Wideband Multimode Fiber (WBMMF) Standardization Update

(a follow-up to kolesar_50GE_NGOATH_01a_0116.pdf)

IEEE 802.3cd

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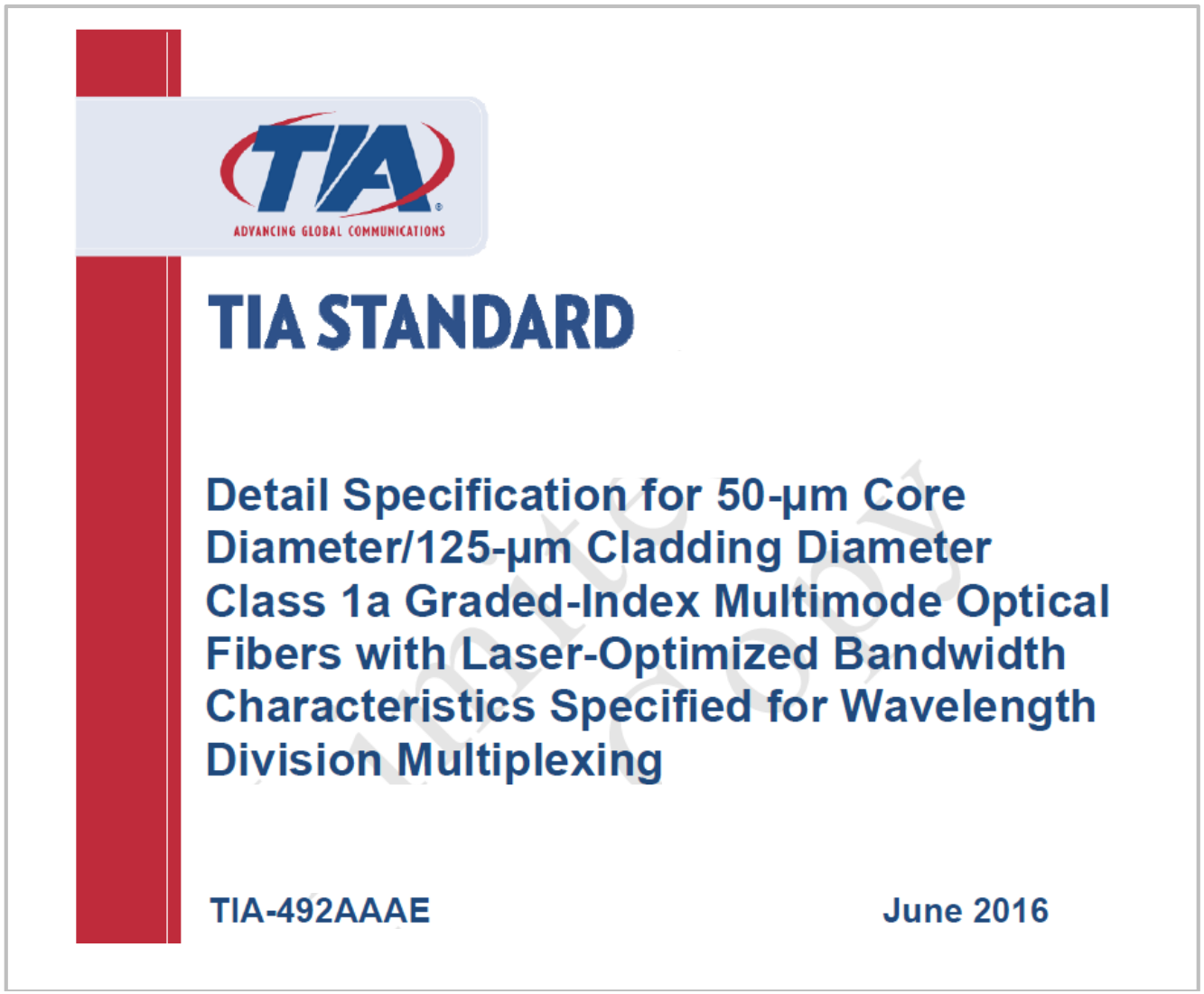
Paul Kolesar – CommScope
TIA WBMMF spec editor
IEC WBMMF project co-leader

WBMMF Standardization - TIA

- TR-42 published TIA-492AAAE in June 2016
  - 6 meetings, 13 teleconferences and 3 ballots over 20 months
  - Participation from IEC 86A members and transceiver makers



WBMMF Standardization - IEC

- IEC 86A initiated WBMMF project in April 2016
  - Backed by liaison request from ISO/IEC for 11801 ed. 3
  - First ballot of IEC 60793-2-10 ed. 6 closes August 19, 2016
  - Harmonized with TIA-492AAAE

86A/1750A/CD

COMMITTEE DRAFT (CD)

IEC/TC or SC: SC86A	Project number IEC 60793-2-10/Ed6	
Title of TC/SC: Fibres and Cables	Date of circulation (2016-06-24) **2016-07-08**	Closing date for comments **2016-08-19**
Also of interest to the following committees	Supersedes document 86A/1748/RR	
Proposed horizontal standard ☐ Other TC/SCs are requested to indicate their interest, if any, in this CD to the TC/SC secretary		
Functions concerned: ☐ Safety ☐ EMC ☐ Environment ☐ Quality assurance		
Secretary: Guy Perrot – FR Email: guy.perrot@nexans.com	THIS DOCUMENT IS STILL UNDER STUDY AND SUBJECT TO CHANGE. IT SHOULD NOT BE USED FOR REFERENCE PURPOSES. RECIPIENTS OF THIS DOCUMENT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.	

Title:
IEC 60793-2-10/Ed6: Optical fibres – Part 2-10: Product specifications – Sectional specification for category A1 multimode fibres

WBMMF Cabling Standardization – ANSI/TIA & ISO/IEC

- ANSI/TIA-568.3-D
  - Emerging revision of optical fiber structured cabling standard (2016)
  - Approves cabling made with TIA-492AAAE fibers

- ISO/IEC 11801 ed. 3
  - Emerging revision of international structured cabling standard (2017)
  - Tentatively specifies cabling made with WBMMF
  - Dependent upon IEC fiber specification maturation

What is WBMMF?

- First MMF specified to support WDM
  - Laser-optimized modal bandwidth
  - Wavelengths from 840 nm to 953 nm
    - Sufficient to support at least 4 low-cost wavelengths
  - Supports all legacy applications
  - Supports emerging SWDM applications

- Performance compliant and superior to OM4
  - Details follow next

Key Performance Spec Comparison

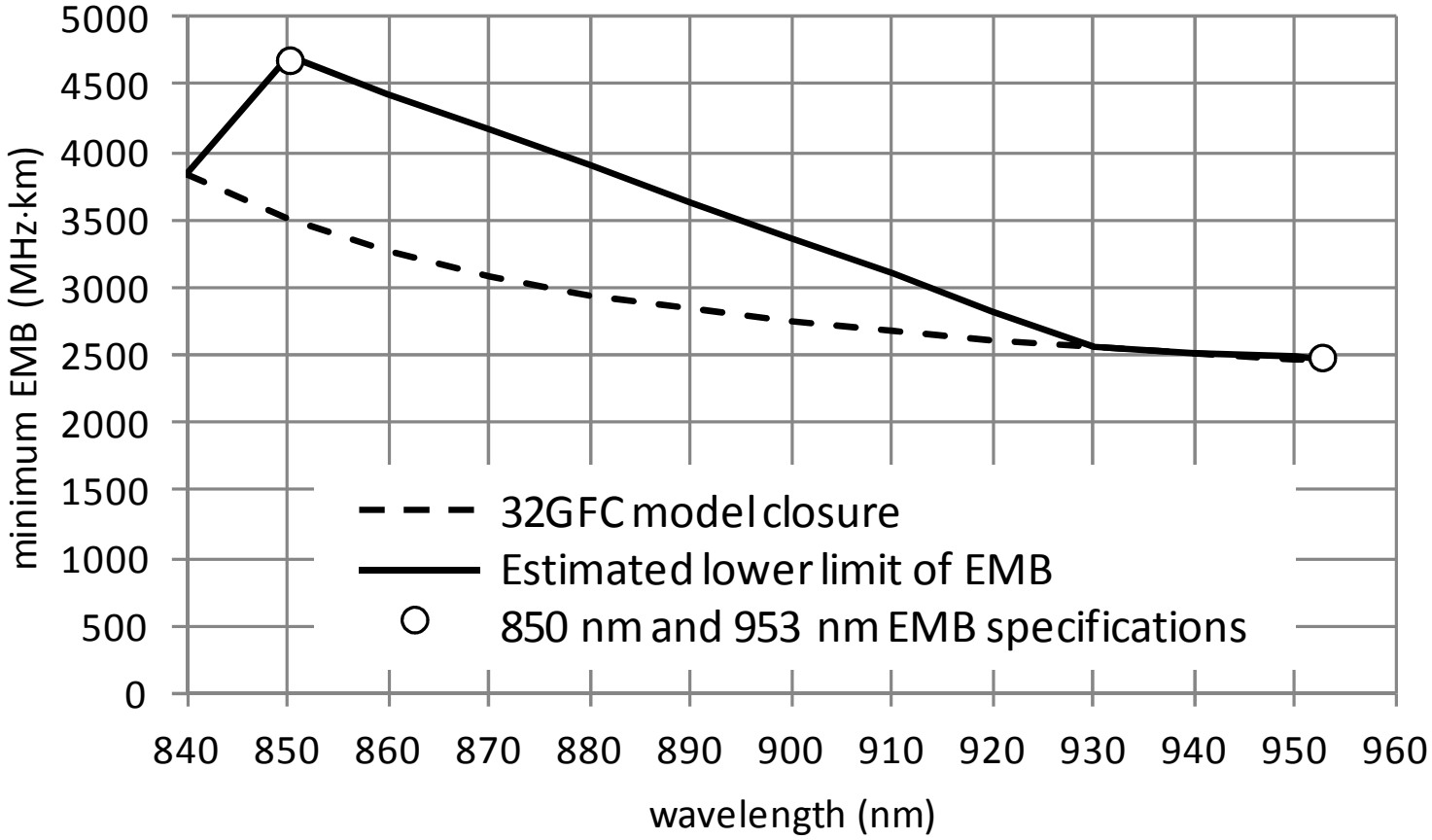
Parameter	OM4	WBMMF	Comment re WBMMF
Effective modal bandwidth at 850 nm, min (MHz*km)	4700	4700	Drop-in substitute for OM4
Effective modal bandwidth at 953 nm, min (MHz*km)	Not spec'd [a]	2470	Assures level total [b] bandwidth over wavelength spectrum
Chromatic dispersion at 840 nm, max (|ps/nm*km|)	108.4	103	Smaller dispersion boosts legacy application support
Chromatic dispersion at 953 nm, max (|ps/nm*km|)	65	61.7	Smaller dispersion helps SWDM application support
Cabled attenuation at 953 nm per 568.3-D, max (dB/km)	Not spec'd [a]	2.3	Assured maximum

[a] Can be characterized

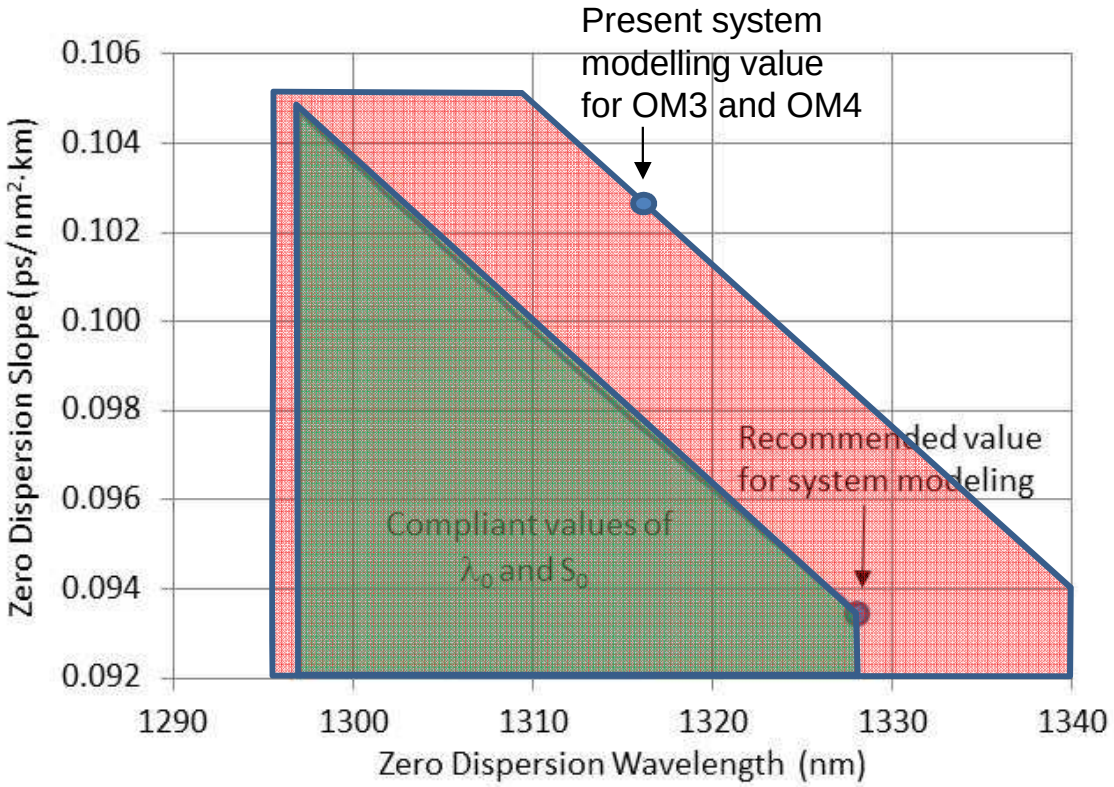
[b] Modal and chromatic bandwidths combined

Effective Modal Bandwidth Characteristics

- Informatively and conservatively specified over full wavelength range



Improved Chromatic Dispersion Spec



Chromatic dispersion specification for wide band fiber tightened from the red region (OM3 & OM4) to the green region.

Increases chromatic bandwidth by 5%, reducing ISI, MPN and Pcross penalties.

The following values recommended for system modeling:
λ_0 = 1328 nm
S_0 = 0.093477 ps/nm^2 ·km
(worst case for all relevant wavelengths)

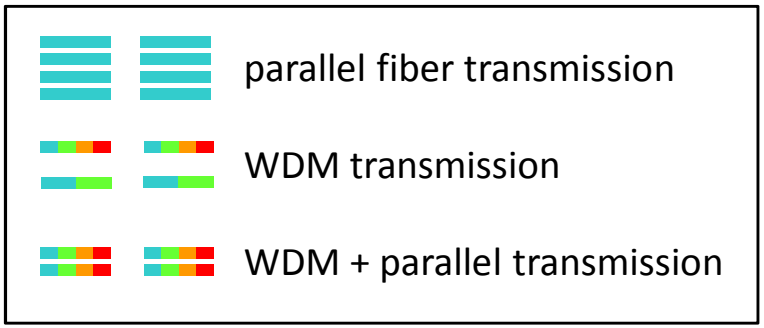
Specification limits:
ZDW (λ_0): 1297 ≤ λ_0 ≤ 1328 nm
ZDS (S_0): $S_0 \leq 4(-103)/(840(1-(\lambda_0/840)^4))$ ps/nm^{2}km

Application Evolution Map – Ethernet Examples

Data Rate	10G NRZ Parallel TX RX	25G NRZ Parallel TX RX	50G PAM4 Parallel TX RX	10, 25, 50G WDM & Parallel TX RX
40G		N/A	N/A	
100G				
200G				
400G				

Imagine running
10G, 40G, 100G, 200G
over the same WBMMF cable plant
using duplex LC connections *

Legend



*Parallel fibers remain essential to support break-out functionality

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P802.3cd Project Considerations

- Experience proves market acceptance of parallel fiber solution
  - Enables higher density ports via break-out cabling
  - Reduces cost per single-lane channel
- Experience proves market acceptance of 2-fiber solution
  - Provides cabling simplicity and continuation of legacy approach
  - WDM enables continuation of 2-fiber solution
  - WBMMF enhances SWDM capability
- Both have broad market potential and distinct identity
  - The break-out approach will be the first deployed (witness 4×10G)
  - The WDM approach will follow as full data rates are required
- WBMMF should be referenced for all MM solutions
  - Independent of adopting a SWDM PHY
  - Owing to compliance with OM4 specifications

Summary

- The industry is moving to utilize SWDM
  - Fibers, cabling, transceivers, switches, servers
  - See proposal in ingham_3cd_01_0716.pdf
- WBMMF is standardized to optimize SWDM solutions
  - While retaining support for 850 nm legacy applications
- SWDM & WB technologies extend the utility of MMF
  - Continuing legacy of delivering lowest-cost optical solutions over enterprise' primary transmission medium
- Ethernet applications can benefit from these technologies
  - to regain or retain two-fiber paradigm for generations

Thank You