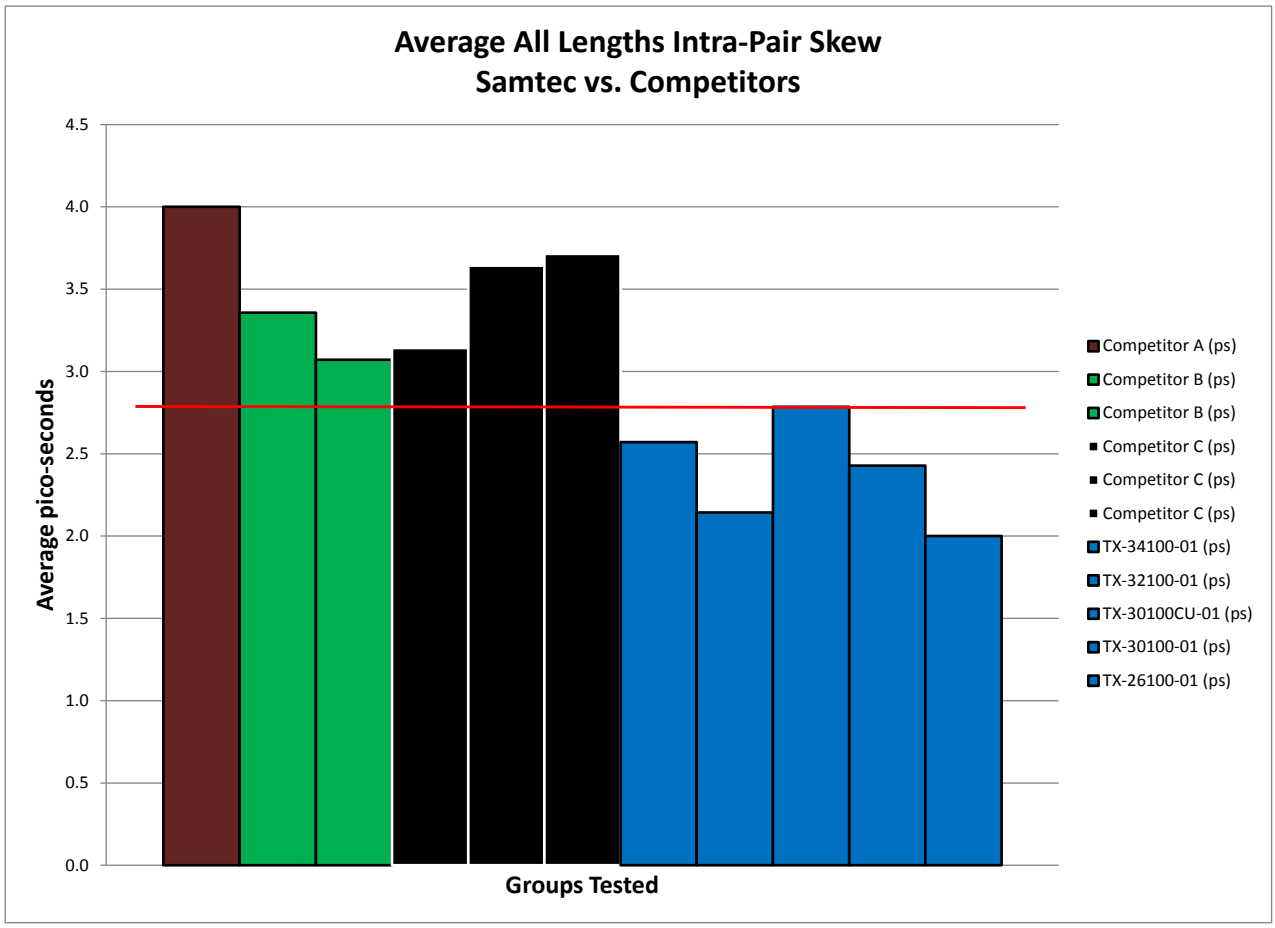
Series: GCCA, PCIEC, EEDP, ERDP, EQDP, 6QDPS, 6QDP, HQDP, EQRP, HDLSP, EPLSP
Description: 26awg to 34awg low skew Twinax cable (Samtec vs. Competition)

Twinax Intra Pair Skew Comparison Report

Various Lengths and Competitors Tested



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Report Revision: 7/16/2015

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Introduction

This testing was performed to evaluate the intra-pair skew measured within Samtec Twinax cables and competitor Twinax cables for comparison. In addition, testing was performed at various cable lengths to quantify how skew relates to increased cable lengths.

Currently Samtec Twinax intra-pair skew specification is <10ps/m, this specification was also listed for competitor Twinax samples selected.

Test procedure for all measurements followed *"Improved Procedure for Measuring Intra-pair Skew in High Speed Differential Cable"* white paper completed by Julian/Travis SIG group on June 13, 2014.

Objective is to determine if Samtec intra-pair skew is equal/better/worse than industry Twinax, in addition skew tested over extended lengths to determine if Samtec is equal/better/worse than industry cables. Finally determine if the current Samtec intra-pair skew specification <10ps/m can be improved for marketing and/or product datasheet.

Product Description

GROUP	Competitor	Series	AWG
A	A-Tempflex	TTC - Filament wind	30awg
B	A-Tempflex	TTS- Solid Diel	30awg
C	B-Leoni	Paralink	30awg
D	B-Leoni	Paralink	26awg
E	C-Amphenol	SpectraStrip-Skew Clear	28awg
F	C-Amphenol	SpectraStrip-Skew Clear EXD	27awg
G	C-Amphenol	SpectraStrip-Skew Clear	26awg
1	Samtec	TX-34100-01	34awg
2	Samtec	TX-32100-01	32awg
3	Samtec	TX-30100CU-01	30awg
4	Samtec	TX-30100-01	30awg
5	Samtec	TX-26100-01	26awg

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Results Summary

All groups had 7 samples tested in which all samples were measured to 3.0, 2.5, 2.0, 1.5, 1.0, 0.50 and 0.25m lengths for comparison of intra pair skew over various lengths and competitors.

Comparing maximum measured skew values from each lengths tested Competitor A on Group A had values larger than 10ps for lengths >1.0 m, but at the 1 meter length and less this product met the published specification of <10ps/m. This cable design was more unstable due to an air enhanced dielectric that exhibited ~10x the skew than Samtec Twinax designs at 3m.

The remainder of all the groups tested across all lengths measured fairly equal and all samples tested below the <10ps/m up to the 3m maximum length evaluated.

Viewing the tabular and graphical data for overall comparison this exhibits a slight Samtec advantage over competitors for both the maximum value measured as well as the average value measured on all samples per a given length.

Conclusion

Samtec Twinax intra-pair skew is in line with competitor performances and test results proved Samtec Twinax was comparable over all lengths tested and the maximum skew measured was 3.5ps/3m, this suggests the current specification of <10ps/m is conservative.

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Tabular Data

	Competitor Testing Group						
	Group A	**Group B**	**Group C**	**Group D**	**Group E**	**Group F**	**Group G**
Length (m)	Competitor A (ps)	Competitor A (ps)	Competitor B (ps)	Competitor B (ps)	Competitor C (ps)	Competitor C (ps)	Competitor C (ps)
3.00	31.0	8.5	4.0	4.5	3.5	2.5	3.0
2.50	21.0	4.0	3.0	3.0	2.0	3.0	3.5
2.00	27.0	3.0	3.0	2.0	4.0	3.0	4.0
1.50	15.0	5.0	3.0	2.5	3.0	4.0	3.5
1.00	9.0	2.5	3.5	3.0	2.5	4.5	4.0
0.50	6.5	2.0	3.0	3.5	3.5	4.0	4.0
0.25	4.0	3.0	4.0	3.0	3.5	4.5	4.0
Minimum (ps)	4.0	2.0	3.0	2.0	2.0	2.5	3.0
Average (ps)	16.2	4.0	3.4	3.1	3.1	3.6	3.7
Maximum (ps)	31.0	8.5	4.0	4.5	4.0	4.5	4.0

	Samtec Testing Group				
	Group 1	**Group 2**	**Group 3**	**Group 4**	**Group 5**
Length (m)	TX-34100-01 (ps)	TX-32100-01 (ps)	TX-30100CU-01 (ps)	TX-30100-01 (ps)	TX-26100-01 (ps)
3.00	3.0	2.0	2.5	3.0	2.0
2.50	2.0	2.5	3.0	2.0	3.0
2.00	2.5	2.5	3.0	2.5	2.0
1.50	2.0	2.0	2.5	2.0	2.5
1.00	2.5	2.5	2.0	2.5	1.5
0.50	2.5	1.5	3.5	3.0	1.5
0.25	3.5	2.0	3.0	2.0	1.5
Minimum (ps)	2.0	1.5	2.0	2.0	1.5
Average (ps)	2.6	2.1	2.8	2.4	2.0
Maximum (ps)	3.5	2.5	3.5	3.0	3.0

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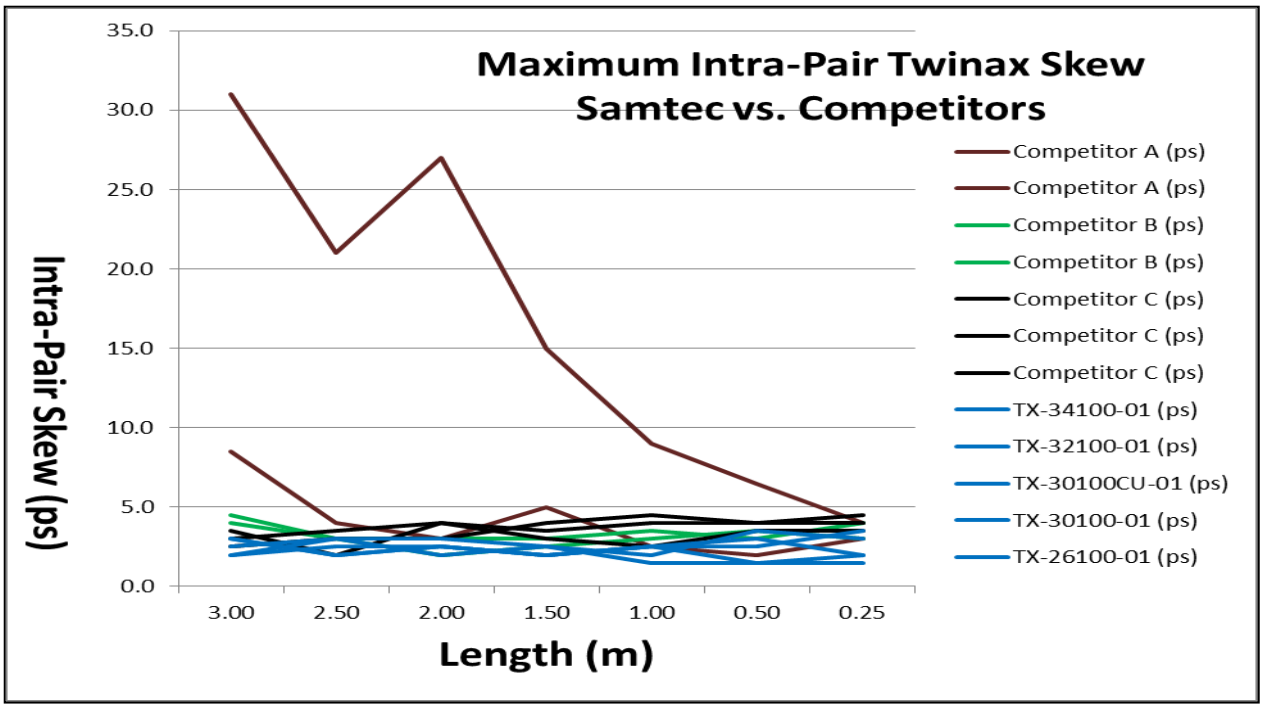
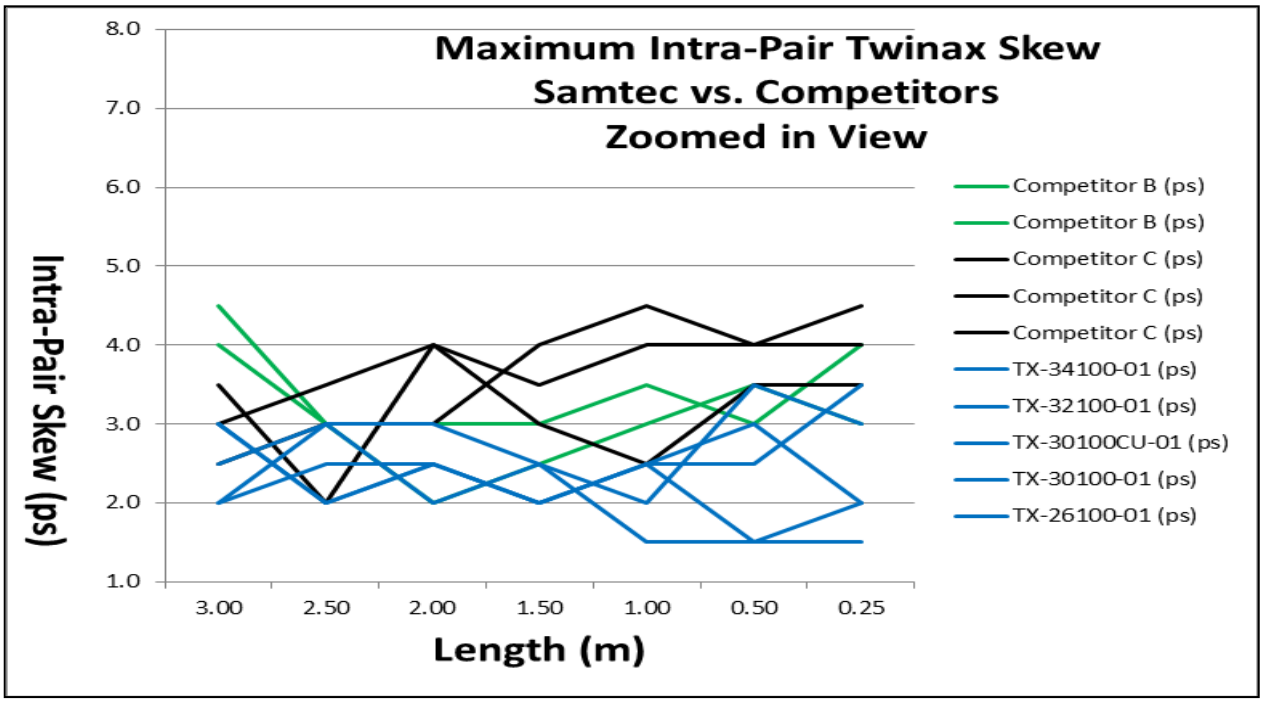
Description: 26awg to 34awg low skew Twinax cable (Samtec vs. Competition)

Graphical Data





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Test Procedures

Intra-pair skew, or in-pair skew, refers to the difference in transmission speed between two conductors of a differential pair. Intra-pair skew can contribute to signal integrity issues such as crosstalk, apparent impedance mismatches, common mode noise, and resonances. It can also cause EMI problems in both immunity and emissions.

During this test study a Tektronix DSA8300 mainframe system with 80E04 differential Time Domain Reflectometry (TDR) head was used for measurements. All measurements were taken using a TDR method to eliminate the 2nd end fixturing, all measurements were then divided by 2 due to the reflection doubling the actual skew typical in a TDT method.

All groups had 7 samples tested in which all samples were measured to 3.0, 2.5, 2.0, 1.5, 1.0, 0.50 and 0.25m lengths for comparison of intra pair skew over various lengths and competitors.

All samples started at 3m with one end prepped to expose center conductors; dielectric was cut to be flush with shield score line to minimize the discontinuity of impedance launch due to exposed dielectric in air. A custom PCB (FYFC6792U) was used with edge mounted SMA connectors (292-04A-5 ADAPTER, SMA, F) and a slot was cut into ground plane to allow Twinax shield to fit inside slot for best transition area and measured results.

All test samples were connected directly to the 80E04 sampling head within the DSA 8300 mainframe, using the TDR approach to locate the open end of both conductors with respect to ground waveforms the intra-pair skew measurement was taken at the point in which both waveforms become monotonic. The measurement taken is the difference between each conductor to ground in time (ps) using the absolute value and then dividing the measurement by 2 for actual intra-pair skew value within the sample being tested. Each sample was then cut at the open end to shorten test length incrementally from 3.0 to 0.25m before removing from PCB transition card, in which the next sample was terminated in the same manner across all groups.

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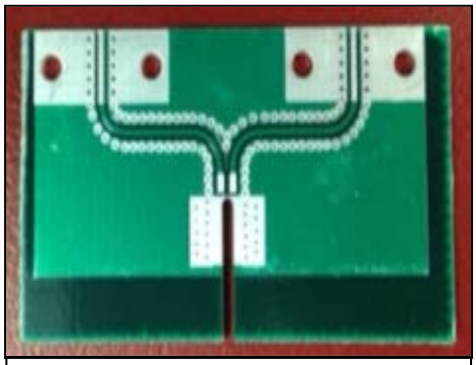
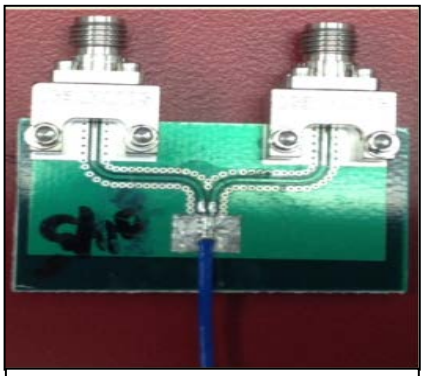
Fixturing

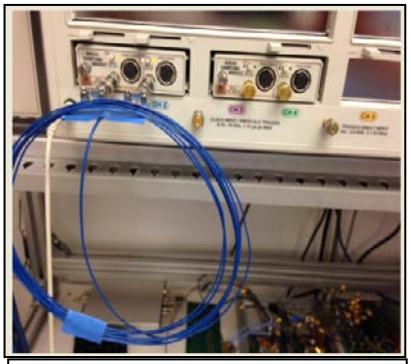
(292-04A-5 Adapter, SMA, F)



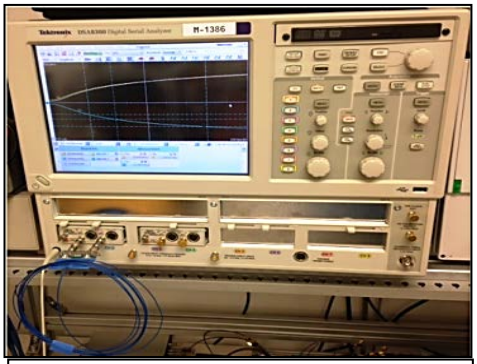
PCB - (FYFC6792U)



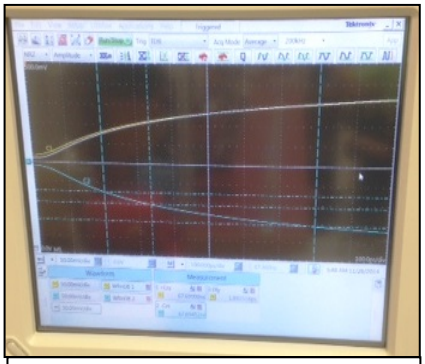
Terminated Twinax (DUT)



DUT Connect to 80E04



DSA 8300 Set Up



TDR Intra-Pair Skew