Baseline Proposal
Cable assembly, Host, MTF, and Channel Insertion Loss

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Purpose

- **Baseline proposal for cable assembly, Host, MTF, and Channel Insertion loss budgets**

Supporting presentations

- **100G CR End-to-End Channel Analysis Update lim_3ck_01_1119.pdf**

- **Synthesized 2 m QSFP CR Channels: End to End IL 28.5 dB and Cable Assembly and IL 19.75 dB**
  - **mellitz_3ck_03_1119 .pdf**

- **QSFP-DD TP1-TP4 Channel Simulations**
  - **Palkert_3ck_01_1119.pdf**

Overview

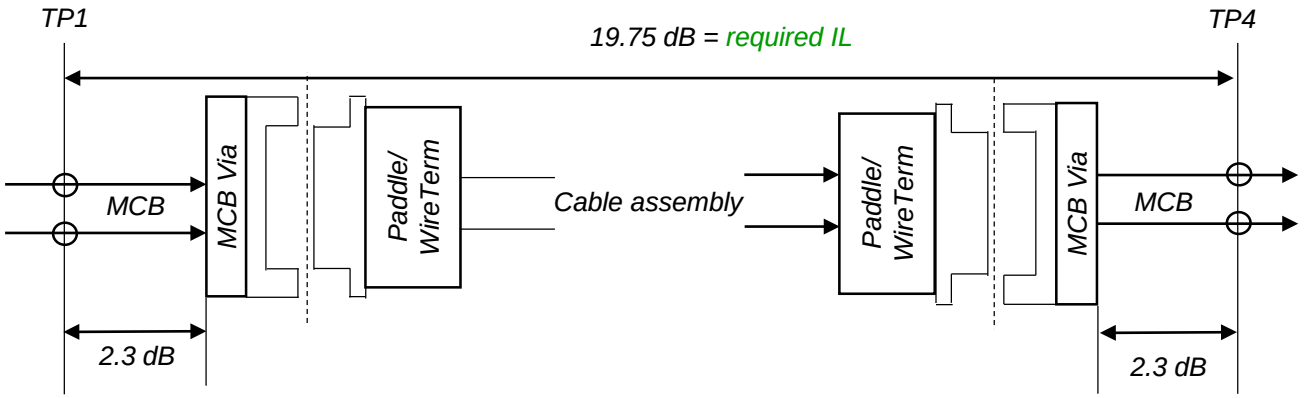
Component	802.3cd Insertion Loss dB @ 13.28 GHz	802.3ck Insertion Loss dB @ 26.56 GHz (proposed)	Comment
Module Compliance Board (MCB) PCB	1.2	2.3	
Host Compliance Board (HCB) PCB	1.38	2.5	
Host	7	6.875	cd-The 7 dB did not include explicit allowances for BGA and connector footprint ck-The 7 dB includes allowance of 1.34 dB for BGA (0.73) via and connector footprint via (0.61)
Host Connector	1.07+0.62	1.6	cd-The host connector is allocated 0.62 dB of additional margin ck- The host connector mating interface is allocated 0.3 dB variation allowance (not including via)
Mated Test Fixture (MTF)	3.65	6.6	
MTF connector	1.07	1.6	ck-includes 0.2 dB via allowance
Bulk cable and wire attachment	12.62	11.55	cd(3m), ck(2m)
Channel	30	28.5	

- Host and Mated test fixture connector mating interfaces are the same >>1.3 dB + variation 0.3 dB = 1.6 dB.
- Variation is to account for multiple MDIs and other factors other than implementation or margin.

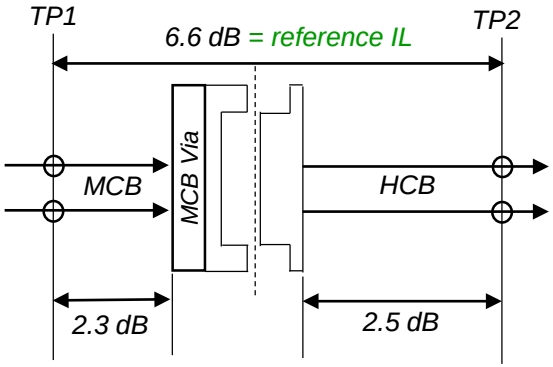
MTF IL = 2.3(MCB PCB)+1.6(conn)+0.2(via)+2.5(HCB PCB) =6.6 dB
Host Channel IL =6.875(Host PCB and via's)+1.6(conn)+2.5(HCB PCB) = 10.975 dB
Channel IL =2*6.875(Host PCB and via's)+2*1.6(conn)+11.55(cable and wire termination) = 28.5 dB

802.3ck Figure XX–1—28.5 dB channel insertion loss budget at 26.56 GHz

Cable Assembly

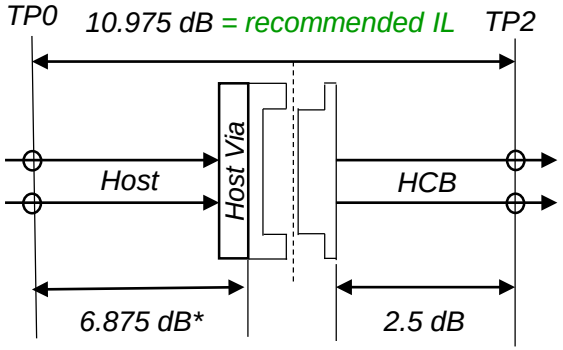


Mated Test Fixture Adopted in Baseline



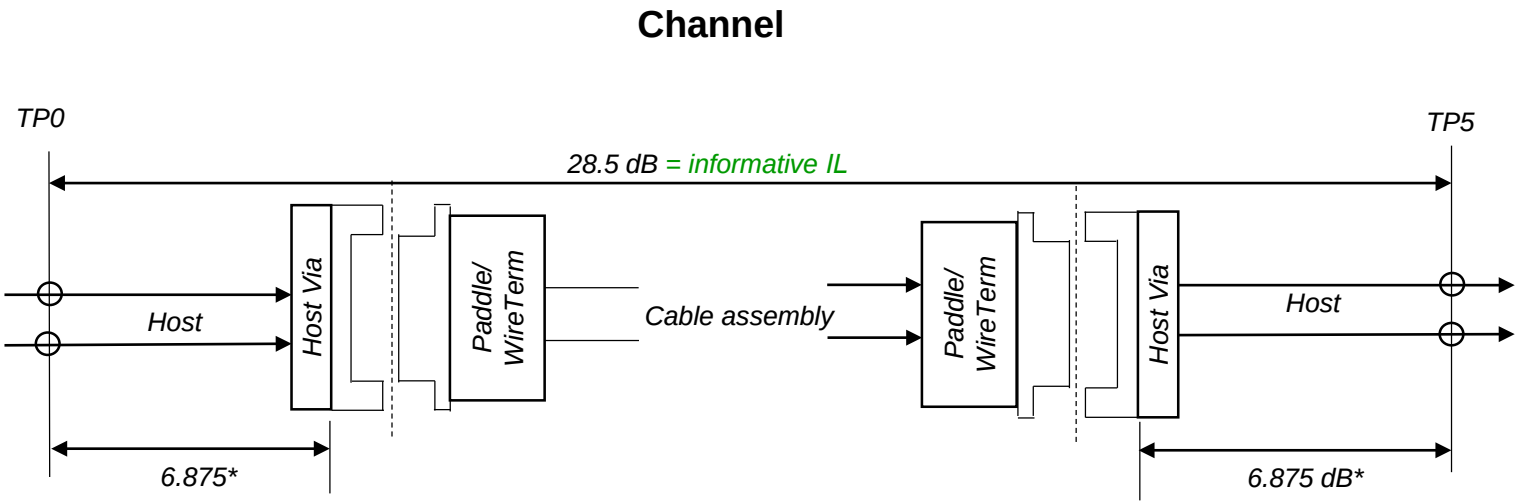
Note: 2.3 dB MCB PCB includes test point IL and MCB Via allowance is 0.2 dB

Host



Note: The 6.875 dB includes via allowances for BGA and connector footprint

802.3ck Figure XX–1—28.5 dB channel insertion loss budget at 26.56 GHz



Channel IL = 28.5 dB @26.56 GHz =2*(6.875+1.6)+11.55

Note: Channel IL derived from cable assembly host, and mated test fixture IL=28.5 dB @26.56 GHz =2*(6.875+1.6)+11.55

Summary

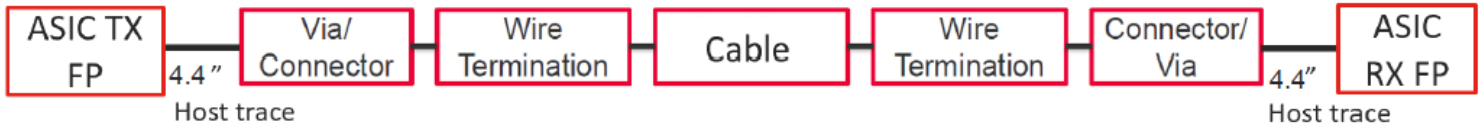
- **Baseline proposal for cable assembly, Host, MTF, and Channel Insertion loss budgets**

Supporting Slides

Channel

- **lim_3ck_01_1119.pdf**

QSFP-DD Channel Buildup



- Channels 4a (new pair) / 4b (legacy pair) – worst case condition: 28.5dB IL

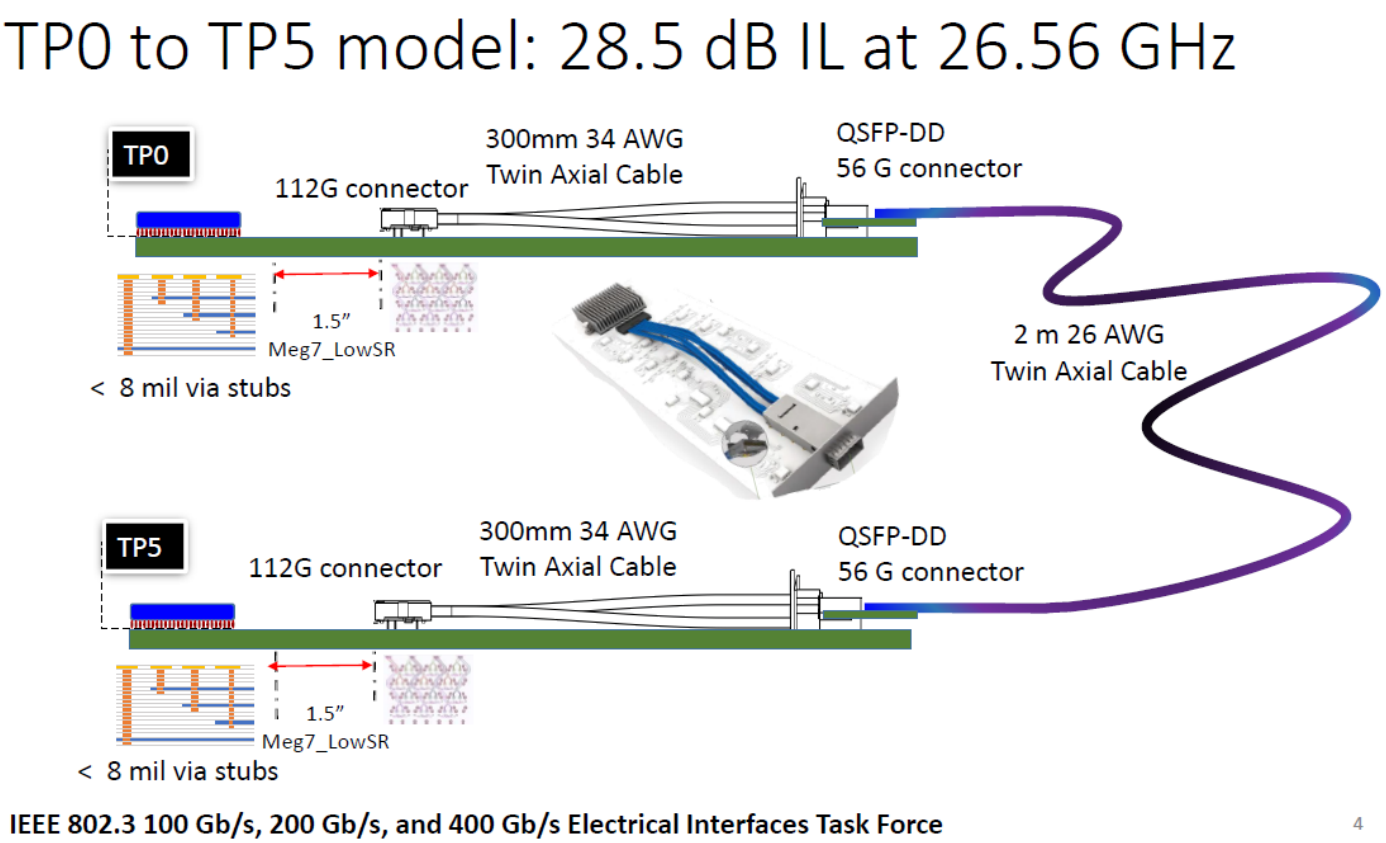
ASIC BGA footprint (mid length via) TX + host PCB trace 4.4" + [QSFP-DD footprint & connector (new/legacy pair) + wire termination + 2m 26AWG cable (mfg variation) + wire termination + QSFP-DD footprint & connector (new/legacy pair)] + host PCB trace 4.4" + improved ASIC BGA footprint (long via) RX (Thru and FEN channel description)

ASIC BGA footprint (long via) RX + host PCB trace 4.4" + [QSFP-DD footprint & connector (new/legacy pair) + wire termination + 2m 26AWG cable (mfg variation) + wire termination + QSFP-DD footprint & connector (new/legacy pair)] + termination (NEN channel description)

S-parameter files have been contributed as lim_3ck_02_1119

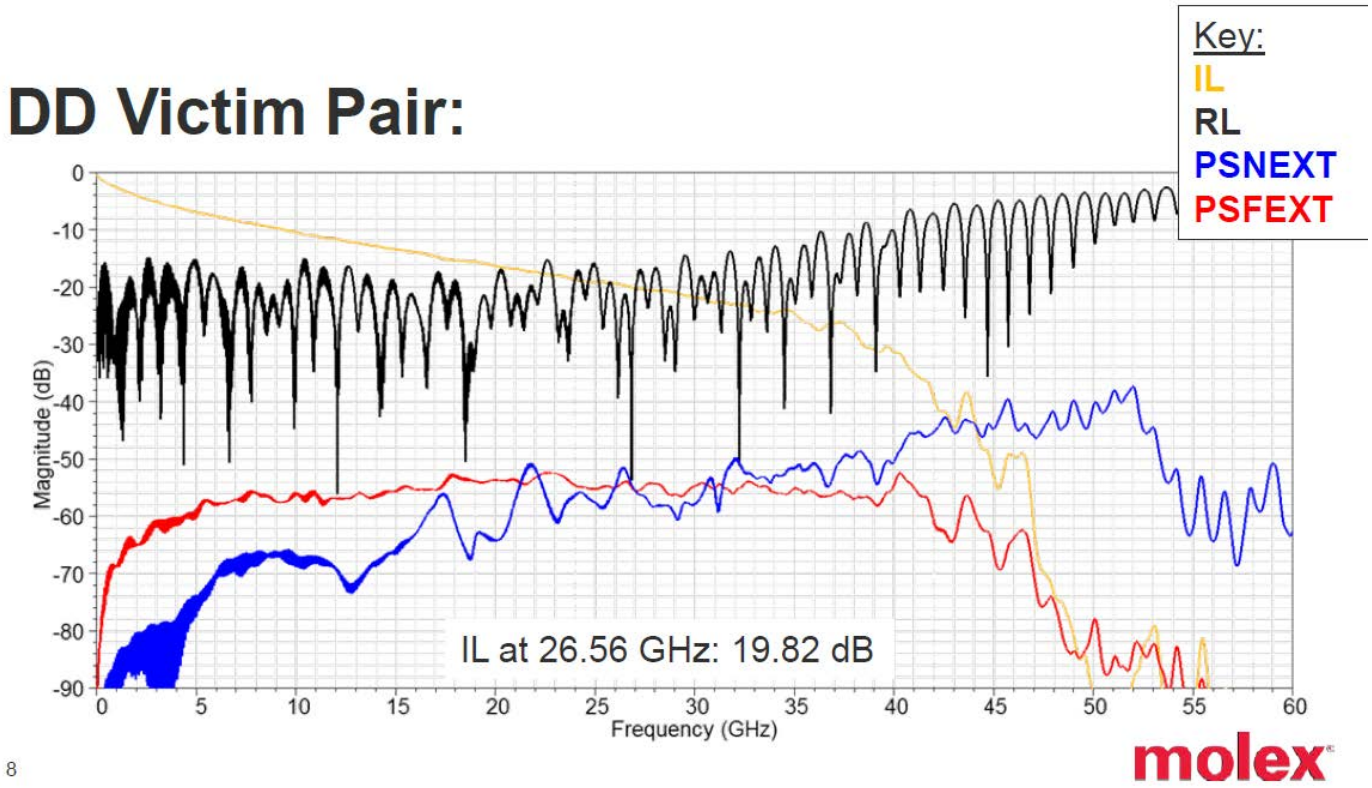
Channel

- **mellitz_3ck_03_1119 .pdf**



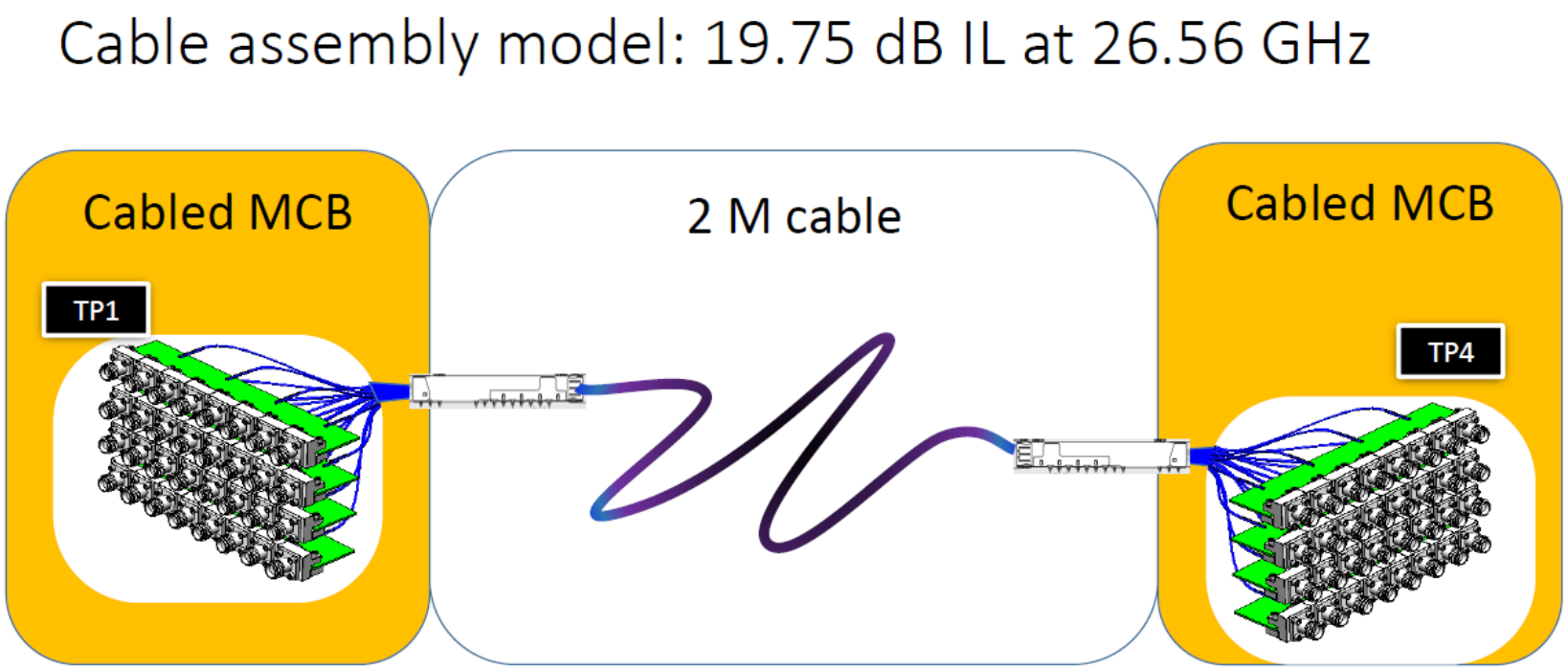
Cable assembly

- **Palkert_3ck_01_1119**



Cable assembly

- **mellitz_3ck_03_1119 .pdf**



Cable assembly – baseline

- Cable assembly specifications – Adopt CL136 – referenced parameters @ 26.56 GHz, f=0.01≤f≤38 (signaling rate 53.125 GBd).

Cable assembly characteristics summary

Parameter description	Value	Unit
Maximum insertion Loss	19.75	dB
Minimum Insertion Loss	11.15	dB
Minimum ERL	TBD	dB
Differential to Common-mode return loss	Equation(TBD)	dB
Differential to Common-mode conversion loss	Equation(TBD)	dB
Common-mode to common–mode return loss	Equation(TBD)	dB
Minimum COM	TBD	dB

http://www.ieee802.org/3/ck/public/19_03/diminico_3ck_01_0319.pdf

Cable Assembly COM- Baseline

- COM - consistent with methodology CL136 – signaling rate 53.125 GBd
- COM parameter values TBD

Table 136–18—COM parameter values

Parameter	Symbol	Value	Units
Signaling rate	f_b	26.5625	GBd
Maximum start frequency	f_{min}	0.05	GHz
Maximum frequency step[a]	Δf	0.01	GHz
Device package model Single-ended device capacitance Transmission line length, Test 1 Transmission line length, Test 2 Single-ended package capacitance at package-to-board interface Package transmission line characteristic impedance	 C_d z_p z_p C_p Z_c	 1.8×10^{-4} 12 30 1.1×10^{-4} 95	 nF mm mm nF Ω
Single-ended reference resistance	R_0	50	Ω

TBD

Table 136–18—COM parameter values *(continued)*

Parameter	Symbol	Value	Units
Single-ended termination resistance	R_d	50	Ω
Receiver 3 dB bandwidth	f_r	$0.75 \times f_b$	GHz
Transmitter equalizer, minimum cursor coefficient	$c(0)$	0.6	—
Transmitter equalizer, 1st pre-cursor coefficient Minimum value Maximum value Step size	$c(-1)$	 –0.25 0 0.05	—
Transmitter equalizer, 2nd pre-cursor coefficient Minimum value Maximum value Step size	$c(-2)$	 0 0.1 0.025	—
Transmitter equalizer, post-cursor coefficient Minimum value Maximum value Step size	$c(1)$	 –0.25 0 0.05	—
Continuous time filter, DC gain Minimum value Maximum value Step size	g_{DC}	 –20 0 1	 dB dB dB
Continuous time filter, DC gain 2 Minimum value Maximum value Step size	g_{DC2}	 –6 0 1	 dB dB dB
Continuous time filter, zero frequency for $g_{DC} = 0$	f_z	$f_b / 2.5$	GHz
Continuous time filter, pole frequencies	f_{p1} f_{p2}	$f_b / 2.5$ $2 \times f_b$	GHz GHz
Continuous time filter, low-frequency pole/zero	f_{LF}	$f_b / 40$	GHz
Transmitter differential peak output voltage Victim Far-end aggressor Near-end aggressor	 A_v A_{fe} A_{ne}	 0.415 0.415 0.604	 V V V
Number of signal levels	L	4	—
Level separation mismatch ratio	R_{LM}	0.95	—
Transmitter signal-to-noise ratio	SNR_{TX}	32.5	dB
Number of samples per unit interval	M	32	—
Decision feedback equalizer (DFE) length	N_b	12	UI
Normalized DFE coefficient magnitude limit for $n = 1$ for $n = 2$ to N_b	$b_{max}(n)$	 0.7 0.2	—
Random jitter, RMS	σ_{RJ}	0.01	UI

TBD

http://www.ieee802.org/3/ck/public/19_03/diminico_3ck_01_0319.pdf

162B.1.1.6 Mated test fixtures (ICN) Tables

Description	Symbol	Value	Units
Symbol rate	f_b	53.125	GBd
3dB reference receiver bandwidth	f_r	39.84	GHz
Near-end disturber peak differential output amplitude	A_{nt}	600	mV
Far-end disturber peak differential output amplitude	A_{ft}	600	mV
Near-end disturber 20% to 80% rise and fall times	T_{nt}	TBD	ps
Far-end disturber 20% to 80% rise and fall times	T_{ft}	TBD	ps

162B.1.1 Mated test fixtures

- Test Fixture specifications – Adopt– referenced parameters 26.56 GHz f=0.01≤f≤40 (signaling rate 53.125 GBd).

Mated test fixtures parameters

Parameter description	Value	Unit
Maximum differential insertion Loss	Equation(TBD)	dB
Minimum differential Insertion Loss	Equation(TBD)	dB
Reference differential insertion loss	Equation (slide 22)	dB
Figure of Merit(FOM) ILD	Equation(TBD)	dB
Minimum Differential Return Loss	Equation(TBD)	dB
Common-mode conversion insertion loss	Equation(TBD)	dB
Common-mode return loss	Equation(TBD)	dB
Common-mode to differential –mode return loss	Equation(TBD)	dB
Integrated crosstalk noise	(TBD)	mV

http://www.ieee802.org/3/ck/public/19_03/diminico_3ck_01_0319.pdf