

Report on the Radio Testing

For

SmarDTV (UK) Ltd.

On

S55

Report no. TRA-031431-00-45-02A

31<sup>st</sup> March 2017

Report Number: TRA-031431-00-45-02A  
Issue: A

REPORT ON THE RADIO TESTING OF A

SmarDTV (UK) Ltd

S55

WITH RESPECT TO SPECIFICATION  
FCC 47CFR 15.247 & IC RSS-247

TEST DATE: From 22-2-2017 to 23-3-2017

Written by: A Wong

Alan Wong  
Radio Test Engineer

Approved by:

Date: 31<sup>st</sup> March 2017

John Charters  
Department Manager (Radio)

Disclaimers:

- [1] THIS DOCUMENT MAY BE REPRODUCED ONLY IN ITS ENTIRETY AND WITHOUT CHANGE  
[2] THE RESULTS CONTAINED IN THIS DOCUMENT RELATE ONLY TO THE ITEM(S) TESTED

## 1 Revision Record

| <i>Issue Number</i> | <i>Issue Date</i>           | <i>Revision History</i> |
|---------------------|-----------------------------|-------------------------|
| A                   | 31 <sup>st</sup> March 2017 | Original                |
|                     |                             |                         |

## 2 Summary

|                             |  |
|-----------------------------|--|
| TEST REPORT NUMBER:         | TRA-031431-00-45-02A   |
| WORKS ORDER NUMBER          | TRA-0314310-00   |
| PURPOSE OF TEST:            | <p>USA: Testing of radio frequency equipment per the relevant authorization procedure of chapter 47 of CFR (code of federal regulations) Part 2, subpart J.</p> <p>Canada: Testing of radio apparatus for TAC (technical acceptance certificate) per subsections 4(2) of the Radiocommunication Act and 21(1) of the Radiocommunication Regulations.</p> |
| TEST SPECIFICATION(S):      | 47CFR15.247 & RSS-247  |
| EQUIPMENT UNDER TEST (EUT): | S55  |
| FCC IDENTIFIER:             | DKN-AVAD1  |
| ISED:                       | 1707A-AVAD1  |
| EUT SERIAL NUMBER:          | Sample S7  |
| MANUFACTURER:               | SmarDTV (UK) Limited   |
| ADDRESS:                    | Beckside Design Centre<br>Millennium Business Park<br>Station Road, Steeton<br>Keighley, West Yorkshire<br>BD20 6QW, United Kingdom  |
| CLIENT CONTACT:             | <p>Chris Wordley</p> <p>☎ 01535 659000</p> <p>✉ <a href="mailto:chris.wordley@smardtv.com">chris.wordley@smardtv.com</a></p>   |
| ORDER NUMBER:               | POR01505   |
| TEST DATE:                  | From 22-2-2017 to 23-3-2017  |
| TESTED BY:                  | Alan Wong<br>Element Hull  |



## 2.1 Test Summary

| Test Method and Description   |      | Requirement Clause |              | Applicable to this equipment        | Result / Note |
|---|------|--------------------|--------------|-------------------------------------|---------------|
|   |      | RSS                | 47CFR15      |                                     |               |
| Radiated spurious emissions (restricted bands of operation and cabinet radiation) |      | Gen, 8.10          | 15.205       | <input checked="" type="checkbox"/> | PASS          |
| AC power line conducted emissions   |      | Gen, 8.8           | 15.207       | <input type="checkbox"/>            | NOTE1         |
| Occupied bandwidth  |      | 247, 5.2 (1)       | 15.247(a)(2) | <input type="checkbox"/>            | NOTE2         |
| Conducted carrier power   | Peak | 247, 5.4 (4)       | 15.247(b)(3) | <input type="checkbox"/>            | NOTE2         |
|   | Max. |                    |              | <input type="checkbox"/>            |               |
| Conducted / radiated RF power out-of-band   |      | 247, 5.5           | 15.247(d)    | <input type="checkbox"/>            | NOTE2         |
| Power spectral density, conducted   |      | 247, 5.2 (2)       | 15.247(e)    | <input type="checkbox"/>            | NOTE2         |
| Calculation of duty correction  |      | -                  | 15.35(c)     | <input type="checkbox"/>            | NOTE2         |

### Notes:

NOTE1: Battery power operation only, with an internal fully charged Lithium-ion battery.

NOTE2: Only radiated emission results are included in this test report. The conducted measurements for the BTLE module are contained within report TRA-029575-02-45-02A.

The results contained in this report relate only to the items tested, in the condition at time of test, and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. Any modifications made are identified in Section 8 of this report.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 5.2 of this test report (Deviations from Test Standards).

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## 4 Introduction

This report TRA-031431-00-45-01A presents the results of the Radio testing on a SmarDTV (UK) Ltd., S55 to specification 47CFR15 Radio Frequency Devices and RSS-247 Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment.

The testing was carried out for a SmarDTV (UK) Ltd. by Element, at the address(es) detailed below.

|                                     |   |                          |  |
|-------------------------------------|---|--------------------------|--|
| <input checked="" type="checkbox"/> | Element Hull<br>Unit E<br>South Orbital Trading Park<br>Hedon Road<br>Hull<br>HU9 1NJ<br>UK | <input type="checkbox"/> | Element Skelmersdale<br>Unit 1<br>Pendle Place<br>Skelmersdale<br>West Lancashire<br>WN8 9PN<br>UK |
|-------------------------------------|---|--------------------------|--|

This report details the configuration of the equipment, the test methods used and any relevant modifications where appropriate.

All test and measurement equipment under the control of the laboratory and requiring calibration is subject to an established programme and procedures to control and maintain measurement standards. The quality management system meets the principles of ISO 9001, and has quality control procedures for monitoring the validity of tests undertaken. Records and sufficient detail are retained to establish an audit trail of calibration records relating to its test results for a defined period. Under control of the established calibration programme, key quantities or values of the test & measurement instrumentation are within specification and comply with the relevant traceable internationally recognised and appropriate standard specifications, which are UKAS calibrated as such where these properties have a significant effect on results. Participation in inter-laboratory comparisons and proficiency testing ensures satisfactory correlation of results conform to Elements own procedures, as well as statistical techniques for analysis of test data providing the appropriate confidence in measurements.

Throughout this report EUT denotes equipment under test.

### FCC Site Listing:

Element is accredited for the above sites under the US-EU MRA, Designation number UK0009.

### IC Registration Number(s):

|                    |       |
|--------------------|-------|
| Element Hull       | 3483A |
| Element North West | 3930B |

The test site requirements of ANSI C63.4-2014 are met up to 1GHz.

The test site SVSWR requirements of CISPR 16-1-4:2010 are met over the frequency range 1 GHz to 18 GHz.

## **5 Test Specifications**

### **5.1 Normative References**

- FCC 47 CFR Ch. I – Part 15 – Radio Frequency Devices.
- ANSI C63.10-2013 – American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- ANSI C63.4-2014 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
- Industry Canada RSS-247, Issue 1, May 2015 – Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
- Industry Canada RSS-Gen, Issue 4, November 2014 – General Requirements for Compliance of Radio Apparatus

### **5.2 Deviations from Test Standards**

Only radiated emission results are included in this test report. The conducted measurements for the BTLE module are contained within report TRA-029575-02-45-02A. The manufacturer declared that no changes to the module were made.

## 6 Glossary of Terms

|               |  |
|---------------|--|
| <b>§</b>      | denotes a section reference from the standard, not this document |
| <b>AC</b>     | Alternating Current  |
| <b>ANSI</b>   | American National Standards Institute                            |
| <b>BW</b>     | bandwidth  |
| <b>C</b>      | Celsius  |
| <b>CFR</b>    | Code of Federal Regulations                                      |
| <b>CW</b>     | Continuous Wave  |
| <b>dB</b>     | decibel  |
| <b>dBm</b>    | dB relative to 1 milliwatt                                       |
| <b>DC</b>     | Direct Current   |
| <b>DSSS</b>   | Direct Sequence Spread Spectrum                                  |
| <b>EIRP</b>   | Equivalent Isotropically Radiated Power                          |
| <b>ERP</b>    | Effective Radiated Power   |
| <b>EUT</b>    | Equipment Under Test   |
| <b>FCC</b>    | Federal Communications Commission                                |
| <b>FHSS</b>   | Frequency Hopping Spread Spectrum                                |
| <b>Hz</b>     | hertz  |
| <b>IC</b>     | Industry Canada  |
| <b>ITU</b>    | International Telecommunication Union                            |
| <b>LBT</b>    | Listen Before Talk   |
| <b>m</b>      | metre  |
| <b>max</b>    | maximum  |
| <b>MIMO</b>   | Multiple Input and Multiple Output                               |
| <b>min</b>    | minimum  |
| <b>MRA</b>    | Mutual Recognition Agreement                                     |
| <b>N/A</b>    | Not Applicable   |
| <b>PCB</b>    | Printed Circuit Board  |
| <b>PDF</b>    | Portable Document Format   |
| <b>Pt-mpt</b> | Point-to-multipoint  |
| <b>Pt-pt</b>  | Point-to-point   |
| <b>RF</b>     | Radio Frequency  |
| <b>RH</b>     | Relative Humidity  |
| <b>RMS</b>    | Root Mean Square   |
| <b>Rx</b>     | receiver   |
| <b>s</b>      | second   |
| <b>SVSWR</b>  | Site Voltage Standing Wave Ratio                                 |
| <b>Tx</b>     | transmitter  |
| <b>UKAS</b>   | United Kingdom Accreditation Service                             |
| <b>V</b>      | volt   |
| <b>W</b>      | watt   |
| <b>Ω</b>      | ohm  |

## **7 Equipment Under Test**

### **7.1 EUT Identification**

- Name: S55
- Serial Number: Sample S7
- Model Number: S55
- Software Revision: RF Test Software
- Build Level: Pre-production S55 sample S7

### **7.2 System Equipment**

Equipment listed below forms part of the overall test setup and is required for equipment functionality and/or monitoring during testing. The compliance levels achieved in this report relate only to the EUT and not items given in the following list.

HD 1080p video source with HDMI output and power supply unit  
RNDIS USB Hub device and power supply unit  
Laptop computer and power supply

### **7.3 EUT Mode of Operation**

#### **7.3.1 Transmission**

The mode of operation for transmitter tests was as follows...

The EUT was connected via an RNDIS USB hub, to a laptop computer. The computer executed a Bluetooth EUT control software, named Bluetool for setting operating frequencies or hopping modes, modulation schemes, data rates and power levels. The same USB connection was also charging the EUT battery at the same time.

#### **7.3.2 Reception**

No receiver tests were carried out.

## 7.4 EUT Radio Parameters

### 7.4.1 General

|   |   |
|---|---|
| <b>Frequency of operation:</b>  | From 2402 MHz to 2480 MHz   |
| <b>Modulation type(s):</b>  | Bluetooth LE  |
| <b>Occupied channel bandwidth(s):</b>                                       | 1 MHz   |
| <b>Channel spacing:</b>   | 1 MHz   |
| <b>Declared output power(s):</b>  | Maximum power setting at 0 dBm  |
| <b>Warning against use of alternative antennas in user manual (yes/no):</b> | N/A: The antennae are internal and completely inaccessible to the user          |
| <b>Nominal Supply Voltage:</b>  | Lithium-ion Battery at 3.7 V d.c.   |
| <b>Frequency stability:</b>   | +/- 20ppm   |
| <b>Location of notice for license exempt use:</b>                           | The FCC part 15.19(a) statement is in the online user manual                    |
| <b>Method of prevention of use on non-US frequencies:</b>                   | Firmware country code is factory set and it cannot be changed in user interface |

### 7.4.2 Antennas

|                              |  |
|------------------------------|--|
| <b>Type:</b>                 | Airgain N2410CSM Embedded  |
| <b>Frequency range:</b>      | Single 2.4 GHz Band Operation 2.4 – 2.49 GHz   |
| <b>Impedance:</b>            | 50 ohms  |
| <b>VSWR:</b>                 | < 2:1  |
| <b>Gain:</b>                 | 2.3 dBi Peak Gain at 2.44 GHz  |
| <b>Polarisation:</b>         | Non-polarised  |
| <b>Beam width:</b>           | N/A: Not directional   |
| <b>Connector type:</b>       | U. FL-compatible cable connection  |
| <b>Length:</b>               | 21.35 x 19.5 x 0.8 mm  |
| <b>Weight:</b>               | 0.78 g (0.026 oz)  |
| <b>Environmental limits:</b> | Operating: -40° C to +75° C (-40° F to +167° F)<br>Storage: -40° C to +85° C (-40° F to +185° F)<br>0% to 95% non-condensing |
| <b>Mounting:</b>             | PCB  |

### 7.4.3 Product specific declarations

|   |                                   |
|---|-----------------------------------|
| <b>Multiple antenna configuration(s), e.g. MIMO:</b>                          | No multiple antenna configuration |
| <b>Fixed pt-pt operations (yes/no):</b>                                       | No                                |
| <b>Installation manual advice on pt-pt operational restrictions (yes/no):</b> | No                                |
| <b>Fixed pt-mpt operations (yes/no):</b>                                      | No                                |
| <b>Simultaneous tx (yes/no):</b>  | No                                |

### 7.5 EUT Description

The EUT is a converter for HDMI video streams and then transmits then data over a WiFi network.

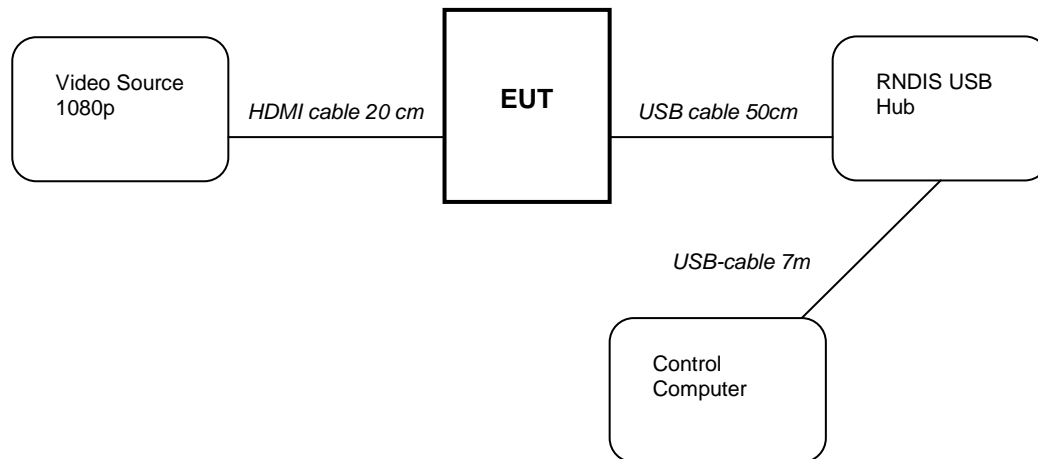
## **8 Modifications**

No modifications were performed during this assessment.

## 9 EUT Test Setup

### 9.1 Block Diagram

The following diagram shows basic EUT interconnections with cable type and cable lengths identified:



## **9.2 General Set-up Photograph**

Please refer to document number TRA-031431-PHOTOS as the client has requested photographs are held short term confidential.

## 10 General Technical Parameters

### 10.1 Normal Conditions

The E U T was tested under the normal environmental conditions of the test laboratory, except where otherwise stated. The normal power source was a built-in Lithium-ion battery with nominal output voltage at 3.7 V d.c.

### 10.2 Varying Test Conditions

There are no specific frequency stability requirements for the type of device. The results contained in this report demonstrate that the occupied bandwidth is contained within the authorised band and the manufacturer has declared sufficient frequency stability (refer to section 7.4).

Variation of supply voltage is required to ensure stability of the declared output power. During carrier power testing the following variations were made:

|                                     | <b>Category</b> | <b>Nominal</b> | <b>Variation</b> |
|-------------------------------------|-----------------|----------------|------------------|
| <input type="checkbox"/>            | Mains           |                | 85 % and 115 %   |
| <input checked="" type="checkbox"/> | Battery         | 3.7 V d.c.     | 3.0 – 4.2 V d.c. |

## 11 Radiated emissions

### 11.1 Definitions

#### *Spurious emissions*

Emissions on a frequency or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

#### *Restricted bands*

A frequency band in which intentional radiators are permitted to radiate only spurious emissions but not fundamental signals.

### 11.2 Test Parameters

|                                      |  |
|--------------------------------------|--|
| Test Location:                       | Element Hull   |
| Test Chamber:                        | Wireless Laboratory 2 (Lab16)                                |
| Test Standard and Clause:            | ANSI C63.10-2013, Clause 6.5 and 6.6                         |
| EUT Channels / Frequencies Measured: | 2402 / 2440 / 2480 MHz                                       |
| EUT Channel Bandwidths:              | 1 MHz  |
| Deviations From Standard:            | None   |
| Measurement BW:                      | 30 MHz to 1 GHz: 120 kHz<br>Above 1 GHz: 1 MHz               |
| Measurement Detector:                | Up to 1 GHz: quasi-peak<br>Above 1 GHz: RMS average and Peak |

#### **Environmental Conditions (Normal Environment)**

|                    |                                |
|--------------------|--------------------------------|
| Temperature: 20 °C | +15 °C to +35 °C (as declared) |
| Humidity: 37 %RH   | 20%RH to 75%RH (as declared)   |
| Supply: 3.7 V dc   | Fully charged Li-ion battery   |

### 11.3 Test Limit

Unwanted emissions that fall within the restricted frequency bands shall comply with the limits specified:

#### **General Field Strength Limits for License-Exempt Transmitters at Frequencies above 30 MHz**

| <b>Frequency<br/>(MHz)</b> | <b>Field Strength<br/>(<math>\mu\text{V/m}</math> at 3 m)</b> |
|----------------------------|---|
| 30 to 88                   | 100   |
| 88 to 216                  | 150   |
| 216 to 960                 | 200   |
| Above 960                  | 500   |

## 11.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure i, the emissions from the EUT were measured on a spectrum analyzer / EMI receiver.

Radiated electromagnetic emissions from the EUT are checked first by preview scans. Preview scans for all spectrum and modulation characteristics are checked, using a peak detector and where applicable worst-case determined for function, operation, orientation, etc. for both vertical and horizontal polarisations. Pre-scan plots are shown with a peak detector and 100 kHz RBW.

If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in ANSI C63.10 are followed. Alternatively, a layout closest to normal use (as declared by the provider) is employed, (see EUT setup photographs for more detail).

Emissions between 30 MHz and 1 GHz are measured using calibrated broadband antennas. Emissions above 1 GHz are characterized using standard gain horn antennas. Pre-amplifiers and filters are used where required. Care is taken to ensure that test receiver resolution bandwidth, video bandwidth and detector type(s) meet the regulatory requirements.

For both horizontal and vertical polarizations, the EUT is then rotated through 360 degrees in azimuth until the highest emission is detected. At the previously determined azimuth the test antenna is raised and lowered from 1 to 4 m in height until a maximum emission level is detected, this maximum value is recorded.

Power values measured on the test receiver / analyzer are converted to field strength, FS, in dBμV/m at the regulatory distance, using:

$$FS = PR + CL + AF - PA + DC - CF$$

Where,

PR is the power recorded on the receiver / spectrum analyzer in dBμV;

CL is the cable loss in dB;

AF is the test antenna factor in dB/m;

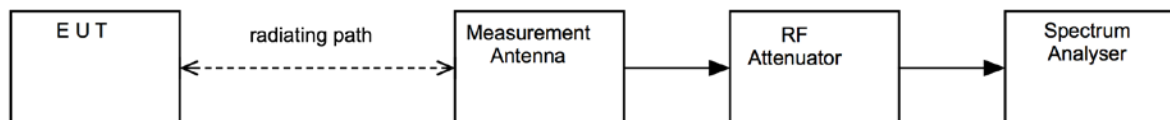
PA is the pre-amplifier gain in dB (where used);

DC is the duty correction factor in dB (where used, e.g. harmonics of pulsed fundamental);

CF is the distance factor in dB (where measurement distance different to limit distance);

This field strength value is then compared with the regulatory limit.

**Figure i Test Setup**



### 11.5 Test Set-up Photograph

Please refer to document number TRA-031431-PHOTOS as the client has requested photographs are held short term confidential.

### 11.6 Test Equipment

| <i><b>Equipment<br/>Description</b></i> | <i><b>Manufacturer</b></i> | <i><b>Equipment<br/>Type</b></i> | <i><b>Element<br/>No</b></i> | <i><b>Due For<br/>Calibration</b></i> |
|---|----------------------------|----------------------------------|------------------------------|---------------------------------------|
| For 30-200 MHz                          | EMCO                       | Biconical Antenna                | RFG095                       | 17/05/2019                            |
| For 200-1000MHz                         | EMCO                       | Log Periodic Antenna             | RFG191                       | 17/05/2019                            |
| For 1-18 GHz                            | EMCO                       | Horn Antenna                     | RFG129                       | 09/02/2018                            |
| Spectrum Analyser                       | R&S                        | FSU46                            | REF910                       | 05/07/2017                            |
| N-Type RF coaxial cable                 | Unknown                    | Cable                            | REF884                       | 04/12/2017                            |
| Pre-Amp (9kHz – 1GHz)                   | Sonoma                     | 310                              | REF927                       | 30/06/2018                            |
| Short SMA RF Cable                      | AtlanTec                   | Cable                            | REF2165                      | 09/12/2017                            |
| Cable                                   | Teledyne                   | 5m 2.92mm                        | REF919                       | 05/10/2017                            |
| Pre-Amp (1 – 26.5GHz)                   | Agilent                    | 8449B                            | REF913                       | 02/02/2018                            |
| EMI / SA                                | R&S                        | ESU                              | RFG701                       | 29/12/2017                            |
| For 18-26.5 GHz                         | Q-Par                      | Horn Antenna                     | RFG629                       | 30/09/2017                            |
| For 26.5-40 GHz                         | FM                         | Horn Antenna                     | REF820                       | 19/07/18                              |
| Ferrite Lined Chamber                   | Rainford                   | SARS                             | REF886                       | 21/07/17                              |

## 11.7 Test Results

### Emissions not related to transmitter in the frequency range from 30 MHz to 1000 MHz

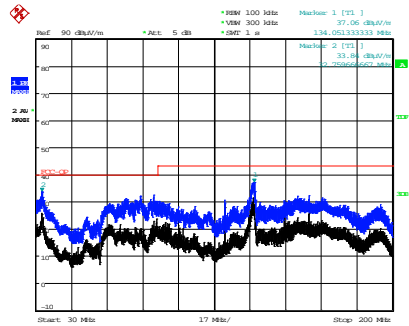
| <i>Frequency<br/>(MHz)</i> | <i>Quasi-Peak<br/>(dBµV/m)</i> | <i>Limit<br/>(dBµV/m)</i> | <i>Quasi-Peak<br/>(µV/m)</i> | <i>Limit<br/>(µV/m)</i> | <i>Result</i> |
|----------------------------|--------------------------------|---------------------------|------------------------------|-------------------------|---------------|
| 32.596                     | 22.2                           | 40.0                      | 12.9                         | 100                     | PASS          |
| 41.293                     | 30.4                           | 40.0                      | 33.1                         | 100                     | PASS          |
| 43.741                     | 31.5                           | 40.0                      | 37.6                         | 100                     | PASS          |
| 43.913                     | 31.5                           | 40.0                      | 37.6                         | 100                     | PASS          |
| 71.333                     | 31.7                           | 40.0                      | 38.5                         | 100                     | PASS          |
| 113.517                    | 30.5                           | 43.5                      | 33.5                         | 150                     | PASS          |
| 119.995                    | 22.9                           | 43.5                      | 14.0                         | 150                     | PASS          |
| 122.153                    | 31.0                           | 43.5                      | 35.5                         | 150                     | PASS          |
| 120.017                    | 41.9                           | 43.5                      | 124.5                        | 150                     | PASS          |
| 133.349                    | 33.5                           | 43.5                      | 47.3                         | 150                     | PASS          |
| 148.347                    | 35.0                           | 43.5                      | 56.2                         | 150                     | PASS          |
| 236.403                    | 31.6                           | 46.0                      | 38.0                         | 200                     | PASS          |
| 237.044                    | 32.1                           | 46.0                      | 40.3                         | 200                     | PASS          |
| 266.531                    | 33.1                           | 46.0                      | 45.2                         | 200                     | PASS          |
| 445.051                    | 39.0                           | 46.0                      | 89.1                         | 200                     | PASS          |
| 480.054                    | 38.0                           | 46.0                      | 79.4                         | 200                     | PASS          |
| 532.961                    | 44.8                           | 46.0                      | 173.8                        | 200                     | PASS          |
| 593.390                    | 44.6                           | 46.0                      | 169.8                        | 200                     | PASS          |
| 741.754                    | 44.2                           | 46.0                      | 162.2                        | 200                     | PASS          |
| 799.439                    | 42.0                           | 46.0                      | 125.9                        | 200                     | PASS          |
| 799.503                    | 44.5                           | 46.0                      | 167.9                        | 200                     | PASS          |
| 798.460                    | 26.4                           | 46.0                      | 20.9                         | 200                     | PASS          |
| 799.487                    | 39.9                           | 46.0                      | 98.9                         | 200                     | PASS          |
| 890.107                    | 45.2                           | 46.0                      | 182.0                        | 200                     | PASS          |
| 906.718                    | 23.7                           | 46.0                      | 15.3                         | 200                     | PASS          |
| 949.391                    | 28.2                           | 46.0                      | 25.7                         | 200                     | PASS          |
| 959.967                    | 33.5                           | 46.0                      | 47.3                         | 200                     | PASS          |
| 960.110                    | 36.2                           | 46.0                      | 64.6                         | 200                     | PASS          |

**Emissions not related to transmitter in the frequency range from 1000 MHz to 5000 MHz**

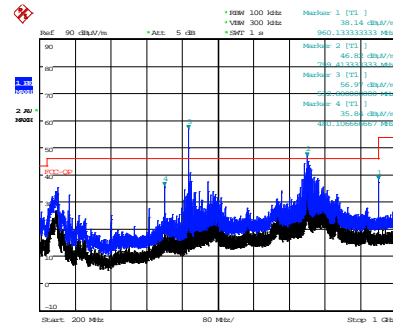
| <b><i>Frequency<br/>(MHz)</i></b> | <b><i>Peak<br/>(dB<math>\mu</math>V/m)</i></b> | <b><i>Limit<br/>(dB<math>\mu</math>V/m)</i></b> | <b><i>Peak<br/>(<math>\mu</math>V/m)</i></b> | <b><i>Limit<br/>(<math>\mu</math>V/m)</i></b> | <b><i>Result</i></b> |
|-----------------------------------|--|---|--|---|----------------------|
| 1319.000                          | 42.2   | 74  | 129.2  | 5000  | PASS                 |
| 1332.538                          | 58.1   | 74  | 803.5  | 5000  | PASS                 |
| 1332.670                          | 61.0   | 74  | 1122.0                                       | 5000  | PASS                 |
| 1563.642                          | 46.1   | 74  | 201.8  | 5000  | PASS                 |
| 1598.770                          | 66.8   | 74  | 2187.8                                       | 5000  | PASS                 |
| 1598.798                          | 64.5   | 74  | 1678.8                                       | 5000  | PASS                 |
| 1599.967                          | 49.7   | 74  | 305.4  | 5000  | PASS                 |
| 1865.316                          | 53.5   | 74  | 473.2  | 5000  | PASS                 |
| 2225.378                          | 50.5   | 74  | 335.0  | 5000  | PASS                 |
| 2332.440                          | 47.2   | 74  | 229.1  | 5000  | PASS                 |
| 2373.692                          | 62.9   | 74  | 1391.2                                       | 5000  | PASS                 |
| 2393.498                          | 48.9   | 74  | 278.6  | 5000  | PASS                 |
| 2398.367                          | 62.9   | 74  | 1391.2                                       | 5000  | PASS                 |
| 2398.416                          | 58.6   | 74  | 851.1  | 5000  | PASS                 |
| 2398.964                          | 52.3   | 74  | 412.1  | 5000  | PASS                 |
| 2464.300                          | 52.8   | 74  | 438.4  | 5000  | PASS                 |
| 2931.250                          | 50.7   | 74  | 342.8  | 5000  | PASS                 |
| 3464.300                          | 59.8   | 74  | 978.1  | 5000  | PASS                 |
| 3464.738                          | 53.8   | 74  | 489.8  | 5000  | PASS                 |
| 3506.644                          | 51.4   | 74  | 371.5  | 5000  | PASS                 |
| 3729.867                          | 54.2   | 74  | 510.4  | 5000  | PASS                 |
| 3730.867                          | 69.4   | 74  | 2940.2                                       | 5000  | PASS                 |
| 4984.765                          | 51.5   | 74  | 374.4  | 5000  | PASS                 |
| 4985.582                          | 54.8   | 74  | 548.1  | 5000  | PASS                 |

**Emissions not related to transmitter in the frequency range from 1000 MHz to 5000 MHz**

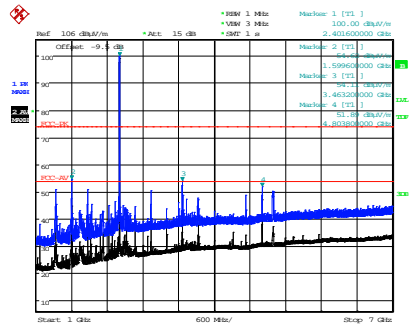
| <b><i>Frequency<br/>(MHz)</i></b> | <b><i>Average<br/>(dBμV/m)</i></b> | <b><i>Limit<br/>(dBμV/m)</i></b> | <b><i>Average<br/>(μV/m)</i></b> | <b><i>Limit<br/>(μV/m)</i></b> | <b><i>Result</i></b> |
|-----------------------------------|------------------------------------|----------------------------------|----------------------------------|--------------------------------|----------------------|
| 1319.000                          | 36.6                               | 54                               | 67.7                             | 500                            | PASS                 |
| 1332.538                          | 37.9                               | 54                               | 78.5                             | 500                            | PASS                 |
| 1332.670                          | 39.3                               | 54                               | 92.3                             | 500                            | PASS                 |
| 1563.642                          | 30.5                               | 54                               | 33.5                             | 500                            | PASS                 |
| 1598.770                          | 37.3                               | 54                               | 73.3                             | 500                            | PASS                 |
| 1598.798                          | 33.7                               | 54                               | 48.4                             | 500                            | PASS                 |
| 1599.967                          | 47.9                               | 54                               | 249.7                            | 500                            | PASS                 |
| 1865.316                          | 36.0                               | 54                               | 63.1                             | 500                            | PASS                 |
| 2225.378                          | 49.4                               | 54                               | 295.1                            | 500                            | PASS                 |
| 2332.440                          | 33.1                               | 54                               | 45.2                             | 500                            | PASS                 |
| 2373.692                          | 47.1                               | 54                               | 226.1                            | 500                            | PASS                 |
| 2393.498                          | 37.4                               | 54                               | 74.1                             | 500                            | PASS                 |
| 2398.367                          | 38.1                               | 54                               | 80.6                             | 500                            | PASS                 |
| 2398.416                          | 40.0                               | 54                               | 100.0                            | 500                            | PASS                 |
| 2398.964                          | 37.9                               | 54                               | 78.5                             | 500                            | PASS                 |
| 2464.300                          | 50.6                               | 54                               | 338.0                            | 500                            | PASS                 |
| 2931.250                          | 36.8                               | 54                               | 69.2                             | 500                            | PASS                 |
| 3464.300                          | 33.8                               | 54                               | 48.9                             | 500                            | PASS                 |
| 3464.738                          | 38.7                               | 54                               | 86.1                             | 500                            | PASS                 |
| 3506.644                          | 57.6                               | 54                               | 758.6                            | 500                            | PASS                 |
| 3729.867                          | 47.4                               | 54                               | 234.4                            | 500                            | PASS                 |
| 3730.867                          | 38.1                               | 54                               | 80.0                             | 500                            | PASS                 |
| 4984.765                          | 41.0                               | 54                               | 112.2                            | 500                            | PASS                 |
| 4985.582                          | 44.4                               | 54                               | 165.7                            | 500                            | PASS                 |

**BTLE Center Frequency: 2402 MHz Full power at 0 dBm Setting****30 – 200 MHz**

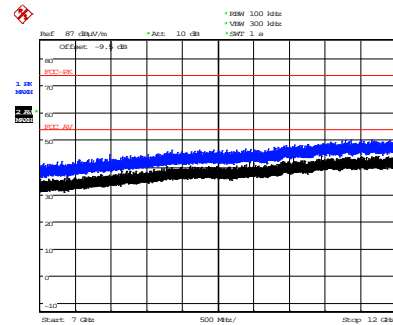
Date: 12.MAR.2017 09:54:11

**200 – 1000 MHz**

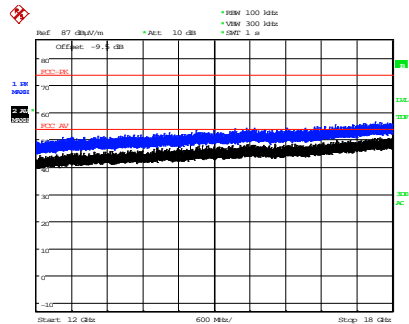
Date: 12.MAR.2017 09:56:12

**1 – 7 GHz**

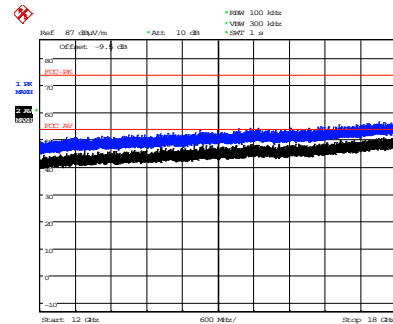
Date: 13.MAR.2017 17:46:00

**7 – 12 GHz with HPF for above 7 GHz**

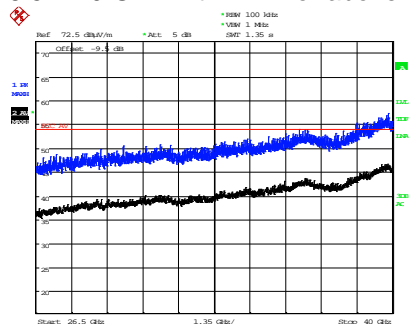
Date: 20.MAR.2017 12:22:10

**12 – 18 GHz with HPF for above 7 GHz**

Date: 20.MAR.2017 12:23:55

**18 – 26.5 GHz with HPF for above 7 GHz**

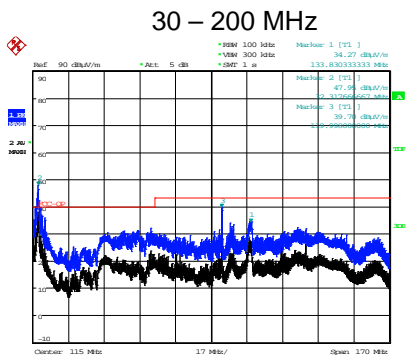
Date: 20.MAR.2017 12:23:55

**26.5 – 40 GHz with HPF for above 7 GHz**

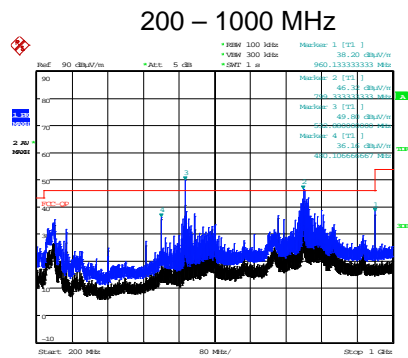
Date: 23.MAR.2017 13:02:37

**Note: HPF means High Pass Filter**

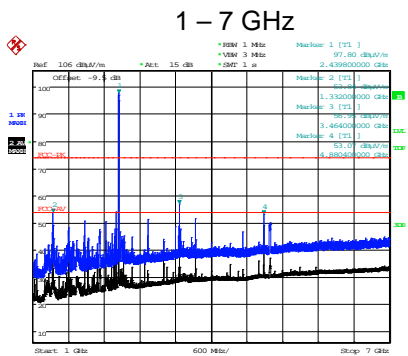
**BTLE Center Frequency: 2440 MHz Full power at 0 dBm Setting**



Date: 12.MAR.2017 11:21:31

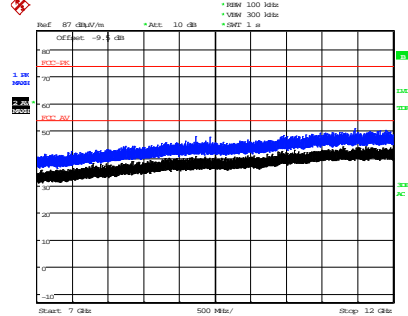


Date: 12.MAR.2017 09:12:31



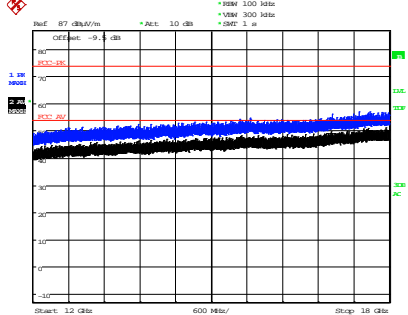
Date: 13.MAR.2017 17:50:04

**7 – 12 GHz with HPF for above 7 GHz**



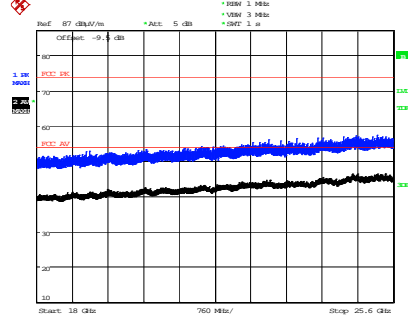
Date: 20.MAR.2017 12:12:37

**12 – 18 GHz with HPF for above 7 GHz**



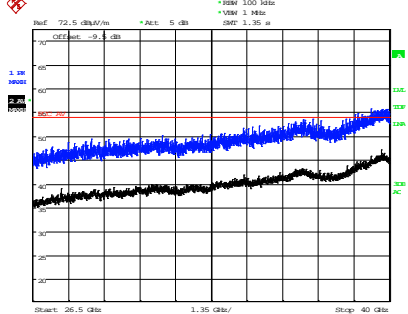
Date: 20.MAR.2017 12:27:50

**18 – 26.5 GHz with HPF for above 7 GHz**



Date: 23.MAR.2017 08:17:46

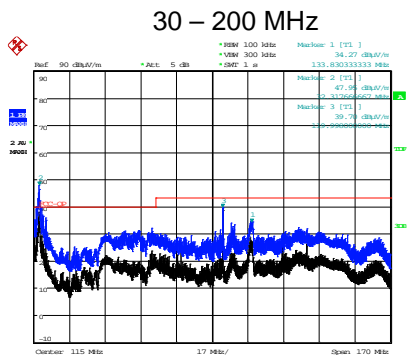
**26.5 – 40 GHz with HPF for above 7 GHz**



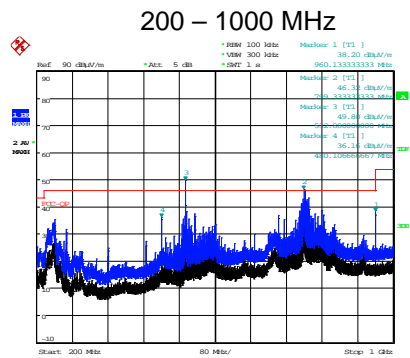
Date: 23.MAR.2017 13:06:15

Note: HPF means High Pass Filter

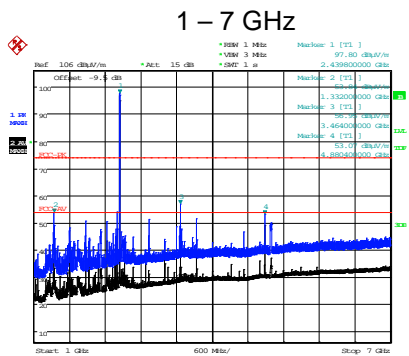
**BTLE Center Frequency: 2480 MHz Full power at 0 dBm Setting**



Date: 12.MAR.2017 11:21:31

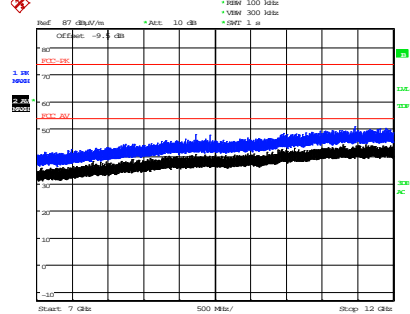


Date: 12.MAR.2017 09:32:31



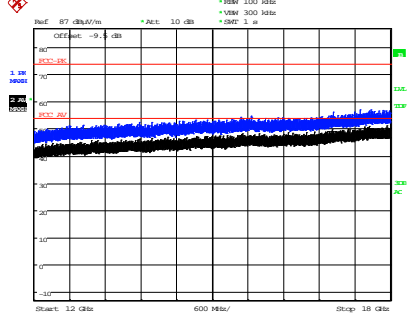
Date: 13.MAR.2017 17:50:04

**7 – 12 GHz with HPF for above 7 GHz**



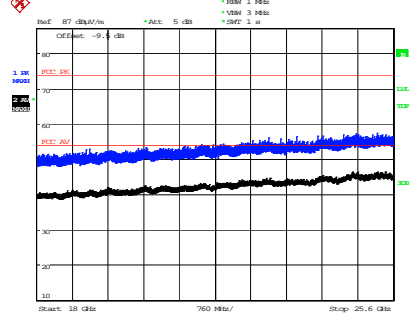
Date: 20.MAR.2017 12:32:37

**12 – 18 GHz with HPF for above 7 GHz**



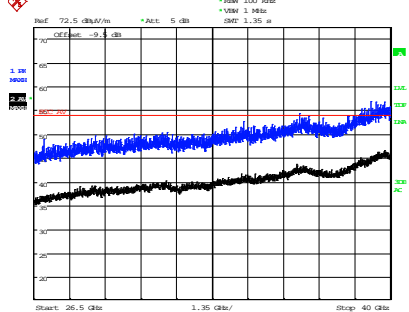
Date: 20.MAR.2017 12:27:50

**18 – 26.5 GHz with HPF for above 7 GHz**



Date: 23.MAR.2017 08:17:46

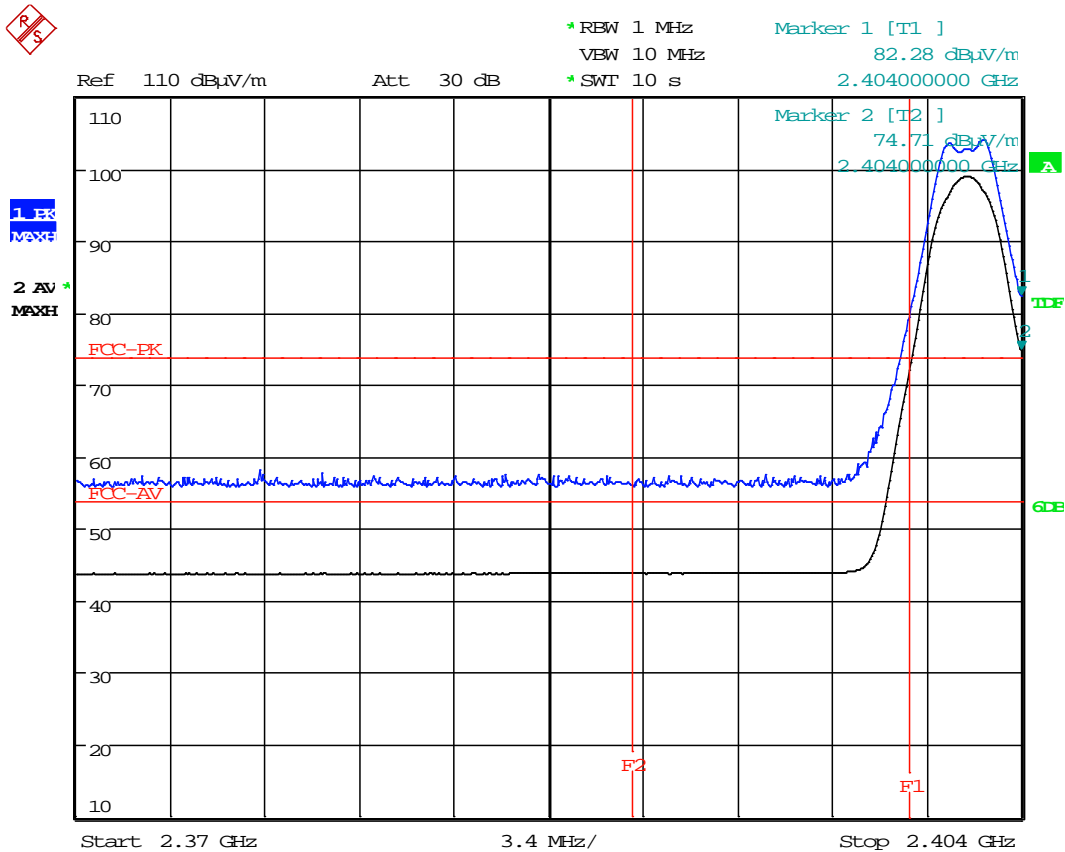
**26.5 – 40 GHz with HPF for above 7 GHz**



Date: 23.MAR.2017 13:03:49

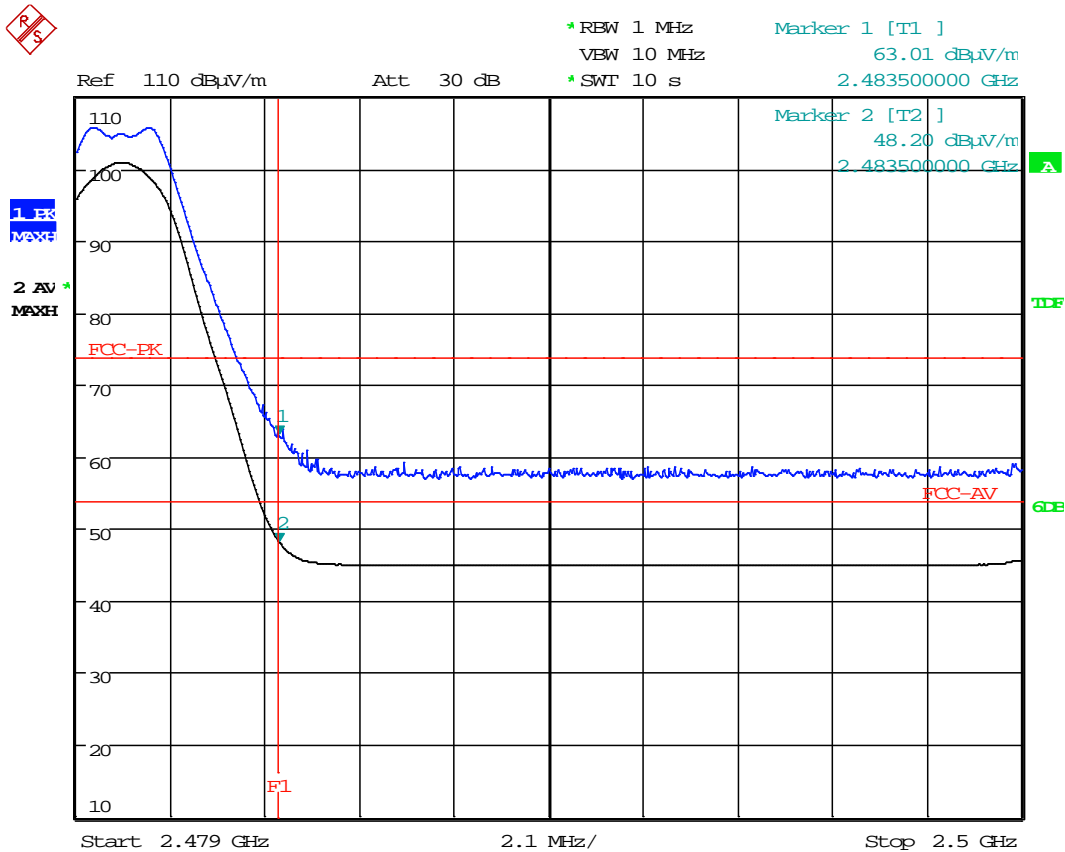
Note: HPF means High Pass Filter

**BTLE Lower Band Edge Channel Frequency 2402 MHz Maximum Power Setting at 0 dBm**



Date: 17.MAY.2016 13:22:12

**BTLE Upper Band Edge Channel Frequency 2480 MHz Maximum Power Setting at 0 dBm**



Date: 17.MAY.2016 11:01:23

## 12 Measurement Uncertainty

### Calculated Measurement Uncertainties

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95 % confidence:

#### [1] Radiated spurious emissions

Uncertainty in test result (30 MHz to 1 GHz) = **4.6 dB**

Uncertainty in test result (1 GHz to 18 GHz) = **4.7 dB**

#### [2] AC power line conducted emissions

Uncertainty in test result = **3.4 dB**

#### [3] Occupied bandwidth

Uncertainty in test result = **15.5 %**

#### [4] Conducted carrier power

Uncertainty in test result (Power Meter) = **1.08 dB**

#### [5] Conducted / radiated RF power out-of-band

Uncertainty in test result – up to 8.1 GHz = **3.31 dB**

Uncertainty in test result – 8.1 GHz to 15.3 GHz = **4.43 dB**

Uncertainty in test result (30 MHz to 1 GHz) = **4.6 dB**

Uncertainty in test result (1 GHz to 18 GHz) = **4.7 dB**

#### [6] Power spectral density

Uncertainty in test result (Spectrum Analyser) = **2.48 dB**