EVM and parametric specifications for coherent transmitters

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Overview

- 802.3cw has identified EVM as a Transmit Quality Metric
  - EVM was selected to provide a Transmit Quality Metric encompassing multiple Tx impairments

- Comments on 802.3cw D1.4 suggested adding parametric specs and removing EVM
  - See comments #30, 34-37, and 43

- Comment resolution on D1.4 reached consensus on adding parametric specifications while maintaining EVM

- This contribution explains the motivation for including EVM along with parametric specs

Parametric specifications

- Individual parameters that result in linear deviations from a perfect transmitter have limits defined
    - Examples: Quadrature error, I/Q imbalance, I/Q skew

- Data should indicate that these limits result in acceptable penalties, when combined at worst case values

- Knowledge of the maximum values of these Tx impairments allows receiver designs to optimize performance

Uses for EVM in a standard

1. Provide an overall quality metric for a transmitter. Any differences between the target symbols and the transmitted symbols will be captured in an EVM measurement.
2. Allow a single transmitter specification to simplify the standard and allow designs to trade-off individual impairments

Point 1 ensures that a transmitter does not meet individual parametric specifications while having other noise or distortion sources that result in an unacceptable Tx quality.

→ Individual Tx parametric imperfections will contribute to EVM

Point 2 requires significant data collection to demonstrate that the impairments result in EVM values that produce comparable receiver penalties.

→ This is not required for a technically complete specification

Discussion

- Parametric specifications have a well-defined basis in coherent optical transmitter design
  - These are readily measured, and we have data for their performance impacts

- Parametric specifications alone will never capture all sources of noise or distortion on a transmitter

- Combining parametric specifications with an EVM specification results in a technically complete definition of the transmitter waveform

- Some parametric specifications could potentially be removed later with sufficient data, however there may be little benefit to this

- Collecting data for EVM penalties using only ASE addition (AWGN) should simplify the task of collecting EVM data

Summary

- Adding Tx parametric specifications to 802.3cw allows progress towards a technically complete standard

- Maintaining EVM alongside the Tx parametric specifications provides a metric for limiting penalties from sources not captured in the Tx parameters

Thanks!