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

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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
- Relying only on TDECQ for interoperable Tx deployment is like a chef serving dishes without ever tasting them.

- End users require their own HW Rx / FEC code masks to qualify 200G/lane optical Tx
- Optical module vendors must test with varied HW Rx / FEC code word masks
- This proposal specifies HW Rx / FEC code masks to standardize functional Tx testing
- All cooking shows have the same mantra: taste, taste, taste.

Functional Receiver (FRx) Test Definition

1. Functional Receiver (FRx) is a hardware receiver which meets 802.3dj receiver specs
   - *FRx complies with Table 180-8, 181-6, 182-8 or 183-7*
2. FRx_OMA is the Tx test FRx input operating point OMA in dB:

   FRx_OMA = Tx_DUT_OMA - max(TDECQ - TECQ, 0) - RxS_TECQ_correction
   - Channel_Insertion_Loss - MPI_DGD_penalty_alloc + Tx_test_FEC_margin
   - *Tx_DUT_OMA complies with current Table 180-7, 181-5, 182-7 or 183-6*
   - *RxS_TECQ_correction is for* FRx RxS deviation from RxS OMA (max) at TECQ of TX DUT specified in Figure 180-4, 181-4, 182-4 or 183-4:

     RxS_TECQ_correction = RxS_OMA(max)_spec - FRx_RxS (both at Tx DUT TECQ)
   - *Tx_test_FEC_margin* increases *FRx_OMA* closer to typical input operating point:

     Tx_test_FEC_margin = 1.5
3. DUT TX is compliant if the FRx FEC code bin limits on the following page are met

FRx FEC Code Bin (S_n) Limits @ BER = 2.40E-05

S_{01}	S_{02}	S_{03}	S_{04}	S_{05}	S_{06}	S_{07}	S_{08}
1.15E-01	7.47E-03	3.24E-04	1.05E-05	2.73E-07	5.88E-09	1.08E-10	1.75E-12

S_{09}	S_{10}	S_{11}	S_{12}	S_{13}	S_{14}	S_{15}	S_{16}
2.50E-14	3.21E-16	3.74E-18	3.98E-20	3.91E-22	3.56E-24	3.02E-26	2.40E-28

FEC code bin (S_n) limits are the maximum probability of having exactly n symbol errors in a single codeword

- Qualitatively similar to 200G/lane optics specifications by multiple end-users
- Extrapolation permitted (see test time presentation)

Clause 180 Comment Resolution

Table 180-7. Insert the following line:

Description	-DRn	Unit
Functional Receiver (FRx) FEC code bin (S_n) limits (max)	S_n limits in table below	probability

Section 180.7.1. Append the following text:

Functional receiver (FRx) *complies with Table 180-8 with input operating point FRx_OMA* in dB:

FRx_OMA = Tx_DUT_OMA - max(TDECQ - TECQ, 0) - RxS_TECQ_correction[a]

- Channel_Insertion_Loss - MPI_DGD_penalty_alloc + TX_test_FEC_margin[b]

RxS_TECQ_correction[a] *= RxS_OMA(max)_spec - FRx_RxS (both at Tx DUT TECQ)*

TX_test_FEC_margin[b] *= 1.5*

[a] *RxS_TECQ_correction is for* FRx RxS deviation from RxS OMA (max) specified in Figure 180-4, at TECQ of TX DUT.

[b] *TX_test_FEC_margin* increases *FRx_OMA* closer to typical operating point.

Add FRx FEC Code Bin (S_n) Limits Table in latest version of cole_3dj_2507

Clause 181 Comment Resolution

Table 181-5. Insert the following line:

Description	-FR4-500	Unit
Functional Receiver (FRx) FEC code bin (S_n) limits (max)	S_n limits in table below	probability

Section 181.7.1. Append the following text:

Functional receiver (FRx) *complies with Table 181-6 with input operating point FRx_OMA* in dB:

FRx_OMA = Tx_DUT_OMA - max(TDECQ - TECQ, 0) - RxS_TECQ_correction[a]

- Channel_Insertion_Loss - MPI_DGD_penalty_alloc + TX_test_FEC_margin[b]

RxS_TECQ_correction[a] = RxS_OMA(max)_spec - FRx_RxS (both at Tx DUT TECQ)

TX_test_FEC_margin[b] = 1.5

[a] *RxS_TECQ_correction is for* FRx RxS deviation from RxS OMA (max) specified in Figure 181-4, at TECQ of TX DUT.

[b] *TX_test_FEC_margin* increases *FRx_OMA* closer to typical operating point.

Add FRx FEC Code Bin (S_n) Limits Table in latest version of cole_3dj_2507

Clause 182 Comment Resolution

Table 182-7. Insert the following line:

Description	-DRn-2	Unit
Functional Receiver (FRx) FEC code bin (S_n) limits (max)	S_n limits in table below	probability

Section 182.7.1. Append the following text:

Functional receiver (FRx) *complies with Table 182-8 with input operating point FRx_OMA* in dB:

FRx_OMA = Tx_DUT_OMA - max(TDECQ - TECQ, 0) - RxS_TECQ_correction[a]

- Channel_Insertion_Loss - MPI_DGD_penalty_alloc + TX_test_FEC_margin[b]

RxS_TECQ_correction[a] = RxS_OMA(max)_spec - FRx_RxS (both at Tx DUT TECQ)

TX_test_FEC_margin[b] = 1.5

[a] *RxS_TECQ_correction is for* FRx RxS deviation from RxS OMA (max) specified in Figure 182-4, at TECQ of TX DUT.

[b] *TX_test_FEC_margin* increases *FRx_OMA* closer to typical operating point.

Add FRx FEC Code Bin (S_n) Limits Table in latest version of cole_3dj_2507

Clause 183 Comment Resolution

Table 183-6. Insert the following line:

Description	-FR4	-LR4	Unit
Functional Receiver (FRx) FEC code bin (S_n) limits (max)	S_n limits in table below		probability

Section 183.7.1. Append the following text:

Functional receiver (FRx) *complies with Table 183-7 with input operating point FRx_OMA* in dB:

FRx_OMA = Tx_DUT_OMA - max(TDECQ - TECQ, 0) - RxS_TECQ_correction[a]

- Channel_Insertion_Loss - MPI_DGD_penalty_alloc + TX_test_FEC_margin[b]

RxS_TECQ_correction[a] = RxS_OMA(max)_spec - FRx_RxS (both at Tx DUT TECQ)

TX_test_FEC_margin[b] = 1.5

[a] *RxS_TECQ_correction is for* FRx RxS deviation from RxS OMA (max) specified in Figure 183-4, at TECQ of TX DUT.

[b] *TX_test_FEC_margin* increases *FRx_OMA* closer to typical operating point.

Add FRx FEC Code Bin (S_n) Limits Table in latest version of cole_3dj_2507

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Functional Receiver and FEC Code Word Mask

Thank you