



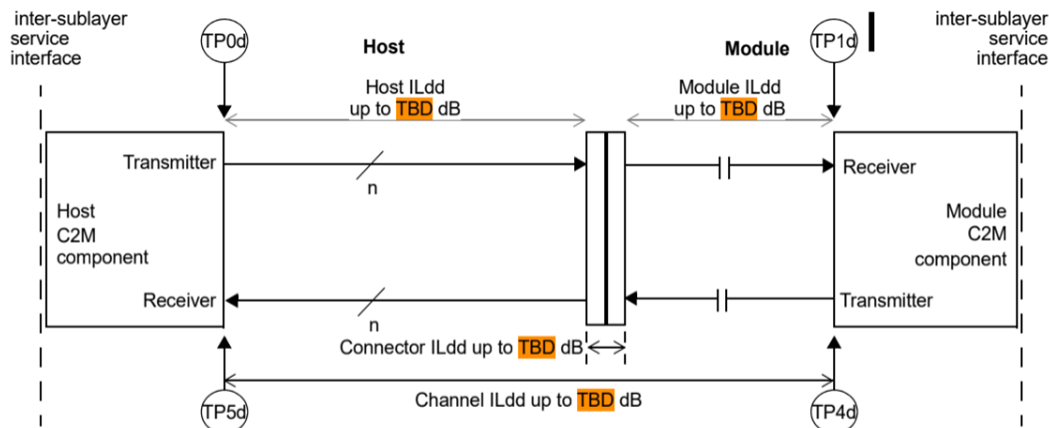
Considerations for C2M Link Budget

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Outline

- Review and update our Feb. 2022 contribution (26dB ILdd-die2die)
- Show an example implementation
- Propose values for TBDs in D1.1 Fig 176E-2 (informative insertion loss budget)



NOTE—The number of lanes n is equal to 1 for 200GAUI-1, 2 for 400GAUI-2, 4 for 800GAUI-4, and 8 for 1.6TAUI-8.

Figure 176E-2—Components of a 200 Gb/s per lane AUI-C2M and insertion loss budget at 53.125 GHz

Background

From July 2024 802.3 Plenary: https://www.ieee802.org/3/dj/public/24_07/lusted_3dj_04_2407.pdf

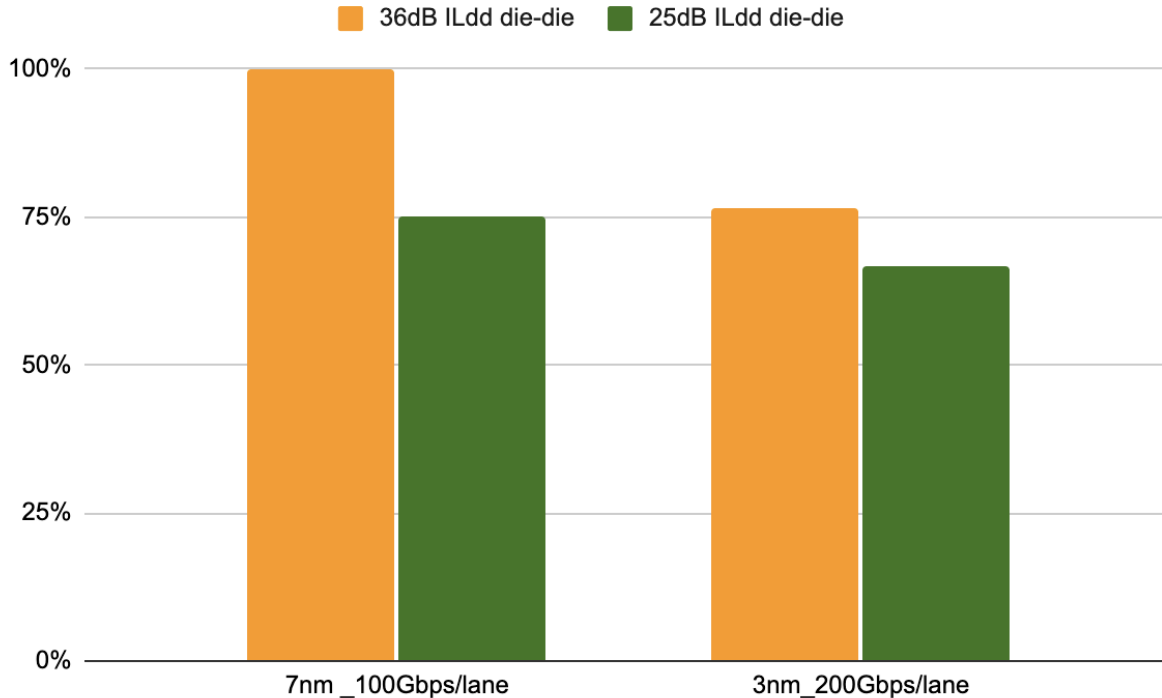
"Consensus seems to be forming around ILdd (die-die) = 33dB, based on offline discussions"

Contribution	ILdd Recommendation
lusted_3dj_01a_2406 (slide 6)	~33dB for PCB host ~29dB for cabled host
ghiasi_3dj_01_2407	30dB 32dB with extra care

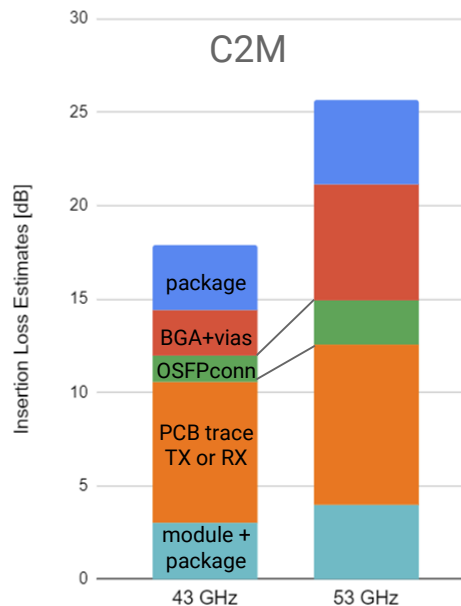
This large ILdd will require a more capable reference receiver (eg MLSE, stronger ctle) than the more modest ILdd proposed in this contribution.

Motivation: SerDes Power Efficiency

Opportunity to improve SerDes power efficiency by ~15% for 200Gbps/lane AUIs
=> Lower system power, optical module power



Feb 2022 C2M link budget



53GHz budget ~26dB:

Package ~5dB

BGA+vias ~6dB

OSFP conn ~2.5dB

PCB trace ~8.5dB

Module+pkg ~4dB

Source: https://www.ieee802.org/3/df/public/22_02/noujeim_3df_01_220224.pdf

Update Aug 2024: redistribute package and BGA/via allocations; overall budget remains unchanged.

July 2024 Example Implementation

- High radix (100T) switch, 64 OSFP ports
- Longest package (~10dB at 53.125GHz) mates with shorter PCB
- Longest PCB (~8") mates with shorter package
- PCB loss 1.3dB/inch: includes generous margin for manufacturing and temperature effects

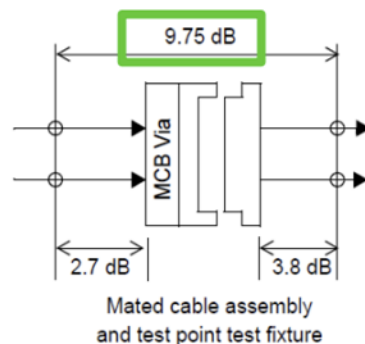
	Package ILdd [dB]	BGA-via rolloff [dB]	PCB Length ["]	PCB ILdd [dB]	connector + vias [dB]	Module ILdd [dB]	Die to Die ILdd [dB]
Max Package	10.0	1.0	6.0	7.8	2.75	2.0	23.55
Max PCB	5.0	1.0	8.0	10.4	2.75	2.0	21.15
Mid Pkg/PCB	7.0	1.0	7.0	9.1	2.75	2.0	21.85

Reconcile Example Budget with Adopted MTF

D1.1 Mated Test Fixture includes:

- 3.8 dB allocation for Host Compliance Board
- 3.25 dB for connector+MCB vias

This is *not* an endorsement of this MTF IL allocation (connector + MCB_via seems too high)



NOTE (180)—2.7 dB MCB PCB ILdd includes the RF connector (up to the RF connector reference plane).
The MCB via allowance is 0.8 dB.

Figure 179A-3—Host-Nominal to Host-Nominal, Cable assembly, and test fixture insertion loss at 53.125 GHz

Modifications for Adopted Mated Test Fixture

Adjust budget to reconcile with Mated Test Fixture D1.1 allocations:

	Package ILdd [dB]	BGA-via rolloff [dB]	PCB Length ["]	PCB ILdd [dB]	connector + vias [dB]	Module ILdd [dB]	Die to Die ILdd [dB]
Max Package	10.0	1.0	6.0	7.8	2.75	2.0	23.55
Max PCB	5.0	1.0	8.0	10.4	2.75	2.0	21.15
Mid Pkg/PCB	7.0	1.0	7.0	9.1	2.75	2.0	21.85



	Package ILdd [dB]	BGA-via rolloff [dB]	PCB Length ["]	PCB ILdd [dB]	Connector + vias [dB]	Module ILdd [dB]	Die to Die ILdd [dB]
Max Package	10.0	1.0	6.0	7.8	3.25	3.8	25.85
Max PCB	5.0	1.0	8.0	10.4	3.25	3.8	23.45
Mid Pkg/PCB	7.0	1.0	7.0	9.1	3.25	3.8	24.15

Proposed Informative ILdd budget

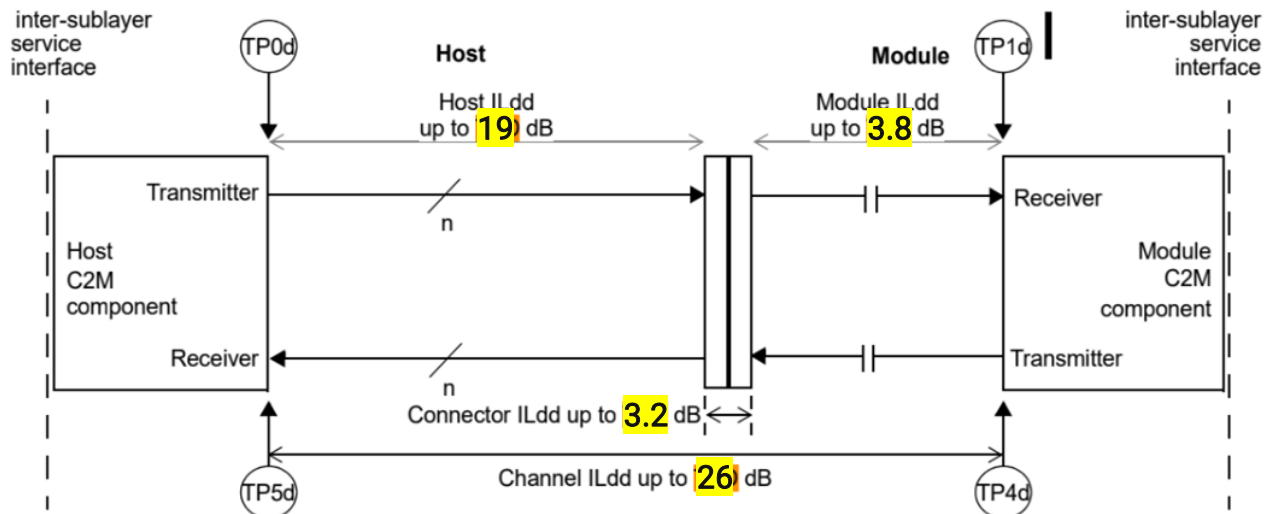


Figure 176E-2—Components of a 200 Gb/s per lane AUI-C2M and insertion loss budget at 53.125 GHz