On grounds of the Prime-minister's Decision no.249/2005 on the appointment of the President of the National Regulatory Authority for Communications,

On grounds of Article 38 (1), (3) and (5), as well as of Article 46 (1) indents 11. and 17. of the of the Government Emergency Ordinance no.79/2002 on the regulatory framework of communications, approved, with amendments and completions, by Law no.591/2002, subsequently amended and completed, as well as of Article 8 (1), Article 9 and Article 14 of the Government Ordinance no. 34/2002 on access to and interconnection of the public electronic communications networks as well as the associated facilities, approved, with amendments and completions, by Law no. 527/2002,

Having regard to the provisions of Articles 20 and 21 of Decision of the President of the National Regulatory Authority for Communications no.1098/2004, on the principles and prerequisites of the reference offer for the unbundled access to the local loop,

Having regard to the Report of the working group provided at Article 18 of Decision of the President of the National Regulatory Authority for Communications no.1098/2004,

THE PRESIDENT OF THE NATIONSAL REGULATORY AUTHORITY FOR COMMUNICATIONS

issues this:

DECISION
on the approval of the Spectrum Management Plan for the local loop and sub-loop

Art.1. – We hereby adopt the Spectrum Management Plan for the local loop and sub-loop, provided in the herewith enclosed Annex.

Art.2. – The company "Romtelecom" – S.A. shall include the Spectrum Management Plan for the local loop and sub-loop in the Reference Unbundling Offer, within 10 days from the communication date of this decision.

Art.3. – This decision shall be communicated to the company „Romtelecom" – S.A.

PRESIDENT,
DAN CRISTIAN GEORGESCU

Bucharest, July 5, 2005
Nr. 1251 / EI

ANNEX

SPECTRUM MANAGEMENT PLAN FOR THE LOCAL LOOP AND SUB-LOOP

1. General provisions

The provision of broadband electronic communications services on the local loop or sub-loop requires signal transmission in extended frequency spectrums, based on service type and the technology used. The provision of these services on different twisted metallic pairs in the same cable of the access network may determine the risk of interferences between the provided services.

The Spectrum Management Plan for the local loop and sub-loop, hereinafter referred to as the *spectrum plan*, establishes certain technical steps for limiting interference risk and ensuring spectral compatibility for the services and technologies using twisted metallic pairs in the same cable. Therefore, the spectrum plan establishes the list of power spectral density masks corresponding to the services provided on the local loop or sub-loop.

The spectrum plan shall apply to all the transmission systems implemented on the local loops in the access network of "Romtelecom" – S.A., hereinafter referred to as *the Operator*, irrespective of whether they are implemented by the Operator or by other providers of public electronic communications networks or of publicly available electronic communications services, disregarding if the provided service include the switching function or if it is a leased line service.

The spectrum plan shall also apply to local sub-loops, on the level of the intermediate distribution frame, to the extent that the transport segment (between the main distribution frame and the intermediate distribution frame) of the Operator's access network corresponding to the respective distribution frame has been fully replaced by fibre optic.

The spectrum plan does not regulate issues regarding the essential requirements to be fulfilled by radio and terminal telecommunications equipments, nor issues regarding the protection requirements concerning electromagnetic compatibility to be fulfilled for the market launch and operation of electrical and electronic devices.

2. Definitions and abbreviations

Within the spectrum plan, the definitions provided in Article 2 of the Government Ordinance no.34/2002 on access to and interconnection of the public electronic communications networks as well as the associated facilities, approved, with amendments and completions, by Law no. 527/2002, and in Article 2 of Decision of the President of the National Regulatory Authority for Communications no.1098/2004, on the principles and prerequisites of the reference offer for the unbundled access to the local loop.

The spectrum plan includes the following abbreviations:

1. ADSL – Asymmetrical Digital Subscriber Line;
2. ADSL2+ – Asymmetrical Digital Subscriber Line Two Plus;
3. ANRC – National Regulatory Authority for Communications;
4. ETSI – European Telecommunications Standards Institute;

5. FDD – Frequency Division Duplexing;
6. HDB3 – High Density Bipolar Order 3;
7. HDSL – High bit-rate Digital Subscriber Line;
8. ISDN-BRA – Integrated Services Digital Network - Basic Rate Access;
9. ITU-T – International Telecommunication Union – Telecommunication Standardization Sector;
10. POTS – Plain Old Telephony System;
11. PSD – Power Spectral Density;
12. SDSL – Symmetrical single pair high bit-rate Digital Subscriber Line (SDSL :: Fn – generic name used for SDSL, where Fn indicates the symbol rate [kbaud] attainable within the respective signal);
13. 2B1Q – Two Binary One Quaternary.

3. Standards and recommendations

This spectrum plan was elaborated with due regard to the following reference standards and recommendations:

1. ETSI TR 101 830-1 (V1.3.1) – Transmission and Multiplexing (TM); Access networks; Spectral management on metallic access networks; Part 1: Definitions and signal library;
2. ETSI TS 102 080 (V1.4.1) – Transmission and Multiplexing (TM); Integrated Services Digital Network (ISDN) basic rate access; Digital transmission system on metallic local lines;
3. ETSI TS 101 135 (V1.5.3) – Transmission and Multiplexing (TM); High bit-rate Digital Subscriber Line (HDSL) transmission systems on metallic local lines; HDSL core specification and applications for combined ISDN-BA and 2048 kbit/s transmission;
4. ETSI TS 101 524 (V1.2.1) – Transmission and Multiplexing (TM); Access transmission systems on metallic access cables; Symmetrical single pair high bit-rate Digital Subscriber Line (SDSL) *(SDSL-ETSI)*;
5. ETSI TS 101 388 (V1.3.1) – Transmission and Multiplexing (TM); Access transmission systems on metallic access cables; Asymmetrical Digital Subscriber Line (ADSL) - European specific requirements [ITU-T G.992.1 modified];
6. ITU-T G.992.5 – Asymmetrical Digital Subscriber Line (ADSL) transceivers – Extended bandwidth ADSL2+ (ADSL2+);
7. ITU-T G.992.1 – Asymmetrical Digital Subscriber Line (ADSL) transceivers;
8. ITU-T G.991.1 – High bit-rate Digital Subscriber Line (HDSL) transceivers;
9. ITU-T G.991.2 – Single-pair High-Speed Digital Subscriber Line (SHDSL) transceivers.

4. Elaboration of the spectrum plan

The spectrum plan establishes the maximum PSD value allowed, represented by a set of PSD masks defined at the two ends of the local loop, respectively at the main distribution frame and at the subscriber's network termination point. The transmission direction from the main distribution frame to the subscriber's point of presence is downstream, whereas from the subscribers' point of presence to the main distribution frame, it is upstream.

The PSD masks have been established taking into account the characteristics of the Operator's access network and the transmission technologies in place, as well as technologies which are to be implemented.

4.1. Local loop classification

The Operator's access network has been designed in view of providing publicly available telephone services, at fixed locations. Therefore, the network has been installed using cables with adequate physical features.

In modernising the access network, various cable types have been used. Thus, at present, the Operator's access network uses both new cables, with a copper wire diameter between 0.4 mm and 0.5 mm, and older cables, with a copper wire diameter of 0.6 mm, 0.8 mm and even 0.9 mm. New cables preserve their initial electrical parameters, whereas older cables may feature degraded electrical parameters.

Another peculiarity of the Operator's network is the coexistence of different access topologies. Generally, the access network features direct distribution, but there are access networks consisting of a transport segment and a distribution segment (with intermediate distribution frames).

Due to these peculiarities, the local loop classification based on the physical length is not relevant, the electrical length (insertion loss measured at a certain frequency) being more relevant for the elaboration of the spectrum plan.

Taking into account the inhomogeneous structure of the access network and the fact that the transmission equipment performance depends on the local loop characteristics, local loops have been classified into 3 categories, based on the electrical length ([dB] loss at 150 kHz):

a) short local loops (≤17 dB);

b) medium local loops (>17 dB and ≤27 dB);

c) long local loops (>27 dB).

For a certain local loop, this classification provides for determining the access technologies to be used and transfer throughput assessment.

4.2. Transmission technologies used on the local loop

The elaboration of the spectrum plan considered the technologies currently used on the Operator's access network. Among these, the construction of the PSD mask has not taken into account the systems functioning with the line code HDB3 (which determines significant interferences), whereas the bindles which include local loops equipped with such systems will be dealt with individually, taking into account their reduced number.

Moreover, new technologies were introduced on the Operator's access network, technologies for which the operators of electronic communications networks and services participated in the working group sessions and manifested interest for technologies such as SDSL and ADSL2+.

The spectrum plan took into consideration all the technologies with a useful bandwidth of up to 2.2 MHz.

The transmission technologies used for constructing PSD masks, based on local loop classification, are the following:

Short local loops	**Medium local loops**	**Long local loops**
POTS and voice band modems	POTS and voice band modems	POTS and voice band modems
ISDN–BRA (2B1Q)	ISDN–BRA	ISDN–BRA
HDSL (2B1Q) (1168 kbps)	HDSL (2B1Q) (1168 kbps)	HDSL (2B1Q) (784 kbps)
SDSL-ETSI (SHDSL-ITU) (max. 2304 kbit/s)	SDSL-ETSI (SHDSL-ITU) (max. 2048 kbit/s)	SDSL-ETSI (SHDSL-ITU) (max. 1024 kbit/s)
ADSL.FDD over POTS	ADSL.FDD over POTS	ADSL.FDD over POTS
ADSL2+.FDD over POTS	ADSL2+.FDD over POTS	ADSL2+.FDD over POTS
ADSL.FDD over ISDN		
ADSL2+ over ISDN		

The transmission technologies used for constructing PSD masks are provided in the ETSI standards or in the ITU-T recommendations.

4.3. PSD masks

According to the applicable standard, each transmission technology (transmission system) is characterised by a pair of PSD masks:

a) downstream PSD mask;

b) upstream PSD mask.

In case of SDSL systems, the working group used the PSD masks corresponding to rates of 192 kbps and 776 kbps for all the categories of local lops and the PSD masks corresponding to rates of 2304 kbps (symmetrical) for the short local loop, 2048 kbps (symmetrical) for the average local loop and 1024 kbps for the long local loop.

Outside the useful bandwidth, the masks provided in the standards have two branches, based on the bandwidth used for measuring PSD. In view of limiting emissions outside the bandwidth, measurements were considered within a 1 MHz window.

For each local loop category, the upstream PSD masks corresponding to the transmission technologies used were established and one upstream PSD mask was constructed as a covering for the respective masks. Thus, 3 upstream PSD masks were found:

a) upstream PSD mask for the short local loop (Exhibit 1);

b) upstream PSD mask for the medium local loop (Exhibit 2);

c) upstream PSD mask for the long local loop (Exhibit 3).

The PSD values of these masks, corresponding to various frequencies, are provided in Table 1 of Annex 1.

A single mask was constructed for downstream. This is represented by the covering of downstream PSD masks corresponding to all the transmission technologies used (Exhibit 4).

The PSD values corresponding to this mask are provided in Table no. 2 of Annex 1.

The PSD masks of the transmission technologies used in elaborating the spectrum plan are provided in Annex 2.

Exhibit 1 **– The upstream PSD mask for the short local loop**

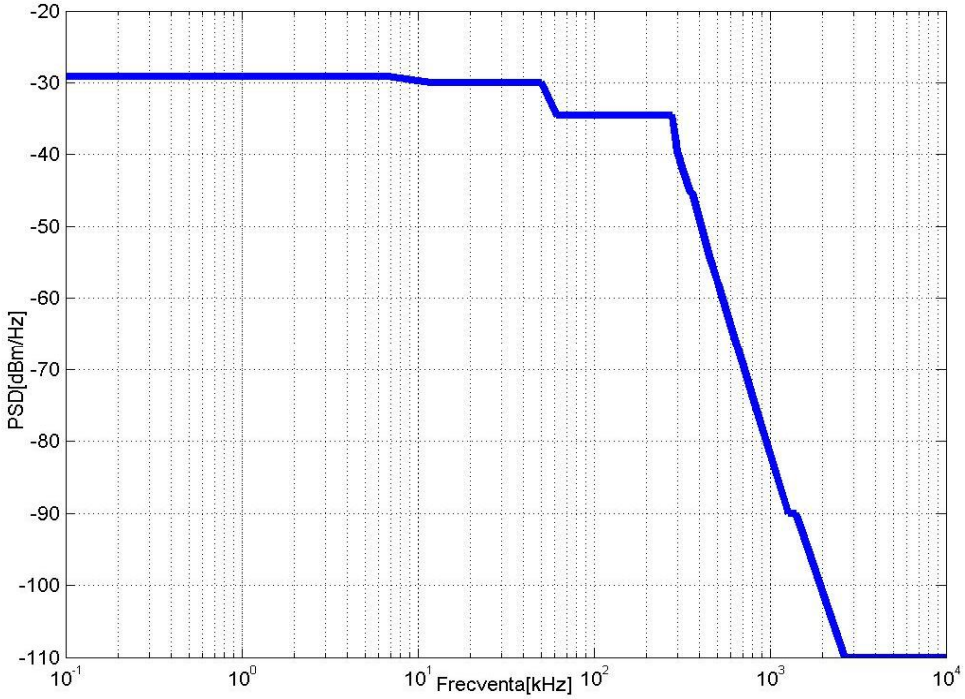


Exhibit 2 **– The upstream PSD mask for the medium local loop**

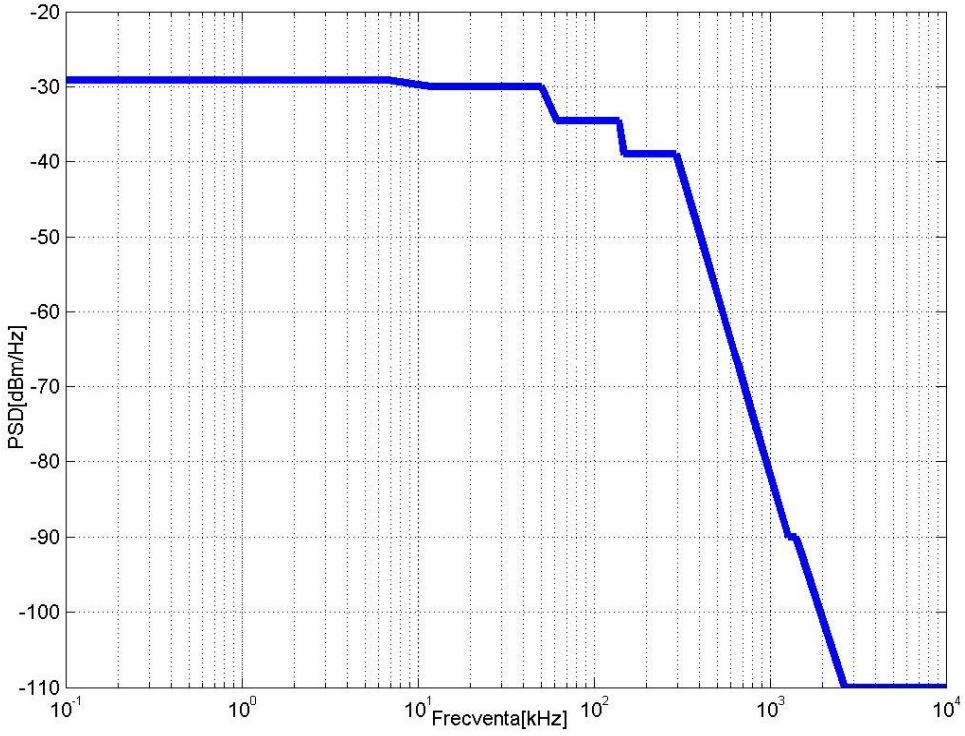


Exhibit 3 **– The upstream PSD mask for the long local loop**

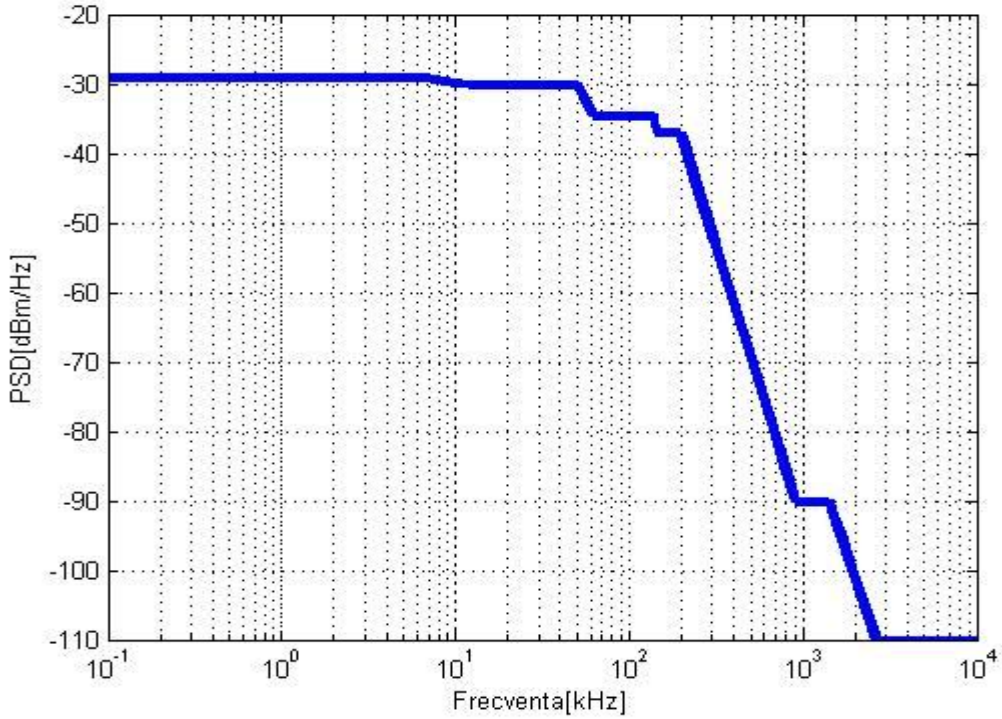
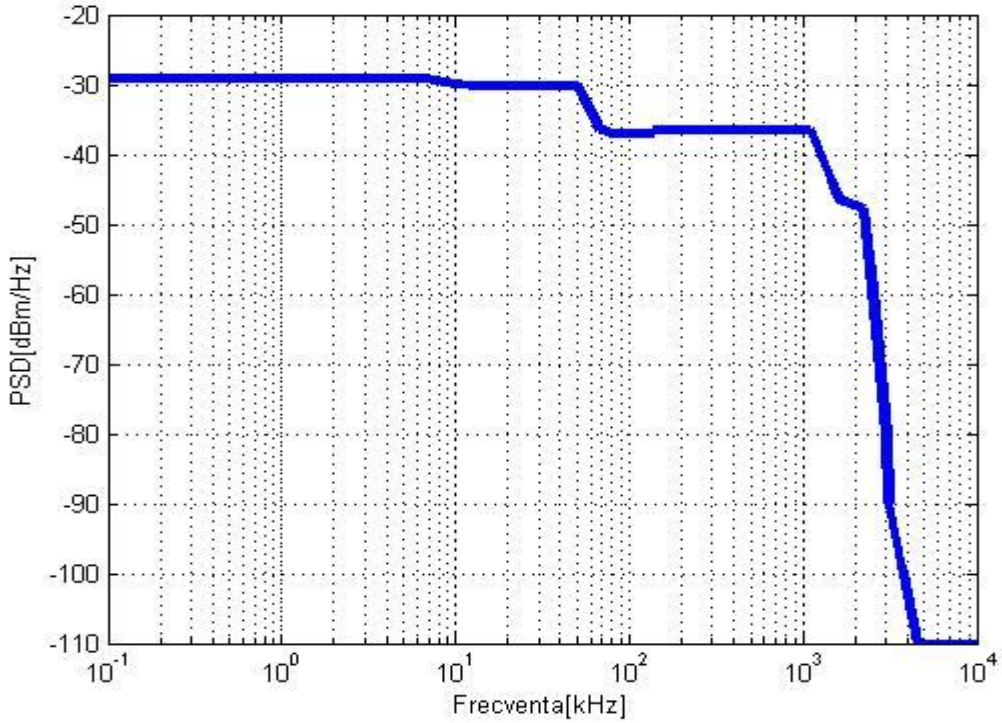


Exhibit 4 **– Downstream PSD mask**



4.4. Spectrum plan implementation

4.4.1. Transmission technologies compatible with the PSD mask

A transmission technology may not be implemented on the Operator's access network in view of providing broadband electronic communications services unless it observes the PSD limits provided in the spectrum plan, both for upstream and for downstream.

If, on one local loop, several transmission technologies are used, the PSD limits provided in the spectrum plan concern the covering of the PSD masks corresponding to the respective technologies.

If the technologies implemented by the date of adopting the spectrum plan are not compatible with the established PSD masks, these shall continue to be used only if they do not significantly interfere with the provision of other services.

4.4.2. Interferences

Although the spectrum plan was conceived so that the interference risk should be limited, in practice, interferences may appear in certain cases, such as:

a) equipment flaws that determine increased power on the local loop;

b) equipments that do not correspond with the technical specifications;

c) high level of undesired coupling (side tone).

The Operator shall collaborate with the providers of electronic communications networks or services involved, in view of stopping the interference. If the interferences do not disappear, a set of regulations on interference treatment shall be elaborated by a working group consisting of representatives of the Operator, of the providers of electronic communications networks and services that have unbundled access to the local loop and of ANRC.

5. Amending the spectrum plan

The spectrum plan may be amended, upon the Operator's request, upon the request of the providers of electronic communications networks and services, as well as *ex officio*, by ANRC, in the following instances:

a) introduction of new technologies, that are not compatible with the PSD masks;

b) modernisation of existing technologies;

c) removal of outdated technologies.

As well, the spectrum plan shall be revised if, following implementation, significant interference are assessed.

ANRC will assess, upon consulting the providers of public electronic communications networks, the providers of publicly available electronic communications services and the manufacturers of electronic communications equipment, the effects of the requested amendments on the spectrum plan and on the access network (by analyses and simulations, tests, pilot projects etc.).

ANRC can approve the taking of test son the access network, in view of assessing transmission technologies that are not compatible with the management plan, establishing the application conditions, as well, upon consulting the Operator and other interested persons.

Annex 1

PSD values by mask

Table 1 **– PSD values for upstream masks**

Frequency [kHz]	PSD [dBm/Hz]		
	Short local loop	Medium local loop	Long local loop
0.1	-29.2	-29.2	-29.2
0.51	-29.2	-29.2	-29.2
1	-29.2	-29.2	-29.2
4	-29.2	-29.2	-29.2
4.01	-29.2	-29.2	-29.2
6.7	-29.2	-29.2	-29.2
10	-29.75	-29.75	-29.75
11.94	-30	-30	-30
18.43	-30	-30	-30
25.88	-30	-30	-30
26.8	-30	-30	-30
31.82	-30	-30	-30
34.4			-30
40.2	-30	-30	-30
50	-30	-30	-30
60.3	-34.07	-34.07	-34.07
61.51	-34.5	-34.5	-34.5
64.32	-34.5	-34.5	-34.5
68.6		-34.5	
77.1	-34.5		
80	-34.5		
94.6			-34.5
120	-34.5		
137.6			-34.5
138	-34.5	-34.5	-34.5
147.24		-39	
151.84			-37
163.4			-37
188.65		-39	
196			-37
206.4			-38.8
212.03	-34.5		
243	-34.5	-39	-44.47
274.4		-39	
276	-34.5		
292	-38.41	-39	
297	-39.59		

307	-40.74	-40.74	-52.59
308.4	-40.9		
309.6			-52.88
325.85		-42.81	
330.24			-55.13
345.63	-44.86		
366.22	-45.7		
411.6		-50.93	
446.17	-53.73		
462.6	-54.99		
500	-57.69	-57.69	-69.54
508.8	-58.29		
614	-64.82		
617.4		-65.01	
658.56		-67.26	
686	-68.68	-68.68	-80.53
693.9	-69.07		
740.16	-71.32		
800	-74.02	-74.02	-85.87
901.06			-90
1221	-88.71	-88.71	-90
1267.31	-90	-90	
1400	-90	-90	-90
1411	-90.25	-90.25	-90.25
1500	-92.17	-92.17	-92.17
1501	-92.19	-92.19	-92.19
1630	-94.78	-94.78	-94.78
1960			-100.57
2645.69	-110	-110	-110
2920	-110	-110	
3637	-110	-110	-110
5275	-110	-110	-110
10000	-110	-110	-110

***Table 2* – PSD values for downstream masks**

Frequency [kHz]	PSD [dBm/Hz]
0.1	-29.2
0.51	-29.2
1	-29.2
4	-29.2
4.01	-29.2
6.7	-29.2
10	-29.75
11.94	-30

18.43	-30
25.9	-30
26.8	-30
31.82	-30
34.4	-30
40.2	-30
50	-30
60.3	-34.07
64.32	-35.47
67.2	-36.42
71.23	-36.5
77.1	-36.92
78.22	-37
80	-37
93.1	-37
94.6	-37
103.6	-37
123.02	-37
137.6	-37
137.9	-37
137.97	-39
138	-36.5
155.4	-36.5
163.4	-36.5
196	-36.5
206.4	-36.5
209	-36.5
212.03	-36.5
233.1	-36.5
248.64	-36.5
253.9	-36.5
254	-36.5
292	-36.5
308.4	-36.5
309.6	-36.5
330.24	-36.5
366.22	-36.5
462.6	-36.5
500	-36.5
693.9	-36.5
740.16	-36.5
800	-36.5
1104	-36.5
1104	-36.5
1400	-42.67
1500	-44.47

1501	-44.48
1622	-46.5
1960	-47.3
2208	-47.8
2500	-59.4
2920	-76.9
3001.5	-80
3086.01	-89.88
3093	-90
3175	-91.36
3637	-98.42
3749.36	-100
3750	-100
4545	-110
7225	-110
10000	-110

Annex 2

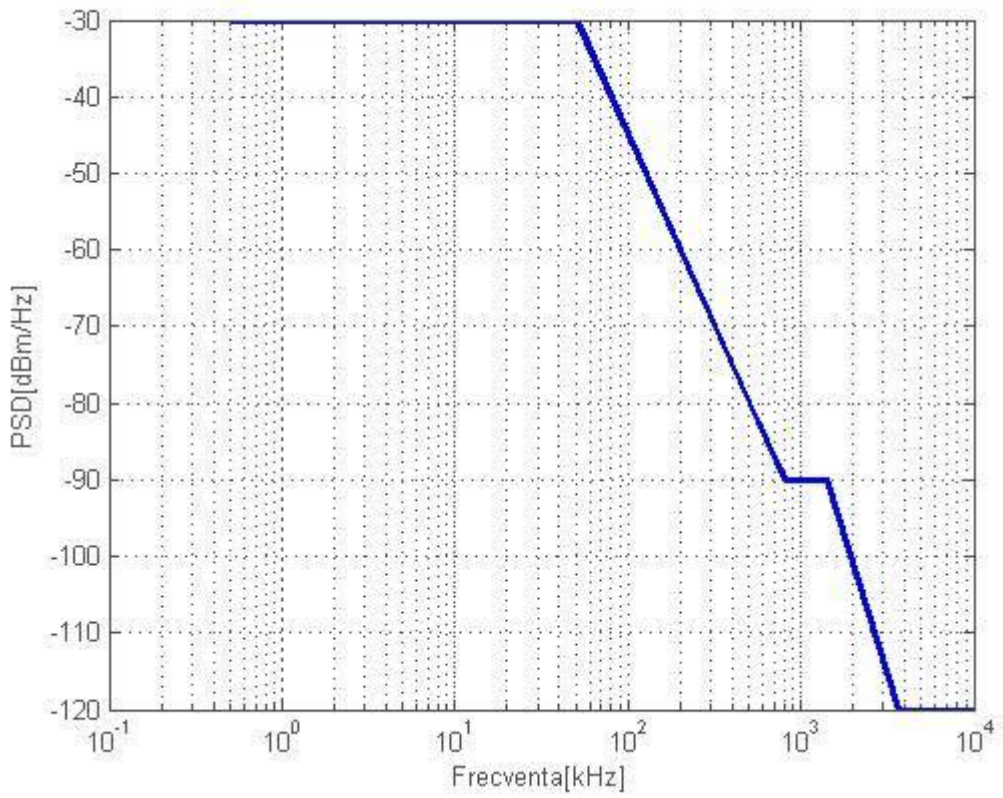
PSD masks of the transmission technologies used in the construction of the structure plan

1. ISDN-BRA (2B1Q) – upstream and downstream PSD

Table 1 **– PSD breaking point**

Frequency [kHz]	R impedance [Ω]	B-power band width	PSD [dBm/Hz]
0.51	135	1 kHz	-30
10	135	1 kHz	-30
50	135	10 kHz	-30
500	135	10 kHz	-80
800	135	1 MHz	-90
1400	135	1 MHz	-90
3637	135	1 MHz	-120
10000	135	1 MHz	-120

Exhibit 1 **– PSD mask**



Reference: 1. ETSI TR 101 830-1 (V1.3.1);
2. ETSI TS 102 080 (V1.4.1).

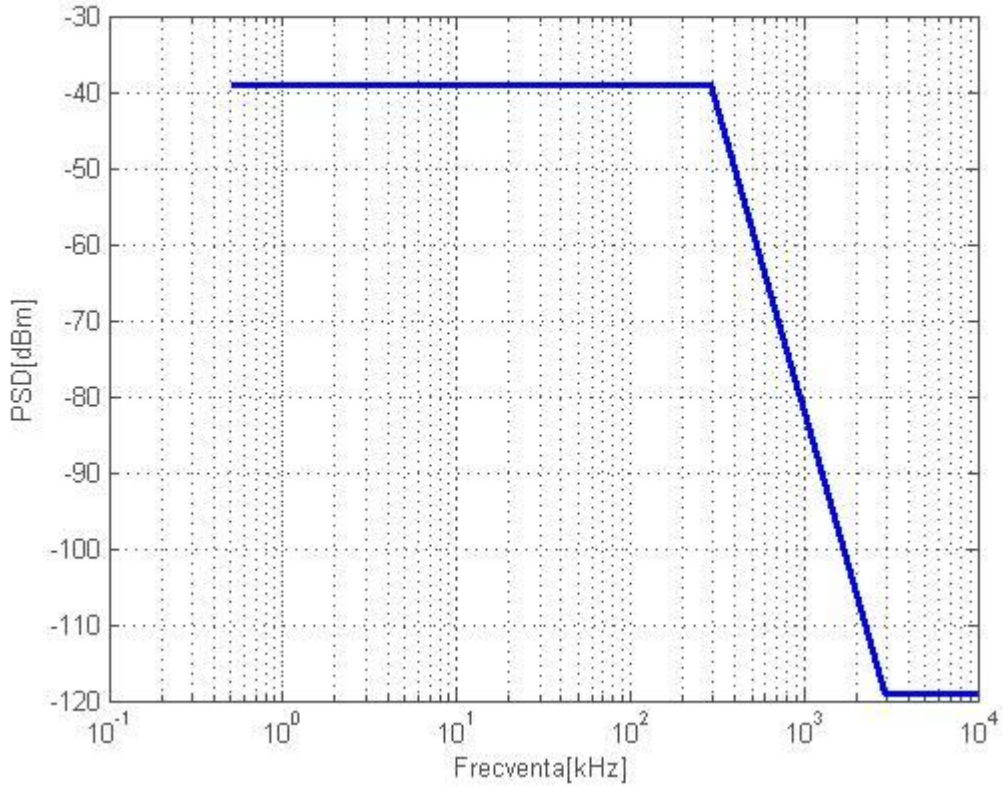
2. HDSL – upstream and downstream PSD masks

2.1. HDSL(2B1Q) (1168 kbps)

Table 2 **– PSD breaking point**

Frequency [kHz]	R impedance [Ω]	B-power band width	PSD [dBm/Hz]
0.51	135	1 kHz	-39
10	135	1 kHz	-39
292	135	10 kHz	-39
2920	135	1 MHz	-119
10000	135	1 MHz	-119

Exhibit 2 **– PSD mask**

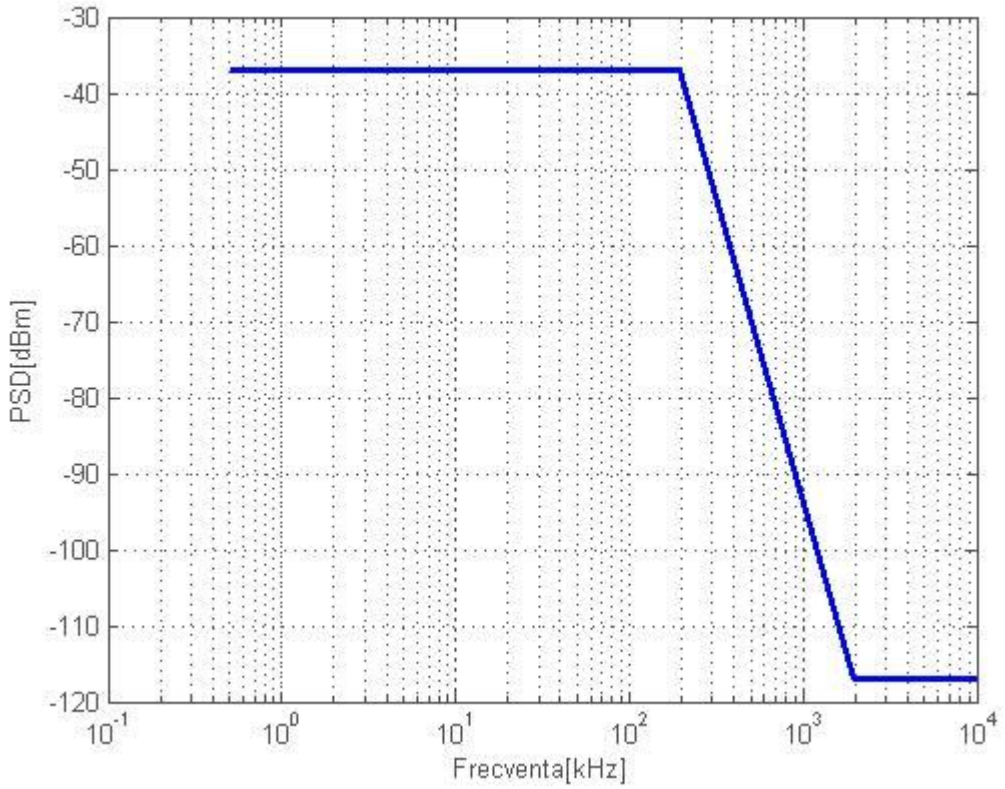


2.2. HDSL (2B1Q) (784 kbps)

Table 3 **– PSD breaking point**

Frequency [kHz]	R impedance [Ω]	B-power band width	PSD [dBm/Hz]
0.51	135	1 kHz	-37
10	135	1/10 kHz	-37
196	135	10 kHz	-37
1960	135	10 kHz/1 MHz	-117
10000	135	1 MHz	-117

Exhibit 3 **– PSD mask**



Reference: 1. ETSI TR 101 830-1 (V1.3.1);
2. ETSI TS 101 135 (V1.5.3);
3. ITU-T G.991.1.

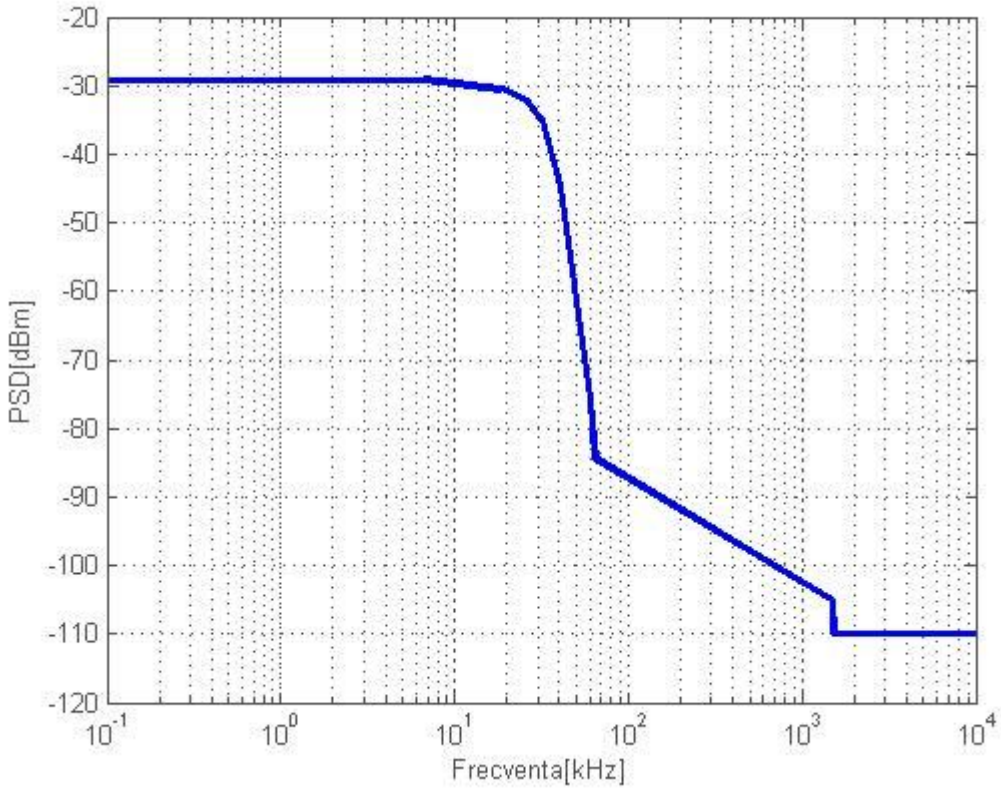
3. SDSL–ETSI (G.SHDSL) – upstream and downstream PSD masks

3.1. SDSL :: 67

Table 4 **– PSD breaking points (192 kbps)**

Frequency [kHz]	R impedance [Ω]	B-power band width	PSD [dBm/Hz]
0.1	135	100 Hz	-29.2
1	135	100 Hz	-29.2
7	135	1 kHz	-29.2
18	135	10 kHz	-30.6
27	135	10 kHz	-32.6
32	135	10 kHz	-35.1
40	135	10 kHz	-44.6
60	135	10 kHz	-75.6
64	135	10 kHz	-84.4
1500	135	10 kHz	-105
1501	135	1 MHz	-110
10000	135	1 MHz	-110

Exhibit 4 **– PSD mask (192kbps)**

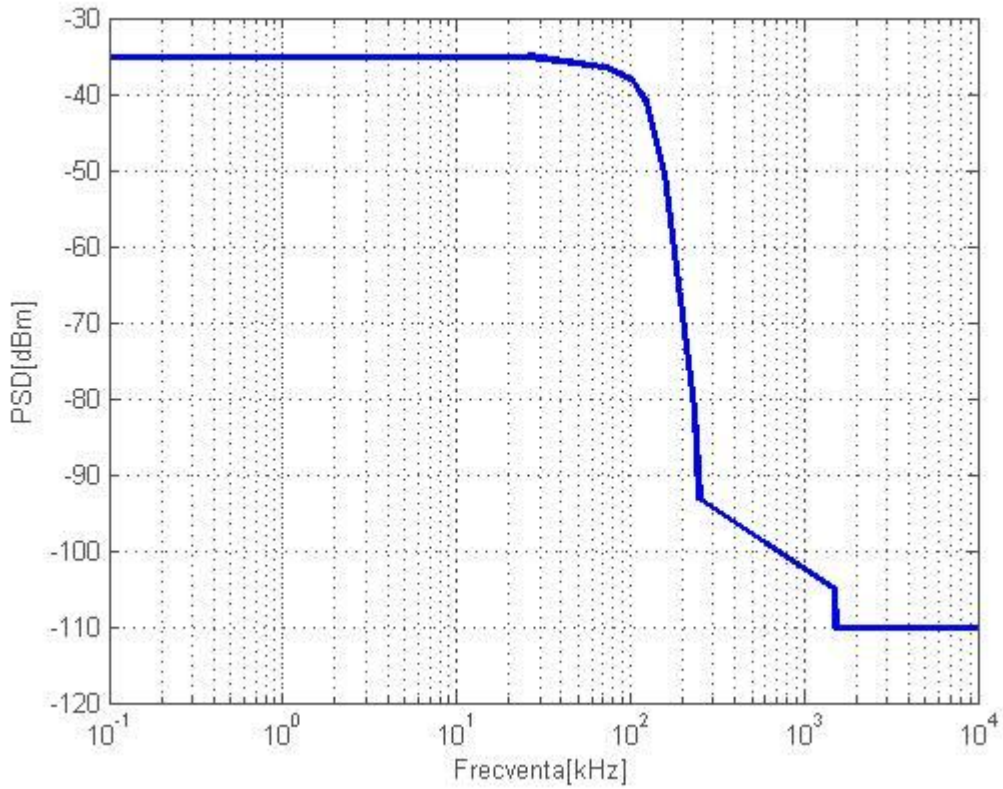


3.2. SDSL :: 259

Table 5 **– PSD breaking points (776 kbps)**

Frequency [kHz]	R impedance [Ω]	B-power band width	PSD [dBm/Hz]
0.1	135	100 Hz	-35.1
1	135	1 kHz	-35.1
26	135	10 kHz	-35.1
71	135	10 kHz	-36.5
104	135	10 kHz	-38.5
123	135	10 kHz	-41
155	135	10 kHz	-50.5
233	135	10 kHz	-81.5
249	135	10 kHz	-93.2
1500	135	10 kHz	-105
1501	135	1 MHz	-110
10000	135	1 MHz	-110

Exhibit 5 **– PSD mask (776 kbps)**

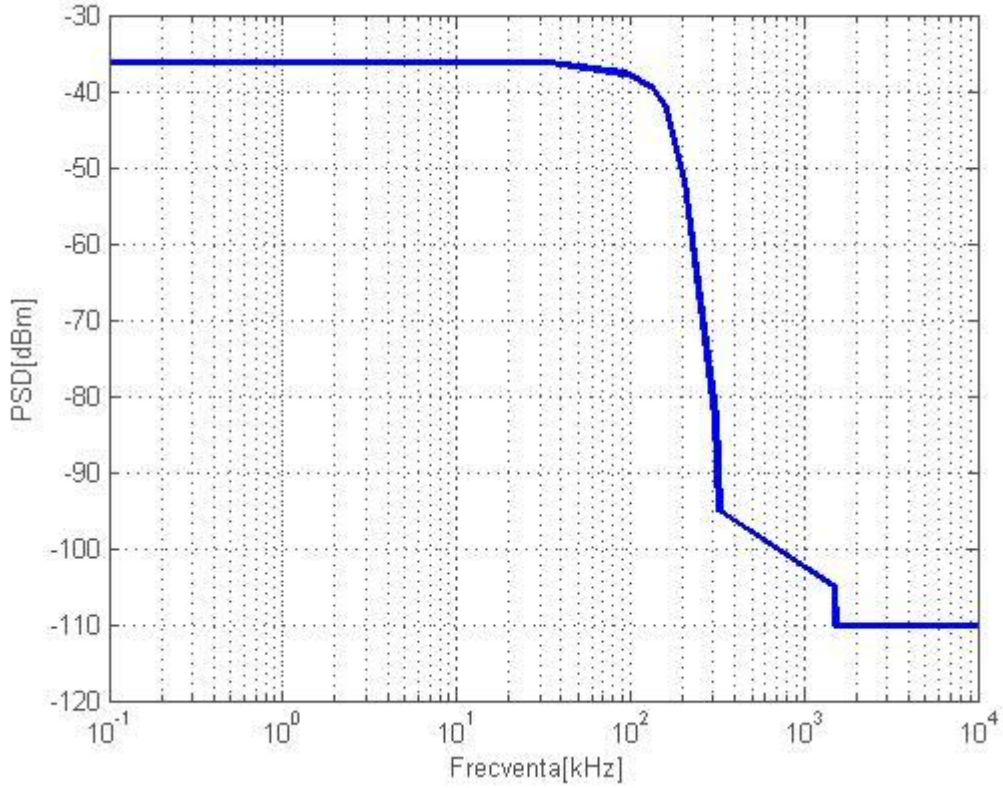


3.3. SDSL :: 344

***Table 6* – PSD breaking points (1024 kbps)**

Frequency [kHz]	R impedance [Ω]	B-power band width	PSD [dBm/Hz]
0.1	135	100 Hz	-36.3
1	135	1 kHz	-36.3
34	135	10 kHz	-36.3
95	135	10 kHz	-37.7
138	135	10 kHz	-39.7
163	135	10 kHz	-42.2
206	135	10 kHz	-51.7
310	135	10 kHz	-82.7
330	135	10 kHz	-95
1500	135	10 kHz	-105
1501	135	1 MHz	-110
10000	135	1 MHz	-110

***Exhibit 6* – PSD mask (1024 kbps)**

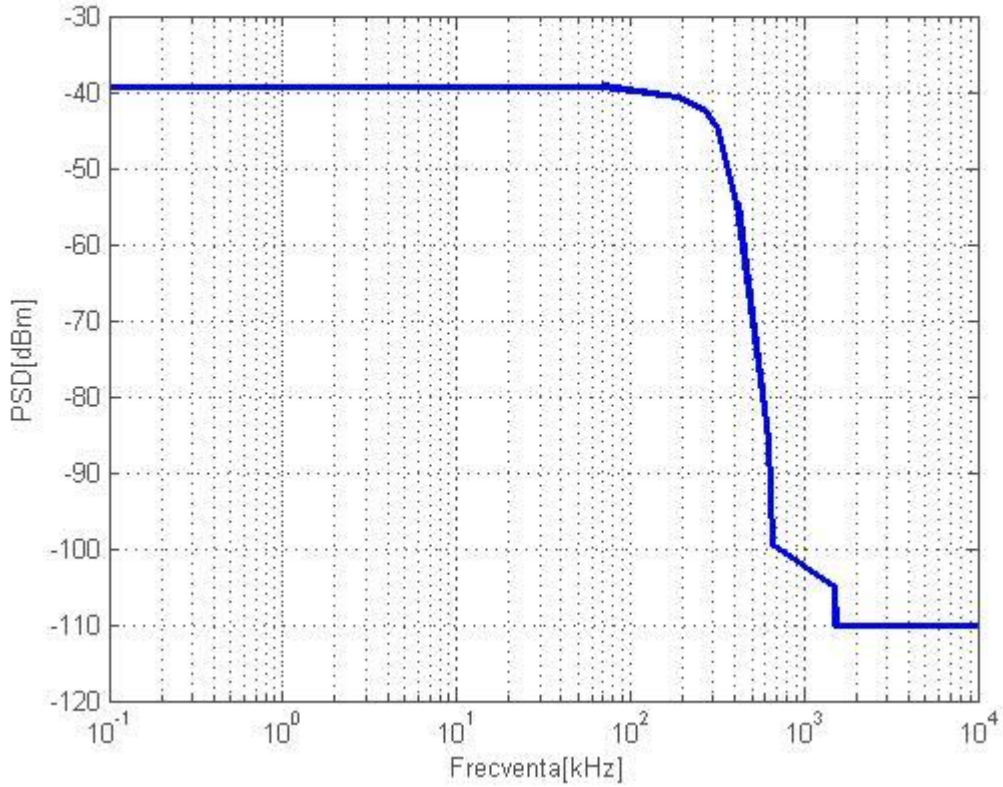


3.4. SDSL :: 686

Table 7 **– PSD breaking points (2048 kbps)**

Frequency [kHz]	R impedance [Ω]	B-power band width	PSD [dBm/Hz]
0.1	135	100 Hz	-39.3
1	135	1 kHz	-39.3
69	135	10 kHz	-39.3
189	135	10 kHz	-40.7
274	135	10 kHz	-42.7
326	135	10 kHz	-45.2
412	135	10 kHz	-54.7
617	135	10 kHz	-85.7
659	135	10 kHz	-99.5
1500	135	10 kHz	-105
1501	135	1 MHz	-110
10000	135	1 MHz	-110

Exhibit 7 **– PSD mask (2048kbps)**

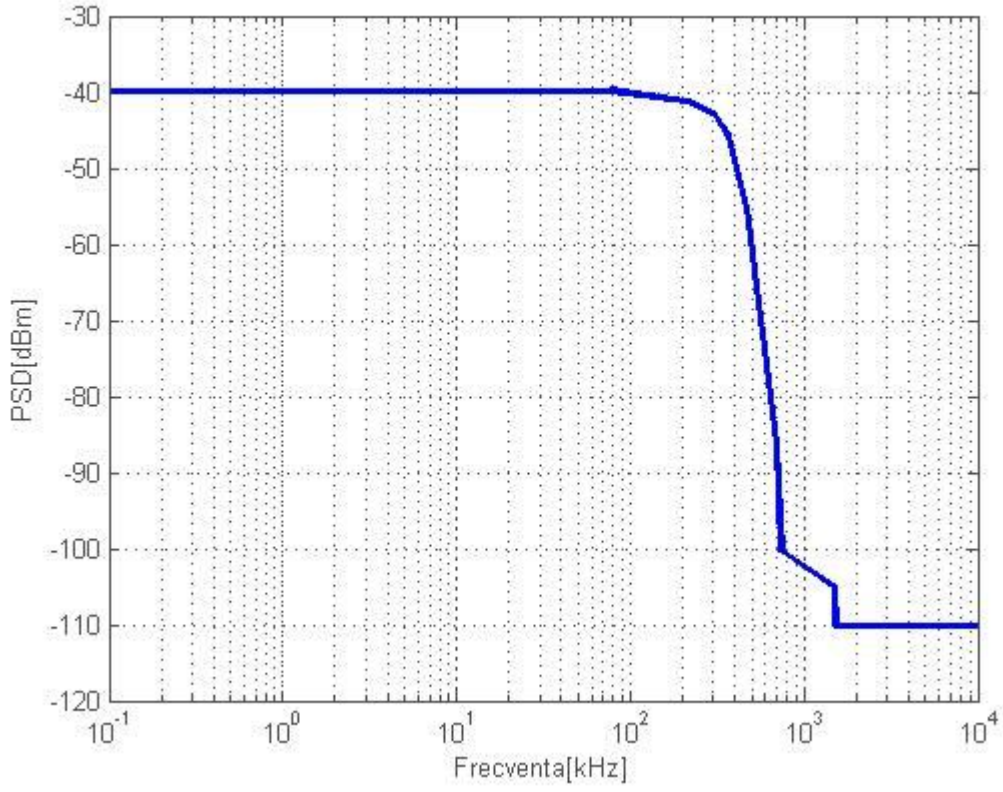


3.5. SDSL :: 771

Table 8 **– PSD breaking points (2304 kbps)**

Frequency [kHz]	R impedance [Ω]	B-power band width	PSD [dBm/Hz]
0.1	135	100 Hz	-39.8
1	135	1 kHz	-39.8
77	135	10 kHz	-39.8
212	135	10 kHz	-41.2
308	135	10 kHz	-43.2
366	135	10 kHz	-45.7
463	135	10 kHz	-55.2
694	135	10 kHz	-86.2
740	135	10 kHz	-100.3
1500	135	10 kHz	-105
1501	135	1 MHz	-110
10000	135	1 MHz	-110

Exhibit 8 **– PSD mask (2304 kbps)**



Reference: 1. ETSI TR 101 830-1 (V1.3.1);
2. ETSI TS 101 524 (V1.2.1).

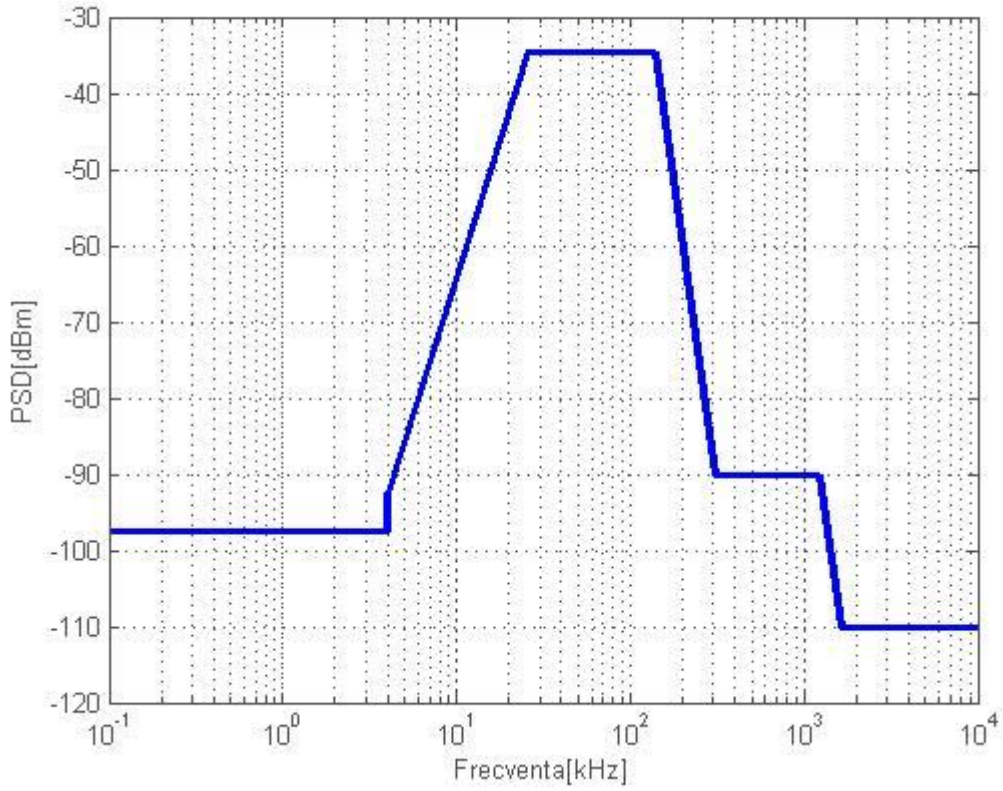
4. ADSL

4.1. ADSL.FDD over POTS - upstream PSD masks

***Table 9* – PSD breaking points**

Frequency [kHz]	R impedance [Ω]	B-power band width	PSD [dBm/Hz]
0.1	600	100 Hz	-97.5
4	600	1 kHz	-97.5
4.01	100	10 kHz	-92.5
25.875	100	10 kHz	-34.5
138	100	10 kHz	-34.5
307	100	10 kHz	-90
1221	100	0.1/1 MHz	-90
1630	100	1 MHz	-110
10000	100	1 MHz	-110

***Exhibit 9* – PSD mask**

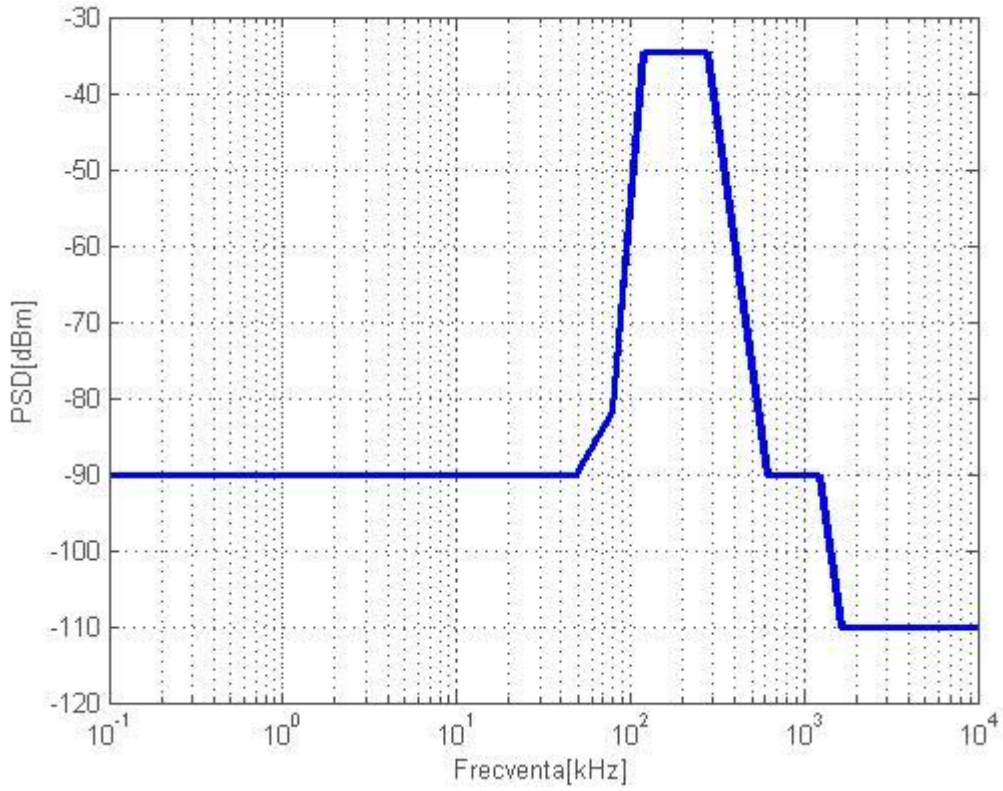


4.2. ADSL.FDD over ISDN - upstream PSD masks

Table 10 **– PSD breaking points**

Frequency [kHz]	R impedance [Ω]	B-power band width	PSD [dBm/Hz]
0.1	100	100 Hz	-90
4	100	1 kHz	-90
50	100	10 kHz	-90
80	100	10 kHz	-81.8
120	100	10 kHz	-34.5
276	100	10 kHz	-34.5
614	100	10 kHz	-90
1221	100	0.1/1 MHz	-90
1630	100	1 MHz	-110
10000	100	1 MHz	-110

Exhibit 10 **– PSD mask**

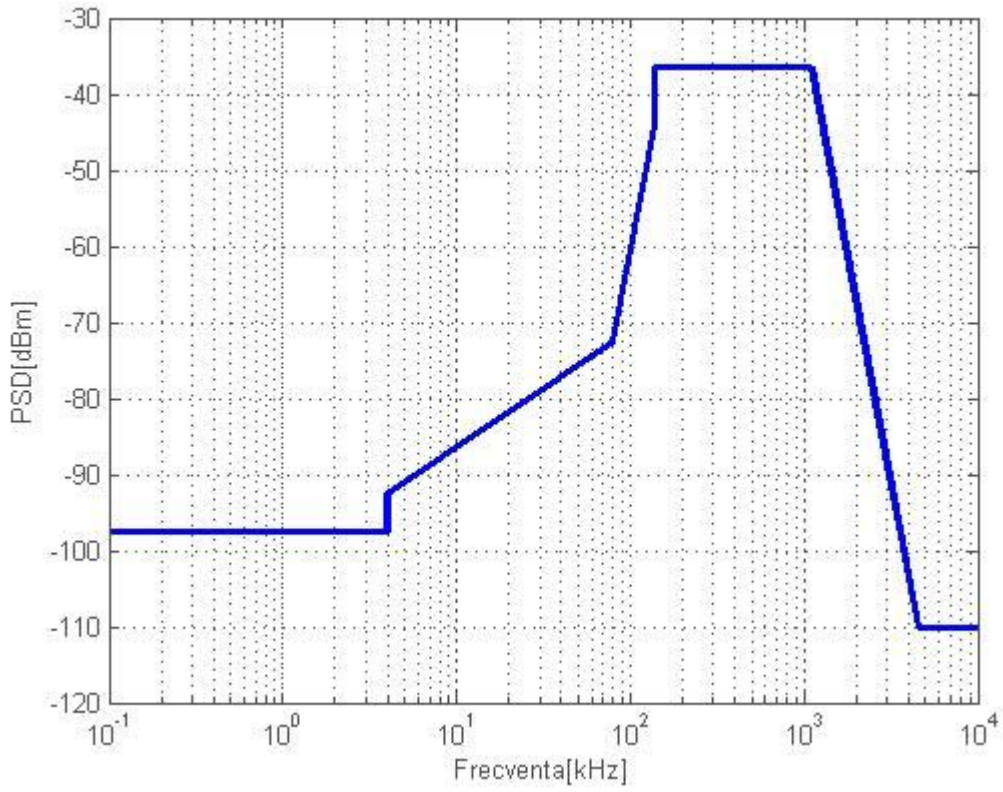


4.3. ADSL.FDD over POTS - downstream PSD masks

Table 11 **– PSD breaking points**

Frequency [kHz]	R impedance [Ω]	B-power band width	PSD [dBm/Hz]
0.1	600	100 Hz	-97.5
1	600	1 kHz	-97.5
4	600	1 kHz	-97.5
4.01	100	10 kHz	-92.5
80	100	10 kHz	-72.5
137.9	100	10 kHz	-44.2
138	100	10 kHz	-36.5
1104	100	10 kHz	-36.5
3093	100	10 kHz/1 MHz	-90
4545	100	1 MHz	-110
10000	100	1 MHz	-110

Exhibit 11 **– PSD mask**



Reference: 1. ETSI TR 101 830-1 (V1.3.1);
2. ETSI TS 101 388 (V1.3.1).

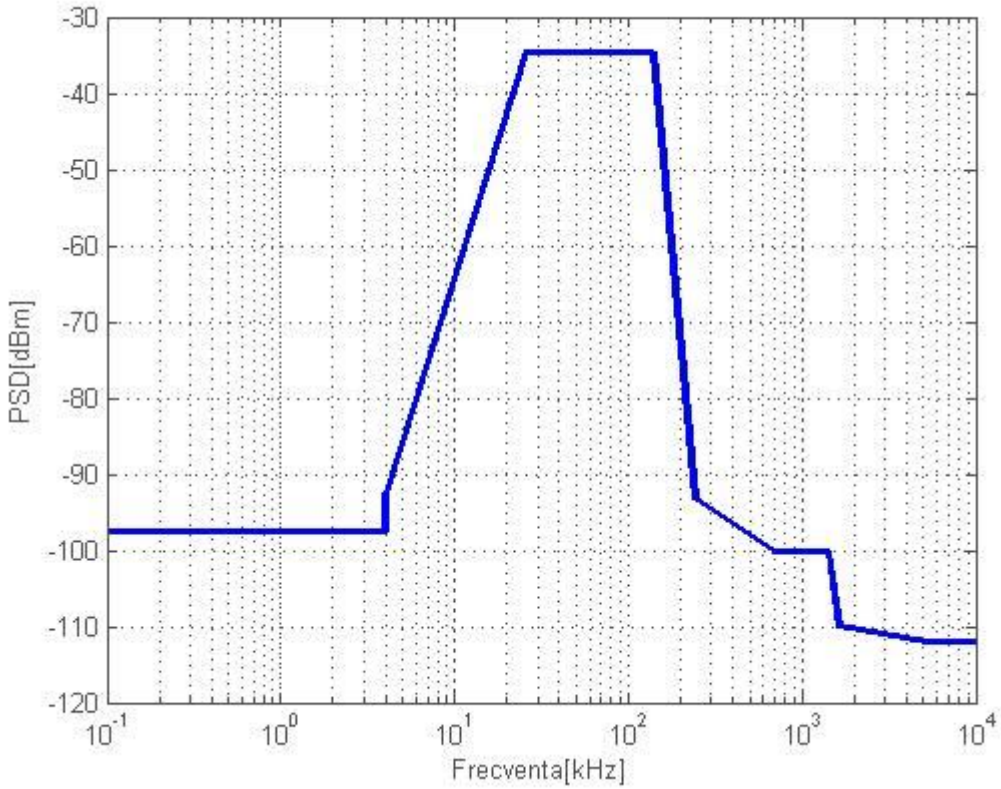
5. ADSL 2+

5.1. ADSL2+ over POTS – downstream PSD masks

Table 12 **– PSD breaking points**

Frequency [kHz]	R impedance [Ω]	B-power band width	PSD [dBm/Hz]
0.1	600	100 Hz	-97.5
4	600	100 Hz	-97.5
4.01	100	100 Hz	-92.5
25.875	100	10 kHz	-34.5
138	100	10 kHz	-34.5
243	100	10 kHz	-93.2
686	100	10 kHz	-100
1411	100	10 kHz/1 MHz	-100
1630	100	1 MHz	-110
5275	100	1 MHz	-112
10000	100	1 MHz	-112

Exhibit 12 **– PSD mask**

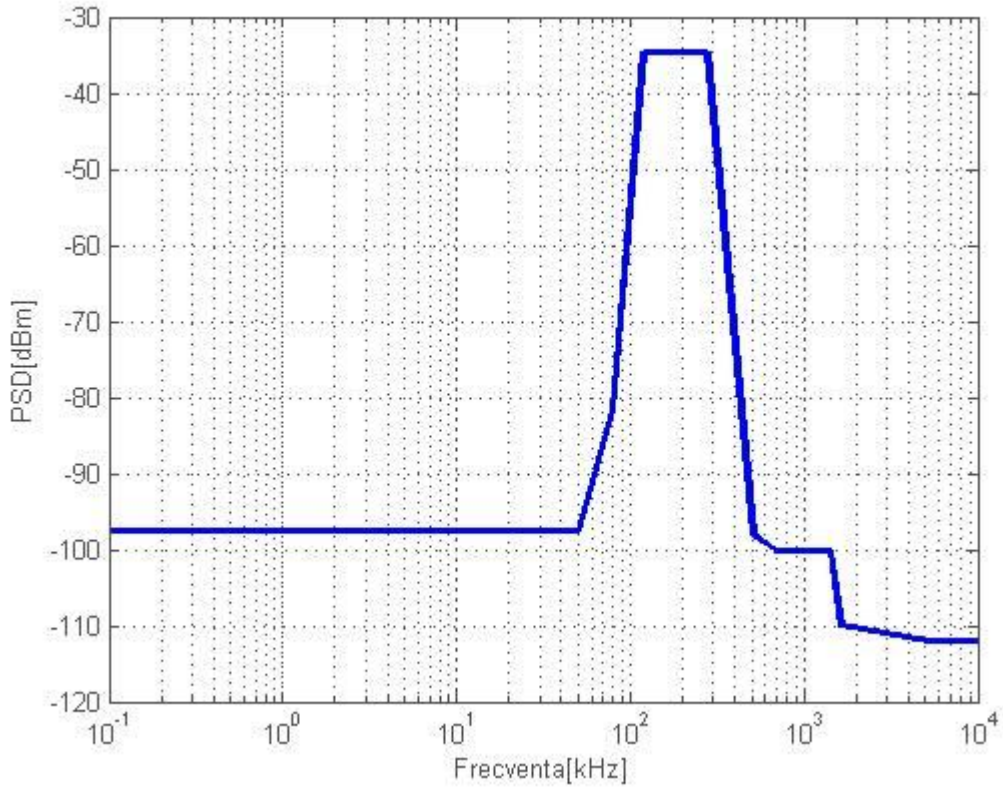


5.2. ADSL2+.FDD over ISDN – upstream PSD masks

Table 13 **– PSD breaking points**

Frequency [kHz]	R impedance [Ω]	B-power band width	PSD [dBm/Hz]
0.1	100	10 kHz	-97.5
50	100	10 kHz	-97.5
80	100	10 kHz	-81.8
120	100	10 kHz	-34.5
276	100	10 kHz	-34.5
508.8	100	10 kHz	-98
686	100	10 kHz	-100
1411	100	10 kHz/1 MHz	-100
1630	100	1 MHz	-110
5275	100	1 MHz	-112
10000	100	1 MHz	-112

Exhibit 13 **– PSD mask**

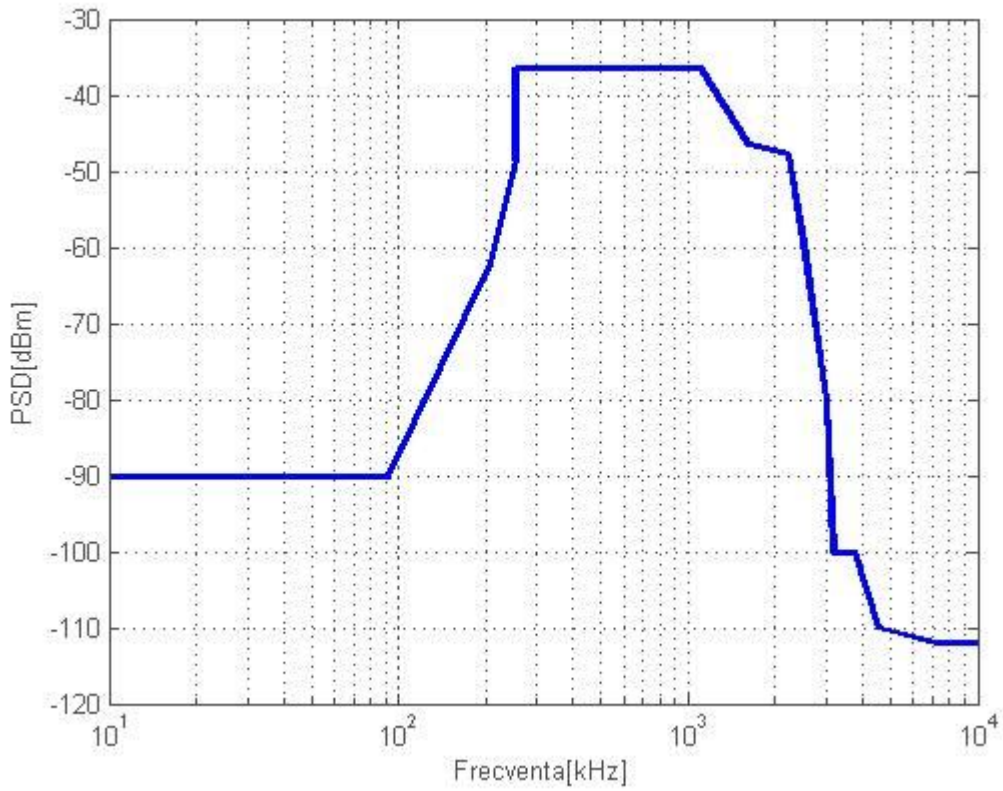


5.3. ADSL2+.FDD over ISDN – downstream PSD masks

Table 14 **– PSD breaking points**

Frequency [kHz]	R impedance [Ω]	B-power band width	PSD [dBm/Hz]
10	100	10 kHz	-90
93.1	100	10 kHz	-90
209	100	10 kHz	-62
253.9	100	10 kHz	-48.5
254	100	10 kHz	-36.5
1104	100	10 kHz	-36.5
1622	100	10 kHz	-46.5
2208	100	10 kHz	-47.8
2500	100	10 kHz	-59.4
3001.5	100	10 kHz	-80
3175	100	10 kHz	-100
3750	100	10 kHz/1 MHz	-100
4545	100	1 MHz	-110
7225	100	1 MHz	-112
10000	100	1 MHz	-112

Exhibit 14 **– PSD mask**



Reference: ITU-T G.992.5.