# Report on the FCC and IC Testing of:

DETNET SOUTH AFRICA (PTY) LTD
Free standing blast controller,
Model: DigiShot 300RF
Omni directional aerial, Model: 2.4 GHz Antenna Universal Mains Charger, Model: GS25B18

## 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
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1645, SOUTH AFRICA

FCC ID: 2ARNH-14521010 IC: 24476-14521010

## COMMERCIAL-IN-CONFIDENCE

Document Number: 75943833-02 | 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)



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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 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 300 RF<br>Omni directional aerial, 2.4 GHz Antenna<br>Mains Charger, GS25B18 |
| Serial Number(s) | Free standing blast controller, 073000218<br>Omni directional aerial, 1120001B8#<br>Mains Charger,10100041D |
| Hardware Version(s) | Hardware rev.8 PCB rev.5 |
| Software Version(s) | SVN 2772 |
| Number of Samples Tested | 1 plus ancillaries |
| Test Specification/Issue/Date | FCC 47 CFR Part 15B: 2017<br>ICES-003: 2016<br>Industry Canada RSS-GEN: (2018-04) |
| Order Number<br>Date | 4500351687<br>18-September-2018 |
| Date of Receipt of EUT | 25-September-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 (2400 MHz to 2483.5 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 300RF |
| **PART NUMBER** | |
| **SERIAL NUMBER** | 1450000B8 |
| **HARDWARE VERSION** | Hardware rev. 8 PCB rev.5 |
| **SOFTWARE VERSION** | SVN 2772 |
| **PSU VOLTAGE/FREQUENCY/CURRENT** | 12 V battery (Can be charged via AC/DC adaptor). |
| **HIGHEST INTERNALLY GENERATED / USED FREQUENCY** | 2483.5 MHz |
| **FCC ID (if applicable)** | 2ARNH-14521010 |
| **INDUSTRY CANADA ID (if applicable)** | 24476-14521010 |
| **TECHNICAL DESCRIPTION** (a brief description of the intended use and operation) | Free standing electronic detonator blast controller. T<br><br>he DigiShot 300RF uses the EDP-111 (RC2500 transceiver) in the 2.4 GHz frequency band. It uses DSSS technology over 83 channels and an output power of approximately 1 dBm.<br><br>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)** | 2400 - 2483 |
| **RECEIVER FREQUENCY OPERATING RANGE (MHz)** | 2400 - 2483 |
| **INTERMEDIATE FREQUENCIES** | |
| **EMISSION DESIGNATOR(S): (i.e. G1D, GXW)** | |
| **MODULATION TYPES: (i.e. GMSK, QPSK)** | |
| **OUTPUT POWER (W or dBm)** | 1 dBm |
| **SEPARATE BATTERY/POWER SUPPLY (if applicable)** | |
| **MANUFACTURING DESCRIPTION** | AC/DC Industrial Desktop Charger |
| **MANUFACTURER** | Meanwell |
| **TYPE** | GS Series |
| **PART NUMBER** | GS25B18-P1J |
| **PSU VOLTAGE/FREQUENCY/CURRENT** | 18V, 50/60Hz, 1.38A |
| **COUNTRY OF ORIGIN** | China |
| **MODULES (if applicable)** | |
| **MANUFACTURING DESCRIPTION** | Radiocraft Multi Channel RF Transceiver Module |
| **MANUFACTURER** | Radiocrafts |
| **TYPE** | RC2500-RC232 |
| **POWER** | 1 dBM |
| **FCC ID** | |
| **INDUSTRY CANADA ID** | |
| **EMISSION DESIGNATOR** | |
| **DHSS/FHSS/COMBINED OR OTHER** | None |
| **COUNTRY OF ORIGIN** | |
| **ANCILLARIES (if applicable)** | |
| **MANUFACTURING DESCRIPTION** | Moulded Dipole Antenna with magnetic base |
| **MANUFACTURER** | Poynting |
| **TYPE** | Dipole Antenna |
| **PART NUMBER** | A-DIPL-0073 |
| **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

The DigiShot 300RF uses the EDP-111 (RC2500 transceiver) in the 2.4 GHz frequency band. It uses DSSS technology over 83 channels and an output power of approximately 1 dBm.

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)

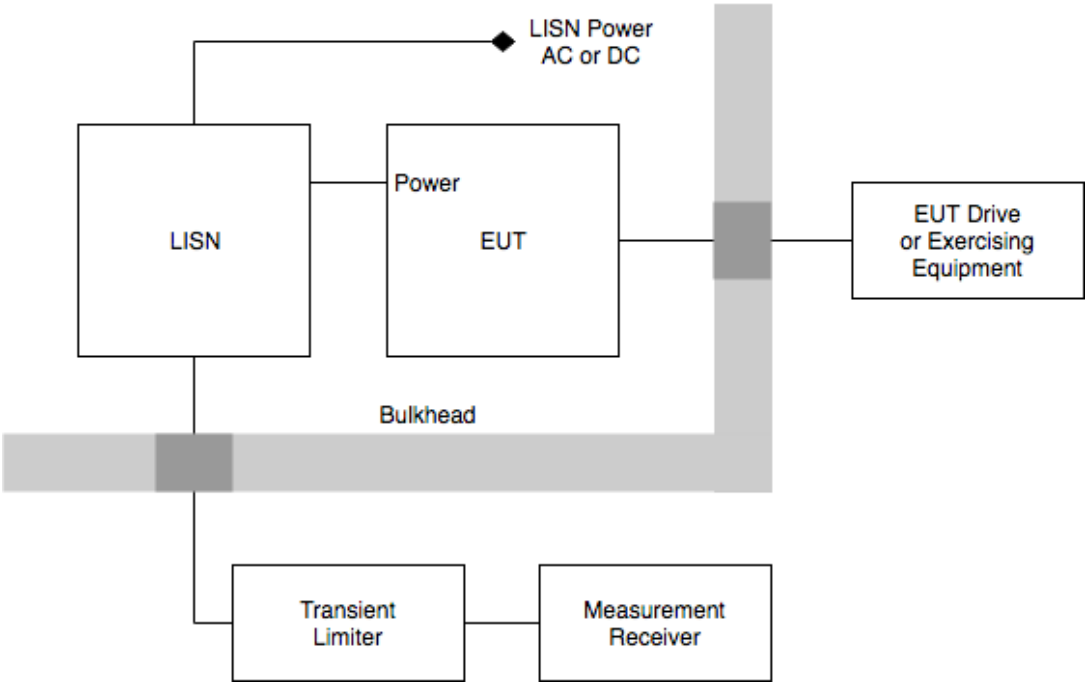
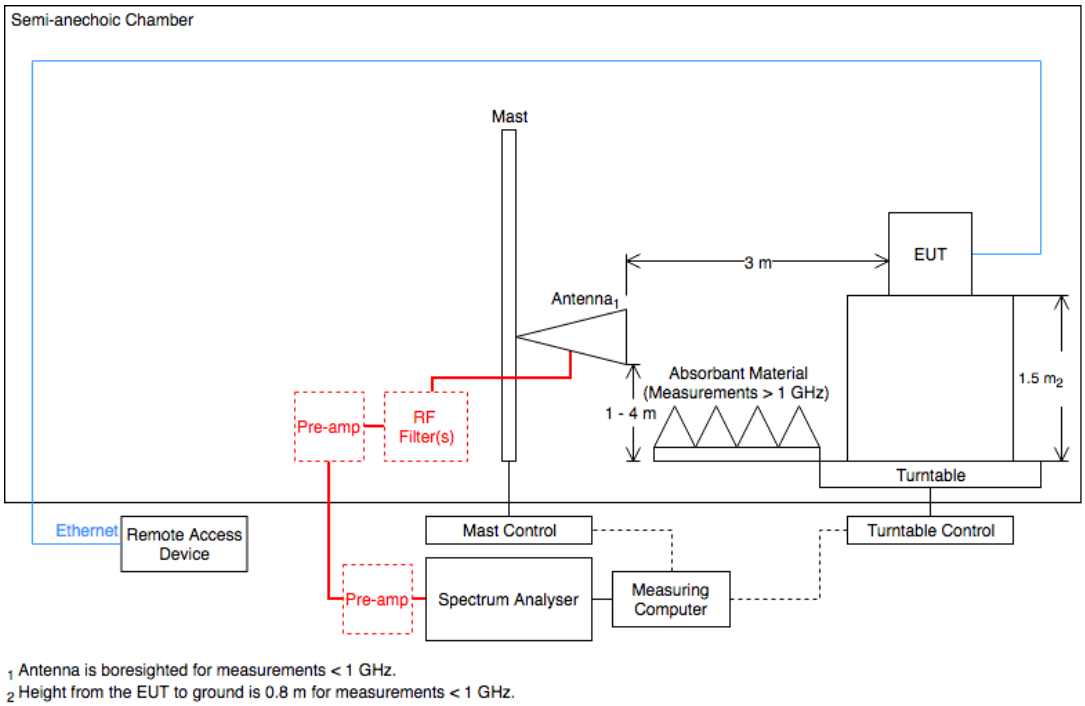



**Figure 1 - AC Line Conducted Emissions Test Setup**




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. 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.

## 1.6 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 |
|---|---|---|---|
| Free standing blast controller, Serial Number: 073000218 | | | |
| 0 | As supplied by the customer | Not Applicable | Not Applicable |
| Omni directional aerial, Serial Number: 1120001B8# | | | |
| 0 | As supplied by the customer | Not Applicable | Not Applicable |
| Mains Charger, Serial Number: 10100041D | | | |
| 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 (2400 MHz to 2483.5 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: 073000218 - Modification State 0
Omni directional aerial, S/N: 1120001B8# - Modification State 0
Mains Charger, S/N: 10100041D - 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 | 18.4 - 18.7 °C |
| Relative Humidity | 44.0 % |

### 2.1.6 Test Results

**Results for Configuration and Mode : Tx Idle, Rx Operating (2400 MHz to 2483.5 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.

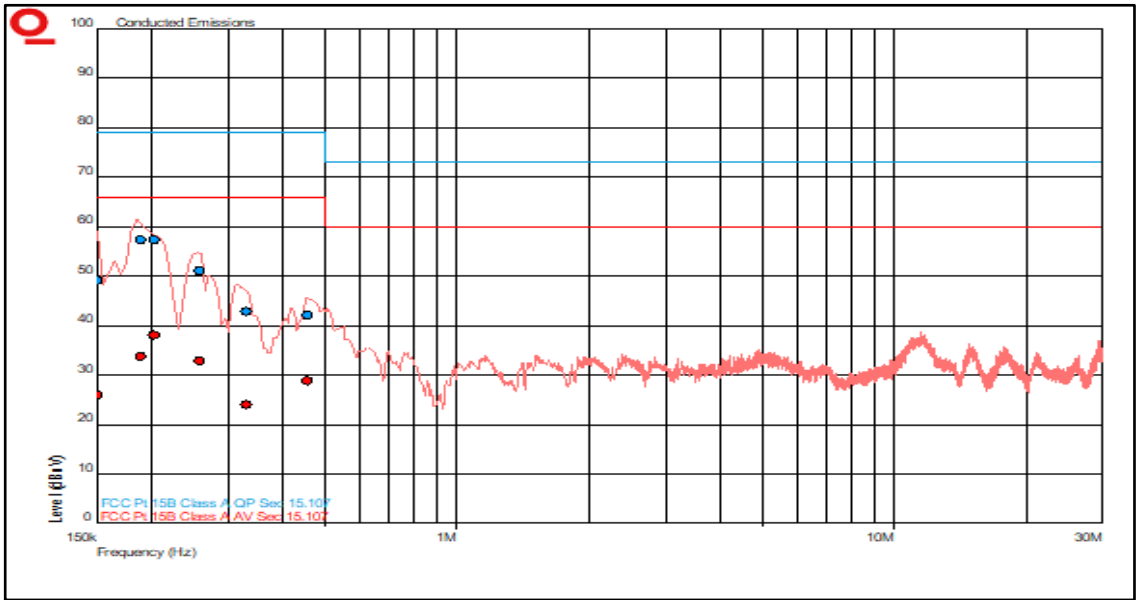



**Figure 3 - Graphical Results - Live Line**

| Frequency (MHz) | QP Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | AV Level (dBuV) | AV Limit (dBuV) | AV Margin (dBuV) |
|---|---|---|---|---|---|---|
| 0.150 | 49.2 | 79.0 | -29.8 | 26.1 | 66.0 | -39.9 |
| 0.189 | 57.4 | 79.0 | -21.6 | 33.8 | 66.0 | -32.2 |
| 0.203 | 57.4 | 79.0 | -21.6 | 38.2 | 66.0 | -27.8 |
| 0.258 | 51.1 | 79.0 | -27.9 | 32.8 | 66.0 | -33.2 |
| 0.330 | 42.9 | 79.0 | -36.1 | 24.2 | 66.0 | -41.8 |
| 0.455 | 42.1 | 79.0 | -36.9 | 28.9 | 66.0 | -37.1 |

**Table 5**

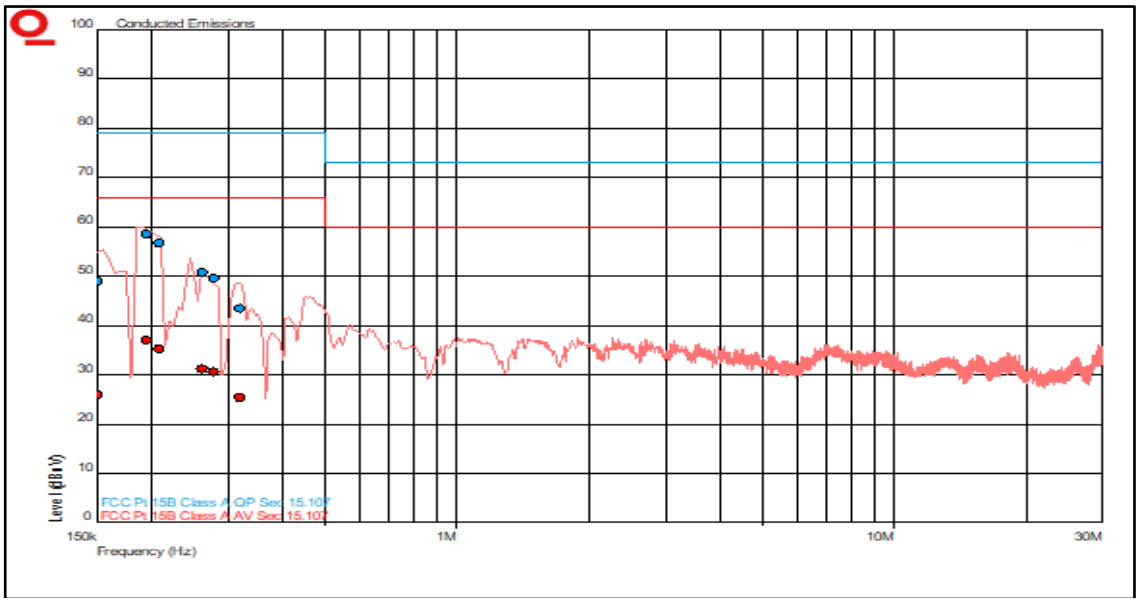



**Figure 4 - Graphical Results - Neutral Line**

| Frequency (MHz) | QP Level (dBuV) | QP Limit (dBuV) | QP Margin (dBuV) | AV Level (dBuV) | AV Limit (dBuV) | AV Margin (dBuV) |
|---|---|---|---|---|---|---|
| 0.150 | 49.0 | 79.0 | -30.0 | 26.0 | 66.0 | -40.0 |
| 0.195 | 58.6 | 79.0 | -20.4 | 37.0 | 66.0 | -29.0 |
| 0.208 | 56.8 | 79.0 | -22.2 | 35.3 | 66.0 | -30.7 |
| 0.262 | 50.8 | 79.0 | -28.2 | 31.3 | 66.0 | -34.7 |
| 0.279 | 49.6 | 79.0 | -29.4 | 30.6 | 66.0 | -35.4 |
| 0.319 | 43.5 | 79.0 | -35.5 | 25.4 | 66.0 | -40.6 |

**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 | 4-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 | 4-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: 073000218 - Modification State 0
Omni directional aerial, S/N: 1120001B8# - Modification State 0
Mains Charger, S/N: 10100041D - 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 | 41.4 % |

### 2.2.6 Test Results

**Results for Configuration and Mode : - Tx Idle, Rx Operating (2400 MHz to 2483.5 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: 2483.5 MHz
Which necessitates an upper frequency test limit of: 13 GHz

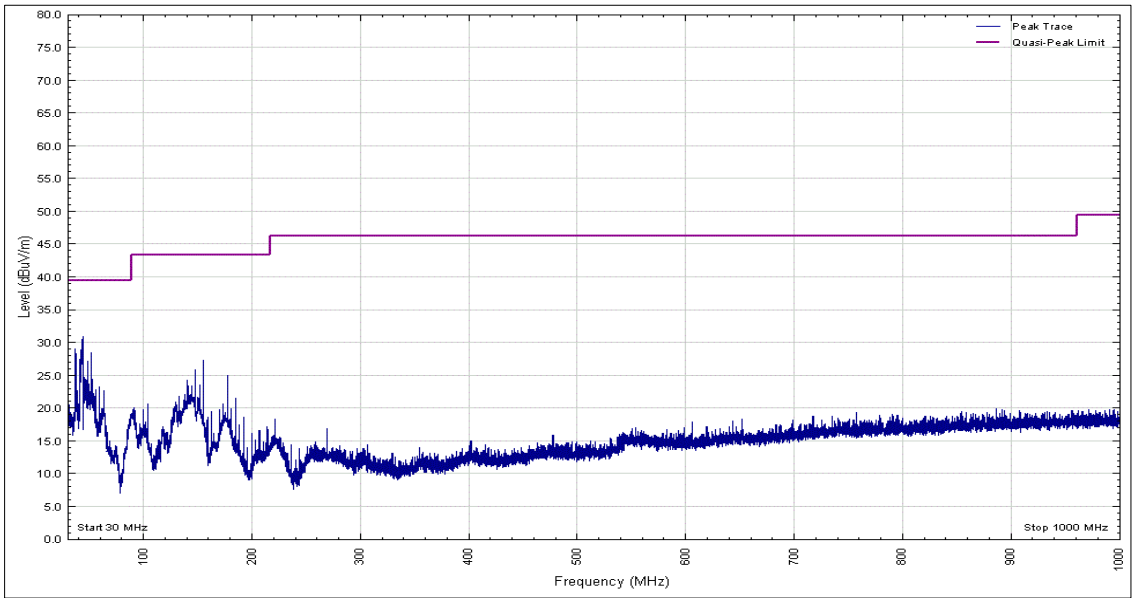



**Figure 5 - Graphical Results - 30 MHz to 1 GHz**
**Vertical Polarity - EUT Orientation: X**

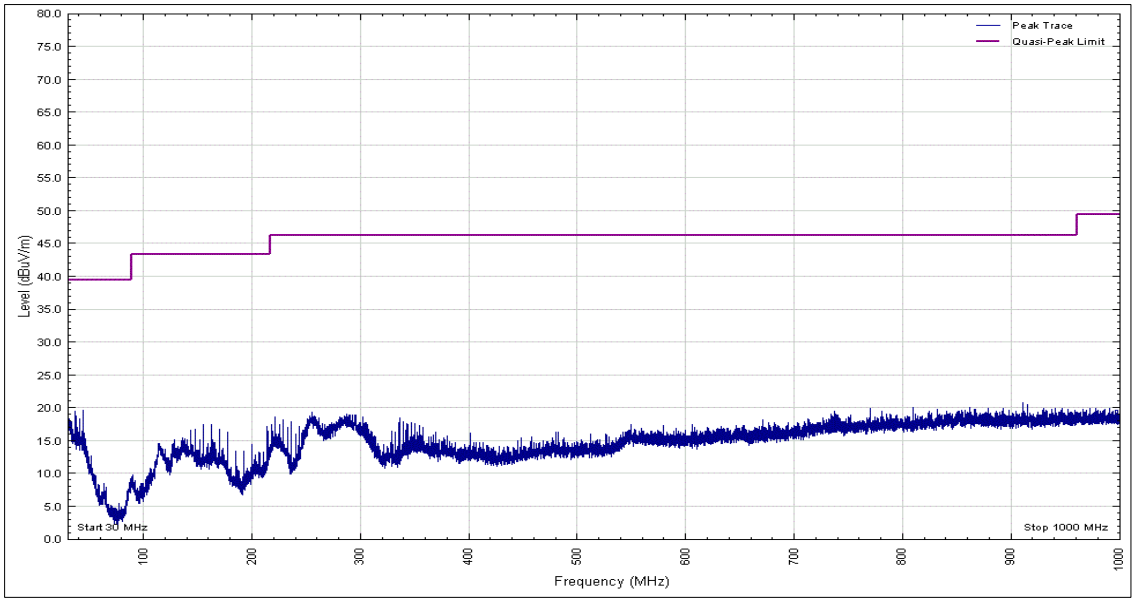



**Figure 6 - Graphical Results - 30 MHz to 1 GHz**
**Horizontal Polarity - EUT Orientation: X**

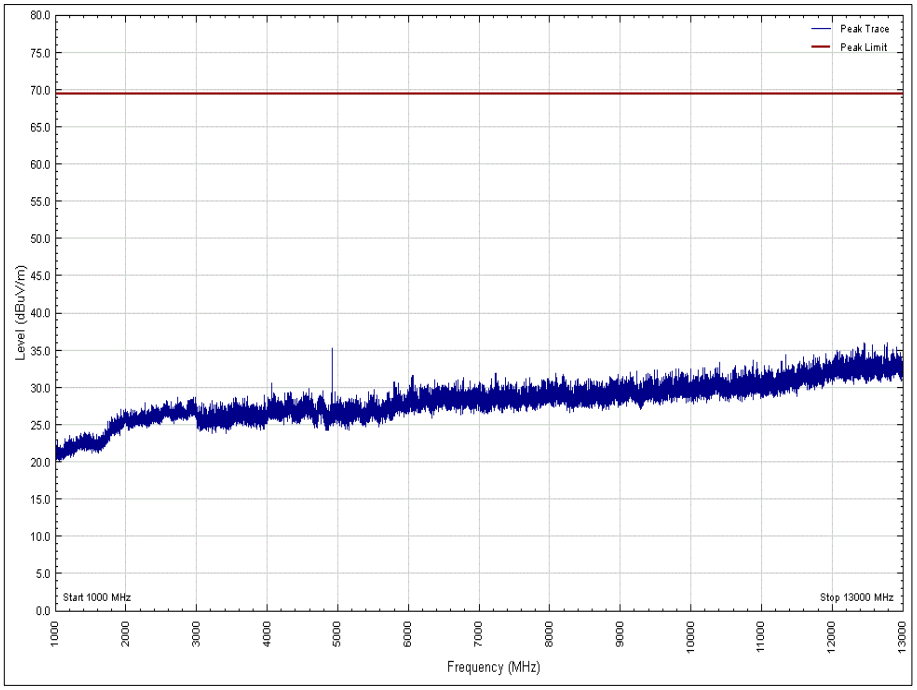



**Figure 7 - Graphical Results - 1 GHz to 13 GHz Peak
Vertical Polarity - EUT Orientation: X**

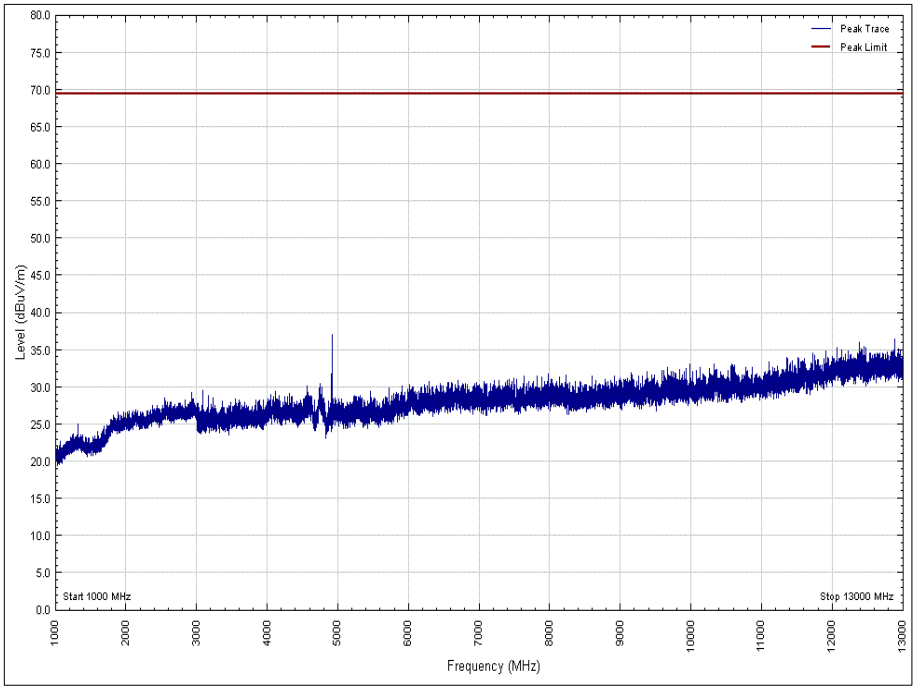



**Figure 8 - Graphical Results - 1 GHz to 13 GHz Peak
Horizontal Polarity - EUT Orientation: X**

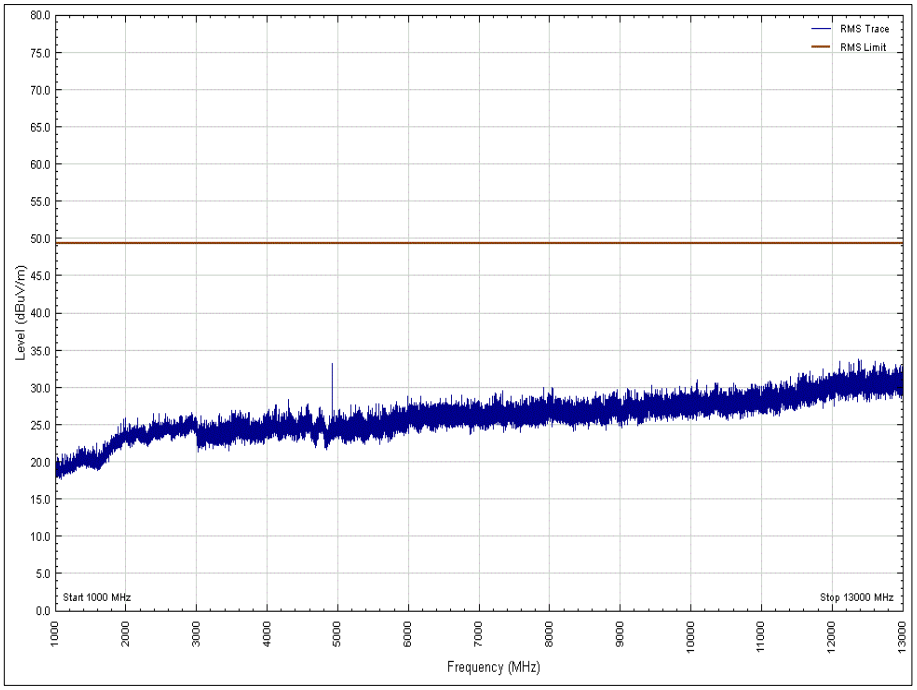



**Figure 9 - Graphical Results - 1 GHz to 13 GHz Average
Vertical Polarity - EUT Orientation: X**

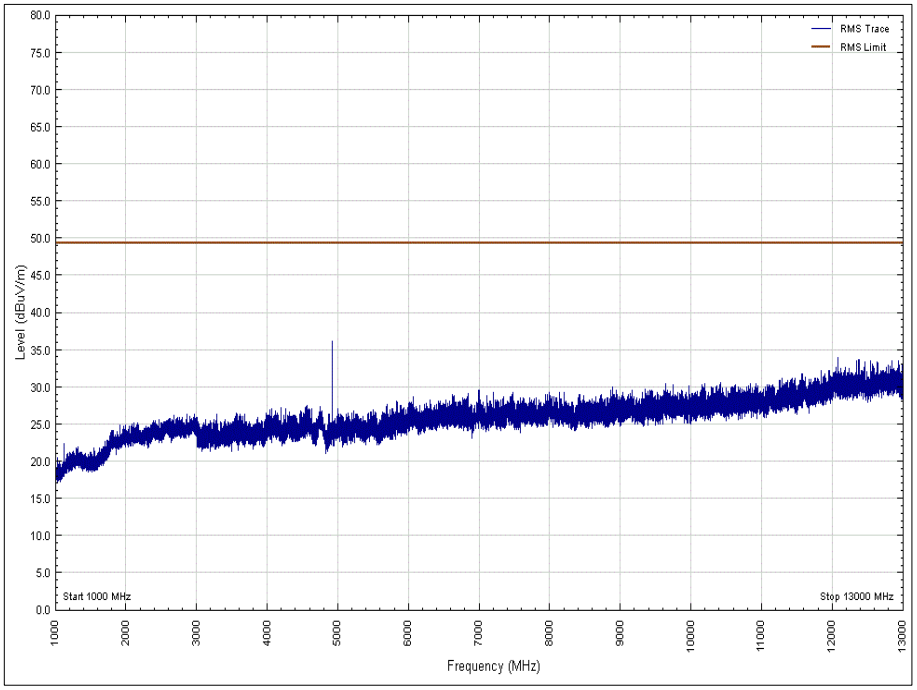



**Figure 10 - Graphical Results - 1 GHz to 13 GHz Average
Horizontal Polarity - EUT Orientation: X**

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

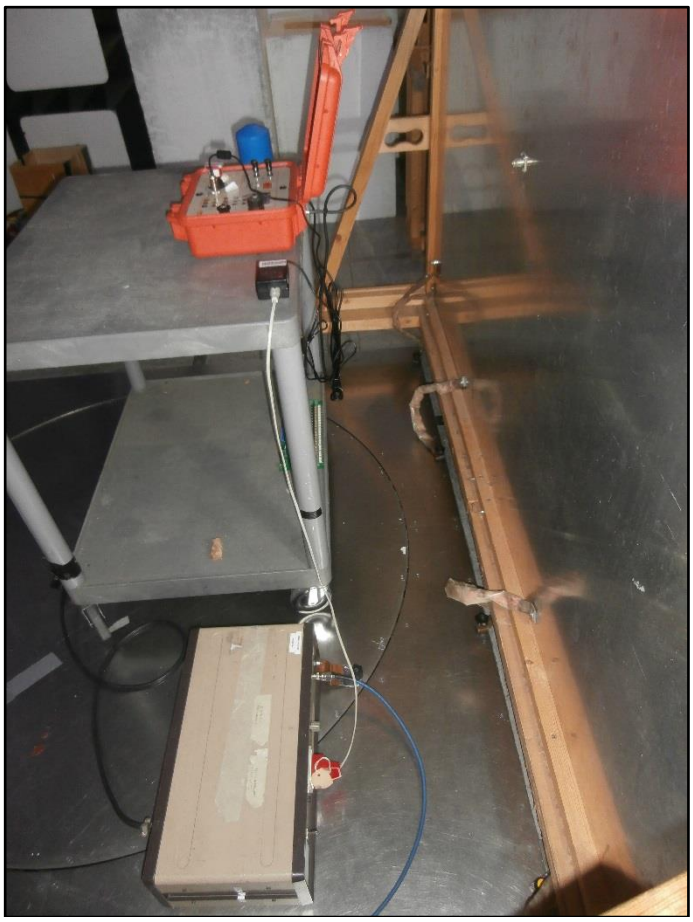


**Figure 11 – Conducted Disturbance at Mains Terminals**

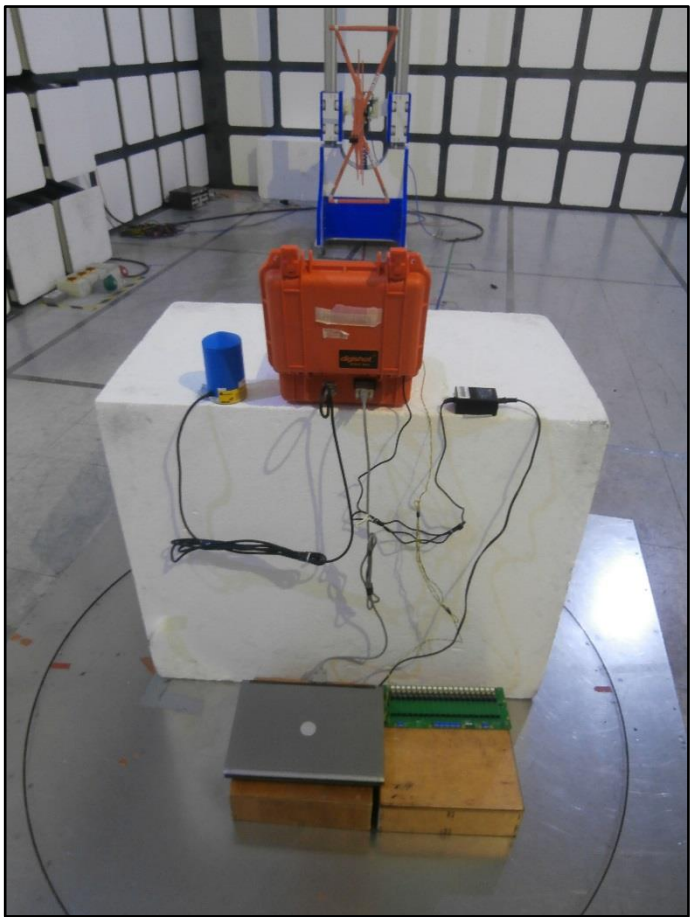


**Figure 12 – Radiated Disturbance - 30 MHz to 1 GHz**

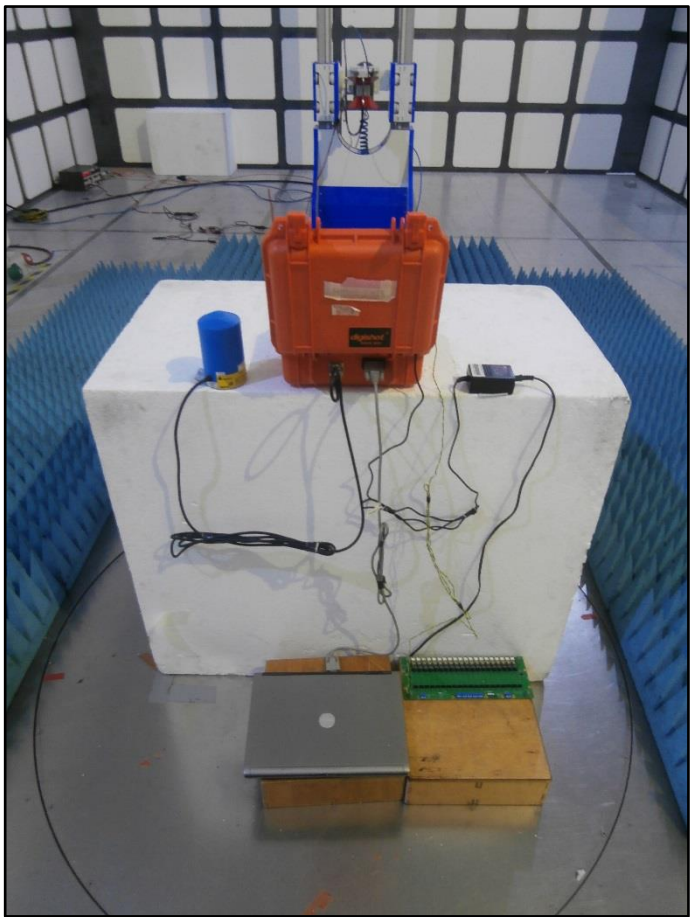


**Figure 13 – Radiated Disturbance - 1 GHz to 13 GHz**

# 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<br>1 GHz to 40 GHz, Horn Antenna, ±6.3 dB |

**Table 9**