

TEST REPORT

1. Applicant

Name : I.S HIGHTECH.INC
Address : 603-1, Sungbon-r i , Daeso-myun, Eumsung-gun ,
chungcheongbuk-do, Korea

2. Products

Name : BluePeaker
Model/Type : BGS-100
Manufacturer : I.S HIGHTECH.INC

3. Test Standard : FCC CFR 47 Part 15.247 Subpart C

4. Test Method : ANSI C63.4-2003

5. Test Result : Positive

6. Date of Application : January 29, 2008

7. Date of Issue : February 05, 2008

Tested by



Bum-Jong Kim

Telecommunication Team
Engineer

Approved by



Seok-Jin Kim

Telecommunication Team
Manager

The test results contained apply only to the test sample(s) supplied by the applicant, and this test report shall not be reproduced in full or in part without approval of the KTL in advance.

Korea Testing Laboratory

TABLE OF CONTENTS

I. GENERAL INFORMATION	3
1. Applicant(client)	
2. Equipment(EUT)	
3. Testing Laboratory	
II. SUMMARY OF TEST RESULTS	5
III. MEASUREMENT & RESULT	6
3.1 20 dB Bandwidth	
3.2 Maximum Peak Power	
3.3 100 kHz Bandwidth of Frequency Band Edges	
3.4 Hopping Channel Separation	
3.5 Number of Hopping Channels	
3.6 Dwell Time	
3.7 Spurious Emission (15.247)	
3.8 Radiated Emission (15.209)	
IV. TEST EQUIPMENTS	27
 ** APPENDIXS	
1. EUT photo	
2. TEST set up photo	

I . GENERAL INFORMATION

1.1 Applicant (Client)

Name	I.S HIGHTECH.INC
Address	603-1,Sungbon-ri,Daeso-myun,Eumsung-gun, chungcheongbuk-do,Korea
Contact Person	Gui-chun, Jung
Telephone No.	+82-43-879-7051
Facsimile No.	+82-43-879-7030
E-mail address	chonggc@is-hightech.com

1.2 Equipment (EUT)

Type of equipment	BluePeaker
Model Name	BGS-100
FCC ID	VYNBGS100
Frequency Band	2402 ~ 2480 MHz
Type of Modulation	FSK/FHSS
Number of Channels	79 channels
Antenna Gain	4 dB
Function Type	Transceiver
Power Source	Input DC 12V (car charger) Output DC 3.7V (Li-Ion battery)
Manufacturer Name	I.S HIGHTECH.INC
Manufacturer Address	603-1,Sungbon-ri,Daeso-myun,Eumsung-gun, chungcheongbuk-do,Korea

1.3 Testing Laboratory

Testing Place	Korea Testing Laboratory (KTL) 1271-12, Sa-Dong Sangnok-Gu, Ansan-si Gyunggi-Do , Korea
Test Engineer	Bum-Jong KIM
Telephone number	+82 31 5000 131
Facsimile number	+82 31 5000 159
E-mail address	temple@ktl.re.kr
Other Comments	-

II. SUMMARY OF TEST RESULTS

Testing performed for : BluePeaker

Equipment Under Test : BGS-100

Receipt of Test Sample : January 29, 2008

Test Start Date : January 29, 2008

Test End Date : February 05, 2008

The following table represents the list of measurements required under the FCC CFR47 Part 15.207, 15.247, 15.209

RFID mode

FCC Rules	Test Requirements	Result
15.247(a)(1)	20dB Bandwidth	Pass
15.247(a)(1)	Hopping channel Separation	Pass
15.247(a)(1)(iii)	Number of Hopping Frequency Used	Pass
15.247(a)(1)(iii)	Dwell Time of Each Frequency	Pass
15.247(b)	Output Power	Pass
15.247(c)	100 KHz Bandwidth of Frequency Band Edges	Pass
15.247(d)	Conducted Spurious Emission	Pass
15.209(a)	Radiated Emission	Pass

Note 1 : Test results reported in this document relate only to the items tested

Note 2 : The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria

Note 3 : Test results apply only to the item(s) tested

* Modifications required for compliance

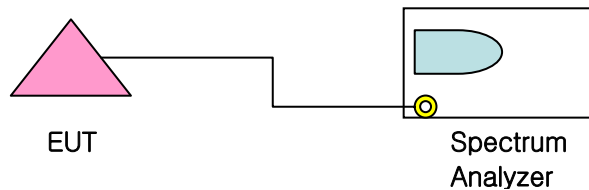
No modifications were implemented by KTL.

All results in this report pertain to the un-modified sample provided to KTL.

III. Measurement & Results

3.1 20dB Bandwidth

3.1.1 Test Setup Layout



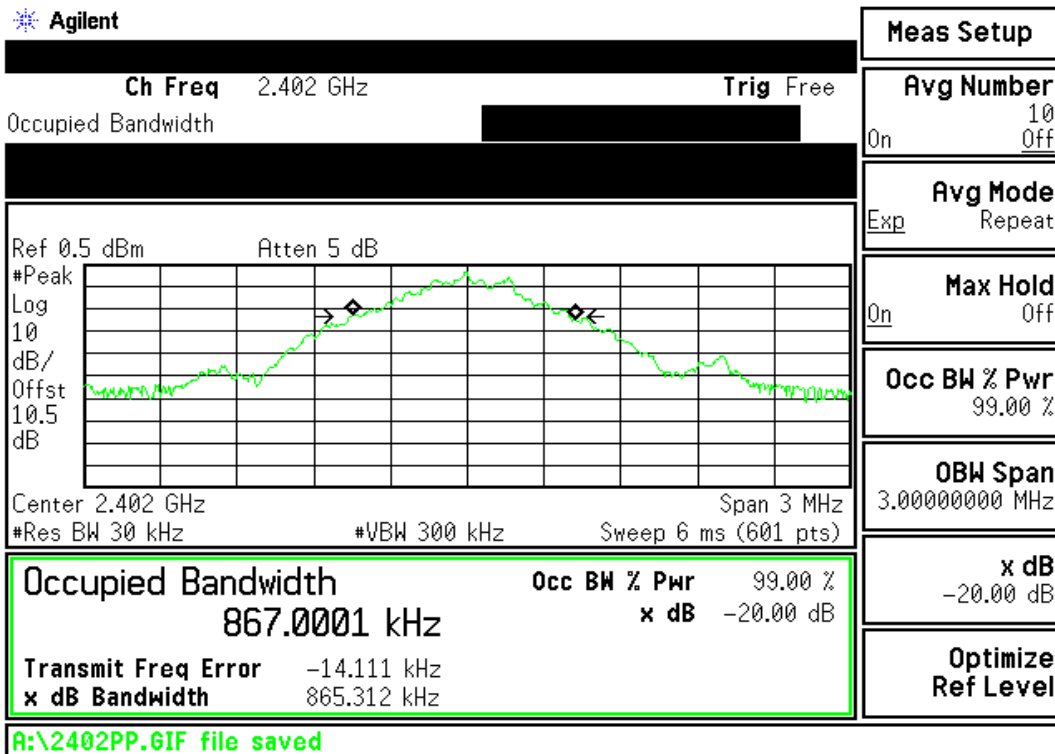
3.1.2 Test Condition

- Set RBW of Spectrum analyzer to 100 kHz
- The 20dB bandwidth is defined as the frequency range where the power is higher than the peak power minus 20dB . 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

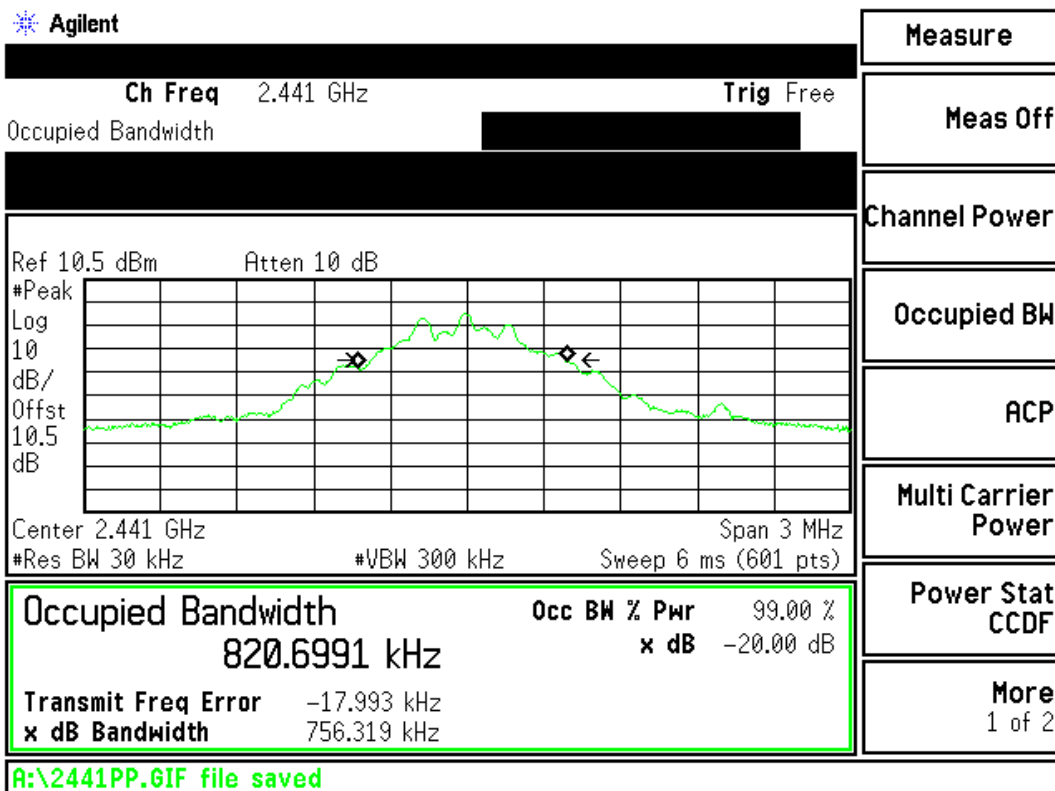
3.1.3 Test result

Bluetooth

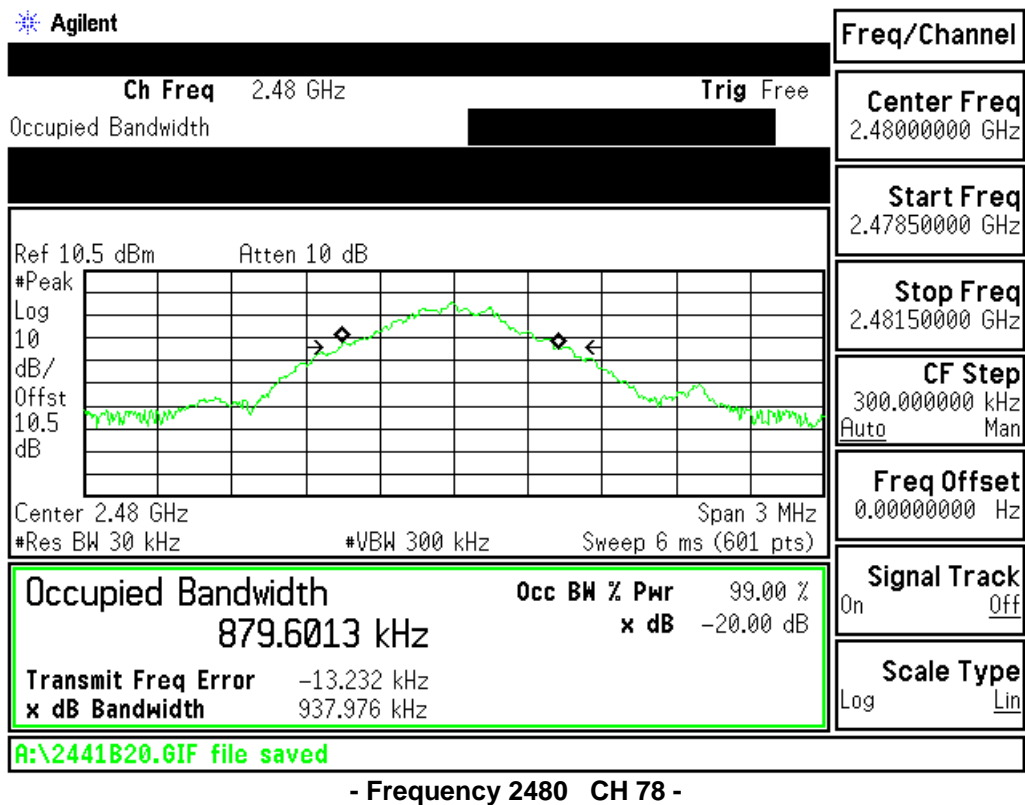
Channels	Frequency (MHz)	Result (kHz)	Verdict
0	2402	865	Pass
39	2441	756	Pass
78	2480	937	Pass



- Frequency 2402 CH 0 -

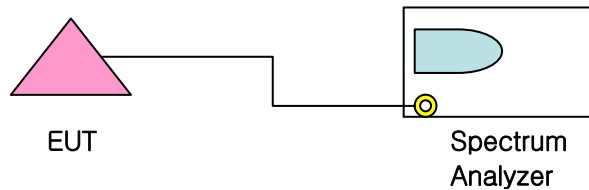


- Frequency 2441 CH 39 -



3.2 Maximum Peak Power

3.2.1 Test Setup Layout



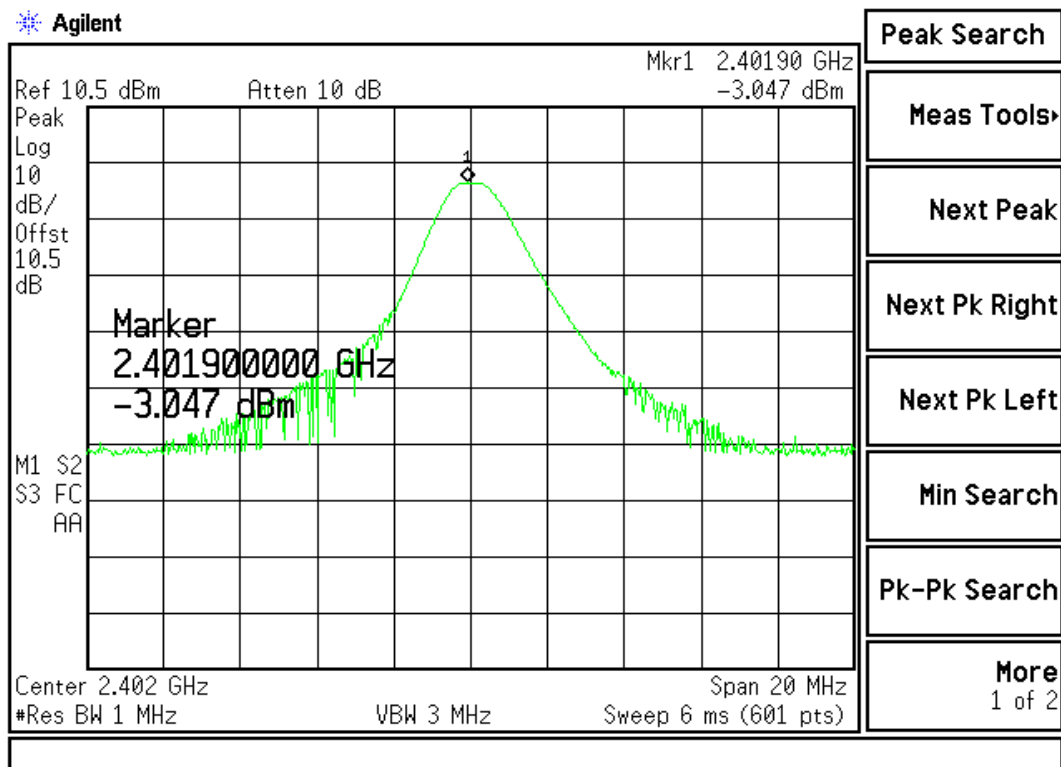
3.2.2 Test Condition

- Set RBW of Spectrum analyzer to 1 MHz
- The Maximum Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. 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 5725-5850 MHz band: 1 watt.

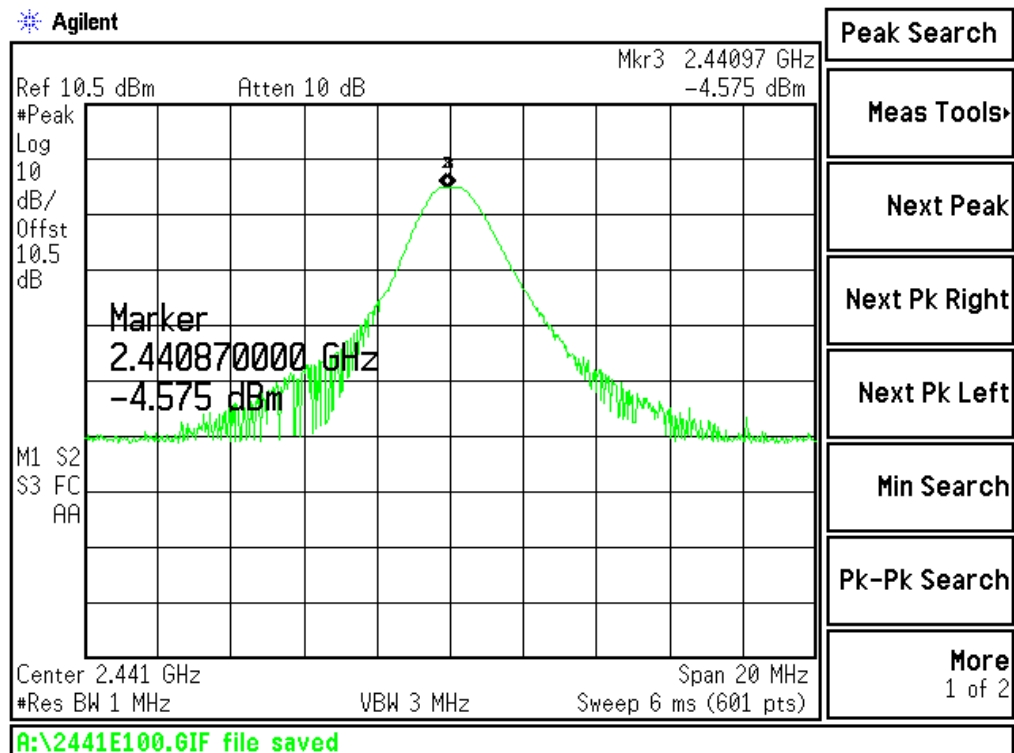
3.2.3 Test result

Bluetooth

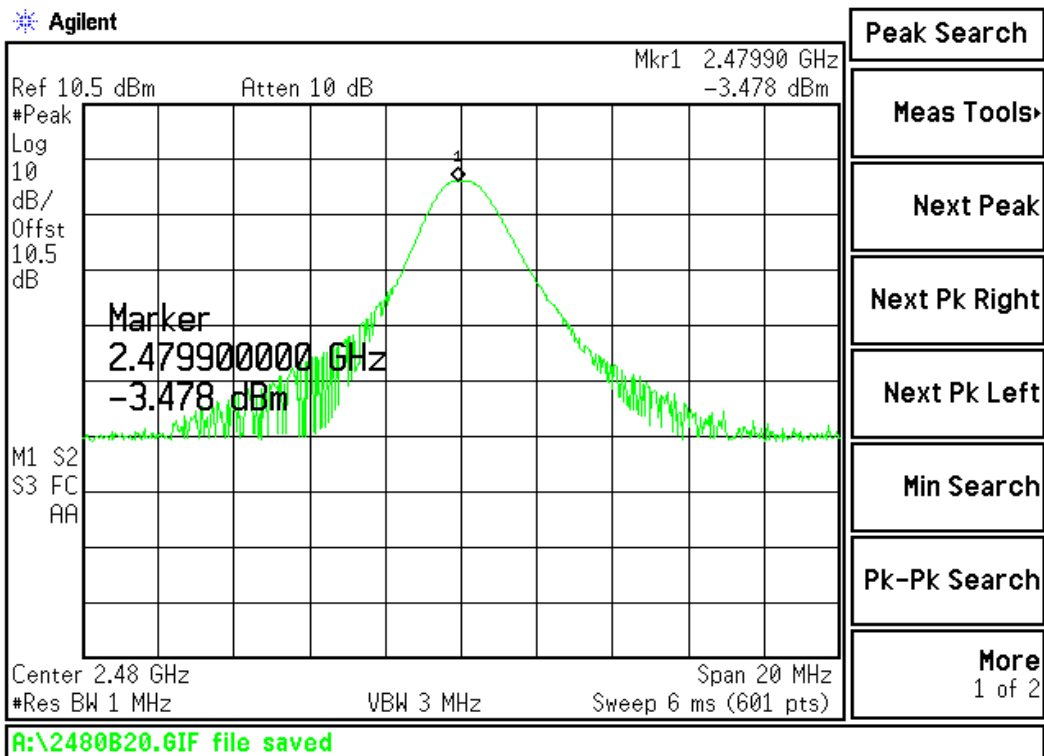
Channels	Frequency (MHz)	Result (dBm)	Limit (dB) 1W = 30 dB	Verdict
0	2402	- 3.047	≤ 30	Pass
39	2441	- 4.575	≤ 30	Pass
78	2480	- 3.478	≤ 30	Pass



- Frequency 2402 CH 0 -



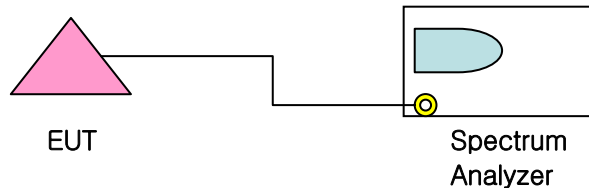
- Frequency 2441 CH 39 -



- Frequency 2480 CH 78 -

3.3 100 KHz Bandwidth of Frequency Band Edges

3.3.1 Test Setup Layout



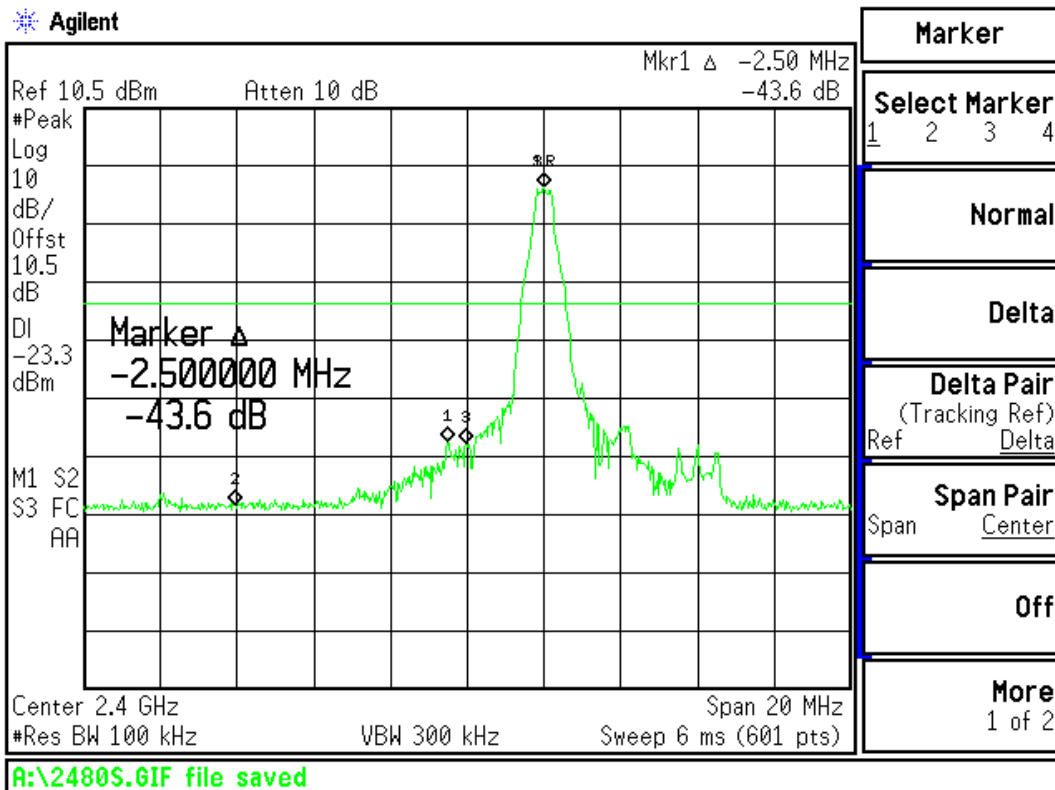
3.3.2 Test Condition

- Set RBW of Spectrum analyzer to 100 kHz
- 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.

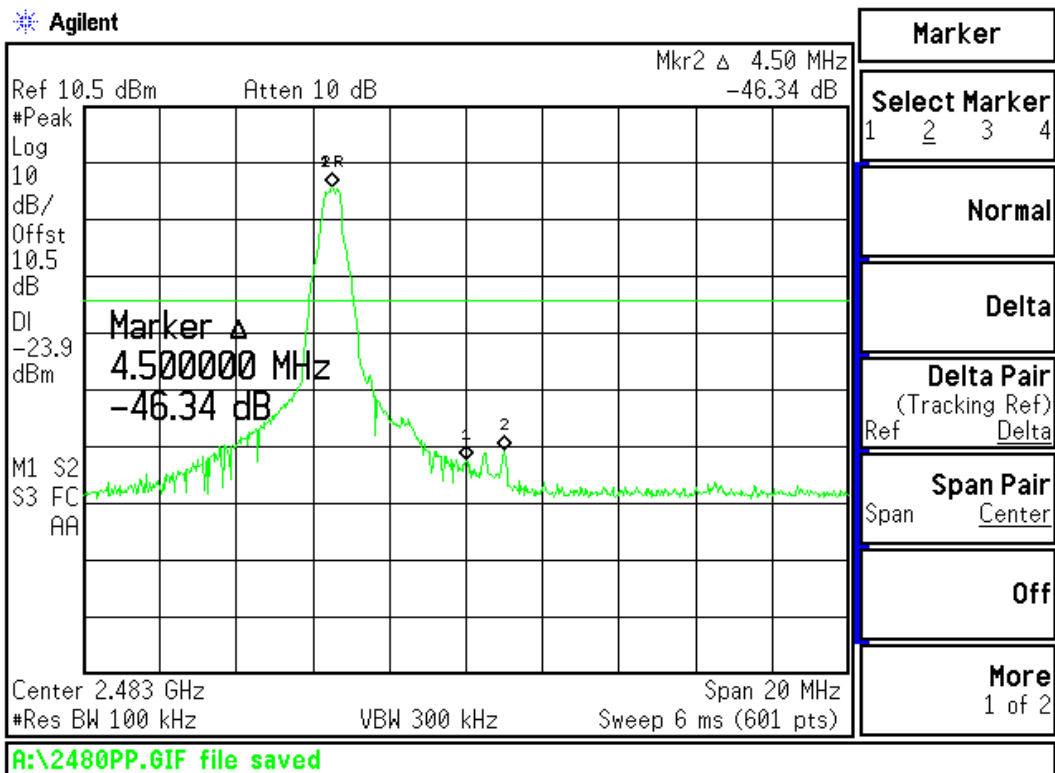
3.3.3 Test result

Bluetooth

Channels	Frequency (MHz)	Result (dBc)	Limit (dBc)	Verdict
0	2402	- 43.6	- 20	Pass
78	2480	- 46.3	- 20	Pass



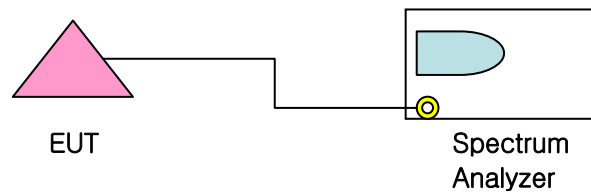
- Frequency 2402 CH 0 -



- Frequency 2480 CH 78 -

3.4 Hopping Channel separation

3.5.1 Test Setup Layout



3.4.2 Test Condition

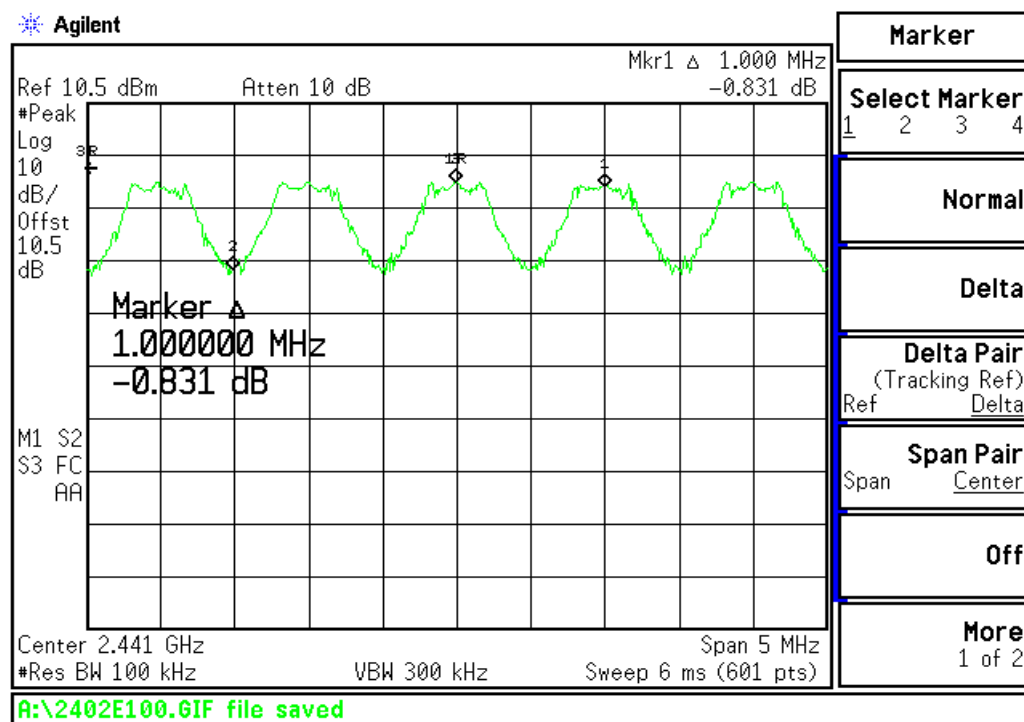
- Set RBW of Spectrum analyzer to 100 kHz
- Frequency hopping system shall have hopping channel carrier frequencies separated by minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

3.4.3 Test result

Bluetooth

Mode	Frequency (MHz)	Result (kHz)	Limit (kHz)	Verdict
Hopping mode	2441	1000	867	Pass

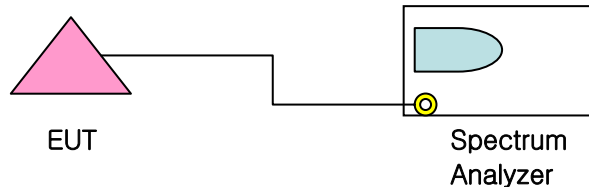
※ Remark : 20dB bandwidth is 867 kHz



- Frequency 2441 CH 39 -

3.5 Number of Hopping Channels

3.5.1 Test Setup Layout



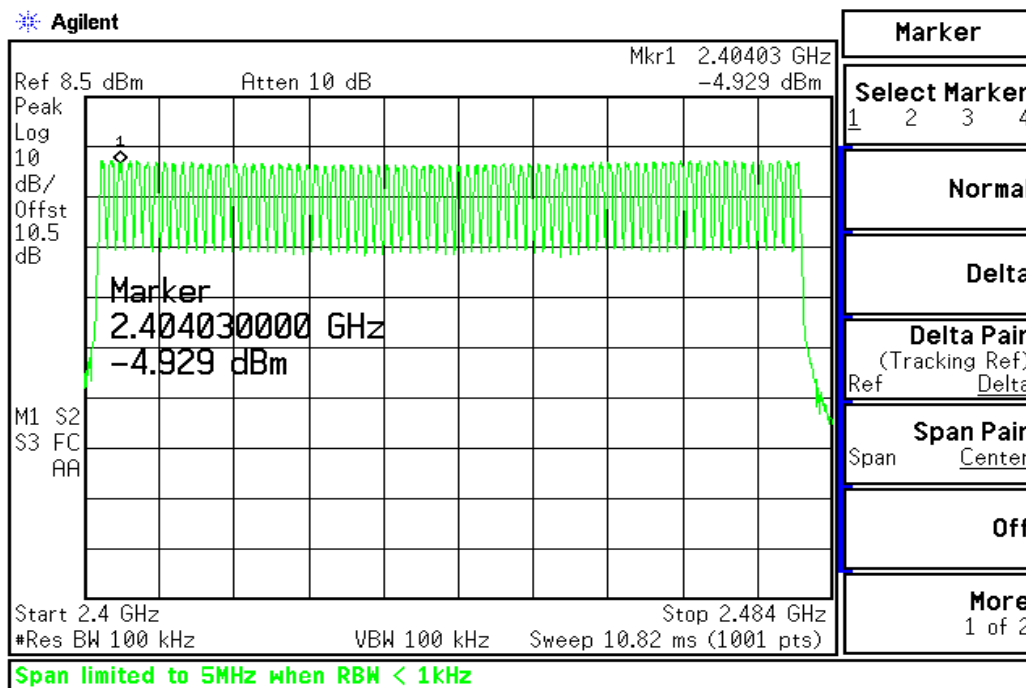
3.5.2 Test Condition

- Set RBW of Spectrum analyzer to 10 kHz
- Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

3.5.3 Test result

Bluetooth

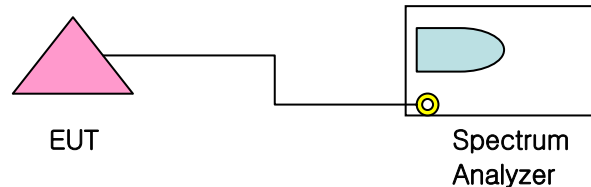
Mode	Frequency (MHz)	Result (channel)	Limit (channel)	Verdict
Hopping mode	2441	79	15	Pass



- Frequency 2441 CH 39 -

3.6 Dwell time

3.6.1 Test Setup Layout



3.6.2 Test Condition

- Set RBW of Spectrum analyzer to 100 kHz, sweep time is 286.6 s
- Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 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. Since the Bluetooth technology uses 79 channels this period is calculated to be 31.6 seconds.

The dwell time is calculated by:

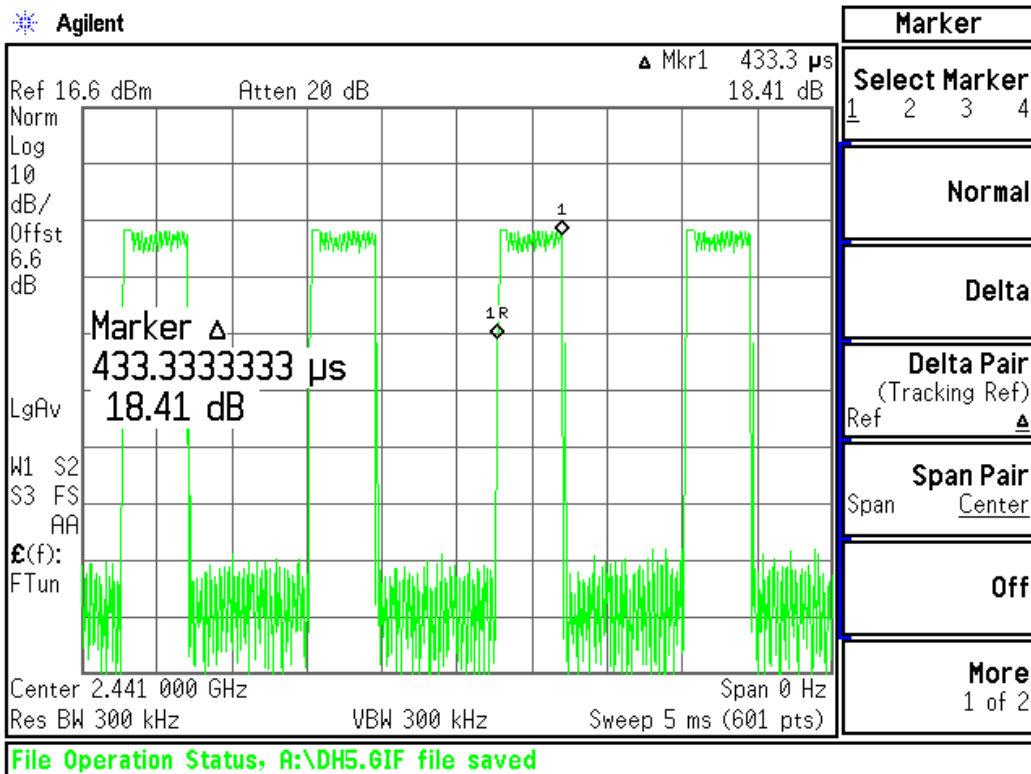
Dwell time = time slot length * hop rate * 31.6 / number of hopping channels with:

- hop rate = $1600 \times 1/s$ for DH1 packets = 1600
- hop rate = $1600/3 \times 1/s$ for DH3 packets = 533.33
- hop rate = $1600/5 \times 1/s$ for DH5 packets = 320
- number of hopping channels = 79
- $31.6 \text{ s} = 0.4 \text{ seconds multiplied by the number of hopping channels} = 0.4 \text{ s} \times 79$

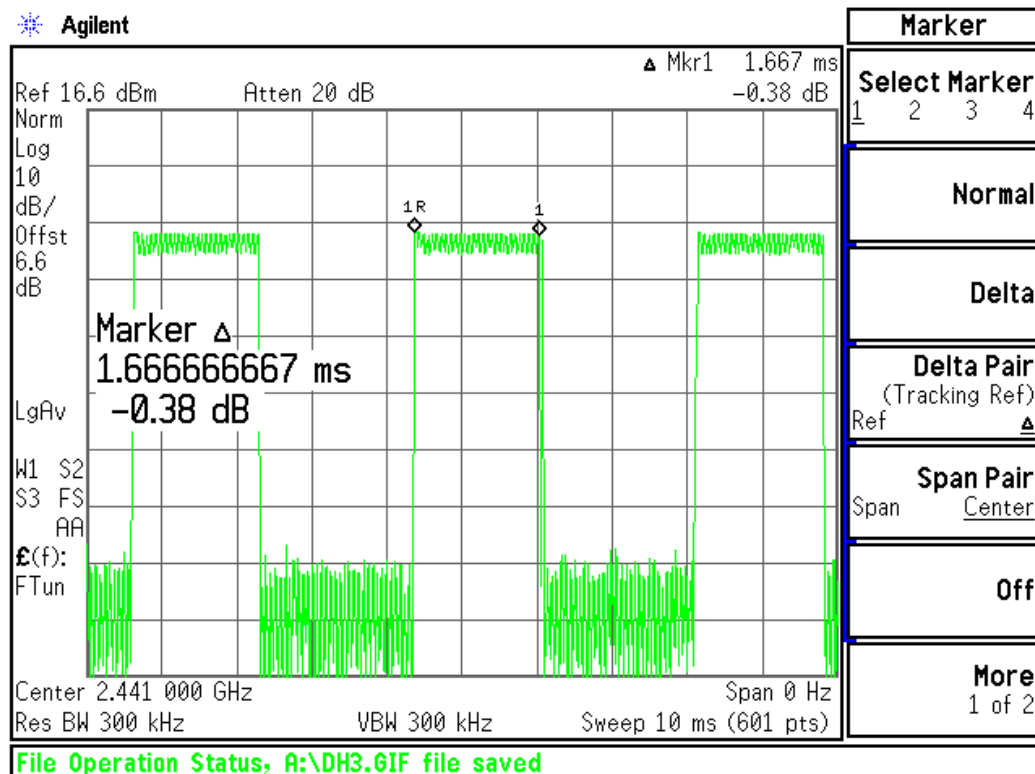
3.6.3 Test result

Bluetooth

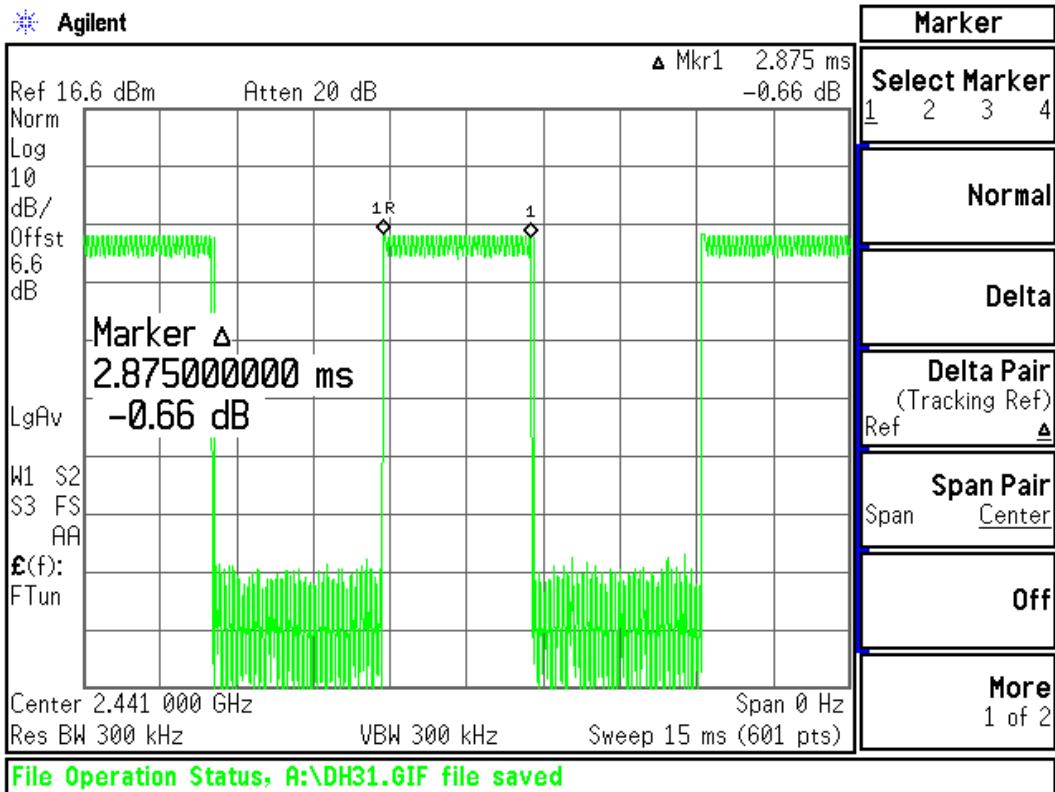
Channels	Type slot length(ms)	Dwell time (ms)	Limits (msec)	Packet type	Verdict
39	0.433	277.12	≤ 400	DH1	Pass
39	1.667	355.62	≤ 400	DH3	Pass
39	2.875	368.00	≤ 400	DH5	Pass



- Frequency 2441 CH39 Packet type DH1 -



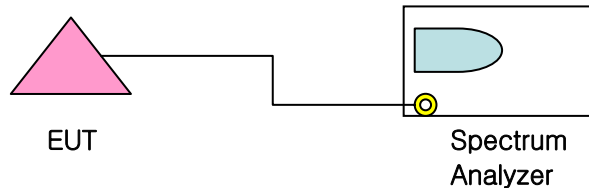
- Frequency 2441 CH39 Packet type DH3 -



- Frequency 2480 CH 78 Packet type DH5 -

3.7 Conducted Spurious Emissions (FCC Part15.247)

3.7.1 Test Setup Layout

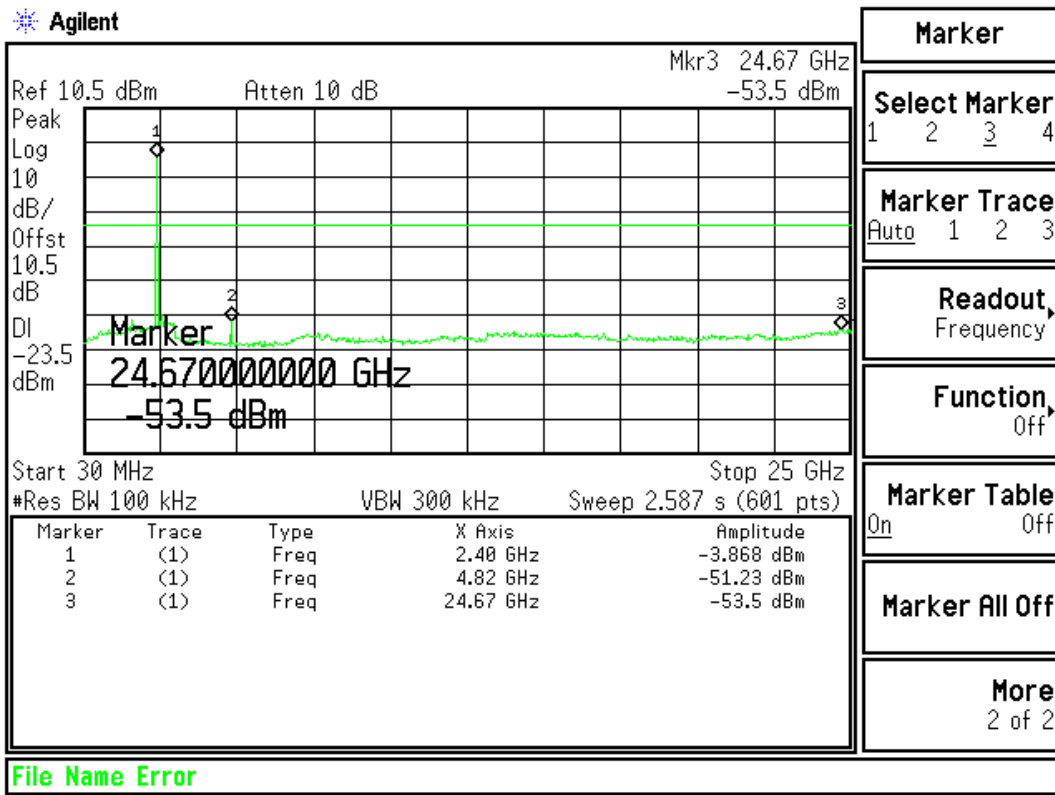


3.7.2 Test Condition

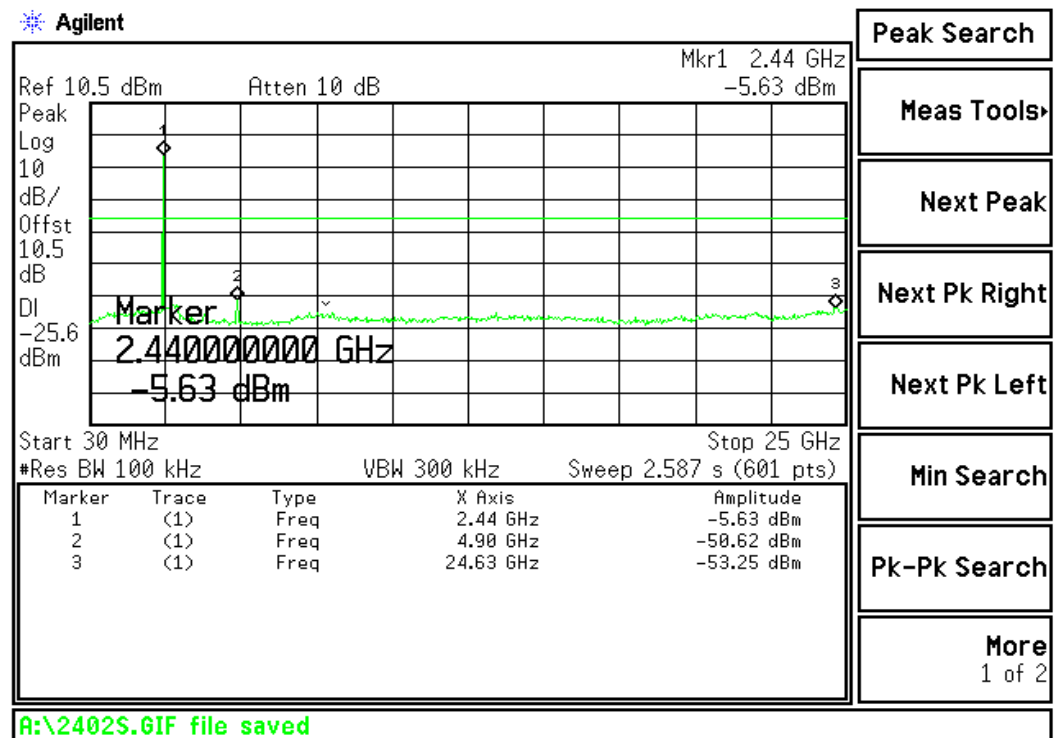
- The Equipment Under Test (EUT) was set up in a shielded room to perform the spurious emissions measurements.
- The EUT was connected to the spectrum analyzer and Bluetooth test set via a power splitter with a known loss.
- The reference value for the measurement of the spurious RF conducted emissions is determined during the test “band edge compliance” (cf. chapter 4.5). This value is used to calculate the 20 dBc limit.

Bluetooth

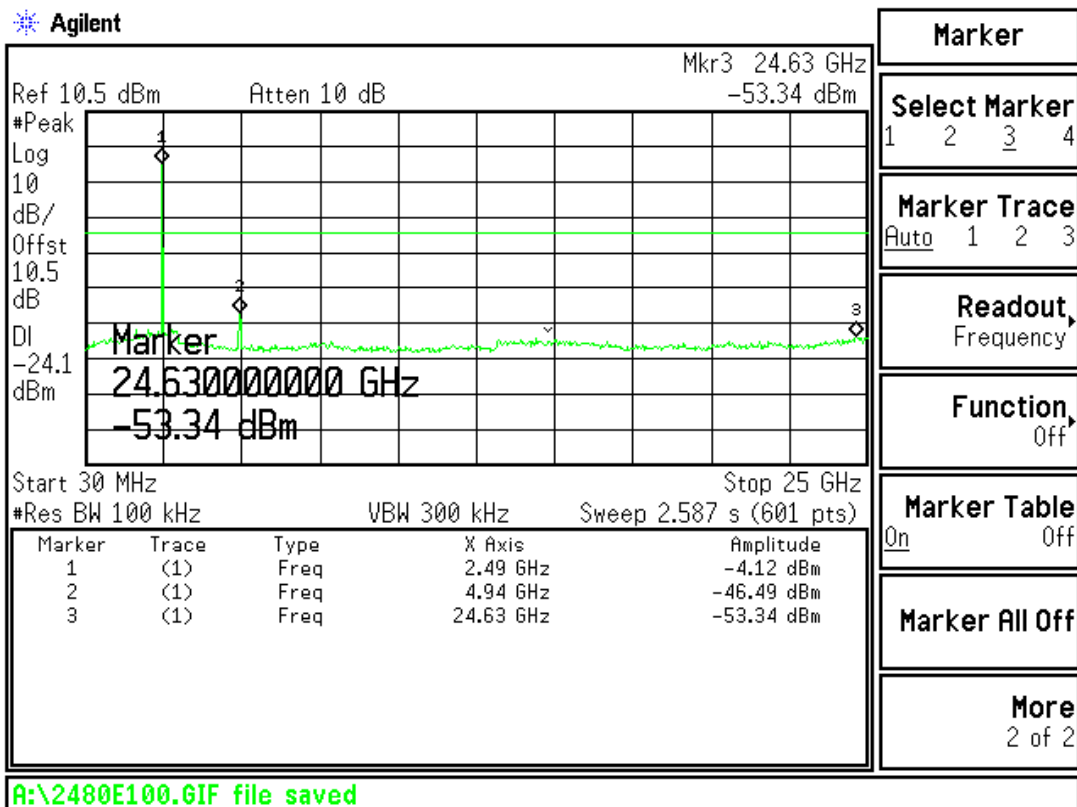
Channels	Frequency (MHz)	Result (dBc)	Limit (dBc)	Verdict
0	2402	- 53.50	- 20	Pass
39	2441	- -50.62	- 20	Pass
78	2480	- 53.34	- 20	Pass



- Frequency 2402 CH0 -



- Frequency 2441 CH39 -



- Frequency 2480 CH 78 -

3.8 Radiated Emissions (FCC Part15.209)

3.8.1 Test Procedure

3.8.1.1 Preliminary Testing for Reference

Preliminary testing was performed in a KTL absorber-lined room to determine the emission characteristics of the EUT. The EUT was placed on the wooden table which has dimensions of 0.8 meters in height, 1 meter in length and 1.5 meters in width. Receiving antenna (Biconi-Log antenna : 30 to 1000 MHz or Horn Antenna : 1 to 18 GHz) was placed at the distance of 1 meter from the EUT.

An attempt was made to maximize the emission level with the various configurations of the EUT. Emission levels from the EUT with various configurations were examined on a spectrum analyzer connected with a RF amplifier and graphed by a plotter.

3.8.1.2 Final Radiated Emission Test at an Absorber-Lined Room

The final measurement of radiated field strength was carried out in a KTL Absorber-Lined Room that was listed up at FCC according to the "Radiated Emissions Testing" procedure specified by ANSI C63.4.

Based on the test results in preliminary test, measurement was made in same test set up and configuration which produced maximum emission level. Receiving antenna was installed at 3-meter distance from the EUT, and was connected to an EMI receiver.

Turntable was rotated through 360 degrees and receiving antenna height was varied from 1 to 4 meters above the ground plane to read maximum emission level. Receiving antenna polarization was changed vertical and horizontal. The worst value was recorded.

If necessary, the radiated emission measurements could be performed at a closer distance than specified distance to ensure higher accuracy and their results were extrapolated to the specified distance using an inverse linear distance extrapolation factor (20 dB/decade) as per Section 15.31(f).

The maximum emission level from the EUT occurred in such configuration as shown in the following photograph.

3.8.2 Limits

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(2)
13.36 - 13.41			

1 Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

2 Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

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 Field Strength Measurement Distance (MHz) (microvolts/meter) (meters)

30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

3.8.3 Sample Calculation

The emission level measured in decibels above one microvolt ($\text{dB } \mu\text{V}$) was converted into microvolt per meter ($\mu\text{V/m}$) as shown in following sample calculation.

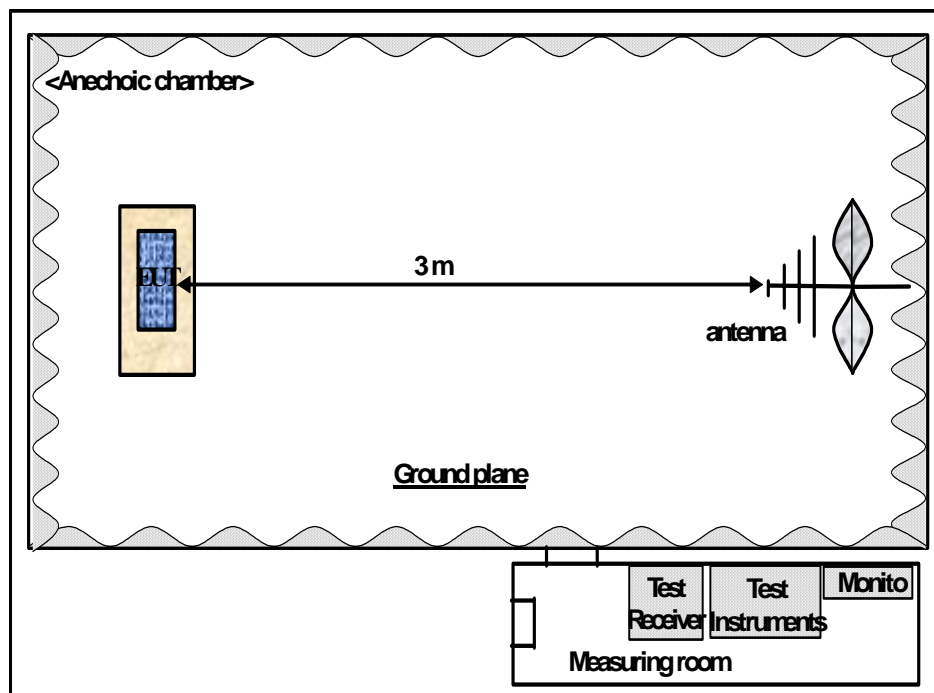
For example :

Measured Value at	<u>4804 MHz</u>	39.4 dB μV
+	Antenna Factor & Cable loss	39.7 dB
-	Preamplifier	-43.9 dB
-	Distance Correction Factor *	0.0 dB

=	Radiated Emission	35.2 dB $\mu\text{V/m}$

* Extrapolated from the measured distance to the specified distance by an inverse linear distance extrapolation.

3.8.4 Photograph for the test configuration



3.8.5 Test Results

3.8.5.1 Intentional Spurious Emission (15.209)

- Measurement mode : **Bluetooth (Transmit mode)**
- Resolution Bandwidth: x CISPR Quasi-Peak (6dB Bandwidth : 120kHz for below 1GHz)
Peak&Average (3dB Bandwidth : 1MHz for above 1GHz)
- Measurement channel : **Ch 0, Ch 39, Ch 78**
- Measurement Distance : 3 Meter
- The worst case is X axes

Frequency (MHz)		* D.M.	* A.P.	Measured Value (dB μ V)	* A.F. + C.L (dB/m)	* A.G. (dB)	* D.C.F. (dB)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	** Margin (dB)
CH 0	4804	P	H	53.4	39.7	-43.9	0	49.2	74	-24.8
	4804	A	H	39.4	39.7	-43.9	0	35.2	54	-18.8
CH39	4882	P	H	52.4	39.7	-44.0	0	48.1	74	-25.9
	4882	A	H	37.6	39.7	-44.0	0	33.3	54	-20.7
CH78	4960	P	H	52.2	40.1	-44.1	0	48.2	74	-25.8
	4960	A	H	38.2	40.1	-44.1	0	34.2	54	-19.8
	-	-	-	-	-	-	-	-	-	-

Note

The observed Spectrum Analyser(E4448A) noise floor level was 2.0 dB μ V. And all other emissions not reported on data were more than 25 dB below the permitted level.

- * D.M. : Detect Mode (P : Peak, Q : Quasi-Peak, A : Average)
- A.P. : Antenna Polarization (H : Horizontal, V : Vertical)
- A.F. : Antenna Factor
- C.L. : Cable Loss
- A.G. : Amplifier Gain
- D.C.F. : Distance Correction Factor
- < : Less than

** Margin (dB) = Emission Level (dB) - Limit (dB)

3.8.5.2 Radiated Emission (Receiving mode)

- Measurement mode : **Bluetooth**
- Resolution Bandwidth: x CISPR Quasi-Peak (6dB Bandwidth : 120kHz for below 1GHz)
Peak (3dB Bandwidth : 1MHz for above 1GHz)
- Measurement channel : **Ch 0, Ch 39, Ch 78**
- Measurement Distance : 3 Meter
- The worst case is X axes

Frequency (MHz)	* D.M.	* A.P.	Measured Value (dB μ V)	* A.F. + C.L. (dB/m)	* A.G. (dB)	* D.C.F. (dB)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	** Margin (dB)
33.3	Q	V	24.9	12.9	-32.0	0.0	5.8	40.0	-34.2
67.0	Q	V	35.7	12.5	-32.0	0.0	16.2	40.0	-23.8
82.8	Q	V	29.8	9.7	-32.0	0.0	7.5	40.0	-32.5
129.9	Q	V	41.2	13.1	-32.0	0.0	22.3	43.5	-21.2
192.8	Q	V	48.5	11.8	-32.0	0.0	28.3	43.5	-15.2
385.5	Q	V	40.7	17.3	-32.0	0.0	26.0	46.0	-20.0
578.8	Q	V	40.9	21.9	-32.0	0.0	30.8	46.0	-15.2
770.5	Q	H	40.5	25.6	-32.0	0.0	34.1	46.0	-11.9
963.2	Q	V	35.9	28.1	-32.0	0.0	32.0	46.0	-14.0
-	-	-	-	-	-	-	-	-	-

Note

The observed EMI receiver(ESVS30) noise floor level was 2.0 dB μ V. And all other emissions not reported on data were more than 25 dB below the permitted level.

- * D.M. : Detect Mode (P : Peak, Q : Quasi-Peak, A : Average)
- A.P. : Antenna Polarization (H : Horizontal, V : Vertical)
- A.F. : Antenna Factor
- C.L. : Cable Loss
- A.G. : Amplifier Gain
- D.C.F. : Distance Correction Factor
- < : Less than

** Margin (dB) = Emission Level (dB) - Limit (dB)

VI. TEST EQUIPMENTS

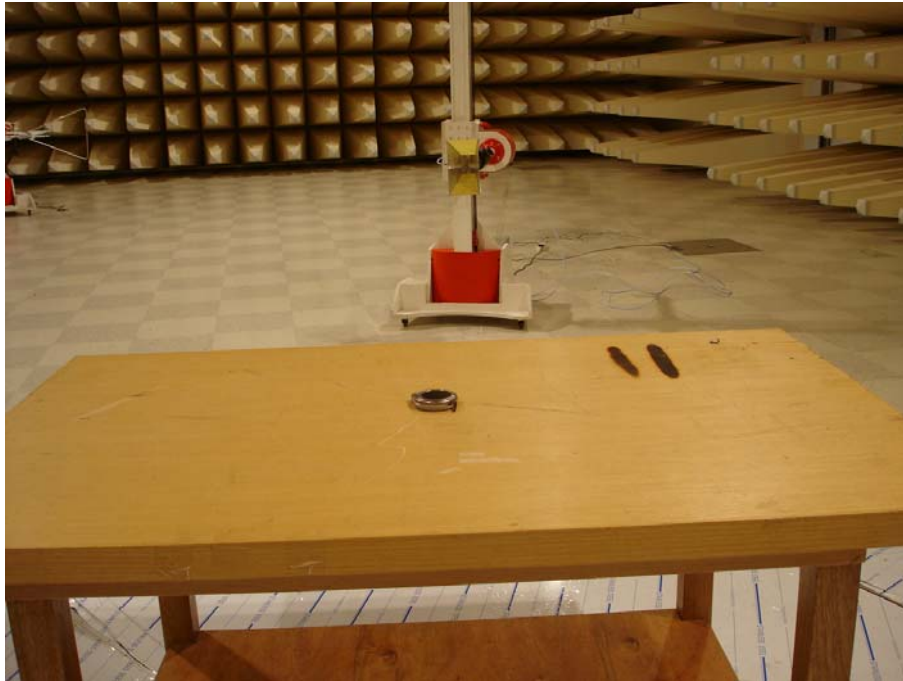
No.	Equipment	Manufacturer	Model	S/N	Effective Cal.Duration
1	EMI Receiver (20 MHz ~ 1 GHz)	R&S	ESVS30	830516002	03/15/2007 ~ 03/15/2008
2	EMI Receiver (9 kHz ~ 3 GHz)	R&S	ESCI	100076	03/28/2007 ~ 03/28/2008
3	Spectrum Analyzer (100 Hz ~ 26.5 GHz)	Agilent	E4407B	US41443316	12/01/2007 ~ 12/01/2008
4	Spectrum Analyzer (3 Hz ~ 50 GHz)	Agilent	E4448A	MY43360322	02/26/2007 ~ 02/26/2008
5	Test Receiver (9 kHz ~ 30 MHz)	R&S	ESH3	860905001	06/18/2007 ~ 06/18/2008
6	Pre-Amplifier (100 kHz ~ 3 GHz)	H.P.	8347A	2834A00543	05/19/2007 ~ 05/19/2008
7	Pre-Amplifier (1 GHz ~ 26.5 GHz)	H.P.	8449B	3008A00302	06/14/2007 ~ 06/14/2008
8	LISN(50 Ω , 50 μ H) (10 kHz ~ 100 MHz)	R&S	ESH3-Z5	826789009	07/05/2007 ~ 07/05/2008
9	Biconi-Log Ant. (30 MHz ~ 1000 MHz)	Schwarzbeck	VULB9168	9168-168	08/16/2007 ~ 08/16/2008
10	Horn Ant. (1 GHz ~ 18 GHz)	EMCO	3115	--	05/09/2007 ~ 05/09/2008
11	Active Loop Ant. (9 kHz ~ 30 MHz)	EMCO	6502	2532	06/08/2007 ~ 06/08/2008
12	Shielded Room (5.0 m x 4.5 m)	SIN-MYUNG	--	--	--
13	Signal Generator (250 kHz ~ 20 GHz)	Agilent	E8257D	MY44320379	01/02/2007 ~ 01/02/2008
14	DC Power Supply	Agilent	E4356A	MY41000296	09/28/2007 ~ 09/28/2008
15	Power Splitter	H.P.	11667A	21063	10/09/2007 ~ 10/09/2008
16	Power Meter	Agilent	E4417A	GB4129075	09/17/2007 ~ 09/17/2008
17	Attenuator	Weinschel	56-20	N8257	01/13/2007 ~ 01/13/2008
18	Oscillator	Kenwood	AG-203D	10040568	10/23/2007 ~ 10/23/2008

APPENDIX

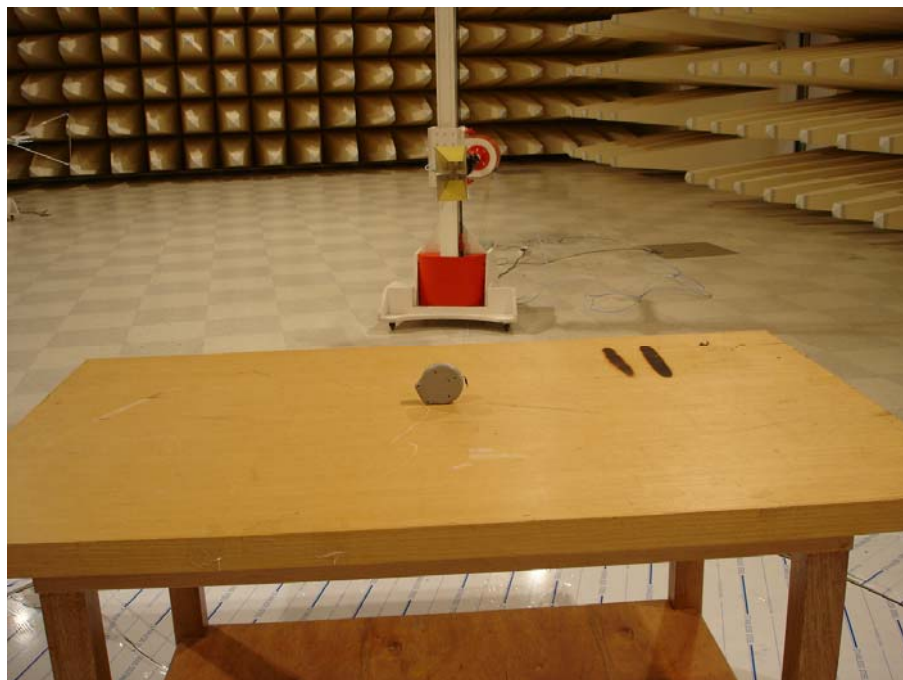
1. EUT photo



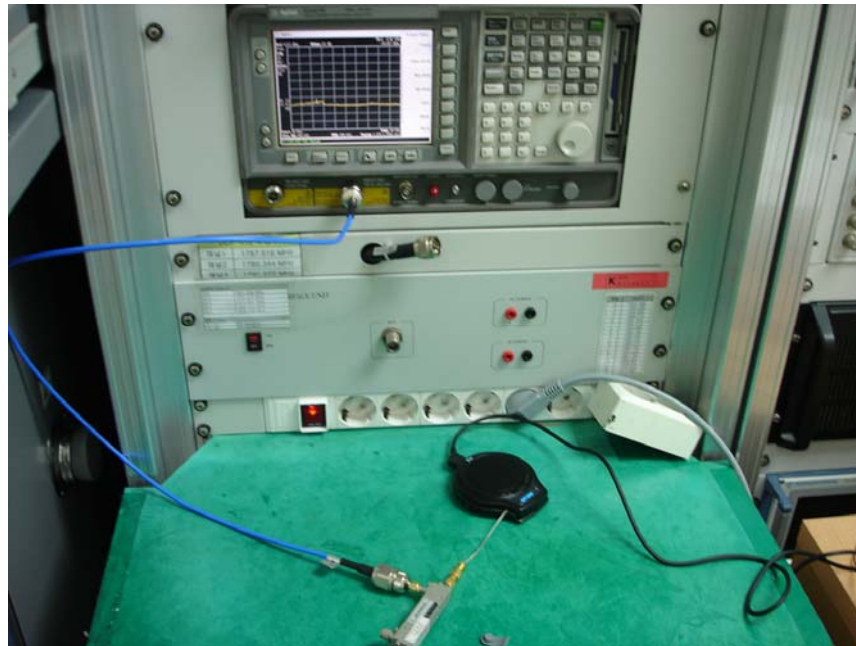
2. Test setup photo



<Radiated Emission>



<Radiated Emission>



<RF Conducted TEST>