

# 800GBASE-FR4 with Inner FEC Bypass

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# Supporters

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# Overview

- Expansion of work in welch\_3dj\_02\_2307:
- Addition of Inner\_FEC Bypass Mode

# BER Requirements

This contribution does not recommend a specific option on the FEC architecture. FEC options are under study and still require more information

- **Inner\_FEC Bypassed:** The BER of the PMD link shall be less than  $2.4 \times 10^{-4}$  provided that the error statistics are sufficiently random that this results in a frame loss ratio of less than  $1.7 \times 10^{-12}$  for 64-octet frames with minimum interpacket gap when processed with an 800GBASE-R/1.6TBASE-R PCS.
- **Inner\_FEC Enabled:** The BER of the PMD link shall be less than  $3 \times 10^{-3}$  provided that the error statistics are sufficiently random that this results in a frame loss ratio of less than  $1.7 \times 10^{-12}$  for 64-octet frames with minimum interpacket gap when processed with an 800GBASE-R/1.6TBASE-R PCS and inner code FEC sublayer.
  - Note: Exact pre-FEC BER level for Option B is not finalized.

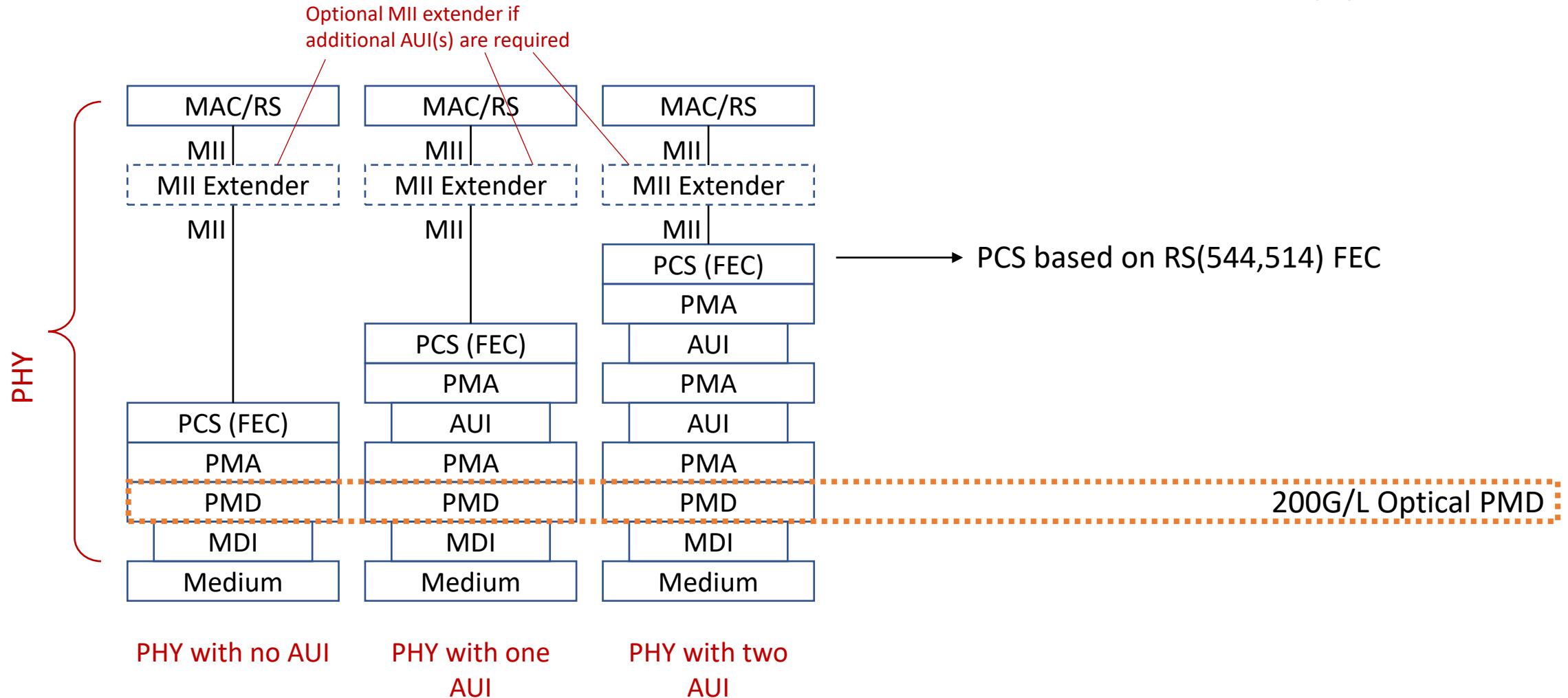
# TDECQ/TECQ/SECQ Reference Receiver

- TDECQ reference filter expanded from FFE5 (1 main + 4 pre/post cursors) to FFETBD (1 main + TBD pre/post cursors)
  - Introduce tap weight limits → Mitigate concerns of extreme TX BW restriction that could have deleterious effects on receiver performance/design

Tap Limits	Min	Max
Main Cursor	TBD	TBD
First Pre/Post Cursor	TBD	TBD
Second Pre/Post Cursor	TBD	TBD
All Other	TBD	TBD
Sum off all taps	1	1

- Note: TECQ/TDECQ/SECQ values and target SER revised to TBD, pending resolution of the questions raised in:  
[https://www.ieee802.org/3/dj/public/adhoc/optics/0623\\_OPTX/leyba\\_3dj\\_optx\\_01\\_230629.pdf](https://www.ieee802.org/3/dj/public/adhoc/optics/0623_OPTX/leyba_3dj_optx_01_230629.pdf)

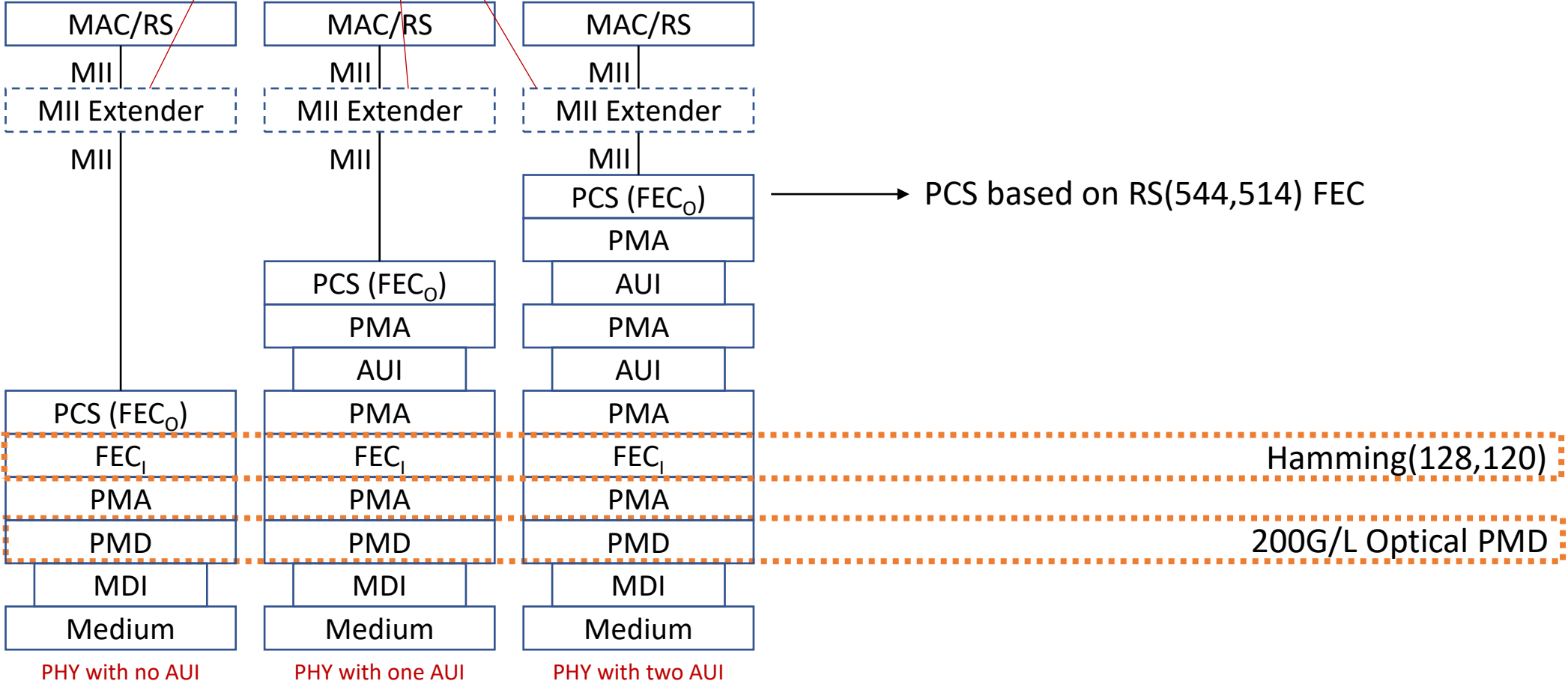
# Location in Ethernet Stack: Inner FEC Bypassed



# Location in Ethernet Stack: Inner FEC Enabled

Optional MII extender if additional AUI(s) are required

PHY



# Proposed Transmitter Specifications

Description	800GBASE-FR4		Unit
	RS(544,514)	+Hamming(128,120)	
Signaling rate, each lane (range)	106.25 ± 50 ppm	113.4375 ± 50 ppm	GBd
Modulation Format	PAM4		
Lane wavelengths (range)	1264.5 to 1277.5 1284.5 to 1297.5 1304.5 to 1317.5 1324.5 to 1337.5		nm
Side-mode suppression ratio (SMSR), (min)	30		dB
Average launch power, each lane (max)	4.9		dBm
Average launch power, each lane (min)	-1.8		dBm
Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ), each lane(max)	4.8		dBm
Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ), each lane(min) for TDECQ < 1.4 dB for 1.4 dB ≤ TDECQ ≤ TDECQ (max)	1.3 -0.1+TDECQ		dBm dBm
Transmitter and dispersion eye closure (TDECQ), each lane (max)	3.6 <sup>a</sup>	TBD <sup>b</sup>	dB
TECQ (max)	3.6 <sup>a</sup>	TBD <sup>b</sup>	dB
TDECQ - TECQ   (max)	2.5 <sup>a</sup>	TBD <sup>b</sup>	dB
Average launch power of OFF transmitter, each lane (max)	-15		dBm
Extinction ratio, each lane, (min)	3.5		dB
Transmitter transition time (max)	8		ps
Transmitter over/under-shoot (max)	22		%
RIN <sub>x</sub> OMA (max)	-139		dB/Hz
Optical return loss tolerance (max)	17.1		dB
Transmitter reflectance (max)	-26		dB

<sup>a</sup> Measured with FFETBD reference equalizer with SER = 4.8e-4

<sup>b</sup> Measured with FFETBD reference equalizer with SER = TBD



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Signaling rate, each lane (range)	106.25 ± 50 ppm	113.4375 ± 50 ppm	GBd
Modulation Format	PAM4		
Lane wavelengths (range)	1264.5 to 1277.5 1284.5 to 1297.5 1304.5 to 1317.5 1324.5 to 1337.5		nm
Damage threshold, each lane	5.9		dBm
Average receive power, each lane (max)	4.9		dBm
Average receive power, each lane (min)	-5.6		dBm
Receive power, each lane (OMA <sub>outer</sub> ) (max)	4.8		dBm
Receiver reflectance (max)	-26		dB
Receiver sensitivity (OMA <sub>outer</sub> ), each lane (max) for TECQ < 1.4 dB for 1.4 dB ≤ TECQ ≤ SECQ	-3.2 -4.6 + TECQ		dBm dBm
Stressed receiver sensitivity (OMA <sub>outer</sub> ), each lane (max)	-1.1	TBD	dBm
Conditions of stressed receiver sensitivity test:			
SECQ	3.6 <sup>a</sup>	TBD <sup>b</sup>	dB
OMA <sub>outer</sub> of each aggressor lane	1.9		dBm

<sup>a</sup> Measured with FFETBD with SER = 4.8e-4

<sup>b</sup> Measured with FFETBD with SER = TBD

# Proposed Link Budget

Description	800GBASE-FR4 <i>RS(544,514)   +Hamming(128,120)</i>		Unit
	Power budget (for max TDECQ)	8	
Operating distance	2000		m
Channel insertion loss	4		dB
Maximum discrete reflectance	-35		dB
Allocation for penalties (for max TDECQ)	3.6	TBD	dB
Additional insertion loss allowed	0		dB

# Summary

- A Baseline proposal for 800GBASE-FR4 with FEC bypass has been presented.
- Proposal contain requirements for operation with inner FEC bypassed or enabled.
- For inner FEC enabled operation parameters derived from a target SER (including TDECQ, TECQ, SECQ, and SRS) have been indicated as TBD