25G Rx Interference Tolerance (RITT) Test Implementation Concerns

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Oct/26/2015

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 and amplitude of the transmitted signal are specified	Transmitter is characterized (jitter SNDR etc.), results used to calculate COM
COM calibration	TX-side noise (substitute to FEXT in prior clauses), controlled using SNR_TX	RX-side noise, controlled using σ_{bbn}
Reference points	PGC (TP0-like) and 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 (PG).
- 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 Table 110-5,6,7
- With the BERT, the issue is that it likely is not protocol unaware and not FEC capable, at present.
  - ❑ 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 or remedy

1. Wait until sponsor ballot or do now?

2. Remedy

   – Change clause 110.8.4.2 to be more like Annex 93C where A_{DD} and σ_{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