Multimode Fiber for use with 100 Gb/s per Wavelength Short Reach PHYs

Earl Parsons

CommScope

100 Gb/s Wavelength Short Reach PHYs Study Group

Geneva, Switzerland Jan 2020

Motivation

- This Study Group is developing a PAR, Objectives, and CSD for "Lower cost, short reach, optical PHYs using 100 Gb/s wavelengths“
- This can cover different applications than what’s traditionally covered by the “SR” PMDs
  - Switch-to-server attachment
  - Switch-to-switch links
- We don’t have to constrain ourselves to fiber types, wavelengths, or reaches that were supported by previous “SR” standards
- This contribution reviews fiber bandwidths, reaches, and wavelengths used by recent 100G and 400G standards and MSAs

The Situation

- IEC and TIA both set fiber specifications
  - IEC 60793-2 series
  - TIA 492xxxx series
- IEC 60793-2-10:2019 provides both normative specifications and informative guidance on minimum EMB from 840-953 nm for OM3 (A1-OM3), OM4 (A1-OM4), and OM5 (A1-OM5) fiber
- TIA TR-42 has long planned to adapt IEC standards. There is a project in TR42.12 to adapt IEC 60793-2-10, and it will become ANSI/TIA-492AAAF, replacing 492-AAAC, AAAD, and AAAE
- Anticipate publication later this year

Multimode Fiber Types

- Most common multimode fiber types: OM3, OM4, OM5
- Reaches supported by recent PMDs:
  - 70 m over OM3 fiber
  - 100 m over OM4 fiber
  - 100 m over OM5 with single wavelength
  - 150 m over OM5 with multiple wavelengths

PMD	OM3 Reach	OM4 Reach	OM5 Reach	Modulation	TDEC(Q)
400G-SR8	70 m	100 m	100 m	PAM4	4.5
400G-SR4.2	70 m	100 m	150 m	PAM4	4.5
400G-BiDi	70 m	100 m	150 m	PAM4	4.5
100G-SR4	70 m	100 m	100 m	NRZ	4.3
100G-SWDM4	70 m	100 m	150 m	NRZ	4.8
100G-BiDi	70 m	100 m	150 m	PAM4	-

OM5 is optimized for WDM operation

- EMB specified as
  - 4700 MHz*km at 850 nm
  - 2470 MHz*km at 953 nm
- Guidance provided for other wavelengths in

  IEC 60793-2-10:2019

  TIA-492AAAE

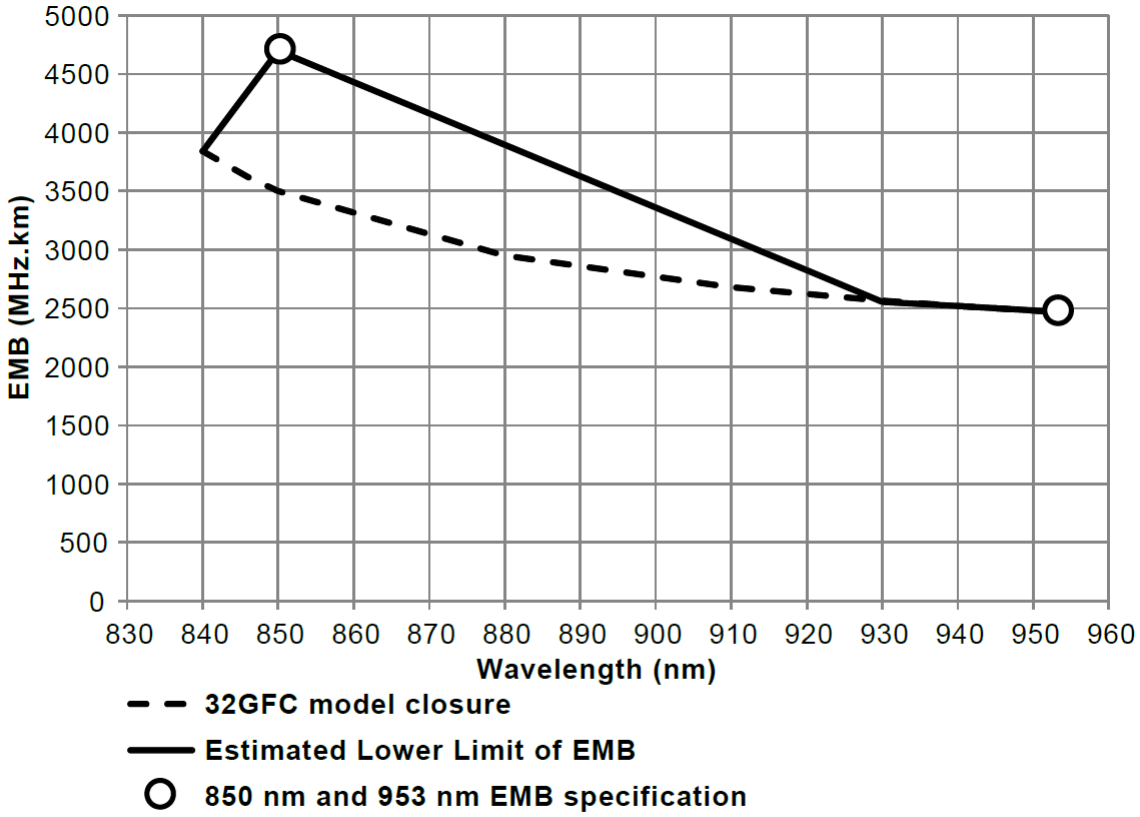


Figure E.3 – Estimated minimum wide band EMB versus wavelength for A1-OM5

OM4 is optimized for 850 nm operation

- EMB specified as
  - 4700 MHz*km at 850 nm
- Estimated minimum EMB provided for other wavelengths in

  IEC 60793-2-10:2019

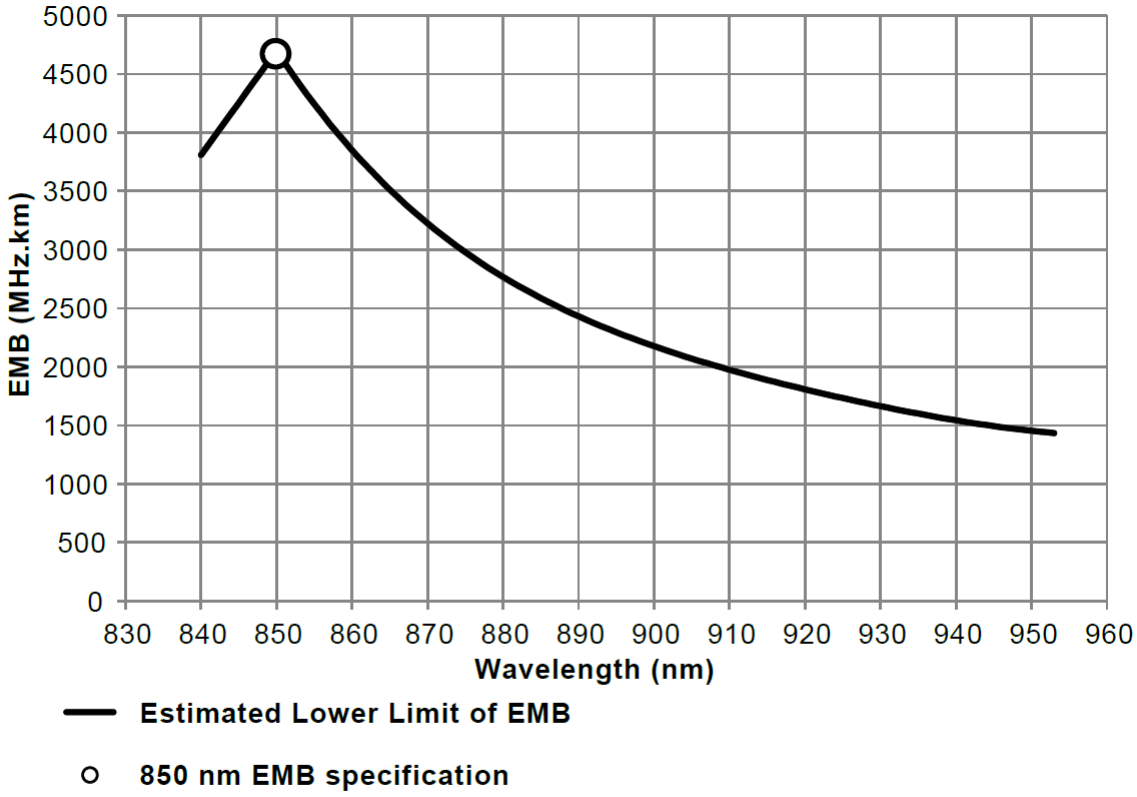


Figure E.2 – Estimated minimum wide band EMB versus wavelength for A1-OM4

OM3 is optimized for 850 nm operation

- EMB specified as
  - 2000 MHz*km at 850 nm
- Estimated minimum EMB provided for other wavelengths in

  IEC 60793-2-10:2019

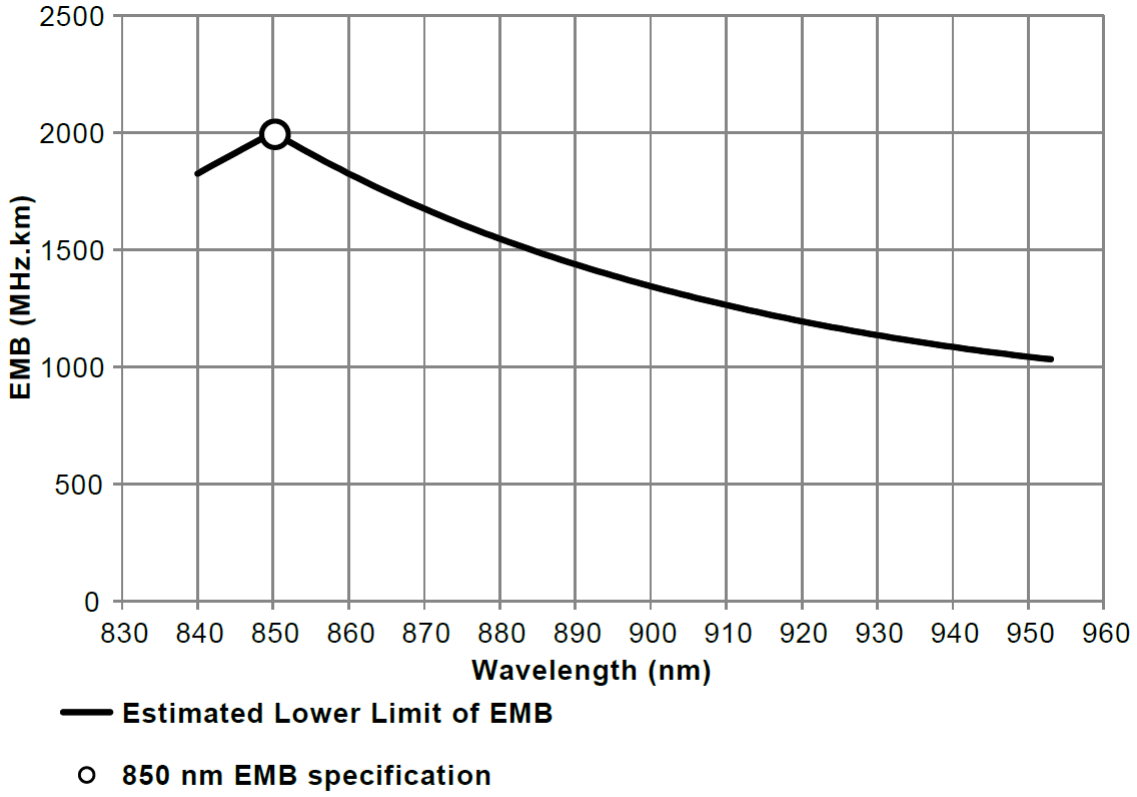
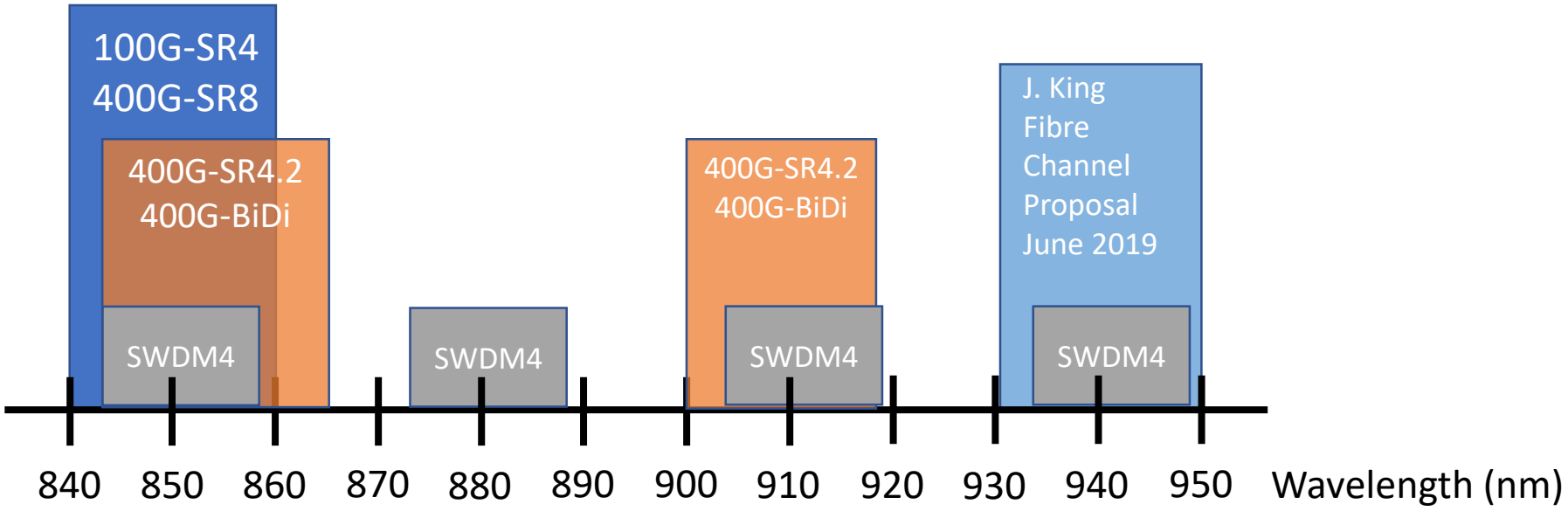


Figure E.1 – Estimated minimum wide band EMB versus wavelength for A1-OM3

Wavelength Range of Recent PMDs

Several different wavelengths are available for 100G per wavelength



Conclusions

- EMB for OM3, OM4, and OM5 fiber reviewed
- Different PMDs have used wavelengths from 850 – 950 nm recently