Report on the FCC and IC Testing of:

DETNET SOUTH AFRICA (PTY) LTD
Free standing blast controller,
Model: DigiShot Plus
Omni directional aerial, Model: DIPL-A0049
AC Adaptor, Model: PTA-27WS18

In accordance with FCC 47 CFR Part 15B, ICES-003 and Industry Canada RSS-GEN

Add value.
Inspire trust.

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

FCC ID: 2ARNH-09230850 IC: 24476-09230850

COMMERCIAL-IN-CONFIDENCE

Document Number: 75943833-01 | Issue: 02

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, ICES-003 and Industry Canada RSS-GEN. 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, ICES-003: 2016 and Industry Canada RSS-GEN: (2018-04)

TÜV SÜD
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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	14 December 2018
2	To amend the FCC and IC IDs and the Model Name	09 April 2019

Table 1

1.2 Introduction

Applicant	DETNET SOUTH AFRICA (PTY) LTD
Manufacturer	DETNET SOUTH AFRICA (PTY) LTD
Model Number(s)	Free standing blast controller, DigiShot Plus Omni directional aerial, DIPL-A0049 AC Adaptor, PTA-27WS18
Serial Number(s)	Free standing blast controller, 1480002C5 Omni directional aerial, Not Serialised (75943833-TSR0011) AC Adaptor, N/A
Hardware Version(s)	Hardware rev.11 PCB rev.3
Software Version(s)	SVN 34340
Number of Samples Tested	1 plus ancillaries
Test Specification/Issue/Date	FCC 47 CFR Part 15B: 2017 ICES-003: 2016 Industry Canada RSS-GEN: (2018-04)
Order Number Date	4500351687 18-September-2018
Date of Receipt of EUT	20-November-2018
Start of Test	20-November-2018
Finish of Test	25-November-2018
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, ICES-003 and Industry Canada RSS-GEN is shown below.

Section	Specification Clause			Test Description	Result	Comments/Base Standard
	Part 15B	ICES-003	RSS-GEN			
Configuration and Mode: Tx Idle, Rx Operating (902 MHz to 928 MHz)						
2.1	15.107	6.1	8.8	Conducted Disturbance at Mains Terminals	Pass	ANSI C63.4: 2014
2.2	15.109	6.2	7.1	Radiated Disturbance	Pass	ANSI C63.4: 2014

Table 2

1.4 Declaration of Build Status

MAIN EUT	
MANUFACTURING DESCRIPTION	Blasting control of electronic detonators
MANUFACTURER	DetNet South Africa
MODEL NAME/NUMBER	DigiShot Plus
PART NUMBER	
SERIAL NUMBER	1480002C5
HARDWARE VERSION	Hardware rev. 11 PCB rev. 3
SOFTWARE VERSION	SVN 34340
PSU VOLTAGE/FREQUENCY/CURRENT	12 V battery (Can be charged via AC/DC adaptor).
HIGHEST INTERNALLY GENERATED / USED FREQUENCY	928 MHz
FCC ID (if applicable)	2ARNH-09230850
INDUSTRY CANADA ID (if applicable)	24476-09230850
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Free standing electronic detonator blast controller. This unit integrates a EDP-209 (AC4490 transceiver) operating in the 902 MHz to 928 MHz frequency band. It uses frequency hopping technology over 32 channels with an output power of approximately 30 dBm and a Tx duty cycle of approximately 2.9%. The units also include an AC PSU for charging and/or operation, a serial port to download / printing of the blast plan and an omni directional antenna.
COUNTRY OF ORIGIN	South Africa
RF CHARACTERISTICS (if applicable)	
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	902 – 928
RECEIVER FREQUENCY OPERATING RANGE (MHz)	902 – 928
INTERMEDIATE FREQUENCIES	
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)	
MODULATION TYPES: (i.e. GMSK, QPSK)	
OUTPUT POWER (W or dBm)	30dBm
SEPARATE BATTERY/POWER SUPPLY (if applicable)	
MANUFACTURING DESCRIPTION	AC/DC Industrial Desktop Adapter
MANUFACTURER	Meanwell
TYPE	GS Series
PART NUMBER	GS25B18-P1J
PSU VOLTAGE/FREQUENCY/CURRENT	18V, 50/60 Hz, 1.38 A
COUNTRY OF ORIGIN	China
MODULES (if applicable)	
MANUFACTURING DESCRIPTION	Long range RF
MANUFACTURER	900 MHz Laird Transceiver (was aerocomm)
TYPE	AC4490LR-100
POWER	30dBm
FCC ID	KQLAC4490
INDUSTRY CANADA ID	
EMISSION DESIGNATOR	
DHSS/FHSS/COMBINED OR OTHER	FHSS
COUNTRY OF ORIGIN	
ANCILLARIES (if applicable)	
MANUFACTURING DESCRIPTION	Moulded Dipole with magnetic base
MANUFACTURER	Poynting
TYPE	Dipole Antenna
PART NUMBER	DIPL-A0049
SERIAL NUMBER	
COUNTRY OF ORIGIN	South Africa

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

Name: H van der Walt Position held: Quality and Compliance Manager
Date: 2018-10-01

1.5 Product Information

1.5.1 Technical Description

Free standing electronic detonator blast controller.

This unit integrates a EDP-209 (AC4490 transceiver) operating in the 902 MHz to 928 MHz frequency band. It uses frequency hopping technology over 32 channels with an output power of approximately 30 dBm and a Tx duty cycle of approximately 2.9%.

The units also include an AC PSU for charging and/or operation, a serial port to download / printing of the blast plan and an omni directional antenna.

1.5.2 Test Setup Diagram(s)

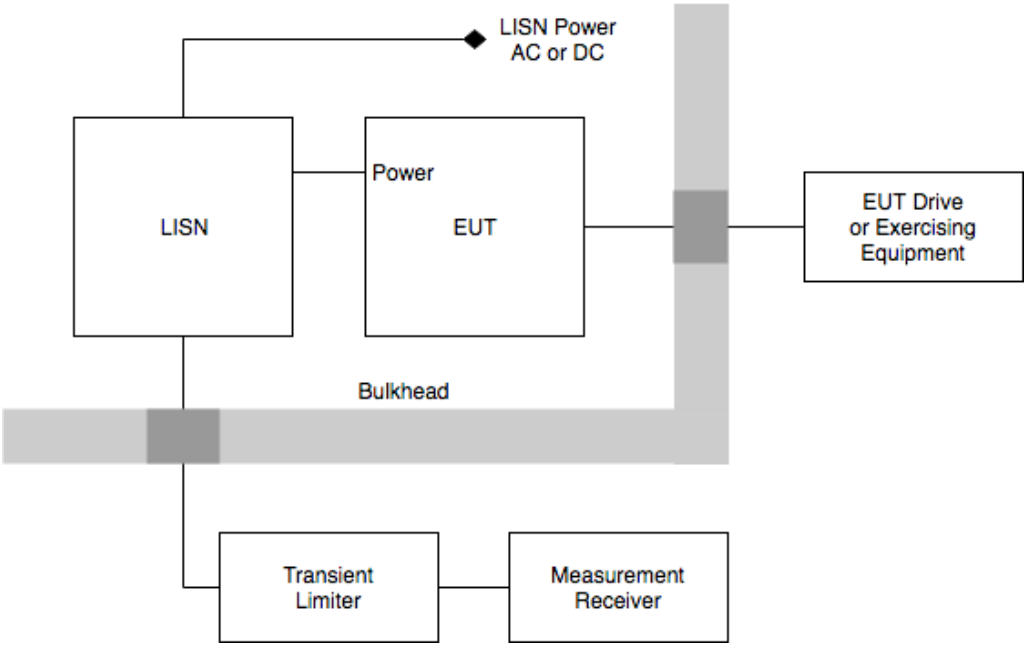
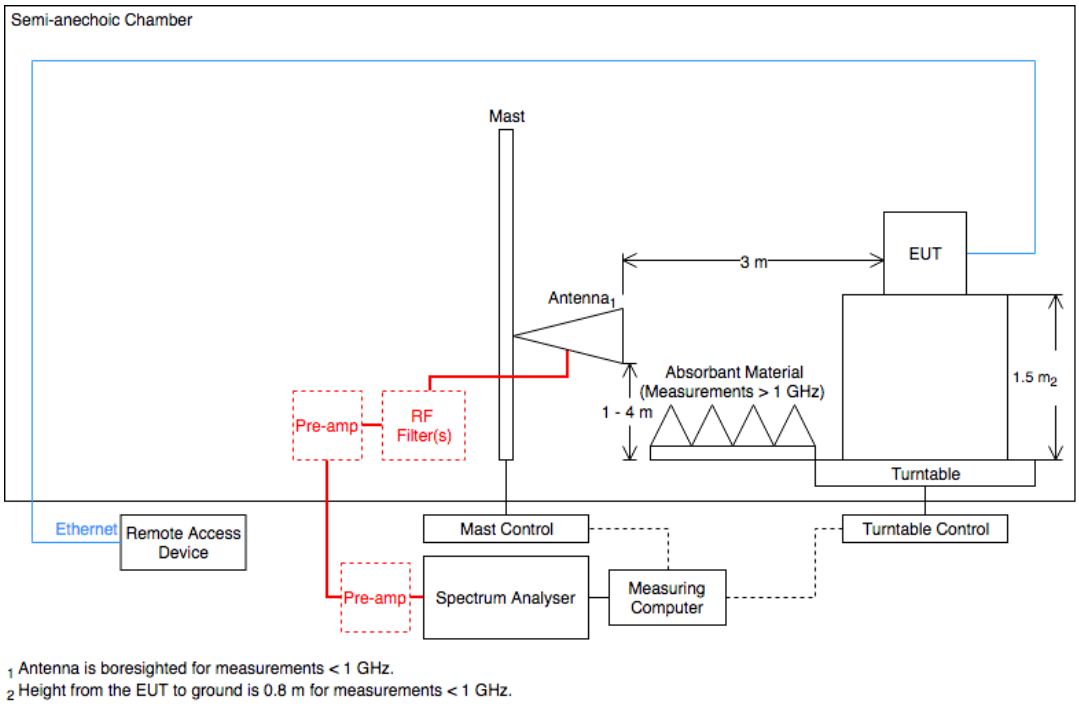


Figure 1 - AC Line Conducted Emissions Test Setup



1 Antenna is boresighted for measurements < 1 GHz.
2 Height from the EUT to ground is 0.8 m for measurements < 1 GHz.

Figure 2 - Radiated Emissions Test Setup

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. Ports on the EUT were terminated with loads as described in ANSI C63.4 clause 6.2.4.

1.6 Deviations from the Standard

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

For EUT's with multiple connectors of the same type, additional interconnecting cables were connected, and pre-scans performed to determine whether the level of the emissions were increased by >2 dB.

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
Free standing blast controller, Serial Number: 1480002C5			
0	As supplied by the customer	Not Applicable	Not Applicable
Omni directional aerial, Serial Number: Not Serialised (75943833- TSR0011)			
0	As supplied by the customer	Not Applicable	Not Applicable
AC Adaptor, Serial Number: N/A			
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: Tx Idle, Rx Operating (902 MHz to 928 MHz)		
Radiated Disturbance	Graeme Lawler	UKAS
Conducted Disturbance at Mains Terminals	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
Industry Canada RSS-GEN, Clause 8.8

2.1.2 Equipment Under Test and Modification State

Free standing blast controller, S/N: 1480002C5 - Modification State 0
Omni directional aerial, S/N: Not Serialised (75943833- TSR0011) - Modification State 0
AC Adaptor, S/N: N/A - Modification State 0

2.1.3 Date of Test

25-November-2018

2.1.4 Test Method

The EUT was placed on a non-conductive table 0.8m above a reference ground plane and 0.4m away from a vertical coupling 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	18.7 °C
Relative Humidity	44.0 %

2.1.6 Test Results

Results for Configuration and Mode : Tx Idle, Rx Operating (902 MHz to 928 MHz).

Testing was performed in accordance with the Class A limits.

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

Detailed results are shown below.

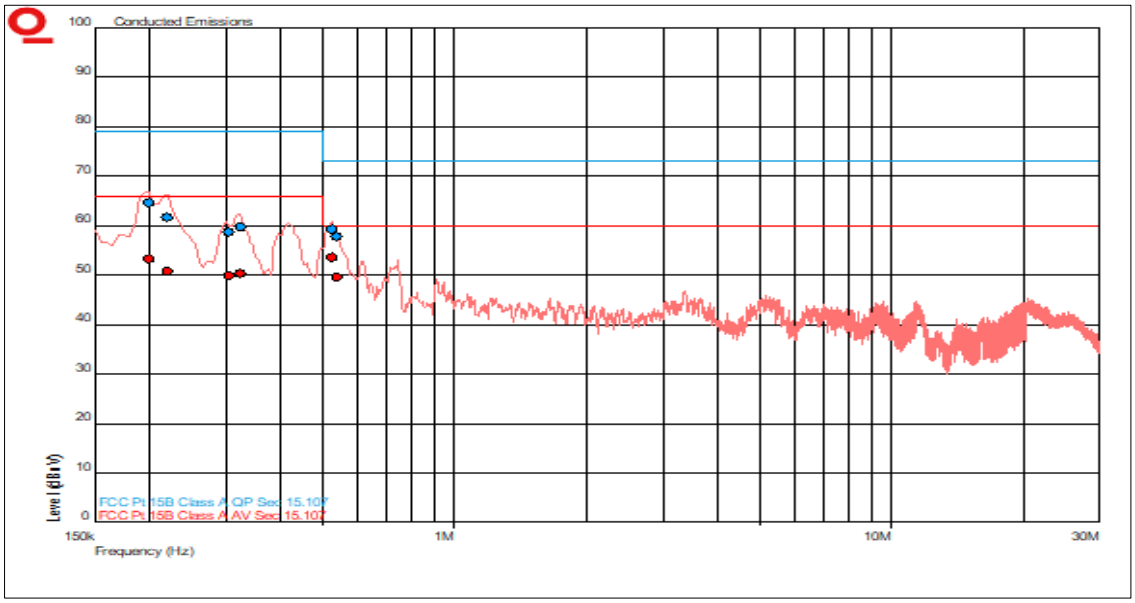


Figure 3 - Graphical Results - Live Line

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.200	64.6	79.0	-14.4	53.4	66.0	-12.6
0.220	61.7	79.0	-17.3	50.8	66.0	-15.2
0.304	58.7	79.0	-20.3	49.9	66.0	-16.1
0.324	59.8	79.0	-19.2	50.4	66.0	-15.6
0.524	59.4	73.0	-13.6	53.6	60.0	-6.4
0.537	57.9	73.0	-15.1	49.6	60.0	-10.4

Table 5

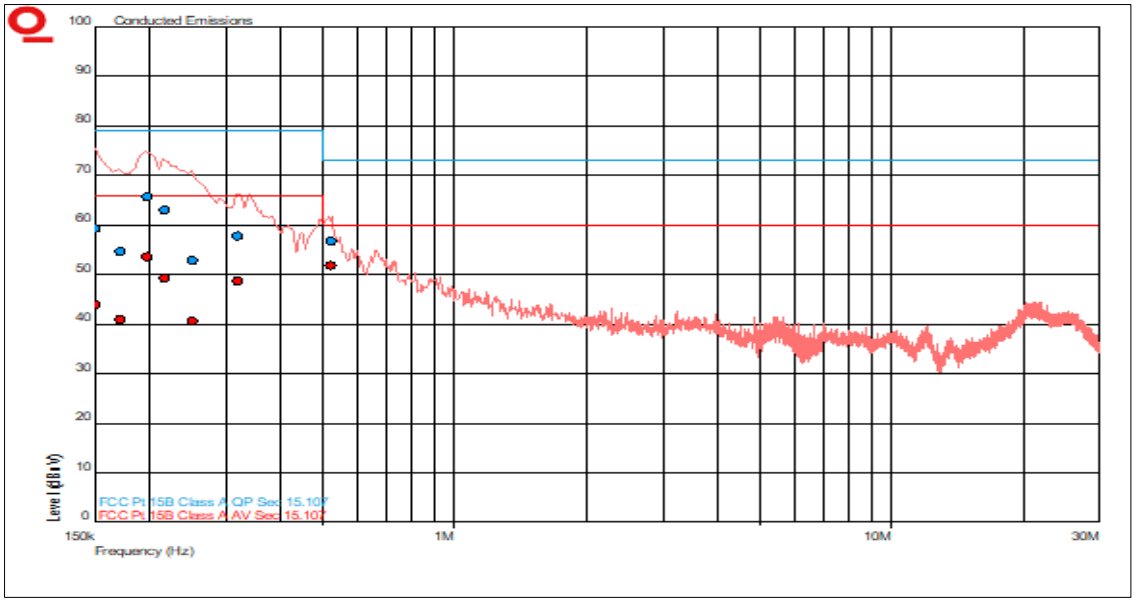


Figure 4 - Graphical Results - Neutral Line

Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.150	59.3	79.0	-19.7	43.9	66.0	-22.1
0.172	54.8	79.0	-24.2	41.0	66.0	-25.0
0.198	65.7	79.0	-13.3	53.7	66.0	-12.3
0.217	63.1	79.0	-15.9	49.3	66.0	-16.7
0.252	53.0	79.0	-26.0	40.7	66.0	-25.3
0.319	57.9	79.0	-21.1	48.7	66.0	-17.3
0.522	56.8	73.0	-16.2	51.8	60.0	-8.2

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
Test Receiver	Rohde & Schwarz	ESIB26	242	12	04-Jul-2019
LISN (1 Phase)	Chase	MN 2050	336	12	10-Apr-2019
Transient Limiter	Hewlett Packard	11947A	1032	12	26-Jul-2019
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Digital Multimeter	Iso-tech	IDM-101	2895	12	04-Oct-2019
Hygrometer	Rotronic	HP21	4989	12	26-Apr-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
Industry Canada RSS-GEN, Clause 7.1

2.2.2 Equipment Under Test and Modification State

Free standing blast controller, S/N: 1480002C5 - Modification State 0
Omni directional aerial, S/N: Not Serialised (75943833- TSR0011) - Modification State 0
AC Adaptor, S/N: N/A - Modification State 0

2.2.3 Date of Test

20-November-2018

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	18.1 °C
Relative Humidity	18.1 - 41.4 %

2.2.6 Test Results

Results for Configuration and Mode : Tx Idle, Rx Operating (902 MHz to 928 MHz).

Testing was performed in accordance with the Class A limits.

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

Detailed results are shown below.

Highest frequency generated or used within the EUT: 928 MHz
Which necessitates an upper frequency test limit of: 5 GHz

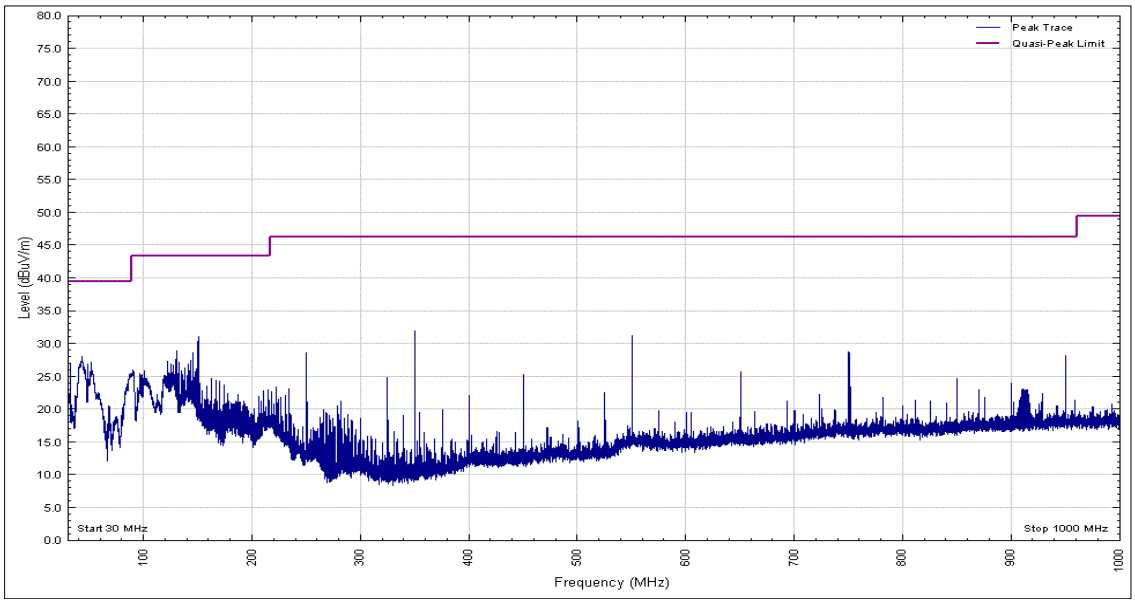


Figure 5 - Graphical Results – 30 MHz to 1 GHz
Vertical Polarity - EUT Orientation: X

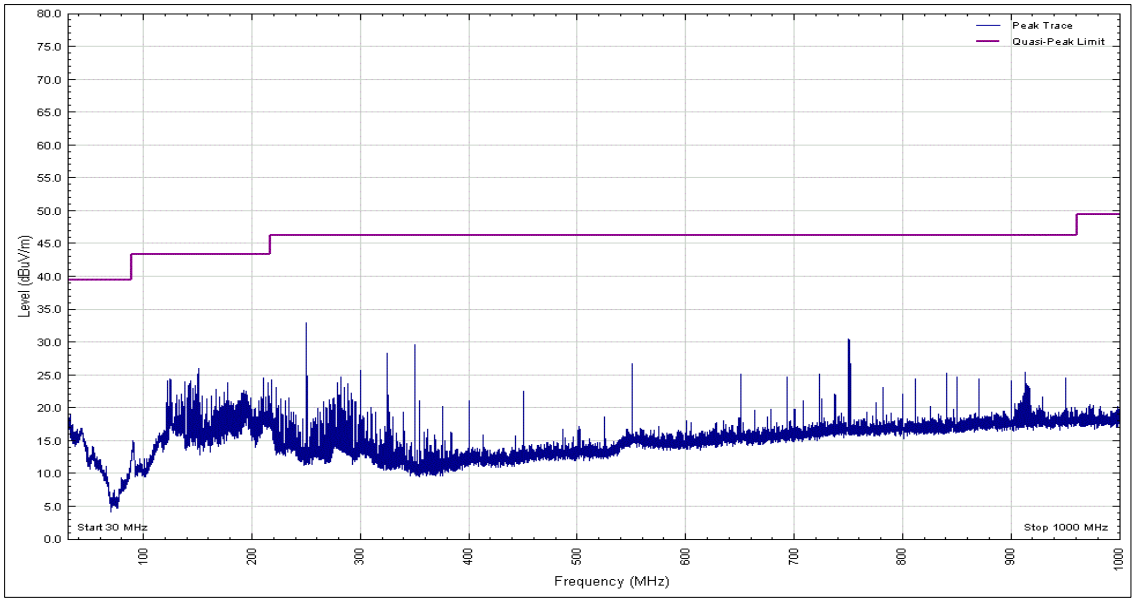


Figure 6 - Graphical Results – 30 MHz to 1 GHz
Horizontal Polarity - EUT Orientation: X

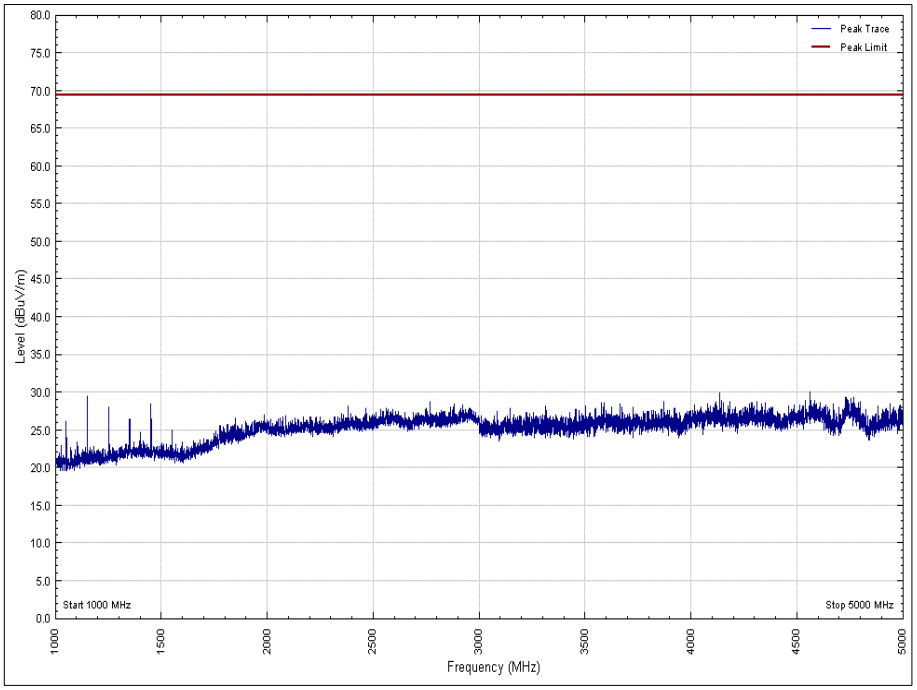


Figure 7 - Graphical Results - 1 GHz to 5 GHz - Peak Vertical Polarity - EUT Orientation: X

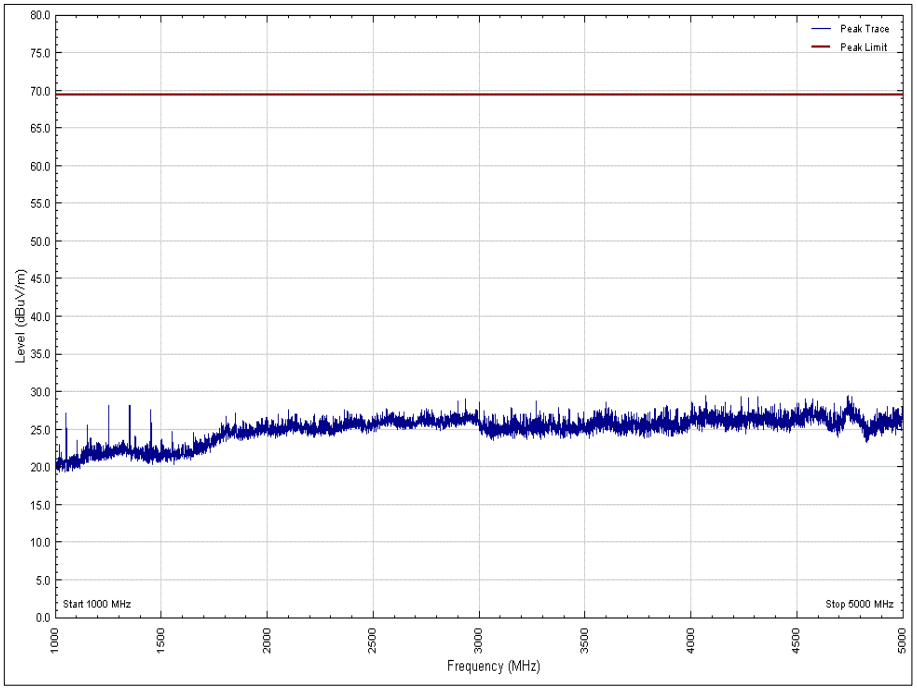


Figure 8 - Graphical Results - 1 GHz to 5 GHz - Peak Horizontal Polarity - EUT Orientation: X

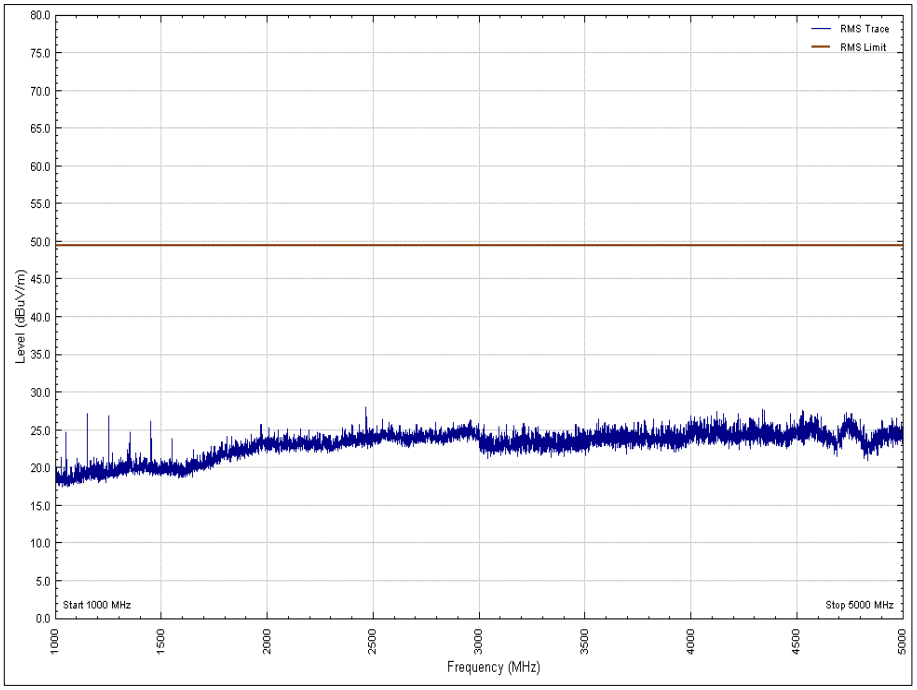


Figure 9 - Graphical Results - 1 GHz to 5 GHz - Average Vertical Polarity - EUT Orientation: X

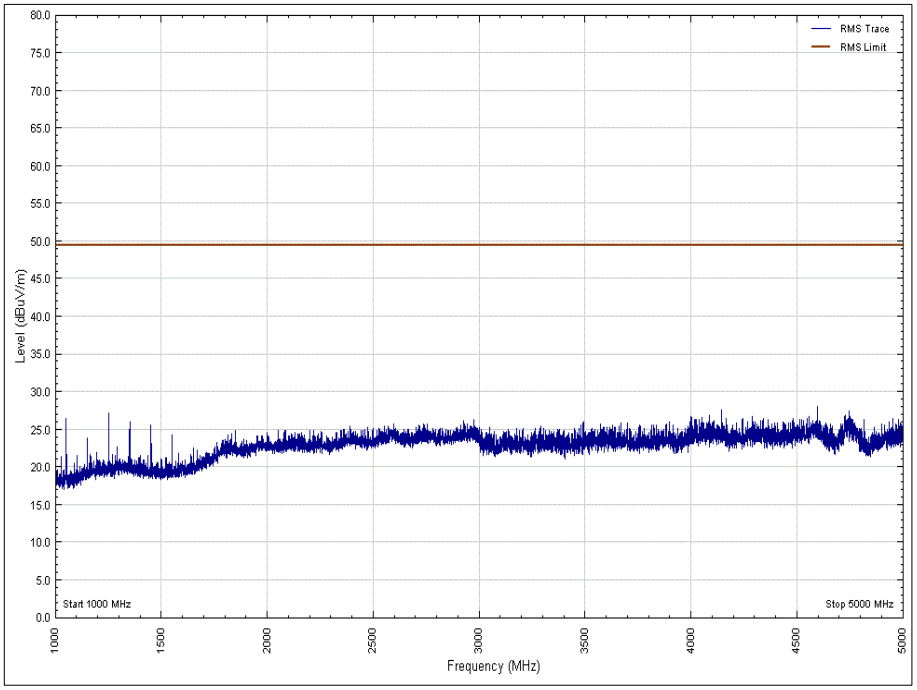


Figure 10 - Graphical Results - 1 GHz to 5 GHz - Average Horizontal Polarity - EUT Orientation: X

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
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
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	25-Oct-2019
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4-KMS	4520	12	13-Feb-2019
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	05-Feb-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
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

Table 8

TU - Traceability Unscheduled

3 Photographs

3.1 Test Setup Photographs

Figure 11 – Conducted Disturbance at Mains Terminals

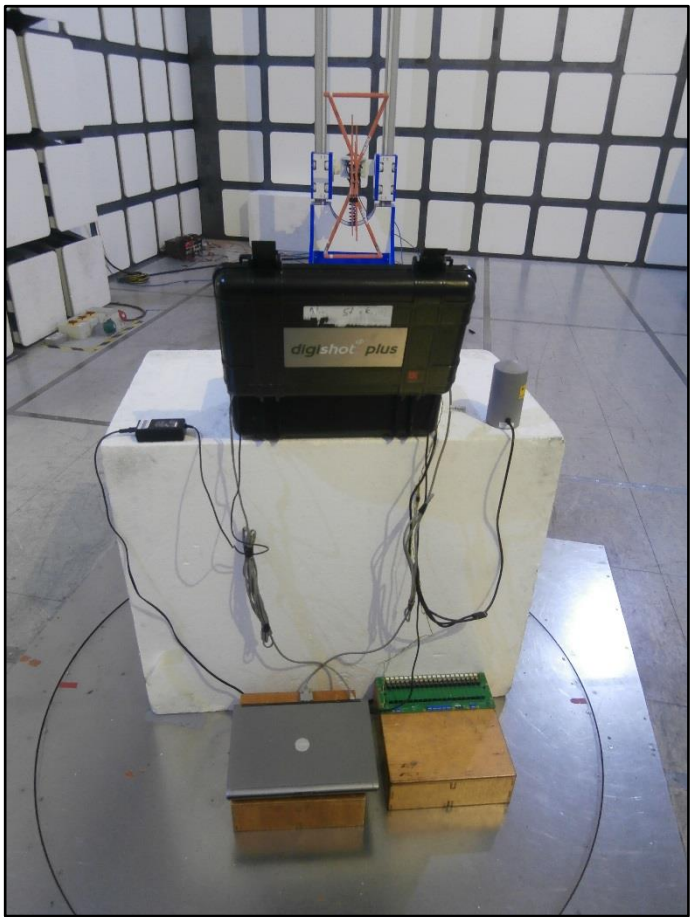


Figure 12 – Radiated Disturbance - 30 MHz to 1 GHz

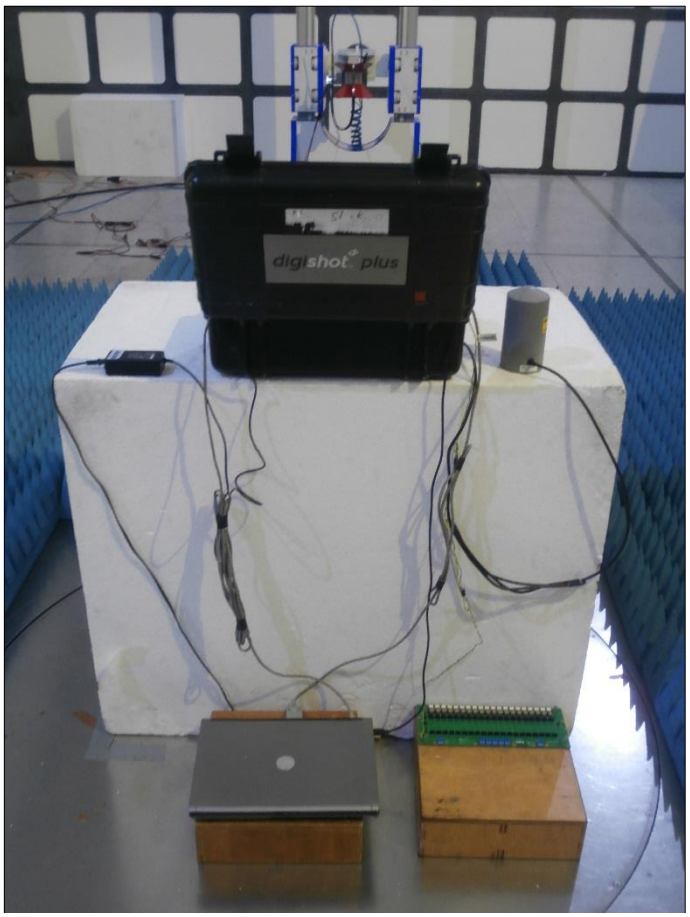


Figure 13 – Radiated Disturbance - 1 GHz to 5 GHz

4 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Conducted Disturbance at Mains Terminals	150 kHz to 30 MHz, LISN, ±3.7 dB
Radiated Disturbance	30 MHz to 1 GHz, Bilog Antenna, ±5.2 dB 1 GHz to 40 GHz, Horn Antenna, ±6.3 dB

Table 9