Template PSD Mask

TABLE 17

V811Lu Upstream Unreferred Coexistence Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	3750	-80	9366.75	-58.7043
4	-97.5	3750	-54.7	9396.9375	-78.7043
4	-92.5	5200	-56.2	9440.0625	-83.5
25.875	-38	5200	-80	9634.125	-112.5
138	-38	5375	-112	12000	-112.5
243	-93.2	8325	-112	12000	-112
686	-100	8500	-80	17664	-112
3575	-100	8500	-58.3		

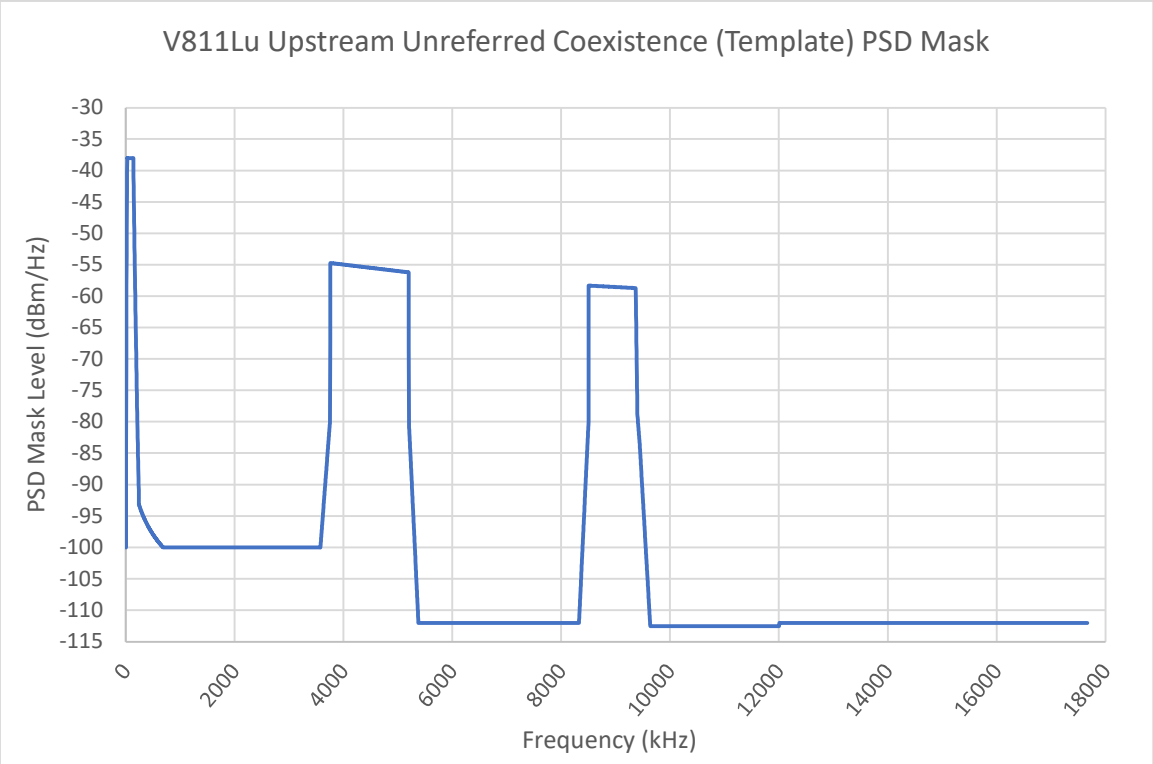

FIGURE 18

V811Lu Upstream Unreferred Coexistence Template PSD Mask

A.11.5 Comparison of V811Lu PSD Masks

For an illustrative comparison of the V811Lu Limit PSD Mask and Unreferred Coexistence Template PSD Mask refer to:

(a) Figure 19 for a comparison of Downstream PSD Masks; and

(b) Figure 20 for a comparison of Upstream PSD Masks.

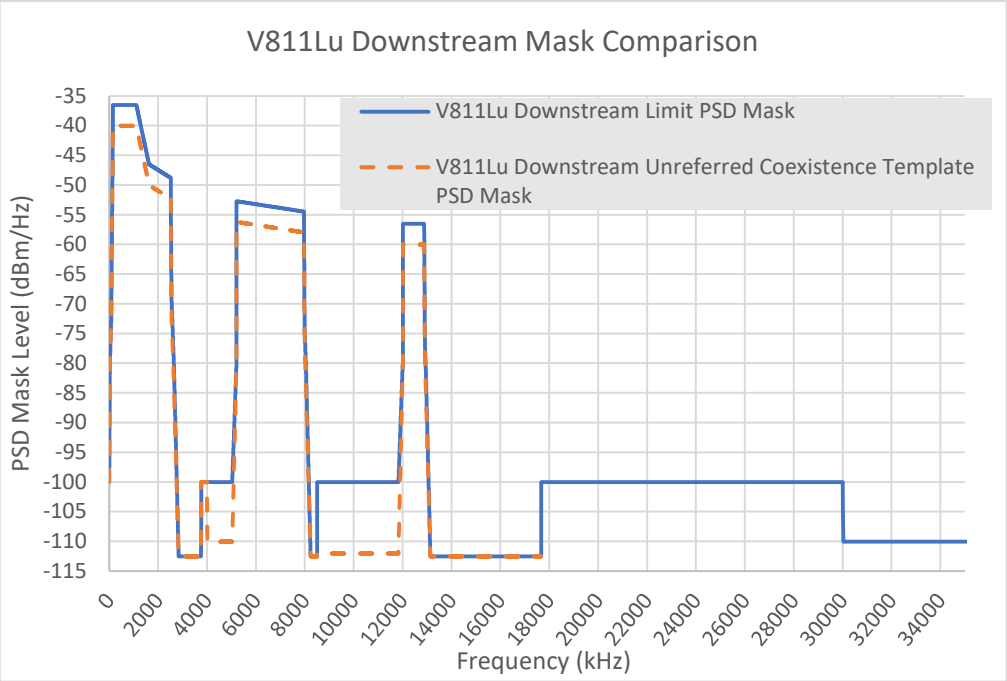

FIGURE 19
Comparison of V811v Downstream PSD Masks

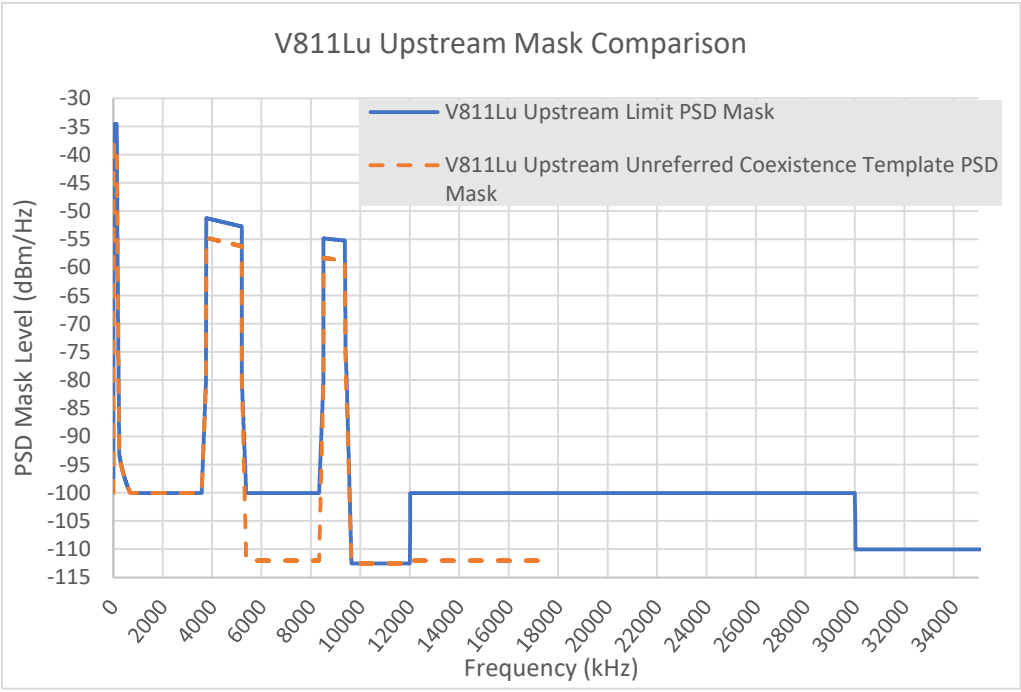

FIGURE 20
Comparison of V811Lu Upstream PSD Masks

A12 V811Lv Deployment Class

A.12.1 General

This section defines a spectrally split Vectored VDSL2 Deployment Class (V811Lv) for Systems that can perform full Vectoring of all bands except US0, according to the requirements of ITU-T G.993.5.

The V811Lv 'low-split' Deployment Class System has been developed to complement the V811Hu and V811Hv 'high-split' Deployment Class Systems. The split spectrum arrangement inherent in these Deployment Class Systems is intended to facilitate harmonious System coexistence when required by the Sharing Resolution Process.

The V811L system would normally be Deployed in conjunction with a V811H systems to the same Shared Cable Bundle.

Systems of each of these Deployment Classes must meet the PSD Mask requirements for the B8-11 system of band plan 998 defined in ITU-T G.993.2.

V811Lv deemed co-existence options are listed in Table 3 Part 1 along with conformance parameters which may include any DPBO required by the rules of Part 1 of this Code.

A.12.2 Coexistence Mask band

The V811Lv Coexistence Masks are defined in frequencies up to and including 17.664 MHz.

A.12.3 First Vectored Tone

Tones up to and including tone 173 (up to and including the tone at 746.0625 kHz) are non-Vectored in the V811Lv Deployment Class. This range of tones includes the entire US0 band and the lower part of DS1. The lowest tones in DS1 have been defined as non-Vectored to facilitate robust operation of the V811Hu and V811Hv Deployment Classes.

All tones above and including tone 174 (above and including the tone at 750.375 kHz) in the DS1, DS2, DS3, US1, and US2 bands are Vectored in the V811Lv Deployment Class.

System Providers Deploying the V811Lv Deployment Class may enable Vectoring in all tones if preferred, but for the purpose of determining Full Coverage, should assume that a V811H Deployment Class has been Deployed to the same Shared Cable Bundle, therefore rendering Vectoring in tones up to and including tone 173 ineffective.

A.12.4 Limit PSD Masks

For V811Lv Deployment Class Systems the:

(i) Downstream (DSLAM towards CE) Limit PSD Mask is defined in Table 18 and illustrated in Figure 21.

(ii) Upstream (CE towards DSLAM) Limit PSD Mask is defined in Table 19 and illustrated in Figure 22.

TABLE 18

V811Lv Downstream Limit PSD Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	2833.3125	-112.5	11825	-100
4	-97.5	3750	-112.5	12000	-80
4	-92.5	3750	-100	12000	-56.5
80	-72.5	5025	-100	12877.125	-56.5
138	-44.2	5200	-80	12907.3125	-76.5
138	-36.5	5200	-52.7	12937.5	-80
1104	-36.5	7956.5625	-54.4541	13131.5625	-112.5
1622	-46.5	7986.75	-74.4541	17664	-112.5
2208	-48	8038.5	-80	17664	-100
2509.875	-48.7742	8232.5625	-112.5	30000	-100
2540.0625	-68.7742	8500	-112.5	30000	-110
2639.25	-80	8500	-100	212000	-110

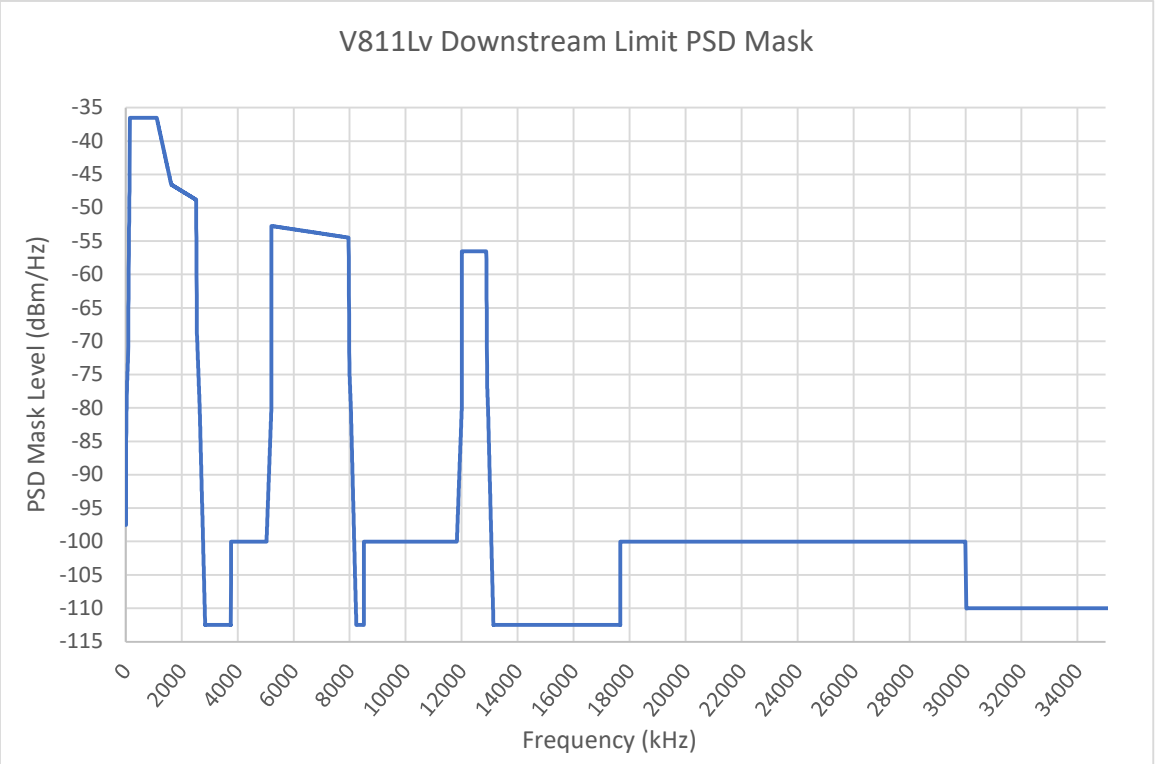

FIGURE 21
V811Lv Downstream Limit PSD Mask

TABLE 19
V811Lv Upstream Limit PSD Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	3750	-51.2	9440.0625	-80
4	-97.5	5200	-52.7	9634.125	-112.5
4	-92.5	5200	-80	12000	-112.5
25.875	-34.5	5375	-100	12000	-100
138	-34.5	8325	-100	30000	-100
243	-93.2	8500	-80	30000	-110
686	-100	8500	-54.8	212000	-110
3575	-100	9366.75	-55.2043		
3750	-80	9396.9375	-75.2043		

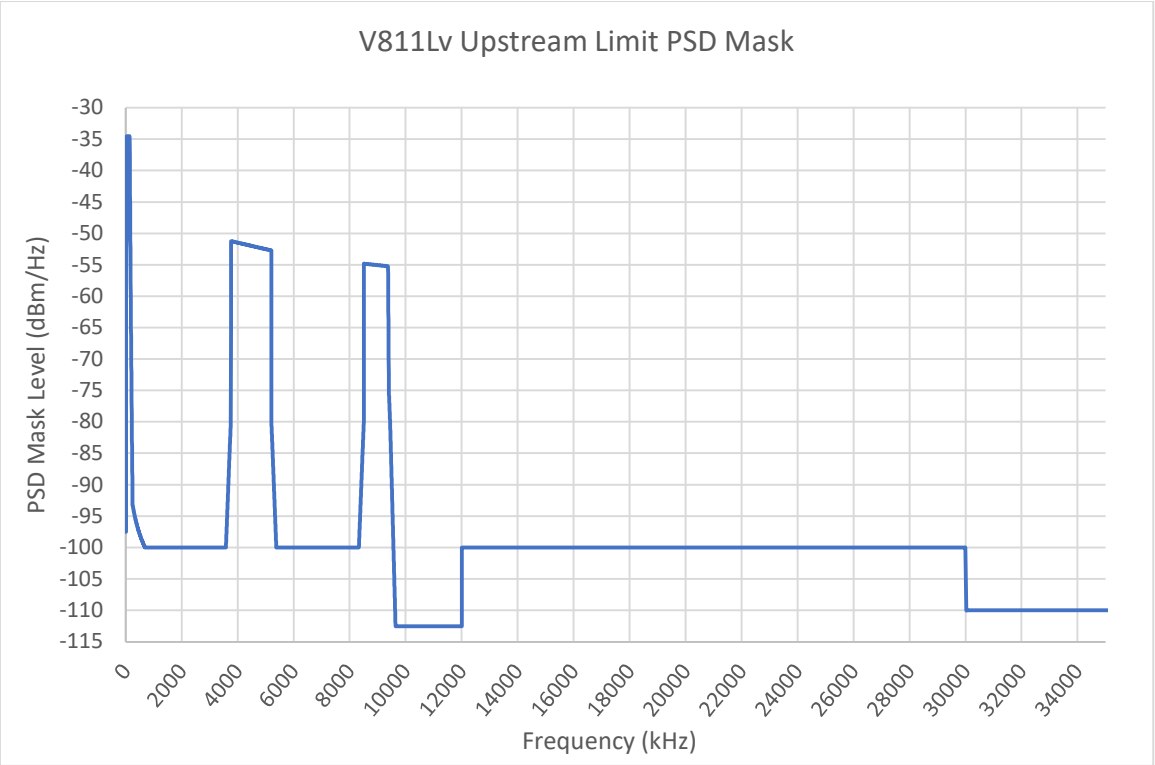

FIGURE 22
V811Lv Upstream Limit PSD Mask

A.12.5 V811Lv Unreferred Coexistence Masks

For V811Lv Deployment Class Systems the:

(i) Downstream (DSLAM towards CE) Unreferred Coexistence Mask is defined in Table 20 and illustrated in Figure 23.

(ii) Upstream (CE towards DSLAM) Unreferred Coexistence Mask is defined in Table 21 and illustrated in Figure 24.

TABLE 20

V811Lv Downstream Unreferred Coexistence Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	2509.875	-77.2742	7986.75	-102.9541
4	-97.5	2540.0625	-97.2742	8232.5625	-112.5
4	-92.5	2833.3125	-112.5	8500	-112.5
80	-72.5	3750	-112.5	8500	-112
138	-44.2	3750	-100	11825	-112
138	-40	4000	-100	12000	-85
750.375	-40	4000	-110	12877.125	-85
750.375	-65	5025	-110	12907.3125	-105
1104	-65	5200	-80	13131.5625	-112.5
1622	-75	5200	-81.2	17664	-112.5
2208	-76.5	7956.5625	-82.9541		

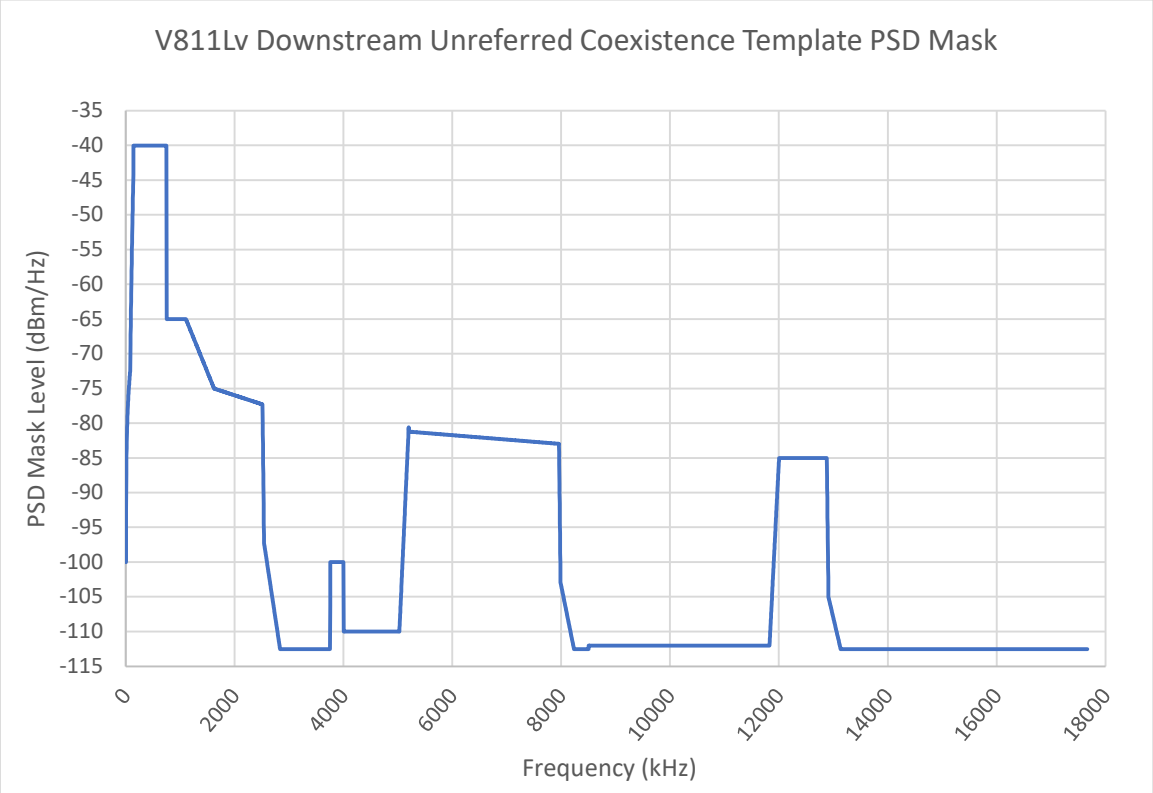

FIGURE 23

V811Lv Downstream Unreferred Coexistence Template PSD Mask

TABLE 21

V811Lv Upstream Unreferred Coexistence Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	3750	-80	9366.75	-83.7043
4	-97.5	3750	-79.7	9396.9375	-103.7043
4	-92.5	5200	-81.2	9634.125	-112.5
25.875	-38	5200	-80	12000	-112.5
138	-38	5375	-112	12000	-112
243	-93.2	8325	-112	17664	-112
686	-100	8500	-80		
3575	-100	8500	-83.3		

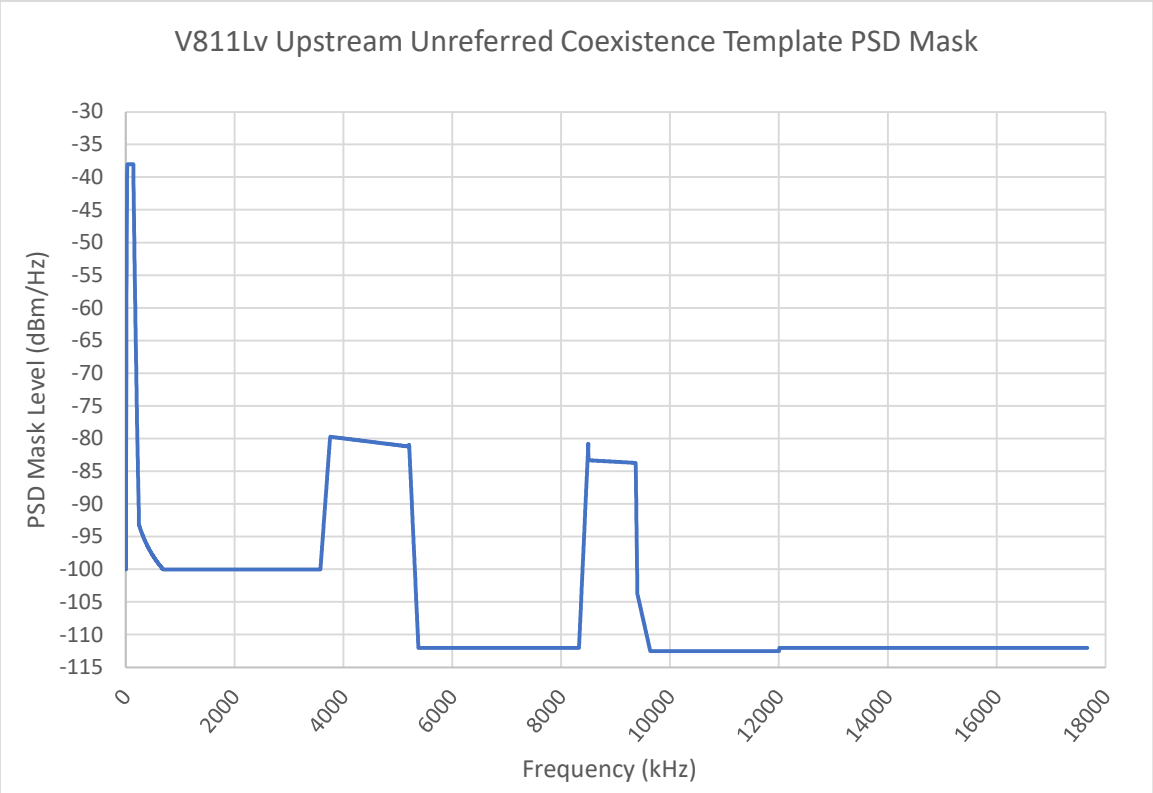

FIGURE 24

V811Lv Upstream Unreferred Coexistence Template PSD Mask

A.12.6 Comparison of V811Lv PSD Masks

For an illustrative comparison of the V811Lv Limit PSD Mask and Unreferred Coexistence Template PSD Mask refer to:

(a) Figure 25 for a comparison of Downstream PSD Masks; and

(b) Figure 26 for a comparison of Upstream PSD Masks.

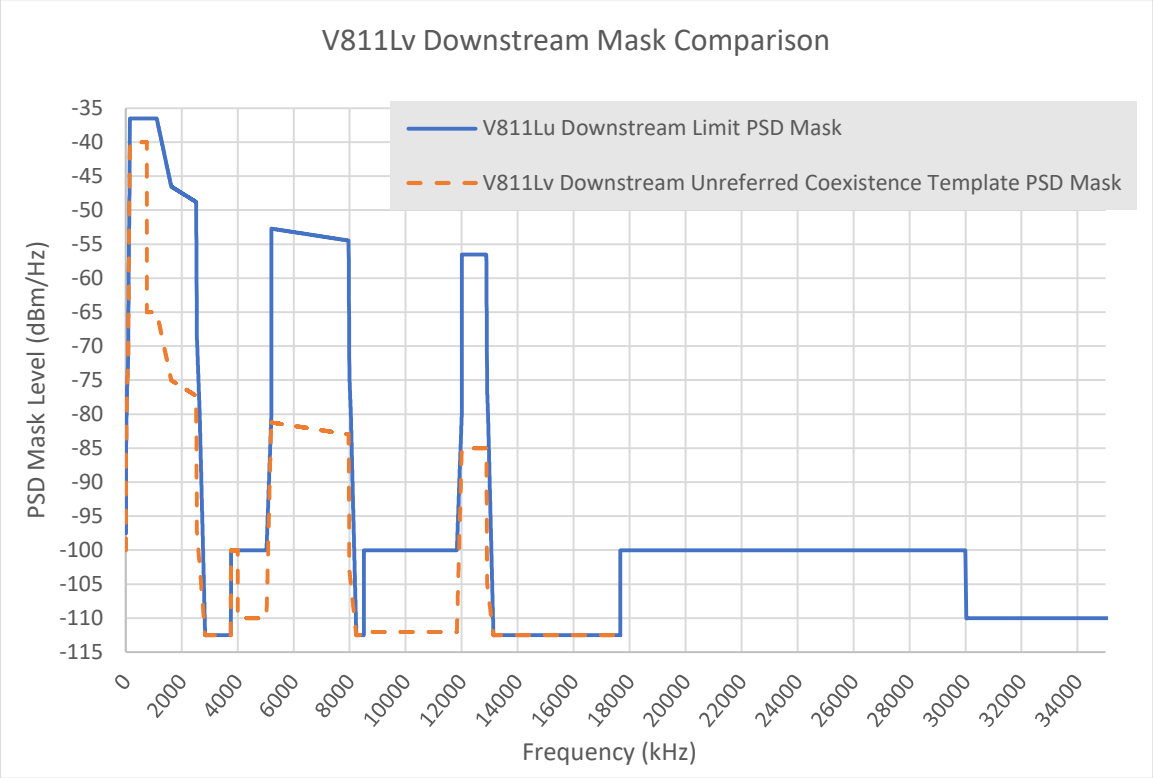

FIGURE 25
Comparison of V811Lv Downstream PSD Masks

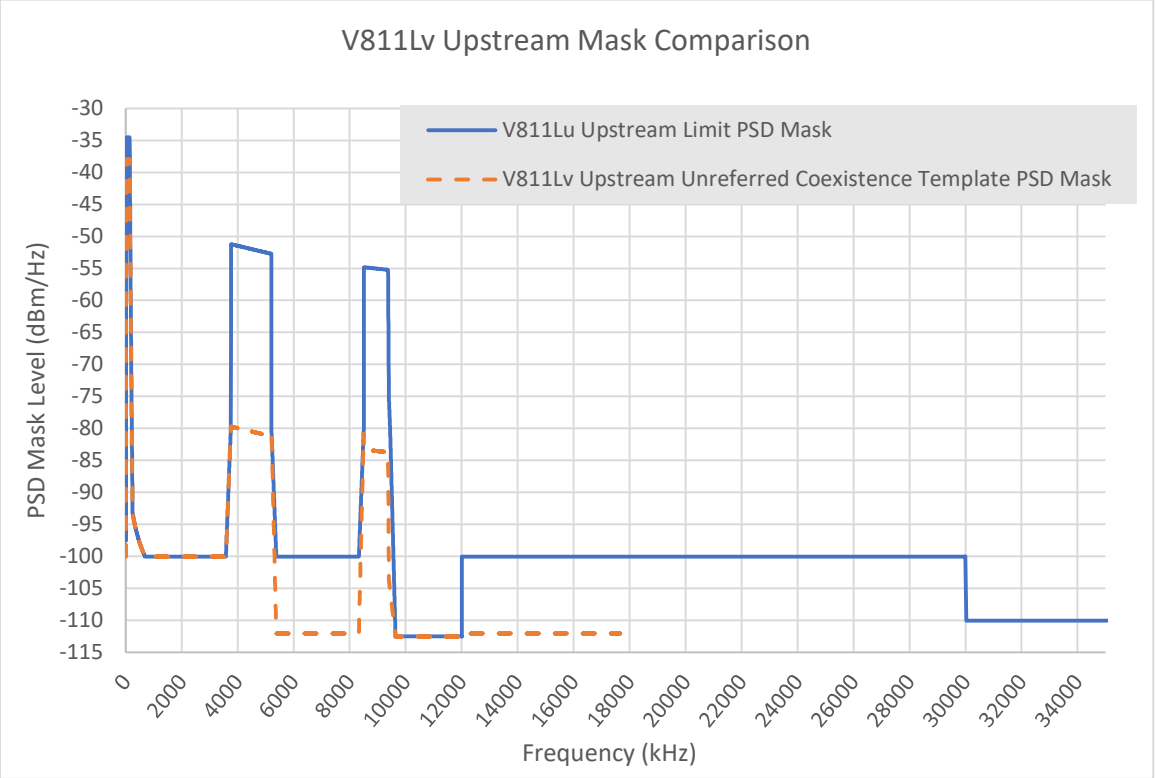

FIGURE 26
Comparison of V811Lv Upstream PSD Masks

A13 V811Hu Deployment Class

A.13.1 General

This section defines a spectrally divided non-Vectored VDSL2 Deployment Class (V811Hu).

The V811Hu 'high-split' Deployment Class System has been developed to complement the V811Lu and V811Lv 'low-split' Deployment Class Systems defined elsewhere in this Code. The split spectrum arrangement inherent in these Deployment Class Systems is intended to facilitate harmonious System coexistence when required by the Sharing Resolution Process.

A V811H systems would normally be Deployed in conjunction a V811L system to the same Shared Cable Bundle.

Systems of each of these Deployment Classes must meet the PSD Mask requirements for the B8-11 system of band plan 998 defined in ITU-T G.993.2.

V811Hu deemed co-existence options are listed in Tables 2 and 3 Part 1 along with conformance parameters which may include a common UPBO set of settings where the upstream spectrum overlap and any DPBO required by the rules of Part 1 of this Code.

A.13.2 Coexistence Mask band

The V811Hu Coexistence Masks are defined in frequencies up to and including 17.664 MHz.

A.13.3 Limit PSD Masks

For V811Hu Deployment Class Systems the:

(i) Downstream (DSLAM towards CE) Limit PSD Mask is defined in Table 22 and illustrated in Figure 27.

(ii) Upstream (CE towards DSLAM) Limit PSD Mask is defined in Table 23 and illustrated in Figure 28.

TABLE 22

V811Hu Downstream Limit PSD Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	2880.75	-49.6068	12000	-100
4	-97.5	3750	-51.2	12000	-112.5
4	-92.5	3750	-80	12864.1875	-112.5
80	-72.5	3925	-100	13058.25	-80
138	-44.2	5200	-100	13088.4375	-76.5
138	-36.5	5200	-112.5	13118.625	-56.5
711.5625	-36.5	7965.1875	-112.5	17664	-56.5
741.75	-56.5	8159.25	-80	17664	-80
944.4375	-80	8206.6875	-74.6325	17839	-100
1138.5	-112.5	8236.875	-54.6325	30000	-100
2565.9375	-112.5	8500	-54.8	30000	-110
2760	-80	8500	-80	212000	-110
2850.5625	-69.6068	8675	-100		

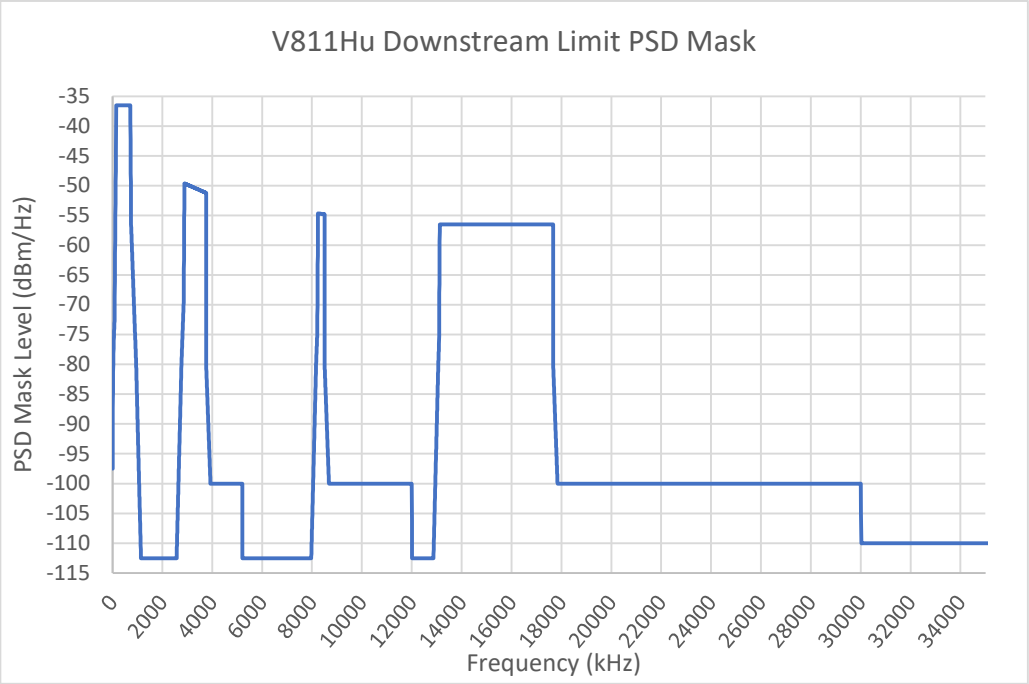

FIGURE 27
V811Hu Downstream Limit PSD Mask

TABLE 23

V811Hu Upstream Limit PSD Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	3750	-112.5	9634.125	-55.329
4	-97.5	5200	-112.5	10000	-55.5
4	-92.5	5200	-100	12000	-55.5
25.875	-34.5	8500	-100	12000	-80
138	-34.5	8500	-112.5	12175	-100
243	-93.2	9366.75	-112.5	30000	-100
686	-100	9560.8125	-80	30000	-110
3750	-100	9603.9375	-75.329	212000	-110

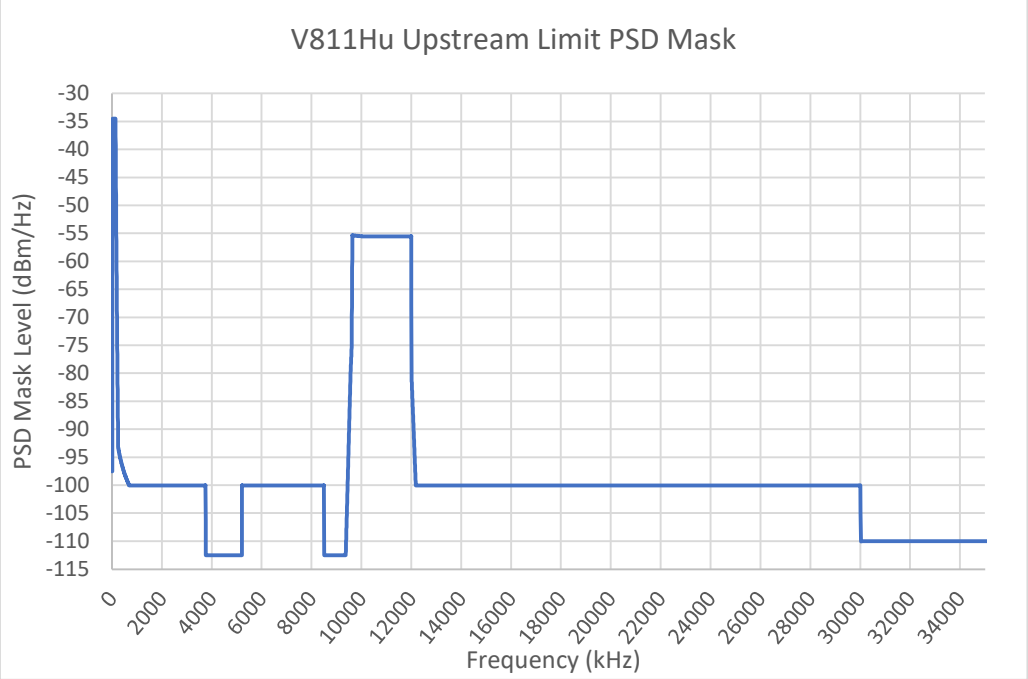

FIGURE 28

V811Hu Downstream Limit PSD Mask

A.13.4 V811Hu Unreferred Coexistence Masks

For V811Hu Deployment Class Systems the:

(i) Downstream (DSLAM towards CE) Unreferred Coexistence Mask is defined in Table 24 and illustrated in Figure 29.

(ii) Upstream (CE towards DSLAM) Unreferred Coexistence Mask is defined in Table 25 and illustrated in Figure 30.

TABLE 24

V811Hu Downstream Unreferred Coexistence Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	2850.5625	-73.1068	8236.875	-58.1325
4	-97.5	2880.75	-53.1068	8500	-58.3
4	-92.5	3750	-54.7	8500	-80
80	-72.5	3750	-80	8675	-112
138	-44.2	3925	-100	12000	-112
138	-40	4000	-100	12000	-112.5
711.5625	-40	4000	-110	12864.1875	-112.5
741.75	-60	5200	-110	13058.25	-83.5
944.4375	-83.5	5200	-112.5	13088.4375	-80
1138.5	-112.5	7965.1875	-112.5	13118.625	-60
2565.9375	-112.5	8159.25	-83.5	17664	-60
2760	-83.5	8206.6875	-78.1325		

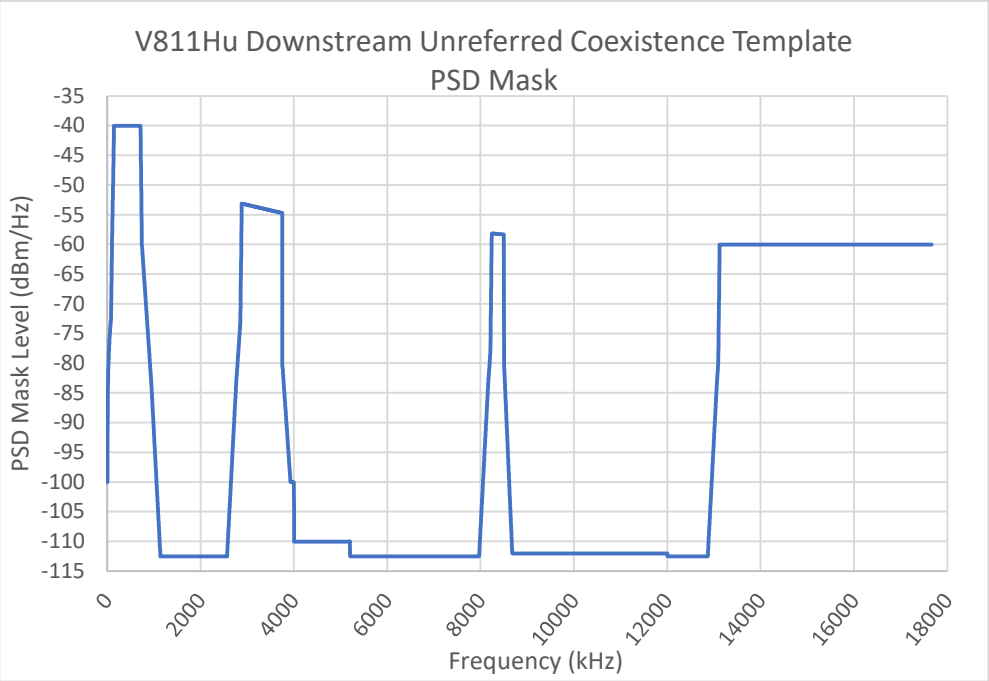

FIGURE 29

V811Hu Downstream Unreferred Coexistence Template PSD Mask

TABLE 25

V811Hu Upstream Unreferred Coexistence Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	3750	-112.5	9634.125	-58.829
4	-97.5	5200	-112.5	10000	-59
4	-92.5	5200	-112	12000	-59
25.875	-38	8500	-112	12000	-80
138	-38	8500	-112.5	12175	-112
243	-93.2	9366.75	-112.5	17664	-112
686	-100	9560.8125	-83.5		
3750	-100	9603.9375	-78.829		

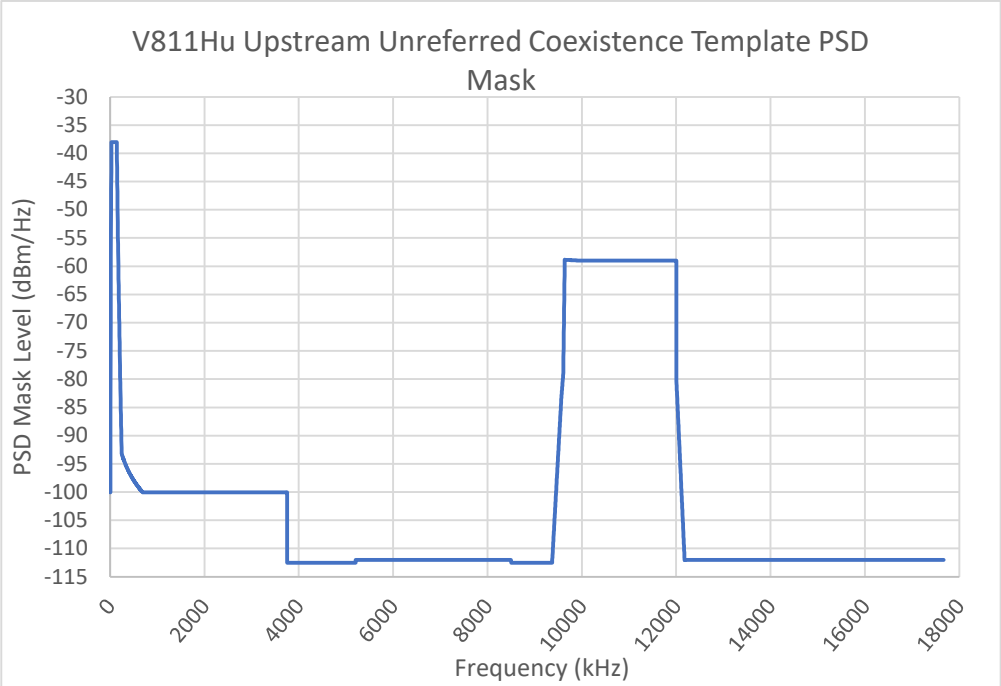

FIGURE 30

V811Hu Upstream Unreferred Coexistence Template PSD Mask

A.13.5 Comparison of V811Hu PSD Masks

For an illustrative comparison of the V811Hu Limit PSD Mask and Unreferred Coexistence Template PSD Mask refer to:

(a) Figure 31 for a comparison of Downstream PSD Masks; and

(b) Figure 32 for a comparison of Upstream PSD Masks.

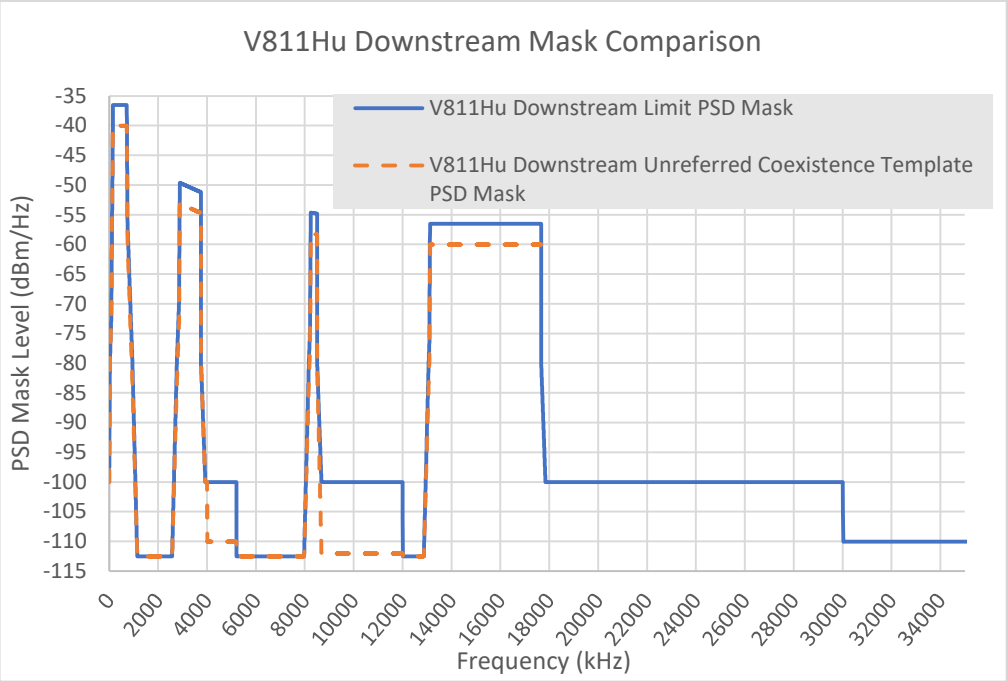

FIGURE 31
Comparison of V811Hu Downstream PSD Masks

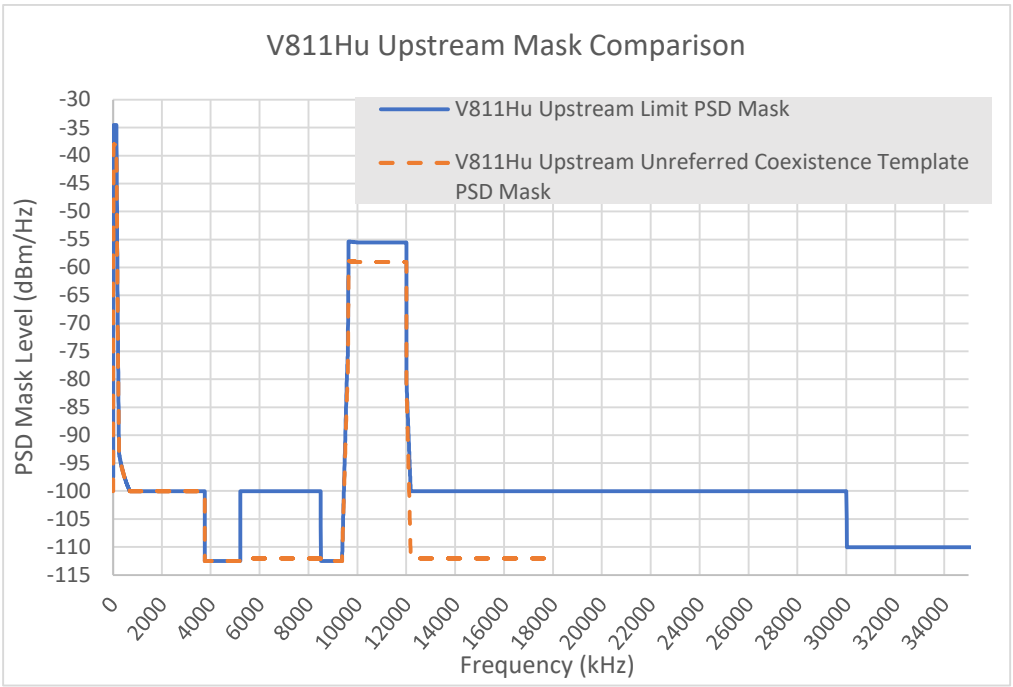

FIGURE 32
Comparison of V811Hu Downstream PSD Masks

A14 V811Hv Deployment Class

A.14.1 General

This section defines a spectrally divided Vectored VDSL2 Deployment Class (V811Hv) for Systems that can perform full Vectoring of all bands except US0, according to the requirements of ITU-T G.993.5.

The V811Hv 'high-split' Deployment Class System has been developed to complement the V811Lu and V811Lv 'low-split' Deployment Class Systems defined elsewhere in this Code. The split spectrum arrangement inherent in these Deployment Class Systems is intended to facilitate harmonious System When required by the Sharing Resolution Process.

A V811H system would normally be Deployed in conjunction with a V811L systems to the same Shared Cable Bundle.

Systems of each of these Deployment Classes must meet the PSD Mask requirements for the B8-11 system of band plan 998 defined in ITU-T G.993.2.

V811Hv deemed co-existence options are listed in Table 3 Part 1 along with conformance parameters which may include any DPBO required by the rules of Part 1 of this Code.

A.14.2 Coexistence Mask band

The V811Hv Coexistence Masks are defined in frequencies up to and including 17.664 MHz.

A.14.3 First Vectored Tone

Tones up to and including tone 640 (up to and including the tone at 2760 kHz) are non-Vectored in the V811Hv Deployment Class. This range of tones includes the entire US0 band and the lower part of DS1. The lowest tones in DS1 have been defined as non-Vectored to facilitate robust operation of the V811Lu and V811Lv Deployment Classes.

All tones above and including tone 641 (above and including the tone at 2764.3125 kHz) in the DS1, DS2, DS3, US1, and US2 bands are Vectored in the V811Hv Deployment Class.

System Providers deploying the V811Hv Deployment Class may enable Vectoring in all tones if preferred, but for the purpose of determining Full Coverage, must assume that a V811L Deployment Class has been Deployed to the same Shared Cable Bundle, therefore rendering Vectoring in tones up to and including tone 640 ineffective.

A.14.4 Limit PSD Masks

For V811Hv Deployment Class Systems the:

(i) Downstream (DSLAM towards CE) Limit PSD Mask is defined in Table 26 and illustrated in Figure 33.

(ii) Upstream (CE towards DSLAM) Limit PSD Mask is defined in Table 27 and illustrated in Figure 34.

TABLE 26

V811Hv Downstream Limit PSD Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	2880.75	-49.6068	12000	-100
4	-97.5	3750	-51.2	12000	-112.5
4	-92.5	3750	-80	12864.1875	-112.5
80	-72.5	3925	-100	13058.25	-80
138	-44.2	5200	-100	13088.4375	-76.5
138	-36.5	5200	-112.5	13118.625	-56.5
711.5625	-36.5	7965.1875	-112.5	17664	-56.5
741.75	-56.5	8159.25	-80	17664	-80
944.4375	-80	8206.6875	-74.6325	17839	-100
1138.5	-112.5	8236.875	-54.6325	30000	-100
2565.9375	-112.5	8500	-54.8	30000	-110
2760	-80	8500	-80	212000	-110
2850.5625	-69.6068	8675	-100		

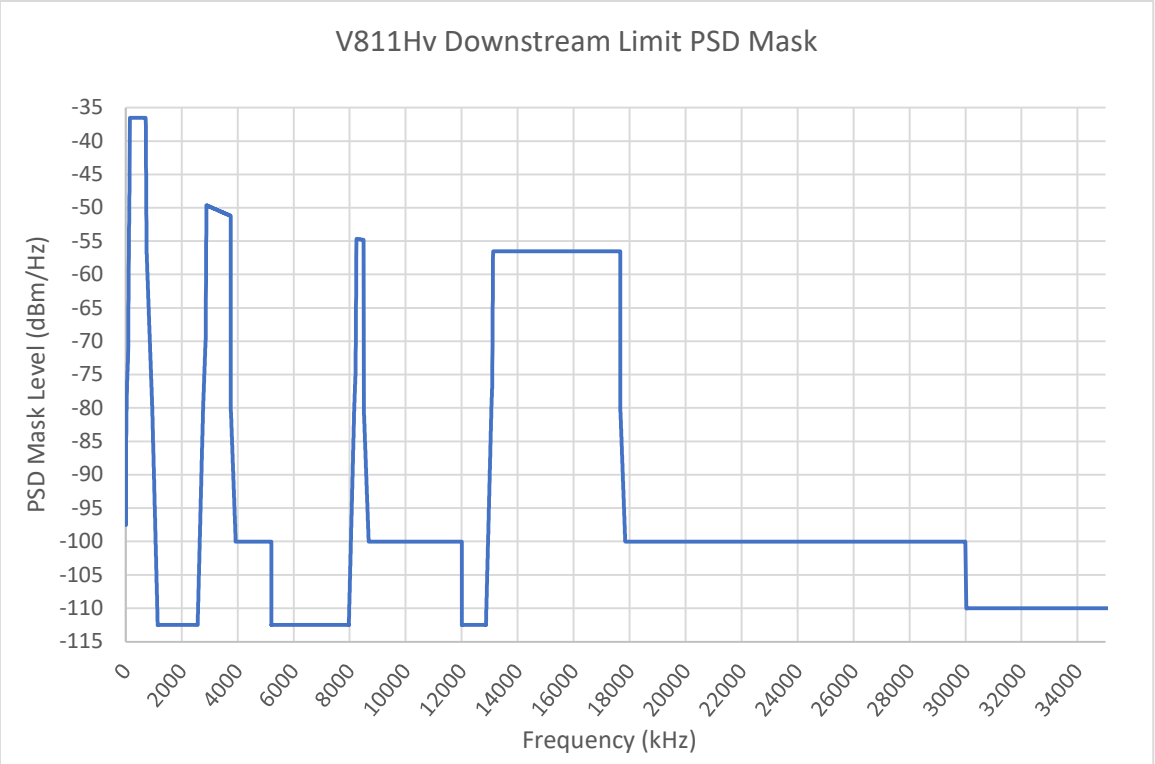

FIGURE 33
V811Hv Downstream Limit PSD Mask

TABLE 27
V811Hv Upstream Limit PSD Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	3750	-112.5	9634.125	-55.329
4	-97.5	5200	-112.5	10000	-55.5
4	-92.5	5200	-100	12000	-55.5
25.875	-34.5	8500	-100	12000	-80
138	-34.5	8500	-112.5	12175	-100
243	-93.2	9366.75	-112.5	30000	-100
686	-100	9560.8125	-80	30000	-110
3750	-100	9603.9375	-75.329	212000	-110

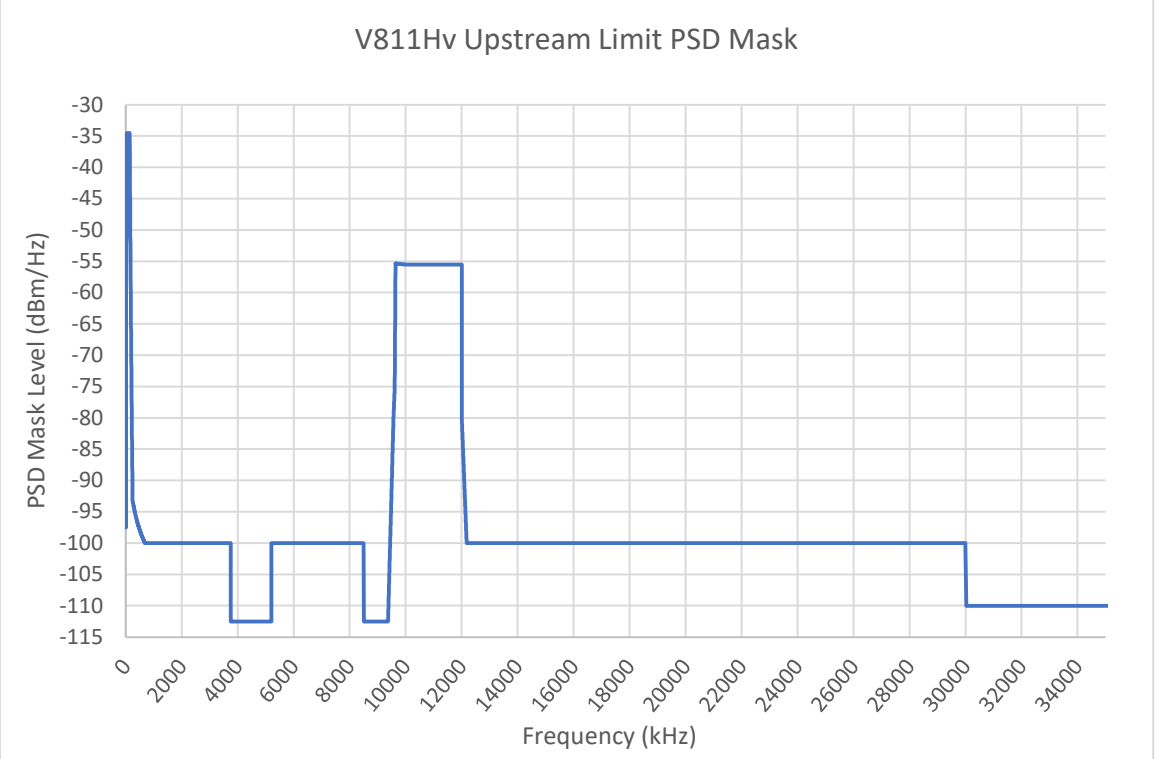

FIGURE 34
V811Hv Downstream Limit PSD Mask

A.14.5 V811Hv Unreferred Coexistence Masks

For V811Hv Deployment Class Systems the:

(i) Downstream (DSLAM towards CE) Unreferred Coexistence Mask is defined in Table 28 and illustrated in Figure 35.

(ii) Upstream (CE towards DSLAM) Unreferred Coexistence Mask is defined in Table 29 and illustrated in Figure 36.

TABLE 28

V811Hv Downstream Unreferred Coexistence Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	2850.5625	-98.1068	8236.875	-83.1325
4	-97.5	2880.75	-78.1068	8500	-83.3
4	-92.5	3750	-79.7	8500	-80
80	-72.5	3750	-80	8675	-112
138	-44.2	3925	-100	12000	-112
138	-40	4000	-100	12000	-112.5
711.5625	-40	4000	-110	12864.1875	-112.5
741.75	-60	5200	-110	13088.4375	-105
944.4375	-83.5	5200	-112.5	13118.625	-85
1138.5	-112.5	7965.1875	-112.5	17664	-85
2565.9375	-112.5	8206.6875	-103.1325		

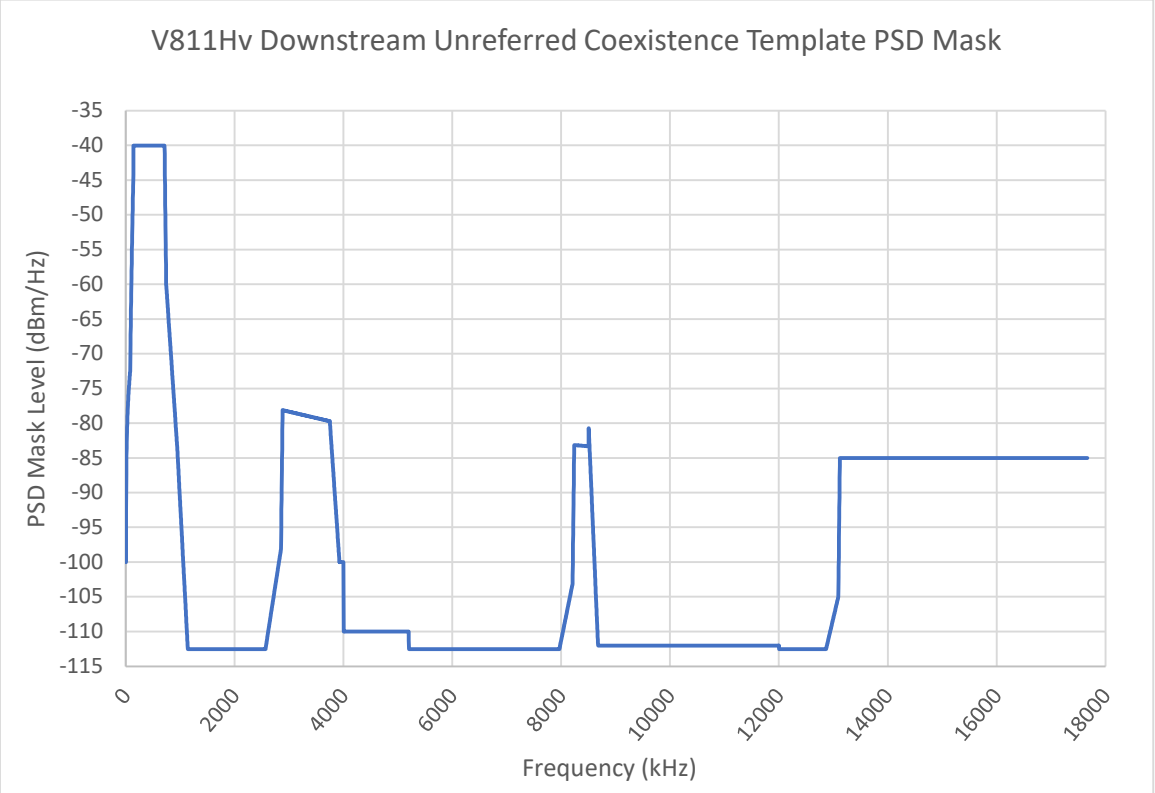

FIGURE 35

V811Hv Downstream Unreferred Coexistence Template PSD Mask

TABLE 29

V811Hv Upstream Unreferred Coexistence Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	3750	-100	9603.9375	-103.829
4	-97.5	3750	-112.5	9634.125	-83.829
4	-92.5	5200	-112.5	10000	-84
25.875	-38	5200	-112	12000	-84
138	-38	8500	-112	12175	-112
243	-93.2	8500	-112.5	17664	-112
686	-100	9366.75	-112.5		

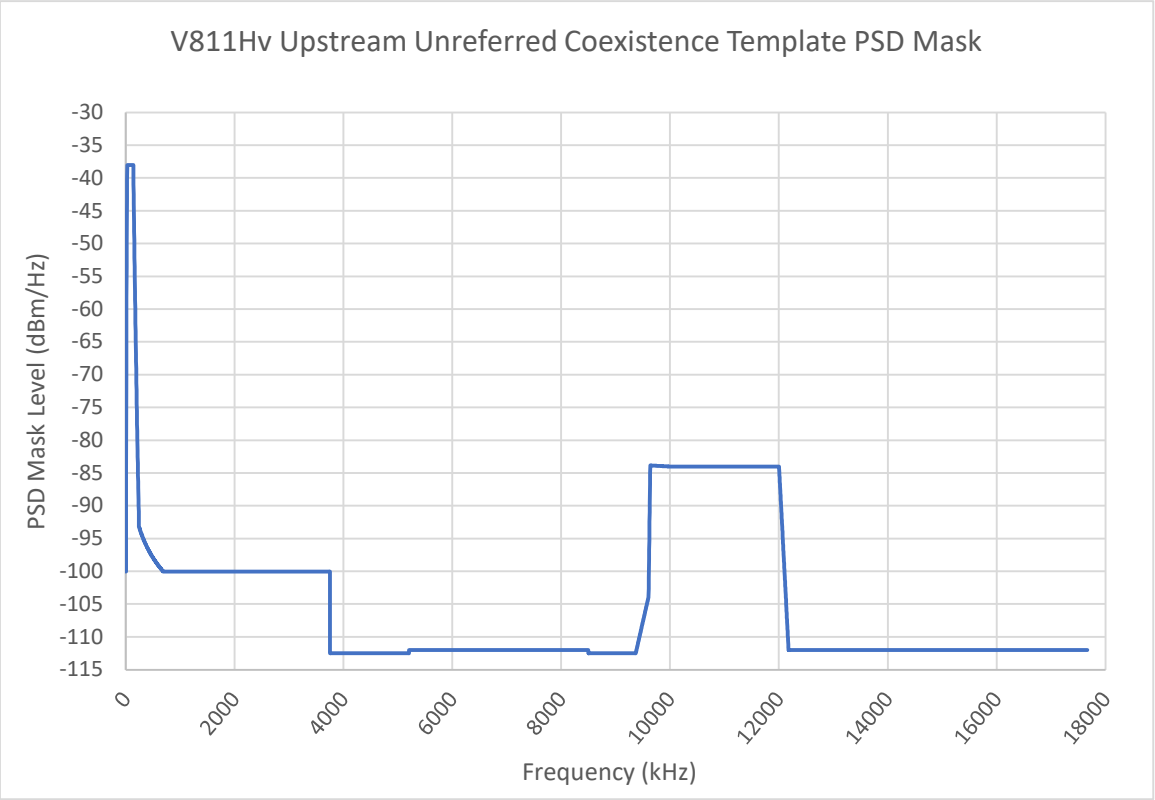

FIGURE 36

V811Hv Upstream Unreferred Coexistence Template PSD Mask

A.14.6 Comparison of V811Hv PSD Masks

For an illustrative comparison of the V811Hv Limit PSD Mask and Unreferred Coexistence Template PSD Mask refer to:

(a) Figure 37 for a comparison of Downstream PSD Masks; and

(b) Figure 38 for a comparison of Upstream PSD Masks.

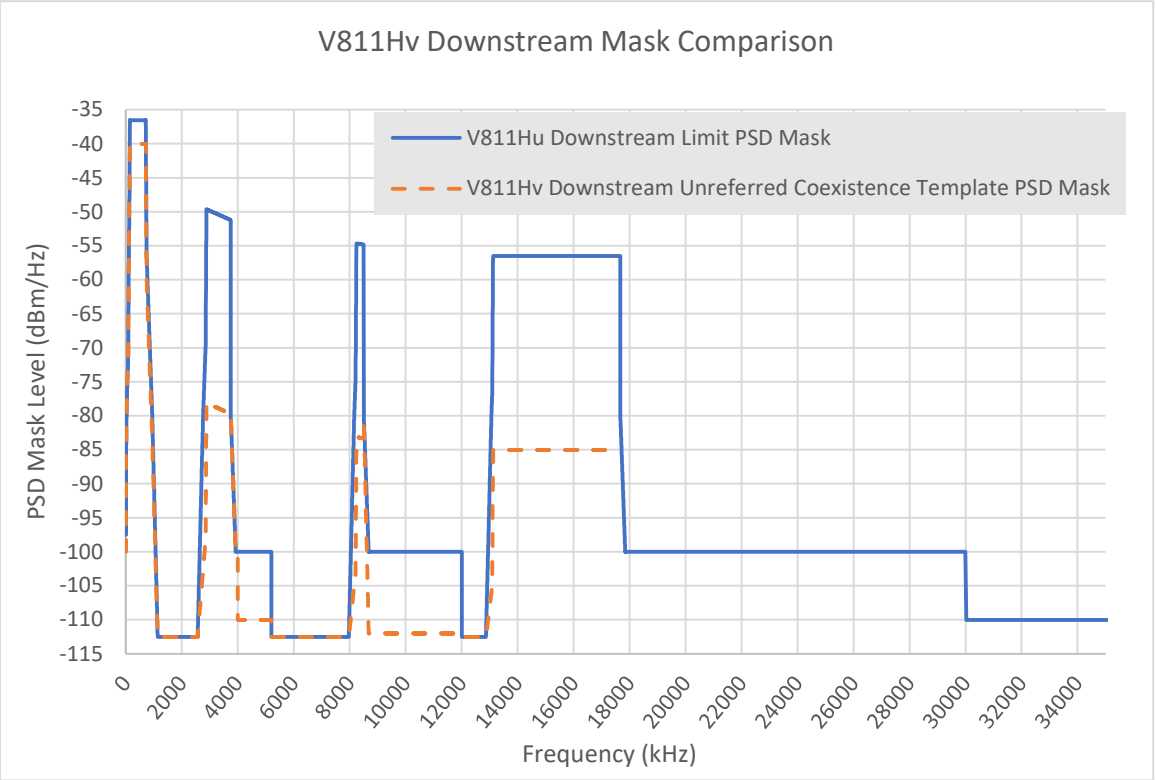

FIGURE 37
Comparison of V811Hv Downstream PSD Masks

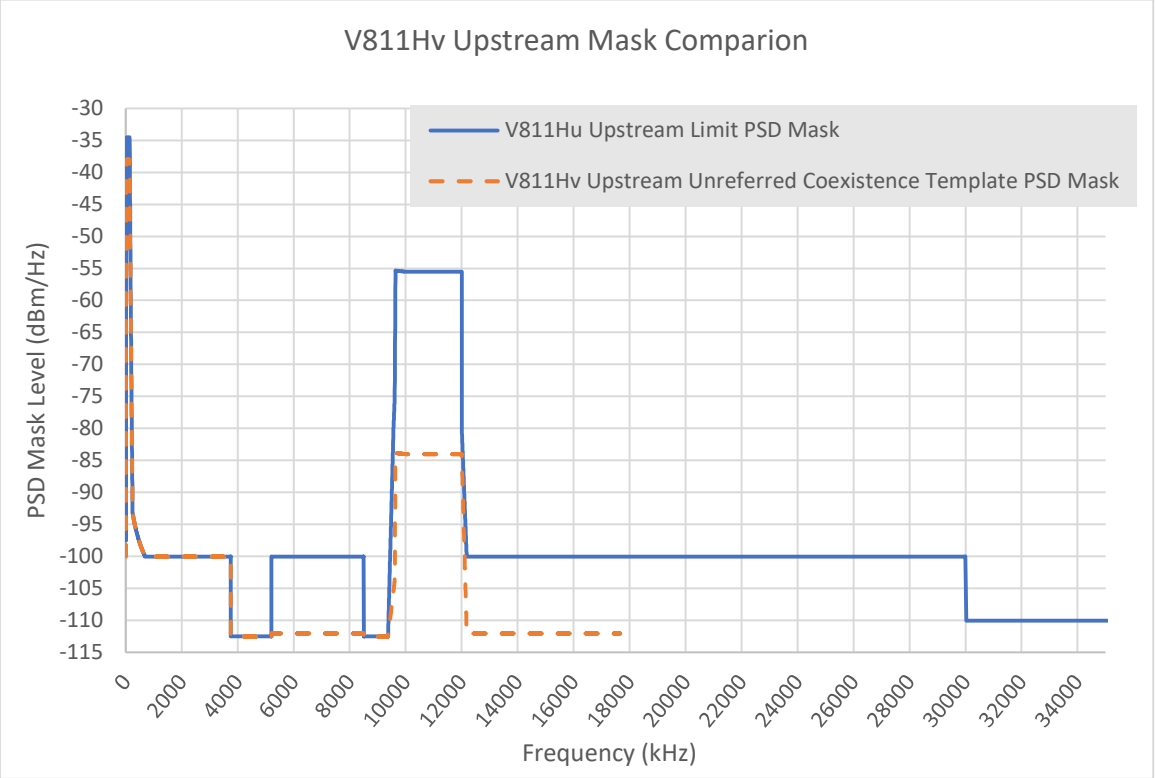

FIGURE 38
Comparison of V811Hv Upstream PSD Masks

APPENDIX

B The G.fast Spectrally Masked (SM) Deployment Class System

B1 General

B.1.1 This appendix defines a G.fast-SM Deployment Class which is based on systems described in ITU-T G.9700 and ITU-T G.9701 that adopt either:

(a) profile 106a; or

(b) profile 212a.

B.1.2 G.fast-SM Deployment Class Systems shall comply with all the ITU-T requirements of either:

(a) profile 106a; or

(b) profile 212a.

NOTE: These requirements are defined in:

(a) ITU-T G.9700 Table 7-1;

(b) ITU-T G.9701 Section 6.2; and

(c) ITU-T G.9701 Table 6-1.

B.1.3 When configured as a G.fast-SM Deployment Class System, the System shall not operate contrary to any of the requirements of ITU-T G.9701 section 7. Determination of compliance shall follow ITU-T G.9700 Section 7.3 and ITU-T G.9700 Section 7.4. Transmit PSD verification shall be determined in accordance with ITU-T G.9700 Section 8.

B.1.4 Each System Provider is responsible to ensure that the requirements of this Deployment Class have been tested and found to comply with the requirements before operating a System under this Deployment Class.

B.1.5 The G.fast-SM Deployment Class is deemed to coexist with every other Deployment Class that is not a G.fast based Deployment Class.

B.1.6 A System operating as a G.fast-SM Deployment Class System cannot coexist with another System operating as a G.fast-SM Deployment Class System.

NOTES:

1. Within the G.fast-SM Deployment Class, ITU-T G.9701 profiles 106a and 212a are treated equivalently.

2. The G.fast-SM Deployment Class does not differentiate between these two profiles because:

(a) the masks for profile 106a are encapsulated entirely within the masks for profile 212a;

(b) the operating parameters described in ITU-T G.9701 Table 6-1 for profile 106a are spectrally compatible with the operating parameters for profile 212a; and

(c) it is technically not possible for:

(i) any one G.fast system to coexist in the same shared cable bundle as any other G.fast system and simultaneously; and
(ii) those coexisting G.fast Systems to achieve Full Service Coverage.

3. It is not technically possible to implement two spectrally split G.fast systems that use the spectrum (a) below 106MHz and (b) 106-212MHz because a G.fast system operating only on106-212 MHz would result in a cable length that is too short to use.

B.1.7 Every G.fast-SM Deployment Class System operates as a vectored System.

B.1.8 Every G.fast-SM Deployment Class System is a TDD System. Each System Operator may configure the TDD ratio according to their individual service objectives, provided that the chosen TDD ratio satisfies the G.fast Full Coverage rate requirement.

B2 Operating Frequency Range

B.2.1 The G.fast band is divided into subcarriers spaced at 51.75 kHz which are identified using integer indices. The integer indices correspond to G.fast tones operating at integer multiples of the subcarrier spacing.

B.2.2 The index of the lowest supported data bearing subcarrier, defined in ITU-T G.9701 Table 6-1, is 43. However subcarriers numbered 386 and below are not supported by and shall not be used to bear data by this Deployment Class.

B.2.3 G.fast-SM Deployment Class Systems operate in the frequency range 20 MHz to 212 MHz inclusive as outlined in Table 30.

TABLE 30

Operating frequency range bands

Band Name	Lower Frequency Edge	Lower Frequency carrier index	Upper Frequency Edge	Upper Frequency carrier index
Gfast-SM	20 MHz	387	212 MHz	4095

B.2.4 Subcarrier indices less than or equal to 386 shall be prevented from bearing data either by applying a:

(a) low-frequency edge stop-band mask with f_{tr3}=20 MHz as described in ITU-T G.9700 section 6.6; or

(b) frequency band notch covering all subcarrier indices less than or equal to 386 as described in ITU-T G.9700 section 6.5.

B3 The G.fast-SM Deployment Class PSD Masks

B.3.1 G.fast-SM Limit PSD Mask

The G.fast-SM Limit PSD Mask breakpoints defined in Table 31 and depicted in Figure 39 and Figure 40 represents the absolute maximum PSD which a compliant System may emit in the band defined by the Limit Mask in either the Downstream (DSLAM towards CE) or Upstream (CE towards DSLAM) transmission directions.

NOTE: The G.fast-SM Upstream and Downstream Limit PSD Masks are identical.

TABLE 31
G.fast-SM Limit PSD Mask

Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)	Frequency (kHz)	PSD Mask Level (dBm/Hz)
0.01	-97.5	500	-100	30000	-73.0
4	-97.5	19825	-100	106000	-76.0
4	-92.5	20000	-80.0	212000	-79.0
20	-90.0	20000	-65.0	232000	-110
500	-90.0	30000	-65.0	236000	-140

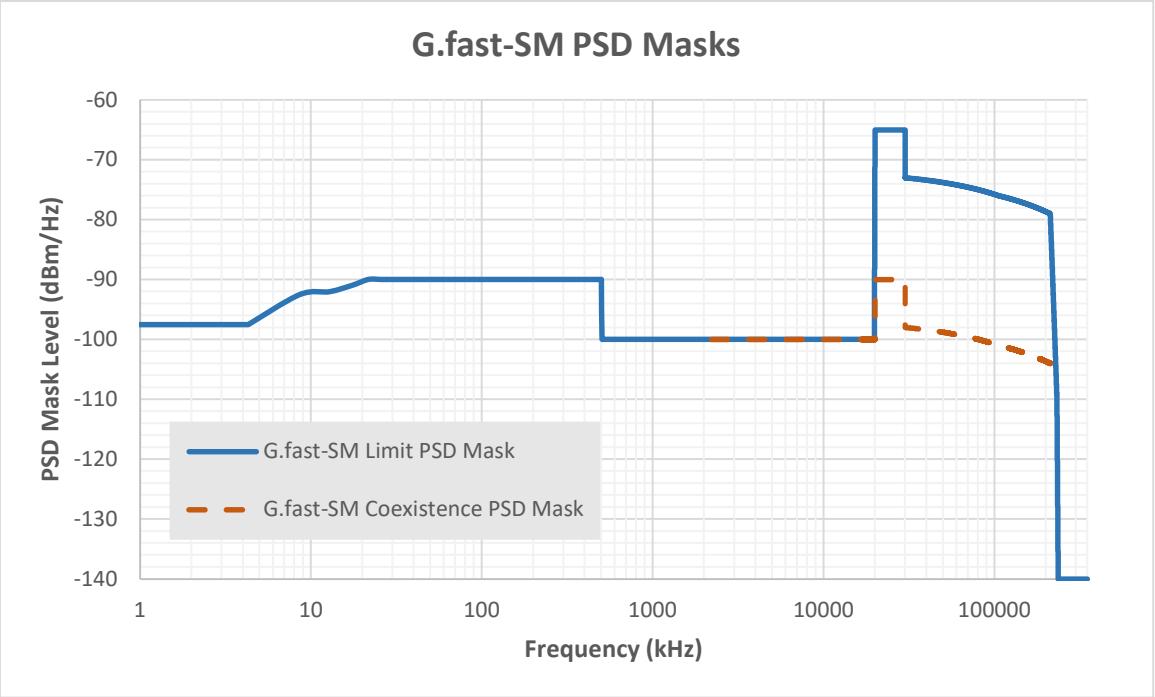

FIGURE 39

G.fast-SM Limit PSD Mask depicted logarithmically

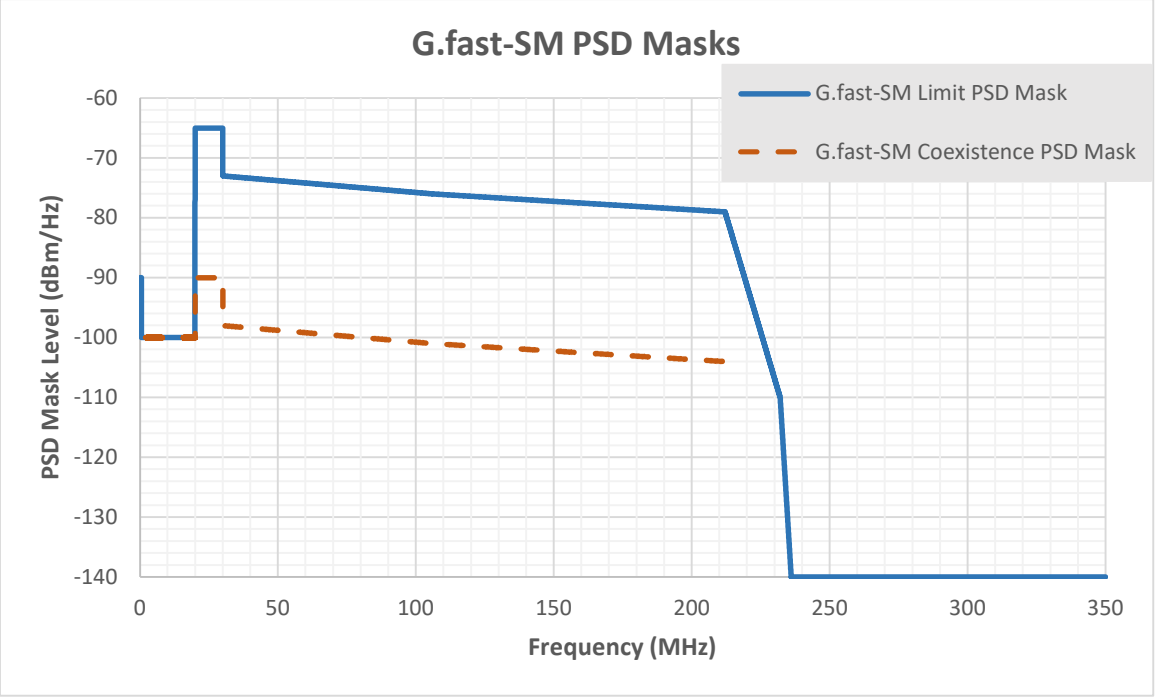

FIGURE 40

G.fast-SM Limit PSD Mask depicted linearly

B.3.2 The G.fast-SM Template PSD Mask is defined for carrier indices between and including 387 and 4095. The PSD level at the defined indices has the same value as the corresponding G.fast-SM Limit PSD Mask carrier index.

Note: The G.fast-SM Upstream and Downstream Template PSD Masks are identical.

B.3.3 The G.fast-SM Deployment Class System definition includes a Coexistence Mask that is based on the Limit PSD Mask, adjusted for Vectoring. The Coexistence Mask shall be applied as a Limit Mask to Non-Deployment Class Systems.

B.3.4 The G.fast-SM Coexistence Mask is defined for frequencies corresponding to carrier indices between and including 43 and 4095. The Coexistence Mask PSD level at frequencies corresponding to carrier indices 386 and below is -100 dBm/Hz. The Coexistence Mask PSD levels at frequencies corresponding to carrier indices greater than 386 is defined to be 25dB lower than the corresponding G.fast-SM Limit PSD Mask at that frequency.

Note: The G.fast-SM Upstream and Downstream Coexistence PSD Masks are identical. The maximum vectoring gain for a G.fast-SM Deployment Class System is 25dB.

B4 Interpolation of frequencies between PSD Mask breakpoints

B.4.1 Logarithmic interpolation of the attenuation in dB, as described in Equation 1, must be used when the frequency is less than 138kHz.

B.4.2 Linear interpolation of the attenuation in dB, as described in Equation 2, must be used when the frequency is greater than or equal to 138kHz.

B5 G.fast-SM equipment configuration

B.5.1 Even if a System meets the ITU-T G.9700 Limit PSD requirements, it will require additional configuration in order to comply with the G.fast-SM Deployment Class Limit PSD requirements.

NOTE: System Operators should seek support from their G.fast System Vendor to:

(a) ensure that the G.fast-SM Deployment Class Limit PSD is fully supported by the G.fast System;

(b) ensure that when the G.fast-SM Deployment Class Limit PSD is correctly applied, the System meets the requirements of this Code; and

(c) obtain a procedure for correctly applying the G.fast-SM Deployment Class Limit PSD to the System and follow it.

B.5.2 A G.fast System that is operated without the correctly applied G.fast-SM Limit PSD configuration settings does not comply with the requirements of this Code. Such a System is deemed to cause Unacceptable Interference to any non-G.fast-SM Deployment Class System operating in the same Shared Cable Bundles.

B6 PSD Notching

B.6.1 Systems shall support PSD Notching defined in Table 32 for the specified amateur radio and ACMA broadcasting service bands.

TABLE 32

Frequency limits between which the transmit PSD Mask should not exceed -95 dBm/Hz when notching is required for that band

Radio Band Description	Lower Frequency (MHz)	Lower Frequency carrier index to be notched	Upper Frequency (MHz)	Upper Frequency carrier index to be notched
Amateur 15 metre	21.0	405	21.45	415
Amateur 12 metre	24.89	480	24.99	483
Amateur 10 metre	28.0	541	29.7	574
Amateur 8 metre	40.0	772	45.0	870
ACMA Band I (a)	45.0	869	52.0	1005
Amateur 6 metre	50.0	966	54.0	1044
ACMA Band I (b)	56.0	1082	70.0	1353
Amateur 4 metre	69.9	1350	70.5	1363
FM Radio	85.0	1642	108.0	2087
ACMA (Channel 5A)	137.0	2647	144.0	2783
Amateur 2 metre	144.0	2782	148.0	2860
ACMA Band III	174.0	3362	212.0	4095

B.6.2 When a potential G.fast-SM interference issue is brought to the attention of a G.fast-SM System Operator, that System Operator shall investigate whether the G.fast-SM System is the source of the interference.

B.6.3 A System may be Deployed with G.fast-SM notching disabled (turned off) by default.

B.6.4 PSD Notching shall be able to be turned on for any selected band(s) being used by the G.fast-SM System in order to:

(a) determine if the G.fast-SM system is causing interference in the notched band; and

(b) avoid ongoing transmissions in that band which were the source of interference in that band.

NOTE: This means that PSD Notching may need to be temporarily applied in one or more specific bands to ascertain whether a G.fast-SM System is causing interference in the specific band(s). PSD Notching does not need to continue to be applied in a specific band if the G.fast-SM System is found not to be the source of the interference in that band.

B.6.5 Where PSD Notching is found to be necessary to avoid causing interference in a band, all carrier indices in the affected band should be notched.

PARTICIPANTS

The Working Committee that developed the Code consisted of the following organisations and their representatives:

Organisation	Membership	Representative
ACCC	Non-Voting	James Park
ACMA	Non-Voting	Cuong Nguyen
Adtran Networks	Voting	Ben Liew
Adtran Networks	Non-Voting	Alex Grigoruk
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This Working Committee was chaired by Peter Cooke. James Duck of Communications Alliance provided project management support.

Communications Alliance was formed in 1997 to provide a unified voice for the Australian communications industry and to lead it into the next generation of converging networks, technologies and services.

In pursuing its goals, Communications Alliance offers a forum for the industry to make coherent and constructive contributions to policy development and debate.

Communications Alliance seeks to facilitate open, effective and ethical competition between service providers while ensuring efficient, safe operation of networks, the provision of innovative services and the enhancement of consumer outcomes.

It is committed to the achievement of the policy objective of the *Telecommunications Act 1997* - the greatest practicable use of industry self-regulation without imposing undue financial and administrative burdens on industry.

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