

FCC Part 15.247 TEST REPORT

for

Portable GNSS Receiver

Model Name: MobileMapper 10
Brand Name: ASHTECH
Report No: SH11030016B02
FCC ID: NZI802140

prepared for

ASHTECH S.A.S

ZAC LA FLEURIAYE BP 60433 RUE THOMAS EDISON
44474 CARQUEFU CEDEX FRANCE

prepared by

Shenzhen Electronic Product Quality Testing Center Morlab Laboratory

3/F, Electronic Testing Building, Shahe Road, Xili,
Nanshan District, Shenzhen, 518055 P. R. China

Tel: +86 755 86130398

Fax: +86 755 86130218



Bluetooth®



Authorized Test Lab

LAB CODE 20081223-00

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1. Test Report Certification

Equipment under Test: Portable GNSS receiver

Brand Name: ASHTECH

Model Name: MobileMapper 10

FCC ID: NZI802140

Applicant: ASHTECH S.A.S.

ZAC LA FLEURIAYE BP 60433 RUE THOMAS EDISON 44474
CARQUEFOU CEDEX FRANCE

Manufacturer: Beijing UniStrong Science & Technology Co., Ltd
6F East, A2 Building, #9 Jiuxianqiao East Road, Chaoyang District,
Beijing 100015, China

Test Standards: 47 CFR Part 15, Subpart C

Test Date(s): Mar.18, 2011 – Apr.16, 2011

Test Result: PASS

* We Hereby Certify That:

The equipment under test was tested by Shenzhen Electronic Product Quality Testing Center Morlab Laboratory. The test data, data evaluation, test procedures and equipment configurations shown in this report were made in accordance with the requirement of related FCC rules.

The test results of this report only apply for the tested sample equipment identified above. The test report shall be invalid without all the signatures of the test engineer, the reviewer and the approver.

| | | | |
|--------------|------------------|--------|------------------|
| Tested by: | <u>Shi Feng</u> | Dated: | <u>2011.4.20</u> |
| | Shi Feng | | |
| Reviewed by: | <u>Zhang Jun</u> | Dated: | <u>2011.4.20</u> |
| | Zhang Jun | | |
| Approved by: | <u>Wei Bei</u> | Dated: | <u>2011.4.20</u> |
| | Wei Bei | | |



2. General Information

2.1. Description of EUT

| Product Feature & Specification | |
|-----------------------------------|--|
| Equipment | Portable GNSS receiver |
| Brand Name | ASHTECH |
| Model Number | MobileMapper 10 |
| Frequency Range | 2400MHz~2483.5MHz |
| Number of Channels | 79 |
| Carrier Frequency of Each Channel | $2402+n*1\text{MHz}; n=0\sim78$ |
| Channel Spacing | 1MHz |
| Max Transmit Power To antenna | Bluetooth (1Mbps) : 0.80 dBm (0.00120 W) Bluetooth EDR (2Mbps) : 0.62 dBm (0.00115 W) Bluetooth EDR (3Mbps) : 0.83 dBm (0.00121 W) |
| Modulation Technique | Bluetooth (1Mbps) : GFSK Bluetooth EDR (2Mbps) : $\pi/4$ -DQPSK Bluetooth EDR (3Mbps) : 8-DPSK |
| Antenna Information | Chip Antenna with gain 5 dBi |
| Hardware Version | v2.0 |
| Software Version | 01.001.1chs |
| EUT Stage | Production Unit |

NOTE:

1. The EUT is a Mobile Phone, it 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).
2. The above EUT's information was declared by manufacturer.. For a more detailed features description about the EUT, please refer to User's Manual.

2.2. 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
- FCC Public Notice DA 00-705
- ANSI C63.4-2003
- IC RSS-210 Issue 7

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:

| № | FCC Rules | IC Rules | Test Type | Limits | Result |
|----|--------------------|-----------|--------------------------------|--|--------|
| 1 | 15.247(a)(1) | A8.4(2) | Number of Hopping Frequency | $\geq 75\text{Chs}$ | PASS |
| 2 | 15.247(b)(1) | A8.1(b) | Peak Output Power | $\leq 1\text{W}$ | PASS |
| 3 | 15.247(a)(1) | A8.1(a) | 20dB Bandwidth | NA | PASS |
| 4 | 15.247(a)(1) | A8.1(b) | Carrier Frequency Separation | $\geq 2/3$ of 20dB BW | PASS |
| 5 | 15.247(a)(1) | A8.1(d) | Time of Occupancy (Dwell time) | $\leq 0.4\text{sec}$ in 31.6sec period | PASS |
| 6 | 15.247(d) | A8.5 | Conducted Spurious Emission | $< 20\text{ dBc}$ | PASS |
| 7 | 15.247(d) | A8.5 | Band Edge | $\leq 20\text{dBc}$ | PASS |
| 8 | 15.207 | Gen 7.2.2 | Conducted Emission | 15.207(a) | PASS |
| 9 | 15.247(d) | A8.5 | Radiated Emission | 15.209(a) & 15.247(d) | PASS |
| 10 | 15.203 & 15.247(b) | A8.4 | Antenna Requirement | N/A | Pass |
| 11 | / | GEN 7.2.3 | Receiver Spurious Emissions | GEN 7.2.3.1 & GEN 7.2.3.1 | Pass |

2.3. Test Facility

Shenzhen Electronic Product Quality Testing Center Morlab Laboratory is a testing organization

accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659.

All measurement facilities used to collect the measurement data are located at Electronic Testing Building, Shahe Road, Xili, Nanshan District, Shenzhen 518055 CHINA. The test site is constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22; the FCC registration number is 741109.

2.4. Environmental conditions

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

| | |
|-----------------------------|---------|
| Temperature (°C): | 20 - 25 |
| Relative Humidity (%): | 40 - 60 |
| Atmospheric Pressure (kPa): | 96 |

2.5. Operation mode of test

The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 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 | N/A | GSM 850 Idle + BT link + Adapter |
| | Channel 39_2441 MHz | | |
| | Channel 78_2480 MHz | | |
| Bluetooth EDR 2Mbps π /4-DQPSK | Channel 00_2402 MHz | N/A | |
| | Channel 39_2441 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 | |

2.6. Ancillary Equipments List

| Equipment | Model | Trade | FCC ID | Data cable | Power cord |
|-----------|-------|-------|--------|------------|------------|
|-----------|-------|-------|--------|------------|------------|

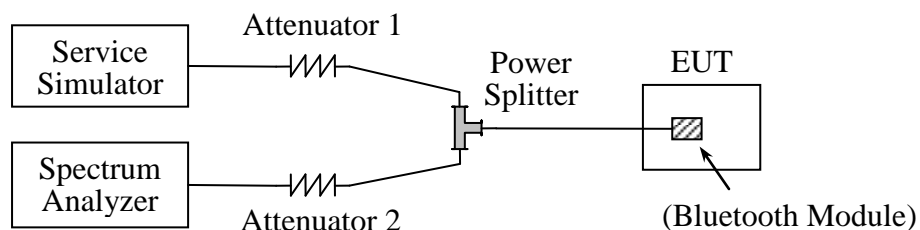
| | | | | | |
|------------------------|---------|---------|---|-----|-------------------|
| Bluetooth base station | MT8852B | Anritsu | / | N/A | Unshielding, 1.8m |
| Notebook PC | SL410 | IBM | / | N/A | Unshielding, 1.8m |
| BT earphone | BH-105 | NOKIA | / | N/A | / |

3. Number of Hopping Frequency

3.1. Requirement

According to FCC section 15.247(a)(1)(ii), frequency hopping systems operating in the 2400MHz to 2483.5MHz bands shall use at least 75 hopping frequencies.

3.2. 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.

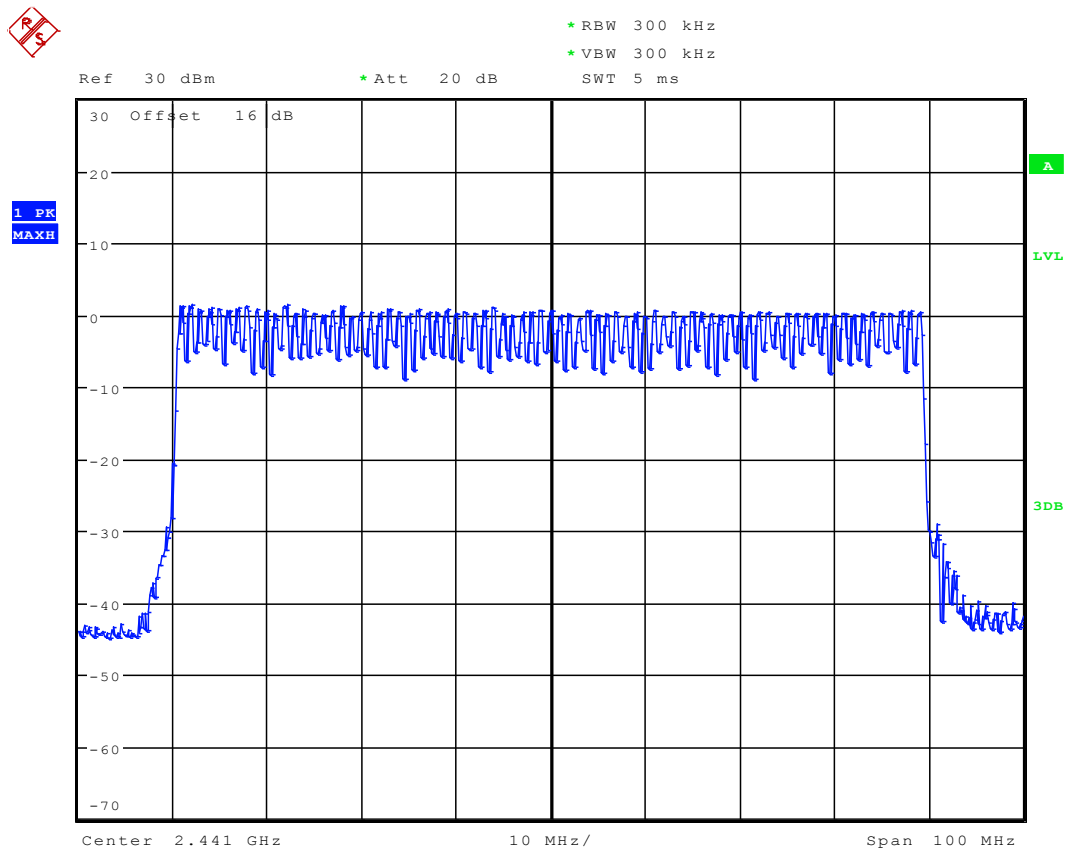
3.3. Test Result

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

3.3.1. Test Verdict:

| Frequency Block (MHz) | Measured Channel Numbers | Min. Limit | Refer to Plot | Verdict |
|-----------------------|--------------------------|------------|---------------|---------|
| 2400 - 2483.5 | 79 | 75 | Plot A | PASS |

3.3.2. Test Plots:



Date: 15.APR.2011 17:21:24

4. Peak Output Power

4.1. 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.

4.2. Test Description

See section 3.2 of this report.

4.3. Test Result

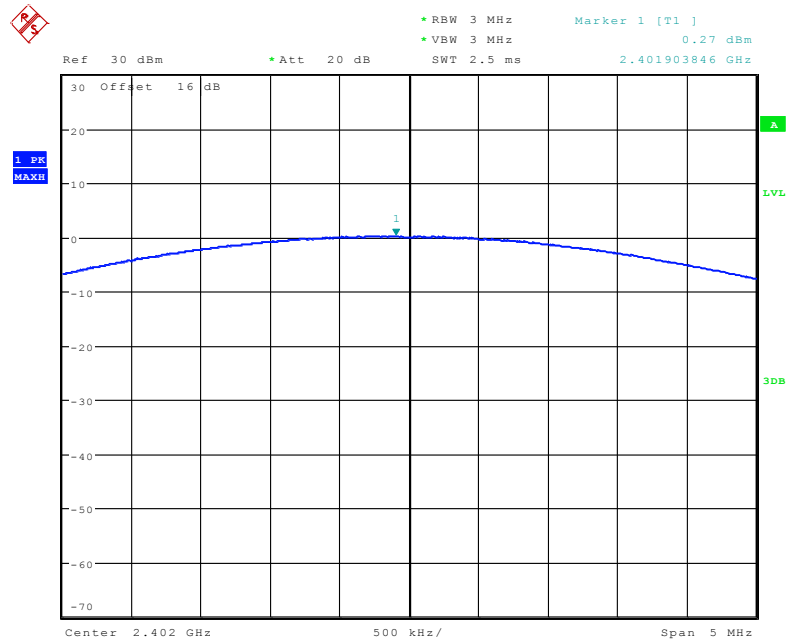
The Bluetooth Module operates at hopping-off test mode. The lowest, middle and highest channels are selected to perform testing to verify the conducted RF output peak power of the Module.

| Channel | Frequency (MHz) | Measured Output Peak Power | | | Limit | Verdict |
|---------|--------------------|----------------------------|----------------|-----------------|-------|---------|
| | | Data Rate/Modulation | | | | |
| | | GFSK | π /4-DQPSK | 8-DPSK | dBm | |
| | | 1Mbps | 2Mbps | 3Mbps | | |
| 0 | 2402 | 0.25 dBm | 0.01 dBm | 0.27 dBm | 30 | PASS |
| 39 | 2441 | 0.18 dBm | 0.10 dBm | 0.20 dBm | | PASS |
| 78 | 2480 | 0.80 dBm | 0.62 dBm | 0.83 dBm | | PASS |

8-DPSK (3Mbps)

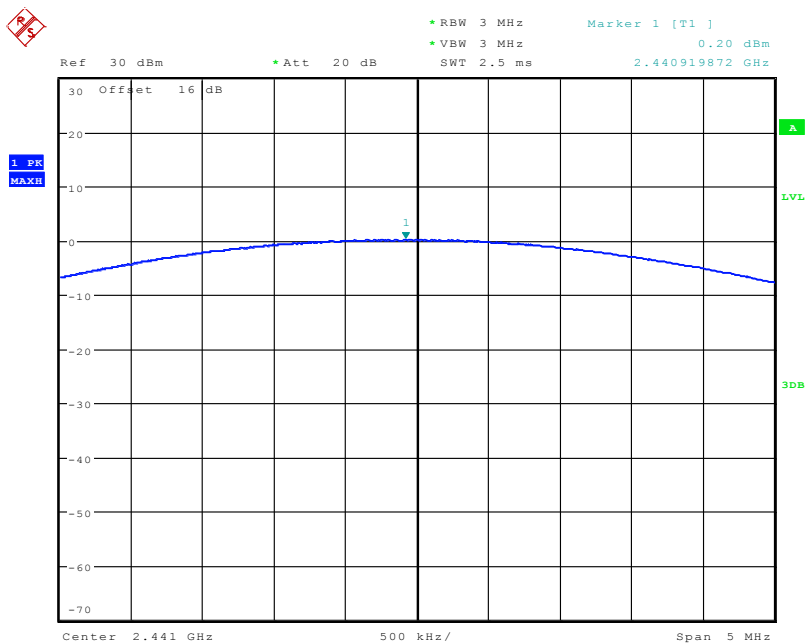
| Channel | Frequency (MHz) | Measured Output Peak Power | | | Limit | | Verdict |
|---------|-----------------|----------------------------|---------|---------------|-------|---|---------|
| | | dBm | W | Refer to Plot | dBm | W | |
| 0 | 2402 | 0.27 | 0.00106 | Plot A | 30 | 1 | PASS |
| 39 | 2441 | 0.20 | 0.00105 | Plot B | | | PASS |
| 78 | 2480 | 0.83 | 0.00121 | Plot C | | | PASS |

4.3.1. Test Plots:



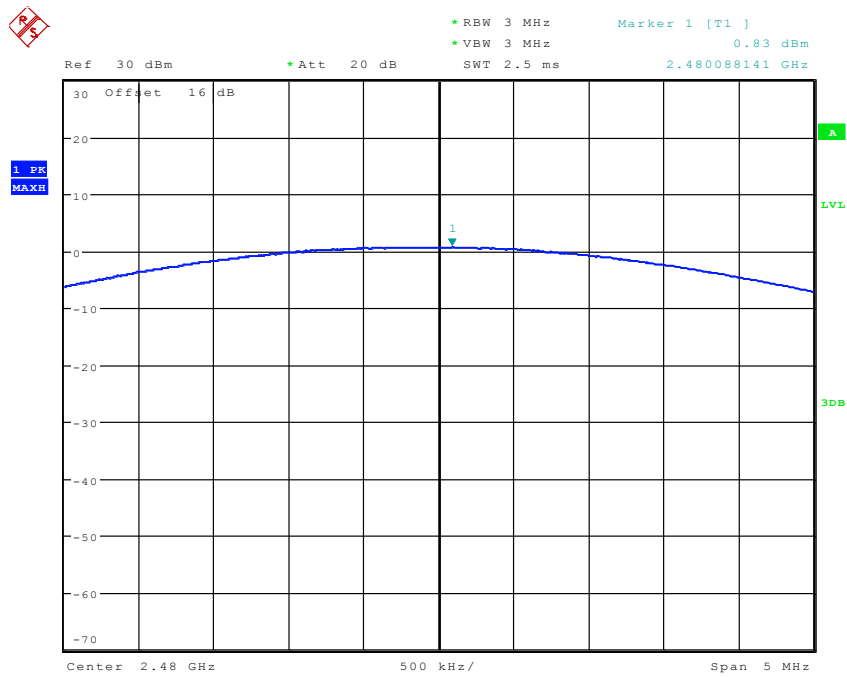
Date: 15.APR.2011 17:29:31

(Plot A: Channel = 2402)



Date: 15.APR.2011 17:29:54

(Plot B: Channel = 2441)



Date: 15.APR.2011 17:30:19

(Plot C: Channel = 2480)

5. 20dB Bandwidth

5.1. Definition

The 20dB bandwidth is known as the 99% emission bandwidth, or 20dB bandwidth ($10 \cdot \log 1\% = 20\text{dB}$) taking the total RF output power.

5.2. Test Description

See section 3.2 of this report.

5.3. 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.

5.3.1. Test Verdict:

GFSK(1Mbps)

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) | Refer to Plot |
|---------|-----------------|----------------------|---------------|
| 0 | 2402 | 0.752 | Plot A |
| 39 | 2441 | 0.755 | Plot B |
| 78 | 2480 | 0.750 | Plot C |

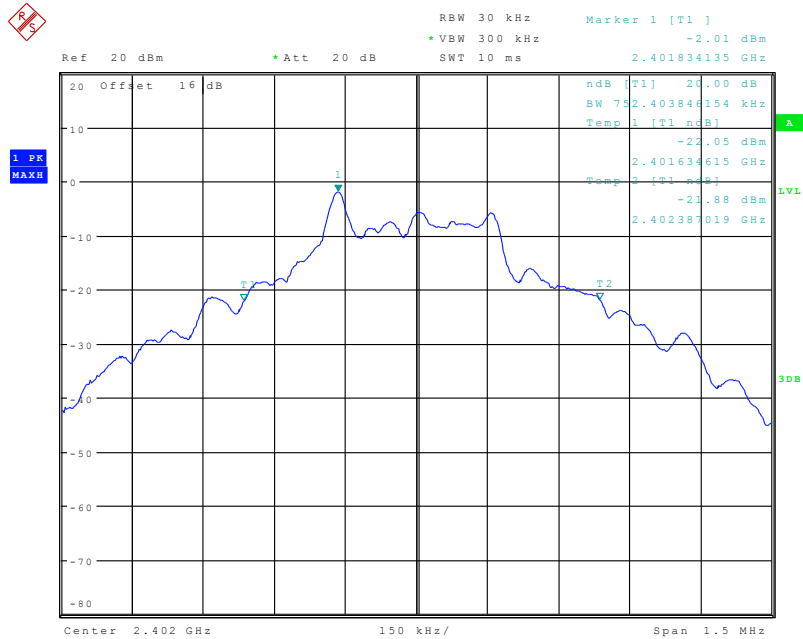
π /4-DQPSK (2Mbps)

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) | Refer to Plot |
|---------|-----------------|----------------------|---------------|
| 0 | 2402 | 0.971 | Plot D |
| 39 | 2441 | 0.976 | Plot E |
| 78 | 2480 | 0.971 | Plot F |

8-DPSK(3Mbps)

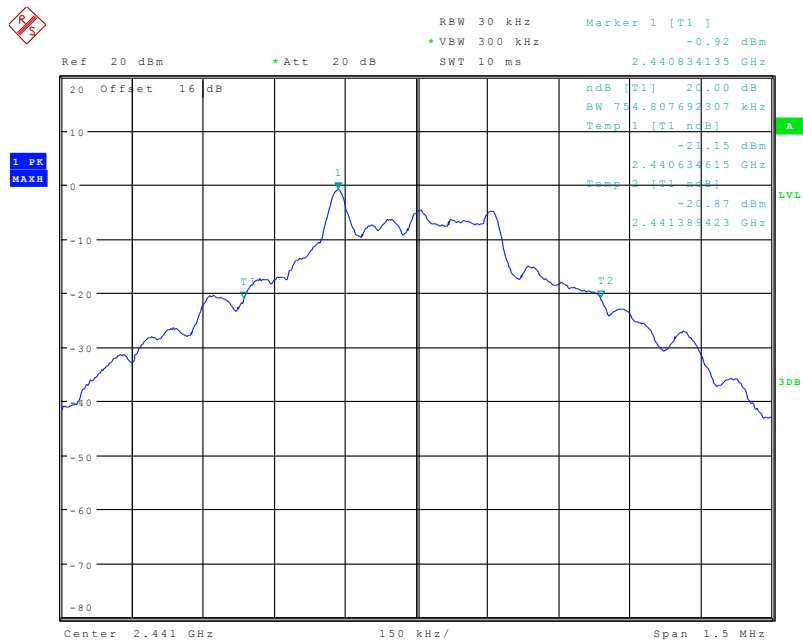
| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) | Refer to Plot |
|---------|-----------------|----------------------|---------------|
| 0 | 2402 | 0.725 | Plot G |
| 39 | 2441 | 0.790 | Plot H |
| 78 | 2480 | 0.817 | Plot I |

5.3.2. Test Plot:



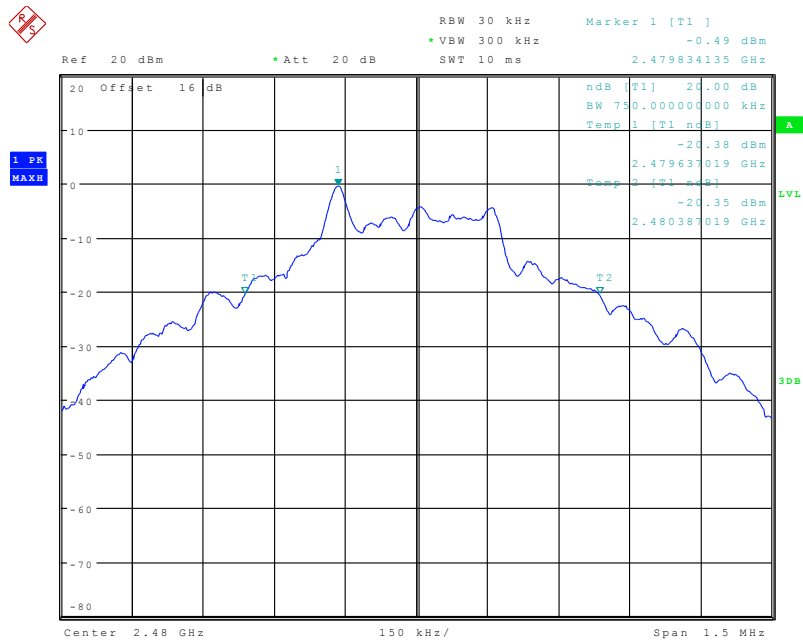
Date: 16.APR.2011 17:05:55

(Plot A: Channel = 2402)



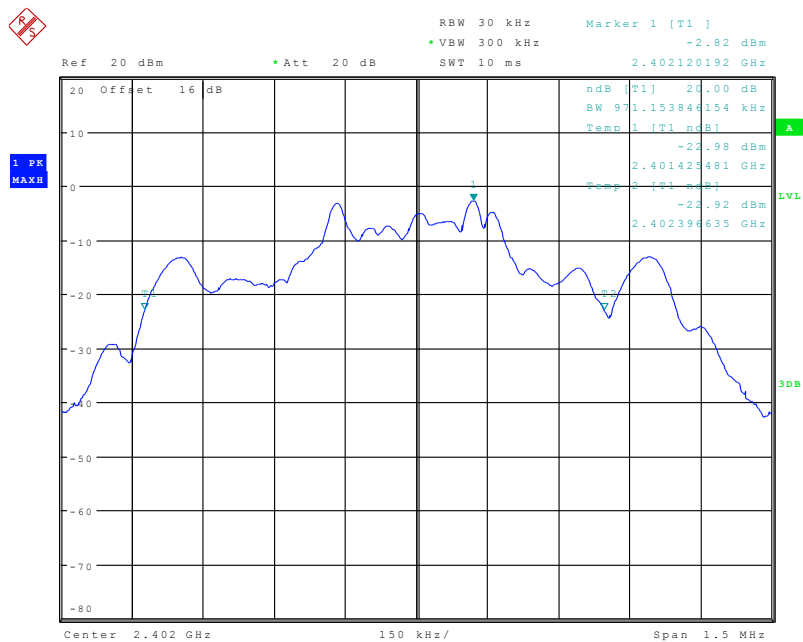
Date: 16.APR.2011 17:05:13

(Plot B: Channel = 2441)



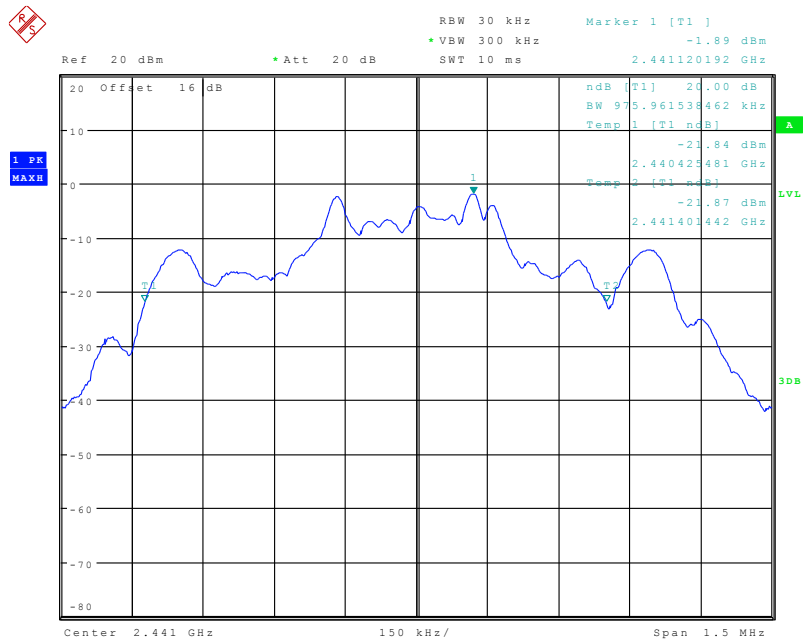
Date: 16.APR.2011 17:04:24

(Plot C: Channel = 2480)



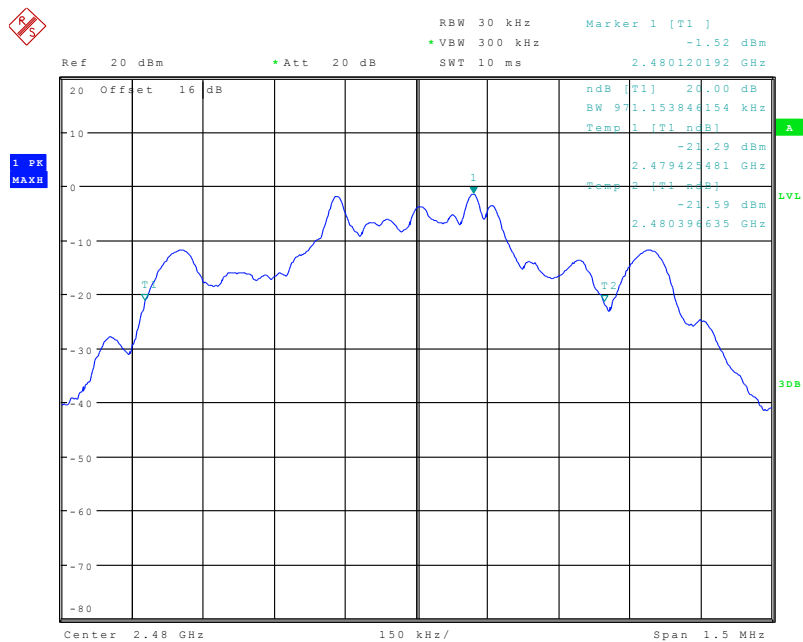
Date: 16.APR.2011 17:08:07

(Plot D: Channel = 2402)



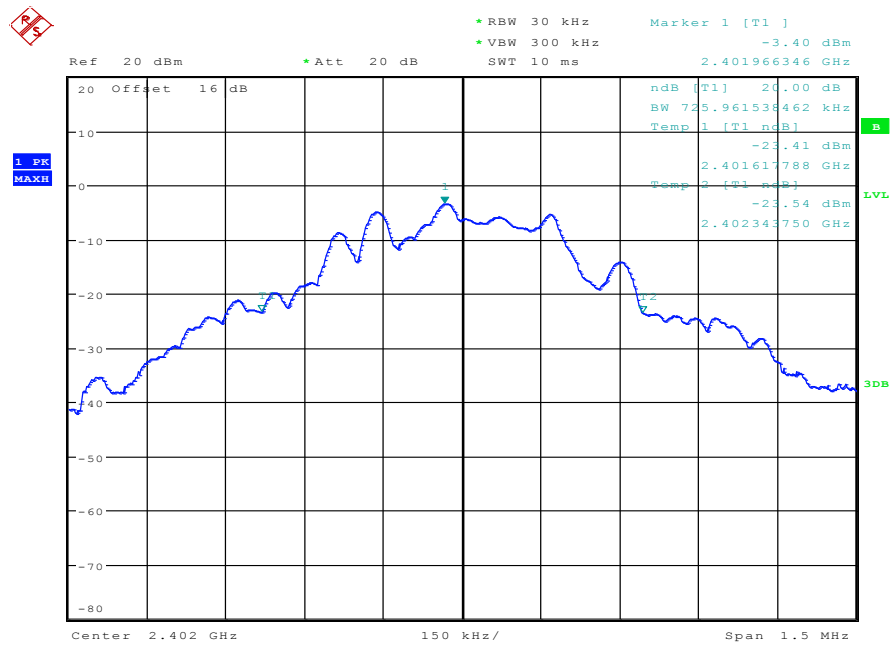
Date: 16.APR.2011 17:08:48

(Plot E: Channel = 2441)



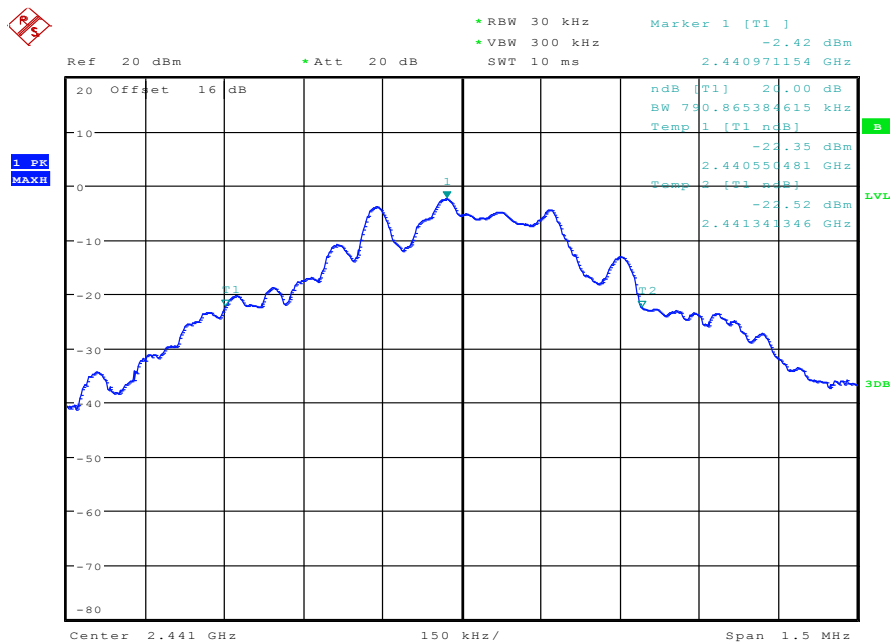
Date: 16.APR.2011 17:09:33

(Plot F: Channel = 2480)



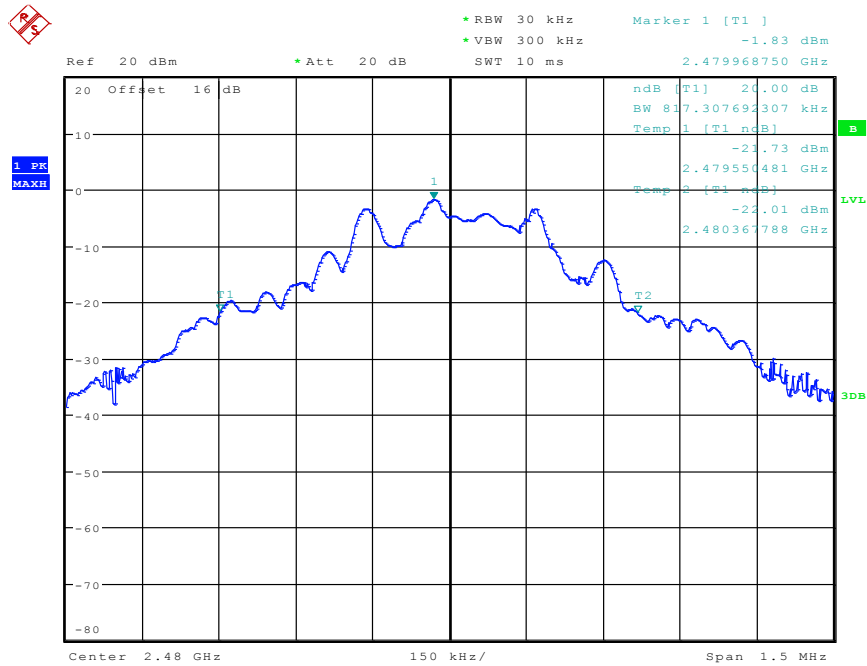
Date: 15.APR.2011 18:06:27

(Plot G: Channel = 2402)



Date: 15.APR.2011 18:08:22

(Plot H: Channel = 2441)



Date: 15.APR.2011 18:09:02

(Plot I: Channel = 2480)

6. Carried Frequency Separation

6.1. 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.

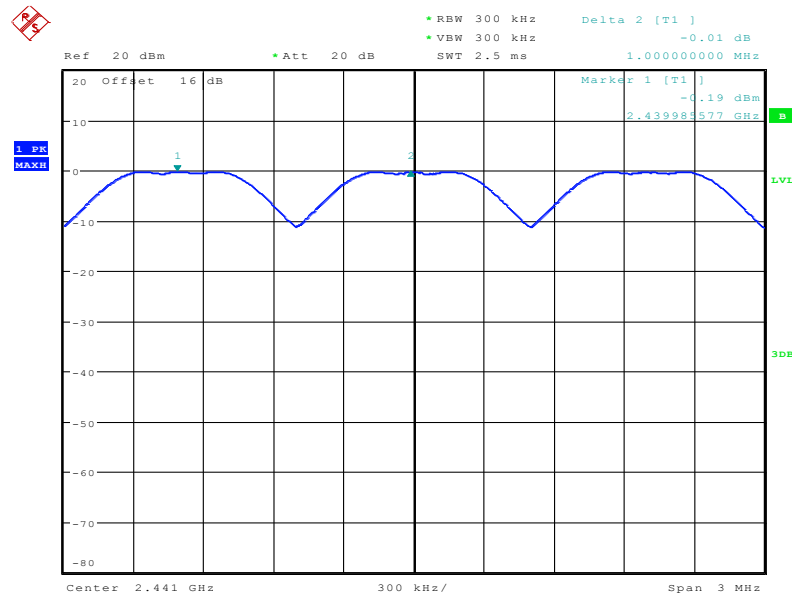
6.2. Test Description

See section 3.2 of this report.

6.3. Test Result

The Bluetooth Module operates at hopping-on test mode.

For any adjacent channels (e.g. the channel 39 and 40 as showed in the Plot A), 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 (refer to section 5.3.1), whichever is greater. So, the verdict is PASS.



Date: 15.APR.2011 18:22:14

(Plot A: Carried Frequency Separation channel 39 and channel 40)

7. Time of Occupancy (Dwell time)

7.1. 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.

7.2. Test Description

See section 3.2 of this report.

7.3. Test Result

The average time of occupancy on any channel within the Period can be calculated with formulas (for DH5 package type):

$$\begin{aligned} \{\text{Total of Dwell}\} &= \{\text{Pulse Time}\} * (1600 / 6) / \{\text{Number of Hopping Frequency}\} * \{\text{Period}\} \\ \{\text{Period}\} &= 0.4s * \{\text{Number of Hopping Frequency}\} \end{aligned}$$

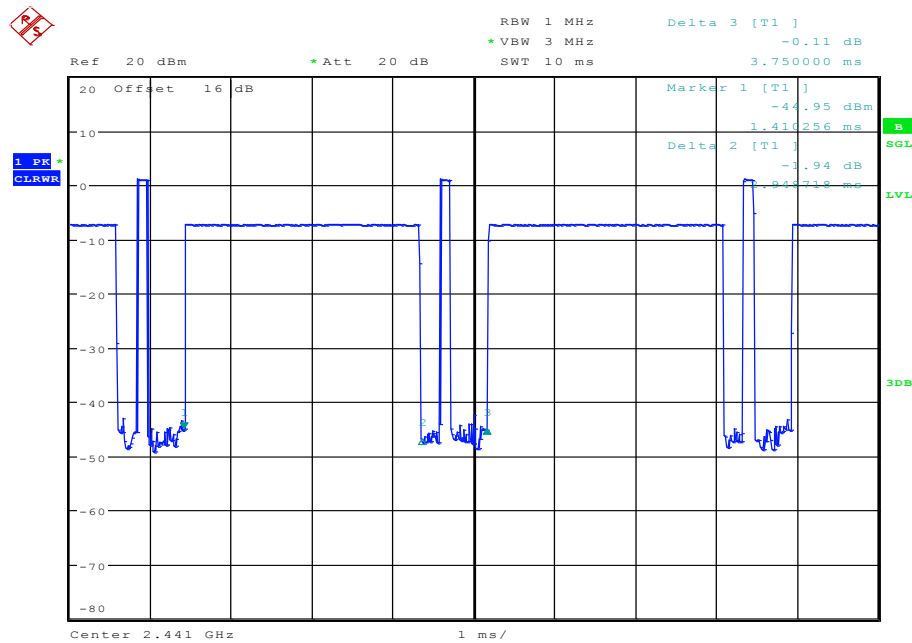
The DH1 , DH3 and DH5 are selected to perform testing to record the dwell time of each occupation measured in this channel, which is called Pulse Time here.

7.3.1. Test Verdict:

DH5

| Channel | Frequency (MHz) | Pulse Time | | Total of Dwell (ms) | Limit (ms) | Verdict |
|---------|-----------------|------------|---------------|---------------------|------------|---------|
| | | ms | Refer to Plot | | | |
| 39 | 2441 | 2.95 | PlotA | 314.67 | 400 | PASS |

7.3.2. Test Plot:



Date: 15.APR.2011 18:49:10

(Plot A: DH5 Channel = 2441)

8. Conducted Spurious Emissions

8.1. Requirement

According to FCC section 15.247(d), 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.

8.2. Test Description

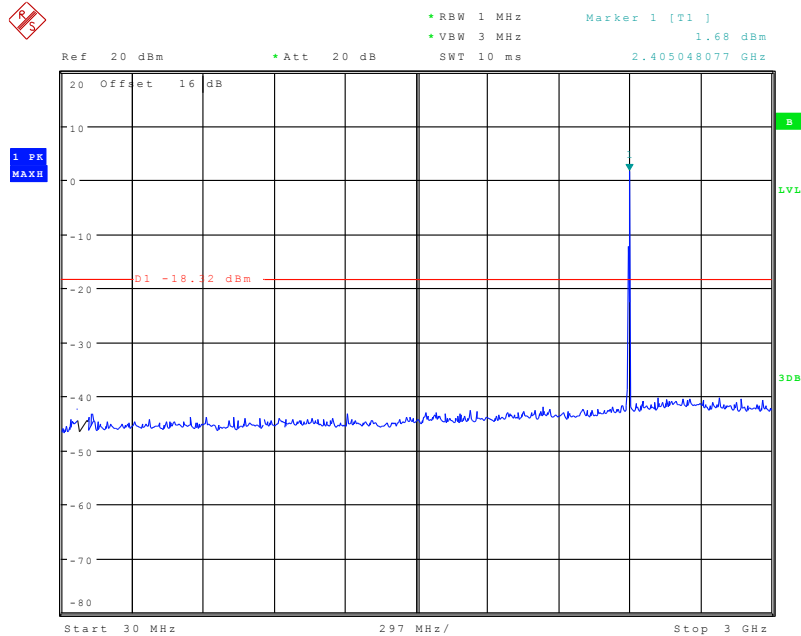
See section 3.2 of this report.

8.3. 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.

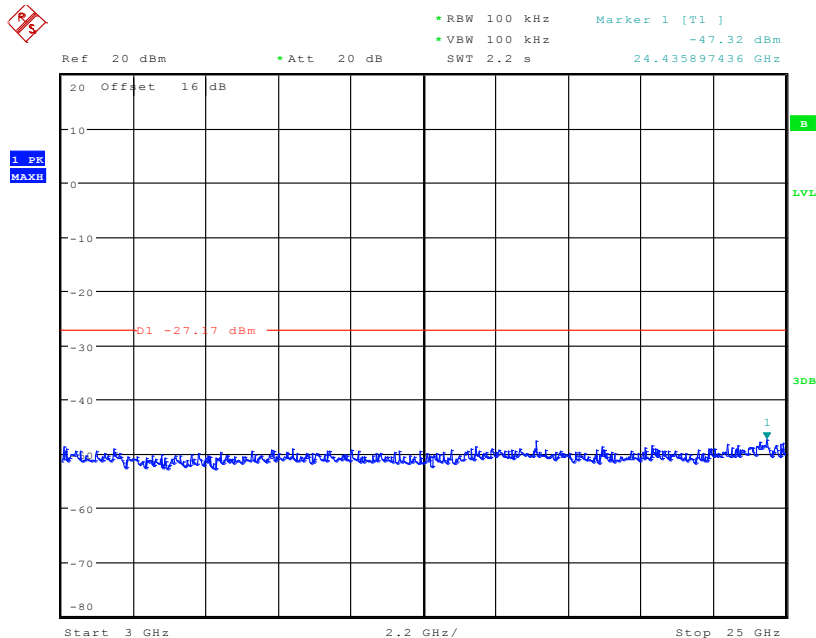
8.3.1. Test Plot:

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



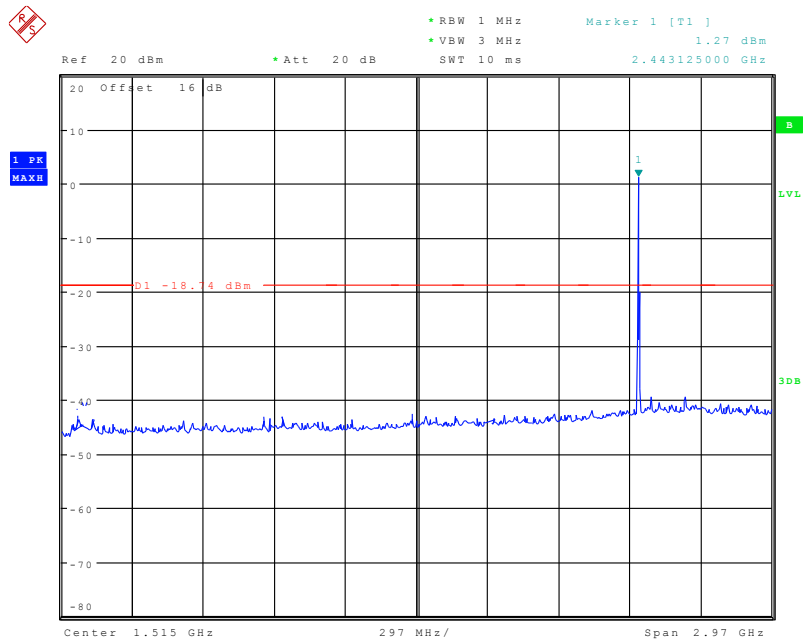
Date: 15.APR.2011 18:57:11

(Plot A.1: Channel = 0, 9KHz to 3GHz)



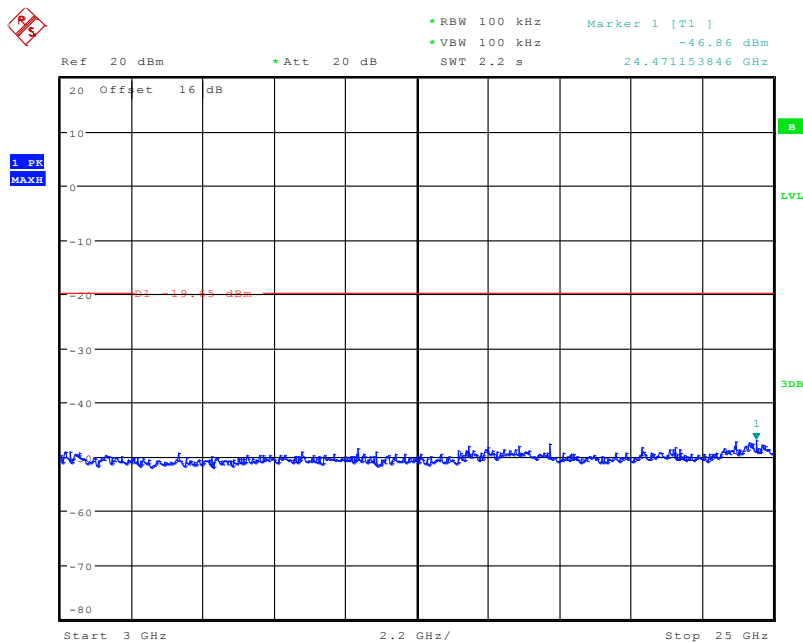
Date: 15.APR.2011 19:19:57

(Plot A.2: Channel = 0, 3GHz to 25GHz)



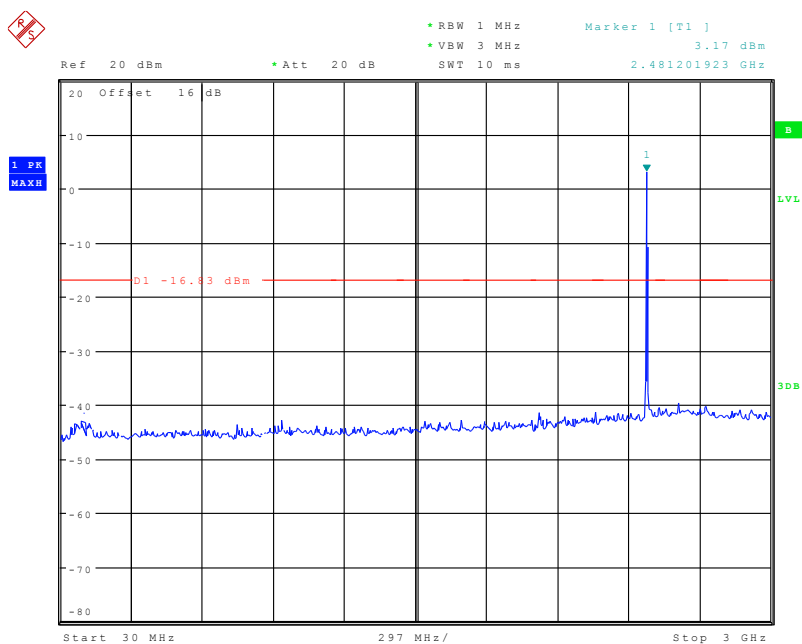
Date: 15.APR.2011 18:59:06

(Plot B.1: Channel = 39, 9KHz to 3GHz)



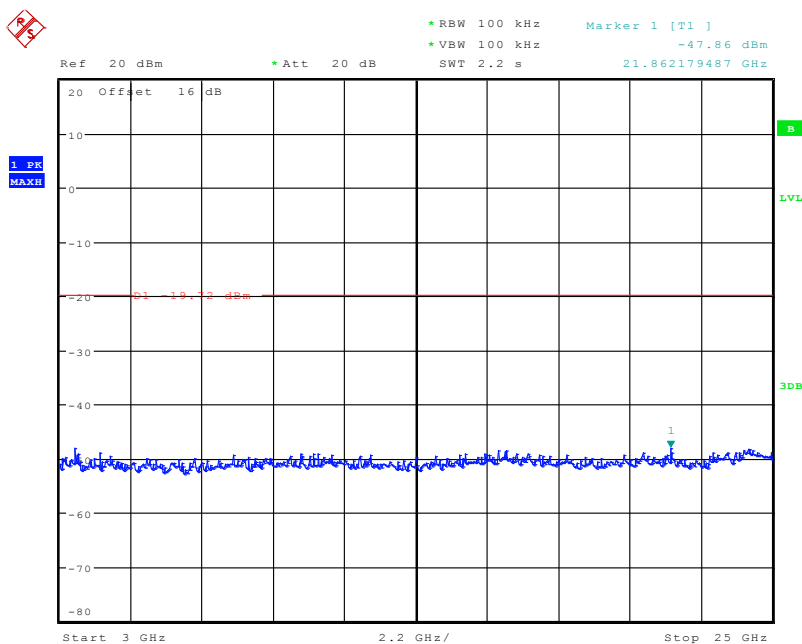
Date: 15.APR.2011 19:21:57

(Plot B.2: Channel = 39, 3GHz to 25GHz)



Date: 15.APR.2011 19:04:00

(Plot C.1: Channel = 78, 9KHz to 3GHz)



Date: 15.APR.2011 19:23:40

(Plot C.2: Channel = 78, 3GHz to 25GHz)

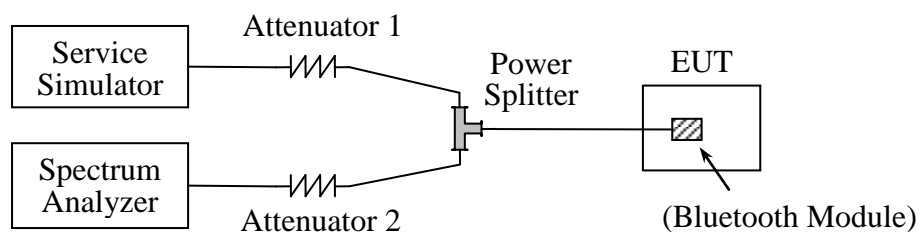
9. Band Edge

9.1. Requirement

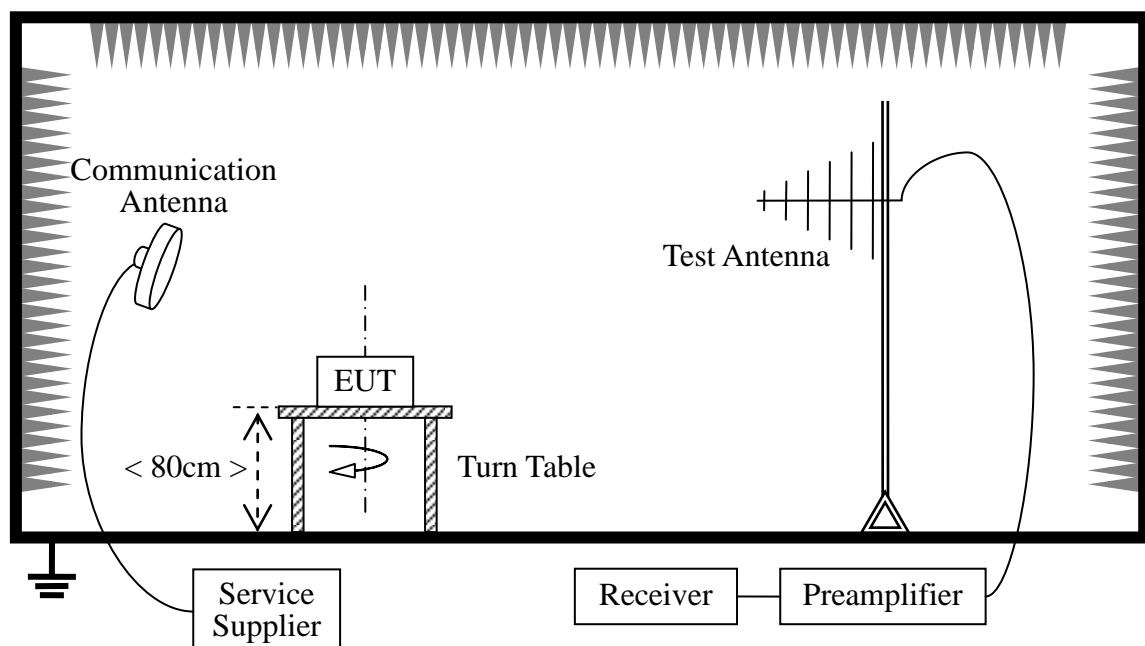
According to FCC section 15.247(d), in any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

9.2. Test Description

Conducted Band Edge



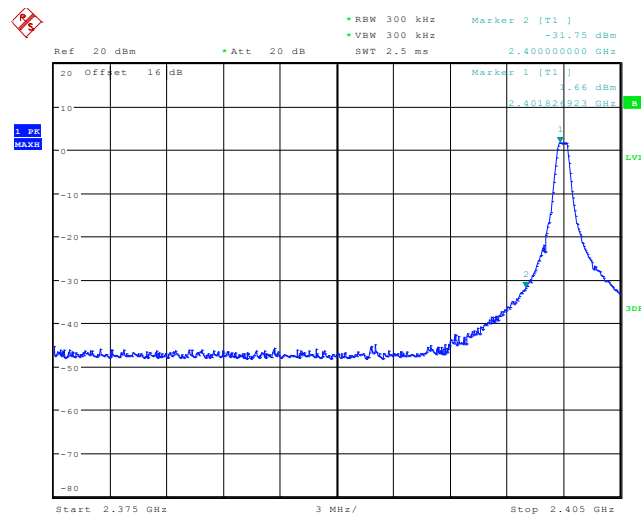
Radiated Band Edge



9.3. Test Result

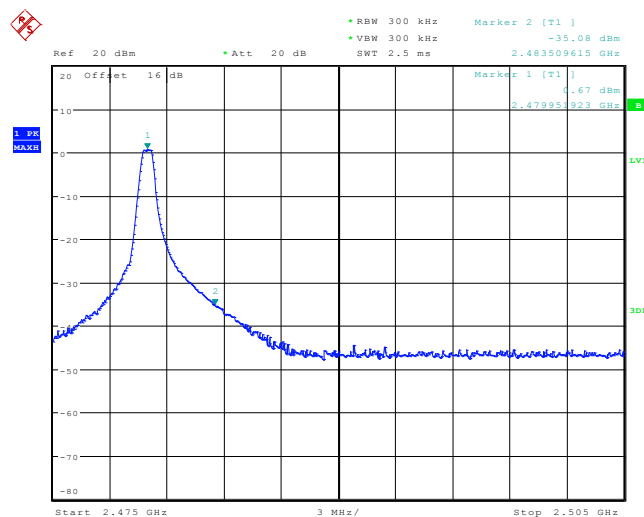
The Bluetooth Module operates at hopping-off test mode. The lowest and highest channels are tested to verify the band edge emissions.

9.3.1. Conducted Band Edge:



Date: 15.APR.2011 19:10:59

(Plot A1: Channel = 0)



Date: 15.APR.2011 19:14:20

(Plot B1: Channel = 78)

9.3.2. Radiated Band Edge:

| Frequency (MHz) | Measure Level (dBuV/m) | Correct Factor (dB) | Reading Level (dBuV) | Limit (dBuV/m) | Detector Type | Antenna Polarity |
|-----------------|------------------------|---------------------|----------------------|----------------|---------------|------------------|
| 2400 | 49.57 | 0.35 | 49.22 | 74 | Peak | H |
| 2400 | 33.49 | 0.35 | 33.14 | 54 | Average | |
| 2400 | 48.53 | 0.35 | 48.18 | 74 | Peak | V |
| 2400 | 32.89 | 0.35 | 32.54 | 54 | Average | |
| 2483.5 | 55.51 | 0.64 | 54.87 | 74 | Peak | H |
| 2483.5 | 42.45 | 0.64 | 41.81 | 54 | Average | |
| 2483.5 | 52.67 | 0.64 | 52.03 | 74 | Peak | V |
| 2483.5 | 40.80 | 0.64 | 40.16 | 54 | Average | |

NOTE:

Measurement Level = Reading Level + Correct Factor

10. Conducted Emission

10.1.Requirement

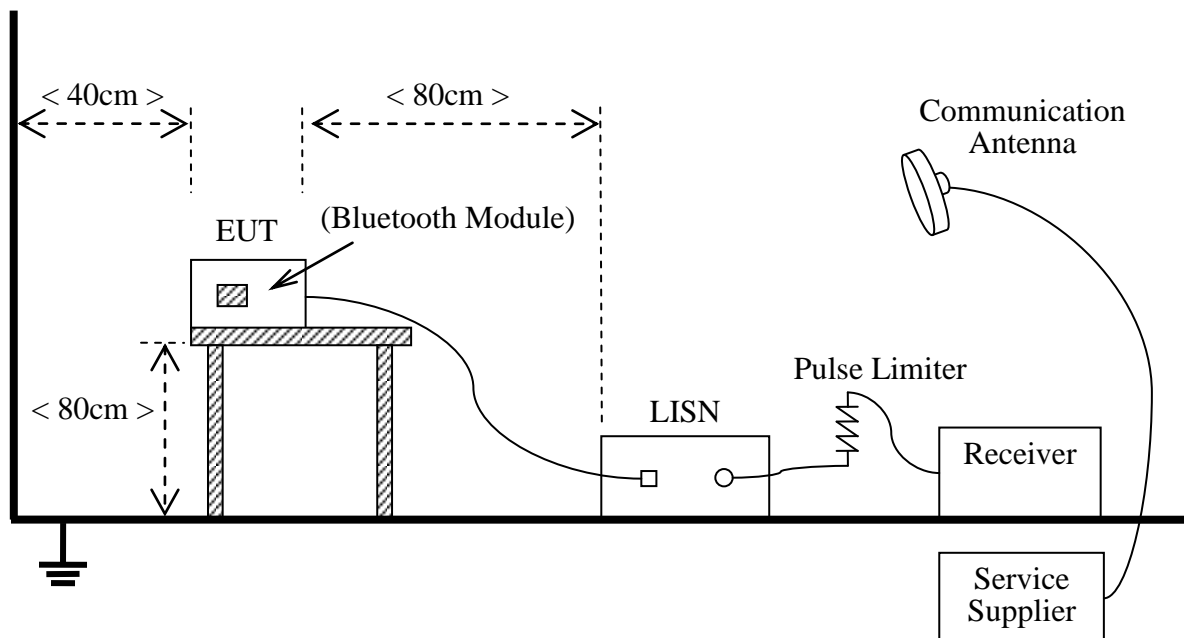
According to FCC section 15.207, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following 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 |
| 0.50 - 30 | 60 | 50 |

NOTE:

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

10.2.Test Description



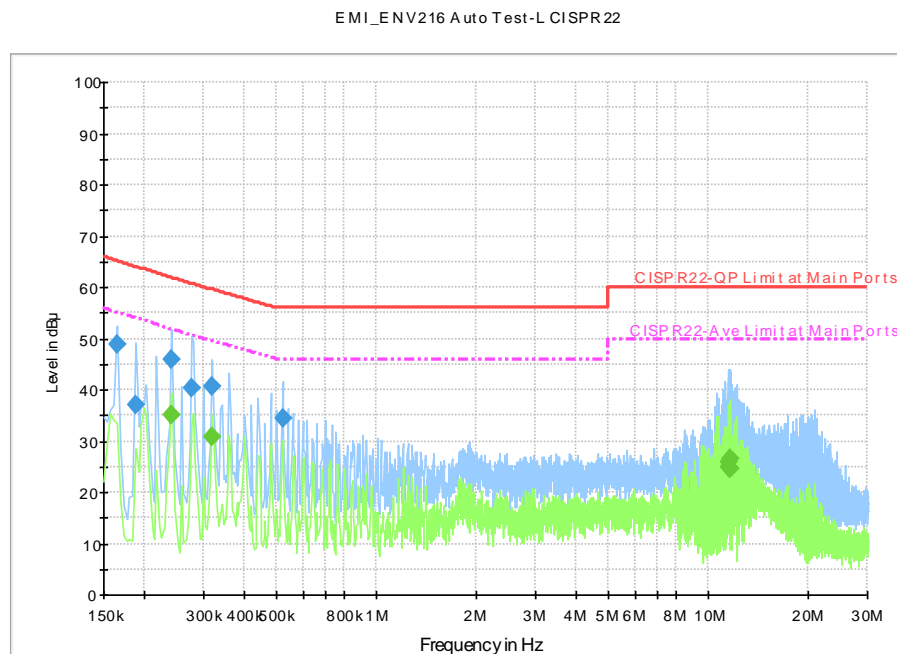
The Table-top EUT was placed upon a non-metallic table 0.8m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4:2003

The Bluetooth Module of the EUT is powered by the Battery charged with the AC Adapter which is

powered by 120V, 60Hz AC mains supply. The factors of the site are calibrated 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.

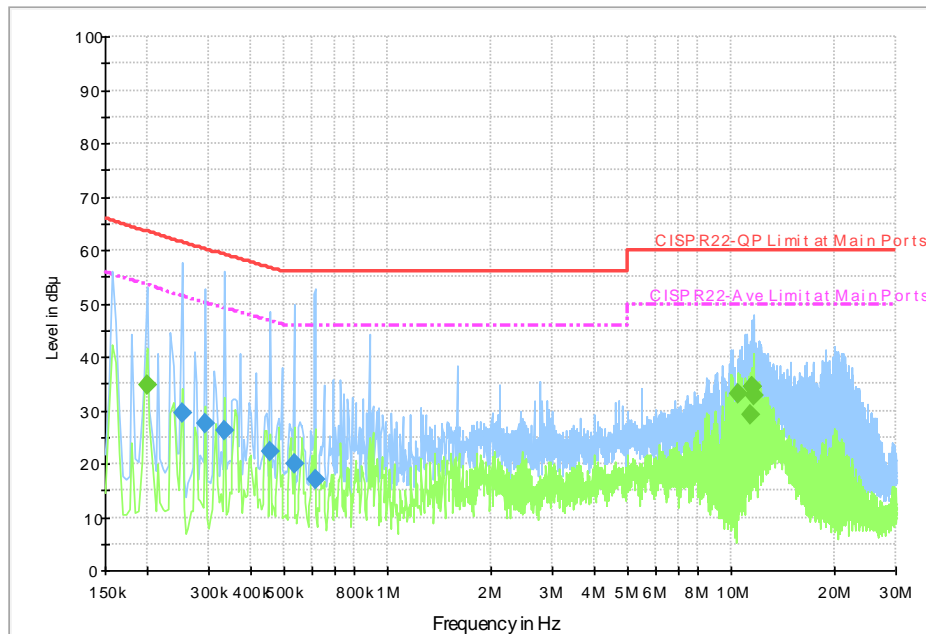
10.3. Test Result

The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.



(Plot A: L Phase)

EMI_ENV216 Auto Test-N CISPR22



(Plot B: N Phase)

11. Radiated Emission

11.1. Requirement

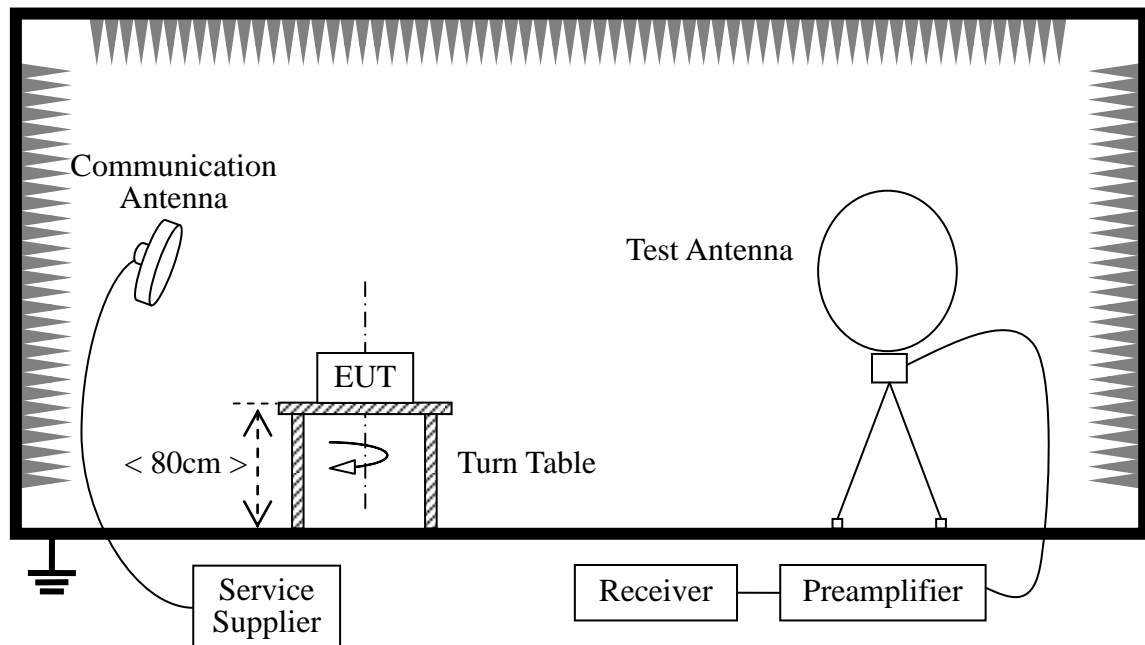
According to FCC section 15.247(d), radiated emission outside the frequency band attenuation below the general limits specified in FCC section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in FCC section 15.205(a), must also comply with the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

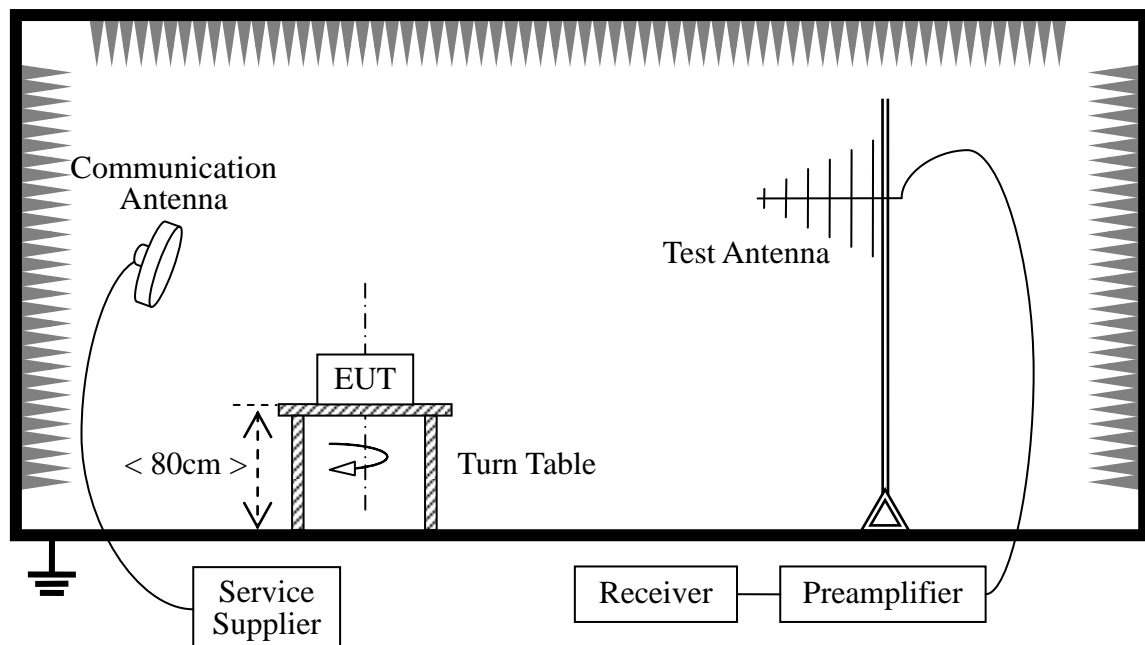
| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|--------------------|--------------------------------------|-------------------------------------|
| 0.009-0.490 | 2400/F(kHz) | 300 |
| 0.490-1.705 | 24000/F(kHz) | 30 |
| 1.705-30 | 30 | 30 |
| 30 - 88 | 100 | 3 |
| 88 - 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| 960 - 1000 | 500 | 3 |
| Above 1000 | 500 | 3 |

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)

11.2. Test Description



radiated emissions below 30MHz



radiated emissions above 30MHz

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2003). 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 charged with the AC Adapter which is powered by 120V, 60Hz AC mains supply. 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.

11.3. Test Result

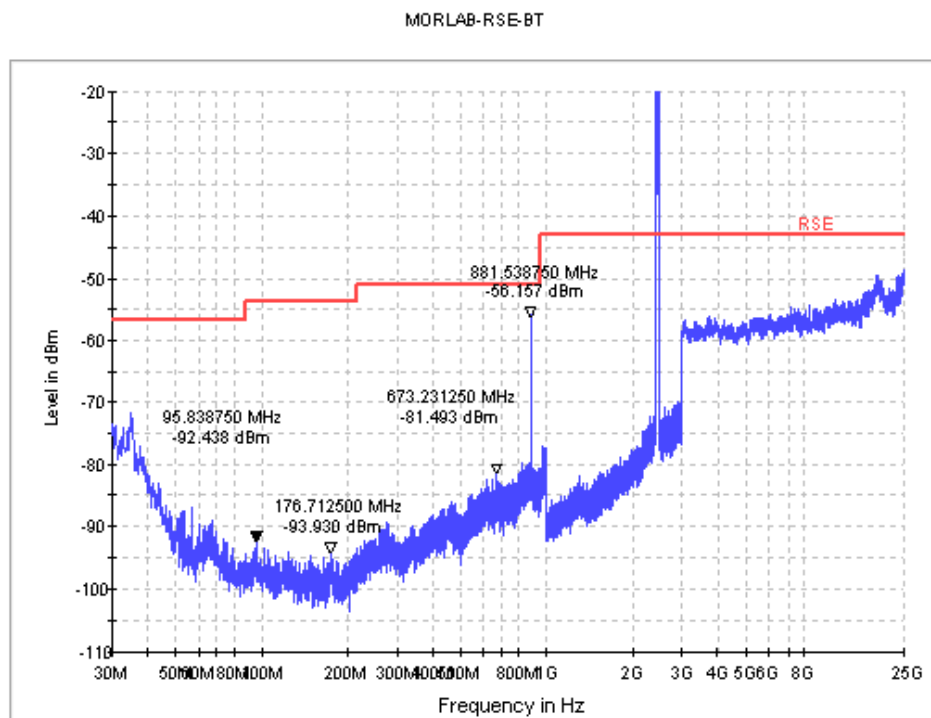
11.3.1. Test Result for 9 kHz ~ 30 MHz:

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

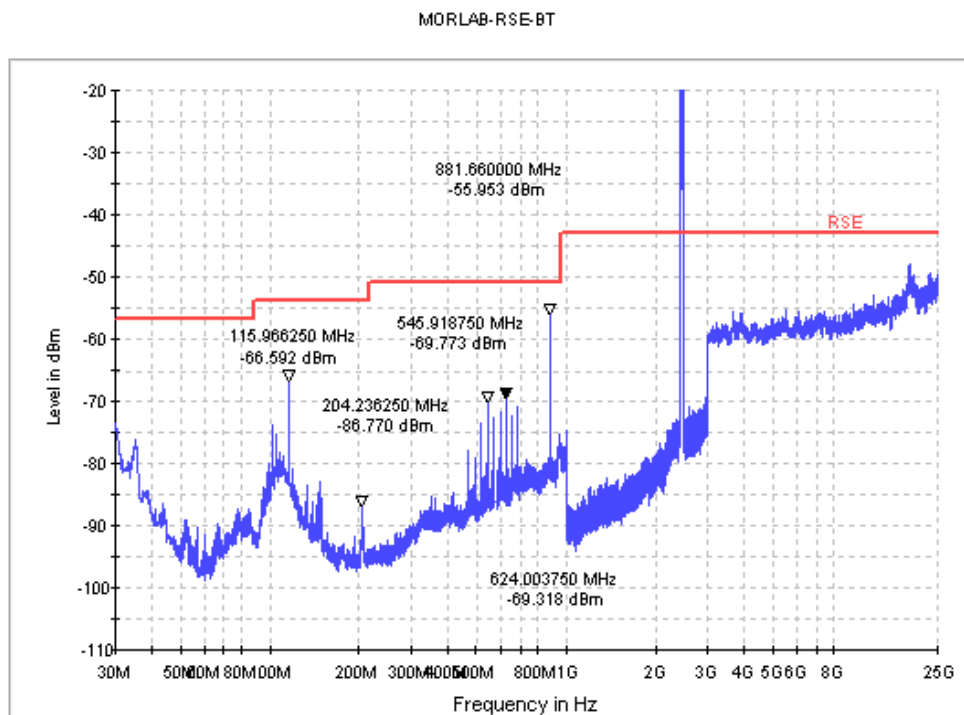
Note:

- 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.

11.3.2. Test Result for 30 MHz ~ 10th Harmonic:



(Plot A.1: Antenna Horizontal)



(Plot A.2: Antenna Vertical)

12. Antenna Requirements

12.1. Requirement of the standard

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 FCC rule.

12.2. Antenna Connected Construction

The antennas type used in this product is Chip Antenna without connector and it is considered to meet antenna requirement.

12.3. Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

13. Receiver Spurious Emissions

13.1. Requirement of the standard

According to RSS-GEN 4.10, the receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate. The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz. According to RSS-GEN 7.2.3.1, If the device has a detachable antenna of known antenna impedance, then the antenna conducted method is permitted in lieu of a radiated measurement.

Receiver spurious emissions at any discrete frequency shall not exceed 2 nanowatts in the band 30-1000 MHz, or 5 nanowatts above 1 GHz.

| Limits for Conducted Receiver Spurious Emissions | |
|--|-------|
| Frequency(MHz) | Limit |
| 30 – 1000 | 2nW |
| Above 1000 | 5nW |

According to RSS-GEN 7.2.3.2, for Radiated Measurement, all spurious emissions shall comply with the limits of Table below:

| Limits for Radiated Receiver Spurious Emissions | |
|---|----------------------------------|
| Frequency(MHz) | Field Strength(microvolts/meter) |
| 30 - 88 | 100 |
| 88 - 216 | 150 |
| 216 - 960 | 200 |
| Above 960 | 500 |

13.2. Test Procedure

Please refer to RSS-GEN section 4.10 for the measurement methods.

13.3. Test Setup

See section 11.2 of this report.

13.4. Test Results

13.4.1. Conducted Receiver Spurious Emissions

| Frequency(MHz) | Measure Result(nW) | Limit (nW) |
|----------------|--------------------|------------|
| 30 – 1000 | -- | 2 |
| Above 1000 | -- | 5 |

13.4.2. Radiated Receiver Spurious Emissions

| No. | Frequency (MHz) | Antenna Polarization | Detector mode | Level ERP(dB μ V) | Limit (dB μ V) | Margin (dB) |
|-----|-----------------|----------------------|---------------|-----------------------|--------------------|-------------|
| 1 | 30 - 88 | Vertical | Peak | -- | 40 | >10 |
| 2 | 88 – 216 | Vertical | Peak | -- | 43.5 | >10 |
| 3 | 216 – 960 | Vertical | Peak | -- | 46 | >10 |
| 4 | 960 - 1000 | Vertical | Peak | -- | 54 | >10 |
| 5 | 1000 – 10000 | Vertical | Average | -- | 54 | >10 |
| 6 | 30 - 88 | Horizontal | Peak | -- | 40 | >10 |
| 7 | 88 – 216 | Horizontal | Peak | -- | 43.5 | >10 |
| 8 | 216 – 960 | Horizontal | Peak | -- | 46 | >10 |
| 9 | 960 - 1000 | Horizontal | Peak | -- | 54 | >10 |
| 10 | 1000 - 10000 | Horizontal | Average | -- | 54 | >10 |

Notes:

- Both radiated measurement method and conducted measurement method were used. For the radiated method, the antenna polarization was set to vertical and horizontal respectively.
- The measurement was performed at the mid operating frequencies.
- “--” in the table above means that the emissions are too small to be measured and are at least 10 dB below the limit.

14. List of Equipments Used

| Description | Manufacturer | Model No. | Cal. Date | Due Date | Serial No. |
|----------------------|-----------------|--------------|-----------|----------|------------|
| Test Receiver | Rohde & Schwarz | ESCI3 | 2010.9 | 2011.9 | 100666 |
| Spectrum Analyzer | Rohde & Schwarz | FSP30 | 2010.9 | 2011.9 | 101020 |
| Spectrum Analyzer | Rohde & Schwarz | FSU26 | 2010.9 | 2011.9 | 200880 |
| System Simulator | Agilent | E5515C | 2010.9 | 2011.9 | GB46040102 |
| System Simulator | Rohde&Schwarz | CMU200 | 2010.9 | 2011.9 | 105571 |
| LISN | Rohde & Schwarz | ENV216 | 2010.9 | 2011.9 | 812744 |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 2010.9 | 2012.9 | A0304220 |
| Ultra Broadband Ant. | Rohde & Schwarz | HL562 | 2010.9 | 2012.9 | A0304224 |
| Horn Ant. | Rohde & Schwarz | HF906 | 2010.9 | 2012.9 | 100150 |
| DC power supply | HP | 66309D | 2010.9 | 2012.9 | US39070653 |
| Shield Room | ETS | Site 1 | / | / | A0304188 |
| Anechoic Chamber | ETS | EMC9×6×6 (m) | / | / | / |

**** END OF REPORT ****