# 25G Rx Interference Tolerance (RITT) Test Implementation Concerns

Kumaran Krishnasamy, Richard Mellitz, Oran Gafni

Adee Ran

Nov/04/2015

# Background

- In 802.3by we currently have two separate receiver test methods with different setup requirements

| Test | Copper cable PHY (clause 110) | Backplane PHY (clause 111) |
|---|---|---|
| Baseline/history | Clauses 92 and 85 | Clause 93, and to some extent Clause 72 |
| Transmitter used in the test | Jitter magnitudes (SJ, RJ, EOJ) of the transmitted signal are *specified* | Transmitter jitter is *characterized* (ERJ, EBUJ, SNDR) |
| COM calibration | Tx-side noise (substitute to FEXT in prior clauses), controlled using SNR_Tx | Rx-side noise, controlled using $\sigma_{bn}$ |
| Reference points | PGC (TP0) to MDI (TP4) | TP0 to TP5 (using replica traces) |

# Background (2)

- Apart from the listed differences, the test requirements are the same:
  - COM target specified, noise is calibrated
  - Training assumed to tune Tx equalization
  - Same test patterns and required performance (depending on FEC mode)

# Problem statement

- The copper cable RITT (Clause 110) has several issues for practical implementation.

# Issues with Clause 110 method

- SJ and RJ jitter components are set to 0.1 UI and 0.01 UI, respectively, in the COM calculation to achieve the required COM values.
  - ❑ This means that we have to apply these amounts of jitter from the Tx (PGC).
- In order to implement the SJ (> 100MHz), we need to use a BERT with jitter generation capability as the Tx.
  - ❑ Problem: This may preclude using a complaint device as the Tx.
  - ❑ Footnote c of Tables 110-5, 6, 7
- With the BERT, the issue is that it is not likely to be protocol aware and FEC capable.
  - ❑ Not being protocol aware dictates the Tx equalization to be set by other methods.
    - ❑ For example, first connect the DUT to a compliant device and then apply the training results in the BERT Tx.
    - ❑ This may still not be the optimal equalization setting if the BERT were to converge directly as a training-capable device.
  - ❑ Problem: Different "solutions" may cause different results.

# Issues with Clause 110 method (2)

- Even-odd jitter (EOJ) component is not used in the COM calculation and required to be applied in the spec tables.

- In order to implement the EOJ, again we need to use a BERT with jitter generation capability as the Tx.

  - Problem: Not many BERT devices support EOJ and equalization together.

  or

  - Problem: EOJ may not be controllable in a compliant device, this may preclude using a compliant device as the transmitter.

# Next steps and discussion

1. This is in preparation for sponsor ballot and starting the discussion now to get consensus on a solution

2. Possible changes for consideration
   - Change clause 110.8.4.2 to be more like Annex 93C where $A_{DD}$ and $\sigma_{rj}$ are measured and used in COM. Perhaps some minimum SJ and RJ requirements in Table 110–5,6,7 but not max. More work is needed to determine this.
     - Instead of current "Applied" values, and the text in 110.8.4.2.4 "The pattern generator shall be set to match the jitter specification specified"
   - Recommend that Tx devices should be selected which have EOJ as close to the maximum specification as possible.
     - instead of current "requirement" (value in the table)
   - Recommend Tx device need to be protocol aware or set up equivalently.
     - Currently in 110.8.4.2.5 : "The pattern generator is first configured to transmit the training pattern […] (the DUT) configures the PG […] to the coefficient settings it would select using the protocol". It is not required or recommended that the pattern generator itself implement the training protocol