Optical Tx Specification Proposal
Functional Receiver & FEC Code Word Mask

IEEE P802.3dj Task Force

Plenary Meeting

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Comments 343, 345, 347, 349

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Outline

- Introduction

- Functional Receiver (FRx) Test Definition

- FRx Test FEC Code Word Limits

- TECQ & TDECQ Alternatives

Introduction

- 100G/lane optics with compliant TDECQ have interoperability issues in deployment
- 200G/lane optics have poor if any TDECQ correlation to link performance
- Optimizing for link performance often increases TDECQ
- Some optimum link settings result in TDECQ exceeding compliance limits
- An analogy is a chef serving dishes without tasting them

- End users use HW Rx and FEC code word masks to qualify 200G/lane optical Tx
- Optical module vendors must test with multiple HW Rx and FEC code word masks
- This proposal standardizes HW Rx and FEC code masks for more uniform Tx testing
- A post-deadline presentation is planned with specific comment resolution proposals
- All cooking shows have the same mantra: taste, taste, taste.

Functional Receiver (FRx) Test Definition

1. FRx is a hardware (HW) receiver which meets 802.3dj receiver specs

    FRx meets receiver characteristics in Table 180-8, 181-6, 182-8, or 183-7

2. FRx_OMA is the FRx input operating point (dB):

    $$FRx\_OMA = Tx\_DUT\_OMA - Channel\_Insertion\_Loss - MPI\_DGD\_penalty\_alloc$$
    $$+ FRx\_correction + FRx\_margin$$

    - *FRx_correction is for* FRx RxS deviation from RxS OMA (max) at TX DUT TECQ, specified in Figure 180-4, 181-4, 182-4, or 183-4

        FRx_correction = FRx_RxS - RxS_OMA_max_spec (at Tx DUT TECQ)

    - *FRx_margin* moves FRx OMA input closer to typical operating point

        FRx_margin = 1 dB

3. DUT TX is compliant if the FRx FEC Code Word limits on the following page are met

FRx Test FEC Code Word Limits / 800GbE* / BER = 2.40E-05

S00	S01	S02	S03	S04	S05	S06	S07	S08
1.37E+08	1.79E+07	1.17E+06	5.08E+04	1.64E+03	4.26E+01	9.18E-01	1.69E-02	2.73E-04

S09	S10	S11	S12	S13	S14	S15	S16
3.90E-06	5.01E-08	5.84E-10	6.22E-12	6.12E-14	5.57E-16	4.72E-18	3.75E-20

200GbE lane code word count limits are ¼ of the above values.

- Proposed by Xiang Zhou, Shuang Yin, Google, Roberto Rodes, Coherent

  Count limits are the average number of FEC codewords/sec, observed with a specific symbol error count, i.e. non-normalized FEC symbol error distribution.

- Qualitatively similar to mask proposed by Pengyue Wen, Meta, and another end user.

TECQ & TDECQ Alternatives

1. Keep *TECQ* & *TDECQ* as normative compliance limits, with changes as proposed in other presentations

2. Modify *TECQ & TECQ* normative compliance limits, using margin to FEC code word count limits (Tx_{margin})

$$TECQ_{compliance} = TECQ_{measured} - max(Tx_{margin}, 1dB)$$

$$TDECQ_{compliance} = TDECQ_{measured} - max(Tx_{margin}, 1dB)$$

3. Remove TECQ & TDECQ as normative compliance limits

Above alternatives under discussion

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Thank you