



Report No. SH15070043W04

FCC RF TEST REPORT

Issued to

Vigo Technologies Inc.

For

Bluetooth Earphone

Model Name : VIGOALPHA
Trade Name : Vigo
Brand Name : Vigo
Standard : 47 CFR Part 15, Subpart C
ANSI C63.4-2009
FCC ID : 2AFKV-VIGO
Test date : Jun.13,2015 to Jun.16,2015
Issue date : Jun.18,2015

Shanghai MORLAB Communication Technology Co., Ltd.



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CTIA Authorized Test Lab
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IEEE 1725

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Change History

| Issue | Date | Reason for change |
|-------|-------------|-------------------|
| 1.0 | Jun.18,2015 | First edition |
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| | | |
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1. General Information

1.1 Applicant

Vigo Technologies Inc.

620 Folsom Street, San Francisco, CA 94107

1.2 Manufacturer

Vigo Technologies Inc.

620 Folsom Street, San Francisco, CA 94107

1.3 Description of EUT

EUT Name.....: Bluetooth Earphone
Model Name.....: VIGOALPHA
Brand Name.....: Vigo
Trade Name.....: Vigo
Hardware Version.....: 1.2
Software Version.....: 1.14
Bluetooth Version.....: 2.1+EDR
Modulation Type.....: FHSS (GFSK(1Mbps), $\pi/4$ -DQPSK(EDR 2Mbps), 8-DPSK(EDR 3Mbps)
Frequency Range.....: 2.402GHz - 2.480GHz (at interval of 1MHz)
Channel Number.....: 79
EUT Stage.....: Production Unit
Antenna Type.....: PCB Antenna
Antenna Gain.....: 0.81dBi
Battery.....: 3.7V, 240mAh

NOTE 1:

*The EUT contains Bluetooth Module operating at 2.4GHz ISM band; the frequencies allocated for the Bluetooth Module is $F(\text{MHz})=2402+1*n$ ($0 \leq n \leq 78$). The lowest, middle, highest channel numbers of the Bluetooth Module used and tested in this report are separately 0 (2402MHz), 39 (2441MHz) and 78 (2480MHz).*

NOTE 2:

The EUT is a Bluetooth Headset. It has 2 Bluetooth chips, CSR8620 (2.1+EDR) and Nrf51822(BLE). Independent antenna is supported for each chip. PCB Antenna for CSR8620 and Ceramic Antenna for Nrf51822. Transmitters are deactivated during charging process.

NOTE 3:

For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacture.

2. Facilities and Accreditations

2.1 Test Facility

Shanghai Morlab Communications Technology Co., Ltd. Morlab Laboratory is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6644. A 9*6*6(m) fully anechoic chamber was used for the radiated spurious emissions test.

2.2 Environmental Conditions

Ambient temperature: 15~35°C

Relative humidity: 30~60%

Atmosphere pressure: 86-106kPa

2.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission: $\pm 1.76\text{dB}$

Uncertainty of Radiated Emission: $\pm 3.16\text{dB}$

2.4 List of Equipments Used

| Description | Manufacturer | Model | Serial No. | Cal. Date | Cal. Due |
|-----------------------------|---------------|--------------|--------------|-----------|----------|
| Service Simulator | Anritsu | MT8852A | 6K00002788 | 2014.9.22 | 1year |
| Spectrum Analyzer | R&S | FSU26 | 200880 | 2015.2.25 | 1year |
| Power Splitter | Weinschel | 1506A | NW521 | (n.a.) | (n.a.) |
| Power Splitter | Mini-Circuits | ZFRSC-183-S+ | 765001016 | (n.a.) | (n.a.) |
| Attenuator 1 | Resnet | 10dB | (n.a.) | (n.a.) | (n.a.) |
| Attenuator 2 | Resnet | 3dB | (n.a.) | (n.a.) | (n.a.) |
| Full/Semi-Anechoic Chamber | Albatross | 9m*6m*6m | (n.a.) | 2012.9.14 | 3year |
| EMI Test Receiver | R&S | ESCI | 101351 | 2014.8.5 | 1year |
| Antenna | Schwarzbeck | BBHA 9120C | 9120C-384 | 2014.7.25 | 1year |
| Antenna | R&S | HL562 | 100385 | 2014.6.17 | 1year |
| Antenna | R&S | HF906 | 100565 | 2014.6.17 | 1year |
| LISN | Rohde&Schwarz | ENV216 | 812744 | 2014.9.22 | 1year |
| Personal Computer | HP | (n.a.) | (n.a.) | (n.a.) | (n.a.) |
| Test Antenna-Horn | Schwarzbeck | BBHA9170 | BBHA91970171 | 2014.9.22 | 1year |
| Test Antenna-Log | Schwarzbeck | VULB 9163 | 9163-561 | 2014.9.25 | 1year |
| Test Antenna-Loop | Rohde&Schwarz | HFH2-Z2 | 860004/001 | 2014.9.22 | 1year |
| Temporary Antenna Connector | Farpu | SMA-K | (n.a.) | (n.a.) | (n.a.) |

NOTE:

Equipments listed above have been calibrated and are in the period of validation.

3. Test Standards and Results

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- ANSI C63.4-2009
- FCC Public Notice DA 00-705

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

Test items and the results are as bellow:

| No | FCC Rules | Test Type | Limits | Result |
|----|--------------------|--------------------------------|--|--------|
| 1 | 15.247(a)(1) | Number of Hopping Frequency | $\geq 75\text{Chs}$ | PASS |
| 2 | 15.247(b)(1) | Peak Output Power | $\leq 0.125\text{W}$ | PASS |
| 3 | 15.247(a)(1) | 20dB Bandwidth | NA | PASS |
| 4 | 15.247(a)(1) | Carrier Frequency Separation | $\geq 2/3$ of 20dB BW | PASS |
| 5 | 15.247(a)(1) | Time of Occupancy (Dwell time) | $\leq 0.4\text{sec}$ in 31.6sec period | PASS |
| 6 | 15.247(d) | Conducted Spurious Emission | $< 20\text{ dB}$ | PASS |
| 7 | 15.247(d) | Band Edge | $\leq 20\text{dB}$ | PASS |
| 8 | 15.207 | Conducted Emission | 15.207(a) | N/A |
| 9 | 15.247(d) | Radiated Emission | 15.209(a) & 15.247(d) | PASS |
| 10 | 15.203 & 15.247(b) | Antenna Requirement | N/A | PASS |

4. Test Conditions Setting

The EUT has been associated with peripherals pursuant to ANSI C63.4-2009 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

Pre-scanned tests were conducted to determine the final configuration from all possible combinations.

The following tables are showing the test modes as the worst cases and recorded in this report.

| TEST MODE | | | |
|--|---------------------|---------------------|-----------------------|
| BT Data Rate / Modulation | Conducted Mode | Radiated Mode | AC Conducted Emission |
| Bluetooth 1Mbps GFSK | Channel 00_2402 MHz | Channel 00_2402 MHz | NA |
| | Channel 39_2441 MHz | Channel 39_2441 MHz | |
| | Channel 78_2480 MHz | Channel 78_2480 MHz | |
| Bluetooth EDR 2Mbps $\pi/4$ -DQPSK | Channel 00_2402 MHz | Channel 00_2402 MHz | |
| | Channel 39_2441 MHz | Channel 39_2441 MHz | |
| | Channel 78_2480 MHz | Channel 78_2480 MHz | |
| Bluetooth EDR 3Mbps 8-DPSK | Channel 00_2402 MHz | Channel 00_2402 MHz | |
| | Channel 39_2441 MHz | Channel 39_2441 MHz | |
| | Channel 78_2480 MHz | Channel 78_2480 MHz | |

5. 47 CFR Part 15C requirements

5.1 Antenna requirement

5.1.1 Applicable standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

5.1.2 Result: Compliant

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

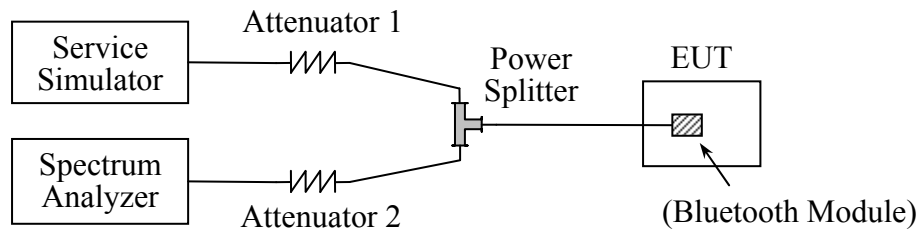
6. Test Result

6.1 Number of Hopping Frequency

6.1.1 Requirement

According to FCC section 15.247(a)(1)(iii), frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 15 hopping frequencies.

6.1.2 Test Setup



The Bluetooth Module of the EUT, which is powered by the Battery, is coupled to the Spectrum Analyzer (SA) and the Bluetooth Service Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. During the measurement, the Bluetooth Module of the EUT is activated and controlled by the SS, and is set to operate under test mode transmitting 339 bytes DH5 packages at maximum power.

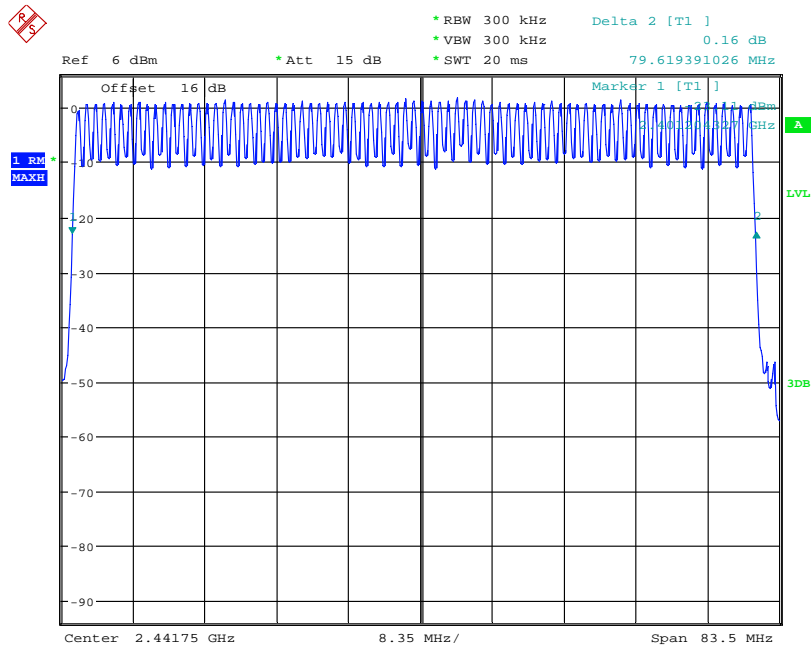
6.1.3 Test Result

The Bluetooth Module operates at hopping-on test mode; the frequencies number employed is counted to verify the Module's using the number of hopping frequency compliance to Hopping Sequence and Equal Usage of the channels

A. Test Verdict:

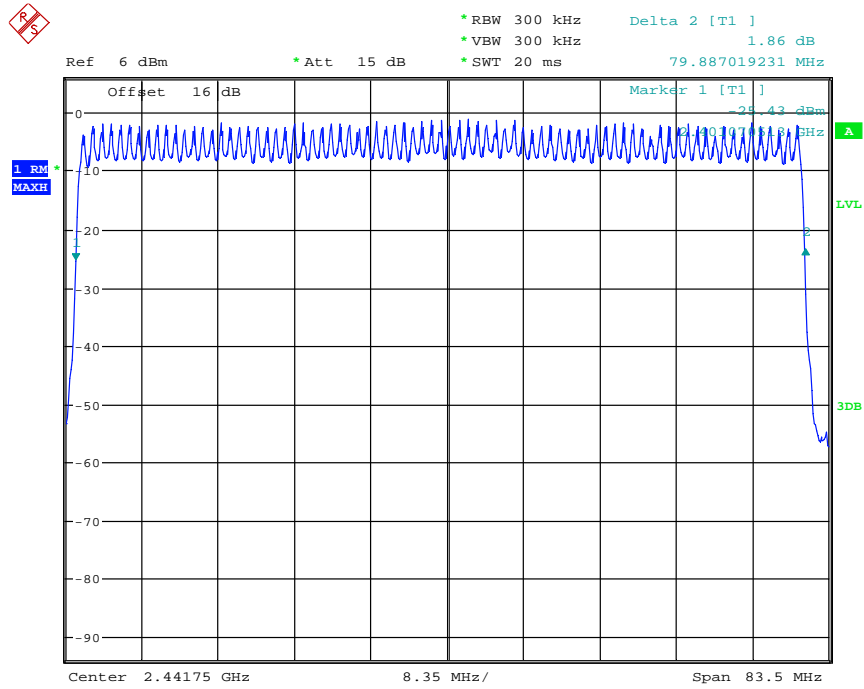
| Modulation | Frequency Block (MHz) | Measured Channel Numbers | Min. Limit | Refer to Plot | Verdict |
|----------------|-----------------------|--------------------------|------------|---------------|---------|
| GFSK | 2400 - 2483.5 | 79 | 15 | Plot A | PASS |
| $\pi/4$ -DQPSK | 2400 - 2483.5 | 79 | 15 | Plot B | PASS |
| 8-DPSK | 2400 - 2483.5 | 79 | 15 | Plot C | PASS |

B. Test Plot:



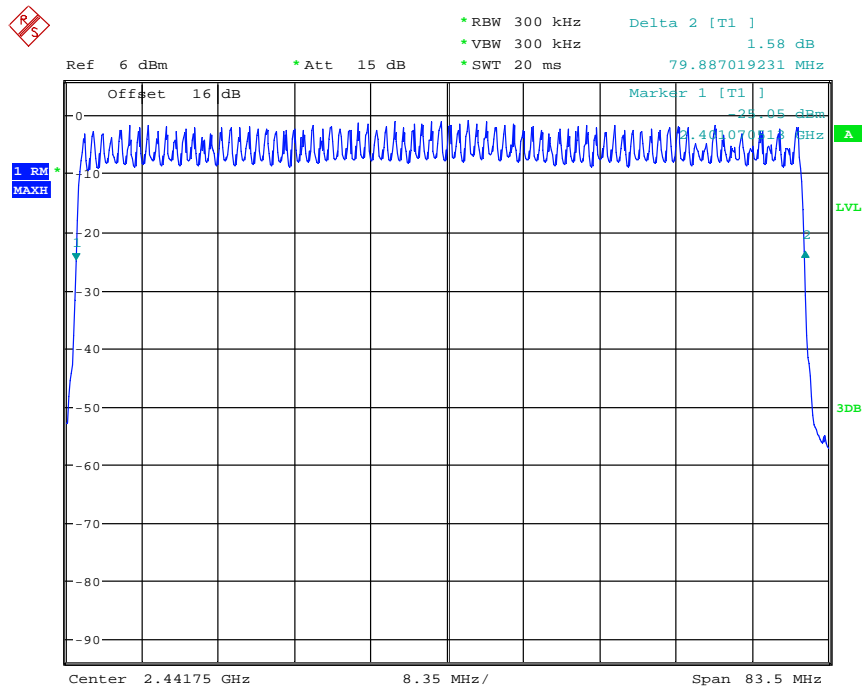
Date: 16.JUN.2015 18:12:26

Plot A



Date: 16.JUN.2015 18:18:22

Plot B



Date: 16.JUN.2015 18:24:40

Plot C

6.2 Peak Output Power

6.2.1 Requirement

According to FCC section 15.247(b)(1), for frequency hopping systems that operates in the 2400MHz to 2483.5MHz band employing at least 75 hopping channels, the maximum peak output power of the intentional radiator shall not exceed 1Watt. For all other frequency hopping systems in the 2400MHz to 2483.5MHz band, it is 0.125Watts.

6.2.2 Test Setup

See section 6.1.2 of this report.

6.2.3 Test Result

The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

A. Test Verdict:

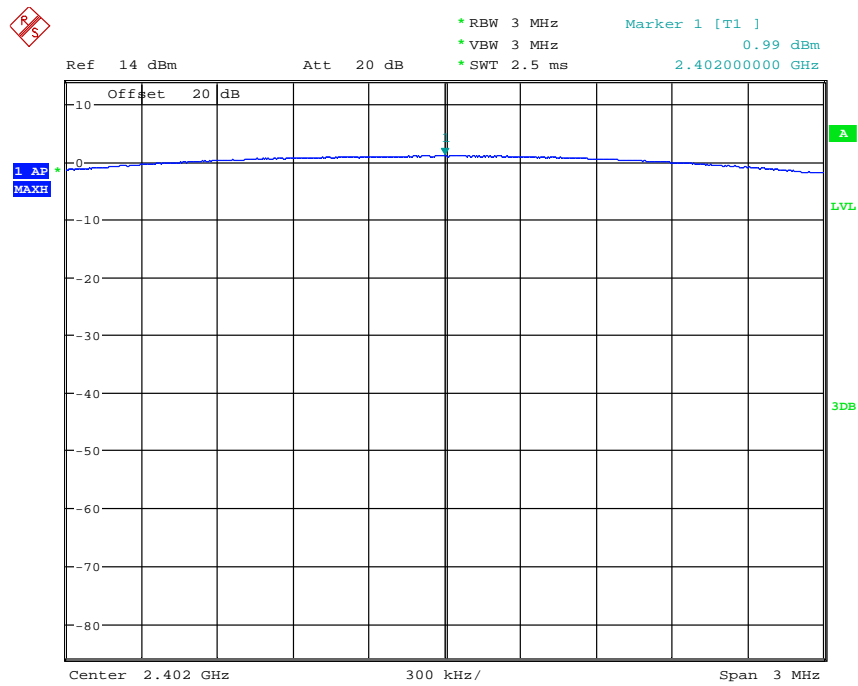
| Channel | Frequency (MHz) | Measured Output Peak Power(dBm) | Limit | Verdict |
|---------|--------------------|---------------------------------|-------|---------|
| | | Data Rate/Modulation | | |
| | | GFSK | dBm | |
| | | 1Mbps | | |
| 0 | 2402 | 0.99 | 30 | PASS |
| 39 | 2441 | 2.19 | | PASS |
| 78 | 2480 | 0.05 | | PASS |

| Channel | Frequency (MHz) | Measured Output Peak Power(dBm) | | Limit | Verdict |
|---------|--------------------|---------------------------------|--------|-------|---------|
| | | Data Rate/Modulation | | | |
| | | π /4-DQPSK | 8-DPSK | dBm | |
| | | 2Mbps | 3Mbps | | |
| 0 | 2402 | -1.35 | -0.99 | 21 | PASS |
| 39 | 2441 | 0.29 | 0.51 | | PASS |
| 78 | 2480 | -1.15 | -1.39 | | PASS |

GFSK (1Mbps)

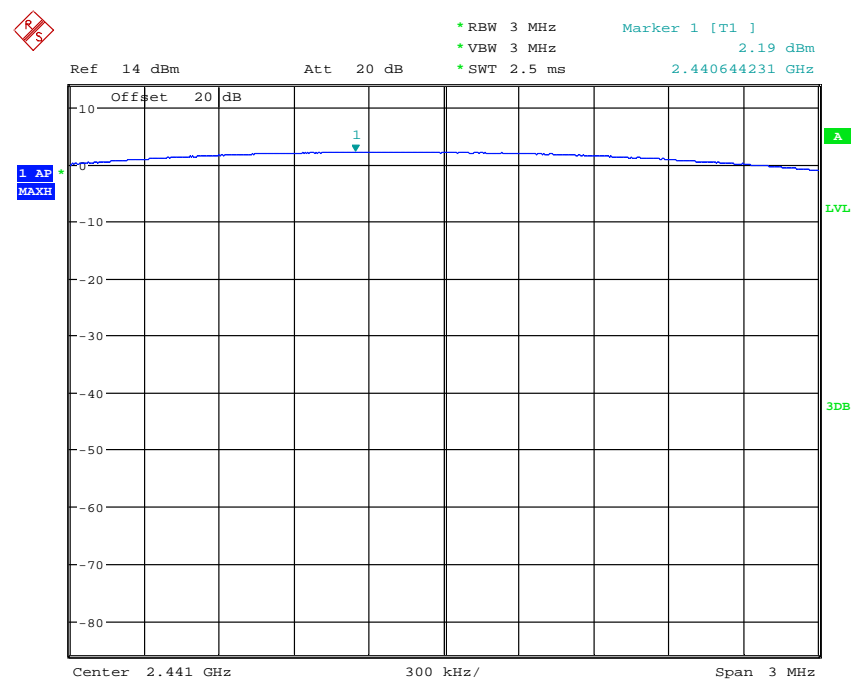
| Channel | Frequency (MHz) | Measured Output Peak Power | | | Limit | | Verdict |
|---------|-----------------|----------------------------|---------|---------------|-------|---|---------|
| | | dBm | W | Refer to Plot | dBm | W | |
| 0 | 2402 | 0.99 | 0.00126 | Plot A | 30 | 1 | PASS |
| 39 | 2441 | 2.19 | 0.00166 | Plot B | | | PASS |
| 78 | 2480 | 0.05 | 0.00101 | Plot C | | | PASS |

B. Test Plot:



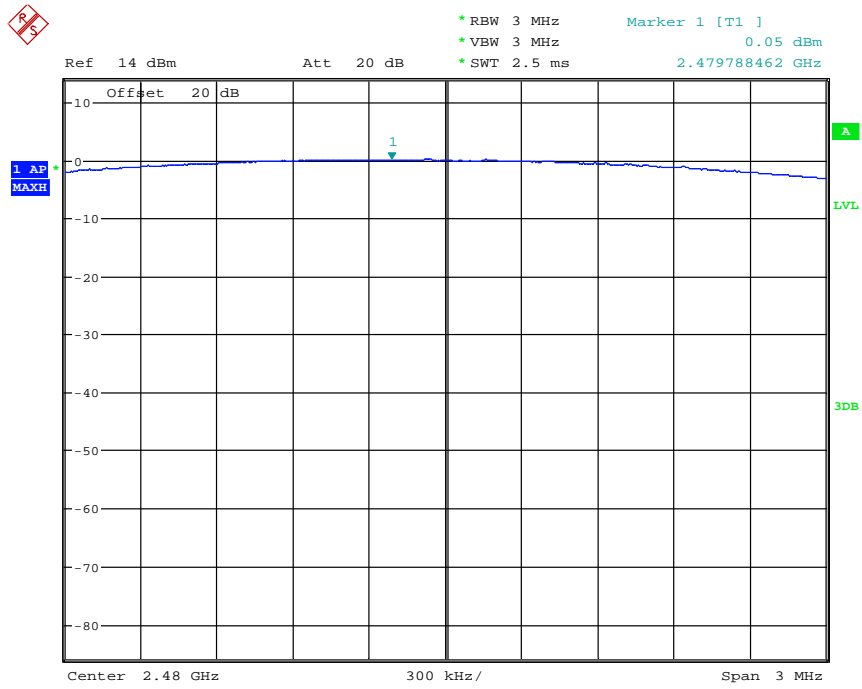
Date: 16.JUN.2015 20:09:14

(Plot A: Channel = 2402)



Date: 16.JUN.2015 20:08:35

(Plot B: Channel = 2441)



Date: 16.JUN.2015 20:10:36

(Plot C: Channel = 2480)

6.3 20dB Bandwidth

6.3.1 Definition

The 20dB bandwidth ($10 \cdot \log 1\% = 20\text{dB}$) taking the total RF output power.

6.3.2 Test Setup

See section 6.1.2 of this report.

6.3.3 Test Result

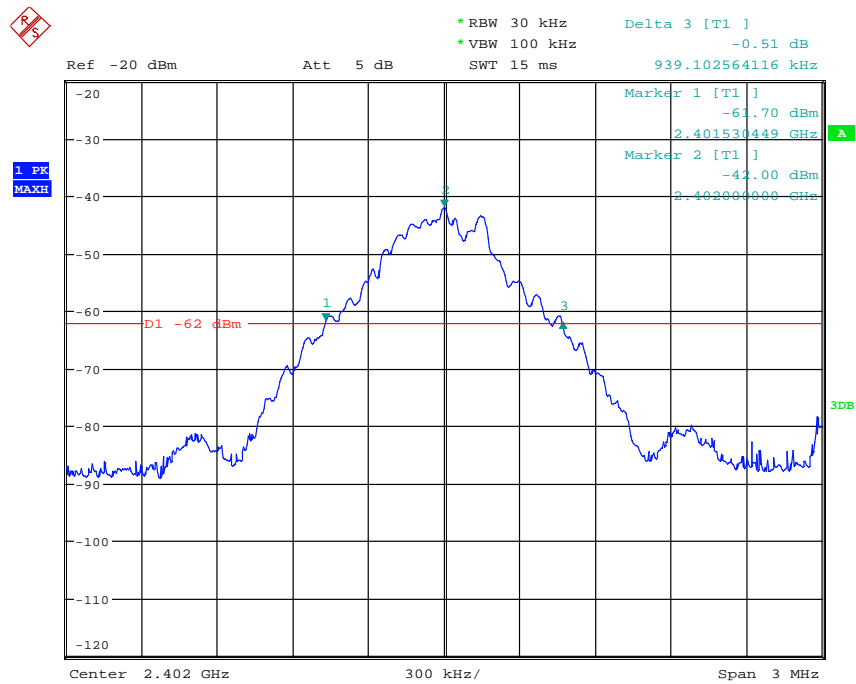
The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to record the 20dB bandwidth of the Module.

A. Test Verdict

The maximum 20dB bandwidth measured is 1.178MHz according to the table below.

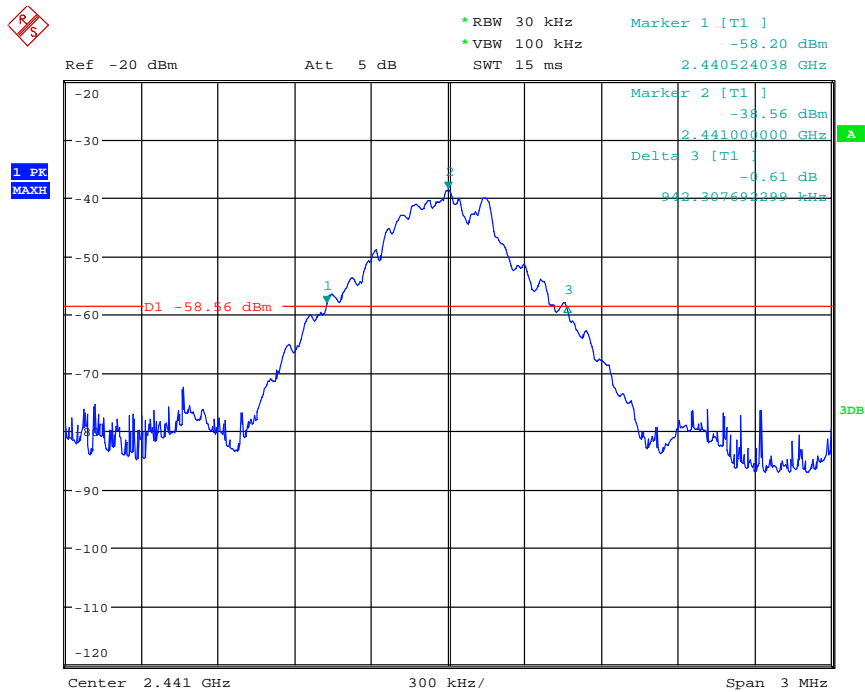
| Modulation | Channel | Frequency (MHz) | 20dB Bandwidth (MHz) | Refer to Plot |
|----------------|---------|-----------------|----------------------|---------------|
| GFSK | 0 | 2402 | 0.939 | Plot A |
| | 39 | 2441 | 0.942 | Plot B |
| | 78 | 2480 | 0.951 | Plot C |
| $\pi/4$ -DQPSK | 0 | 2402 | 1.256 | Plot D |
| | 39 | 2441 | 1.254 | Plot E |
| | 78 | 2480 | 1.254 | Plot F |
| 8-DPSK | 0 | 2402 | 1.280 | Plot G |
| | 39 | 2441 | 1.283 | Plot H |
| | 78 | 2480 | 1.274 | Plot I |

B. Test Plot:



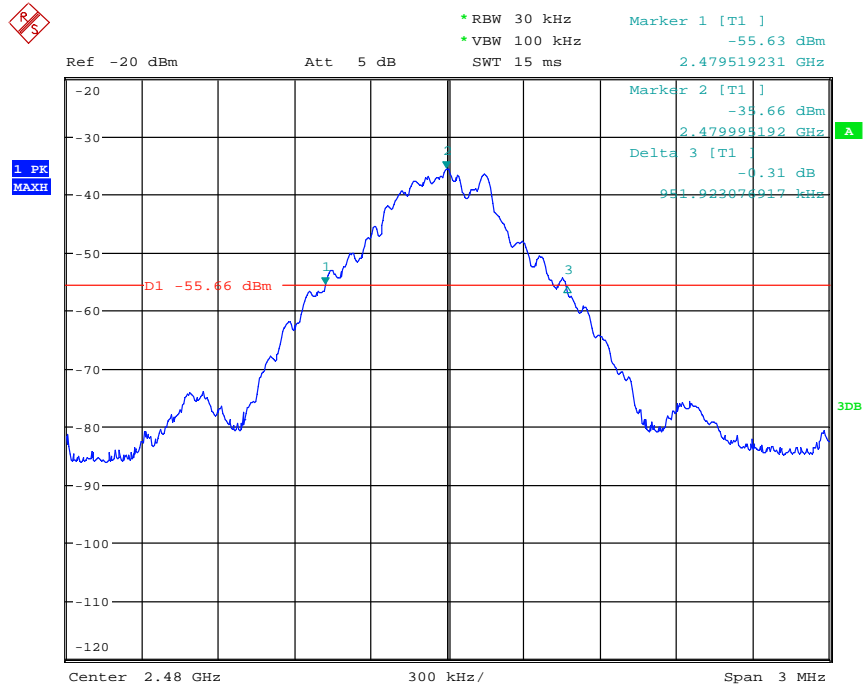
Date: 16.JUN.2015 20:28:35

(Plot A: Channel = 2402)



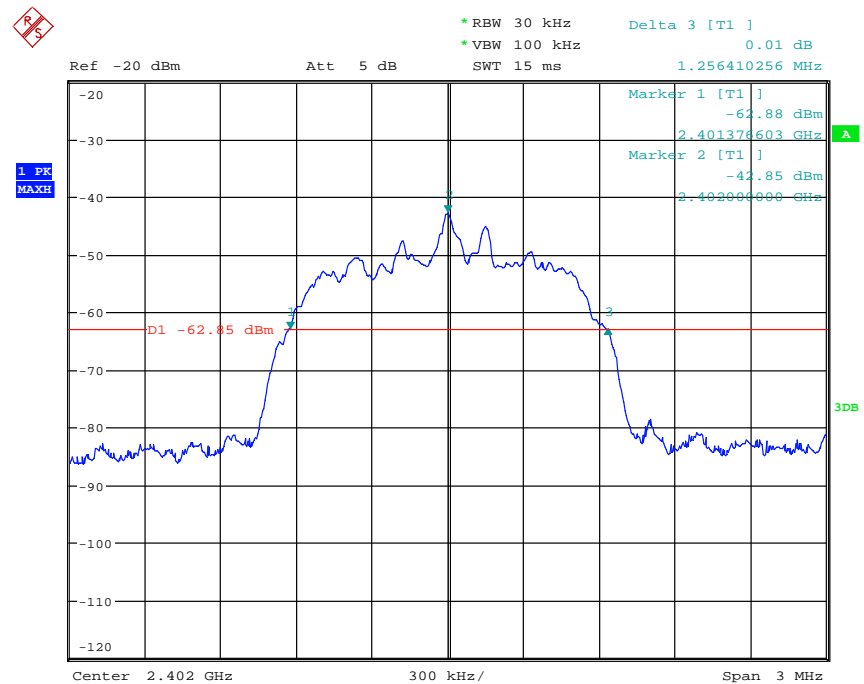
Date: 16.JUN.2015 20:30:36

(Plot B: Channel = 2441)



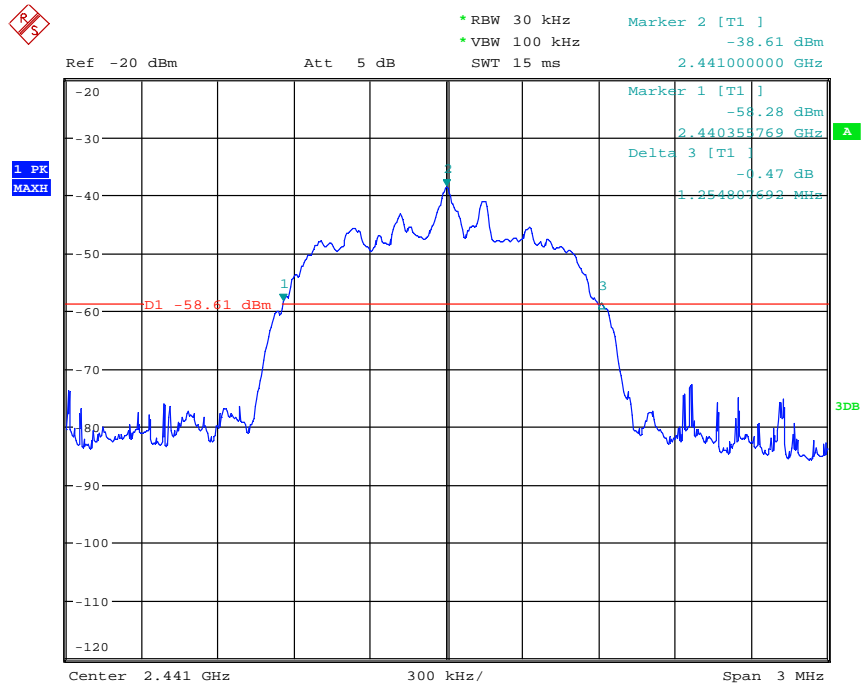
Date: 16.JUN.2015 20:31:03

(Plot C: Channel = 2480)



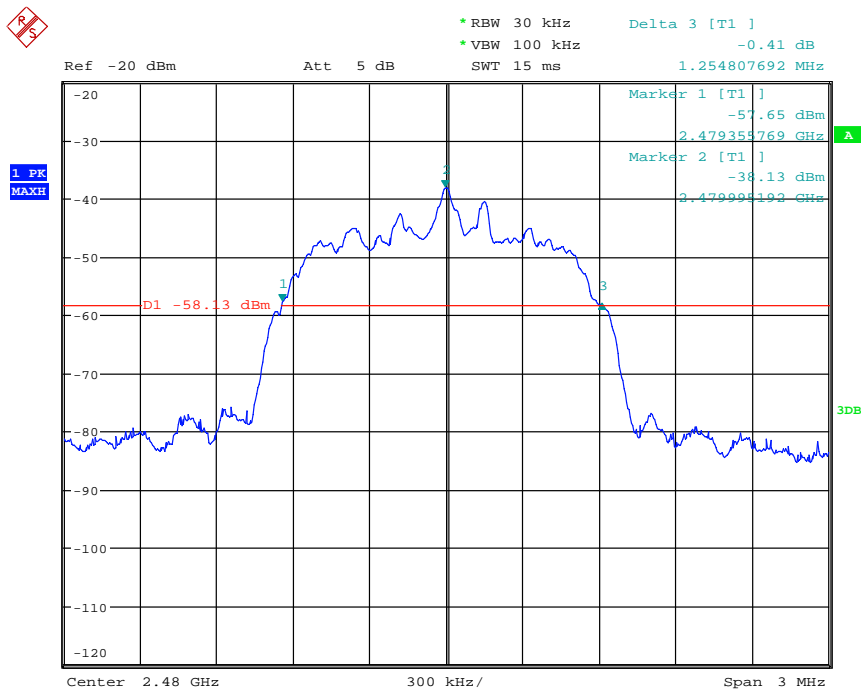
Date: 16.JUN.2015 20:33:10

(Plot D: Channel = 2402)



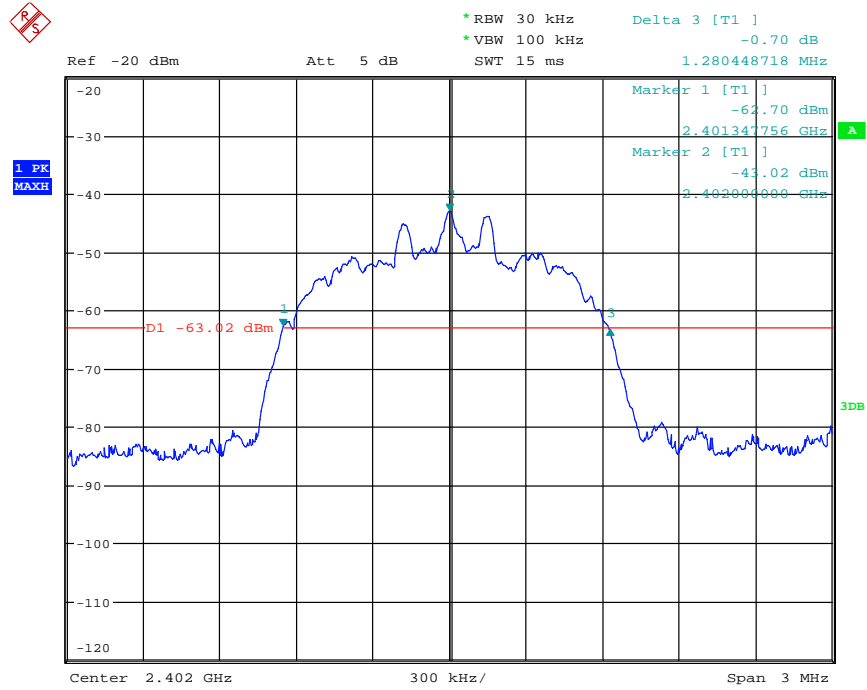
Date: 16.JUN.2015 20:32:35

(Plot E: Channel = 2441)



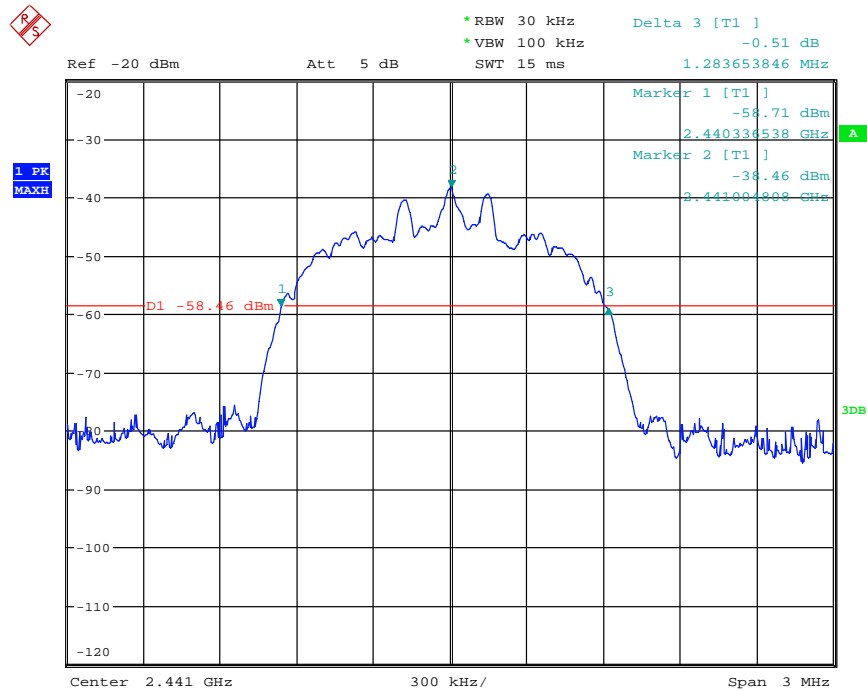
Date: 16.JUN.2015 20:31:49

(Plot F: Channel = 2480)



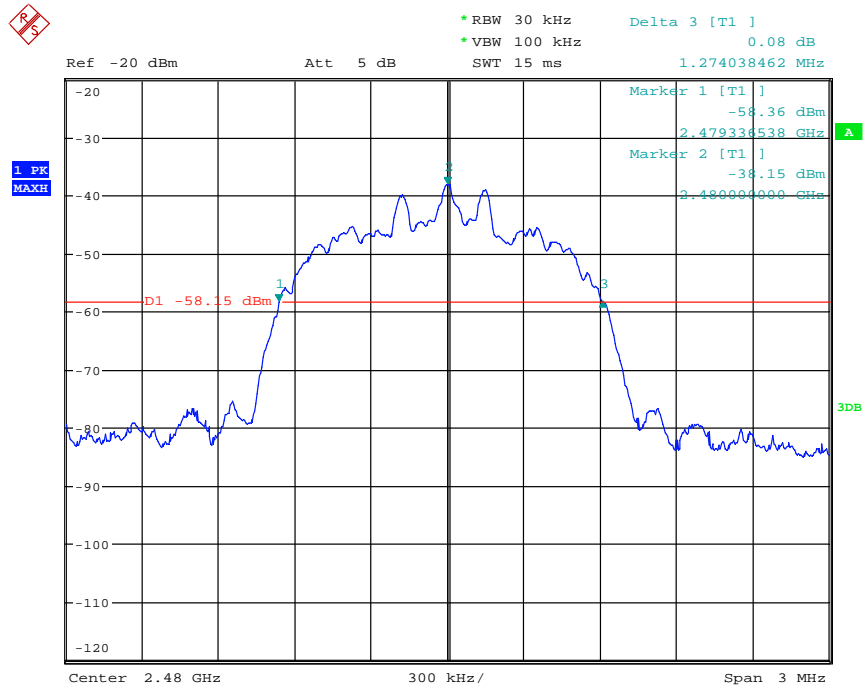
Date: 16.JUN.2015 20:34:10

(Plot G: Channel = 2402)



Date: 16.JUN.2015 20:35:46

(Plot H: Channel = 2441)



Date: 16.JUN.2015 20:36:36

(Plot I: Channel = 2480)

6.4 Carried Frequency Separation

6.4.1 Definition

According to FCC section 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater.

6.4.2 Test Setup

See section 6.1.2 of this report.

6.4.3 Test Result

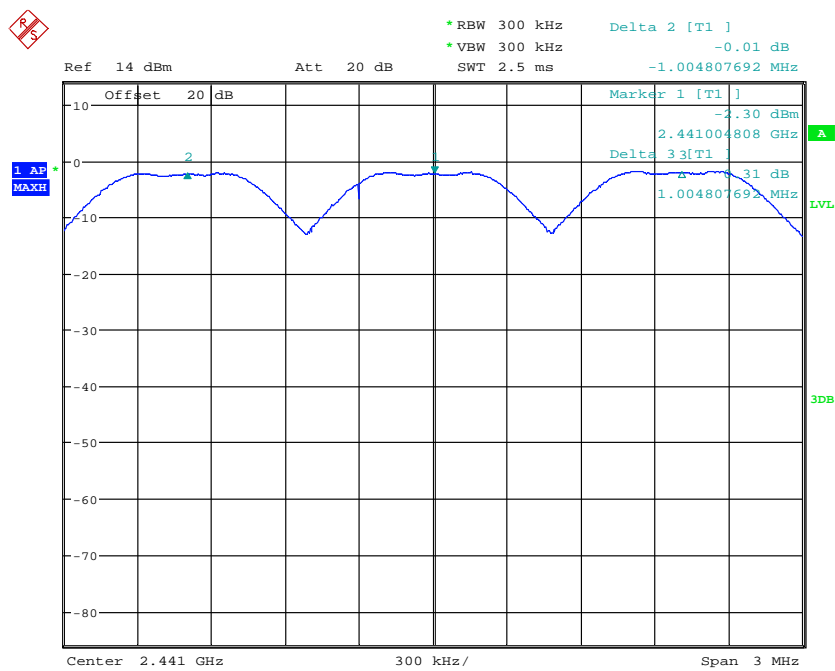
The Bluetooth Module operates at hopping-on test mode.

For any adjacent channels, the Module does have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater. So, the verdict is PASS.

A. Test Verdict:

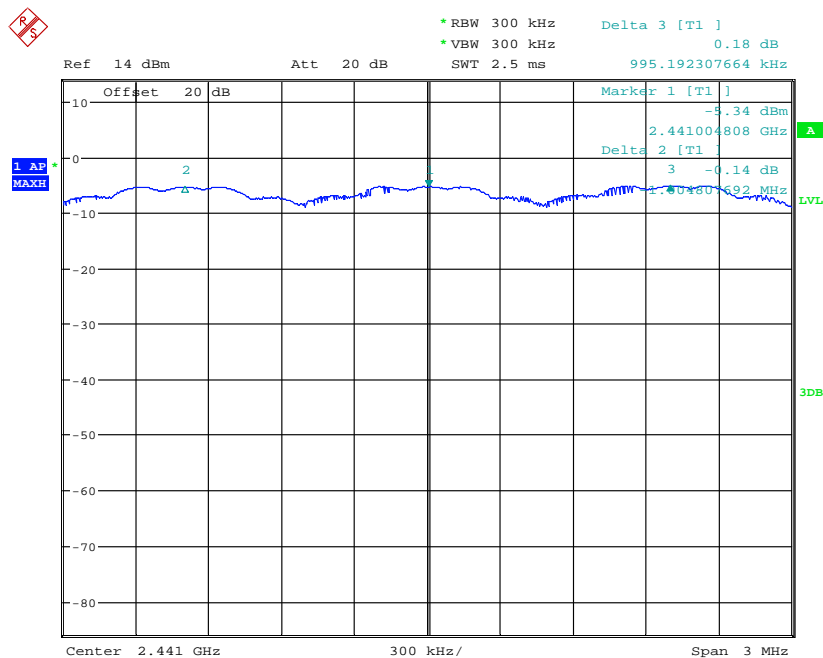
| Modulation | Carried Frequency Separation (KHz) | Limit (MHz) | Refer to Plot | Result |
|----------------|------------------------------------|---------------------------------|---------------|--------|
| GFSK | 1005 | 0.025 or 2/3 the 20dB bandwidth | Plot A | PASS |
| $\pi/4$ -DQPSK | 1005 | 0.025 or 2/3 the 20dB bandwidth | Plot B | PASS |
| 8DPSK | 1005 | 0.025 or 2/3 the 20dB bandwidth | Plot C | PASS |

B. Test Plot:



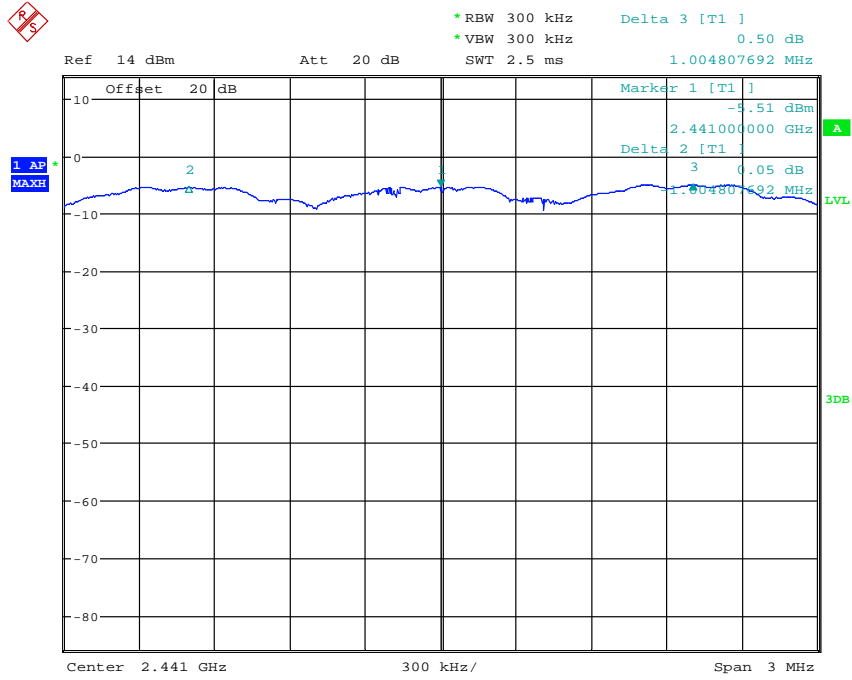
Date: 16.JUN.2015 20:54:51

(Plot A: GFSK Channel)



Date: 16.JUN.2015 20:58:12

(Plot B: $\pi/4$ -DQPSK Channel)



Date: 16.JUN.2015 21:00:35

(Plot C: 8DPSK Channel)

6.5 Time of Occupancy (Dwell time)

6.5.1 Requirement

According to FCC section 15.247(a)(1)(iii), frequency hopping systems in the 2400 - 2483.5MHz band shall use at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

6.5.2 Test Setup

See section 6.1.2 of this report.

6.5.3 Test Result

The average time of occupancy on any channel within the Period can be calculated with formulas:

$$\text{DH5 : } \{\text{Total of Dwell}\} = \{\text{Pulse Time}\} * (1600 / 6) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\}$$

$$\{\text{Period}\} = 0.4\text{s} * \{\text{Number of Hopping Frequency}\}$$

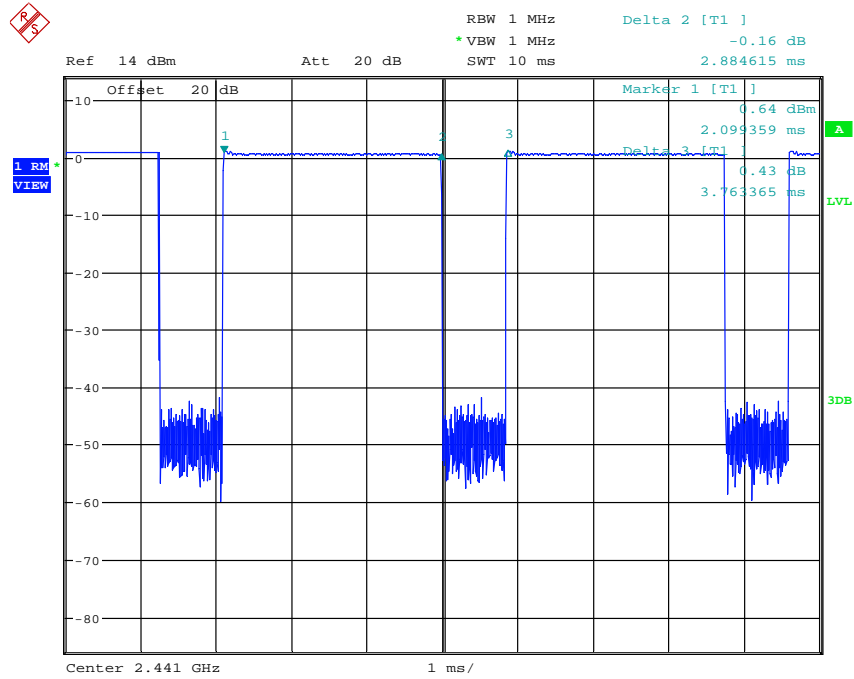
The lowest, middle and highest channels are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.

A. Test Verdict:

| Modulation | Channel | Pluse Time | | Total of Dwell (ms) | Limit (ms) | Result |
|----------------|---------|------------|---------------|------------------------|---------------|--------|
| | | ms | Refer to Plot | | | |
| GFSK | 39 | 2.88 | Plot A | 307.20 | 400 | PASS |
| $\pi/4$ -DQPSK | 39 | 2.90 | Plot B | 309.33 | 400 | PASS |
| 8DPSK | 39 | 2.87 | Plot C | 306.13 | 400 | PASS |

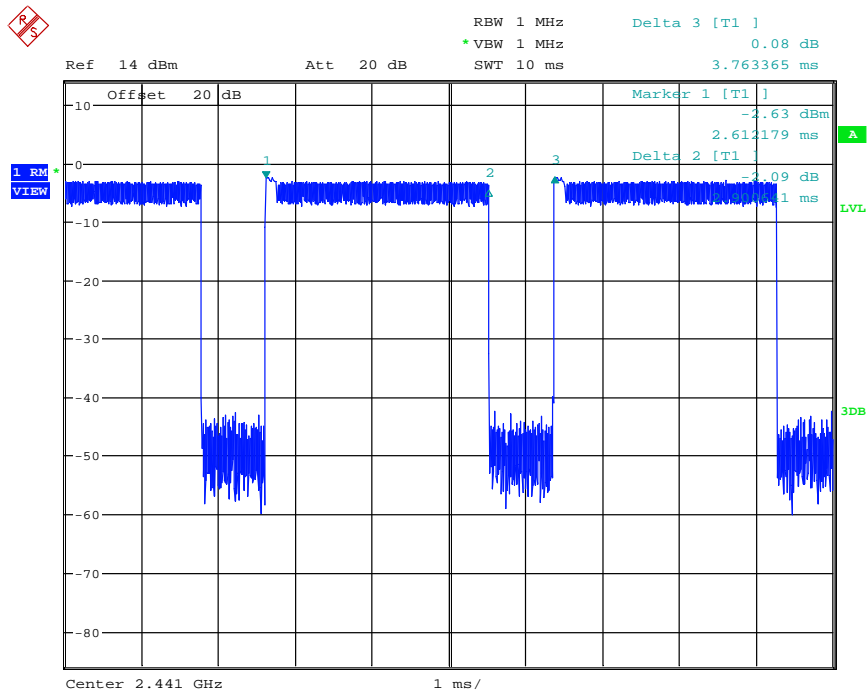
B. Test Plot:

Note: the following plots record the Pulse Time of the Module carrier.



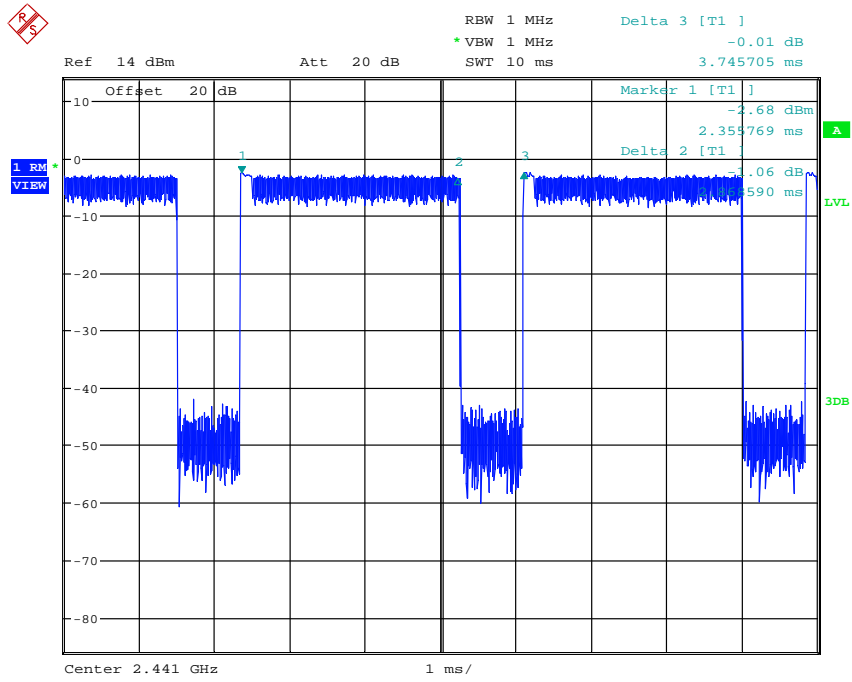
Date: 16.JUN.2015 21:49:40

(Plot A: GFSK Channel = 2441)



Date: 16.JUN.2015 21:50:35

(Plot B: $\pi/4$ -DQPSK Channel = 2441)



Date: 16.JUN.2015 21:51:22

(Plot C: 8-DPSK Channel = 24410)

6.6 Conducted Spurious Emissions

6.6.1 Requirement

According to FCC section 15.247(c), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

6.6.2 Test Setup

See section 6.1.2 of this report.

6.6.3 Test Result

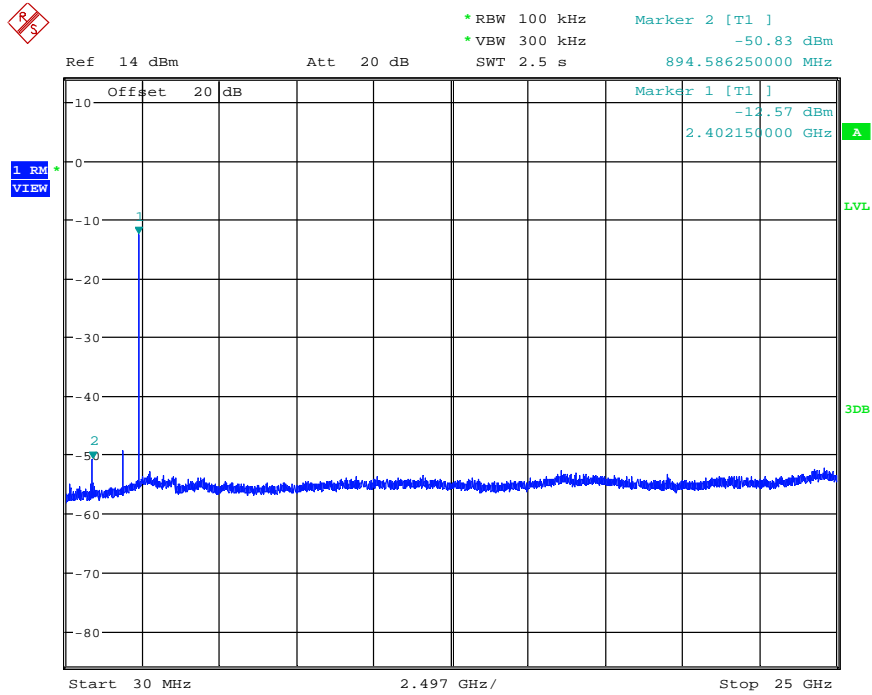
The Bluetooth Module operates at hopping-off test mode. The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions.

A. Test Verdict

| Channel | Frequency (MHz) | Measured Max Out of Band Emission (dBm) | Refer to Plot | Limit (dBm) | | Result |
|---------|-----------------|---|---------------|---------------|-------------------------|--------|
| | | | | Carrier Level | Calculated -20dBc Limit | |
| 0 | 2402 | -50.83 | Plot A | -12.57 | -32.57 | PASS |
| 39 | 2441 | -52.08 | Plot B | -13.47 | -33.47 | PASS |
| 78 | 2480 | -53.14 | Plot C | -14.92 | -34.92 | PASS |

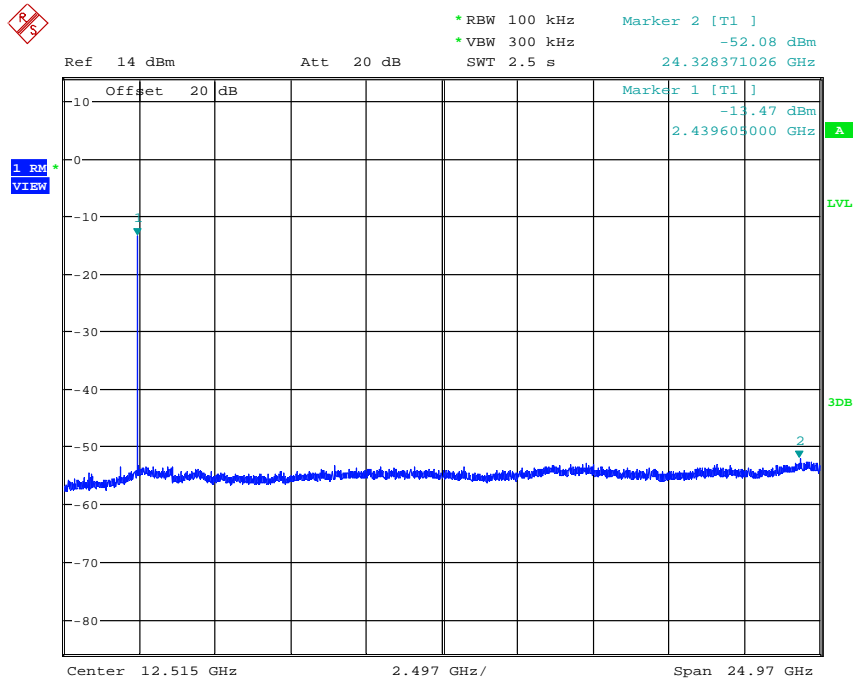
B. Test Plot

Note: the power of the Module transmitting frequency should be ignored.



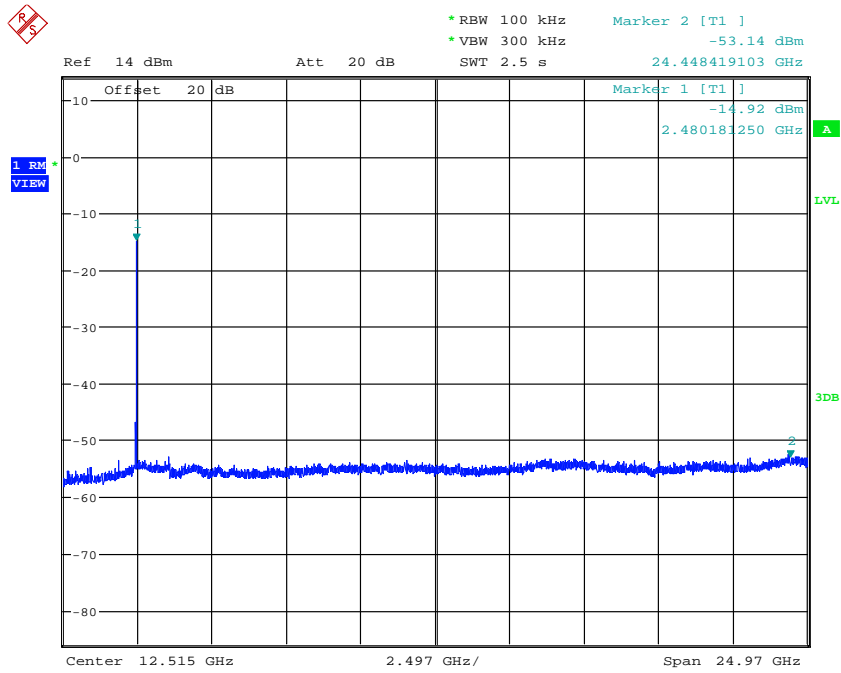
Date: 16.JUN.2015 21:54:14

Plot A



Date: 16.JUN.2015 21:57:14

Plot B



Date: 16.JUN.2015 21:59:37

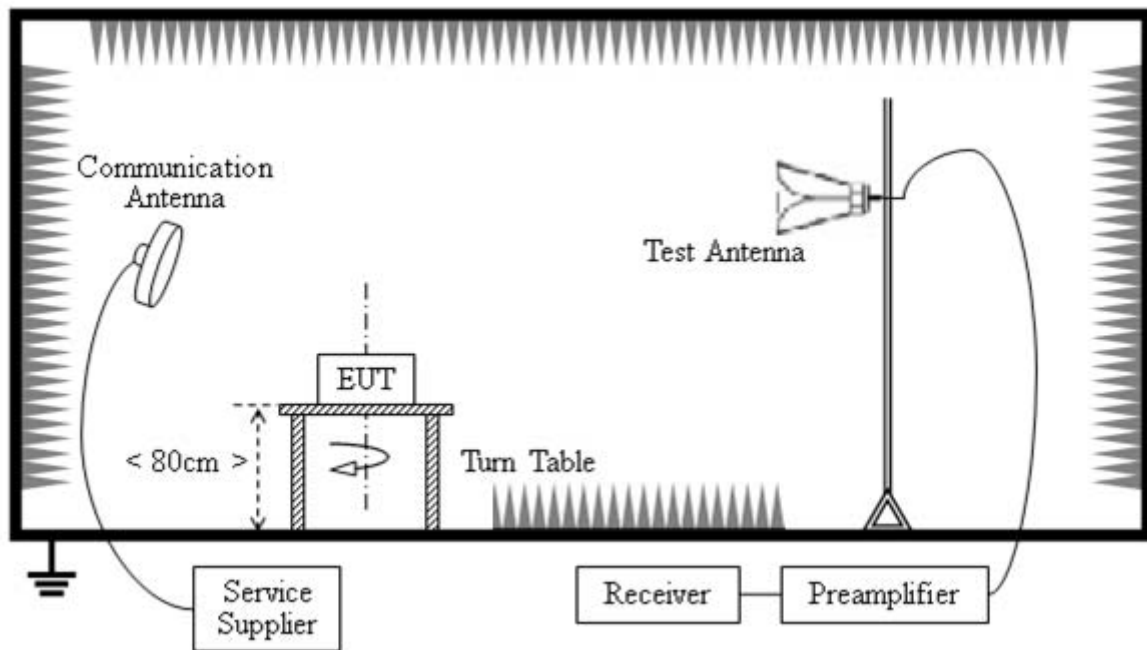
Plot C

6.7 Band Edge

6.7.1 Requirement

According to FCC section 15.247(c), in any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

6.7.2 Test Setup



The Bluetooth Module of the EUT is powered by the battery. The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the Bluetooth Module is activated and controlled by the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under hopping-on test mode transmitting 339 bytes DH5 packages at maximum power.

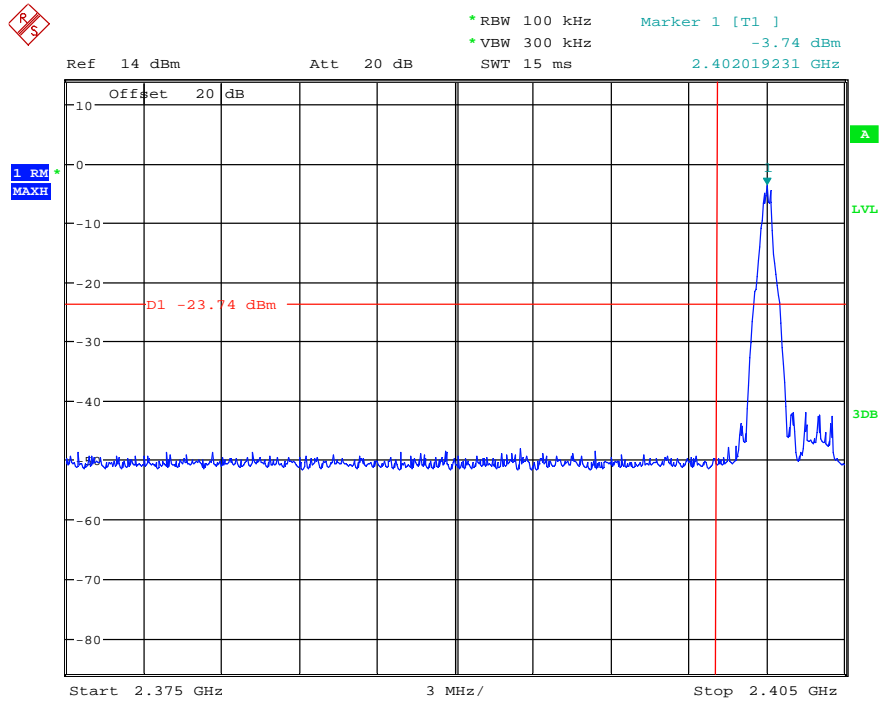
For the Test Antenna:

Horn Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength.

6.7.3 Test Result

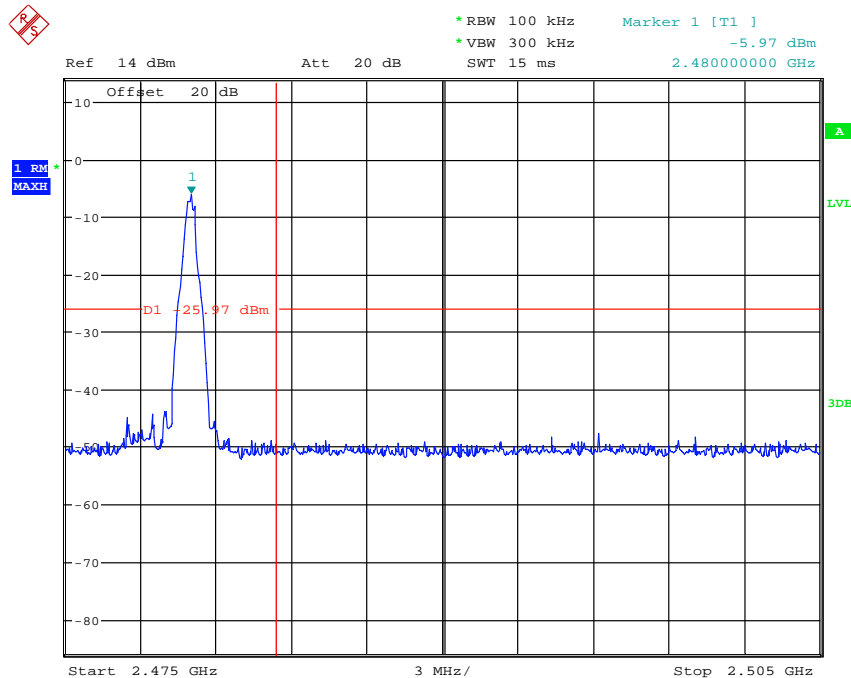
A. Conducted Band Edge:

Both hopping-on mode and hopping-off mode had been pre-tested and only the worst case (hopping –off mode) is recorded in the test report.



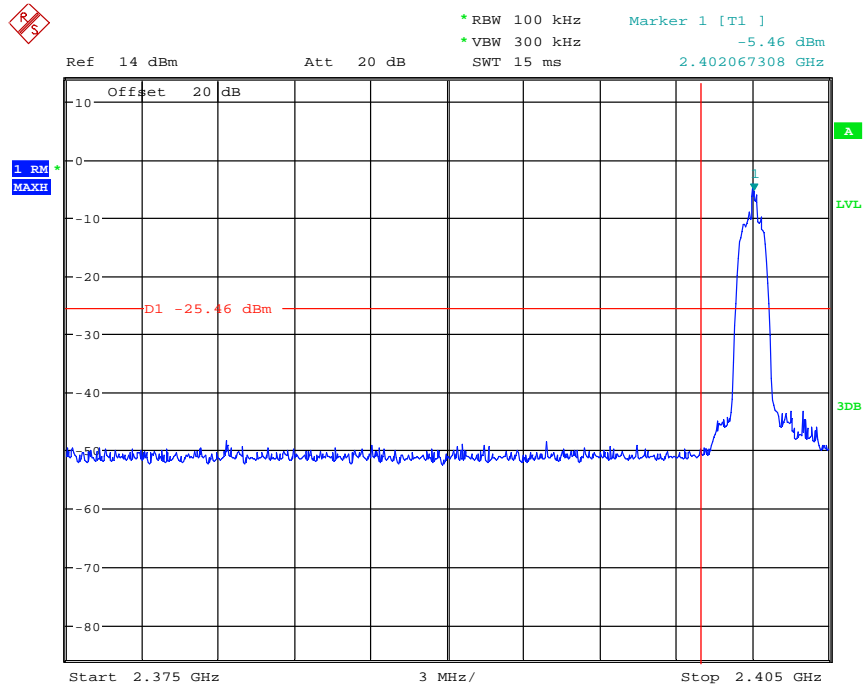
Date: 16.JUN.2015 22:10:17

(Plot A: GFSK Channel = 0)

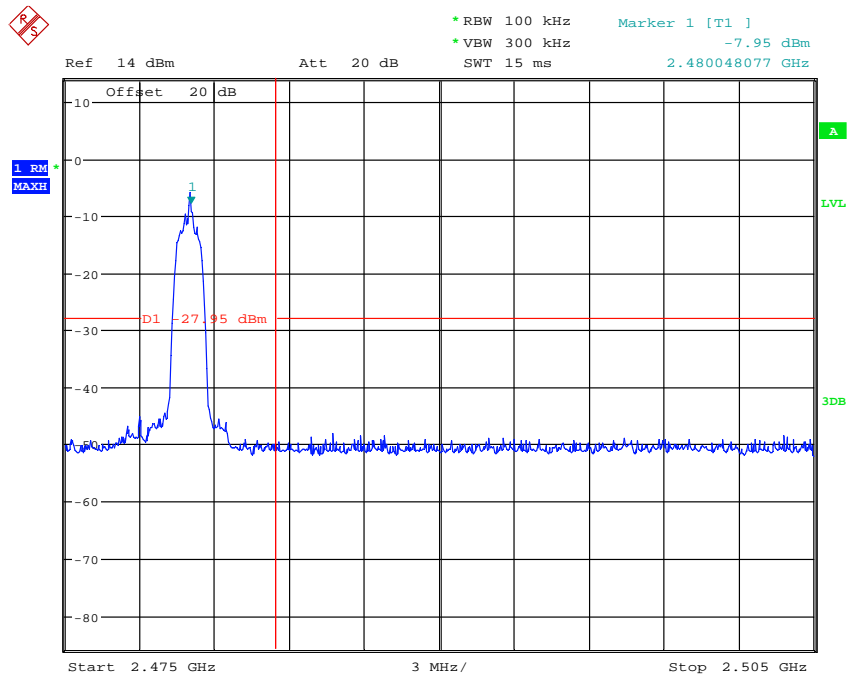


Date: 16.JUN.2015 22:16:40

(Plot B: GFSK Channel = 78)

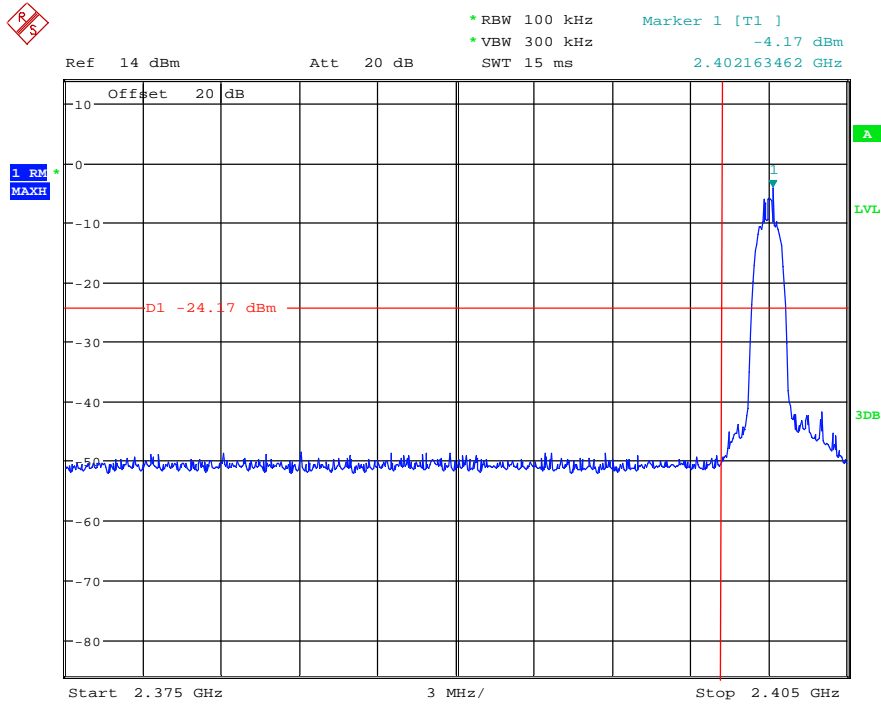


Date: 16.JUN.2015 22:11:00

(Plot C: $\pi/4$ -DQPSK Channel = 0)


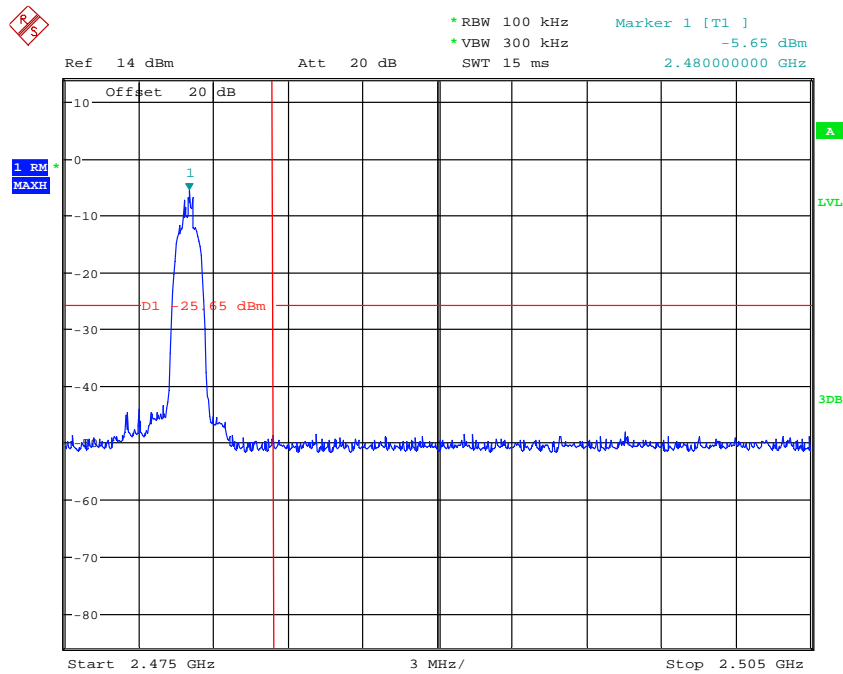
Date: 16.JUN.2015 22:15:55

(Plot D: $\pi/4$ -DQPSK Channel = 78)



Date: 16.JUN.2015 22:11:53

(Plot E: 8DPSK Channel = 0)



Date: 16.JUN.2015 22:14:26

(Plot F: 8DPSK Channel = 78)

6.8 Conducted Emission

6.8.1 Requirement

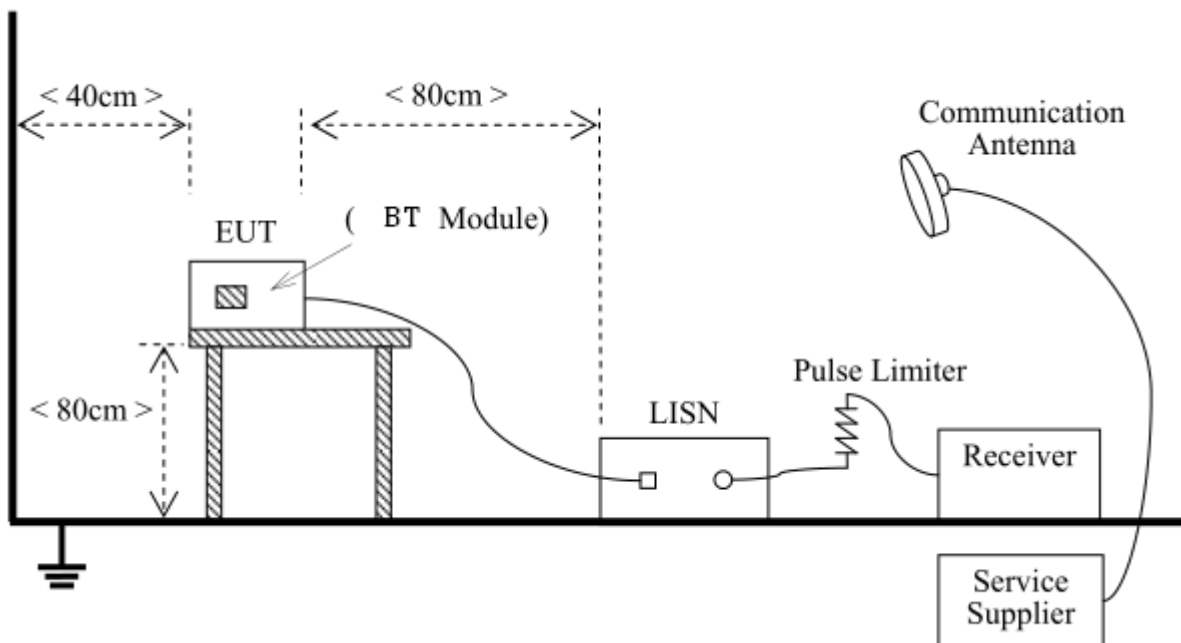
According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network(LISN).

| Frequency range (MHz) | Conducted Limit (dB μ V) | |
|-----------------------|------------------------------|----------|
| | Quai-peak | Average |
| 0.15 - 0.50 | 66 to 56 | 56 to 46 |
| 0.50 - 5 | 56 | 46 |
| 5 - 30 | 60 | 50 |

NOTE:

- (a) The lower limit shall apply at the band edges.
- (b) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

6.8.2 Test Description



The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4:2009

6.8.3 Test result

N/A, this device is powered by battery and the transmitters are deactivated during charging process.

6.9 Radiated Emission

6.9.1 Requirement

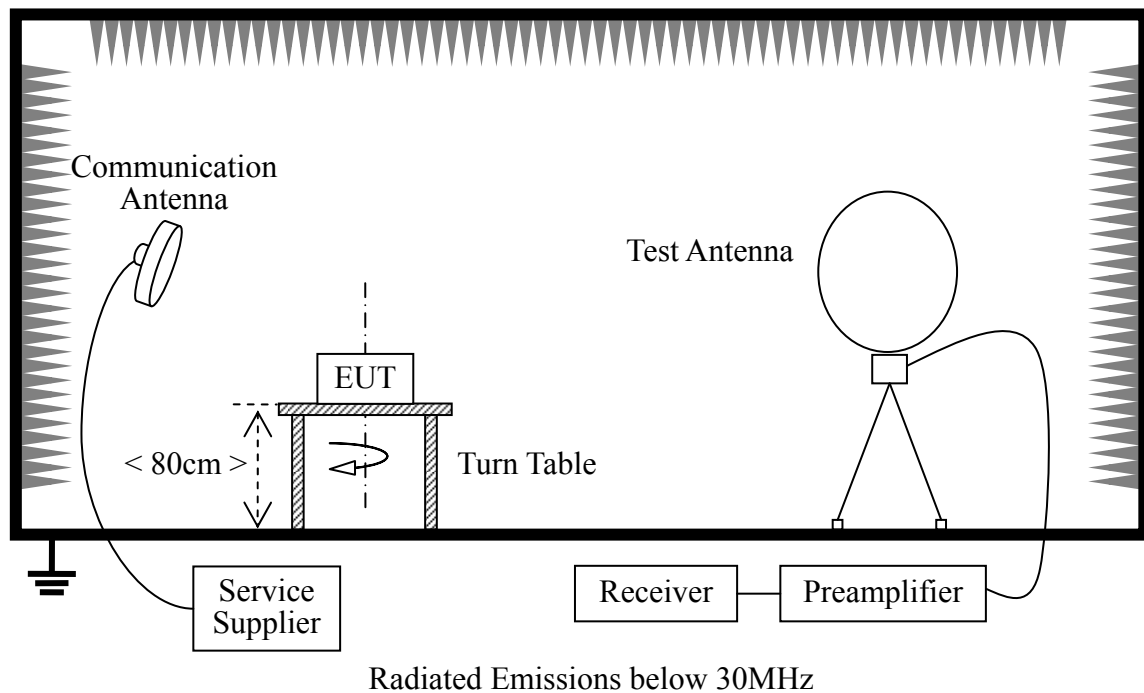
According to FCC section 15.247(c), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the radiated emission limits specified in FCC section 15.209(a).

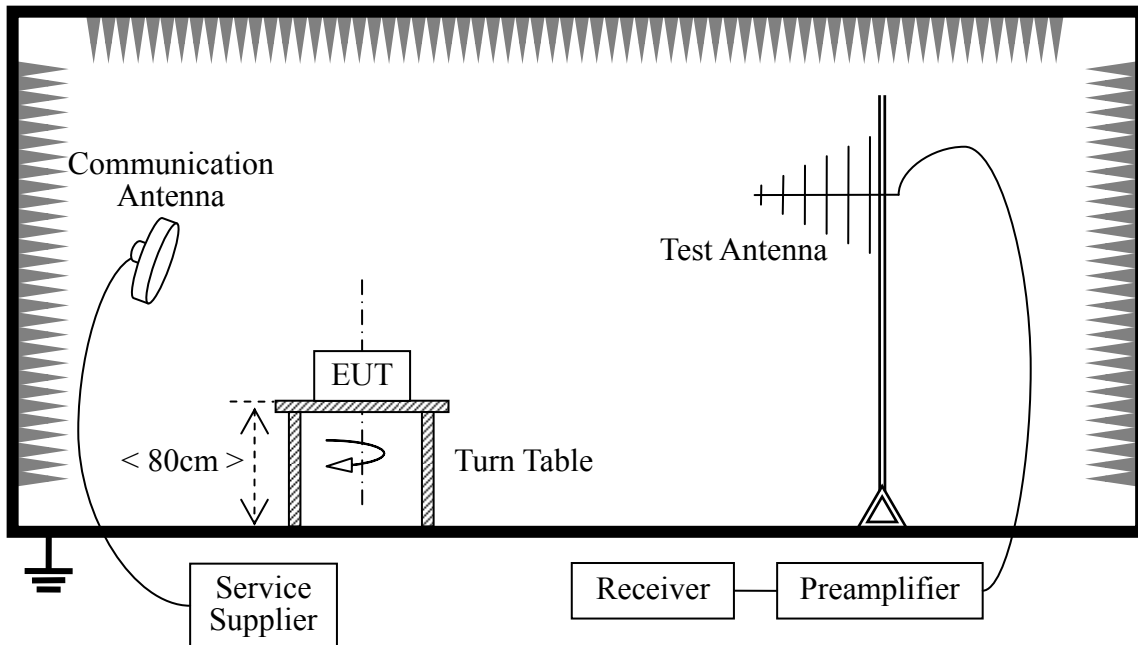
According to FCC section 15.209 (a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength ($\mu\text{V/m}$) | Measurement Distance (m) | Limit(dB $\mu\text{V/m}$) | Detector |
|-----------------|------------------------------------|--------------------------|----------------------------|----------|
| 0.009-0.490 | 2400/F(kHz) | 300 | / | / |
| 0.490-1.705 | 24000/F(kHz) | 30 | / | / |
| 1.705-30 | 30 | 30 | / | / |
| 30 - 88 | 100 | 3 | 40 | QP |
| 88 - 216 | 150 | 3 | 43.5 | QP |
| 216 - 960 | 200 | 3 | 46 | QP |
| 960 - 1000 | 500 | 3 | 54 | QP |
| Above 1000 | 500 | 3 | 54 | AV |

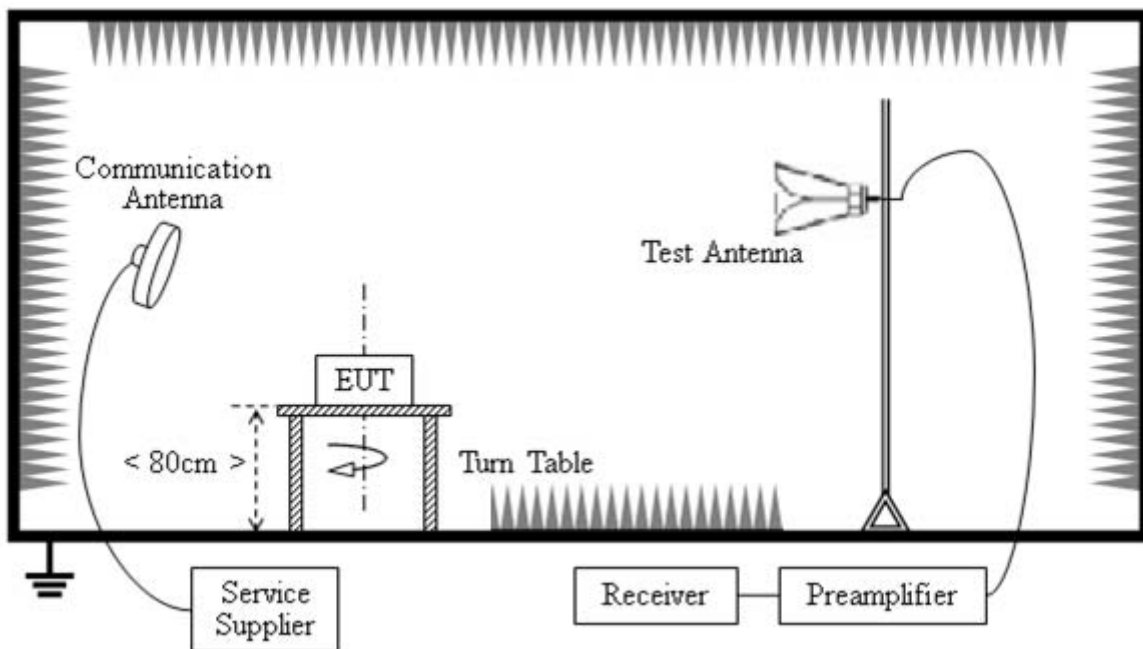
In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also should comply with the radiated emission limits specified in Section 15.209(a)(above table)

6.9.2 Test Setup





Radiated Emissions 30-1000MHz



Radiated Emissions above 1000MHz

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2009). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4.

The Bluetooth Module of the EUT is powered by the battery. The Module is located in a 3m Semi-Anechoic Chamber; the antenna factors, cable loss and so on of the site as factors are calculated to correct the reading. During the measurement, the Bluetooth Module is activated and controlled by

the Bluetooth Service Supplier (SS) via a Common Antenna, and is set to operate under hopping-on test mode transmitting 339 bytes DH5 packages at maximum power.

For the Test Antenna: In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength, the azimuth range of turntable was 0° to 360°, the receive antenna has two polarizations horizontal and vertical. When doing measurements above 1GHz, the EUT was placed within the 3dB beam width range of the horn antenna, and the EUT was tested in 3 orthogonal positions as recommended in ANSI C63.4 for Radiated Emissions and the worst-case data was presented.

6.9.3 Test Result

A. Test Result for 9 kHz ~ 30 MHz:

| Frequency (MHz) | Level (dBuV) | Over Limit (dB) | Limit Line (dBuV) | Remark |
|-----------------|--------------|-----------------|-------------------|----------|
| -- | -- | 10 | -- | See Note |

Note:

- The amplitude of spurious emissions that are attenuated by more than 10dB below the permissible value has no need to be reported.*
- Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);*
- Limit line = specific limits (dBuV) + distance extrapolation factor.*

B. Test Result for 30 MHz ~ 10th Harmonic

Channel 0 (2402MHz)

| Frequency (MHz) | Level (dBuV) | Limit Line (dBuV) | Margin (dB) | Antenna Polarization | Result |
|-----------------|--------------|-------------------|-------------|----------------------|--------|
| 265.05 | 20.69 | 46 | -25.31 | Horizontal | PASS |
| 399.69 | 21.46 | 46 | -24.54 | Horizontal | PASS |
| 530.42 | 21.37 | 46 | -24.63 | Horizontal | PASS |
| 2500.00 | 36.14 | 54 | -17.86 | Horizontal | PASS |
| 4804.75 | 42.69 | 54 | -11.31 | Horizontal | PASS |
| 7207.25 | 48.98 | 54 | -5.02 | Horizontal | PASS |
| 265.63 | 20.10 | 46 | -25.9 | Vertical | PASS |
| 398.92 | 20.36 | 46 | -25.64 | Vertical | PASS |
| 532.47 | 21.97 | 46 | -24.03 | Vertical | PASS |
| 2500.00 | 36.47 | 54 | -17.53 | Vertical | PASS |
| 4804.75 | 43.01 | 54 | -10.99 | Vertical | PASS |
| 7207.25 | 48.76 | 54 | -5.24 | Vertical | PASS |

Channel 39 (2441MHz)

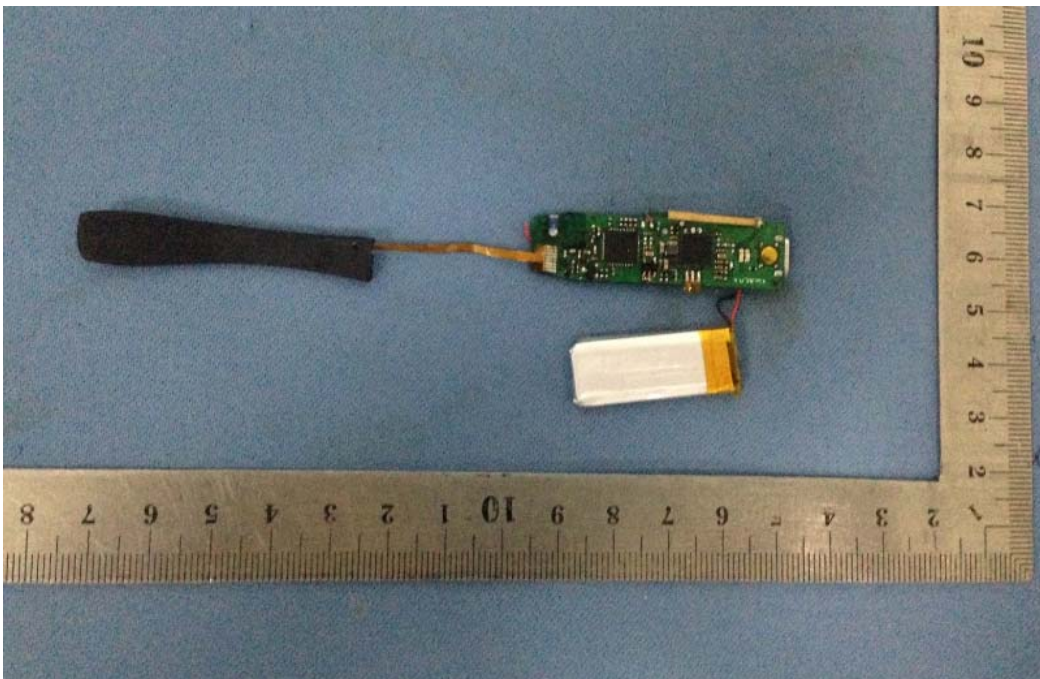
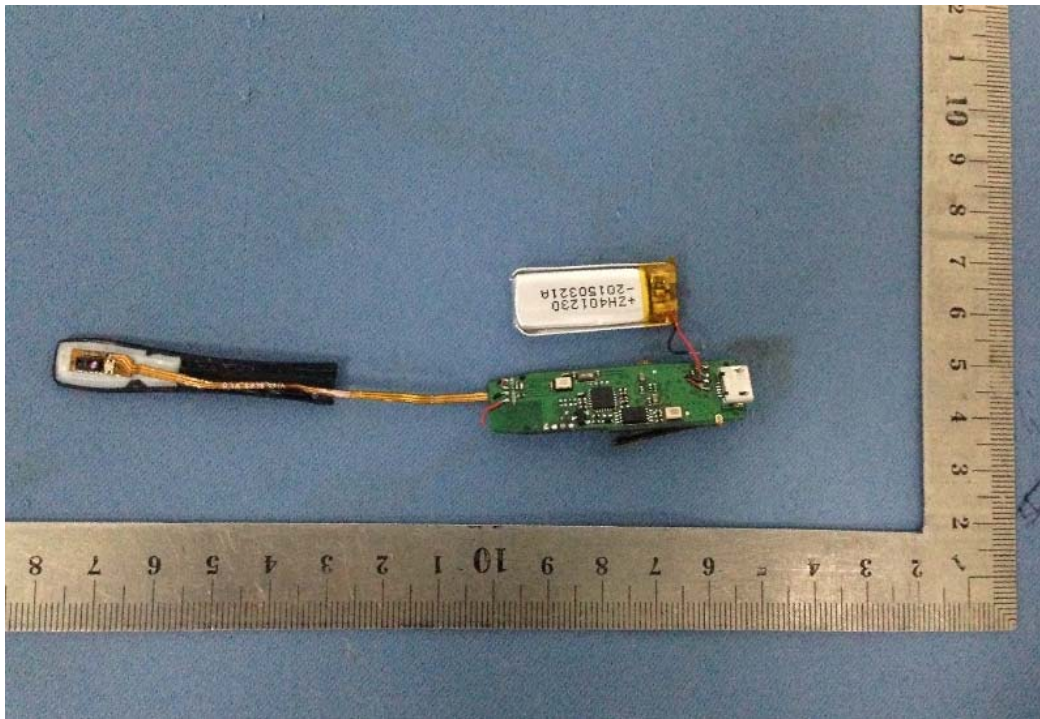
| Frequency (MHz) | Level (dBuV) | Limit Line (dBuV) | Margin (dB) | Antenna Polarization | Result |
|-----------------|--------------|-------------------|-------------|----------------------|--------|
| 265.44 | 21.65 | 46 | -24.35 | Horizontal | PASS |
| 399.69 | 22.39 | 46 | -23.61 | Horizontal | PASS |
| 530.12 | 21.78 | 46 | -24.22 | Horizontal | PASS |
| 2500.00 | 35.47 | 54 | -18.53 | Horizontal | PASS |
| 4882.95 | 42.78 | 54 | -11.22 | Horizontal | PASS |
| 7325.27 | 48.35 | 54 | -5.65 | Horizontal | PASS |
| 265.77 | 20.41 | 46 | -25.59 | Vertical | PASS |
| 399.42 | 20.96 | 46 | -25.04 | Vertical | PASS |
| 548.31 | 22.14 | 46 | -23.86 | Vertical | PASS |
| 2500.01 | 36.17 | 54 | -17.83 | Vertical | PASS |
| 4882.95 | 43.69 | 54 | -10.31 | Vertical | PASS |
| 7325.27 | 49.68 | 54 | -4.32 | Vertical | PASS |

Channel 78 (2480MHz)

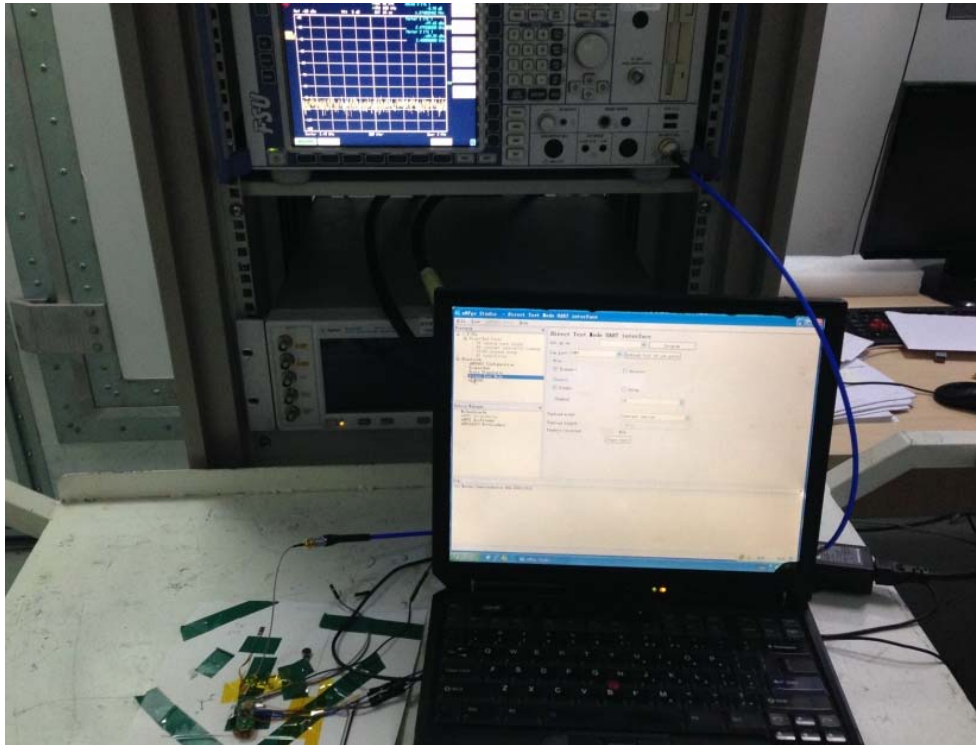
| Frequency (MHz) | Level (dBuV) | Limit Line (dBuV) | Margin (dB) | Antenna Polarization | Result |
|-----------------|--------------|-------------------|-------------|----------------------|--------|
| 265.47 | 20.61 | 46 | -25.39 | Horizontal | PASS |
| 403.96 | 20.91 | 46 | -25.09 | Horizontal | PASS |
| 559.14 | 20.64 | 46 | -25.36 | Horizontal | PASS |
| 2499.98 | 36.12 | 54 | -17.88 | Horizontal | PASS |
| 4961.30 | 44.30 | 54 | -9.7 | Horizontal | PASS |
| 7442.26 | 47.87 | 54 | -6.13 | Horizontal | PASS |
| 279.64 | 20.98 | 46 | -25.02 | Vertical | PASS |
| 377.33 | 21.70 | 46 | -24.3 | Vertical | PASS |
| 413.47 | 22.26 | 46 | -23.74 | Vertical | PASS |
| 2499.98 | 37.34 | 54 | -16.66 | Vertical | PASS |
| 4961.30 | 43.76 | 54 | -10.24 | Vertical | PASS |
| 7441.88 | 49.88 | 54 | -4.12 | Vertical | PASS |

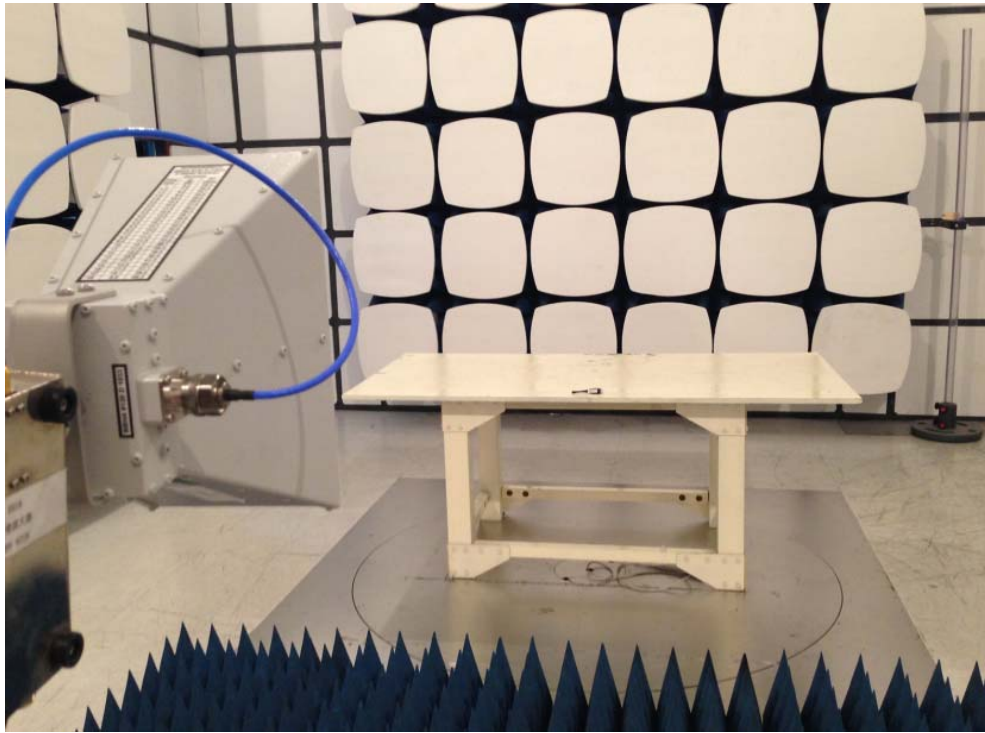
Annex A Photos of the EUT





Annex B Photos of Setup





** END OF REPORT **