

Transceiver Module Wavelength Distribution Statistics for CD Spec. Discussions

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I Supporters

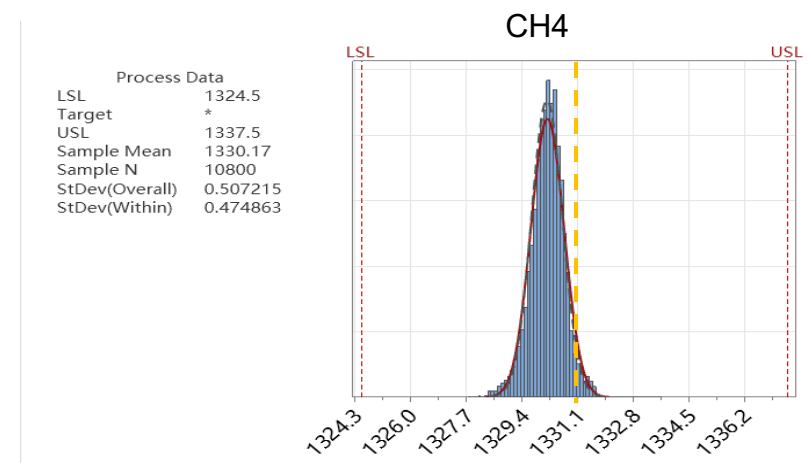
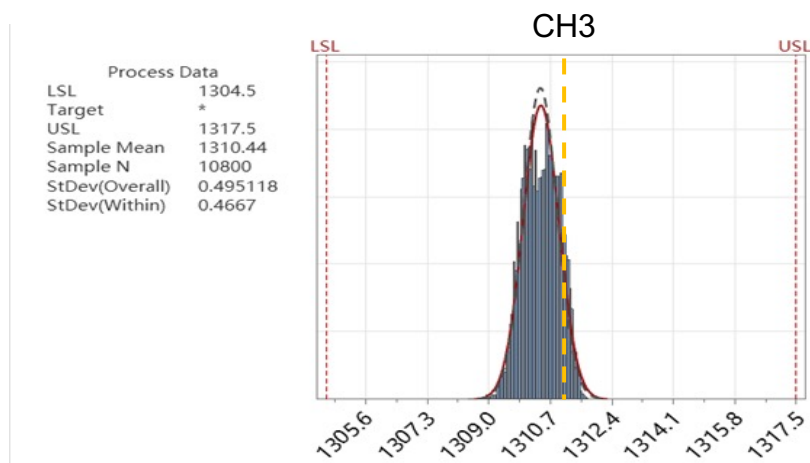
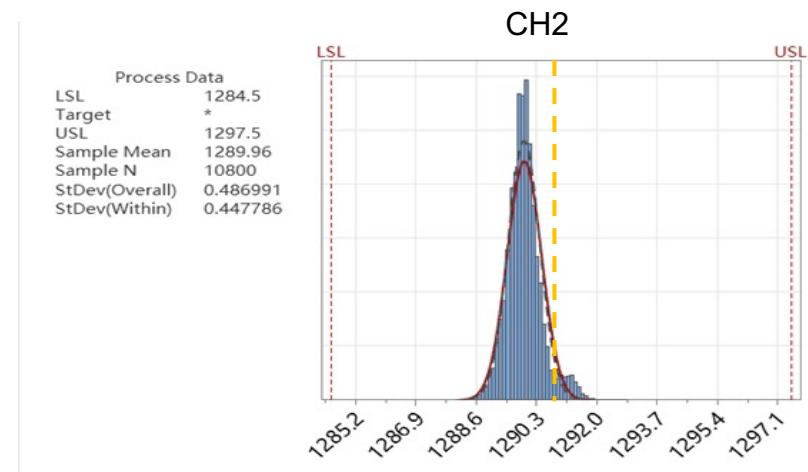
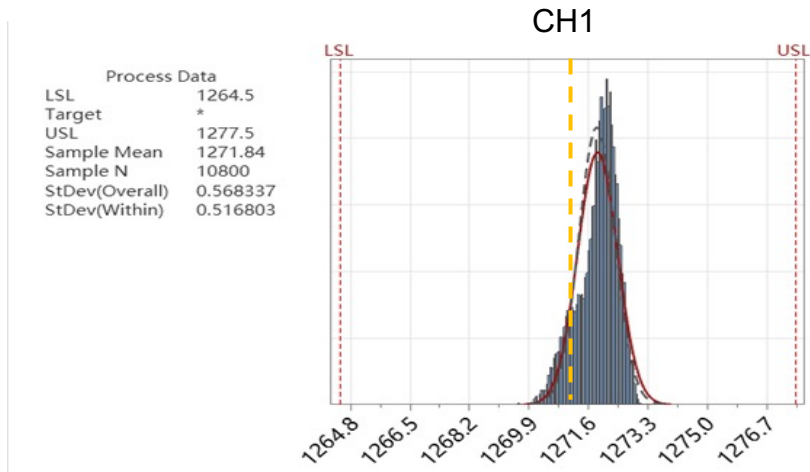
- Earl Parsons, Comscope
- Xiang Liu, Huawei

I Overview

- Chromatics Dispersion (CD) spec. becoming more and more important at high baud rate IMDD optical solutions, especially up and coming 400G optics
- 802.3dj made progress with Fiber distribution model towards a baseline CD spec. for 800G-FR4 and 800G-LR4:
 - Transceiver wavelength distribution had not been considered so far for spec. considerations
- We present measured data with wavelength distribution of 400G-FR4 (CWDM) and 400G-ERL (LWDM) modules
- The results are provided as references to proposed baseline wavelengths specification, and for refinement of CD specifications for 200G per lane PMDs such as 800G LR4 and FR4, and future PMDs at higher baud rate

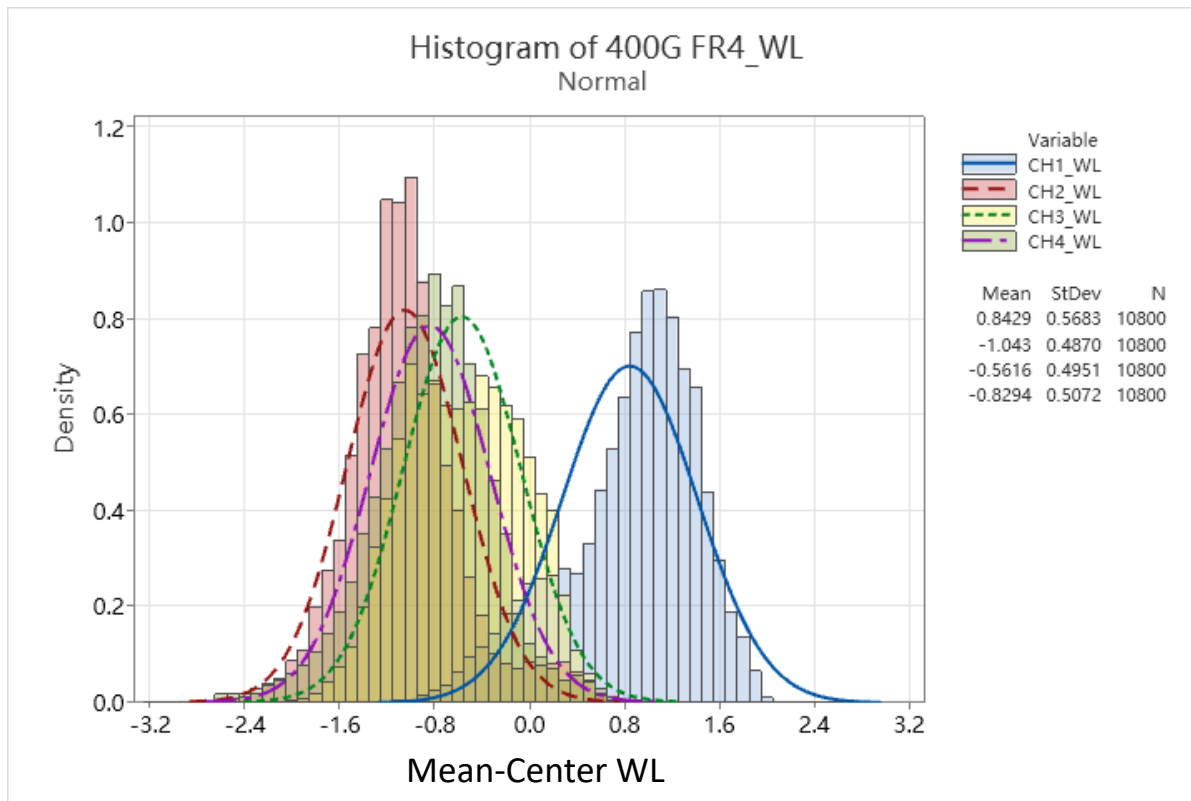
400G-FR4 (CWDM) Wavelength Distributions

- 400G-FR4 TRx Module Products based on TEC Cooled CWDM EMLs
- Sample size > 10,000 Units



400G-FR4 (CWDM) Wavelength Distributions

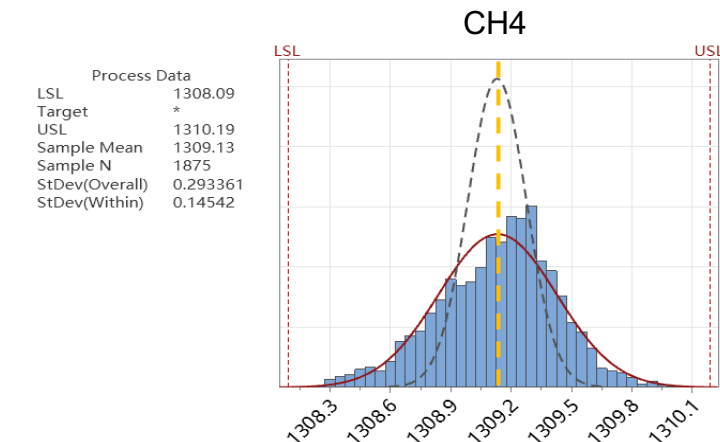
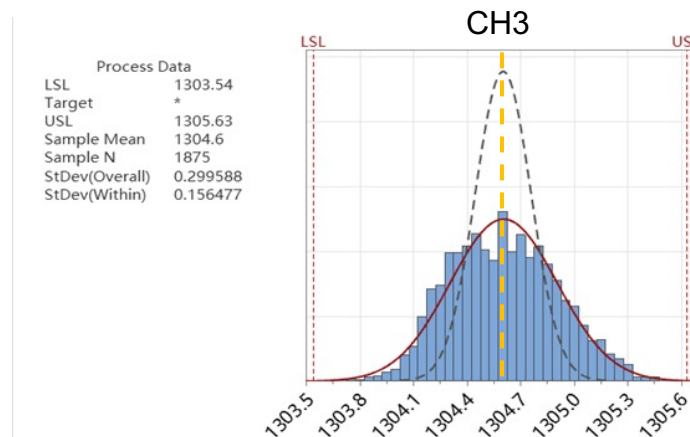
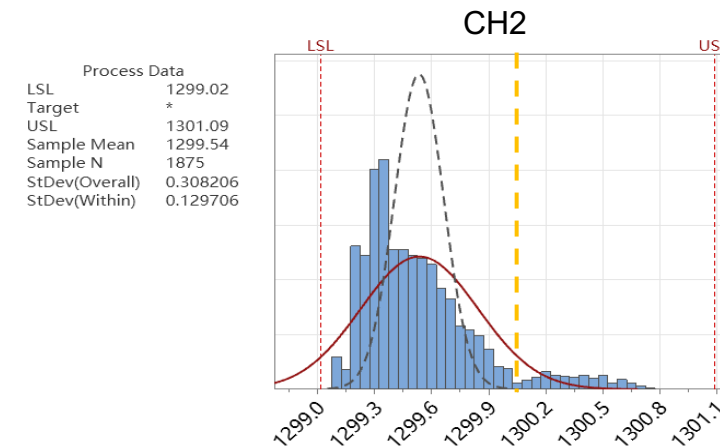
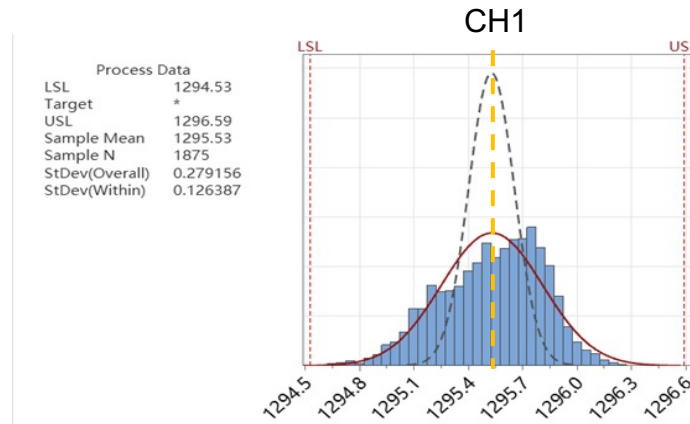
- Distribution relative to center wavelengths
- Wavelength data well within range of +/-3nm, vs. +/-6nm with large margin



	Center WL Spec.	WL Spec. Range	Mean WL	Deviation of (Mean-Center)	StDev (σ)
CH1	1271	+/-6.5	1271.84	0.843	0.563
CH2	1291	+/-6.5	1289.96	-1.043	0.487
CH3	1311	+/-6.5	1310.44	-0.562	0.495
CH4	1331	+/-6.5	1330.17	-0.829	0.507

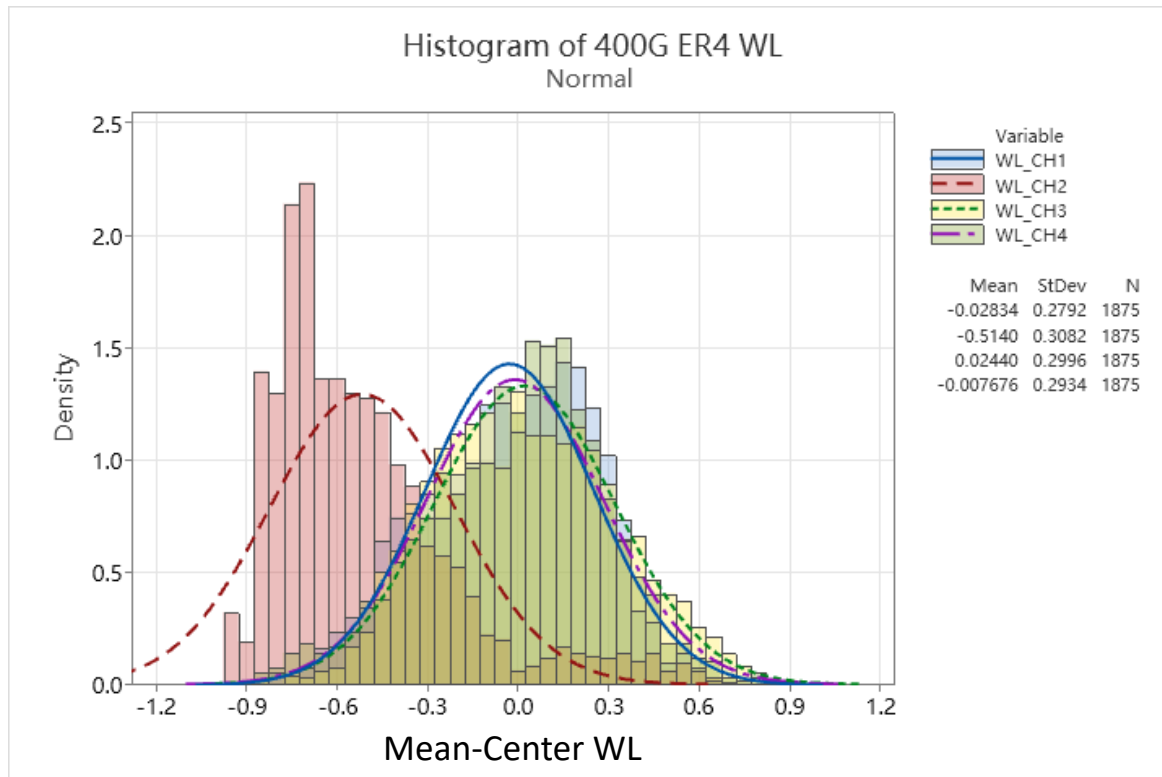
400G-ER4L (LWDM) TRx Module Test Data vs. Specifications

- 400G-ER4L TRx Module Products based on TEC Cooled LWDM EMLs
- Sample size ~ 3x625 Units (over 3 temps)



400G-ER4L (LWDM) TRx Module Test Data vs. Specifications

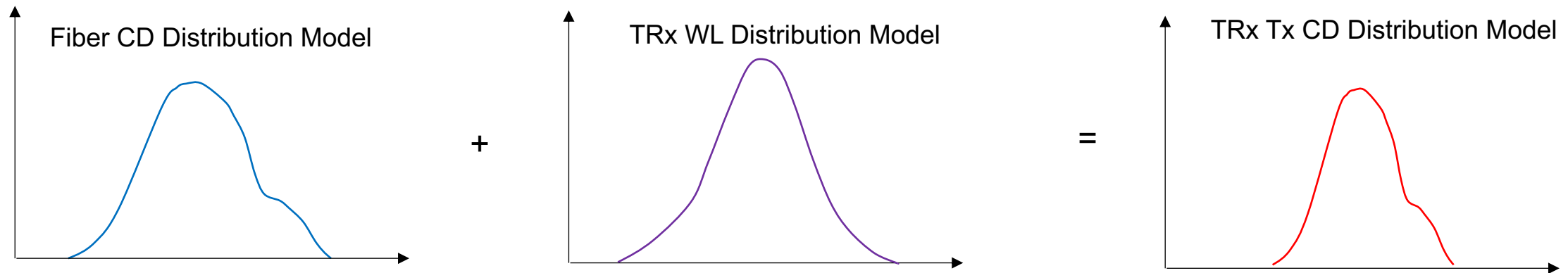
- Distribution relative to center wavelengths
- Wavelengths distribution well within +/-1nm, vs. spec. +/-1.7nm
 - Channel 2 wavelength mean deviation from center ~ 0.5nm, much higher than other 3 channels, may need to look into more detail



	Center WL Spec.	WL Spec. Range (nm)	Mean WL	Deviation of (Mean-Center)	StDev (σ)
CH1	1295.56	+/-1.7	1295.53	-0.028	0.279
CH2	1300.05	+/-1.7	1299.54	-0.514	0.308
CH3	1304.58	+/-1.7	1304.60	0.024	0.300
CH4	1309.14	+/-1.7	1309.13	-0.008	0.293

Summary

- 400G-FR4 and 400G-ER4L TRx Module Level wavelengths data presented with distributions well within proposed wavelength range for 800G-FR4 and 800G-LR4 with good margin
 - All data are from cooled EMLs
 - Will check more data from uncooled laser (e.g., uncooled CW + SiPho)
- TRx module wavelength distribution may be considered for co-simulate with fiber CD distribution model so a more comprehensive probability of CD values experienced by Realistic TRx module can be accessed for future PMD, such as 400G per lane IMDD solutions





Thank You!
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