TITLE **PSD masks for VDSL: inclusions of comments**

PROJECT VDSL

SOURCE:

Authors: Bas van den Heuvel, KPN Research
Rosaria Persico, Telecom Italia Lab

Presented by: Rob van den Brink, KPN Research

Supported by: Jean-Marc Corolleur, France Telecom R&D
Kaare Ingar Sletta, Telenor R&D
John Cook, British Telecom
Marko Löffelholz, T-Nova Deutsche Telekom

CONTACT

Bas van den Heuvel
KPN Research
PO Box 421
2260 AK Leidschendam
The Netherlands
tel: +31 70 446.1071
fax: +31 70 446.3477
email: b.m.vandenheuvel @kpn.com

Rosaria Persico
Telecom Italia Lab
Via Reiss Romoli, 274
10148 Torino
Italy
tel: +39 011 228.7325
fax: +39 011 228.5085
email: rosaria.persico@tilab.com

STATUS For Decision

ABSTRACT At the previous TM6 meeting a proposal was made [4] concerning the PSD masks for VDSL. That proposal addressed the merging of the VDSL band allocation plan [2] and the older requirements on the PSD in [1]. This document contains the common viewpoint of a large number of FSAN operators as this work is being progressed by the FS-VDSL Committee. It discusses a number of issues that were raised at the last ETSI meeting and during subsequent e-mail discussions. An improved literal text proposal is presented that has taken the comments into account.

1. Introduction

At the Stockholm meeting, TD24 [4] proposed a merging of the VDSL band allocation plan [2] and the older requirements on the PSD in [1]. This merging proposal resolved the ambiguities between the two sets of requirements. At the same time, a reduction of the number and the complexity of the masks was proposed.

During the Stockholm meeting a number of issues were raised concerning the PSD masks. These issues were subsequently discussed on the ETSI TM6 exploder. Moreover, a survey was held among the FSAN operators working together in the FS-VDSL Committee regarding their positions on these issues [5].

The present contribution contains the common viewpoint of a large number of operators. It has taken into account the issues that were raised during the Stockholm meeting and on the exploder. This document will discuss these issues. After the discussion, an editorial text proposal is presented to replace the current sets of PSD requirements in the standard.

2. The Issues[1]

2.1 Issue 1: Interpolation on the frequency scale

> Shall the PSD masks be obtained joining the corner points with straight lines on a graph with a logarithmic or linear frequency scale (Hz)? Is there an added value in using one or the other approach?

This question arises because part 1 and part 2 of the TS 101 270 use different approaches to define different PSD requirements. In particular, section 8.3.5 of part 1 [1] (which specifies the in-band values of the PSDs) requires that the PSD masks are obtained "joining the points using straight lines on a graph with a logarithmic frequency scale (Hz) and a linear power density scale (dBm/Hz)." On the other hand, section 5.1.2.1 of part 2 [2] (which specifies the out-of-band values of the PSDs) defines in Table 2: "the corners of a straight-line graph of PSD versus frequency on a linear, linear scale."

The present contribution proposes to use the interpolation on a logarithmic frequency scale, as proposed in TD24 [4]. TD24 has implicitly assumed using this logarithmic approach for both the in-band and the out-of-band parts of the PSDs. The rationale behind this was that the error made interpreting the out-of-band requirements expressed in part 2 (in a wrong way!) with the logarithmic approach is insignificant, whereas this is not the case if the part 1 requirements are interpreted (in a wrong way!) with the linear approach.

Moreover, other reasons were identified to choose the logarithmic interpolation. Most importantly, the fact that other xDSL standards - including the long-established part 1 of the VDSL spec - use this type of interpolation. It is also the most meaningful physical interpolation for wideband signals.

> The PSD mask shall be obtained from the appropriate tables by joining the points using straight lines on a graph with a logarithmic frequency scale (Hz) and a linear power density scale (dBm/Hz).

Of course, if desired, it is possible to render informative plots of the PSDs on a linear frequency scale.

2.2 Issue 2: Constant in-band values for the boosted PSDs

> Is it worthwhile to use appropriate constant in-band values for boosted PSDs in the upstream bands and the 2nd downstream band? In case positive, what values?

This question arises because the in-band levels allowed for boosted masks by part 1 do not have a constant value, but the differences between the values at the corner points of 2D, 1U and 2U bands are rather small.

TD24 has already proposed to have the second upstream band flat at –60 dBm/Hz: this would be a small change compared to what the formal application of the standard requirements would impose. The Stockholm contribution WD20 [6] has proposed further simplifications: flat M2 masks in the bands 1U, 2U and 2D, with the levels reported in Table 1.

Several observations were made by the European Operators. The benefits of constant levels seemed not obvious to some of them: in particular, it was noted that UPBO requires non-flat values for best performance. Other Operators stressed the importance of standard compliance, which would mean that the constant in-band levels would have to be chosen equal to the PSD value at the right corner of each band. Another proposal was to select a constant in-band level such that the total transmit power in that band remains the same (see Table 1).

[1] The original part1 FTTCab PSDs were in conflict with the Default Set of Transmission Parameters (DF-STP, see Table 85 in 8.3.2.2 of Part 2) for the 1st downstream band. The present proposal does not address this issue yet. Filtering of the DF-STP or moving this DF-STP to higher frequencies may be considered to resolve this issue.

On the whole, a simplification by using flat in-band values is favoured. The last column in the table shows the proposed values. These proposed values closely follow the starting point that the new constant in-band values should comply to the existing standard. Moreover, they are chosen such that the same values apply for both the VDSL band plan, and for the optional regional specific VDSL band plan.

Band	PSD value @ left corner (dBm/Hz)	PSD value @ right corner (dBm/Hz)	TD24 proposal	WD20 proposal: constant value (dBm/Hz)	Compliant to present standard	Preservation of total transmit power	Present Proposal
VDSL band plan							
1U	-54.8	-57.1	Not flat, compliant to part 1	-55.5	-57.1	-56	**-57**
2D	-57.1	-58.5	Not flat, compliant to part 1	-57.5	-58.5	-57.8	**-59**
2U	-58.5	-60	-60 dBm/Hz	-58	-60	-60	**-60**
Optional regional specific VDSL band plan							
1U	-55.7	-57.2	Not flat, compliant to part 1	-55.5	-57.2	-56.5	**-57**
2D	-57.2	-59.3	Not flat, compliant to part 1	-57.5	-59.3	-58.3	**-59**
2U	-59.3	-60	-60 dBm/Hz	-58	-60	-60	**-60**

Table 1: Overview of proposed in-band values for the boosted (M2) PSDs.
The rightmost column contains the proposal of the present document.

The constant in-band PSD values for the boosted (M2) masks shall be chosen equal to the rightmost column in Table 1.

2.3 Issue 3: The use of the band 0 --- 138 kHz.

Shall the use of the band (0, 138 kHz) be allowed for VDSL? Shall this band (or part of it) be used for upstream or downstream? Shall it be optional or mandatory? What should the PSD masks have to be in the downstream and upstream directions in the band below 138 kHz?

TD24 did not consider the use of the band (0, 138 kHz) for VDSL: this because in the authors' opinion the use of that band (or, better, of part of it) should be optional and so defining the PSD limit in this band was judged of less priority.

However, at the last ETSI meeting, an explicit request for studying the frequencies below 138 kHz was made in WD17 [7] by Alcatel, Globespan, Metalink, Telia and Texas Instruments. It was argued during the email discussion that "*the most likely way forward to solve this issue is to come to an agreement similar to the T1E1.4 agreement*". This agreement basically states that the band (25, 138 kHz) can be OPTIONALLY used for upstream or downstream (but not both). A similar agreement has been achieved in ITU-T SG14 Question 4 and inserted in the G.993 (ex G.vdsl.f), although ITU-T explicitly mentions G.hs for the negotiation of the use of that band. However, the actual levels of the PSD to be used in the optional band (25, 138 kHz) have not been decided yet anywhere.

The supporters of this document are of the opinion that the optional use of the band below 138 kHz should not delay the progress of the specifications of the mandatory VDSL bands. That having said, there is a general agreement among the supporters of this contribution on the optional UPSTREAM use of the band (25, 138 kHz), where the PSD mask can be exactly equal to that of ADSL upstream. The DOWNSTREAM use of the same band is not excluded, but the PSD levels in this case are not

yet identified and therefore should be left for further study in order to progress on the mandatory bands.

> The optional use of the band below 138 kHz shall be allowed for both downstream and upstream VDSL transmission.
> The PSD levels in the band (25, 138 kHz) have to be equal to those of ADSL upstream if the band is used for upstream transmission.
> The PSD levels in the band below 138 kHz are left for further study if the band is used for downstream.
> The study of the use of the band below 138 kHz should not delay the progress of the specifications of the mandatory VDSL bands.

2.4 Issue 4: On PSD masks.

> Is it needed to define a sort of "peak masks" to allow multi-carrier systems to exceed the "nominal masks" with their PSD ripples? What could be the risks in doing this?

TD24 proposes PSD masks that are 'hard' or 'peak' masks, i.e. narrowband (10 kHz) masks that are not to be exceeded at all by the VDSL equipment. Both this interpretation and the chosen values for the masks were in accordance with the part 1 requirements of the VDSL standard which have been stable for a long period of time.

In contrast, TD46 [8] proposes the use of both a wideband and a narrowband constraint to be used as respectively a 'nominal mask' and a 'peak mask', to allow for the presence of the typical DMT ripple. TD46 argues that only the nominal power is relevant from the point of view of the generation of crosstalk. Furthermore, TD46 points out that the value of –39.5 dBm/Hz of the VDSL mask is similar to the –40 dBm/Hz of the ADSL mask and that therefore the masks should be given the interpretation of a 'nominal mask'.

It should be noted that this discussion is only relevant for the downstream FTTEx masks.

The supporters of this document propose that the PSD masks keep their original meaning (i.e. that of a hard, peak mask). Above 1104 kHz, the chosen levels in part 1 were the outcome of lengthy discussions in TM6, which makes changing these levels very controversial. There are concerns regarding RF emissions by VDSL systems. Therefore, further increases in the actual emitted levels by interpreting the VDSL masks as wideband-masks are undesirable, especially since such emissions will be measured in a 9/10 kHz bandwidth. Therefore, it is proposed that the PSD masks keep their original meaning, and also (above 1104 kHz) their original values.

However, for compatibility reasons, it is recognised that below 1104 kHz, the requirements should match those of ADSL.

> - The most important mask in the standard remains the *peak* mask (10 kHz resolution bandwidth).
> - The mask value is increased from –39.5 dBm/Hz to –36.5 dBm (for FTTEx, below 1104 kHz, in 10 kHz resolution bandwidth)
> - An additional nominal constraint shall limit the PSD to the ADSL level of –40 dBm/Hz (for FTTEx, below 1104 kHz). The resolution bandwidth of this nominal constraint shall be 100 kHz, in accordance with the Spectral Management document [9].

To check compliance with such a nominal constraint, it is proposed to do the PSD measurements with a narrow (10 kHz) bandwidth, because if a measurement with much higher resolution bandwith (e.g. 100 kHz) is used, the measurement becomes incorrect in all the parts of the spectrum where the PSD is not flat (for example in the transition bands and around them). In the VDSL case, there are many parts of the in-band spectrum where the PSD is not flat. It is suggested that, once one has acquired

the transmit PSD, an average in the in-band part is performed with a sliding window to check if the PSD complies to the nominal constraint.

It should be noted that matching the ADSL requirements also implies that further nominal constraints posed by ADSL power back-off need to be considered in the frequency range below 1104 kHz.

2.5 Issue 5: On the total power relaxation

Is it appropriate to relax the total power constraint (currently fixed at 11.5 dBm) up to 21 dBm (as proposed in TD24) to actually allow the downstream PSD boosting in FTTEx configuration?

TD24 has highlighted an inconsistency in the standard between the boosting of the PSDs allowed in FTTEx configuration and the total power constraint (11.5 dBm). In particular, the highlighted contradiction has as consequence the fact that practically the boosting in FTTEx configuration is prohibited by the limitation on the total power. In order to allow a profitable VDSL deployment from the local exchange, TD24 proposes an increase up to 21 dBm for the total power transmitted in downstream in FTTEx scenarios.

Some Vendors have expressed concerns about this proposal due to feasibility issues of a unique analog front-end for both FTTEx and FTTCab chipsets. A proposal of 14.5 dBm for the total power has also come up from the TM6 floor. However, it can be noticed that a so low total power combined with a loose (boosted) mask has as consequence that the actual PSD can be spread everywhere within the mask: this will complicate the interoperability between chipset from different manufactures.

To many operators, it is important to be able to use the full potential of FTTEx VDSL. Therefore, a relaxation of the total power constraint to 21 dBm is still desired.

The total output power transmitted in downstream shall not exceed 21 dBm @ 135Ω in FTTEx configuration and shall not exceed 11.5 dBm @ 135Ω in FTTCab configuration. The total output power transmitted in upstream shall not exceed 11.5 dBm @ 135Ω.

3. Text proposal

Editorial comment: This text should replace section 8.3.4 and 8.3.5 and Annex D of part 1 and section 5.1.1 and 5.1.2. of part 2. Section 8.2 of part 1 and section 5.1 of part 2 have to be deleted. The current section 8.3.5.1 and 8.3.5.2 (part 1) can be put after the current proposal as section 8.3.5.6 and 8.3.5.7 respectively.

********** BEGIN OF TEXT PROPOSAL **********

8.3.4 Wideband launch power

For compliance with the requirements detailed in this subclause the VDSL transceiver shall be terminated in the design impedance (R_V) and be configured to transmit pseudo-random data with any repetitive framing patterns enabled. Power shall be measured across the termination resistance of R_V.

The average wideband power of the VDSL downstream signal transmitted by a transceiver measured over the frequency range 10 kHz to 30 MHz shall be no greater than +21 dBm in FTTEx scenario and no greater than +11.5 dBm in FTTCab scenario when terminated with an impedance of R_V. This shall be measured at the LINE port. There shall be no energy inserted into the TELE port during this test.
The average wideband power of the VDSL upstream signal transmitted by a transceiver measured over the frequency range 10 kHz to 30 MHz shall be not greater than +11.5 dBm when terminated with an impedance of R_V. This shall be measured at the LINE port. There shall be no energy inserted into the TELE port during this test.

8.3.5 Band allocation and power spectral density

8.3.5.1 Upstream and downstream bands

VDSL modems shall use Frequency Division Duplexing (FDD). This applies to single carrier and multi-carrier modulation schemes as described in *TDB.*

Four possible bands denoted 1D, 2D, 1U and 2U (two for downstream and two for upstream respectively) are transmitted in separate frequency bands as presented in Figure TBD. The actual band allocation is defined by the values of transition frequencies *f1- f5*.

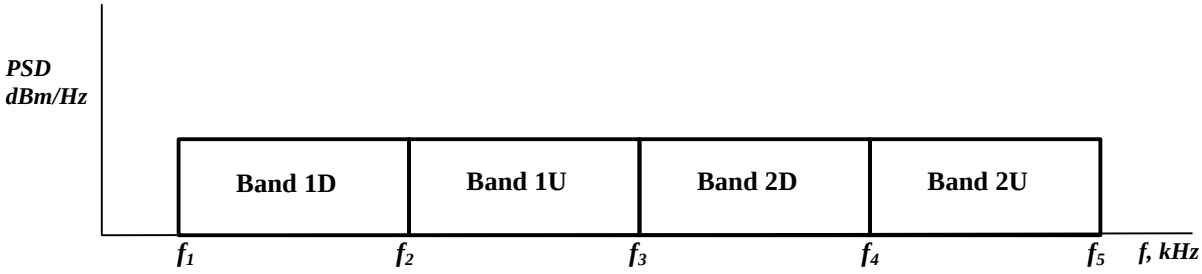


Figure TBD: FDD Band Allocation

Table TBD: Band transition frequencies

Band Transition Frequencies (MHz)	f_1	f_2	f_3	f_4	f_5
VDSL bands	138	3 000	5 100	7 050	12 000
Optional regional-specific bands	138	3 750	5 200	8 500	12 000

NOTE 1: Use of frequencies above f_5 is not covered in this specification and is reserved for future systems.
NOTE 2: Use of frequencies below f_1 is not covered in this specification and is reserved for future systems.

The band allocation for VDSL is shown in Figure TBD.

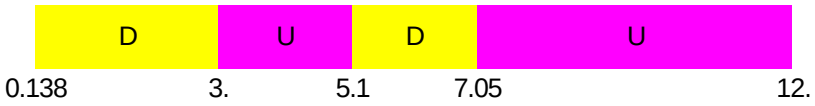


Figure TBD: VDSL Band Allocation

Optionally, modems may use the band allocation shown in Figure TBD to satisfy alternative regional requirements.

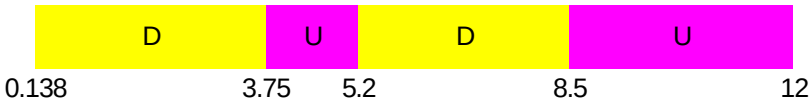


Figure TBD: Optional regional-specific VDSL Band Allocation

Other plans are under study as alternatives to Figure TBD to satisfy alternative regional requirements

8.3.5.2 PSD specifications

A VDSL transceiver shall have the capability of operating according to the requirements of all the mandatory transmitter PSD masks described in this subclause. These masks shall be measured at the LINE port when it is terminated by impedance R_V. These masks shall apply equally to class I and class II compliant transceivers. These masks shall be interpreted as peak masks for the PSD.

For the purposes of compliance with this requirement, a measurement resolution bandwidth of 10 kHz (in line with standard EMC practice) shall be used.

The location of the LT transceiver (FTTCab or FTTEx) effects the allowable crosstalk and therefore the PSD masks.

- For the VTU-R, the first upstream band starts at 3000 (3750) kHz. Since there are no crosstalk considerations regarding the impact of the upstream transmission on other types of services, the masks for FTTCab and FTTEx are identical for upstream transmission. There are only two PSD masks: mask M1 with notches (see subclause TBD) and mask M2 without notches (see subclause TDB). The symbolic names of the masks are shown in Table TBD and their boundary values are detailed in Table TBD
- For the VTU-C, the mask for FTTCab and FTTEx will differ. Similarly to the NT masks, there will also be a difference between M1 and M2 masks This leads to two FTTCab masks.

  For the FTTEx case, only so-called ‘P’ masks (with baseband services on same wire pair) are considered. The ‘D’ masks (no baseband services on the same wire pair) are for further study. For the FTTEx case a further distinction is made between ‘P1’ (ADSL over ISDN present in the bundle) and ‘P2’ (ADSL over POTS present in the bundle). This leads to four FTTEx masks.

	M1 (Not boosted, with notches)	M2 (Boosted, without notches)
VTU-R	P.NT.M1	P.NT.M2
VTU-C	Pcab.LT.M1 Pex.P1.LT.M1 Pex.P2.LT.M1	Pcab.LT.M2 Pex.P1.LT.M2 Pex.P2.LT.M2

TABLE TBD: Overview of all PSDs. The symbolic names refer to detailed specifications below.

The following tables shall be used as upper bounds for the PSD when joining the points using straight lines on a graph with a logarithmic frequency scale (Hz) and a linear power density scale (dBm/Hz).

8.3.5.2.1 Upstream masks

P.NT.M1

Freq (kHz)	PSD (dBm/Hz)
0.001	-110
225	-110
225	-100
2825	-100
3000	-80
3000	-60
5100	-60
5100	-80
5275	-100
6875	-100
7050	-80
7050	-60
12000	-60
12000	-80
12175	-100
30000	-100

P.NT.M2

Freq (kHz)	PSD (dBm/Hz)
0.001	-110
225	-110
225	-100
2825	-100
3000	-80
3000	-57
5100	-57
5100	-80
5275	-100
6875	-100
7050	-80
7050	-60
12000	-60
12000	-80
12175	-100
30000	-100

8.3.5.2.2 Downstream masks for FTTCab scenario

Pcab.LT.M1

Freq (kHz)	PSD (dBm/Hz)
0.001	-110
225	-110
225	-100
929	-100
1104	-80
1104	-60
3000	-60
3000	-80
3175	-100
4000	-100
4925	-100
5100	-80
5100	-60
7050	-60
7050	-80
7225	-100
30000	-100

Pcab.LT.M2

Freq (kHz)	PSD (dBm/Hz)
0.001	-110
225	-110
225	-100
929	-100
1104	-80
1104	-60
1394	-50
3000	-54.8
3000	-80
3175	-100
4000	-100
4925	-100
5100	-80
5100	-59
7050	-59
7050	-80
7225	-100
30000	-100

8.3.5.2.3 Downstream masks for FTTEx scenario

Pex.P1.LT.M1

Freq (kHz)	PSD (dBm/Hz)
0.001	-90
138	-90
138	-60
217	-60
276	-36.5
1104	-36.5
1677	-60
3000	-60
3000	-80
3175	-100
4000	-100
4925	-100
5100	-80
5100	-60
7050	-60
7050	-80
7225	-100
30000	-100

Pex.P1.LT.M2

Freq (kHz)	PSD (dBm/Hz)
0.001	-90
138	-90
138	-60
217	-60
276	-36.5
1104	-36.5
1394	-50
3000	-54.8
3000	-80
3175	-100
4000	-100
4925	-100
5100	-80
5100	-59
7050	-59
7050	-80
7225	-100
30000	-100

Pex.P2.LT.M1

Freq (kHz)	PSD (dBm/Hz)
0.001	-90
138	-90
138	-36.5
1104	-36.5
1677	-60
3000	-60
3000	-80
3175	-100
4000	-100
4925	-100
5100	-80
5100	-60
7050	-60
7050	-80
7225	-100
30000	-100

Pex.P2.LT.M2

Freq (kHz)	PSD (dBm/Hz)
0.001	-90
138	-90
138	-36.5
1104	-36.5
1394	-50
3000	-54.8
3000	-80
3175	-100
4000	-100
4925	-100
5100	-80
5100	-59
7050	-59
7050	-80
7225	-100
30000	-100

8.3.5.3 PSD specifications for the optional regional specific band allocation

8.3.5.3.1 Upstream masks (optional band plan)

P.NT.M1

Freq (kHz)	PSD (dBm/Hz)
0.001	-110
225	-110
225	-100
3575	-100
3750	-80
3750	-60
5200	-60
5200	-80
5375	-100
8325	-100
8500	-80
8500	-60
12000	-60
12000	-80
12175	-100
30000	-100

P.NT.M2

Freq (kHz)	PSD (dBm/Hz)
0.001	-110
225	-110
225	-100
3575	-100
3750	-80
3750	-57
5200	-57
5200	-80
5375	-100
8325	-100
8500	-80
8500	-60
12000	-60
12000	-80
12175	-100
30000	-100

8.3.5.3.2 Downstream masks for FTTCab scenario (optional band plan)

Pcab.LT.M1

Freq (kHz)	PSD (dBm/Hz)
0.001	-110
225	-110
225	-100
929	-100
1104	-80
1104	-60
3750	-60
3750	-80
3925	-100
4000	-100
5025	-100
5200	-80
5200	-60
8500	-60
8500	-80
8675	-100
30000	-100

Pcab.LT.M2

Freq (kHz)	PSD (dBm/Hz)
0.001	-110
225	-110
225	-100
929	-100
1104	-80
1104	-60
1394	-50
3750	-55.7
3750	-80
3925	-100
4000	-100
5025	-100
5200	-80
5200	-59
8500	-59
8500	-80
8675	-100
30000	-100

8.3.5.3.3 Downstream masks for FTTEx scenario (optional band plan)

Pex.P1.LT.M1

Freq (kHz)	PSD (dBm/Hz)
0.001	-90
138	-90
138	-60
217	-60
276	-36.5
1104	-36.5
1677	-60
3750	-60
3750	-80
3925	-100
4000	-100
5025	-100
5200	-80
5200	-60
8500	-60
8500	-80
8675	-100
30000	-100

Pex.P1.LT.M2

Freq (kHz)	PSD (dBm/Hz)
0.001	-90
138	-90
138	-60
217	-60
276	-36.5
1104	-36.5
1394	-50
3750	-55.7
3750	-80
3925	-100
4000	-100
5025	-100
5200	-80
5200	-59
8500	-59
8500	-80
8675	-100
30000	-100

Pex.P2.LT.M1

Freq (kHz)	PSD (dBm/Hz)
0.001	-90
138	-90
138	-36.5
1104	-36.5
1677	-60
3750	-60
3750	-80
3925	-100
4000	-100
5025	-100
5200	-80
5200	-60
8500	-60
8500	-80
8675	-100
30000	-100

Pex.P2.LT.M2

Freq (kHz)	PSD (dBm/Hz)
0.001	-90
138	-90
138	-36.5
1104	-36.5
1394	-50
3750	-55.7
3750	-80
3925	-100
4000	-100
5025	-100
5200	-80
5200	-59
8500	-59
8500	-80
8675	-100
30000	-100

8.3.5.4 Nominal requirements on the spectrum below 1104 kHz

For the FTTEx case, the PSD shall comply to the following requirements on the maximum power in a 100 kHz wide sliding window.

PSD	Range (kHz)	Maximum power in a 100 kHz sliding window (dBm)	Spectral Power (dBm/Hz)
Pex.P1.LT.M1	276 to 1104	10	-40
Pex.P1.LT.M2	276 to 1104	10	-40
Pex.P2.LT.M1	138 to 1104	10	-40
Pex.P2.LT.M2	138 to 1104	10	-40

TABLE TBD: Nominal requirements for the FTTEx case below 1104 kHz.

NOTE1: This requirement serves to impose the constraint that the nominal PSD for FTTEx downstream transmission in the ADSL frequency band shall be limited to –40 dBm/Hz, the same value that applies to ADSL.
NOTE2: The sliding window constraint is to be applied as follows: for the case of Pex.P1.LT.M1 for instance, the center frequency of the 100 kHz wide sliding window shall run from 276+50=326 kHz upto 1104-50 = 1054 kHz.

8.3.5.5 Wide band requirements on the out-of-band spectrum

The out-of-band PSD shall comply to the following requirements on the maximum power in a 1 MHz sliding window.

Upstream		**Downstream**	
Range (MHz)	Maximum power in a 1 MHz sliding window (dBm)	Range (MHz)	Maximum power in a 1 MHz sliding window (dBm)
5.275 to 6.875	-52	4 to 4.925	-50
12.175 to 30	-52	7.225 to 30	-52

TABLE TBD: Wide band requirements for the VDSL band allocation

Upstream		**Downstream**	
Range (MHz)	Maximum power in a 1 MHz sliding window (dBm)	Range (MHz)	Maximum power in a 1 MHz sliding window (dBm)
5.375 to 8.325	-52	4 to 5.025	-50
12.175 to 30	-52	8.675 to 30	-52

TABLE TBD: Wide band requirements for the optional regional specific VDSL band allocation

********** END OF TEXT PROPOSAL **********

4. References

[1] ETSI-TS 101 270-1 V1.2.1,"Transmission and Multiplexing (TM); Access transmission systems on metallic access cables; Very high speed Digital Subscriber Line (VDSL); Part 1: Functional requirements", October 1999.

[2] ETSI-TS 101 270-2 V1.1.1, "Transmission and Multiplexing (TM); Access transmission systems on metallic access cables; Very high speed Digital Subscriber Line (VDSL); Part 2: Transceiver specification", February 2001.

[3] Don Clarke, "Liaison to ETSI from FS-VDSL Committee concerning PSD mask ambiguities", TD 04 - ETSI TM6 meeting in Stockholm, 10 th –14 th, September 2001

[4] B.M. van den Heuvel, R. Persico, "Merging of spectral allocation plans and PSD masks for VDSL", TD24 – ETSI TM6 meeting in Stockholm,10 th –14 th, September 2001

[5] R. Persico, B.M. van den Heuvel, "Questionnaire on VDSL PSD masks", FS-????, FS-VDSL document, October 2001.

[6] V. Oksman, "VDSL PSD Mask adjustments", WD20—ETSI TM6 meeting in Stockholm,10 th –14 th, September 2001

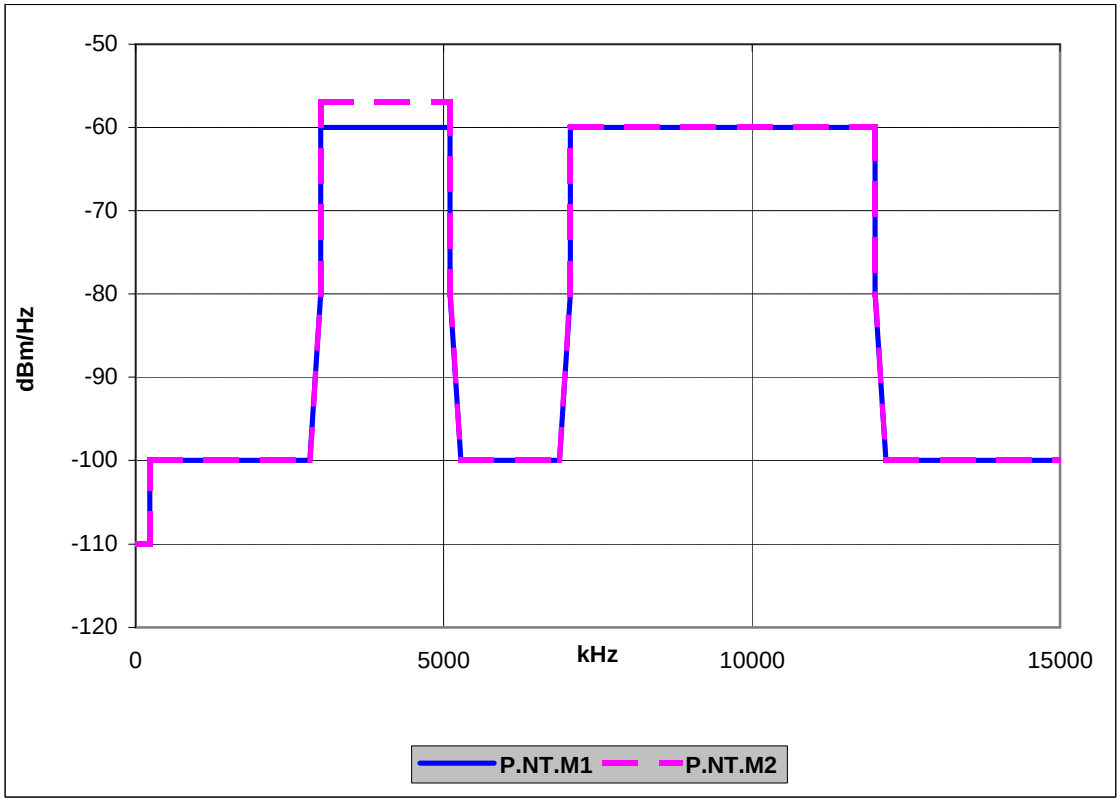
[7] S. Schelstraete, "On the use of frequencies below 138 kHz", WD17—ETSI TM6 meeting in Stockholm,10 th –14 th, September 2001

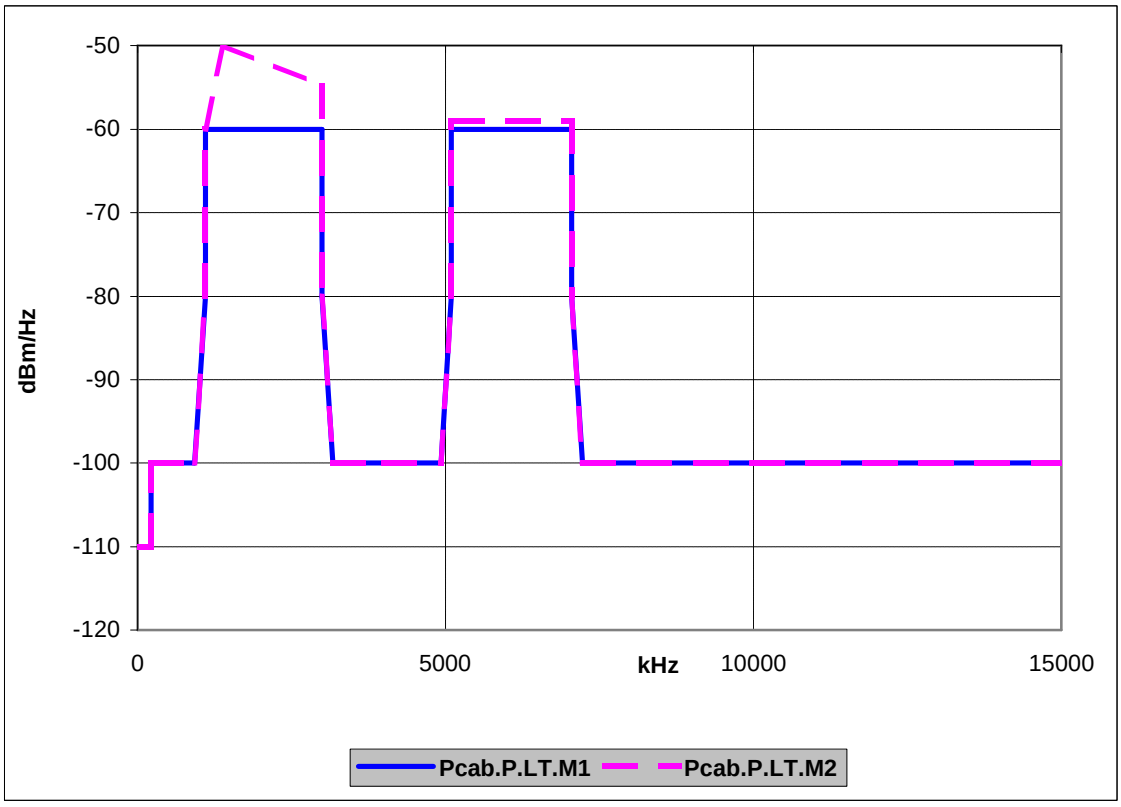
[8] S. Schelstraete, "Transmit PSD masks and ripple", TD46--- ETSI TM6 meeting in Stockholm,10 th –14 th, September 2001

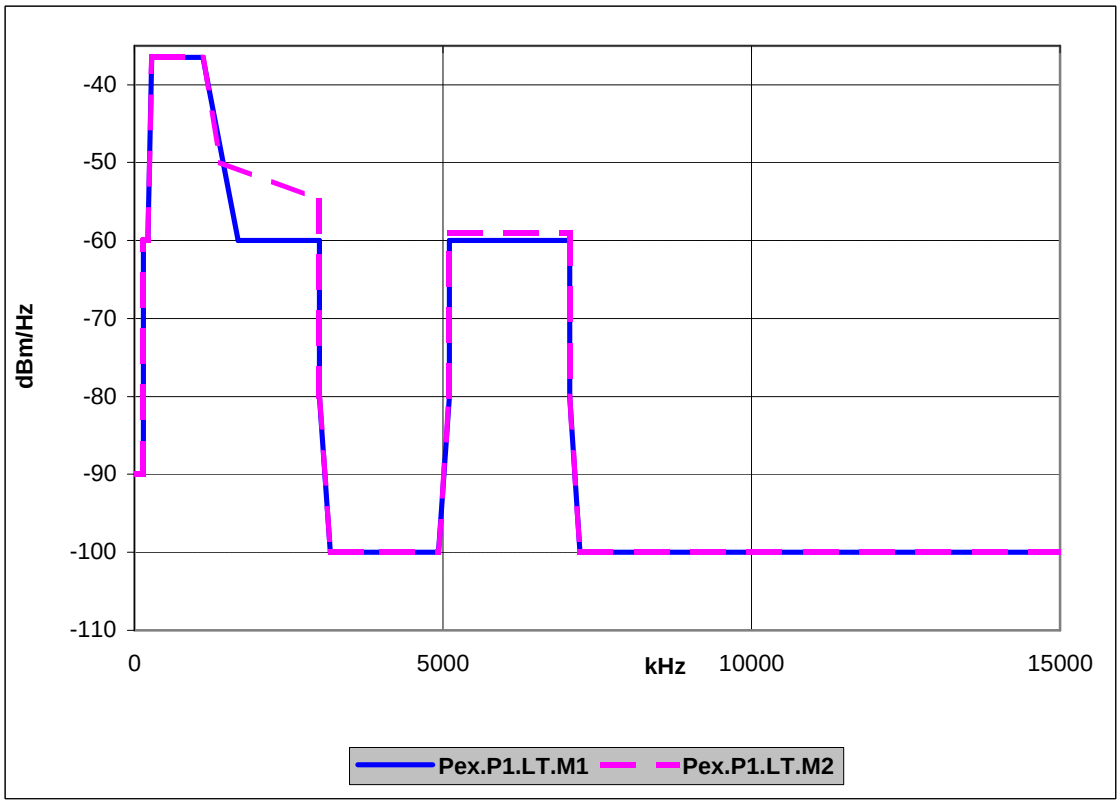
[9] ETSI-TS 101 524-1 V1.1.1,"Transmission and Multiplexing (TM); Spectral Management on metallic access networks; Part 1: Definitions and signal library", April 2000.

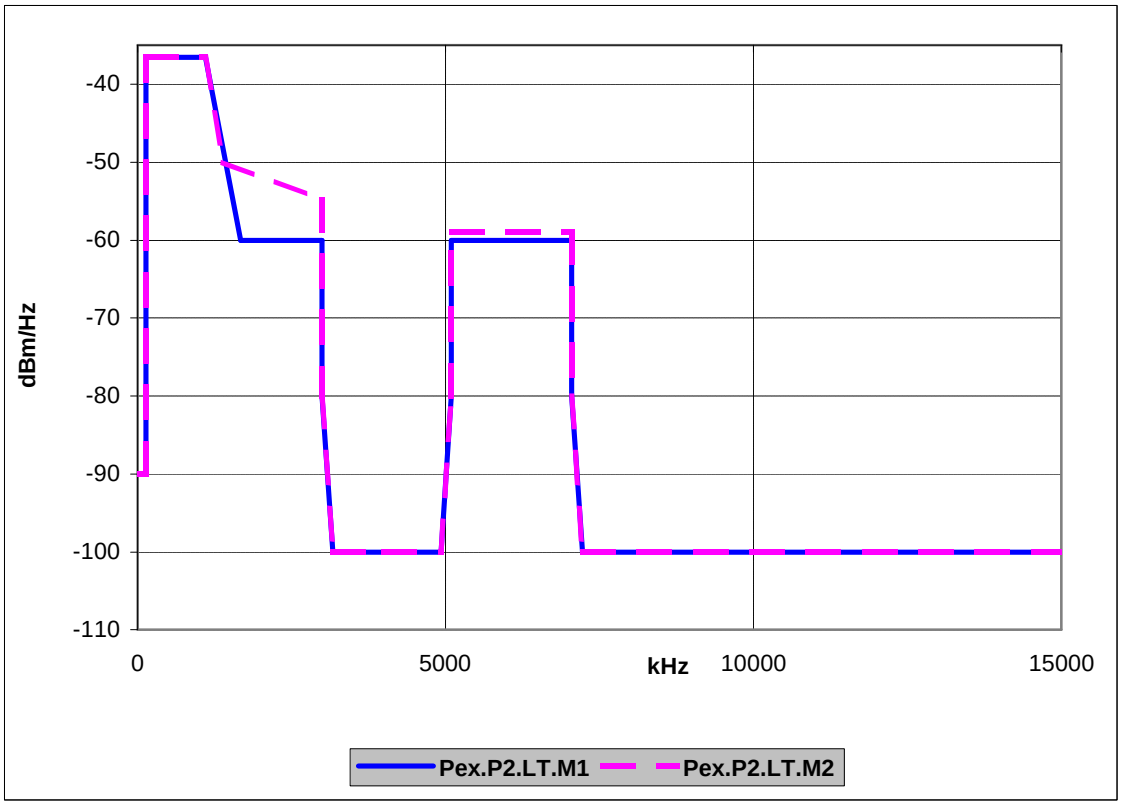
5. Annex: figures of PSDs

5.1 The VDSL band allocation

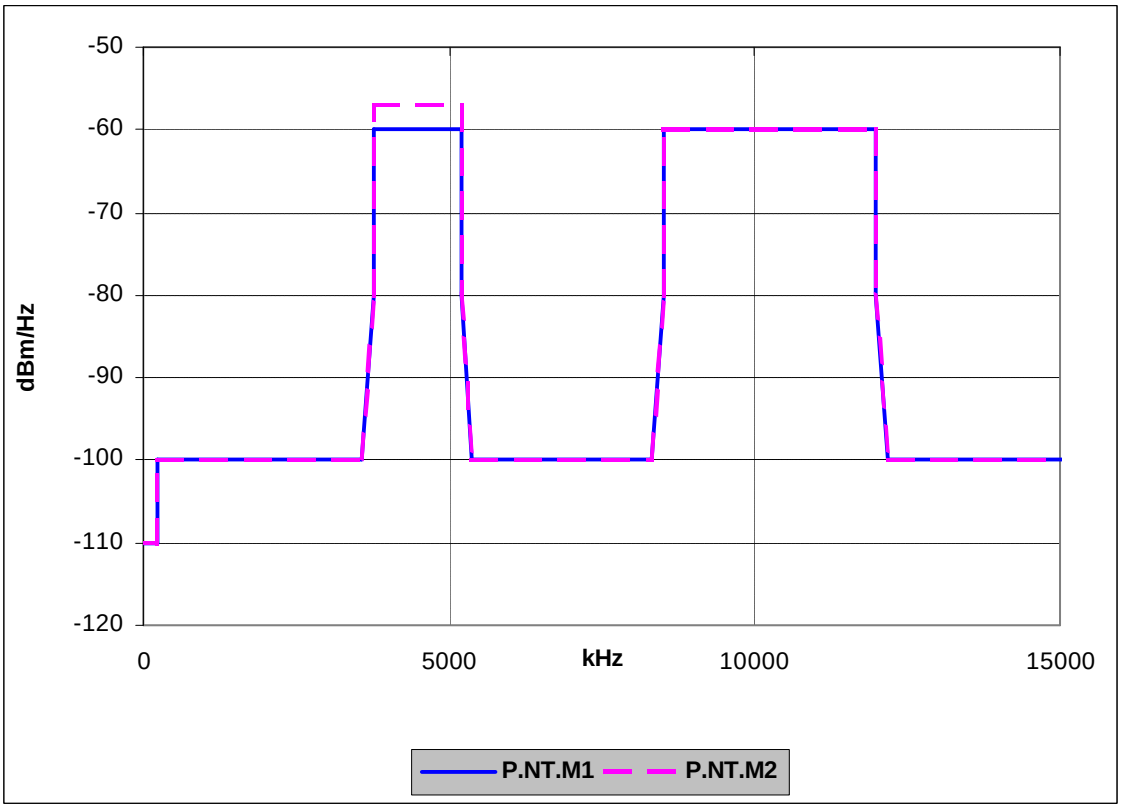


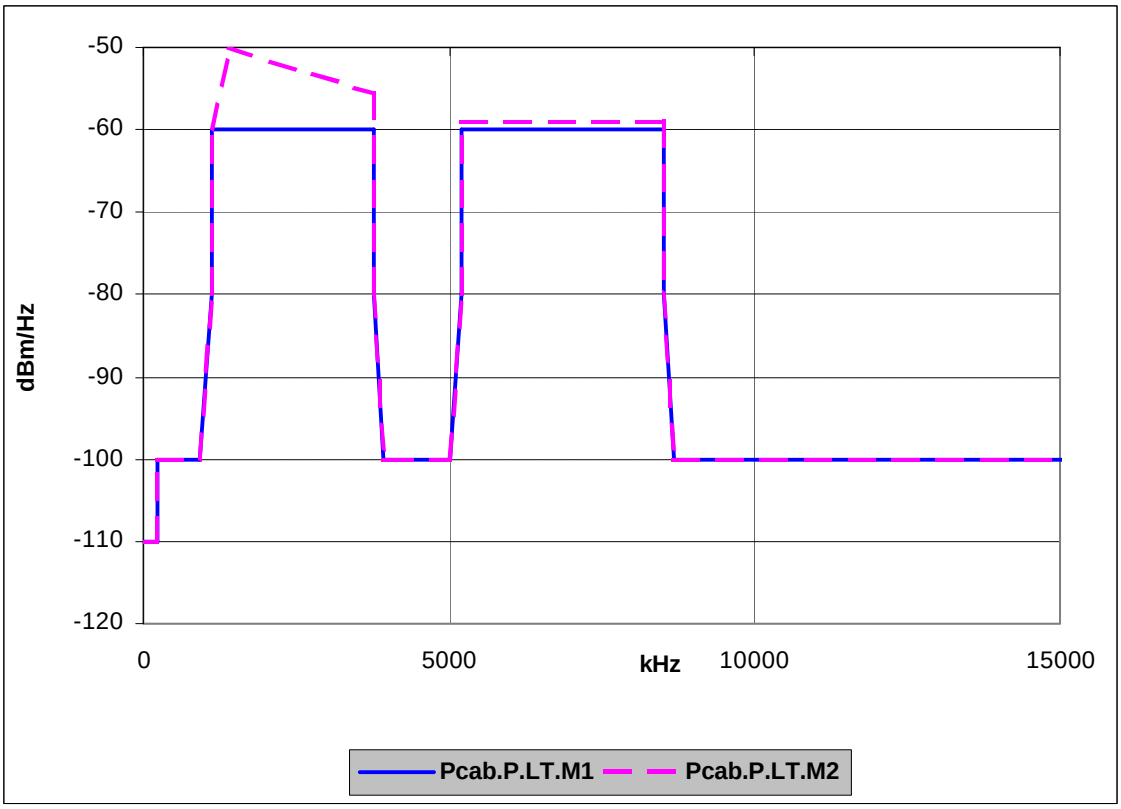


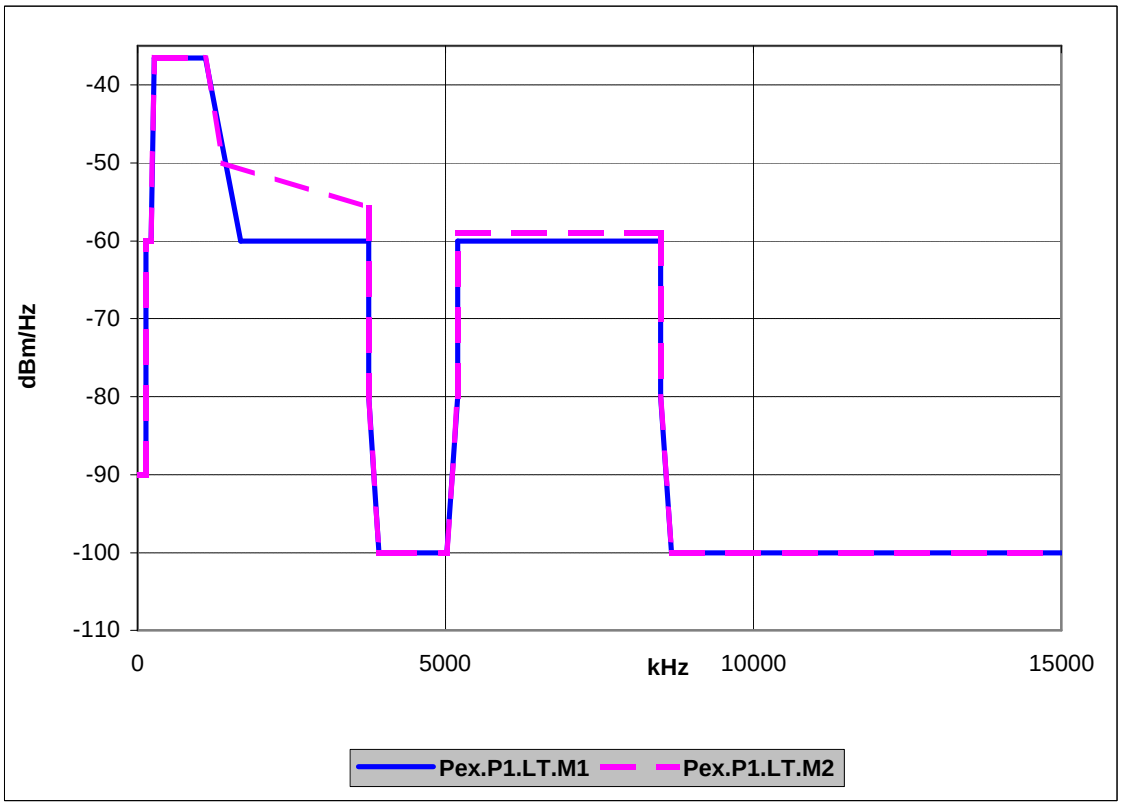

-40
-50
-60
-70
-80
-90
-100
-110
dBm/Hz
0
5000
kHz
10000
15000
Pex.P1.LT.M1
Pex.P1.LT.M2

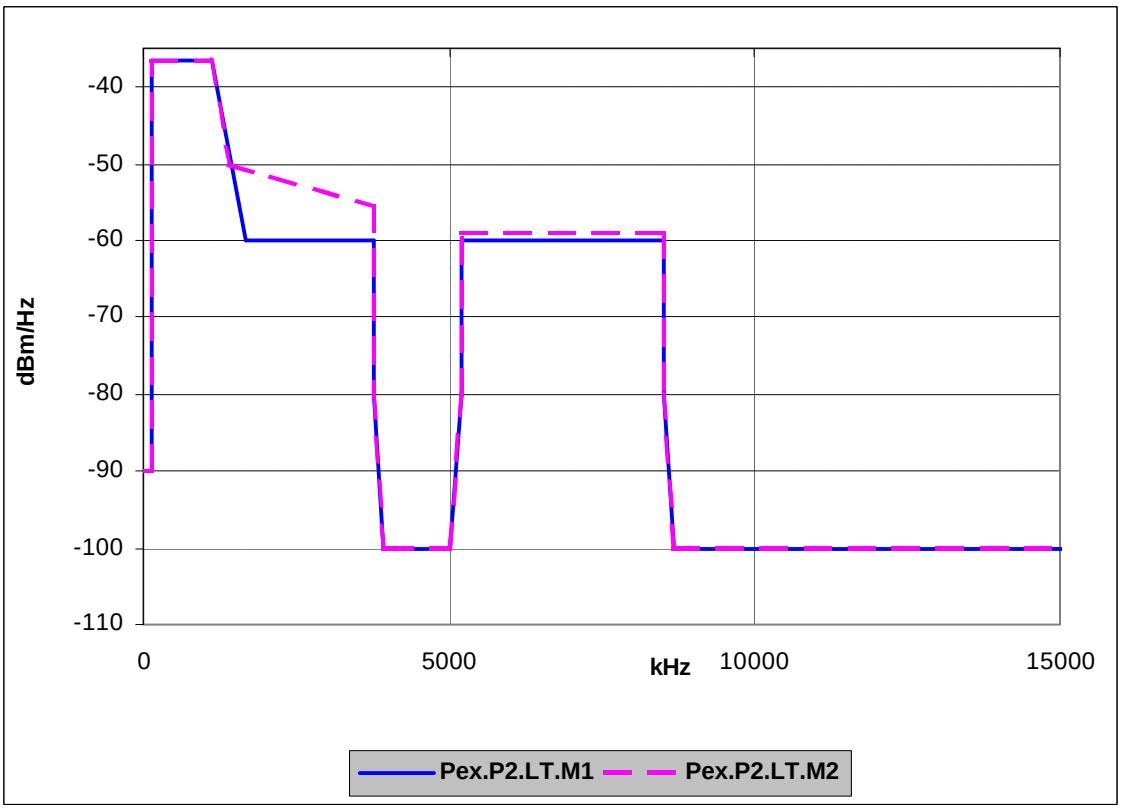

-40
-50
-60
-70
-80
-90
-100
-110
dBm/Hz
0
5000
kHz
10000
15000
Pex.P2.LT.M1
Pex.P2.LT.M2

5.2 Optional regional-specific VDSL Band Allocation






-40
-50
-60
-70
-80
-90
-100
-110
dBm/Hz
0
5000
kHz
10000
15000
Pex.P1.LT.M1
Pex.P1.LT.M2


-40
-50
-60
-70
-80
-90
-100
-110
dBm/Hz
0
5000
kHz
10000
15000
Pex.P2.LT.M1
Pex.P2.LT.M2