

Towards Consensus 100GBASE-CWDM Baseline Proposal

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Introduction

100G-BASE-WDM4 PMD has been proposed

[vlasov_01a_1112_optx](#)

[vlasov_01a_0313_optx](#)

And discussed

[vlasov_01a_0113_smf](#)

[shen_01_0113_optx](#)

[yu_01_0313_optx](#)

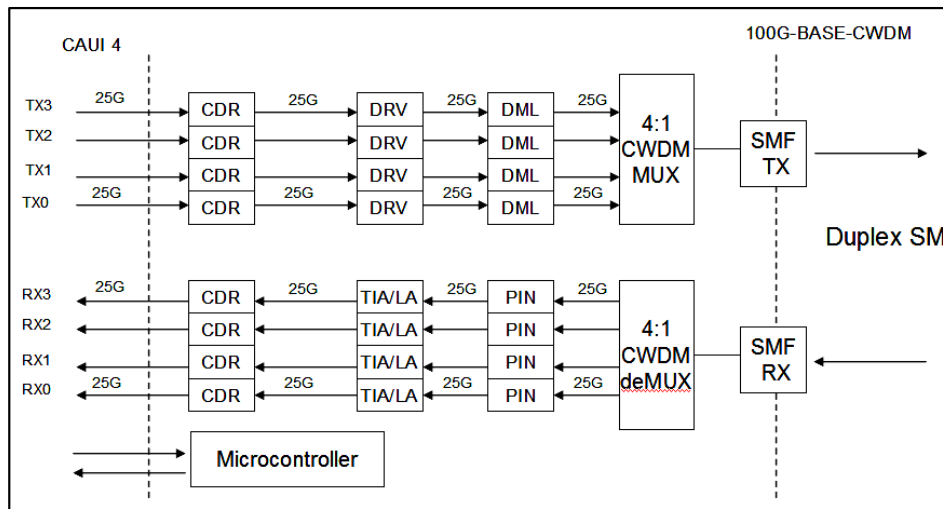
[petrilla_02a_0413_smf](#)

[shen_01a_0313_smf](#)

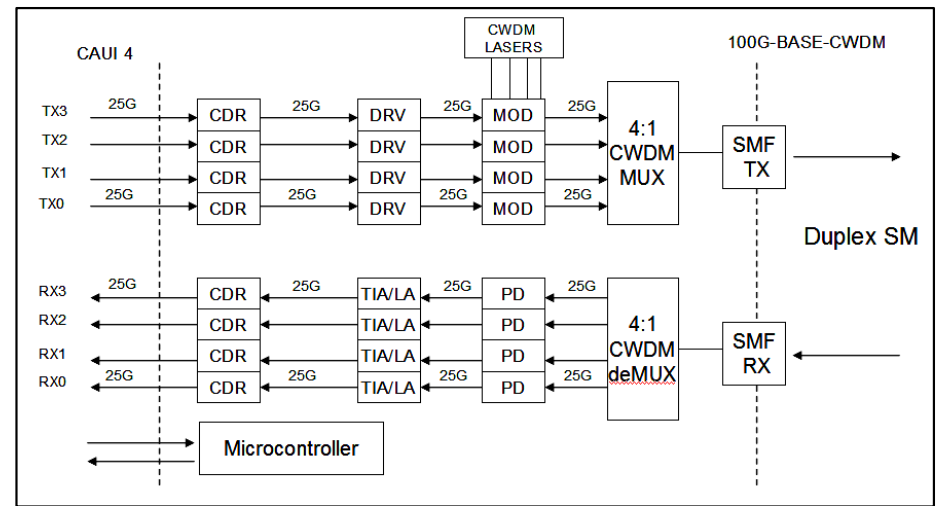
Objective:

- ✓ Develop a consensus proposal that can satisfy the fundamental tradeoffs of as many technologies as possible to meet the baseline CWDM specs
- ✓ Consensus building is ongoing – here is the current snapshot of the effort

Various technological implementations of 100GBASE-CWDM



DML-based



Si Mod-based

General strategy to reduce cost:

- Take 100GBASE-LR4 specs for 10km reach

- Change WDM grid to CWDM to avoid TEC cooling

- Relax TX/RX parameters as needed for 2.3dB lower channel insertion loss

Objective:

- DML and Si Phot technologies have different fundamental tradeoffs

- Need to come up with balanced baseline proposal to allow both technologies to fit

100G CWDM transmit characteristics

Parameter	Unit	100GBASE-LR4	vlasov_01a_0313	consensus
Signaling rate, each lane (range)	GBd	25.78125 ± 100 ppm	25.78125 ±100 ppm	25.78125 ±100 ppm
Side-mode suppression ratio (SMSR), (min)	dB	30	30	
Total average launch power (max)	dBm	10.5	9	
Average launch power, each lane (max)	dBm	4.5	3	
Average launch power, each lane (min)	dBm	-4.3	-4.3	
Optical modulation amplitude (OMA), each lane (max)	dBm	4.5	3	
Optical modulation amplitude (OMA), each lane (min)	dBm	-1.3	-1.3	-2.0
Launch power in OMA minus TDP, each lane, (min)	dBm	-2.3	-2.3	-3.0
Transmitter and dispersion penalty (TDP), each lane (max)	dB	2.2	2.2	2.2
Extinction ratio (min)	dB	4	4	
RIN20OMA (max)	dB/Hz	-130	-130	
Optical return loss tolerance (max)	dB	20	20	
Transmitter reflectance (max)	dB	-12	-12	
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}		{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}	{0.25, 0.4, 0.45, 0.25, 0.28, 0.4}	

Decrease in OMA_{min} allows to relax requirements for DML TOSA

100G CWDM receiver characteristics

Parameter	Unit	100GBASE-LR4	vlasov_01a_0313_optx	consensus
Signaling rate, each lane (range)	GBd	25.78125 ± 100 ppm	25.78125 ±100 ppm	25.78125 ±100 ppm
Receiver sensitivity (OMA), each lane (max)	dBm	-8.6	-6.3	-7.0
Receiver 3dB electrical upper cutoff frequency, each lane (max)	GHz	31	31	
Receiver reflectance (max)	dB	-26	-26	
Stressed receiver sensitivity, each lane (OMA)	dBm	-6.8	TBD	
Conditions of stressed receiver sensitivity test			TBD	

To keep the 4dB insertion loss link budget RX sensitivity OMA is decreased to -7.0dB acceptable for both DML and Si Photonics implementations

TDP definition for 100GBASE-CWDM

Parameter	40GBASE-LR4 CD for 10km reach	100GBASE-CWDM CD for 0.5km reach	Unit
L0 lane 1271nm center	-59.5/0	-3.0	ps/nm
L2 lane 1291nm center	-39/0	-2.0	ps/nm
L2 lane 1311nm center	-19/+16	-1.0/+0.8	ps/nm
L3 lane 1331nm center	0/+33.5	0/+1.7	ps/nm

References:

1. 40GBASE-LR4
2. ITU contribution of P. Anslow, WD6-07, Sunnyvale, March 2009
3. C. Cole contribution to 802.3ba, [Cole_01_0708](#), July 2008

Presentation [Isono_01_0708](#) indicate that TDP penalties for DML as they were measured 5 years back should be expected as less than 1dB for 0.5km reach link

100G CWDM illustrative link power budget

Parameter	Unit	100GBASE-LR4	vlasov_01a_0313_optx	petrilla_02a_0413_smf	consensus
Power budget (for max TDP)	dB	8.5	6.2	7.4	6.2
Operating distance	km	10	0.5	0.5	0.5
Channel insertion loss	dB	6.3	4.0	4.0	4.0
Max discreet reflectance	dB	-26	-26	-35	-26
Allocation of penalties (for max TDP)	dB	2.2	2.2	3.4	2.2
Additional insertion loss allowed	dB	0	0	0	0

In [petrilla_02a_0413_smf](#) much higher TDP of 3.4dB has been proposed for DML-based CWDM. This results in a link power budget of 7.4dB that is only 1.1dB lower than 100GBASE-LR4.

In view of a 20 times shorter link reach than 100GBASE-LR4 this TDP looks excessive. It can affect the main objective of a significant cost reduction.

Currently agreed on keeping the TDP 2.2dB consistent with LR4 specifications.

Conclusions

- Consensus is being developed for 100GBASE-CWDM baseline proposal
- Fine tuning of TOSA/ROSA specifications allows to find a good compromise for both DML and SI Photonics technologies
- TDP value of 2.2dB consistent with 100GBASE-LR4 is adopted
- Further fine tuning of specifications is required and is ongoing