



**Verizon NEBS™ Compliance: Generic
Requirements for Passive Optical Component**
Verizon Technical Purchasing Requirements
VZ.TPR.9427
Issue 4, February 2008





CHANGE CONTROL RECORD:

Version	Date	Action*	Reason for Revision
1	07/31/2007	New	New Document
2	10/04/2007	Add	Added temperature requirements for optical characterization
3	10/28/2007	Change	Changed the During test measurement requirement
	10/28/2007	Delete	“Hermetic Product Only” from Section 5.4.2.3
	10/28/2007	Add	Added note for providing additional test data
4	2/1/2008	Change	Removed RL requirement during testing.
	2/1/2008	Add	Added notes for clarity on some of the testing.

* New, Add, Delete, Change, Reissue

Trademark Acknowledgement – NEBS is a trademark of Telcordia Technologies, Inc.



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1.0 PURPOSE

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

2.0 SCOPE

FOC Products

3.0 REFERENCES

Verizon ITL Memo #26, June 30 2005	Notes and Information – Various GR's
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 #40, June 26, 2006	Summary Notes
GR-1209-CORE; Issue 3, March 2001	Generic Requirements for Passive Optical Components

4.0 ACRONYMS

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



5.0 TEST 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 completed by a Verizon approved ITL.

M x N Splitter Module FOC GR-1209 Qualification Test Program		
Task Name	Optical Measurements	Test Conditions
Prepare Test Samples & Materials		Room Temp unless noted otherwise
3. General and Design Criteria		
3.1.1 General Documentation		Per GR-1209
3.1.2 Workcenter Information Package		Per GR-1209
3.2 Marking, Packaging, and Shipping		Per GR-1209
3.3 Physical Design Criteria		Per GR-1209
3.3.1 General Physical Design Criteria		Per GR-1209
3.3.2 Optical Fiber		Per GR-1209
3.3.3 Optical Connectors		Per GR-1209
3.3.4 Materials		Per GR-1209
3.3.4.1 Toxicity		Per GR-1209
3.3.4.2 Corrosion Resistance		Per GR-1209
3.3.4.3 Dissimilar Metals		Per GR-1209
3.3.4.4 Fungus Resistance		Per GR-1209
3.3.4.5 Flammability		Per GR-1209
3.3.5 Safety		Per GR-1209
3.3.6 Mounting		Per GR-1209
3.4 Passive Optical Component Qualification		Per GR-1209
3.5 Reliability Assurance		Per GR-1209
3.6 Quality Technology Program		Per GR-1209
4.0 Optical Performance Criteria (Characterization)		
4.1 Optical Bandpass		Measured from 1260nm thru 1635nm
4.2 Insertion Loss		Reported at 1310/1490/1550/1625
4.3 Uniformity		
4.4 Isolation		N/A Splitters
4.5 Directivity		Measurements on Adjacent ports (output)
4.6 Return Loss		Measured on all Output ports
4.7 Polarization-Dependent Loss		
4.8 Polarization Dependent Wavelength		N/A Splitters
4.9 Polarization-Mode Dispersion		Measured @ 1550nm only



M x N Splitter Module FOC GR-1209 Qualification Test Program		
Task Name	Optical Measurements	Test Conditions
4.10 Temperature Effects on DWDM Components		N/A Splitters
4.11 Other Fiber Optic Filter Specific Criteria		N/A Splitters
Initial Optical Performance Measurements	All	Complete set of initial optical characterization measurements at four wavelengths @-40°C, 23°C, 85°C
5.0 Environmental and Mechanical Performance Test Sequence		
5.4.1 Transportation and Handling		
5.4.1.1 Temperature-Humidity Aging *	IL - B/D/A, RL - B	75° C/ 90% RH, 7 days
5.4.1.5 Temperature Cycling *	IL - B/D/A,	-40°C to +70°C; 10 cycles; Dwell Time: ≥15 minutes; Ramp Rate: 1°C/min.
5.4.2 Operational Performance		
5.4.2.2 Temperature-Humidity Cycle: Uncontrolled Environment *	IL - B/D/A	Between -40°C and +85°C; humidity from 20% RH to 85% RH
5.4.2.3 Water Immersion *	IL - B/D/A, RL - A	+43°C, pH 5.5, 168 hrs.
5.4.1 Transportation and Handling		
5.4.1.2 Vibration	IL - B/A	10-55 Hz, 1.52 mm amplitude, 3 axes (20 minutes/axis) for 1 hour if only testing to VZ.TPR.9427 or GR-1221 Section 6.2.2.1 Vibration Test - Condition A, 20 G maximum, 20-2000 Hz, 4 minutes per cycle and 4 cycles per axis if testing to both VZ.TPR.9427 and VZ.TPR.9405
5.4.1.4 Module Impact - Mechanical Shock	IL - B/A	50 G (based on module mass), 3 axes, 2 impacts/direction, (12 impacts total), Nominal 1ms, Half Sine Pulse / GR-1221 Mechanical Shock Test
5.4.3 Fiber Integrity Criteria		
5.4.3.1 Fiber Flex	IL - B/A	Loose Buffered Fiber: 0.45 kg, 30 cycles Reinforced Cable: 0.45 kg, 30 cycles <i>There is a conditional cycling require of 300 cycles for the product.</i>
5.4.3.2 Fiber Twist	IL - B/A	Loose Buffered Fiber: 0.45 kg, 10 cycles Reinforced Cable: 0.45 kg, 10 cycles
5.4.3.3 Fiber Side Pull	IL - B/A	Coated Fiber: 0.23 kg, 90°, 5 sec, 2 dir. Tight Buffered Fiber: 0.23 kg, 90°, 5 sec, 2 dir. Loose Buffered: 0.45 kg, 90°, 5 sec Reinforced Cable: 0.45 kg, 90°, 5 sec
5.4.3.4 Fiber and Cable Retention (Straight Pull)	IL - B/A	Coated Fiber: 0.45 kg, 60 sec, 1x, or 5 sec, 3x Tight Buffered Fiber: 0.45 kg, 60 sec, 1x, or 5 sec, 3x Loose Buffered Fiber: 1.0 kg, 60 sec, 1x, or 5 sec, 3x



M x N Splitter Module FOC GR-1209 Qualification Test Program		
Task Name	Optical Measurements	Test Conditions
		Reinforced cable: 1.0 kg, 60 sec, 1x, or 5 sec, 3x
4.0 Optical Performance Criteria		
4.2 Insertion Loss		
4.6 Return Loss		
Final Optical Performance Measurements	All	Complete set of initial optical characterization measurements at four wavelengths @ 23°C.
Provide Test data		
Write Test Reports		
See the individual procedures for the number of required samples and the list of equipment regarding each test		

Optical Measurements:

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

Sample Configurations:

1 product 11 samples / 3 hot spares
 2 or more products 7samples/7samples/x.... 2 hot spares/2 hot spares/x....
 * - Environmental Testing to be preformed sequentially (Temp Humidity Aging, Temp Cycling, Temp/Humidity Cycling, Water Immersion)

Notes:

Optical Bandpass: is specified at a max range of 1635nm rather than 1625nm to allow for a +/- 10nm variance in the source as in most of the other standards.

RL on all Output Ports: This method was advised as a means of making the measurement easier to perform and more accurate. While using a mandrel deading method for RL, measuring RL from output to input will provide a return loss of a specific channel. Measuring from the input to the outputs provides for the maximum return loss of all of the channels in the device. Although this seems simpler due to the need to only perform one measurement, utilizing a wrapping measurement method can be very difficult to ensure you properly deadened all connections. If you can accurately read the product from the input to the output, this would be acceptable providing utilization of a Verizon approved methodology.



***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:
(i.e. - qualified splitter module that you intend on replacing the splitter with a new, unqualified splitter within the module)
 - Splitter qualified to both GR-1209 and GR-1221
 - Complete set of initial optical characterization measurements 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 at four wavelengths @ 23°C

- Option B – Splitter Qualified/Module not Qualified
 - Complete set of initial optical characterization measurements 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 at four wavelengths @ 23°C