# OPEN POSSIBILITIES.

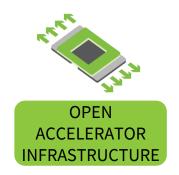
Experience Center- OAI v1.5 Test System



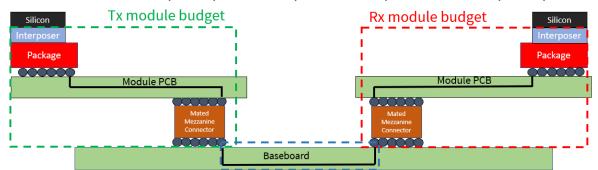
#### OAM v1.5 System Channel Considerations

OAM/UBB v1.5 Total Channel Loss Budget (28GHz): 28-30dB

Test fixture goal: Enable channel testing between OAM modules



OAM Tx (8dB) + UBB (12-14dB) + OAM Rx (8dB)



Baseboard Budget(BGA pad to BGA pad)





## OAM v1.5 Channel Loss Budget





Loss budget at 28GHz								
SMA*2	Mirror Mezz Pro*2	UBB trace loss(EM892K)	UBB via*2	OAM trace loss(EM892K)*2	OAM via*2	Total channel		
0.25/pcs	0.25/pcs	13dB for 15.2" trace (0.855dB/inch)	0.5dB/per via	6.85dB for 8" trace (0.855dB/inch)	0.7 (SMA via + conn via)			
0.25*2=0.5dB	0.25*2 = 0.5dB	13dB	0.5*2=1dB	6.85*2=13.7dB	0.7*2=1.4dB	30dB		

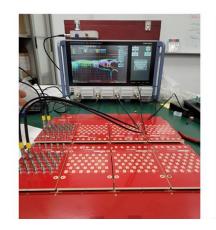


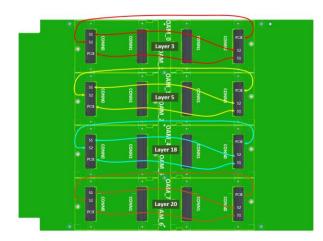


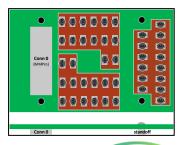
#### 112G PAM4 Test Fixture

Г	$\top$	Port	OAM Layer	OAM Length (inch)	MMPro Loss (dB)	SMA Loss (dB)	OAM Via Loss (dB)	OAM Loss (dB)	UBB Lenght (inch)	UBB Length Loss (dB)	UBB Via Loss (dB)	UBB Total Loss (dB)	UBB Layer	OAM Length (inch)	MMPro Loss (dB)	SMA Loss (dB)	OAM Via Loss (dB)	OAM Loss (dB)	OAM Laye	r Port	
T	S1	1_RX[12]	L5	7.99	0.21	0.25	0.71	8	15.20	13.00	1.00	14.00	L3	7.99	0.21	0.25	0.71	8	L9	S2_RX[8]	
OA	M1 52	2_RX[8]	L9	7.99	0.21	0.25	0.71	8	15.20	13.00	1.00	14.00	L3	7.99	0.21	0.25	0.71	8	L26	PCIE_RX[8]	OAM0
	PO	CIE_RX[8]	L26	7.99	0.21	0.25	0.71	8	15.20	13.00	1.00	14.00	L3	7.99	0.21	0.25	0.71	8	L5	S1_RX[12]	
	S1	1_RX[12]	L5	7.99	0.21	0.25	0.71	8	15.20	13.00	1.00	14.00	L5	7.99	0.21	0.25	0.71	8	L9	S2_RX[8]	
OA	M2 52	2_RX[8]	L9	7.99	0.21	0.25	0.71	8	15.20	13.00	1.00	14.00	L5	7.99	0.21	0.25	0.71	8	L26	PCIE_RX[8]	OAM3
	PO	CIE_RX[8]	L26	7.99	0.21	0.25	0.71	8	15.20	13.00	1.00	14.00	L5	7.99	0.21	0.25	0.71	8	L5	S1_RX[12]	
	S1	1_RX[12]	L5	7.99	0.21	0.25	0.71	8	15.20	13.00	1.00	14.00	L18	7.99	0.21	0.25	0.71	8	L9	S2_RX[8]	
OA	M5 S2	2_RX[8]	L9	7.99	0.21	0.25	0.71	8	15.20	13.00	1.00	14.00	L18	7.99	0.21	0.25	0.71	8	L26	PCIE_RX[8]	OAM4
	PC	CIE_RX[8]	L26	7.99	0.21	0.25	0.71	8	15.20	13.00	1.00	14.00	L18	7.99	0.21	0.25	0.71	8	L5	S1_RX[12]	
	S1	1_RX[12]	L5	7.99	0.21	0.25	0.71	8	15.20	13.00	1.00	14.00	L20	7.99	0.21	0.25	0.71	8	L9	S2_RX[8]	
OA	M6 52	2_RX[8]	L9	7.99	0.21	0.25	0.71	8	15.20	13.00	1.00	14.00	L20	7.99	0.21	0.25	0.71	8	L26	PCIE_RX[8]	OAM7
L	PC	CIE_RX[8]	L26	7.99	0.21	0.25	0.71	8	15.20	13.00	1.00	14.00	L20	7.99	0.21	0.25	0.71	8	L5	S1_RX[12]	











OPEN POSSIBILITIES.

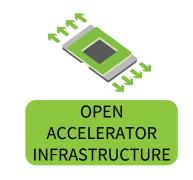
#### **PCB Material**

UBB v1.0 Reference Design – Ultra Low Loss Material

@14GHz (loss/inch): ~0.88dB

UBB v1.5 Reference Design – Hyper/Extreme Low Loss Material

• @28GHz (loss/inch): **0.73 – 0.92dB** 



Material	Stack up (Core/PP)	Loss @28GHz	UBB Length (Inch)
Vendor A	4/5	0.92	14.2
Vendor A	5/6	0.73	17.8
Vendor B	4/5	0.85	15.3
Vendor B	5/6	0.78	16.7





#### Test System Stack Up

		(	GCE proposal			
GCE stackup	Thickness	Copper/Glass type	Oxide Treatment Chemical	ASSUMED Copper rate	Supplier Dk	Supplier [
	(mil)				1 GHz	1 GHz
solder mask	1.00					
0.5 oz+plating	2.10	STDH.T.E				
1078 65% × 1	2.68				2.99	0.0010
1.0 oz	1.25	HVLP4	BONDFILM HF 1000	80%		
4.0 mils core	4.00	1035 66% x 2			2.98	0.0010
1.0 oz	1.25	HVLP 4	BONDFILM HF 1000	40%		
1078 65% × 2	4.96				2.99	0.0010
1.0 oz	1.25	HVLP 4	BONDFILM HF 1000	80%		
4.0 mils core	4.00	1035 66% x 2			2.98	0.0010
1.0 oz	1.25	HVLP 4	BONDFILM HF 1000	40%		
1078 65½ x 2	4.96			10.1	2.99	0.0010
1.0 oz	1.25	HVLP 4	BONDFILM HF 1000	80%		0.0010
4.0 mils core	4.00	1035 66% x 2	DOILDI IZITTII 1000	0071	2.98	0.0010
1.0 oz	1.25	HVLP4	BONDFILM HF 1000	40%	2.00	0.0010
1078 65½ x 2	4.96	HVCF 4	DOMBITE TITE 1000	40%	2.99	0.0010
1.0 oz	1.25	HVLP 4	BONDFILM HF 1000	80%	2.33	0.0010
4.0 mils core	4.00	1035 66% × 2	DOMDITIENTI 1000	00%	2.98	0.0010
1.0 oz	1.25	HVLP4	BONDFILM HF 1000	40%	2.30	0.0010
1078 65% × 2	4.96	HVLF 4	DOMDITERTII 1000	40%	2.99	0.0010
1.0 oz	1.25	RTF	BONDFILM MS 100	80%	2.33	0.0010
4.0 mils core	4.00	1035 66% × 2	DOMDFILM MS 100	00%	2.98	0.0010
4.0 mils core 2.0 oz	2.61	035 66% # Z	BONDFILM MS 100	80%	2.30	0.0010
1078 67% × 4	2.61 11.44	RIF	BUNDFILM MS 100	80%	2.96	0.0010
			DOMDEN 11 110 400	80%	2.36	0.0010
2.0 oz	2.61	RTF	BONDFILM MS 100	80%	0.00	0.004
4.0 mils core	4.00	1035 66% × 2	DOLLDEN 11 110 100		2.98	0.001
1.0 oz	1.25	RTF	BONDFILM MS 100	80%		
1078 65% × 2	4.96				2.99	0.001
1.0 oz	1.25	HVLP4	BONDFILM HF 1000	40%		
4.0 mils core	4.00	1035 66% × 2			2.98	0.001
1.0 oz	1.25	HVLP 4	BONDFILM HF 1000	80%		
1078 65% × 2	4.96				2.99	0.001
1.0 oz	1.25	HVLP4	BONDFILM HF 1000	40%		
4.0 mils core	4.00	1035 66% × 2			2.98	0.001
1.0 oz	1.25	HVLP 4	BONDFILM HF 1000	80%		
1078 65% x 2	4.96				2.99	0.001
1.0 oz	1.25	HVLP4	BONDFILM HF 1000	40%		
4.0 mils core	4.00	1035 66% x 2			2.98	0.001
1.0 oz	1.25	HVLP 4	BONDFILM HF 1000	80%		
1078 65% x 2	4.96				2.99	0.001
1.0 oz	1.25	HVLP 4	BONDFILM HF 1000	40%		
4.0 mils core	4.00	1035 66% × 2			2.98	0.001
1.0 oz	1.25	HVLP 4	BONDFILM HF 1000	80%		
1078 65% x 1	2.68				2.99	0.001
0.5 oz+plating	2.10	STDH.T.E				
solder mask	1.00					
total=	128.33	(w/o.S/M)				

GCE proposal							
GCE stackup	Thickness	Copper/Glass type	Ozide Treatment Chemical	ASSUMED Copper rate	Supplier Dk	Supplier I	
	(mil)		- Cilcinioui	Copperiate	1GHz	1 GHz	
zalder mark	1.00						
0.5 ax+plating	2.10	STD H.T.E					
1078 65% x 1	2.68				2.99	0.0010	
1.0 az	1.25	HVLP4	BONDFILM HF 1000	\$0×			
4.0 mile care	4.00	103566××2			2.98	0.0010	
1.0 oz	1.25	HVLP 4	BONDFILM HF 1000	40×			
107865%×2	4.96				2.99	0.0010	
1.0 ox	1.25	HVLP 4	BONDFILM HF 1000	\$0X			
4.0 milr care	4.00	103566××2	BONDFILM HF 1000		2.98	0.0010	
1.0 az 1078 65××2	1.25 4.96	HVLP 4	ROMDEITM HE 1666	40×	2.99	0.0010	
1078652×2	1.25	HVLP 4	BONDFILM HF 1000	##×	2.99	0.0010	
4.0 mile care	4,00	103566%×2	BONDFILM HE 1999	***	2.98	0,0010	
1.0 az	1.25	HVLP 4	BONDFILM HF 1000	40×	2.70	0.0010	
1078 65% × 2	4.96	mer 4	DONDITIES IN 1444	447.	2.99	0.0010	
1.0 oz	1.25	HVLP 4	BOHDFILM HF 1000	##X	2.77	0.0010	
4.0 mile core	4.00	103566××2	DOMESTICITING 1000	***	2.98	0.0010	
1.0 pz	1.25	HVLP 4	BOHDFILM HF 1000	40 z			
1078 65% × 2	4.96				2,99	0,0010	
1.0 mx	1.25	RTF	BONDFILM MS 100	\$0×			
4.0 milr care	4.00	1035.66%×2			2.98	0.0010	
2.0 ox	2.61	RTF	BONDFILM MS 100	##X			
1035 77××2	4.56				2.85	0.0009	
2.0 az	2.61	RTF	BONDFILM MS 100	\$0×			
4.0 milr care	4.00	103566××2			2.98	0.0010	
1.0 ox	1.25	RTF	BONDFILM MS 100	\$82			
1035 77%×2	4.82				2.85	0.0009	
2.0 az	2.61	RTF	BONDFILM MS 100	\$0×			
5.5 milr care	5.50	107859.5%×2			3.05	0.0010	
2.0 oz	2.61	RTF	BONDFILM MS 100	\$ <b>9</b> %			
1035 77%×2	4.82				2.85	0.0009	
1.0 oz	1.25	RTF	BONDFILM MS 100	\$0×			
4.0 milr care	4.00	1035 66% × 2			2.98	0.0010	
2.0 az	2.61	RTF	BONDFILM MS 100	##X	2.45	0.0009	
103577××2 2.0 ox	4.56 2.61	RTF	BONDFILM MS 100	##X	2.85	0.0009	
4.0 milr core	4.00	103566××2	BONDFILM HS 100	***	2.98	0.0010	
1.0 oz	1.25	RTF	BONDFILM MS 100	\$0×	2.70	0.0010	
1078 65% × 2	4.96	nir .	BONDFILM HS 100	***	2.99	0,0010	
1.0 nz	1.25	HVLP4	BONDFILM HF 1000	40 z	6.77	0.0010	
4.0 mile care	4.00	103566××2			2.98	0.0010	
1.0 pz	1.25	HVLP 4	BONDFILM HF 1000	\$0×	2	******	
1078 65××2	4.96				2.99	0.0010	
1.0 oz	1.25	HVLP4	BOHDFILM HF 1000	40×			
4.0 milr care	4.00	103566%×2			2.98	0.0010	
1.0 oz	1.25	HVLP 4	BOHDFILM HF 1000	##X			
1078 65% x 2	4.96				2.99	0.0010	
1.0 oz	1.25	HVLP4	BOHDFILM HF 1000	40×			
4.0 mile care	4.00	103566××2			2.98	0.0010	
1.0 az	1.25	HVLP 4	BONDFILM HF 1000	\$ <b>0</b> 2			
107865%×2	4.96				2.99	0.0010	
1.0 ox	1.25	HVLP 4	BONDFILM HF 1000	40×			
4.0 milr care	4.00	103566××2			2.98	0.0010	
1.0 ox	1.25	HVLP 4	BONDFILM HF 1000	##X	2.44		
1078 65××1	2.68	STD H.T.E			2.99	0.0010	
0.5 az+plating		SIDH.T.E					
zalder mark	1.00	(uda SAM)					
total-							

ODEN

OPEN
ACCELERATOR
INFRASTRUCTURE

22 Layers
128.39 mils Thickness

OPEN POSSIBILITIES.

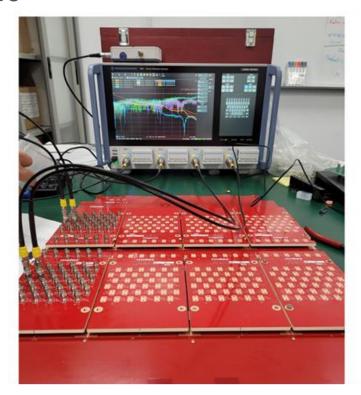
28 Layers PCB Thickness: 162.14 mils



#### OAM v1.5 112G Channel Demo

Demo video of validation for this fixture design

**Channel Test Video** 







## **Availability Details**

Item	Availability
Mirror Mezz Pro Connector	5mm: Tooled/Available Part Number: 218910-1115 8mm: November 2021
OAM Test Vehicle	November 2021
Connector CTV	920hm: November 2021 850hm: December 2021





### OPEN POSSIBILITIES.

#### Mirror Mezz Pro

Next generation Mirror Mezz capable of performance up to 112G

Optimized BGA size to minimize RL impact

Terminal tuned to minimize RL impact and reduce impedance variation

Highest density (107-115 DP/in²), same pin mapping, footprint, and mechanical requirements as original Mirror Mezz

Color difference to distinguish between two connector generations





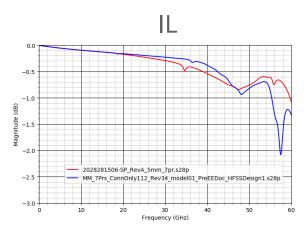


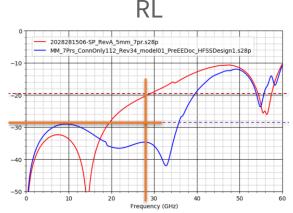


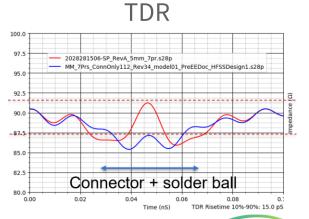
## Mezzanine Connector

OAM/UBB v1.0 – Molex Mirror Mezz OAM/UBB v1.5 – Molex Mirror Mezz Pro





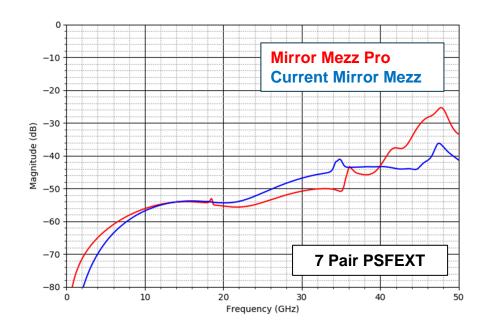






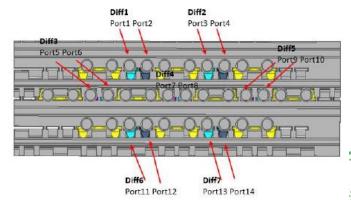
#### OPEN POSSIBILITIES.

#### Mezzanine: Simulated Connector Only





Condition	FEXT ICN
Nominal	0.86mv
MM pro	0.70mv





## High Speed Workstream Channel Development Team

OPEN ACCELERATOR INFRASTRUCTURE

- Inspur: UBB layout
- Wiwynn: SMT assembly, UBB layout
- Intel: System architect/project lead
- Molex: OAM layout, connector design, test system performance validation
- EMC: Material provision
- GCE: PCB Fab





## Call to Action

Get involved in the project:

OCP Server Project: <a href="https://www.opencompute.org/projects/server">https://www.opencompute.org/projects/server</a>

OAI Subgroup: <a href="https://www.opencompute.org/wiki/server/OAI">https://www.opencompute.org/wiki/server/OAI</a>

OAI Mailing List: <a href="https://oc-all.goup.io/g/OCP-OAI">https://oc-all.goup.io/g/OCP-OAI</a>





## Thank you!

