
TITLE **Input for a brainstorm on splitter filter requirements**

PROJECT VDSL part 1, and ADSL

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STATUS input for brainstorm

1. Purpose of this working document

While KPN was preparing TD27, we produced the tables in this working document. Due to lack of time, tables like this were not included in TD27. KPN will continue with internal discussion on this topic but we think that the tables are quite valuable to stimulate similar discussion at other operators or manufacturers.

This information is for brainstorming purposes only! KPN is not proposing this as splitter requirements.

x.5.2 Low frequency path (POTS)

Table 1a

Requirement / parameter	Recommended value	Remarks
Resistance to earth (A- wire and B-wire)	$\geq 10 \text{ ? } \text{M}\Omega$	Tested with $\geq 1000 \text{ V d.c.}$
DC resistance between A- and B-wire	$\geq 2 \text{ ? } \text{M}\Omega$	Tested with $\geq 150 \text{ V d.c.}$
DC series resistance (the sum of resistance of A- wire + resistance of B-wire)	$\leq 25 \text{ ? } \Omega$	
Insertion loss IL_{LT} and IL_{TL} 300-1000 Hz 1000-2400 Hz 2400-3400 Hz 3400-4000 Hz (note a5) (d.c. loop current 0-50 mA)	$\leq 0,15 \text{ ? dB}$ $\leq 0,2 \text{ ? dB}$ $\leq 0,3 \text{ ? dB}$ $\leq 1,5 \text{ ? dB}$	port L \rightarrow port T $Z_{\text{source}} = Z_{\text{ref}}$ $Z_{\text{load}} = Z_{\text{ref}}$
Passband ripple ????? 300-3400 Hz (d.c. loop current 0-50 mA)	$\leq 0,x \text{ ? dB}$	port L \rightarrow port T
Insertion loss at 25 Hz $\pm 1 \%$ and / or 50 Hz $\pm 1 \%$	$\leq 0,15 \text{ ? dB}$ (note a6)	port L \rightarrow port T $Z_{\text{source}} = 10 \text{ ? } \Omega$ $Z_{\text{load}} = 4000 \text{ ? } \Omega$
Total Harmonic Distortion, for all sine waves of frequencies 300 - 3400 Hz (by a d.c. loop current of 0-50 mA)	$\leq 2 \text{ ? } \%$	port L \rightarrow port T $Z_{\text{source}} = Z_{\text{ref}}$ $Z_{\text{load}} = Z_{\text{ref}}$
Transparency Transparency is defined by Return Loss requirements against 4 different impedance's Range: 300-3400 Hz Return Loss against Z1 Return Loss against Z2 Return Loss against Z3 Return Loss against Z4 (Z1 to Z4 are defined in table ...)	$\geq 14 \text{ ? dB}$ $\geq 14 \text{ ? dB}$ $\geq 14 \text{ ? dB}$ $\geq 14 \text{ ? dB}$	port T \rightarrow port L
Unbalance about earth LCL	$\geq 46 \text{ ? dB}$	port L port T
Noise (psophometric)	$\leq -70 \text{ ? dBVp}$	port L ; port T
Pulse distortion	$\leq x \text{ ms.}$	
Insertion loss from f_L to f_H kHz (= ADSL band)	$\geq 80 \text{ ? dB}$ $\geq 80 \text{ ? dB}$	port T \rightarrow port L $Z_{\text{source}} = 135 \text{ } \Omega$ $Z_{\text{load}} = 135 \text{ } \Omega$

Table [x] POTS splitter requirements

Note a5 - The frequency range 3400-4000 is specified to support V.34 modems at high bitrates.

Note a6 - An Insertion Loss of 0,15 dB (0,3 dB for two splitters) gives for example a decrease in voltage from 30 Volts to 29 Volts.

x.5.2.1. Metering

In case of metering at 12 or 16 kHz we have additional requirements. see Table 1b

Table 1b

	Requirement / parameter	Recommended value	Remarks
	Insertion loss 12 kHz 16 kHz	$\leq x$? dB $\leq x$? dB	Zsource = ? Zload = 200 Ω

Table [x] POTS metering splitter requirements

x.5.2.1 Separate low and high frequency part

If the splitter consist of a separate low frequency and a separate high frequency part, we have to add a requirement for the high frequency band (ADSL / VDSL) . See table 1c

Table 1c

	Requirement / parameter	Recommended value	Remarks
	Impedance from f_L to f_H kHz	≥ 10 ? k Ω	at port L

x.5.3. Low frequency path (ISDN)

The requirements are in table 2a.

Table 2a -

	Requirement / parameter	Recommended value	Remarks
	Resistance to earth (A- wire and B-wire)	≥ 10 ? M Ω	Tested with ≥ 1000 V d.c.
	DC resistance between A- and B-wire	≥ 2 ? M Ω	Tested with ≥ 150 V d.c.
	DC series resistance (the sum of resistance of A- wire + resistance of B-wire)	≤ 40 ? Ω	
	Insertion loss from 100 Hz to f_l kHz	$\leq 1,0$? dB	port T to port L Zsource = 135 Ω Zload = 135 Ω
	Passband ripple ?????????? from 100 Hz to f_l kHz	$\leq x$ dB	port T to port L Zsource = 135 Ω Zload = 135 Ω
	Return loss from 100 ? Hz to f_l kHz (against 135 Ω)	≥ 14 ? dB	
	Unbalance about earth from 100 Hz to f_l kHz	≥ 46 ? dB	
	Noise at port T from 100 Hz to f_l kHz	≤ -100 ? dBm (in 1 kHz)	
	Insertion loss from f_L to f_H kHz (= ADSL band)	≥ 80 ? dB	port T to port L Zsource = 135 Ω Zload = Zref or 135 Ω

x.5.3.1. Separate low and high frequency part

If the splitter consist of a separate Low frequency and a separate High frequency part, we have to add a requirement for the ADSL band. See table 2

Table 2b

Requirement / parameter	Recommended value	Remarks
Impedance from f_L to f_H kHz	$\geq 10 \text{ ? k}\Omega$	

x.5.4 High frequency path (ADSL / VDSL)

Table 3a

Requirement / parameter	Recommended value	Remarks
Resistance to earth (A- wire and B-wire)	$\geq 10 \text{ ? M}\Omega$	
DC resistance between A- and B-wire at port L and port X	$\geq 2 \text{ ? M}\Omega$	
Series resistance A-wire B-wire	$\geq 2 \text{ M}\Omega$ $\geq 2 \text{ M}\Omega$	port L \rightarrow port X port X \rightarrow port L
Insertion loss from f_L to f_H kHz	$\leq 0,5 \text{ dB}$	port L \rightarrow port X port X \rightarrow port L
Passband ripple from f_L to f_H kHz	$\leq 0,5 \text{ dB}$	port L \rightarrow port X port X \rightarrow port L
Return loss from f_L to f_H kHz (against $135 \text{ }\Omega$)	$\geq 14 \text{ ? dB}$	at port L at port X
Unbalance about earth from f_L to f_H kHz	$\geq 46 \text{ ? dB}$	at port L at port X
Noise from f_L to f_H kHz	$\leq -100 \text{ ? dBm}$ (in 1 kHz)	at port L at port X
Insertion loss from 300 Hz to 3400 Hz	$\geq 80 \text{ ? dB}$	port T \rightarrow port L $Z_{\text{source}} = 135 \text{ }\Omega$ $Z_{\text{load}} = Z_{\text{ref}}$ or $135 \text{ }\Omega$ (in case of POTS)
Insertion loss 12 kHz / 16 kHz	$\geq 80 \text{ ? dB}$	port T \rightarrow port L $Z_{\text{source}} = 135 \text{ }\Omega$ $Z_{\text{load}} = Z_{\text{ref}}$ or $135 \text{ }\Omega$ (in case of metering)
Insertion loss from 100 ? Hz to f_1 kHz	$\geq 80 \text{ ? dB}$	port T \rightarrow port L $Z_{\text{source}} = 135 \text{ }\Omega$ $Z_{\text{load}} = Z_{\text{ref}}$ or $135 \text{ }\Omega$ (in case of ISDN)

x.5.4.1 Separate low and high frequency part

If the splitter consist of a separate Low frequency and a separate High frequency part, we have to add a requirement for the port L. See table 3b

Table 3b

	Requirement / parameter	Recommended value	Remarks
	DC resistance between A- and B-wire	$\geq 2 \text{ ? } M\Omega$	at port L
	Impedance at port L from 25 Hz to 3400 Hz	$\geq 10 \text{ ? } k\Omega$	in case of POTS
	Impedance at port L 12 kHz / 16 kHz	$\geq 10 \text{ ? } k\Omega$	in case of 12 /16 kHz metering
	Impedance at port L from 100 Hz to f_1 kHz	$\geq 10 \text{ ? } k\Omega$	in case of ISDN