TR-338
Reverse Power Feed Testing

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Issue History

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Executive Summary

Broadband Forum's Technical Report TR-338 [1] defines functional and safety test cases for the Power Source Equipment (PSE) implemented according to ETSI specification TS 101 548-1 [3], either as a stand-alone device or as a function integrated in the G.fast network termination ([4] and [5]), and reversely powered DPU implementations ([2]). Issue 1 of TR-338 focuses on a PSE standalone tests in the test setup in which a DPU implementation only includes the reverse powering features specified in [3].

This amendment to TR-338 [1] includes new Appendix I, with testing guidance and generalized test setup for the Differential Mode RPF Noise Limits test.

1   Purpose and Scope

1.1   Purpose

With short copper loops required by G.fast Distribution Point Units (DPUs) that push the deployment of the DPUs closer to the customer premises, local power and forward power may not be available at the deployment location. To power the DPU, power will come from the customer premises location over the copper pair used for data transmission; this is referred to as Reverse Power Feed (RPF).

Broadband Forum's technical Report TR-338 [1] specifies a set of test cases and related pass/fail requirements for reverse powering (RPF) of remote network nodes (Gfast DPUs, single-port or multi-port) from customer premises equipment (one or multiple CPEs). Specifically, it defines functional and safety test cases for the Power Source Equipment (PSE) implemented according to ETSI specification TS 101 548-1 [3], either as a stand-alone device or as a function integrated in the G.fast network termination ([4] and [5]), and reversely powered DPU implementations ([2]). Issue 1 of TR-338 focuses on a PSE standalone tests in the test setup in which a DPU implementation only includes the reverse powering features specified in [3].

Test cases are mainly specified with reference to TS 101 548-1 [3] and TR-301 [2] requirements. Furthermore they are designed to ensure safe deployment of RPF equipment.

1.2   Scope

This document is an informative supplement to TR-338 [1]. It contains, in Appendix I, testing guidance and generalized test setup for the Differential Mode RPF Noise Limits test.

2   References and Terminology

2.1   Conventions

In this Working Text, several words are used to signify the requirements of the specification. These words are always capitalized. More information can be found be in RFC 2119 [6].

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 MUST be prepared to inter-operate with another implementation that does include the option.

2.2   References

The following references are of relevance to this Working Text. At the time of publication, the editions indicated were valid. All references are subject to revision; users of this Working Text 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.

Document	Title	Source	Year
[1] TR-338 Issue 1	*Reverse Power Feed Testing*	BBF	2018
[2] TR-301 Issue 2	*Architecture and Requirements for Fiber to the Distribution Point*	BBF	2017
[3] TS 101 548-1 v2.2.1	*European Requirements for Reverse Powering of Remote Access Equipment*	ETSI	2018
[4] G.9700	*Fast Access to Subscriber Terminals (G.fast) – Power spectrum density specification*	ITU-T	2018
[5] G.9701	*Fast Access to Subscriber Terminals (G.fast) –*	ITU-T	2018

Physical layer specification

| [6] RFC 2119 | *Key words for use in RFCs to Indicate Requirement Levels* | IETF | 1997 |

2.3   Definitions

The following terminology is used throughout this Working Text.

| **One-box solution** | Power Source Equipment (PSE) is integrated in the same physical entity as CPE |
| **Two-box solution** | Power Source Equipment (PSE) is a stand-alone device and not integrated in the same physical entity as CPE |

2.4   Abbreviations

This Working Text uses the following abbreviations:

AC	Alternating Current
CPE	Customer Premises Equipment
DC	Direct Current
DPU	Distribution Point Unit
FTTdp	Fiber to the distribution point
FTU	G.fast Transceiver Unit
FTU-O	FTU at the Optical Network Unit (i.e. operator end of the line)
FTU-R	FTU at the Remote site (i.e. subscriber end of the line) located inside the network termination (NT)
G.fast	Fast Access to Subscriber Terminals
NT	Network Termination
PSE	Power Source Equipment
PSU	Power Supply Unit
RPF	Reverse Power Feed
SUT	System Under Test

3   Working Text Impact

3.1   Energy Efficiency

WT-338i1a1 has no impact on energy efficiency.

3.2   Security

WT-338i1a1 has no impact on security.

3.3   Privacy

Any issues regarding privacy are not affected by WT-338i1a1.

Appendix I: Differential Mode RPF Noise Limits test

Appendices are used to provide informative information.

I.1　Test Purpose

The purpose of this test is to verify that the noise generated by a standalone PSE (two-box solution) is within the limits of the differential mode RPF noise defined in TS 101 548-1 [3].

I.1.1　Test Setup

The following figure shows an example of the measurement arrangement for measuring the differential mode noise generated by the RPF PSE. The Test setup and procedure shall verify that the PSE is in normal operations while the noise is measured.

Ensure that noise from the mains supply does not influence the measurement. Otherwise, a Mains filter SHOULD be used.
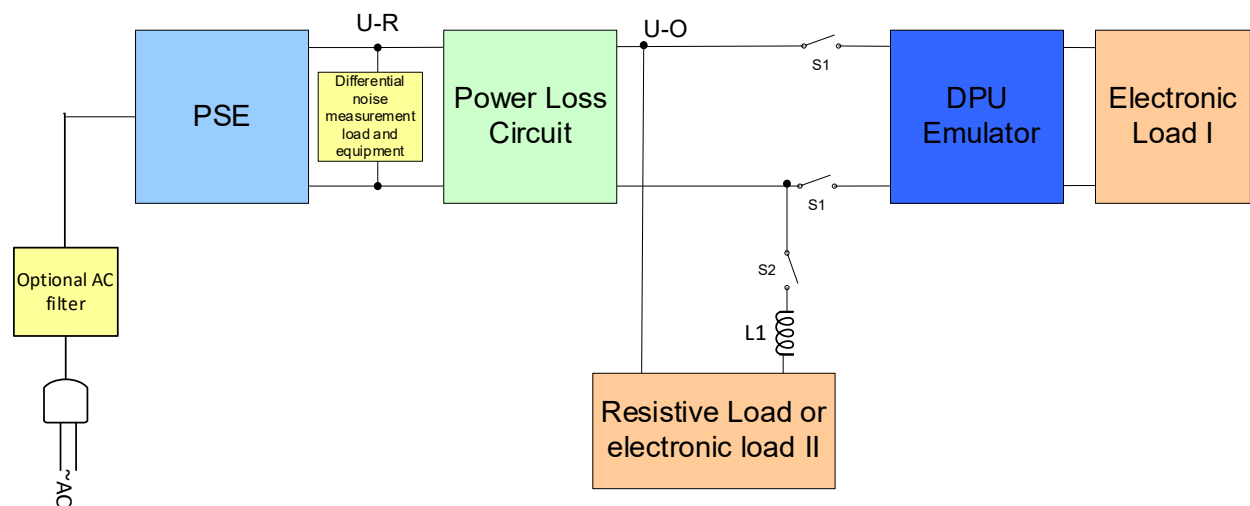
Figure I-1 – Test setup for PSE for measuring the differential noise from RPF PSE

Table I-1 – Electronic load II and resistive load configuration for PSE differential noise measurement

Condition:	RPF class:	SR1	SR2	SR3
Low Load	Electronic load II	11mA		
	Resistive load	5000 Ohm±5%		
Mid Load	Electronic load II	80 mA	121 mA	168 mA
	Resistive load	673 Ohm±5%	432 Ohm±5%	300 Ohm±5%
High load	Electronic load II	137 mA	210 mA	293 mA
	Resistive load	379 Ohm±5%	232 Ohm±5%	154 Ohm±5%

The inductance of L1 of Figure I-1 shall be 70mH ±10%, the resistance of the inductor L1 shall be compensated by reducing either the resistance of the Power Loss circuit or the resistance of the Resistive load by the resistance of inductor L1.

I.1.2   Test Configuration

1. Arrange the equipment as shown in Figure I-1.
2. The loop resistor Rloop of Power Loss Circuit SHALL be set to 43Ω +/-5%, see Table 6-7
3. The electronic load I (ISRi) SHALL be set to 10mA
4. The DPU signature RV-SIG SHALL be set to 24.9kΩ +/-1%.
5. The RPF Power Class resistor SHALL be set to the power class that corresponds to the tested PSE power class, see Table 6-4.
6. Connect the differential noise measurement equipment at the U-R and load to the U-R interface of the PSE under test.
7. The Resistive load or Electronic Load II shall set at the Low Load condition for the tested RPF Power Class as per Table I-1, set switch S2 to open.

I.1.3   Method of Procedure

1. Connect DPU emulator (Close switches S1).
2. Apply input power to the PSE.
3. Wait 5 seconds, then measure the output voltage at the PSE.
4. Connect Resistive Load or Electronic Load II (Close switch S2).
5. Disconnect the DPU emulator (Open switches S1).
6. Wait 5 seconds, then measure output voltage at the PSE.
7. Measure the differential noise.
8. Measure the output voltage at the PSE.
9. Disconnect the resistive Load or Electronic Load II (Open switch S2).
10. Disconnect power from the PSE.
11. Set Resistive load or Electronic Load II at the Mid Load condition for the tested RPF power class as per Table I-1.
12. Repeat steps 1 through 10.
13. Set Resistive load or Electronic Load II at the High Load condition for the tested RPF power class as per Table I-1.
14. Repeat steps 1 through 10.

I.1.4   Report

1. The measured output voltage in step 3, 6, and 8.
2. The measured noise in step 7.

I.1.5   Expected Results

1. In steps 3, 6, and 8, for each of the load conditions, the measured output voltage SHALL be in the range of 55.75 - 60V.

End of Broadband Forum Technical Report TR-338