Bridge proposal for 400GBASE-ZR specification methodology baseline

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Introduction

- The presentation provides further consideration on the specification methodology for 400GBASE-ZR

- Salt Lake City straw Poll #2 resulted in a lack of consensus on the specification baseline:
  - A) tables and listed parameters on slides 5-7 per stassar_3ct_01a_0519
  - B) individual measurable Rx impairments per zhang_3ct_01a_0519
  - Results: A:8, B:9, Need more information: 10

- This presentation proposes to bridge both proposals by creating an illustrative ONSR link budget table

IEEE 802: Criteria For Standards Development (CSD)

- **Technical Feasibility:**
  - Each proposed IEEE 802 LMSC standard shall provide evidence that the project is technically feasible within the time frame of the project. At a minimum, address the following items to demonstrate technical feasibility:

    a) Demonstrated system feasibility

    b) Proven similar technology via testing, modeling, simulation, etc.

    c) Confidence in reliability

- **Assumption:** 802.3ct standard should not define a product specification, but a vendor specific product specification should be able to be translated from the standard; while ensuring confidence in reliability between multiple suppliers of a 802.3ct compliant product

Summary of pros and cons of the current approaches

- **zhang_3ct_01a_0519:**
  - Specify Rx penalties for various impairments at TP3
- **Pros:**
  - Allows for well defined, quantifiable and measurable set of individual parameters
- **Cons**
  - Constrains impairment allocations between penalties
  - Uncertainty on relationship to system performance (when all parameters are combined)
    - May lead to conservative min OSNR spec, hence increased cost

- **Stassar_3ct_01a_0519:**
  - Specify single Rx requirement under worst case signal at TP3
- **Pros:**
  - Allows for greater implementation flexibility and compliance methodologies
- **Cons**
  - Statistically challenging to define worst case signal for Rx
    - May lead to conservative min OSNR spec, hence increased cost
  - Uncertainty on confidence to meet IEEE CSD (including working group time frames)

Proposal to Bridge the two approaches

- Proposal is to develop an <u>illustrative OSNR link budget</u> to reduce the uncertainty of the statistical approach and provide guidance to the users of the standard to how to quantify the link impairments

- Additional benefits:
  - Inline with the Black Link methodology
  - Leverages the work already completed at the OIF on individual impairments

- Precedence already established in IEEE
- Proposing to create a similar table but for OSNR link budget (see next slide for details)

Table 122–13—200GBASE-FR4, 200GBASE-LR4, 400GBASE-FR8, and 400GBASE-LR8 illustrative link power budgets

Parameter	200GBASE-FR4	400GBASE-FR8	200GBASE-LR4	400GBASE-LR8	Unit
Power budget (for maximum TDECQ):					
for extinction ratio ≥ 4.5 dB	7.6	7.4	10.2	10.1	dB
for extinction ratio < 4.5 dB	7.7	7.5	10.3	10.2	dB
Operating distance	2		10		km
Channel insertion loss	4[a]		6.3		dB
Maximum discrete reflectance	See 122.11.2.2		See 122.11.2.2		dB
Allocation for penalties[b] (for maximum TDECQ):					
for extinction ratio ≥ 4.5 dB	3.6	3.4	3.9	3.8	dB
for extinction ratio < 4.5 dB	3.7	3.5	4	3.9	dB
Additional insertion loss allowed	0		0		dB

[a]The channel insertion loss is calculated using the maximum distance specified in Table 122–8 for 200GBASE-FR4 and 400GBASE-FR8 and fiber attenuation of 0.5 dB/km plus an allocation for connection and splice loss given in 122.11.2.1.
[b]Link penalties are used for link budget calculations. They are not requirements and are not meant to be tested.

Proposed illustrative OSNR Link Budget details

Description	Proposed Strawman Value	Units
OSNR Tolerance (min)	26	dB
Allocation for OSNR Penalties		
Dispersion (min to max)	0.5	dB
DGD + SOPMD (@ max)	0.5	dB
SOP (@Max)	0.5	dB
PDL (@Max)	1.3	dB
Optical Power Transient (@Max)	0.5	dB
Ripple penalty (@Max)	0.5	dB
Inter-channel Crosstalk (@Max)	0	dB
Interferometric Crosstalk (@Max)	0	dB
Min OSNR*	29.8	dB

* Min OSNR will be included as part of Rx specifications table

- Individual penalties are illustrative, not a requirement, not required to be tested

400GBase-ZR Black Link Channel Characteristics

- Contains Min/Max values used for ONSR link budget

Description	Proposed Strawman Value	Units
Channel Spacing	100	GHz
Ripple (max)	+/-2	dB
(Residual) Chromatic dispersion (max)	1600	ps/nm
(Residual) Chromatic dispersion (min)	-200	ps/nm
Optical return loss at TP2 (min)	24	dB
Discrete reflectance between TP2 and TP3 (max)	-27	dB
DGD Differential Group delay (max)	33	ps
PDL Polarization dependent loss (max)	2	dB
SOPMD Second Order PMD (Max)	TDB	dB
Polarization Rotation Speed (max)	50	krad/s
Inter-channel crosstalk at TP3 (max)	TBD	dB
Interferometric crosstalk at TP3 (max)	TBD	dB
Optical path OSNR penalty (max)	3.8	dB

Proposal Summary

- Use an illustrative OSNR link budget table which includes individual link impairment tolerances and provides a tool for users of the standard

- Maintain Tx and Rx spec tables per Stassar_3ct_01a_0519 assuming consensus can be reached on how to define and model the worst case Min Rx ONSR penalty

Thank you!

Questions?