

Further baseline considerations and proposals for 100G and 400G DWDM objectives

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Introduction

This presentation provides further considerations and associated proposals towards optical baseline specifications for the following objectives:

- *Provide a physical layer specification supporting 100 Gb/s operation on a single wavelength capable of at least 80 km over a DWDM system.*
- *Provide a physical layer specification supporting 400 Gb/s operation on a single wavelength capable of at least 80 km over a DWDM system.*

It provides a follow up to

http://www.ieee802.org/3/ct/public/19_05/stassar_3ct_01a_0519.pdf

presented at the previous meeting in Salt Lake City, May 2019.

Approach for x00GBASE-ZR specifications

- **It is proposed to use the list of parameters, shown on the following 3 slides, for developing baselines for the x00GBASE-ZR specifications.**

Parameters for x00GBASE-ZR transmit characteristics

Parameter Name	Units
Maximum mean channel output power	dBm
Minimum mean channel output power	dBm
Minimum central frequency	THz
Maximum central frequency	THz
Maximum spectral excursion	GHz
Minimum side mode suppression ratio	dB
Maximum laser linewidth	kHz
Maximum offset between the carrier and the nominal central frequency	GHz
Maximum power difference between polarizations	dB
Maximum skew between the two polarizations	ps
Maximum error vector magnitude	%
Maximum I-Q offset	dB
Minimum Transmitter OSNR(193.6)	dB

Parameters for x00GBASE-ZR receive characteristics

Parameter Name	Units
Maximum mean input power	dBm
Minimum mean input power [amplified]	dBm
Minimum mean input power [unamplified]	dBm
Minimum OSNR(193.6) [amplified]	dB (0.1 nm)
Minimum OSNR(193.6) [unamplified]	dB (0.1 nm)
Receiver OSNR tolerance(193.6)	dB (0.1 nm)
Maximum reflectance of receiver	dB

Parameters for x00GBASE-ZR black link characteristics

Parameter Name	Units
Maximum ripple	dB
Maximum (residual) chromatic dispersion	ps/nm
Minimum (residual) chromatic dispersion	ps/nm
Minimum optical return loss at TP2	dB
Maximum discrete reflectance between TP2 and TP3	dB
Maximum differential group delay	ps
Maximum polarization dependent loss	dB
Maximum polarization rotation speed	krad/s
Maximum inter-channel crosstalk at TP3	dB
Maximum interferometric crosstalk at TP3	dB
Maximum optical path OSNR penalty	dB

Parameter values for 100GBASE-ZR

- Updated proposals are made on the following 3 slides for the list of strawman parameter values for 100GBASE-ZR towards a baseline specification proposal, shown in “**bold red**”.
- Requesting further proposals & discussions regarding the values labelled “TBD”.

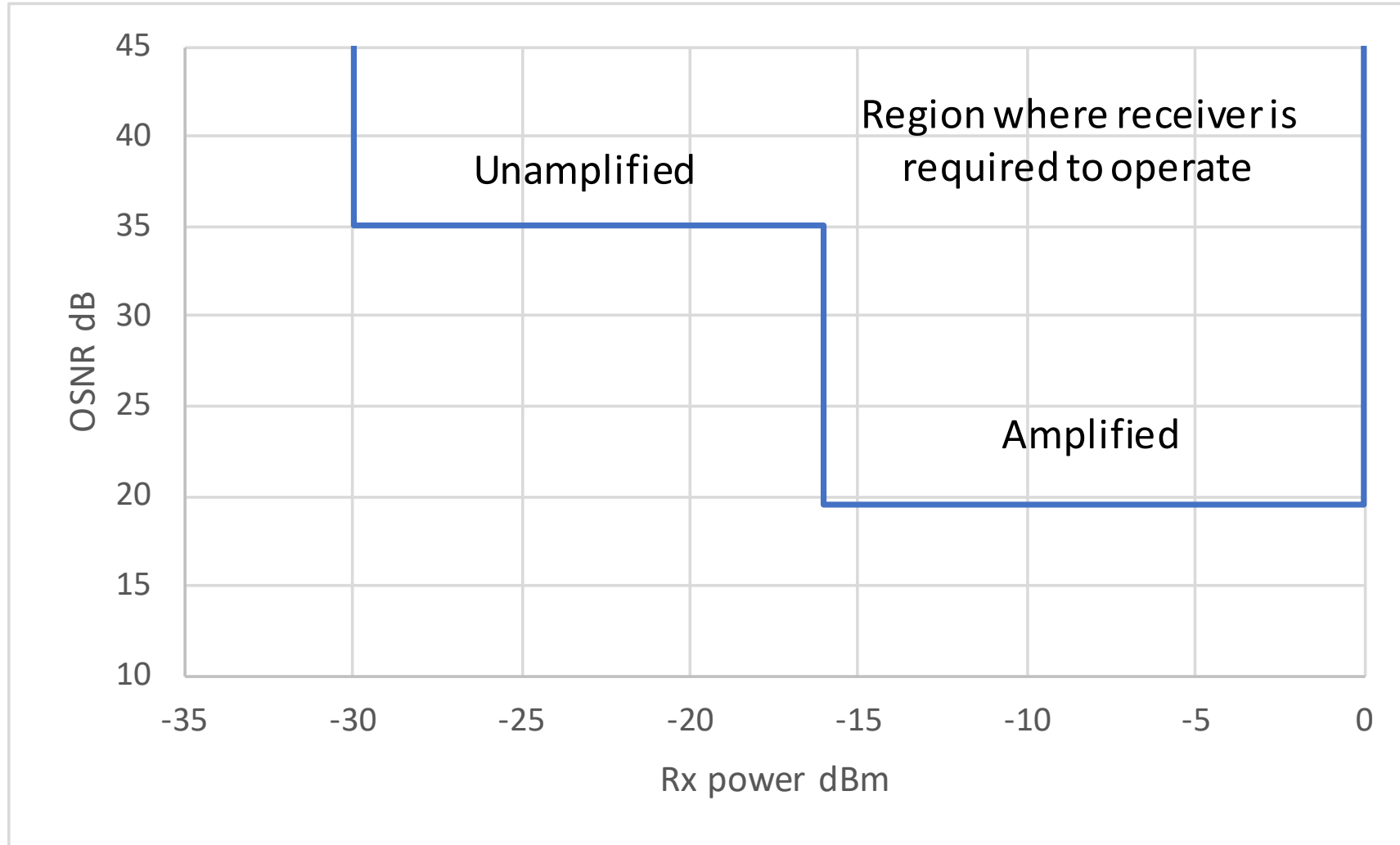
100GBASE-ZR transmit characteristics

Parameter Name	Units	G.698.2 Value	CL PHYv1.0	Proposed strawman
Maximum mean channel output power	dBm	-3	+7	TBD
Minimum mean channel output power	dBm	-8	-6.5	-8
Minimum central frequency	THz	191.5	191.3	TBD
Maximum central frequency	THz	196.2	196.2	TBD
Maximum spectral excursion	GHz	±15	NA	±15
Minimum side mode suppression ratio	dB	30	NA	30
Maximum laser linewidth	kHz	500	1000	1000
Maximum offset between the carrier and the nominal central frequency	GHz	1.8	1.8	1.8
Maximum power difference between polarizations	dB	1.5	1.5	1.5
Maximum skew between the two polarizations	ps	10	6	TBD
Maximum error vector magnitude	%	23	NA	23
Maximum I-Q offset	dB	-25	NA	-25
Minimum Transmitter OSNR(193.6)	dB	NA	35	35

100GBASE-ZR receive characteristics

Parameter Name	Units	G.698.2 Value	CL PHYv1.0	Proposed strawman
Maximum mean input power	dBm	0	NA	0
Minimum mean input power [amplified]	dBm	-18	-10	-16
Minimum mean input power [unamplified]	dBm	NA	-30	-30
Minimum OSNR(193.6) [amplified]	dB (0.1 nm)	24	18.5 (?)	19.5
Minimum OSNR(193.6) [unamplified]	dB (0.1 nm)	NA	35	35
Receiver OSNR tolerance(193.6)	dB (0.1 nm)	19	15.5 (?)	16.5
Maximum reflectance of receiver	dB	-27	-20	TBD

100GBASE-ZR receiver operating region



100GBASE-ZR black link characteristics

Parameter Name	Units	G.698.2 Value	CL PHYv1.0	Proposed strawman
Maximum ripple	dB	2.5	NA	2.5
Maximum (residual) chromatic dispersion	ps/nm	2400	2400	2400
Minimum (residual) chromatic dispersion	ps/nm	-200	NA	-200
Minimum optical return loss at TP2	dB	24	25	TBD
Maximum discrete reflectance between TP2 and TP3	dB	-27	-20	TBD
Maximum differential group delay	ps	20	20	20
Maximum polarization dependent loss	dB	1.5	0.5	1.5
Maximum polarization rotation speed	krad/s	50	50	50
Maximum inter-channel crosstalk at TP3	dB	-16	NA	-16
Maximum interferometric crosstalk at TP3	dB	-25	NA	-25
Maximum optical path OSNR penalty	dB	5	3 (?)	3

Parameter values for 400GBASE-ZR

- Updated proposals are made on the following 3 slides for the list of strawman parameter values for 400GBASE-ZR towards a baseline specification proposal on the basis of the latest Liaison Statement from the OIF, shown in “**bold red**”.
- Requesting further proposals & discussions regarding the values labelled “TBD”.

400GBASE-ZR transmit characteristics

Parameter Name	Units	OIF Value	Lyubomirsky, Zhang, et al	Proposed strawman
Maximum mean channel output power	dBm	-6	-6	-6
Minimum mean channel output power	dBm	-10	-10	-10
Minimum central frequency	THz	191.4	191.3	TBD
Maximum central frequency	THz	196.1	196.1	TBD
Maximum spectral excursion	GHz	32	TBD	TBD
Minimum side mode suppression ratio	dB	TBD	TBD	TBD
Maximum laser linewidth	kHz	500	500	500
Maximum offset between the carrier and the nominal central frequency	GHz	1.8	1.8	1.8
Maximum power difference between polarizations	dB	1.5	1.5	1.5
Maximum skew between the two polarizations	ps	5	5	5
Maximum error vector magnitude	%	TBD	TBD	TBD
Maximum I-Q offset	dB	-26	-26	-26
Minimum Transmitter OSNR(193.6)	dB	34	37	34

400GBASE-ZR receive characteristics

Parameter Name	Units	OIF Value	Lyubomirsky, Zhang, et al	Proposed strawman
Maximum mean input power	dBm	0	0	0
Minimum mean input power [amplified]	dBm	-12	-12	-12
Minimum mean input power [unamplified]	dBm	-20	TBD	TBD
Minimum OSNR(193.6) [amplified]	dB (0.1 nm)	TBD	TBD	TBD
Minimum OSNR(193.6) [unamplified]	dB (0.1 nm)	34	TBD	34
Receiver OSNR tolerance(193.6)	dB (0.1 nm)	26	26	26
Maximum reflectance of receiver	dB	-20	-20	-27

400GBASE-ZR black link characteristics

Parameter Name	Units	OIF Value	Lyubomirsky, Zhang, et al	Proposed strawman
Maximum ripple	dB	1.5	TBD	2.5*
Maximum (residual) chromatic dispersion	ps/nm	2400	2000	2400
Minimum (residual) chromatic dispersion	ps/nm	0	-200	-200
Minimum optical return loss at TP2	dB	24	24	24
Maximum discrete reflectance between TP2 and TP3	dB	-27	-27	-27
Maximum differential group delay	ps	28	33	20*
Maximum polarization dependent loss	dB	2	2	1.5*
Maximum polarization rotation speed	krad/s	50	50	50
Maximum inter-channel crosstalk at TP3	dB	-40	TBD	-16
Maximum interferometric crosstalk at TP3	dB	-35	TBD	-25
Maximum optical path OSNR penalty	dB	0.5	4	TBD

Note: values with * are aligned with 100GBASE-ZR proposed strawman for consistency

Summary of proposals

- **Updated proposals are made for:**
 - **List of parameters for x00GBASE-ZR specifications**
 - **Updated list of strawman parameter values for 100GBASE-ZR**
 - **Updated list of strawman parameter values for 400GBASE-ZR**

Thanks!