



## PRODUCT SAFETY AND COMPLIANCE EMC LABORATORY

### EMC TEST REPORT - Addendum

**Test Report Number** –24974-1 Bluetooth

**Report Date** – 2012-04-13

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: Hongpeng Yin

Title: EMC Project Manager

Test: 2012-03-20 to 2012-04-11

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: 2012-05-06

This report must not be reproduced, except in full, without written approval from this laboratory.

FCC Registration Number: 177885

IC Registration Number: 109AW-1

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



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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 Requested By: Motorola Mobility Inc.  
No. 1 Wang Jing East Road  
Chao Yang District  
Beijing, 100102, P. R. China

Product Type: Cell phone with embedded Bluetooth

Signaling Capability: GSM850/1900, EDGE850/1900, WCDMA  
850/1700, Bluetooth, 802.11b/802.11g/802.11n

HEX: A000002C98F7E8

FCC ID: IHDT56NH4

Project number: 24974-1

Testing Complete Date: 2012-03-31

## **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).

KDB558074, "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 test sample was tested using a fully charged embedded battery when applicable. 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	N/A
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

The antennas used in the various tests are listed in the below table. The log-periodic antenna is used as communication and link establishment antenna for Bluetooth.

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
Active Loop Antenna	FMZB1513	1513-105	9 kHz – 30 MHz	04.01.2012

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.

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

The 24974-1 fitness device sample offers Bluetooth as a feature. The Bluetooth spread-spectrum, frequency hopping transceiver is designed to operate between 2400 and 2483.5 MHz. The antenna installation is permanent. For a more thorough description of the functionality please refer to Exhibit 12 of this package.

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

There is a switch in the Bluetooth/WLAN (BT/WiFi) module that switches between BT and WiFi. They share the same antenna, and you are able to use a BT headset while in a WiFi VoIP call, however, they do not transmit and receive at the same time. There is a 20 ms delay (for switching between the two systems in time domain) using an intelligent multiplexing scheme. Even though they share the same antenna they are NOT ON at the same time. The BT is therefore tested as a standalone transmitter.

The Equipment Under Test (EUT) offers Bluetooth LE+EDR as feature. Bluetooth LE is designed to operate from 2400-2483.5 MHz

## 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)

A fully charged battery was used for the supply voltage.

**The test sample 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**

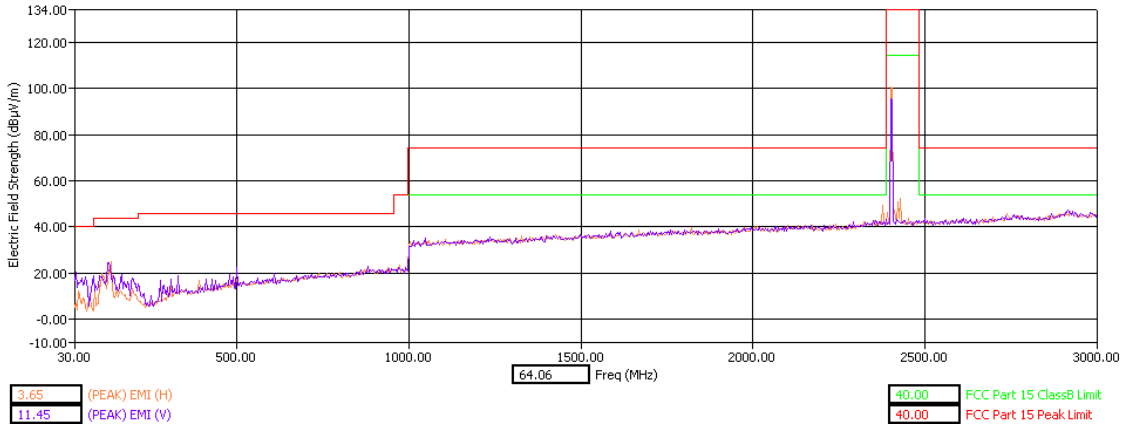
All tests were done in Bluetooth version 4.0 Low Energy mode.

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.

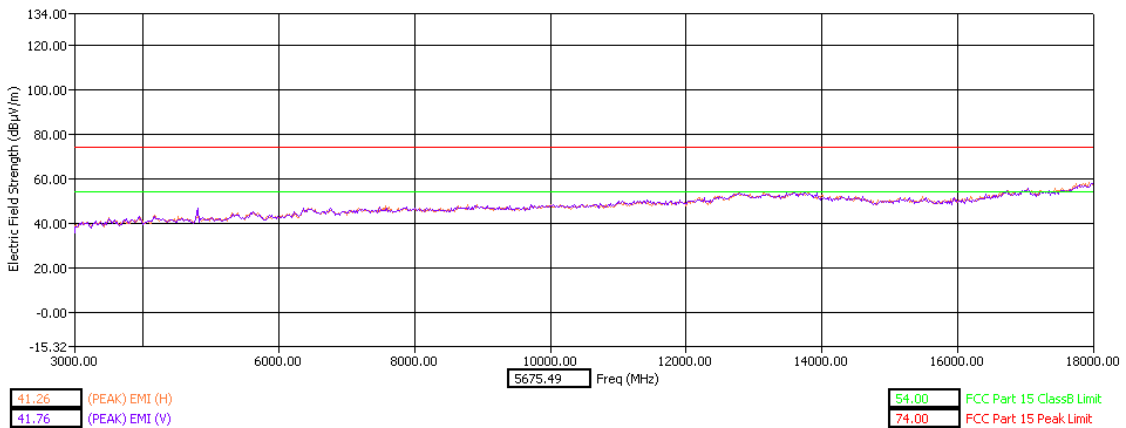
Only the worst field strength of spurious emissions for each channel is displayed for Bluetooth.

Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Jiakui Chen  
 EUT type: 24965-1, HEX:A000002C98F7E8  
 EUT condition: HW:P2B  
 Date: 3/31/2012  
 Time: 1:19:40 PM  
 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.



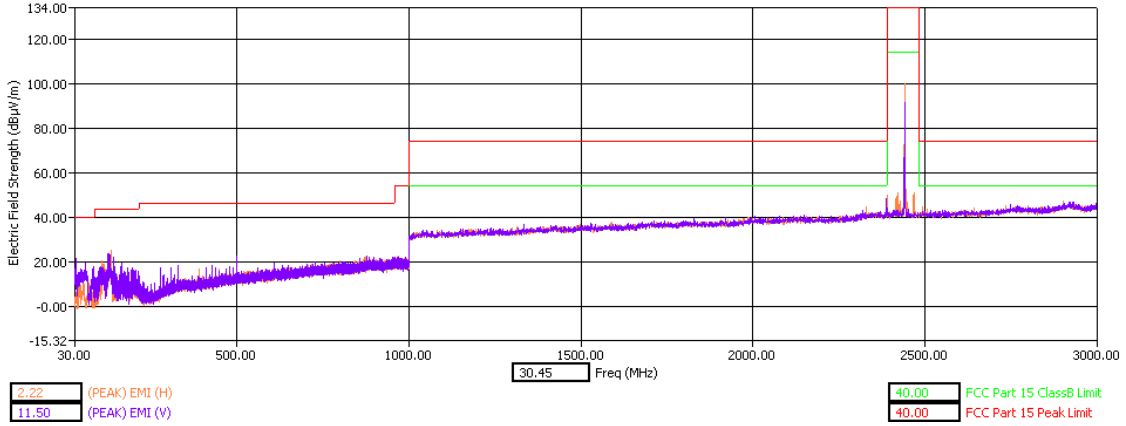
**30 MHz – 3 GHz Low Channel Dual Polarization Z**

Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Hongzhi Sun  
 EUT type: 24965-1, HEX:A000002C98F7E8  
 EUT condition: HW:P2B  
 Date: 4/1/2012  
 Time: 11:33:46 AM  
 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.



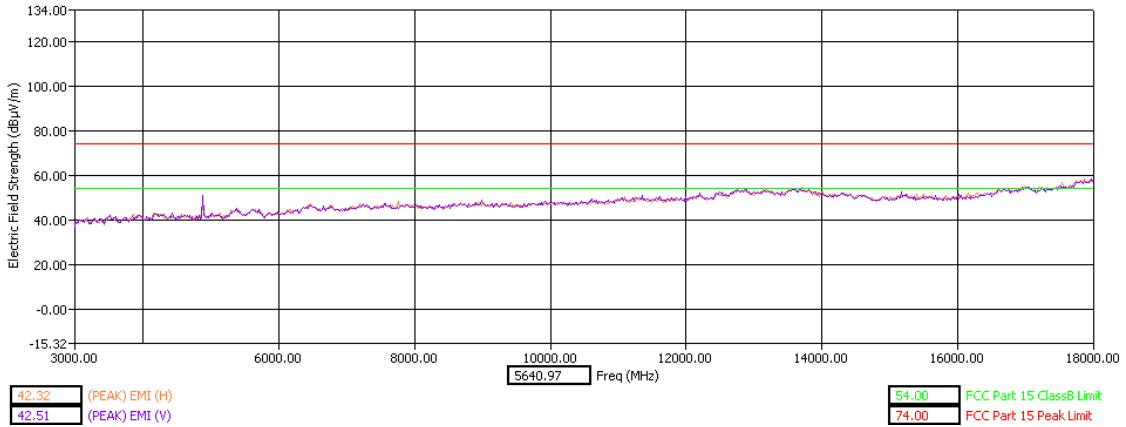
**3 GHz – 18 GHz Low Channel Dual Polarization Z**

Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Jiahui Chen  
 EUT type: 2496S-1, HEX:A000002C98F7E8  
 EUT condition: HW:P2B  
 Date: 3/31/2012  
 Time: 7:58:07 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.



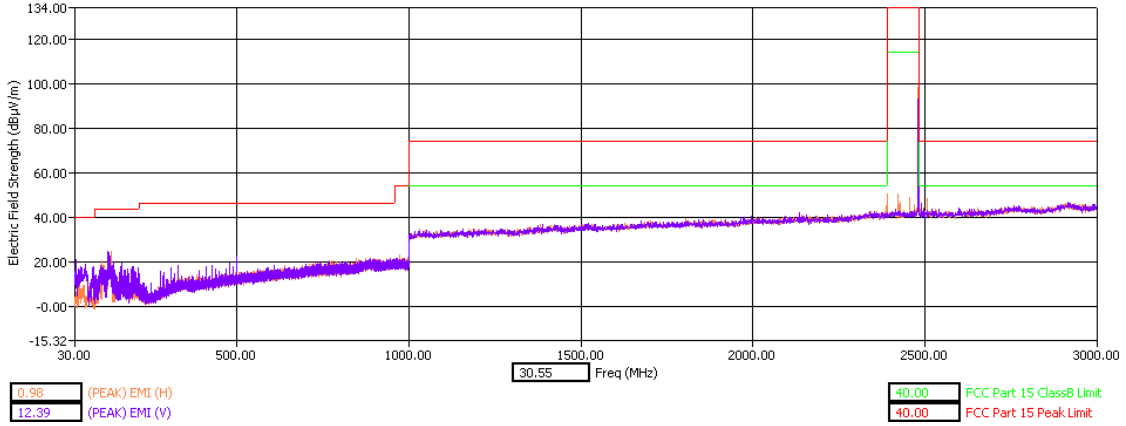
**30 MHz – 3 GHz Middle Channel Dual Polarization Z**

Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Hongzhi Sun  
 EUT type: 2496S-1, HEX:A000002C98F7E8  
 EUT condition: HW:P2B  
 Date: 4/1/2012  
 Time: 11:25:15 AM  
 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.



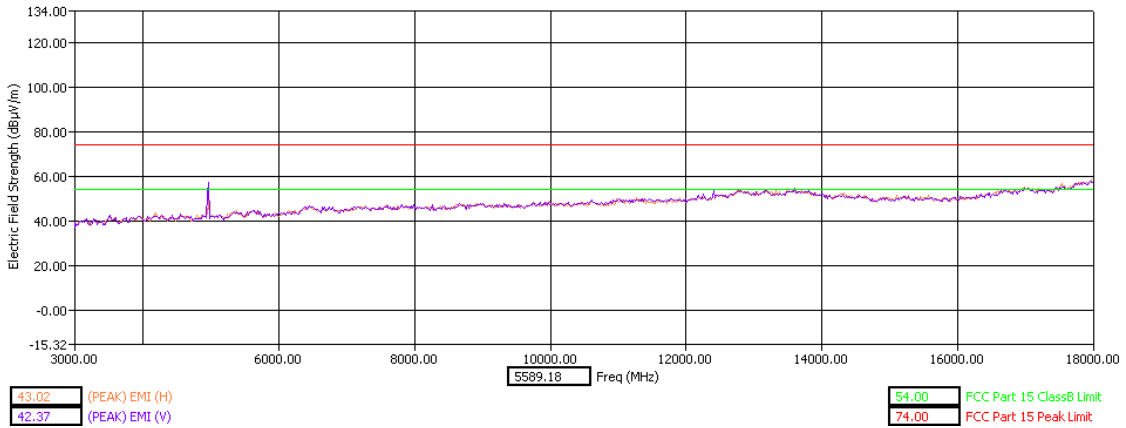
**3 GHz – 18 GHz Middle Channel Dual Polarization Z**

Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Jiahui Chen  
 EUT type: 24965-1, HEX:A000002C98F7E8  
 EUT condition: HW:P2B  
 Date: 3/31/2012  
 Time: 1:27:04 PM  
 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: Hongzhi Sun  
 EUT type: 24965-1, HEX:A000002C98F7E8  
 EUT condition: HW:P2B  
 Date: 4/1/2012  
 Time: 11:16:05 AM  
 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)

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

### **Measurement Results**

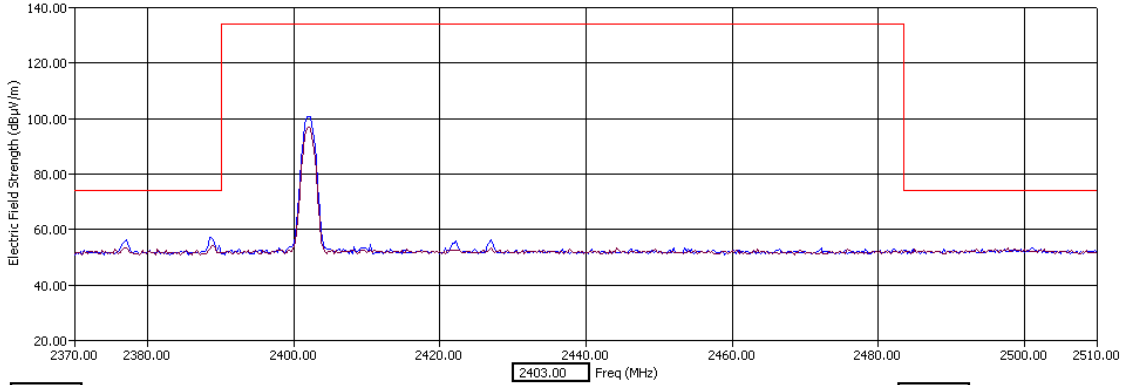
Comments:

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 has been added to the graphical plots.

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

See Attached:

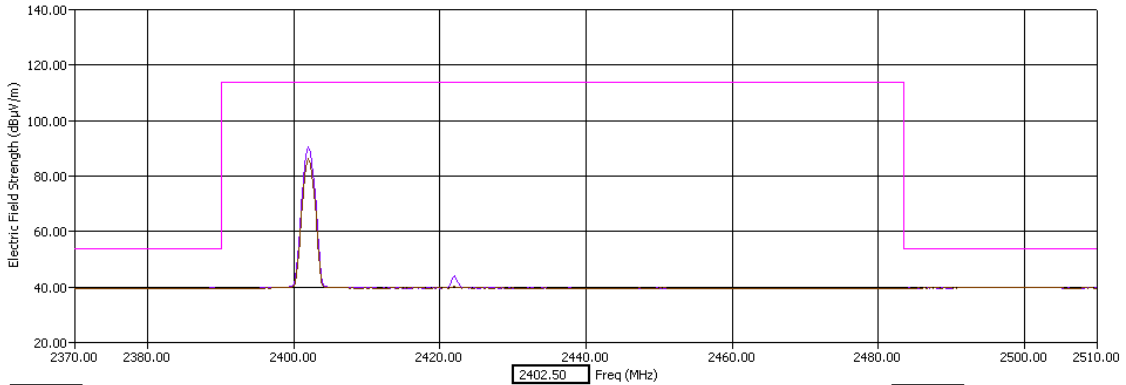
Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Jiakui Chen  
 EUT type: 24965-1, HEX:A000002C98F7E8  
 EUT condition: HW:P2B  
 Date: 3/31/2012  
 Time: 8:06:30 AM  
 Comments: FCC 15.247 (c) (1) BT LE emission in TCH mode.  
 BT LE ch. 0 (2402 MHz) do in test mode. Orientation Z=V  
 HLP 3003C antenna (30 MHz - 3 GHz).  
 HRN 0118 antenna (3GHz-18GHz).  
 AVG detector used.



85.29 (PEAK) EMI(H)  
 81.09 (PEAK) EMI (V)

134.00 FCC Part 15 Peak Limit

Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Jiakui Chen  
 EUT type: 24965-1, HEX:A000002C98F7E8  
 EUT condition: HW:P2B  
 Date: 3/31/2012  
 Time: 8:06:30 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-18GHz).  
 AVG detector used.

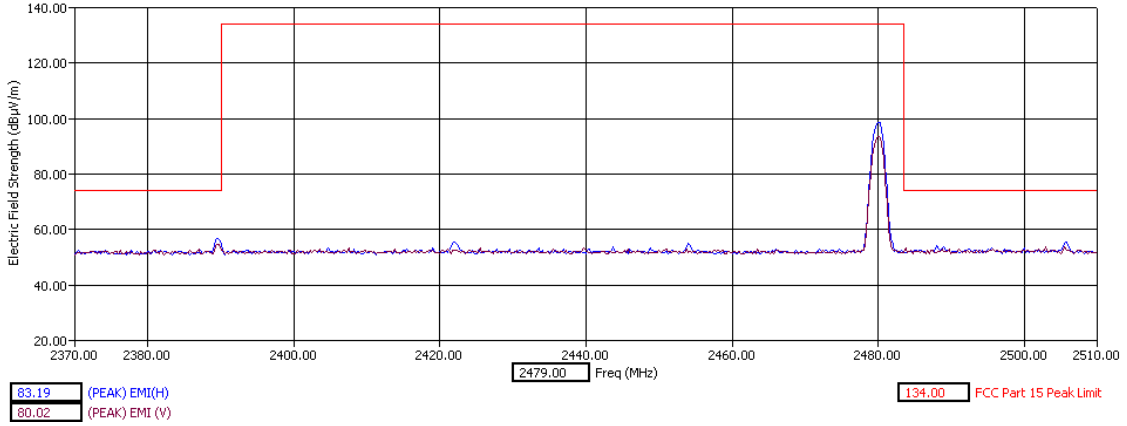


84.65 (AVG) EMI (H)  
 80.50 (AVG) EMI (V)

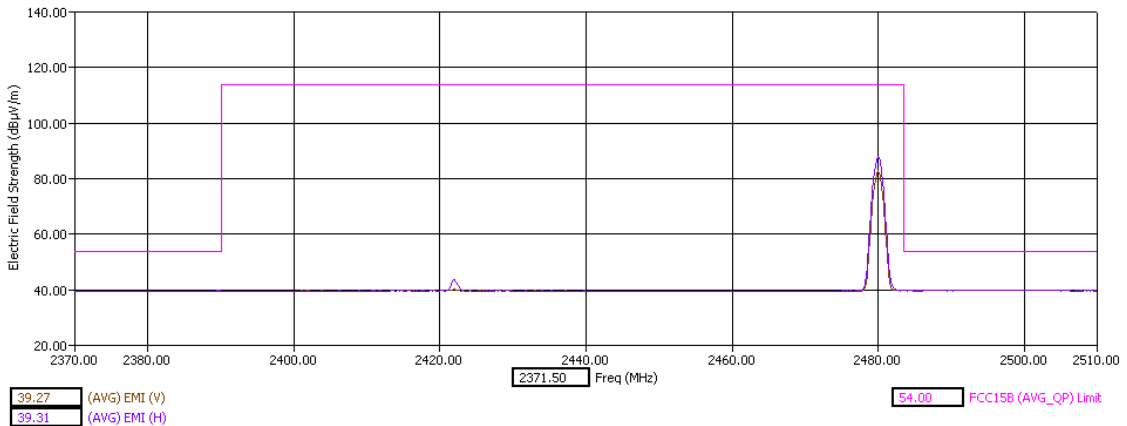
114.00 FCC15B (AVG\_QP) Limit

**Authorized Band Emissions Low Channel Dual Polarization Z**

Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Jiakui Chen  
 EUT type: 24965-1, HEX:A000002C98F7E8  
 EUT condition: HW:P2B  
 Date: 3/31/2012  
 Time: 1:34:59 PM  
 Comments: FCC 15.247 (c) (1) BT LE 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 (3GHz-18GHz).  
 AVG detector used.



Test title: FCC 15.205, 15.209, 15.247  
 Operator name: Jiakui Chen  
 EUT type: 24965-1, HEX:A000002C98F7E8  
 EUT condition: HW:P2B  
 Date: 3/31/2012  
 Time: 1:34:59 PM  
 Comments: FCC 15.247 (c) (1) BT LE 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 (3GHz-18GHz).  
 AVG detector used.



**Authorized Band Emissions High Channel Dual Polarization Z**

**End of Test Report**