



**Verizon NEBS™ Compliance: Generic
Reliability Assurance Requirements for Passive
Optical Components**
Verizon Technical Purchasing Requirements
VZ.TPR.9405
Issue 4, February 2008





CHANGE CONTROL RECORD:

Version	Date	Action*	Reason for Revision
1	08/21/2007	New	New Document
2	10/04/2007	Add	Stress screening requirements for PLC splitters, Full optical characterization for sample Group-A
3	10/28/07	Change Add	Changed the During test measurement requirement Added note for providing additional test data
4	2/1/2008	Change	Modified pass criteria from 5% to 5% dB
	2/1/2008	Change	Added only after 23°C note for final characterization
* New, Add, Delete, Change, Reissue			

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1.0 PURPOSE

The purpose of this Verizon Technical Purchasing Requirement document is to provide FOC testing Reliability Assurance Requirements for Passive Optical Components.

2.0 SCOPE

FOC Products

3.0 REFERENCES

Verizon FOC Memo #27, Rev 1; July 27, 2005	GRs: 1209 and 1221 Splitters and other Passive Optical Components, Complete Program Test Punch Lists and Modified Test Programs/Punch Lists for Specific Scenarios
Verizon FOC Memo #26, June 30 2005	Notes and Information – Various GR's
Verizon FOC Memo #40, June 26, 2006	Summary Notes
Verizon FOC Memo # 43, October 3, 2006	GR-326, 3120, 1435, 3152, 3128, 1081 Extended Thermal Cycling (Reliability) Test
Verizon FOC Memo # 45; November 3, 2006	Reinforcing the need of completing Factory audit requirements in a timely manner.
Verizon April 2007 FOC Conference	Day 2 - Critical FOC Memos for April 2007 Meeting
Verizon April 2005 FOC Conference	Requirements Checklists Analysis for Verizon Approved Test Plans
GR-1209-CORE, Issue 3, March 2001	Generic Requirements for Passive Optical Components
GR-1221-CORE; Issue 2, January 1999	Generic Reliability Assurance Requirements for Passive Optical Components



4.0 ACRONYMS

A	After
B	Before
D	During
FDH	Fiber Distribution Hub
FOC	Fiber Optic Components
IL	Insertion Loss
ITL	Independent Testing Laboratory
N/A	Not Applicable
nm	Nanometer
RL	Return Loss

5.0 RELIABILITY ASSURANCE REQUIREMENTS FOR PASSIVE OPTICAL COMPONENTS

Verizon is considering using Passive Optical Components for all applications as required. The following are the test requirements for qualifying Passive Optical Components. All the testing must be performed by a Verizon approved ITL.

1x16 and/or 1x32 Splitter Module PFOC GR-1221 Qualification Test Program				
Task Name	Sample Groups	Number of Samples	Optical Monitoring	Test Conditions
Prepare Test Samples & Materials				Room Temp unless noted otherwise.
3.0 Basic Reliability Assurance Program Requirements				Manufacturing Quality & Operations Audit
3.1 Vendor and Device Qualification				
3.2 Lot-To-Lot Quality and Reliability Controls				
3.3 Standardized Test Procedures				
3.4 Feedback and Corrective Action				
3.5 Device Storage and Handling				
3.6 Documentation and Test Data				
3.7 Availability of Devices				
4.0 Specific Reliability and Quality Criteria				Manufacturing Quality & Operations Audit



1x16 and/or 1x32 Splitter Module PFOC GR-1221 Qualification Test Program				
Task Name	Sample Groups	Number of Samples	Optical Monitoring	Test Conditions
4.1 Qualification of Passive Optical Devices				
4.2 Qualification of Integrated Passive Optical Module				
4.3 Quality Assurance and Lot Controls				
4.4 Reliability and Quality of Optical Adhesives				
Initial Optical Performance Measurements	A		Complete set of initial optical characterization measurements at four wavelengths @ -40°C, 23°C, 85°C	1310 nm, 1490 nm, 1550 nm, and 1625 nm, All ports unless otherwise stated.
6.0 Reliability Test Procedures				
6.2.4 High Temperature Storage Test (Dry Heat)	A	7 & 7 or 11	Complete initial optical characterization at four wavelengths @ -40°C, 23°C, and 85°C. Before & After IL and RL (Input Port) measurements.	85°C (±5°C), < 40% RH, 2,000 hrs. for qualification and ≥ 5000 hrs (optional) for information. IL measurements initially, and then at 168- (optional), 500-, 1000-, and 2000-hour intervals.
6.2.5 High Temperature Storage Test (Damp Heat)	B	7 & 7 or 11	Complete initial optical characterization at four wavelengths @ 23°C. B & A IL and RL (Input Port) measurements.	75°C (±5°C), 90% (± 5%) RH, 2,000 hrs. For qualification and ≥ 5000 hrs (optional) for information. IL measurements initially, and then at 168- (optional) 500-, 1000-, 2000-hour intervals.



1x16 and/or 1x32 Splitter Module PFOC GR-1221 Qualification Test Program

Task Name	Sample Groups	Number of Samples	Optical Monitoring	Test Conditions
6.2.6 Low Temperature Storage Test	C	7 & 7 or 11	Complete initial optical characterization at four wavelengths @ 23°C. B & A IL and RL (Input Port) measurements.	-40°C (±5°C), uncontrolled humidity, 2,000 hrs. For qualification and ≥ 5000 hrs (optional) for information. IL measurements initially, and then at 168- (optional), 500-, 1000-, 2000-hour intervals.
6.2.1 Mechanical Shock (Impact Test)	D	7 & 7 or 11	B & A IL and RL (Input port).	50 G (based on module mass), 5 times per direction for 6 directions (on 3 axes), 1 ms. B & A IL and RL (Input port) measurements only at four wavelengths at 23°C.
6.2.2 Variable Frequency Vibration Test	D	7 & 7 or 11	B & A IL and RL (Input port).	20 G maximum acceleration, 20-2,000 Hz, 4 min per cycle and 4 cycles per axis. IL and RL (Input port) measurements only at four wavelengths at 23°C.
6.2.8 Cyclic Moisture Resistance Test	E	7 & 7 or 11	B & A IL and RL (Input port).	85-95% at 75°C; uncontrolled at 25°C & -40°C, 3 to 16 Hours dwell time at extremes, 5 complete cycles (each complete cycle has 5 sub-cycles). B & A IL and RL (Input port) measurements only at four wavelengths at 23°C.
6.2.7 Temperature Cycling Test	E	7 & 7 or 11	B & A IL and RL (Input port).	- 40°C to 70°C (± 2°C) for CO, 40°C to 85°C (± 2°C) for RT/UNC, ≥ 15 minutes dwell time at extremes, 100 cycles pass/fail, 500 cycles (optional) for information for CO, 500 cycles pass/fail, 1000 cycles (optional) for information for RT/UNC.



Optical Measurements:

Characterization	100% of devices and channels unless other wise specified
B & A - Before and After	IL Testing @ (1310, 1490, 1550 and 1625nm) - 100% of channels
D - During	IL Testing @ (1310, 1490, 1550 and 1625nm) - 100% of channels

Sample Configurations:

1 product	11 samples / 3 hot spares
2 or more products	7samples/7samples/x.... 2 hot spares/2 hot spares/x....

***Plug and Play Splitters:**

Plug and Play Splitters must be tested in a configuration that uses the actual complete FDH or a fixture that simulates the FDH receptacle shelf for the splitter. When performing the GR-1209 Temperature and Humidity Cycle the following procedural steps are required:

At 23 C, do 10 insert/remove cycles, do IL/RL, then 42 cycles of Temp/Hum per GR-1209, do IL/RL then at 40 C, do 25 insert/remove cycles, do IL/RL, then at -18 C, do 25 insert/remove cycles, do IL/RL then at 23 C do 10 insert/remove cycles, do IL/RL.

Splitter & Splitter Module Re-Qualification Guidelines (Due to Design Changes):

Note: Test results for all the requirements that need testing per Section 3 of GR-1209 and Section 3 & 4 of GR-1221 must be provided with option A & B below.

- Option A – Splitter not Qualified/Module remains the same:
 - Splitter qualified to both GR-1209 and GR-1221
 - Complete set of initial optical characterization measurements for Group-A at four wavelengths @-40°C, 23°C, 85°C
 - Fiber integrity testing not required if module already qualified
 - No module level testing required
 - Complete set of final optical characterization measurements for Group-A at four wavelengths @ 23°C (only)



- Option B – Splitter Qualified/Module not Qualified
 - Complete set of initial optical characterization measurements for Group-A at four wavelengths @ -40°C, 23°C, 85°C
 - Run all of GR-1209 test
 - Substitute Vibration and Physical Shock from 1221 with that of 1209
 - Complete set of final optical characterization measurements for Group-A at four wavelengths @ 23°C (only)

Extended Thermal Cycle Test Conditions (modified GR-1221 requirement)

Temperature: Cycle in Figure 1 (-40°C to 85°C).

All ramp times are 1.4°C per minute. All plateaus are 30 minutes.

Humidity: Uncontrolled

Duration: 500 cycles in 2000 hours

Measurement of Insertion Loss and Reflectance: Data shall be taken initially, and then at 100, 168, 500, 1000, and 2000-hour intervals

The test conditions for the Extended Thermal Cycle Test are shown in Figure 1 below.

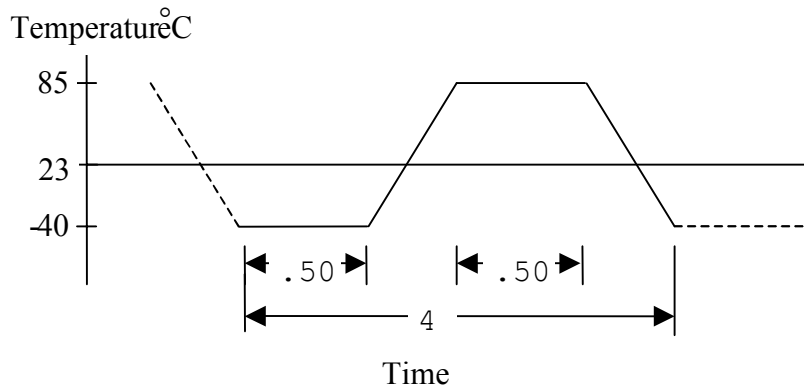


Figure 1: Temperature Profile for Extended Thermal Cycle Test



Stress Screening Requirements:

Splitters:

- Temperature cycling: Temperature cycling testing is performed for all PLC splitters. The testing condition is as follows.
 - Number of cycle: 10
 - Temperature limits: -40 and 85 degree C
- Measurement before Temp cycling
 - Insertion loss at 1310 nm and 1550 nm
- Measurement after Temp cycling
 - Insertion loss at 1310 nm and 1550 nm
 - Insertion loss change by Temp cycling at 1310 nm and 1550 nm (Pass criteria 5% of dB change)
 - Uniformity at 1310 nm and 1550 nm
 - PDL at 1310 nm and 1550 nm
 - Return loss at 1310 nm and 1550 nm
 - Bandpass
 - Directivity (adjacent channels only @ 1310 nm and 1550 nm)

If a supplier is buying splitters from some other manufacturer, it is the responsibility of the supplier to Verizon to ensure that above listed conditions are followed by the PLC manufacturer.

Splitter Modules:

No Stress Screening is required for the Splitter Modules; however, a Lot-to-Lot reliability test program is required. Manufacturer of Splitter Modules can decide on the number of samples to be tested for reliability per lot.