
# Report On

FCC Testing of the
RF Solutions Ltd
Tensator Button

COMMERCIAL-IN-CONFIDENCE

FCC ID: P9OQ1864-BTN

Document 75907908 Report 01 Issue 2 February 2010

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**REPORT ON**

FCC Testing of the
RF Solutions Ltd
Tensator Button

Document 75907908 Report 01 Issue 2

February 2010

**PREPARED FOR**

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**DATED** 04 February 2010

**This report has been up-issued to Issue 2 to include additional test results.**

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 CFR 47 Part 15. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineers;

G Lawler A Guy S Hartley R A Blagg

UKAS TESTING 0141

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**CONTENTS**

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**SECTION 1**

**REPORT SUMMARY**

FCC Testing of the
RF Solutions Ltd
Tensator Button

## 1.1 INTRODUCTION

The information contained in this report is intended to show verification of the RF Solutions Ltd, Tensator Button to the requirements of FCC CFR 47 Part 15.

| | |
|---|---|
| Objective | To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out. |
| Manufacturer | RF Solutions Ltd |
| Model Number | Q1864-BTN |
| Serial Number(s) | Not Serialised |
| Software Version | Version 1 |
| Hardware Version | Version 1 |
| Number of Samples Tested | 1 |
| Test Specification/Issue/Date | FCC CFR 47 Part 15: 2007 |
| Incoming Release<br>Date | Declaration of Build Status<br>05 January 2010 |
| Disposal<br>Reference Number<br>Date | Held Pending Disposal<br>Not Applicable<br>Not Applicable |
| Order Number<br>Date | 13465<br>20 October 2009 |
| Start of Test | 24 October 2009 |
| Finish of Test | 27 January 2010 |
| Name of Engineer(s) | A Guy<br>G Lawler<br>S Hartley<br>R A Blagg |
| Related Document(s) | ANSI C63.4: 2003 |

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## 1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 15, is shown below.

| Configuration 1 - Stand Alone | | | | | | |
|---|---|---|---|---|---|---|
| Section | Spec Clause | Test Description | Mode | Mod State | Result | Base Standard |
| 2.1 | 15.109<br>15.231 15.205 | Radiated Emissions (Enclosure Port) | Transmit with modulation | 0 | Pass | - |
| | | | Idle | 0 | Pass | |
| | 15.107 | Conducted Emissions (AC Power Port) | Transmit with modulation | | N/A | |
| | | | Idle | | N/A | |
| 2.2 | 15.231 | Bandwidth of the Emission | Transmit with modulation | 0 | Pass | - |
| | | | Idle | | N/A | |

N/A – Not Applicable

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## 1.3 DECLARATION OF BUILD STATUS

| MAIN EUT | |
|---|---|
| **MANUFACTURING DESCRIPTION** | Tensator Button |
| **MANUFACTURER** | RF Solutions Ltd |
| **TYPE** | BTN |
| **PART NUMBER** | Q1864-BTN |
| **SERIAL NUMBER** | N/A |
| **HARDWARE VERSION** | Version 1 |
| **SOFTWARE VERSION** | Version 1 |
| **TRANSMITTER OPERATING RANGE** | - |
| **RECEIVER OPERATING RANGE** | - |
| **COUNTY OF ORIGIN** | UK |
| **INTERMEDIATE FREQUENCIES** | - |
| **HIGHEST INTERNALLY GENERATED FREQUENCY** | - |
| **OUTPUT POWER (W or dBm)** | - |
| **TECHNICAL DESCRIPTION (a brief description of the intended use and operation)** | Operator button, for activation of Tensator Que forwarding system. |

**Signature** 

**Date** 05 January 2010

**D of B S Serial No** 75907908

Note: This document has been prepared to enable manufacturers with no mechanism for producing their own Declaration of Build Status, to declare the build state of the equipment submitted for test.

No responsibility will be accepted by TÜV Product Service as to the accuracy of the information declared in this document by the manufacturer.

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## 1.4 PRODUCT INFORMATION

### 1.4.1 Technical Description

The Equipment Under Test (EUT) was a RF Solutions Ltd, Tensator Button as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.


Equipment Under Test

Product Service

### 1.4.2 Test Configuration

Configuration 1: Stand Alone

The EUT was configured in accordance with FCC CFR 47 Part 15.

### 1.4.3 Modes of Operation

Modes of operation of EUT during testing were as follows:

Mode 1 – Transmit with modulation

Mode 2 – Idle

Information on the specific test modes utilised are detailed in the test procedure for each individual test.

Product Service

## 1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or an open test area as appropriate.

The EUT was powered from the EUT's internal battery.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

## 1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

## 1.7 MODIFICATION RECORD

No modifications were made to the EUT during testing.

Product Service

**SECTION 2**

**TEST DETAILS**

FCC Testing of the
RF Solutions Ltd
Tensator Button

## 2.1 RADIATED EMISSIONS (ENCLOSURE PORT)

### 2.1.1 Specification Reference

FCC CFR 47 Part 15, Clauses 15.109, 15.231(b) and 15.205

### 2.1.2 Equipment Under Test

Tensator Button, S/N: Not Serialised

### 2.1.3 Date of Test and Modification State

24 to 25 October, 26 November and 08 December 2009 - Modification State 0

### 2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.1.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of ANSI C63.4.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1
- Mode 2

### 2.1.6 Environmental Conditions

| | 24 October 2009 | 25 October 2009 | 26 November 2009 |
|---|---|---|---|
| Ambient Temperature | 20.0°C | 21.9°C | 20.0°C |
| Relative Humidity | 35% | 33% | 30% |
| Atmospheric Pressure | 1005mbar | 1010mbar | 998 - 1000mbar |

| | 08 December 2009 |
|---|---|
| Ambient Temperature | 23°C |
| Relative Humidity | 29% |
| Atmospheric Pressure | 1009mbar |

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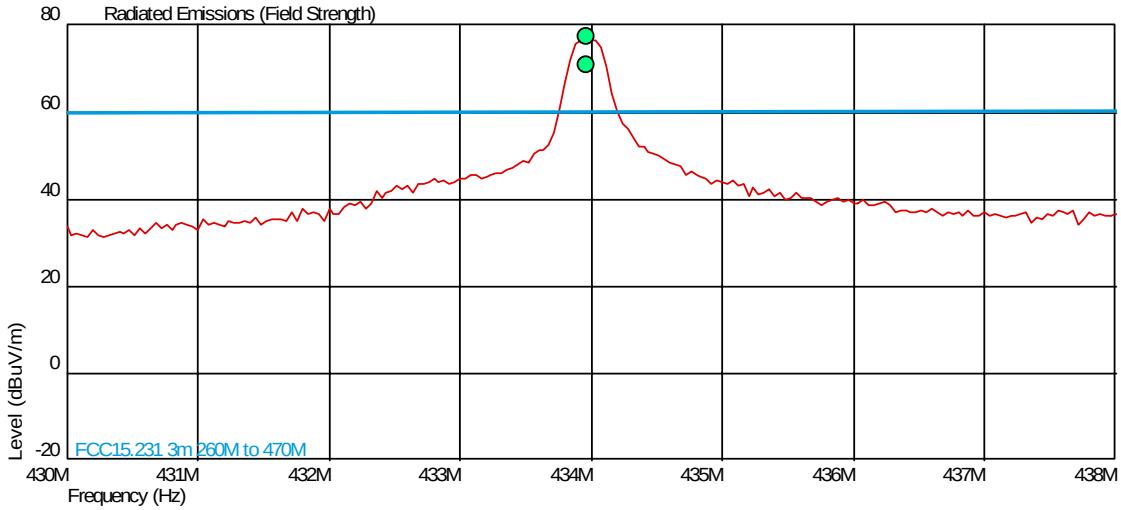
### 2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15.231 (b) and FCC CFR 47 Part 15.205, for Radiated Emissions (Enclosure Port).

The test results are shown below.

Configuration 1 - Mode 1

Carrier Field Strength




| Frequency (MHz) | QP Level (dBµV/m) | QP Level (µV/m) | QP Limit (dBµV/m) | QP limit (µV/m) | QP Margin (dBµV/m) | QP Margin (µV/m) | Angle (deg) | Height (m) | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 433.960 | 71.0 | 3548.1 | 80.1 | 10116.0 | -9.1 | -6567.9 | 64 | 1.37 | Vertical |
| 433.960 | 77.5 | 7498.9 | 80.1 | 10116.0 | -2.6 | -2617.1 | 360 | 2.02 | Horizontal |

Bandwidth for measurement used was 120kHz.

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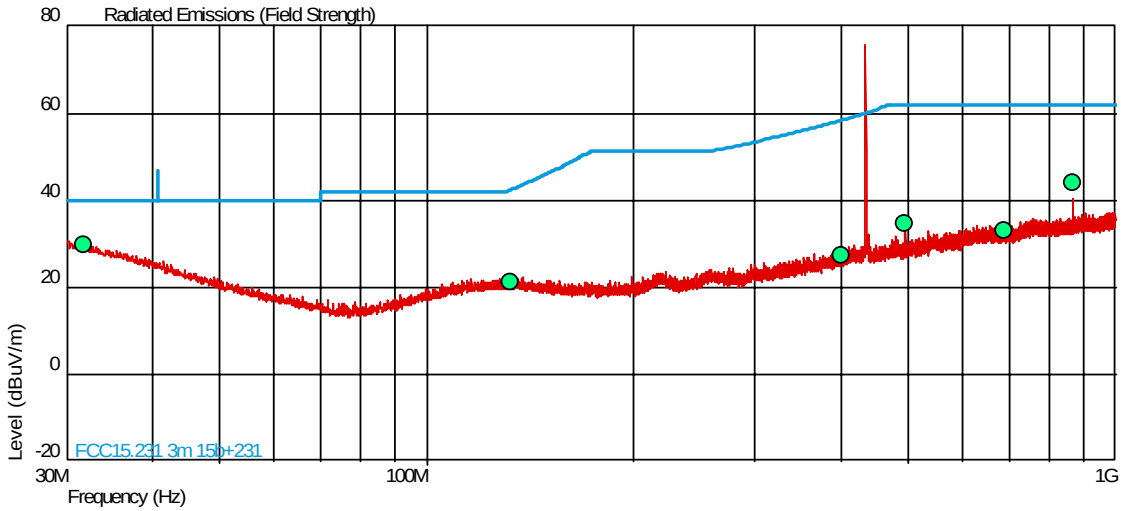
Spurious Emissions

30MHz to 1GHz




| Frequency (MHz) | QP Level (dBµV/m) | QP Level (µV/m) | QP Limit (dBµV/m) | QP Limit (µV/m) | QP Margin (dBµV/m) | QP Margin (µV/m) | Angle (Deg) | Height (m) | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 31.847 | 29.7 | 31.3 | 40.0 | 100 | -10.3 | -68.7 | 340 | 1.53 | Vertical |
| 132.567 | 21.3 | 11.6 | 42.5 | 133 | -21.2 | -121.7 | 167 | 1.00 | Horizontal |
| 400.226 | 27.5 | 23.7 | 58.4 | 832 | -21.1 | -808.1 | 228 | 1.00 | Horizontal |
| 493.950 | 34.8 | 55.0 | 61.9 | 1245 | -27.1 | -1189.6 | 114 | 1.00 | Vertical |
| 688.835 | 33.0 | 44.7 | 61.9 | 1245 | -28.9 | -1199.8 | 279 | 1.00 | Horizontal |
| 867.872 | 44.1 | 160.3 | 61.9 | 1245 | -17.8 | -1084.2 | 86 | 1.18 | Vertical |

Note: the emission at 433MHz which exceeds the limit is the transmisson frequency of the EUT

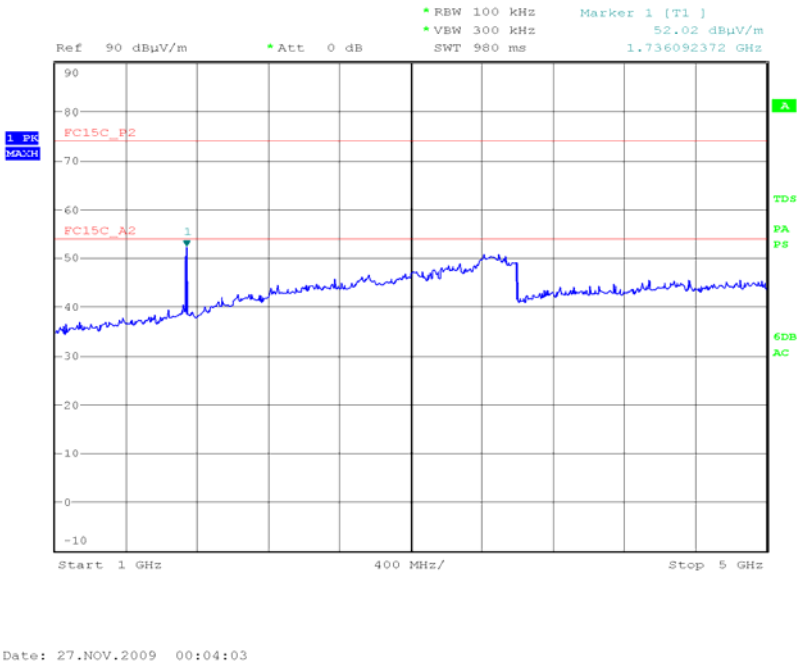
Product Service

1GHz to 5GHz

| Freq. GHz | Ant Pol V/H | Ant Hgt cm | EUT Arc Deg | Final Peak dBµV/m | Final Average dBµV/m | Final Peak µV/m | Final Average µV/m | Peak Limit dBµV/m | Peak Limit µV/m |
|---|---|---|---|---|---|---|---|---|---|
| 1.735 | V | 100 | 200 | 52.9 | Peak Final is under Average limit. No measurement required. | 441.6 | N/A | 62.0 | 1250 |
| 1.736 | V | 100 | 200 | 52.8 | | 436.5 | N/A | 62.0 | 1250 |

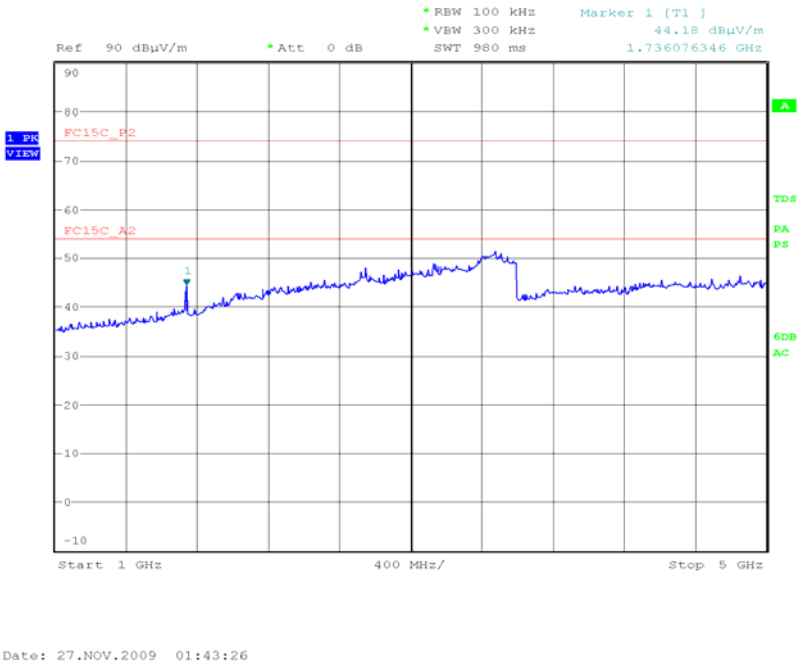
Note: as the Peak measurement met the Average Limit, no Average Measurements were performed.

Vertical



Product Service

Horizontal

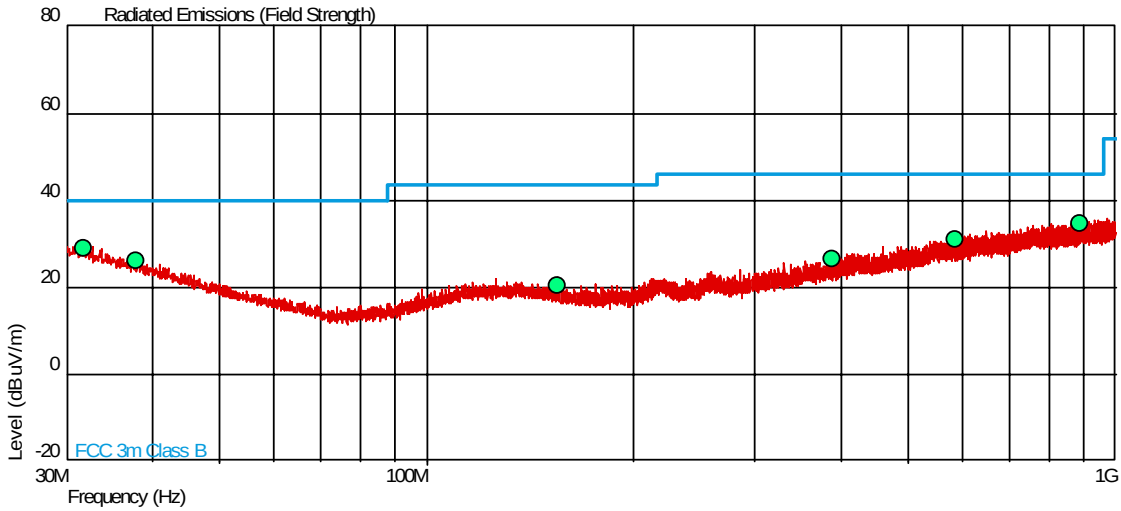


Product Service

For the period of test the EUT met the requirements of FCC CFR 47 Part 15.109 for Radiated Emissions (Enclosure Port).

The test results are shown below.

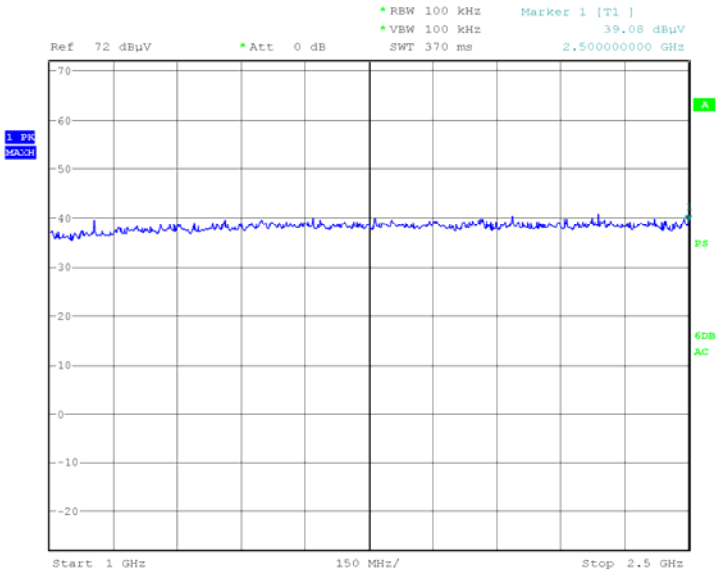
Configuration 1 - Mode 2




| Frequency (MHz) | QP Level (dBµV/m) | QP Level (µV/m) | QP Limit (dBµV/m) | QP limit (µV/m) | QP Margin (dBµV/m) | QP Margin (µV/m) | Angle (deg) | Height (m) | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 31.795 | 29.1 | 28.5 | 40.0 | 100.0 | -10.9 | -71.5 | 0 | 1.00 | Horizontal |
| 37.857 | 26.1 | 20.2 | 40.0 | 100.0 | -13.9 | -79.8 | 0 | 1.00 | Horizontal |
| 154.839 | 20.5 | 10.6 | 43.5 | 150.0 | -23.0 | -139.4 | 0 | 1.00 | Vertical |
| 388.076 | 26.5 | 21.1 | 46.0 | 200.0 | -19.5 | -178.9 | 0 | 1.00 | Vertical |
| 587.023 | 30.9 | 33.9 | 46.0 | 200.0 | -15.1 | -166.1 | 0 | 1.00 | Vertical |
| 889.226 | 34.7 | 54.3 | 46.0 | 200.0 | -11.3 | -145.7 | 0 | 1.00 | Vertical |

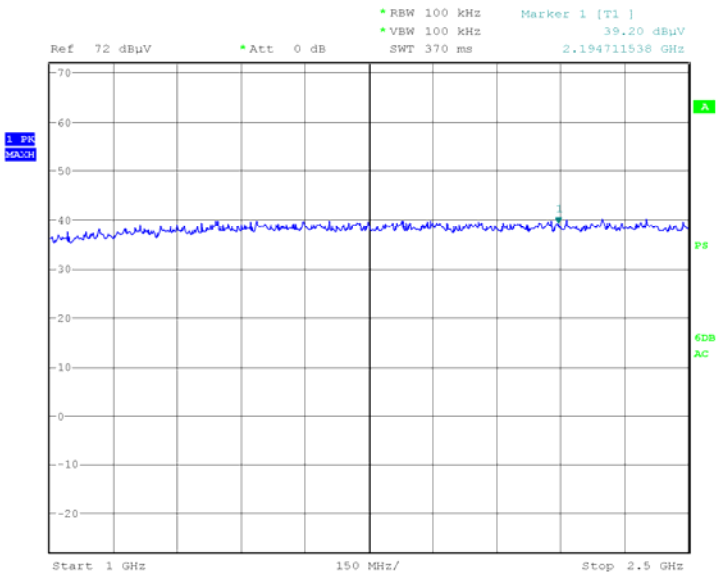
1GHz to 2.5GHz

Vertical




Date: 25.OCT.2009 12:19:51

Horizontal




Date: 25.OCT.2009 12:23:11

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

Product Service

## 2.2 BANDWIDTH OF THE EMISSIONS

### 2.2.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.231

### 2.2.2 Equipment Under Test

Tensator Button, S/N: Not Serialised

### 2.2.3 Date of Test and Modification State

27 January 2010 - Modification State 0

### 2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

### 2.2.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1

### 2.2.6 Environmental Conditions

| | 27 January 2010 |
|---|---|
| Ambient Temperature | 22.8°C |
| Relative Humidity | 22.7% |

Product Service

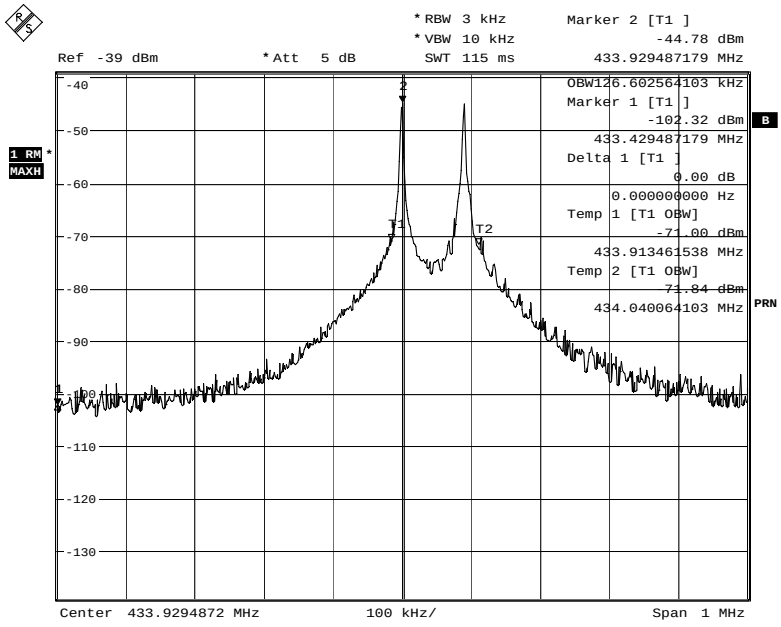
### 2.2.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15, for Bandwidth of the Emission.

The test results are shown below.

Configuration 1 - Mode 1

| Channel Number/Frequency | Result (MHz) | Limit (MHz) |
|---|---|---|
| 433.920 | 0.1266 | 1.0848 |




Limit Clause

The 99% bandwidth shall be no wider than 0.25% of the centre frequency for devices operating between 70 MHz to 900 MHz. For devices opeating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency.

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**SECTION 3**

**TEST EQUIPMENT USED**

## 3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

| Instrument | Manufacturer | Type No. | TE No. | Calibration Period (months) | Calibration Due |
|---|---|---|---|---|---|
| **Section 2.1 EMC - Radiated Emissions** | | | | | |
| Antenna (1GHz-18GHz) | EMCO | 3115 | 235 | 12 | 12-Oct-2010 |
| Pre-Amplifier | Phase One | PS04-0085 | 1532 | 12 | 16-Sep-2010 |
| Screened Room (5) | Rainford | Rainford | 1545 | 36 | 11-Feb-2011 |
| Mast Controller | Inn-Co GmbH | CO 1000 | 1606 | - | TU |
| Turntable/Mast Controller | EMCO | 2090 | 1610 | - | TU |
| Antenna (Bilog) | Chase | CBL6143 | 287 | 24 | 21-Jan-2010 |
| Antenna (Bilog) | Chase | CBL6143 | 2904 | 24 | 28-Nov-2009 |
| Signal Generator | Rohde & Schwarz | SMR40 | 3171 | 12 | 4-Aug-2010 |
| EMI Test Receiver | Rohde & Schwarz | ESU40 | 3506 | 12 | 1-Sep-2010 |
| **Section 2.2 Radio (Tx) - Occupied Bandwidth** | | | | | |
| GPS Frequency Standard | Rapco | GPS-804/3 | 1312 | 6 | 4-Mar-2010 |
| Spectrum Analyser | Rohde & Schwarz | FSU26 | 2747 | 12 | 2-Nov-2010 |
| Hygrometer | Rotronic | I-1000 | 2891 | 12 | 17-Apr-2010 |

TU – Traceability Unscheduled

## 3.2 MEASUREMENT UNCERTAINTY

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

| Test Discipline | Frequency / Parameter | MU |
|---|---|---|
| Radiated Emissions, Bilog Antenna, AOATS | 30MHz to 1GHz Amplitude | 5.1dB* |
| Radiated Emissions, Horn Antenna, AOATS | 1GHz to 40GHz Amplitude | 6.3dB* |
| Conducted Emissions, LISN | 150kHz to 30MHz Amplitude | 3.2dB* |
| Conducted Emissions, ISN | 150kHz to 30MHz Amplitude | 2.1dB |
| Substitution Antenna, Radiated Field | 30MHz to 18GHz Amplitude | 2.6dB |
| Discontinuous Interference | 150kHz to 30MHz Amplitude | 3.0dB* |
| Interference Power | 30MHz to 300MHz Amplitude | 3.0dB* |
| Radiated E-Field Susceptibility | 26MHz to 2.5GHz Test Amplitude | 1.4dB† |
| Conducted Susceptibility | 100kHz to 250MHz Amplitude | 1.8dB† |
| DC Input Ripple Immunity | Current<br>Voltage | 0.45%<br>0.91% |
| Power Frequency Magnetic Field | 50Hz/60Hz Amplitude | 0.45% |
| Magnetic Emissions | 9kHz to 30MHz Amplitude | 3.4dB* |
| Magnetic Field/Flux iaw EN 50366 | 10Hz to 400kHz | 2.64% |
| Harmonics and Flicker | The test was applied using proprietary equipment that meets the requirements of EN 61000-3-2 and EN 61000-3-3 | — |
| Mains Voltage Variations and Interrupts | The test was applied using proprietary equipment that meets the requirements of EN 61000-4-11 | — |
| Fast Transient Burst | The test was applied using proprietary equipment that meets the requirements of EN 61000-4-4 | — |
| Electrostatic Discharge | The test was applied using proprietary equipment that meets the requirements of EN 61000-4-2 | — |
| Surge | The test was applied using proprietary equipment that meets the requirements of EN 61000-4-5 | — |
| Vehicle Transients | The test was applied using proprietary equipment that meets the requirements of ISO 7637-1 and 2 | — |
| Compass Safe Distance | Azimuth Accuracy | 0.10° |

Worst case error for both Time and Frequency measurement 12 parts in $10^6$.

* In accordance with CISPR 16-4
† In accordance with UKAS Lab 34

Product Service

## SECTION 4

## PHOTOGRAPHS

Product Service

## 4.1 TEST SET UP PHOTOGRAPHS


Radiated Emissions (Enclosure Port)

Product Service

## SECTION 5

## ACCREDITATION, DISCLAIMERS AND COPYRIGHT

## 5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).