Optical Channel model proposal update: Comparison to Earl Parson's data and future steps

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Introduction

Historically, IEEE used worst case ITU-T dispersion that results from a worst-case ZDW and a worst-case Slope pair.

That worst case ZDW-Slope pair now impacts IMDD at 200G/lane and beyond.

Extensive dataset collected in parsons_3dj_01b_2403 shows than most fibers dispersion are well within the historical worst-case margins

A statistical methodology was proposed in rodes_3dj_01a_2401 for the task force to start building a more realistic optical channel model

Steps to define optical channels

1. Obtain fiber cable dataset that best represents the application

2. Define analytical model to describe the chosen dataset in a compact form

3. Decide on PMD-dependent parameters:
    1. Confidence level (TBD)
    2. Number of segments (TBD)

4. Derive specs based on MonteCarlo simulation using chosen parameters:
    1. Min/max values for link budget
    2. Equation for Transmitter compliance test

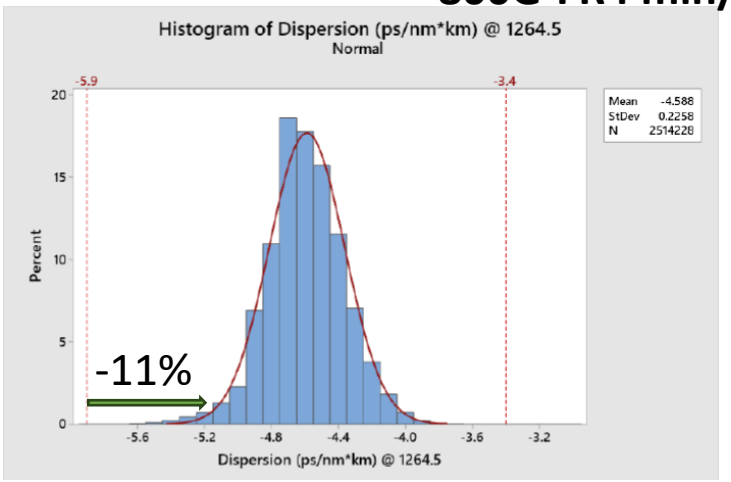
Experimental Dataset

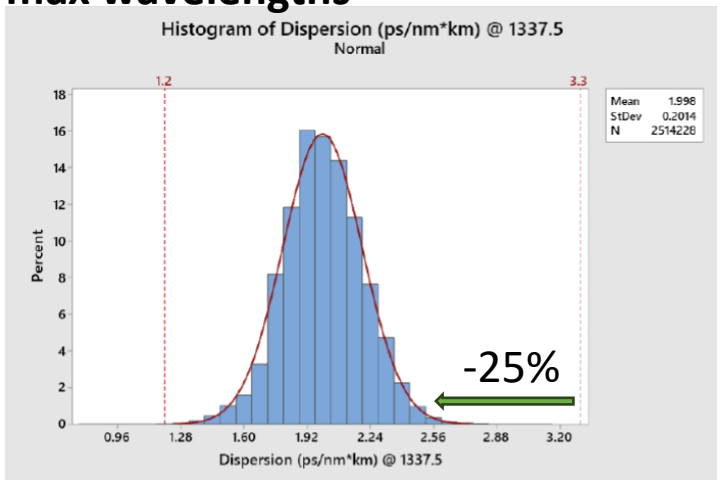
Thanks to large dataset on parsons_3dj_01_2405, there is a clear evidence that:

- Most optical links would have significant dispersion margin
- Good fit with Gaussian distributions

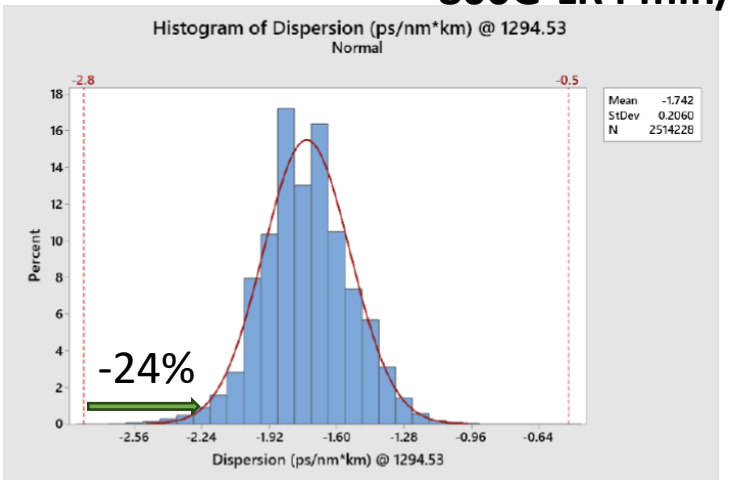
parsons_3dj_01_2405

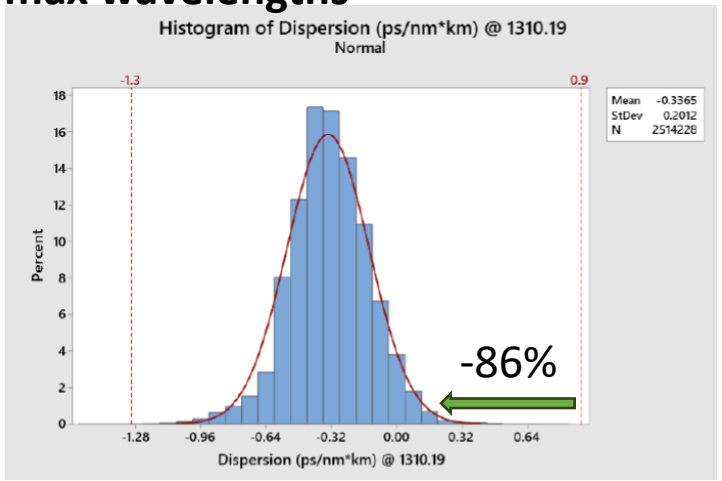
800G-FR4 min/max wavelengths





800G-LR4 min/max wavelengths



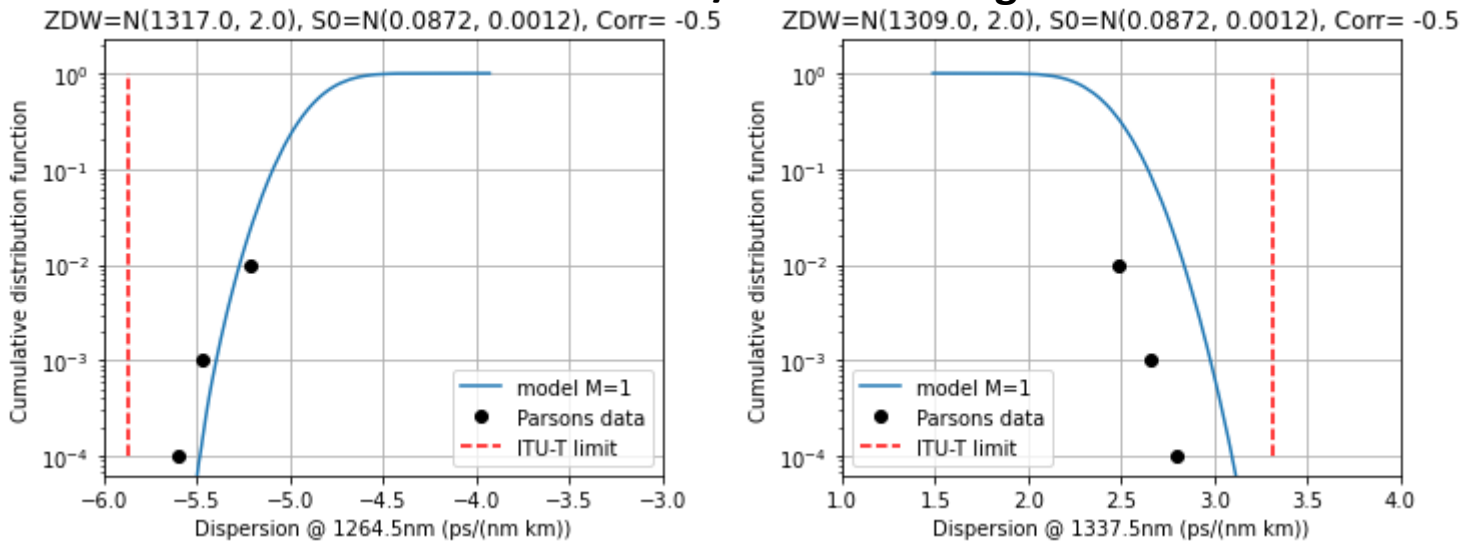


Dataset vs analytical model comparison

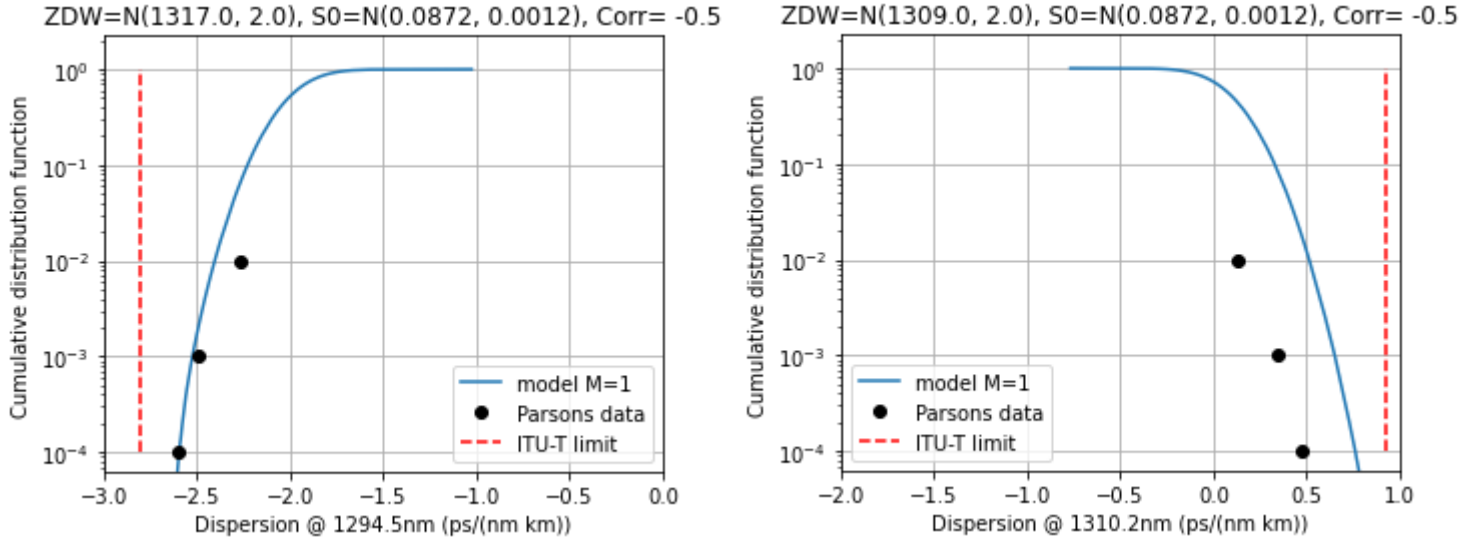
Proposed distribution in rodes_3dj_01a_2403 agrees reasonably well with parsons_3dj_01_2405 on the negative dispersion side and is significantly more conservative on the positive dispersion side.

A parametrized analytical distribution is very helpful as it is reproducible by anyone and can be readily explainable in an appendix.

800G-FR4 min/max wavelengths



800G-LR4 min/max wavelengths



Future work

We plan to bring a spec proposal into the next meeting based on:

- Analytical distributions fitting the totality of the dataset in parsons_3dj_01_2405
- MC analysis with 99.99% confidence level
- Any additional feedback.