

## Report on the FCC Testing of:

MiX Telematics International (Pty) Ltd  
Vehicle Tracking Fleet Management Device,  
Model: MiX45MC-4G-B  
GPS Antenna, Model: AA18051162  
USB Key, Model: N/A

## In accordance with FCC 47 CFR Part 15B

Prepared for: MiX Telematics Euro Ltd  
Cherry Orchard North, Kembrey Park,  
Swindon, SN1 2NR, United Kingdom

FCC ID: 2AFMS-45MC4G



Product Service

Choose certainty.  
Add value.

## COMMERCIAL-IN-CONFIDENCE

Document Number: 75942815-01 | Issue: 02

### SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Kim Archer	Sales Manager	Authorised Signatory	19 November 2018

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

### ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15B. The sample tested was found to comply with the requirements defined in the applied rules.

### SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Graeme Lawler	Test Engineer	Testing	19 November 2018

FCC Accreditation  
90987 Octagon House, Fareham Test Laboratory

### EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15B: 2017.



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# 1 Report Summary

## 1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	05 November 2018
2	To include a hyphen in the FCC ID	19 November 2018

**Table 1**

## 1.2 Introduction

Applicant	MiX Telematics Euro Ltd
Manufacturer	MiX Telematics International (Pty) Ltd
Model Number(s)	Vehicle Tracking Fleet Management Device: MiX 45MC-4G-B GPS Antenna: AA18051162 USB Key: N/A
Declared Variant(s)	MiX 45MC-4G
Serial Number(s)	MiX 45MC-4G-B: 45000209 / IMEI 357812090498665 GPS Antenna: N/A USB Key: N/A
Hardware Version(s)	1
Software Version(s)	1.8.0
Number of Samples Tested	1 set
Test Specification/Issue/Date	FCC 47 CFR Part 15B: 2017
Order Number	P0089659
Date	21-May-2018
Date of Receipt of EUT	01-October-2018
Start of Test	01-October-2018
Finish of Test	01-October-2018
Name of Engineer(s)	Graeme Lawler
Related Document(s)	ANSI C63.4: 2014



Product Service

### 1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15B is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: All Tx devices Idle Mode and GNSS Receiver Operating				
2.1	15.109	Radiated Disturbance	Pass	ANSI C63.4: 2014

**Table 2**



1.4 Declaration of Build Status

MAIN EUT	
MANUFACTURING DESCRIPTION	Vehicle Tracking Fleet Management
MANUFACTURER	MiX Telematics International (Pty) Ltd
MODEL NAME/NUMBER	MiX 45MC-4G; MiX 45MC-4G-B
PART NUMBER	440FT0187; 440FT0191
SERIAL NUMBER	4400 0204; 4400 0208; 4500 0212; 4500 0203
HARDWARE VERSION	1
SOFTWARE VERSION	1.8.0
PSU VOLTAGE/FREQUENCY/CURRENT	12V / 24V, < 2A (7.5A Fused)
HIGHEST INTERNALLY GENERATED / USED FREQUENCY	2480MHz
FCC ID (if applicable)	2AFMS-45MC4G
INDUSTRY CANADA ID (if applicable)	
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	The MiX 4000 LTE is a fleet product that incorporates the latest market trends. It consists mainly of an on-board computer, a LTE CAT M1 modem, a GNSS, an accelerometer, Low Energy Bluetooth, I/O, 2 x CAN, 2 x RS232, 4 x positive drives and 434MHz / 915MHz short range transceiver.
COUNTRY OF ORIGIN	South Africa
RF CHARACTERISTICS (if applicable)	
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	902-928MHz, 2400-2480MHz, LTE BANDS [12,13, 5, 4, 2] [2]1850-1910, [4]1710-1755, [5]824-849, [12]699-716, [13]777-787
RECEIVER FREQUENCY OPERATING RANGE (MHz)	902-928MHz, 2400-2480MHz, LTE BANDS [12, 13, 5, 4, 2] [2]1930-1990, [4]2110-2150, [5]869-894, [12]729-746, [13]746-756
INTERMEDIATE FREQUENCIES	unknown
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)	SRD915 F1D, BLE F1D, LTE X7D
MODULATION TYPES: (i.e. GMSK, QPSK)	2FSK for SRD915, GFSK for BLE, for LTE SC-FDMA/OFDMA.16QAM
OUTPUT POWER (W or dBm)	SRD 915 <20dBm, BLE <7dBm, LTE <23dBm
SEPARATE BATTERY/POWER SUPPLY (if applicable)	
MANUFACTURING DESCRIPTION	Uniross Rechargeable batteries
MANUFACTURER	Guangzhou Great Power Energy & Technology Co., Ltd.
TYPE	Rechargeable Li-ion batteries
PART NUMBER	IFR655060Fe
PSU VOLTAGE/FREQUENCY/CURRENT	3.2 V / DC/ 1600 mAh, 5.12 Wh
COUNTRY OF ORIGIN	China
MODULES (if applicable)	
MANUFACTURING DESCRIPTION	SARA-R410M-52B
MANUFACTURER	UBLOX
TYPE	LTE CAT M1/NB1
POWER	1.9W @3.8V
FCC ID	XPY2AGQN4NNN
INDUSTRY CANADA ID	8595A-2AGQN4NNN
EMISSION DESIGNATOR	LTE X7D
DHSS/FHSS/COMBINED OR OTHER	Other Switzerland
COUNTRY OF ORIGIN	
ANCILLARIES (if applicable)	
MANUFACTURING DESCRIPTION	GNSS ANTENNA
MANUFACTURER	RF Design
TYPE	ACTIVE PATCH
PART NUMBER	GNS-AF50002-3VDT
SERIAL NUMBER	N/A
COUNTRY OF ORIGIN	South Africa

I hereby declare that the information supplied is correct and complete.

Name: B van der Merwe  
 Date: 12 October 2018

Position held: Senior RF Engineer



**1.5 Product Information**

**1.5.1 Technical Description**

The MiX 4000 LTE is a fleet vehicle tracking product that incorporates the latest market trends. It consists mainly of an on-board computer, a LTE CAT M1 modem, a GNSS Rx, an accelerometer, Low Energy Bluetooth, I/O, 2 x CAN, 2 x RS232, 4 x positive drives and 434MHz / 915MHz short range transceiver.

**1.6 Deviations from the Standard**

No deviations from the applicable test standard were made during testing.

**1.7 EUT Modification Record**

The table below details modifications made to the EUT during the test programme. The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Vehicle Tracking Fleet Management Device: Serial Number: 45000209 / IMEI 357812090498665			
0	As supplied by the customer	Not Applicable	Not Applicable
GPS Antenna: Serial Number: N/A			
0	As supplied by the customer	Not Applicable	Not Applicable
USB Key: Serial Number: N/A			
0	As supplied by the customer	Not Applicable	Not Applicable

**Table 3**

**1.8 Test Location**

TÜV SÜD Product Service conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: All Tx Devices Idle Mode and GNSS Receiver Operating		
Radiated Disturbance	Graeme Lawler	UKAS

**Table 4**

Office Address:

Octagon House  
 Concorde Way  
 Segensworth North  
 Fareham  
 Hampshire  
 PO15 5RL  
 United Kingdom



## 2 Test Details

### 2.1 Radiated Disturbance

#### 2.1.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.109

#### 2.1.2 Equipment Under Test and Modification State

MiX 45MC-4G-B, S/N: 45000209 / IMEI 357812090498665 - Modification State 0  
GPS Antenna: AA18051162, S/N: N/A - Modification State 0  
USB Key: N.A, S/N: N/A - Modification State 0

#### 2.1.3 Date of Test

01-October-2018

#### 2.1.4 Test Method

The EUT was set up in a semi-anechoic chamber on a remotely controlled turntable and placed on a non-conductive table 0.8m above a reference ground plane. A pre-scan of the EUT emissions profile was made while varying the antenna-to-EUT azimuth and antenna-to-EUT polarisation using a peak detector; measurements were taken at a 3m distance. Using the pre-scan list of the highest emissions detected, their bearing and associated antenna polarisation, the EUT was then formally measured using a Quasi-Peak, Peak, Average detector as appropriate. The readings were maximised by adjusting the antenna height, polarisation and turntable azimuth, in accordance with the specification.

#### 2.1.5 Environmental Conditions

Ambient Temperature	22.2 °C
Relative Humidity	36.3 %



### 2.1.6 Test Results

#### Results for Configuration and Mode : All Tx Devices Idle Mode and GNSS Receiver Operating.

Tested in accordance with Class B limits.

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Highest frequency generated or used within the EUT: 2480 MHz  
Which necessitates an upper frequency test limit of: 13 GHz

Frequency Range of Test: 30 MHz to 1 GHz

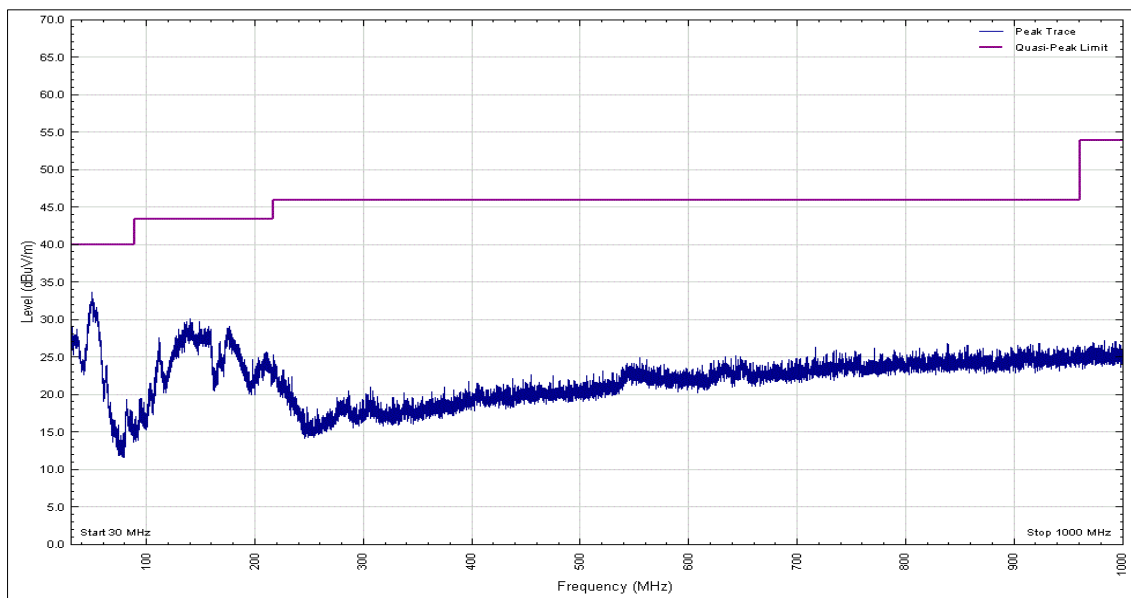
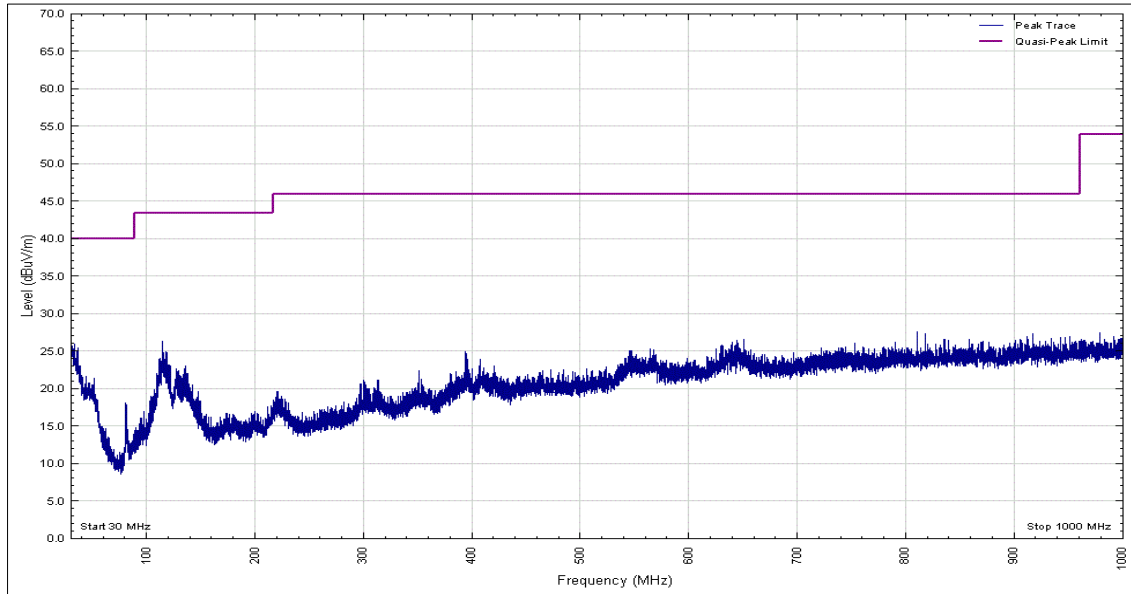


Figure 1 - Graphical Results  
Vertical Polarity - EUT Orientation: X





Frequency Range of Test: 30 MHz to 1 GHz



**Figure 2 - Graphical Results**  
**Horizontal Polarity - EUT Orientation: X**

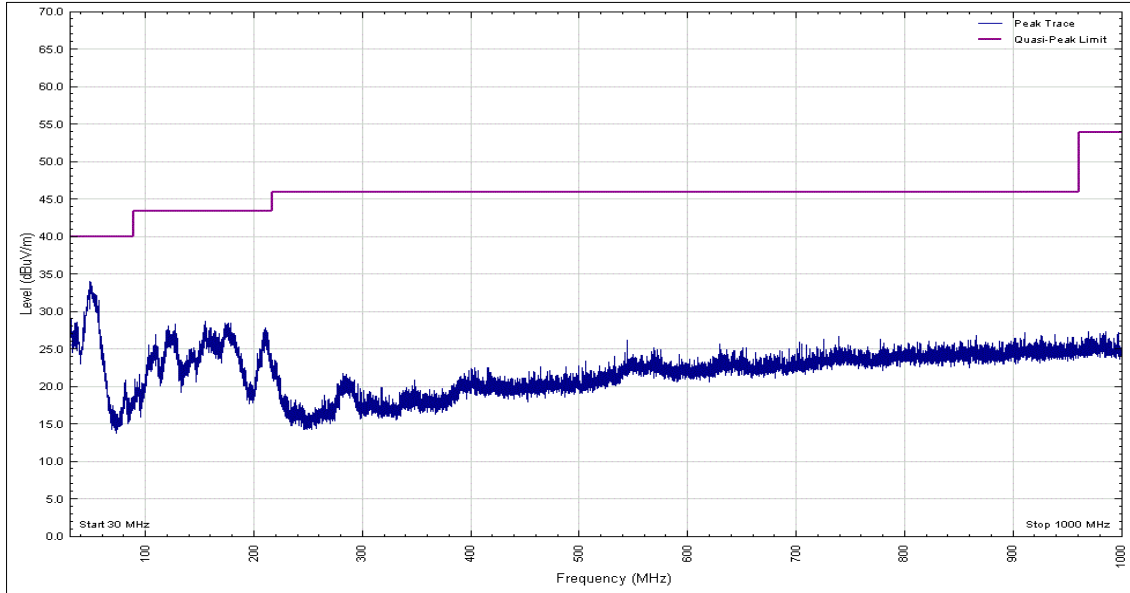
Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
*						

**Table 5 - Emissions Results: 30 MHz to 1 GHz - EUT Orientation: X**

\*No emissions were detected within 10 dB of the limit.

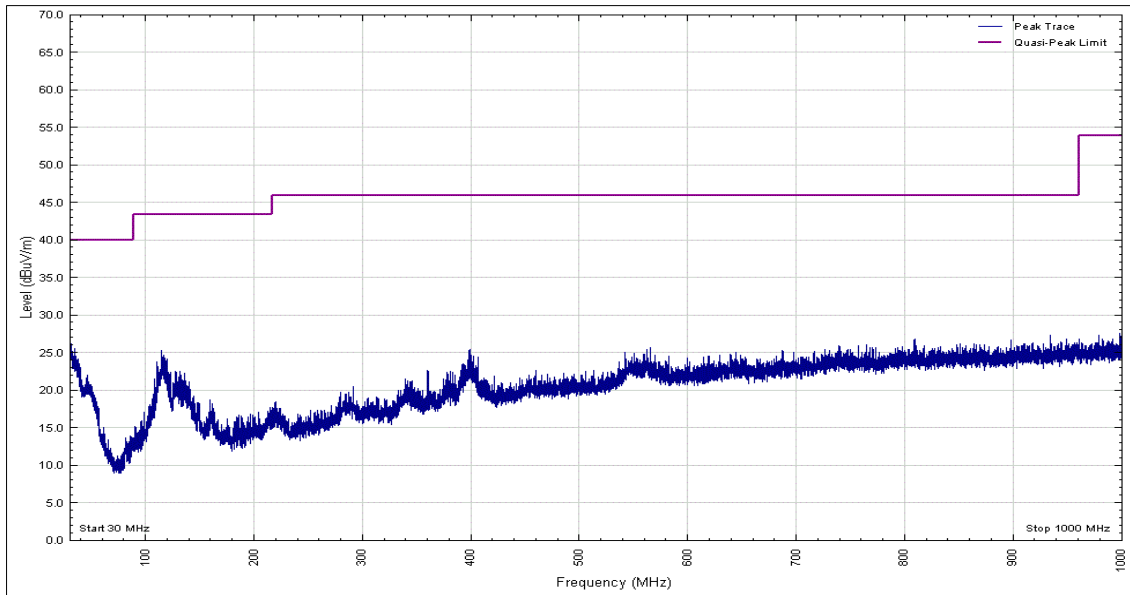


Frequency Range of Test: 30 MHz to 1 GHz



**Figure 3 - Graphical Results  
 Vertical Polarity - EUT Orientation: Y**

Frequency Range of Test: 30 MHz to 1 GHz



**Figure 4 - Graphical Results  
 Horizontal Polarity - EUT Orientation: Y**

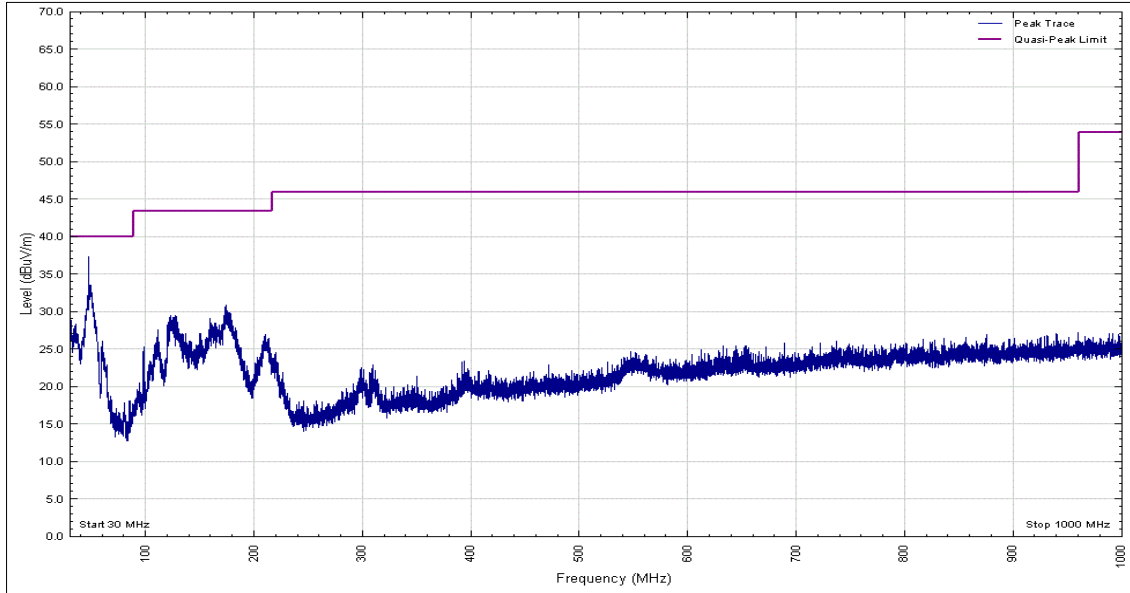
Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
47.782	30.4	40.0	-9.6	25	1.01	Vertical

**Table 6 - Emissions Results: 30 MHz to 1 GHz - EUT Orientation: Y**

No other emissions were detected within 10 dB of the limit.

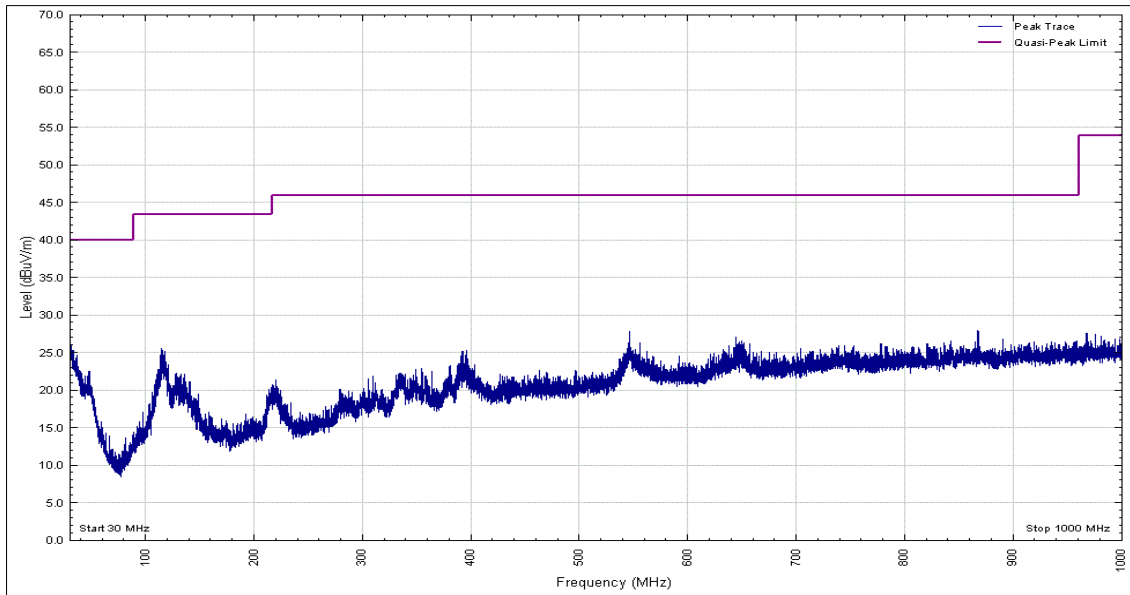


Frequency Range of Test: 30 MHz to 1 GHz



**Figure 5 - Graphical Results**  
**Vertical Polarity - EUT Orientation: Z**

Frequency Range of Test: 30 MHz to 1 GHz

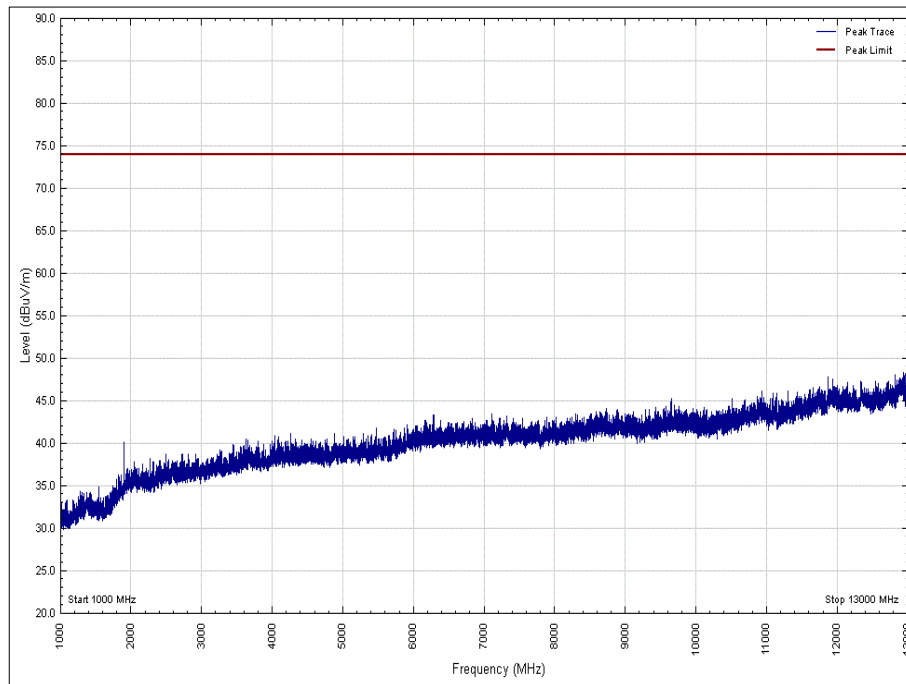


**Figure 6 - Graphical Results**  
**Horizontal Polarity - EUT Orientation: Z**

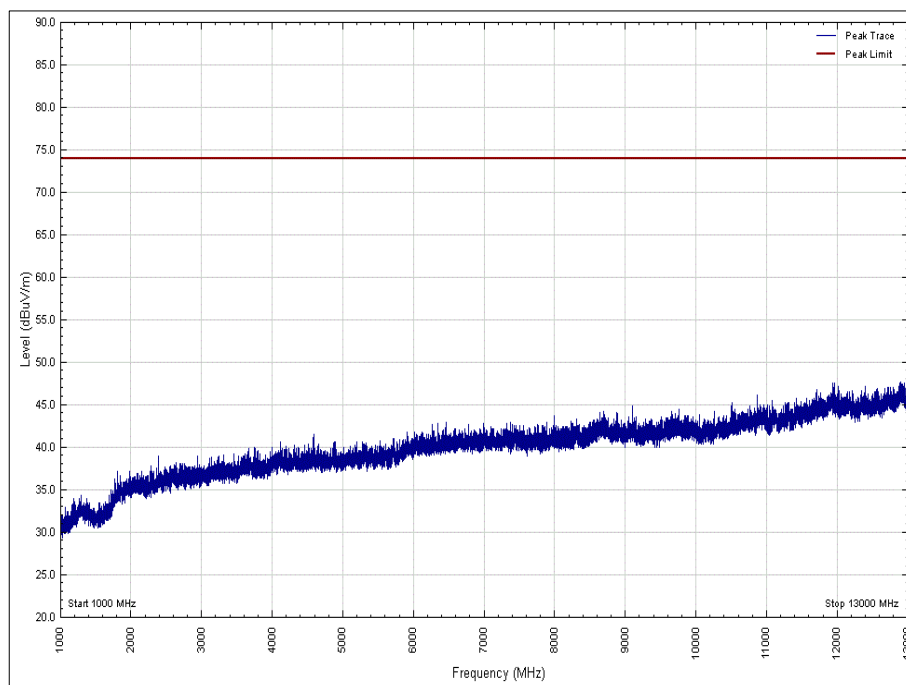
Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
48.695	30.2	40.0	-9.8	249	1.0	Vertical

**Table 7 - Emissions Results: 30 MHz to 1 GHz - EUT Orientation: Z**

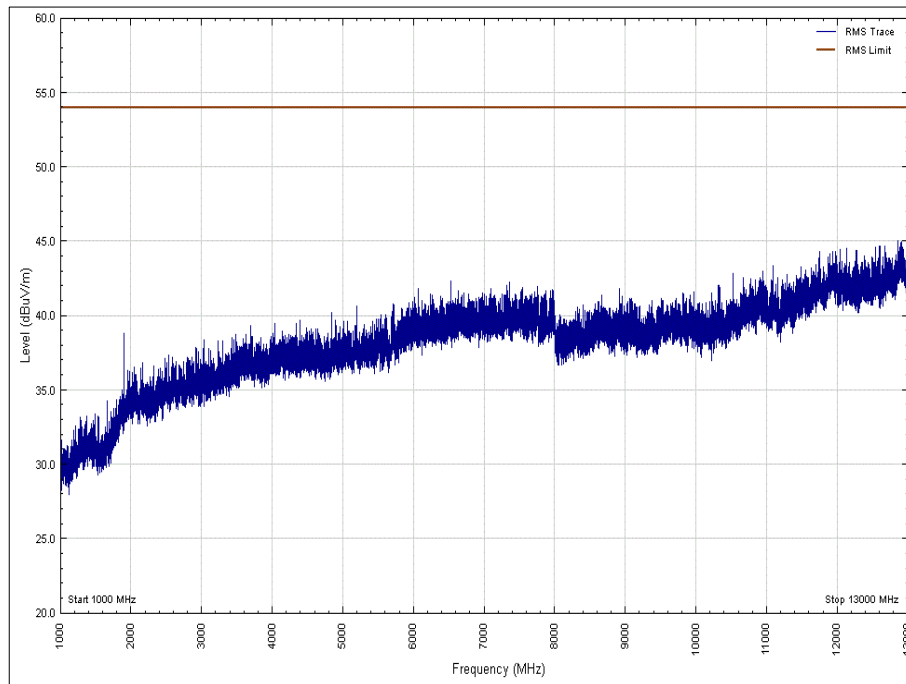
No other emissions were detected within 10 dB of the limit.



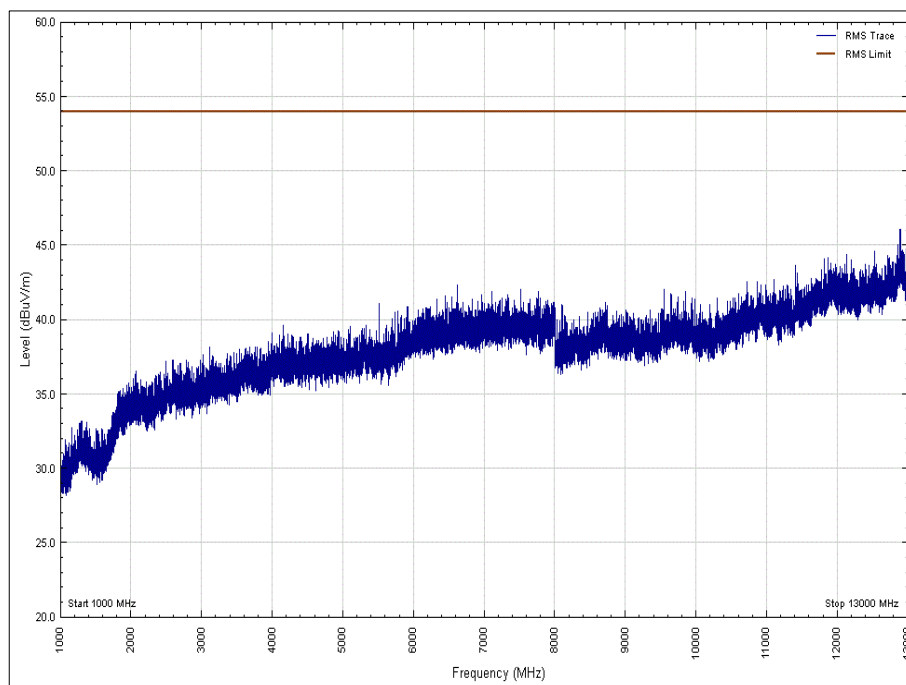
**Figure 7 - Graphical Results - 1 GHz to 13 GHz  
Vertical Polarity - EUT Orientation: X**



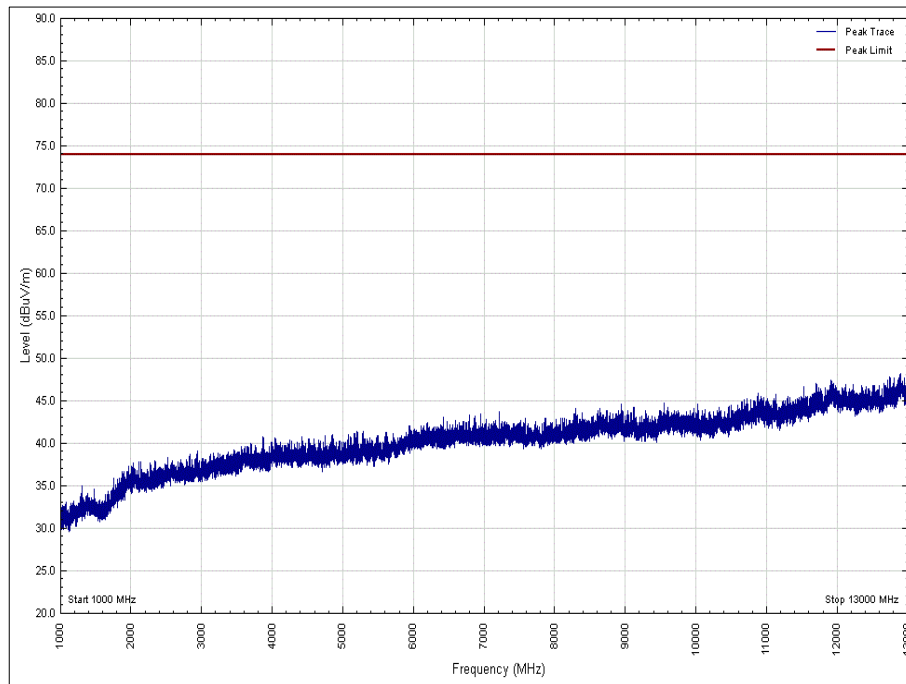
**Figure 8 - Graphical Results - 1 GHz to 13 GHz  
Horizontal Polarity - EUT Orientation: X**



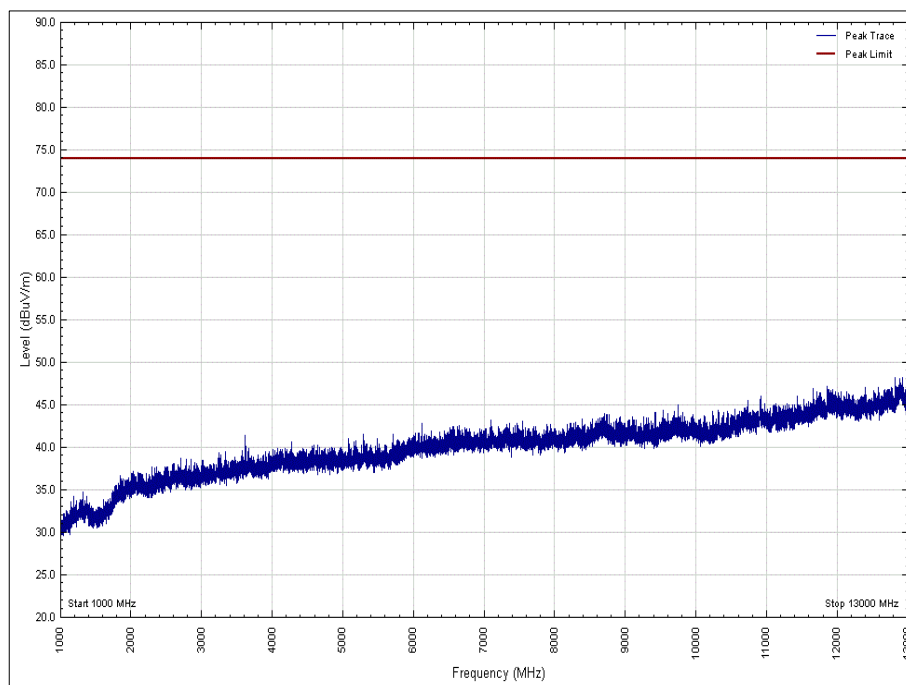
**Figure 9 - Graphical Results - 1 GHz to 13 GHz  
Vertical Polarity - EUT Orientation: X**



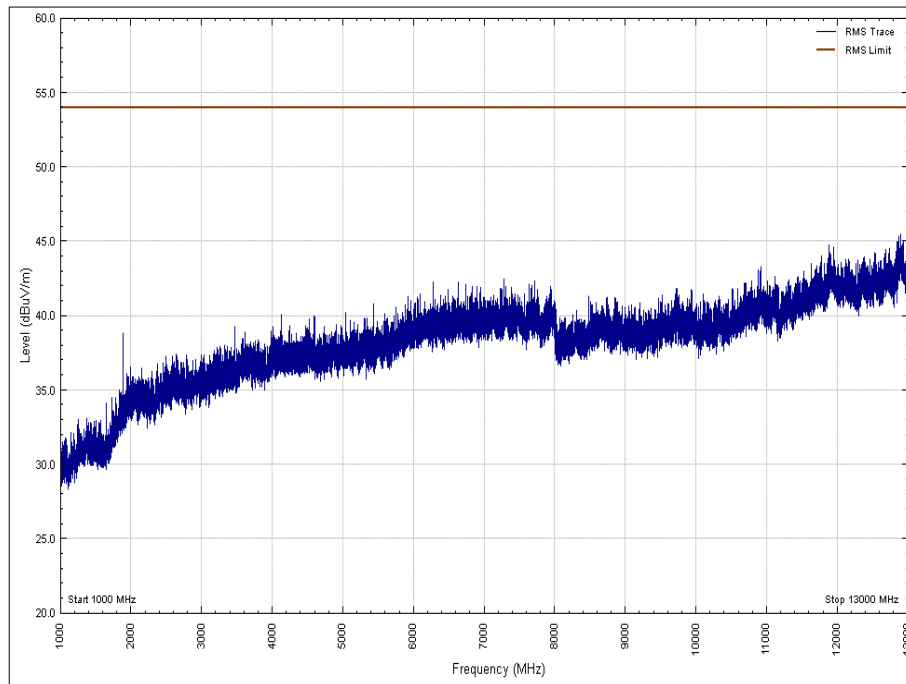
**Figure 10 - Graphical Results - 1 GHz to 13 GHz  
Horizontal Polarity - EUT Orientation: X**



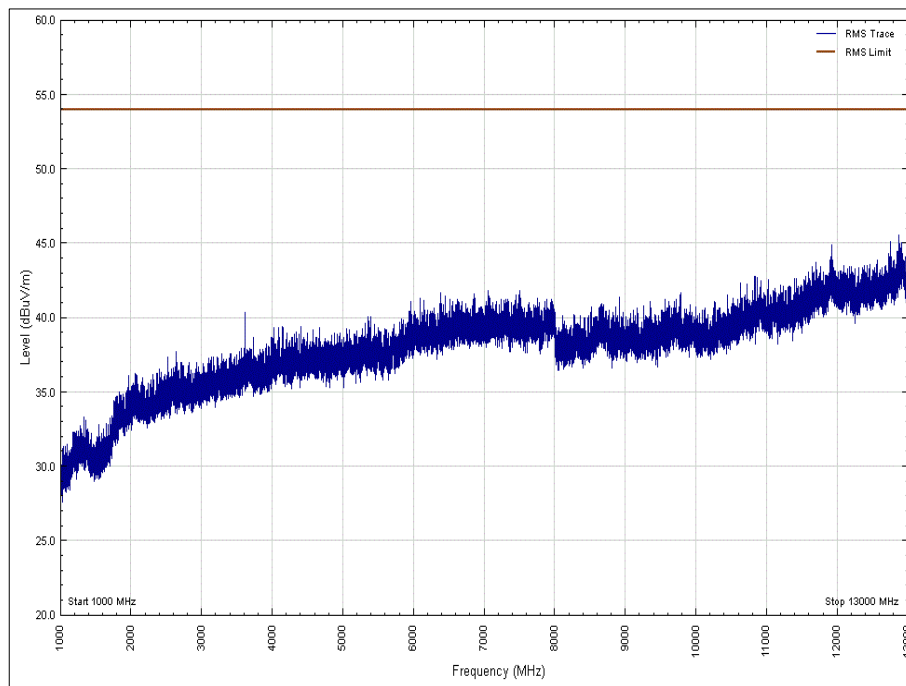
**Figure 11 - Graphical Results - 1 GHz to 13 GHz  
Vertical Polarity - EUT Orientation: Y**



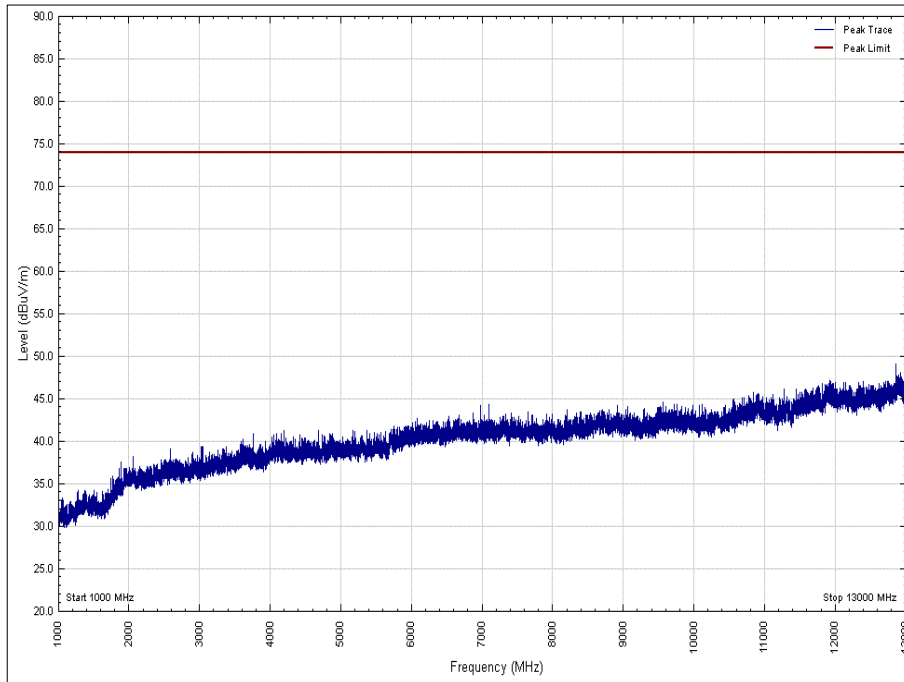
**Figure 12 - Graphical Results - 1 GHz to 13 GHz  
Horizontal Polarity - EUT Orientation: Y**



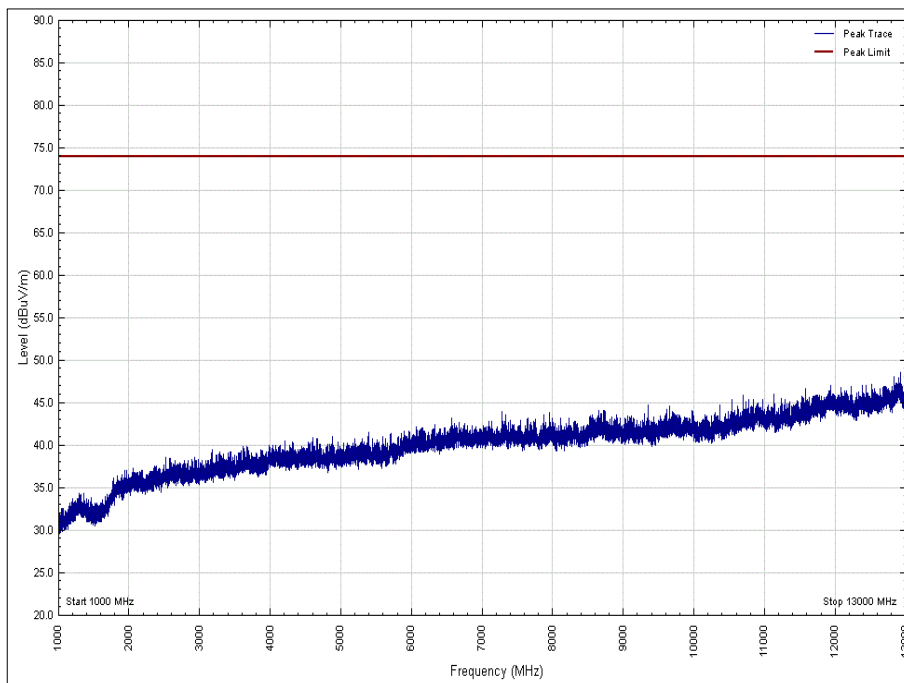
**Figure 13 - Graphical Results - 1 GHz to 13 GHz  
Vertical Polarity - EUT Orientation: Y**



**Figure 14 - Graphical Results - 1 GHz to 13 GHz  
Horizontal Polarity - EUT Orientation: Y**

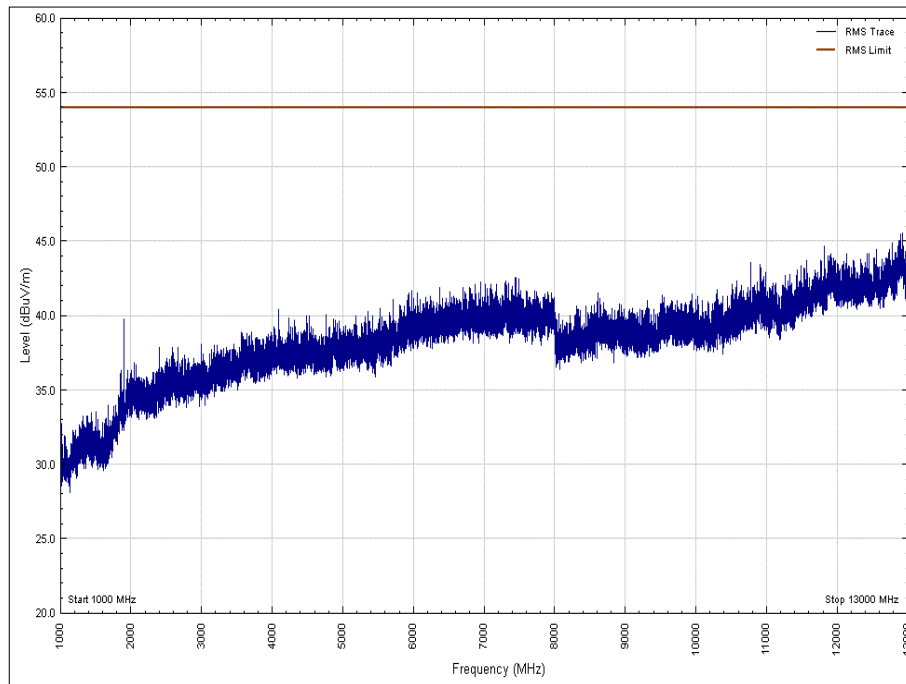


**Figure 15 - Graphical Results - 1 GHz to 13 GHz  
Vertical Polarity - EUT Orientation: Z**

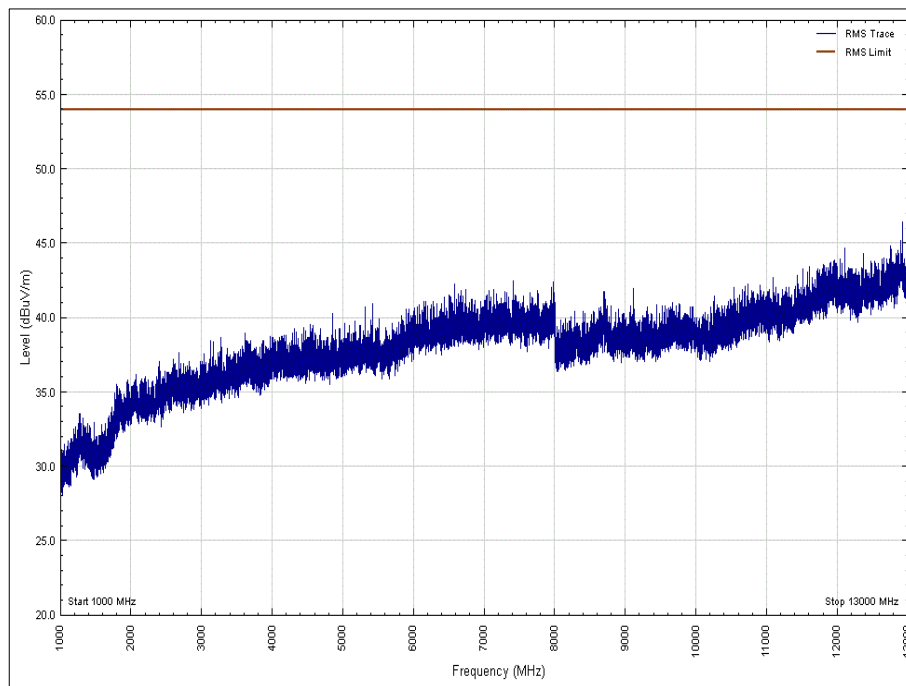


**Figure 16 - Graphical Results - 1 GHz to 13 GHz  
Horizontal Polarity - EUT Orientation: Z**





**Figure 17 - Graphical Results - 1 GHz to 13 GHz  
Vertical Polarity - EUT Orientation: Z**



**Figure 18 - Graphical Results - 1 GHz to 13 GHz  
Horizontal Polarity - EUT Orientation: Z**

No emissions were detected within 10 dB of the limit.



### 2.1.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Pre-Amplifier	Phase One	PS04-0086	1533	12	12-Jan-2019
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Multimeter	Iso-tech	IDM101	2419	12	23-Nov-2018
Antenna with permanent attenuator (Bilog)	Chase	CBL6143	2904	24	08-Aug-2019
Comb Generator	Schaffner	RSG1000	3034	-	TU
1GHz to 8GHz Low Noise Amplifier	Wright Technologies	APS04-0085	4365	12	18-Oct-2018
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	01-Mar-2019
Mast Controller	Maturo GmbH	NCD	4810	-	TU
Tilt Antenna Mast	Maturo GmbH	TAM 4.0-P	4811	-	TU
9m N type RF cable	Rosenberger	2303-0 9.0m PNm PNm	4827	6	04-Jan-2019
4dB Attenuator	Pasternack	PE7047-4	4935	12	28-Nov-2018
Hygrometer	Rotronic	HP21	4989	12	26-Apr-2019
Cable (40GHz)	Rosenberger	LU1-001-2000	5020	-	O/P Mon
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	12-Sep-2019

**Table 8**

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



### 3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
Radiated Disturbance	30 MHz to 1 GHz, Bilog Antenna, $\pm 5.2$ dB 1 GHz to 40 GHz, Horn Antenna, $\pm 6.3$ dB

**Table 9**