



## PRODUCT SAFETY AND COMPLIANCE EMC LABORATORY

# EMC TEST REPORT

**Test Report Number** – 24934-1 BT-Radiated

**Report Date** – 2012-03-30

The test results contained herein relate only to the model(s) identified. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics.

Signature:

Name: Jiakui Chen

Title: EMC Project Manager

Test: 2012-03-16 to 2012-03-30

As the responsible test lab manager, I hereby declare that the model tested as specified in this report conforms to the requirements indicated.

Signature:

Name: Yilin Zhao

Title: Test Lab Manager

Date: 2012-03-30

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FCC Registration Number: 402854

IC Registration Number: 109AW-1

ADR Testing Service location ADR BJ  
ISO/IEC-17025:2005 accredited by UKAS



**UKAS Certificate Number: 2404**

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**Test Report Details**

Tests Performed By: Motorola (Beijing) Mobility Technologies Co., Ltd.  
 Asia Global Compliance Labs  
 No.1 Wang Jing East Road  
 Chao Yang District  
 Beijing, 100102, P. R. China  
 Phone: +86 10 8499 5891  
 FCC Registration Number: 402854  
 IC Registration Number: 109AW-1

Tests Performed By: ADR Testing Service  
 Location Code: ADR LV  
 Motorola Mobility Inc  
 Product Safety and Compliance Group  
 600 North US Hwy 45  
 Libertyville, IL 60048  
 FCC Registration Number: 316588  
 Industry Canada Number: 109O-1

Tests Requested By: Motorola Mobility, Inc.  
 600 North US Hwy 45  
 Libertyville, IL 60048  
 United States

Product Type: Cellular phone

Signaling Capability: WCDMA 1900/850/2100/1700, GSM  
 1900/850/900/1800, LTE Band 04/Band 17,  
 HSDPA, HSUPA, GPS/aGPS, Bluetooth  
 LE+EDR, 802.11n/802.11b/802.11g/802.11a

IMEI: 356453040032470

FCC ID: IHDP56MB4

IC ID: 109O-P56MB4

Project number: 24934-1

Testing Complete Date: 2012-03-29

## Applicable Standards

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

- Part 15 Subpart C – Intentional Radiators
- Part 22 Subpart H - Public Mobile Services
- Part 24 - Personal Communications Services
- Part 27 - Wireless Communications Service
- Part 90 - Private Land Mobile Radio Service

Applicable Standards: ANSI C63.4-2003, RSS-GEN, RSS-210 (Bluetooth).

KDB 558074(2005), "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems" published by the Federal Communications Commission was also used in the testing of this product.

The following tests were performed according to the regulations:

- The **spurious radiated emission** requirements of § **15.247(d) of CFR47 Part 15 2006**, specifically" radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
- Under this project only 30 to 1000 Hz, 1 to 26.5 GHz radiated emissions and radiated band-edge measurements were performed.
- For frequencies below 1 GHz a 100 kHz RBW (6 dB) is used and above 1 GHz a 1 MHz RBW (6 dB) is used.

**Summary of Testing**

Test	Test Name	Pass/Fail
1	Field Strength of Spurious Emissions	Pass
2	Band-edge Compliance of RF Radiated Emissions	Pass

Test	Test Name	Results
1	Field Strength of Spurious Emissions	See plots
2	Band-edge Compliance of RF Radiated Emissions	See plots

The margin with respect to the limit is the minimum margin for all modes and bands.

**General and Special Conditions**

The Product utilizes an internal battery that is not removable. Where a battery could not be used due to the need for a controlled variation of input voltage, an external power supply was utilized.

All testing was done in an indoor controlled environment with an average temperature of 25 ° C ± 1 ° C and relative humidity of 45 % ± 6 % over the dates used for testing.

## Equipment and Cable Configurations

The test sample was tested in a stand-alone configuration that is representative of typical use.

## Measuring Equipment and Calibration Information

Equipment related to the semi-anechoic chamber testing:

Equipment	Model/type	Serial number	Operational range	Date of calibration
EMI analyzers	ESU 40	100036	20 Hz – 40 GHz	11.11.2011
Pre Amplifiers	PA-02-0001:	2007343	(10 kHz – 3 GHz)	07.04.2011
	PA-02-218	2007344	3 GHz – 18 GHz	07.04.2011
	PA-02-5	2007345	18 GHz – 40 GHz	07.04.2011
Radio com. Tester	CMU 200	112790	GSM 850/900/1800/1900 IS95, UMTS, CDMA, Bluetooth	No Need Calibration*
Band Reject Filter	WRCD	N/A	GSM 850/900/1800/1900 IS95, UMTS, CDMA	N/A
	4N45-24241/3/6	N/A	WLAN	N/A

\*Note: it is only used for communication connection during testing, not the measuring device.

The antennas used in the various tests are listed in the below table.

Antenna	Type	Serial number	Operational range	Date of calibration
Hybrid-log periodic	TDK HLP 3003C	130361	30 MHz – 3 GHz	11.14.2011
Double ridged Horn	TDK HRN0118	130303	1 GHz – 18 GHz	01.22.2011
Double ridged Horn	ETS HRN3116	00071938	18 GHz – 40 GHz	07.13.2011

Note that the hybrid antenna and horn antenna are on a three-year calibration cycle. All other equipments are on a one-year calibration cycle.

LV equipment list

Manufacturer	Equipment	Model/type	Serial number	Date of calibration
ETS	Loop Antenna	6507	00049471	12/13/11
Rohde & Schwarz	Receiver	ESU 40	100286	07/13/11

## **Description of Bluetooth (BT LE) Transmitter**

The Equipment Under Test (EUT) offers Bluetooth LE + EDR as a feature. This report covers Bluetooth LE operation only. The Bluetooth LE + EDR spread-spectrum, is designed to operate between 2400 and 2483.5 MHz. The Bluetooth antenna is mounted inside of the EUT. The antenna installation is permanent. For a more thorough description of the functionality please refer to Exhibit 12 of this package.

As a Bluetooth LE transmitter, it is designed operate with other Bluetooth LE devices as defined by the industrial standard. In this application, the device is battery operated.

## **Measurement Procedures and Data**

### **FIELD STRENGTH OF SPURIOUS EMISSIONS**

CFR Part 2.1053, 15.205, 15.209, 15.247

#### **Measurement Procedure**

The test sample is placed inside the semi-anechoic chamber on a polystyrene table at the turntable center. For each spurious frequency, the antenna mast is raised and lowered from 1 to 4 meters and the turntable is rotated 360 degrees to obtain a maximum reading on the spectrum analyzer. This is repeated for both horizontal and vertical polarizations of the receive antenna.

For 30 MHz – 18 GHz:

Field Strength (dB $\mu$ V/m) = EMI Receiver Level (dB $\mu$ V) + Cable Loss (dB) - Amplifier Gain (dB) + Filter loss (dB) + Antenna Correction Factor (3/m)

For 18 GHz – 26.5 GHz:

Field Strength (dB $\mu$ V/m) = EMI Receiver Level (dB $\mu$ V) + Cable Loss (dB) - Amplifier Gain (dB) + Filter loss (dB) + Antenna Correction Factor (1/m)

For frequencies below 1GHz, using the following spectrum analyzer setting:

1. Detector Mode = Peak/QP
2. For Peak detector, RBW=100 kHz (6dB), VBW=Auto; For QP detector, RBW=120 kHz (6dB), VBW=Auto.

For frequencies below 1GHz, using the following spectrum analyzer setting:

1. Detector Mode = Peak/AV
2. For Peak detector, RBW=1 MHz (6dB), VBW=Auto; For AV detector, RBW=1 MHz (6dB), VBW=Auto.

A fully charged battery was used for the supply voltage.

#### **The EUT was operated during the measurements under the following conditions:**

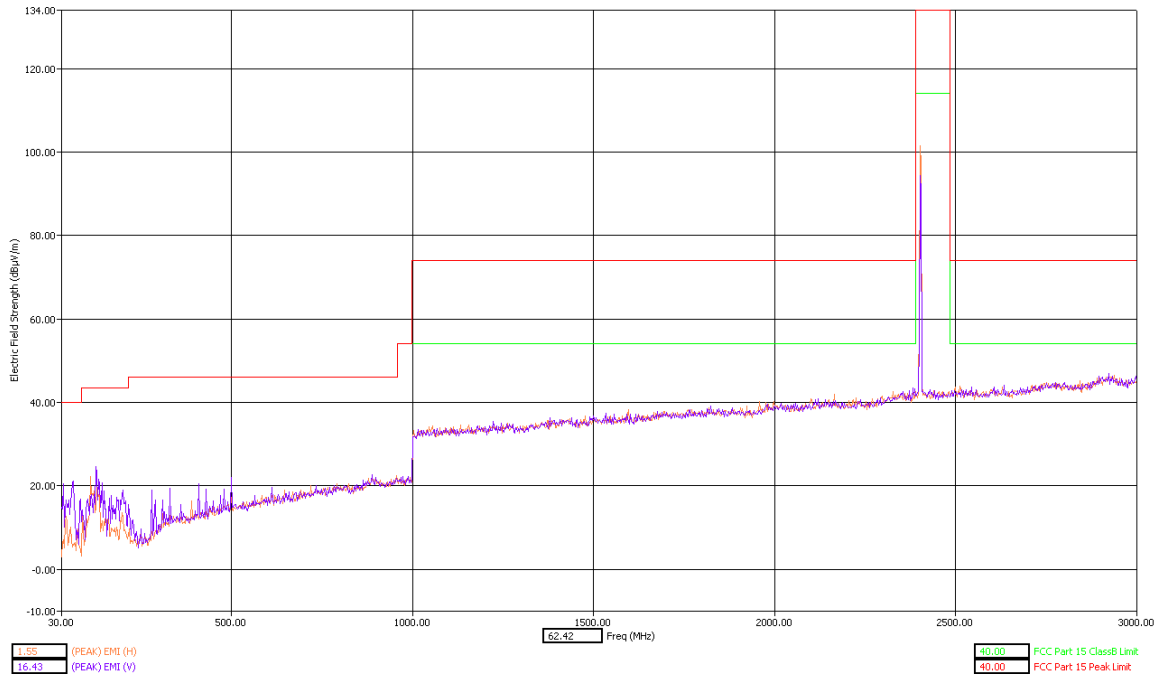
- Tests were performed at low, mid and high channels.
- Tests were performed in both horizontal and vertical polarity.
- Tests were performed in X, Y and Z polarizations.

## **Measurement Results**

All tests were done in Bluetooth version 4.0 Low Energy mode.  
For peak emissions detected above 1 GHz, only those emissions that are higher than the AVG limit line plus 8 dB are selected for final emission analysis.  
Radiated emissions were measured from 9 kHz to 30 MHz and all emissions were 20 dB below the limit.

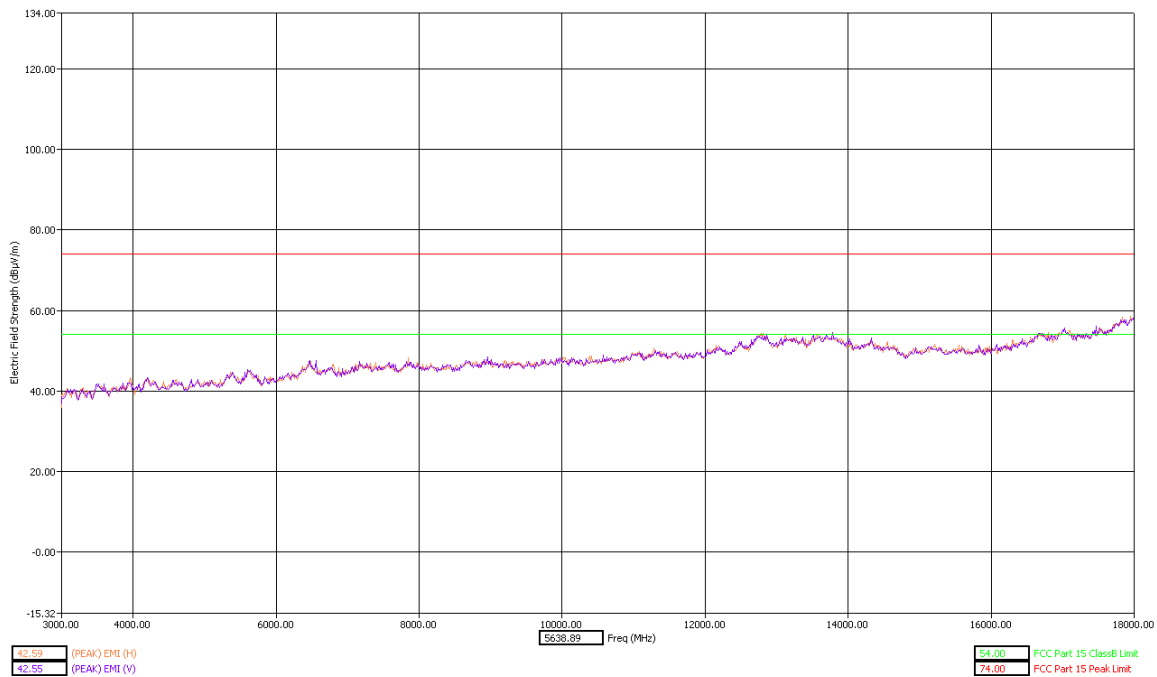
All three orthogonal planes were investigated and worst results are reported.

Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Jakui Chen  
 EUT type: 24934-1, IMEI:356453040032470  
 EUT condition: HW:P2  
 Date: 3/23/2012  
 Time: 9:08:38 AM  
 Comments: FCC 15.247 (c) (1) Bluetooth (BT) emission in TCH mode.  
 BT LE ch. 00 (2402 MHz) do in test mode. Orientation Z=V  
 HLP 3003C antenna (30 MHz - 3 GHz).  
 HRN 0118 antenna (3 GHz-18 GHz).  
 Peak detector used.



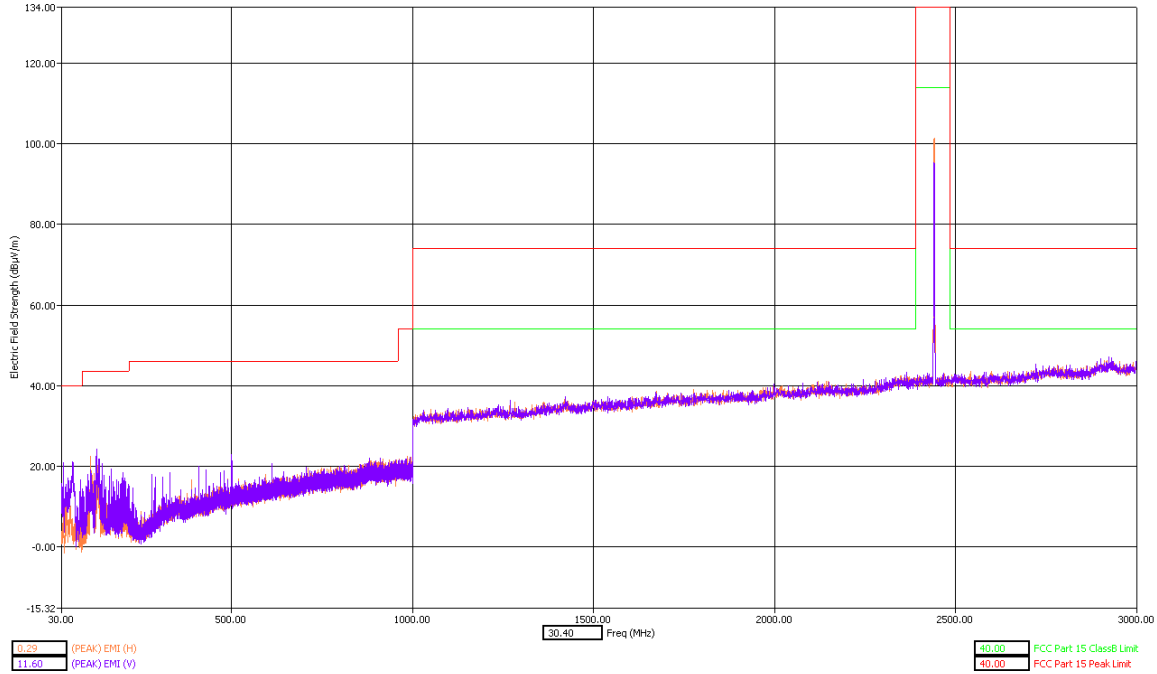
**30 MHz – 3 GHz Low Channel Dual Polarization Z**

Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Hongchi Sun  
 EUT type: 23934, IMEI:268435458115085125  
 EUT condition: HW:P2.5  
 Date: 3/23/2012  
 Time: 1:17:22 PM  
 Comments: FCC 15.247 (c) (1) Bluetooth (BT) emission in TCH mode.  
 BT LE ch. 0 (2402 MHz) do in test mode. Orientation Z=V  
 HLP 3003C antenna (30 MHz - 3 GHz).  
 HRN 0118 antenna (3 GHz-18 GHz).  
 Peak detector used.



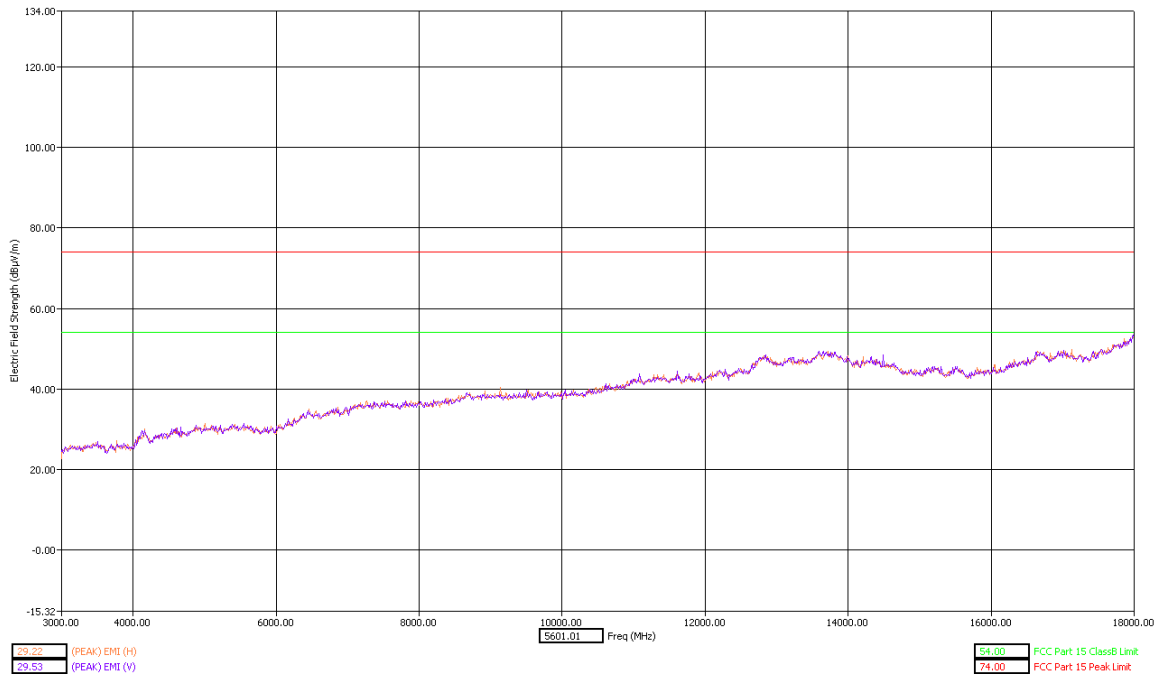
**3 GHz – 18 GHz Low Channel Dual Polarization Z**

Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Jakui Chen  
 EUT type: 24934-1, IMEI:356453040032470  
 EUT condition: HW:P2  
 Date: 3/23/2012  
 Time: 9:28:34 AM  
 Comments: FCC 15.247 (c) (1) Bluetooth (BT) emission in TCH mode.  
 BT LE ch. 19 (2440 MHz) do in test mode. Orientation Z=V  
 HLP 3003C antenna (30 MHz - 3 GHz).  
 HRN 0118 antenna (3 GHz-18 GHz).  
 Peak detector used.



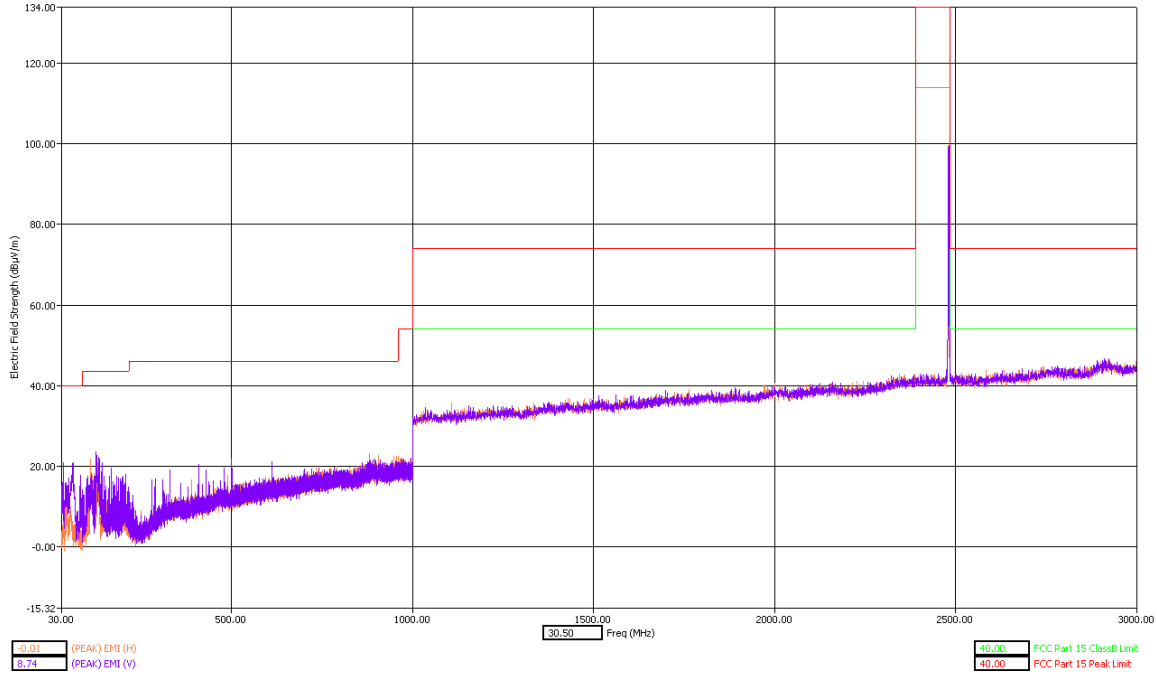
### 30 MHz – 3 GHz Middle Channel Dual Polarization Z

Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Hongchi Sun  
 EUT type: 23934, IMEI:268435458115085125  
 EUT condition: HW:P2.5  
 Date: 3/23/2012  
 Time: 2:28:09 PM  
 Comments: FCC 15.247 (c) (1) Bluetooth (BT) emission in TCH mode.  
 BT ch. 19 (2440 MHz) do in test mode. Orientation Z=V  
 HLP 3003C antenna (30 MHz - 3 GHz).  
 HRN 0118 antenna (3 GHz-18 GHz).  
 Peak detector used.



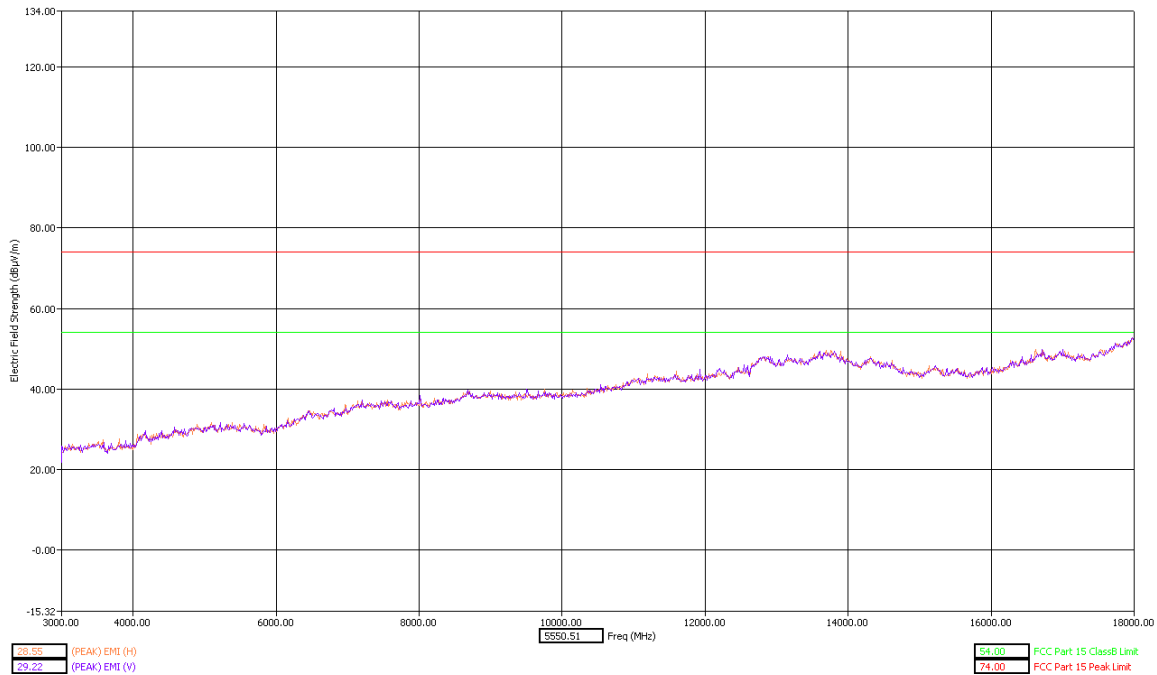
### 3 GHz – 18 GHz Middle Channel Dual Polarization Z

Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Jakui Chen  
 EUT type: 24934-1, IMEI:356453040032470  
 EUT condition: HW:P2  
 Date: 3/23/2012  
 Time: 9:39:55 AM  
 Comments: FCC 15.247 (c) (1) Bluetooth (BT) emission in TCH mode.  
 BT LE ch. 39 (2480 MHz) do in test mode. Orientation Z=V  
 HLP 3003C antenna (30 MHz - 3 GHz).  
 HRN 0118 antenna (3 GHz-18 GHz).  
 Peak detector used.



**30 MHz – 3 GHz High Channel Dual Polarization Z**

Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Hongqi Sun  
 EUT type: 23934, IMEI:268435458115085125  
 EUT condition: HW:P2.5  
 Date: 3/23/2012  
 Time: 2:43:23 PM  
 Comments: FCC 15.247 (c) (1) Bluetooth (BT) emission in TCH mode.  
 BT ch. 39 (2480 MHz) do in test mode. Orientation Z=V  
 HLP 3003C antenna (30 MHz - 3 GHz).  
 HRN 0118 antenna (3 GHz-18 GHz).  
 Peak detector used.



**3 GHz – 18 GHz High Channel Dual Polarization Z**

**There were no discernible emissions above the noise floor for 18 - 26.5 GHz for Low, Mid and High Channels and all polarizations in Bluetooth band.**

## **BAND-EDGE COMPLIANCE OF RF RADIATED EMISSIONS**

CFR Part 15.247

### **Measurement Procedure**

The test sample is placed inside the semi-anechoic chamber on a polystyrene table at the turntable center. Test is repeated for both horizontal and vertical polarizations of the receive antenna.

For 30 MHz – 18 GHz:

Field Strength (dB $\mu$ V/m) = EMI Receiver Level (dB $\mu$ V) + Cable Loss (dB) - Amplifier Gain (dB) + Filter loss (dB) + Antenna Correction Factor (3/m)

For 18 GHz – 26.5 GHz:

Field Strength (dB $\mu$ V/m) = EMI Receiver Level (dB $\mu$ V) + Cable Loss (dB) - Amplifier Gain (dB) + Filter loss (dB) + Antenna Correction Factor (1/m)

For Band-edge radiated Emission test, using the following spectrum analyzer setting:

1. Detector Mode = Peak/AV
2. For Peak detector, RBW=1 MHz (6dB), VBW=10 kHz; For AV detector, RBW=1 MHz (6dB), VBW=10 kHz.

The EUT was operated in Bluetooth single channel test mode. A fully charged battery was used for the supply voltage.

### **Measurement Results**

Comments:

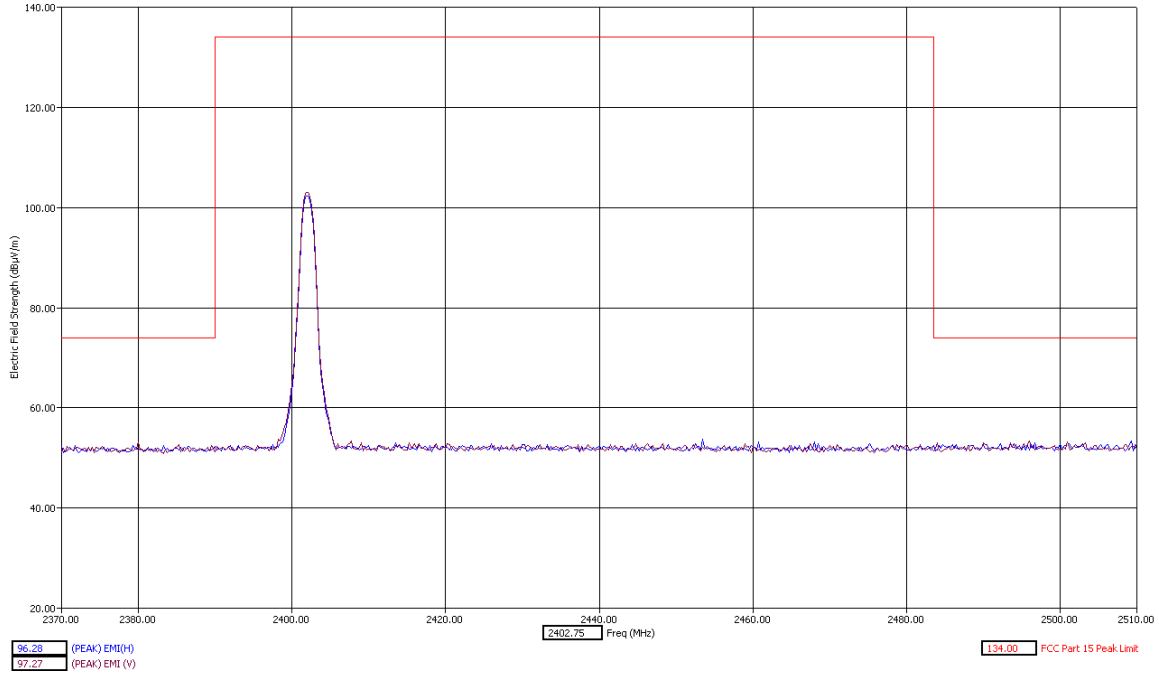
All tests were done in Bluetooth version 4.0 Low Energy mode.

The band edge measurements crossing the corner for the low/high channel with respect to the average limit line is acceptable when applying the FCC rule specified in CFR 47 part 15.35(b) for the use of peak detector above 1 GHz. The peak detector limit line and the average detector limit have been added to the graphical plots.

The peak detector limit line has been added to the graphical plots.

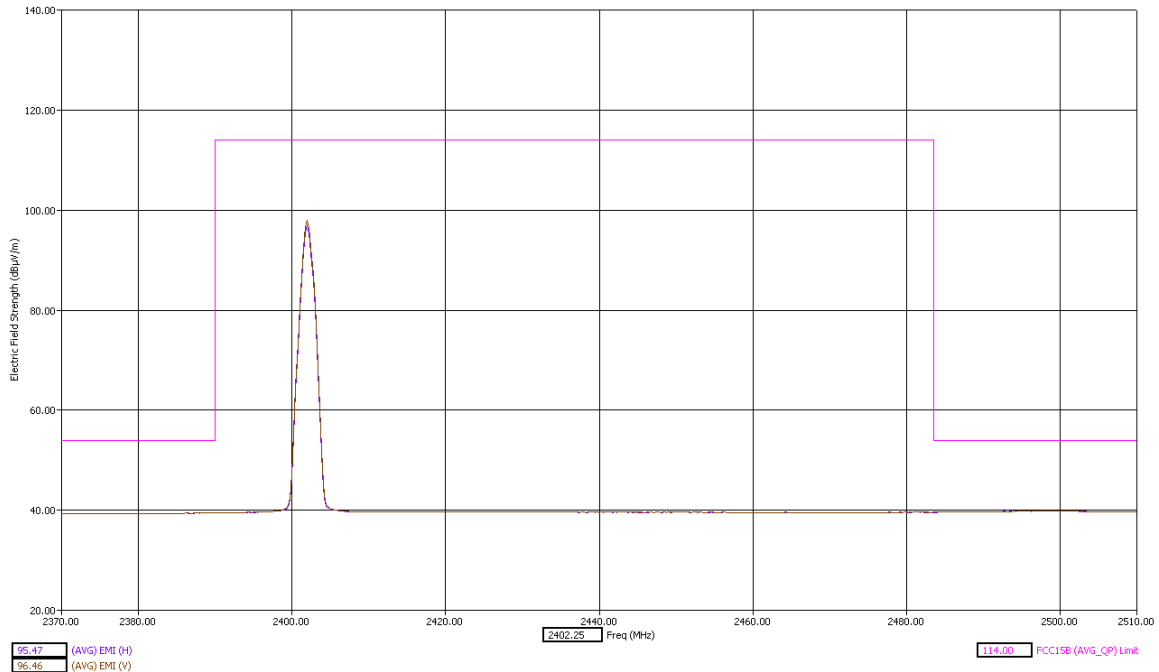
See Attached:

Test title: FCC 15.205, 15.209, 15.247  
Operator name: Jakui Chen  
EUT type: 24934-1, IMEI:356453040032470  
EUT condition: HW-P2  
Date: 3/29/2012  
Time: 9:15:58 AM  
Comments: FCC 15.247 (c) (1) BT LE emission in TCH mode.  
BT LE ch. 0 (2402 MHz) do in test mode. Orientation Z=v  
HLP 3003C antenna (30 MHz ~ 3 GHz).  
HRN 0118 antenna (3GHz-19GHz).  
Peak detector used.



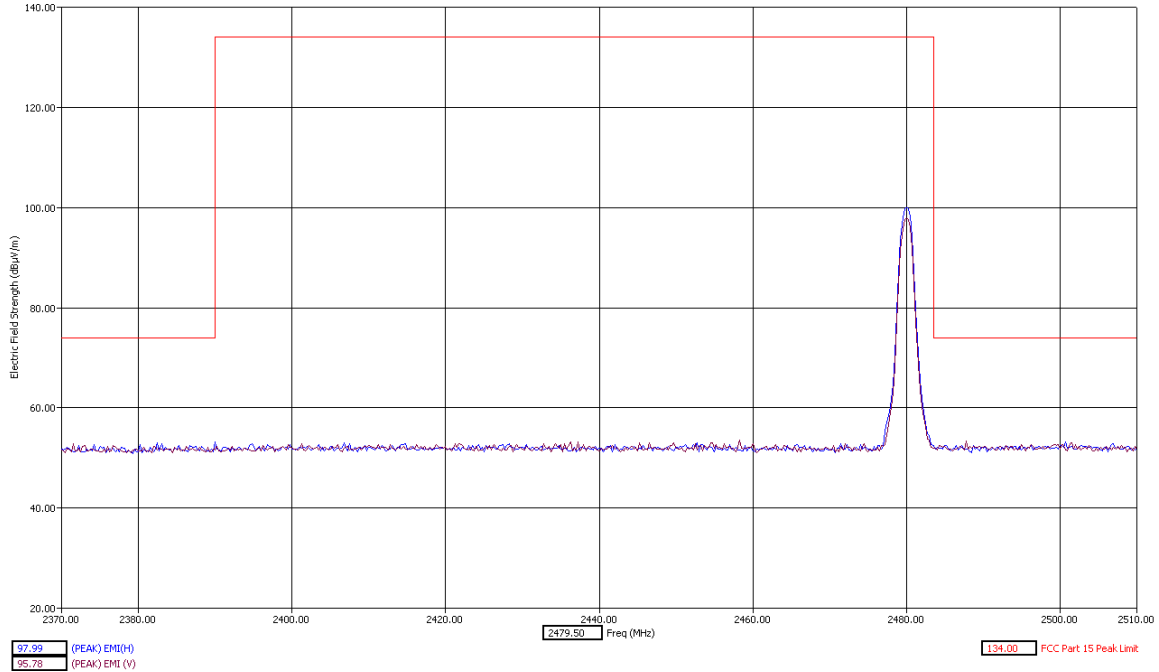
**Authorized Band Emissions Low Channel Dual Polarization Z (Peak Detector)**

Test title: FCC 15.205, 15.209, 15.247  
Operator name: Jakui Chen  
EUT type: 24934-1, IMEI:356453040032470  
EUT condition: HW-P2  
Date: 3/29/2012  
Time: 9:15:58 AM  
Comments: FCC 15.247 (c) (1) BT LE emission in TCH mode.  
BT LE ch. 0 (2402 MHz) do in test mode. Orientation Z=v  
HLP 3003C antenna (30 MHz ~ 3 GHz).  
HRN 0118 antenna (3GHz-19GHz).  
AVG detector used.



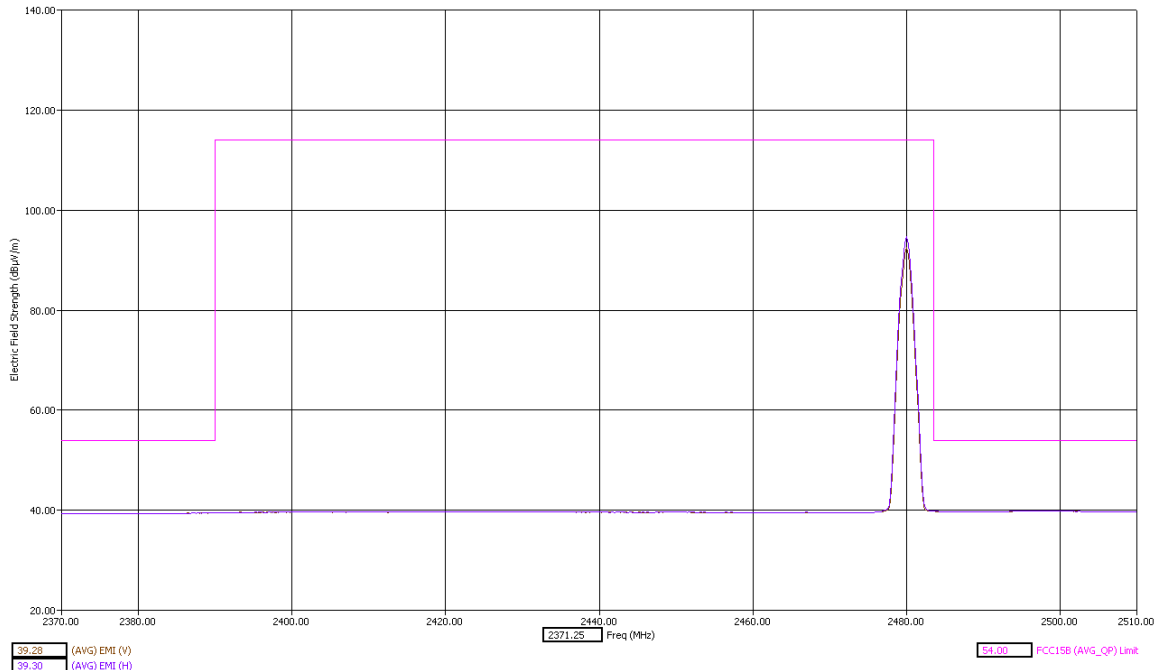
**Authorized Band Emissions Low Channel Dual Polarization Z (Average Detector)**

Test title: FCC 15.205, 15.209, 15.247  
Operator name: Jakui Chen  
EUT type: 24934-1, IMEI:356453040032470  
EUT condition: HW-P2  
Date: 3/29/2012  
Time: 9:49:27 AM  
Comments: FCC 15.247 (c) (1) BT LE emission in TCH mode.  
BT LE ch. 39 (2480 MHz) do in test mode. Orientation Z=w  
HLP 3003C antenna (30 MHz - 3 GHz).  
HRN 0118 antenna (3GHz-19GHz).  
Peak detector used.



**Authorized Band Emissions High Channel Dual Polarization Z (Peak Detector)**

Test title: FCC 15.205, 15.209, 15.247  
Operator name: Jakui Chen  
EUT type: 24934-1, IMEI:356453040032470  
EUT condition: HW-P2  
Date: 3/29/2012  
Time: 9:49:27 AM  
Comments: FCC 15.247 (c) (1) BT LE emission in TCH mode.  
BT LE ch. 39 (2480 MHz) do in test mode. Orientation Z=w  
HLP 3003C antenna (30 MHz - 3 GHz).  
HRN 0118 antenna (3GHz-19GHz).  
AVG detector used.



**Authorized Band Emissions High Channel Dual Polarization Z (Average Detector)**

## **End of Test Report**