MMF for 50 m Reach

Ramana Murty

Broadcom Inc.

IEEE P802.3ds Task Force

200 Gb/s per Wavelength MMF PHYs

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Supporters

Earl Parsons, CommScope/Amphenol

Jing Li, YOFC

Jose Castro, Panduit

Limin Geng, Huawei

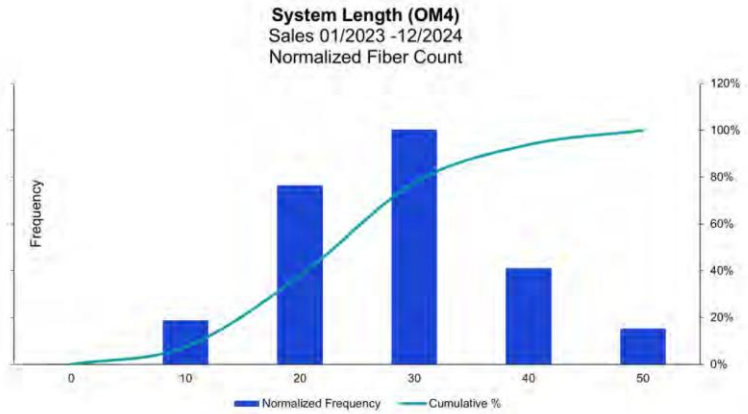
Reach

- 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

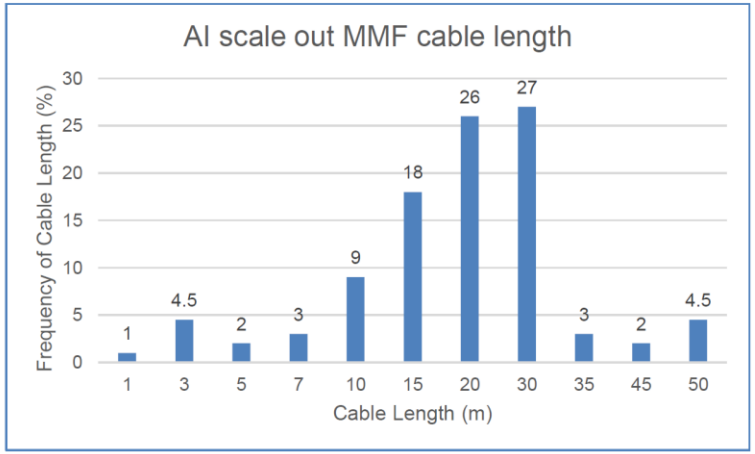
- Links are generally under 30 m, and reach up to 50 m will cover a majority of the AI links [CFI_200GMMF_R4_250717]

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
  - No guidance is sought for EMB outside the wavelength window of 852 – 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

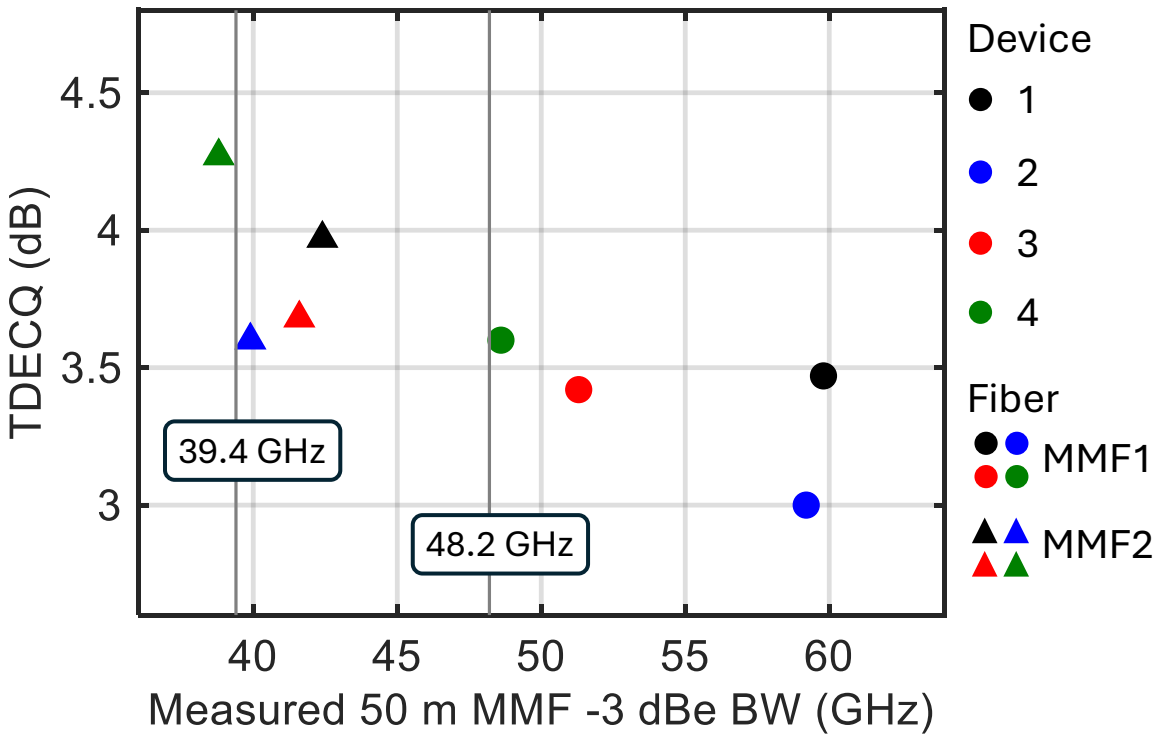
MMF for 50 m Reach (2)

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 will help P802.3ds to keep to the proposed schedule, mi_3ds_01a_2601

50 m Link Measurements

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



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. TDECQ 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.