

HRPPD Meeting Update

2025-12-16

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Current Status

HRPPD Tasks: Due by 01/12/2026

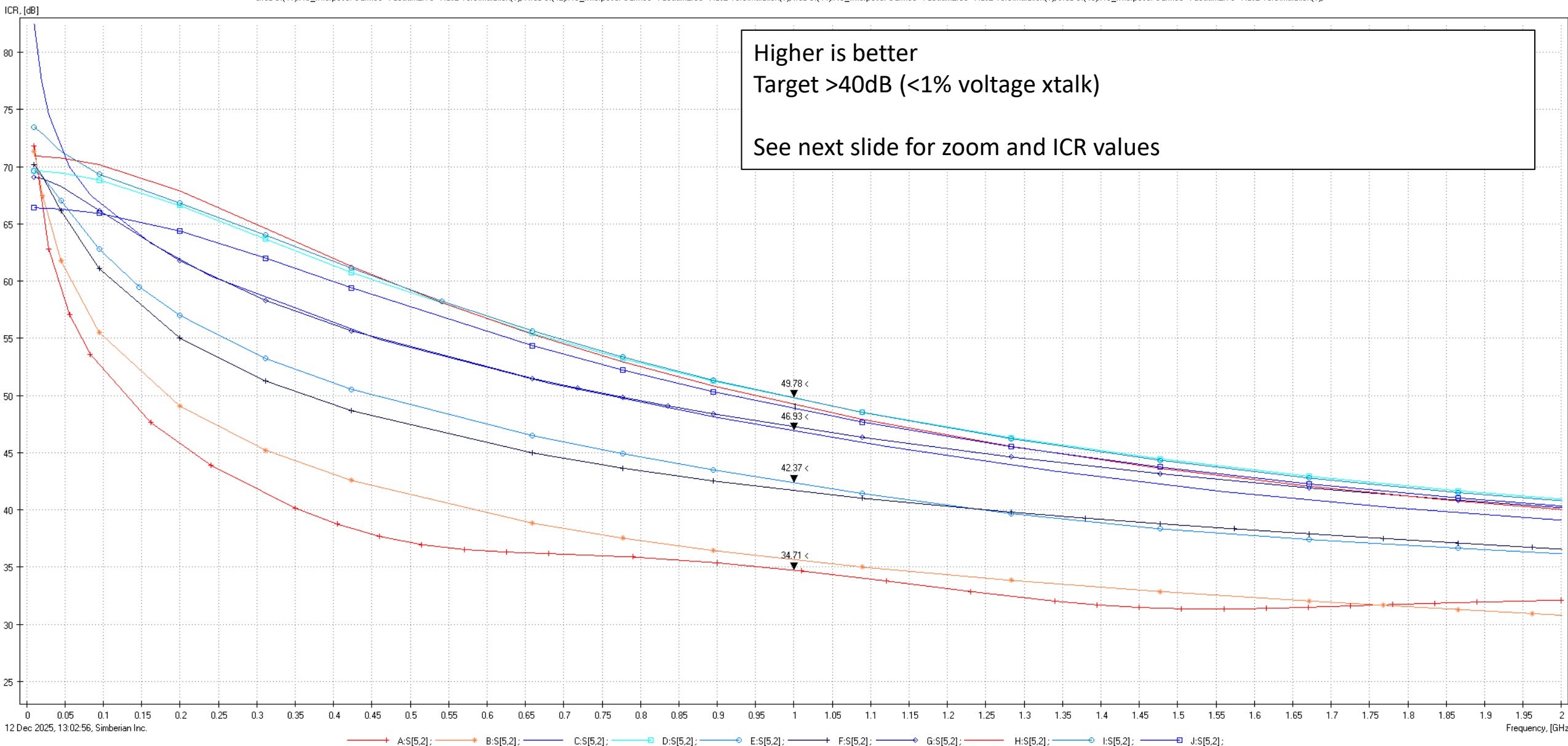
- **Simulations**
 - Complete - stitching vias, air side interposer pad reduction, GND planes
 - Complete 12/16 - Vacuum side pad size selection
 - TBD
 - Interposer downselection (in progress)
 - Interposer Ground pour
- **High Voltage (HV) Design**
 - Complete - preliminary pogo pins selected, HV spacing determined
 - TBD
 - Location of ground and power connections to MCPs
 - Optimization of number of vias (in progress)
- **Mechanical Changes**
 - TBD
 - Interposer positional tolerance
 - Pogo pin placement
 - Plastic connectors for HV connections
 - Check backplane fit for pogo pins and connectors
 - Match outline to mechanical changes
- **Other**
 - Complete - Break in ground ring placed
 - TBD
 - Test file import with Kyocera
 - Update HRPPD with final design changes

Non-HRPPD Tasks: Due after

- **Backplane Changes**
 - Cables
 - Safety resistors
 - Bypass capacitors + ringing resistors
- **FCFD Test Board**
 - Board design complete
 - Final quote received, ETA 20 days ARO

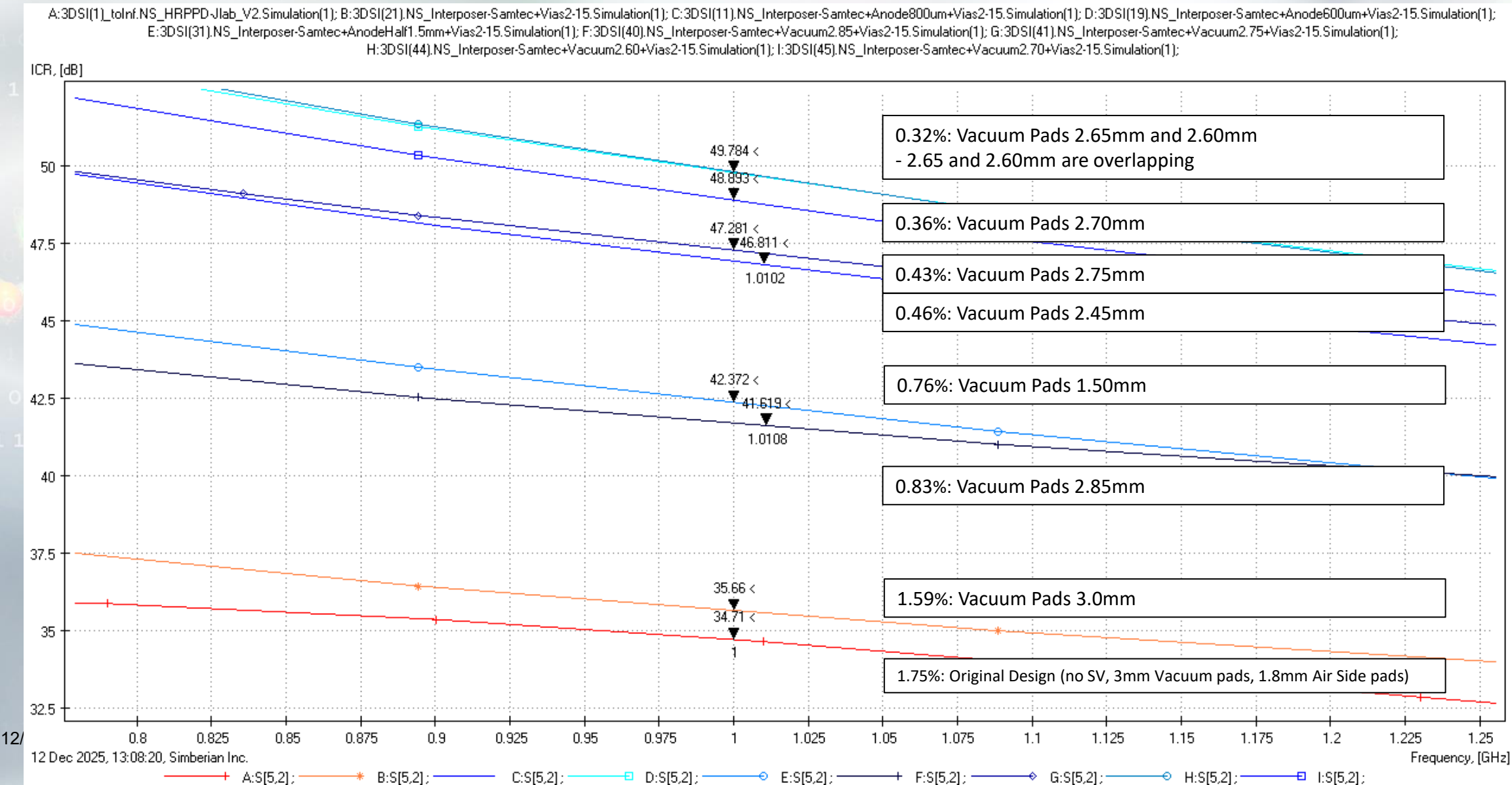
Pad Size Comparison – Overall View

A: 3DSI(1)_toInf.NS_HRPPD-Jlab_V2.Simulation(1); B: 3DSI(21).NS_Interposer-Samtec+Vias2-15.Simulation(1); C: 3DSI(11).NS_Interposer-Samtec+Anode800um+Vias2-15.Simulation(1); D: 3DSI(19).NS_Interposer-Samtec+Anode600um+Vias2-15.Simulation(1); E: 3DSI(31).NS_Interposer-Samtec+AnodeHalf1.5mm+Vias2-15.Simulation(1); F: 3DSI(40).NS_Interposer-Samtec+Vacuum2.85+Vias2-15.Simulation(1); G: 3DSI(41).NS_Interposer-Samtec+Vacuum2.75+Vias2-15.Simulation(1); H: 3DSI(42).NS_Interposer-Samtec+Vacuum2.65+Vias2-15.Simulation(1); I: 3DSI(44).NS_Interposer-Samtec+Vacuum2.60+Vias2-15.Simulation(1); J: 3DSI(45).NS_Interposer-Samtec+Vacuum2.70+Vias2-15.Simulation(1);



Pad Size Comparison – Zoomed View

All simulations have smaller air side pads (0.8mm) and and stitching via span layers 2-15



Vaccum Side Pad Size Summary

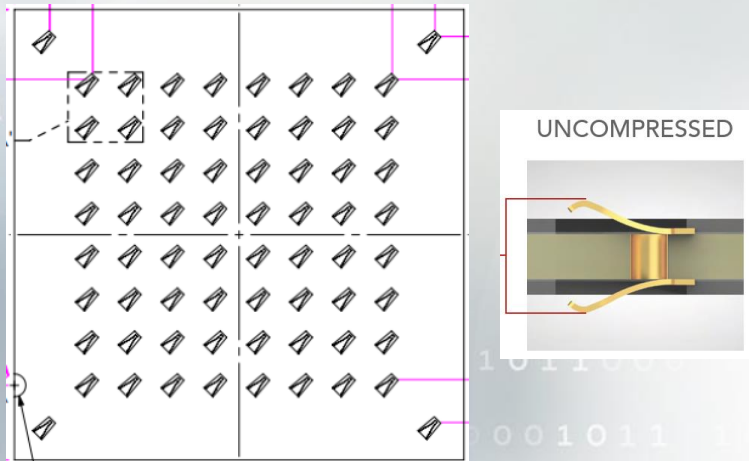
- Tested pad sizes:
 - 3.0, (2.85), (2.75), (2.7), 2.65, (2.6), 2.45, 1.5
 - () Indicating new simulations
- “Knee” for ICR is 2.65-2.60mm
 - 2.60 performs very **slightly** better in IL and RL
- Suggested Vacuum Side Pad Size:
 - 2.75mm (108mil) to maximize detection area without major impacts to crosstalk, IL, and RL
 - Gives pad-pad spacing of 0.5mm / 20mil
 - This is double the current spacing with 3mm pads (0.25mm / 10mil)

Test Case	ICR	IL	RL
Vacuum Pads 2.60mm	0.32%	1.87%	3.08%
Vacuum Pads 2.65mm	0.32%	2.05%	3.46%
Vacuum Pads 2.70mm	0.36%	2.15%	3.62%
Vacuum Pads 2.75mm	0.43%	2.22%	3.74%
Vacuum Pads 2.45mm	0.46%	1.38%	2.02%
Vacuum Pads 1.5mm	0.76%	0.51%	0.57%
Vacuum Pads 2.85mm	0.83%	2.80%	4.82%
Vacuum Pads 3.0mm	1.59%	3.47%	6.04%
Original (no SV, 3mm Vacuum pads, 1.8mm Air Side pads)	1.75%	4.83%	8.15%

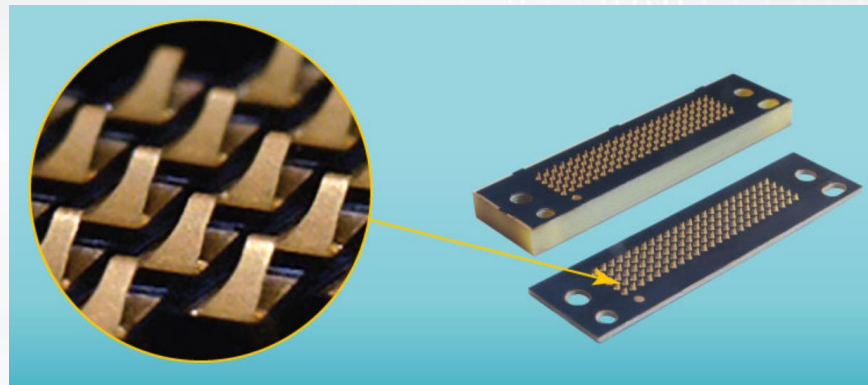
Interposers

- Current Samtec interposer has no ground pins within signal pin field, just in corners
 - SI concern - no grounds between adjacent pins allows crosstalk through capacitive coupling and return current
- In order to add ground pins but not significantly affect footprint (increase size or change routing), considering a 1mm pitch interposer instead of a 2mm pitch one
- Added pins will be used for ground, but increased number of pins significantly affects force
 - Interposer company can selectively (de)populate interposer to alleviate this

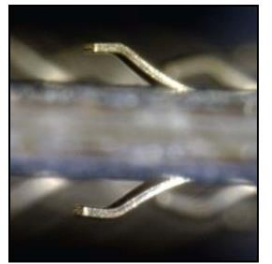
Samtec, 2mm pitch



Neoconix, 1mm pitch



Dual Compression (LGA/LGA)



Interposer Configurations

- 2mm pitch interposer force per pin: 30g (0.07 lbs)
- 1mm pitch interposer force per pin: 30g
 - Note: Interposer force is per interposer, overall force is force per HRPPD (x16 interposer)
 - Grounds were removed from outer rings of “by2” and “by4” to reduce force

	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Q	g																g
P																	
O																	
N																	
M																	
L																	
K																	
J																	
I																	
H																	
G																	
F																	
E																	
D																	
C																	
B																	
A	g																g

Samtec (Current 2mm)
No Isolation

Total pins: 68
Interposer force: 4.5 lbs
Overall force: 72 lbs

	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Q	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
P	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g
O	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
N	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g
M	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
L	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g
K	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
J	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g
I	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
H	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g
G	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
F	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g
E	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
D	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g
C	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g
B	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g	x	g
A	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g	g

Neoconix (1mm)
Fully Isolated

Total pins: 289
Interposer force: 19.1 lbs
Overall force: 305 lbs

	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Q																	
P		x		x		x		x		x		x		x		x	
O			g			g			g			g			g		
N		x		x		x		x		x		x		x		x	
M				g			g			g			g			g	
L		x		x		x		x		x		x		x		x	
K		g			g			g			g			g			g
J		x		x		x		x		x		x		x		x	
I				g			g			g			g			g	
H		x		x		x		x		x		x		x		x	
G			g			g			g			g			g		
F		x		x		x		x		x		x		x		x	
E				g			g			g			g			g	
D		x		x		x		x		x		x		x		x	
C			g			g			g			g			g		
B		x		x		x		x		x		x		x		x	
A																	

Neoconix (1mm)
Partial Isolation – each signal
adjacent to 2 ground (“by2”)

Total pins: 89
Interposer force: 5.87 lbs
Overall force: 94 lbs

	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Q																	
P		x		x		x		x		x		x		x		x	
O			g		g		g		g		g		g		g		g
N		x		x		x		x		x		x		x		x	
M			g		g		g		g		g		g		g		g
L		x		x		x		x		x		x		x		x	
K			g		g		g		g		g		g		g		g
J		x		x		x		x		x		x		x		x	
I			g		g		g		g		g		g		g		g
H		x		x		x		x		x		x		x		x	
G			g		g		g		g		g		g		g		g
F		x		x		x		x		x		x		x		x	
E			g		g		g		g		g		g		g		g
D		x		x		x		x		x		x		x		x	
C			g		g		g		g		g		g		g		g
B		x		x		x		x		x		x		x		x	
A																	

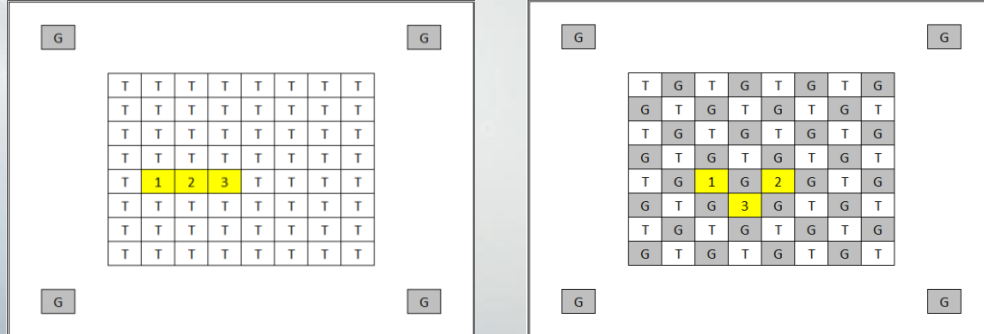
Neoconix (1mm)
Partial Isolation – each signal
adjacent to 4 grounds (“by4”)

Total pins: 113
Interposer force: 7.46 lbs
Overall force: 119 lbs

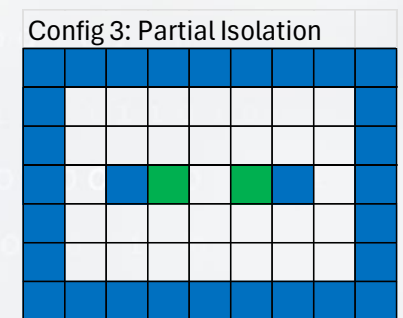
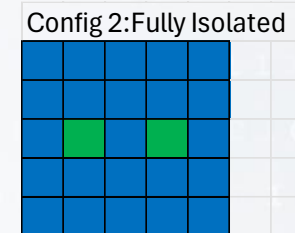
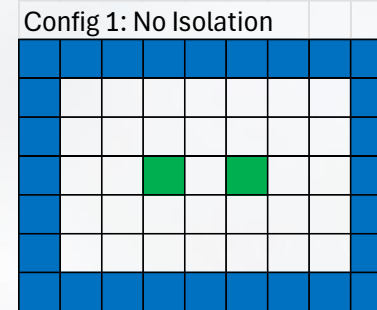
Interposer Models

- Received touchstone models from Samtec and Neoconix
- Only modeled a portion of the connector as a full grid (8x8 or 17x17) would be too large and have too many ports
 - Created equivalent models for Neoconix interposers:

Samtec models



Neoconix models



Interposers - ICR

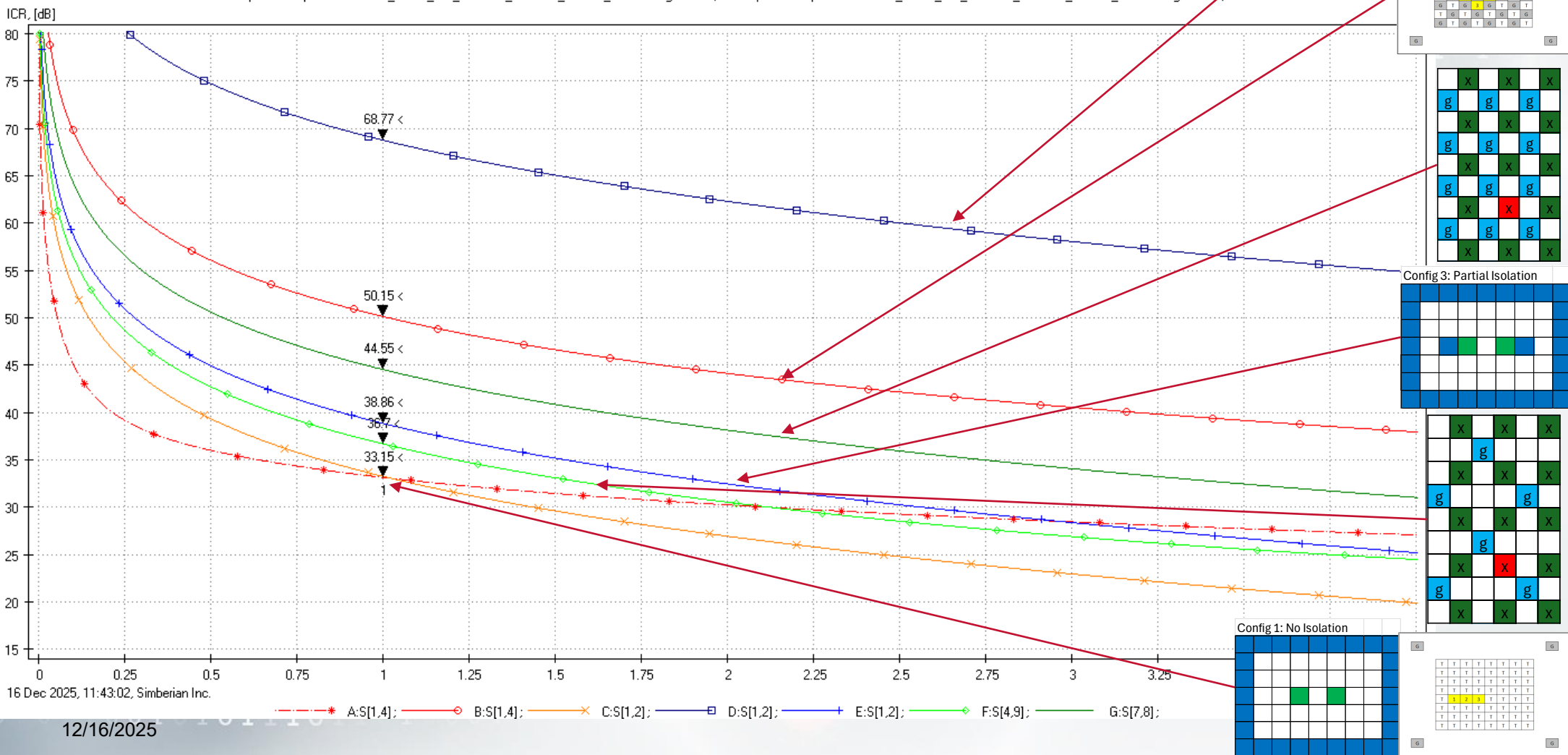
Higher is better
Target: >40dB (1%)
Values in % voltage
Takeaway:

- By 4 configuration performs within 1%
- Interposers will require grounds in outer ring

A: Interposer-compare.Samtec_20250805_TS_10G_2001_z50_ZSP-232827-01;

C: Interposer-compare.SI-0328-01_1mmP_9x7_array_PCBBeam_3mmThk_Config1.MFP; D: Interposer-compare.SI-0329-01_1mmP_5x5_array_PCBBeam_3mmThk_Config2.MFP; E: Interposer-compare.SI-0330-01_1mmP_9x7_array_PCBBeam_3mmThk_Config3.MFP;

F: Interposer-compare.SI-0345-01_1mmP_9x7_PCBBeam_3mmThk_2GNDs_HFSSDesign1.MFP; G: Interposer-compare.SI-0346-01_1mmP_9x7_PCBBeam_3mmThk_4GNDs_HFSSDesign1.MFP;



FEXT @ 1GHz

Neoconix full iso

19.1lbs per interposer

68.77 dB = 0.04%

Samtec SGS

50.15 dB = 0.31%

Neoconix By4

7.46lbs per interposer

44.55 dB = 0.59%

Neoconix partial iso

38.86 dB = 1.14%

Neoconix By2

5.87lbs per interposer

36.7 dB = 1.46%

Samtec/Neoconix no iso

Current design

4.49lbs per interposer

33.15 dB = 2.2%

Interposers - IL

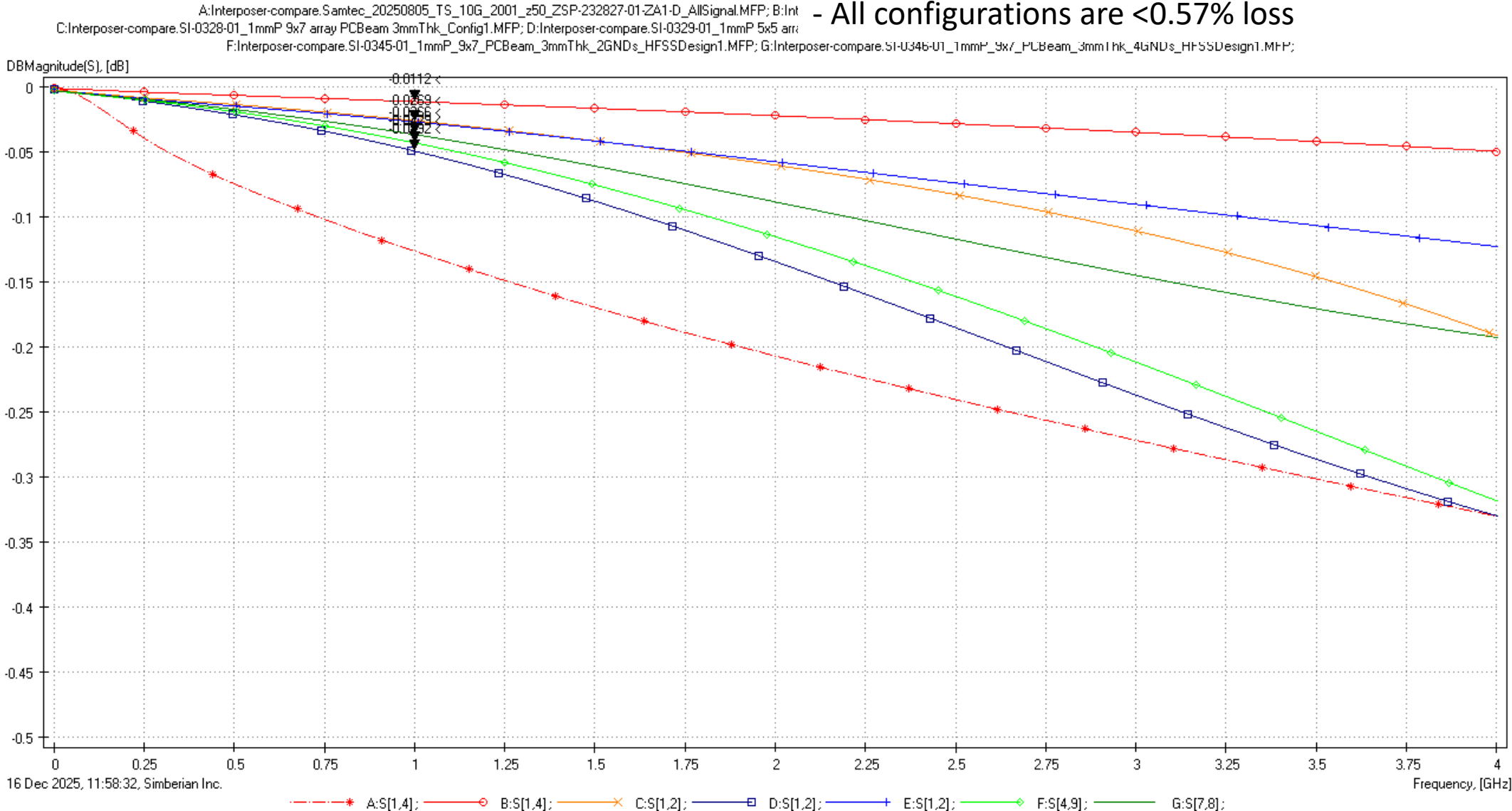
Higher is better

Target: $> -1\text{dB}$ (10% loss)

Values in % voltage

Takeaway:

- All configurations are $< 0.57\%$ loss



Suggested Interposer

- Suggest “by4” configuration with grounds re-added to the outer ring
- 1mm pitch interposer force per pin: 30g
 - Note: Interposer force is per interposer, overall force is force per HRPPD (x16 interposer)
 - Grounds are required in outer ring

	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Q	g		g		g		g		g		g		g		g		g
P		x		x		x		x		x		x		x		x	
O	g		g		g		g		g		g		g		g		g
N		x		x		x		x		x		x		x		x	
M	g		g		g		g		g		g		g		g		g
L		x		x		x		x		x		x		x		x	
K	g		g		g		g		g		g		g		g		g
J		x		x		x		x		x		x		x		x	
I	g		g		g		g		g		g		g		g		g
H		x		x		x		x		x		x		x		x	
G	g		g		g		g		g		g		g		g		g
F		x		x		x		x		x		x		x		x	
E	g		g		g		g		g		g		g		g		g
D		x		x		x		x		x		x		x		x	
C	g		g		g		g		g		g		g		g		g
B		x		x		x		x		x		x		x		x	
A	g		g		g		g		g		g		g		g		g

Neoconix (1mm)

Partial Isolation – each signal adjacent to 4 grounds (“by4”)

Total pins: 145

Interposer force: 9.57 lbs

Overall force: 153 lbs