TITLE **Merging of spectral allocation plans and PSD masks for VDSL**

PROJECT VDSL

SOURCE:

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ABSTRACT In Part 1 of the VDSL specification (TS 101 270-1 - “Functional Requirements”) there are 18 PSD masks defined for VDSL [1]; in Part 2 (TS 101 270-2 - “Transceiver specification”), the VDSL band allocation and the out-of-band power limits are specified [2]. This contribution proposes a replacement text that clarifies and merges these two sets of requirements. Moreover, a significant reduction of this large number of PSDs is proposed to improve the usability of the standard in practice.

1. Introduction

With the addition of the VDSL band allocation plan [2] to the existing requirements on the PSD in [1], there are two sets of requirements on the VDSL PSD. This is an undesirable situation, especially because merging the two sets of requirements is not completely straightforward: there are some ambiguities to be resolved.

Another issue with the current version of the PSD requirements in [1] is that the number of PSD masks is rather large. The goal of interoperability is not achievable by having too many PSD masks. The necessary merging of the band allocation with the existing PSD masks gives us the opportunity to review and simplify the overall PSD requirements.

This contribution discusses the various issues that are to be resolved in the merging process, and proposes solutions. This leads to a unified proposal for the VDSL PSD masks. At the same time, a simplification is proposed that drastically reduces the number of different PSD masks.

After discussion of the various options, an editorial text proposal is presented to replace the current sets of PSD requirements.

2. The Issues

2.1 Out-of-band requirements

The main ambiguity in merging the requirements in part 1 and part 2 of TS 101 270 concerns the out-of-band content. The question is whether the out-of-band requirement specified in part 2 prevails over the various (low-frequency) requirements imposed by the original PSD masks.

The out-of-band requirements expressed in Part 2 are specifically intended to limit the maximum amount of NEXT that a VDSL modem is allowed to produce into the frequency band utilised for receiving. Therefore, the most natural assumption on the out-of-band content within the range from 138 kHz to 12 MHz is the following:

> Within the VDSL band [0.138, 12] MHz, the out-of-band content (i.e. the VDSL downstream PSD in the upstream bands and the VDSL upstream PSD in the downstream bands) is defined by the PSD requirements contained in TS 101 270 Part 2.

Concerning the range above 12 MHz, in order to leave room to a possible future extension of VDSL at higher frequencies, it is also considered suitable to extend the part 2 requirements to the out-of-band content above 12 MHz.

> Above 12 MHz, the out-of-band content of downstream and upstream VDSL PSD is defined by the PSD requirements contained in TS 101 270 Part 2.

Concerning the range below 138 kHz, first of all this contribution does not address the issue related to the use of that band for allocating another VDSL band (which would be OPTIONAL). Moreover, this contribution limits itself to the 'P' masks (with baseband services on the same pair).

> The desirability and the precise shape of the 'D' masks (no baseband services on the same pair) are left for further study; similarly, the PSD levels of a possible optional band below 138 kHz are left for further study.

Given that, it is now necessary to distinguish the out-of-band content allowed for downstream and upstream bands below 138 kHz.

For upstream PSD, in the band below 138 kHz, there is no need to let part 1 prevail, because this would be less severe than the limitation imposed in the first downstream band by part 2. This would imply in some cases a third "spurious" upstream band at very low frequencies. It rather makes sense to extend the out-of-band requirements that already apply to the masks in the range from 3000 kHz down to 138 kHz all the way down to 0 Hz.

> Below 138 kHz, the out-of-band of upstream VDSL PSD is defined by the PSD requirements contained in TS 101 270 Part 2.

For downstream PSD, in the band below 138 kHz, it can be noticed that Part 1 of the standard uses two different approaches for FTTCab and FTTEx scenarios. In the FTTCab case the distinction between D and P masks is rather insignificant (-90 and –110 dBm/Hz respectively), whereas in the FTTEx case the distinction is somewhat significant, as usable PSD levels are allowed for the D masks (-60 or even –39.5 dBm/Hz).
Taking also into account the observations made in section 2.4.1 and in line with the intention of reducing the total number of masks, we have made the following choices.

> For the FTTCab case, below 138 kHz, the out-of-band content of the downstream VDSL PSD is defined by the PSD requirements contained in TS 101 270 Part 2 .

On the contrary, for the FTTEx case, adopting Part 2 requirements[1] would eliminate the differences between P and D masks, which, as said, is not insignificant. So,

[1] The way the requirements contained in Part 2 of the standard could be applied in the FTTEx case would be anyway controversial, because the band (0,138 kHz) is narrower than the transition band (175 kHz) allowed by those requirements.

For the FTTEx case, below 138 kHz, the out-of-band content of the downstream VDSL PSD is defined by the PSD requirements contained in TS 101 270 Part 1 .

2.2 Many PSD masks

The many PSD masks that are currently defined in part 1 differ mainly in their low-frequency behaviour. This is caused by the fact that a large number of cases are distinguished, corresponding to the choices shown in Table 1.

#	
1	FTTEx versus FTTCab
2	'P' versus 'D' masks (Are baseband services present on the same pair ?)
3	M1 versus M2 (notched and not-boosted versus not-notched and boosted)
4	Possible presence of ADSL_over_POTS in the same bundle versus possible presence of ADSL_over_ISDN in the same bundle.

Table 1: Distinction that are made in part 1 of the VDSL standard regarding PSD masks

2.3 Upstream masks

Analysing the current part 1 masks for upstream VDSL transmission, there would be eight applicable masks, corresponding to the choices #1, #2 and #3 of Table 1.

However, the first two choices only lead to differences below 1104 kHz, i.e. far below the first VDSL upstream band. This means that there is no need of distinguishing between FTTEx and FTTCab for upstream transmission; likewise, there is no reason for distinguishing the upstream PSD according to the presence of baseband services on the same pair.

For VDSL upstream transmission, there are only two PSD masks:
- P.NT.M1 (notched, not boosted)
- P.NT.M2 (unnotched, boosted)

Note that this has the nice consequence that the CPE modem can be the same for both FTTEx and FTTCab deployment.

2.4 Downstream masks

For the downstream masks, the situation is more complicated. It is not just that the distinction #1 and #2 of Table 1 are relevant for the downstream masks, but also that the presence and the type of ADSL services in the same bundle leads (at least in the FTTEx case) to a number of different PSD masks.

2.4.1 FTTCab masks

For FTTCab, the situation is straightforward: choice #2 and #3 of Table 1 lead to different four different PSD masks. However, it should be noted that the in-band content of the FTTCab masks specifically starts at 1104 kHz to protect the ADSL downstream service in the same cable. In order to optimise this protection, the stringent behaviour as implied by the part2 requirements is adopted for the roll-off of the spectrum below 1104 kHz. This is in line with the earlier choice of adopting the part 2 requirements in the band [138 kHz, 12 MHz]. Moreover, below 138 kHz, the difference between D and P masks, as already noticed, is almost insignificant (-90 and –110 dBm/Hz respectively).

As a consequence of this choice, the difference between P and D masks actually vanishes for the FTTCab case, as for the upstream masks.

In conclusion, for FTTCab there are two PSD masks:

For VDSL downstream transmission in the FTTCab case:
- There are two PSD masks:
  - Pcab.LT.M1 (notched, not boosted)
  - Pcab.LT.M2 (unnotched, boosted)

NOTE.
It must be noted that in 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.

2.4.2 FTTEx masks

For FTTEx, the situation is complicated by choice #4 of Table 1. The difference between the P1 and P2 mask (and also between the D1, D2 and D3 masks) for the FTTEx case was inspired by the idea that the first downstream VDSL band should not interfere via NEXT with the ADSL upstream band. It would be desirable to avoid having many options here, but the deployment of different types of ADSL (in particular ADSL over POTS and ADSL over ISDN) in Europe makes necessary the distinction between P1 and P2 masks. So for FTTEx, there are 4 PSD masks:

For VDSL downstream transmission in the FTTEx case:
- There are four mandatory PSD masks:
  - Pex.P1.LT.M1 (ADSL over ISDN present in bundle; notched, not boosted)
  - Pex.P1.LT.M2 (ADSL over ISDN present in bundle; unnotched, boosted)
  - Pex.P2.LT.M1 (ADSL over POTS present in bundle; notched, not boosted)
  - Pex.P2.LT.M2 (ADSL over POTS present in bundle; unnotched, boosted)

Although outside the scope of the current contribution, the authors call for a more effective merging of the D masks to be done in the future (can D1, D2 and D3 masks be merged in ONE mask?). In particular they recognise that the issue related to the D masks in FTTEx case should be addressed whenever PSD levels in the optional band (0-138 kHz) are set.

2.6 Additional simplifications

The proposals described above result in a simplification of the number of PSD masks. This section describes additional small adjustments to the masks built on the basis of the above proposals. The goal of these small adjustments is to remove artificiality from the resulting masks.

- In the "*second*" upstream band, there would be only an insignificant difference between the masks P.NT.M1 and P.NT.M2.
  In particular, P.NT.M1 would be flat at –60 dBm/Hz dropping down at 10 MHz with –38 dB/octave slope (reaching –70 dBm/Hz at 12 MHz); whereas P.NT.M2 would slightly drop from –58.5 (in the case of the mandatory frequency plan 997) or –59.3 dBm/Hz (in the case of the optional regional plan 998) to –60 dBm/Hz, remaining steady at – 60 dBm/Hz up to 12 MHz.

  We propose to have a flat band for both the M1 and M2 upstream mask at the level of –60 dBm/Hz.

- The content of the two upstream and the FTTCab downstream masks at frequencies below 138 kHz is derived from part 2 of the standard. This part of the standard requires two step in that band: a first step at 120 kHz from –120 to –110 dBm/Hz and a second step at 225 kHz from –110 to –100 dBm/Hz.

  We propose to have just one step at 225 kHz from –110 to –100 dBm/Hz.

- In the original part 1, concerning the M2 downstream masks, there is a frequency point which slightly differs between the two cases FTTCab and FTTEx (1349 versus 1394 kHz) - possibly an editorial error. The PSD level would be -51.44 dBm/Hz @ 1349 kHz and –51.3 dBm/Hz @ 1394 kHz in both the cases FTTEx and FTTCab.

  In order to give the same shape to FTTCab and FTTEx masks, we propose to maintain the frequency point '1394 kHz' everywhere and use a PSD level of –50 dBm/Hz.

- For the optional regional specific plan ('Plan 998'), in the downstream masks there would be a small band (only 25 kHz, between 5 and 5.025 MHz) where the sliding window constraints change. We propose to neglect the change in this band, using the –50 dBm value for the sliding window limitation.

2.7 Total power constraint

Currently, a VDSL transceiver is limited to a total output power of 11.5 dBm @ 135Ω. It has been observed [3] that some of the masks (in particular, downstream masks for FTTex scenarios) constructed on the same assumptions described above (at least in the in-band part of the spectrum) would allow much more power than 11.5 dBm. This is due to the fact that, in FTTEx configuration, VDSL downstream PSD level can be boosted up to –39.5 dBm/Hz, in order to protect VDSL against FEXT noise from ADSL downstream.

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, we propose a relaxation in the transmit total power limitation, at least in downstream and at least in FTTEx scenarios.

The limitation at 11.5 dBm currently applicable can be maintained in FTTCab scenarios, where power constraints related to the ONU feeding occur. Anyway the applicable masks in FTTCab scenarios would allow at maximum 12 dBm of transmit power (see [3]), which is a limitation consistent with the maximum total power imposed by the specification.

> The total output power transmitted <u>in downstream</u> 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 <u>in upstream</u> shall not exceed 11.5 dBm @ 135Ω.

2.8 Masks and Templates

So far, the discussion has focused on defining the proper PSD masks for VDSL. From the point of view of performance testing, it is though necessary to properly define the amount of self-crosstalk produced by a VDSL modem into other lines. This can be best done by defining a PSD *template* representing the typical VDSL signal that will be produced by a transceiver.
As starting point for the PSD *template* we take the appropriate PSD mask as defined above. Concerning the out-of-band part of the PSD templates, in order to avoid a pessimistic model, the proposal is the following.

> In the out-of-band part of the PSD templates, the peak level admitted by the mask is replaced by the average PSD level admitted by the wide-band constraint imposed through the sliding window concept (where it is defined)

Concerning the in-band content for PSD templates, the proposal is the following.

> The PSD masks can be also used as PSD templates for computing the noise produced by VDSL systems, unless the total power under the masks is higher than the total power constraint imposed by the standard (11.5 or 21 dBm).
> If the total power under a PSD mask is higher than the power constraint, the template is obtained from the mask by decreasing in flat the in-band level just down to a value, which guarantees that the total power limitation is respected.

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 (part1) can be put after the current proposal as section 8.3.5.5 and 8.3.5.6 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*.

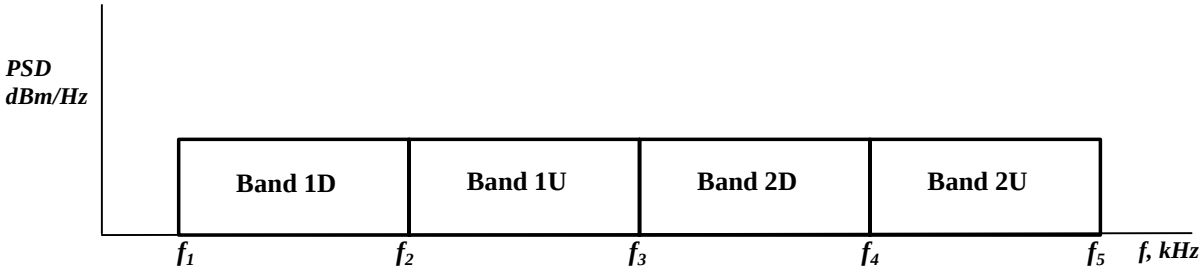


Figure TBD: FDD Band Allocation

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.

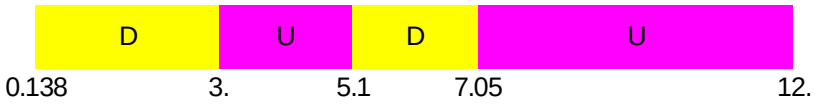


Figure TBD: VDSL Band Allocation

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

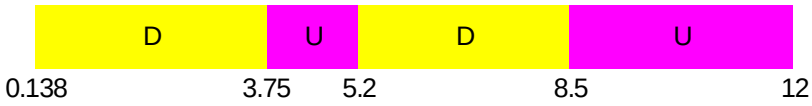


Figure TBD: Optional regional-specific VDSL Band Allocation

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.

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	-54.8
5100	-57.1
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	-57.1
7050	-58.5
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	-39.5
1104	-39.5
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	-39.5
1104	-39.5
1394	-50
3000	-54.8
3000	-80
3175	-100
4000	-100
4925	-100
5100	-80
5100	-57.1
7050	-58.5
7050	-80
7225	-100
30000	-100

Pex.P2.LT.M1

Freq (kHz)	PSD (dBm/Hz)
0.001	-90
138	-90
138	-39.5
1104	-39.5
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	-39.5
1104	-39.5
1394	-50
3000	-54.8
3000	-80
3175	-100
4000	-100
4925	-100
5100	-80
5100	-57.1
7050	-58.5
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	-55.7
5200	-57.2
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	-57.2
8500	-59.3
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	-39.5
1104	-39.5
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	-39.5
1104	-39.5
1394	-50
3750	-55.7
3750	-80
3925	-100
4000	-100
5025	-100
5200	-80
5200	-57.2
8500	-59.3
8500	-80
8675	-100
30000	-100

Pex.P2.LT.M1

Freq (kHz)	PSD (dBm/Hz)
0.001	-90
138	-90
138	-39.5
1104	-39.5
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	-39.5
1104	-39.5
1394	-50
3750	-55.7
3750	-80
3925	-100
4000	-100
5025	-100
5200	-80
5200	-57.2
8500	-59.3
8500	-80
8675	-100
30000	-100

8.3.5.3 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 (kHz)	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 (kHz)	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

8.3.5.4 PSD template specifications

From the point of view of performance testing, it is necessary to properly define the amount of self-crosstalk produced by a VDSL modem into other lines (see section TDB). This has to be done by using the PSD *template,* representing the typical VDSL signal that will be produced by a transceiver. The PSD template must be built starting from the appropriate PSD mask according to the following two steps:

1. In the out-of-band part, the peak level admitted by the mask has to be replaced by the average PSD level admitted by the sliding window concept (where it is defined)

2. The in-band levels of the PSD mask have to be used also for the PSD template, unless the total power under the mask is higher than the total power constraint imposed in section TDB. If the total power is higher than the power constraint, the template has to be obtained from the mask by decreasing in flat the in-band level just down to a value, which guarantees that the total power limitation is respected.

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

4. References

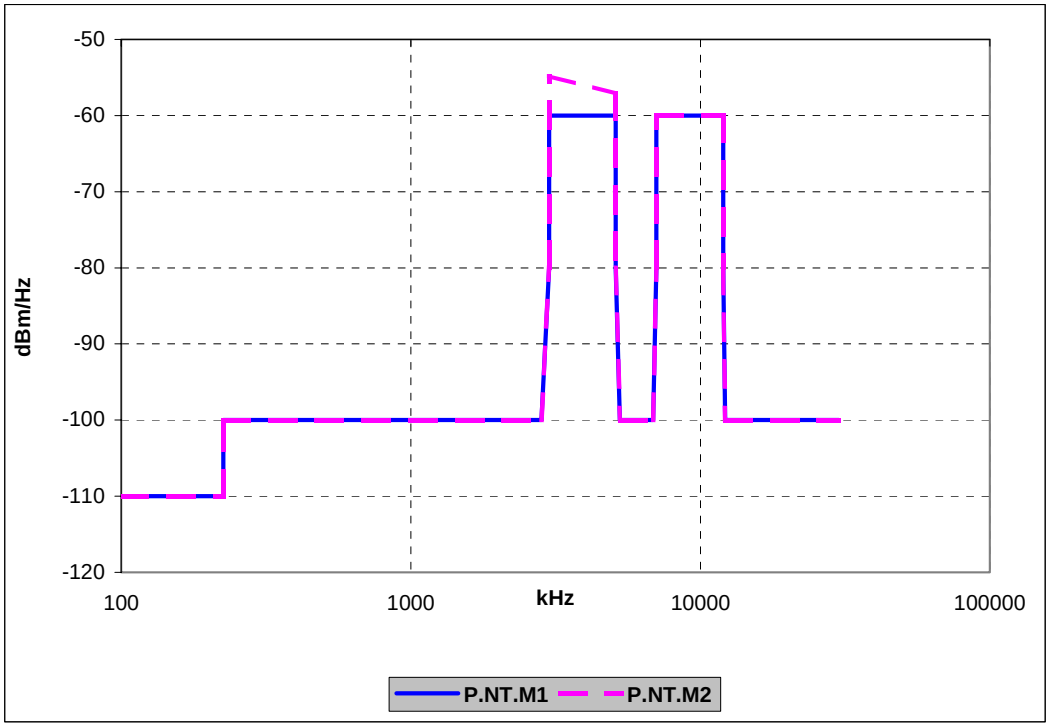
[1] ETSI-TS 101 270-1 V1.2.1,"Transmission and Multiplexing (TM); Access transmission systems on metallic access cables; Very high speed Digital Subscriber Line (VDSL); Part 1: Functional requirements", October 1999.

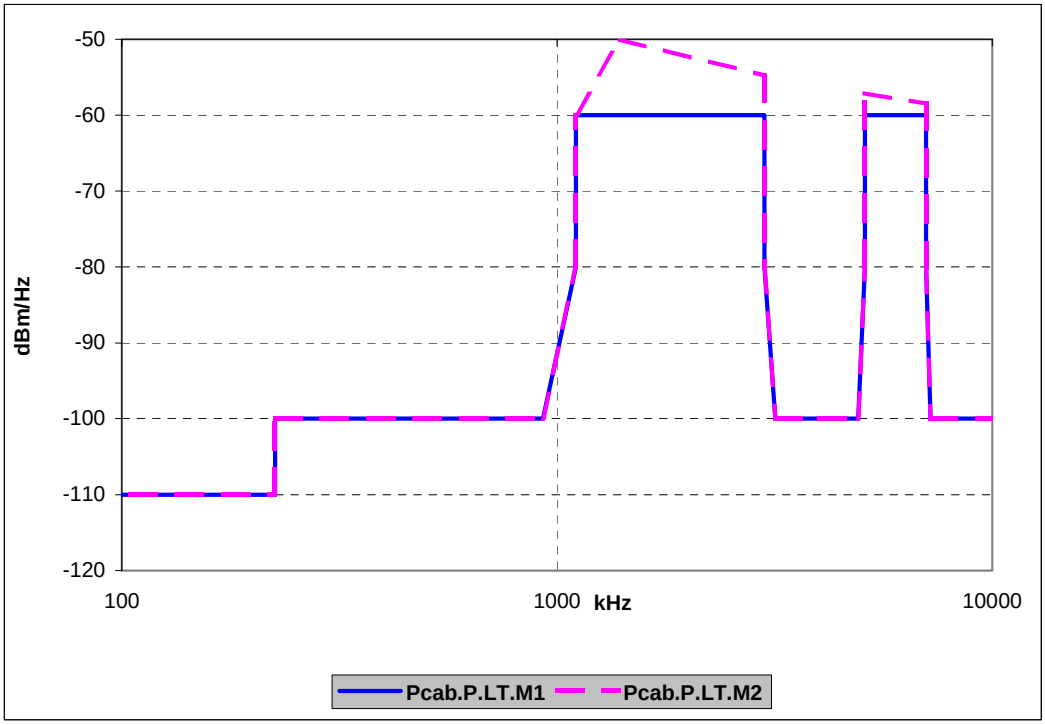
[2] ETSI-TS 101 270-2 V1.1.1, "Transmission and Multiplexing (TM); Access transmission systems on metallic access cables; Very high speed Digital Subscriber Line (VDSL); Part 2: Transceiver specification", February 2001.

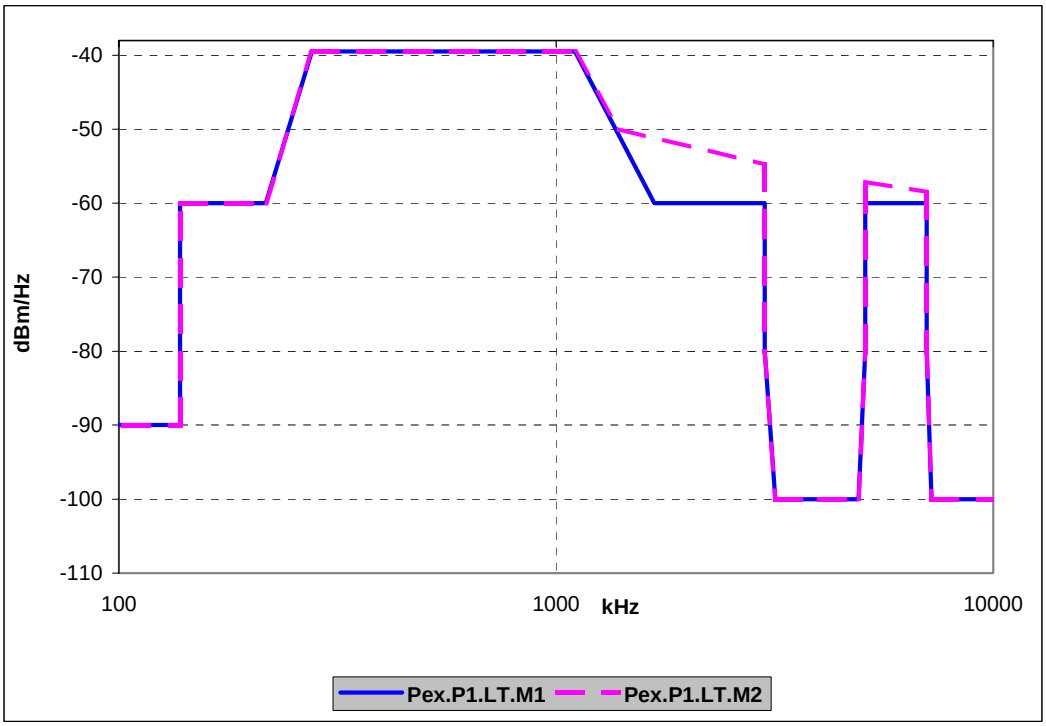
[3] Don Clarke, "Liaison to ETSI from FS-VDSL Committee concerning PSD mask ambiguities", TD 04 - ETSI TM6 meeting in Stockholm, 10 th –14 th, September 2001

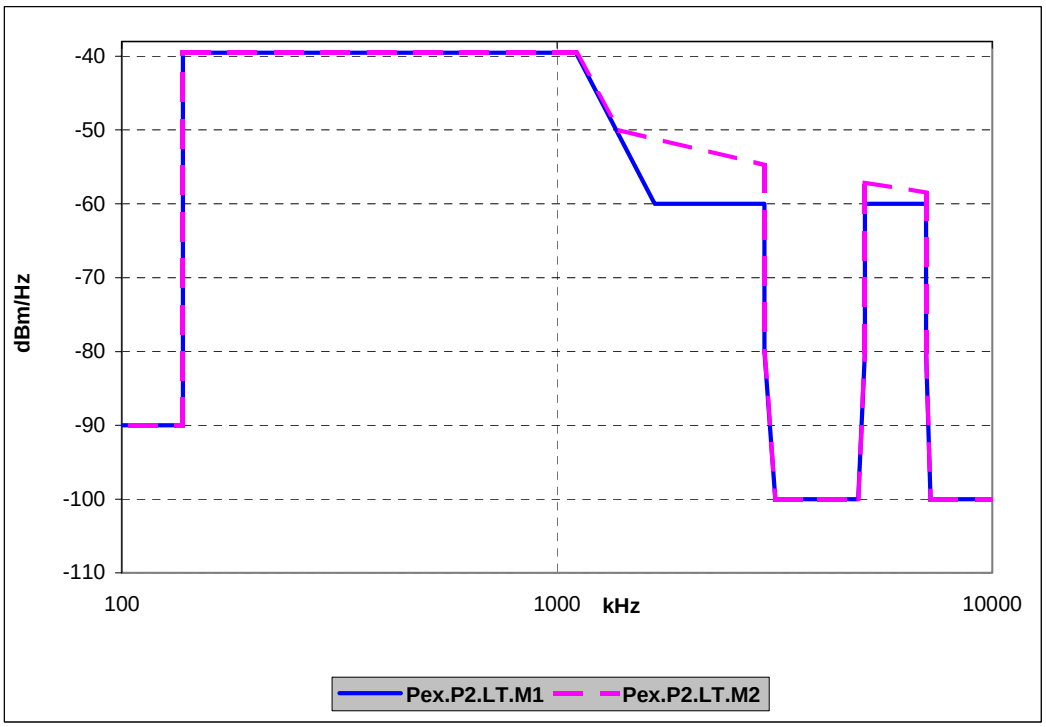
5. Annex: figures of PSDs

5.1 The VDSL band allocation

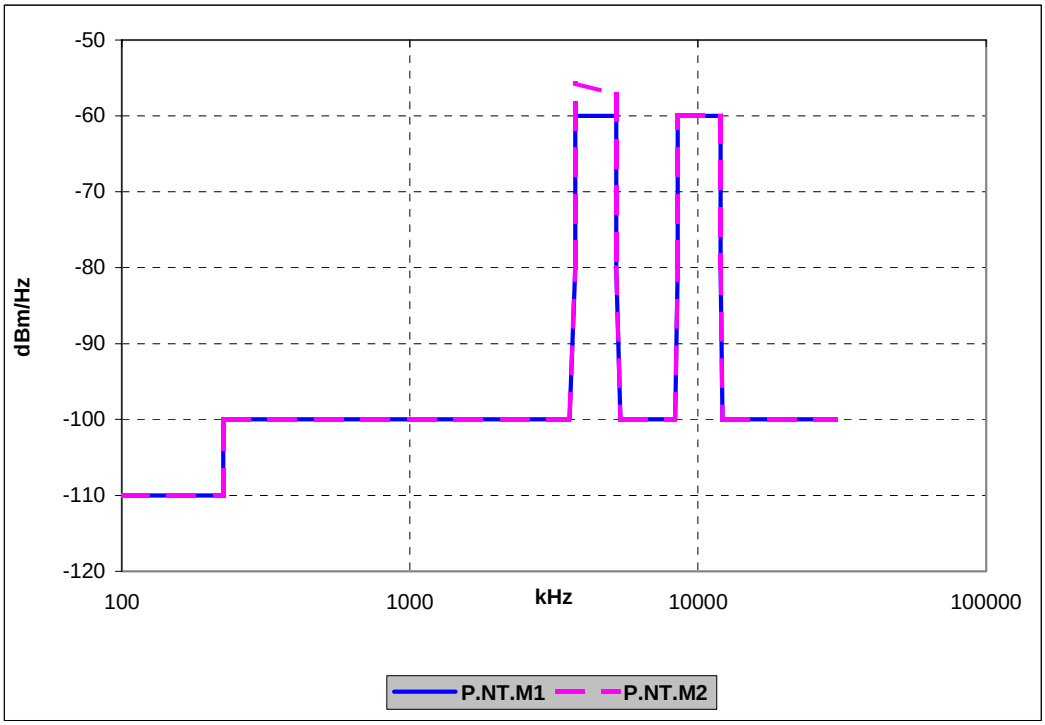


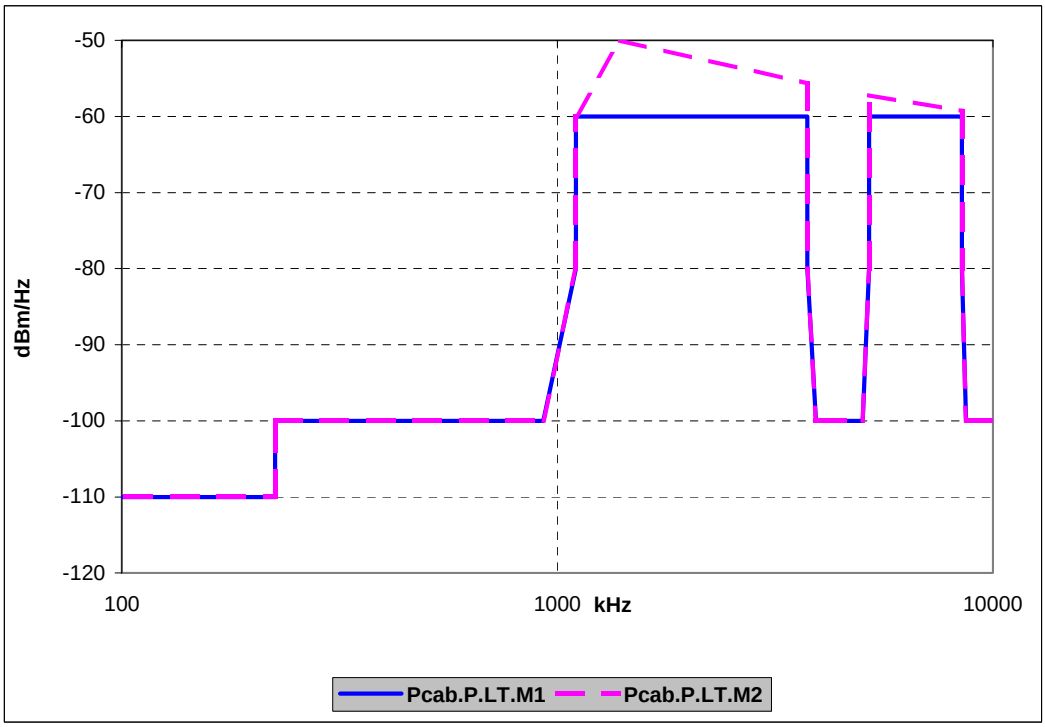


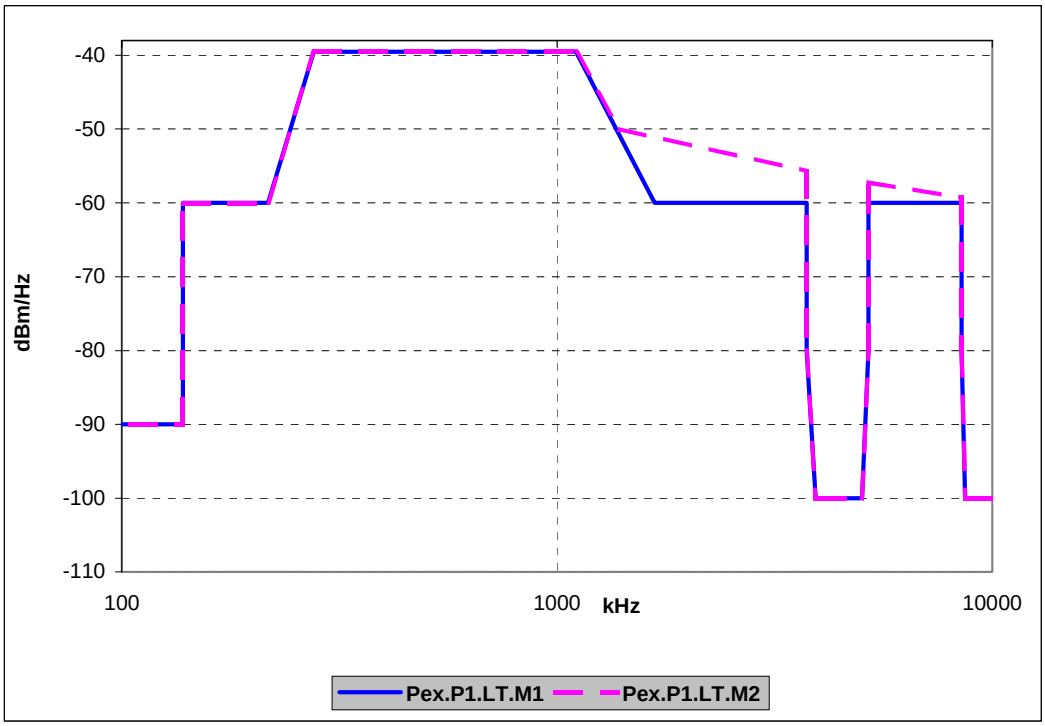

-40
-50
-60
-70
-80
-90
-100
-110
dBm/Hz
100
1000
kHz
10000
Pex.P1.LT.M1
Pex.P1.LT.M2

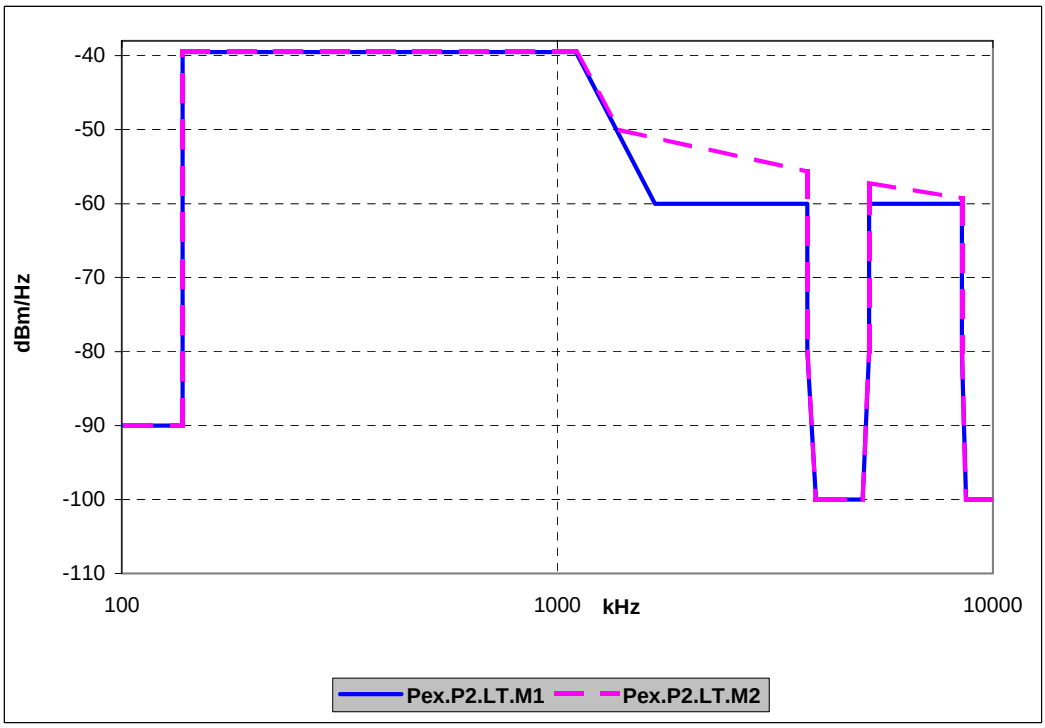

-40
-50
-60
-70
-80
-90
-100
-110
dBm/Hz
100
1000
kHz
10000
Pex.P2.LT.M1
Pex.P2.LT.M2

5.2 Optional regional-specific VDSL Band Allocation






-40
-50
-60
-70
-80
-90
-100
-110
dBm/Hz
100
1000
kHz
10000
Pex.P1.LT.M1
Pex.P1.LT.M2


-40
-50
-60
-70
-80
-90
-100
-110
dBm/Hz
100
1000
kHz
10000
Pex.P2.LT.M1
Pex.P2.LT.M2