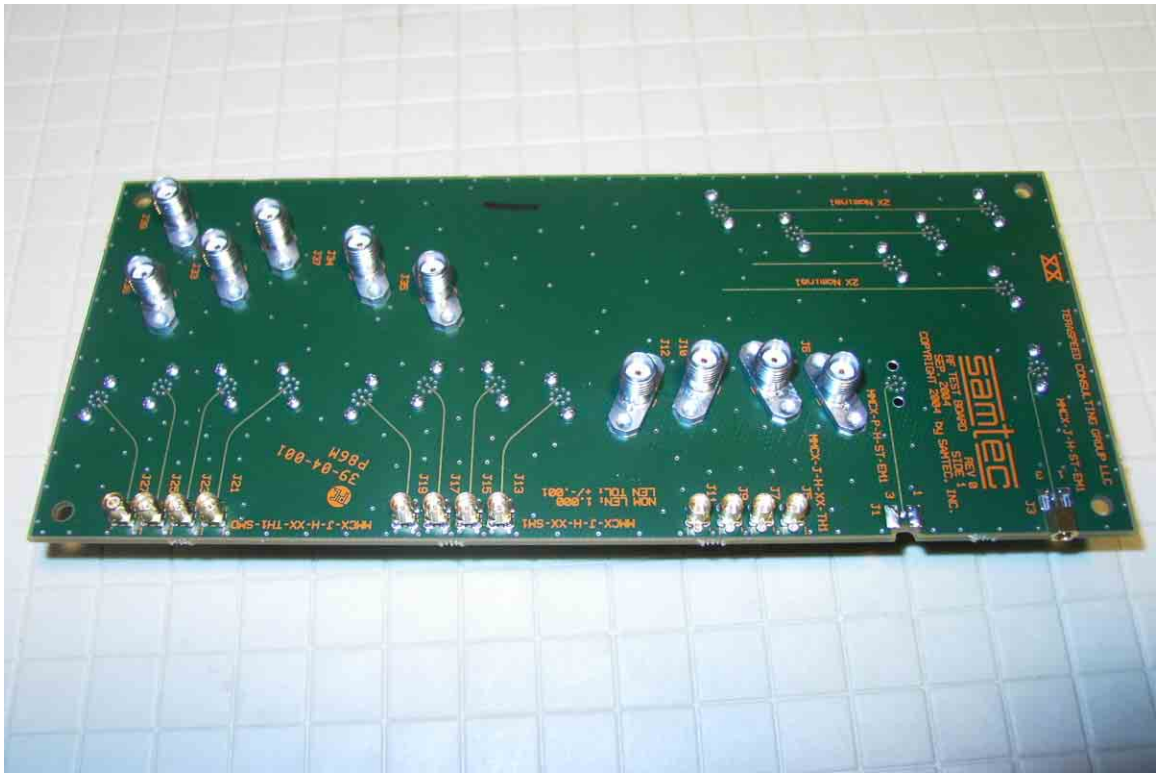
High Speed Characterization Report

MMCX-P-P-H-ST-TH1 mated with MMCX-J-P-H-ST-TH1
MMCX-P-P-H-ST-MT1 mated with MMCX-J-P-H-ST-MT1
MMCX-P-P-H-ST-SM1 mated with MMCX-J-P-H-ST-SM1
MMCX-P-P-H-ST-EM1 mated with MMCX-J-P-H-ST-EM1



REVISION DATE: January 6, 2005

TABLE OF CONTENTS

Introduction

This testing was performed to evaluate the electrical performance of the MMCX Series RF Connectors. Testing was performed in accordance to the High Performance Electrical Interconnect (HPEI) SFF-8416, Level 1, testing standards when applicable.

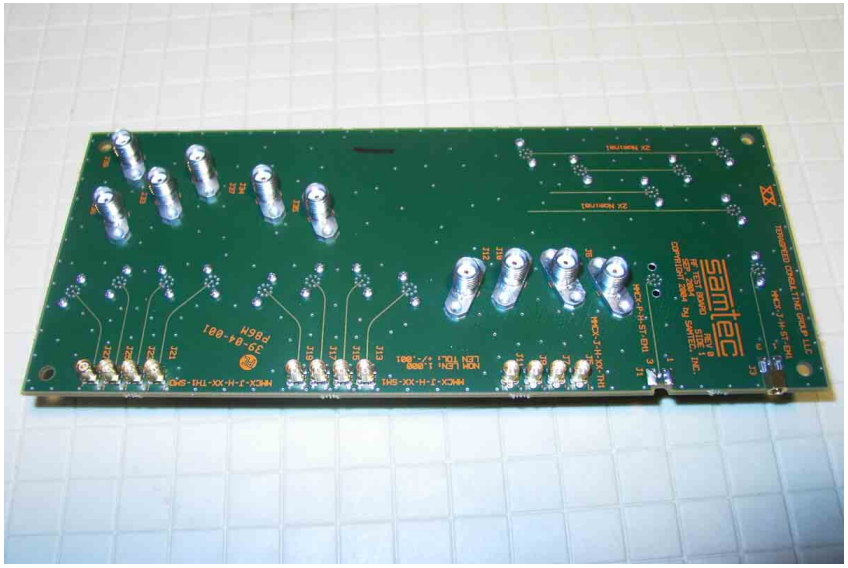


Figure 1: Sample Test Board

Testing was performed to assess Insertion Loss, Return Loss, Impedance, VSWR, and where appropriate, Crosstalk. Testing was performed with TDR and VNA technology and the results are displayed in Time (Impedance) or Frequency Domain (Insertion Loss, Return Loss, NEXT, FEXT, and VSWR) as required. TDA Systems' IConnect Software (V3.0.2) was employed to convert the raw TDR/TDT measurements into the displayed data. Arc RF Systems SPViewII was employed with the Frequency Domain information. A custom set of test boards supplied by Samtec was used for all measurements. See Figure 1.

Product Description

The samples consisted of four different variations of the PCB mounted, straight MMCX Series RF mated connector sets. The mounting scheme conventions included through-hole technology (MMCX-x-P-H-ST-TH1) to hybrid surface mount and through-hole (MMCX-x-P-H-ST-MT1) , surface mount only (MMCX-x-P-H-ST-SM1), and edge launched surface mount connectors (MMCX-x-P-H-ST-EM1).

Part Number - Plug	Part Number - Jack	Mounting Configuration
MMCX-P-P-H-ST-TH1	MMCX-J-P-H-ST-TH1	Through-Hole
MMCX-P-P-H-ST-MT1	MMCX-J-P-H-ST-MT1	Through-Hole/Surface Mount
MMCX-P-P-H-ST-SM1	MMCX-J-P-H-ST-SM1	Surface Mount
MMCX-P-P-H-ST-EM1	MMCX-J-P-H-ST-EM1	Flush Edge Mount

Table 1: MMCX Sample Descriptions

Results Summary

Time Domain Data

Impedance

Impedance measurements were performed using an input risetime of 30ps as launched into the test boards. The minimum and maximum impedances are for the mated MMCX connector region only.

Connector	Minimum Impedance	Maximum Impedance
MMCX-x-P-H-ST-TH1	35 Ohms	51 Ohms
MMCX-x-P-H-ST-MT1	47 Ohms	54 Ohms
MMCX-x-P-H-ST-SM1	48 Ohms	56 Ohms
MMCX-x-P-H-ST-EM1	47 Ohms	60 Ohms

Table 2: Impedance Measurements

NEXT and FEXT

Near End and Far End Crosstalk was measured in the time domain. In all cases, the percent time domain crosstalk was less than 1 %.

Connector	NEXT		FEXT	
MMCX-x-P-H-ST-TH1	0.5 mV	0.20%	0.9 mV	0.36%
MMCX-x-P-H-ST-MT1	0.3 mV	0.12%	1.1 mV	0.44%
MMCX-x-P-H-ST-SM1	1.3 mV	0.52%	1.3 mV	0.52%
MMCX-x-P-H-ST-EM1	(See Note 1)		(See Note1)	

Table 3: Crosstalk Measurements

(NOTE 1: Since only a single set of the edge-mount MMCX (MMCX-x-P-H-ST-EM1) was tested, crosstalk was not able to be measured.)

Impedance Profiles

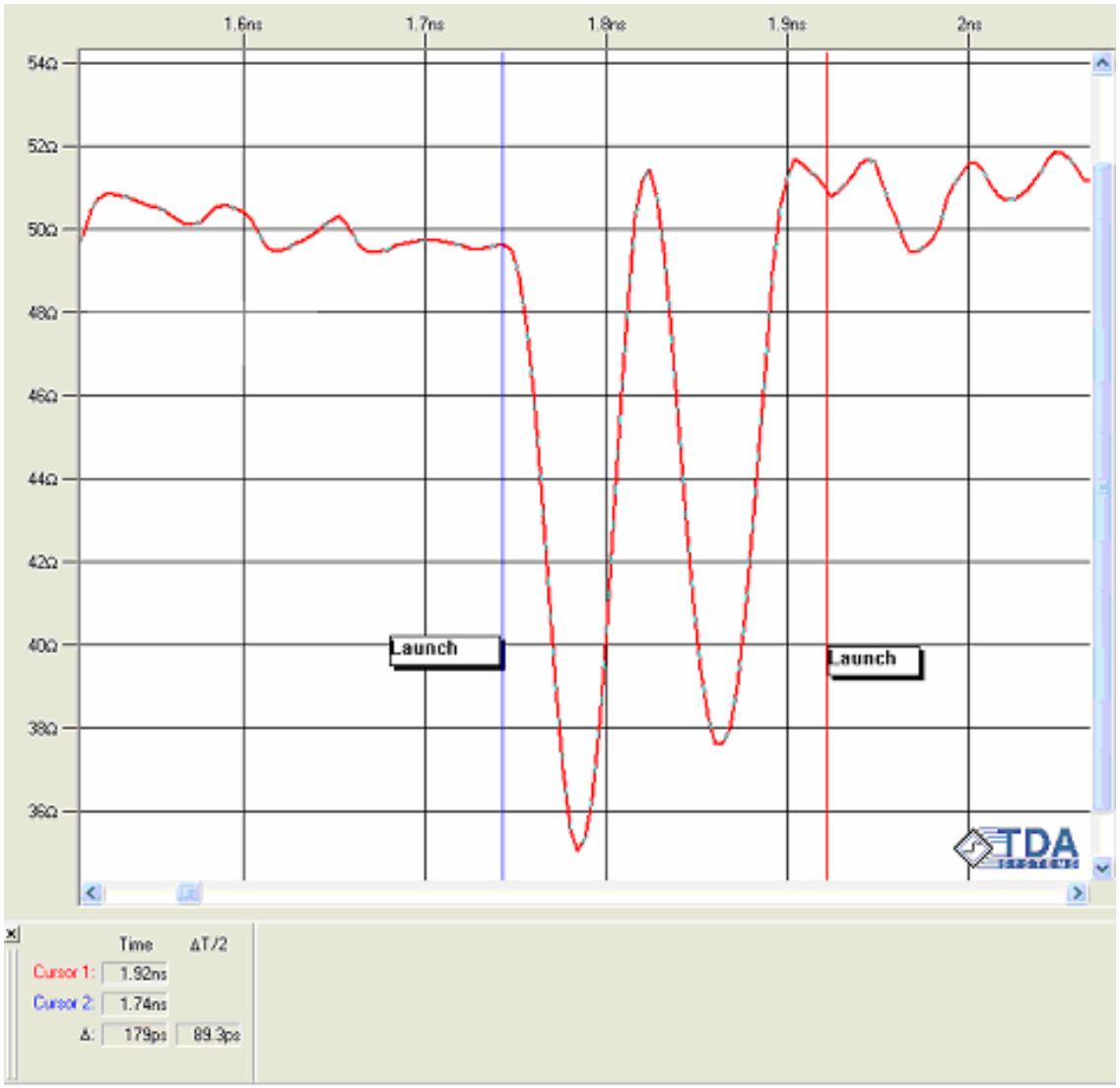


Figure 2: Impedance Profile - MMCX-x-P-H-ST-TH1

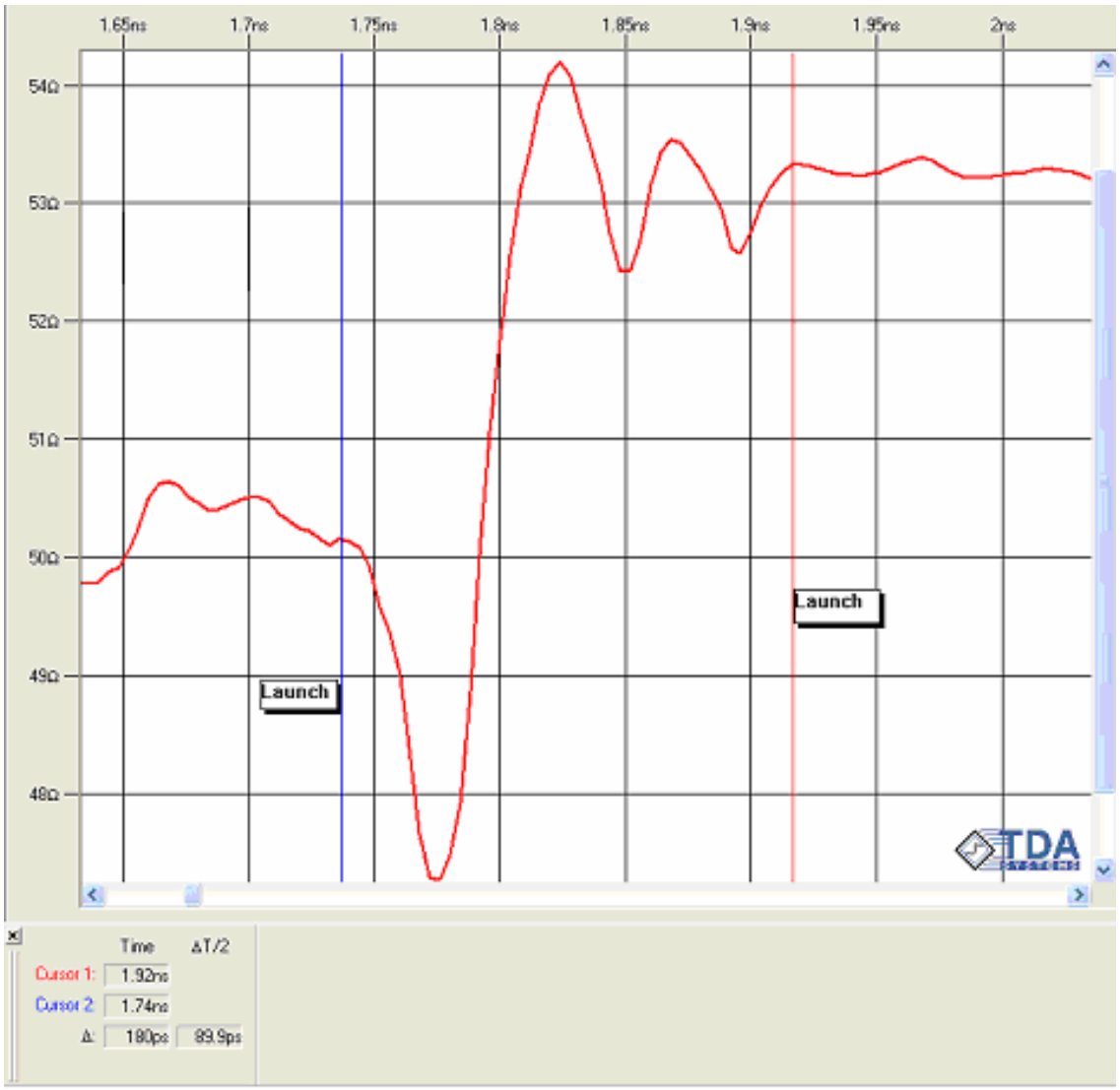


Figure 3: Impedance Profile - MMCX-x-P-H-ST-MT1

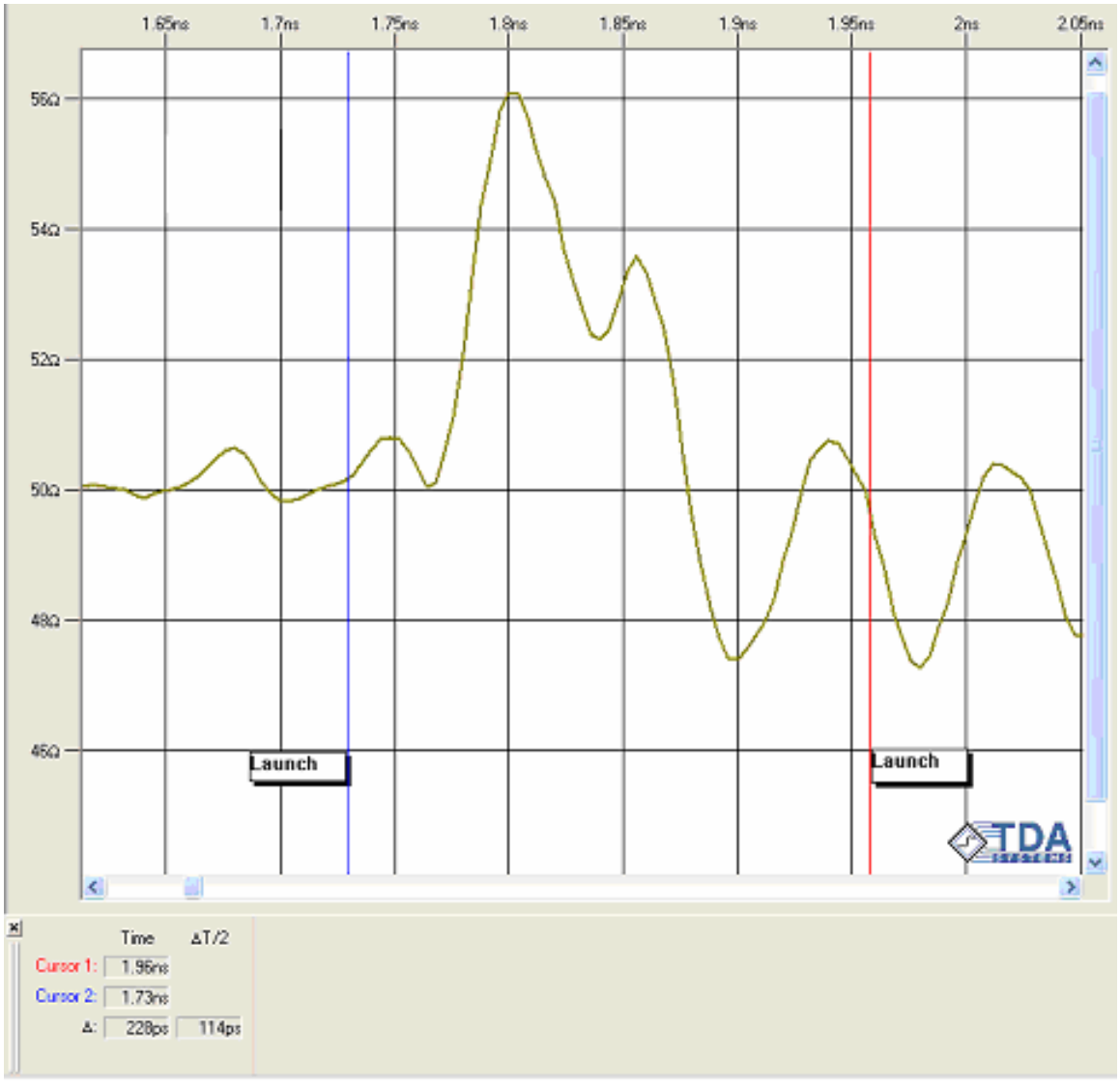


Figure 4: Impedance Profile - MMCX-x-P-H-ST-SM1

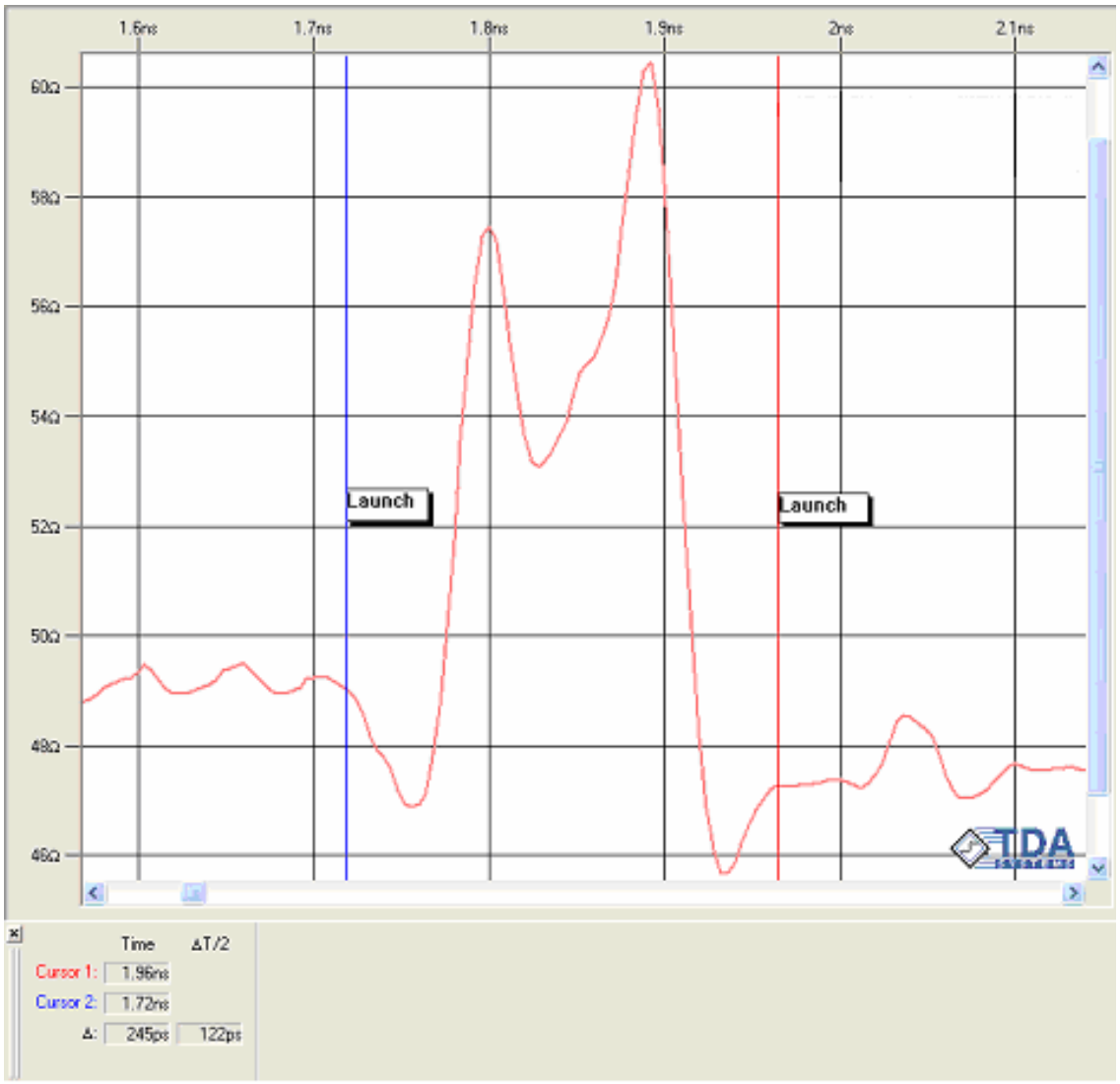


Figure 5: Impedance Profile - MMCX-x-P-H-ST-EM1

Frequency Domain Data
Insertion Loss

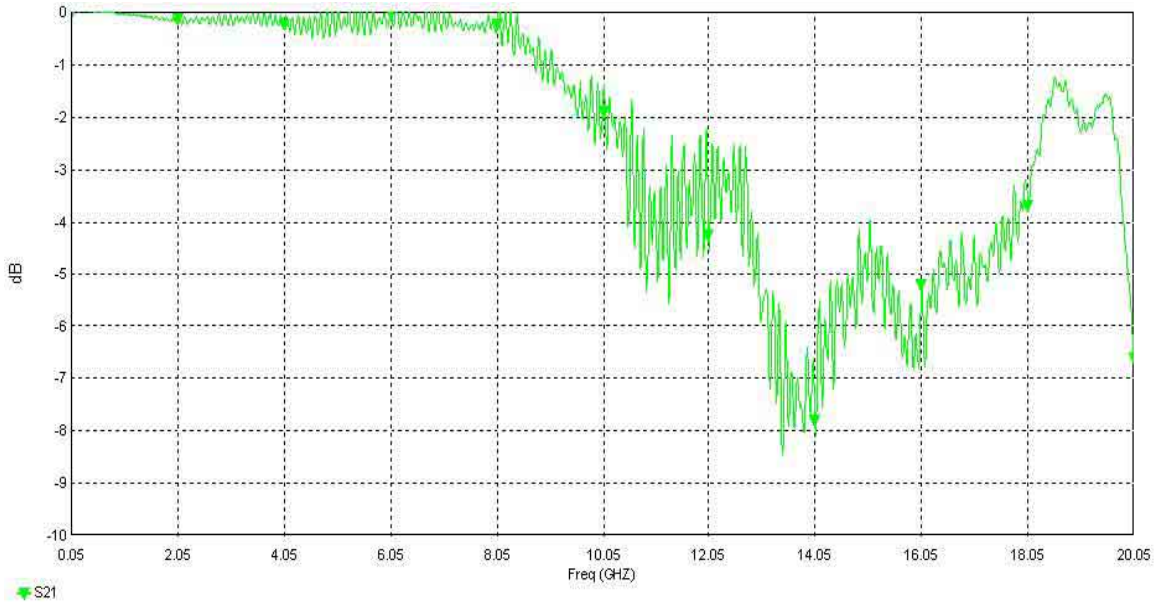


Figure 6: Insertion Loss - MMCX-x-P-H-ST-TH1

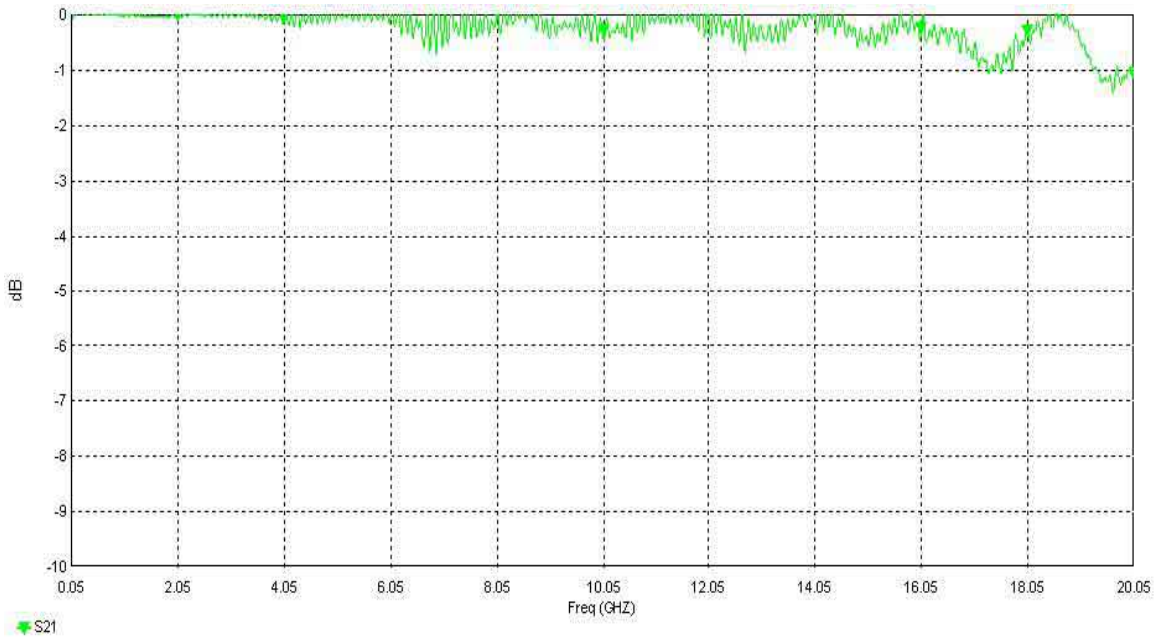


Figure 7: Insertion Loss - MMCX-x-P-H-ST-MT1

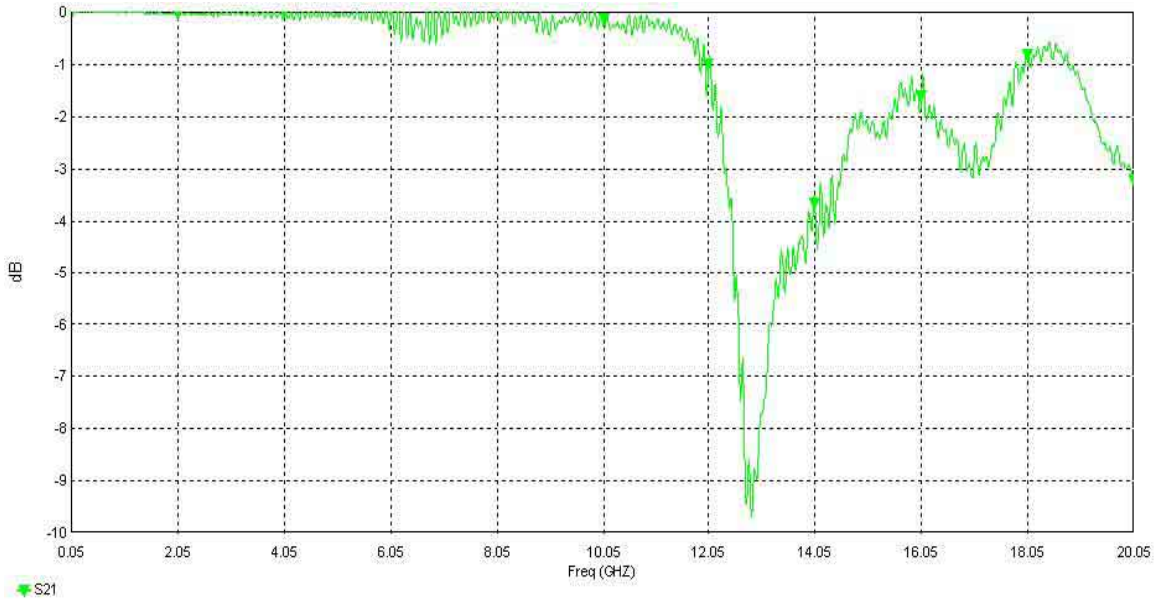


Figure 8: Insertion Loss - MMCX-x-P-H-ST-SM1

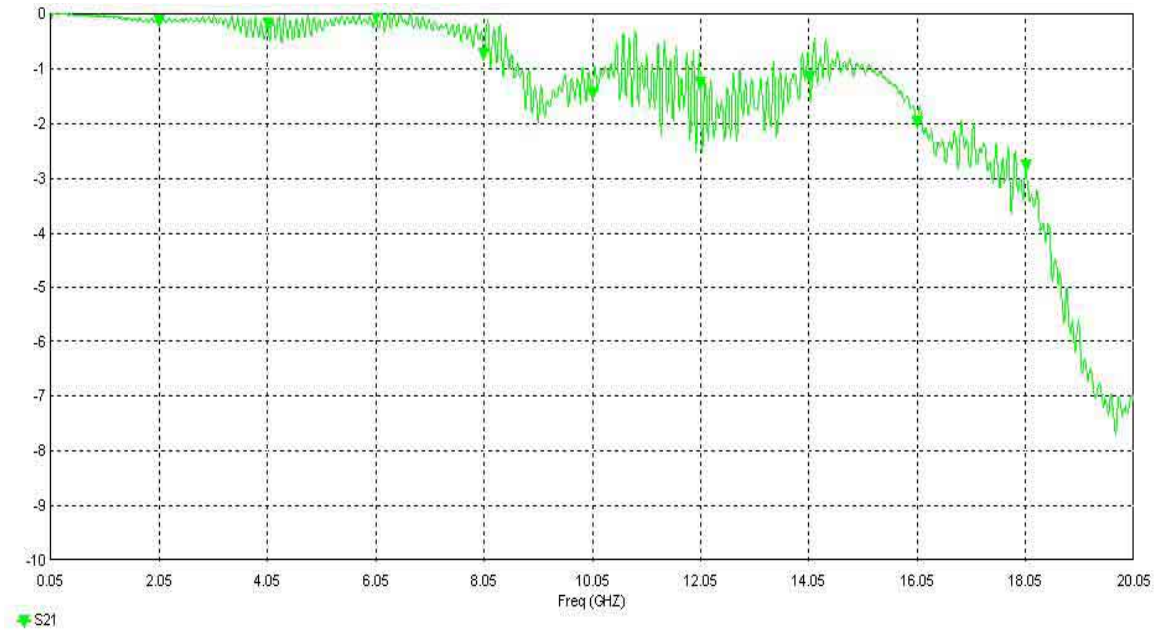


Figure 9: Insertion Loss - MMCX-x-P-H-ST-EM1

Return Loss

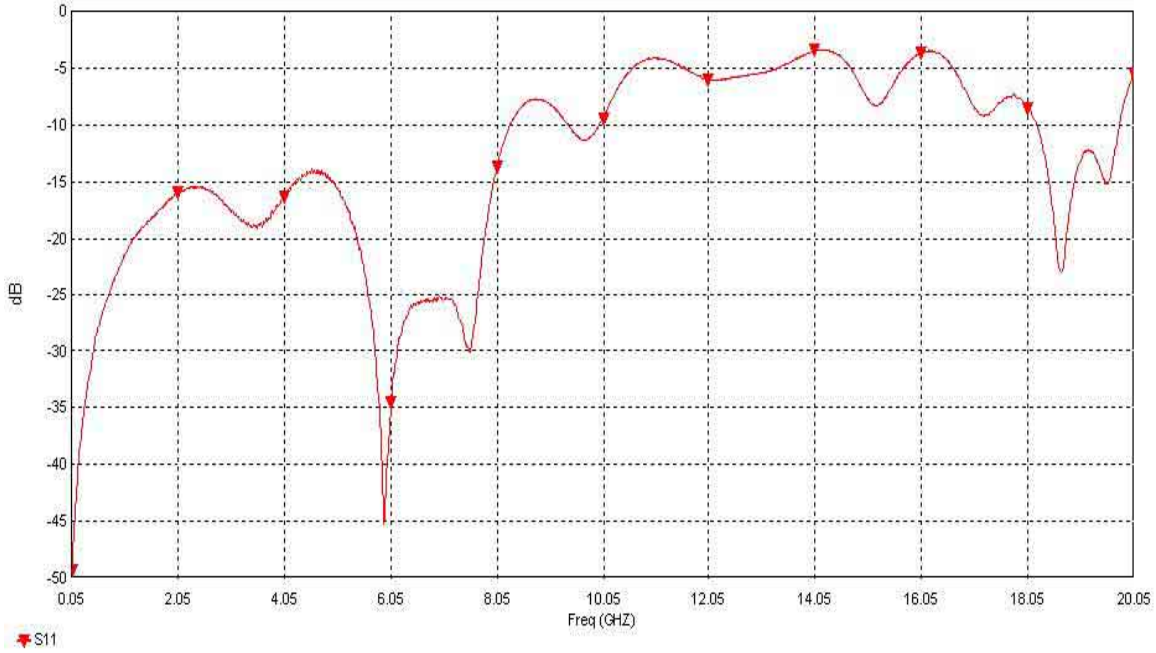


Figure 10: Return Loss - MMCX-x-P-H-ST-TH1

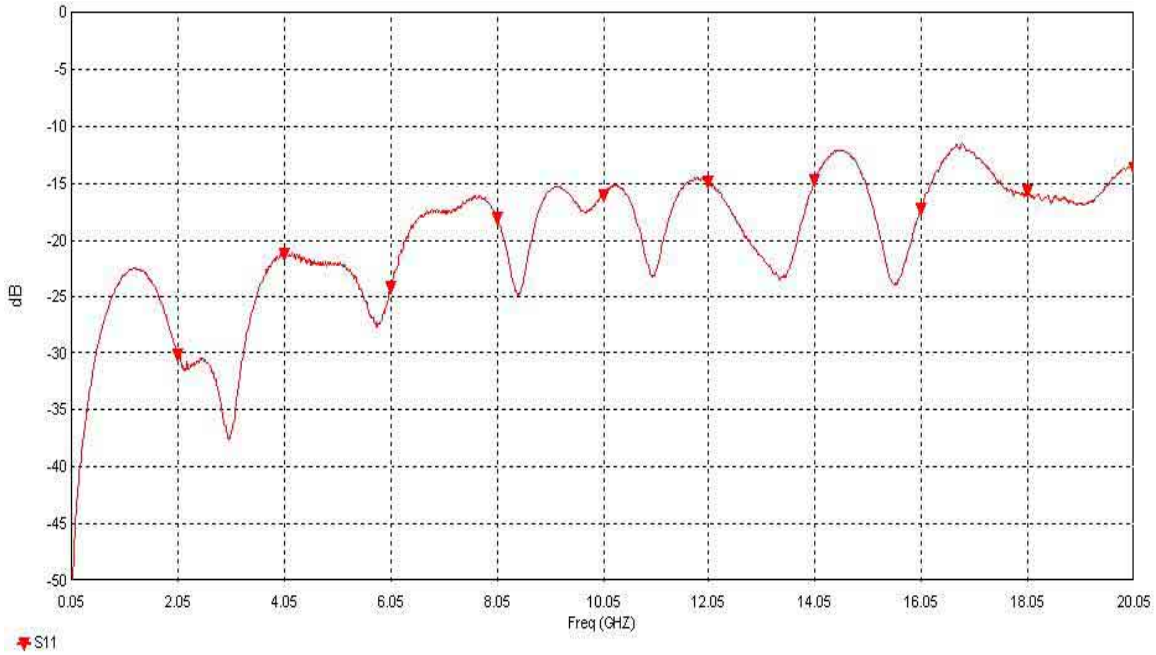


Figure 11: Return Loss - MMCX-x-P-H-ST-MT1

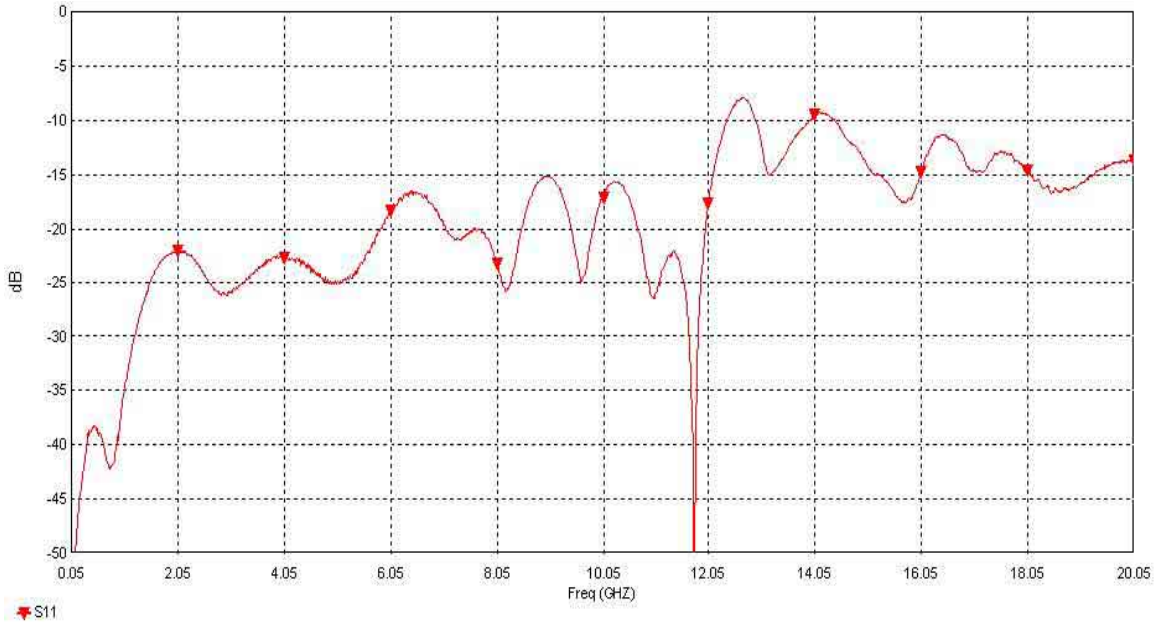


Figure 12: Return Loss - MMCX-x-P-H-ST-SM1

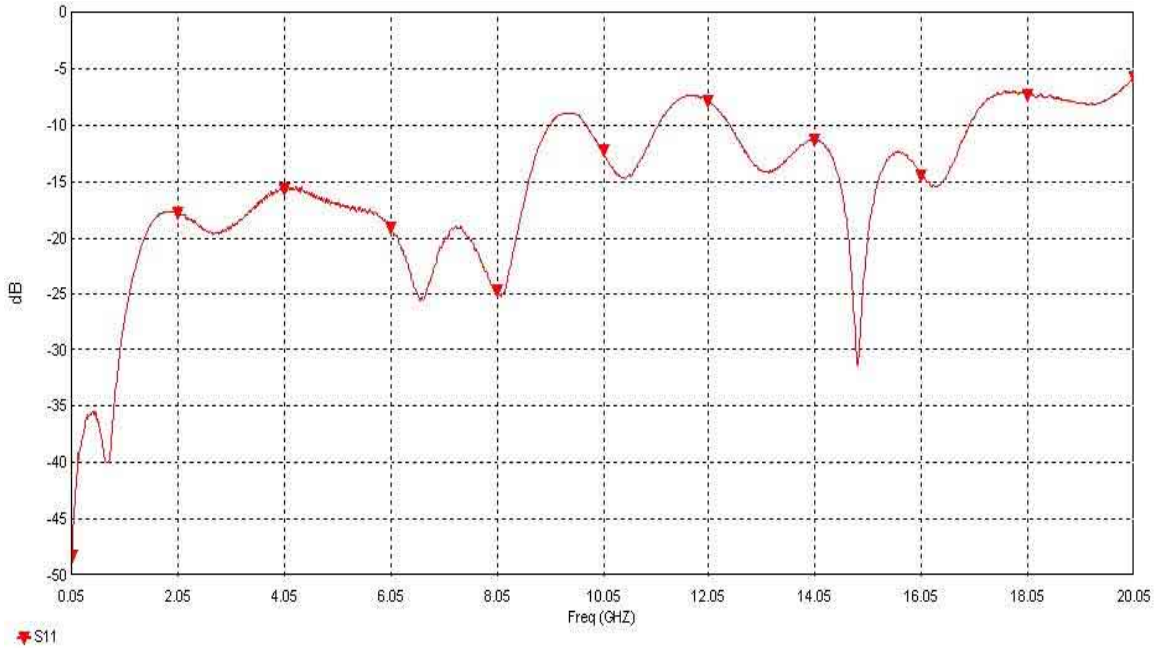


Figure 13: Return Loss - MMCX-x-P-H-ST-EM1

Near End Crosstalk

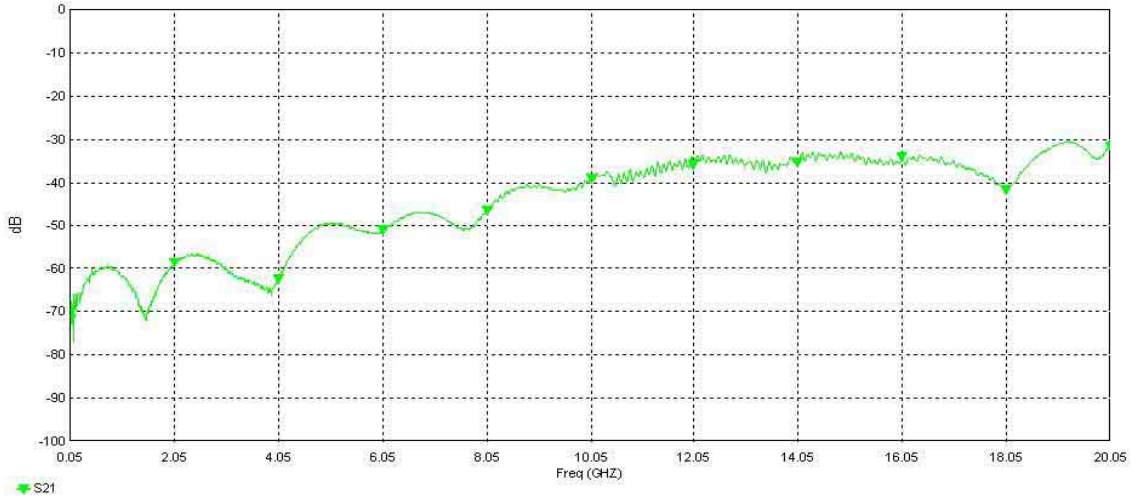


Figure 14: NEXT - MMCX-x-P-H-ST-TH1

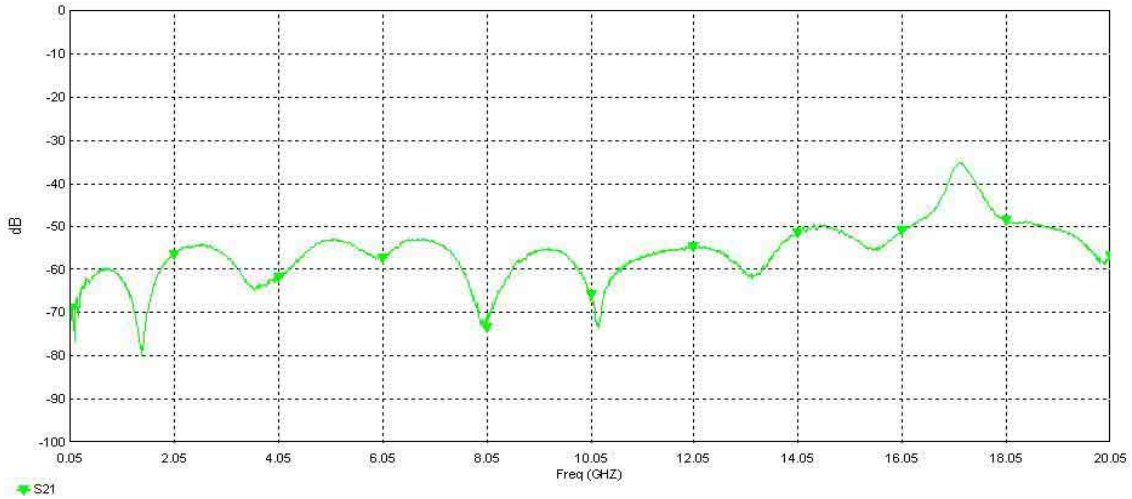


Figure 15: NEXT - MMCX-x-P-H-ST-MT1

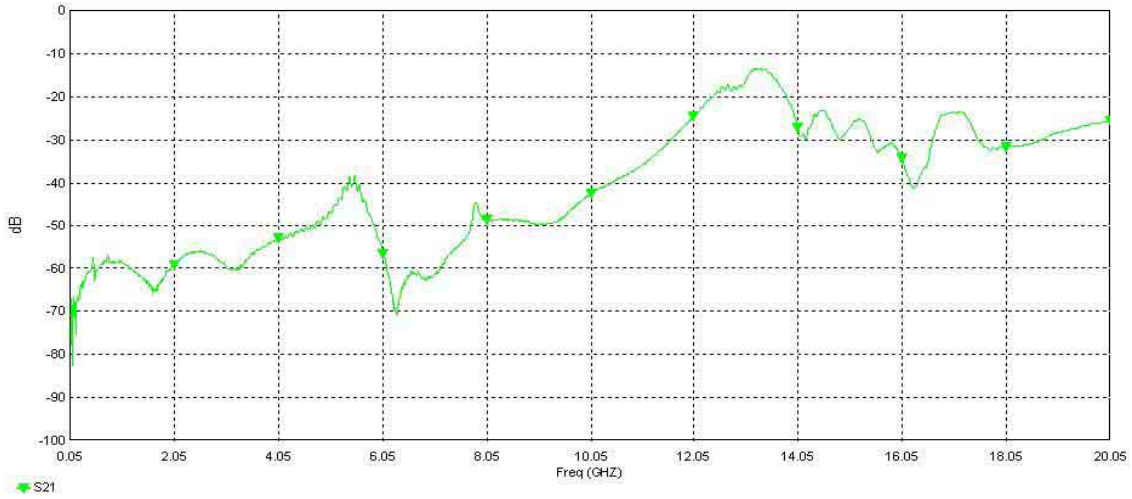


Figure 16: NEXT - MMCX-x-P-H-ST-SM1

Far End Crosstalk

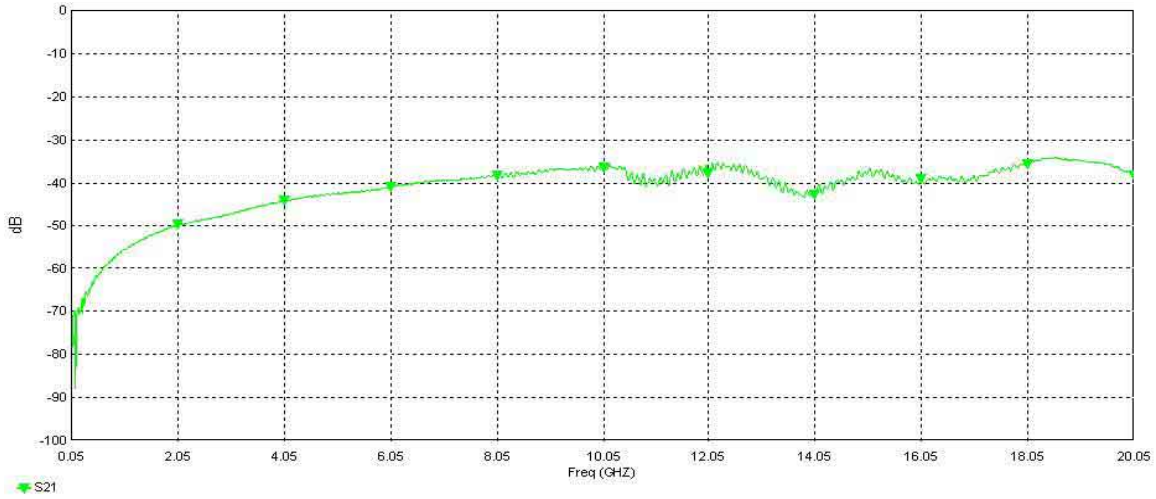


Figure 17: FEXT - MMCX-x-P-H-ST-TH1

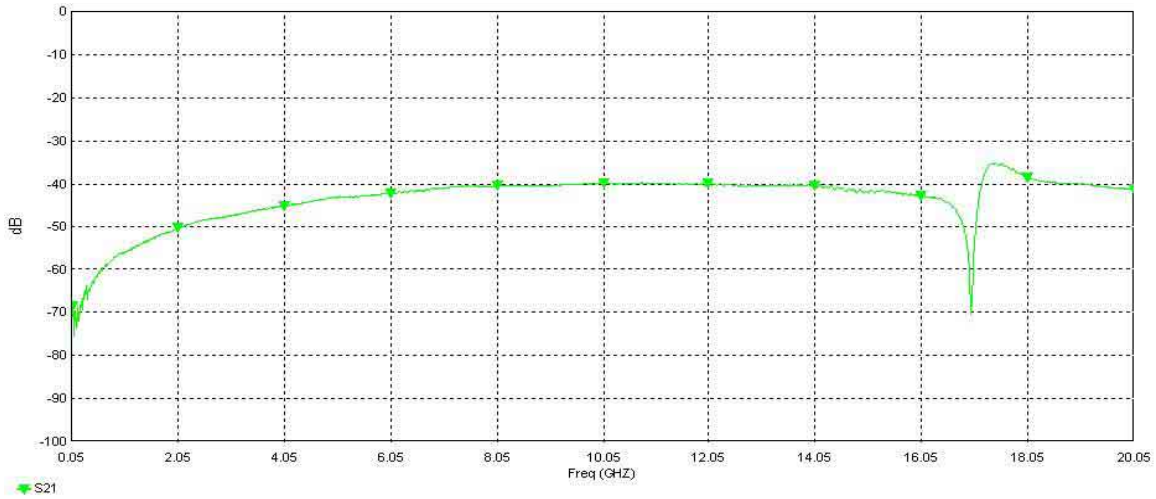


Figure 18: FEXT - MMCX-x-P-H-ST-MT1

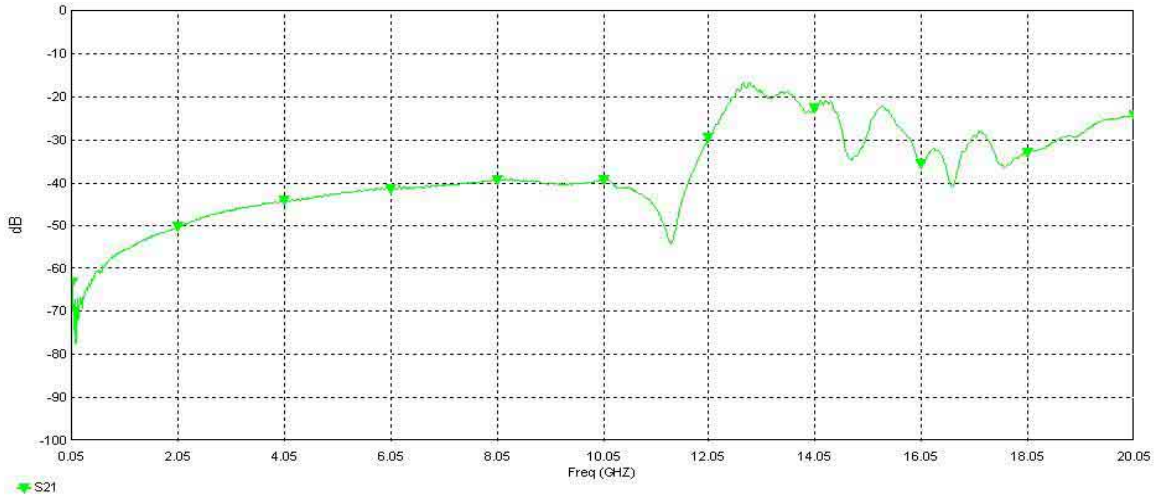


Figure 19: FEXT - MMCX-x-P-H-ST-SM1

VSWR

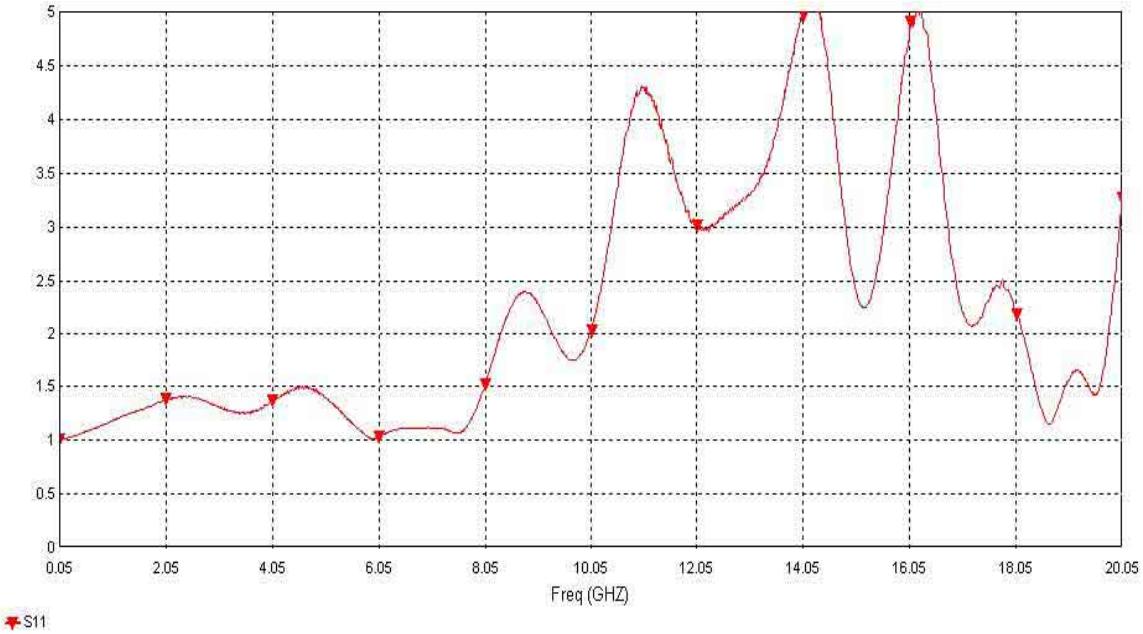


Figure 20: VSWR - MMCX-x-P-H-ST-TH1

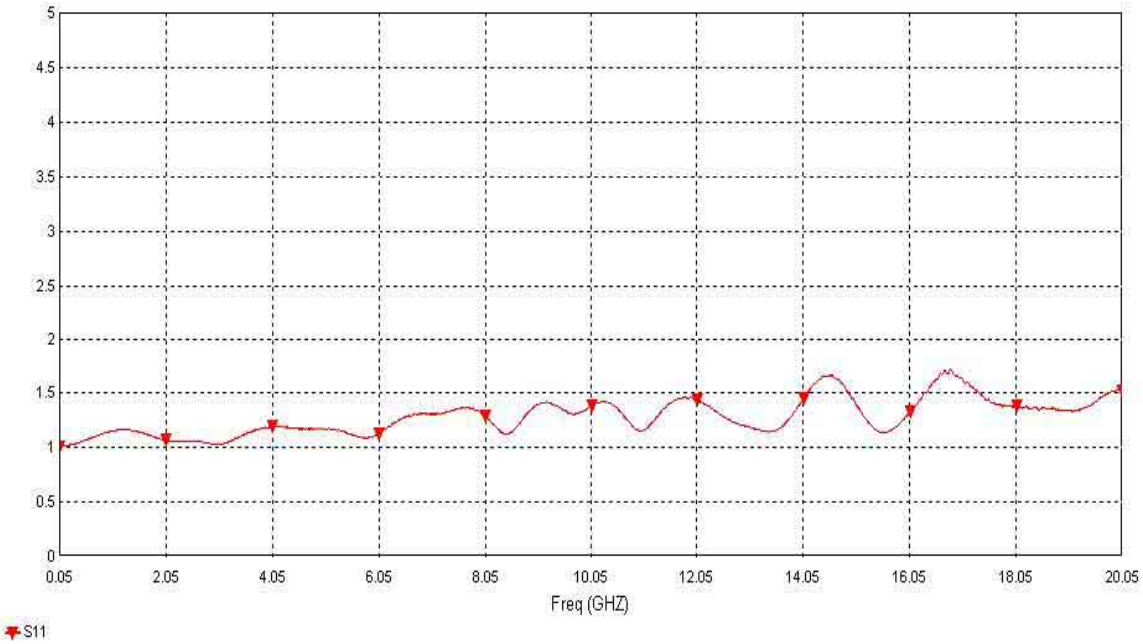


Figure 21: VSWR - MMCX-x-P-H-ST-MT1

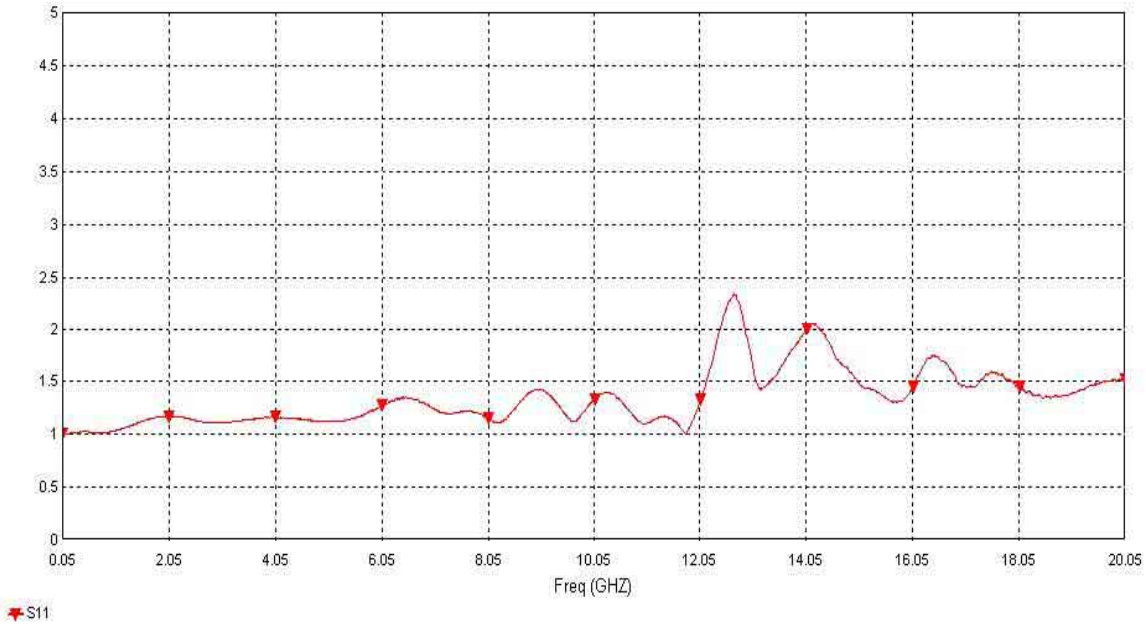


Figure 22: VSWR - MMCX-x-P-H-ST-SM1

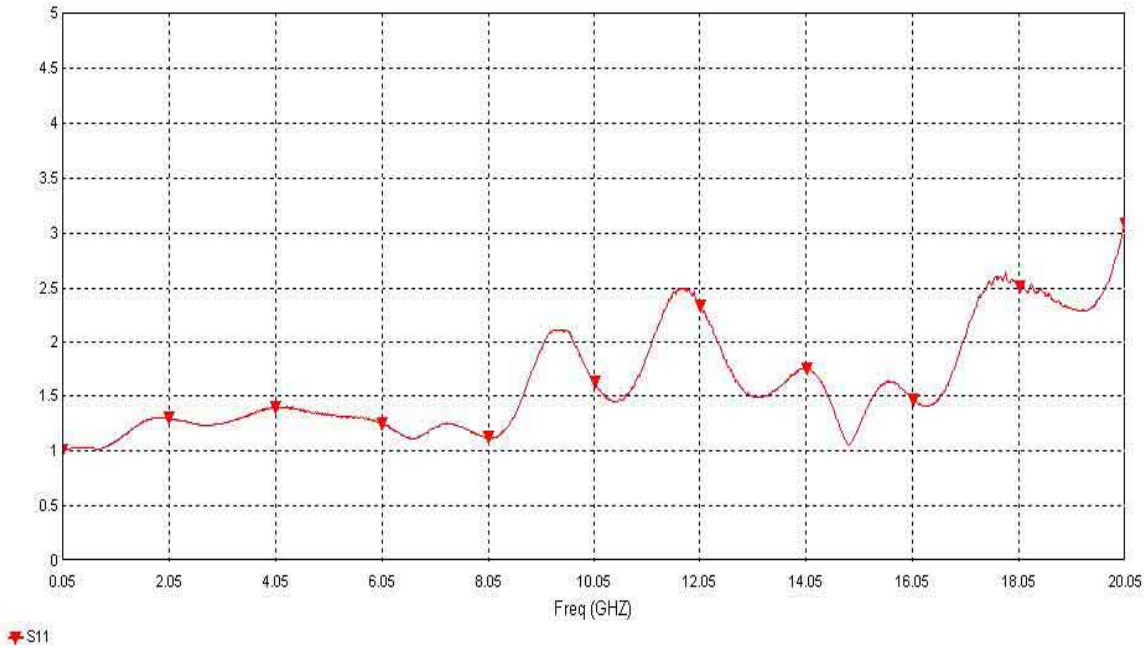


Figure 23: VSWR - MMCX-x-P-H-ST-EM1

Test Procedures

Fixturing

All measurements were performed using the RF Test Board, Rev. 0. The Test Board includes test traces and two printed circuit test boards. For measurements that required reference measurements, reference traces were utilized as shown in Figure 24 below. The reference board was used to compensate for the losses due to the coaxial test cables, SMA launch, and the trace routing of the test PCB during the measurement process.

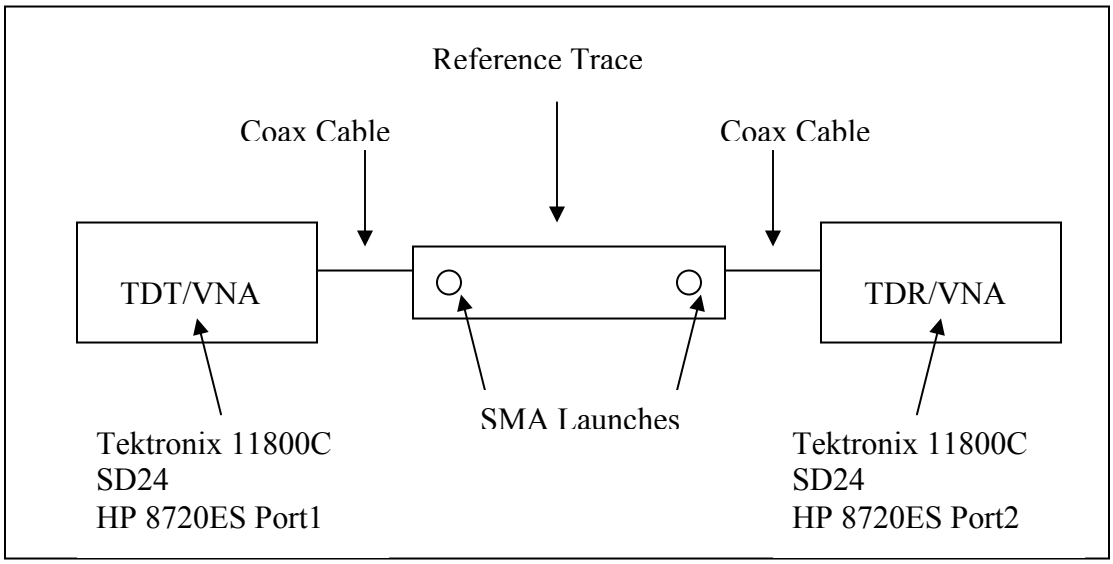


Figure 24: Test setup for reference acquisition.

Measurements were then performed using the test PCBs as shown in Figure 25.

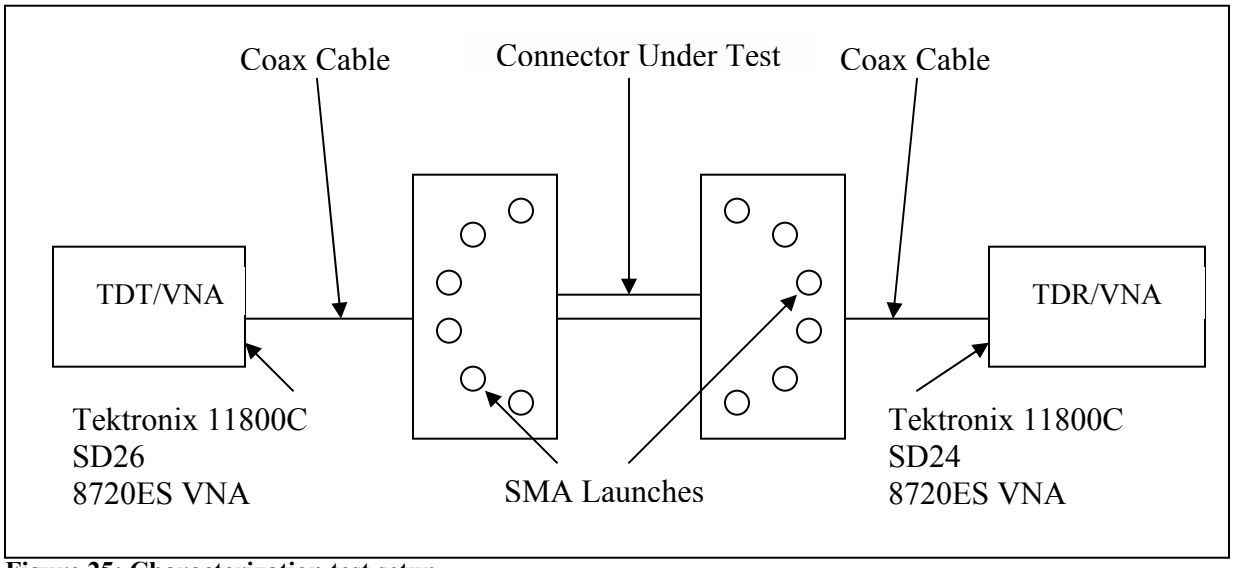


Figure 25: Characterization test setup.

Time Domain Testing

Impedance

The Tektronix 11800C Oscilloscope was set up in TDR (Time Domain Reflectometry) mode using 128 averages and a 5000-point record length. The horizontal scale was set to 2ns/div to allow the near end connector and a portion of the cable to be displayed. No filtering function was set.

NEXT and FEXT

Near End Crosstalk (NEXT) and Far End Crosstalk (FEXT) measurements were made using the Tektronix 11800C with SD24 and SD26 Sampling Heads. A thru reference of the coaxial test cables, SMAs, and reference board was performed to compensate for the test setup losses and the routing layer differences in the PCBs (see Figure 24).

To acquire Crosstalk, a signal line was driven using the TDR. NEXT was measured on an adjacent line at the near end. FEXT was measured on an adjacent line at the far end (see Figure 25). All adjacent lines were terminated, at both ends, with 50Ω SMA loads.

Frequency Domain Testing

Insertion Loss

Insertion Loss measurements were made using the Hewlett Packard 8720ES. Testing was performed over a 50 MHz to 20GHz range. Test setup losses were compensated for by acquiring a thru measurement of the coaxial test cables, SMAs, and the reference board (see Figure 24).

The reference trace was then replaced with the Test PCBs and the sample (see Figure 25). A thru measurement was taken and then post processed by using Arc RF System's SPViewII. The result is the insertion loss of the MMCX Connectors.

Return Loss and VSWR

Return Loss measurements were made using the Hewlett Packard 8720ES VNA. Testing was performed over a 50 MHz to 20GHz range. Test setup losses were compensated for by acquiring a thru measurement of the coaxial test cables, SMAs, and the reference board (see Figure 25).

A matched reflection waveform of the connector assembly was acquired and then post processed by using Arc RF System's SPViewII. The result is the return loss and VSWR of the total test board and MMCX connectors.

NEXT and FEXT

NEXT and FEXT were measured in the Frequency Domain using the Hewlett Packard 8720ES VNA.

To acquire the NEXT, a line was driven using the VNA. NEXT was measured on an adjacent line (see Figure 26). NEXT was then post processed by using Arc RF System's SPViewII. The result is the NEXT of the MMCX connector in the Frequency Domain.

FEXT was measured on an adjacent line at the far end (see Figure 27). FEXT was then post processed by using Arc RF System's SPViewII. The result is the FEXT of the MMCX connector in the Frequency Domain. All adjacent lines were terminated, at both ends, with 50Ω SMA loads.

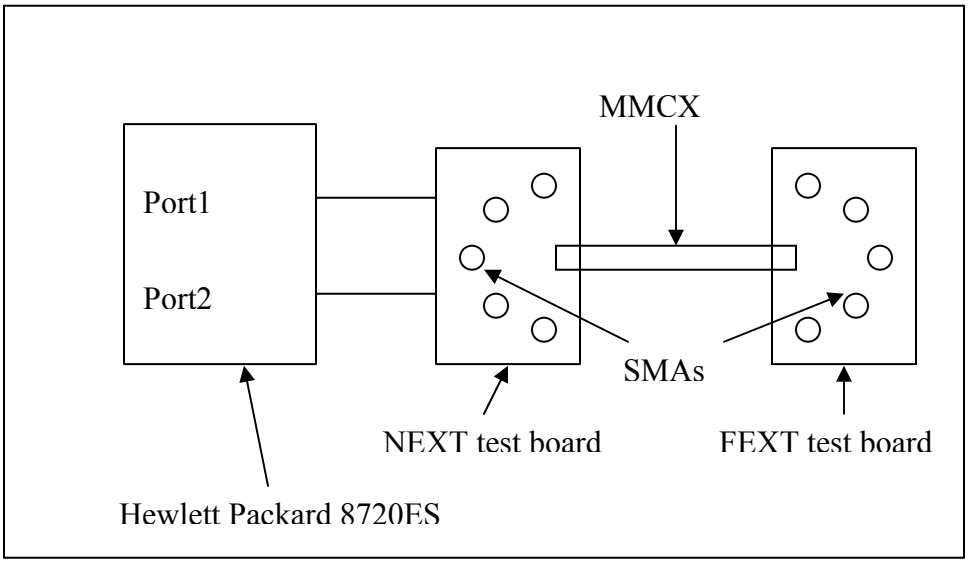


Figure 26: NEXT Measurement Setup.

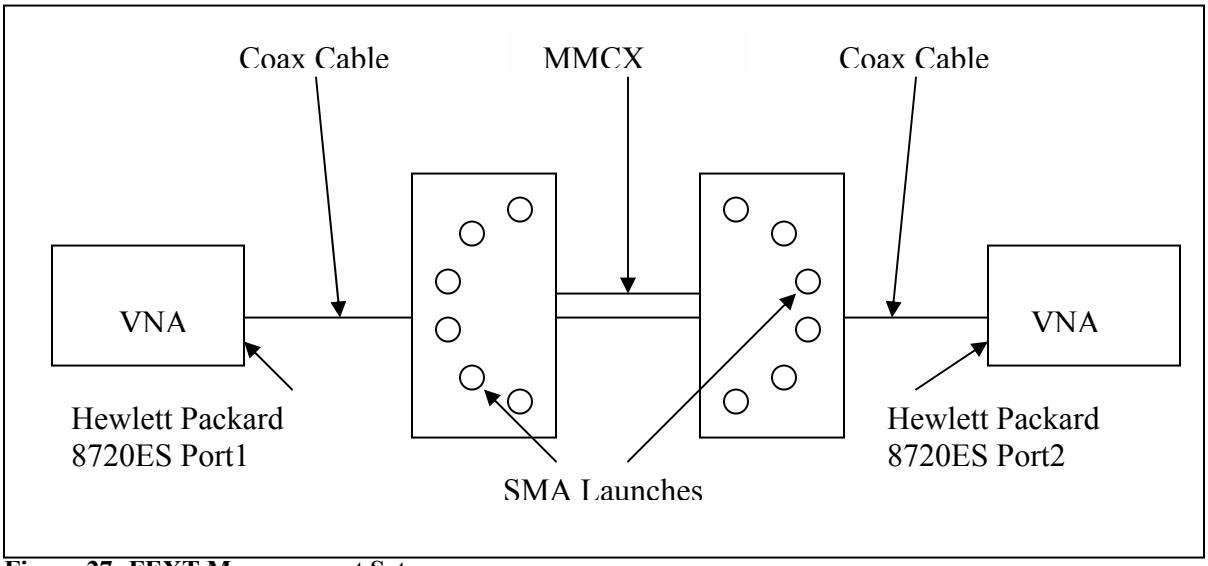


Figure 27: FEXT Measurement Setup.

Equipment

Time Domain Testing

Tektronix 11800C Oscilloscope
Tektronix SD26 Sampling Head
Tektronix SD24 TDR/Sampling Head

Frequency Domain Testing

Hewlett Packard 8720ES VNA