

A Single PMD to Cover 840 – 990 nm with OM3 fiber

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Data Links with Multiple Wavelengths

VCSEL-based data links with multiple wavelengths

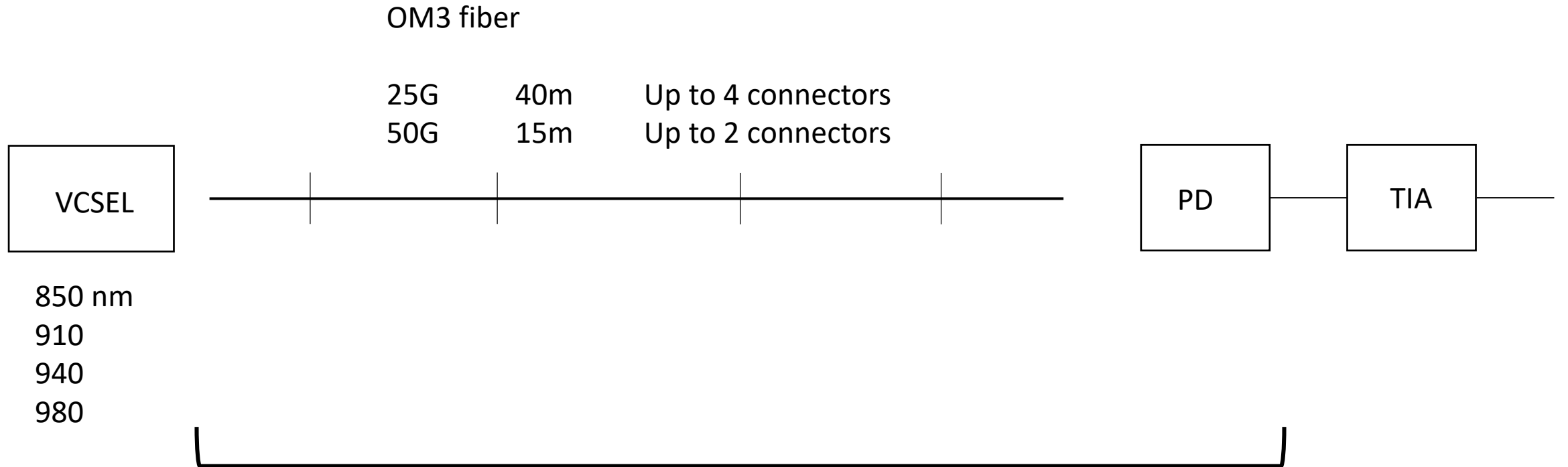
- 802.3cm 400GBASE-SR4.2: A 26.5625 GBd PAM4 bidirectional link

VCSEL 844 – 863 nm, 900 – 918 nm

- SWDM A 4 × 25 Gb/s WDM NRZ link

VCSEL Wavelength windows centered at 850, 880, 910 and 940 nm.

Automotive Link



How does the behavior of fiber and photodiode (PD) vary across 850 – 980 nm?

OM3 Fiber

Fiber bandwidth exceeds the receiver bandwidth (≈ 13.5 GHz) across 844 – 990 nm by a significant margin.

⇒ Fiber BW is not a limitation in the link performance.

Wavelength	Modal Dispersion BW	Chromatic Dispersion BW **	Effective BW
844 nm	1896 MHz·km	2844 MHz·km	1577 MHz·km
990 nm	≈ 950 MHz·km*	5557 MHz·km	936 MHz·km

40m reach

844 nm Effective Fiber BW 39.4 GHz

990 nm Effective Fiber BW 23.4 GHz

* John Abbott, [abbott_3cz_02_0521_Laser_Optimized_Fiber.pdf](#)

** Calculated for RMS spectral width of 0.65 nm.

Photodiode

➤ Responsivity

InGaAs PIN shows good responsivity across the wavelength range of interest (840 – 990 nm).

Reference*: *The ROSAs are also designed for 25 Gbps NRZ operation with responsivities of*

<i>0.65 A/W</i>	<i>853 nm</i>
<i>0.60</i>	<i>942</i>
<i>0.60</i>	<i>976</i>

➤ AR coating on PD

A wide band AR coating is required to (a) maintain good responsivity, and (b) keep return loss within specification.

SWDM links (840 – 950 nm) use a wide band AR coating.

* Y. Sun et al, J. Lightwave Technol. 35, 3149(2017).

SWDM PAM4 Transmission From 850 to 1066 nm Over NG-WBMMF Using 100G PAM4 IC Chipset With Real-Time DSP

Yi Sun, *Senior Member, IEEE*, Robert Lingle, Frank Chang, *Senior Member, IEEE*,
Alan H. McCurdy, *Member, IEEE*, Kasyapa Balemarthy, Roman Shubochkin, Hideyuki Nasu, *Senior Member, IEEE*,
Timo Gray, Kristine Scott, Wenjuan Fan, David Braganza, *Senior Member, IEEE*, John Kamino, Tomofumi Kise,
Jim A. Tatum, and Sudeep Bhoja

Summary

A single PMD that uses a VCSEL source in the wavelength range 840 – 990 nm with an OM3 fiber is feasible over the link lengths being considered for automotive links.

- Interoperability is feasible
- Reduces the number of PMDs*
- Enables multiple VCSEL suppliers

* S. Swanson, [swanson_3cz_01b_150621_straw_polls.pdf](#)