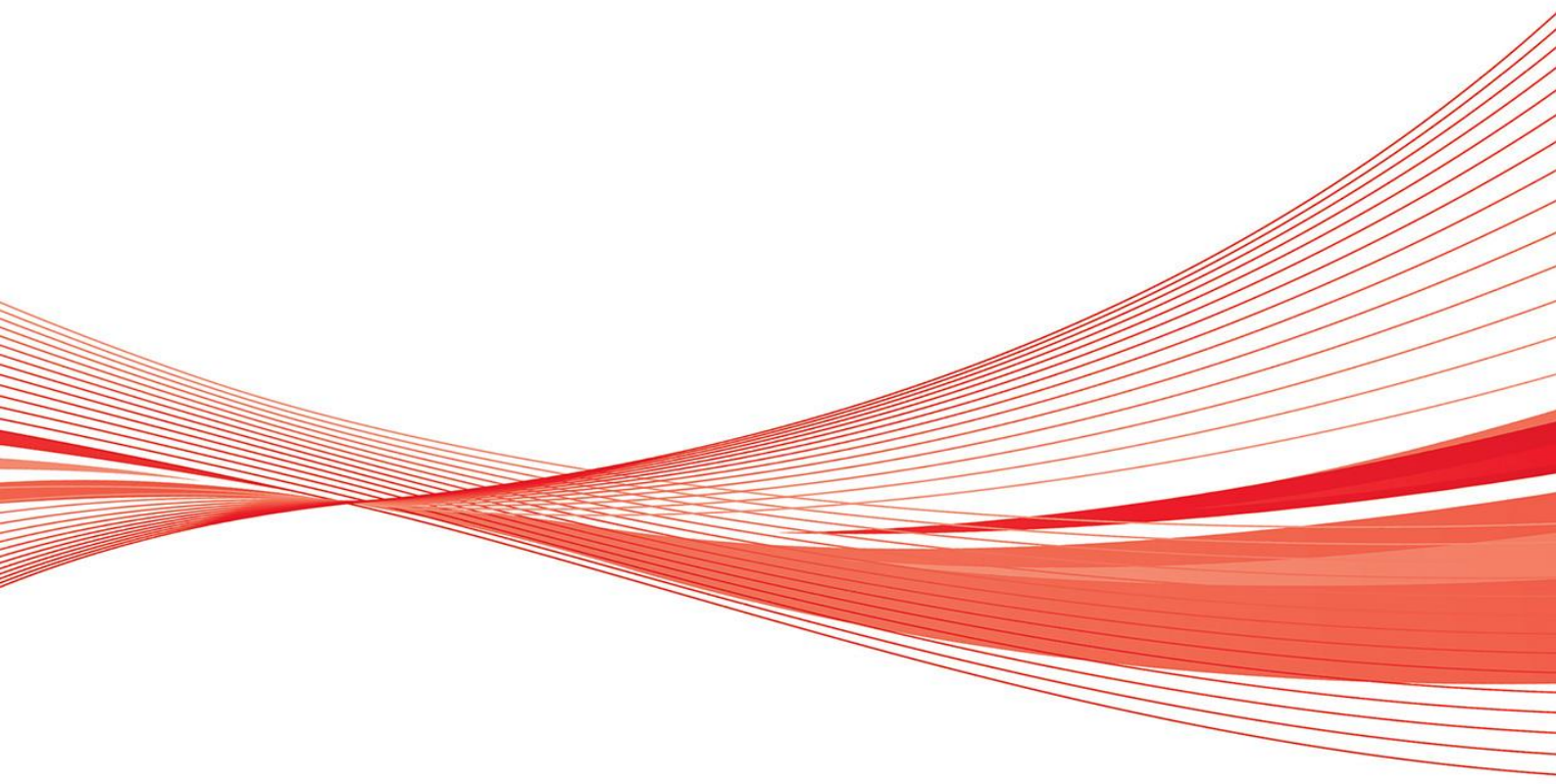
Harwin Test Report Summary

HT08002

Archer .8 (M58 Series)

Electrical, Mechanical & Environmental Testing



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1. Introduction

1.1. Description and Purpose

Archer .8 (M58 Series) is a range of board-to-board mezzanine 0.8mm pitch connectors in a double row format with polarized, shrouded housings with location pegs. The connectors are available in male and female vertical connector styles for surface mount soldering, with contact counts up to 120 (60+60).

The Archer .8 range offers a low profile, high density connector in tape & reel ready for high volume automated assembly, and high speed signal transmission. The following tests were performed to confirm the connectors meet the proposed specifications under the EIA-364 electrical connector standards.

1.2. Conclusion

The following data has been taken from Harwin Test report QA000250. The results were used to define the Component Specification C053XX for the Archer .8 range. The tests indicate that the Archer .8 range performs as required, suitable for a wide range of applications calling for high density, high speed, board-to-board connectors.

2. Test Method and Requirements

2.1. Specification Parameters

Tests were carried out in general accordance with EIA-364 standards. The list of tests covered in this summary are as follows:

Testing Standard	Description of Test	Section	Page No.
EIA-364-23B: 2000	Contact Resistance	3.1	3
EIA-364-70A: 1998	Current Rating	3.2	3 – 4
EIA-364-09C: 1999	Durability	3.3	5
EIA-364-20C: 2004	Withstand Voltage	3.4	5
EIA-364-21C: 2000	Insulation Resistance	3.4	5
N/A	Temperature Life (without load)	3.5	6
EIA-364-32C: 2000	Thermal Shock (Temperature Cycling)	3.6	6
EIA-364-26B: 1999	Salt Spray	3.7	6
EIA-364-31B: 1999	Humidity	3.8	6
EIA-364-28D: 1999 (BS EN 60068-2-6: 2008 Test Fc)	Vibration	3.9	7
EIA-364-27B: 1996	Mechanical Shock	3.10	8
N/A (Signal Integrity – 3.11 [9])	Insertion Loss	3.11.1	10-11
	Return Loss	3.11.2	12-13
	Impedance	3.11.3	14-15
	Crosstalk	3.11.4	16-17
	VSWR	3.11.5	18

2.2. List of Connectors

The following connectors are used throughout the testing:

- M58-2800342R – Female 30 contact SMT connector
- M58-3800342R – Male 30 contact SMT connector
- M58-2800642R – Female 60 contact SMT connector
- M58-3800642R – Male 60 contact SMT connector
- M58-2801242R – Female 120 contact SMT connector
- M58-3801242R – Male 120 contact SMT connector

3. Test Results

3.1. Contact Resistance to EIA-364-06C: 1999

Specification: **Initial:** 50mΩ max. per contact.
Post-Conditioned: 100mΩ max. per contact.

Methodology: One contact, 20 contacts, and 30 contacts on each 30-contact sample connector (M58-2800342R – M58-3800342R) were measured using a precision milli/micro-ohmmeter for resistance prior to any electrical, mechanical, or environmental testing. Post conditioned samples of 30-contact connectors (M58-2800342R – M58-3800342R) were subjected to contact resistance testing. The pre-conditioned samples tested are detailed below.

Initial Contact Resistance (mΩ)			
Mated Pair	Max	Min	Average
Sample 1	36.47	30.39	33.12
Sample 2	36.60	32.61	35.21
Sample 3	33.30	31.41	32.55
Sample 4	35.50	32.65	33.75
Sample 5	35.16	32.20	33.29

Post conditioned samples of 30 contact connectors were subjected to contact resistance testing. The results are detailed below.

Post Conditioned Contact Resistance (mΩ)			
Condition	Max	Min	Average
Temperature Life	44.42	40.35	42.55
Vibration	45.5	41.9	43.35
Thermal Shock	45.3	41.6	43.71
Salt Spray	44.39	40.58	42.24
Humidity	44.59	40.23	42.29

3.2. Power Rating (Current vs Temperature Rise) to EIA-364-23B: 2000

Specification: Current Rating = 0.5A per contact.

Methodology: The test demonstrates the current carrying capacity of pre-conditioned Archer .8 connectors, using test methodology EIA-364-23B: 2000. The mated connector pairing had contacts linked in series through traces on custom test PCBs. The thermocouple was positioned in the center of the connectors, with a hole drilled through the female half after being mounted to the PCB.

Current was applied in 0.1A steps from 0A to 0.5A. The results are detailed in the following graphs.

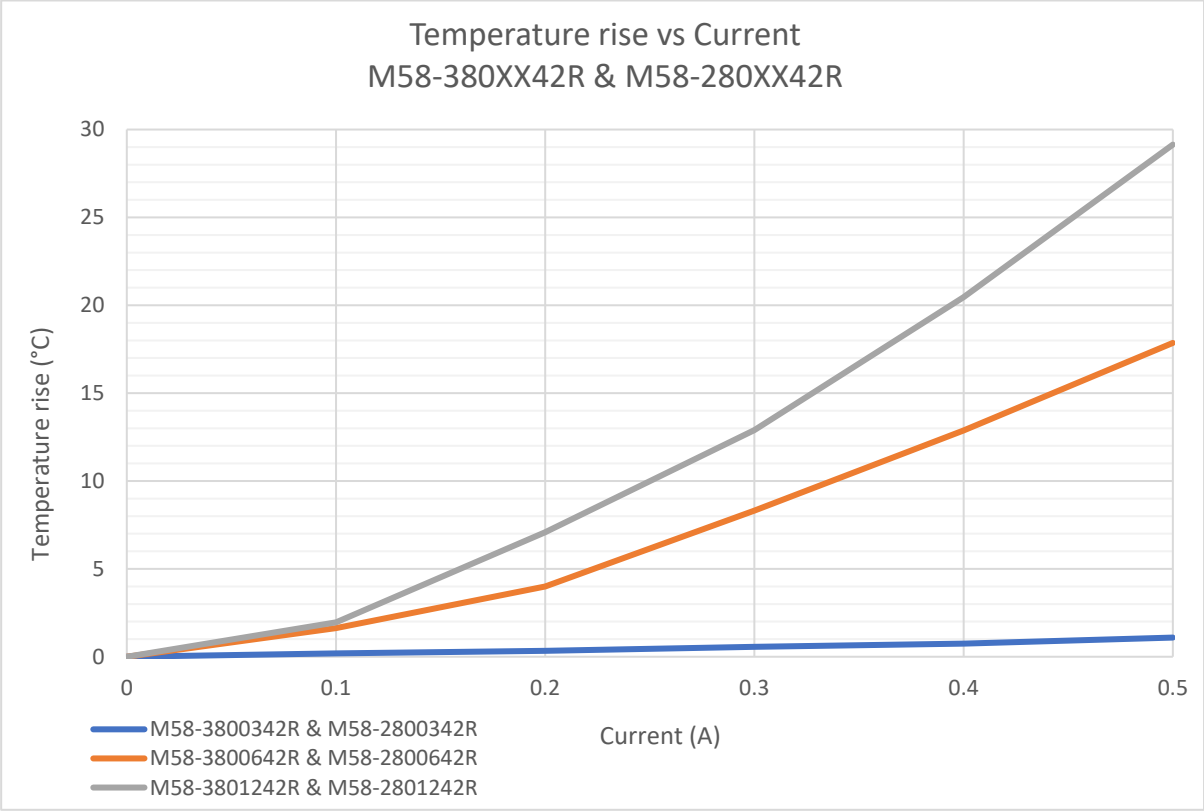

Figure 1: Temperature Rise vs Current for Different Contact Counts

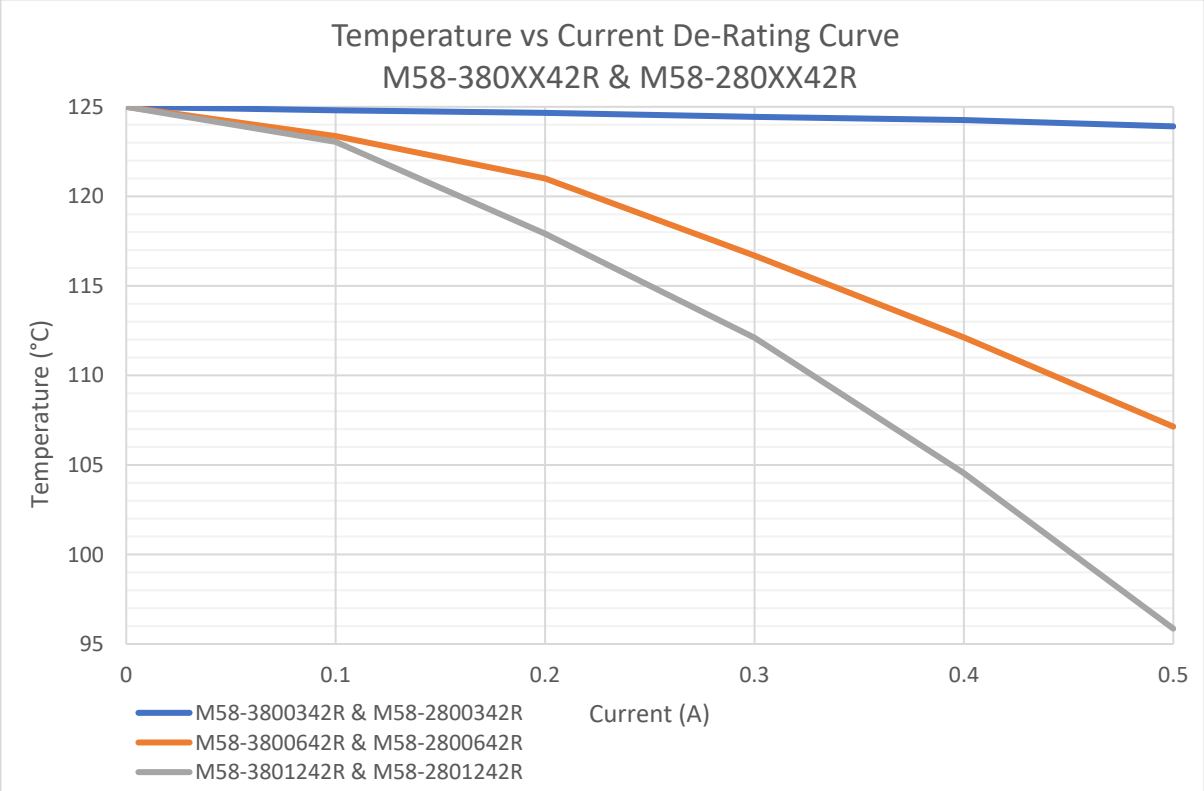

Figure 2: De-rate Curve for Different Contact Counts

3.3. Durability to EIA-364-09C: 1999

Specification: 1.0N maximum insertion force per contact, 0.1N minimum withdrawal force per contact.

Methodology: For this test fully-assembled connector pairs were mated at a speed of 25±3 mm/min for 30 cycles, in general accordance with EIA-364-09C. The mated pairs tested are detailed below.

Mated Pair	Pre-conditioned	Humidity 96h
M58-2800342R & M58-3800342R	PASS	PASS
M58-2800642R & M58-3800642R	PASS	PASS
M58-2801242R & M58-3801242R	PASS	PASS

3.4. Withstand Voltage to EIA-364-20C: 2004 & Insulation Resistance to EIA-364-21C: 2000

Withstand Voltage

Specification: Voltage Proof = 500V AC/DC for 60 seconds, Current leakage: 1mA max.

Methodology: A minimum of 500V AC (60Hz) was applied to connector pairs in two series cicuits for 60 seconds to determine whether breakdown or flashover occurred. Current leakage was meaasured during the test. Samples were visually inspected following the test, with no obvious changes to the connectors occuring.

Mated Pair	Pre-conditioned	Humidity 96h
M58-2800342R & M58-3800342R	PASS	PASS
M58-2800642R & M58-3800642R	PASS	PASS
M58-2801242R & M58-3801242R	PASS	PASS

Insulation Resistance

Specification: 1000MΩ min at 500V.

Methodology: 500V was applied to connector pairs in two series circuits for two minutes to determine whether the resistance satisfies the required specifcation values of >1000MΩ. Samples were visually inspected following the test, with no obvious changes to the connectors occuring.

Mated Pair	Pre-conditioned	Humidity 96h
M58-2800342R & M58-3800342R	PASS	PASS
M58-2800642R & M58-3800642R	PASS	PASS
M58-2801242R & M58-3801242R	PASS	PASS

3.5. Temperature Life (Without Load)

Specification: Operating temperature = -40°C to +125°C.

Methodology: All connectors tested were mounted to boards through solder reflow and so were subjected to temperatures exceeding 150°C prior to any testing. The connectors were subjected to 96 hours at +125°C and 96 hours at -40°C. Samples were visually inspected following the test, with no obvious changes to the connectors occurring. Contact resistance was measured, see section 3.1 for results.

3.6. Thermal Shock (Temperature Cycling) in general accordance with EIA-364-32C: 2000

Specification: 5 cycles: -40°C for 30 minutes, +125°C for 30 minutes.

Methodology: Samples were tested in general accordance with EIA-364-32C: 2000 Test Condition 1. This test was conducted by cycling the temperature between the two extremes (-40°C to +125°C) for 5 cycles with a dwell time of 30 minutes at each extreme. Samples were visually inspected following the test, with no obvious changes to the connectors occurring. Contact resistance was measured, see section 3.1 for results.

3.7. Salt Spray in general accordance with EIA-364-26B: 1999

Specification: 24hrs continuous salt spray, Salt Solution: 5% NaCl, Salt Mist Chamber Temp.: +35°C±2°C.

Methodology: Samples were tested in general accordance with and EIA-364-26B. The samples were rinsed clean following testing and were visually inspected following the test, with no obvious changes to the connectors occurring. Contact resistance was measured, see section 3.1 for results.

3.8. Humidity to EIA-364-31B: 1999

Specification: 24 hours pre-conditioning at +50°C, Relative Humidity: 90-95%, Temperature: +40°C, Duration: 120hrs

Methodology: Samples were tested in general accordance with EIA-364-31B: 2000 Method 2 Test Condition A. The samples were preconditioned for 24 hours at 50°C, then conditioned in a humidity chamber for 96 hours at 40°C with 90-95% relative humidity. The connectors were subjected to a visual inspection post-testing. There were no obvious changes as a result.

Post conditioned testing was performed for Contact Resistance (section 3.1) and Withstand Voltage and Insulation Resistance (section 3.4).

3.9. Vibration to EIA-364-28D: 1999 (BS EN 60068-2-6: 2008 Test Fc)

Specification: 10Hz to 55Hz, 1.52mm pk-pk displacement, 198m/s² (20G), 2 hours in each of three axes.

Methodology: Samples were tested in general accordance with BS EN 60068-2-6: 2008 Test Fc and EIA-364-28D Test Condition 4. The pre-conditioned samples were subjected to a Swept Sine Test with continuous monitoring at ≥1 microsecond. No triggers were noted on any samples during the test process. Upon completion of testing the samples were visually inspected; no obvious changes to the samples were noted.

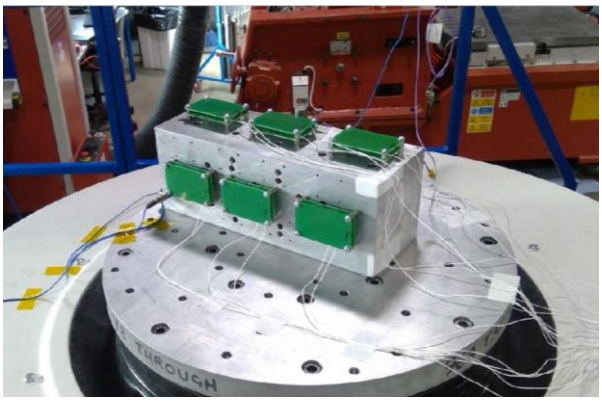

Figure 3: Mounted for Z and X axes testing

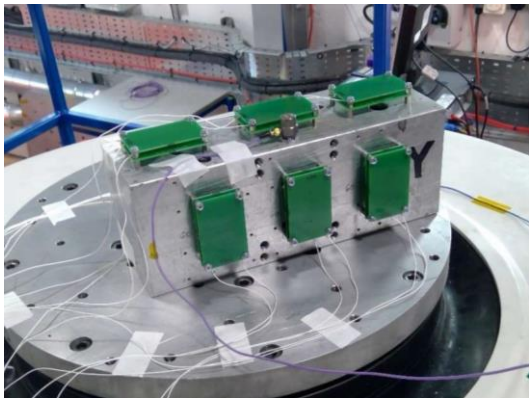

Figure 4: Mounted for Z and Y axes testing

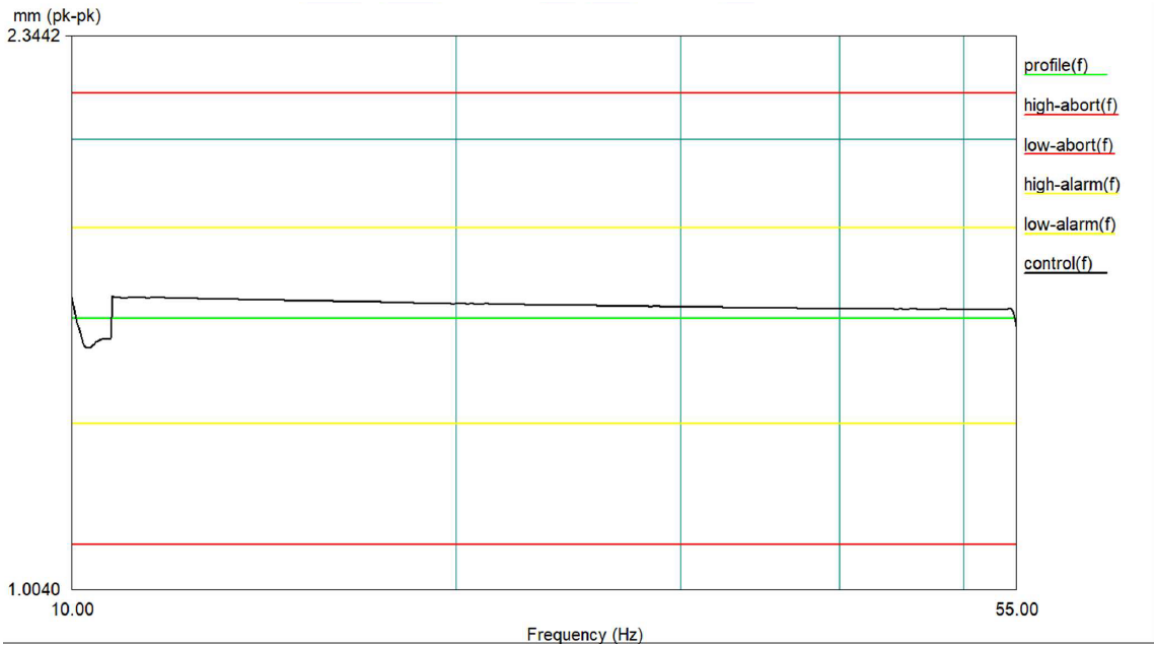

Figure 5: Typical Sine Vibration Plot

3.10. Mechanical Shock to EIA-364-27B: 1996

Specification: Acceleration: 50G (gn), Shock Duration: 11ms, Shock Shape: Half Sine Pulse, 3 shocks in each axis.

Methodology: Shock Test Sequence was carried out on pre-conditioned samples. During the test, the samples were monitored continuously for discontinuities of ≥1 microsecond. No triggers were noted on any sample during the test process. Upon completion of testing the samples were visually inspected, no obvious changes to the samples.

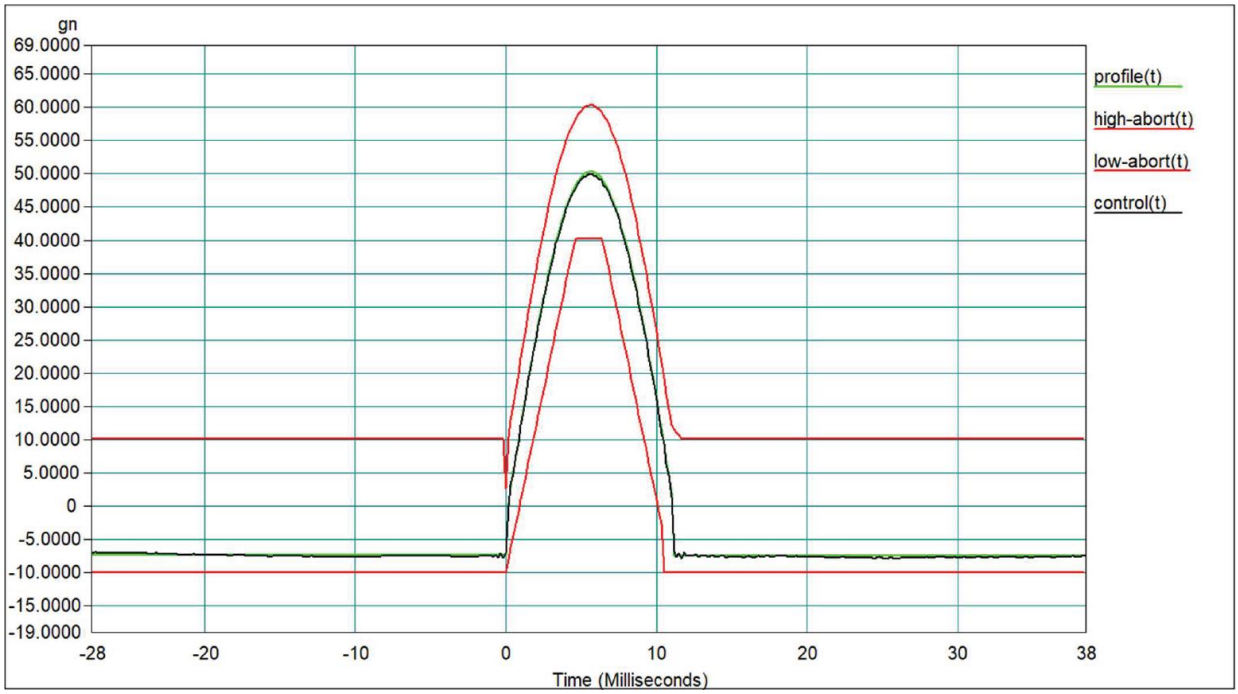

Figure 6: Typical Positive Mechanical Shock

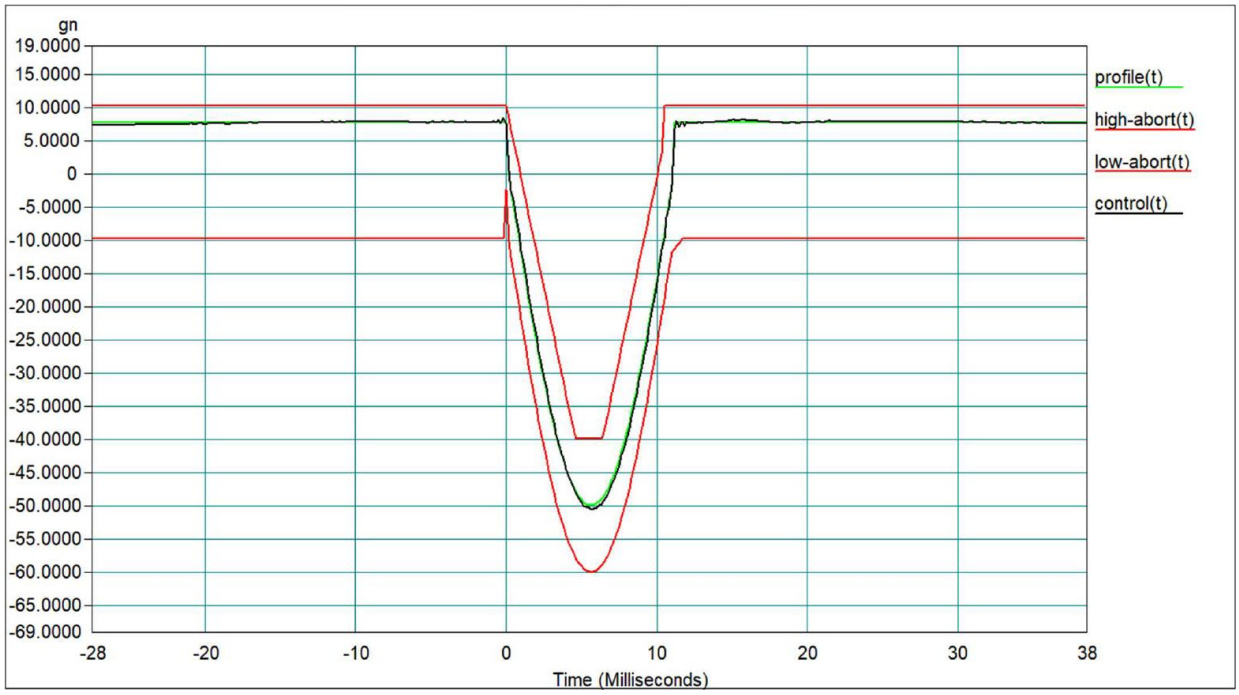

Figure 7: Typical Negative Mechanical Shock

3.11. Signal Integrity

Specification: Connectors were analysed on the following: Insertion loss, Return loss, Impedance, Crosstalk (NEXT/FEXT), VSWR.

Methodology: Samples were tested for insertion and return loss up to 5GHz and 20GHz using a VNA with the mated samples connected through surface mount SMA's with impedance matched traces. Impedance profiles were produced using rise times of 50ps and 35ps. A digital twin was produced in parallel to perform further analysis.

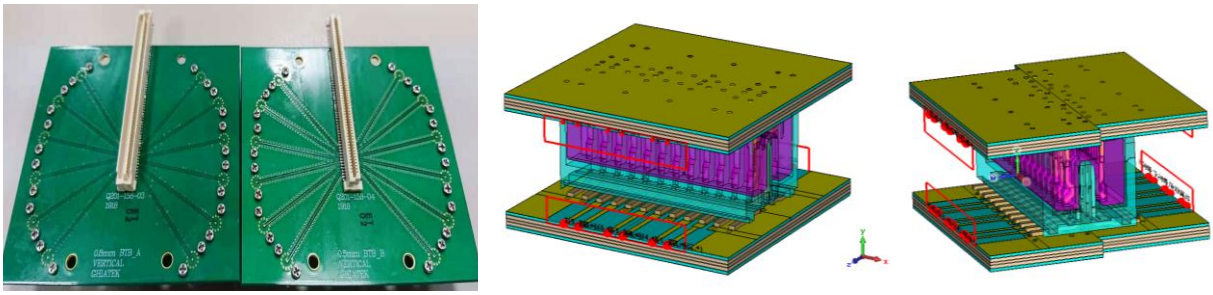

Figure 8: Signal Integrity Test PCB's, Simulated test setups (inline pairs, offset pairs)

The results are shown in the following order:

Insertion Loss – section 3.11.1:

- 5GHz Test (6 contacts, 1 contact per plot)..... -0.68dB @ 5GHz
- 20GHz Test (6 contacts on single plot)..... -3dB @ >18GHz
- 18GHz Simulation..... -1dB @ 15GHz

Return Loss – section 3.11.2:

- 5GHz Test (6 contacts, 1 contact per plot)..... -14.67dB @ 5GHz
- 20GHz Test (6 contacts on single plot)..... -15dB @ 10GHz, -10dB @ 15GHz
- 18GHz Simulation..... -10dB @ >16GHz

Impedance – section 3.11.3:

- 50ps rise time Test..... 84.96-99.74Ω @ 50ps
- 35ps rise time Test..... 77-92Ω @ 35ps
- 55ps rise time Simulation..... 79-100Ω @ 50ps

Crosstalk – section 3.11.4:

- 20GHz Test ..... -20dB @ >20GHz (NEXT)
-25dB @ >20GHz (FEXT)
- 18GHz Simulation near-end crosstalk (NEXT)..... -25dB @ >18GHz
- 18GHz Simulation far-end crosstalk (FEXT)..... -25dB @ >18GHz

VSWR – section 3.11.5:

- 18GHz Simulation..... <1.2:1 @ 12GHz

3.11.1. **Insertion Loss** (5GHz, 20GHz, Simulation up to 18GHz)

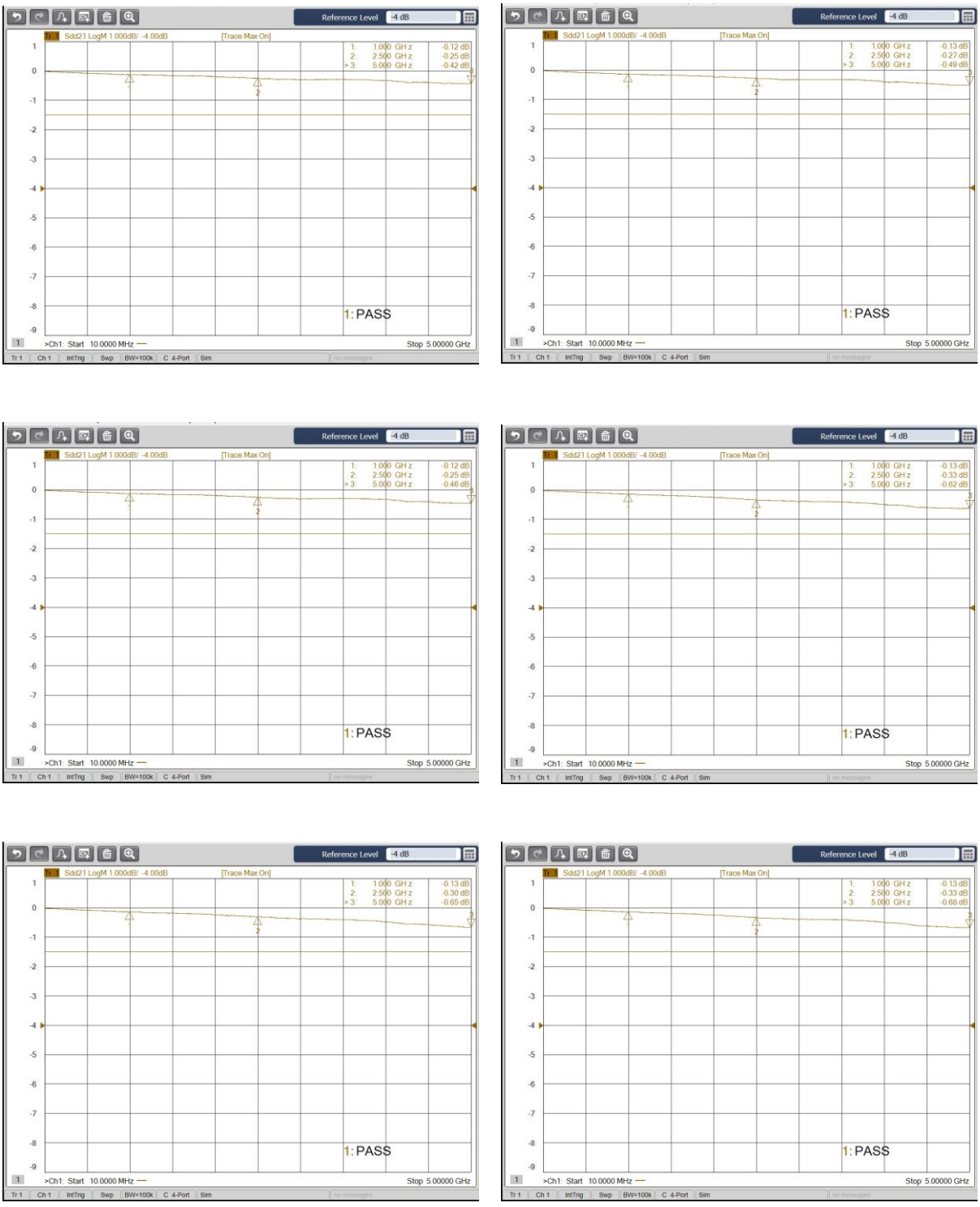

Figure 9: Insertion Loss measured up to 5GHz (-0.68dB @ 5GHz)

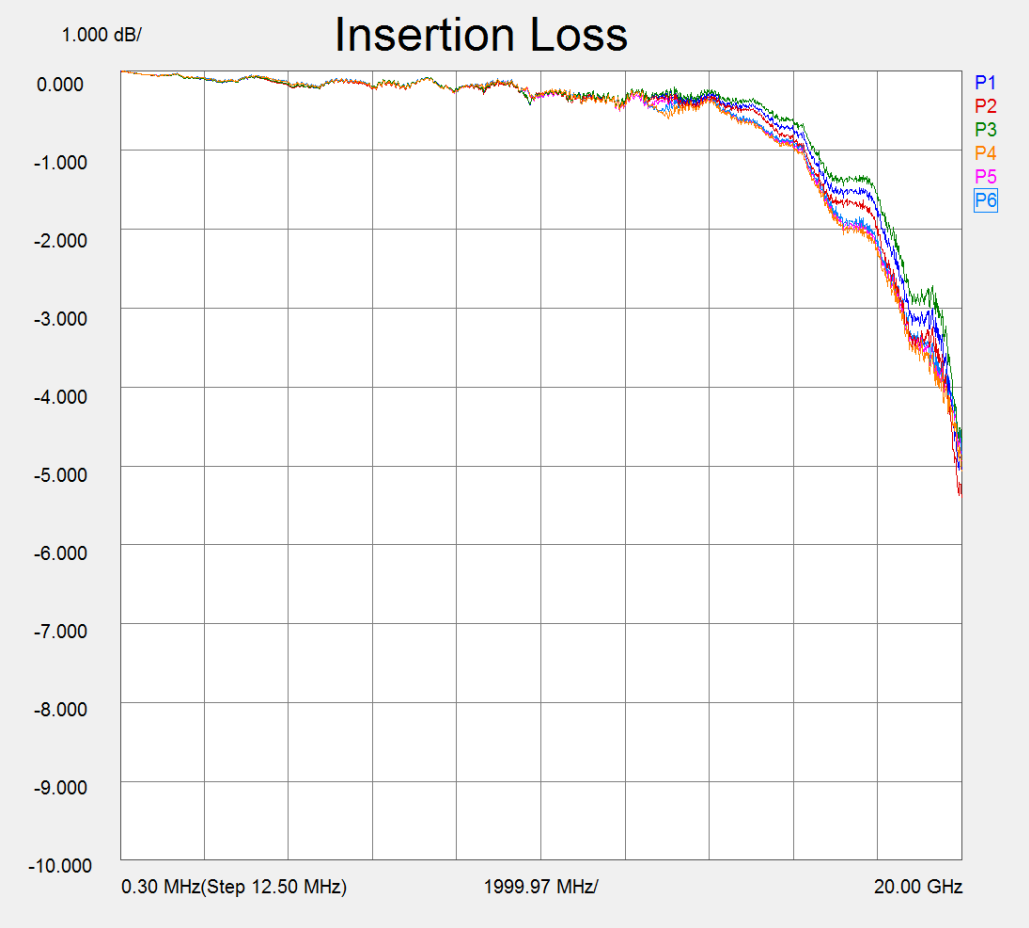

Figure 10: Insertion Loss measured up to 20GHz (-3dB @ >18GHz)

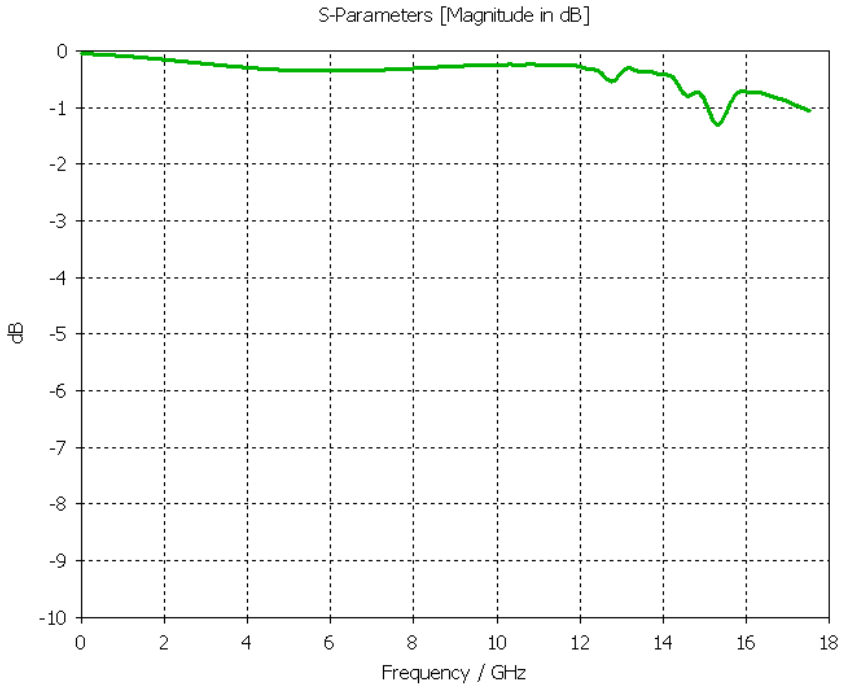

Figure 11: Insertion Loss simulated up to 18GHz (-1dB @ 15GHz)

3.11.2. **Return Loss** (5GHz, 20GHz, Simulation up to 18GHz)

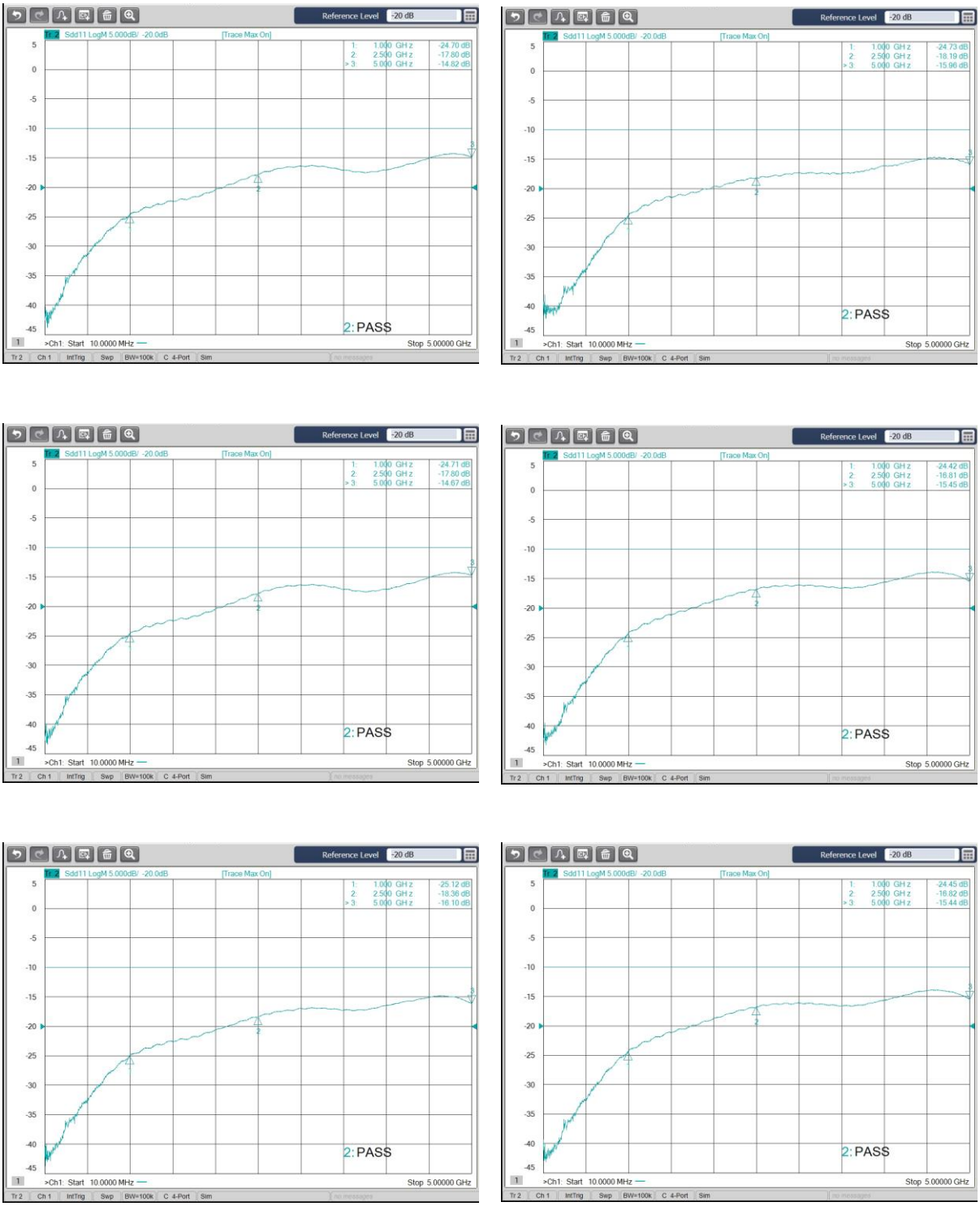

Figure 12: Return Loss measured up to 5GHz (-14.67dB @ 5GHz)

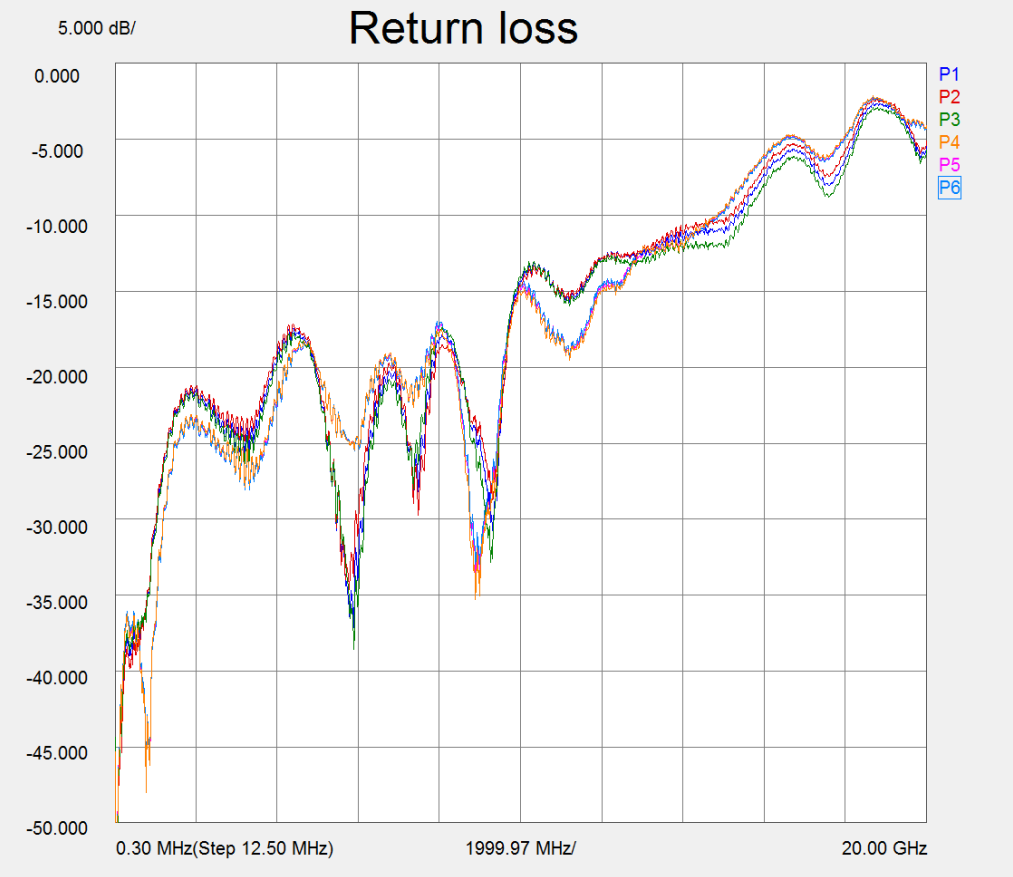

Figure 13: Return Loss measured up to 20GHz (-15dB @ 10GHz, -10dB @ 15GHz)

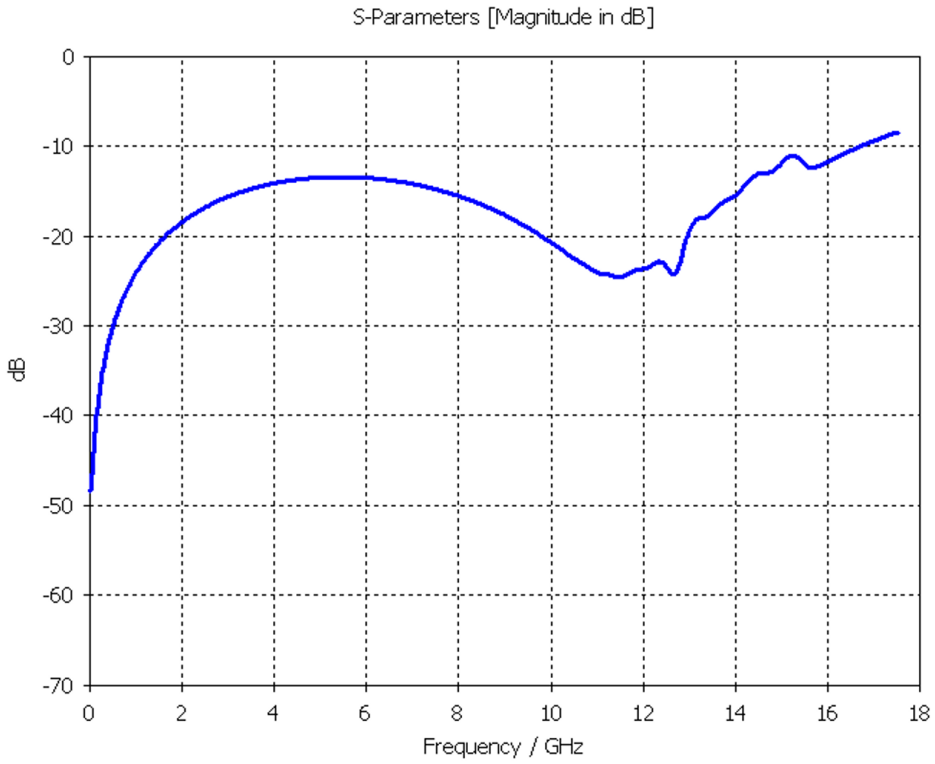

Figure 14: Return Loss simulated up to 18GHz (-10dB @ >16GHz)

3.11.3. **Impedance** (20GHz, 28GHz, Simulation at 18GHz)

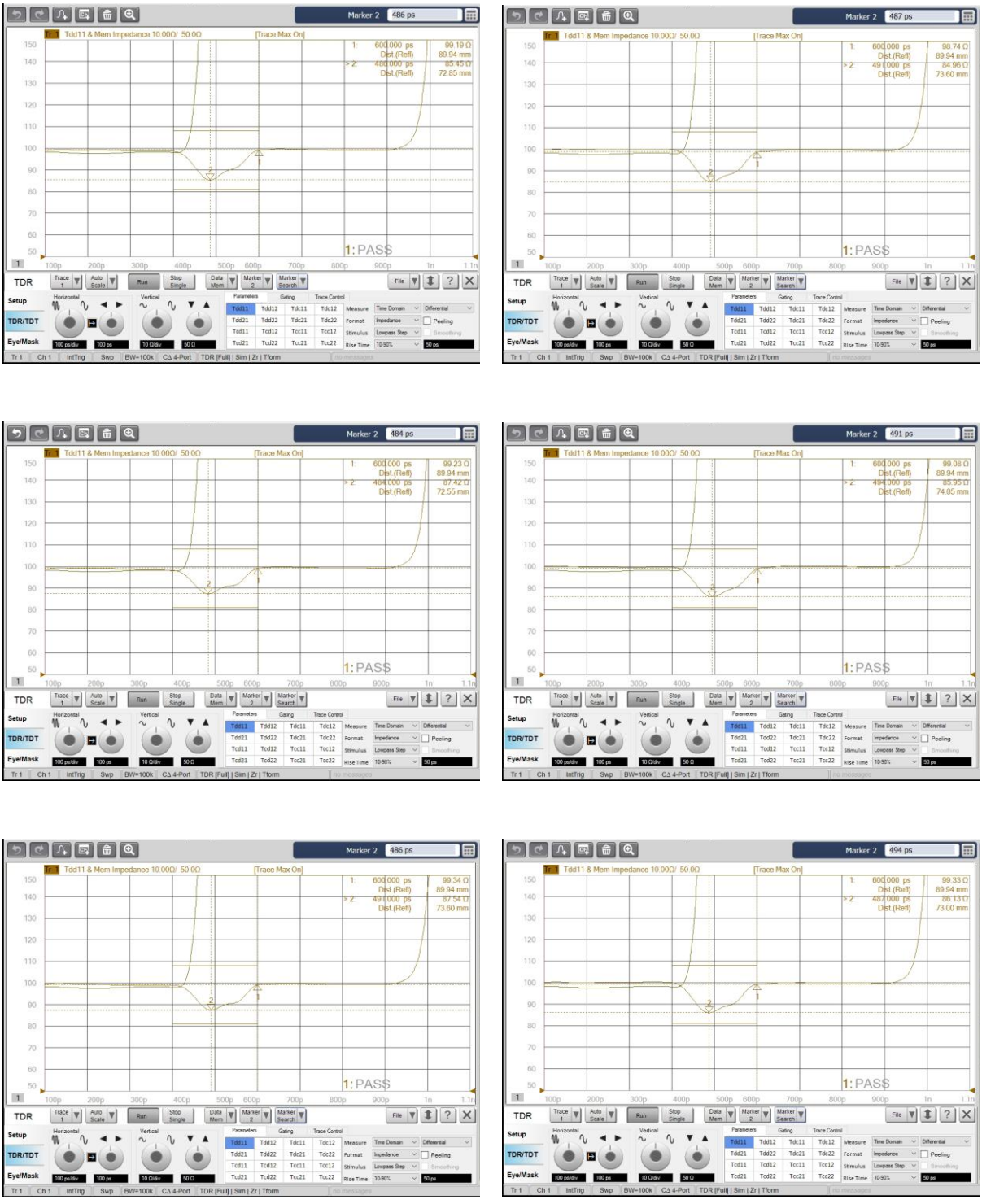

Figure 15: Impedance profile measured at 20GHz (84.96-99.74Ω @ 50ps)

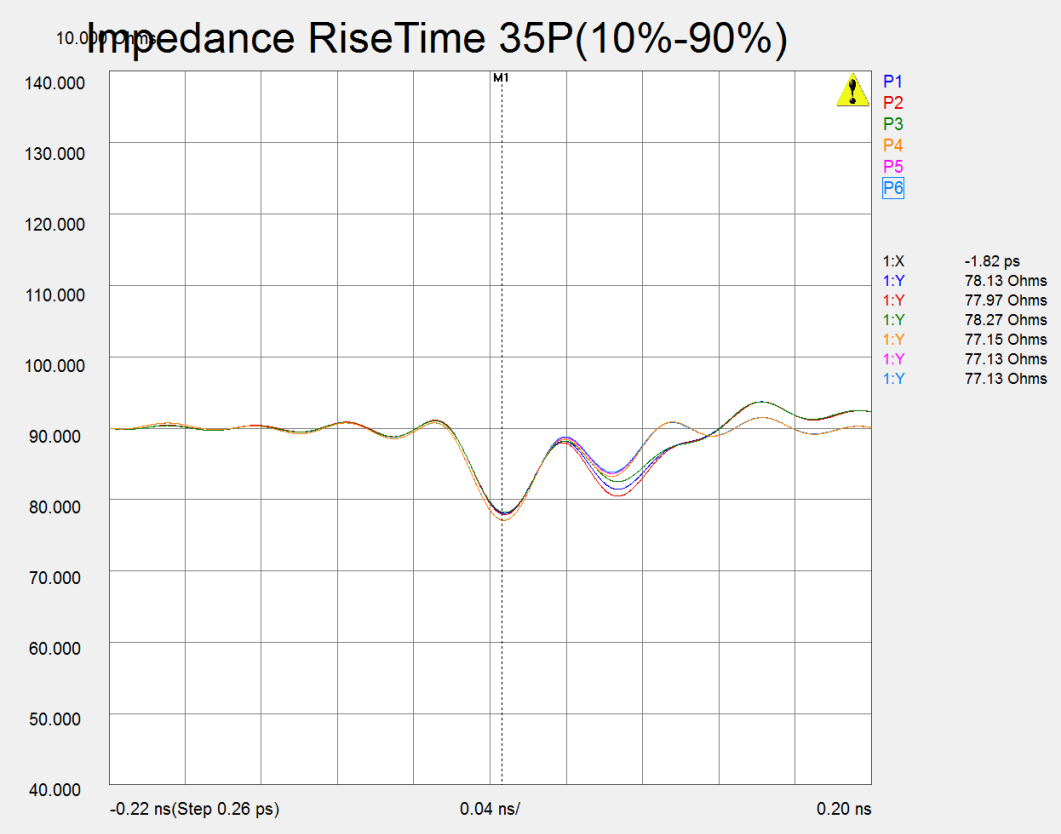

Figure 16: Impedance profile measured at 28GHz (77-92Ω @ 35ps)

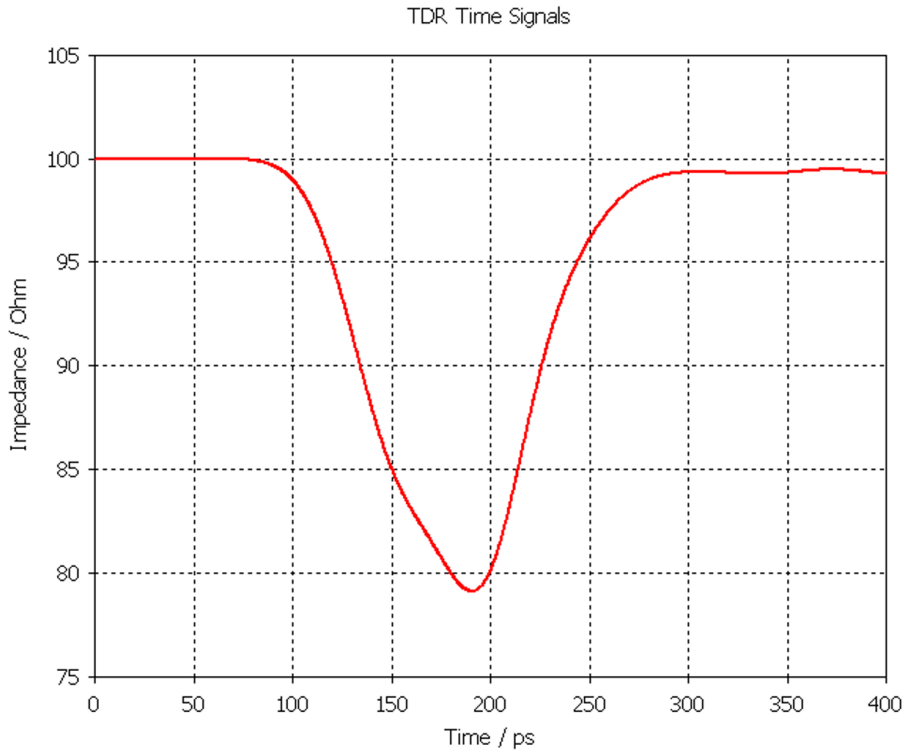

Figure 17: Impedance profile simulated at 18GHz (79-100Ω @ 55ps)

3.11.4. Crosstalk (20GHz, Simulation up to 18GHz)

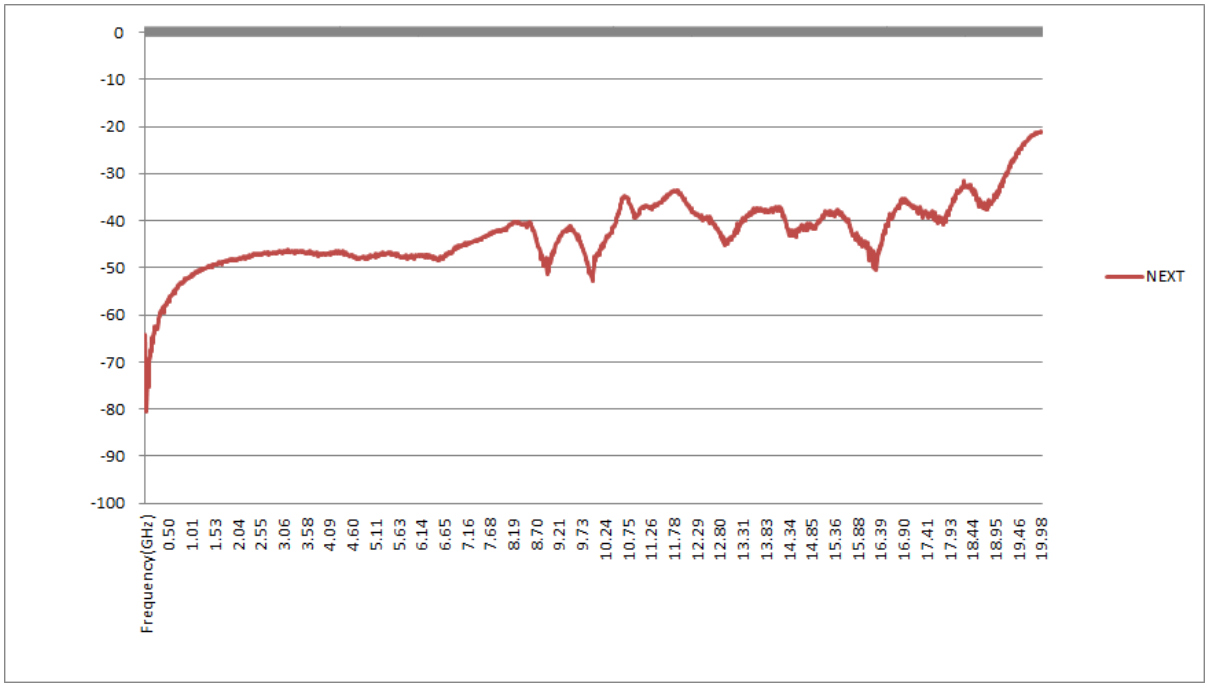

Figure 18: Near-end Crosstalk measured up to 20GHz (-20dB @ >20GHz)

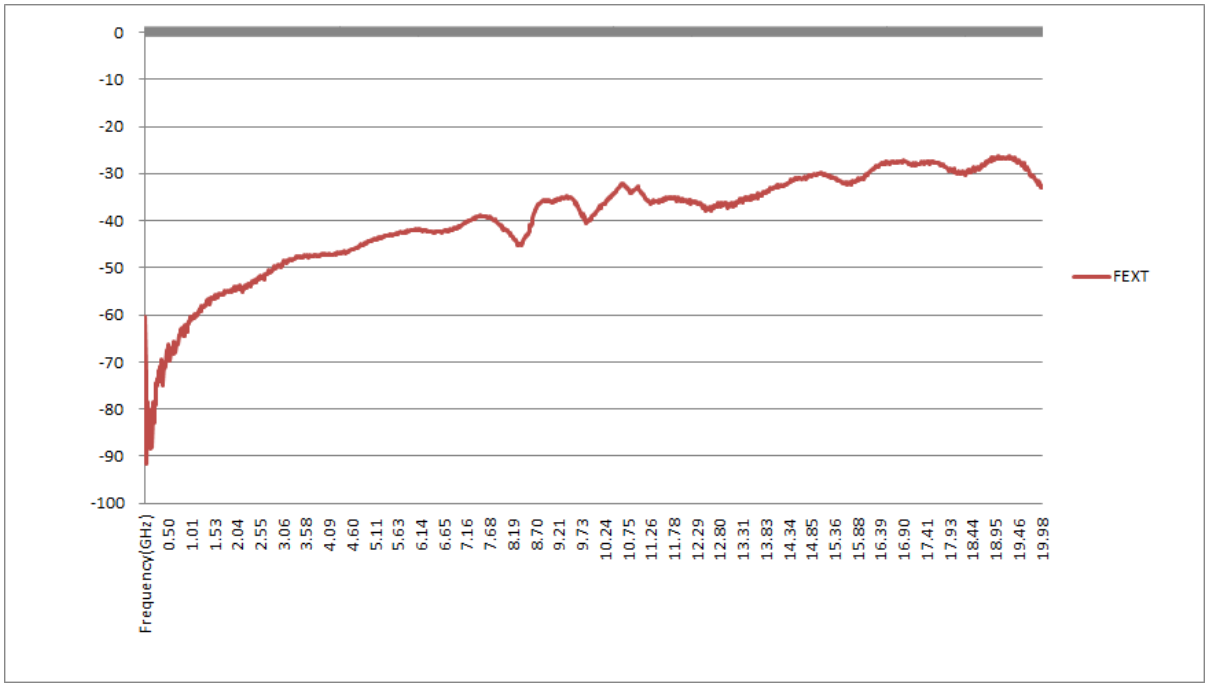

Figure 19: Far-end Crosstalk measured up to 20GHz (-25dB @ >20GHz)

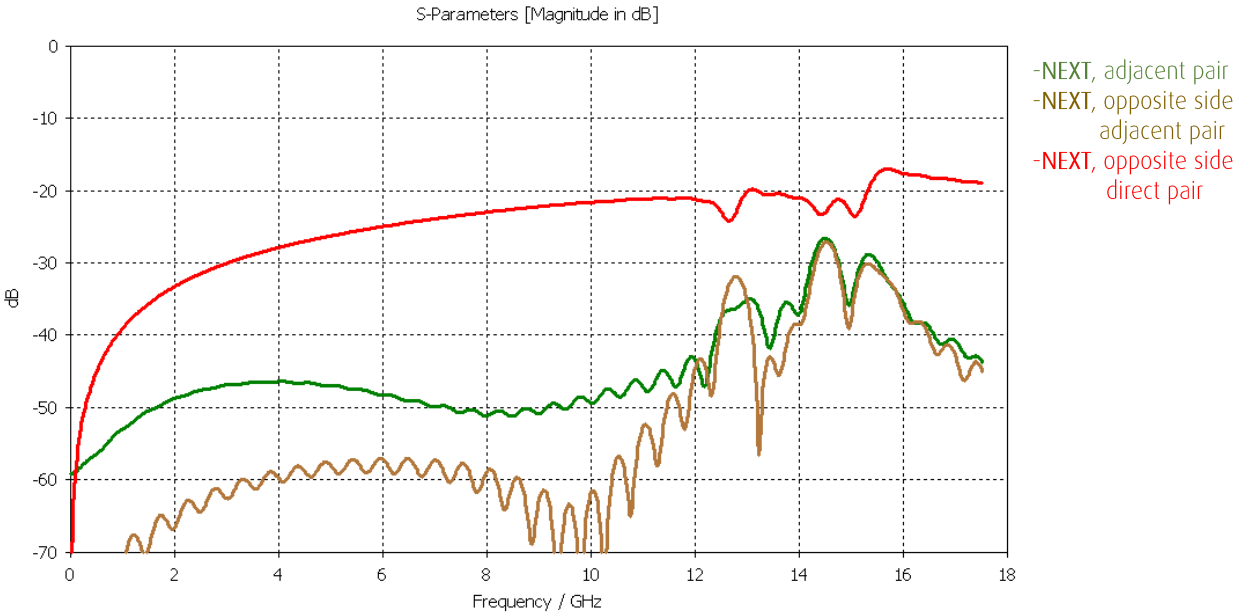

Figure 20: Near-end Crosstalk simulated up to 18GHz (-25dB @ >18GHz)

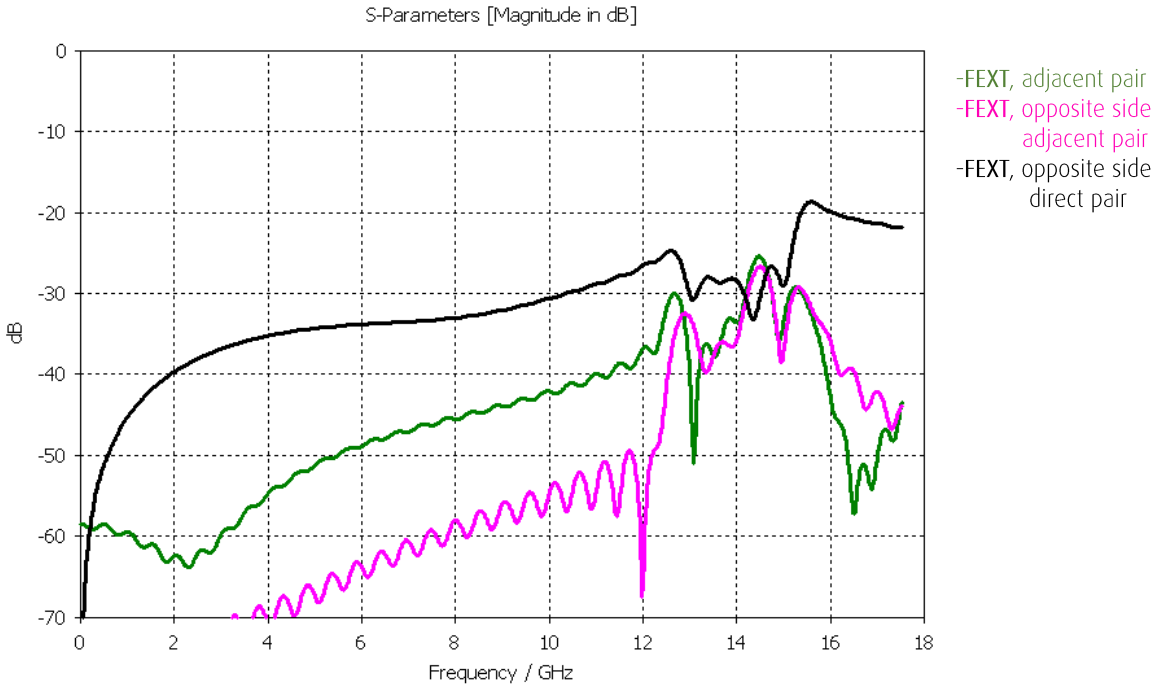

Figure 21: Far-end Crosstalk simulated up to 18GHz (-25dB @ >18GHz)

3.11.5. **VSWR** (Simulation up to 18GHz)

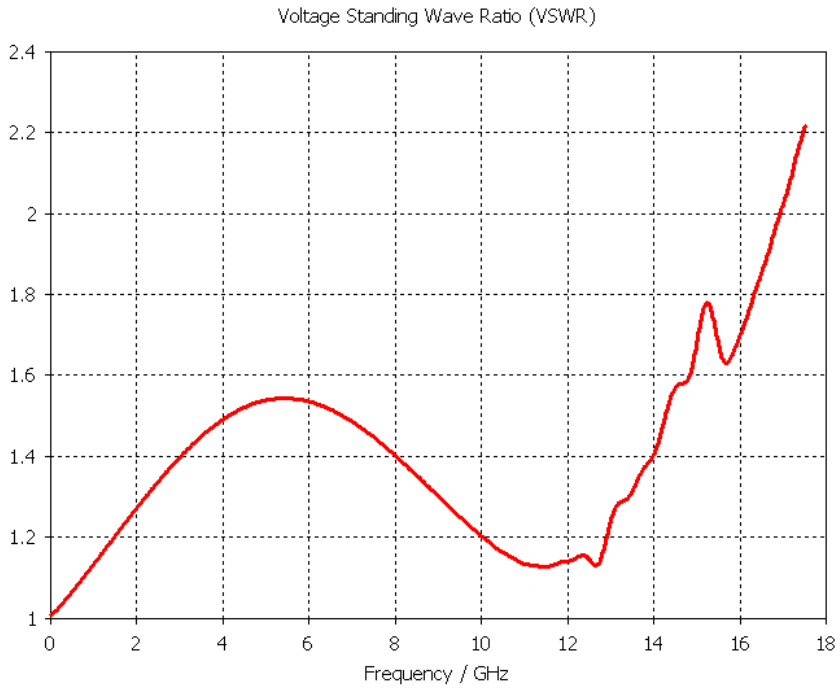

Figure 22: VSWR simulated up to 18GHz (<1.2:1 @ 12GHz)