MMF for 50 m Reach

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200 Gb/s per Wavelength MMF PHYs

March 11, 2026

Supporters

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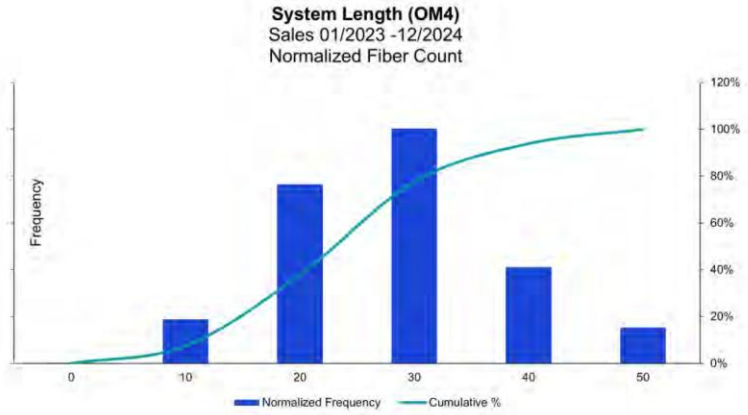
Reach

- Reach objectives adopted in P802.3ds:

  Define a physical layer specification that supports 200/400/800/1600 Gb/s operation:
  - over 1/2/4/8 pairs of MMF with lengths up to at least 30 m
  - over 1/2/4/8 pairs of MMF with lengths up to at least 50 m

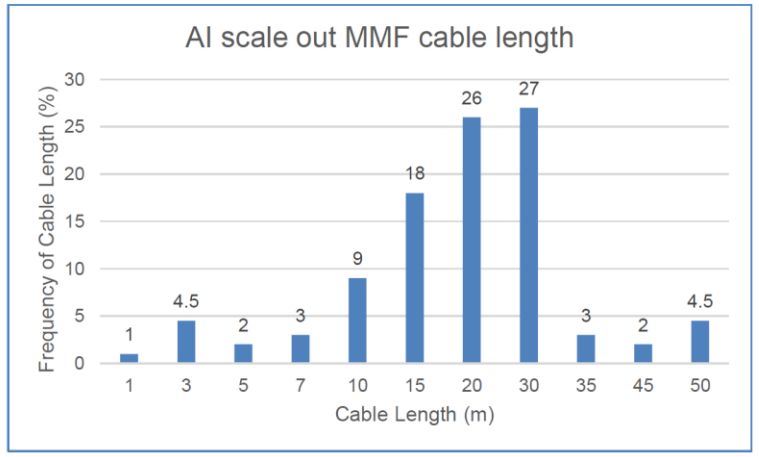
- Links are generally under 30 m, and reach up to 50 m will cover a majority of the AI links [CFI_200GMMF_R4_250717]

Vince Ferretti, Corning and Angela Lambert, Corning



- 30m OM4 reach covers 78% of data center links
- 50m OM4 reach covers 100% of data center links
- Average OM4: ~28m

Howard Trieu, Lightera and Mabud Choudhury, Lightera



- AI scale out, xPU to switch, MMF cable length
- 90.5% ≤ 30 m
- 100% ≤ 50 m
- Chart data represents many thousands of MMF links
- Timeframe: 2024
- OM3/OM4 (predominantly OM4)

OM4 MMF

- OM4 is the MMF with highest EMB (min 4700 MHz·km at 850 nm) defined in IEC. Guidance is provided for

  modal dispersion kolesar_3cm_01_0118, and
  chromatic dispersion abbott_3db_adhoc_01_080620

  as a function of center wavelength and RMS spectral width.

- OM4 -3 dBe bandwidth at 30 m and 50 m

Link	OM4 – 3 dBe BW (min)
30 m reach, λ_c = 868 nm, Uw = 0.55 nm	60.7 GHz
50 m reach, λ_c = 868 nm, Uw = 0.45 nm	39.4 GHz

  - At 30 m, OM4 bandwidth exceeds 60.7 GHz
    Measurements indicate the fiber bandwidth is adequate bernier_3ds_01a_2601

  - At 50 m, minimum OM4 bandwidth of 39.4 GHz when considered together with VCSEL bandwidth is not sufficient to make links with adequate margin

MMF for 50 m Reach (1)

- A MMF with higher EMB for 50 m reach was discussed in P802.3ds with support from major stakeholders
  murty_200gmmf_adhoc_01_250904
  murty_200gmmf_01a_2509

- Specification:

  EMB > 5200 MHz·km over 852 – 868 nm

  - P802.3ds standard is developed using the minimum EMB value of 5200 MHz·km
  - Guidance is sought for EMB over the wavelength window of 844 – 868 nm
  - EMB should equal or exceed that of OM4 over 844 – 868 nm

- This will be another grade of 50 μm core multimode fiber, i.e., an addition to OM3/OM4/OM5, and not a new fiber

- Fiber -3 dBe bandwidth for Uw = 0.45 nm

Link **50 m reach, Uw = 0.45 nm**	**– 3 dBe BW (min)**
λ_c = 852 nm	48.2 GHz
λ_c = 868 nm	50.2 GHz

MMF for 50 m Reach (2)

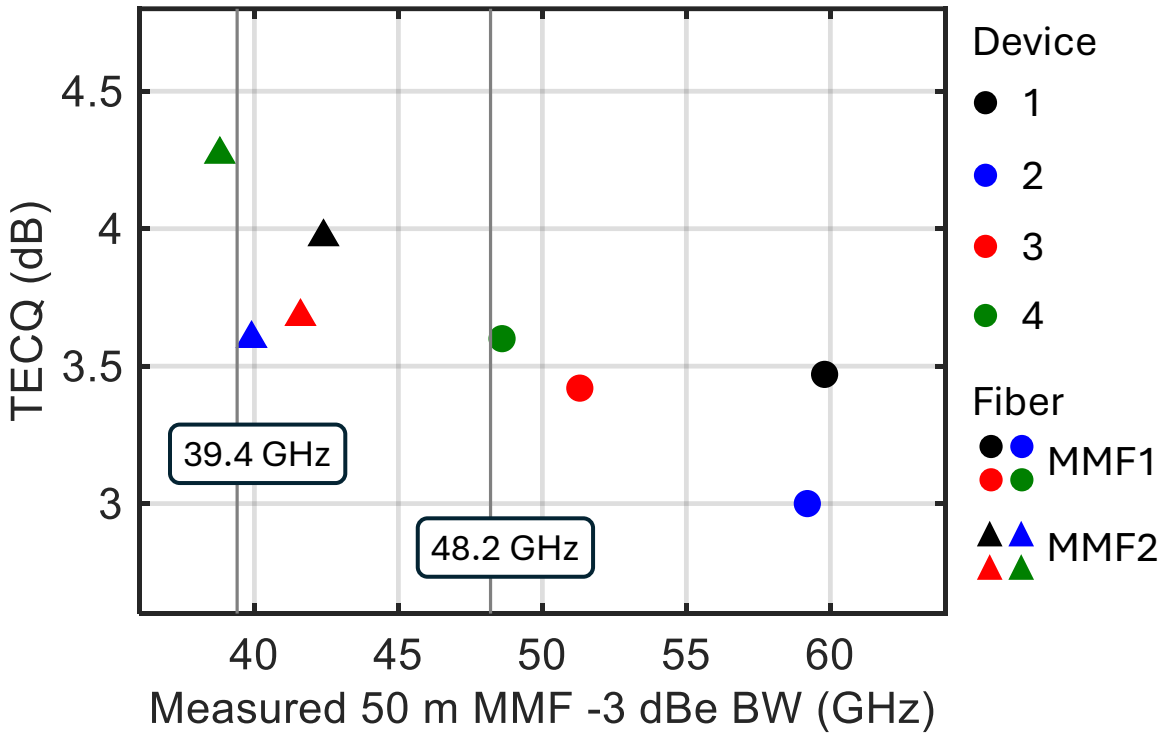
Work to define the multimode fiber with EMB specified on slide 5 is requested beginning with a liaison letter from IEEE 802.3 to IEC. The next IEC meeting is in Apr.

This can help P802.3ds keep to the timeline adopted by the TF, timeline_3ds_2601

50 m Link Measurements

- 50 m link performance has been reported in past presentations: rodes_200gmmf_01_2511, CFI_200GMMF_R4_250717

Eye closure penalty is measured after transmission through 50 m MMF



Data rate	212.5 Gb/s
Modulation format	PAM4
Pattern	PRBS15Q
SIRC filter BW	53.1 GHz
DCA equalizer	15-tap FFE + 1-tap DFE
Target SER for TDECQ	4.56×10^{-4}
Outer ER	2.5 – 2.7 dB
Temperature	Room

1. Eye closure quaternary penalty (TECQ) is calculated with 0.08 UI histogram spacing and 0.04 UI histogram width
2. DFE tap coefficient max limit is 0.4
3. Two 50 m long multimode fibers of different EMB to cover the range of interest
4. Fiber bandwidth was measured for each link
5. Modulation signal for VCSEL is from Keysight M8199B AWG

❑ The higher EMB MMF discussed on slides 5 – 6 will provide the margin for robust links at 200G per lane.