

CDAUI-8 chip-to-chip even-odd jitter measurement

Adam Healey

IEEE P802.3bs 400 Gb/s Ethernet Task Force, May 2016

Problem statement

- The even-odd jitter measurement in 120E.3.3.2 cannot be applied “regardless of transmitter equalizer setting”
- *The time of a transition from 0 to 3, 3 to 0, 1 to 2, or 2 to 1 is the time at which the signal crosses the mid point of V_{mid} [VC_{mid}] defined in 120E.4.2.*
- *Calculate the voltage center (VC_{mid}) of the middle eye as the mid-point in voltage between $MIDCDF1$ and $MIDCDF0$ with a value of 10^{-5} .*
- But what if there is no eye opening at 10^{-5} ?
- As a result, the specification cannot be realized as currently defined

Options for even-odd jitter measurement

1. No longer require that the “specification shall be met regardless of the transmit equalization setting”
 - Any (or all?) transmitter equalizer settings that produce an adequate eye opening
2. Define an equalizer that is capable of addressing both under-compensated and over-compensated cases
 - E.g., a finite impulse response (FIR) filter
3. Reinstate JP03B as the even-odd jitter test pattern and use the measurement method described in 94.3.12.6.2

Trade-offs

Option	Pro	Con
1	<ul style="list-style-type: none">• Simplest change to the draft• Re-use of transmitter output waveform data	<ul style="list-style-type: none">• Partial coverage of equalization space• Low signal-to-noise ratio for “small” transitions
2	<ul style="list-style-type: none">• Full coverage of equalization space• Re-use of transmitter output waveform data	<ul style="list-style-type: none">• Low signal-to-noise ratio for “small” transitions
3	<ul style="list-style-type: none">• Simplest to measure• Independent of transmitter equalizer setting	<ul style="list-style-type: none">• Additional test pattern and measurement• Miss pattern-dependent effects?

- “Small” transitions (e.g., 0 to 1) are more susceptible to amplitude-to-phase noise conversion
 - More noise suppression (averaging?) needed to accurately measure EOJ due to 1/3 slew rate
- Unclear how test pattern impacts even-odd jitter

Summary and conclusions

- Option 3 is the simplest method for the accurate measurement of even-odd jitter
- Methods based on PRBS13Q could also be used to avoid additional test pattern and measurement
 - The measurement conditions must be carefully considered
 - Waveform equalization is required
 - Extra care must be taken to ensure accuracy