

Report on the FCC Testing of:

ip.access Ltd
E-Class Access Point, Model: 495X

In accordance with FCC 47 CFR Part 15B

Prepared for: ip.access Ltd
Building 2020
Cambourne Business Park
Cambourne
CB23 6DW
United Kingdom

FCC ID: QGGIPA495X



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Document Number: 75945166-01 | Issue: 01

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Kim Archer	Sales Manager	Authorised Signatory	24 May 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	24 May 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.



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Glasgow G75 0QF, United Kingdom
Registered number: SC215164

TÜV SÜD 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



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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	24 May 2019

Table 1

1.2 Introduction

Applicant	ip.access Ltd
Manufacturer	ip.access Ltd
Model Number(s)	E-Class Access Point: 495X Ancillaries: AC Switching Power Supply: PSAA30R-120 PoE: 9001GR
Serial Number(s)	E-Class Access Point: 000295-0100008307 Ancillaries: Switching Power Supply: Not Serialised (75945166-TSR0007) PoE: C11286561000000010
Hardware Version(s)	Rev A
Software Version(s)	5978
Number of Samples Tested	4
Test Specification/Issue/Date	FCC 47 CFR Part 15B: 2018
Order Number	PO41448
Date	18-February-2019
Date of Receipt of EUT	29-March-2019 and 25-March-2019
Start of Test	22-April-2019
Finish of Test	06-May-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: AC Powered – LTE Rx (Mid Channel) with Ethernet Traffic				
2.1	15.107	Conducted Disturbance at Mains Terminals, Class B.	Pass	ANSI C63.4: 2014
2.2	15.109	Radiated Disturbance, Class B.	Pass	ANSI C63.4: 2014
Configuration and Mode: Power over Ethernet - LTE Rx (Mid Channel) with Ethernet Traffic				
2.1	15.107	Conducted Disturbance at Mains Terminals, Class B.	Pass	ANSI C63.4: 2014
2.2	15.109	Radiated Disturbance, Class B.	Pass	ANSI C63.4: 2014

Table 2



1.4 Application Form

Equipment Description

Technical Description: (Please provide a brief description of the intended use of the equipment)	LTE TDD Small Cell
Manufacturer:	Ip access ltd
Model:	E61 Band 48
Part Number:	495X
Hardware Version:	Rev A
Software Version:	TBC
FCC ID (if applicable)	QGGIPA495X
IC ID (if applicable)	Click to edit

Intentional Radiators

Technology	LTE	Click to edit	Click to edit	Click to edit	Click to edit	Click to edit
Frequency Band (MHz)	3550MHz to 3700 MHz	Click to edit	Click to edit	Click to edit	Click to edit	Click to edit
Conducted Declared Output Power (dBm)	24dBm / port	Click to edit	Click to edit	Click to edit	Click to edit	Click to edit
Antenna Gain (dBi)	Click to edit	Click to edit	Click to edit	Click to edit	Click to edit	Click to edit
Supported Bandwidth(s) (MHz)	10M & 20M	Click to edit	Click to edit	Click to edit	Click to edit	Click to edit
Modulation Scheme(s)	QPSK, 16 QAM, 64 QAM	Click to edit	Click to edit	Click to edit	Click to edit	Click to edit
ITU Emission Designator	20M0G1W	Click to edit	Click to edit	Click to edit	Click to edit	Click to edit
Bottom Frequency (MHz)	3550MHz	Click to edit	Click to edit	Click to edit	Click to edit	Click to edit
Middle Frequency (MHz)	3625MHz	Click to edit	Click to edit	Click to edit	Click to edit	Click to edit
Top Frequency (MHz)	3700MHz	Click to edit	Click to edit	Click to edit	Click to edit	Click to edit

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	3700MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	1.4MHz
Class A Digital Device (Use in commercial, industrial or business environment) ☐	
Class B Digital Device (Use in residential environment only) ☒	

AC Power Source

AC supply frequency: Click to edit (Hz)	
Click to edit V	Max current: Click to edit A
Single Phase ☐ Three Phase ☐	



DC Power Source

Nominal voltage: 12 V
Extreme upper voltage: 12.6 V
Extreme lower voltage: 11.4 V
Max current: 1.75 A

Battery Power Source

Voltage: Click to edit V
End-point voltage: Click or tap here to enter text V (Point at which the battery will terminate)
Alkaline ☐ Leclanche ☐ Lithium ☐ Nickel Cadmium ☐ Lead Acid* ☐ *(Vehicle regulated)
Other ☐ Please detail: Click to edit

Charging

Can the EUT transmit whilst being charged	Yes ☐ No ☒
---	---

Temperature

Minimum temperature: 0 °C	Maximum temperature: 45 °C
---------------------------	----------------------------

Antenna Characteristics

Antenna connector ☐ State impedance Click to edit Ohm
Temporary antenna connector ☐ State impedance Click to edit Ohm
Integral antenna ☒ Type Custom State impedance 2 dBi
External antenna ☐ Type Click to edit State impedance Click to edit dBi

Ancillaries (if applicable)

Manufacturer: Click to edit	Part Number: Click to edit
Model: Click to edit	Country of Origin: Click to edit

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

Name: Adrian Pearce
Position held: Engineering Director
Date: 11/03/2019

1.5 Product Information

1.5.1 Technical Description

LTE TDD Small Cell.

1.5.2 Test Setup Diagram(s)

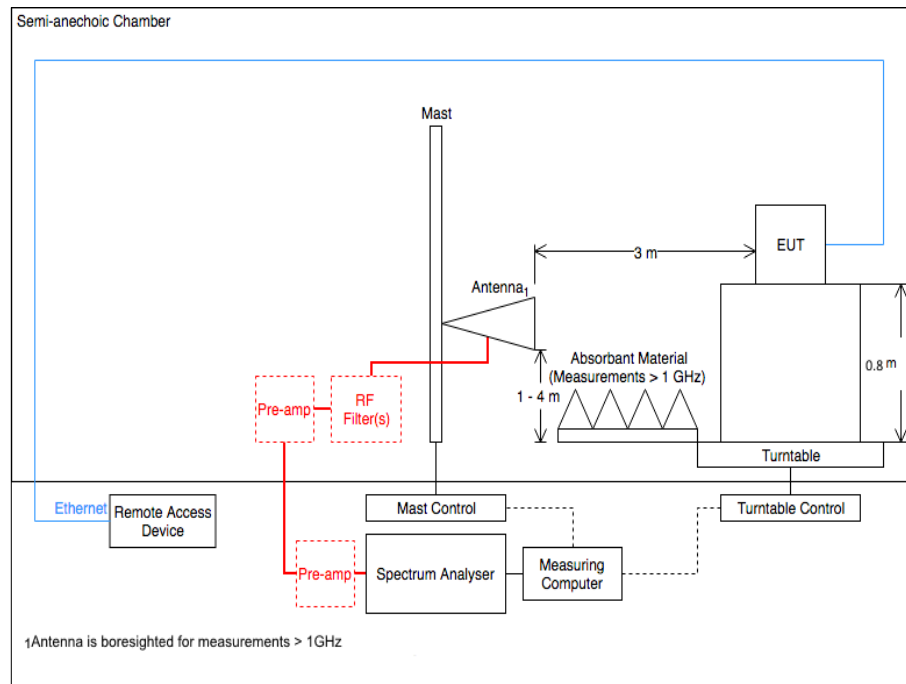


Figure 1 - Radiated Emissions

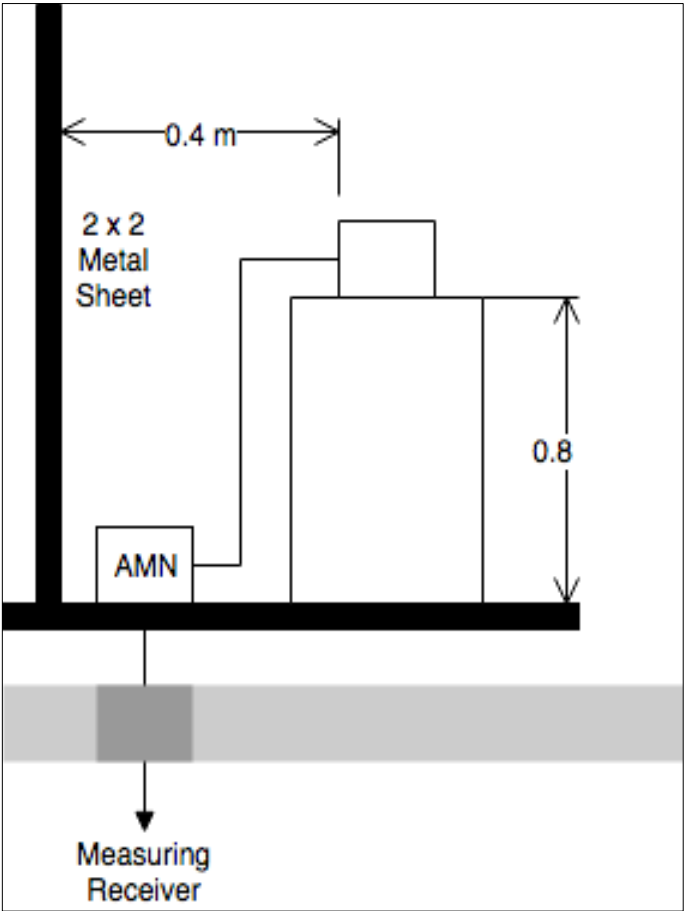


Figure 2 - AC Line Conducted Emissions

1.5.3 EUT Configuration and Rationale for Radiated Spurious Emissions

The EUT was placed on the non-conducting platform in a manner typical of a normal installation. 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.

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: 000295-0100008307			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3



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: AC Powered - LTE Rx (Mid Channel) with Ethernet Traffic		
Conducted Disturbance at Mains Terminals	Graeme Lawler	UKAS
Radiated Disturbance	Graeme Lawler	UKAS
Configuration and Mode: Power over Ethernet - LTE Rx (Mid Channel) with Ethernet Traffic		
Conducted Disturbance at Mains Terminals	Graeme Lawler	UKAS
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 Conducted Disturbance at Mains Terminals

2.1.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.107

2.1.2 Equipment Under Test and Modification State

495X, S/N: 000295-0100008307 - Modification State 0

Ancillaries:

AC Power Supply: PSAA30R-120, S/N: Not Serialised (75945166-TSR0007) - Modification State 0
PoE: 9001GR, S/N: C11286561000000010 - Modification State 0

2.1.3 Date of Test

22-April-2019 to 06-May-2019

2.1.4 Test Method

The EUT was placed on a non-conductive table 0.8m above a reference ground plane. All power was connected to the EUT through an Artificial Mains Network (AMN). Conducted disturbance voltage measurements on mains lines were made at the output of the AMN. The AMN was placed 0.8m from the boundary of the EUT and bonded to the reference ground plane.

2.1.5 Environmental Conditions

Ambient Temperature	17.8 - 20.0 °C
Relative Humidity	37.9 - 43.7 %



2.1.6 Test Results

Results for Configuration and Mode: AC Powered - LTE Rx (Mid Channel) with Ethernet Traffic.

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

Detailed results are shown below.

Line Under Test: AC Mains Neutral

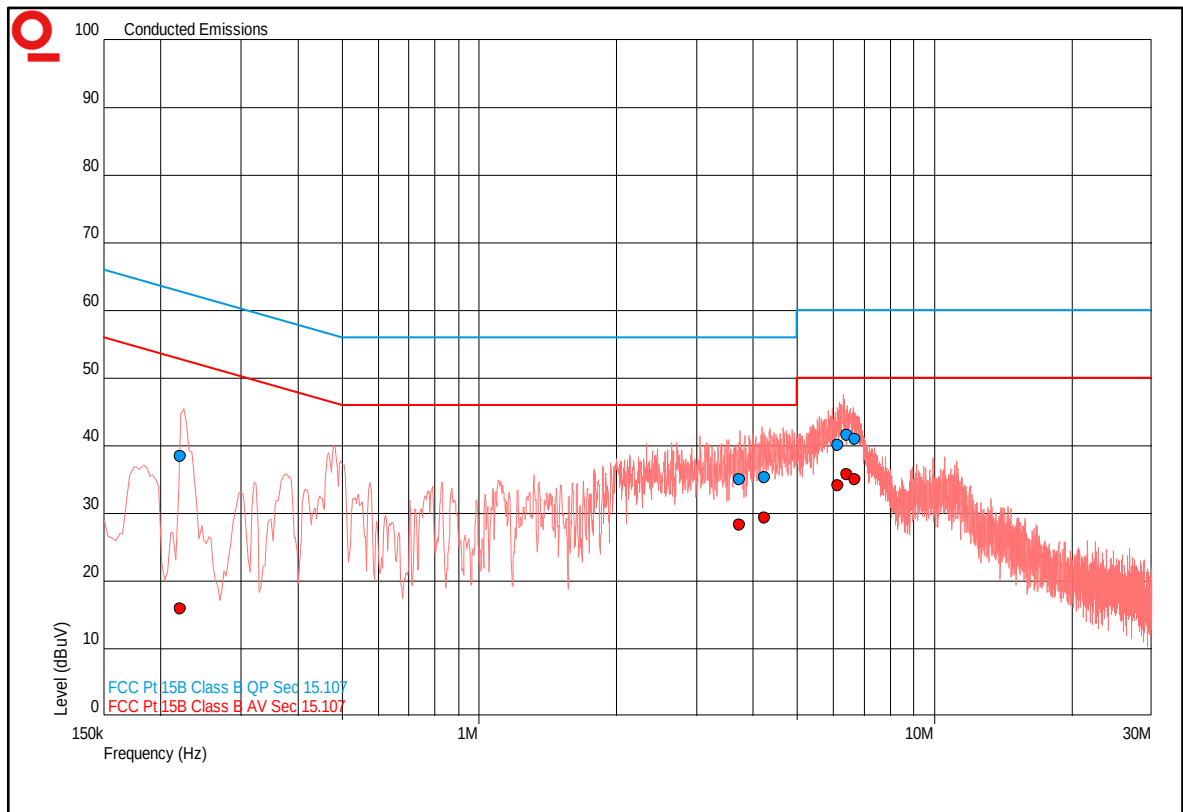


Figure 3 - Graphical Results - AC Mains Neutral

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.221	38.4	62.8	-24.4	15.9	52.8	-36.9
3.741	35.0	56.0	-21.0	28.2	46.0	-17.8
4.234	35.3	56.0	-20.7	29.3	46.0	-16.7
6.143	40.1	60.0	-19.9	34.1	50.0	-15.9
6.429	41.5	60.0	-18.5	35.7	50.0	-14.3
6.702	40.9	60.0	-19.1	35.0	50.0	-15.0

Table 5



Line Under Test: AC Mains Live

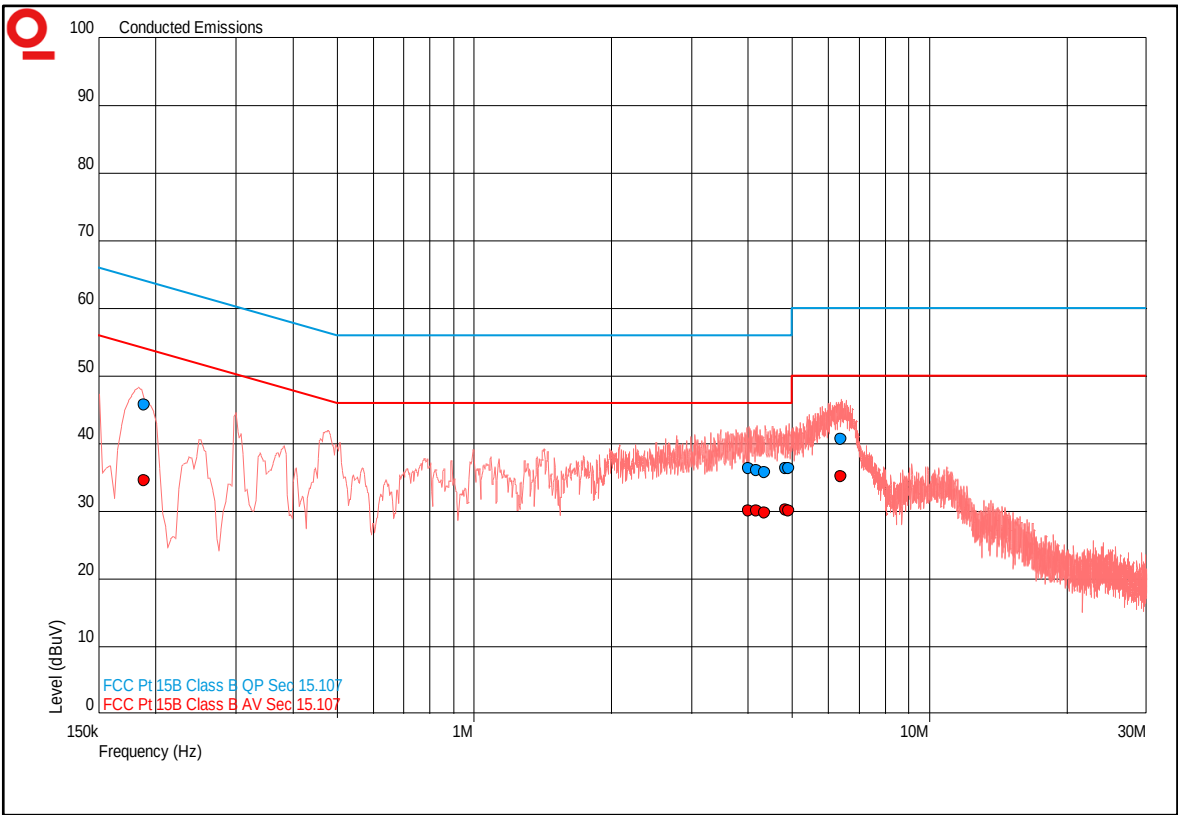


Figure 4 - Graphical Results - AC Mains Live

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.189	45.7	64.1	-18.3	34.5	54.1	-19.6
4.012	36.4	56.0	-19.6	30.1	46.0	-15.9
4.170	36.1	56.0	-19.9	30.1	46.0	-15.9
4.359	35.7	56.0	-20.3	29.8	46.0	-16.2
4.849	36.4	56.0	-19.6	30.2	46.0	-15.8
4.906	36.3	56.0	-19.7	30.1	46.0	-15.9
6.395	40.7	60.0	-19.3	35.1	50.0	-14.9

Table 6

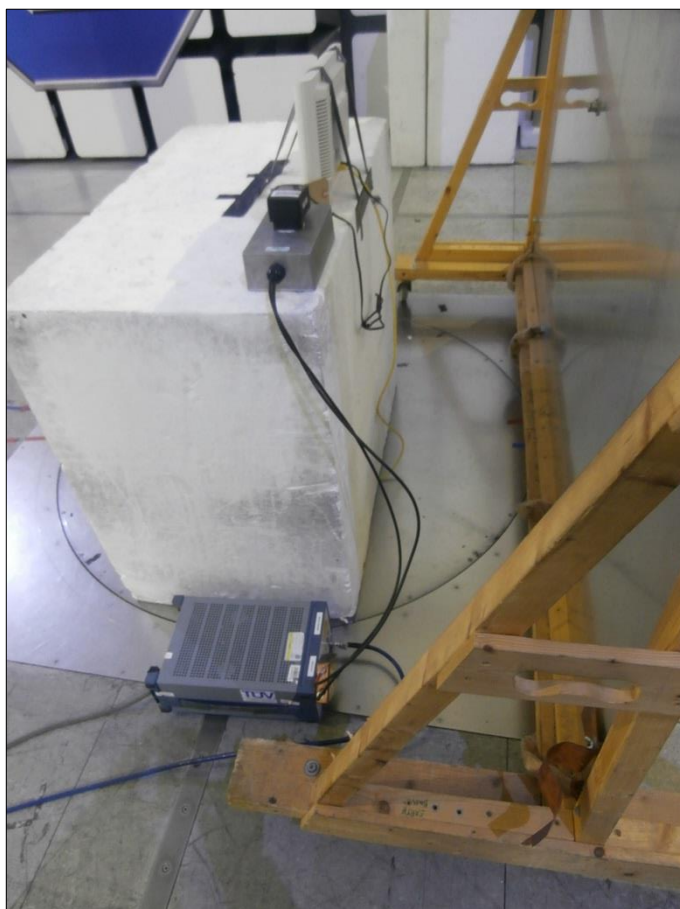


Figure 5 - AC Line Conducted Emissions



Results for Configuration and Mode: Power over Ethernet LTE Rx (Mid Channel) with Ethernet Traffic

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

Detailed results are shown below.

Line Under Test: AC Mains Neutral

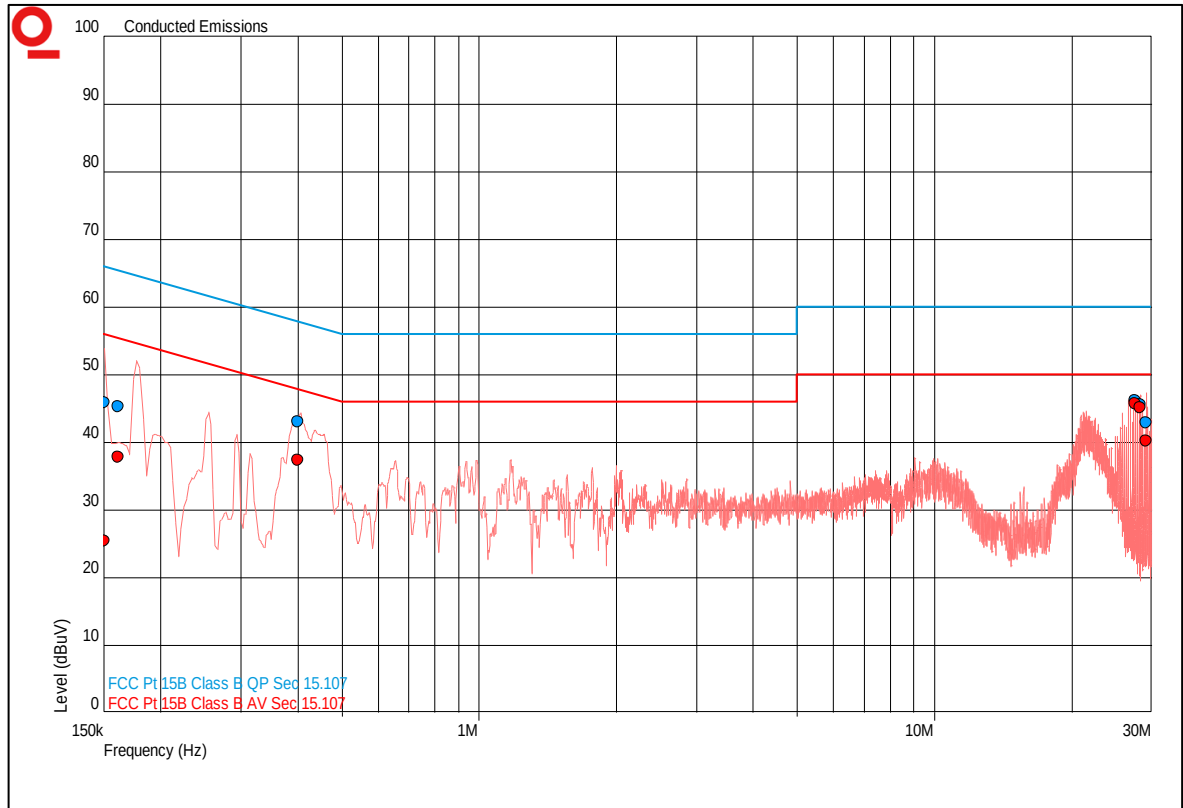


Figure 6 - Graphical Results - AC Mains Neutral

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.150	46.0	66.0	-20.0	25.5	56.0	-30.5
0.162	45.3	65.4	-20.1	37.8	55.4	-17.6
0.400	43.1	57.9	-14.7	37.4	47.9	-10.4
27.614	46.1	60.0	-13.9	45.7	50.0	-4.3
28.360	45.6	60.0	-14.4	45.2	50.0	-4.8
29.104	42.9	60.0	-17.1	40.2	50.0	-9.8

Table 7



Line Under Test: AC Mains Live

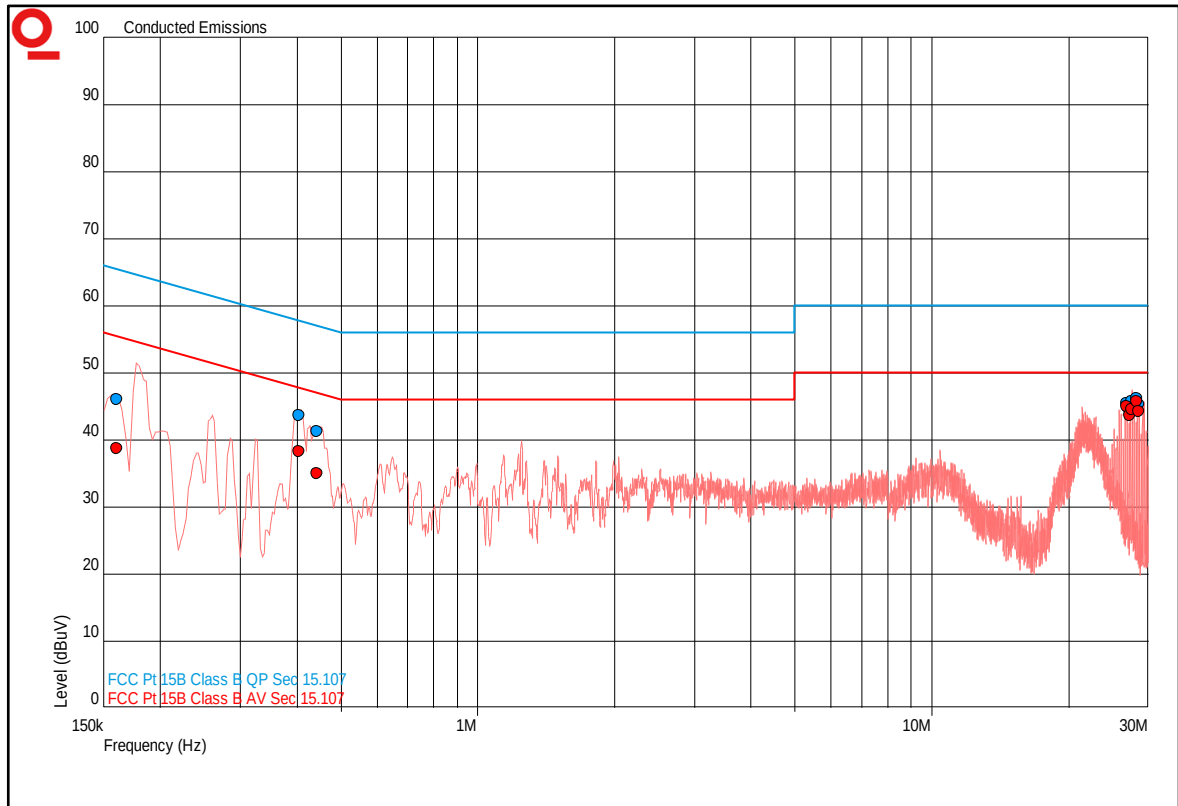


Figure 7 - Graphical Results - AC Mains Live

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.161	46.0	65.4	-19.4	38.7	55.4	-16.7
0.404	43.7	57.8	-14.1	38.3	47.8	-9.5
0.443	41.3	57.0	-15.7	35.0	47.0	-12.0
26.868	45.5	60.0	-14.5	45.0	50.0	-5.0
27.364	44.4	60.0	-15.6	43.7	50.0	-6.3
27.618	45.7	60.0	-14.3	44.6	50.0	-5.4
28.361	46.2	60.0	-13.8	45.8	50.0	-4.2
28.613	45.3	60.0	-14.7	44.3	50.0	-5.7

Table 8



Figure 8 - AC Conducted Emissions



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
Transient Limiter	Hewlett Packard	11947A	15	12	26-Jul-2019
3 Phase Artificial Mains Network (LISN)	Rohde & Schwarz	ESH2-Z5	16	12	28-Feb-2020
LISN (1 Phase)	Chase	MN 2050	336	12	10-Apr-2019
LISN (1 Phase)	Chase	MN 2050	336	12	28-May-2019
LISN	Rohde & Schwarz	ESH3-Z5	1390	12	20-Nov-2019
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Multimeter	Iso-tech	IDM 101	2118	12	08-Feb-2020
Hygrometer	Rotronic	A1	2677	12	20-Feb-2020
Digital Multimeter	Iso-tech	IDM-101	2895	12	04-Oct-2019
Compliance 5 Emissions	Teseq	V5.26.51	3275	-	Software
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	17-Dec-2019
Hygrometer	Rotronic	HP21	4989	12	26-Apr-2019
8 Meter Cable	Teledyne	PR90-088-8MTR	5212	6	28-Jul-2019

Table 9



2.2 Radiated Disturbance

2.2.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.109

2.2.2 Equipment Under Test and Modification State

495X, S/N: 000295-0100008307 - Modification State 0

Ancillaries:

AC Power Supply: PSAA30R-120, S/N: Not Serialised (75945166-TSR0007) - Modification State 0

PoE: 9001GR, S/N: C11286561000000010 - Modification State 0

2.2.3 Date of Test

22-April-2019

2.2.4 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.

2.2.5 Environmental Conditions

Ambient Temperature 18.7 - 20.0 °C

Relative Humidity 41.3 - 43.7 %

2.2.6 Test Results

Results for Configuration and Mode: AC Powered - LTE Rx (Mid Channel) with Ethernet Traffic

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

Detailed results are shown below.

Highest frequency generated or used within the EUT: 3.7 GHz

Which necessitates an upper frequency test limit of: 20 GHz

Frequency (MHz)	Level	Limit	Margin	Detector	Unit	Angle (°)	Height (cm)	Polarisation
*								

Table 10 - Radiated Emissions Result, 30 MHz to 1 GHz

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



Frequency Range of Test: 30 MHz to 1 GHz

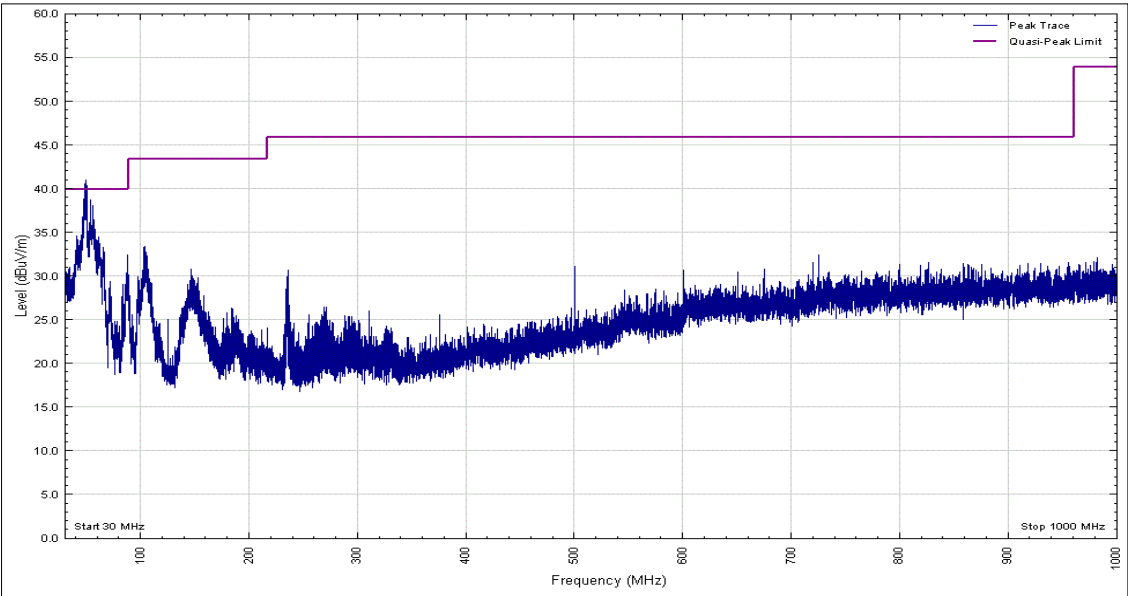


Figure 9 - Graphical Results
Vertical Polarity - EUT Orientation: Y

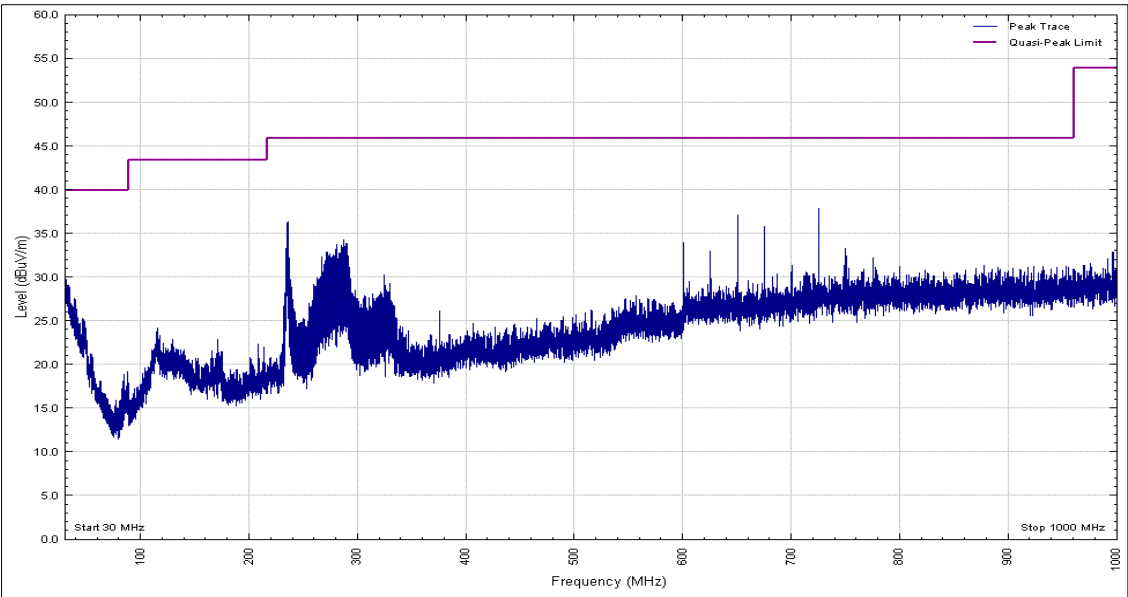


Figure 10 - Graphical Results
Horizontal Polarity - EUT Orientation: Y



Frequency Range of Test: 1 GHz to 20 GHz

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)		EUT Orientation
	Peak	Average	Peak	Average	Peak	Average	
*							

Table 11

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

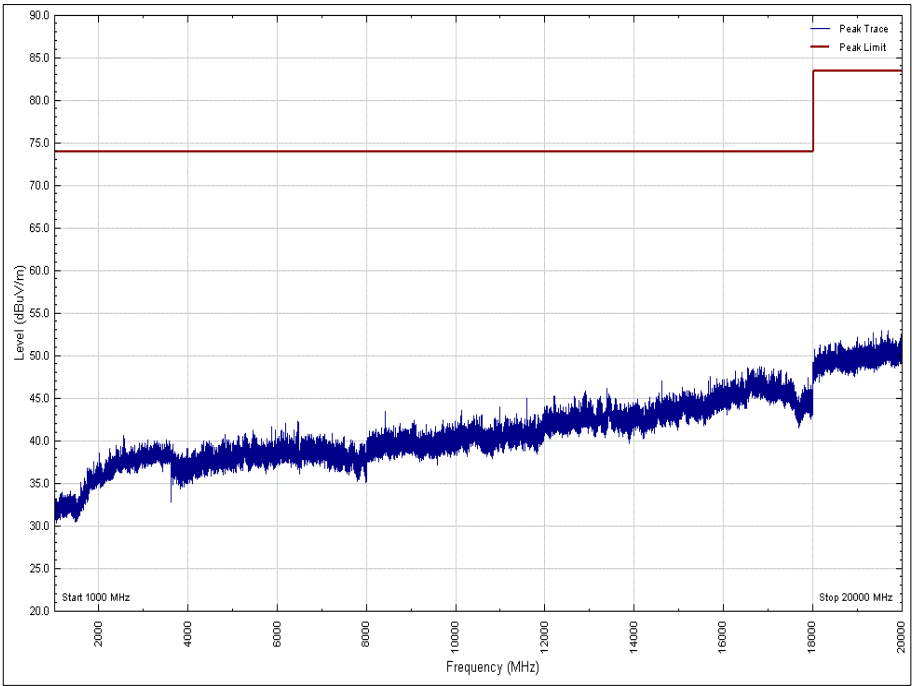


Figure 11 - Graphical Results - 1 GHz to 20 GHz - Peak Vertical Polarity - EUT Orientation: Y

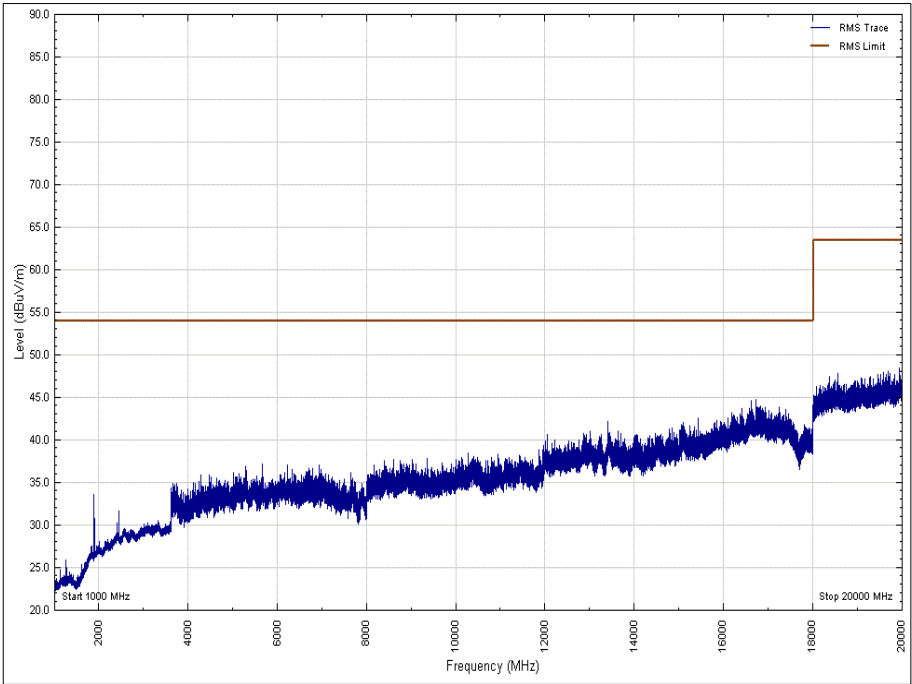


Figure 12 - Graphical Results - 1 GHz to 20 GHz - Average Vertical Polarity - EUT Orientation: Y

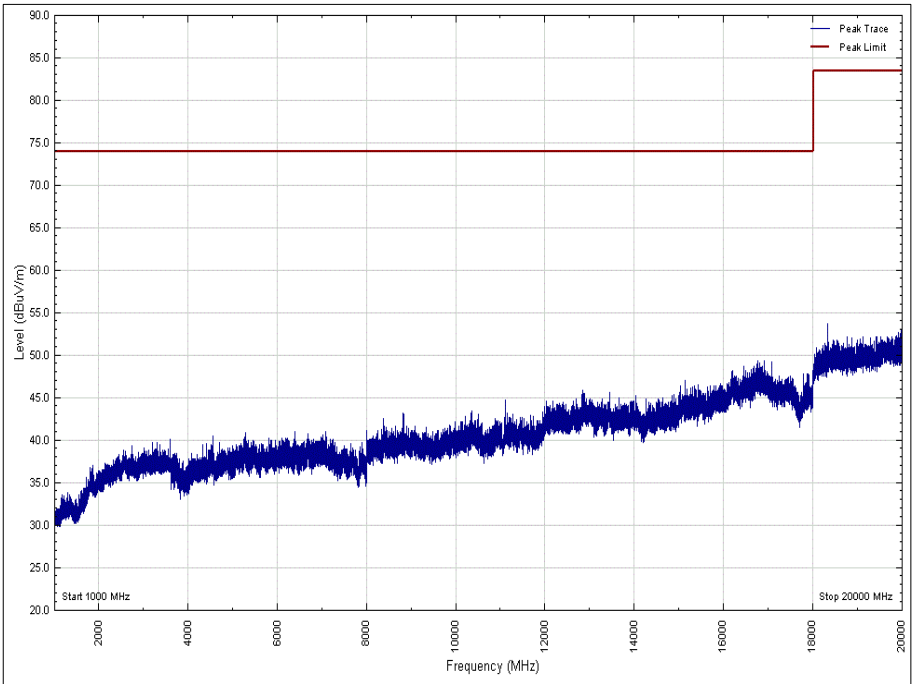


Figure 13 - Graphical Results - 1 GHz to 20 GHz - Peak Horizontal Polarity - EUT Orientation: Y

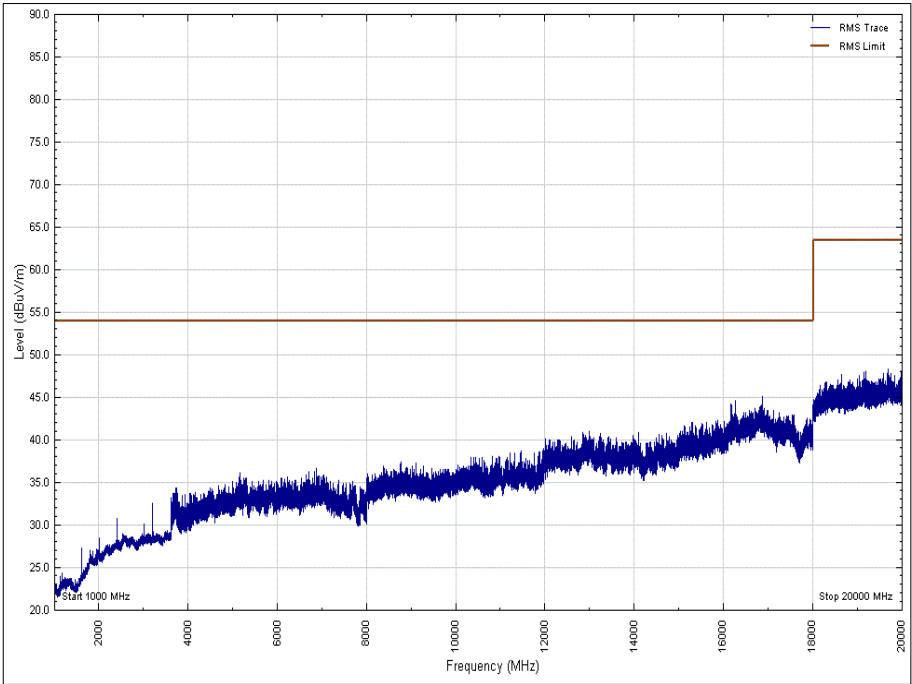


Figure 14 - Graphical Results - 1 GHz to 20 GHz - Average Horizontal Polarity - EUT Orientation: Y



Results for Configuration and Mode: Power Over Ethernet - LTE Rx (Mid Channel) with Ethernet Traffic

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

Detailed results are shown below.

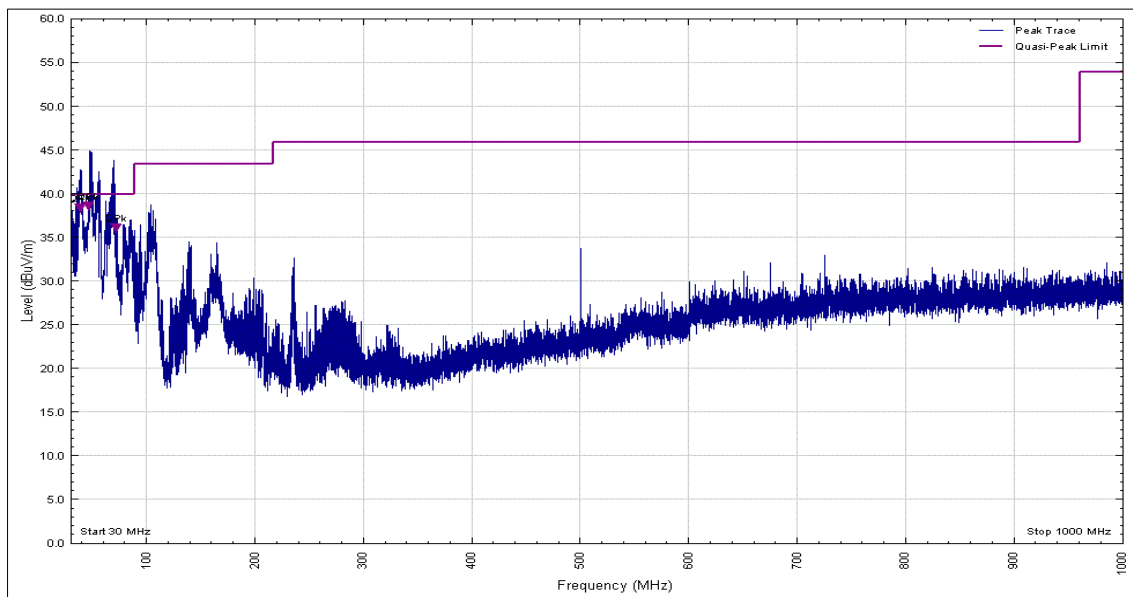
Highest frequency generated or used within the EUT: 3.7 GHz
 Which necessitates an upper frequency test limit of: 20 GHz

Frequency Range of Test: 30 MHz to 1 GHz

Frequency (MHz)	Level	Limit	Margin	Detector	Unit	Angle (°)	Height (cm)	Polarisation
39.196	37.6	40.0	-2.4	Q-Peak	dBuV/m	6	100	Vertical
47.050	37.8	40.0	-2.2	Q-Peak	dBuV/m	17	103	Vertical
72.253	35.3	40.0	-4.7	Q-Peak	dBuV/m	112	100	Vertical

Table 12 - Emissions Results: 30 MHz to 1 GHz - EUT Orientation: Y

Frequency Range of Test: 30 MHz to 1 GHz



**Figure 15 - Graphical Results
 Vertical Polarity - EUT Orientation: Y**

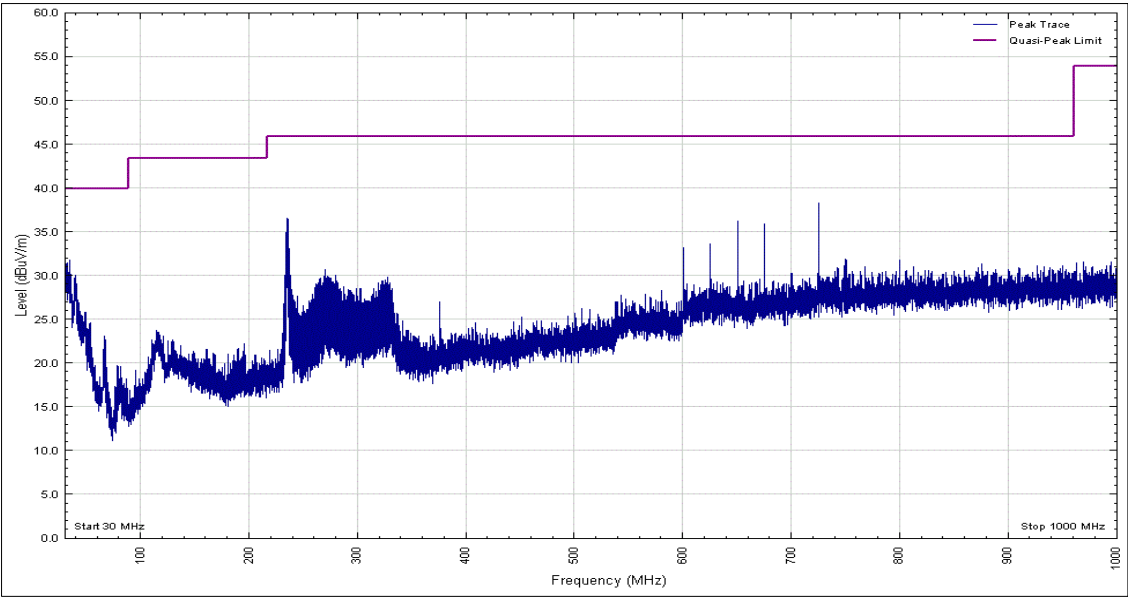


Figure 16 - Graphical Results
Horizontal Polarity - EUT Orientation: Y



Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)		EUT Orientation
	Peak	Average	Peak	Average	Peak	Average	
*							

Table 13

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

Frequency Range of Test: 1 GHz to 20 GHz

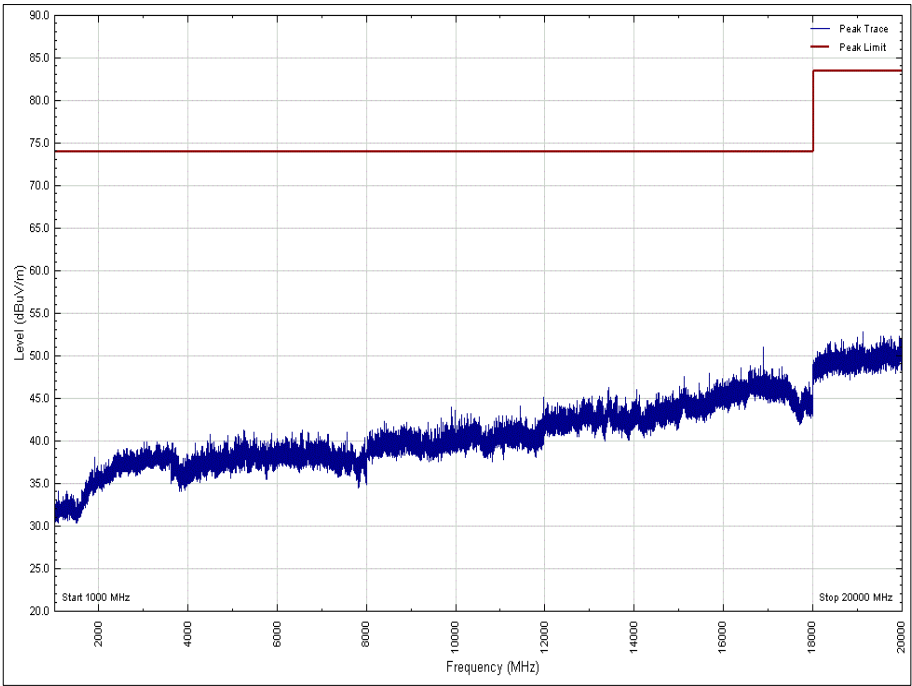


Figure 17 - Graphical Results - 1 GHz to 20 GHz - Peak Vertical Polarity - EUT Orientation: Y

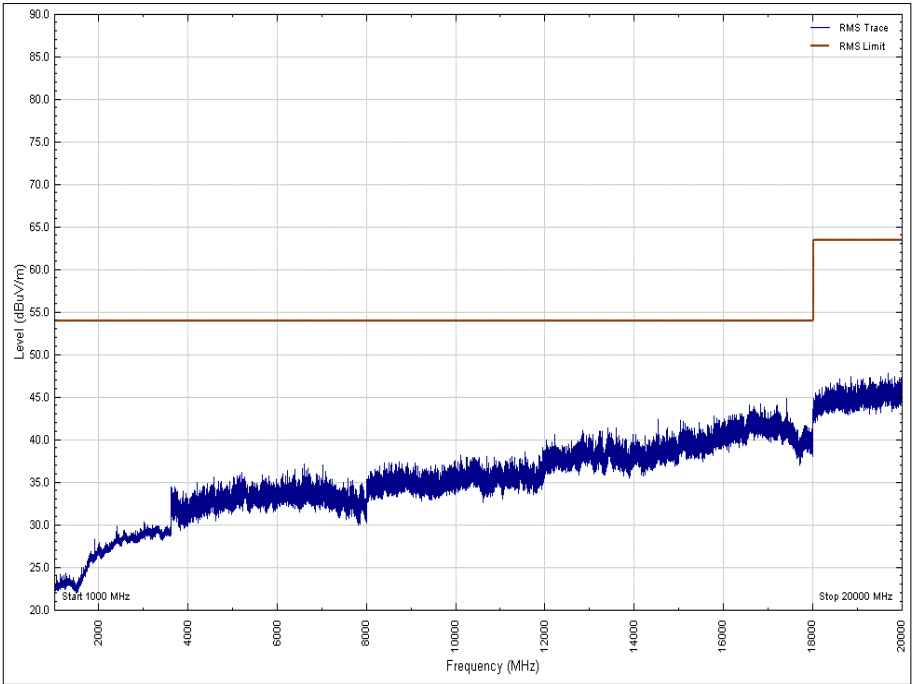


Figure 18 - Graphical Results - 1 GHz to 20 GHz - Average Vertical Polarity - EUT Orientation: Y

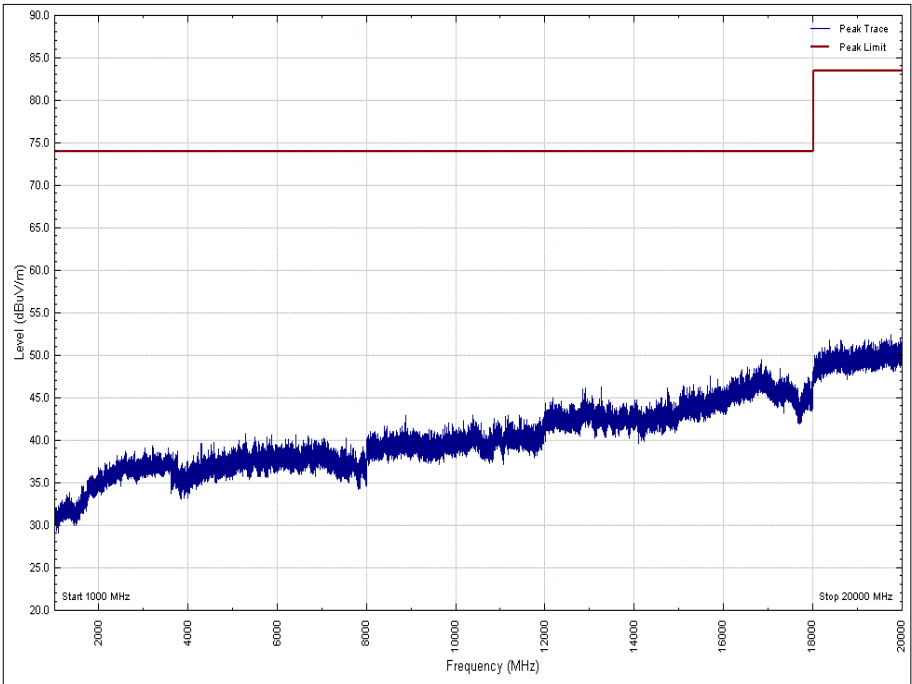
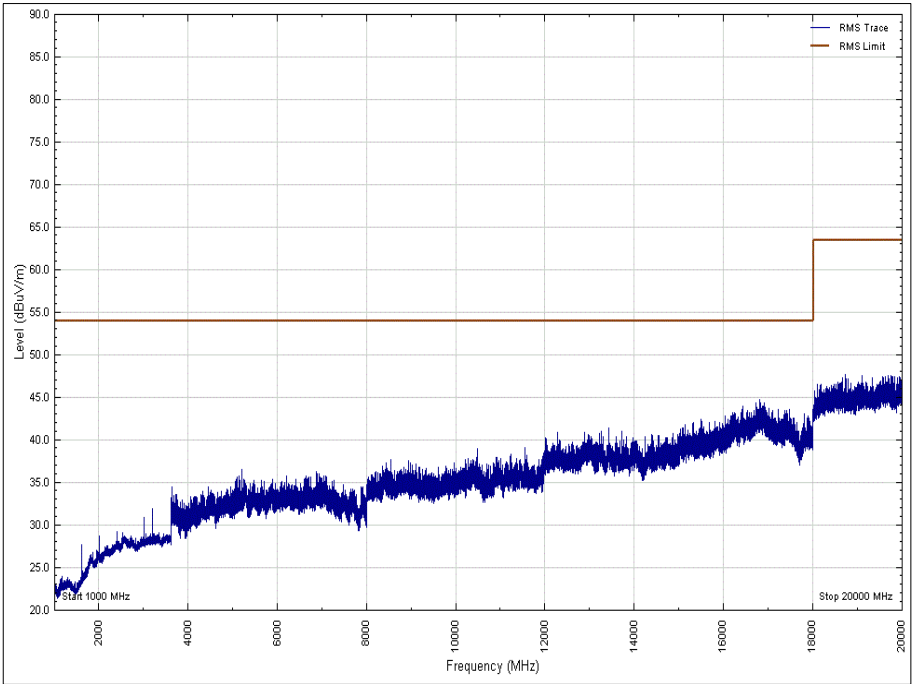


Figure 19 - Graphical Results - 1 GHz to 20 GHz - Peak Horizontal Polarity - EUT Orientation: Y



**Figure 20 - Graphical Results - 1 GHz to 20 GHz - Average
Horizontal Polarity - EUT Orientation: Y**



2.2.7 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
Antenna 18-40GHz (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	02-May-2020
Pre-Amplifier	Phase One	PS04-0086	1533	12	08-Feb-2020
18GHz - 40GHz Pre-Amplifier	Phase One	PS04-0087	1534	12	05-Feb-2020
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Multimeter	Iso-tech	IDM 101	2118	12	08-Feb-2020
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 1503 2M 2.92(P)m 2.92(P)m	Rhophase	KPS-1503A-2000-KPS	4293	12	26-Oct-2019
1GHz to 8GHz Low Noise Amplifier	Wright Technologies	APS04-0085	4365	12	25-Oct-2019
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	26-Apr-2019
Cable (Rx, SMAM-SMAM 0.5m)	Scott Cables	SLSLL18-SMSM-00.50M	4528	6	26-Apr-2019
1 - 18GHz DRG Antenna	ETS-Lindgren	3117	4738	12	05-Mar-2020
Mast Controller	Maturo GmbH	NCD	4810	-	TU
Tilt Antenna Mast	Maturo GmbH	TAM 4.0-P	4811	-	TU
4dB Attenuator	Pasternack	PE7047-4	4935	24	28-Nov-2019
8m N-Type RF Cable	Teledyne	PR90-088-8MTR	5093	12	04-Oct-2019
1.5m 40GHz RF Cable	Scott Cables	KPS-1501-2000-KPS	5127	6	26-Apr-2019

Table 14

TU - Traceability Unscheduled



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, ± 5.2 dB
	1 GHz to 40 GHz, Horn Antenna, ± 6.3 dB
Conducted Disturbance at Mains Terminals	150 kHz to 30 MHz, LISN, ± 3.7 dB

Table 15