

End Face Termination Process for Butt Coupling (GI-POF)

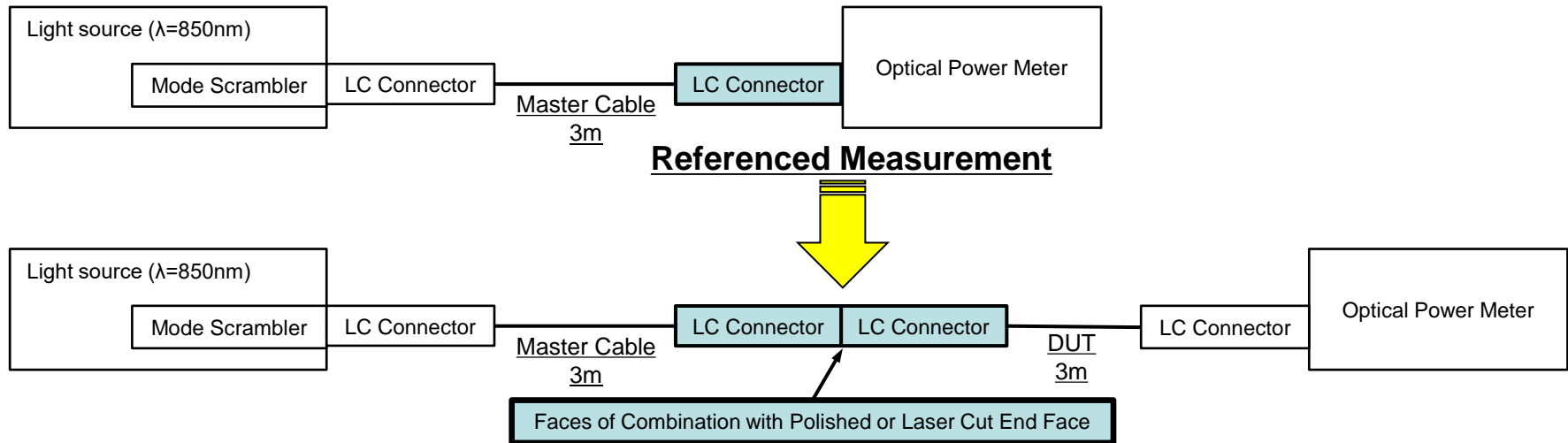
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15th Sept. 2020

IEEE P802.3cz Multi-Gigabit Optical
Automotive Ethernet Task Force

- Laser Cut Process
 - GI-POF
 - Connection Loss
 - Modal Dispersion
 - Eye Pattern and BER
 - End Face Shape

- GI-POF
 - In this presentation, I evaluated with typical Graded Index (e.g. 50 micron core) plastic optical fiber.
 - Prepared the End Faces Combination of Optical Cables with LC Connector (3m)
 - #1 Polished and Polished
 - #2 Polished and **Laser Cut**
 - #3 **Laser Cut** and **Laser Cut**

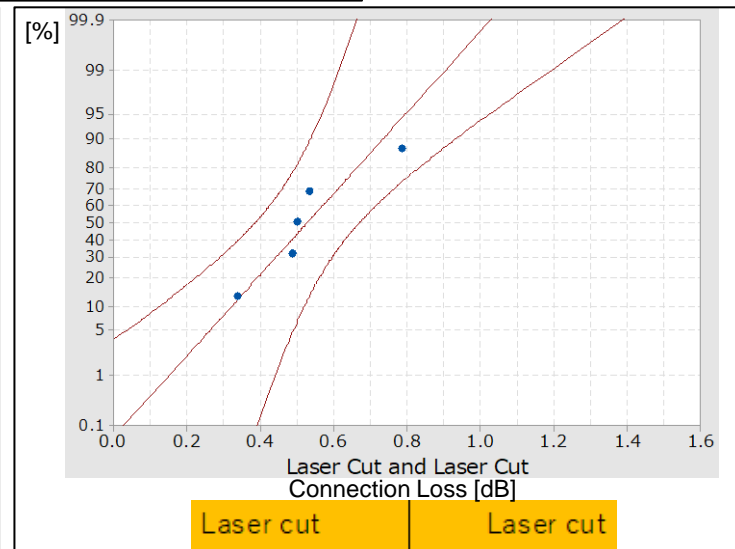
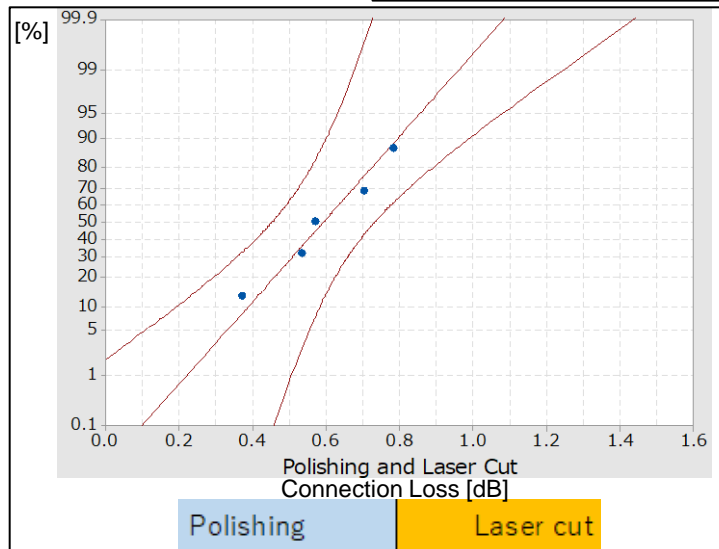
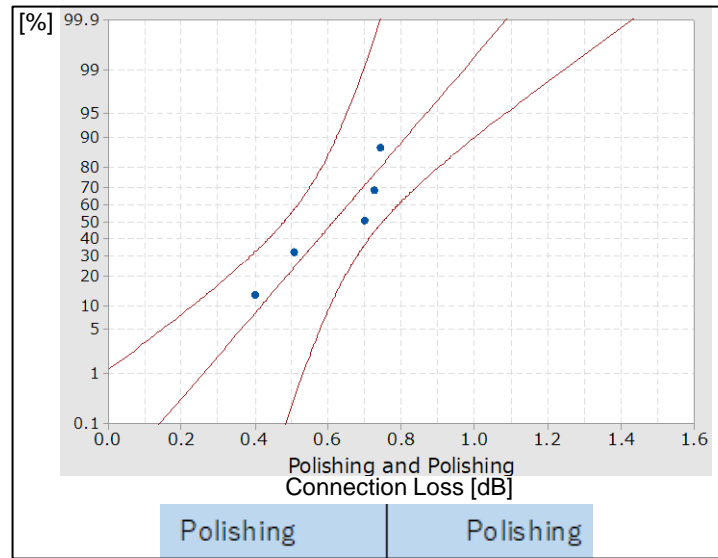
GI-POF Connection Measurement



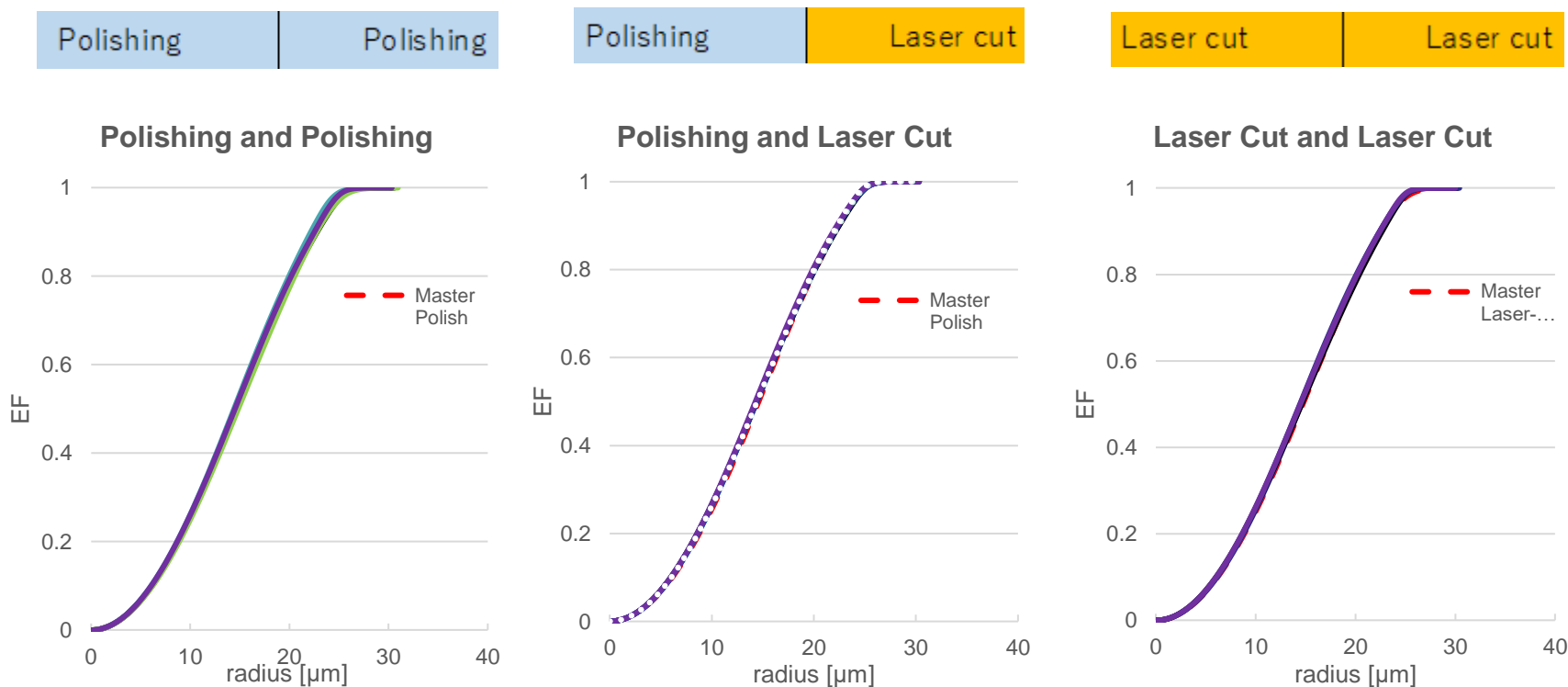
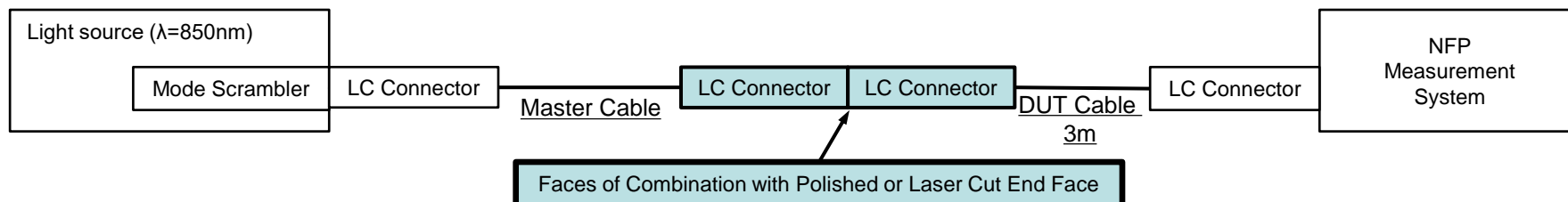
Actual Connection Measurement						
Fiber Type	Side of Master	Side of DUT	Connection	Max.	Min.	Ave.
	End face processing	End face processing	Loss [dB]	[dB]	[dB]	[dB]
GI-POF	Polishing	Polishing	0.725	0.741	0.397	0.613
			0.397			
			0.697			
			0.741			
			0.505			
	Polishing	Laser cut	0.702	0.781	0.370	0.590
			0.370			
			0.530			
			0.781			
			0.569			
	Laser cut	Laser cut	0.335	0.783	0.335	0.526
			0.497			
			0.783			
			0.486			
			0.531			

Probability Plot of Connection Loss

- 95% CI, (Confidence Interval)
 - Normal distribution [Upper/Lower] Fitted line



NFP: Near Field Pattern, Measurement (EF: Encircled Flux, Results)

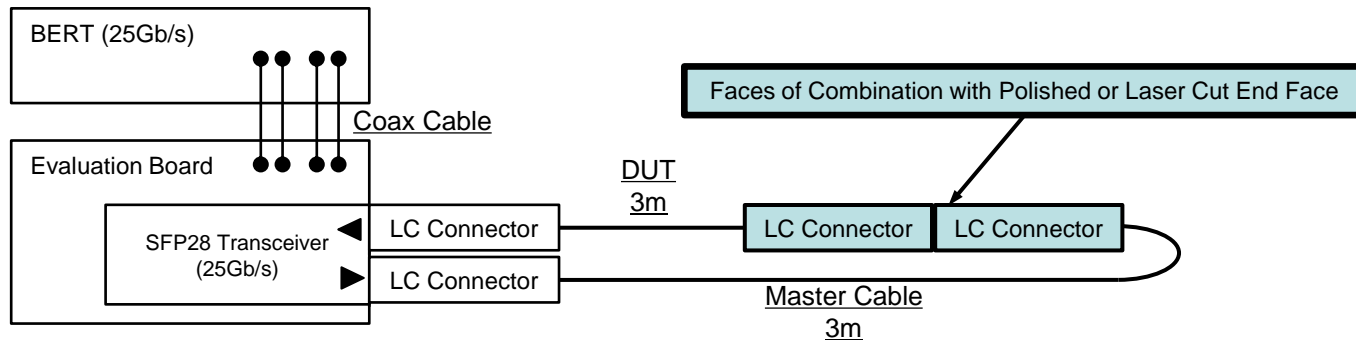


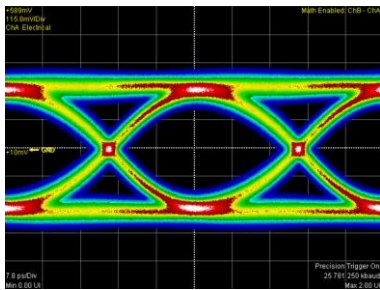
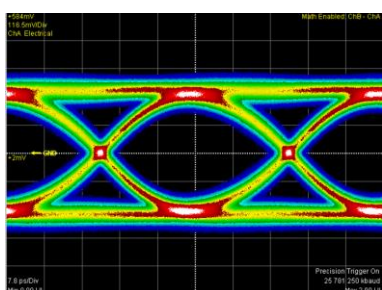
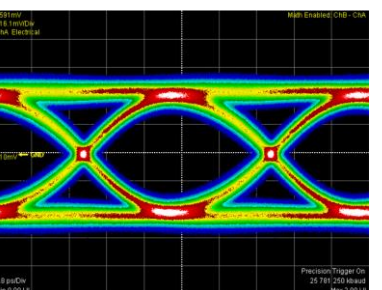
- Evaluation with SFP28(25GBASE-SR) Transceiver

Bit Rate : 25.78Gb/s

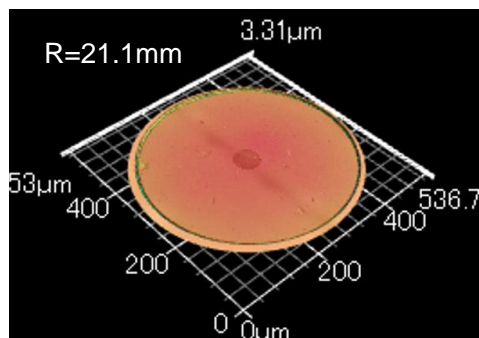
BER (Bit rate Error Ratio) : 10^{-12}

Data Pattern : PRBS2³¹-1

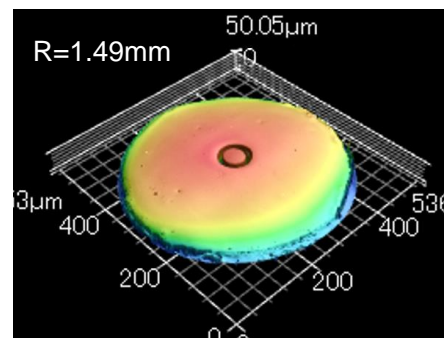


GI-POF Eye Pattern Measurement and BER Results			
End Face Combination	Polished and Polished	Polished and Laser Cut	Laser Cut and Laser Cut
Eye Pattern			
BER	10^{-12} [Error Free]	10^{-12} [Error Free]	10^{-12} [Error Free]

- Measurement on 3D Laser Scanning Confocal Microscope



GI-POF
Polished Fiber End Face



GI-POF
Laser Cut Fiber End Face

- I evaluated laser cut process for GI-POF
 - Laser cut process had successful with GI-POF
 - The connection loss probability plot are shown under 1.5dB with 95% CI, (Confidence Interval)
 - The modal dispersion is similar as usual polishing end-face combination.
 - The eye pattern and BER looks good with 1 connection.
 - The end face shape could modified and improve with laser cut process.
- So, I confidence the laser cut process is even practical for automotive applications.

Thank you!