

## FCC PART 15 SUBPART C TEST REPORT

### FCC PART 15.247

**Report Reference No.....:** MWR150600404

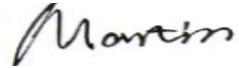
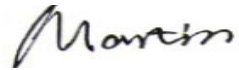
**FCC ID.....:** 2AFAUTIS001

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Date of issue.....: Jul 09, 2015


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Address.....: Floor 1-A, Baisha Technology Park, No. 3011, Shaheixi Road, Nanshan,Shenzhen,China

**Applicant's name.....:** HGR HERMANOS GARCIA ROMERO S.A.S

Address.....: CARRERA 20 No. 13 - 39 off. 212 BOGOTA, COLOMBIA DC 110111

**Test specification.....:**

Standard.....: **FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz**

TRF Originator.....: Maxwell International Co., Ltd.

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**Test item description.....:** Mobile Phone

Trade Mark.....: Tigers

**Manufacturer.....:** WASAM TECHNOLOGY (SHEN ZHEN) CO.,LTD.

Model/Type reference.....: TIS001

Listed Models .....: N/A

Modulation Type.....: GFSK

Operation Frequency.....: From 2402MHz to 2480MHz

Rating.....: DC 3.70V

Hardware version.....: F1H-V1.1

Software version .....: bestsonny.f1h.w500c.V1.0.20140910

Result.....: **PASS**

**TEST REPORT**

|                                       |               |
|---------------------------------------|---------------|
| <b>Test Report No. :</b> MWR150600404 | Jul 09, 2015  |
|                                       | Date of issue |

Equipment under Test : Mobile Phone

Model /Type : TIS001

Listed Models : N/A

**Applicant** : **HGR HERMANOS GARCIA ROMERO S.A.S**

Address : CARRERA 20 No. 13 - 39 off. 212 BOGOTA, COLOMBIA  
DC 110111

**Manufacturer** **WASAM TECHNOLOGY (SHEN ZHEN) CO.,LTD.**

Address : B, F Building, (Hengqiang Industrial Park), Bogang  
Taifeng Industrial Zone, Shajing Town, Bao'an District,  
Shenzhen, China

|                    |             |
|--------------------|-------------|
| <b>Test Result</b> | <b>PASS</b> |
|--------------------|-------------|

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.

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## **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 C63.4-2009](#): 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

[558074 D01 DTS Meas Guidance v03r03](#): GUIDANCE FOR PERFORMING COMPLIANCE MEASUREMENTS ON DIGITAL TRANSMISSION SYSTEMS (DTS) OPERATING UNDER §15.247

## 2. SUMMARY

### 2.1. General Remarks

|                                |   |              |
|--------------------------------|---|--------------|
| Date of receipt of test sample | : | May 20, 2015 |
|                                |   |              |
| Testing commenced on           | : | May 21, 2015 |
|                                |   |              |
| Testing concluded on           | : | Jul 09, 2015 |

### 2.2. Product Description

The **HGR HERMANOS GARCIA ROMERO S.A.S** 's Model: TIS001 or the "EUT" as referred to in this report; more general information as follows, for more details, refer to the user's manual of the EUT.

|                                        |                                                                                                                                                                                               |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name of EUT                            | Mobile Phone                                                                                                                                                                                  |
| Model Number                           | TIS001                                                                                                                                                                                        |
| Modulation Type                        | GMSK for GSM/GPRS,8-PSK for EDGE,QPSK for UMTS                                                                                                                                                |
| Antenna Type                           | Internal                                                                                                                                                                                      |
| UMTS Operation Frequency Band          | Device supported UMTS FDD Band II and FDD Band V                                                                                                                                              |
| WLAN FCC Operation frequency           | IEEE 802.11b:2412-2462MHz<br>IEEE 802.11g:2412-2462MHz<br>IEEE 802.11n HT20:2412-2462MHz<br>IEEE 802.11n HT40:2422-2452MHz                                                                    |
| BT FCC Operation frequency             | 2402MHz-2480MHz                                                                                                                                                                               |
| HSDPA Release Version                  | Release 7                                                                                                                                                                                     |
| HSUPA Release Version                  | Release 6                                                                                                                                                                                     |
| DC-HSUPA Release Version               | Not Supported                                                                                                                                                                                 |
| WCDMA Release Version                  | R99                                                                                                                                                                                           |
| WLAN FCC Modulation Type               | IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)<br>IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)<br>IEEE 802.11n HT20: OFDM (64QAM, 16QAM, QPSK,BPSK)<br>IEEE 802.11n HT40: OFDM (64QAM, 16QAM, QPSK,BPSK) |
| BT Modulation Type                     | GFSK (BT4.0 BLE)/GFSK,8DPSK, $\pi/4$ DQPSK(BT 3.0+EDR)                                                                                                                                        |
| Hardware version                       | F1H-V1.1                                                                                                                                                                                      |
| Software version                       | bestsonny.f1h.w500c.V1.0.20140910                                                                                                                                                             |
| GPS function                           | Supported                                                                                                                                                                                     |
| WLAN                                   | Supported 802.11b/802.11g/802.11n                                                                                                                                                             |
| Bluetooth                              | Supported BT4.0 BLE /BT 3.0+EDR                                                                                                                                                               |
| GSM/EDGE/GPRS                          | Supported GSM/GPRS/EDGE                                                                                                                                                                       |
| GSM/EDGE/GPRS Power Class              | GSM850:Power Class 4/PCS1900:Power Class 1                                                                                                                                                    |
| GSM/EDGE/GPRS Operation Frequency      | GSM850 :824.2MHz-848.8MHz/PCS1900:1852.4MHz-1907.6MHz                                                                                                                                         |
| GSM/EDGE/GPRS Operation Frequency Band | GSM850/PCS1900/GPRS850/ GPRS 1900/EDGE850/EDGE1900                                                                                                                                            |
| GSM Release Version                    | R99                                                                                                                                                                                           |
| GPRS/EDGE Multislot Class              | GPRS/EDGE: Multi-slot Class 12                                                                                                                                                                |
| Extreme temp. Tolerance                | -30°C to +50°C                                                                                                                                                                                |
| Extreme vol. Limits                    | 3.40VDC to 4.20 VDC (nominal: 3.70 VDC)                                                                                                                                                       |
| GPRS operation mode                    | Class B                                                                                                                                                                                       |
| Ant Gain                               | GSM850:-2.92dBi,GSM1900:-0.07dBi<br>WCDMA Band 850: -2.92dBi WCDMA1900: GSM1900:-0.07dBi<br>WIFI/BT:-0.58 dBi                                                                                 |

Note:

- 1..The EUT is Dual SIM,But The two SIMs cannot use synchronization and only one can use for each time.
2. 3D and ALS+PS sensor used by this device and ,no power reduction during use.

## 2.3. Equipment Under Test

### Power supply system utilised

|                      |   |                                                                   |                                   |
|----------------------|---|-------------------------------------------------------------------|-----------------------------------|
| Power supply voltage | : | <input type="radio"/> 120V / 60 Hz                                | <input type="radio"/> 115V / 60Hz |
|                      |   | <input type="radio"/> 12 V DC                                     | <input type="radio"/> 24 V DC     |
|                      |   | <input checked="" type="radio"/> Other (specified in blank below) |                                   |

DC 3.70V

## 2.4. Description of the test mode

The application provider specific test software to control sample in continuous TX and RX (Duty Cycle >98%)

For testing meet KDB558074 test requirement.

The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous 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

| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
|---------|----------------|---------|----------------|
| 00      | 2402           | 20      | 2442           |
| 01      | 2404           | 21      | 2444           |
| 02      | 2406           | 22      | 2446           |
| 03      | 2408           | 23      | 2448           |
| 04      | 2410           | 24      | 2450           |
| 05      | 2412           | 25      | 2452           |
| 06      | 2414           | 26      | 2454           |
| 07      | 2416           | 27      | 2456           |
| 08      | 2418           | 28      | 2458           |
| 09      | 2420           | 29      | 2460           |
| 10      | 2422           | 30      | 2462           |
| 11      | 2424           | 31      | 2464           |
| 12      | 2426           | 32      | 2466           |
| 13      | 2428           | 33      | 2468           |
| 14      | 2430           | 34      | 2470           |
| 15      | 2432           | 35      | 2472           |
| 16      | 2434           | 36      | 2474           |
| 17      | 2436           | 37      | 2476           |
| 18      | 2438           | 38      | 2478           |
| 19      | 2440           | 39      | 2480           |

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

### 2.5.1 General Description

TIS001 is subscriber equipment in the WCDMA/GSM system. The HSPA/UMTS frequency band is Band II, Band V; The GSM/GPRS/EDGE frequency and includes GSM850 and GSM900 and DCS1800 and PCS1900, but only Band II and Band V and GSM850 and PCS1900 bands test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, HSPA/UMTS and GSM/GPRS/EDGE protocol processing, voice, video MMS service, GPS, and WIFI etc. Externally it provides micro SD card interface, earphone port (to provide voice service) and SIM card interface. It also provides Bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

Note: The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

### 2.5.2 Customized Configurations

| #EUT Conf. | Signal Description | Operating Frequency |
|------------|--------------------|---------------------|
| TM1_Ch00   | GFSK modulation    | Ch No. 00/2402MHz   |
| TM1_Ch19   | GFSK modulation    | Ch No. 19/ 2440MHz  |
| TM1_Ch39   | GFSK modulation    | Ch No. 39/ 2480MHz  |

### 2.5.3 Test Environments

NOTE: The values used in the test report maybe stringent than the declared.

| Environment Parameter | Selected Values During Tests |         |                   |
|-----------------------|------------------------------|---------|-------------------|
| NTNV                  | Temperature                  | Voltage | Relative Humidity |
|                       | Ambient                      | 3.70VDC | Ambient           |

### 2.6. EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides command to control the EUT for staying in continuous transmitting (Duty Cycle >98%) and receiving mode for testing.

### 2.7. 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. :    | / |

### 2.8. Internal Identification of AE used during the test

| AE ID* | Description |
|--------|-------------|
| AE1    | Charger     |

Adapter:

Trademark: Tigers

INPUT:AC 100-240V 50/60Hz 0.15A

OUTPUT: DC 5.0V,1A

\*AE ID: is used to identify the test sample in the lab internally.

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

This submittal(s) (test report) is intended for **FCC ID: 2AFAUTIS001** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

### 2.10. Modifications

No modifications were implemented to meet testing criteria.

**2.11.NOTE**

1. The EUT is a Mobile Phone with WCDMA/GSM/GPRS/EDGE, WiFi and Bluetooth function, The functions of the EUT listed as below:

|               | Test Standards          | Reference Report |
|---------------|-------------------------|------------------|
| GSM/GPRS/EDGE | FCC Part 22/FCC Part 24 | MWR150600401     |
| WCDMA         | FCC Part 22/FCC Part 24 | MWR150600402     |
| Bluetooth     | FCC Part 15 C 15.247    | MWR150600403     |
| BLE           | FCC Part 15 C 15.247    | MWR150600404     |
| WiFi          | FCC Part 15 C 15.247    | MWR150600405     |
| USB Port      | FCC Part 15 B           | MWR150600406     |
| SAR           | FCC Part 2 §2.1093      | MWR150600407     |

### 3. TEST ENVIRONMENT

#### 3.1. Address of the test laboratory

**Shenzhen CTL Testing Technology Co., Ltd.**

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen, China

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:

#### **FCC-Registration No.: 970318**

Shenzhen CTL Testing Technology Co., Ltd. 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 970318, Dec 19, 2013

#### 3.3. Environmental conditions

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

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

#### 3.4. 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 CTL Testing Technology Co., Ltd. National Digital Electronic Product Testing Center 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 CTL Testing Technology Co., Ltd. National Digital Electronic Product Testing Center is reported:

| Test                  | Range      | Measurement Uncertainty | Notes |
|-----------------------|------------|-------------------------|-------|
| Radiated Emission     | 30~1000MHz | 4.24 dB                 | (1)   |
| Radiated Emission     | 1~18GHz    | 5.16 dB                 | (1)   |
| Radiated Emission     | 18-40GHz   | 5.54 dB                 | (1)   |
| Conducted Disturbance | 0.15~30MHz | 3.39 dB                 | (1)   |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 3.5. Test Description

| Test Item                                                      | FCC Part No.        | Requirements                                                                                                                        | Verdict |
|----------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------|---------|
| DTS (6 dB) Bandwidth                                           | 15.247(a)(2)        | $\geq 500$ kHz.                                                                                                                     | PASS    |
| Maximum Peak Conducted Output Power                            | 15.247(b)(3)        | For directional gain: $< 30\text{dBm} - (G[\text{dBi}] - 6 [\text{dB}])$ , peak;<br>Otherwise : $< 30\text{dBm}$ , peak.            | PASS    |
| Maximum Power Spectral Density Level                           | 15.247(e)           | For directional gain : $< 8\text{dBm}/3$ kHz – $(G[\text{dBi}] - 6[\text{dB}])$ , peak.<br>Otherwise : $< 8\text{dBm}/3$ kHz, peak. | PASS    |
| Band Edges Compliance                                          | 15.247(d)           | $< -20\text{dBm}/100$ kHz if total peak power $\leq$ power limit.                                                                   | PASS    |
| Unwanted Emissions into Non-Restricted Frequency Bands         | 15.247(d)           | $< -20\text{dBm}/100$ kHz if total peak power $\leq$ power limit.                                                                   | PASS    |
| Unwanted Emissions into Restricted Frequency Bands (Conducted) | 15.247(d)<br>15.209 | $< -20\text{dBm}/100$ kHz if total peak power $\leq$ power limit.                                                                   | PASS    |
| Unwanted Emissions into Restricted Frequency Bands (Radiated)  | 15.247(d)<br>15.209 | FCC Part 15.209 field strength limit;                                                                                               | PASS    |
| AC Power Line Conducted Emissions                              | 15.207              | FCC Part 15.207 conducted limit;                                                                                                    | PASS    |

Remark: The measurement uncertainty is not included in the test result.

### 3.6. Summary of measurement results

| Test Specification clause | Test case                               | Test Mode | Test Channel                                                                                                                            | Recorded In Report |                                                                                                                                         | Pass                                | Fail                     | NA                       | NP                       | Remark   |
|---------------------------|-----------------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------------|--------------------------|--------------------------|----------|
| §15.247(b)(4)             | Antenna gain                            | GFSK      | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Middle<br><input checked="" type="checkbox"/> Highest | GFSK               | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Middle<br><input checked="" type="checkbox"/> Highest | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | complies |
| §15.247(e)                | Power spectral density                  | GFSK      | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Middle<br><input checked="" type="checkbox"/> Highest | GFSK               | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Middle<br><input checked="" type="checkbox"/> Highest | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | complies |
| §15.247(a)(1)             | Spectrum bandwidth – 6 dB bandwidth     | GFSK      | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Middle<br><input checked="" type="checkbox"/> Highest | GFSK               | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Middle<br><input checked="" type="checkbox"/> Highest | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | complies |
| §15.247(b)(1)             | Maximum output power                    | GFSK      | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Middle<br><input checked="" type="checkbox"/> Highest | GFSK               | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Middle<br><input checked="" type="checkbox"/> Highest | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | complies |
| §15.247(d)                | Band edge compliance conducted          | GFSK      | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Highest                                               | GFSK               | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Highest                                               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | complies |
| §15.205                   | Band edge compliance radiated           | GFSK      | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Highest                                               | GFSK               | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Highest                                               | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | complies |
| §15.247(d)                | TX spurious emissions conducted         | GFSK      | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Middle<br><input checked="" type="checkbox"/> Highest | GFSK               | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Middle<br><input checked="" type="checkbox"/> Highest | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | complies |
| §15.247(d)                | TX spurious emissions radiated          | GFSK      | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Middle<br><input checked="" type="checkbox"/> Highest | GFSK               | <input checked="" type="checkbox"/> Lowest<br><input checked="" type="checkbox"/> Middle<br><input checked="" type="checkbox"/> Highest | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | complies |
| §15.109                   | RX spurious emissions radiated          | -/-       | -/-                                                                                                                                     | -/-                | -/-                                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | complies |
| §15.209(a)                | TX spurious Emissions radiated < 30 MHz | GFSK      | -/-                                                                                                                                     | GFSK               | -/-                                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | complies |
| §15.107(a)<br>§15.207     | Conducted Emissions < 30 MHz            | GFSK      | -/-                                                                                                                                     | GFSK               | -/-                                                                                                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | complies |

Remark:

1. The measurement uncertainty is not included in the test result.

2. NA = Not Applicable; NP = Not Performed

### 3.7. Test Conditions

| Test Case                                                      | Test Conditions    |                                                                                                |
|----------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------|
|                                                                | Configuration      | Description                                                                                    |
| DTS (6 dB)<br>Bandwidth                                        | Measurement Method | FCC KDB 558074 §8.2 Option 2                                                                   |
|                                                                | Test Environment   | NTNV                                                                                           |
|                                                                | EUT Configuration  | TM1_Ch00<br>TM1_Ch19<br>TM1_Ch39                                                               |
|                                                                |                    |                                                                                                |
| Maximum Peak Conducted Output Power                            | Measurement Method | FCC KDB 558074§9.1.2                                                                           |
|                                                                | Test Environment   | NTNV                                                                                           |
|                                                                | EUT Configuration  | TM1_Ch00<br>TM1_Ch19<br>TM1_Ch39                                                               |
|                                                                |                    |                                                                                                |
| Maximum Power Spectral Density Level                           | Measurement Method | FCC KDB 558074 §10.2 (peak PSD).                                                               |
|                                                                | Test Environment   | NTNV                                                                                           |
|                                                                | EUT Configuration  | TM1_Ch00<br>TM1_Ch19<br>TM1_Ch39                                                               |
|                                                                |                    |                                                                                                |
| Unwanted Emissions into Non-Restricted Frequency Bands         | Measurement Method | FCC KDB 558074§11.0                                                                            |
|                                                                | Test Environment   | NTNV                                                                                           |
|                                                                | EUT Configuration  | TM1_Ch00<br>TM1_Ch19<br>TM1_Ch39                                                               |
|                                                                |                    |                                                                                                |
| Unwanted Emissions into Restricted Frequency Bands (Conducted) | Measurement Method | FCC KDB 558074§12.2, Conducted (antenna-port).                                                 |
|                                                                | Test Environment   | NTNV                                                                                           |
|                                                                | EUT Configuration  | TM1_Ch00<br>TM1_Ch19<br>TM1_Ch39                                                               |
|                                                                |                    |                                                                                                |
| Unwanted Emissions into Restricted                             | Measurement Method | FCC KDB 558074§12.1,Radiated(cabinet/case emissions with Impedance matching for antenna-port). |
|                                                                | EUT Configuration  | TM1_Ch00<br>TM1_Ch19<br>TM1_Ch39                                                               |
|                                                                |                    |                                                                                                |
|                                                                |                    |                                                                                                |

| Test Case                         | Test Conditions    |                         |
|-----------------------------------|--------------------|-------------------------|
|                                   | Configuration      | Description             |
| AC Power Line Conducted Emissions | Measurement Method | AC mains conducted.     |
|                                   | Test Environment   | NTNV                    |
|                                   | EUT Configuration  | TM1_Ch19 (Worst Conf.). |
|                                   |                    |                         |

Note: For Radiated Emissions, By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Y axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

### 3.8. Equipments Used during the Test

| AC Power Conducted Emission |                   |               |             |            |            |            |
|-----------------------------|-------------------|---------------|-------------|------------|------------|------------|
| Item                        | Test Equipment    | Manufacturer  | Model No.   | Serial No. | Last Cal.  | Cal.Due    |
| 1                           | Artificial Mains  | Rohde&Schwarz | ENV216      | 101316     | 2014/07/02 | 2015/07/01 |
|                             |                   |               |             |            | 2015/06/02 | 2016/06/01 |
| 2                           | EMI Test Receiver | Rohde&Schwarz | ESCI3       | 103710     | 2014/07/02 | 2015/07/01 |
|                             |                   |               |             |            | 2015/06/02 | 2016/06/01 |
| 3                           | Pulse Limiter     | Com-Power     | LIT-153     | 53226      | 2014/07/01 | 2015/06/30 |
|                             |                   |               |             |            | 2015/06/02 | 2016/06/01 |
| 4                           | EMI Test Software | Rohde&Schwarz | ES-K1 V1.71 | N/A        | N/A        | N/A        |
| 5                           | Coaxial Cables    | HUBER+SUHNER  | SUCOFLEX    | 3m         | 2014/10/19 | 2015/10/18 |

|  |  |  |                           |  |  |  |
|--|--|--|---------------------------|--|--|--|
|  |  |  | 104PEA-3M<br>(9KHz-26.5G) |  |  |  |
|--|--|--|---------------------------|--|--|--|

| Radiated Emission |                     |                              |                                        |            |            |            |
|-------------------|---------------------|------------------------------|----------------------------------------|------------|------------|------------|
| Item              | Test Equipment      | Manufacturer                 | Model No.                              | Serial No. | Last Cal.  | Cal.Due    |
| 1                 | Bilog Antenna       | Sunol Sciences Corp.         | JB1                                    | A061713    | 2015/05/19 | 2016/05/18 |
| 2                 | EMI TEST Receivcer  | Rohde&Schwarz                | ESCI3                                  | 103710     | 2014/07/02 | 2015/07/01 |
|                   |                     |                              |                                        |            | 2015/06/02 | 2016/06/01 |
| 3                 | EMI TEST Software   | Audix                        | E3                                     | N/A        | N/A        | N/A        |
| 4                 | EMI TEST Software   | Rohde&Schwarz                | ESK1                                   | N/A        | N/A        | N/A        |
| 5                 | HORN ANTENNA        | Sunol Sciences Corp.         | DRH-118                                | A062013    | 2015/05/19 | 2016/05/18 |
| 6                 | Amplifer            | HP                           | 8447D                                  | 3113A07663 | 2015/05/19 | 2016/05/18 |
| 7                 | Preamplifier        | HP                           | 8349B                                  | 3155A00882 | 2015/05/19 | 2016/05/18 |
| 8                 | Amplifer            | Compliance Direction systems | PAP1-4060                              | 129        | 2015/05/19 | 2016/05/18 |
| 9                 | Active Loop Antenna | Daze                         | ZN30900A                               | N/A        | 2015/05/19 | 2016/05/18 |
| 10                | TURNTABLE           | MATURO                       | TT2.0                                  | ----       | N/A        | N/A        |
| 11                | ANTENNA MAST        | MATURO                       | TAM-4.0-P                              | ----       | N/A        | N/A        |
| 12                | Horn Antenna        | SCHWARZBECK                  | BBHA9170                               | 25849      | 2015/05/19 | 2016/05/18 |
| 13                | Spectrum Analyzer   | Rohde&Schwarz                | FSU26                                  | 201148     | 2015/05/20 | 2016/05/19 |
| 14                | Coaxial Cables      | HUBER+SUHNER                 | SUCOFLEX<br>104PEA-10M<br>(9KHz-26.5G) | 10m        | 2014/10/19 | 2015/10/18 |
| 15                | Coaxial Cables      | HUBER+SUHNER                 | SUCOFLEX<br>104PEA-3M<br>(9KHz-26.5G)  | 3m         | 2014/10/19 | 2015/10/18 |

| Maximum Peak Output Power / Power Spectral Density / 20dB Bandwidth / Band Edge Compliance of RF Emission / Spurious RF Conducted Emission |                                 |                 |                     |            |            |            |
|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------|---------------------|------------|------------|------------|
| Item                                                                                                                                       | Test Equipment                  | Manufacturer    | Model No.           | Serial No. | Last Cal.  | Cal.Due    |
| 1                                                                                                                                          | Spectrum Analyzer               | Rohde&Schwarz   | FSU26               | 201148     | 2015/05/20 | 2016/05/19 |
| 2                                                                                                                                          | Spectrum Analyzer               | Agilent         | E4407B              | MY45108355 | 2015/05/21 | 2016/05/20 |
| 3                                                                                                                                          | Power meter                     | Rohde & Schwarz | NRVD                | 260540     | 2015/05/21 | 2016/05/20 |
| 4                                                                                                                                          | Power Sensor                    | Rohde&Schwarz   | NRR-Z81             | 256697     | 2015/05/21 | 2016/05/20 |
| 6                                                                                                                                          | Coaxial Cables                  | WK CE Cable     | N/A<br>(9KHz-26.5G) | N/A        | 2014/10/19 | 2015/10/18 |
| 7                                                                                                                                          | The temporary antenna connector | MMCX - SMA      | 1547                | 23657478   | 2014/10/19 | 2015/10/18 |
| 8                                                                                                                                          | Cable                           | MURATA          | MM8430 -<br>2610    | 11548      | 2014/10/19 | 2015/10/18 |

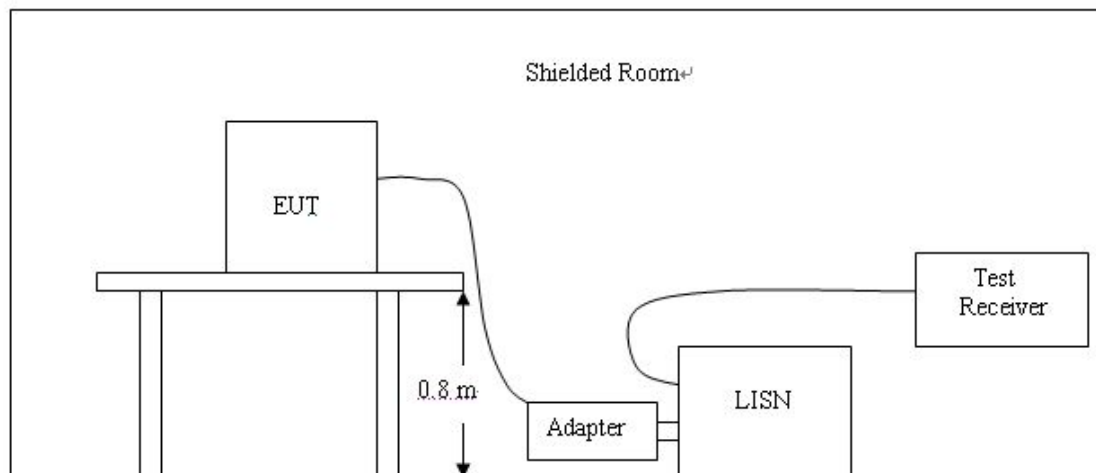
Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

The Cal.Interval was one year

## 4. TEST CONDITIONS AND RESULTS

### 4.1. AC Power Conducted Emission

#### 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 DC5V 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<br>(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     |

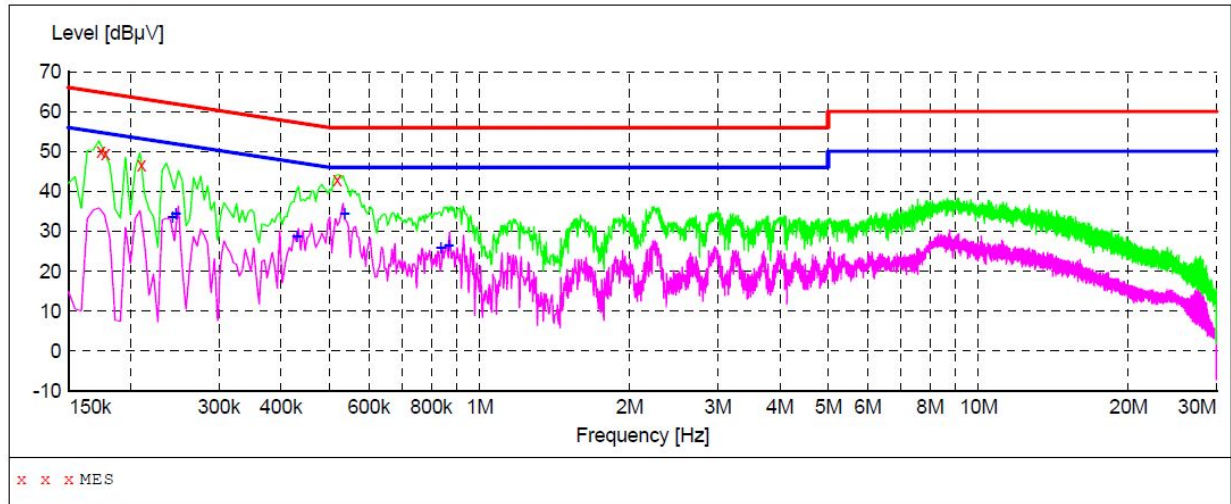
\* Decreasing linearly with the logarithm of the frequency

#### TEST RESULTS

The AC Power Conducted Emission measurement is performed at both TX and RX (Idle) mode, recorded worst case at TX mode..

**SCAN TABLE: "Voltage (9K-30M)FIN"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT:**

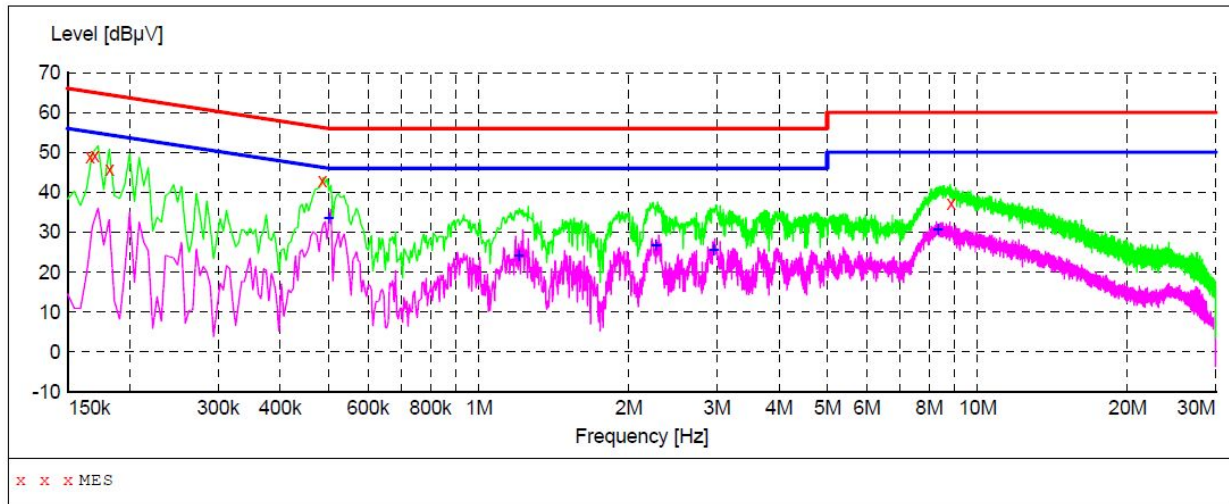
| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.174000         | 50.00         | 9.9          | 65            | 14.8         | QP       | L1   | GND |
| 0.178000         | 49.60         | 9.9          | 65            | 15.0         | QP       | L1   | GND |
| 0.210000         | 46.70         | 9.9          | 63            | 16.5         | QP       | L1   | GND |
| 0.518000         | 43.00         | 9.9          | 56            | 13.0         | QP       | L1   | GND |

**MEASUREMENT RESULT:**

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.242000         | 33.60         | 9.9          | 52            | 18.4         | AV       | L1   | GND |
| 0.246000         | 34.40         | 9.9          | 52            | 17.5         | AV       | L1   | GND |
| 0.430000         | 28.70         | 9.9          | 47            | 18.6         | AV       | L1   | GND |
| 0.536000         | 34.40         | 9.9          | 46            | 11.6         | AV       | L1   | GND |
| 0.836000         | 25.80         | 10.1         | 46            | 20.2         | AV       | L1   | GND |
| 0.866000         | 26.40         | 10.1         | 46            | 19.6         | AV       | L1   | GND |

**SCAN TABLE: "Voltage (9K-30M)FIN"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT:**

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.166000         | 48.80         | 9.9          | 65            | 16.4         | QP       | N    | GND |
| 0.170000         | 49.10         | 9.9          | 65            | 15.9         | QP       | N    | GND |
| 0.182000         | 45.70         | 9.9          | 64            | 18.7         | QP       | N    | GND |
| 0.486000         | 42.80         | 9.9          | 56            | 13.4         | QP       | N    | GND |
| 8.852000         | 37.20         | 10.7         | 60            | 22.8         | QP       | N    | GND |

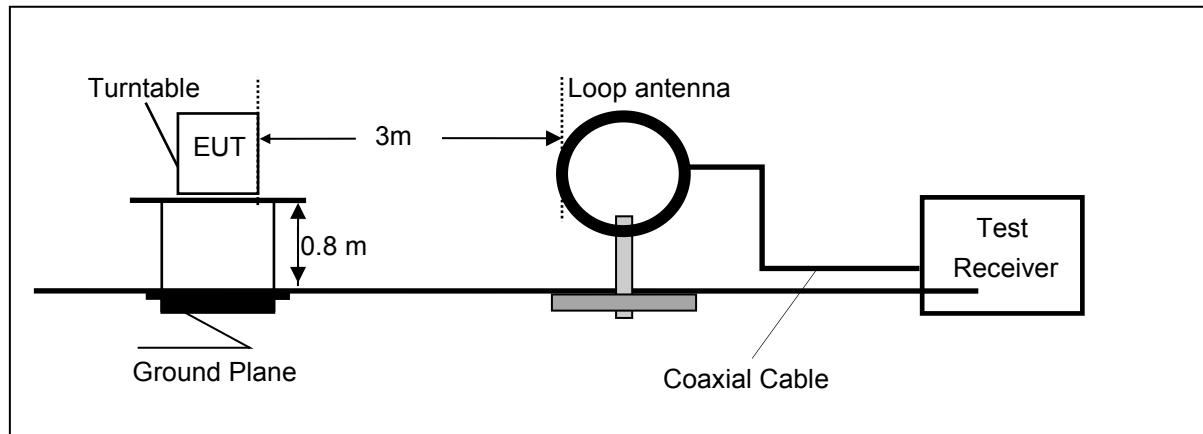
**MEASUREMENT RESULT:**

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.500000         | 33.40         | 9.9          | 46            | 12.6         | AV       | N    | GND |
| 1.202000         | 24.10         | 10.2         | 46            | 21.9         | AV       | N    | GND |
| 2.264000         | 26.70         | 10.4         | 46            | 19.3         | AV       | N    | GND |
| 2.954000         | 25.70         | 10.5         | 46            | 20.3         | AV       | N    | GND |
| 8.318000         | 30.60         | 10.7         | 50            | 19.4         | AV       | N    | GND |

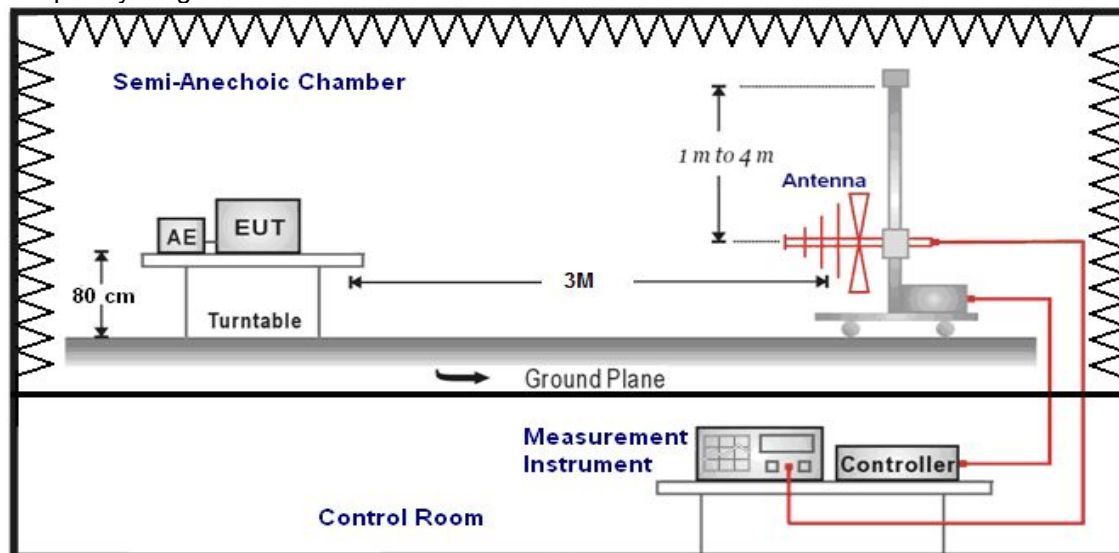
## 4.2. Radiated Emission

### TEST CONFIGURATION

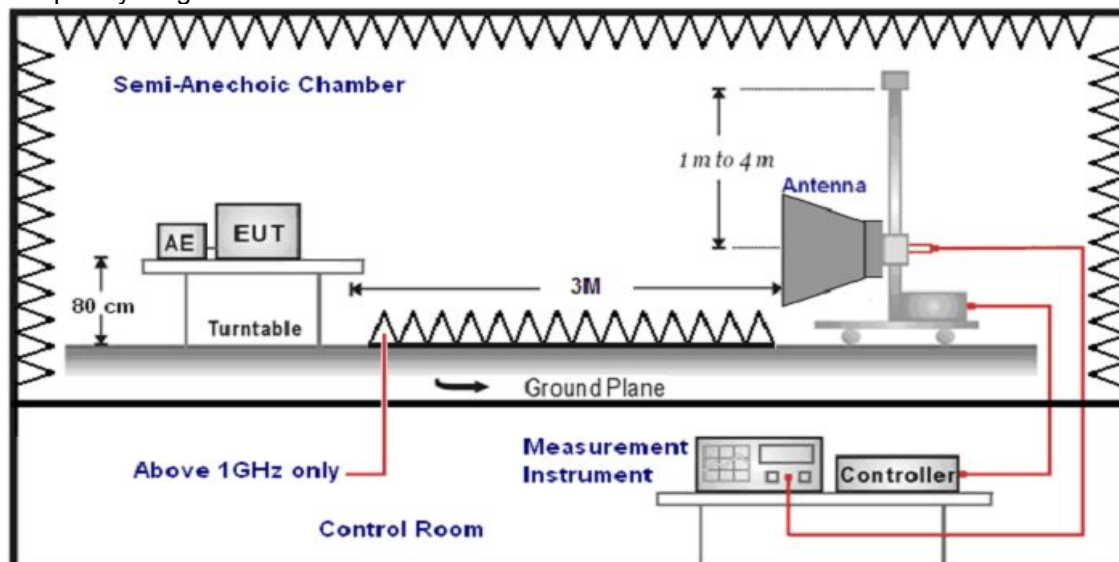
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



### 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. For the radiated emission test above 1GHz:  
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
4. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Repeat above procedures until all frequency measurements have been completed.
6. The EUT minimum operation frequency was 32.768 KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9 KHz to 25GHz..
7. The distance between test antenna and EUT as following table states:

| Test Frequency range | Test Antenna Type          | Test Distance |
|----------------------|----------------------------|---------------|
| 9KHz-30MHz           | Active Loop Antenna        | 3             |
| 30MHz-1GHz           | Ultra-Broadband Antenna    | 3             |
| 1GHz-18GHz           | Double Ridged Horn Antenna | 3             |
| 18GHz-25GHz          | Horn Antenna               | 3             |

8. Setting test receiver/spectrum as following table states:

| Test Frequency range | Test Receiver/Spectrum Setting                    | Detector           |
|----------------------|---------------------------------------------------|--------------------|
| 9KHz-150KHz          | RBW=200Hz/VBW=3KHz, Sweep time=Auto               | QP                 |
| 150KHz-30MHz         | RBW=9KHz/VBW=100KHz, Sweep time=Auto              | QP                 |
| 30MHz-1GHz           | RBW=120KHz/VBW=1000KHz, Sweep time=Auto           | QP                 |
| 1GHz-40GHz           | Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto    | Peak (Receiver)    |
|                      | Average Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto | Average (Receiver) |

### **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 the 100kHz bandwidth within the band that contains the highest level of desired power.

| Frequency (MHz) | Distance (Meters) | Radiated (dBµV/m)         | Radiated (µV/m) |
|-----------------|-------------------|---------------------------|-----------------|
| 0.009-0.49      | 300               | $20\log(2400/F(KHz))+80$  | $2400/F(KHz)$   |
| 0.49-1.705      | 30                | $20\log(24000/F(KHz))+40$ | $24000/F(KHz)$  |
| 1.705-30        | 30                | $20\log(30)+40$           | 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             |

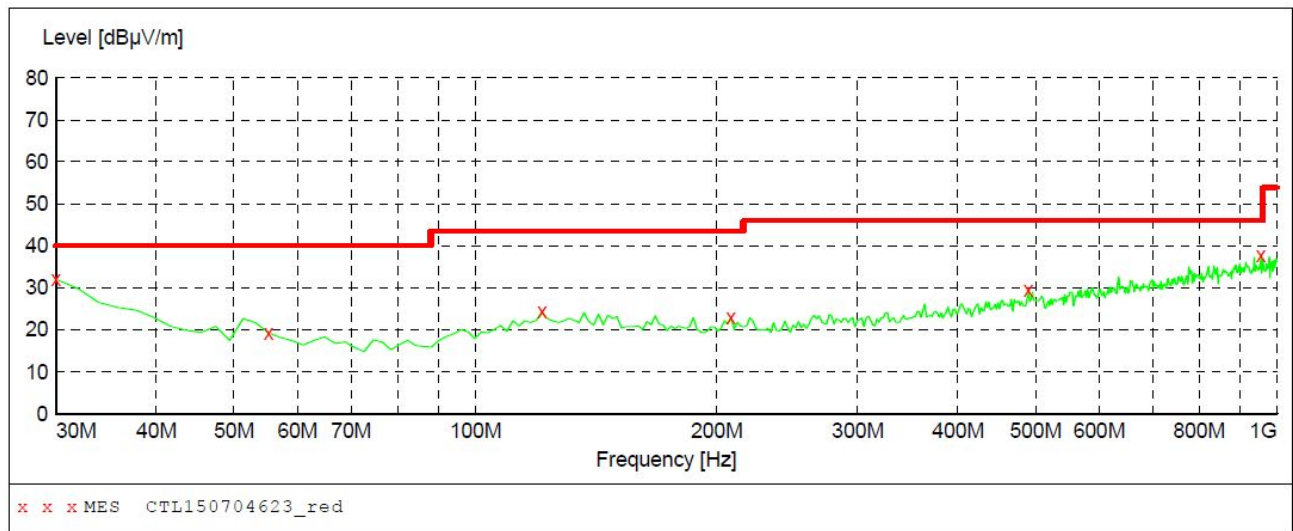
**TEST RESULTS**

Remark:

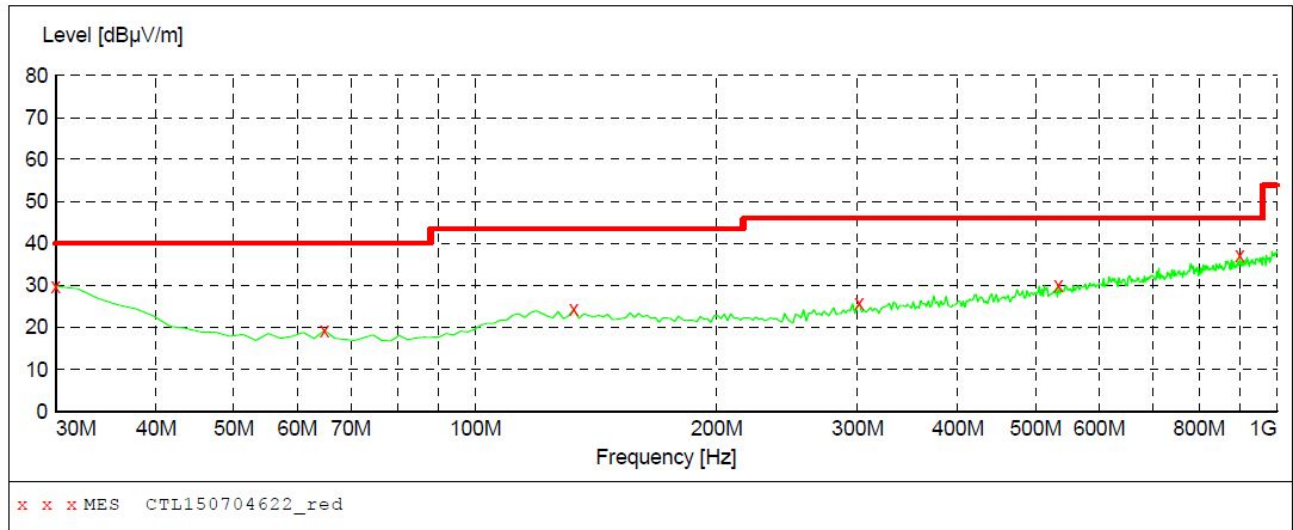
1. The radiated measurement are performed the each channel (low/mid/high), the datum recorded below (the middle channel) is the worst case for all test channels.
2. ULTRA-BROADBAND ANTENNA for the radiation emission test below 1G.
3. HORN ANTENNA for the radiation emission test above 1G.
4. We tested both battery powered and powered by adapter charging mode at three orientations, recorded worst case at powered by adapter charging mode.
5. "---" means not recorded as emission levels lower than limit.
6. Margin= Limit - Level

**For 9KHz to 30MHz**

| Frequency (MHz) | Corrected Reading (dB $\mu$ V/m)@3m | FCC Limit (dB $\mu$ V/m) @3m | Margin (dB) | Detector | Result |
|-----------------|-------------------------------------|------------------------------|-------------|----------|--------|
| 12.00           | 43.38                               | 69.54                        | 26.16       | QP       | PASS   |
| 24.00           | 41.22                               | 69.54                        | 28.32       | QP       | PASS   |

**For 30MHz to 1000MHz****Polarization****Vertical**

| Frequency MHz | Level dB $\mu$ V/m | Transd dB | Limit dB $\mu$ V/m | Margin dB | Polarization |
|---------------|--------------------|-----------|--------------------|-----------|--------------|
| 30.000000     | 32.00              | 21.1      | 40.0               | 8.0       | VERTICAL     |
| 55.220000     | 19.30              | 8.3       | 40.0               | 20.7      | VERTICAL     |
| 121.180000    | 24.40              | 15.1      | 43.5               | 19.1      | VERTICAL     |
| 208.480000    | 22.90              | 14.3      | 43.5               | 20.6      | VERTICAL     |
| 489.780000    | 29.40              | 20.3      | 46.0               | 16.6      | VERTICAL     |
| 955.380000    | 37.80              | 26.7      | 46.0               | 8.2       | VERTICAL     |

**Polarization****Horizontal**

| Frequency<br>MHz | Level<br>dBμV/m | Transd<br>dB | Limit<br>dBμV/m | Margin<br>dB | Polarization |
|------------------|-----------------|--------------|-----------------|--------------|--------------|
| 30.000000        | 29.80           | 21.1         | 40.0            | 10.2         | HORIZONTAL   |
| 64.920000        | 19.30           | 8.4          | 40.0            | 20.7         | HORIZONTAL   |
| 132.820000       | 24.30           | 14.8         | 43.5            | 19.2         | HORIZONTAL   |
| 301.600000       | 25.80           | 15.4         | 46.0            | 20.2         | HORIZONTAL   |
| 534.400000       | 30.10           | 20.6         | 46.0            | 15.9         | HORIZONTAL   |
| 899.120000       | 37.10           | 26.1         | 46.0            | 8.9          | HORIZONTAL   |

For 1GHz to 25GHz

**Low Channel @ Channel 00 @ 2402 MHz**

| <b>ANTENNA POLARITY &amp; TEST DISTANCE: HORIZONTAL AT 3 M</b> |                 |                        |    |                |             |                  |                       |                   |                    |                          |
|----------------------------------------------------------------|-----------------|------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| No.                                                            | Frequency (MHz) | Emssion Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1                                                              | 4804.00         | 52.76                  | PK | 74.00          | 21.24       | 48.25            | 33.49                 | 6.91              | 35.89              | 4.51                     |
| 2                                                              | 4804.00         | 39.30                  | AV | 54.00          | 14.70       | 34.79            | 33.49                 | 6.91              | 35.89              | 4.51                     |
| 3                                                              | 7206.00         | 54.87                  | PK | 74.00          | 19.13       | 43.76            | 36.95                 | 9.18              | 35.03              | 11.11                    |
| 4                                                              | 7206.00         | 37.45                  | AV | 54.00          | 16.55       | 26.34            | 36.95                 | 9.18              | 35.03              | 11.11                    |

| <b>ANTENNA POLARITY &amp; TEST DISTANCE: VERTICAL AT 3 M</b> |                 |                        |    |                |             |                  |                       |                   |                    |                          |
|--------------------------------------------------------------|-----------------|------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| No.                                                          | Frequency (MHz) | Emssion Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1                                                            | 4804.00         | 49.03                  | PK | 74.00          | 24.97       | 44.52            | 33.49                 | 6.91              | 35.89              | 4.51                     |
| 2                                                            | 4804.00         | 36.18                  | AV | 54.00          | 17.82       | 31.67            | 33.49                 | 6.91              | 35.89              | 4.51                     |
| 3                                                            | 7206.00         | 50.75                  | PK | 74.00          | 23.25       | 39.64            | 36.95                 | 9.18              | 35.03              | 11.11                    |
| 4                                                            | 7206.00         | 35.81                  | AV | 54.00          | 18.19       | 24.70            | 36.95                 | 9.18              | 35.03              | 11.11                    |

**Middle Channel @ Channel 40 @ 2442 MHz**

| <b>ANTENNA POLARITY &amp; TEST DISTANCE: HORIZONTAL AT 3 M</b> |                 |                        |    |                |             |                  |                       |                   |                    |                          |
|----------------------------------------------------------------|-----------------|------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| No.                                                            | Frequency (MHz) | Emssion Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1                                                              | 4884.00         | 54.05                  | PK | 74.00          | 19.95       | 47.80            | 33.60                 | 6.95              | 34.30              | 6.25                     |
| 2                                                              | 4884.00         | 39.61                  | AV | 54.00          | 14.39       | 33.36            | 33.60                 | 6.95              | 34.30              | 6.25                     |
| 3                                                              | 7326.00         | 55.84                  | PK | 74.00          | 18.16       | 42.06            | 37.46                 | 9.23              | 32.91              | 13.78                    |
| 4                                                              | 7326.00         | 37.62                  | AV | 54.00          | 16.38       | 23.84            | 37.46                 | 9.23              | 32.91              | 13.78                    |

| <b>ANTENNA POLARITY &amp; TEST DISTANCE: VERTICAL AT 3 M</b> |                 |                        |    |                |             |                  |                       |                   |                    |                          |
|--------------------------------------------------------------|-----------------|------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| No.                                                          | Frequency (MHz) | Emssion Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
| 1                                                            | 4884.00         | 49.50                  | PK | 74.00          | 24.50       | 43.25            | 33.60                 | 6.95              | 34.30              | 6.25                     |
| 2                                                            | 4884.00         | 36.33                  | AV | 54.00          | 17.67       | 30.08            | 33.60                 | 6.95              | 34.30              | 6.25                     |
| 3                                                            | 7326.00         | 50.81                  | PK | 74.00          | 23.19       | 37.03            | 37.46                 | 9.23              | 32.91              | 13.78                    |
| 4                                                            | 7326.00         | 35.98                  | AV | 54.00          | 18.02       | 22.20            | 37.46                 | 9.23              | 32.91              | 13.78                    |

**High Channel @ Channel 78 @ 2480 MHz****ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

| No. | Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
|-----|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| 1   | 4960.00         | 54.31                   | PK | 74.00          | 19.69       | 49.39            | 33.84                 | 7.00              | 35.92              | 4.92                     |
| 2   | 4960.00         | 39.68                   | AV | 54.00          | 14.32       | 34.76            | 33.84                 | 7.00              | 35.92              | 4.92                     |
| 3   | 7340.00         | 55.77                   | PK | 74.00          | 18.23       | 43.82            | 37.64                 | 9.28              | 34.97              | 11.95                    |
| 4   | 7340.00         | 37.56                   | AV | 54.00          | 16.44       | 25.61            | 37.64                 | 9.28              | 34.97              | 11.95                    |

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

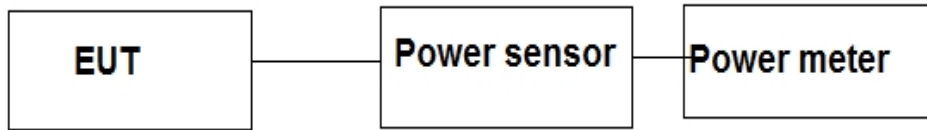
| No. | Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
|-----|-----------------|-------------------------|----|----------------|-------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| 1   | 4960.00         | 49.40                   | PK | 74.00          | 24.60       | 44.48            | 33.84                 | 7.00              | 35.92              | 4.92                     |
| 2   | 4960.00         | 36.23                   | AV | 54.00          | 17.77       | 31.31            | 33.84                 | 7.00              | 35.92              | 4.92                     |
| 3   | 7340.00         | 50.96                   | PK | 74.00          | 23.04       | 39.01            | 37.64                 | 9.28              | 34.97              | 11.95                    |
| 4   | 7340.00         | 35.80                   | AV | 54.00          | 18.20       | 23.85            | 37.64                 | 9.28              | 34.97              | 11.95                    |

**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 average measurement was not performed when the peak measured data under the limit of average detection.

### 4.3. Maximum Peak Output Power

#### TEST CONFIGURATION



#### TEST PROCEDURE

According to 558074 D01 DTS Meas Guidance v03r03 9.1.2 PKPM1 Peak power meter method "The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector."

#### LIMIT

The Maximum Peak Output Power Measurement is 30dBm.

#### TEST RESULTS

##### A. Test Verdict

| Channel | Frequency (MHz) | Measured Output Peak Power (dBm) | Limits (dBm) | Verdict |
|---------|-----------------|----------------------------------|--------------|---------|
| 00      | 2402            | -3.34                            | 30           | PASS    |
| 19      | 2440            | -3.21                            | 30           | PASS    |
| 39      | 2480            | -2.94                            | 30           | PASS    |

Note:

1. The test results including the cable lose.

#### 4.4. Power Spectral Density

##### TEST CONFIGURATION



##### TEST PROCEDURE

According to KDB 558074 D01 V03 Method PKPSD (peak PSD) this procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
4. Set the VBW  $\geq 3 \text{ RBW}$ .
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 amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

##### 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

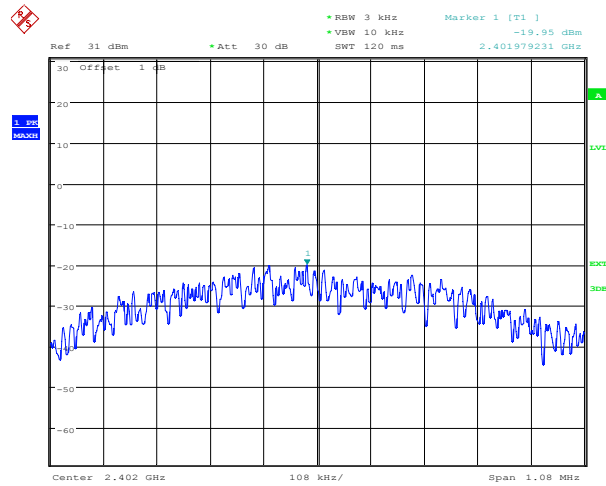
###### A. Test Verdict

| Channel | Frequency (MHz) | Report PSD (dBm/3kHz) | Refer to Plot | Limits (dBm/3KHz) | Verdict |
|---------|-----------------|-----------------------|---------------|-------------------|---------|
| 00      | 2402            | -19.95                | Plot 4.4.1 A  | 8                 | PASS    |
| 19      | 2440            | -19.73                | Plot 4.4.1 B  | 8                 | PASS    |
| 39      | 2480            | -19.52                | Plot 4.4.1 C  | 8                 | PASS    |

###### Note

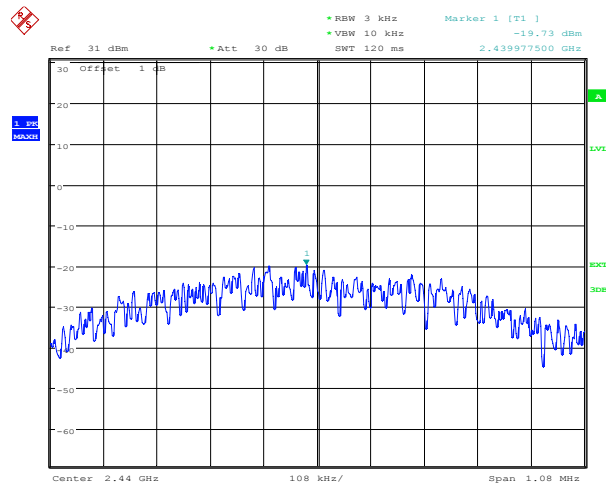
1. The test results including the cable loss.

###### B. Test Plots



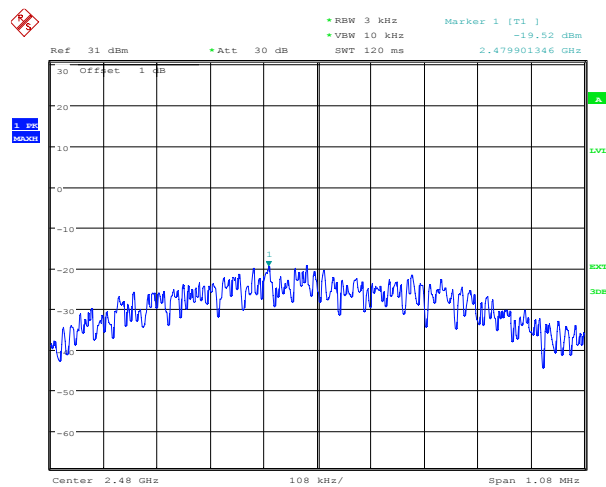
Date: 28.JUN.2015 12:36:45

(Plot 4.4.1 A: Channel 00: 2402 MHz @ GFSK)



Date: 28.JUN.2015 12:36:59

(Plot 4.4.1 B: Channel 19: 2440 MHz @ GFSK)



Date: 28.JUN.2015 12:37:08

(Plot 4.4.1 C: Channel 39: 2480 MHz @ GFSK)

## 4.5. Band Edge Compliance of RF Emission

### TEST REQUIREMENT

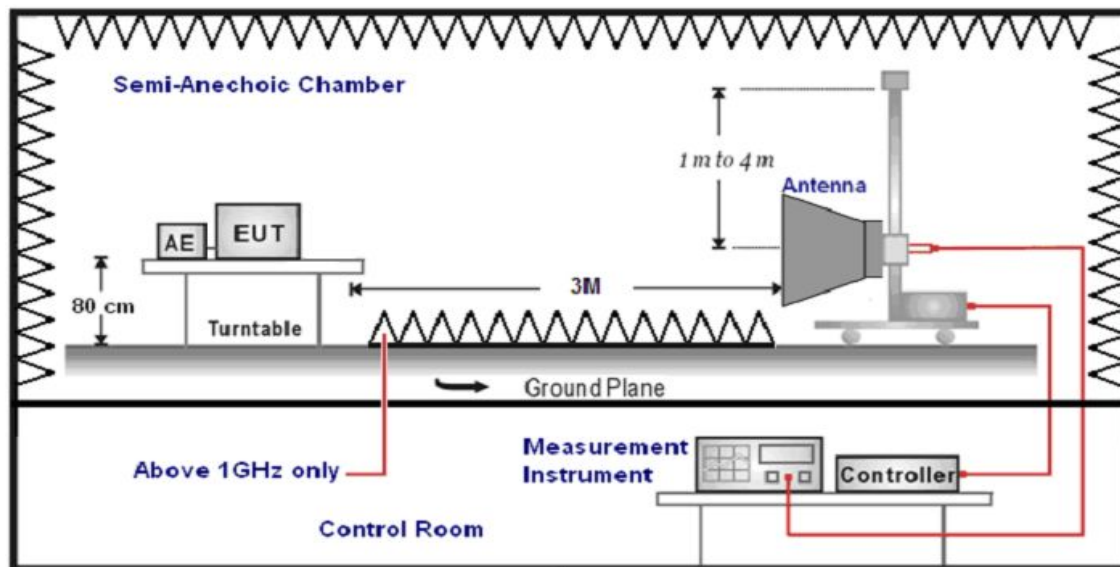
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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 RBW of spectrum analyzer to 100 kHz and VBW of spectrum analyzer to 300KHz with a convenient frequency span including 100kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz..
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.

### TEST CONFIGURATION

#### *For Radiated*



#### *For Conducted*



### 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..
5. The distance between test antenna and EUT was 3 meter:
6. Setting test receiver/spectrum as following table states:

| Test Frequency range | Test Receiver/Spectrum Setting                       | Detector              |
|----------------------|------------------------------------------------------|-----------------------|
| 1GHz-40GHz           | Peak Value: RBW=1MHz/VBW=3MHz,<br>Sweep time=Auto    | Peak<br>(Receiver)    |
| 1GHz-40GHz           | Average Value: RBW=1MHz/VBW=3MHz,<br>Sweep time=Auto | Average<br>(Receiver) |

### **LIMIT**

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

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)

### **TEST RESULTS**

#### **4.5.1 For Radiated Bandedge Measurement**

| Test Mode: |                 | GFSK(2402MHz)          |                 |                       | Polarization:      |                |                | Horizontal  |          |
|------------|-----------------|------------------------|-----------------|-----------------------|--------------------|----------------|----------------|-------------|----------|
| Mark       | Frequency (MHz) | Reading Level (dBuV/m) | Cable Loss (dB) | Antenna Factor (dB/m) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
| 1          | 2390.00         | 17.56                  | 4.60            | 28.72                 | 0.00               | 50.88          | 74.00          | 23.12       | Peak     |
| 2          | 2390.00         | 7.15                   | 4.60            | 28.72                 | 0.00               | 40.47          | 54.00          | 13.53       | Average  |
| 3          | 2401.73         | 61.68                  | 4.61            | 28.78                 | 0.00               | 95.07          | 74.00          | -21.07      | Peak     |
| 4          | 2401.97         | 60.32                  | 4.61            | 28.78                 | 0.00               | 93.71          | 54.00          | -39.71      | Average  |

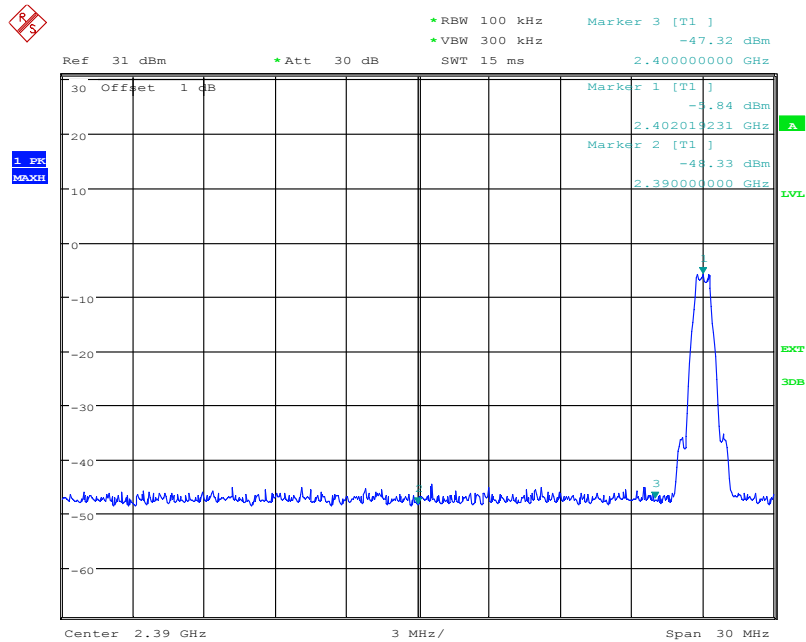
| Test Mode: |                 | GFSK(2402MHz)          |                 |                       | Polarization:      |                |                | Vertical    |          |
|------------|-----------------|------------------------|-----------------|-----------------------|--------------------|----------------|----------------|-------------|----------|
| Mark       | Frequency (MHz) | Reading Level (dBuV/m) | Cable Loss (dB) | Antenna Factor (dB/m) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
| 1          | 2390.00         | 17.52                  | 4.60            | 28.72                 | 0.00               | 50.84          | 74.00          | 23.16       | Peak     |
| 2          | 2390.00         | 7.73                   | 4.60            | 28.72                 | 0.00               | 41.05          | 54.00          | 12.95       | Average  |
| 3          | 2401.72         | 60.29                  | 4.61            | 28.78                 | 0.00               | 93.68          | 74.00          | -19.68      | Peak     |
| 4          | 2402.01         | 58.88                  | 4.61            | 28.78                 | 0.00               | 92.27          | 54.00          | -38.27      | Average  |

| Test Mode: |                 | GFSK(2480MHz)          |                 |                       | Polarization:      |                |                | Horizontal  |          |
|------------|-----------------|------------------------|-----------------|-----------------------|--------------------|----------------|----------------|-------------|----------|
| Mark       | Frequency (MHz) | Reading Level (dBuV/m) | Cable Loss (dB) | Antenna Factor (dB/m) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
| 1          | 2480.20         | 61.52                  | 4.70            | 28.92                 | 0.00               | 95.14          | 74.00          | -21.14      | Peak     |
| 2          | 2479.99         | 60.33                  | 4.70            | 28.92                 | 0.00               | 93.95          | 54.00          | -39.95      | Average  |
| 3          | 2483.50         | 17.67                  | 4.70            | 28.93                 | 0.00               | 51.30          | 74.00          | 22.70       | Peak     |
| 4          | 2483.50         | 7.43                   | 4.70            | 28.93                 | 0.00               | 41.06          | 54.00          | 12.94       | Average  |

| Test Mode: |                 | GFSK(2480MHz)          |                 |                       | Polarization:      |                |                | Vertical    |          |
|------------|-----------------|------------------------|-----------------|-----------------------|--------------------|----------------|----------------|-------------|----------|
| Mark       | Frequency (MHz) | Reading Level (dBuV/m) | Cable Loss (dB) | Antenna Factor (dB/m) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector |
| 1          | 2480.21         | 60.52                  | 4.70            | 28.92                 | 0.00               | 94.14          | 74.00          | -20.14      | Peak     |
| 2          | 2480.05         | 59.18                  | 4.70            | 28.92                 | 0.00               | 92.80          | 54.00          | -38.80      | Average  |
| 3          | 2483.50         | 18.34                  | 4.70            | 28.93                 | 0.00               | 51.97          | 74.00          | 22.03       | Peak     |
| 4          | 2483.50         | 6.89                   | 4.70            | 28.93                 | 0.00               | 40.52          | 54.00          | 13.48       | Average  |

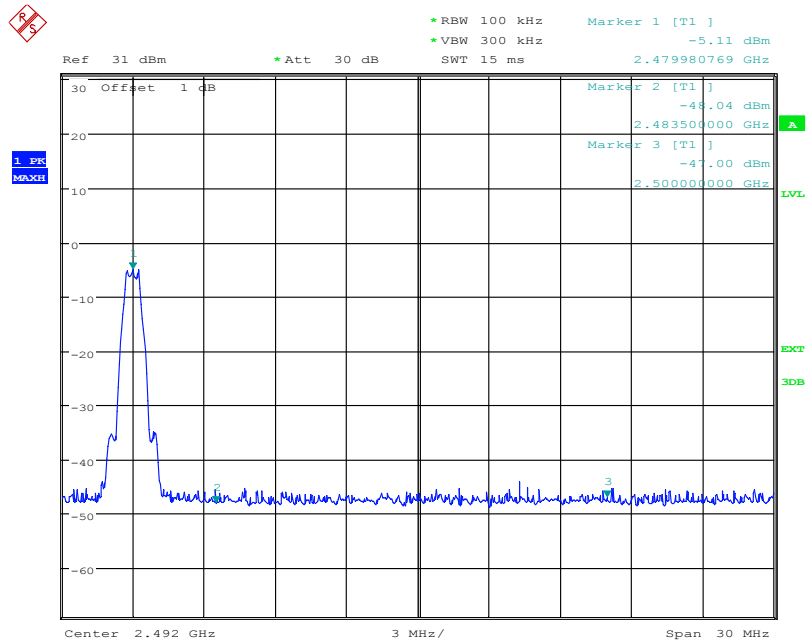
## 4.5.2 For Conducted Bandedge Measurement

### A. Test Plots



Date: 28.JUN.2015 12:38:52

(Plot 4.5.2.1 A: Channel 00: 2402MHz @ GFSK)



Date: 28.JUN.2015 12:39:28

(Plot 4.5.2.1 B: Channel 39: 2402MHz @ GFSK)

## 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 C63.4-2009 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=100 kHz and VBW= 300 KHz to measure the peak field strength, and measure frequency range from 9 KHz 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

Remark: The measurement frequency range is from 9KHz to the 10<sup>th</sup> harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandedge measurement data.

### TEST RESULTS

Remark: The measurement frequency range is from 9 KHz to the 10<sup>th</sup> harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandedge measurement data.

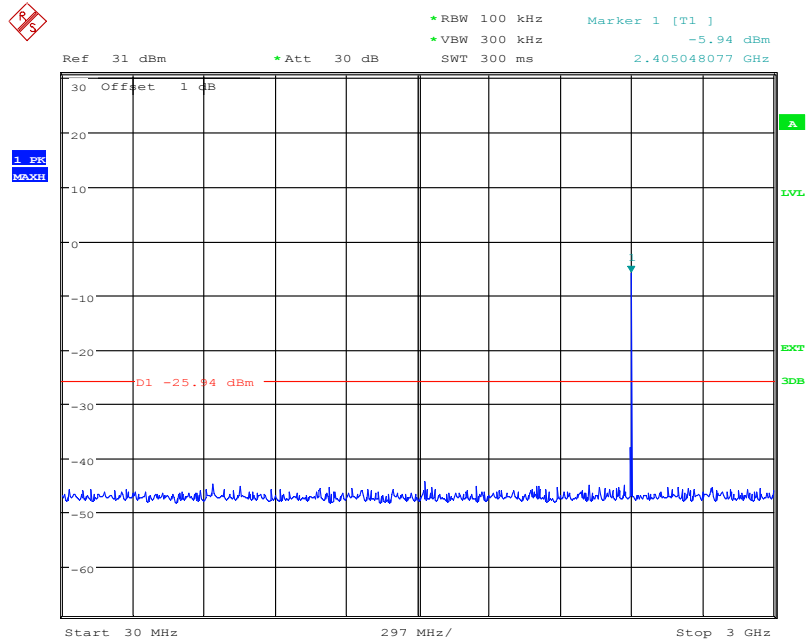
#### A. Test Verdict

| Channel | Frequency (MHz) | Frequency Range | Refer to Plot | Limit (dBc) | Verdict |
|---------|-----------------|-----------------|---------------|-------------|---------|
| 00      | 2402            | 30MHz-3 GHz     | Plot 4.6.1 A1 | ---         | PASS    |
|         |                 | 3 GHz -15 GHz   | Plot 4.6.1 A2 | -20         | PASS    |
|         |                 | 15 GHz -25GHz   | Plot 4.6.1 A3 | -20         | PASS    |
| 19      | 2440            | 30MHz-3 GHz     | Plot 4.6.1 B1 | ---         | PASS    |
|         |                 | 3 GHz -15 GHz   | Plot 4.6.1 B2 | -20         | PASS    |
|         |                 | 15 GHz -25GHz   | Plot 4.6.1 B3 | -20         | PASS    |
| 39      | 2480            | 30MHz-3 GHz     | Plot 4.6.1 C1 | ---         | PASS    |
|         |                 | 3 GHz -15 GHz   | Plot 4.6.1 C2 | -20         | PASS    |
|         |                 | 15 GHz -25GHz   | Plot 4.6.1 C3 | -20         | PASS    |

Note:

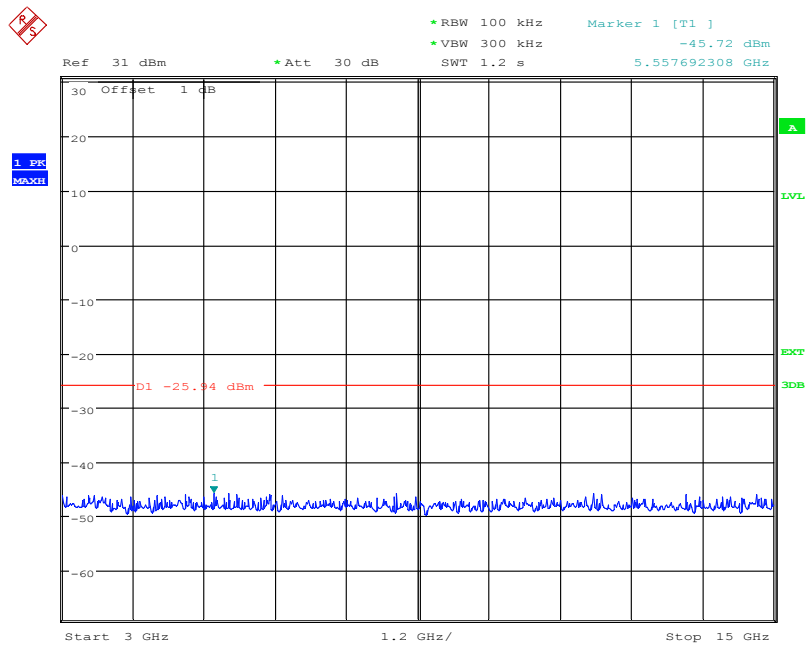
1. The test results including the cable lose.
2. For 9KHz -30MHz, Because there was more 20dB less than limit So We did not recorded data.

#### B. Test Plots



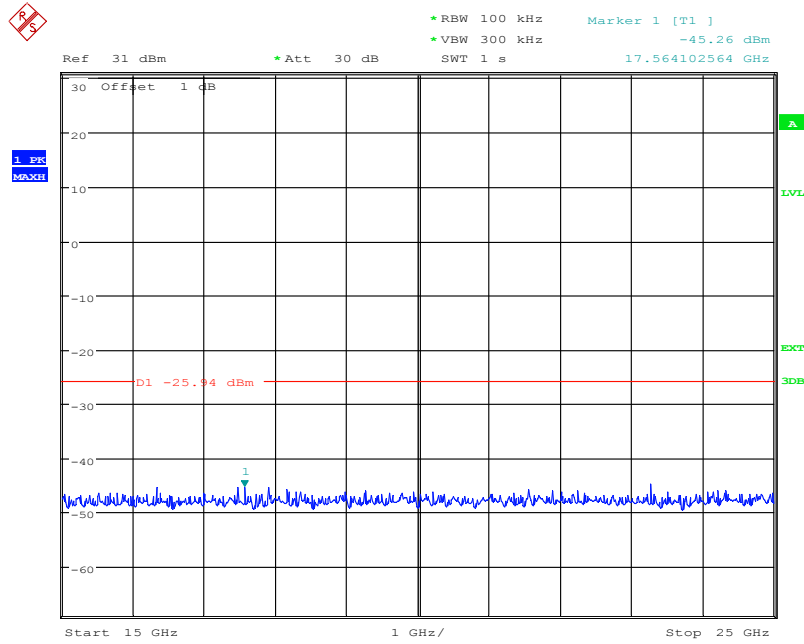
Date: 28.JUN.2015 12:40:04

(Plot 4.6.1 A1: Channel 00: 2402MHz @ GFSK)



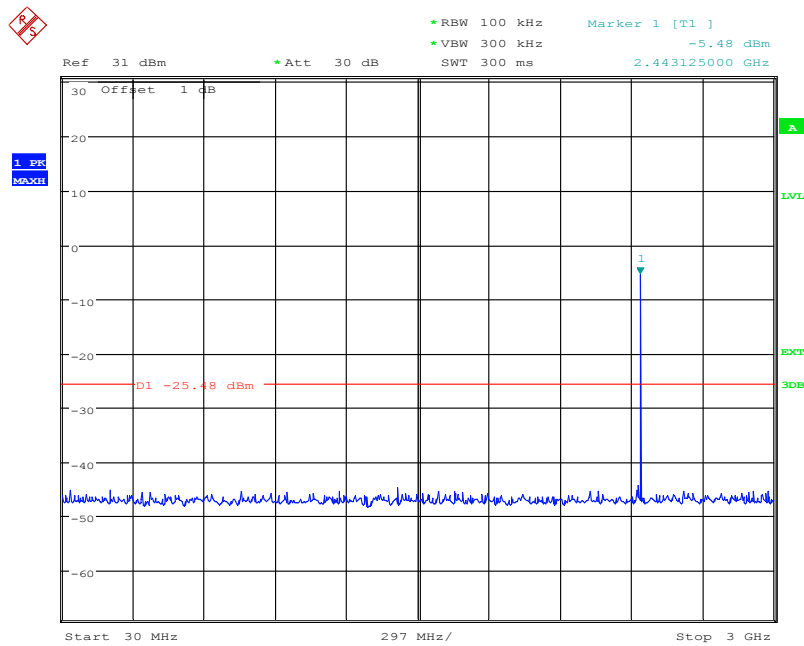
Date: 28.JUN.2015 12:40:29

(Plot 4.6.1 A2: Channel 00: 2402MHz @ GFSK)



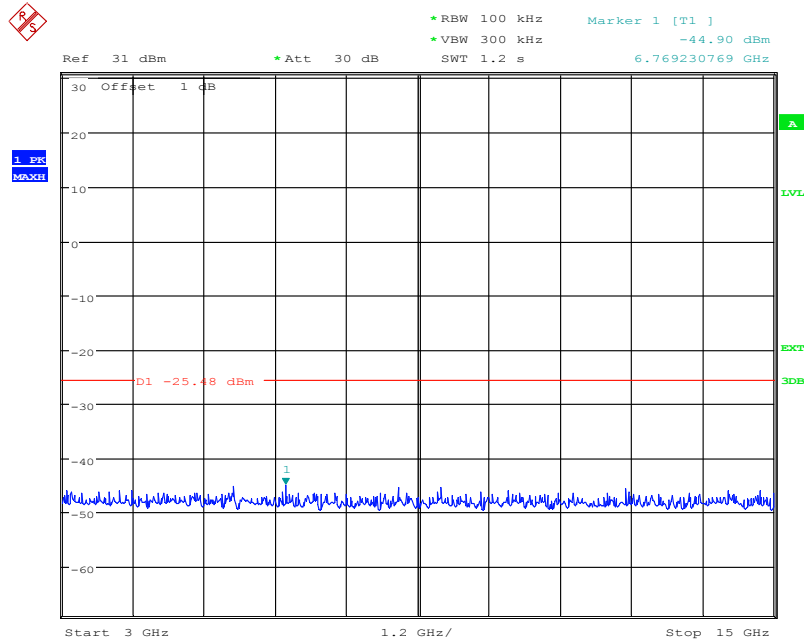
Date: 28.JUN.2015 12:40:37

(Plot 4.6.1 A3: Channel 00: 2402MHz @ GFSK)



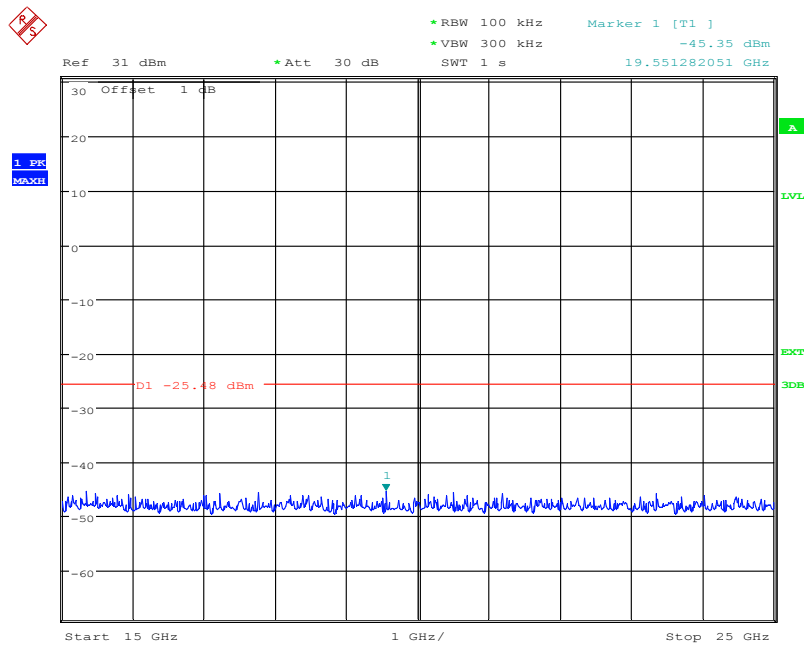
Date: 28.JUN.2015 12:41:35

(Plot 4.6.1 B1: Channel 19: 2440MHz @ GFSK)



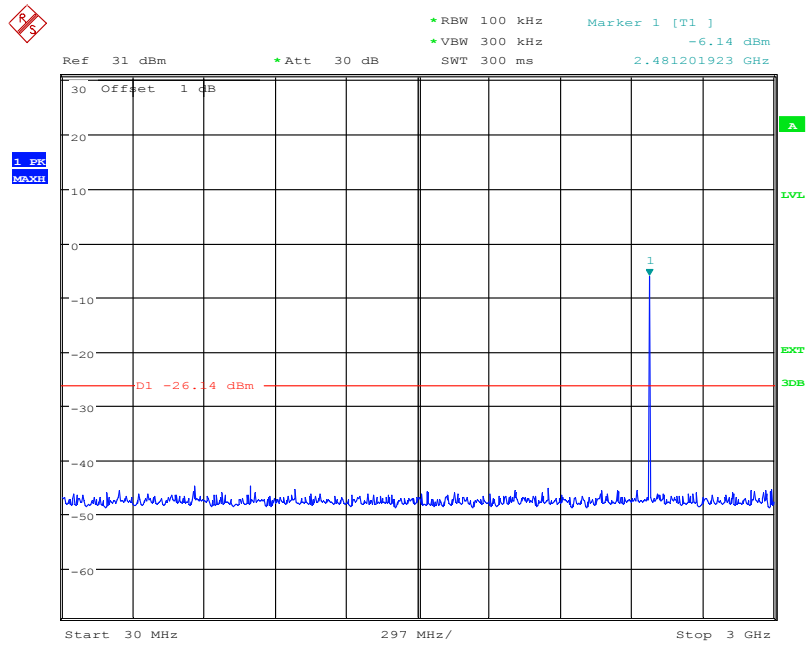
Date: 28.JUN.2015 12:41:43

(Plot 4.6.1 B2: Channel 19: 2440MHz @ GFSK)



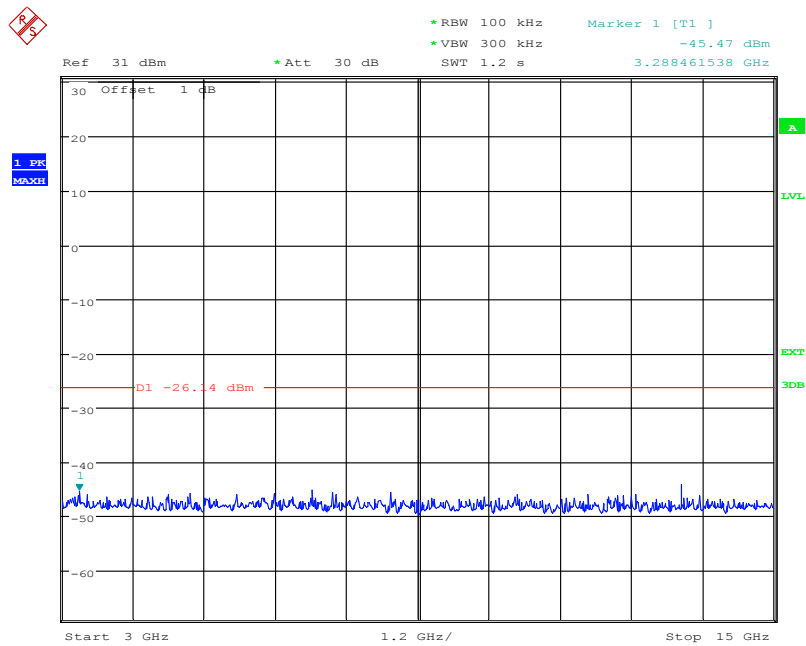
Date: 28.JUN.2015 12:41:49

(Plot 4.6.1 B3: Channel 19: 2440MHz @ GFSK)



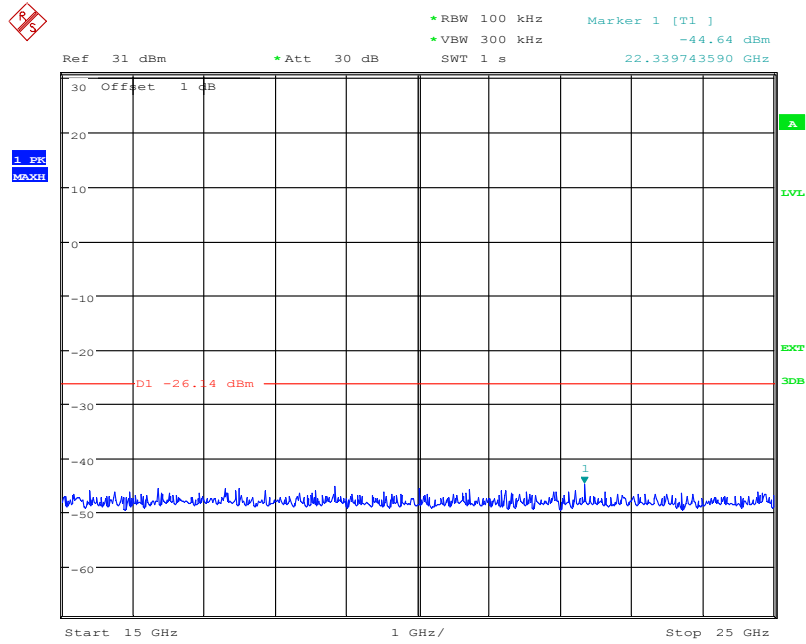
Date: 28.JUN.2015 12:42:39

(Plot 4.6.1 C1: Channel 39: 2480MHz @ GFSK)



Date: 28.JUN.2015 12:42:47

(Plot 4.6.1 C2: Channel 39: 2480MHz @ GFSK)



Date: 28.JUN.2015 12:42:54

(Plot 4.6.1 C3: Channel 39: 2480MHz @ GFSK)

## 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 with 100 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. According to KDB558074 D01 V03 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW)  $\geq 3$  RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### LIMIT

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

### TEST RESULTS

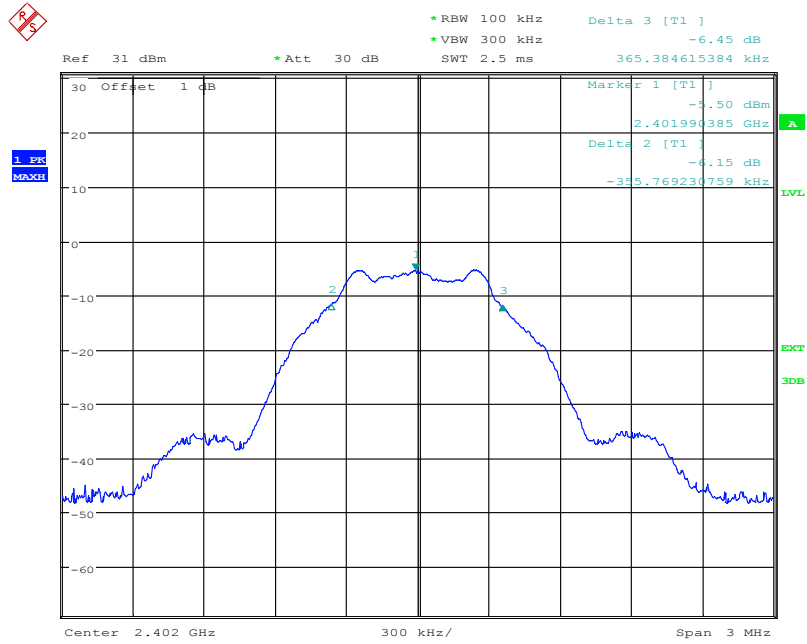
#### A. Test Verdict

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | Refer to Plot | Limits (kHz) | Verdict |
|---------|-----------------|----------------------|---------------|--------------|---------|
| 00      | 2402            | 0.721                | Plot 4.7.1 A  | $\geq 500$   | PASS    |
| 19      | 2440            | 0.692                | Plot 4.7.1 B  | $\geq 500$   | PASS    |
| 39      | 2480            | 0.712                | Plot 4.7.1 C  | $\geq 500$   | PASS    |

Note:

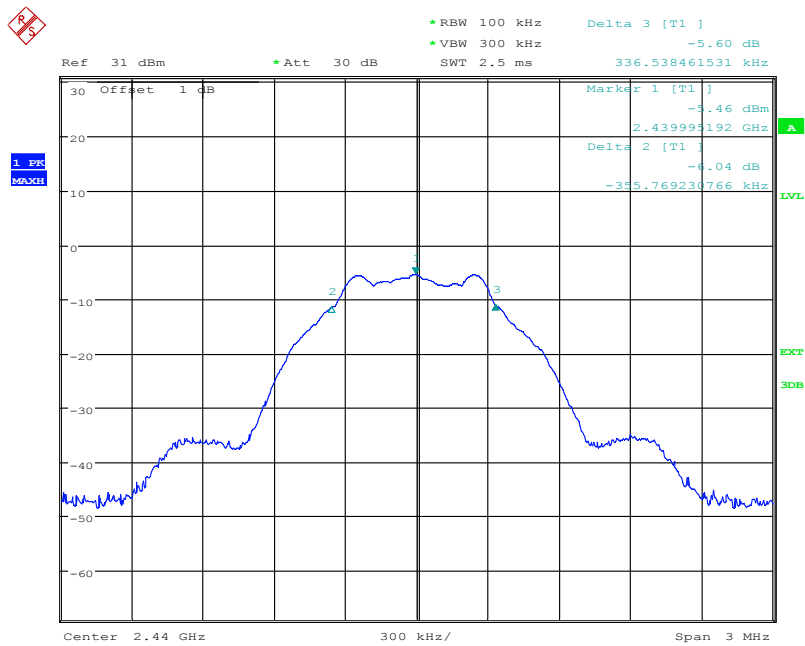
1. The test results including the cable loss.

#### B. Test Plots



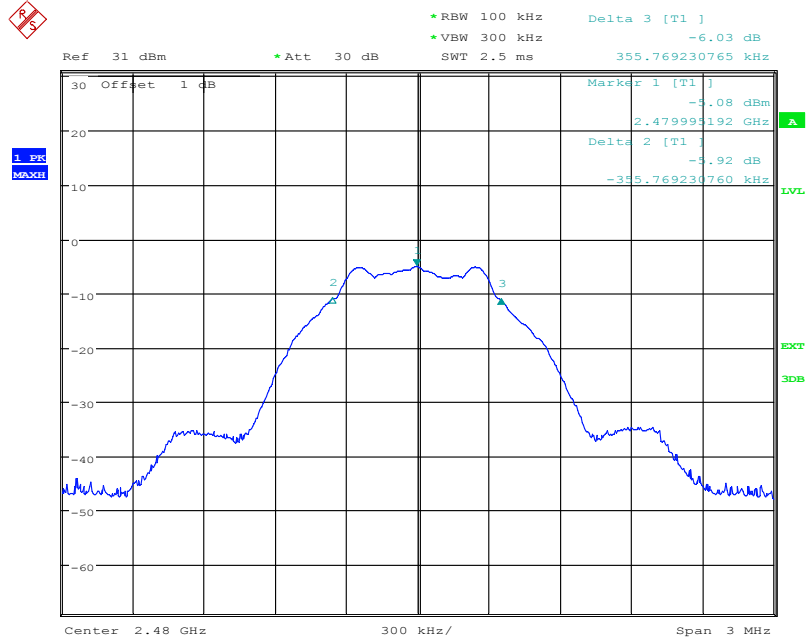
Date: 28.JUN.2015 12:34:11

(Plot 4.7.1 A: Channel 00: 2402MHz @ GFSK)



Date: 28.JUN.2015 12:35:01

(Plot 4.7.1 B: Channel 19: 2440MHz @ GFSK)



Date: 28.JUN.2015 12:35:37

(Plot 4.7.1 C: Channel 39: 2480MHz @ GFSK)

## 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 maximum gain of Bluetooth antenna was -0.58dBi and it is a FPC ANT.



## 5. Test Setup Photos of the EUT



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