Consensus Building on 800GBASE-FR4

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Overview

- Continuation of work in:
  - https://www.ieee802.org/3/dj/public/23_05/rodes_3dj_02b_2305.pdf
  - https://www.ieee802.org/3/dj/public/23_05/mi_3dj_01a_2305.pdf
  - https://www.ieee802.org/3/dj/public/23_05/welch_3dj_02a_2305.pdf
- Reconciliation of differences in power levels and budget
- Discussion ongoing on parameters related to TDECQ/TECQ/SECQ: FFE depth & tap limits, SER, Value, SRS

BER Requirements

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

- The BER of the PMD link shall be less than **3×10^{-3}** provided that the error statistics are sufficiently random that this results in a frame loss ratio of less than 1.7×10^{-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 Hamming(128,120) inner FEC is not finalized.

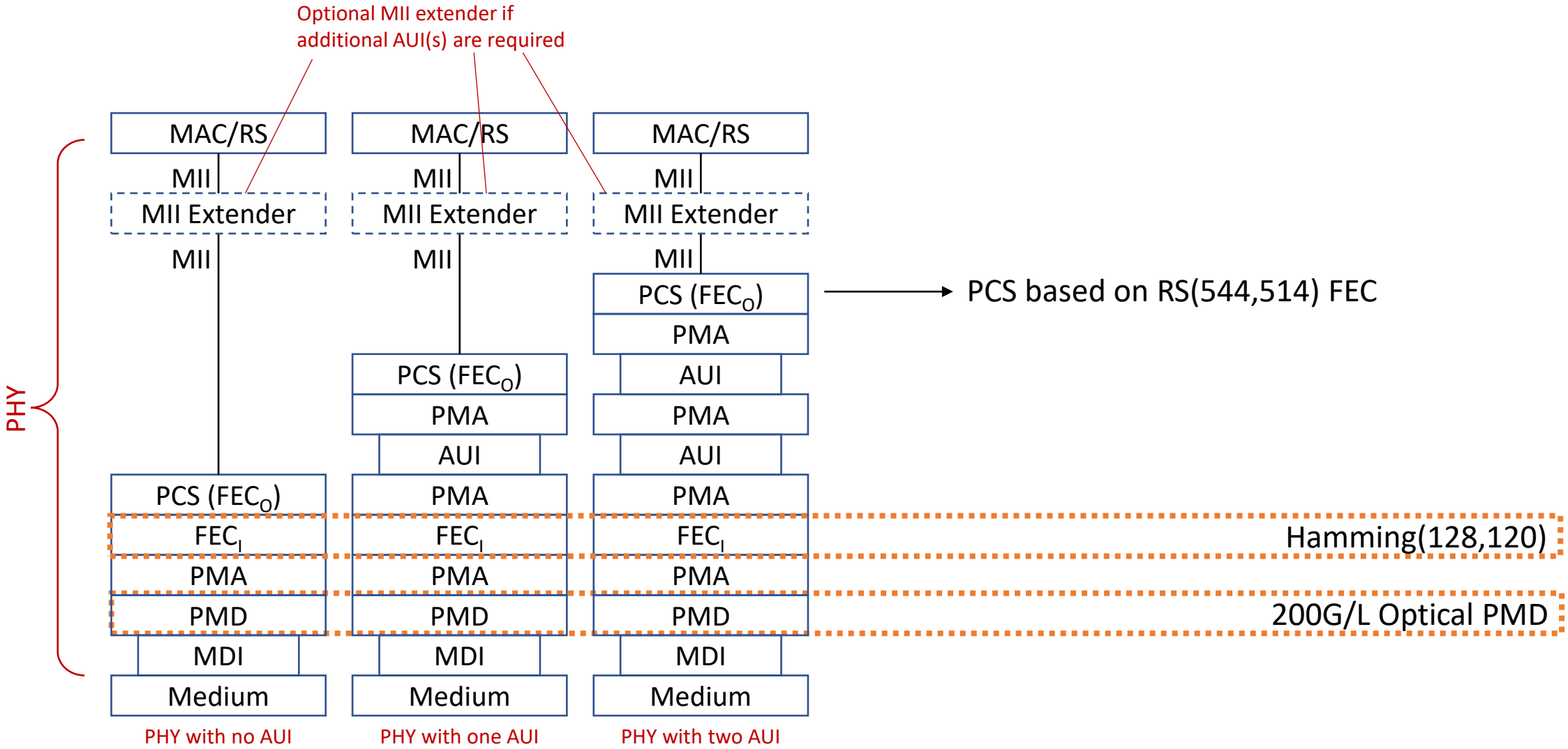
TDECQ/TECQ/SECQ Reference Receiver

- 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

Location in Ethernet Stack



Proposed Transmitter Specifications

Description	800GBASE-FR4	Unit
Signaling rate, each lane (Range)	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_{outer}), each lane(max)	4.8	dBm
Outer Optical Modulation Amplitude (OMA_{outer}), each lane(min)† for TDECQ < 1.4dB for 1.4 dB ≤ TDECQ ≤ TDECQ (max)	 1.3 -0.1+TDECQ	 dBm dBm
Transmitter and dispersion eye closure (TDECQ), each lane (max) †	TBD	dB
TECQ (max) †	TBD	dB
| TDECQ - TECQ| (max) †	TBD	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_x OMA (max)	-139	dB/Hz
Optical return loss tolerance (max)	17.1	dB
Transmitter reflectance (max)	-26	dB

† Measured with FFETBD reference equalizer with SER = TBD

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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_{outer}) (max)	4.8	dBm
Receiver reflectance (max)	-26	dB
Receiver sensitivity (OMA_{outer}), each lane (max) for TECQ < 1.4dB for 1.4 dB ≤ TECQ ≤ TECQ (max)	 -3.2 -4.6 + TECQ	 dBm dBm
Stressed receiver sensitivity (OMA_{outer}), each lane (max)†	TBD	dBm
Conditions of stressed receiver sensitivity test:		
SECQ†	TBD	dB
OMA_{outer} of each aggressor lane	1.9	dBm

† Measured with FFETBD reference equalizer with SER = TBD

Proposed Link Budget

Description	800GBASE-FR4	Unit
Power budget (for max TDECQ)	TBD	dB
Operating distance	2000	m
Channel insertion loss	4	dB
Maximum discrete reflectance	-35	dB
Allocation for penalties (for max TDECQ)	TBD	dB
Additional insertion loss allowed	0	dB

Summary

- A Baseline proposal for 800GBASE-FR4 has been presented, representing the current state of consensus between the co-authors
- Parameters derived from a target SER (including TDECQ, TECQ, SECQ, and SRS) have been indicated as TBD