

Report on the FCC and IC Testing of:

DETNET SOUTH AFRICA (PTY) LTD
Blast Web - Blast Control Unit, Model: Blast BCU
Blast Web - Power Supply Unit, Model: BlastWeb

In accordance with FCC 47 CFR Part 15B and ICES-003

Prepared for: DETNET SOUTH AFRICA (PTY) LTD
Block 1B, Founders Hill Office Park
Centenary Road
Modderfontein PO Box 10
1645
SOUTH AFRICA



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SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Kim Archer	Sales Manager	Authorised Signatory	09 April 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 and ICES-003. 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	09 April 2019

FCC Accreditation

90987 Octagon House, Fareham Test Laboratory

Industry Canada Accreditation

IC2932B-1 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 and ICES-003: 2016.



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ACCREDITATION

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TÜV SÜD
is a trading name of TÜV SÜD Ltd
Registered in Scotland at East Kilbride,
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	08 March 2019
2	To include references to ICES-003	21 March 2019
3	To amend the FCC and IC IDs.	09 April 2019

Table 1

1.2 Introduction

Applicant	DETNET SOUTH AFRICA (PTY) LTD
Manufacturer	DETNET SOUTH AFRICA (PTY) LTD
Model Number(s)	1) Blast BCU 2) BlastWeb
Serial Number(s)	1) 0890004BB 2) 078000493
Hardware Version(s)	V3A
Software Version(s)	36694
Number of Samples Tested	1 plus power supply
Test Specification/Issue/Date	FCC 47 CFR Part 15B: 2017 ICES-003: 2016
Order Number	4500366033
Date	30-January-2019
Date of Receipt of EUT	18-February-2019
Start of Test	04-March-2019
Finish of Test	04-March-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 and ICES-003 is shown below.

Section	Specification Clause		Test Description	Result	Comments/Base Standard
	Part 15B	ICES-003			
Configuration and Mode: AC Powered - Charging and Ethernet Data Transfer					
2.1	15.107	6.1	Conducted Disturbance at Mains Terminals	Pass	ANSI C63.4: 2014
2.2	15.109	6.2	Radiated Disturbance	Pass	ANSI C63.4: 2014

Table 2



1.4 Application Form

EQUIPMENT DESCRIPTION	
Model Name/Number	Blast BCU
Part Number	073000XX
Hardware Version	V3A
Software Version	36694
FCC ID (if applicable)	2ARNH-0743337A
Industry Canada ID (if applicable)	24476-0743337A
Technical Description (Please provide a brief description of the intended use of the equipment)	Fixed installation underground electronic detonator blast controller for mining and tunnel development

INTENTIONAL RADIATORS									
Technology	Frequency Band (MHz)	Conducted Declared Output Power (dBm)	Antenna Gain (dBi)	Supported Bandwidth (s) (MHz)	Modulation Scheme(s)	ITU Emission Designator	Test Channels (MHz)		
							Bottom	Middle	Top

UN-INTENTIONAL RADIATOR	
Highest frequency generated or used in the device or on which the device operates or tunes	192MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	1200Hz
Class A Digital Device (Use in commercial, industrial or business environment) ☒	
Class B Digital Device (Use in residential environment only) ☐	

Power Source			
AC	Single Phase	Three Phase	Nominal Voltage
	230		230
External DC	Nominal Voltage		Maximum Current
Battery	Nominal Voltage		Battery Operating End Point Voltage
	12		14.2
Can EUT transmit whilst being charged?			Yes ☒ No ☐



EXTREME CONDITIONS					
Maximum temperature	70	°C	Minimum temperature	-20	°C

Ancillaries
Please list all ancillaries which will be used with the device.
PC blast controller via ethernet connection

ANTENNA CHARACTERISTICS			
☐	Antenna connector	State impedance	Ohm
☐	Temporary antenna connector	State impedance	Ohm
☐	Integral antenna	Type	
☐	External antenna	Type	

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

Name: Herman van der Walt

Position held: Quality and Compliance Manager

Date: 2019-02-01

1.5 Product Information

1.5.1 Technical Description

Fixed installation underground electronic detonator blast controller for mining and tunnel development

1.5.2 Test Setup Diagram(s)

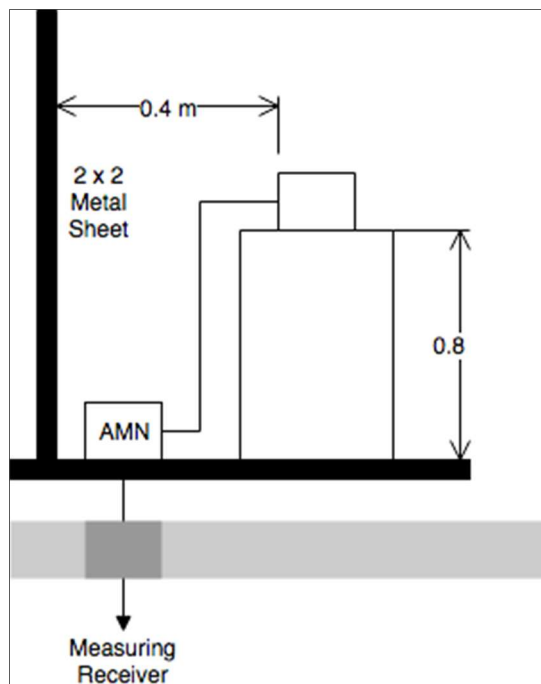


Figure 1 - Conducted Disturbance at Mains Terminals

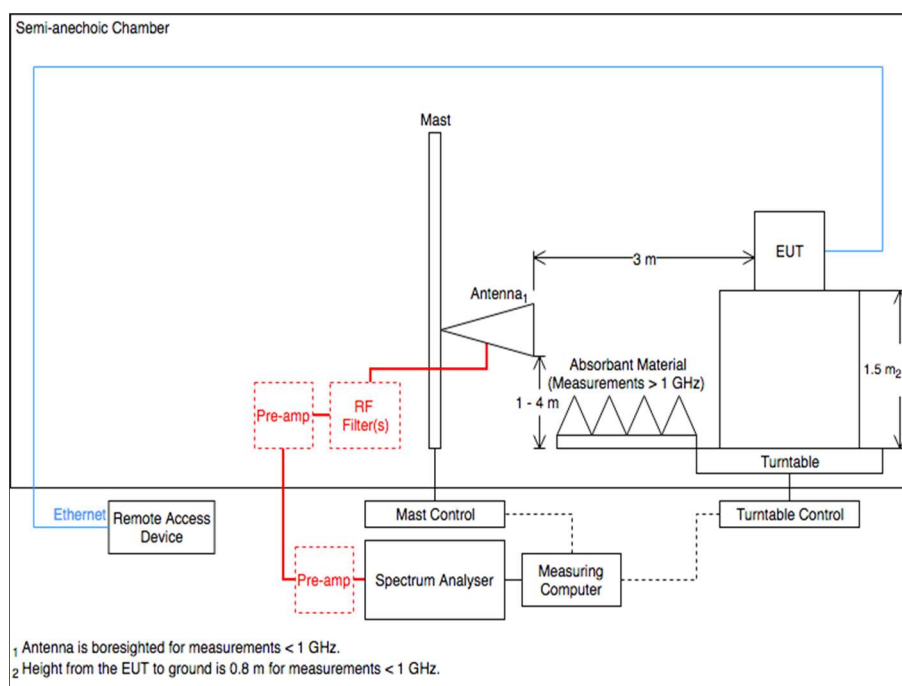


Figure 2 - Radiated Disturbance



1.5.3 EUT Configuration and Rationale for Radiated Spurious Emissions

The EUT was setup on a non-conductive platform 0.8m above a horizontal ground reference plane. All six output channels were representatively loaded.

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
Blast Web - Blast Control Unit: Serial Number: 078000493			
0	As supplied by the customer	Not Applicable	Not Applicable
Blast Web – Power Supply Unit: Serial Number: 0890004BB			
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: AC Powered - Charging and Ethernet Data Transfer		
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
ICES-003, Clause 6.1

2.1.2 Equipment Under Test and Modification State

Blast Web - Blast Control Unit, S/N: 0890004BB - Modification State 0
Blast Web - Power Supply Unit, S/N: 078000493 - Modification State 0

2.1.3 Date of Test

04-March-2019

2.1.4 Test Method

The EUT was placed on a non-conductive table 0.8m above a reference ground plane and 0.4m from a vertical 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	20.2 °C
Relative Humidity	42.4 %



2.1.6 Test Results

Results for Configuration and Mode : AC Powered - Charging and Ethernet Data Transfer.

This test was tested in accordance with the Class A limits.

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

Detailed results are shown below.

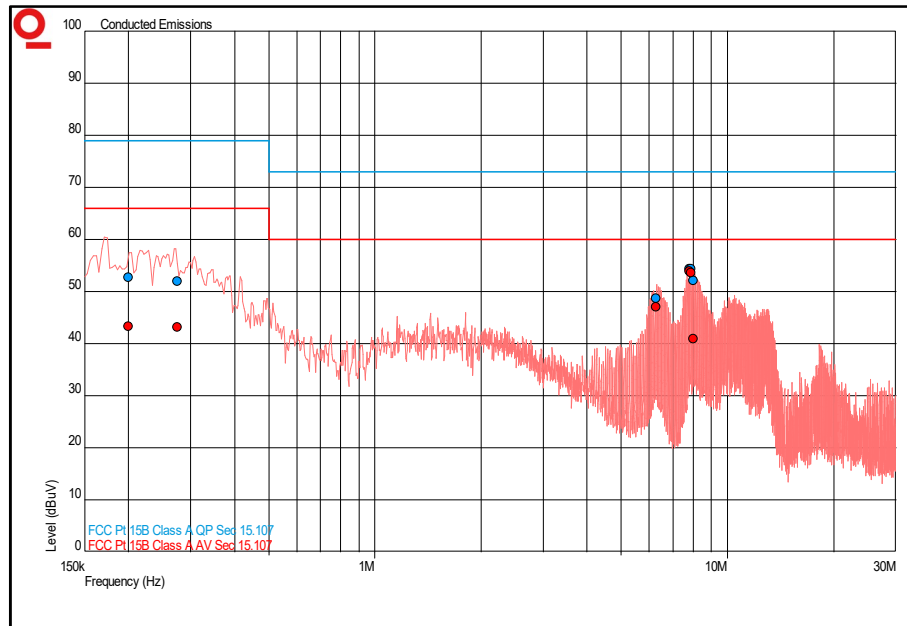


Figure 3 - Graphical Results - AC Mains Neutral

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.200	52.8	79.0	-26.2	43.4	66.0	-22.6
0.275	52.0	79.0	-27.0	43.2	66.0	-22.8
6.284	48.7	73.0	-24.3	47.1	60.0	-12.9
7.807	54.4	73.0	-18.6	54.0	60.0	-6.0
7.870	54.4	73.0	-18.6	53.7	60.0	-6.3
7.988	52.2	73.0	-20.8	41.0	60.0	-19.0

Table 5

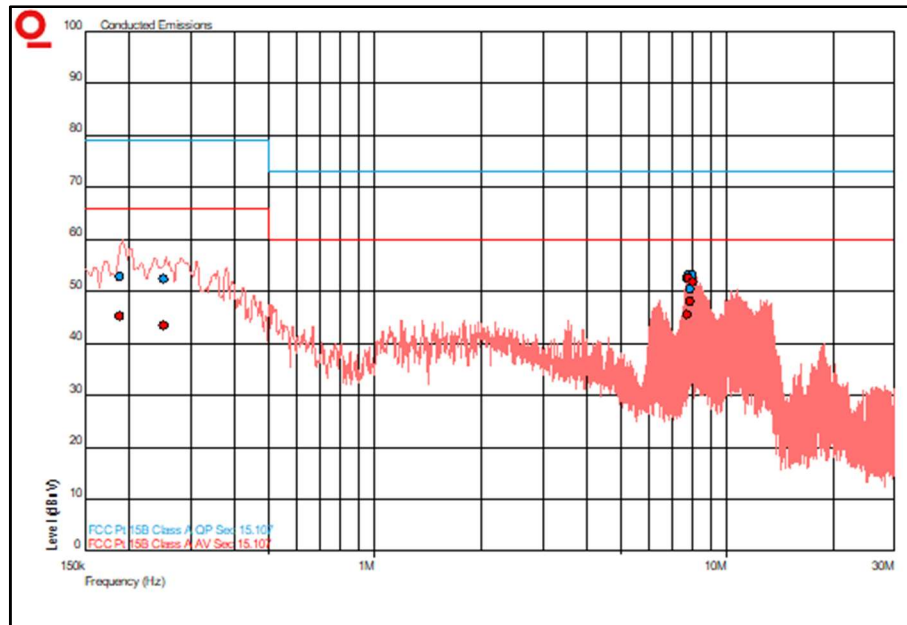


Figure 4 - Graphical Results - AC Mains Live

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.188	53.0	79.0	-26.0	45.4	66.0	-20.6
0.251	52.4	79.0	-26.6	43.5	66.0	-22.5
7.729	52.6	73.0	-20.4	45.7	60.0	-14.3
7.792	53.2	73.0	-19.8	52.6	60.0	-7.4
7.862	50.5	73.0	-22.5	48.1	60.0	-11.9
7.989	53.1	73.0	-19.9	51.9	60.0	-8.1

Table 6

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
LISN (1 Phase)	Chase	MN 2050	336	12	10-Apr-2019
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
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 7



2.2 Radiated Disturbance

2.2.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.109
ICES-003, Clause 6.2

2.2.2 Equipment Under Test and Modification State

Blast Web - Blast Control Unit, S/N: 0890004BB - Modification State 0
Blast Web - Power Supply Unit, S/N: 078000493 - Modification State 0

2.2.3 Date of Test

04-March-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	20.2 °C
Relative Humidity	42.4 %



2.2.6 Test Results

Results for Configuration and Mode: AC Powered - Charging and Ethernet Data Transfer.

This test was tested in accordance with the 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: 198 MHz
Which necessitates an upper frequency test limit of: 2 GHz

Frequency (MHz)	Level	Limit	Margin	Detector	Unit	Angle (°)	Height (cm)	Polarisation
32.000	30.30	39.5	9.20	Q-Peak	dBuV/m	17	103	Vertical
45.248	31.53	39.5	7.97	Q-Peak	dBuV/m	15	100	Vertical

Table 8 - Emissions Results: 30 MHz to 1 GHz, Horizontal and Vertical Polarity

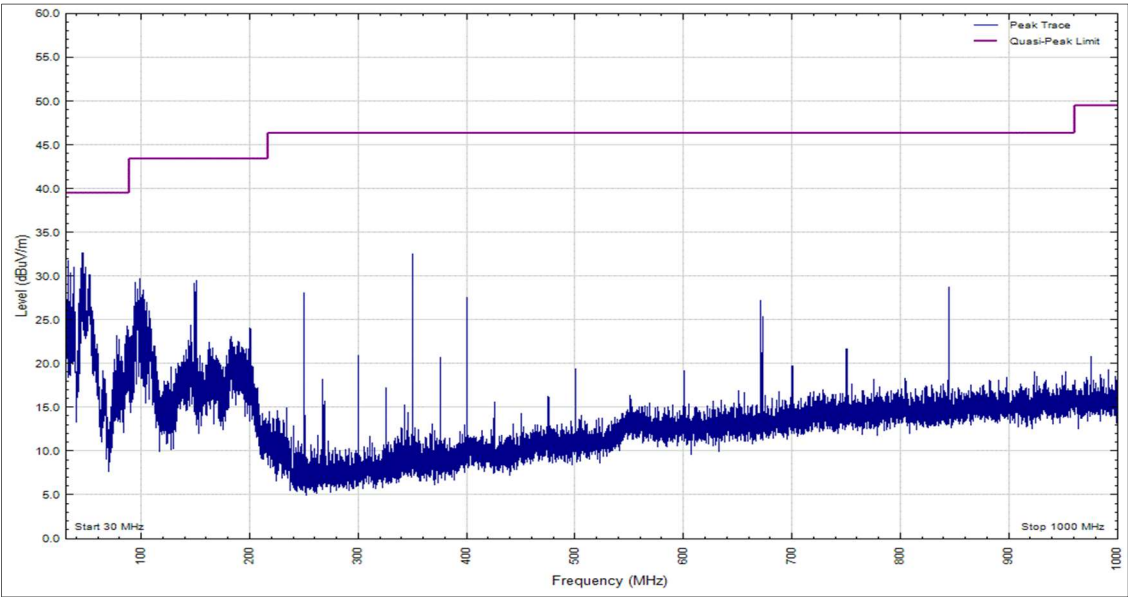


Figure 5 - Graphical Results - 30 MHz to 1 GHz - Vertical Polarity

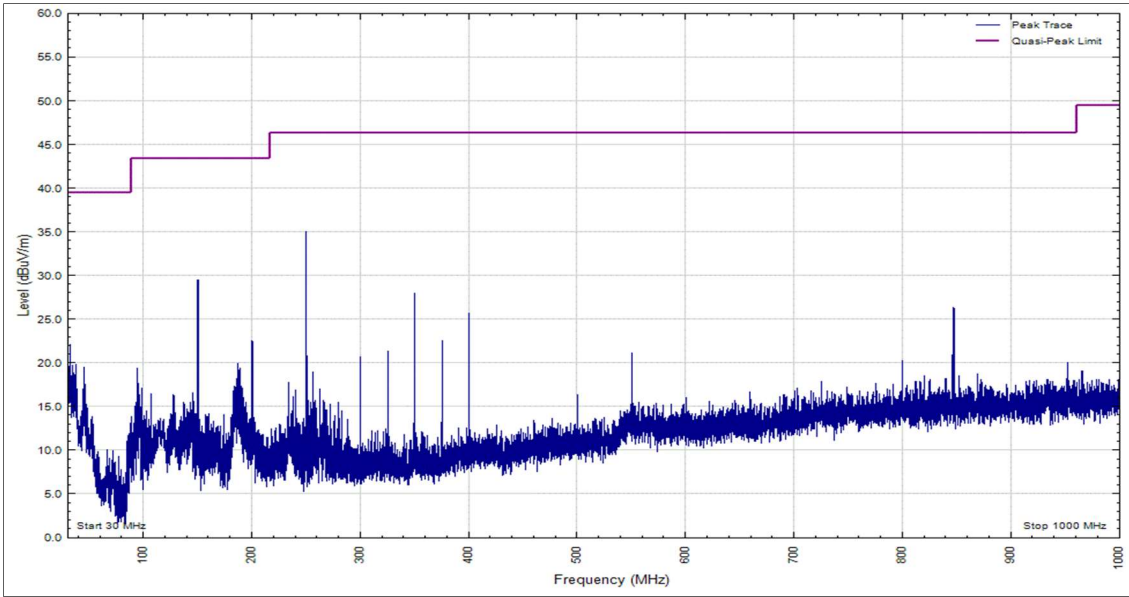


Figure 6 - Graphical Results - 30 MHz to 1 GHz - Horizontal Polarity-

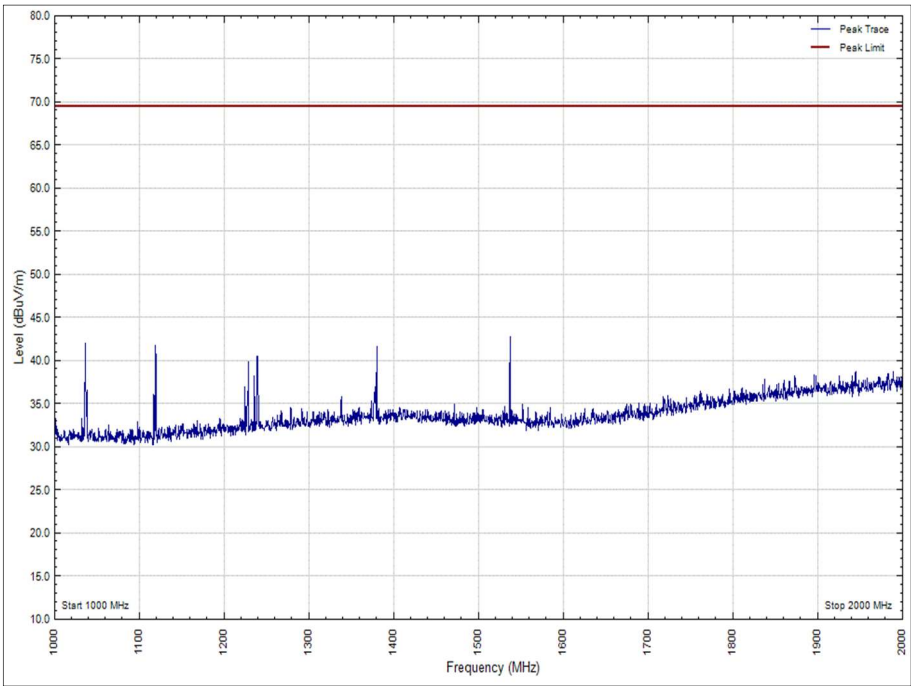


Figure 7 - Graphical Results - 1 GHz to 2 GHz – Peak Vertical Polarity

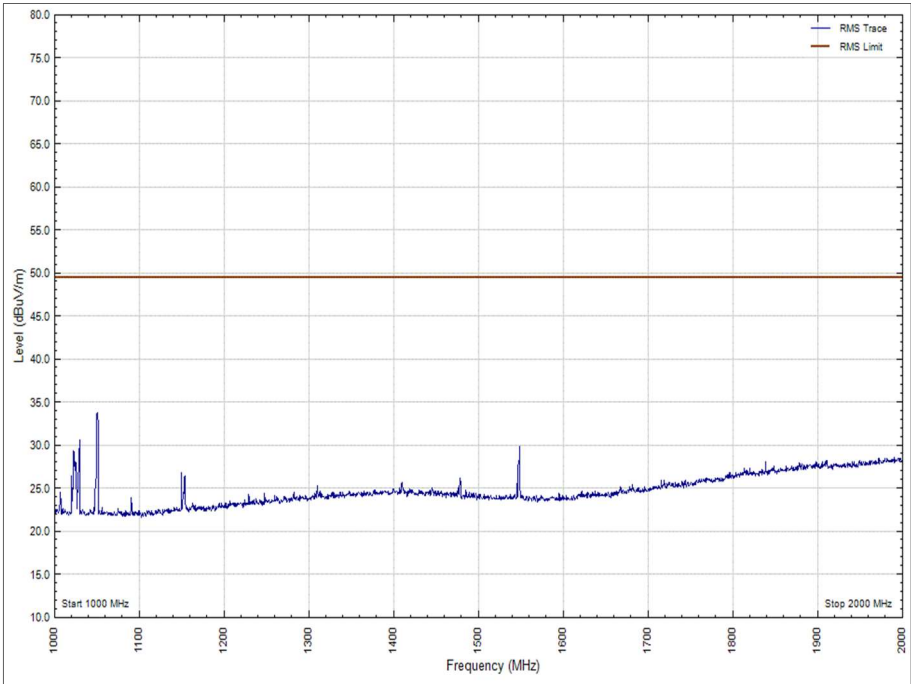


Figure 8 - Graphical Results - 1 GHz to 2 GHz – Average - Vertical Polarity

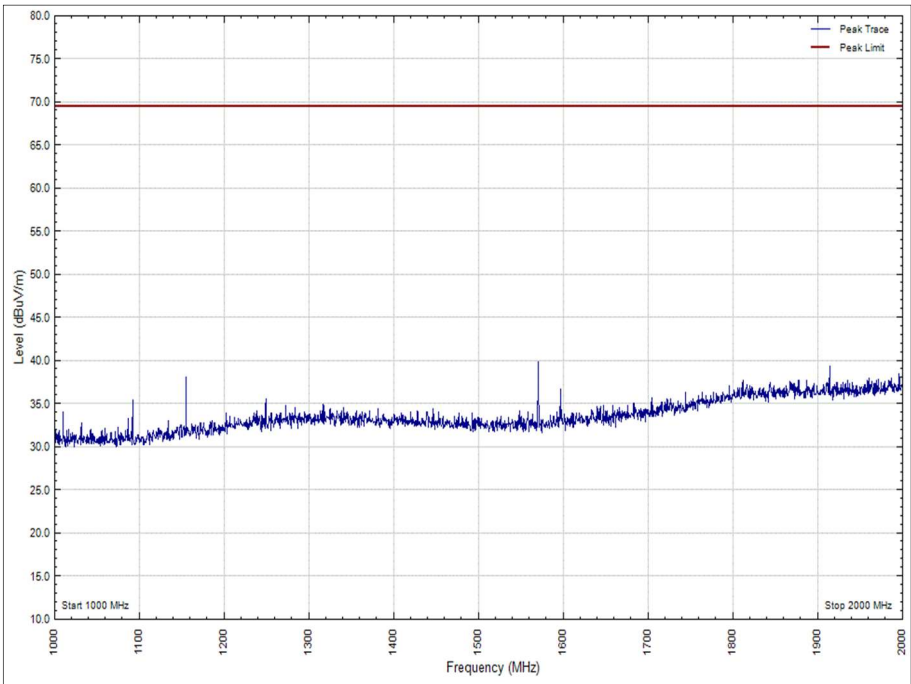


Figure 9 - Graphical Results - 1 GHz to 2 GHz – Peak - Horizontal Polarity

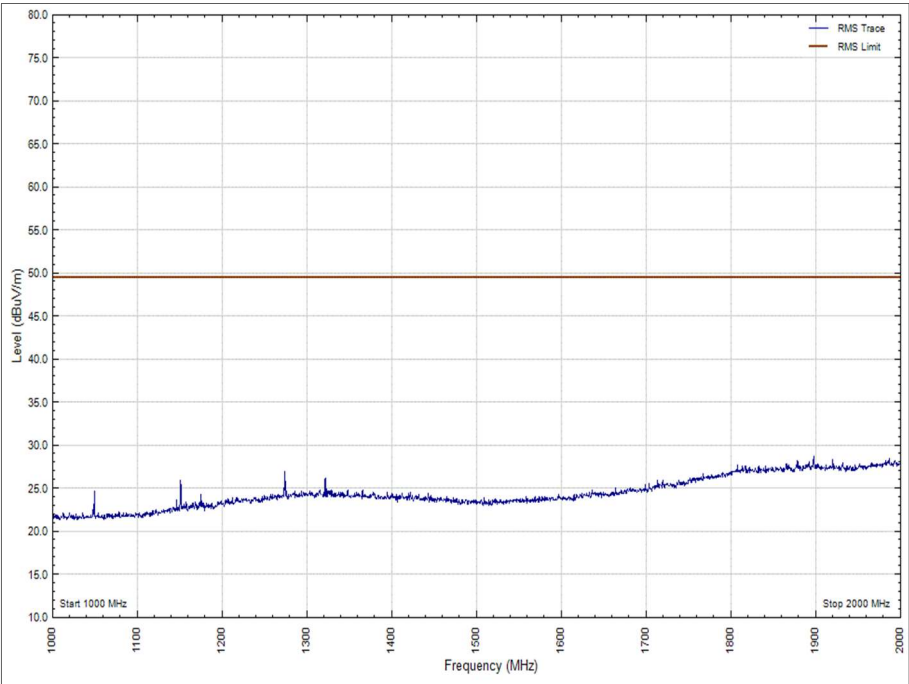


Figure 10 - Graphical Results - 1 GHz to 2 GHz – Average - Horizontal Polarity

Frequency (GHz)	Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)		Angle (°)	Height (m)	Polarisation	EUT Orientation
	Peak	Average	Peak	Average	Peak	Average				
*										

Table 9

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



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
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
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	26-Apr-2019
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
4dB Attenuator	Pasternack	PE7047-4	4935	24	28-Nov-2019
Hygrometer	Rotronic	HP21	4989	12	26-Apr-2019
8m N-Type RF Cable	Teledyne	PR90-088-8MTR	5093	12	04-Oct-2019

Table 10

TU - Traceability Unscheduled

3 Photographs

3.1 Test Setup Photographs



Figure 11 – Conducted Disturbance at Mains Terminals



Figure 12 – Radiated Disturbance (30 MHz to 1 GHz)

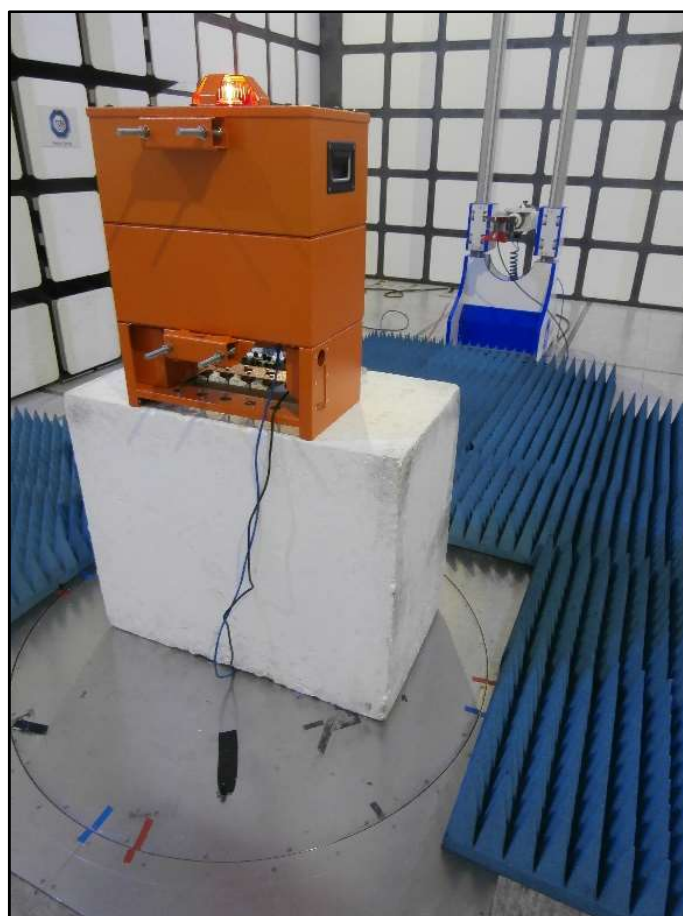


Figure 13 – Radiated Disturbance (1 GHz to 2 GHz)



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
Conducted Disturbance at Mains Terminals	150 kHz to 30 MHz, LISN, ± 3.7 dB

Table 11