

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

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IEEE P802.3ct Task Force, Salt Lake City, May 2019

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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_03/stassar_3ct_01_0319.pdf, presented at the previous meeting in Vancouver, March 2019, and

http://www.ieee802.org/3/cn/public/adhoc/19_0425/schmitt_3ct_01_190425.pdf, presented at the ad hoc call on 25 April 2019.

Approach for x00GBASE-ZR specifications

- **Taking into consideration the level of support on:**
 - http://www.ieee802.org/3/ct/public/19_03/stassar_3ct_01_0319.pdf
- **And**
 - http://www.ieee802.org/3/cn/public/adhoc/19_0425/schmitt_3ct_01_190425.pdf,
- **Presented at the meeting in Vancouver last March and the P802.3ct ad hoc call on 25 April, respectively,**
- **It is proposed to use the list of parameters, shown on the following 3 slides, described in http://www.ieee802.org/3/ct/public/19_03/stassar_3ct_01_0319.pdf, 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 S_S	dB
Maximum discrete reflectance between S_S and R_S	dB
Maximum differential group delay	ps
Maximum polarization dependent loss	dB
Maximum polarization rotation speed	krad/s
Maximum inter-channel crosstalk at R_S	dB
Maximum interferometric crosstalk at R_S	dB
Maximum optical path OSNR penalty	dB

Parameter values for 100GBASE-ZR

- **Taking into consideration the level of support on:**
 - http://www.ieee802.org/3/ct/public/19_03/stassar_3ct_01_0319.pdf
- **And**
 - http://www.ieee802.org/3/cn/public/adhoc/19_0425/schmitt_3ct_01_190425.pdf,
- **Updated proposals are made on the following 3 slides for the list of strawman parameter values for 100GBASE-ZR towards a baseline specification proposal.**
- **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	TBD
Minimum mean input power [unamplified]	dBm	NA	-30	TBD
Minimum OSNR(193.6) [amplified]	dB (0.1 nm)	24	18.5 (?)	TBD
Minimum OSNR(193.6) [unamplified]	dB (0.1 nm)	NA	35	35
Receiver OSNR tolerance(193.6)	dB (0.1 nm)	19	15.5 (?)	TBD
Maximum reflectance of receiver	dB	-27	-20	TBD

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 S_S	dB	24	25	TBD
Maximum discrete reflectance between S_S and R_S	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 R_S	dB	-16	NA	-16
Maximum interferometric crosstalk at R_S	dB	-25	NA	-25
Maximum optical path OSNR penalty	dB	5	3 (?)	TBD

Parameter values for 400GBASE-ZR

- **Taking into consideration the level of support on:**
 - http://www.ieee802.org/3/ct/public/19_03/stassar_3ct_01_0319.pdf
- **And**
 - http://www.ieee802.org/3/cn/public/adhoc/19_0425/schmitt_3ct_01_190425.pdf,
- **And the parameter values from OIF 400ZR listed in:**
 - http://www.ieee802.org/3/private/liaison_docs/OIF/OIF_to_IEEE_802d3_400ZR_Mar_2019_att1.pdf
- **And the parameter values proposed in:**
 - http://www.ieee802.org/3/ct/public/19_03/lyubomirsky_3ct_01a_0319.pdf
- **And**
 - http://www.ieee802.org/3/cn/public/adhoc/19_0502/zhang_3cn_01_190502.pdf
- **Updated proposals are made on the following 3 slides for the list of strawman parameter values for 400GBASE-ZR towards a baseline specification proposal.**
- **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	191.3/191.4	191.3	TBD
Maximum central frequency	THz	196.1	196.1	TBD
Maximum spectral excursion	GHz	TBD	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	37	37	37

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)	37	TBD	37
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	2.5	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 S_S	dB	24	24	24
Maximum discrete reflectance between S_S and R_S	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 R_S	dB	-16	TBD	-16
Maximum interferometric crosstalk at R_S	dB	-25	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

- **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!