(2004)量认(国)字(H2402)号 No.L1659

FCC TEST REPORT

of

Home Gateway

FCC ID: Q78-ZXV10H100 (ZXV10 H100)

Model No.: ZXV10 H100, ZXV10 H110

Serial No.: N.A.

Report No.: FCC06-8039

Date: July 22, 2006

Prepared for

ZTE Corporation

ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park,
Nanshan District, Shenzhen, Guangdong, P.R.China

Prepared by

ShenZhen Electronic Product Quality Testing Center

Electronic Testing Building, Shahe Road, Xili, Nanshan District, ShenZhen, 518055, P.R.China
Tel: 86 755 26627338 Fax: 86 755 26627238

Table of Contents

1 Test Report Certification

Product:	Home Gateway
Model No.:	ZXV10 H100, ZXV10 H110
Applicant:	ZTE Corporation
Applicant Address:	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, P.R.China
Manufacturer:	ZTE Corporation
Manufacturer Address:	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, P.R.China
Test Standards:	47 CFR Part 15, Subpart C
Test Result:	**PASS**

We, Shenzhen Electronic Product Quality Testing Center, hereby certify that the submitted samples of the above item, as detailed in chapter 2.1 of this report, has been tested in our facility. The test record, data evaluation and test configuration represented herein are true and accurate accounts of measurements of the sample's EMC characteristics under the conditions herein specified.

Tested by: Lin Xingsun, Date: Jul 22, 2006
Lin Xingsun

Checked by: Smart Li, Date: Jul 24. 2006
Smart Li

Approved by: Wu Li An, Date: Jul. 24, 2006
Wu Li An

2 General Information

2.1 Description of EUT

Product:	Home Gateway
Model No.:	ZXV10 H100
Operating Frequency:	Bluetooth: 2402MHz – 2480 MHz WLAN: 2412 – 2462 MHz
Rated Power:	Bluetooth: 10mW WLAN:18mW
Serial No.:	N.A.
Power Supply:	d.c. 12V 2.5A
AC/DC adapter:	Model: AD048S110/220-12-A; Input: a.c. 100-240, 1.0A, 50-60Hz; Output: d.c. 12V，2.5A; Manufacturer: Shenzhen Baili Electric Devices Co., Ltd.

NOTE:

1. ZXV10 H100 and ZXV10 H110 are series of products which have the same electric circuit structure and critical components. They differ only on the configuration of I/O ports. According to the requirements of the applicant, FCC tests were performed only on ZXV10 H100 which has the maximum I/O ports configuration. The test results in this report should also represent that of ZXV10 H110.
2. The EUT is a modular access gateway, linking multiple devices through Internet connections. It provides wireless interface (Bluetooth and WLAN) operating at 2.4GHz ISM band.
3. The Bluetooth modulation is Frequency Hopping Spread Spectrum (FHSS). The Channels and transmitter center frequencies are: F(MHz)=2401+1*n, $1 \leqq n \leqq 79$.
4. The WLAN interface of the EUT is compliance to IEEE 802.11b and IEEE 802.11g. The modulations are:

   - WLAN (IEEE 802.11b), Direct Sequence Spread Spectrum (DSSS).
   - WLAN (IEEE 802.11g), Orthogonal Frequency Division Multiplexing (OFDM).

   The Channels and transmitter center frequencies are: F(MHz)=2407+5*n, $1 \leqq n \leqq 11$.
5. Please refer to Appendix I for the photographs of the EUT. For a more detailed features description about the EUT, please refer to User's Manual.

2.2 Objective

Perform EMC test according to FCC rule Part 15 for FCC ID Certification.

2.3 Test Standards and Results

The EUT has been tested according to 47 CFR Part 15, Radio Frequency Devices.

Test items and the results are as bellow:

№	FCC Rules	Test Type	Result
1	§15.207	Conducted Emission (Charger AC mains port)	PASS
2	§15.247(a)	Occupied Bandwidth	PASS
3	§15.247(a)	Carrier Frequency Separation	PASS
4	§15.247(a)	Hopping Sequence	PASS
5	§15.247(a)	Equal Hopping Frequency Use	PASS
6	§15.247(a)	Receiver Input Bandwidth and Hopping Capability	PASS
7	§15.247(a)	Time of Occupancy(Dwell time)	PASS
8	§15.247(b)	Peak Output Power	PASS
9	§15.247(b)	Antenna Requirements	PASS
10	§15.247(b)	RF Exposure Evaluation	PASS
11	§15.247(c)	Band Edge	PASS
12	§15.247(c) §15.209	Radiated Spurious Emission	PASS
13	§15.247(d)	Power Spectrum Density	PASS

2.4 List of Test Equipments Used

Description	Manufacturer	Model No.	Cal. Due Date	Serial No.
Test Receiver	Schwarzbeck	FCKL1528	2007.06.05	A0304230
Test Receiver	Rohde & Schwarz	ESIB26	2007.06.05	A0304218
Spectrum Analyzer	Rohde & Schwarz	FSP13	2006.12.25	M-030176
LISN	Schwarzbeck	NSLK8127	2007.06.05	A0304233
Ultra Broadband Ant.	Rohde & Schwarz	HL562	2007.06.05	A0304224
Horn Ant.	Rohde & Schwarz	HF906	2007.06.05	100150
Shield Room	Nanbo Tech	Site 3	2007.03.18	A9901141
Shield Room	Nanbo Tech	Site 1	2007.01.17	A0304188
Anechoic Chamber	Albatross	EMC12.8×6.8×6.4(m)	2007.04.10	A0304210

2.5 Test Facility

Shenzhen Electronic Product Quality Testing Center (SET) is a third party testing organization accredited by China National Accreditation Board for Laboratories (CNAL) according to ISO/IEC 17025. The accreditation certificate number is **L1659**.

The EMC chamber site No.1 (EMC12.8×6.8×6.4(m)), and the radiated and conducted Emission test equipments of SET are constructed and calibrated to meet the FCC requirements ANSI C63.4:2001 and CISPR 22/EN 55022. The FCC Registration Number is **261302**.

The EMC chamber site No.1 (EMC12.8×6.8×6.4(m)) also complies with Canada standard RSS 212, and acceptable to Industry Canada for the performance of radiated measurements. The Industry Canada Registration Number is **IC 5915**.

2.6 Environmental conditions

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

- Temperature: 15-35ºC
- Humidity: 30-60 %
- Atmospheric pressure: 86-106 kPa

3 Conducted Emission Test

3.1 Limits of Conducted Emission

According to FCC §15.207, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dBμV), Class B digital device	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

NOTE:

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

3.2 Test Procedure

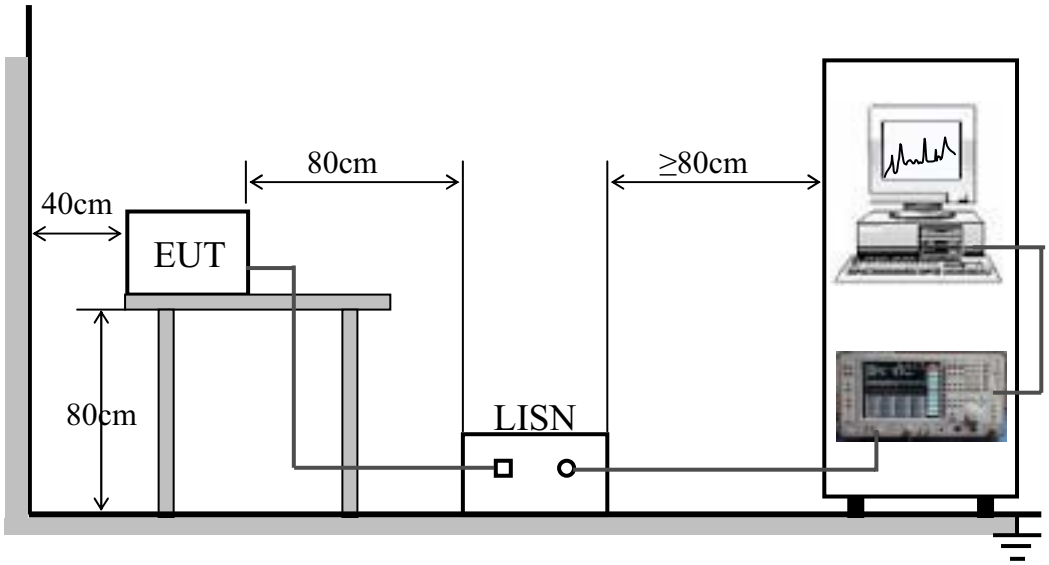
a. The EUT was placed on a 0.8m high insulating table and kept 0.4 meters from the conducting wall of shielded room.

b. The EUT was connected to the power mains through a line impedance stabilization network (LISN). The LISN provide 50Ω/50μH of coupling impedance for the measuring instrument.

c. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

d. The frequency range from 150 kHz to 30 MHz was searched using CISPR Quasi-Peak and Average detector.

3.3 Test Setup



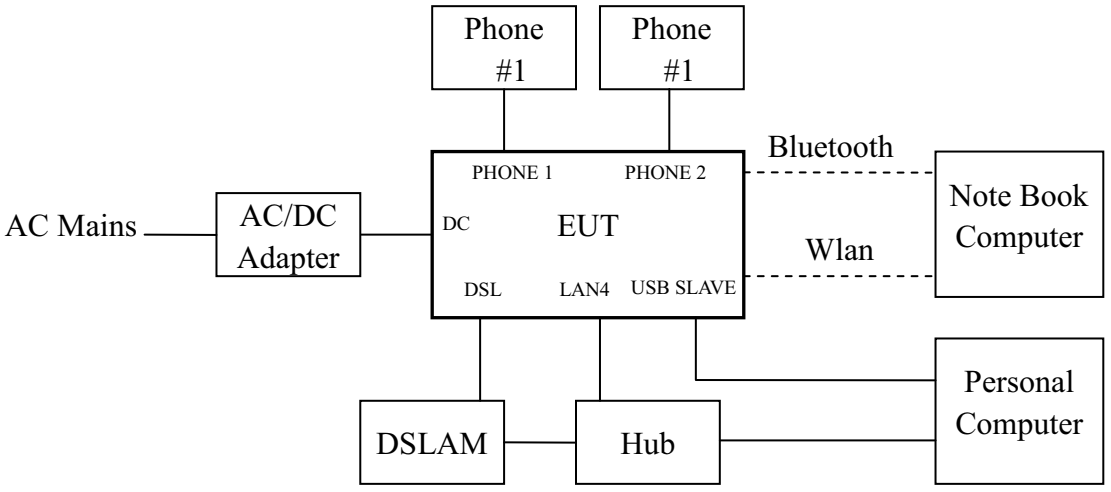
For the actual test configuration, please refer to the related item - Photographs of the Test Configuration.

3.4 EUT Setup and Operating Conditions

The EUT together with the AC/DC adapter was powered by 120V AC Mains.

A note book computer served as a companion equipment to establish wireless communication links with the EUT. A DSLAM, a Hub, a PC and two phones were used to establish DSL, Ethernet, and telephone connections. During the test, all connections were active. Operating at full load, the EUT was at the worst case of EMI emission.

The configuration of the EUT was as the following figure.



The auxiliary equipments were listed bellow.

Auxiliary Equipments	Model	Serial No.	Manufacture
DSLAM	ZXDSL 9806	/	ZTE
Hub	TL-SF1008D	05204301770	TP-LINK
Note Book Computer	2668	2668CC2	IBM
Personal Computer	M6400	/	Lenovo
PC Monitor	/	/	Shenzhen Jizhan
Phone #1	HA-8000P	0081829	Siemens
Phone #1	HA-8000P	0081800	Siemens
Bluetooth Adapter	/	/	/

3.5 Test Results

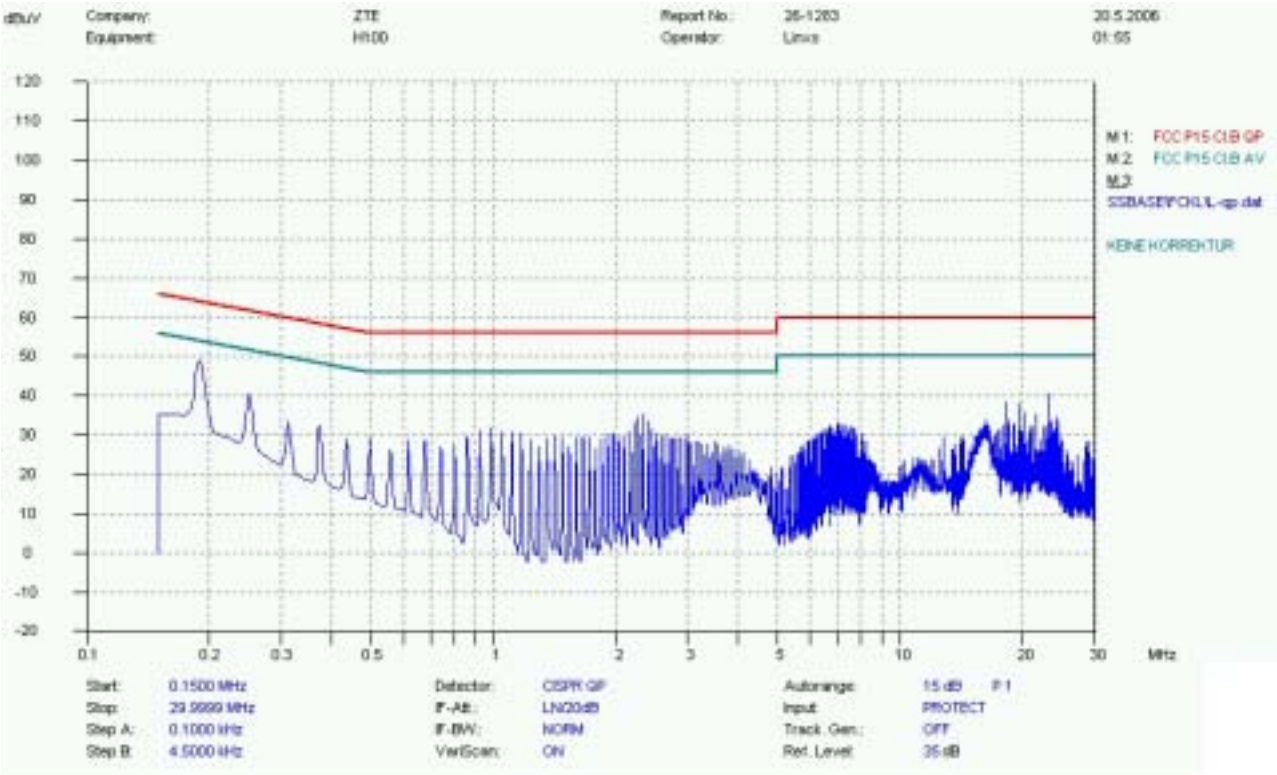
No.	Freq. (MHz)	Limit Value (dBμV)		Emission Level (dBμV)	
		QP	AV	QP	AV
1	0.1905	64.0	54.0	49.3	--
2	0.2490	61.8	51.8	40.4	--
3	0.3120	59.9	49.9	33.6	--
4	2.3325	56.0	46.0	35.4	--
5	7.1745	60.0	50.0	32.9	--
6	23.1360	60.0	50.0	40.5	--

NOTE:

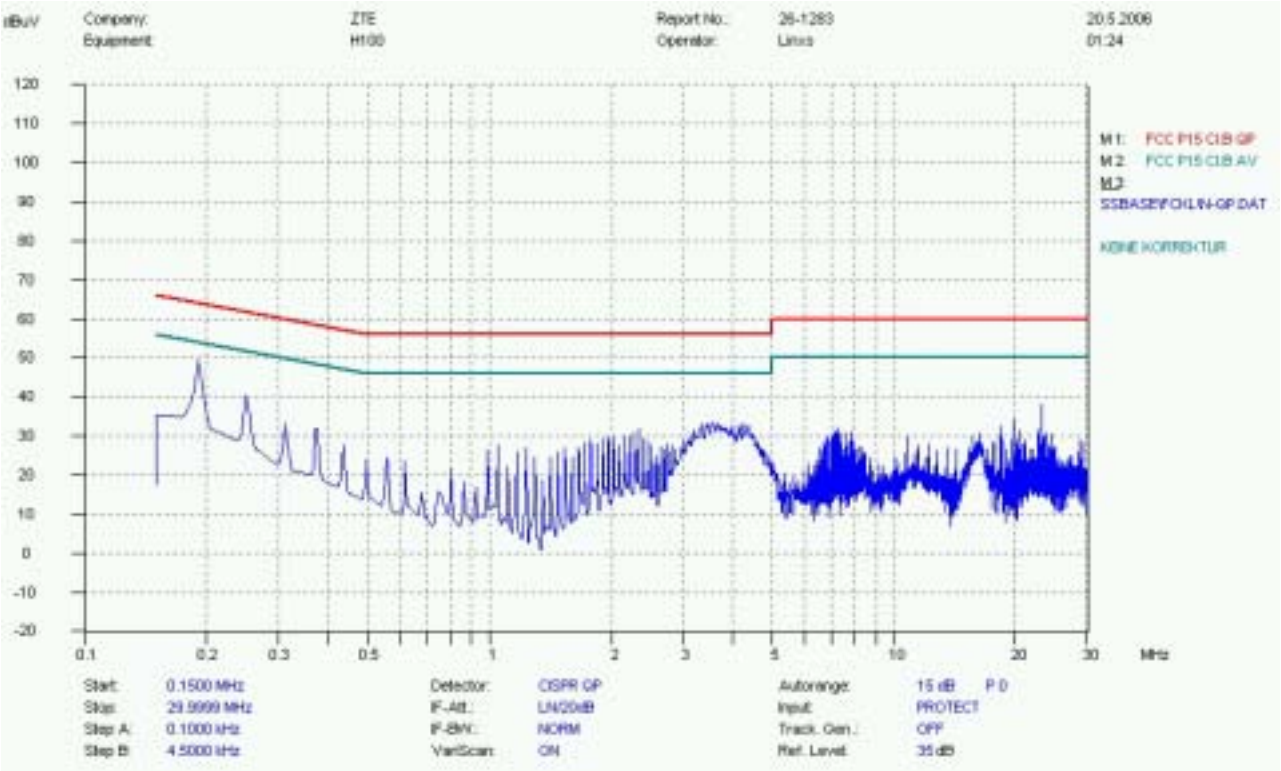
1. QP and AV are abbreviations of the quasi-peak and average individually.
2. If the emission levels measured with QP detector are lower than AV limits, there is unnecessary to measure with AV detector.
3. The emission levels recorded above is the larger ones of both L phase and N phase.

Conducted Emission Test Plots

1. Mains terminal disturbance voltage, L phase



2. Mains terminal disturbance voltage, N phase



4 Occupied Bandwidth

4.1 Definition

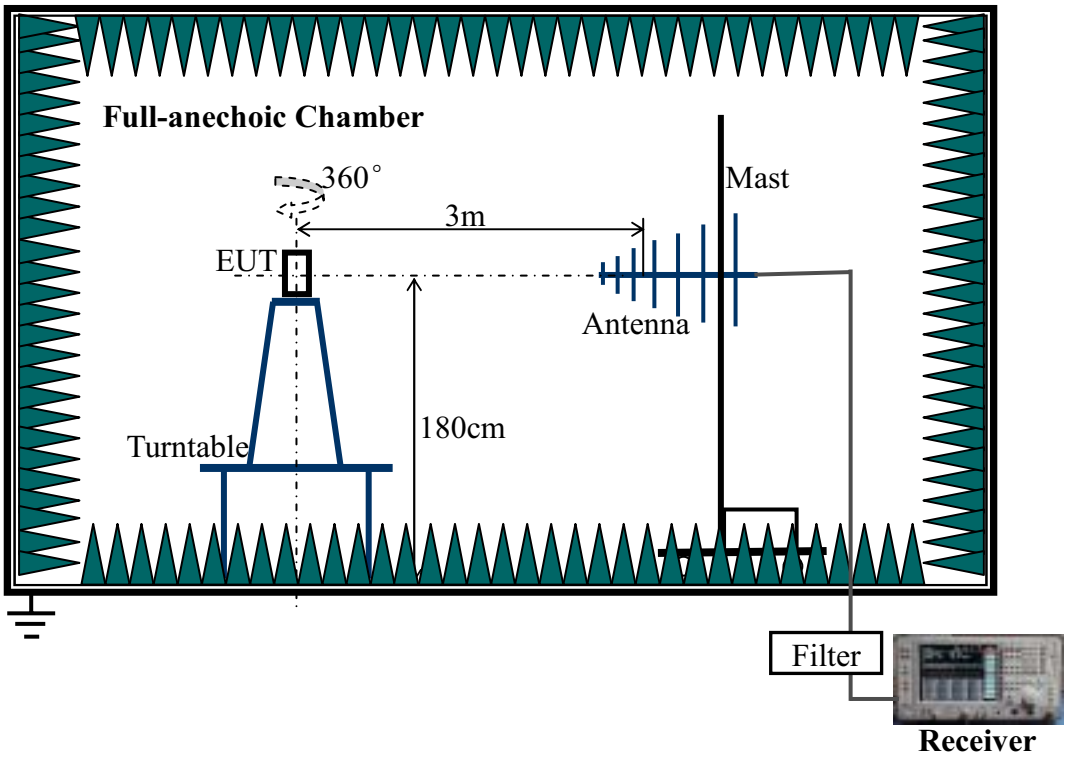
According to FCC §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

According to FCC §15.247 (a) (2), Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

4.2 Test Procedure

a. Radiation method was adopted for the test of RF performance since the EUT is integral antenna equipment and has no temporary antenna connector.
b. Radiation measurement was performed in a full anechoic chamber. The air lost of the site and the factors of the test system is pre-calibrated using substitution method. The test system gives the ERP value directly.
c. The EUT was placed on the vertical axis of a turntable 1.8 meters above the ground.
d. For the frequency range 30 MHz to 3 GHz, ultra-broadband bi-log antenna was used. For the frequency range above 3 GHz, horn antenna was used. The antenna was at the same height as the EUT. Since the there was no reflection from the chamber floor and the site was pre-calibrated, the antenna height need not to be changed as the open site method
e. The spectrum analyzer was set to Maxpeak Detector function and Maximum Hold mode.
f. The resolution bandwidth of the spectrum analyzer was set to at least 1% of the EUT emission bandwidth. For Bluetooth, VBW=RBW=30 kHz; For WLAN, VBW-RBW=100 kHz.

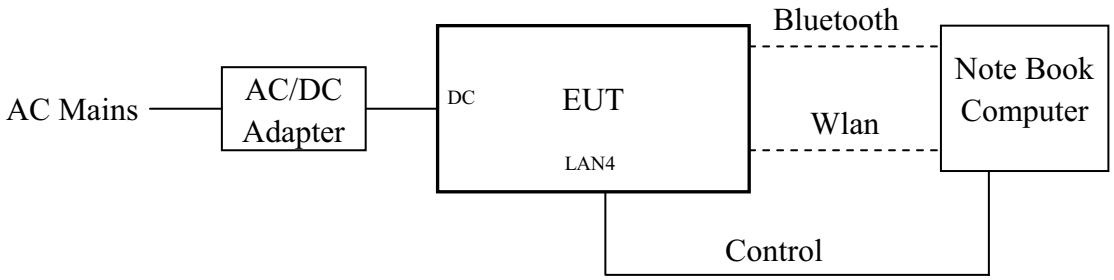
4.3 Test Setup



For the actual test configuration, please refer to the related item-Photographs of the Test Configuration.

4.4 EUT Setup and Operating Conditions

A note book computer (IBM, 2668) served as a companion equipment to establish wireless communication links with the EUT. It was also a controller to set the EUT to specific frequencies and operating modes for measurement. The following figure shows the EUT setup.



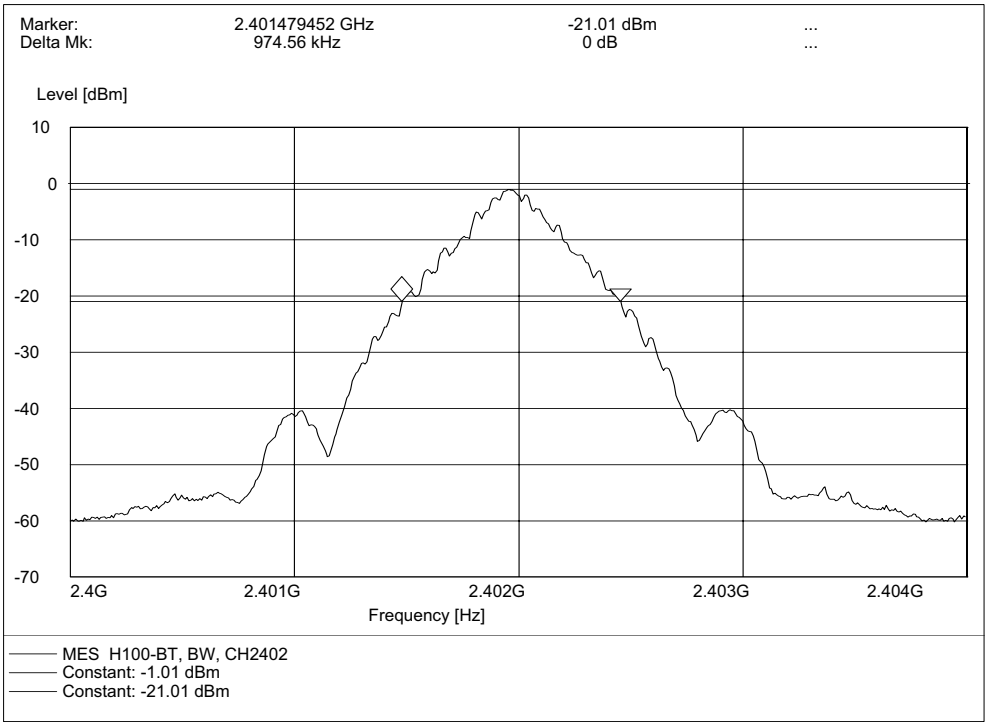
During the measurement of transmitter parameters, the EUT was continuously operating at maximum transmitting power and maximum data rate. The lowest, middle and highest channels were measured respectively.

4.5 Test Results

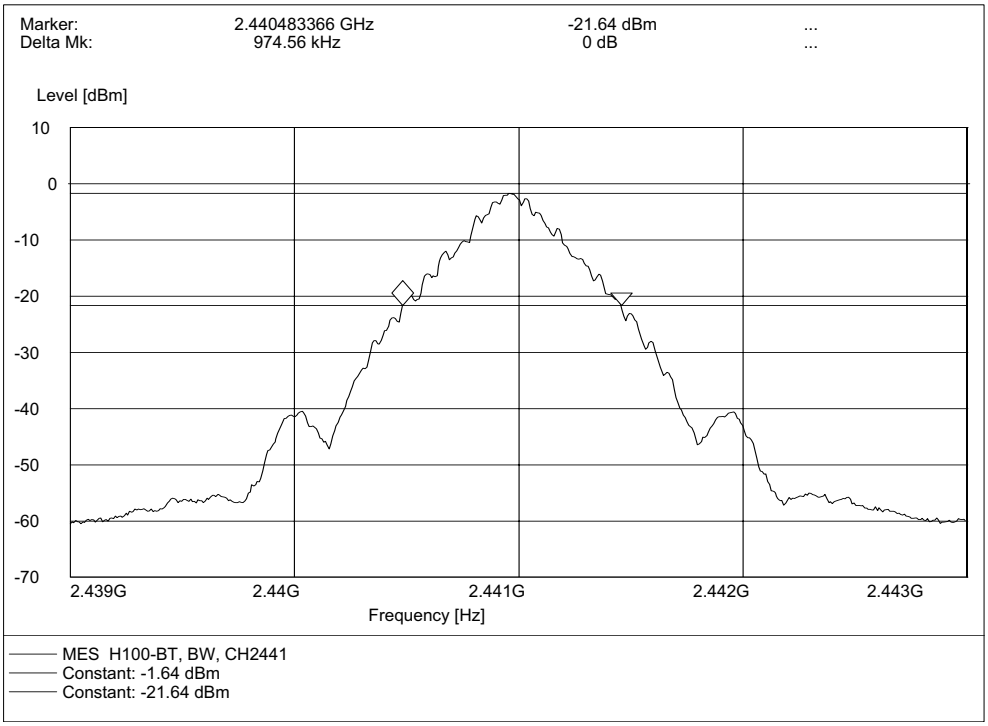
I. Bluetooth:

The 20dB bandwidth was measured to be about 0.95MHz. Refer to the following plots.

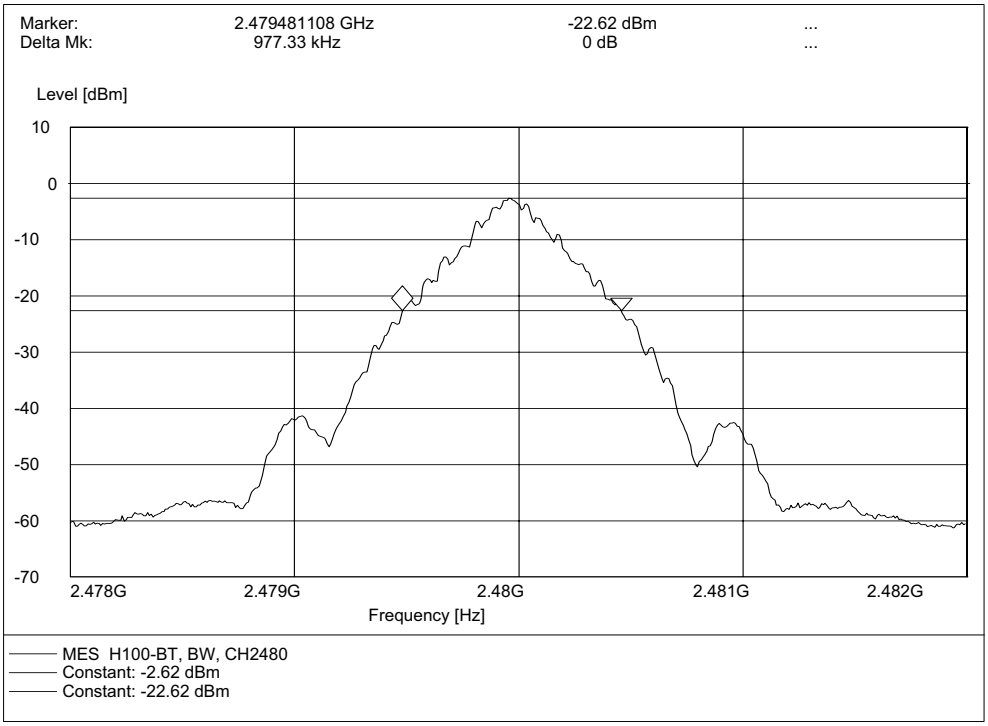
1. Lowest channel No.1 (2402MHz)



2. Middle channel No.40 (2441MHz)



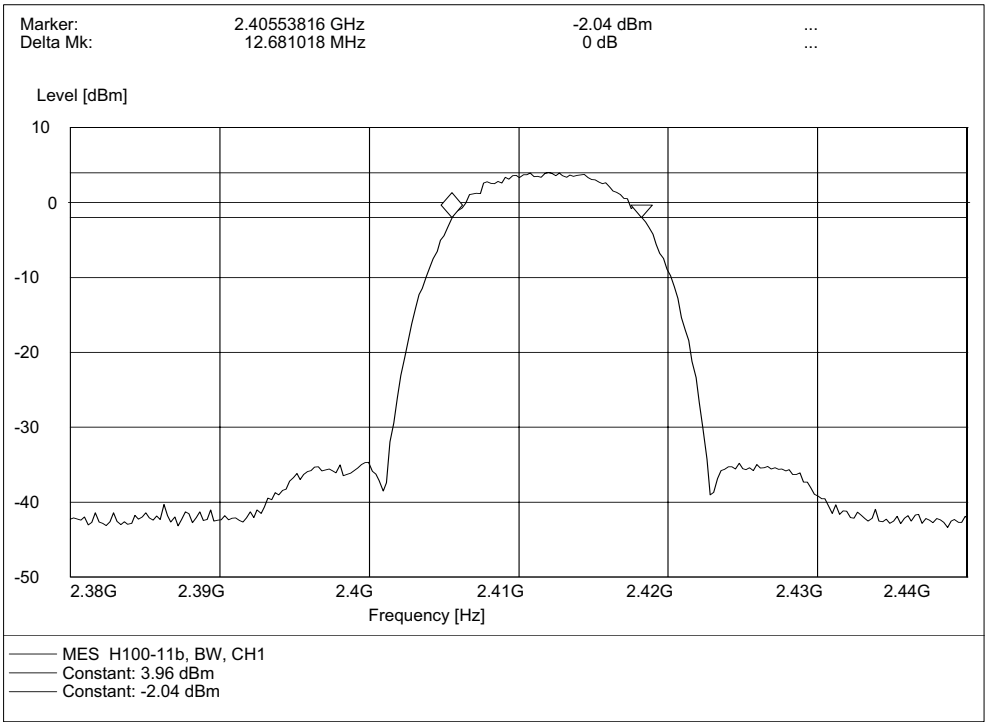
3. Highest channel No.79 (2480MHz)



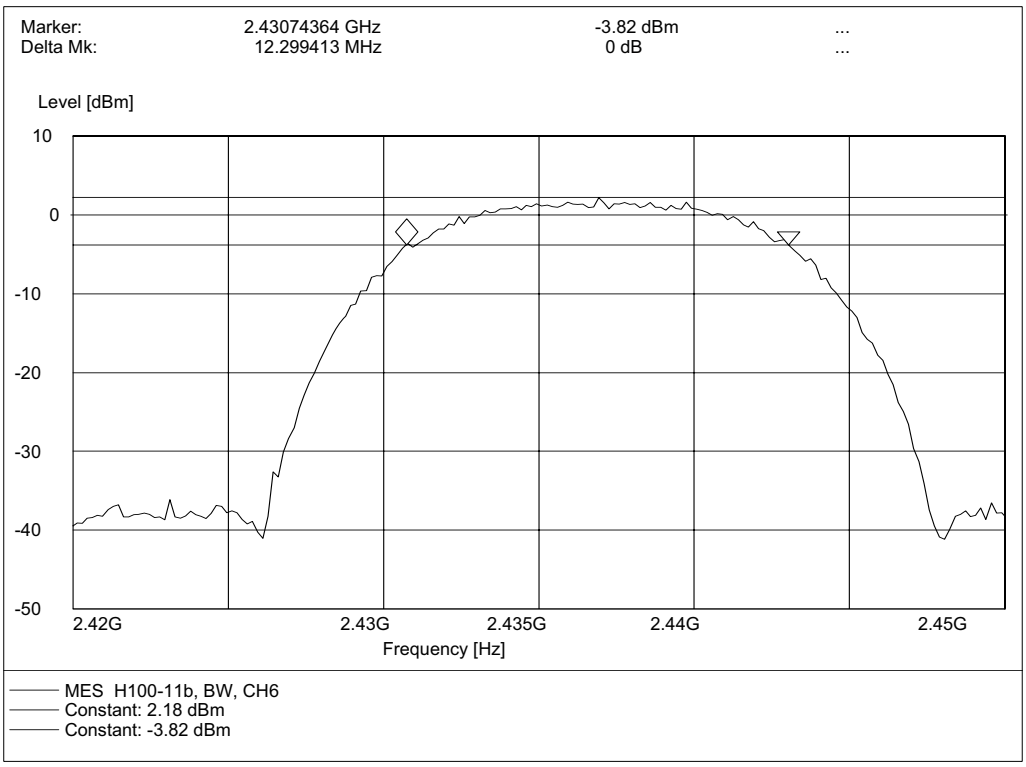
II. WLAN (802.11b)

The 6dB bandwidth was measured to be about 12.5MHz. Refer to the following plots.

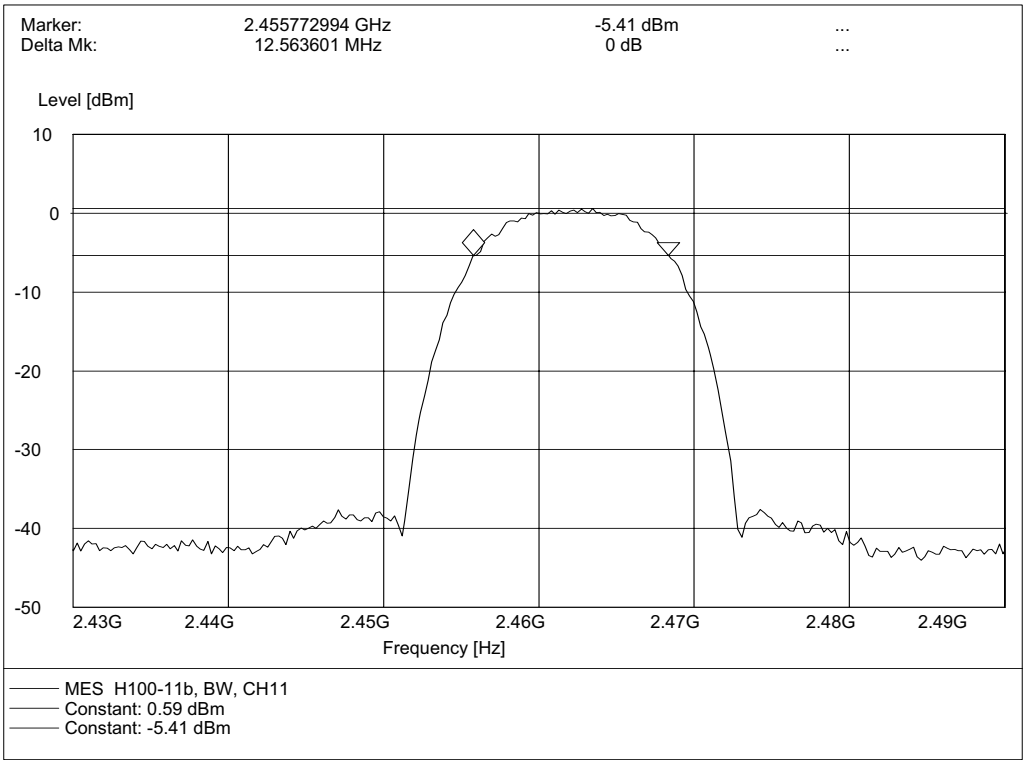
1. Lowest channel No.1 (2412MHz)



2. Middle channel No.6 (2437MHz)



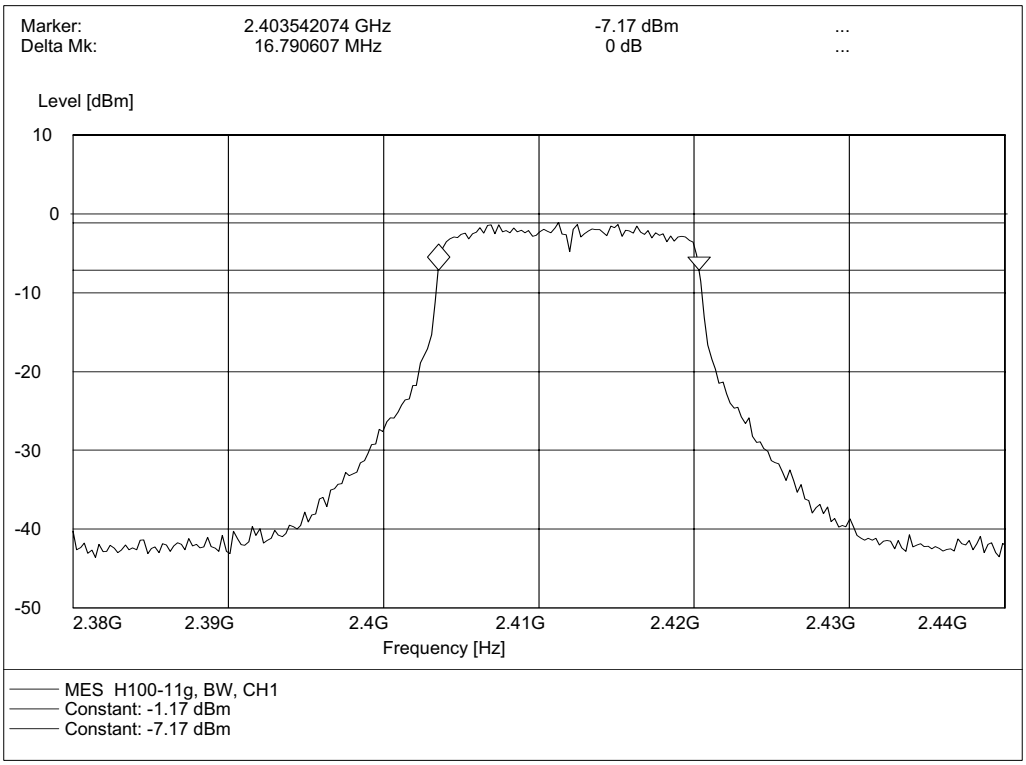
3. Highest channel No.11 (2462MHz)



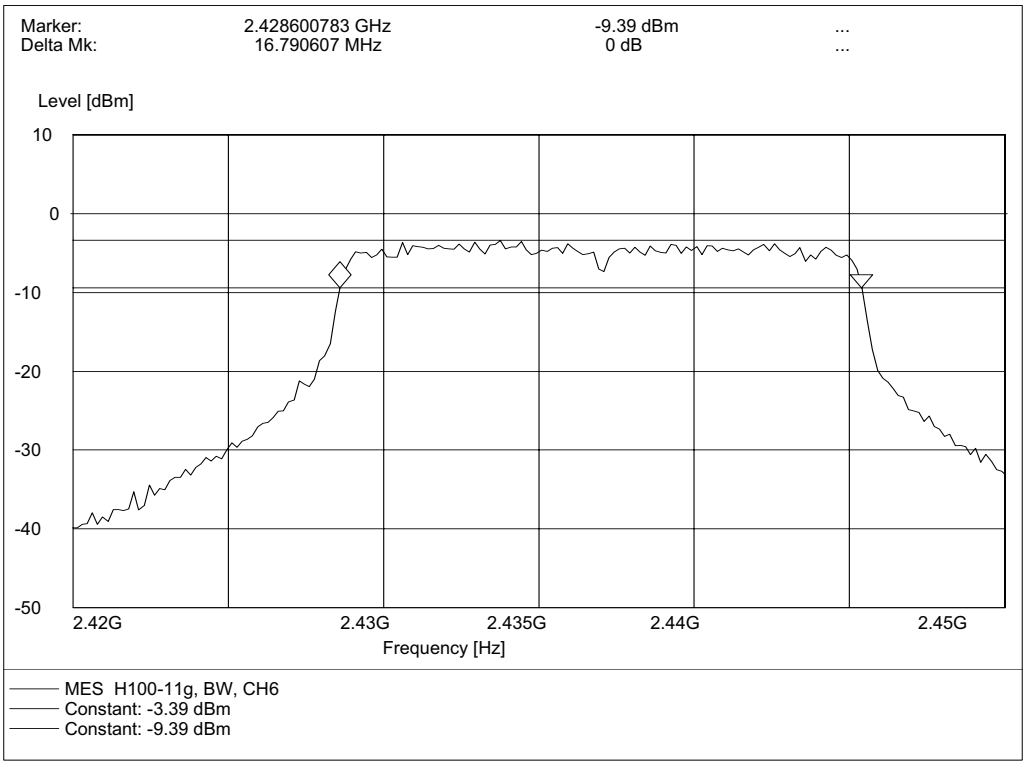
III. WLAN (802.11g)

The 6dB bandwidth was measured to be about 16.8MHz. Refer to the following plots.

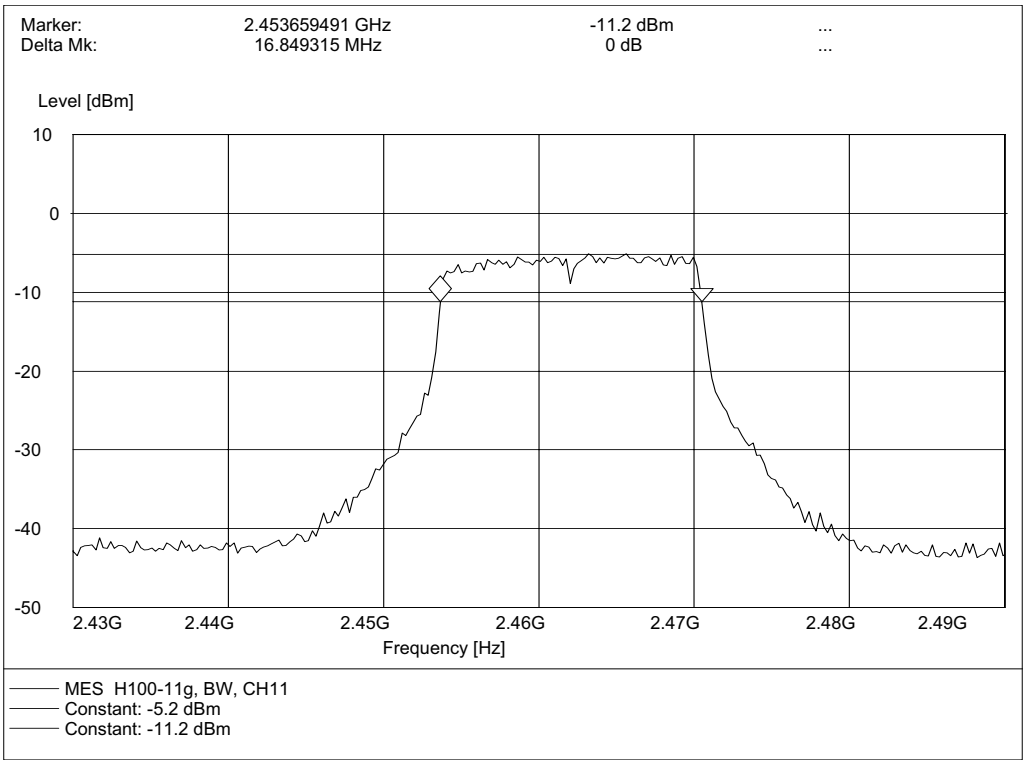
1. Lowest channel No.1 (2412MHz)



2. Middle channel No.6 (2437MHz)



3. Highest channel No.11 (2462MHz)



5 Carrier Frequency Separation

5.1 Requirement of the standard

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

5.2 Test Procedure

a. Radiation method was adopted for the test of RF performance since the EUT is integral antenna equipment and has no temporary antenna connector.
b. Radiation measurement was performed in a full anechoic chamber. The air lost of the site and the factors of the test system is pre-calibrated using substitution method. The test system gives the ERP value directly.
c. The EUT was placed on the vertical axis of a turntable 1.8 meters above the ground.
d. For the frequency range 30 MHz to 3 GHz, ultra-broadband bi-log antenna was used. For the frequency range above 3 GHz, horn antenna was used. The antenna was at the same height as the EUT. Since the there was no reflection from the chamber floor and the site was pre-calibrated, the antenna height need not to be changed as the open site method.
e. The spectrum analyzer was set to Maxpeak Detector function and Maximum Hold mode.
f. The resolution bandwidth of the spectrum analyzer was set to at least 1% of the EUT emission bandwidth. VBW=RBW=30 kHz.

5.3 Test Setup

Same as 4.3

5.4 EUT Setup and Operating Conditions

Refer to 4.4. The Bluetooth function was active and operating at hopping on mode.

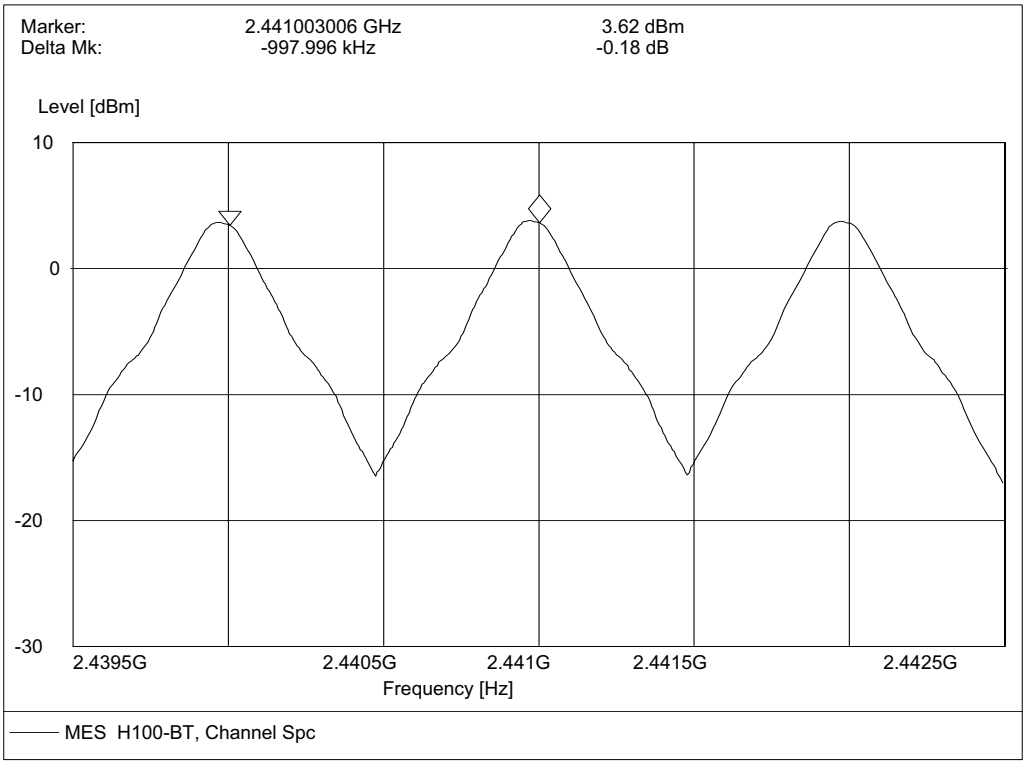
5.5 Test Results

The frequency separation of the hopping channels is 1 MHz, more than the 20dB bandwidth (0.95MHz, see chapter 4.5).

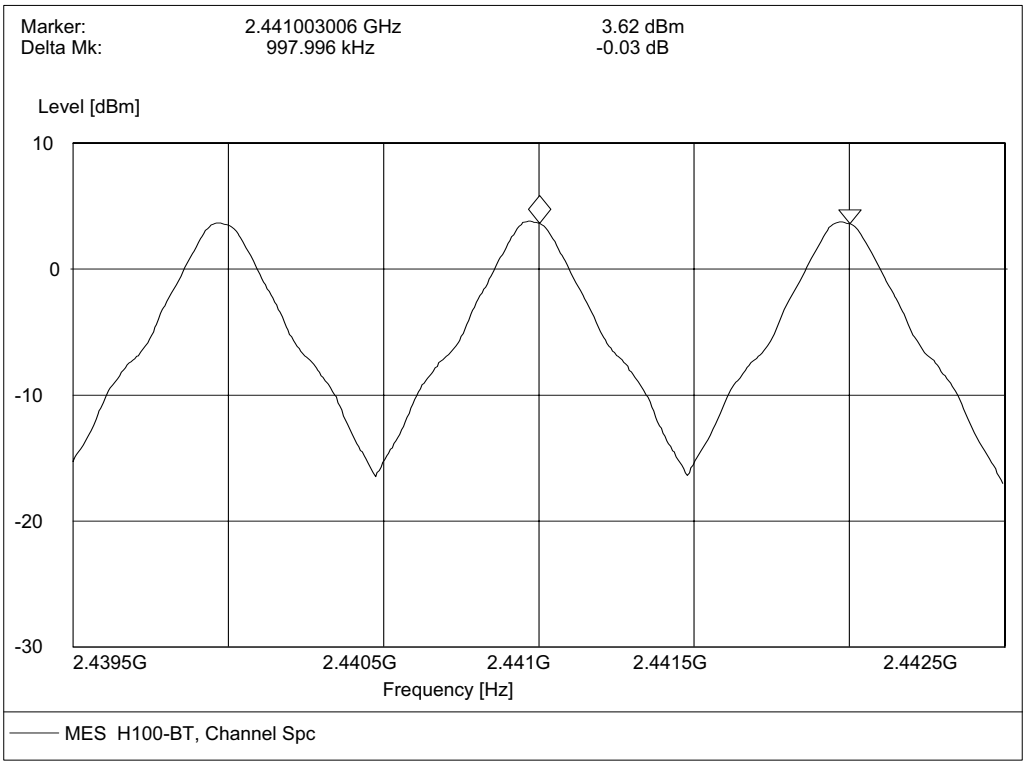
Please refer to the following test plots.

Carrier Frequency Separation Test Plots

1.



2.



6 Hopping Sequence

6.1 Requirement of the standard

According to FCC §15.247(a)(1), The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies.

6.2 Test Results

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master. For details refer to the Bluetooth standard.

7 Equal Hopping Frequency Use

7.1 Requirement of the standard

According to FCC §15.247(a)(1), Each frequency must be used equally on the average by each transmitter.

7.2 Test Results

The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.

8 Receiver Input Bandwidth and Hopping Capability

8.1 Requirement of the standard

According to FCC §15.247(a)(1), The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals

8.2 Test Results

The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.

9 Time of Occupancy (Dwell Time)

9.1 Time of Occupancy Requirement

According to FCC §15.247(a)(1)(iii), Frequency hopping systems in the 2400-2483.5 MHz 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.

9.2 Test Procedure

a. Since the EUT is integral antenna equipment and has no temporary antenna connector, RF signal was coupled into the spectrum analyzer through air interface.

b. The spectrum analyzer was set to Maxpeak Detector function and Maximum Hold mode.

c. The resolution bandwidth of the spectrum analyzer was comparable to the EUT emission bandwidth. RBW=1 MHz, VBW=3 MHz.

9.3 Test Setup

Same as 4.3

9.4 EUT Setup and Operating Conditions

Refer to 4.4. The Bluetooth function was active and operating at hopping on mode.

9.5 Test Results

Number of hopping channels is 79.

A channel (e.g. 2441MHz) was used 107 times within 0.4×79=31.6 S.

Dwell time of each occupation in this channel is 2.936mS.

2.963mS×107＝0.317 S < 0.4 S

10 Peak Output Power

10.1 Peak Output Power Requirement

According to FCC §15.247(b)(1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850MHz band, the maximum peak output power of the intentional radiator shall not exceed 1 Watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 Watts.

According to FCC §15.247 (b) (3), the maximum peak output power of systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands is 1 Watt.

10.2 Test Procedure

a. Radiation method was adopted for the test of RF performance since the EUT is integral antenna equipment and has no temporary antenna connector.
b. Radiation measurement was performed in a full anechoic chamber. The air lost of the site and the factors of the test system is pre-calibrated using substitution method. The test system gives the EIRP value directly.
c. The EUT was placed on the vertical axis of a turntable 1.8 meters above the ground.
d. For the frequency range 30 MHz to 3 GHz, ultra-broadband bi-log antenna was used. For the frequency range above 3 GHz, horn antenna was used. The antenna was at the same height as the EUT. Since the there was no reflection from the chamber floor and the site was pre-calibrated, the antenna height need not to be changed as the open site method. Measurement was performed with the receiving antenna at both vertical and horizontal directions. Maximum value was recorded.
e. The spectrum analyzer was set to Maxpeak Detector function and Maximum Hold mode.
f. The resolution bandwidth of the spectrum analyzer was comparable to the EUT emission bandwidth.

10.3 Test Setup

Same as 4.3

10.4 EUT Setup and Operating Conditions

Same as 4.4

10.5 Test Results

Channel	Frequency (MHz)	EIRP (dBm)	Limit(dBm)
Bluetooth			
1	2402	10.33	30
40	2441	9.39	30
79	2480	8.12	30
WLAN (802.11b)			
1	2412	17.51	30
6	2437	17.15	30
11	2462	17.10	30
WLAN (802.11g)			
1	2412	18.67	30
6	2437	18.71	30
11	2462	18.39	03

11 Antenna Description

11.1 Antenna Requirements

According to FCC §15.247 (b) (4), Except as shown in following paragraphs (i), (ii), and (iii), if transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs FCC §15.247 (b)(1), (b)(2), and (b)(3), as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

(ii) Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

(iii) Fixed, point-to-point operation, as used in paragraphs (b)(4)(i) and (b)(4)(ii) of this section, excludes the use of point-to-multipoint systems, omnidirectional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

According to FCC §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

11.2 Antenna Description

The Bluetooth and WLAN antennas of the EUT are internal antennas with 0.5 dBi gain.

12 RF Exposure Evaluation

12.1 RF Radiation Exposure Limits

According to FCC §15.247 (b) (4), Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. *See* FCC § 1.1307(b)(1).

According to FCC §1.1310, for general population/uncontrolled exposure at 2.4GHz, the limit for Maximum Permissible Exposure (MPE) is 1.0 mW/cm^2.

12.1 Evaluation of RF Radiation Exposure

The EUT uses internal antenna and is designed to operate at 20cm or far from persons.

The exposure type is general population/uncontrolled exposure.

The maximum measured power is 18.67dBm EIRP. See chapter 7.5 of this report.

The maximum radiation power density level is calculated using the general equation:

$$S=P*G/4\pi R^2$$

Here, P*G=EIRP=18.71dBm=74.30mW, R=20 cm, π= 3.14.

Solving for S, the power density at 20 cm is **0.015 mW/cm^2**.

13 Band Edge

13.1 Requirement of the standard

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

13.2 Test Procedure

a. Radiation method was adopted for the test of RF performance since the EUT is integral antenna equipment and has no temporary antenna connector.
b. Radiation measurement was performed in a full anechoic chamber. The air lost of the site and the factors of the test system is pre-calibrated using substitution method. The test system gives the ERP value directly.
c. The EUT was placed on the vertical axis of a turntable 1.8 meters above the ground.
d. For the frequency range 30 MHz to 3 GHz, ultra-broadband bi-log antenna was used. For the frequency range above 3 GHz, horn antenna was used. The antenna was at the same height as the EUT. Since the there was no reflection from the chamber floor and the site was pre-calibrated, the antenna height need not to be changed as the open site method.
e. The spectrum analyzer was set to Maxpeak Detector function and Maximum Hold mode.
f. According to the standard requirement, the resolution bandwidth of the spectrum analyzer was set to RBW=100 kHz, VBW=300 kHz.

13.3 Test Setup

Same as 4.3

13.4 EUT Setup and Operating Conditions

Refer to 4.4. The transmitter operated at the lowest and highest channels respectively.

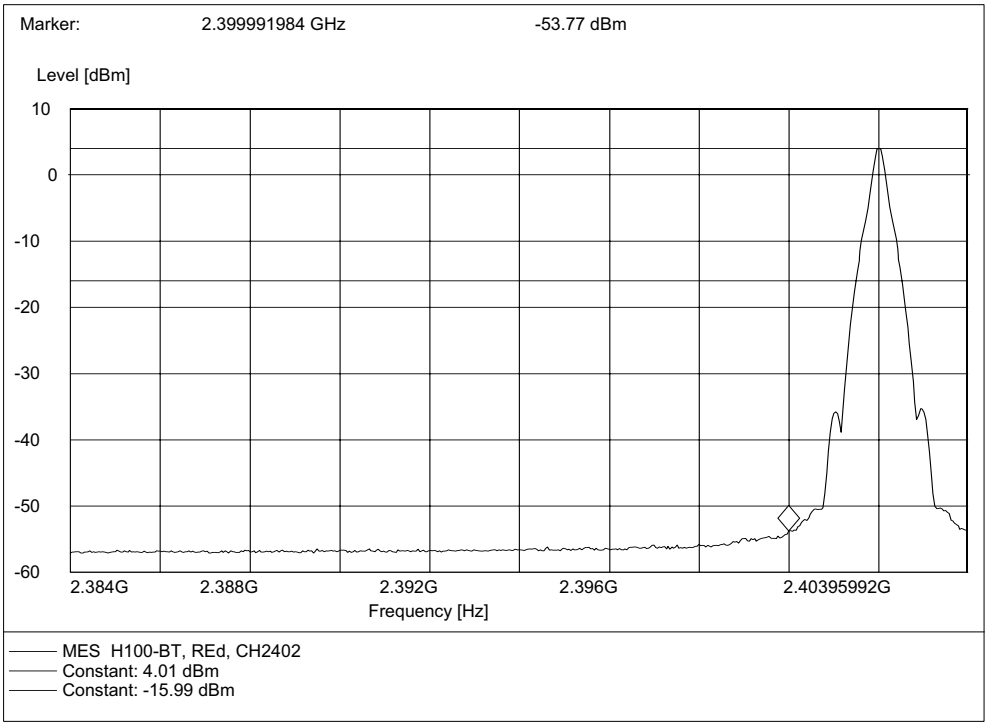
13.5 Test Results

The radio frequency power beyond the band edges 2400 and 2483.5MHz was 20dB below the peak output power, measured with 100 kHz resolution bandwidth. Refer to the following test plots

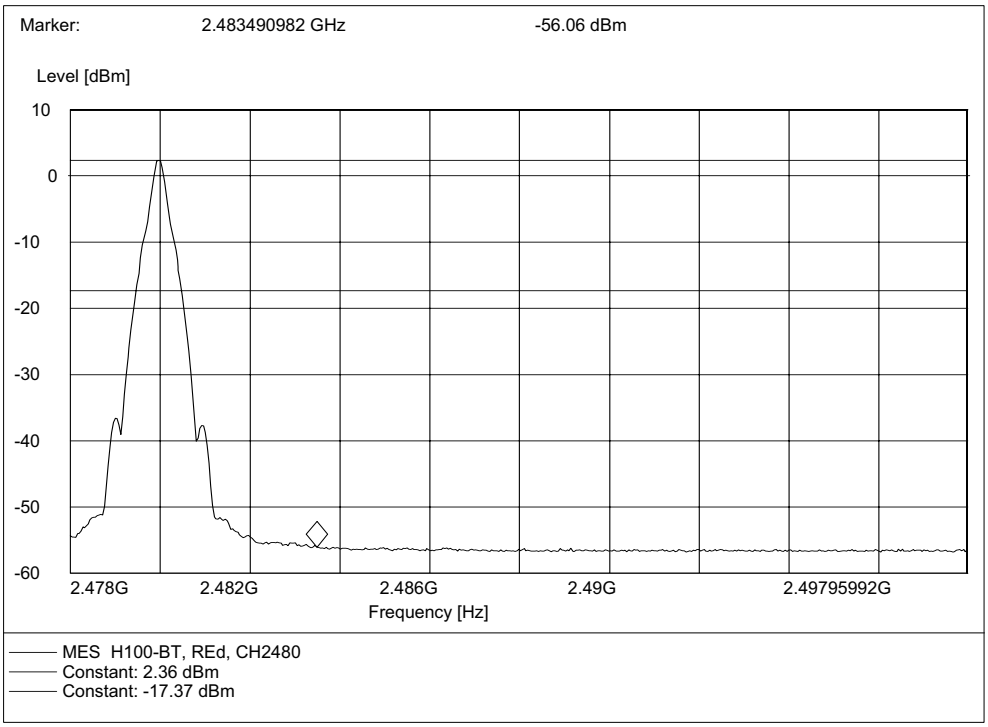
Band Edge Test Plots

I. Bluetooth

1. Lowest channel No.1 (2402MHz)

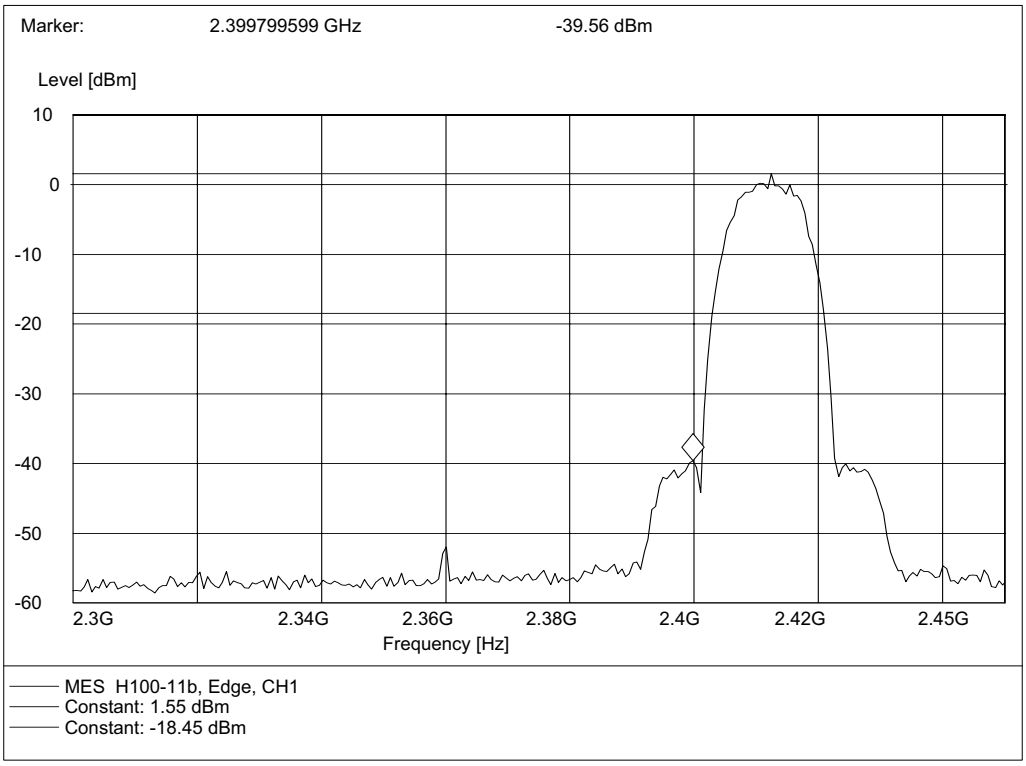


2. Highest channel No.79 (2480MHz)

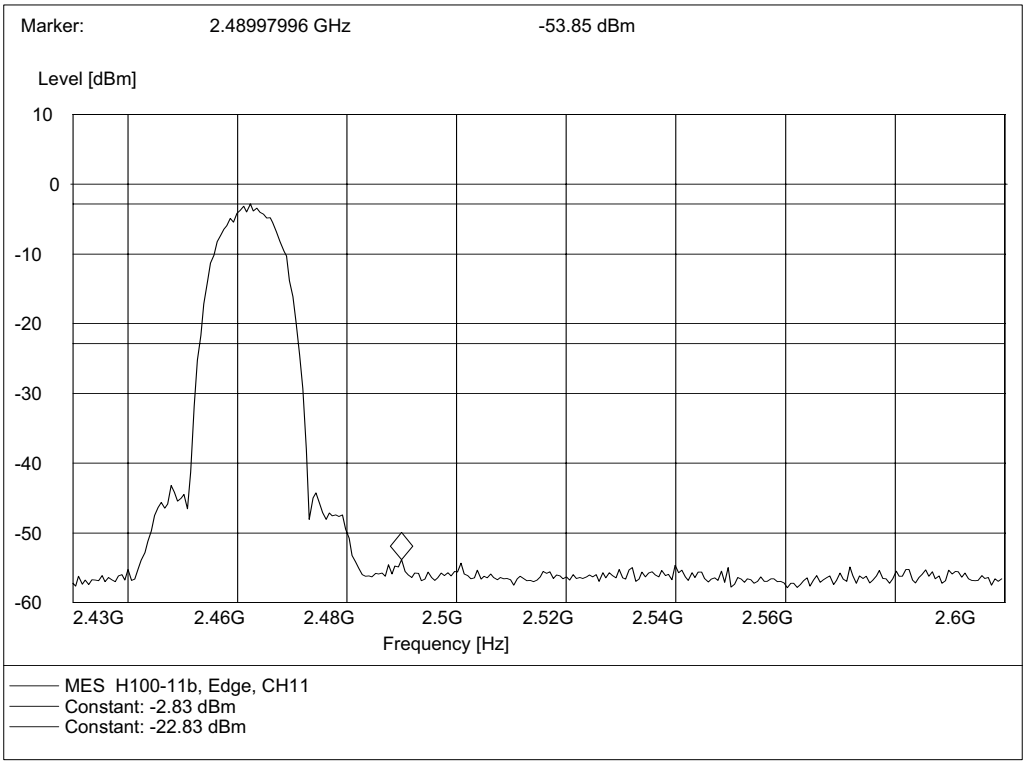


II. WLAN (802.11b)

1. Lowest channel No.1 (2412MHz)

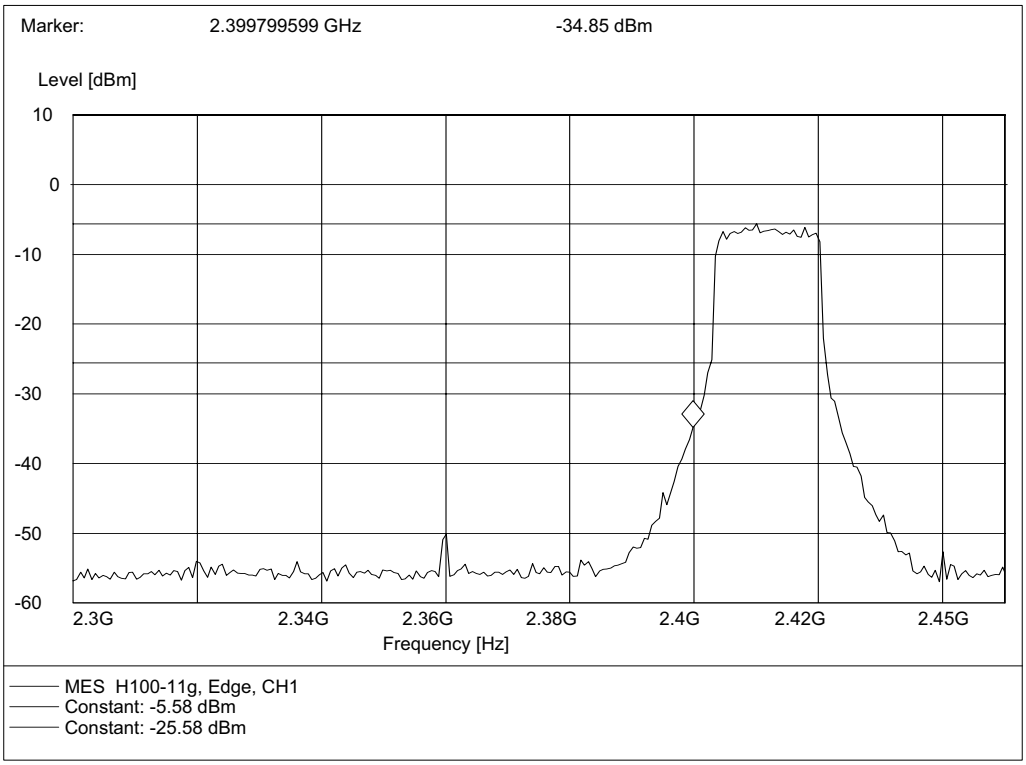


2. Highest channel No.11 (2462MHz)

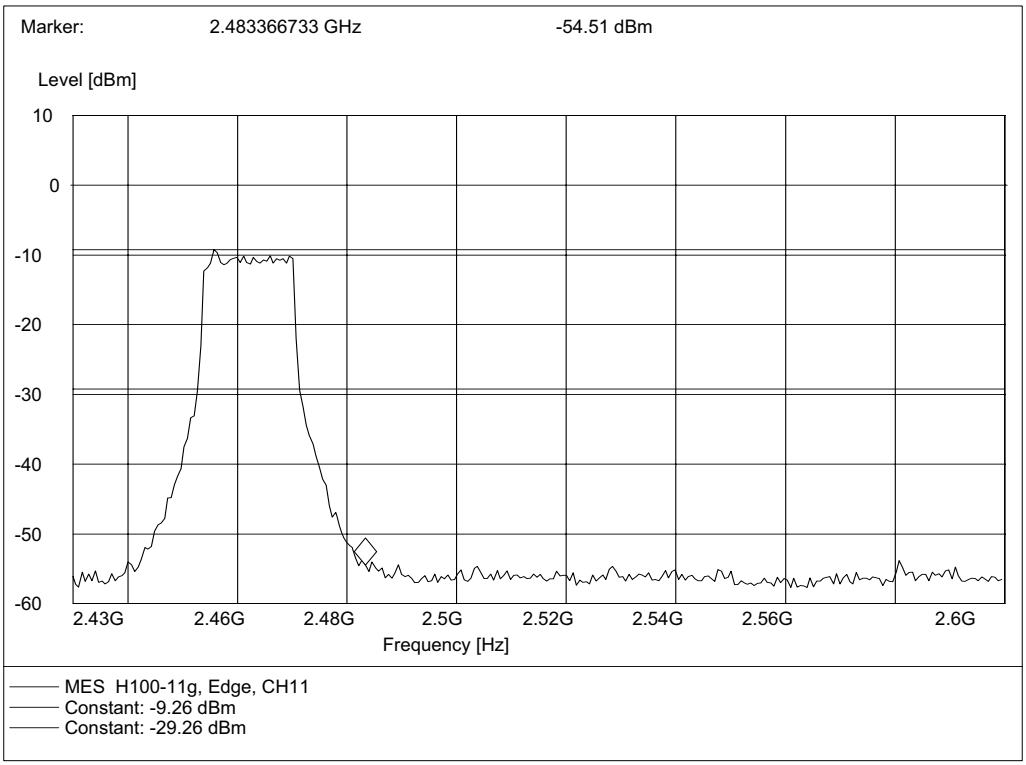


III. WLAN (802.11g)

1. Lowest channel No.1 (2412MHz)



2. Highest channel No.11 (2462MHz)



14 Radiated Spurious Emission

14.1 Requirement of the standard

According to FCC §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(μV/m)	Measurement Distance(m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules,

According to FCC §15.247 (c), attenuation below the general limits specified in Section 15.209(a) is not required. In addition, 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).

14.2 Test Procedure

a. The radiated field strength measurement was performed in a semi-anechoic chamber.

b. The EUT was placed on the top of an insulating table 0.8 meters above the ground at a semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

c. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. The antenna is varied from 1 to 4 meter above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

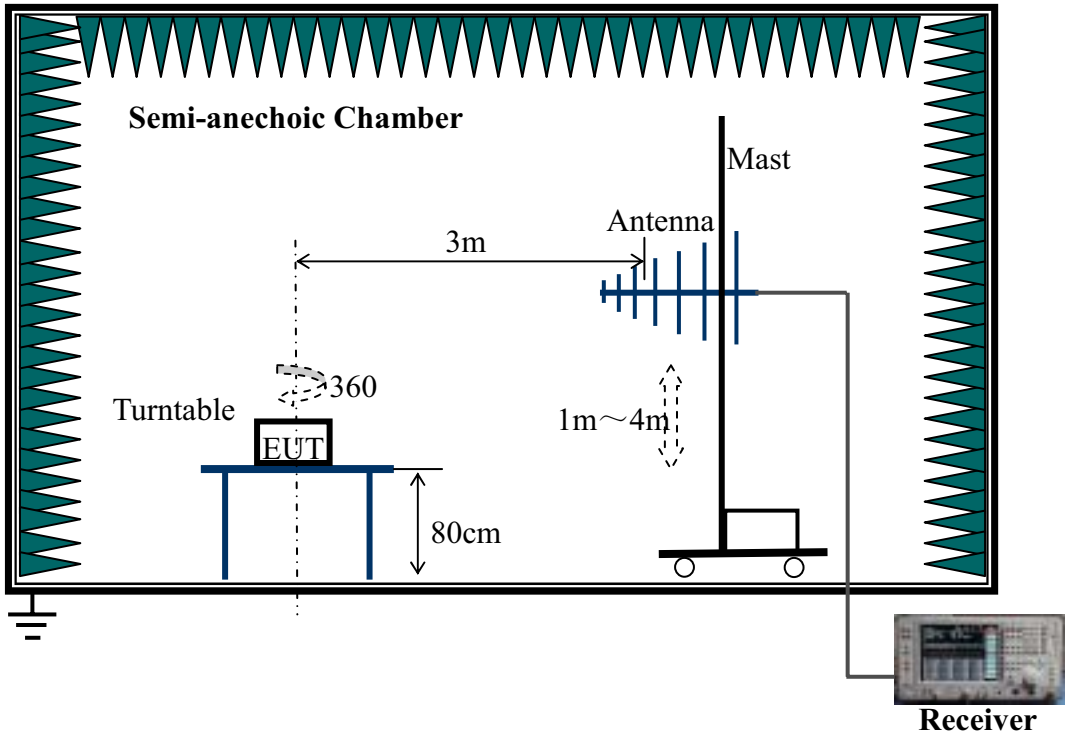
d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to the heights from 1 to 4 meters and the ratable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The spurious radiations from 9 kHz to 10th harmonic of the fundamental frequency are researched. For the frequency range 9 kHz to 30 MHz, loop antenna was used. For the frequency range 30 MHz to 3 GHz, ultra-broadband bi-log antenna was used. For the frequency range above 3 GHz, horn antenna was used.

f. For frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz, the test receiver was set to Average Detector mode and Max Peak Detector mode. For other frequency bands, the test receiver was set to Quasi-Peak Detector mode.

g. The resolution bandwidth of the test receiver was 120kHz for frequency below 1GHz and 1 MHz for frequency above 1GHz.

14.3 Test Setup



For the actual test configuration, please refer to the related item-Photographs of the Test Configuration.

14.4 EUT Setup and Operating Conditions

Two operating mode was researched:

First, the EUT was operating at full load with all connections active. Refer to chapter 3.4. This was the worst case of EMI emission, especially for frequency range of below 1GHz.

Secondary, the EUT was operating at different transmitter mode respectively. Refer to chapter 4.4. This was the worst case of the spurious emission above 1GHz, especially for harmonics.

14.5 Test Results

I. Full Load

No.	Disturbance Source	Frequency (MHz)	Detector Function	Emission Level (dBμV/m)	Limits (dBμV/m)
Antenna: **V**ertical					
1	Other	100.00	QP	32.55	43.5
2	Other	627.00	QP	43.03	46
3	Other	660.00	QP	42.87	46
4	Other	693.00	QP	41.75	46
Antenna: **H**orizontal					
1	Other	360.00	QP	41.76	46
2	Other	363.00	QP	40.71	46
3	Other	627.00	QP	40.06	46
4	Other	660.00	QP	42.13	46

II. Bluetooth, Lowest channel No.1 (2402MHz)

No.	Disturbance Source	Frequency (MHz)	Detector Function	Emission Level (dBμV/m)	Limits (dBμV/m)
Antenna: **V**ertical					
1	Fundamental	2402.00	AV	97.42	--
2			PK	103.23	--
3	Other	3841.68	AV	35.63	54
4			PK	41.94	74
5	Harmonic	4804.00	AV	48.68	54
6			PK	60.95	74
7	Harmonic	7206.00	AV	40.02	54
8			PK	54.94	74
9	Harmonic	9608.00	AV	42.59	54
10			PK	56.14	74
Antenna: **H**orizontal					
1	Fundamental	2402.00	AV	99.16	--
2			PK	104.73	--
3	Other	3841.68	AV	30.66	54
4			PK	35.23	74
5	Harmonic	4804.00	AV	39.55	54
6			PK	52.57	74
7	Harmonic	7206.00	AV	46.57	54
8			PK	58.98	74
9	Harmonic	9608.00	AV	37.60	54
10			PK	51.82	74

III. Bluetooth, Middle channel No.40 (2441MHz)

No.	Disturbance Source	Frequency (MHz)	Detector Function	Emission Level (dBμV/m)	Limits (dBμV/m)
Antenna: **V**ertical					
1	Fundamental	2441.00	AV	90.95	--
2			PK	103.13	--
3	Other	3841.68	AV	24.16	54
4			PK	39.21	74
5	Harmonic	4882.00	AV	45.55	54
6			PK	59.84	74
7	Harmonic	7323.00	AV	45.49	54
8			PK	59.51	74
9	Harmonic	9764.00	AV	42.24	54
10			PK	55.64	74
Antenna: **H**orizontal					
1	Fundamental	2441.00	AV	96.29	--
2			PK	104.73	--
3	Other	3841.68	AV	21.94	54
4			PK	34.01	74
5	Harmonic	4882.00	AV	40.15	54
6			PK	54.30	74
7	Harmonic	7323.00	AV	46.02	54
8			PK	60.48	74
9	Harmonic	9764.00	AV	39.22	54
10			PK	26.40	74

IV. Bluetooth, Highest channel No.79 (2480MHz)

No.	Disturbance Source	Frequency (MHz)	Detector Function	Emission Level (dBμV/m)	Limits (dBμV/m)
Antenna: **V**ertical					
1	Fundamental	2480.00	AV	93.29	--
2			PK	102.35	--
3	Other	3841.68	AV	27.55	54
4			PK	39.63	74
5	Harmonic	4960.00	AV	45.52	54
6			PK	59.24	74
7	Harmonic	7440.00	AV	42.47	54
8			PK	57.20	74
9	Harmonic	9920.00	AV	38.67	54
10			PK	52.70	74
Antenna: **H**orizontal					
1	Fundamental	2480.00	AV	92.03	--
2			PK	104.73	--
3	Other	3841.68	AV	24.07	54
4			PK	36.68	74
5	Harmonic	4960.00	AV	48.81	54
6			PK	61.59	74
7	Harmonic	7440.00	AV	44.90	54
8			PK	57.14	74
9	Harmonic	9920.00	AV	43.30	54
10			PK	55.61	74

V. WLAN (802.11b), Lowest channel No.1 (2412MHz)

No.	Disturbance Source	Frequency (MHz)	Detector Function	Emission Level (dBμV/m)	Limits (dBμV/m)
Antenna: **V**ertical					
1	Fundamental	2412.00	AV	96.68	--
2			PK	106.27	--
3	Harmonic	4824.00	AV	33.55	54
4			PK	45.62	74
Antenna: **H**orizontal					
1	Fundamental	2412.00	AV	97.29	--
2			PK	106.99	--
3	Harmonic	4824.00	AV	32.58	54
4			PK	46.39	74

VI. WLAN (802.11b), Middle channel No.6 (2437MHz)

No.	Disturbance Source	Frequency (MHz)	Detector Function	Emission Level (dBμV/m)	Limits (dBμV/m)
Antenna: **V**ertical					
1	Fundamental	2437.00	AV	96.65	--
2			PK	106.24	--
3	Harmonic	4874.00	AV	33.45	54
4			PK	45.91	74
Antenna: **H**orizontal					
1	Fundamental	2437.00	AV	96.11	--
2			PK	106.85	--
3	Harmonic	4874.00	AV	32.12	54
4			PK	46.56	74

VII. WLAN (802.11b), Highest channel No.11 (2462MHz)

No.	Disturbance Source	Frequency (MHz)	Detector Function	Emission Level (dBμV/m)	Limits (dBμV/m)
Antenna: **V**ertical					
1	Fundamental	2462.00	AV	94.27	--
2			PK	104.86	--
3	Harmonic	4924.00	AV	34.82	54
4			PK	58.37	74
Antenna: **H**orizontal					
1	Fundamental	2462.00	AV	94.08	--
2			PK	104.23	--
3	Harmonic	4924.00	AV	33.20	54
4			PK	48.17	74

VIII. WLAN (802.11g), Lowest channel No.1 (2412MHz)

No.	Disturbance Source	Frequency (MHz)	Detector Function	Emission Level (dBμV/m)	Limits (dBμV/m)
Antenna: **V**ertical					
1	Fundamental	2412.00	AV	95.91	--
2			PK	105.77	--
3	Harmonic	4824.00	AV	33.32	54
4			PK	47.91	74
Antenna: **H**orizontal					
1	Fundamental	2412.00	AV	96.09	--
2			PK	107.56	--
3	Harmonic	4824.00	AV	31.70	54
4			PK	44.54	74

IX. WLAN (802.11g), Middle channel No.6 (2437MHz)

No.	Disturbance Source	Frequency (MHz)	Detector Function	Emission Level (dBμV/m)	Limits (dBμV/m)
Antenna: **V**ertical					
1	Fundamental	2437.00	AV	95.13	--
2			PK	105.35	--
3	Harmonic	4874.00	AV	31.02	54
4			PK	45.27	74
Antenna: **H**orizontal					
1	Fundamental	2437.00	AV	96.54	--
2			PK	105.35	--
3	Harmonic	4874.00	AV	31.83	54
4			PK	45.28	74

X. WLAN (802.11g), Highest channel No.11 (2462MHz)

No.	Disturbance Source	Frequency (MHz)	Detector Function	Emission Level (dBμV/m)	Limits (dBμV/m)
Antenna: **V**ertical					
1	Fundamental	2462.00	AV	96.45	--
2			PK	108.45	--
3	Harmonic	4924.00	AV	31.53	54
4			PK	45.41	74
Antenna: **H**orizontal					
1	Fundamental	2462.00	AV	95.00	--
2			PK	107.42	--
3	Harmonic	4924.00	AV	31.55	54
4			PK	45.72	74

15 Power Spectrum Density Measurement

15.1 Limits of Power Spectrum Density

According to FCC §15.247(d), for digitally modulated systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

15.2 Test Procedure

a. Radiation method was adopted for the test of RF performance since the EUT is integral antenna equipment and has no temporary antenna connector.
b. Radiation measurement was performed in a full anechoic chamber. The air lost of the site and the factors of the test system is pre-calibrated using substitution method. The test system gives the ERP value directly.
c. The EUT was placed on the vertical axis of a turntable 1.8 meters above the ground.
d. For the frequency range 30 MHz to 3 GHz, ultra-broadband bi-log antenna was used. For the frequency range above 3 GHz, horn antenna was used. The antenna was at the same height as the EUT. Since the there was no reflection from the chamber floor and the site was pre-calibrated, the antenna height need not to be changed as the open site method.
e. The spectrum analyzer was set to Maxpeak Detector function and Maximum Hold mode. The resolution bandwidth was set to 3 kHz.

15.3 Test Setup

Same as 4.3

15.4 EUT Setup and Operating Conditions

Refer to 4.4. The EUT was operating at lowest, middle and highest channels respectively.

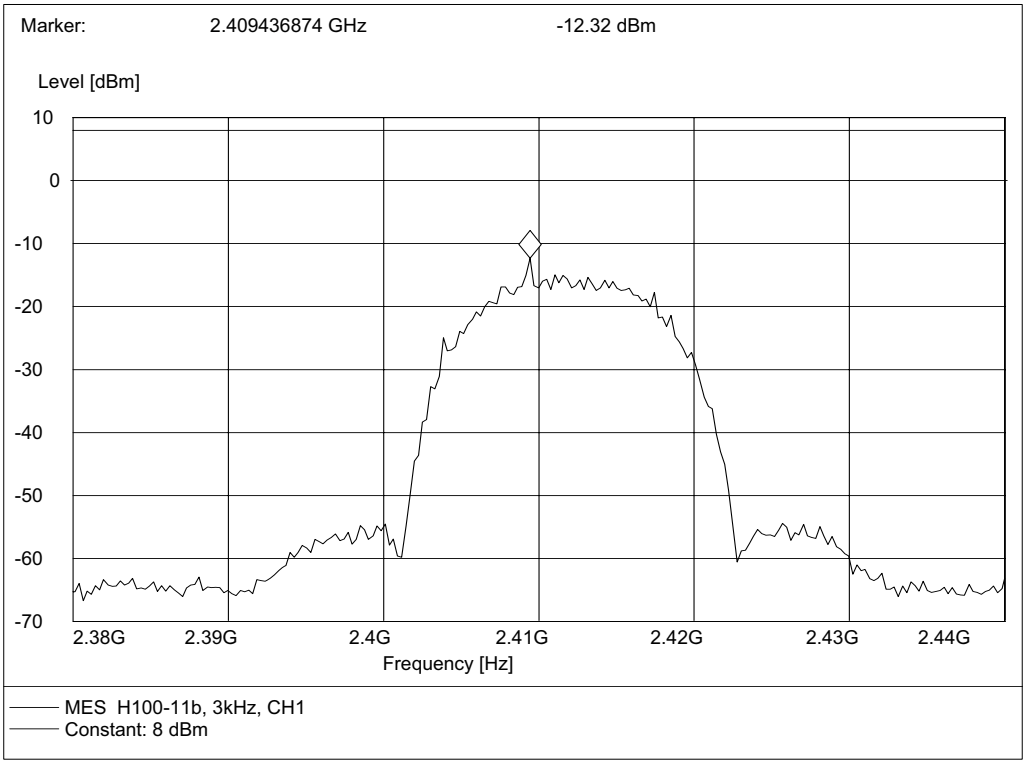
15.5 Test Results

The peak power spectral density was measured to be less than 8dBm/3kHz. Refer to the following test plots

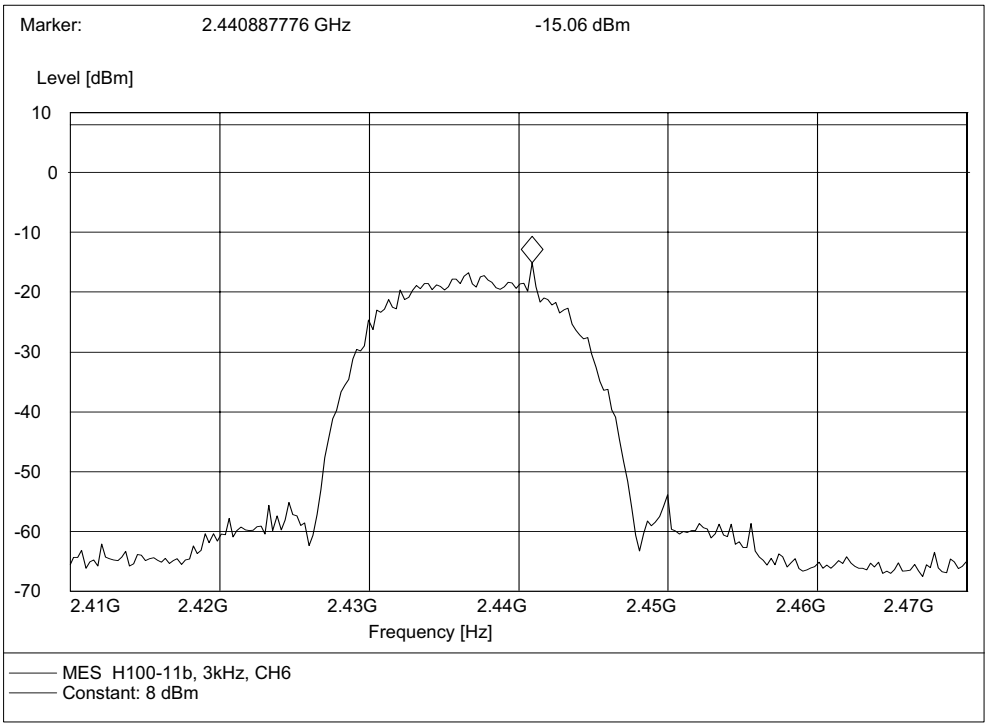
Plots of power spectrum density

I. WLAN (802.11b)

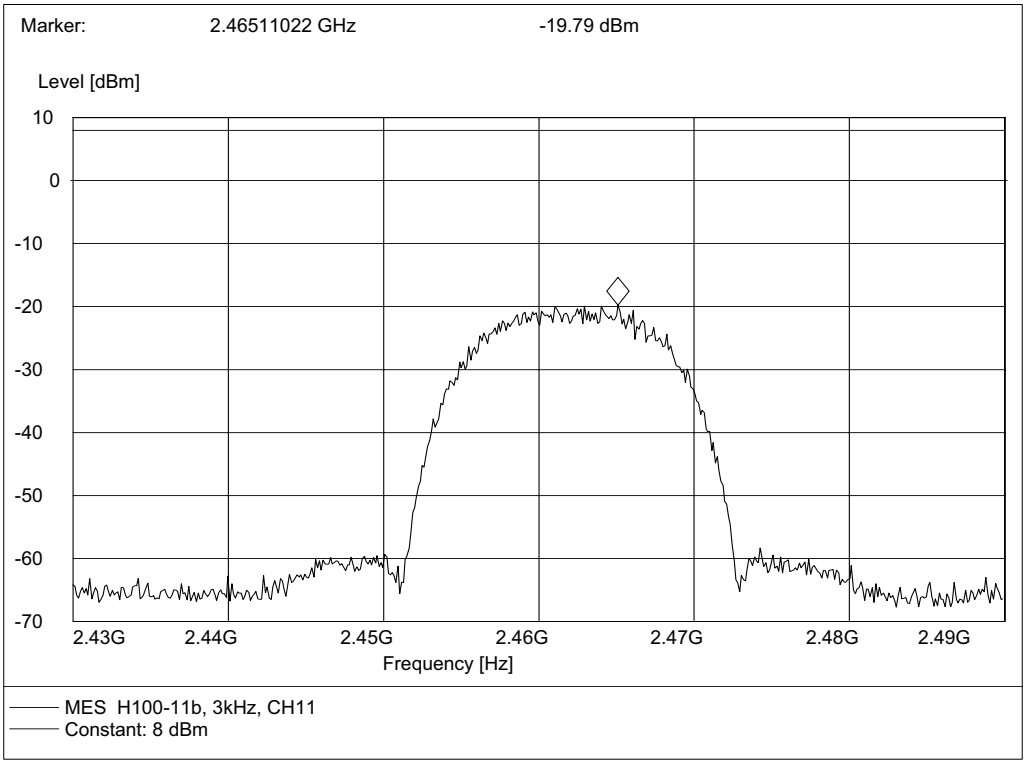
1. Lowest channel No.1 (2412MHz)



2. Middle channel No.6 (2437MHz)

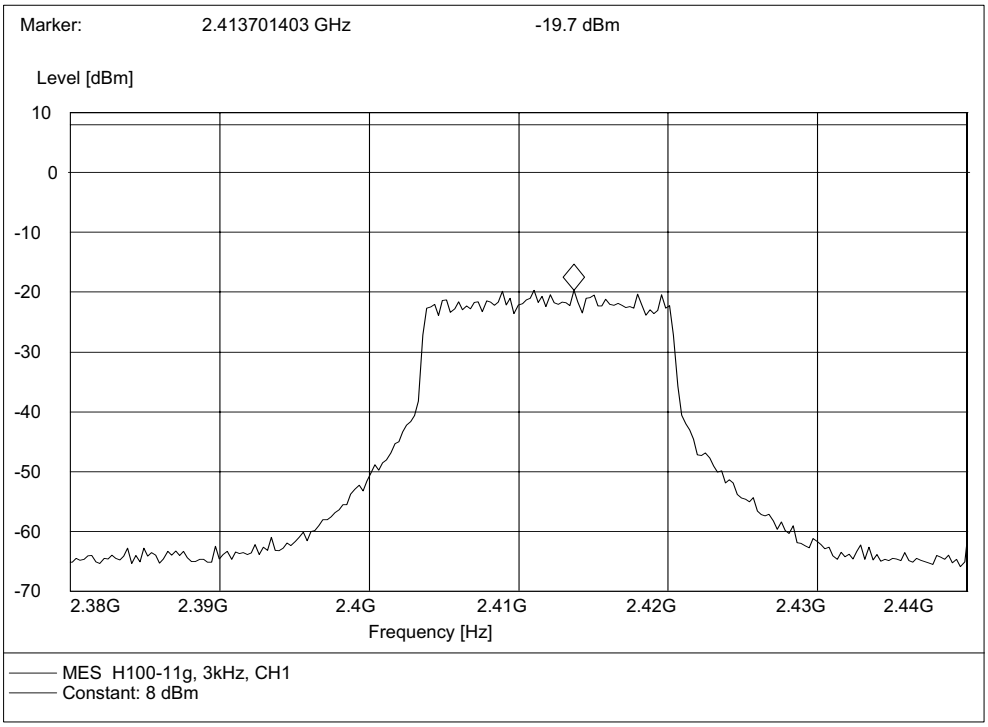


3. Highest channel No.11 (2462MHz)



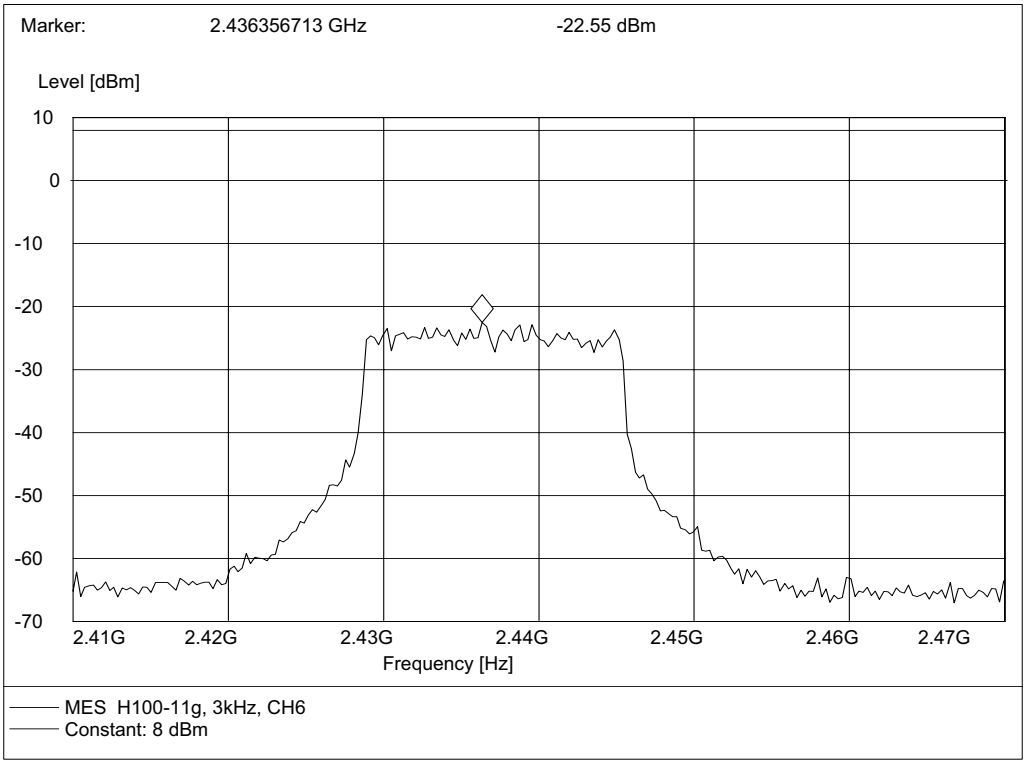
II. WLAN (802.11g)

1. Lowest channel No.1 (2412MHz)

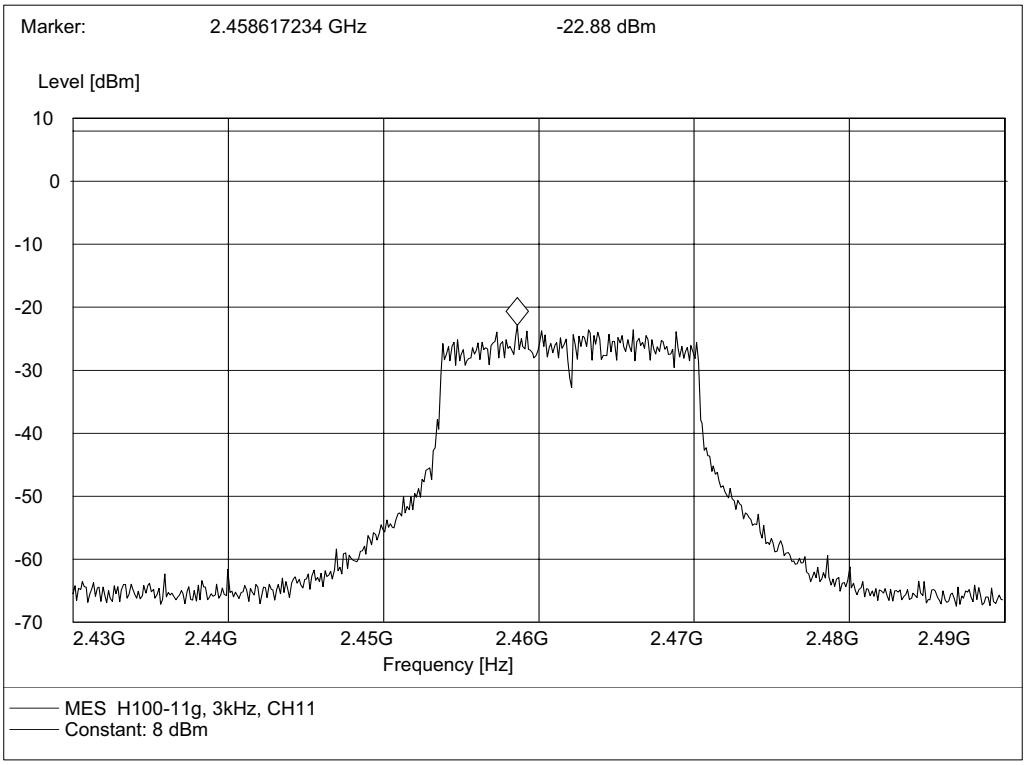


I

2. Middle channel No.6 (2437MHz)



3. Highest channel No.11 (2462MHz)



Appendix I: Photographs of the EUT

1. Appearance of the EUT

2. Inside of the EUT


D330
94V-0

Appendix II：Photographs of the Test Configuration

1. Conducted Emission Test

2. Radiated Emission Test

3. Conducted RF Test

4. Radiated RF Test