



TECHNICAL REPORT

TR-105

ADSL2/ADSL2plus Functionality Test Plan

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Executive Summary

See *Executive Summary/TR-105 Issue 2*.

TR-105 contains new tests or modifications to the existing material in TR-105 Issue 2.

The following tests are added:

1. *Inhibition of Performance Monitoring Counters* in Section 7.8
2. *Performance monitoring counters during retransmission* in Section 7.9

The following tests are modified:

1. *Low power (L2) mode* in Section 5.8
2. *Performance monitoring counters for Failed Full Initialization* in Section 7.5

1 Purpose and Scope

See *Section 1/TR-105 Issue 2*.

2 References and Terminology

2.1 Conventions

In this Technical Report, several words are used to signify the requirements of the specification. These words are always capitalized. More information can be found in RFC 2119 [5].

SHALL	This word, or the term “REQUIRED”, means that the definition is an absolute requirement of the specification.
SHALL NOT	This phrase means that the definition is an absolute prohibition of the specification.
SHOULD	This word, or the term “RECOMMENDED”, means that there could exist valid reasons in particular circumstances to ignore this item, but the full implications need to be understood and carefully weighed before choosing a different course.
SHOULD NOT	This phrase, or the phrase "NOT RECOMMENDED" means that there could exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications need to be understood and the case carefully weighed before implementing any behavior described with this label.
MAY	This word, or the term “OPTIONAL”, means that this item is one of an allowed set of alternatives. An implementation that does not include this option SHALL be prepared to inter-operate with another implementation that does include the option.

2.2 References

The following references are of relevance to this Technical Report. At the time of publication, the editions indicated were valid. All references are subject to revision; users of this Technical Report are therefore encouraged to investigate the possibility of applying the most recent edition of the references listed below.

A list of currently valid Broadband Forum Technical Reports is published at www.broadband-forum.org.

See *Section 2.2/TR-105 Issue 2*.

Document	Title	Source	Year
[1] TR-105 Issue 2	<i>ADSL2/ADSL2plus Functionality Test Plan</i>	BBF	2011
[2] TR-100 Issue 2	<i>ADSL2/ADSL2plus Performance Test Plan</i>	BBF	2012
[3] G.992.3 Amendment 4	<i>Assymetric digital subscriber line transceivers 2 (ADSL2), Amendment 4</i>	ITU-T	2011

- | | | | | |
|-----|----------|---|-------|------|
| [4] | G.997.1 | <i>Physical Layer Management for Digital Subscriber Line (DSL) Transceivers, including all in force amendments and corrigenda</i> | ITU-T | 2012 |
| [5] | RFC 2119 | <i>Key words for use in RFCs to Indicate Requirement Levels</i> | IETF | 1997 |

2.3 Definitions

The following terminology is used throughout this Technical Report.

See *Section 2.3/TR-105 Issue 2*.

2.4 Abbreviations

This Technical Report uses the following abbreviations:

See *Section 2.4/TR-105 Issue 2*.

LS	Line power management state (L0-Showtime, L2-Low Power)
PEIN	Prolonged Electrical Impulse Noise
REIN	Repetitive Electrical Impulse Noise

2.5 G.997.1 Parameters

This Technical Report uses the following abbreviations:

See *Section 2.5/TR-105 Issue 2*.

Parameter	Section in G.997.1
ACTINP	7.5.2.4
LOSS-L	7.2.1.1.4
LOSS-LFE	7.2.1.2.4

3 Technical Report Impact

3.1 Energy Efficiency

TR-105 contains a revision of the L2 low power mode test, allowing for reliable testing of systems implementing extended Lp values defined in G.992.3 Amendment 4 [3].

3.2 IPv6

TR-105 has no impact on IPv6.

3.3 Security

TR-105 has no impact on security.

3.4 Privacy

Any issues regarding privacy are not affected by TR-105.

4 Inhibition of Performance Monitoring Counters

Add section 7.8 Inhibition of Performance Monitoring Counters as follows:

7.8 Inhibition of Performance Monitoring Counters

Table 7-9 Test of inhibition of CV, ES, SES, LOSS counters

Test Configuration	<p>(1) See Section 4.1 [1] for the test configuration.</p> <p>(2) Configure the SUT with one of the specific test profiles relevant for the G.992.5 Annex under test:</p> <ul style="list-style-type: none"> • A2P_RA_F_30000k and A2P_RA_I_30000k <ul style="list-style-type: none"> i. DS: I-16/2 ii. US: I-16/0.5 • B2P_RA_F_30000k and B2P_RA_I_30000k <ul style="list-style-type: none"> i. DS: I-16/2 ii. US: I-16/0.5 <p>(3) Additional test conditions: OPTIONAL OLR (SRA, DRR) SHALL not be used.</p>
Method of Procedure	<p>(1) Connect ATU-C and ATU-R to 7kft 26AWG or 2250m PE04 for Annex A, or 2250m PE04 for Annex B.</p> <p>(2) Set the noise generator to -120dBm/Hz AWGN at the ATU-R side and to -110dBm/Hz AWGN at the ATU-C side of the loop.</p> <p>(3) Force an initialization and wait for modem to sync. Wait 1 minute following synchronization.</p> <p>(4) Note down the value of the CV-C, CV-CFE, ES-L, ES-LFE, SES-L, SES-LFE, LOSS-L and LOSS-LFE performance monitoring counters at the ATU-C and, if available, the value of the CV-C, ES-L, SES-L and LOSS-L counters at the ATU-R.</p> <p>(5) Inject the REIN noise of duration $T_{burst}=2sec$ (Figure 7-1 [1]) at the ATU-R side of the loop with a pulse duration Δ_{REIN} depending on the specific test profile:</p> <ul style="list-style-type: none"> • X2P_RA_F_30000k: $\Delta_{REIN} = 100\mu s$ • X2P_RA_I_30000k: calculate Δ_{REIN} as $[(\max(\text{ACTINP}_{us}, \text{ACTINP}_{ds}) + 1) \times 0.25ms] \times 2$, rounded up to the nearest ms <p>(6) Force performance monitoring counters update and wait 30 seconds for the counters to be read out.</p> <p>(7) Note down the values of the counters as in step (4).</p> <p>(8) Calculate the increase of these counters between the values from step (7) and step (4).</p> <p>(9) Force one "micro-interruption" of duration 200ms.</p> <p>(10) Force performance monitoring counters update and wait 30 seconds for the counters to be read out.</p>

	<p>(11) Note down the values of the counters as in step (4).</p> <p>(12) Calculate the increase of these counters between the values from step (11) and step (7).</p> <p>(13) Inject the REIN noise as in step (5) but with $T_{burst}=15sec$.</p> <p>(14) If the modems retrain, wait until they reach Showtime.</p> <p>(15) Wait 10 seconds.</p> <p>(16) Force performance monitoring counters update and wait 30 seconds for the counters to be read out.</p> <p>(17) Note down the values of the counters as in step (4).</p> <p>(18) Calculate the increase of these counters between the values from step (17) and step (11).</p>
Expected Result	<p>(1) As measured in MOP(8), the increase of SES-LFE counter at the ATU-C shall be ≥ 2 and ≤ 3. If the increase of SES-LFE counter at the ATU-C is 3, the increase of CV-C counter at the ATU-R and the increase of CV-CFE counter at the ATU-C SHALL be ≤ 1. If the increase of SES-LFE counter at the ATU-C is 2, the increase of CV-C counter at the ATU-R and the increase of CV-CFE counter at the ATU-C SHALL be ≤ 18.</p> <p>(2) As measured in MOP(8), the increase of ES-L counter at the ATU-R and the increase of ES-LFE counter at the ATU-C SHALL be ≥ 2 and ≤ 4.</p> <p>(3) As measured in MOP(12), the increase of LOSS-L counter at the ATU-R, as well as the increase of LOSS-LFE counter at the ATU-C, SHALL be ≥ 1 and ≤ 2.</p> <p>(4) As measured in MOP(18), the increase of ES-L at the ATU-R, as well as the increase of ES-LFE at the ATU-C SHALL be ≤ 2.</p> <p>(5) As measured in MOP(18), no increase of SES-L and LOSS-L at the ATU-R, as well as no increase of SES-LFE and LOSS-LFE counter at the ATU-C SHALL be reported.</p>

5 Performance Monitoring Counters during Retransmission

Add section 7.9 Performance monitoring counters during retransmission as follows:

7.9 Performance Monitoring Counters during G.998.4 retransmission

Table 7-10 Test of performance monitoring counters during retransmission

Test Configuration	(1) See Section 4.1 [1] for the test configuration. The ADSL2plus test profile shall be configured to A2P_RA_R15/0/41_30000k (as defined in Table R-4 [2]).
Method of Procedure	<ol style="list-style-type: none"> (1) Connect ATU-C and ATU-R to 2400m PE04. (2) Set the noise generator to -140dBm/Hz AWGN at the ATU-R and ATU-C end of the loop. (3) Force an initialization and wait for modem to sync. Wait 1 minute following synchronization. (4) Note down the initial value of the CV-CFE, ES-LFE and SES-LFE counters at the ATU-C. (5) Enable PEIN test pattern 1 as given in Table 7-11. (6) Allow test to run for 2 minutes. (7) Disable PEIN test pattern. (8) Note down the initial value of the CV-CFE, ES-LFE and SES-LFE counters at the ATU-C. (9) Calculate the increase of these counters between step (4) and step (8). (10) Enable PEIN test pattern 2 as given in Table 7-11. (11) Allow test to run for 2 minutes. (12) Disable PEIN test pattern. (13) Note down the value of the CV-CFE, ES-LFE and SES-LFE counters at the ATU-C. (14) Calculate the increase of these counters between step (8) and step (13).
Expected Result	<ol style="list-style-type: none"> (1) No loss of synchronization SHALL occur during the test. (2) As measured in step (9), there SHALL be no increase in CV-CFE, ES-LFE and SES-LFE counters. (3) As measured in step (14), there SHALL be: <ol style="list-style-type: none"> i. an increase in CV-CFE counter ≥ 120 and ≤ 360 ii. an increase in ES-LFE counter of at least 120 but not more than 121 iii. no increase in the SES-LFE counter

Table 7-11 PEIN test patterns during retransmission test

PEIN test pattern 1	
PSD (dBm/Hz)	Pulse Duration
-86	5 ms
-140	995 ms
Repeat above sequence for 2 minutes	

PEIN test pattern 2	
PSD (dBm/Hz)	Pulse Duration
-86	20 ms
-140	980 ms
Repeat above sequence for 2 minutes	

6 Low power (L2) mode

Modify section 5.8 Low power (L2) mode as follows:

5.8 Low power (L2) mode

The purpose of this test is to verify the functionality of the L2 mode. The test SHALL be performed for the following general line settings: F-1/0 and either I-16/0.5 (for systems supporting Downstream Framing-Memory Class FC1 defined in Table 4-6 [1]) or 16/2 (for systems supporting other Downstream Framing-Memory Classes defined in Table 4-6 [1]) for G.992.5 Annex A, and F-1/0 and 16/2 for G.992.5 Annex B. The test SHALL be performed for two out of the three following parameter sets.

Table 5-35 L2 mode test parameter sets

Parameter Set	L0-TIME (s)	L2-TIME (s)	L2-ATPR (dB)	L2-ATPRT (dB)
1	10	10	5	20
2	30	30	1	5
3	10	10	3	12

Table 5-36 L2 mode test

Test Configuration	<ol style="list-style-type: none"> (1) See Section 4.1 [1] for the test configuration. (2) Configure the SUT for operation in the following specific test profiles associated to the ADSL operation mode to be tested: <ul style="list-style-type: none"> • G.992.5 Annex A: A2P_RA_F_30000k, A2P_RA_I1/2_30000k or A2P_RA_I_30000k • G.992.5 Annex B: B2P_RA_F_30000k, B2P_RA_I_30000k (2) Connect ATU-C and ATU-R to 4 kft 26AWG or 1250m PE04 for Annex A or 1250m PE04 for Annex B. (3) Configure one of the L2 mode parameter sets defined in Table 5-35. (4) Set the noise generator to -120dBm/Hz AWGN at both ends of the loop. (5) Enable low power mode by configuring parameter PMMode. (6) Following additional parameters are to be used for this test: Minimum data rate in low power state = 128kbps. (7) Additional test conditions: OPTIONAL OLR (SRA) SHALL be disabled. (8) Configure the traffic generator to send frames with a fixed size of 1024 bytes.
Method of Procedure	<ol style="list-style-type: none"> (1) Force a new initialization and wait for modems to sync. (2) Directly after synchronization, inject bi-directional traffic at a rate of 75% of maximum theoretical throughput.

	<p>(3) Wait for 1 minute for bitswaps to settle.</p> <p>(4) Note down the L2 mode parameter set.</p> <p>(5) On ATU-C side, note down the Line power management state as LS1, ACTATPds1, actual SNRMds1 and net data rate DS as rateDS1. On ATU-R side, note down the net data rate DS as rateDS1_R.</p> <p>(6) On ATU-C side, note down the values of CV and SES counters as CV1 and SES1, respectively.</p> <p>(7) Start the packet loss measurement in both directions.</p> <p>(8) Reduce the DS traffic to a rate less than 64kbps.</p> <p>(9) Wait for $((L2-ATPRT / L2-ATPR) * L2-TIME + L0-TIME + 30s)$ for L2 mode transition and maximum power reduction.</p> <p>(10) Stop the packet loss measurement.</p> <p>(11) On ATU-C side, note down the Line power management state as LS2, ACTATPds2, actual SNRMds2 and net data rate DS as rateDS2. On ATU-R side, note down the net data rate DS as rateDS2_R.</p> <p>(12) Wait a further 5 minutes.</p> <p>(13) On ATU-C side, note down the Line power management state as LS3, ACTATPds3, actual SNRMds3 and net data rate DS as rateDS3. On ATU-R side, note down the net data rate DS as rateDS3_R.</p> <p>(14) Start the packet loss measurement in both directions.</p> <p>(15) Increase traffic to the rate defined in step (2).</p> <p>(16) Wait for 30 sec.</p> <p>(17) Note down the values of CV and SES counters on ATU-C side as CV2 and SES2, respectively.</p> <p>(18) On ATU-C side, note down the Line power management state as LS4, ACTATPds4, actual SNRMds4 and net data rate DS as rateDS4. On ATU-R side, note down the net data rate DS as rateDS4_R.</p> <p>(19) If $LS4 \neq L0$ and the DS traffic is below the maximum theoretical throughput, increase the DS traffic by 10% of maximum theoretical throughput (but not above the maximum theoretical throughput) and redo steps (16)-(19) (see NOTE).</p> <p>(20) Stop the packet loss measurement.</p> <p>(21) Repeat steps (1) to (20) with another L2 mode parameter set, different from the set reported in (4).</p>
Expected Result	<p>(1) No loss of synchronization SHALL occur during the test.</p> <p>(2) $LS2 = L2$ and $LS3 = L2$.</p>

	<p>(3) $LS1 = L0$ and $LS4 = L0$.</p> <p>(4) $ACTATPds2 < ACTATPds1$.</p> <p>(5) $ACTATPds2 = ACTATPds3$.</p> <p>(6) $ACTATPds4 - ACTATPds1 \leq 1dB$.</p> <p>(7) $SNRMds1 - SNRMds4 \leq 1dB$.</p> <p>(8) $rateDS1 = rateDS2 = rateDS3 = rateDS4$.</p> <p>(9) $rateDS1_R = rateDS2_R = rateDS3_R = rateDS4_R$.</p> <p>(10) $SES2 - SES1 = 0$.</p> <p>(11) $CV2 - CV1 \leq 1$.</p> <p>(12) No more than 1 packet lost is measured during L2 entry (steps 7-10) or during L2 exit (steps 14-20) in either direction.</p>
<p>NOTE: This step may be necessary for G.992.5 systems supporting extended Lp values in L2 low power mode, as defined in Table 7-23 in G.992.3 Amendment 4.</p>	

7 Performance Monitoring Counters for Failed Full Initialization

Modify section 7.5 Performance monitoring counters for Failed Full Initialization as follows:

7.5 Performance monitoring counters for Failed Full Initialization

Table 7-6 Correct reporting of the Failed Full Initialization counter

Test Configuration	<ol style="list-style-type: none"> (1) See Section 4.1 [1] for the test configuration. (2) Configure the ATU-C with A2_Fix_I_7288k or B2_Fix_I_7288k profile depending on the G.992.3 Annex under test.
Method of Procedure	<ol style="list-style-type: none"> (1) Connect ATU-C and ATU-R to 4000m PE04 or 12kft 26AWG for Annex A, or 3000m PE04 for Annex B and -140dBm/Hz White Noise injected on both sides. (2) Note down the initial value of failed full initialization counter at the ATU-C. (3) Wait for 3 minutes. (4) Note down the value of failed full initialization counter at the ATU-C. (5) Calculate the increase of failed full initialization counter as the noted value of step (4) minus the noted value of step (2). (6) If during any time during the test the modem synchronizes, stop the test execution, increase the PE04 loop length by 150m or the 26AWG loop length by 500ft and redo the test from step (1).
Expected Result	The increase of the failed full initialization counter SHALL be greater than or equal to 2.

End of Broadband Forum Technical Report TR-105