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Keji S,12th , Road, Hi-tech Industrial Park, Shenzhen, Guangdong, China
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CNASL1225

# FCC PART 15 SUBPART C TEST REPORT

## FCC PART 15.247

| | |
|---|---|
| **Report Reference No.....:** | **TRE1210001401 R/C:59226** |
| **FCC ID.....:** | **QSE13EAQSE** |
| Compiled by ( position+printed name+signature)..: | File administrators Tim Zhang |
| Supervised by ( position+printed name+signature)..: | Test Engineer Eric Zhang |
| Approved by ( position+printed name+signature)..: | Manager Wenliang Li |
| Date of issue.....: | Oct 29, 2012 |
| **Testing Laboratory Name** .....: | **Shenzhen Huatongwei International Inspection Co., Ltd** |
| Address .....: | Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China |
| **Applicant's name**.....: | **VTrump Tech (Shanghai) Co., Ltd** |
| Address .....: | Rm 2206, 66-1 Huayuan Road, Shanghai, China |
| **Test specification:** | |
| Standard .....: | **FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz** |
| TRF Originator.....: | Shenzhen Huatongwei International Inspection CO., Ltd |
| Master TRF.....: | Dated 2006-06 |



| | |
|---|---|
| **Test item description .....:** | VTag |
| Trade Mark .....: | / |
| Model/Type reference.....: | M20 |
| Listed Models .....: | / |
| Operation Frequency.....: | From 2400MHz to 2483.5MHz |
| Result.....: | **Positive** |

# TEST REPORT

| Test Report No. : | TRE1210001401 | Oct 29, 2012<br>Date of issue |
|---|---|---|

| | | |
|---|---|---|
| Equipment under Test | : | VTag |
| Model /Type | : | M20 |
| Listed Models | : | / |
| **Applicant** | : | **VTrump Tech (Shanghai) Co., Ltd** |
| Address | : | Rm 2206, 66-1 Huayuan Road, Shanghai, China |
| **Manufacturer** | | **VTrump Tech (Shanghai) Co., Ltd** |
| Address | : | Rm 2206, 66-1 Huayuan Road, Shanghai, China |

| | |
|---|---|
| **Test Result** according to the standards on page 4: | **Positive** |

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

# Contents

# 1. TEST STANDARDS

The tests were performed according to following standards:

**FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.**

**ANSI C63.10: American National Standard for Testing Unlicensed Wireless Devices**

**KDB558074: DTS Meas Guidance v01 of Measurement Procedure**

# 2 . SUMMARY

## 2.1. General Remarks

| | | |
|---|---|---|
| Date of receipt of test sample | : | Oct 15, 2012 |
| | | |
| | | |
| Testing commenced on | : | Oct 15, 2012 |
| | | |
| | | |
| Testing concluded on | : | Oct 29, 2012 |

## 2.2. Equipment Under Test

## Power supply system utilised

| | | | | | |
|---|---|---|---|---|---|
| Power supply voltage | : | ○ | 120V / 60 Hz | ○ | 115V / 60Hz |
| | | ○ | 12 V DC | ○ | 24 V DC |
| | | ○ | Other (specified in blank below) | | |

DC 3.0V

## 2.3. Short description of the Equipment under Test (EUT)

2.4GHz (VTag (M20))

For more details, refer to the user's manual of the EUT.

Serial number: Prototype

## 2.4. EUT operation mode

The EUT has been tested under typical operating condition.The Applicant provides Bluetooth tools software to control the EUT for staying in continous transmitting and receiving mode for testing. There are 40 channels of EUT, and the test carried out at the lowest channel, middle channel and highest channel.

| | |
|---|---|
| Frequency Range: | 2402-2480MHz |
| Channel number: | 40 channels |
| Modulation type: | Bluetooth 4.0-LE: GFSK |
| Antenna Gain: | 1.0dBi |
| Antenna type: | Ceramic antenna |

## 2.5. EUT configuration

**The following peripheral devices and interface cables were connected during the measurement:**

● - supplied by the manufacturer

○ - supplied by the lab

| | | | |
|---|---|---|---|
| ○ | Power Cable | Length (m) : | / |
| | | Shield : | / |
| | | Detachable : | / |
| ○ | Multimeter | Manufacturer : | / |
| | | Model No. : | / |

## 2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: QSE13EAQSE** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

## 2.7. Modifications

No modifications were implemented to meet testing criteria.

## 2.8. NOTE

1. The EUT is a VTag,The functions of the EUT listed as below:

| | Test Standards | Reference Report |
|---|---|---|
| Bluetooth 4.0 | FCC Part 15 Subpart C (Section15.247) | TRE1210001401 |
| MPE REPORT | FCC Per 47 CFR 2.1093 (d) | TRE1210001402 |

2. The frequency bands used in this EUT are listed as follows:

| Frequency Band(MHz) | 2400-2483.5 | 5150-5350 | 5470-5725 | 5725-5850 |
|---|---|---|---|---|
| Bluetooth | √ | — | — | — |

3. The EUT provides one completed transmitter and receiver.

| Modulation Mode | TX Function |
|---|---|
| Bluetooth | 1TX |

# 3. TEST ENVIRONMENT

## 3.1. Address of the test laboratory

Shenzhen Huatongwei International Inspection Co., Ltd
Keji Nan No.12 Road, Hi-tech Park, Shenzhen, China
Phone: 86-755-26715686 Fax: 86-755-26748089

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2009) and CISPR Publication 22.

## 3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

### CNAS-Lab Code: L1225

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: Mar. 29, 2012. Valid time is until Feb. 28, 2015.

### A2LA-Lab Cert. No. 2243.01

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing. Valid time is until Sept. 30, 2013.

### FCC-Registration No.: 662850

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 662850, Renewal date June. 01, 2012, valid time is until Jun. 01, 2015.

### IC-Registration No.: 5377A

The 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377A on Jan. 25, 2011, valid time is until Jan. 24, 2014.

### ACA

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

### NEMKO-Aut. No.: ELA125

Shenzhen Huatongwei International Inspection Co., Ltd has been assessed the quality assurance system, the testing facilities, qualifications and testing practices of the relevant parts of the organization. The quality assurance system of the Laboratory has been validated against ISO/IEC 17025 or equivalent. The laboratory also fulfils the conditions described in Nemko Document NLA-10, the authorization is valid through July 07, 2013

### VCCI

The 3m Semi-anechoic chamber (12.2m×7.95m×6.7m) and Shielded Room (8m×4m×3m) of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-292. Date of Registration: Dec. 24, 2010. Valid time is until Dec. 23, 2013.

Main Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: C-2726. Date of Registration: Dec. 20, 2009. Valid time is until Dec. 19, 2012.

Telecommunication Ports Conducted Interference Measurement of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: T-1837. Date of Registration: May 07, 2010. Valid time is until May 06, 2013.

**DNV**

Shenzhen Huatongwei International Inspection Co., Ltd. has been found to comply with the requirements of DNV towards subcontractor of EMC and safety testing services in conjunction with the EMC and Low voltage Directives and in the voluntary field. The acceptance is based on a formal quality Audit and follow-ups according to relevant parts of ISO/IEC Guide 17025 (2005), in accordance with the requirements of the DNV Laboratory Quality Manual towards subcontractors. Valid time is until Aug. 24, 2013.

## 3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

| | |
|---|---|
| Temperature: | 15-35 ° C |
| Humidity: | 30-60 % |
| Atmospheric pressure: | 950-1050mbar |

## 3.4. Configuration of Tested System


**Equipment Used in Tested System**

## 3.5. Test Description

| **FCC PART 15** | | |
|---|---|---|
| FCC Part 15.207 | AC Power Conducted Emission | N/A |
| FCC Part 15.247(a)(2) | 6dB Bandwidth | PASS |
| FCC Part 15.247(d) | Spurious RF Conducted Emission | PASS |
| FCC Part 15.247(b) | Maximum Peak Output Power | PASS |
| FCC Part 15.247(e) | Power Spectral Density | PASS |
| FCC Part 15.109/ 15.205/ 15.209 | Radiated Emissions | PASS |
| FCC Part 15.247(d) | Band Edge | PASS |
| FCC Part 15.203/15.247 (b) | Antenna Requirement | PASS |
| FCC Part1.1307 (b) | MPE Evaluation | PASS |

Remark: The measurement uncertainty is not included in the test result.
Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases.

## 3.6. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Huatongwei laboratory is reported:

| Test Items | Measurement Uncertainty | Notes |
|---|---|---|
| Frequency stability | 25 Hz | (1) |
| Transmitter power conducted | 0.57 dB | (1) |
| Transmitter power Radiated | 2.20 dB | (1) |
| Conducted spurious emission 9KHz-12.75 GHz | 1.60 dB | (1) |
| Radiated spurious emission 9KHz-12.75 GHz | 2.20 dB | (1) |
| Conducted Emission 9KHz-30MHz | 3.39 dB | (1) |
| Radiated Emission 30~1000MHz | 4.24 dB | (1) |
| Radiated Emissio 1~18GHz | 5.16 dB | (1) |
| Radiated Emissio 18-40GHz | 5.54 dB | (1) |
| Occupied Bandwidth | --------- | (1) |
| Emission Mask | --------- | (1) |
| Modulation Characteristic | --------- | (1) |
| Transmitter Frequency Behavior | --------- | (1) |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

## 3.7. Equipments Used during the Test

| AC Power Conducted Emission | | | | | |
|---|---|---|---|---|---|
| Item | Test Equipment | Manufacturer | Model No. | Serial No. | Last Cal. |
| 1 | Artificial Mains | Rohde&Schwarz | ESH2-Z5 | 100028 | 2012/10/27 |
| 2 | EMI Test Receiver | Rohde&Schwarz | ESCS 30 | 100038 | 2012/10/27 |
| 3 | Pulse Limiter | Rohde&Schwarz | ESHSZ2 | 100044 | 2012/10/27 |
| 4 | EMI Test Software | Rohde&Schwarz | ES-K1 V1.71 | N/A | 2012/10/27 |

| Radiated Emission | | | | | |
|---|---|---|---|---|---|
| Item | Test Equipment | Manufacturer | Model No. | Serial No. | Last Cal. |
| 1 | ULTRA-BROADBAND ANTENNA | Rohde&Schwarz | HL562 | 100015 | 2012/10/27 |
| 2 | EMI TEST RECEIVER | Rohde&Schwarz | ESI 26 | 100009 | 2012/10/27 |
| 3 | RF TEST PANEL | Rohde&Schwarz | TS / RSP | 335015/ 0017 | 2012/10/27 |
| 4 | TURNTABLE | ETS | 2088 | 2149 | 2012/10/27 |
| 5 | ANTENNA MAST | ETS | 2075 | 2346 | 2012/10/27 |
| 6 | EMI TEST OFTWARE | Rohde&Schwarz | ESK1 | N/A | 2012/10/27 |
| 7 | HORN ANTENNA | Rohde&Schwarz | HF906 | 100039 | 2012/10/27 |
| 8 | Amplifer | Sonoma | 310N | E009-13 | 2012/10/27 |
| 9 | JS amplifer | Rohde&Schwarz | JS4-00101800-28-5A | F201504 | 2012/10/27 |
| 10 | High pass filter | Compliance Direction | BSU-6 | 34202 | 2012/10/27 |

| | | | | | |
|---|---|---|---|---|---|
| | | systems | | | |
| 11 | Horn Antenna | SCHWARZBECK | BBHA9170 | 25841 | 2012/10/27 |
| 12 | Amplifer | Compliance Direction systems | PAP-1G-40 | 48 | 2012/10/27 |
| 13 | Loop Antenna | Rohde&Schwarz | HFH2-Z2 | 100020 | 2012/10/27 |

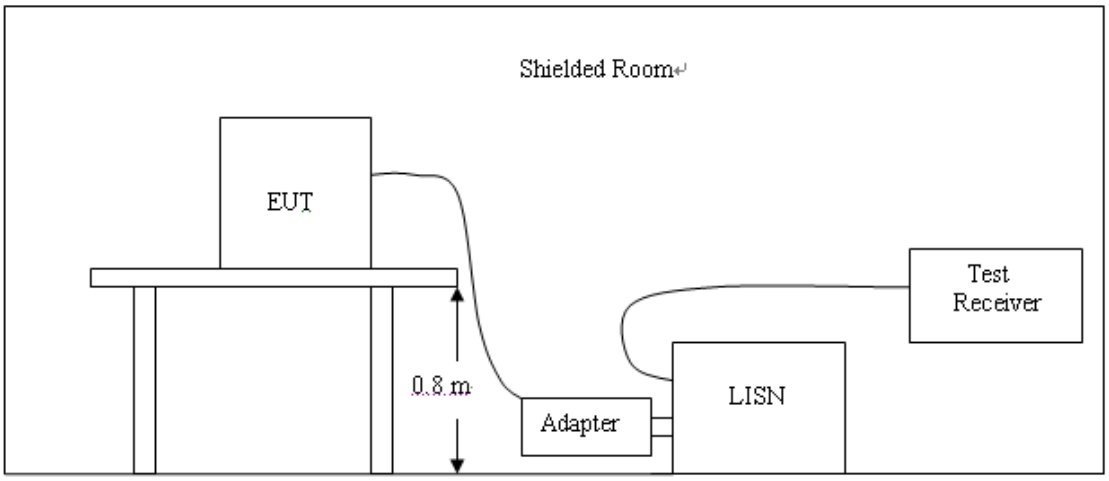
| Maximum Peak Output Power / Power Spectral Density / 6dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission | | | | | |
|---|---|---|---|---|---|
| Item | Test Equipment | Manufacturer | Model No. | Serial No. | Last Cal. |
| 1 | EMI TEST RECEIVER | Rohde&Schwarz | ESI 26 | 100009 | 2012/10/27 |
| 2 | Power Meter | Anritsu | ML2487A | 6K00001568 | 2012/10/27 |
| 3 | Power Meter Sensor | Anritsu | ML2491A | 0630989 | 2012/10/27 |
| 4 | Spectrum Analyzer | Rohde&Schwarz | FSP40 | 1164.4391.40 | 2012/10/27 |

The calibration interval was one year.

# 4. TEST CONDITIONS AND RESULTS

## 4.1. AC Power Conducted Emission(Not applicable)

**TEST CONFIGURATION**




**TEST PROCEDURE**

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4-2009.
2 Support equipment, if needed, was placed as per ANSI C63.4-2009
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4-2009
4 The EUT received DC12V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

**AC Power Conducted Emission Limit**

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

| Frequency (MHz) | Maximum RF Line Voltage (dBμV) | | | |
|---|---|---|---|---|
| | CLASS A | | CLASS B | |
| | Q.P. | Ave. | Q.P. | Ave. |
| 0.15 - 0.50 | 79 | 66 | 66-56* | 56-46* |
| 0.50 - 5.00 | 73 | 60 | 56 | 46 |
| 5.00 - 30.0 | 73 | 60 | 60 | 50 |

* Decreasing linearly with the logarithm of the frequency

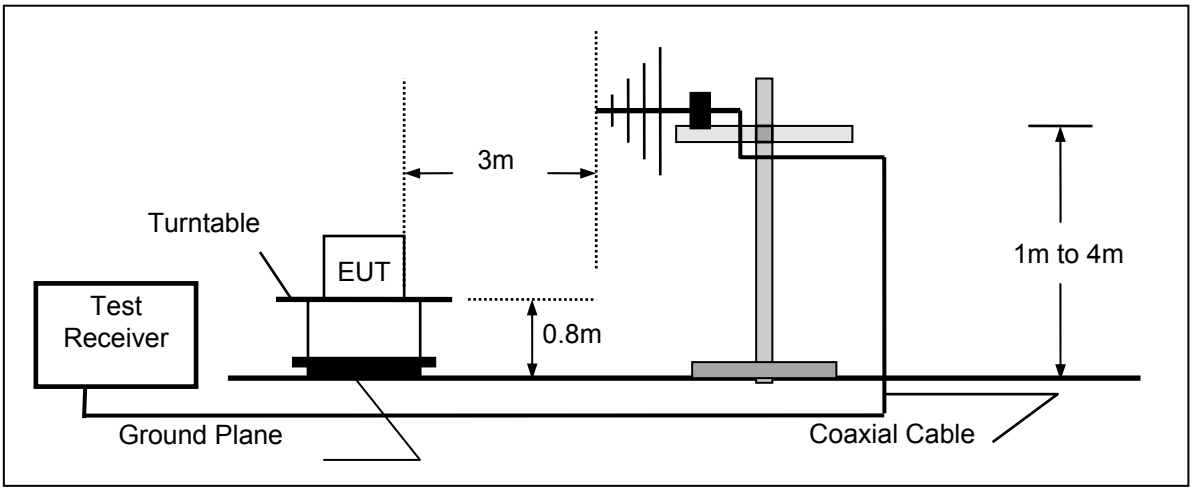
**TEST RESULTS**

**Not applicable to this device (beacuse the equipment power by Battery)**

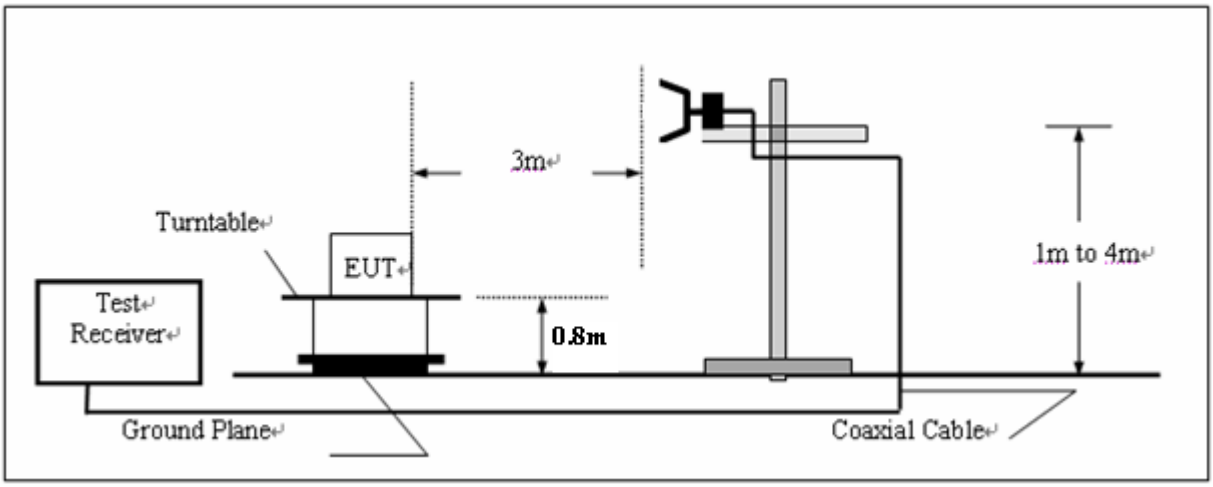
## 4.2. Radiated Emission

**TEST CONFIGURATION**

(a) Radiated Emission Test Set-Up, Frequency below 1000MHz




(b) Radiated Emission Test Set-Up, Frequency above 1000MHz




**TEST PROCEDURE**

1 The EUT was placed on a turn table which is 0.8m above ground plane.
2 Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.

**Field Strength Calculation**

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

**FS = RA + AF + CL - AG**

| | |
|---|---|
| Where FS = Field Strength | CL = Cable Attenuation Factor (Cable Loss) |
| RA = Reading Amplitude | AG = Amplifier Gain |
| AF = Antenna Factor | |

**RADIATION LIMIT**

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

The frequency spectrum above 1 GHz for Transmitter was investigated. All emission not reported are much lower than the prescribed limits. Set the RBW=1MHz,VBW=3MHz for Peak Detector while the RBW=1MHz,VBW=10Hz for Average Detector,Readings are both peak and average values.

| Frequency (MHz) | Distance (Meters) | Radiated (dBμV/m) | Radiated (μV/m) |
|---|---|---|---|
| 0.009-0.49 | 300 | 20log(2400/F(KHz))+80 | 2400/F(KHz) |
| 0.49-1.705 | 30 | 20log(24000/F(KHz))+40 | 24000/F(KHz) |
| 1.705-30 | 30 | 20log(30)+40 | 30 |
| 30-88 | 3 | 40.0 | 100 |
| 88-216 | 3 | 43.5 | 150 |
| 216-960 | 3 | 46.0 | 200 |
| Above 960 | 3 | 54.0 | 500 |

**TEST RESULTS**

Note: 1.The radiated measurement are performed the each channel (low/mid/high), the datum recorded below (the middle channel) is the worst case for all the channel.
2. ULTRA-BROADBAND ANTENNA for the radiation emission test below 1G.
3. HORN ANTENNA for the radiation emission test above 1G.

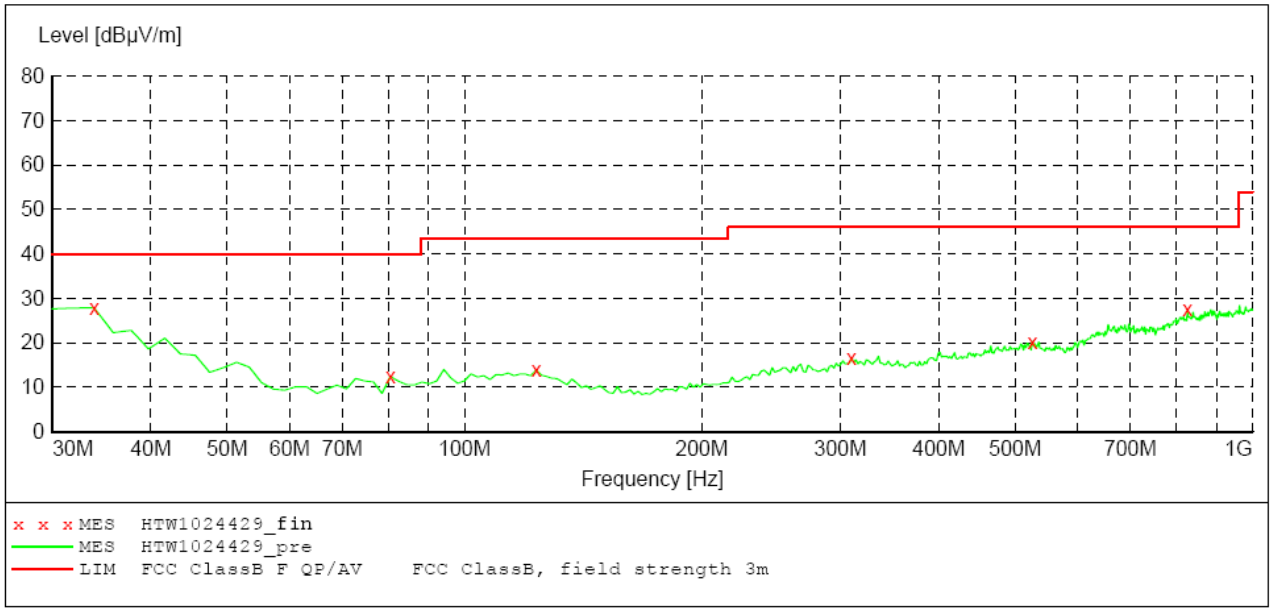
**For 9KHz to 30MHz**

| Frequency (MHz) | Corrected Reading (dBμV/m)@3m | FCC Limit (dBμV/m) @3m | Margin (dB) | Detector | Result |
|---|---|---|---|---|---|
| 0.62 | 53.96 | 71.76 | 17.80 | QP | Pass |
| 1.20 | 43.85 | 66.02 | 22.17 | QP | Pass |
| 10.32 | 41.03 | 69.54 | 28.51 | QP | Pass |
| 22.32 | 46.22 | 69.54 | 23.32 | QP | Pass |

**For 30MHz to 1000MHz**

***SCAN TABLE: "test Field (30M-1G) QP"***

```
Short Description:              Field Strength (30M-1G)
Start      Stop       Step       Detector  Meas.     IF       Transducer
Frequency  Frequency  Width                Time      Bandw.
30.0 MHz   1.0 GHz    60.0 kHz   QuasiPeak 1.0 s     120 kHz  HL562
```



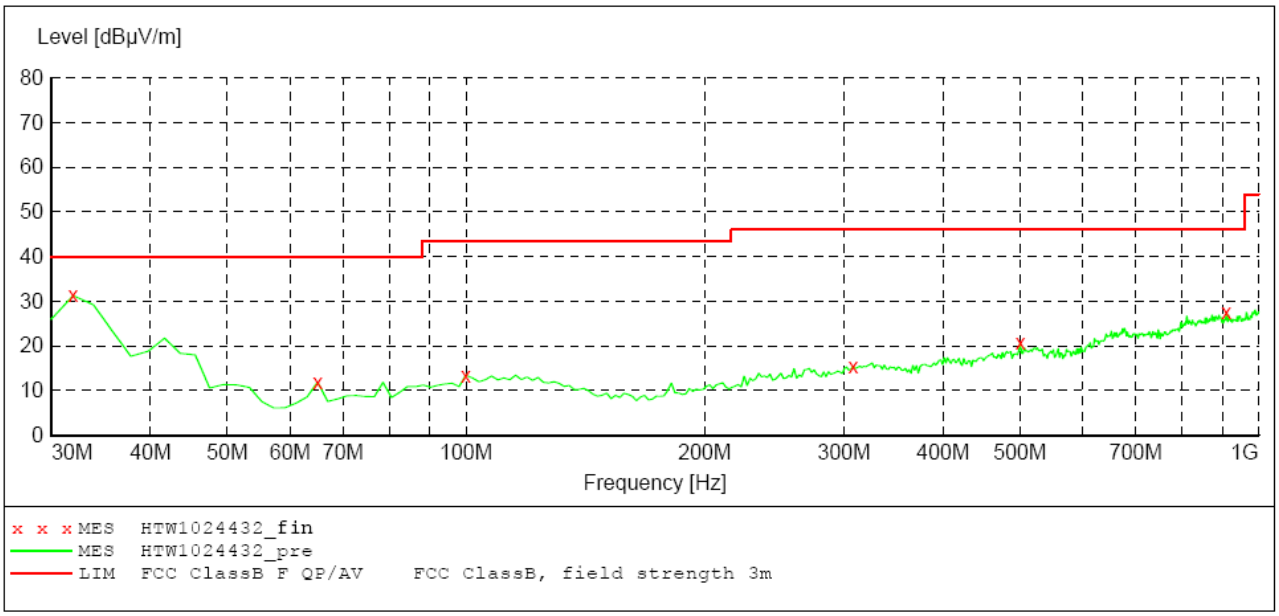

***MEASUREMENT RESULT: "HTW1024429_fin"***

10/24/2012 5:11PM

| Frequency MHz | Level dBµV/m | Transd dB | Limit dBµV/m | Margin dB | Det. | Height cm | Azimuth deg | Polarization |
|---|---|---|---|---|---|---|---|---|
| 33.887776 | 27.80 | -13.1 | 40.0 | 12.2 | QP | 100.0 | 255.00 | HORIZONTAL |
| 80.541082 | 12.40 | -22.2 | 40.0 | 27.6 | QP | 100.0 | 185.00 | HORIZONTAL |
| 123.306613 | 13.80 | -19.5 | 43.5 | 29.7 | QP | 100.0 | 300.00 | HORIZONTAL |
| 309.919840 | 16.60 | -16.5 | 46.0 | 29.4 | QP | 300.0 | 104.00 | HORIZONTAL |
| 525.691383 | 20.30 | -13.1 | 46.0 | 25.7 | QP | 300.0 | 297.00 | HORIZONTAL |
| 826.993988 | 27.50 | -7.8 | 46.0 | 18.5 | QP | 100.0 | 205.00 | HORIZONTAL |

***SCAN TABLE: "test Field (30M-1G) QP"***

```
Short Description:            Field Strength (30M-1G)
Start      Stop       Step       Detector  Meas.     IF       Transducer
Frequency  Frequency  Width                Time      Bandw.
30.0 MHz   1.0 GHz    60.0 kHz   QuasiPeak 1.0 s     120 kHz HL562
```




***MEASUREMENT RESULT: "HTW1024432_fin"***

10/24/2012 5:15PM

| Frequency MHz | Level dBµV/m | Transd dB | Limit dBµV/m | Margin dB | Det. | Height cm | Azimuth deg | Polarization |
|---|---|---|---|---|---|---|---|---|
| 31.943888 | 31.30 | -12.1 | 40.0 | 8.7 | QP | 100.0 | 358.00 | VERTICAL |
| 64.989980 | 11.90 | -23.8 | 40.0 | 28.1 | QP | 100.0 | 113.00 | VERTICAL |
| 99.979960 | 13.40 | -19.8 | 43.5 | 30.1 | QP | 100.0 | 146.00 | VERTICAL |
| 307.975952 | 15.50 | -16.6 | 46.0 | 30.5 | QP | 100.0 | 279.00 | VERTICAL |
| 500.420842 | 20.70 | -13.5 | 46.0 | 25.3 | QP | 100.0 | 3.00 | VERTICAL |
| 910.581162 | 27.50 | -7.3 | 46.0 | 18.5 | QP | 100.0 | 155.00 | VERTICAL |

## Low channel

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Frequency (MHz) | Emssion Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 11 | *2402.00 | 97.80 | PK | | | 1.00 | 210 | 101.20 | 28.3 | 4.90 | 36.6 | -3.40 |
| 1 | *2402.00 | 92.68 | AV | | | 1.00 | 210 | 96.08 | 28.3 | 4.90 | 36.6 | -3.40 |
| 2 | 4804.00 | 58.92 | PK | 74.00 | 15.08 | 1.00 | 220 | 55.72 | 32.7 | 7.00 | 36.5 | 3.20 |
| 2 | 4804.00 | 43.19 | AV | 54.00 | 10.81 | 1.00 | 220 | 39.99 | 32.7 | 7.00 | 36.5 | 3.20 |
| 3 | 7206.00 | 53.06 | PK | 74.00 | 20.94 | 1.00 | 124 | 43.66 | 35.8 | 8.90 | 35.3 | 9.40 |
| 3 | 7206.00 | -- | AV | 54.00 | -- | 1.00 | 124 | -- | 35.8 | 8.90 | 35.3 | 9.40 |
| 4 | 10243.21 | 54.15 | PK | 74.00 | 19.85 | 1.00 | 66 | 37.55 | 38.0 | 11.30 | 32.7 | 16.6 |
| 4 | 10243.21 | -- | AV | 54.00 | -- | 1.00 | 66 | -- | 38.0 | 11.30 | 32.7 | 16.6 |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Frequency (MHz) | Emssion Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 11 | *2402.00 | 97.17 | PK | | | 1.00 | 330 | 100.57 | 28.3 | 4.90 | 36.6 | -3.40 |
| 1 | *2402.00 | 91.94 | AV | | | 1.00 | 330 | 95.34 | 28.3 | 4.90 | 36.6 | -3.40 |
| 2 | 4804.00 | 56.89 | PK | 74.00 | 17.11 | 1.00 | 240 | 53.69 | 32.7 | 7.00 | 36.5 | 3.20 |
| 2 | 4804.00 | 43.85 | AV | 54.00 | 10.15 | 1.00 | 240 | 40.65 | 32.7 | 7.00 | 36.5 | 3.20 |
| 3 | 7206.00 | 50.35 | PK | 74.00 | 23.65 | 1.00 | 183 | 40.95 | 35.8 | 8.90 | 35.3 | 9.40 |
| 3 | 7206.00 | -- | AV | 54.00 | -- | 1.00 | 183 | -- | 35.8 | 8.90 | 35.3 | 9.40 |
| 4 | 10423.45 | 53.53 | PK | 74.00 | 20.47 | 1.00 | 120 | 36.93 | 38.0 | 11.30 | 32.7 | 16.6 |
| 4 | 10423.45 | -- | AV | 54.00 | -- | 1.00 | 120 | -- | 38.0 | 11.30 | 32.7 | 16.6 |

## Middle channel

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Frequency (MHz) | Emssion Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1 | *2440.00 | 98.90 | PK | | | 1.00 | 120 | 102.10 | 28.3 | 5.10 | 36.6 | -3.20 |
| 1 | *2440.00 | 93.72 | AV | | | 1.00 | 120 | 96.92 | 28.3 | 5.10 | 36.6 | -3.20 |
| 2 | 4880.00 | 56.26 | PK | 74.00 | 17.74 | 1.00 | 33 | 52.86 | 32.3 | 7.60 | 36.5 | 3.40 |
| 2 | 4880.00 | 49.21 | AV | 54.00 | 4.79 | 1.00 | 33 | 45.81 | 32.3 | 7.60 | 36.5 | 3.40 |
| 3 | 7320.00 | 51.08 | PK | 74.00 | 22.92 | 1.00 | 244 | 41.68 | 36.1 | 8.60 | 35.3 | 9.40 |
| 3 | 7320.00 | -- | AV | 54.00 | -- | 1.00 | 244 | -- | 36.1 | 8.60 | 35.3 | 9.40 |
| 4 | 12200.00 | 53.82 | PK | 74.00 | 20.18 | 1.00 | 332 | 37.22 | 38.0 | 11.30 | 32.7 | 16.6 |
| 4 | 12200.00 | -- | AV | 54.00 | -- | 1.00 | 332 | -- | 38.0 | 11.30 | 32.7 | 16.6 |

| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Frequency (MHz) | Emssion Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1 | *2440.00 | 97.77 | PK | | | 1.00 | 95 | 100.97 | 28.3 | 5.10 | 36.6 | -3.20 |
| 1 | *2440.00 | 92.88 | AV | | | 1.00 | 95 | 96.08 | 28.3 | 5.10 | 36.6 | -3.20 |
| 2 | 4880.00 | 58.26 | PK | 74.00 | 15.74 | 1.00 | 126 | 54.86 | 32.3 | 7.60 | 36.5 | 3.40 |
| 2 | 4880.00 | 48.88 | AV | 54.00 | 5.12 | 1.00 | 126 | 45.48 | 32.3 | 7.60 | 36.5 | 3.40 |
| 3 | 7320.00 | 51.46 | PK | 74.00 | 22.54 | 1.00 | 325 | 42.06 | 36.1 | 8.60 | 35.3 | 9.40 |
| 3 | 7320.00 | -- | AV | 54.00 | -- | 1.00 | 325 | -- | 36.1 | 8.60 | 35.3 | 9.40 |
| 4 | 12200.00 | 54.21 | PK | 74.00 | 19.79 | 1.00 | 215 | 37.61 | 38.0 | 11.30 | 32.7 | 16.6 |
| 4 | 12200.00 | -- | AV | 54.00 | -- | 1.00 | 215 | -- | 38.0 | 11.30 | 32.7 | 16.6 |

## High channel

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Frequency (MHz) | Emssion Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1 | *2480.00 | 96.98 | PK | | | 1.00 | 65 | 100.28 | 28.2 | 5.10 | 36.6 | -3.30 |
| 1 | *2480.00 | 92.57 | AV | | | 1.00 | 65 | 95.87 | 28.2 | 5.10 | 36.6 | -3.30 |
| 2 | 4960.00 | 56.91 | PK | 74.00 | 17.09 | 1.00 | 148 | 53.11 | 33.0 | 7.00 | 36.2 | 3.80 |
| 2 | 4960.00 | 45.86 | AV | 54.00 | 8.14 | 1.00 | 148 | 42.06 | 33.0 | 7.00 | 36.2 | 3.80 |
| 3 | 7340.00 | 50.83 | PK | 74.00 | 23.17 | 1.00 | 320 | 41.43 | 36.2 | 8.50 | 35.3 | 9.40 |
| 3 | 7340.00 | -- | AV | 54.00 | -- | 1.00 | 320 | -- | 36.2 | 8.50 | 35.3 | 9.40 |
| 4 | 10535.10 | 53.53 | PK | 74.00 | 20.47 | 1.00 | 265 | 36.93 | 38.0 | 11.30 | 32.7 | 16.6 |
| 4 | 10535.10 | -- | AV | 54.00 | -- | 1.00 | 265 | -- | 38.0 | 11.30 | 32.7 | 16.6 |

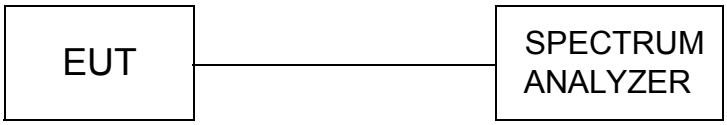
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Frequency (MHz) | Emssion Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1 | *2480.00 | 95.79 | PK | | | 1.00 | 66 | 99.09 | 28.2 | 5.10 | 36.6 | -3.30 |
| 1 | *2480.00 | 91.34 | AV | | | 1.00 | 66 | 94.64 | 28.2 | 5.10 | 36.6 | -3.30 |
| 2 | 4960.00 | 57.89 | PK | 74.00 | 16.11 | 1.00 | 251 | 54.09 | 36.2 | 8.50 | 35.3 | 3.80 |
| 2 | 4960.00 | 47.25 | AV | 54.00 | 6.75 | 1.00 | 251 | 43.45 | 36.2 | 8.50 | 35.3 | 3.80 |
| 3 | 7340.00 | 51.71 | PK | 74.00 | 22.29 | 1.00 | 326 | 42.31 | 37.4 | 10.10 | 34.8 | 9.40 |
| 3 | 7340.00 | -- | AV | 54.00 | -- | 1.00 | 326 | -- | 37.4 | 10.10 | 34.8 | 9.40 |
| 4 | 10361.45 | 53.94 | PK | 74.00 | 20.06 | 1.00 | 147 | 37.34 | 38.0 | 11.30 | 32.7 | 16.6 |
| 4 | 10361.45 | --- | AV | 54.00 | -- | 1.00 | 147 | -- | 38.0 | 11.30 | 32.7 | 16.6 |

| Suprious emission in restricted band | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Frequency (MHz) | Emssion Level (dBuV/m) | | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1 | 2390.00 | 44.71 | PK | 74.00 | 29.29 | 1.00 H | 210 | 48.11 | 28.3 | 4.90 | 36.6 | -3.40 |
| 1 | 2390.00 | -- | AV | 54.00 | -- | 1.00 H | 210 | -- | 28.3 | 4.90 | 36.6 | -3.40 |
| 2 | 2390.00 | 44.08 | PK | 74.00 | 29.92 | 1.00 V | 330 | 47.48 | 28.3 | 4.90 | 36.6 | -3.40 |
| 2 | 2390.00 | -- | AV | 54.00 | -- | 1.00 V | 330 | -- | 28.3 | 4.90 | 36.6 | -3.40 |
| 3 | 2483.50 | 46.29 | PK | 74.00 | 27.71 | 1.00 H | 102 | 49.59 | 28.2 | 5.10 | 36.6 | -3.30 |
| 3 | 2483.50 | -- | AV | 54.00 | -- | 1.00 H | 102 | -- | 28.2 | 5.10 | 36.6 | -3.30 |
| 4 | 2483.50 | 45.10 | PK | 74.00 | 28.9 | 1.00 V | 90 | 48.4 | 28.2 | 5.10 | 36.6 | -3.30 |
| 4 | 2483.50 | -- | AV | 54.00 | -- | 1.00 V | 90 | -- | 28.2 | 5.10 | 36.6 | -3.30 |

**REMARKS**: 1. Emission level (dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) +Pre-amplifier Factor
3. The other emission levels were very low against the limit.
4. Margin value = Limit value- Emission level.
5. The limit value is defined as per 15.247
6. "* ": Fundamental frequency

## 4.3. Maximum Peak Output Power

**TEST CONFIGURATION**




**TEST PROCEDURE**

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

**LIMIT**

The Maximum Peak Output Power Measurement limit is 30dBm.

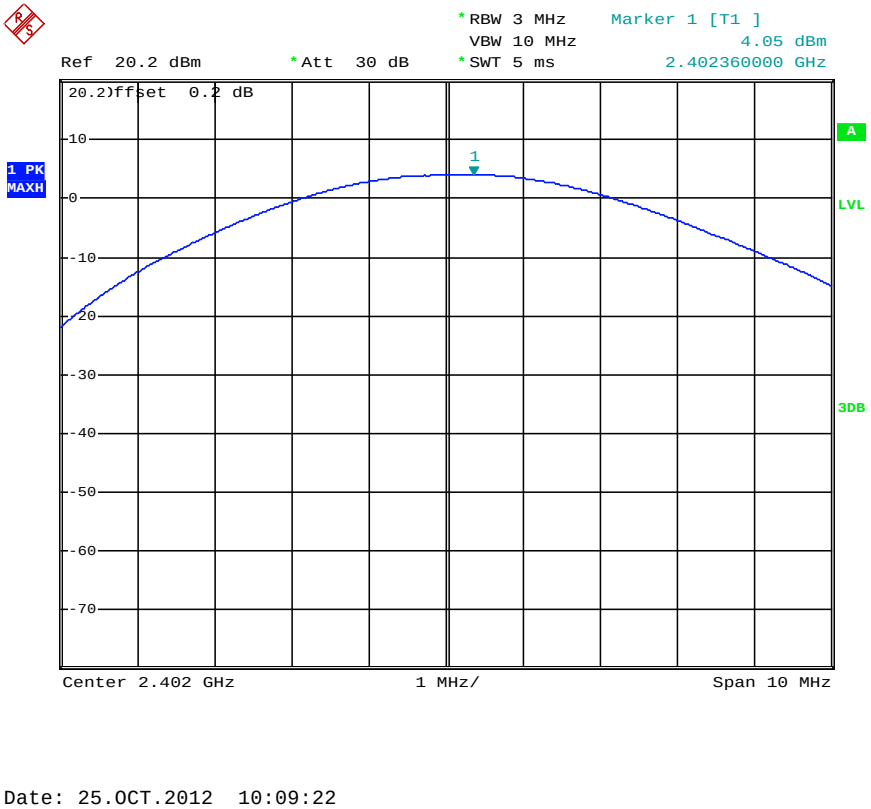
**TEST RESULTS**

| Channel | Frequency (MHz) | Peak Power Output (dBm) | Peak Power Limit (dBm) | Pass / Fail |
|---|---|---|---|---|
| 0 | 2402 | 4.05 | 30 | PASS |
| 19 | 2440 | 3.84 | 30 | PASS |
| 39 | 2480 | 3.51 | 30 | PASS |

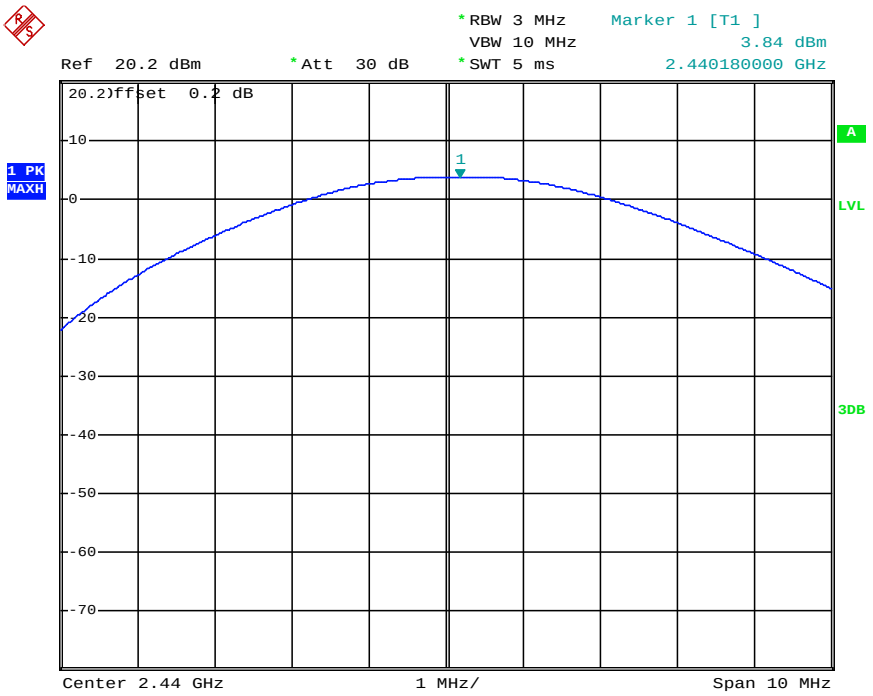
*Note: The test results including the cable lose.*

**Photos of Maximum Peak Output Power**

*channel 0*

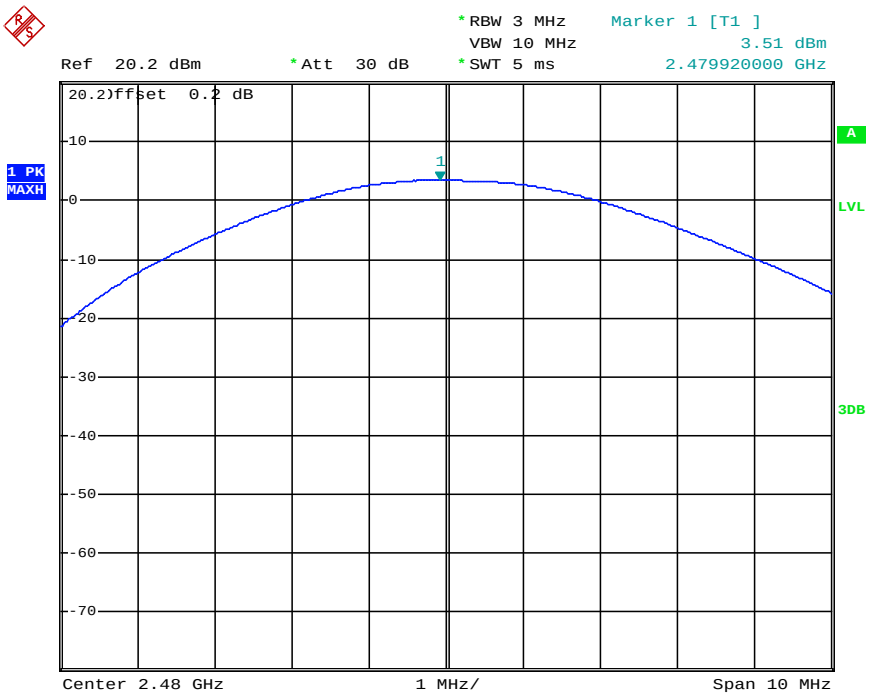


*channel 19*




Date: 25.OCT.2012 10:10:18

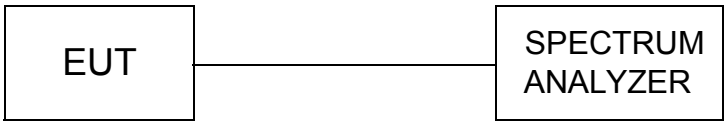
*channel 39*




Date: 25.OCT.2012 10:11:05

## 4.4. Power Spectral Density

**TEST CONFIGURATION**




**TEST PROCEDURE**

1.Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.

2.Set the RBW = 100 kHz.

3.Set the VBW  300 kHz.

4.Set the span to 5-30 % greater than the EBW

5.Detector = peak.

6.Sweep time = auto couple.

7.Trace mode = max hold.

8.Allow trace to fully stabilize.

9.Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

10.Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log(3 kHz/100 kHz= -15.2 dB).

11.The resulting peak PSD level must be  8 dBm.

Follow KDB 558074 D01 DTS Meas Guidance v01 of measurement procedure PKPSD

**LIMIT**

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

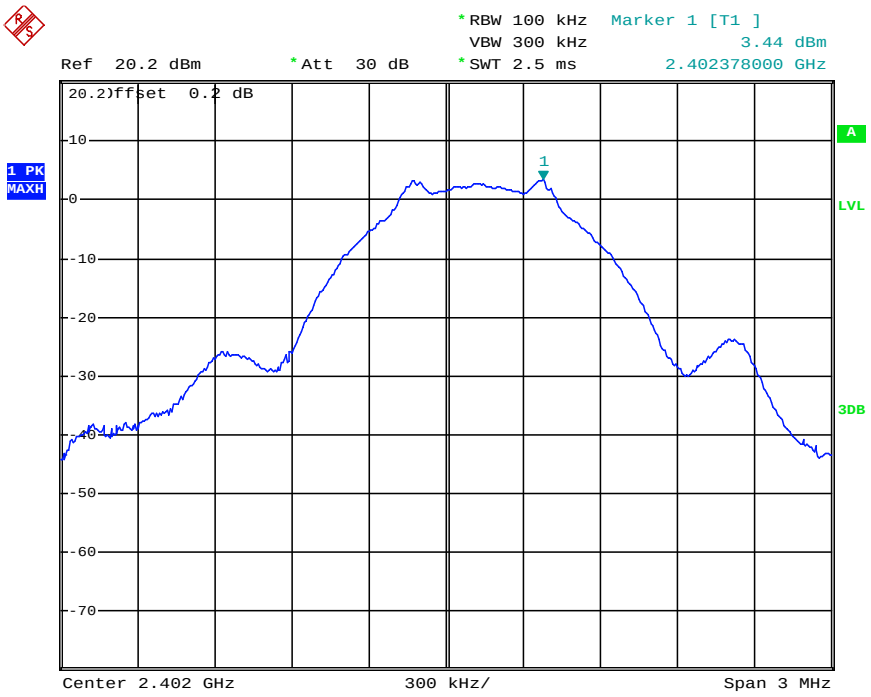
**TEST RESULTS**

| CHANNEL NUMBER | FREQUENCY (MHz ) | PSD (dBm/100KHz) | PSD (dBm/3KHz) | LIMIT (dBm/3KHz) | PASS/FAIL |
|---|---|---|---|---|---|
| 0 | 2402 | 3.44 | -11.76 | 8 | PASS |
| 19 | 2440 | 3.33 | -11.87 | 8 | PASS |
| 39 | 2480 | 2.76 | -12.44 | 8 | PASS |

*Note: The test results including the cable lose.*

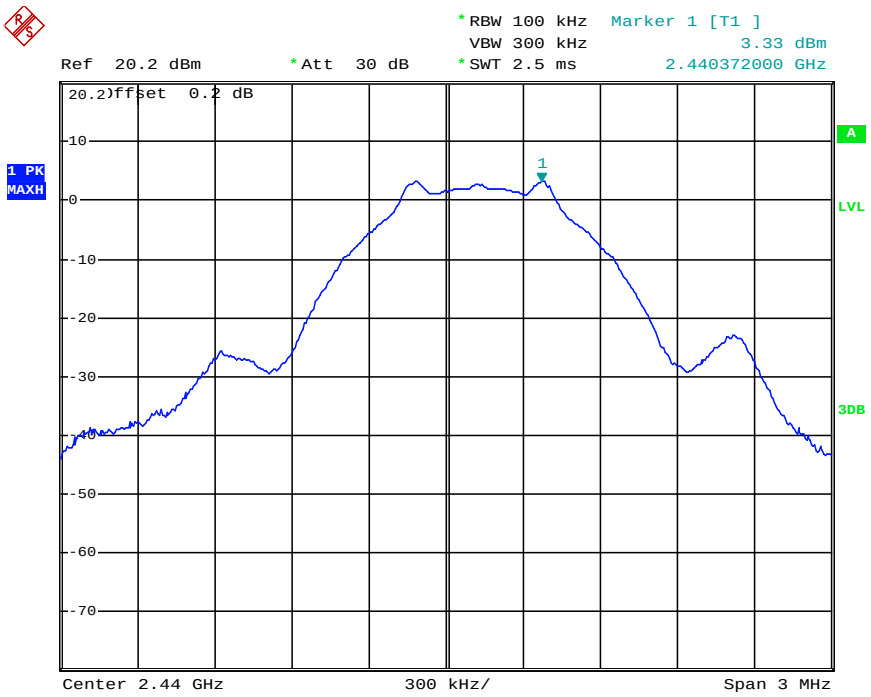
## Photos of Power Spectral Density Measurement

*channel 0*



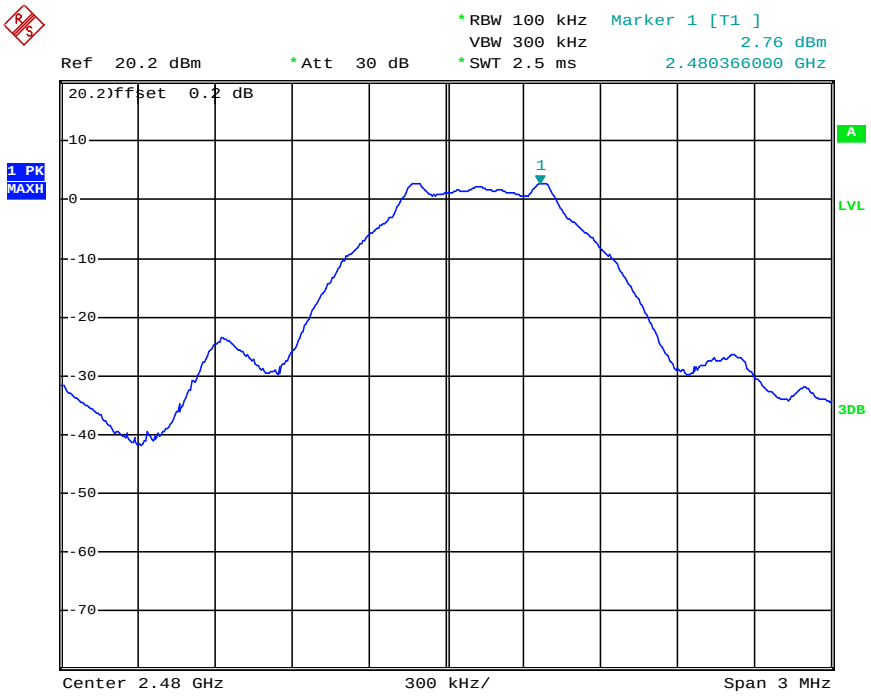

Date: 25.OCT.2012 10:16:45

*channel 19*




Date: 25.OCT.2012 10:15:56

*channel 39*




Date: 25.OCT.2012 10:13:39

## 4.5. Band Edge Compliance of RF Emission

**Applicable Standard**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

**TEST PROCEDURE**

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz for peak detector and RBW=1MHz, VBW=10Hz for average detector.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

**LIMIT**

1. Below -20dB of the highest emission level in operating band.

2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209(see Section 15.205(c)).

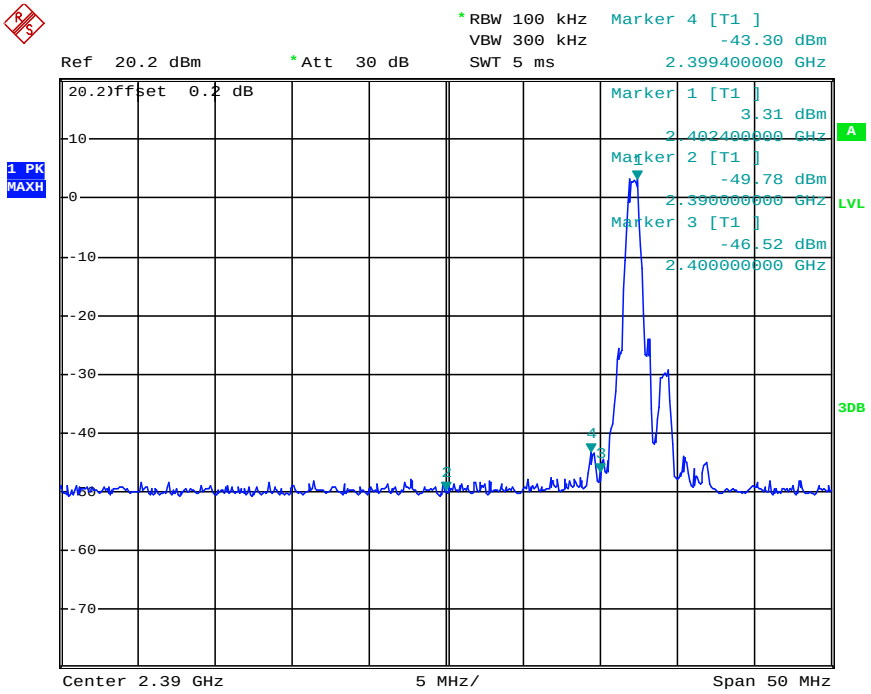
| Frequency (MHz) | Limit Average (dBuv/m) | Limit Peak (dBuv/m) |
|---|---|---|
| Below 2390 or Above 2483.5 | 54 | 74 |

**TEST RESULTS**

**Suprious emission in restricted band please see page 17**

**Photos of Conducted Band Edge Measurement**

| Channel | Frequency | Delta peak to band emission | Limit(dBc) |
|---|---|---|---|
| 0 | 2399.4MHz | 46.61 | 20 |
| 39 | 2483.5MHz | 50.69 | 20 |

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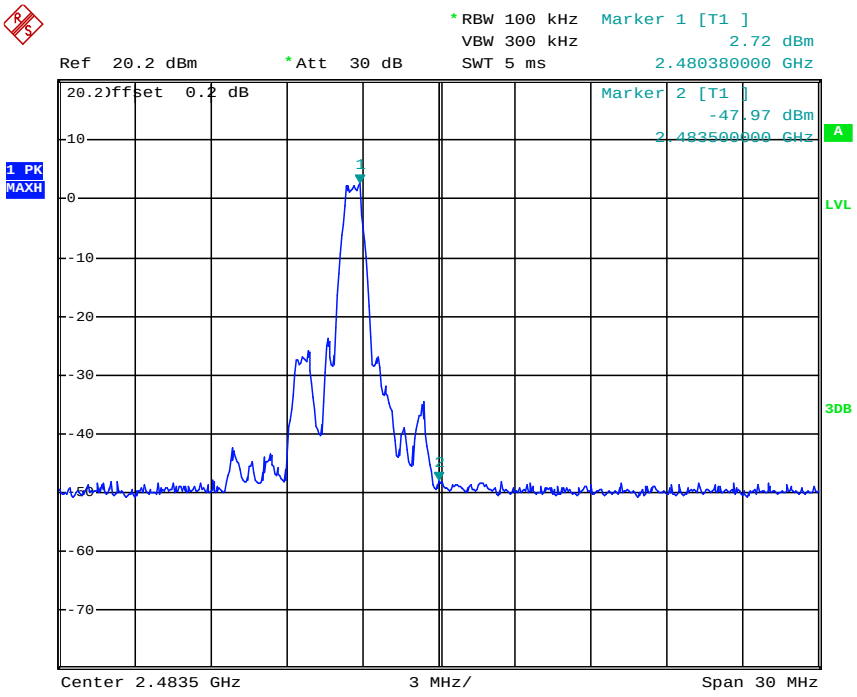
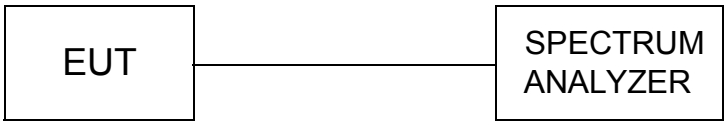



Date: 25.OCT.2012 10:23:01

## 4.6. Spurious RF Conducted Emission

**TEST CONFIGURATION**




**TEST PROCEDURE**

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2009 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBM= 300KHz to measure the peak field strength , and mwasure frequeny range from 30MHz to 26.5GHz.

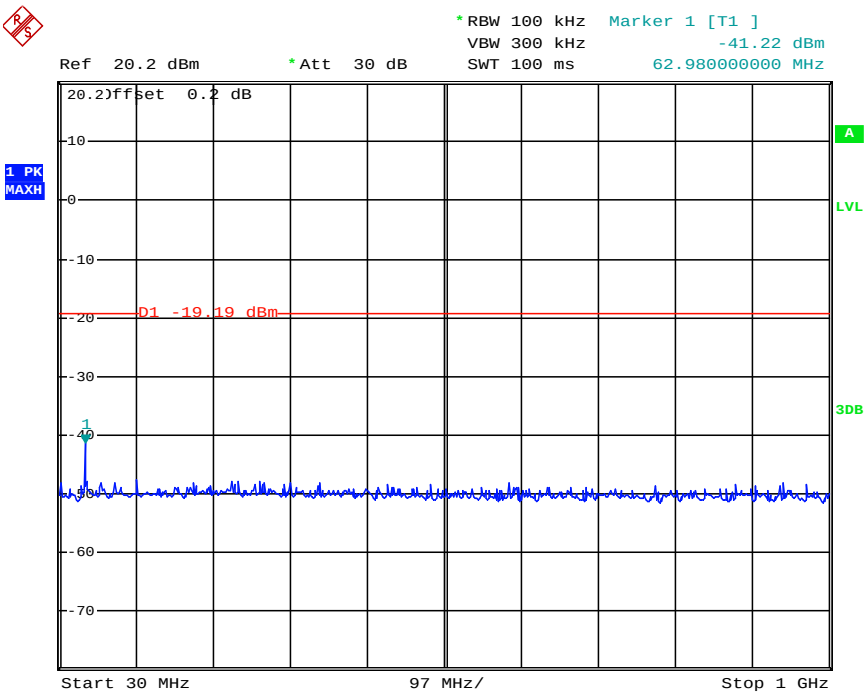
**LIMIT**

1. Below -20dB of the highest emission level in operating band.

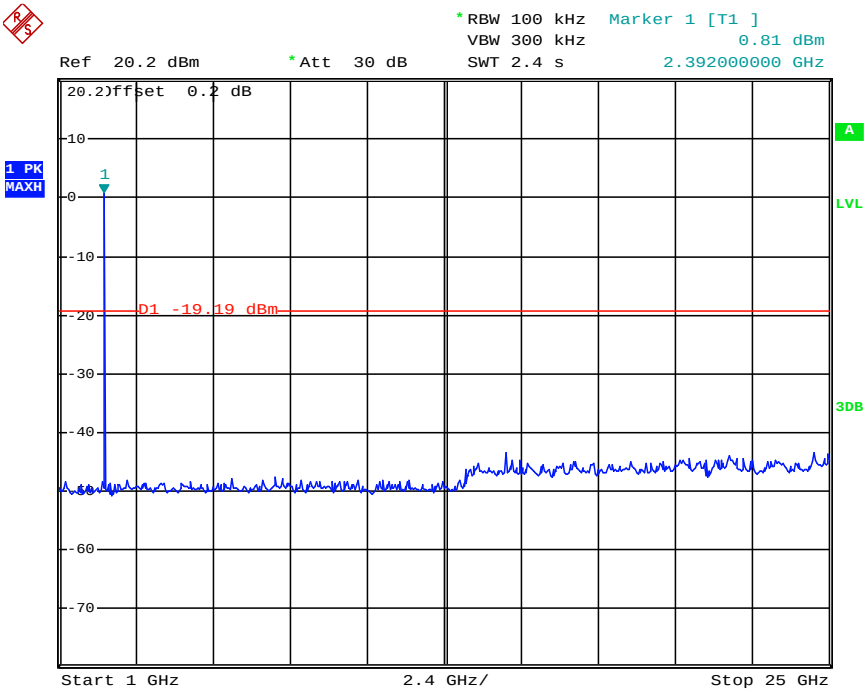
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.

**TEST RESULTS**

*channel 0*

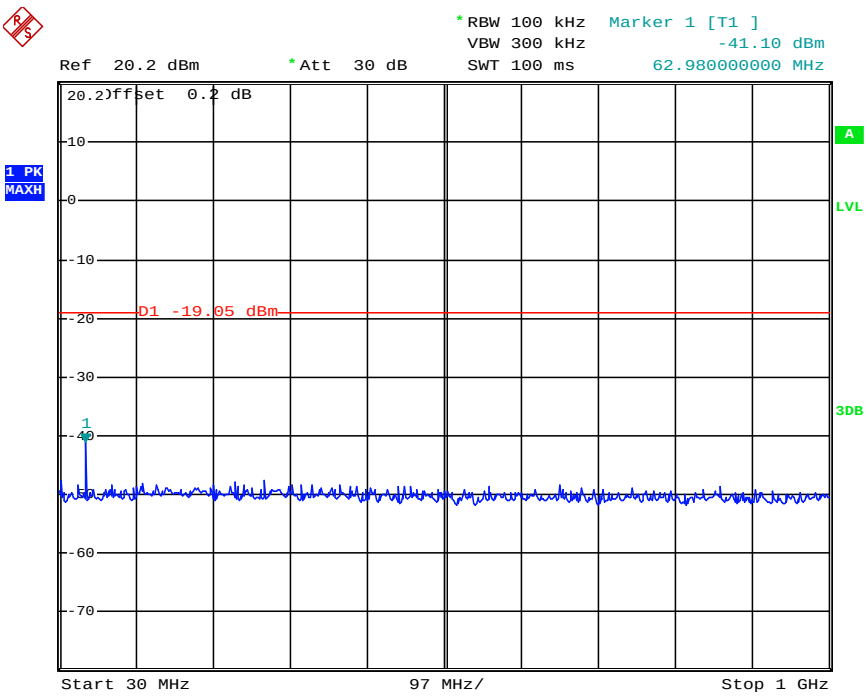



Date: 25.OCT.2012 10:28:43

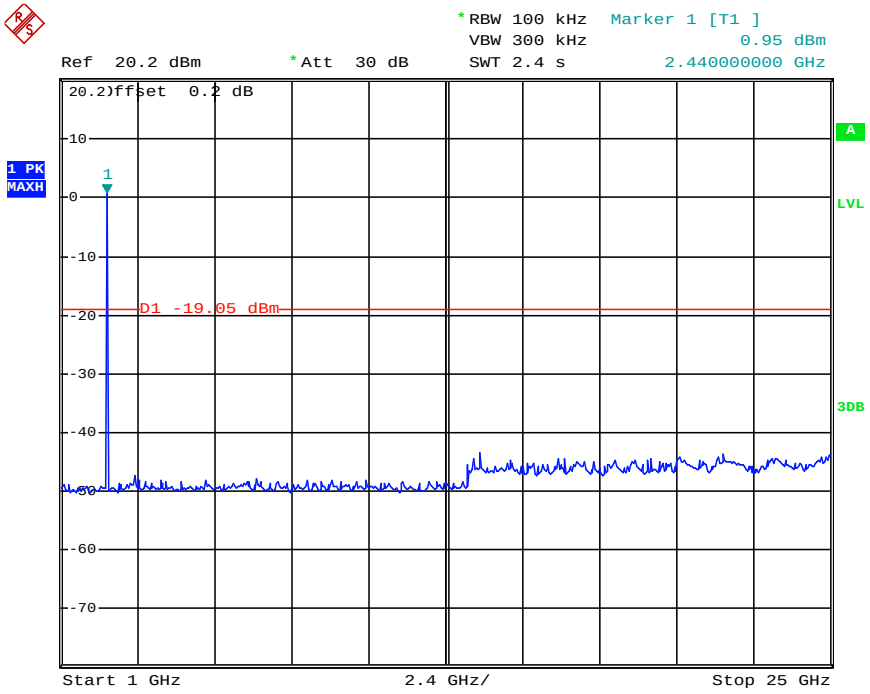



Date: 25.OCT.2012 10:28:23

*Mode channel 19*

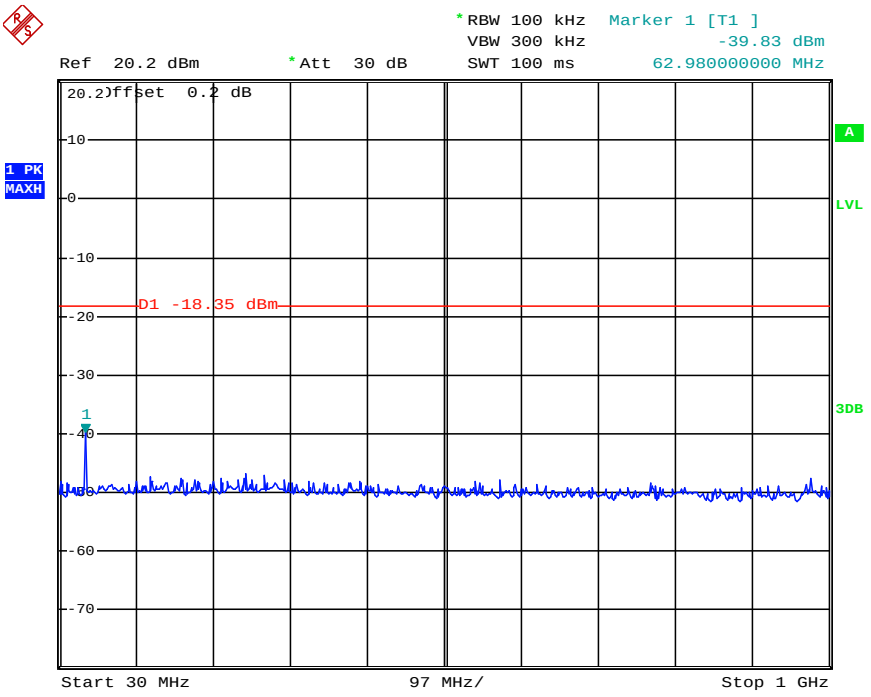



Date: 25.OCT.2012 10:27:28

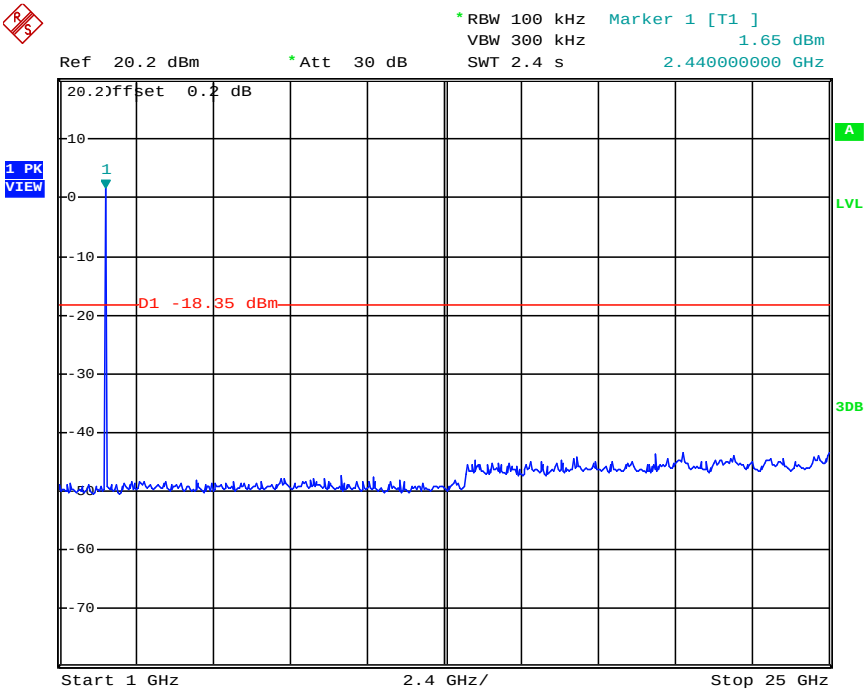



Date: 25.OCT.2012 10:27:10

*channel 39*



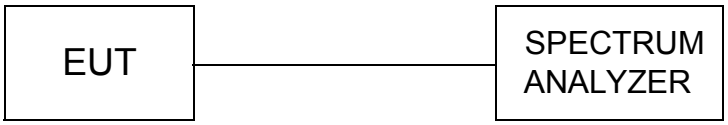

Date: 25.OCT.2012 10:25:38




Date: 25.OCT.2012 10:25:14

## 4.7. 6dB Bandwidth

**TEST CONFIGURATION**




**TEST PROCEDURE**

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with100 KHz RBW and 300KHz VBW.

The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

**LIMIT**

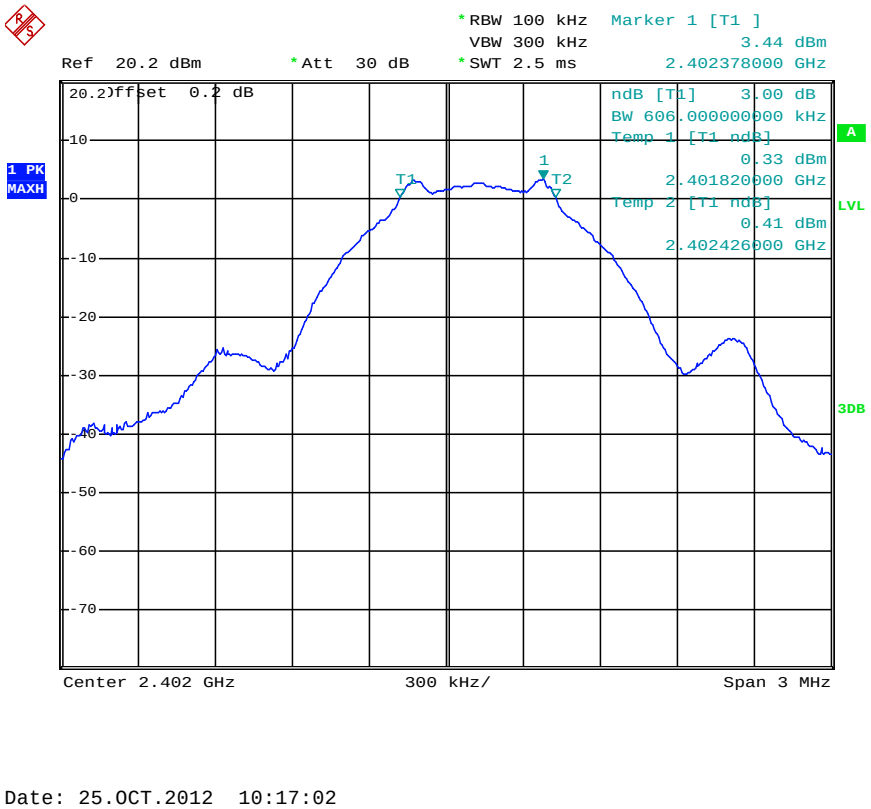
For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

**TEST RESULTS**

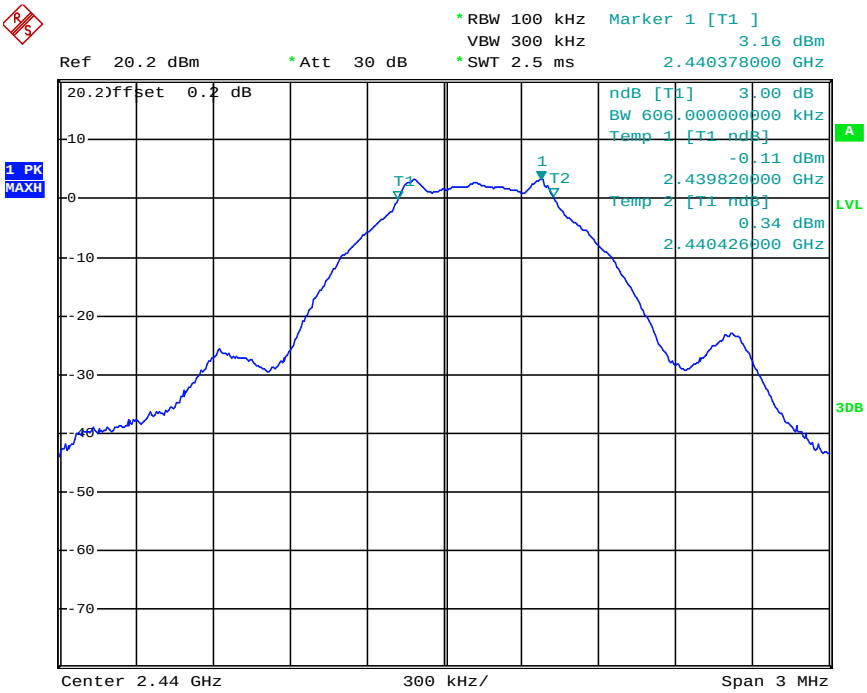
| CHANNEL | FREQUENCY (MHz) | 6 dB BANDWIDTH (MHz) | MINIMUM LIMIT(MHz) | PASS/FAIL |
|---|---|---|---|---|
| 0 | 2402 | 0.606 | 0.5 | PASS |
| 19 | 2440 | 0.606 | 0.5 | PASS |
| 39 | 2480 | 0.612 | 0.5 | PASS |

**Photos of 6dB Bandwidth Measurement**

*channel 0*

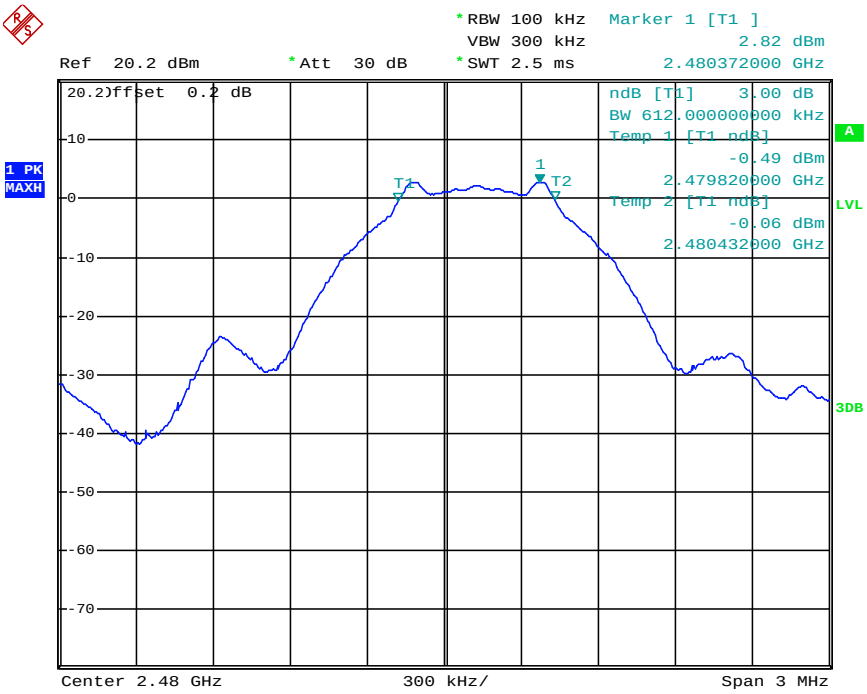


*channel 19*




Date: 25.OCT.2012 10:15:40

*channel 39*




Date: 25.OCT.2012 10:14:28

## 4.8. Antenna Requirement

**Standard Applicable**

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

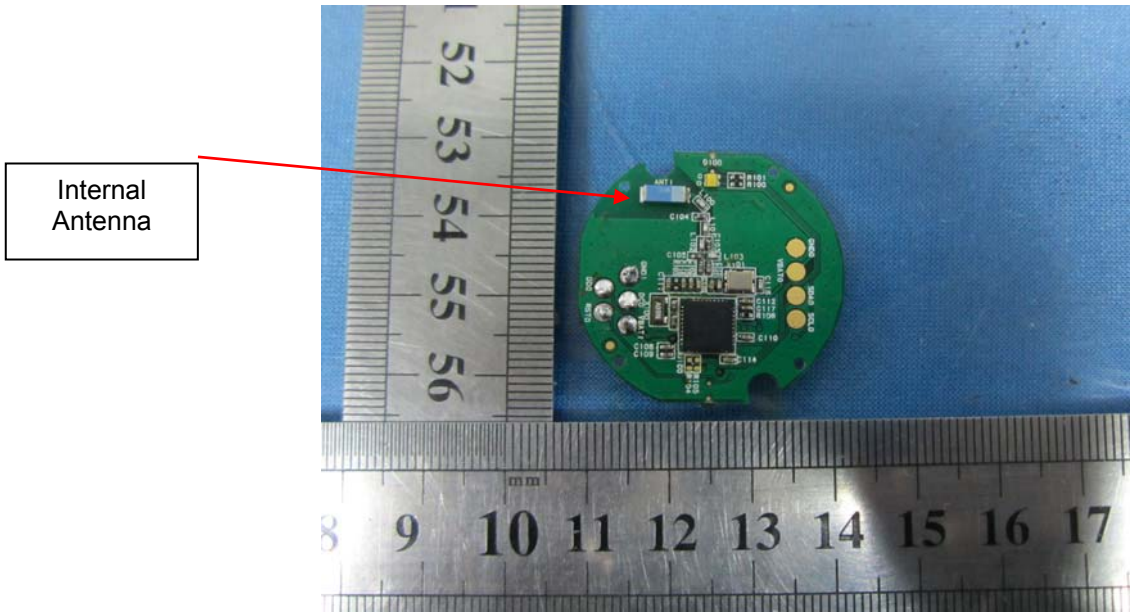
And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

**Refer to statement below for compliance**

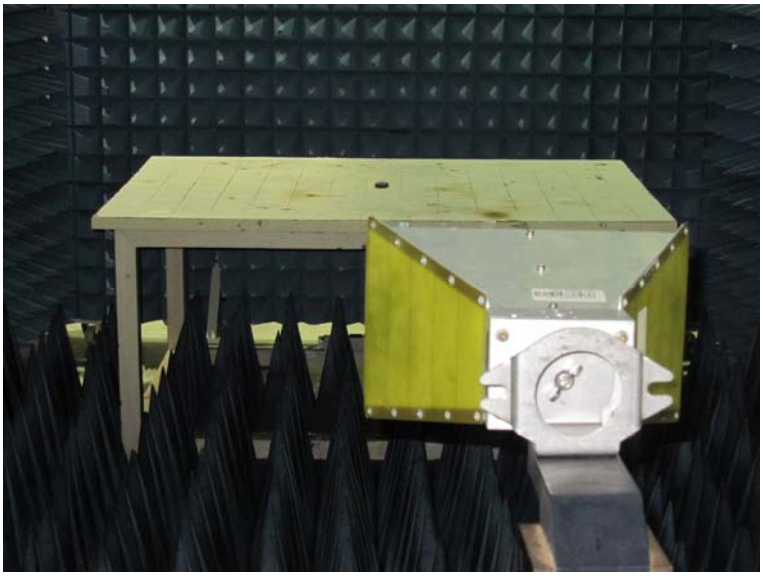
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

**Antenna Connected Construction**

The Gain of the antenna is 1.0dBi.

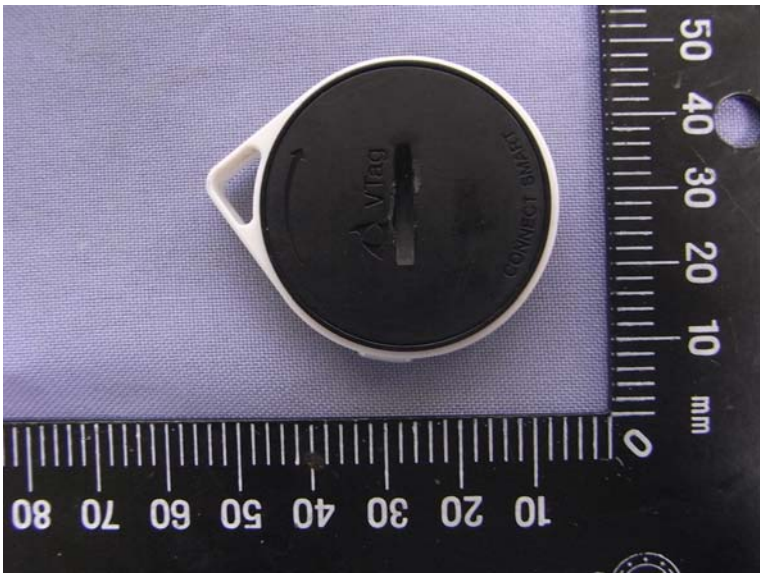


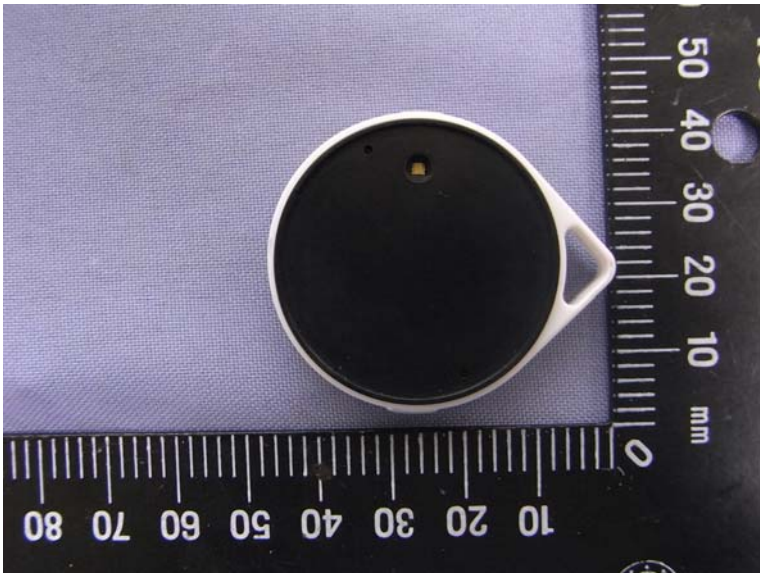
# 5. Test Setup Photos of the EUT

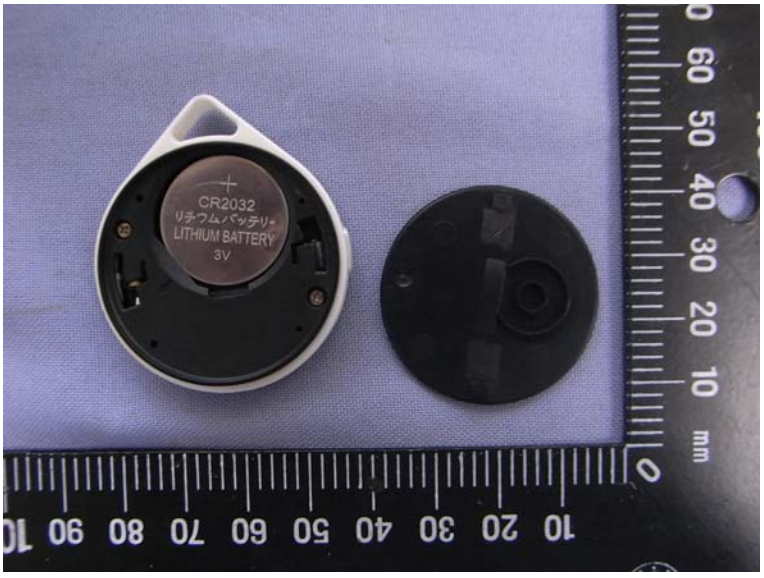



# 6. External and Internal Photos of the EUT

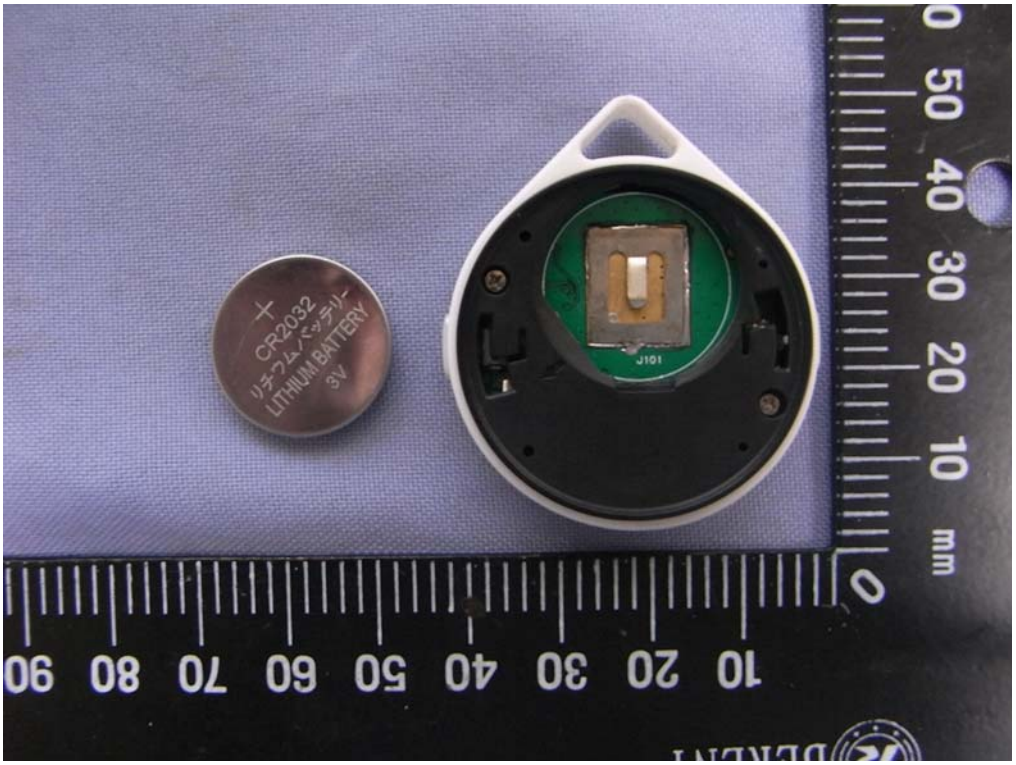
**External Photos**

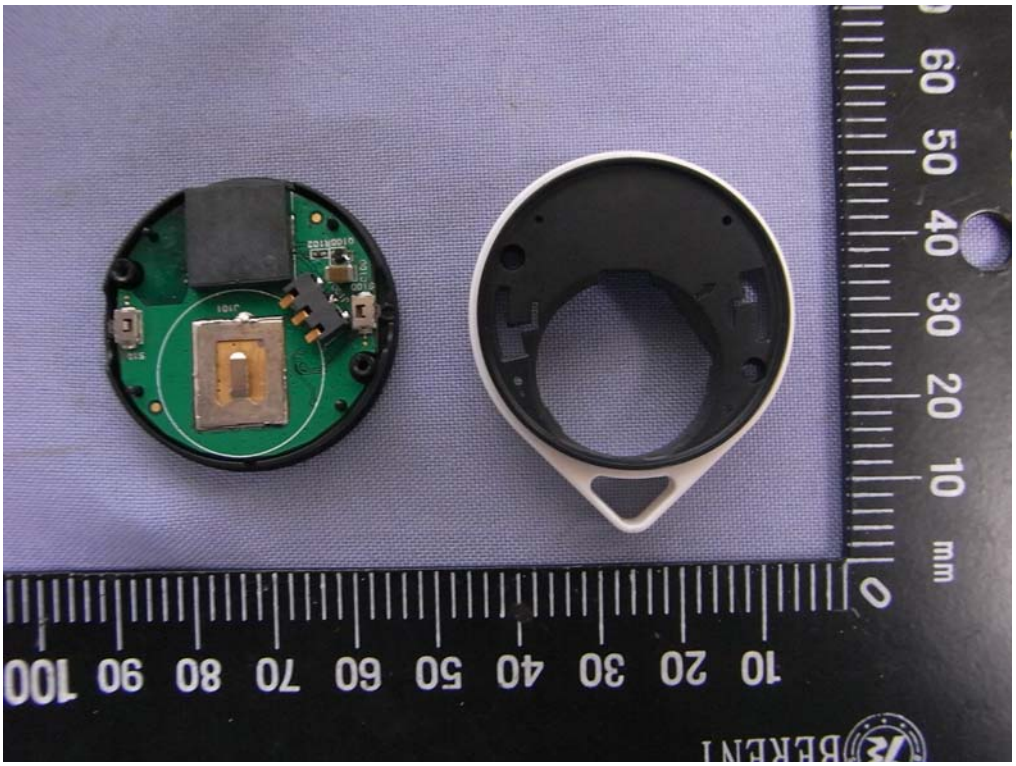


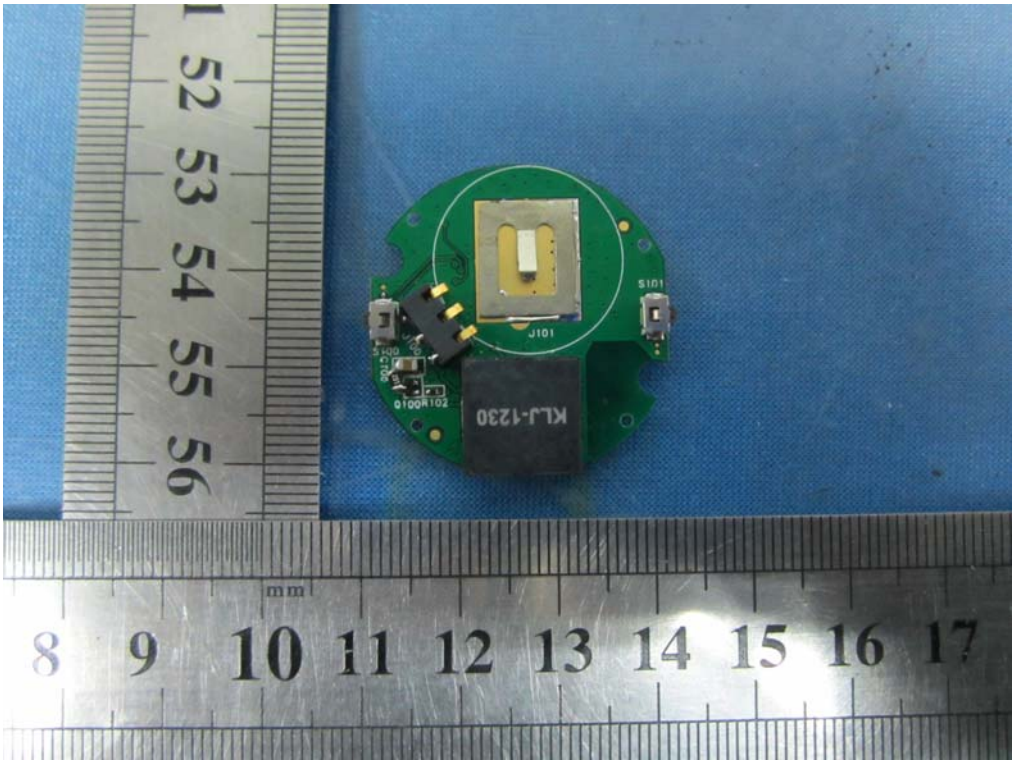



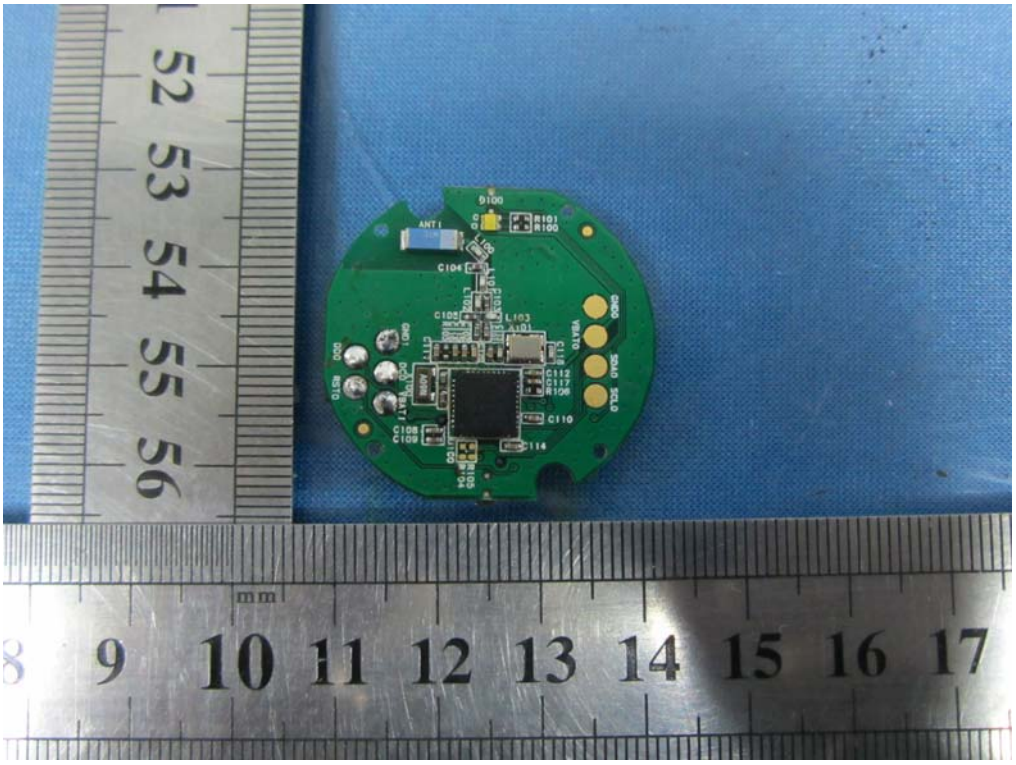



**Internal Photos**






**.....End of Report.....**