# 100GBASE-DR, FR1, and LR1 Average Power Min specs

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# Comment 54

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 SC 140.6
 P41
 L18
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 Comment Type
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 Comment Status
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 Tx avg power

The Average launch power max for 100GBASE-FR1 is calculated for an extinction ratio = ~14 dB. This is inconsistent with 100GBSE-LR1 as well as with 400GBASE-FR4 and 400GBASE-LR4-6, which all use an infinite extinction ratio in this calculation.

#### SuggestedRemedy

Use an infinite extinction ratio to calculate the Average launch power max for 100GBASE-FR1. Replace the value of -2.9 dBm in Table 140-6 with -3.2 dBm

#### Proposed Response Status W

PROPOSED REJECT.

We presume the commenter intends to modify Average launch power (min), not the maximum. If implemented this change would affect Average receive power (min) for -FR1.

Additionally the change would limit interop between -FR1 and -DR to less than the 3dB -DR channel. Maximum loss in the -FR1 to -DR direction would become 2.7 dB.

For task force discussion and decision.

## Overview

- Tx Average Power Min is currently calculated with different Extinction Ratio (ER) for 100GBASE-DR, 100GBASE-FR1, and 100GBASE-LR1
- Values are to proposed to change the 100GBASE-FR1 values to an infinite ER
- This has potential implications for DR specs due to interop support
- Signal power and link budgets are based on OMA and TDECQ
  - The changes proposed will not impact link budgets

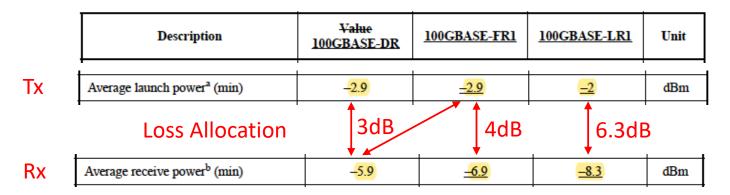
# Current specs, D2.0

Table 140–6—100GBASE-DR, 100GBASE-FR1, and 100GBASE-LR1 transmit characteristics

Description	<del>Value</del> 100GBASE-DR	100GBASE-FR1	100GBASE-LR1	Unit
Signaling rate (range)	53.125 ± 100 ppm			GBd
Modulation format	PAM4			_
Wavelength (range)	1304.5 to 1317.5			nm
Side-mode suppression ratio (SMSR), (min)	30			đΒ
Average launch power (max)	4	4	48	dBm
Average launch power <sup>a</sup> (min)	(-2.9)	(-2.9)	( <u>-2</u> )	dBm
Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ) (max)	92	4.3	<u></u>	dBm
Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ) (min) <sup>b</sup>	-0.8	<u>-0.2</u>	1	dBm
			A	
10dB ER		15dB ER		Inf

- Different ER values are used to calculate the Average launch power (min) for the three PMDs
- Using an infinite ER for 100GBASE-FR1 would result in Average launch power (min) = -3.2 dBm

# Tx and Rx Specs



bAverage receive power (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.

- Average receive power (min) is calculated from the launch power (min) Loss Allocation
- Reducing Tx Launch Power will also impact the average receive power (min)
- The editor's concern was that changing the 100GBASE-FR1 values would result in < 3dB loss allocation between a 100GBASE-FR1
   Tx and a 100GBASE-DR Rx</li>
- This concern is not a link budget concern, as link budgets are based on OMA and TDECQ.
- Ideally, all three PMDs would have their Average power specs aligned with infinite ER
- Note: Footnote b is not accurate without using infinite ER to calculate minimum average power

# Proposed modifications

### Current

	DR	FR1	LR1
Tx			
OMAmax	4.2	4.2	5
OMAmin	-0.8	-0.2	1
Ermin	3.5	3.5	3.5
Pavemax	4	4	4.8
Pavemin	-2.9	-2.9	-2
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Rx			
Ave Max	4	4	4.8
Ave Min	-5.9	-6.9	-8.3

## Proposed

	DR	FR1	LR1
Tx			
OMAmax	4.2	4.2	5
OMAmin	-0.8	-0.2	1
Ermin	3.5	3.5	3.5
Pavemax	4	4	4.8
Pavemin	-3.8	-3.2	-2
Rx			
Ave Max	4	4	4.8
Ave Min	-6.8	-7.2	-8.3

- The values highlighted would align the three PMDs to using infinite ER for average power min specs
- Only 100GBASE-FR1 is currently in scope, however ideally we should aim to align these

## 400GBASE-DR4 average powers

Table 124–6—400GBASE-DR4 transmit characteristics

Description	Value	Unit
Signaling rate, each lane (range)	53.125 ± 100 ppm	GBd
Modulation format	PAM4	_
Lane wavelength (range)	1304.5 to 1317.5	nm
Side-mode suppression ratio (SMSR), (min)	30	dB
Average launch power, each lane (max)	4	dBm
Average launch power, each lane <sup>a</sup> (min)	-2.9	dBm
Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ), each lane (max)	4.2	dBm
Outer Optical Modulation Amplitude (OMA <sub>outer</sub> ), each lane (min) <sup>b</sup>	-0.8	dBm
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<sup>&</sup>lt;sup>a</sup> Average launch power, each lane (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.

b Even if the TDECO < 1.4 dB, the CMA (min) must preced these values.

- 400GBASE-DR4 has average power defined using 10 dB ER, which is the same value as currently used for 100GBASE-DR
- 400GbE breakout to 4x100GbE is an important application, we should consider modifying this to align to infinite extinction ratio

## Recommendation

- Calculate 100GBASE-FR1 average power specs with infinite extinction ratio in 802.3cu
- Modify 100GBASE-DR and 400GBASE-DR4 specs in a similar manner
  - Mechanism for this can be discussed

# Thanks!