

Extended Reach on MMF: Concepts for Informative Annex

Paul Kolesar, CommScope

Mike Dudek, JDSU

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Outline

- Purpose
- Key concepts
- Test fixture
- Parametric tabulation of scenarios
- MMF chromatic dispersion element
- Advantages of approach

Purpose

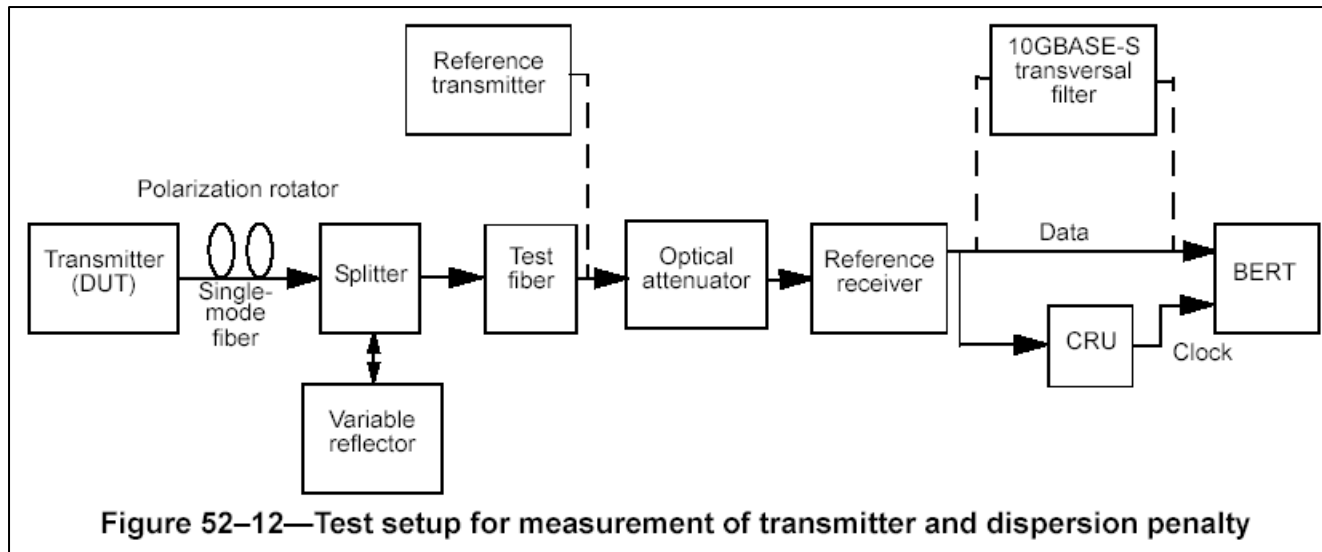
- Socialize measurement-based methodology for screening extended reach capability of 40GBASE-SR4 and 100GBASE-SR10
- Initiate discussions that may lead to a proposal in May 2009

Key Concepts

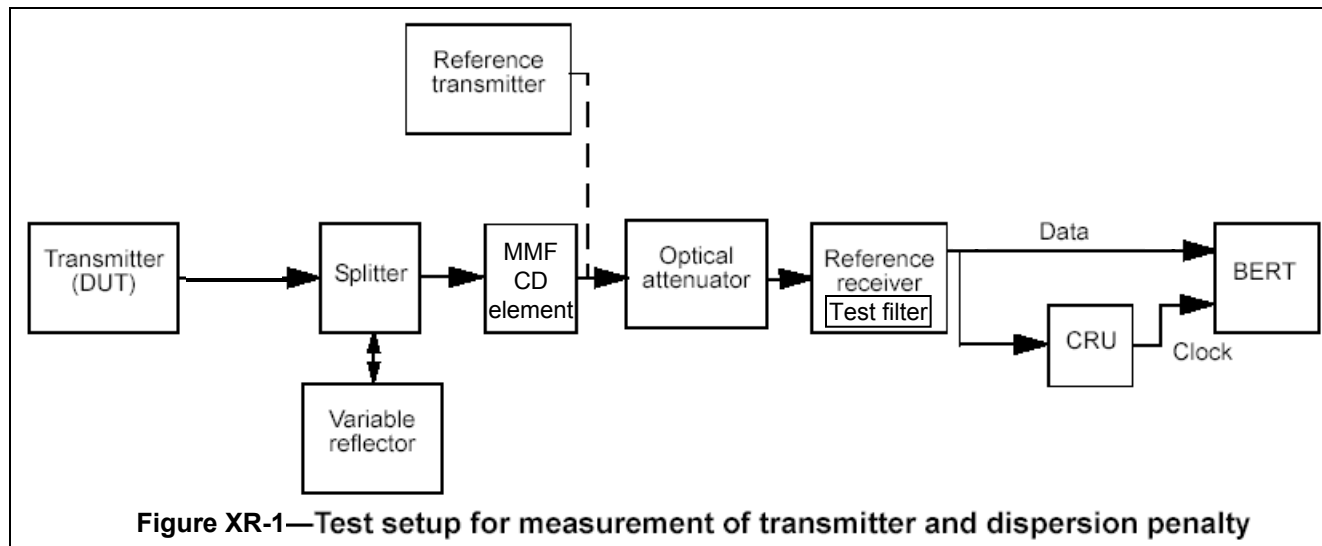
- Use existing TDP test fixture:
 - defined in clause 52.9.10 and
 - modified by clause 86.7.5.4 (ref Rx filter)
- Apply a chromatic dispersion element
 - as presently done for SM tests, but
 - use selected MMF (described in detail later)
 - of length tailored to targeted extended reach
- Adjust test fixture filter in receiver
 - to account for modal bandwidth decrease with length
- Bump up minimum OMA spec limit
 - to account for additional loss due to increased length

TDP Test Fixture Comparison

Clause 52



XR Annex



Parametric Tabulation of Scenarios

clause	Tx sp wid (nm)	target dist (km)	media code	EMB 840nm (MHz*km)	effBWm 3dBo (GHz)	effBWm 3dBe (GHz)	BWch 3dBe (GHz)	BWrefrx 3dBe (GHz)	test filter		CD elem length (km)	OMA addition (dB)
									value	unit		
52.9.10	0.45	0.300	OM3	2000	6.7	4.7	9.0	7.5	55.0 ps	transversal	n.a.	n.a.
86.7.5.4	0.65	0.100	OM3	2000	20.0	14.1	18.8	7.5	6.25 GHz	4th ord BT	n.a.	n.a.
XR annex	n.a.	0.125	OM3	2000	16.0	11.3	n.a.	7.5	6.25 GHz	4th ord BT	0.137	0.09
XR annex	n.a.	0.150	OM3	2000	13.3	9.4	n.a.	7.5	5.87 GHz	4th ord BT	0.164	0.18
XR annex	n.a.	0.175	OM3	2000	11.4	8.1	n.a.	7.5	5.50 GHz	4th ord BT	0.192	0.26
XR annex	n.a.	0.125	OM4	4400*	35.2	24.9	n.a.	7.5	7.18 GHz	4th ord BT	0.137	0.09
XR annex	n.a.	0.150	OM4	4400	29.3	20.7	n.a.	7.5	7.05 GHz	4th ord BT	0.164	0.18
XR annex	n.a.	0.175	OM4	4400	25.1	17.8	n.a.	7.5	6.91 GHz	4th ord BT	0.192	0.26
XR annex	n.a.	0.200	OM4	4400	22.0	15.6	n.a.	7.5	6.76 GHz	4th ord BT	0.219	0.35
XR annex	n.a.	0.225	OM4	4400	19.6	13.8	n.a.	7.5	6.59 GHz	4th ord BT	0.247	0.44
XR annex	n.a.	0.250	OM4	4400	17.6	12.4	n.a.	7.5	6.42 GHz	4th ord BT	0.274	0.53
XR annex	n.a.	0.275	OM4	4400	16.0	11.3	n.a.	7.5	6.25 GHz	4th ord BT	0.301	0.61

*Note: 4700 EMB de-rated for operation at 840 nm.

MMF Chromatic Dispersion Element

- 50 μm fiber with:
 - negligible modal dispersion
 - $\text{DMD (0 - 23)} \leq 0.066 \text{ ps/m}$
 - $\text{EMB} \geq 10,000 \text{ MHz*km}$
 - measured chromatic dispersion
 - known Zero Dispersion Wavelength
 - known Zero Dispersion Slope
- 100 km of such fiber is presently available
 - CD properties of all spools matched to 0.5%
 - Thanks to Draka for manufacturing and selecting this inventory

Advantages Of Approach

- Uses existing TDP fixture with minor mods
 - Small incremental cost for filter and fiber
- Allows assessment of CD impairments as composite measurement with TDP
 - Reduces testing overhead and cost
 - Could be adopted normatively for clause 86
- Applies to any transmitter-based improvement
 - Jitter reduction (CDR)
 - Spectral width reduction
 - Rise time reduction
- Dovetails with existing clause 86 specs