

Key Required Measurements for 400G PAM4 Specifications

IEEE 802.3 400GPL Study Group Electronic Interim

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Introduction

- 400G optics specifications have to be based on measurements
- Unlike electrical specifications, analysis and models are not sufficient to predict new performance
- Scaling 200G characteristics is only a starting point
 - Must be verified with measurements
 - Not presumed correct by default, with burden placed on disproof
- Major challenge
 - Components do not exist
 - Reluctance to share because of competitive considerations
 - Not an excuse to adopt specifications without measurements

Transmitter Measurements

- Time domain
 - Eye diagrams
 - Some already presented at OFC'26
- TECQ/TDECQ
 - Measured instrument characteristics
 - Simulations must include analog front end characteristics
 - Sampling non-idealities are first order
 - Sampling effects dwarf DSP 2nd order issues extensively discussed at 200G
 - Correlation with link BER penalties
- Functional BER
 - Mask Margin
 - Penalties

Channel Measurements

- John Johnson has presented limitations of existing SMF models on closing links
- Characterization of modern SMF deployed in AI build-outs is required
- Legacy SMF can not be supported without compromising feasibility and cost
- 200G statistical models will need to be updated to more accurately reflect deployment scenarios

Receiver Measurements

- LRS
 - Updated specifications need validation
- SRS
 - Entirely new specifications need to be written; this was deferred from 200G
 - Requires validation
- Receiver Sensitivity
 - No components or measurements have been reported
 - Huge concern area; >1dB improvements are aspirational
 - 200G timeline was saved by measurements from Vasu
 - Perhaps best way to make progress here is to send flowers



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Thank you