

Building Toward a Baseline

400GBASE-DR1, 800GBASE-DR2, 1.6TBASE-DR4

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Building Toward a Baseline

- Starting with 802.3dj 500m specifications
- Change what must be changed
- Preserve what need not be changed
- Key considerations: Performance, Power, Latency

Consideration for (key) changes

- **Receiver:** Increased noise and noise integration bandwidth degrading TIA sensitivity (approximately 3dB shift).
 - 1.5dB shift in sensitivity spec to split the burden with transmitter
 - **Tradeoff:** Transmitter OMA
- **Transmitter:** Increasing OMA to (partially) compensate for increase burden on TIA
 - 1.5 dB shift in TX OMA (Limited headroom to scale).
 - **Tradeoff:** Receiver Sensitivity
- **Reference Receiver:** Expand/enhance reference receiver (DFE tap weight and/or FFE depth)
 - **Tradeoff:** Receiver Sensitivity & Burst Error Tolerance

Considerations for (key) non-changes

- Maintain PAM4 signaling
- Maintain FEC architecture(s) from 802.3dj
 - RS(544,514) FECo for 500m solutions
- Start with TX+RX quality metrics from 802.3dj
 - Assess if/how to supplement & refine through task force

Other Considerations

- Optical loss budget(s)?
 - Is channel model from 802.3dj the best representation of AI networks?
- Link training?

END

Reference: 802.3dj

Table 180–7—200GBASE-DR1, 400GBASE-DR2, 800GBASE-DR4, and 1.6TBASE-DR8 transmit characteristics

Description	Reference	200GBASE-DR1	400GBASE-DR2 800GBASE-DR4 1.6TBASE-DR8	Unit
Signaling rate, each lane (range)	Change	106.25 ± 50 ppm		GBd
Modulation format	—	PAM4		—
Lane wavelength (range)	180.9.3	1304.5 to 1317.5		nm
Side-mode suppression ratio (SMSR), each lane (min)	180.9.3	30		dB
Average launch power, each lane (max)	180.9.4	4		dBm
Average launch power, each lane ^a (min)	Change	–3.1 ^b		dBm
Outer optical modulation amplitude (OMA _{outer}), each lane (max)	180.9.5	4.2		dBm
Outer optical modulation amplitude (OMA _{outer}), each lane (min)	180.9.5	–1 + max(TECQ, TDECQ)		dBm
for max(TECQ, TDECQ) < 0.9 dB		–0.1		
for 0.9 dB ≤ max(TECQ, TDECQ) ≤ 3.4 dB	Change			
Transmitter and dispersion eye closure for PAM4 (TDECQ), each lane (max)	180.9.6	3.4		dB
Transmitter eye closure for PAM4 (TECQ), each lane (max)	180.9.8	3.4		dB
TDECQ – TECQ , each lane (max)	—	2.5		dB
TDECQ _{CER} , each lane (max)	180.9.7	4.4		dB
Transmitter functional symbol error histogram, each lane (max)	180.9.9	See Table 180–18		—
Transmitter overshoot and undershoot, each lane (max)	180.9.10	22		%
Transmitter power excursion, each lane (max)	180.9.11	2.3		dBm
Extinction ratio, each lane (min)	180.9.12	3.5		dB
Transmitter transition time, each lane (max)	180.9.13	8		ps
Average launch power of OFF transmitter, each lane (max)	—	–15		dBm
RIN _{xx} OMA, each lane (max)	180.9.14	–139	—	dB/Hz
xx = 15.5		—	–139	dB/Hz
xx = 21.4	Change			
Optical return loss tolerance, each lane (max)	—	15.5	21.4	dB
Transmitter reflectance ^c , each lane (max)	—	–26		dB

Table 180–8—200GBASE-DR1, 400GBASE-DR2, 800GBASE-DR4, and 1.6TBASE-DR8 receive characteristics

Description	Reference	Value	Unit
Signaling rate, each lane (range)	Change	106.25 ± 50 ppm	GBd
Modulation format	—	PAM4	—
Lane wavelengths (range)	180.9.3	1304.5 to 1317.5	nm
Damage threshold ^a , each lane	—	5	dBm
Average receive power, each lane (max)	—	4	dBm
Average receive power, each lane ^b (min)	Change	–6.1	dBm
Receive power (OMA _{outer}), each lane (max)	—	4.2	dBm
Receiver reflectance (max)	—	–26	dB
Receiver sensitivity (OMA _{outer}), each lane ^c (max)	180.9.15	–3.4	dBm
for TECQ < 0.9 dB		–4.3 + TECQ	
for 0.9 dB ≤ TECQ ≤ SECQ	Change		
Stressed receiver sensitivity (OMA _{outer}), each lane ^c (max)	180.9.16	–0.9	dBm
Conditions of stressed receiver sensitivity test ^d :			
Stressed eye closure for PAM4 (SECQ), lane under test	—	3.4	dB
OMA _{outer} of each aggressor lane ^e	—	4.2	dBm

Table 180–16—Reference equalizer tap coefficients

Parameter	Symbol	Value	
		Minimum	Maximum
Feed-forward equalizer (FFE) length	Change	N_w	15
Number of equalizer pre-cursor taps	—	0	3
Main tap coefficient limit	$w(0)$	0.8	2.5

Parameter	Symbol	Value	
		Minimum	Maximum
Normalized equalizer coefficient limits:	$i = -3$	–0.15	0.1
	$i = -2$	–0.1	0.25
	$i = -1$	–0.5	0.1
	$i = 1$	–0.6	0.2
	$i = 2$	–0.2	0.3
	$i = 3$	–0.15	0.15
	$i = 4$	–0.15	0.15
	$i = 5$	–0.15	0.15
	$i = 6$	–0.15	0.15
	$i ≥ 7$	–0.1	0.1
Pre-post equalizer coefficient difference limit:			
$ w(1)/w(0) - b(1) - w(-1)/w(0) $	—	—	0.25
Equalizer DC gain ^a	—		1
Decision feedback equalizer (DFE) length	N_b		1
DFE coefficient limit ^b	Change	$b(1)$	0.3