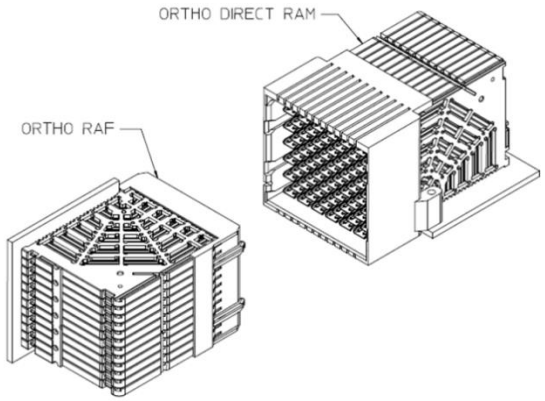
CONNECTOR TEST DOCUMENTATION

MODEL SUMMARY

This document describes the application details of a full electrical model (S-parameter) of an Impel Orthogonal Direct 270 degree orientation connector system. The connector system includes 12 wafers, each holding 6 differential pairs and their associated grounds. Signal path consists of a standard orthogonal right-angled daughter card connector mated to a direct orthogonal right-angled male connector. The electrical model was simulated using ANSYS HFSS in the Frequency domain. The frequency range of this simulation is from 0GHz to 40GHz with increments of 0.02 GHz.



APPLICABLE PART NUMBERS:

171740 Series – OD RAM; 171500 Series – Orthogonal DC

THIS SUPPORT DOCUMENT IS ASSOCIATED WITH, AND APPLICABLE TO S-PARAMETER MODEL 1717409001am000_03_26JAN18_ImpelOD_RAM_PlatedPlastic_6Px12C_5p5mmCrop.s72p ONLY.

MODEL TYPE: Connector	**STRUCTURE:** Mated Connector
MODEL SOURCE: Model	**VALIDATION:** No
NUMBER OF PORTS: 72	**MAXIMUM FREQUENCY:** 0~40 GHz

DISCLAIMERS: Information contained in this document is simulated. Molex Incorporated does not guarantee the performance of the final product to the information provided in this document.

Molex does not represent, warrant or guarantee the accuracy of the information, expressly disclaims all warranties including the implied warranties of merchantability and fitness for particular purpose, and shall not be liable for any damages whatsoever arising from use of, or inability to use, the information contained in this document or accompanying electronic file.

The user is responsible for verifying the results of their use of this information, and assume all risk of doing or not doing so. Use of the electronic file evidences user's agreement to the above terms.

Any charts or schematics in this report are only for general reference. The schematic allows the user to configure a similar simulation circuit in any simulation tool. The resulting charts provided allow a comparison of results to the Molex simulation using the stated schematic.

ORTHO PIN MAPPING (RAF - OD RAM)											
M1-A11	M2-B12	M3-C11	M4-D12	M5-E11	M6-F12	M7-G11	M8-H12	M9-J11	M10-K12	M11-L11	M12-M12
L1-B11	L2-A12	L3-D11	L4-C12	L5-F11	L6-E12	L7-H11	L8-G12	L9-K11	L10-J12	L11-M11	L12-L12
K1-A9	K2-B10	K3-C9	K4-D10	K5-E9	K6-F10	K7-G9	K8-H10	K9-J9	K10-K10	K11-L9	K12-M10
J1-B9	J2-A10	J3-D9	J4-C10	J5-F9	J6-E10	J7-H9	J8-G10	J9-K9	J10-J10	J11-M9	J12-L10
H1-A7	H2-B8	H3-C7	H4-D8	H5-E7	H6-F8	H7-G7	H8-H8	H9-J7	H10-K8	H11-L7	H12-M8
G1-B7	G2-A8	G3-D7	G4-C8	G5-F7	G6-E8	G7-H7	G8-G8	G9-K7	G10-J8	G11-M7	G12-L8
F1-A5	F2-B6	F3-C5	F4-D6	F5-E5	F6-F6	F7-G5	F8-H6	F9-J5	F10-K6	F11-L5	F12-M6
E1-B5	E2-A6	E3-D5	E4-C6	E5-F5	E6-E6	E7-H5	E8-G6	E9-K5	E10-J6	E11-M5	E12-L6
D1-A3	D2-B4	D3-C3	D4-D4	D5-E3	D6-F4	D7-G3	D8-H4	D9-J3	D10-K4	D11-L3	D12-M4
C1-B3	C2-A4	C3-D3	C4-C4	C5-F3	C6-E4	C7-H3	C8-G4	C9-K3	C10-J4	C11-M3	C12-L4
B1-A1	B2-B2	B3-C1	B4-D2	B5-E1	B6-F2	B7-G1	B8-H2	B9-J1	B10-K2	B11-L1	B12-M2
A1-B1	A2-A2	A3-D1	A4-C2	A5-F1	A6-E2	A7-H1	A8-G2	A9-K1	A10-J2	A11-M1	A12-L2

Aggressor Victim

Fig 1: Ortho 270 degree orientation pin mapping

CONNECTOR TEST DOCUMENTATION

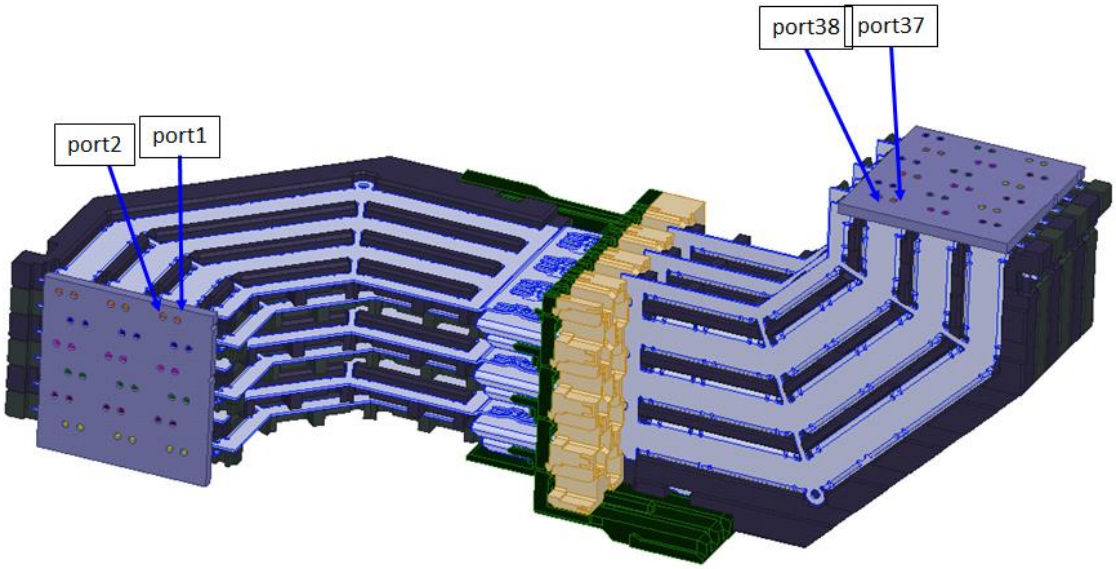
NEAR SIDE TO FAR SIDE PORT MAPPING TABLE

Differential Ports	PIN 1(NS-FS)	PIN 2(NS-FS)	Diff. Thru Ports Near Side, Far Side
DIFF 1	G7-H7	H7-G7	1,19
DIFF 2	J7-H9	K7-G9	2,20
DIFF 3	L7-H11	M7-G11	3,21
DIFF 4	G8-G8	H8-H8	4,22
DIFF 5	J8-G10	K8-H10	5,23
DIFF 6	L8-G12	M8-H12	6,24
DIFF 7	G9-K7	H9-J7	7,25
DIFF 8	J9-K9	K9-J9	8,26
DIFF 9	L9-K11	M9-J11	9,27
DIFF 10	G10-J8	H10-K8	10,28
DIFF 11	J10-J10	K10-K10	11,29
DIFF 12	L10-J12	M10-K12	12,30
DIFF 13	G11-M7	H11-L7	13,31
DIFF 14	J11-M9	K11-L9	14,32
DIFF 15	L11-M11	M11-L11	15,33
DIFF 16	G12-L8	H12-M8	16,34
DIFF 17	J12-L10	K12-M10	17,35
DIFF 18	L12-L12	M12-M12	18,36

PART ILLUSTRATIONS

Near side (Single Ended Ports)

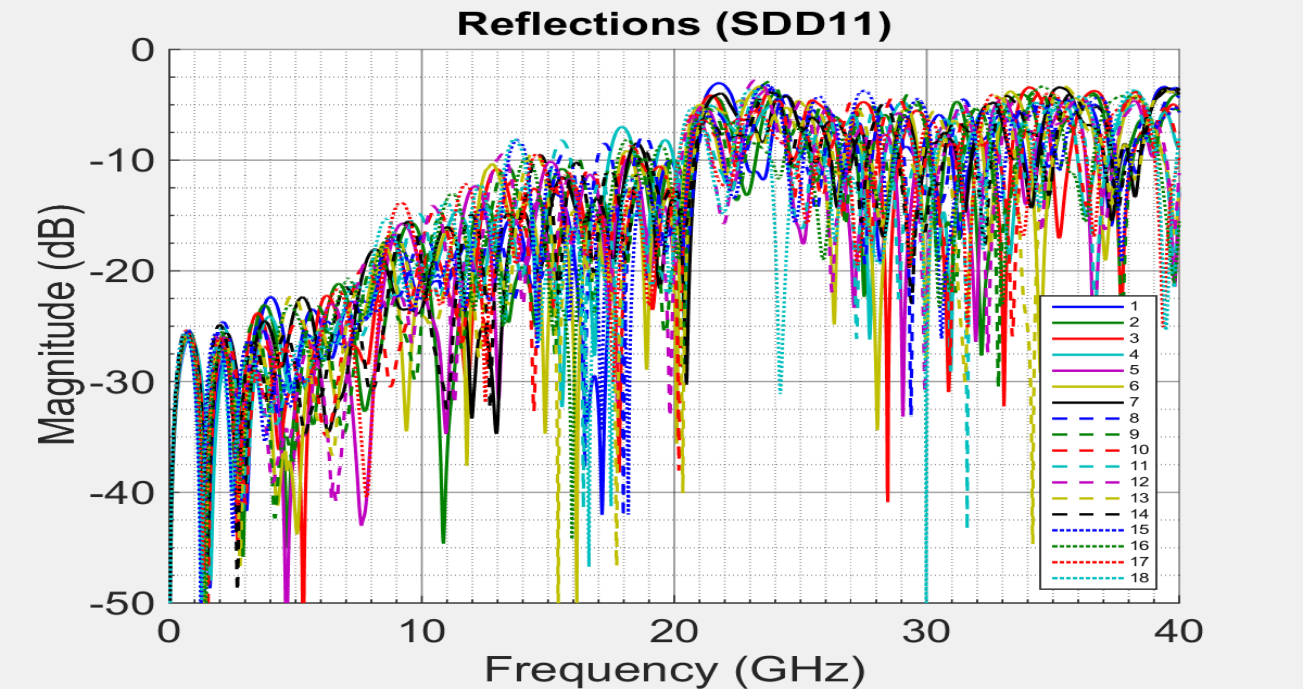
Far side (Single Ended Ports)



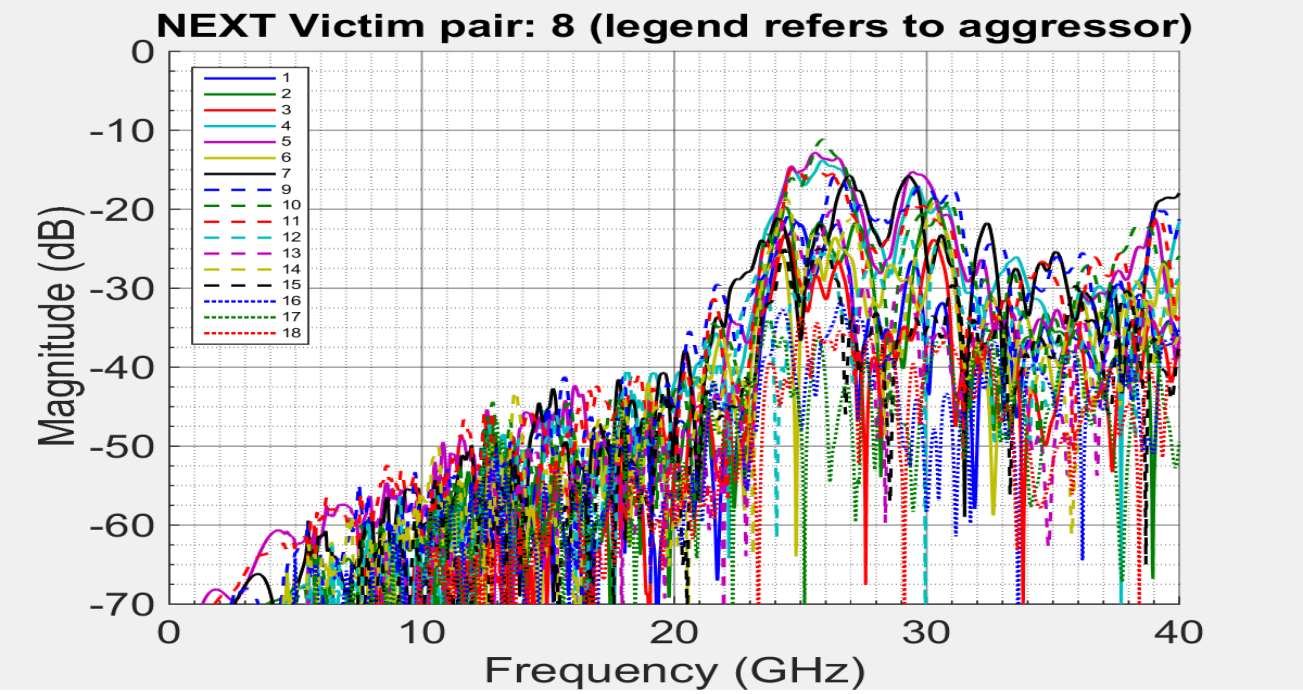
REFERENCE RESULTS

Differential Insertion Loss:

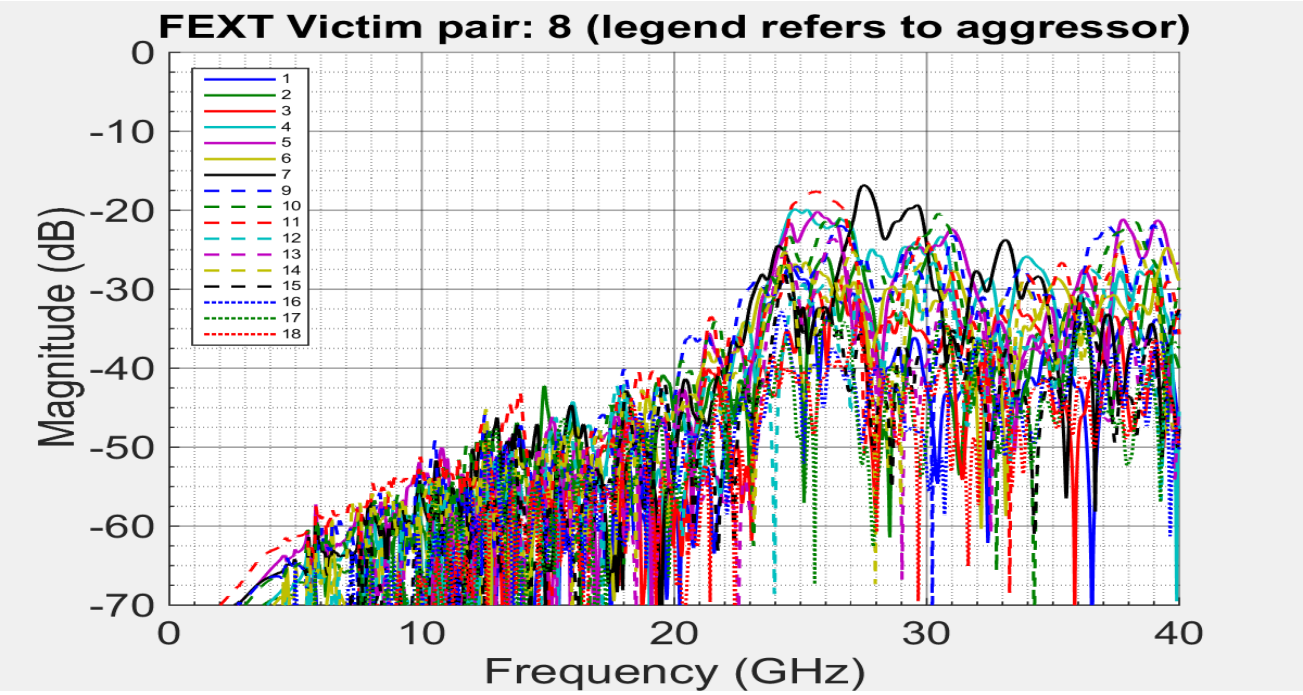
Differential Return Loss:



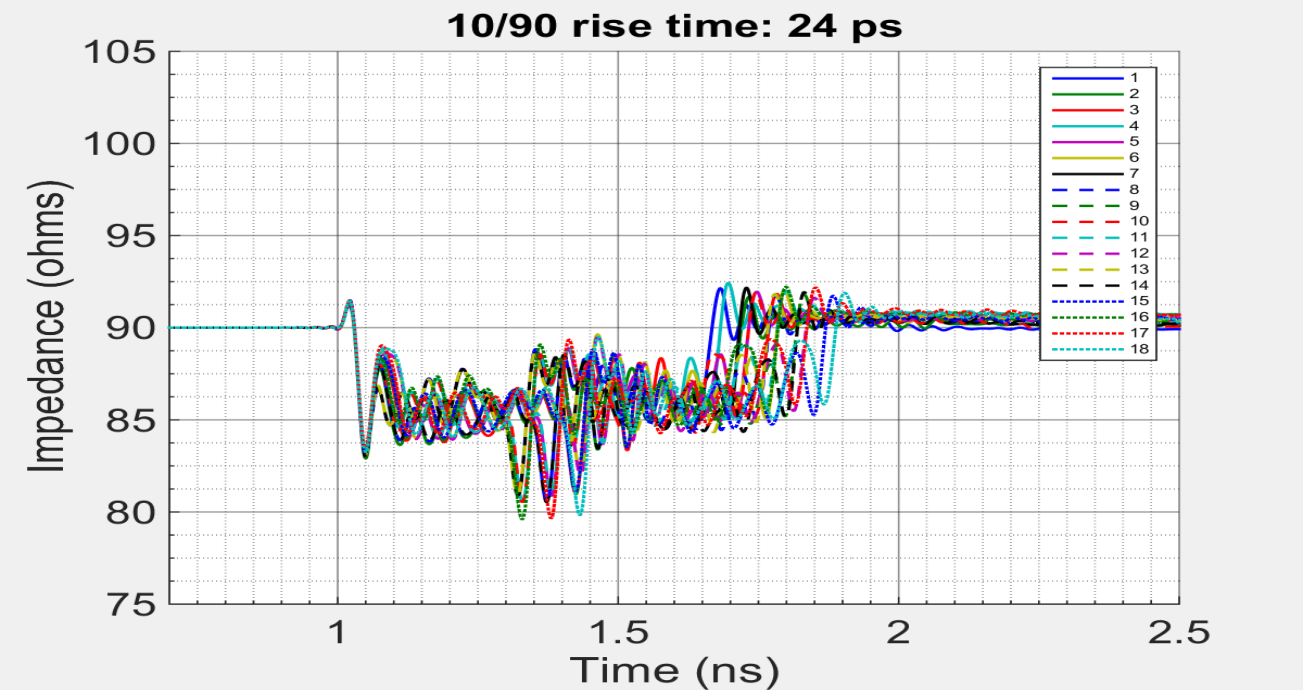
Differential Near End Crosstalk



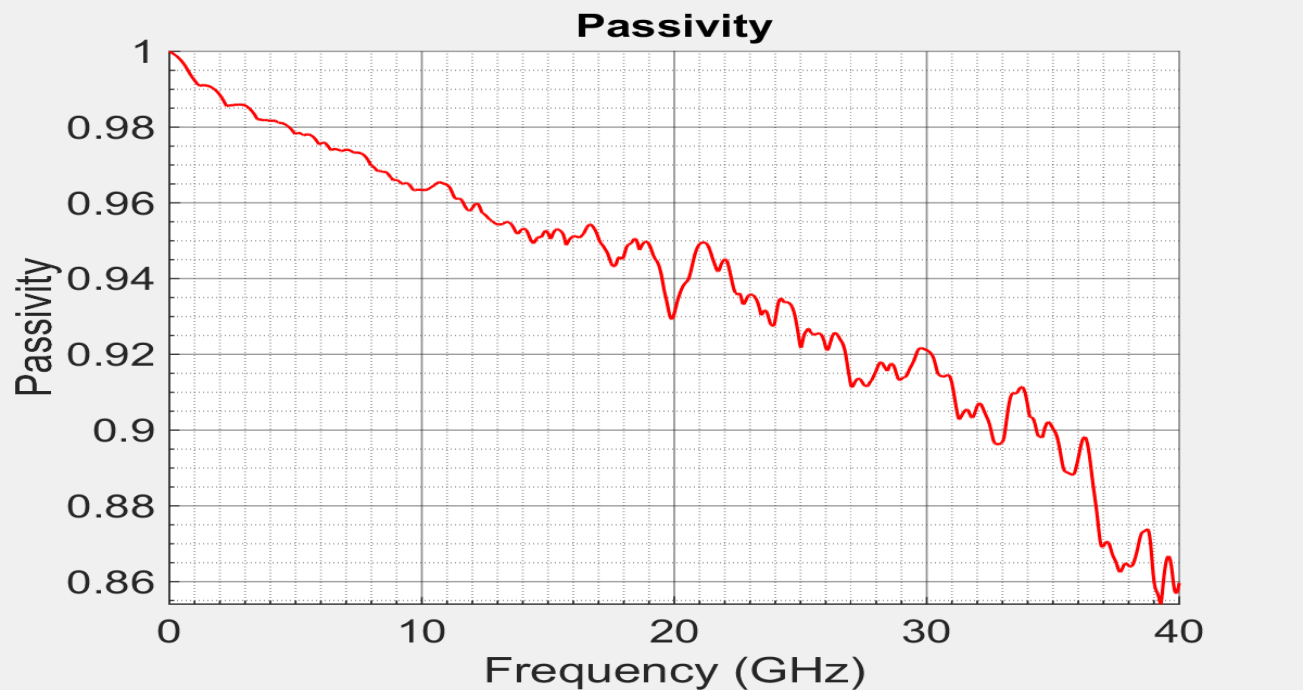
Differential Far End Crosstalk:



Differential Impedance: T_r = 24ps 10/90



Passivity Check:



The passivity of the model, unlike S-parameter results, does not indicate the expected electrical performance of the simulated connector. Rather, it is one of a number of ways to determine the accuracy of the S-parameter model in describing the connectors electrical performance. Since (unless specifically designed to incorporate active components) all connectors are passive devices, the associated model should also be passive at all frequencies. While small non-passivity at isolated frequencies within a model does not necessarily mean that the S-parameters generated are without validity. The presence of non-passivity within a model does suggest caution in its use and closer investigate of the results.

The model is passive at all frequencies based on Ansoft HFSS passivity checker. Other methods of checking passivity may return different results based on the methods used. Very small passivity issues should have a negligible impact on the electrical simulation results.

SKEW:
Electrical length of the connector (delay) can also be derived using 3D Electromagnetic modeler. Time domain solver can readily produce this quantity. Frequency domain solver results can also be transformed to time domain to obtain the same quantity. Since the delay difference between the adjacent conductors is small (a few Pico Seconds), direct measurement can introduce substantial error due to the trace length differences, PCB material inhomogeneity.

In this analysis, Ansoft HFSS solver has been used to provide information on the amount of skew between the two conductors in each differential pair of the Impel™ connector. S-parameter derived from this model is used in Ansoft Designer to obtain transmitted impulse responses. The transmission time difference between the input and the output for each signal conductor constitutes the corresponding single ended electrical delay. The difference between the delays for each conductor in a pair is the skew.

II. CONNECTOR ELECTRICAL DELAY AND SKEW

Diff Pairs		Pin 1(ps)	Pin 2(ps)	Single-Ended Skew (ps)
Pin 1	Pin 2			
G7-H7	H7-G7	317.5	317.5	0
J7-H9	K7-G9	343.3	343.3	0
L7-H11	M7-G11	369	369.1	0.1
G8-G8	H8-H8	326.6	325.6	-1
J8-G10	K8-H10	352.3	351.1	-1.2
L8-G12	M8-H12	378	377.2	-0.8
G9-K7	H9-J7	343.2	343.2	0
J9-K9	K9-J9	368.9	368.9	0
L9-K11	M9-J11	394.7	394.7	0
G10-J8	H10-K8	352.4	351.1	-1.3
J10-J10	K10-K10	378.2	376.9	-1.3
L10-J12	M10-K12	403.8	402.9	-0.9
G11-M7	H11-L7	369	368.9	-0.1
J11-M9	K11-L9	394.8	394.6	-0.2
L11-M11	M11-L11	420.4	420.4	0
G12-L8	H12-M8	378.8	377.7	-1.1
J12-L10	K12-M10	317.5	317.5	0
L12-L12	M12-M12	343.3	343.3	0

Table: Connector single ended skew as evaluated from EM model of Impel OD 270degree 3P6W connector