

Annex 63B. Performance guidelines for 2BASE-TL PMD profiles

63B.1 Introduction and rationale

Annex 63B defines performance guidelines for 2Base-TL PMD profiles. The definition of those guidelines is challenging due to the varying nature of the access network. The access network has large variations in cable characteristics from region to region. In addition, the make-up of a cable can encompass multiple cable gauges and/or different configuration of bridged taps. Finally, services may vary from region to region creating different noise scenarios. Typically, deployment guidelines are a function of the telecommunications operator, which is operating a loop and the regional spectrum management policies, which govern deployment on that loop.

Given that one cannot test every possible combination of loop make-up and noise conditions, the performance guidelines are covered from two perspectives. Firstly, Section 63B.3 lists a suite of artificial tests crafted to test the 2Base-TL PHYs under representative worst-case noise and loop conditions. Secondly, Section 63B.3 defines a deployment guideline rule which allows a service provider to determine whether a given loop will support a given profile.

63B.2 Relationship to other clauses

Annex 63A [see Annex 63A] lists a set of PMD profiles for 2Base-TL.

Clause 30 [see Clause 30] describes how the selection of Annex 63A profiles is exported to a management entity.

Clause 45 [see Clause 45] registers describe an optional mechanism for configuring a 2Base-TL PHY to use a particular profile. The register settings for each profile are contained in 63A.x.y.z

63B.3 Performance Test Cases.

Profiles 1 shall successfully pass the corresponding test described in Table A-1 of G.991.2.

Editor's note: There are no test in G.991.2 specifically defined to test the 1024, 704 and 512kbps rates. One could define completely new tests, however this would necessitate new test equipment. The tests in Table 63A-1 reuse the noise shapes defined for the existing 768kbps. The length of the loop is adjusted in

order to challenge the Device Under Test (DUT) in the same way as for the other rates.

The profiles associated with the 1024, 704 and 512 kbps (profiles 2, 3 and 4) shall satisfy the tests described in table 63A-1. The same test methodology defined in G.991.2 annex A shall be applied. The test cases are numbered 57 to 74 to differentiate them from the existing tests 1 to 56 in Table A-1 of G.991.2.

Table 63A-1. Additional tests for the Annex A 1024 & 704 kbps data rate

Test	Test Loop (from Table A-1 of G.991.2)	L ($\times 1000'$)	Test Unit	Payload Data Rate (kbps)	PSD	Interferer Combination	Required Margin (dB)
57	S	9.3	STU-C	1024	symmetric	49-HDSL	$5 + \Delta^*$
58	BT1-C	8.1	STU-C	1024	symmetric	49-SHDSL_768_sym	$5 + \Delta^*$
59	BT1-C	8.1	STU-C	1024	symmetric	49-HDSL	$5 + \Delta^*$
60	S	9.3	STU-R	1024	symmetric	49-HDSL	$5 + \Delta^*$
61	BT1-R	8.1	STU-R	1024	symmetric	49-SHDSL_768_sym	$5 + \Delta^*$
62	BT1-R	8.1	STU-R	1024	symmetric	49-HDSL	$5 + \Delta^*$
63	S	11.3	STU-C	704	symmetric	49-HDSL	$5 + \Delta^*$
64	BT1-C	10.4	STU-C	704	symmetric	49-SHDSL_768_sym	$5 + \Delta^*$
65	BT1-C	10.4	STU-C	704	symmetric	49-HDSL	$5 + \Delta^*$
66	S	11.3	STU-R	704	symmetric	49-HDSL	$5 + \Delta^*$
67	BT1-R	10.4	STU-R	704	symmetric	49-SHDSL_768_sym	$5 + \Delta^*$
68	BT1-R	10.4	STU-R	704	symmetric	49-HDSL	$5 + \Delta^*$
69	S	13.4	STU-C	512	symmetric	49-HDSL	$5 + \Delta^*$
70	BT1-C	12.3	STU-C	512	symmetric	49-SHDSL_768_sym	$5 + \Delta^*$
71	BT1-C	12.3	STU-C	512	symmetric	49-HDSL	$5 + \Delta^*$
72	S	13.4	STU-R	512	symmetric	49-HDSL	$5 + \Delta^*$
73	BT1-R	12.3	STU-R	512	symmetric	49-SHDSL_768_sym	$5 + \Delta^*$
74	BT1-R	12.3	STU-R	512	symmetric	49-HDSL	$5 + \Delta^*$

Profile 5, 6 and 8 shall be tested using the tests defined in Annex B of G.991.2. The loops defined in annex B do not scale as well as the loops of annex A because they are defined in terms of insertion loss at a given frequency (with a granularity of 0.5dB), rather than a length in meters. The 704kbps data rate (profile 7) is expected to successfully pass the test associated with the 768kbps data rate. Therefore, for Annex B testing, the 704kbps data rate will be tested using the 768 kbps test.

63B.4 Deployment Guidelines

The ITU-T G.991.2 defines an equivalent loop attenuation which can be used to determine whether a cable insertion loss function $I/H(f)$, can support a given profile associated with a nominal transmit signal power spectral density $S(f)$. The loop attenuation should not be confused with another popular metric called the loop insertion loss at a given frequency. The latter specifies the insertion loss of the loop at a single

frequency while the former weights the transmitted signal PSD and insertion loss of the loop over a frequency range corresponding to the transmitted signal bandwidth. The loop attenuation provides a more precise estimate of the loop capability to support a given data rate.

The SHDSL Loop Attenuation shall be defined as follows (section 9.5.5.7.5 of G.991.2):

$$LoopAtten_{SHDSL}(H) = \frac{2}{f_{Baud}} \left(\int_0^{\frac{f_{Baud}}{2}} 10 * \log_{10} \left[\sum_{n=0}^1 S(f - nf_{Baud}) \right] df - \int_0^{\frac{f_{Baud}}{2}} 10 * \log_{10} \left[\sum_{n=0}^1 S(f - nf_{Baud}) |H(f - nf_{Baud})|^2 \right] df \right)$$

where f_{Baud} is the symbol rate, $1/H(f)$ is the insertion loss of the loop, and $S(f)$ is the nominal transmit PSD.

Table 63B-1 lists the maximum loop attenuation for a margin of 5 dB assuming the presence of 49 and 12 self-interferers for the profiles defined in annex 63-A. The 49 self-interferer case corresponds to a very conservative deployment reach.

Table 63B-1. Loop Attenuation guideline.

Profile	Data rate (kbps)	Maximum SHDSL Loop Attenuation for 49-self-interferers	Maximum SHDSL Loop Attenuation for 12-self-interferers
1 & 5	2048	24.0	27.7
3 & 6	1024	28.6	32.1
4 & 7	704	31.0	34.7
5 & 8	512	33.1	36.7

Assuming a data rate of 2048kbps, the deployment reach for AWG24 gauge cable corresponds to 2.8km for the 49-self number and 3.2km for the 12-self number.