
TITLE **Text, for including power backoff in the SDSL + ADSL models**

PROJECTS Spectral Management, part 2.

SOURCE: Rapporteur, TNO Telecom

AUTHOR: Rob van den Brink

CONTACT: Rob F. M. van den Brink,
TNO Telecom
~~P.O. Box 421~~
~~2260 AK Leidschendam~~
PO Box 5050
2600 GB Delft
The Netherlands

tel ~~+31 70 4462389~~ +31.15.2857059
fax: ~~+31 70 4463166~~ +31.15.2857354
e-mail: R.F.M.vandenBrink@telecom.tno.nl

the above numbers and e-mail address are changed since 1 January 2003, and changed again since 21 nov 2003.

STATUS for Decision

ABSTRACT The inclusion of a smooth power backoff mechanism in the modelling of transmitters was provisionally agreed, but a few tiny details likes the literal text, were left open. The current Living List for SpM provides this text, plus a few editorial notes/questions for decision. This working document corrects some typos and proposes final text, to have this issue closed. Please spend special attention to the text in red.

<LITERAL TEXT PROPOSAL>

3.1 Definitions

Power back-off: is a generic mechanism to reduce the power. It has many purposes, including the reduction of power consumption, receiver dynamic range, crosstalk, etc.

Power cut-back: is specific variant of power back-off, used to reduce the dynamic range of the receiver. It is characterized by a frequency independent reduction of the in-band PSD. It is used, for instance, in ADSL and SDSL.

4.3 Cluster 3 Transmitter signal models

4.3.3 Transmitter signal model for "SDSL"

> ED. NOTE. PSD Template definition is already in the draft

Power back-off (both directions)
The transmitter signal model includes a mechanism to cut-back the power for short loops, and will be activated when the "Estimated Power Loss" (EPL) of the loop is below a threshold loss PL_{thres}. This EPL is defined as the ratio between the total transmitted power (in W), and the total received power (in W). This loss is usually expressed in dB as EPL_{dB}.
This power back-off *PCB* is equal for all transmit frequencies, and is specified in expression 1. Mark that this model is based on a smooth cut-back mechanism, although practical SDSL modems may cut back their power in discrete steps ("staircase"). This expression [*] is simplified for simulation purposes. The SDSL power back-of is described in [SDSLversion 1.2.1] clause 9.2.6.
NOTE: This method is applicable to SDSL 16-UC-PAM at rates up to 2,312 Mb/s

$$PCB_{dBm} = \begin{cases} = 0dB \\ = PL_{thres,dB} - EPL_{dB} \\ = 6dB \end{cases} \quad \begin{array}{l} \left(if \quad EPL_{dB} > PL_{thres,dB}\right) \\ \left(if \quad \left(PL_{thres,dBm} - 6dB\right) \le EPL_{dB} \le PL_{thres,dBm}\right) \\ \left(if \quad EPL_{dB} < \left(PL_{thres,dBm} - 6dB\right)\right) \end{array}$$

Expression 1: Power back-off of the transmitted signal (in both directions), as a function of the estimated power loss (EPL) and a threshold loss of PL_{thres}=6.5 db, and represents some average of the "staircase".

4.4 Cluster 4 Transmitter signal models

4.4.1 Transmitter signal model for "ADSL over POTS" (EC)

ED. NOTE. PSD Template definition is already in the draft

Power cut-back (downstream only)

The transmitter signal model includes a mechanism to cut-back the power for short loops and will be activated when the band-limited power P_{rec}, received within a specified frequency band at the other side of the loop, exceeds a threshold value P_{thres}. This frequency band is from 6.5×Δ*f* to 18.5×Δ*f*, where Δ*f* = 4.3125 kHz, and covers 12 consecutive sub carriers (7…18).
The cut back mechanism reduces the PSD template to a level PSD_{max}, as specified expression 2, for those frequencies where the downstream PSD template exceeds this level. For all other frequencies, the PSD template remains unchanged. Note that this model is based on a smooth cut-back mechanism, although practical ADSL modems may cut back their power in discrete steps ("staircase").

$$PSD_{\max,dBm} = \begin{cases} = -40dBm/Hz \\ = -40dBm/Hz - 2\times\left(P_{rec,dBm} - P_{thres,dBm}\right) \\ = -52dBm/Hz \end{cases} \quad \begin{array}{l} \left(if \quad \left(P_{rec,dBm} - P_{thres,dBm}\right) < 0dB\right) \\ \left(if \quad 0 \le \left(P_{rec,dBm} - P_{thres,dBm}\right) \le 6dB\right) \\ \left(if \quad \left(P_{rec,dBm} - P_{thres,dBm}\right) > 6dB\right) \end{array}$$

Expression 2: Maximum PSD values of the transmitted downstream signal, as a function of the band-limited received power P_{rec} and a threshold level of P_{thres} = 2.5 dB, and represents some average of the "staircase".

4.4.2 Transmitter signal model for "ADSL.FDD over POTS"

ED. NOTE. PSD Template definition is already in the draft

Power cut-back (downstream only)
The transmitter signal model includes a mechanism to cut-back the power for short loops, using the same mechanism as specified in expression 2, for modeling "ADSL over POTS" transmitters.

4.4.3 Transmitter signal model for "ADSL over ISDN" (EC)

ED. NOTE. PSD Template definition is already in the draft

Power cut-back (downstream only)
The transmitter signal model includes a mechanism to cut-back the power for short loops, and will be activated when the band-limited power P_{rec}, received within a specified frequency band at the other side of the loop, exceeds a threshold value P_{thres}. This frequency band is from 35.5×Δf to 47.5×Δf, where Δf = 4.3125 kHz, and covers 12 consecutive sub carriers (36…47).
The cut back mechanism reduces the PSD template to a level PSD_{max}, as specified expression 3, for those frequencies where the downstream PSD template exceeds this level. For all other frequencies, the PSD template remains unchanged. Note that this model is based on a smooth cut-back mechanism, although practical ADSL modems may cut back their power in discrete steps ("staircase").

$$PSD_{\max,dBm} = \begin{cases} = -40dBm/Hz \\ = -40dBm/Hz - \tfrac{4}{3} \times \left(P_{rec,dBm} - P_{thres,dBm}\right) \\ = -52dBm/Hz \end{cases} \quad \begin{matrix} \left(if \quad \left(P_{rec,dBm} - P_{thres,dBm}\right) < 0dB\right) \\ \left(if \quad 0 \le \left(P_{rec,dBm} - P_{thres,dBm}\right) \le 9dB\right) \\ \left(if \quad \left(P_{rec,dBm} - P_{thres,dBm}\right) > 9dB\right) \end{matrix}$$

Expression 3: Maximum PSD values of the transmitted downstream signal, as a function of the band-limited received power P_{rec} and a threshold level of P_{thres} = –0.75 dB, and represents some average of the "staircase".

4.4.4 Transmitter signal model for "ADSL.FDD over ISDN"

ED. NOTE. PSD Template definition is already in the draft

Power cut-backf (downstream only)
The transmitter signal model includes a mechanism to cut-back the power for short loops, using the same mechanism as specified in expression 3, for modeling "ADSL over ISDN" transmitters.