Report on the FCC Testing of:

Fortecho Solutions Ltd
433 MHz RFiD Reader, Model: FS-1000

In accordance with FCC 47 CFR Part 15B

Prepared for: Fortecho Solutions Ltd
Solon House
40A Peterborough Road
London, SW6 3BN
UNITED KINGDOM

FCC ID: 2ATM6-FS1000

Add value.
Inspire trust.

COMMERCIAL-IN-CONFIDENCE

Document Number: 75945973-03 | Issue: 01

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Kim Archer	Sales Manager	Authorised Signatory	26 November 2019

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD 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	26 November 2019

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: 2018 for the tests detailed in section 1.3.

TÜV SÜD
is a trading name of TUV SUD Ltd
Registered in Scotland at East Kilbride,
Glasgow G75 0QF, United Kingdom
Registered number: SC215164

TUV SUD Ltd is a
TÜV SÜD Group Company

Phone: +44 (0) 1489 558100
Fax: +44 (0) 1489 558101
www.tuv-sud.co.uk

TÜV SÜD
Octagon House
Concorde Way
Fareham
Hampshire PO15 5RL
United Kingdom

Contents

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	26 November 2019

Table 1

1.2 Introduction

Applicant	Fortecho Solutions Ltd
Manufacturer	Fortecho Solutions Ltd
Model Number(s)	FS-1000
Serial Number(s)	0048-003-098
Hardware Version(s)	HW-03
Software Version(s)	1.74
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15B: 2018
Order Number Date	0429 01-May-2019
Date of Receipt of EUT	10-June-2019
Start of Test	09-July-2019
Finish of Test	09-July-2019
Name of Engineer(s)	Graeme Lawler
Related Document(s)	ANSI C63.4: 2014

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: USB Powered – RFID Receive mode / Ethernet Ping / USB Address				
2.1	15.109	Radiated Disturbance – Class A.	Pass	ANSI C63.4: 2014

Table 2

1.4 Declaration of Build Status

MAIN EUT			
MANUFACTURING DESCRIPTION	Fortecho RFID Reader 433MHz		
MANUFACTURER	Fortecho Solutions Ltd		
MODEL NAME/NUMBER	FS1000-433		
PART NUMBER			
SERIAL NUMBER	0048-003-098		
HARDWARE VERSION	HW-03		
SOFTWARE VERSION	1.74		
PSU VOLTAGE/FREQUENCY/CURRENT	12V		
HIGHEST INTERNALLY GENERATED / USED FREQUENCY	434.790 MHz		
FCC ID (if applicable)	2ATM6-FS1000		
INDUSTRY CANADA ID (if applicable)	Not Applicable		
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Active RFID reader used for reading Fortecho Tags		
COUNTRY OF ORIGIN	UK		
RF CHARACTERISTICS (if applicable)			
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	433 MHz		
RECEIVER FREQUENCY OPERATING RANGE (MHz)	433 MHz ISM band		
INTERMEDIATE FREQUENCIES			
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)			
MODULATION TYPES: (i.e. GMSK, QPSK)	2GFSK		
OUTPUT POWER (W or dBm)	10 dBm		
SEPARATE BATTERY/POWER SUPPLY (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
PSU VOLTAGE/FREQUENCY/CURRENT			
COUNTRY OF ORIGIN			
MODULES (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
POWER			
FCC ID			
INDUSTRY CANADA ID			
EMISSION DESIGNATOR			
DHSS/FHSS/COMBINED OR OTHER			
COUNTRY OF ORIGIN			
ANCILLARIES (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
SERIAL NUMBER			
COUNTRY OF ORIGIN			

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

Name: Will Damerell
Position held: Technical Director
Date: 25 November 2019

1.5 Product Information

1.5.1 Technical Description

The Equipment Under Test (EUT) was a Fortecho Solutions, active RFiD reader used for Fortecho tags.

The primary function of the EUT is to provide monitoring for theft, damage and dangerous environmental changes. Additionally, the EUT has functionality for wireless monitoring that can be integrated with existing security infrastructures including CCTV, SMS, VMS, digital mobile radio and intruder detection systems.

A full description and detailed product specification details are available from the manufacturer.

Figure 1 - Reader 433 MHz - General View

Figure 2 - Reader 433 MHz - Rear View

1.5.2 EUT Port/Cable Identification

Port	Max Cable Length specified	Usage	Type	Screened
Configuration and Mode: USB Powered – Receive mode				
USB	> 3m	EUT power and exercising EUT	USB	Yes
Wired Network	> 3m	Pinging IP address	Ethernet	No

Table 3

1.5.3 Test Configuration

The EUT was powered via its USB port for test purposes but in normal use it is battery powered hence no Mains / USB adapter power line conducted emissions tests were performed.

1.5.4 Modes of Operation

The ethernet port was exercised by pinging the IP address of the EUT.

The USB port was exercised by continuously requesting the MAC address of the EUT.

RFID in Rx Mode.

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
Serial Number: 0048-003-098			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 4

1.8 Test Location

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

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: USB Powered – RFID Receive mode – Ethernet Ping – USB Address		
Radiated Disturbance	Graeme Lawler	UKAS

Table 5

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

FS-1000, S/N: 0048-003-098 - Modification State 0

2.1.3 Date of Test

09-July-2019

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.

For an EUT which could reasonable be used in multiple planes, pre-scans were performed with the EUT orientated in X, Y and Z planes with reference to the ground plane.

A pre-scan of the EUT emissions profile was made at a 3m distance while varying the antenna-to-EUT azimuth and polarisation using a peak detector.

Using a list of the highest emissions detected during the pre-scan along with their bearing and associated antenna polarisation, the EUT was formally measured using a Quasi-Peak, Peak or CISPR Average detector as appropriate.

The readings were maximised by adjusting the antenna height, polarisation and turntable azimuth, in accordance with the specification.

Class A emission limits were used to determine compliance.

2.1.5 Example Calculation

Below 1GHz:

Quasi-Peak level (dBµV/m) = Receiver level (dBµV/m) + Correction Factor (dB)
Margin (dB) = Limit (dBµV/m) – Quasi-Peak level (dBµV/m)

Above 1GHz:

CISPR Average level (dBµV/m) = Receiver level (dBµV/m) + Correction Factor (dB)
Margin (dB) = Limit (dBµV/m) – CISPR Average level (dBµV/m)

Peak level (dBµV/m) = Receiver level (dBµV/m) + Correction Factor (dB)
Margin (dB) = Limit (dBµV/m) – Peak level (dBµV/m)

2.1.6 Example Test Setup Diagram

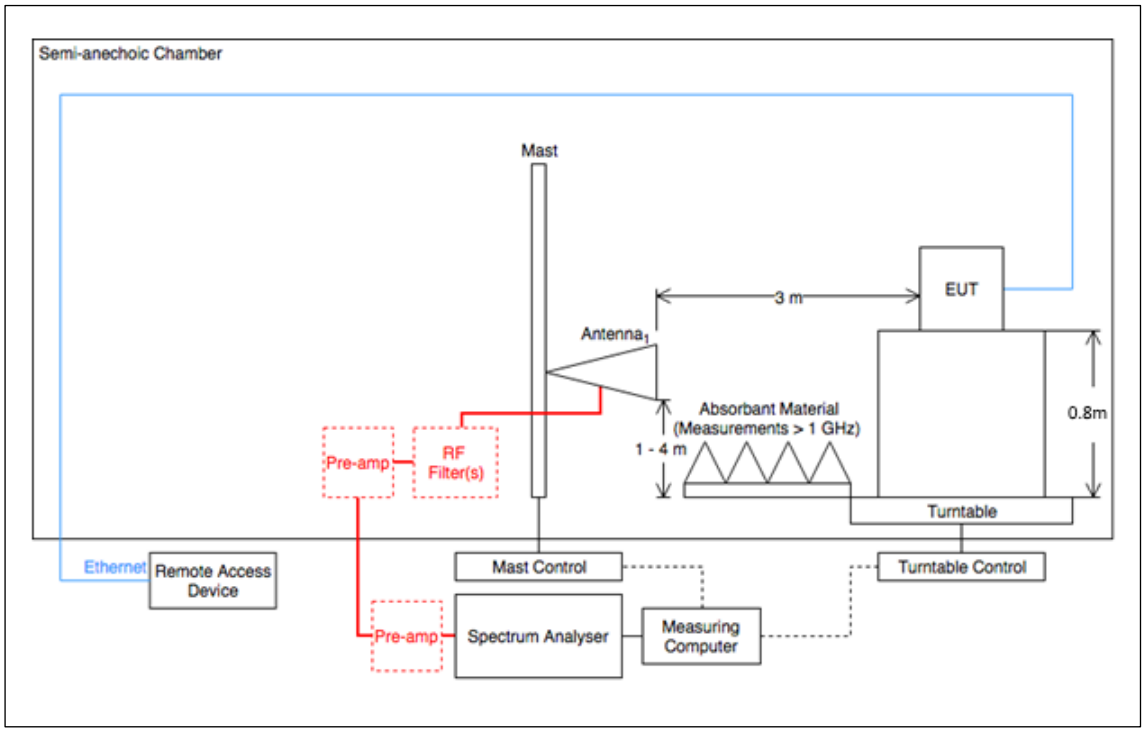

Figure 3 - Radiated Disturbance Example Test Setup

2.1.7 Environmental Conditions

Ambient Temperature	19.5 °C
Relative Humidity	62.2 %

2.1.8 Specification Limits

Required Specification Limits, Field Strength (Class A @ 10m)		
Frequency Range (MHz)	(µV/m)	(dBµV/m)
30 to 88	90	39.1
88 to 216	150	43.5
216 to 960	210	46.4
Above 960	300	49.5
Supplementary information: Quasi-peak detector to be used for measurements below 1 GHz CISPR Average detector to be used for measurements above 1 GHz Peak test limit above 1 GHz is 20 dB higher than the CISPR Average test limit.		

Table 6

2.1.9 Test Results

Results for Configuration and Mode: USB Powered – RFID Rx / Ethernet Ping / USB Address.

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

Tested to Class A Test Limits.

Detailed results are shown below.

Highest frequency generated or used within the EUT: 434.790 MHz
Which necessitates an upper frequency test limit of: 2 GHz

Frequency Range of Test: 30 MHz to 1 GHz - Peak - X Orientation

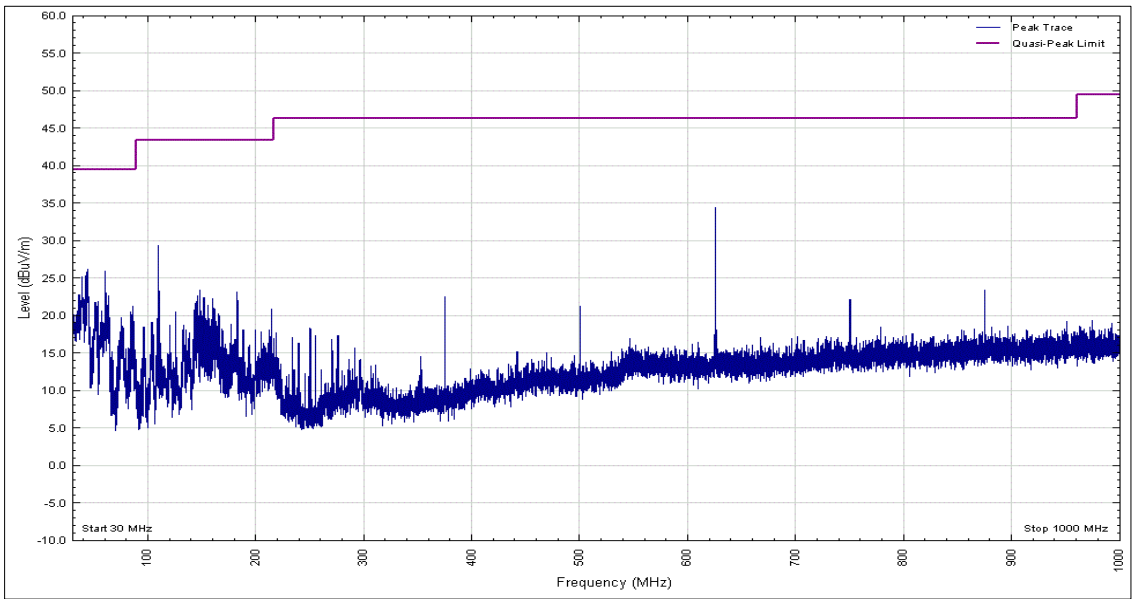

Figure 4 - Graphical Results - Vertical Polarity

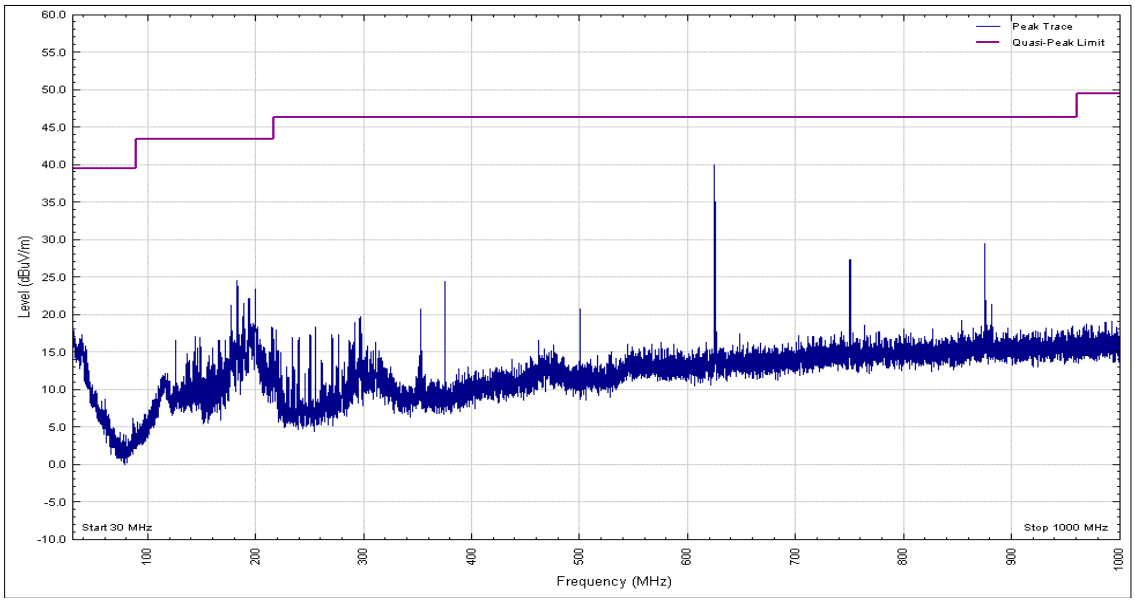

Figure 5 - Graphical Results - Horizontal Polarity

Frequency (MHz)	Level	Limit	Margin	Detector	Unit	Angle (°)	Height (cm)	Polarisation
625.008	40.08	46.44	-6.36	Peak	dBuV/m	118	132	Horizontal

Table 7

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

Frequency Range of Test: 1 GHz to 2 GHz - Peak - X Orientation

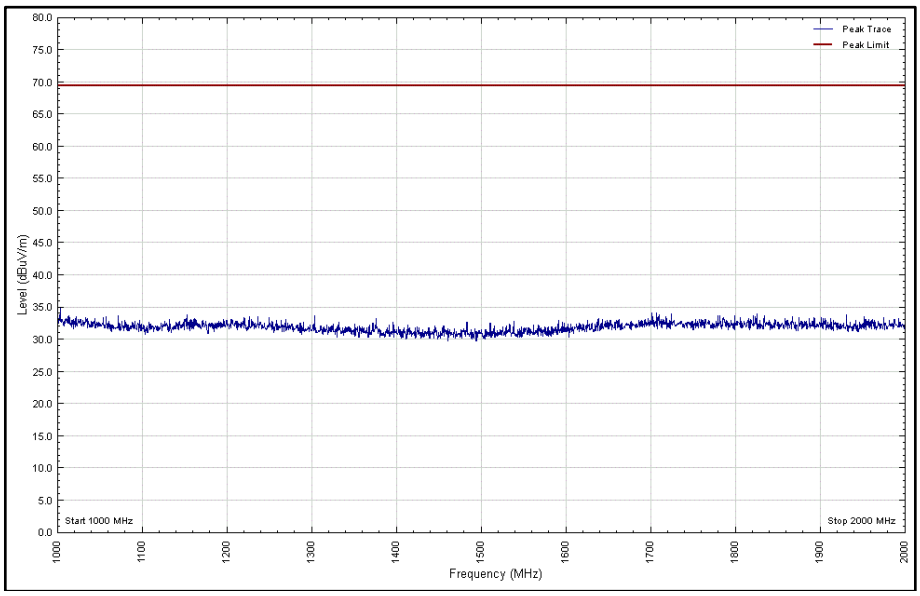

Figure 6 - Graphical Results - Vertical Polarity

Frequency Range of Test: 1 GHz to 2 GHz - Average - X Orientation

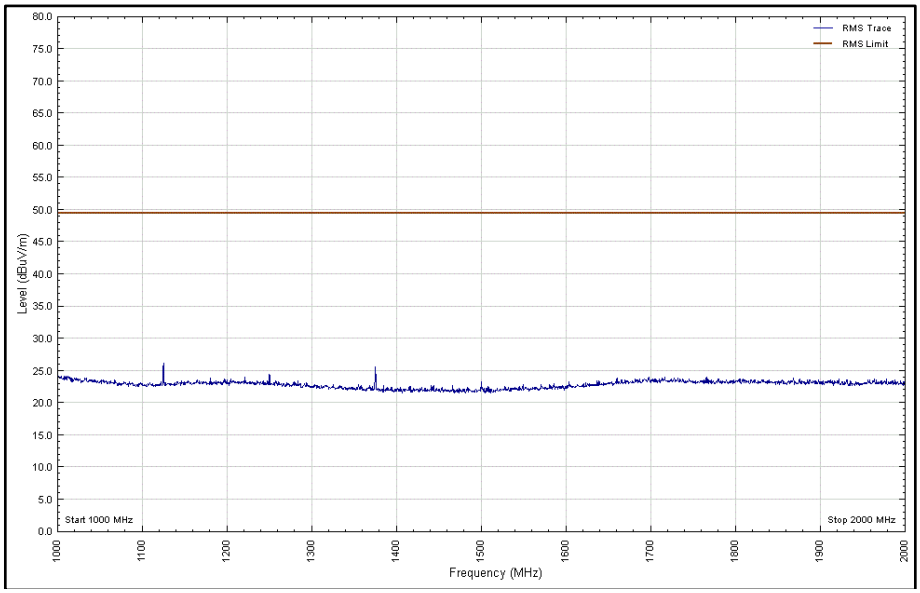

Figure 7 - Graphical Results – Vertical Polarity

Frequency Range of Test: 1 GHz to 2 GHz - Peak - X Orientation

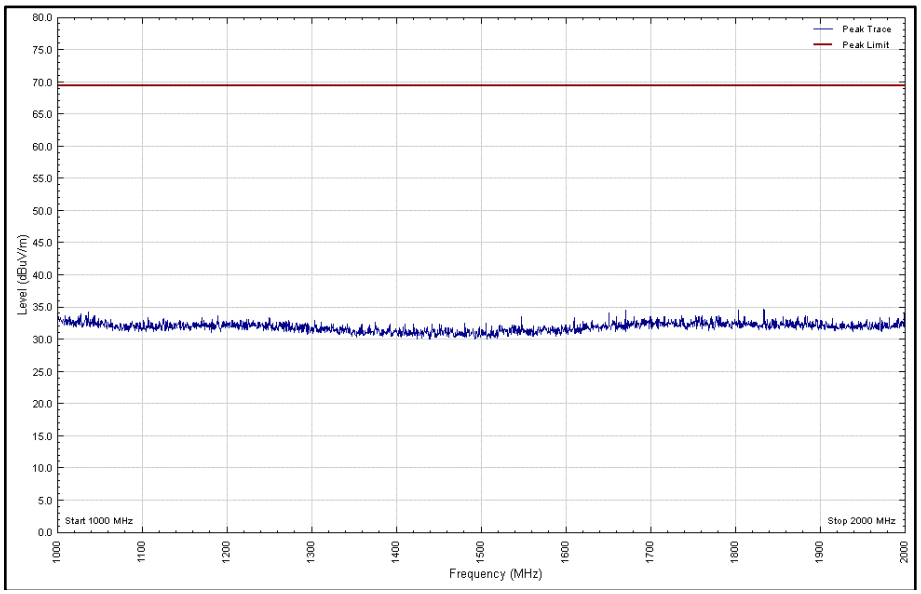

Figure 8 - Graphical Results – Horizontal Polarity

Frequency Range of Test: 1 GHz to 2 GHz - Average - X Orientation

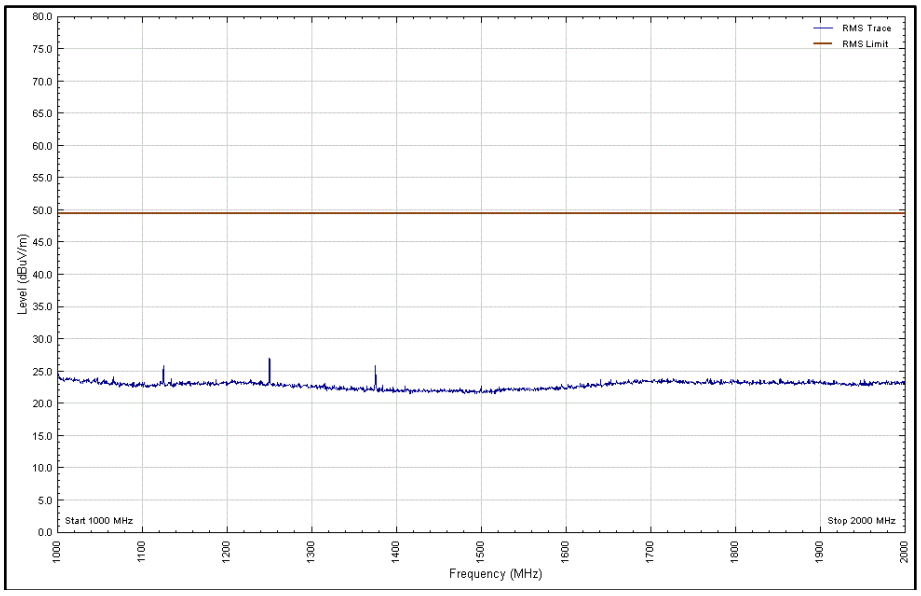

Figure 9 - Graphical Results - Horizontal Polarity

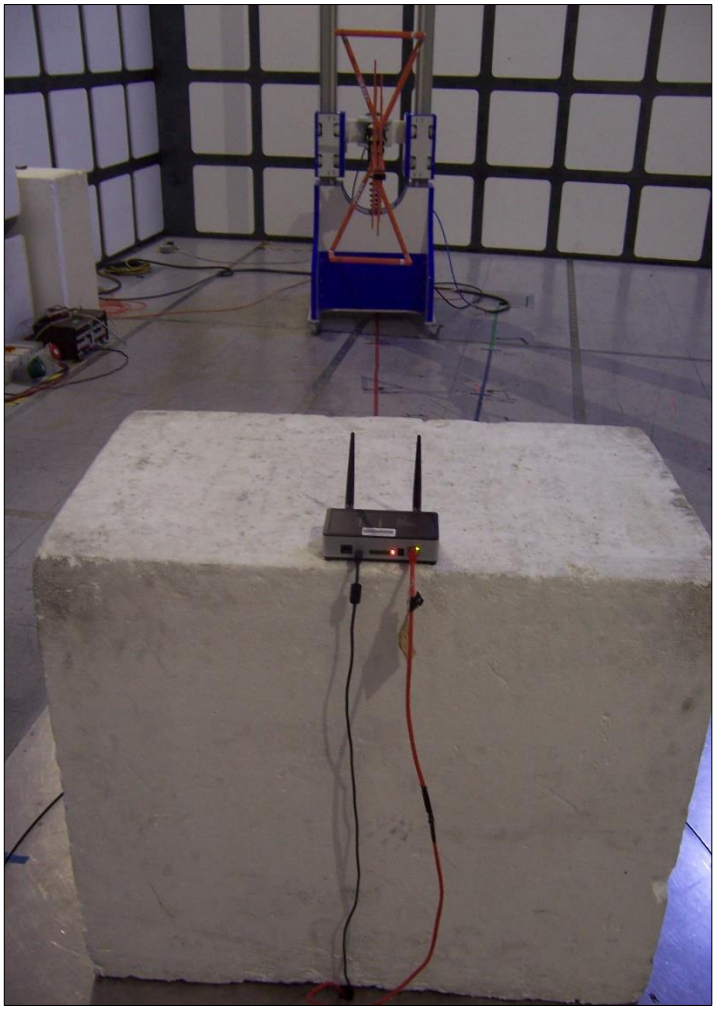

Figure 10 – Test Setup - Radiated Disturbance (30 MHz to 1 GHz)

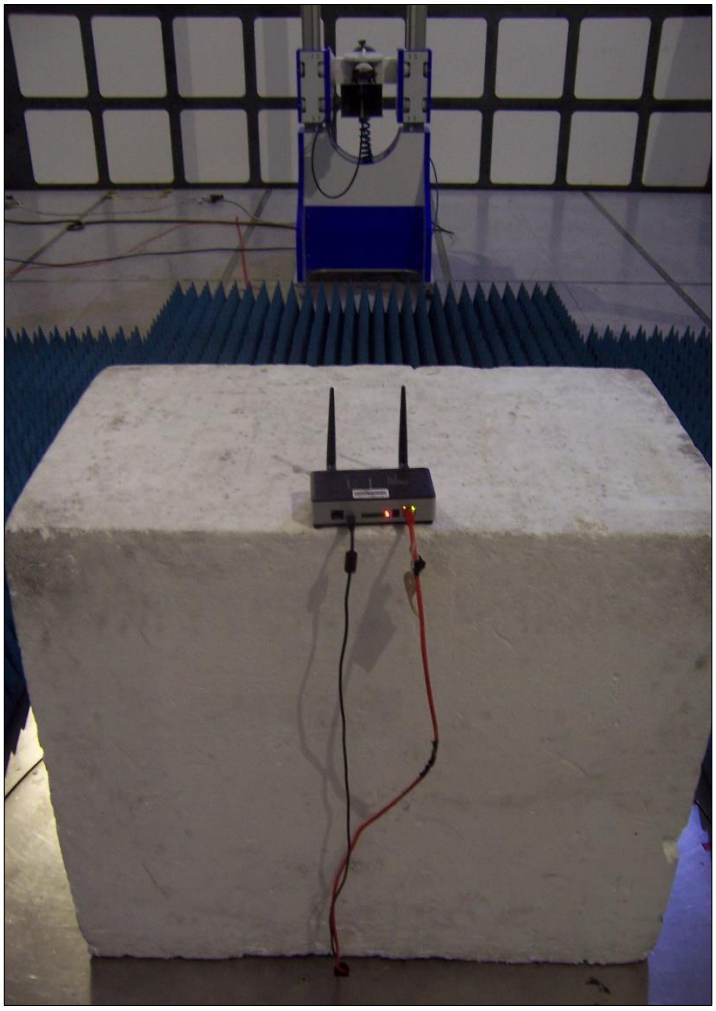

Figure 11 – Test Setup - Radiated Disturbance (1 GHz to 2 GHz)

2.1.10 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
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygromer	Rotronic	A1	2677	12	20-Feb-2020
Digital Multimeter	Iso-tech	IDM-101	2895	12	04-Oct-2019
Antenna with permanent attenuator (Bilog)	Chase	CBL6143	2904	24	08-Aug-2019
Comb Generator	Schaffner	RSG1000	3034	-	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	17-Dec-2019
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	11-Dec-2019
Mast Controller	Maturo Gmbh	NCD	4810	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	4811	-	TU
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	11-Mar-2020
4dB Attenuator	Pasternack	PE7047-4	4935	24	28-Nov-2019
8m N-Type RF Cable	Teledyne	PR90-088-8MTR	5093	12	04-Oct-2019
EmX Software	TUV SUD	EmX V.1.4.7	5125	-	Software

Table 8

TU – Traceability Unscheduled

3 Incident Reports

No incidents reports were raised.

4 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, ±5.2 dB 1 GHz to 40 GHz, Horn Antenna, ±6.3 dB

Table 9

Worst case error for both Time and Frequency measurement 12 parts in 10^6.
All measurement uncertainties have been calculated using CISPR guidelines.