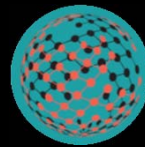


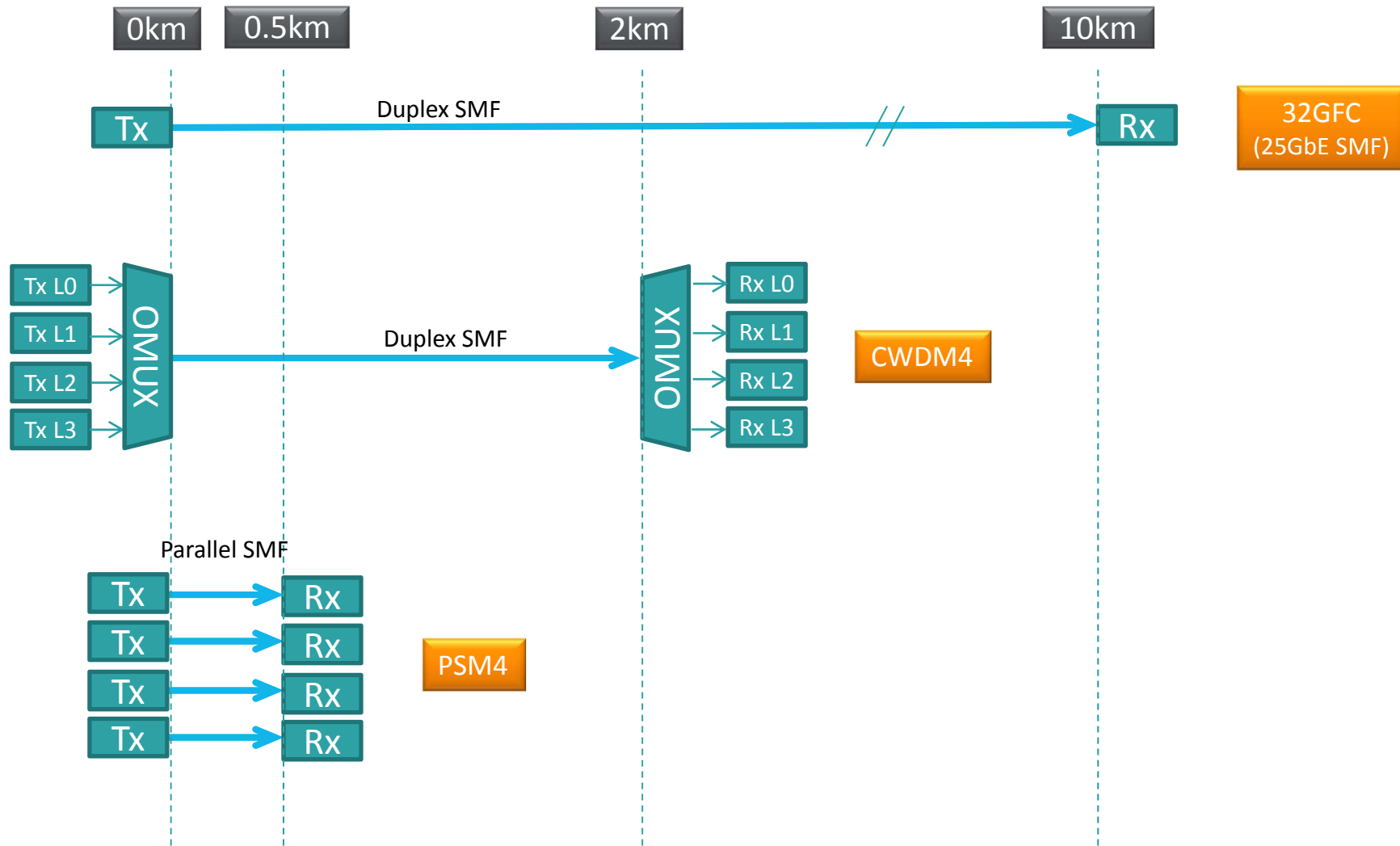


An Approach To 25GbE SMF 10km Specification

Kohichi Tamura

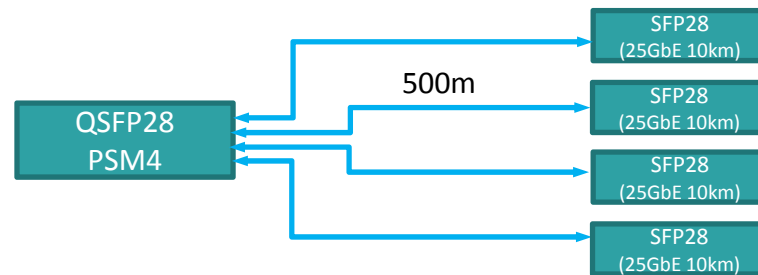


Existing 25G/Lane Specifications With FEC



Considerations

1. 32GFC is specification for 28.05Gbps over 10km. Suggestion already made to use as starting point for 25GbE SMF 10km.
2. CWDM4 is a 4-wavelength 25.8Gbps/lane 100G specification with link power budget (8.5dB) that is almost enough for 10km → Could use Tx characteristics of one lane of CWDM4 and set Rx characteristics to be consistent with 10km link power budget (channel loss of 6.3dB).
3. Desirable for 25GbE-10km to be interoperable with one channel of PSM4 at 500m for breakout terminations → Assuming (2), this should be achievable by adopting wavelength range of PSM4 and 32GFC.



25GbE-10km Illustrative Link Power Budget

Parameter	Units	32GFC	CWDM4	PSM4	Proposal for 25GbE SMF
Power budget (for max TDP)	dB	9.04	8.5	6.2	9.3
Operating distance	km	10	2	0.5	10
Channel insertion loss	dB	6.34 ^a	5	3.3	6.3
Maximum discrete reflectance	dB	-	-26	-35	-26
Allocation for penalties (for max TDP)	dB	2.7	3	2.9	3
Additional insertion loss allowed	dB	0	0	0	0

^a For 32GFC at 10km and 2.0dB connection loss

25GbE-10km Transmit Characteristics

Description	Units	32GFC	CWDM4	PSM4	Proposal for 25GbE SMF
Operating range (max)	km	10	2	0.5	10
Signaling rate	Gbps	28.05	25.78125	25.78125	25.78125
Operating BER		1.0×10^{-6}	5.0×10^{-5}	5.0×10^{-5}	5.0×10^{-5}
Wavelength (max)	nm	1325	1337.5	1325	1325
Wavelength (min)	nm	1295	1264.5	1295	1295
Average launch power (max)	dBm	2	2.5	2	2.5
Average launch power (min)	dBm	-5	-6.5	-9.4	-6.5
OMA (max)	dBm	-	2.5	2.2	2.5
OMA (min)	dBm	-2	-4	-	-4
Launch power in OMA minus TDP (min)	dBm	-5	-5	-5.15 (center) -3.4 (edge) ^a	-5
Transmitter and dispersion penalty (max)	dB	2.7	3	2.9	3
Extinction ratio (min)	dB	4	3.5	3.5	3.5
Transmitter eye mask	{X1,X2,X3, Y1,Y2,Y3}	{0.22, 0.4, 0.45, 0.31, 0.33, 0.5}	{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}	{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}	{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}

Tx Eye Mask Comparison: 32GFC and CWDM4/PSM4

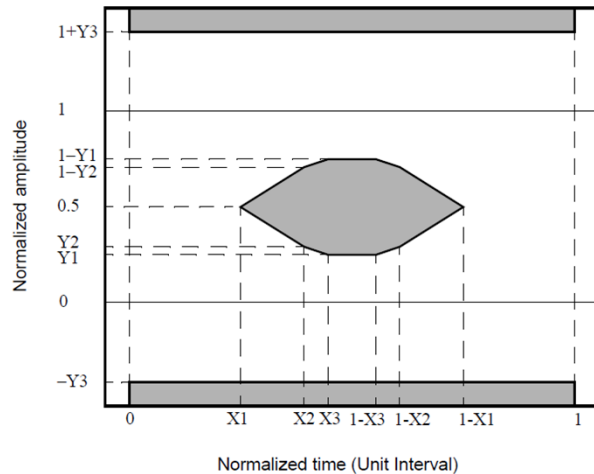
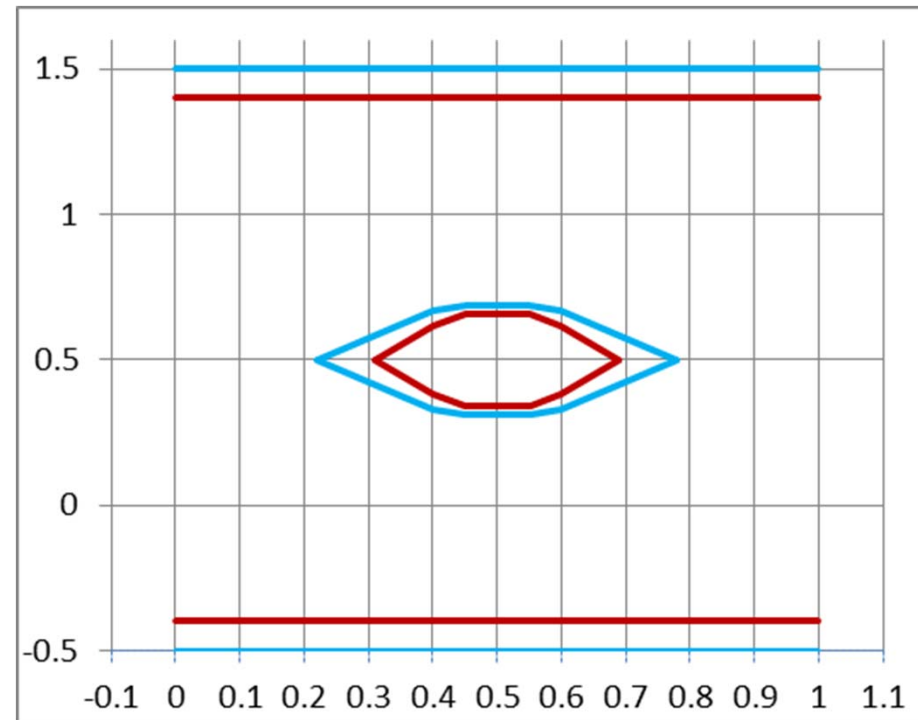


Figure 86-4—Transmitter eye mask definition

Parameter	32GFC (UI)	CWDM4/PSM4 (UI)
X1	0.22	0.31
X2	0.40	0.40
X3	0.45	0.45
Y1	0.31	0.34
Y2	0.33	0.38
Y3	0.50	0.40



— 32GFC
— CWDM4/PSM4

CWDM4/PSM4 eye mask better for low cost

25GbE-10km Receive Characteristics

Description	Units	32GFC	CWDM4	PSM4	Proposal for 25GbE SMF
Signaling rate	Gbps	28.05	25.78125	25.78125	25.78125
Operating BER		1.0×10^{-6}	5.0×10^{-5}	5.0×10^{-5}	5.0×10^{-5}
Receiver reflectance (max)	dB	-26	-26	-26	-26
Receiver sensitivity (OMA, max)	dBm	-11.4	-10	-11.35 (center) -9.6 (edge)	-11.3
Stressed receiver sensitivity (OMA, max)	dBm	-9.2	-7.3	-8.79 (center) -7.04 (edge)	TBD
Conditions of stressed receiver sensitivity test	VEP J2: J4:	-	1.9 0.33 UI 0.48 UI	1.9 0.30 UI 0.41 UI	TBD

Summary

1. For 25GbE SMF specification, one approach is to adopt Tx characteristics of one lane of CWDM4 that has a link power budget that is almost enough for 10km.
 1. OMUX loss contribution not removed → keep as margin for lower cost.
2. Specify Rx characteristics to be consistent with link power budget of 10km (9.3dB).
 1. Channel loss of 6.3dB + TDP of 3dB

Revisions After Adhoc Call

1. 32GFC has minimum OMA-TDP spec of -5dBm. Add to table.
- 2.