

FCC RADIO TEST REPORT-BLE

FCC ID:2AGNHBLUEBOX

Product : Blue Box

Trade Name : N/A

Model Name : HM03-001

Serial Model : N/A

Report No. : ISOT151116078F

Prepared for

Herman Miller

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Prepared by

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TEST RESULT CERTIFICATION

Applicant's name Herman Miller

Address..... 202, 1 Yip Fat Street, Wong Chuk Hang, Hong Kong

Manufacture's Name.. BCD China Electronics Manufacturing (Shenzhen) Ltd

Address..... 3/F, Bldg B2, Xin An No. 3 Industrial Park, HangCheng Industrial Zone,
Qian Jin Rd, Xi Xiang, Bao An District, Shenzhen

Product description

Product name..... Blue Box

Model and/or type reference HM03-001

Serial Model N/A

Standards FCC Part15.247: 2015

Test procedure ANSI C63.10-2013

This device described above has been tested by ISOTek, and the test results show that the equipment under test (EUT) is in compliance with the Industry Canada requirements. And it is applicable only to the tested sample identified in the report.

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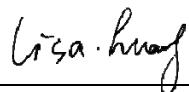
Date of Test

Date (s) of performance of tests.....: 16 Nov. 2015 ~30 Nov. 2015

Date of Issue: 30 Nov. 2015

Test Result.....: **Pass**

Compiled by:



Lisa Huang/ Project Engineer

Approved by:



Richard Chen/ Manager

Table of Contents

	Page
1 . SUMMARY OF TEST RESULTS	5
1.1 TEST FACILITY	6
1.2 MEASUREMENT UNCERTAINTY	6
2 . GENERAL INFORMATION	7
2.1 GENERAL DESCRIPTION OF EUT	7
2.2 DESCRIPTION OF TEST MODES	9
2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED	10
2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)	11
2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS	12
3 . EMC EMISSION TEST	13
3.1 CONDUCTED EMISSION MEASUREMENT	13
3.1.1 POWER LINE CONDUCTED EMISSION LIMITS	13
3.1.2 TEST PROCEDURE	14
3.1.3 DEVIATION FROM TEST STANDARD	14
3.1.4 TEST SETUP	14
3.1.5 EUT OPERATING CONDITIONS	14
3.1.6 TEST RESULTS	15
3.2 RADIATED EMISSION MEASUREMENT	17
3.2.1 RADIATED EMISSION LIMITS	17
3.2.2 TEST PROCEDURE	18
3.2.3 TEST PROCEDURE	18
3.2.4 DEVIATION FROM TEST STANDARD	18
3.2.5 TEST SETUP	19
3.2.6 EUT OPERATING CONDITIONS	20
3.2.7 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)	21
3.2.8 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)	22
3.2.9 TEST RESULTS (ABOVE 1000 MHZ)	24
4 . POWER SPECTRAL DENSITY TEST	25
4.1 APPLIED PROCEDURES / LIMIT	25
4.1.1 TEST PROCEDURE	25
4.1.2 DEVIATION FROM STANDARD	25
4.1.3 TEST SETUP	25
4.1.4 EUT OPERATION CONDITIONS	25
4.1.5 TEST RESULTS	26
5 . BANDWIDTH TEST	28
5.1 APPLIED PROCEDURES / LIMIT	28

Table of Contents

	Page
5.1.1 TEST PROCEDURE	28
TEST SETUP	28
5.1.2 EUT OPERATION CONDITIONS	28
5.1.3 TEST RESULTS	29
6 . PEAK OUTPUT POWER TEST	31
6.1 APPLIED PROCEDURES / LIMIT	31
6.1.1 TEST PROCEDURE	31
6.1.2 DEVIATION FROM STANDARD	31
6.1.3 TEST SETUP	31
6.1.4 EUT OPERATION CONDITIONS	31
6.1.5 TEST RESULTS	32
7 . 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE	33
7.1 DEVIATION FROM STANDARD	33
7.2 TEST SETUP	33
7.3 EUT OPERATION CONDITIONS	33
7.4 TEST RESULTS	34
8 . ANTENNA REQUIREMENT	36
8.1 STANDARD REQUIREMENT	36
8.2 EUT ANTENNA	36
9 . EUT TEST PHOTO	37
APPENDIX-PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS	

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

FCC Part15 (15.247) , Subpart C			
Standard Section	Test Item	Judgment	Remark
15.207	Conducted Emission	PASS	
15.247 (a)(2)	6dB Bandwidth	PASS	
15.247 (b)	Peak Output Power	PASS	
15.247 (c)	Radiated Spurious Emission	PASS	
15.247 (d)	Power Spectral Density	PASS	
15.205	Band Edge Emission	PASS	
15.203	Antenna Requirement	PASS	

NOTE:

(1)" N/A" denotes test is not applicable in this Test Report

1.1 TEST FACILITY

Shenzhen ISOTek Standards Technical Services Co.,Ltd.

Add.: 13/F, HuaFengRui Building, XinHu Rd., XiXiang, Bao'an District, Shenzhen, China

FCC Registration No.: **918037**

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2** , providing a level of confidence of approximately **95 %** .

No.	Item	Uncertainty
1	Conducted Emission Test	$\pm 1.38\text{dB}$
2	RF power,conducted	$\pm 0.16\text{dB}$
3	Spurious emissions,conducted	$\pm 0.21\text{dB}$
4	All emissions,radiated(<1G)	$\pm 4.68\text{dB}$
5	All emissions,radiated(>1G)	$\pm 4.89\text{dB}$
6	Temperature	$\pm 0.5^\circ\text{C}$
7	Humidity	$\pm 2\%$

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Blue Box										
Trade Name	N/A										
Model Name	HM03-001										
Serial Model	N/A										
Model Difference	N/A										
Product Description	<p>The EUT is a Blue Box</p> <table border="1"> <tr> <td>Operation Frequency:</td><td>2402~2480MHz</td></tr> <tr> <td>Modulation Type:</td><td>GFSK</td></tr> <tr> <td>Number Of Channel</td><td>40CH</td></tr> <tr> <td>Antenna Designation:</td><td>Please see Note 3.</td></tr> <tr> <td>Antenna Gain (dBi)</td><td>1.0dBi</td></tr> </table>	Operation Frequency:	2402~2480MHz	Modulation Type:	GFSK	Number Of Channel	40CH	Antenna Designation:	Please see Note 3.	Antenna Gain (dBi)	1.0dBi
Operation Frequency:	2402~2480MHz										
Modulation Type:	GFSK										
Number Of Channel	40CH										
Antenna Designation:	Please see Note 3.										
Antenna Gain (dBi)	1.0dBi										
Channel List	Please refer to the Note 2.										
Ratings	DC 5 V										
Adapter	N/A										
Battery	N/A										
Connecting I/O Port(s)	RJ45										
BT version	V4.0+BLE										
Hardware version:	REV 03										
Software version:	V 01										

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.

Channel	Frequency (MHz)
00	2402
01	2404
.....
.....
...	...
.....
38	2478
39	2480

3.

Table for Filed Antenna

Ant	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	NOTE
A	N/A	N/A	The antenna is integrated inside the SIP module (BCM20737S)	N/A	1.0	BT Antenna

2.2 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH00
Mode 2	CH19
Mode 3	CH39
Mode 4	Link Mode

For Conducted Emission	
Final Test Mode	Description
Mode 4	Link Mode

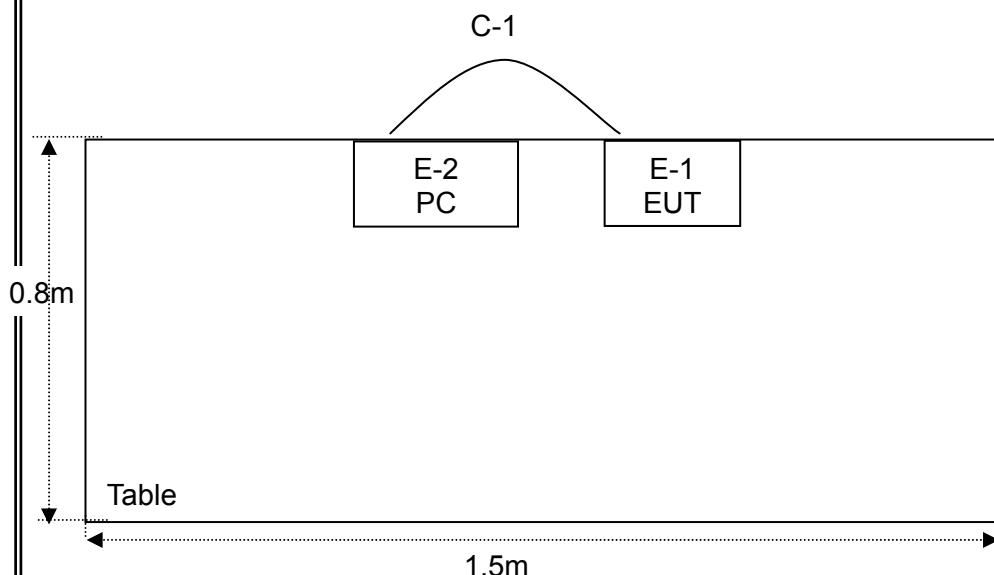
For Radiated Emission	
Final Test Mode	Description
Mode 1	CH00
Mode 2	CH19
Mode 3	CH39
Mode 4	Link Mode

Note:

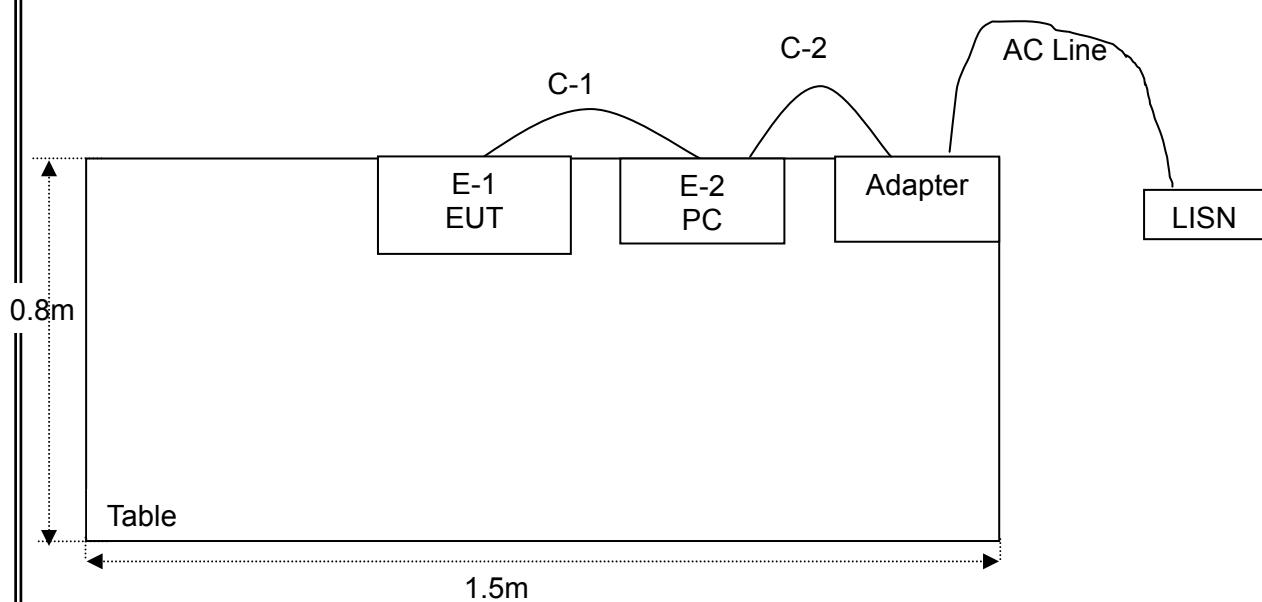
- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.
- (3) EUT through cable connection to control board, Control board and computer through the USB port connection, so, PC control software sends commands to the control panel, Control board send instructions to EUT, at a fixed and/or Hopping frequency transmitter.

2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

RE



CE



2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Brand	Model/Type No.	Series No.	Note
E-1	Blue Box	N/A	HM03-001	N/A	EUT
E-2	Personal computer	DELL	FT4Y23X	N/A	
	Adapter	DELL	HSTAN-LA13	N/A	

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	1.2m	

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation & other conducted test test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4446A	US44300451	2015.07.06	2016.07.05	1 year
2	EMI Test Receiver	R&S	ESCI	101165	2015.07.06	2016.07.05	1 year
3	Loop Antenna	ARA	PLA - 1030/B	1029	2015.07.06	2016.07.05	1 year
4	Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2015.07.06	2016.07.05	1 year
5	Horn Antenna	Schwarzbeck	BBHA 9170	9170-182	2015.07.06	2016.07.05	1 year
6	Amplifier	Schwarzbeck	BBV9743	9743-019	2015.07.06	2016.07.05	1 year
7	Test Cable Below 1GHz	ATM	R-01	3564	2015.07.06	2016.07.05	1 year
8	Test Cable Above 1GHz	ATM	R-02	3565	2015.07.06	2016.07.05	1 year
9	Power Meter	R&S	NRVS	100696	2015.07.06	2016.07.05	1 year
10	Power Sensor	R&S	URV5-Z4	0395.1619.05	2015.07.06	2016.07.05	1 year
11	Horn Antenna	Sunol Sciences	DRH-118	A052604	2015.07.06	2016.07.05	1 year

Conduction Test equipment

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	LISN	messtec	AN3019	NO.1	Jul. 06, 2015	Jul. 05, 2016	1 year
2	LISN	SCHWARZB ECK	NNLK 8129	8126466	Jul. 06, 2015	Jul. 05, 2016	1 year
3	Pulse Limiter	SCHWARZB ECK	VTSD9596F	9618	Jul. 06, 2015	Jul. 05, 2016	1 year
4	EMI Test Receiver	R&S	ESCI	100843	Jul. 06, 2015	Jul. 05, 2016	1 year
5	Switch	Schwarzbeck	CX - 210	100196	Jul. 06, 2015	Jul. 05, 2016	1 year
6	Test Cable 9KHz-300MHz	ATM	C01	3566	Jul. 06, 2015	Jul. 05, 2016	1 year

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)		Standard
	Quasi-peak	Average	Quasi-peak	Average	
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	CISPR
0.50 -5.0	73.00	60.00	56.00	46.00	CISPR
5.0 -30.0	73.00	60.00	60.00	50.00	CISPR

0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *	FCC
0.50 -5.0	73.00	60.00	56.00	46.00	FCC
5.0 -30.0	73.00	60.00	60.00	50.00	FCC

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

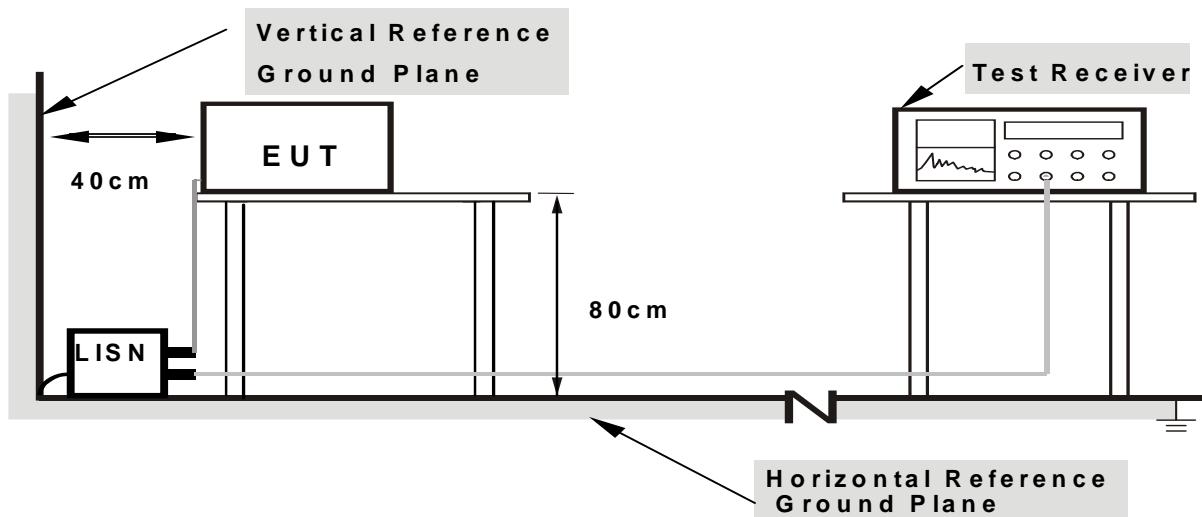
3.1.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 DEVIATION FROM TEST STANDARD

No deviation

3.1.4 TEST SETUP



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

3.1.6 TEST RESULTS

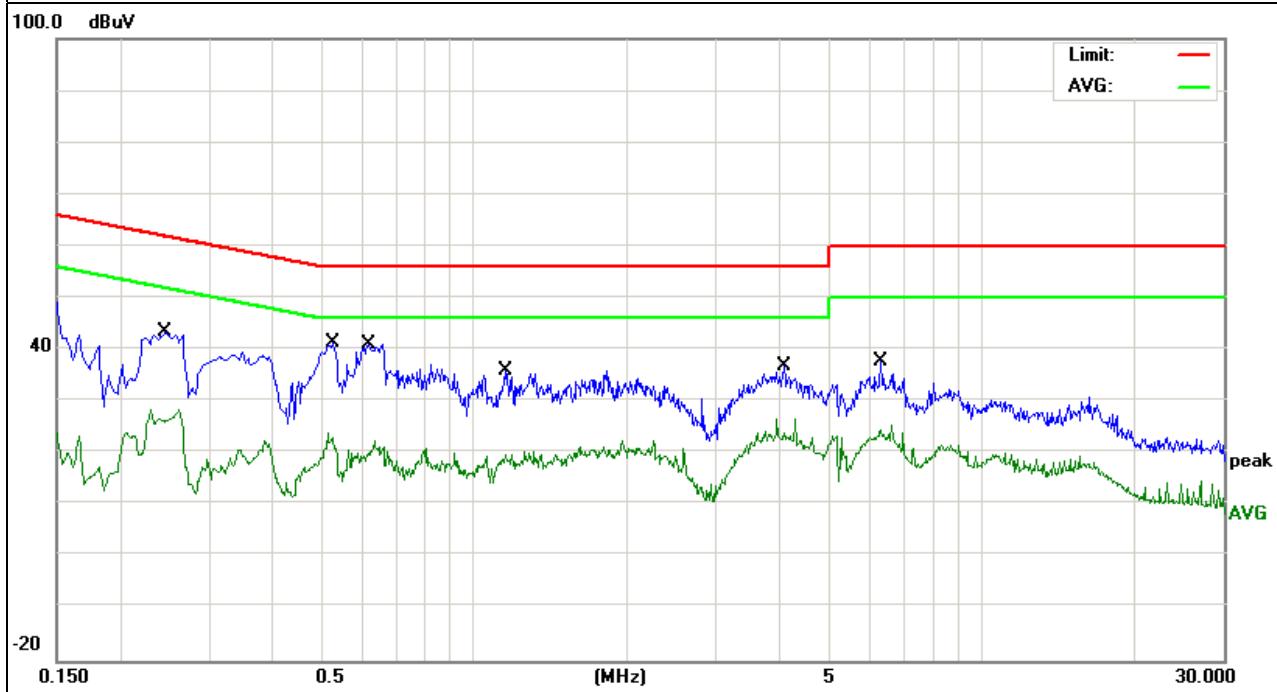
EUT :	Blue Box	Model Name. :	HM03-001
Temperature :	26 °C	Relative Humidity :	56%
Pressure :	1010hPa	Phase :	L
Test Voltage :	DC 5.0V form PC of adapter AC 120V/60Hz	Test Mode :	Mode 4

Frequency	Reading Level	Correct Factor	Measure-ment	Limits	Margin	Remark
(MHz)	(dB μ V)	(dB)	(dB μ V)	(dB μ V)	(dB)	
0.2459	33.83	9.50	43.33	61.89	-18.56	QP
0.2459	14.15	9.50	23.65	51.89	-28.24	AVG
0.5260	31.90	9.55	41.45	56.00	-14.55	QP
0.5260	13.14	9.55	22.69	46.00	-23.31	AVG
0.6179	31.55	9.56	41.11	56.00	-14.89	QP
0.6179	14.02	9.56	23.58	46.00	-22.42	AVG
1.1499	26.35	9.56	35.91	56.00	-20.09	QP
1.1499	13.18	9.56	22.74	46.00	-23.26	AVG
4.0819	27.28	9.66	36.94	56.00	-19.06	QP
4.0819	12.03	9.66	21.69	46.00	-24.31	AVG
6.3219	27.97	9.69	37.66	60.00	-22.34	QP
6.3219	13.08	9.69	22.77	50.00	-27.23	AVG

Remark:

1. All readings are Quasi-Peak and Average values.

2. Factor = Insertion Loss + Cable Loss.

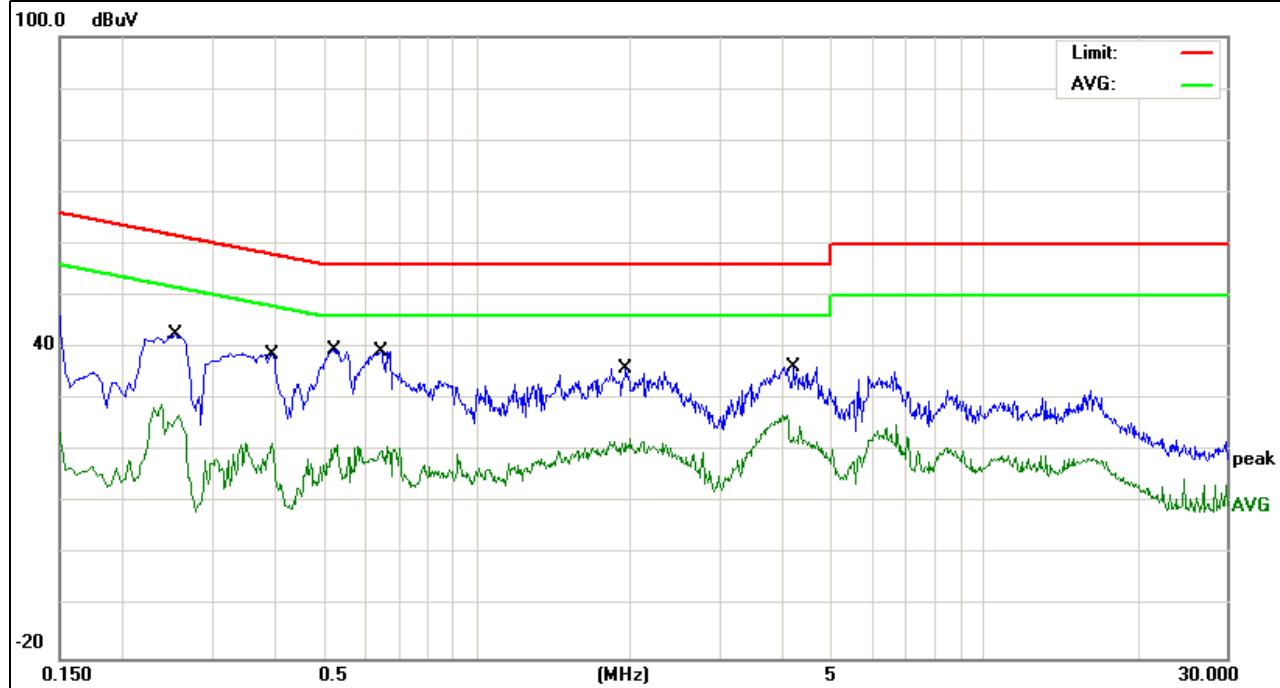


EUT :	Blue Box	Model Name. :	HM03-001
Temperature :	26 °C	Relative Humidity :	56%
Pressure :	1010hPa	Phase :	N
Test Voltage :	DC 5.0V form PC of adapter AC 120V/60Hz	Test Mode :	Mode 4

Frequency (MHz)	Reading Level (dB μ V)	Correct Factor (dB)	Measure-ment (dB μ V)	Limits (dB μ V)	Margin (dB)	Remark
0.2540	32.95	9.45	42.40	61.62	-19.22	QP
0.2540	14.34	9.45	23.79	51.62	-27.83	AVG
0.3940	29.36	9.44	38.80	57.98	-19.18	QP
0.3940	12.61	9.44	22.05	47.98	-25.93	AVG
0.5220	30.17	9.46	39.63	56.00	-16.37	QP
0.5220	12.42	9.46	21.88	46.00	-24.12	AVG
0.6460	29.75	9.44	39.19	56.00	-16.81	QP
0.6460	10.25	9.44	19.69	46.00	-26.31	AVG
1.9659	26.49	9.46	35.95	56.00	-20.05	QP
1.9659	12.32	9.46	21.78	46.00	-24.22	AVG
4.2058	26.72	9.47	36.19	56.00	-19.81	QP
4.2058	13.24	9.47	22.71	46.00	-23.29	AVG

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
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

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class B (dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.2.2 TEST PROCEDURE

3.2.3 TEST PROCEDURE

- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 m for below 1GHz and 1.5m for above 1GHz the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m for below 1GHz and 1.5m for above 1GHz; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

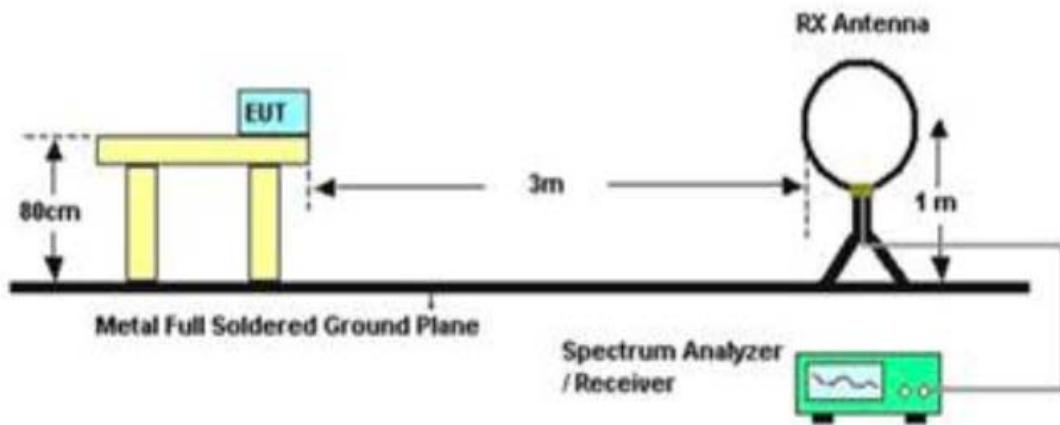
Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	QP	120 kHz	300 kHz
Above 1000	Peak	1 MHz	1 MHz
	Peak	1 MHz	10 Hz

3.2.4 DEVIATION FROM TEST STANDARD

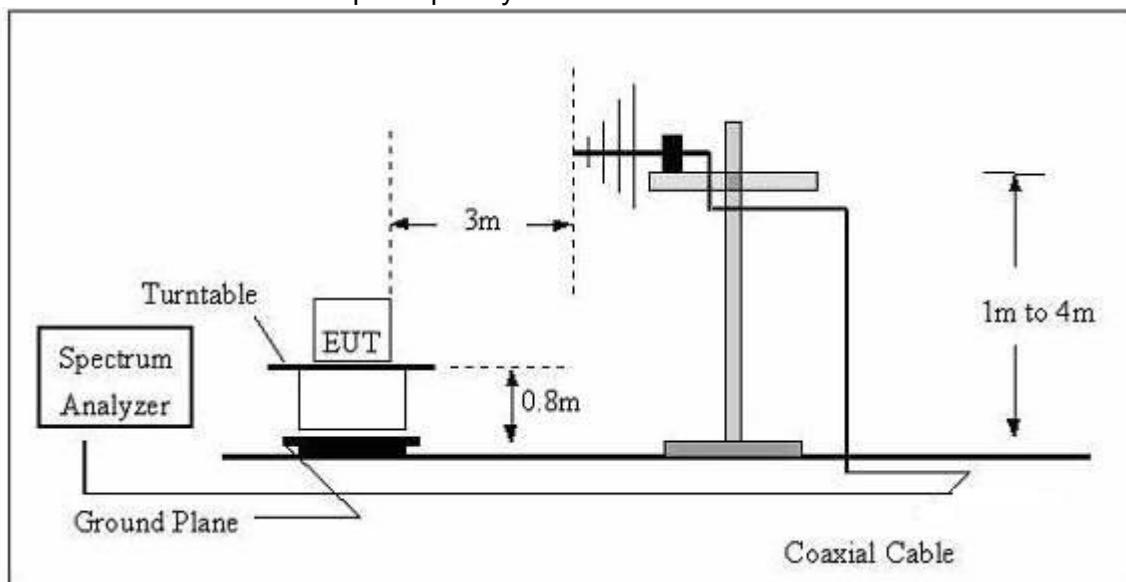
No deviation

3.2.5 TEST SETUP

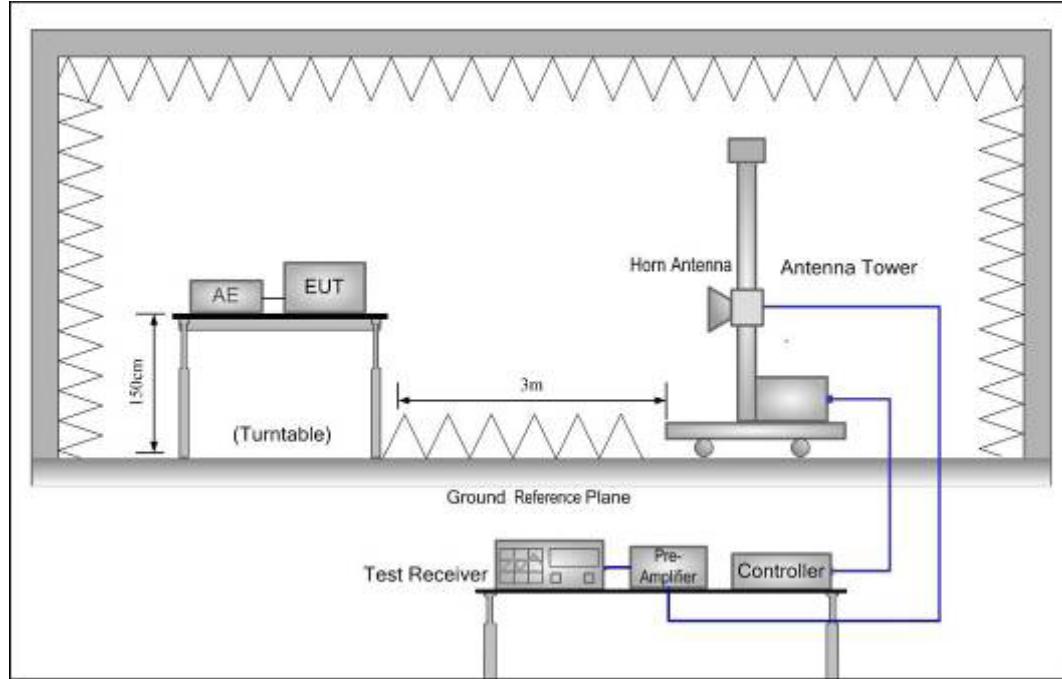
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



3.2.6 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.7 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

EUT:	Blue Box	Model Name. :	HM03-001
Temperature:	20 °C	Relative Humidity:	48%
Pressure:	1010 hPa	Test Voltage :	DC 5V
Test Mode :	TX	Polarization :	--

Freq. (MHz)	Reading (dBuV/m)	Limit (dBuV/m)	Margin (dB)	State
				P/F
--	--	--	--	P
--	--	--	--	P

NOTE:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $40 \log (\text{specific distance}/\text{test distance})$ (dB);
Limit line = specific limits(dBuV) + distance extrapolation factor.

Note: High CH is the worst mode.

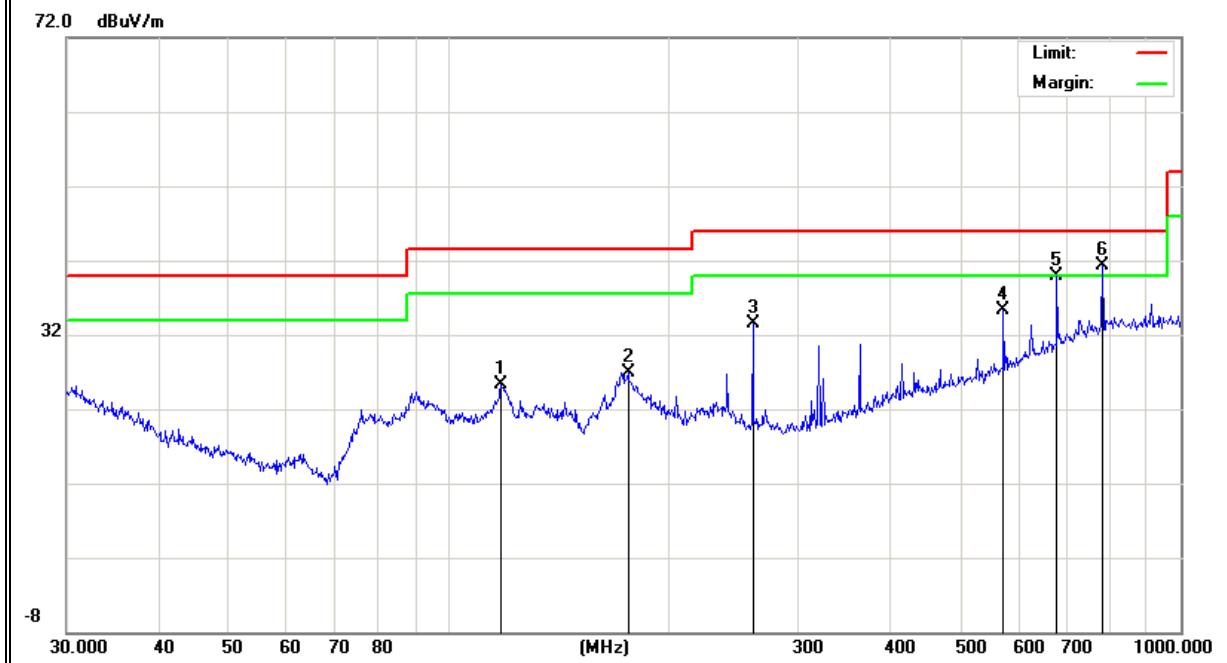
3.2.8 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)

EUT :	Blue Box	Model Name :	HM03-001
Temperature :	20 °C	Relative Humidity :	48%
Pressure:	1010 hPa	Test Voltage :	DC 5V
Test Mode :	TX-High CH		

Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
V	117.7724	13.63	11.62	25.25	43.50	-18.25	QP
V	175.6516	16.34	10.60	26.94	43.50	-16.56	QP
V	260.1444	19.73	13.70	33.43	46.00	-12.57	QP
V	572.6144	13.53	21.82	35.35	46.00	-10.65	QP
V	677.5798	15.80	24.17	39.97	46.00	-6.03	QP
V	782.3453	14.42	26.95	41.37	46.00	-4.63	QP

Remark:

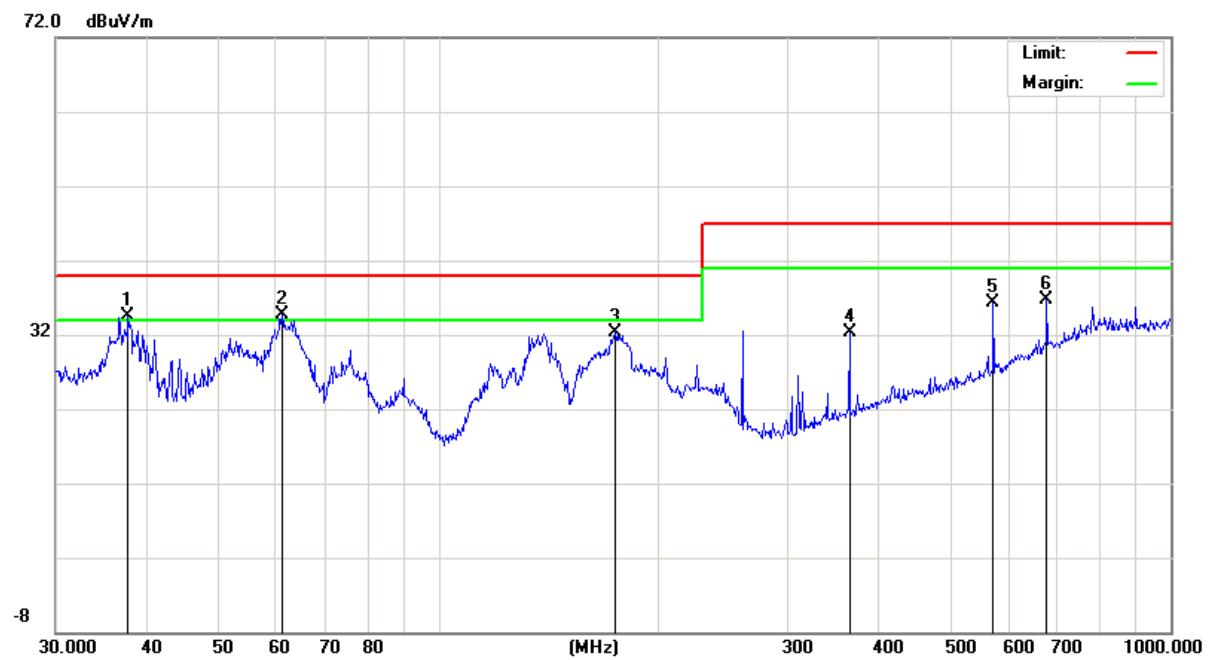
Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



Polar (H/V)	Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Remark
	(MHz)	(dBuV)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	
H	37.6798	19.45	15.00	34.45	40.00	-5.55	QP
H	61.1316	27.20	7.58	34.78	40.00	-5.22	QP
H	174.4241	21.82	10.58	32.40	40.00	-7.60	QP
H	364.2595	15.38	16.83	32.21	47.00	-14.79	QP
H	572.6144	14.40	21.82	36.22	47.00	-10.78	QP
H	677.5798	12.52	24.17	36.69	47.00	-10.31	QP

Remark:

Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit



Note: High CH is the worst mode.

3.2.9 TEST RESULTS (1000 M~25000MHZ)

EUT :	Blue Box	Model Name :	HM03-001
Temperature :	20 °C	Relative Humidity :	48%
Pressure:	1010 hPa	Test Voltage :	DC 5V
Test Mode :	TX		

Frequency (MHz)	Reading (dB μ V)	Factor (dB)	Corrected Amplitude (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Remark	Polar (H/V)
Low Channel (2402 MHz)-Above 1G							
4804.121	63.15	-3.64	59.51	74.00	-14.49	Pk	Vertical
4804.121	43.55	-3.64	39.91	54.00	-14.09	AV	Vertical
7206.189	60.88	-0.95	59.93	74.00	-14.07	Pk	Vertical
7206.189	40.14	-0.95	39.19	54.00	-14.81	AV	Vertical
4804.186	64.71	-3.64	61.07	74.00	-12.93	Pk	Horizontal
4804.186	43.26	-3.64	39.62	54.00	-14.38	AV	Horizontal
7206.315	61.59	-0.95	60.64	74.00	-13.36	Pk	Horizontal
7206.315	40.32	-0.95	39.37	54.00	-14.63	AV	Horizontal
Mid Channel (2440 MHz)-Above 1G							
4880.303	62.37	-3.68	58.69	74.00	-15.31	Pk	Vertical
4880.303	42.61	-3.68	38.93	54.00	-15.07	AV	Vertical
7320.195	60.15	-0.82	59.33	74.00	-14.67	Pk	Vertical
7320.195	42.16	-0.82	41.34	54.00	-12.66	AV	Vertical
4880.267	59.68	-3.68	56.00	74.00	-18.00	Pk	Horizontal
4880.267	38.11	-3.68	34.43	54.00	-19.57	AV	Horizontal
7320.214	61.29	-0.82	60.47	74.00	-13.53	Pk	Horizontal
7320.214	42.35	-0.82	41.53	54.00	-12.47	AV	Horizontal
High Channel (2480MHz)- Above 1G							
4960.158	61.41	-3.59	57.82	74.00	-16.18	Pk	Vertical
4960.158	40.52	-3.59	36.93	54.00	-17.07	AV	Vertical
7440.131	59.79	-0.68	59.11	74.00	-14.89	Pk	Vertical
7440.131	43.94	-0.68	43.26	54.00	-10.74	AV	Vertical
4960.255	61.57	-3.59	57.98	74.00	-16.02	Pk	Horizontal
4960.255	41.52	-3.59	37.93	54.00	-16.07	AV	Horizontal
7440.284	60.55	-0.68	59.87	74.00	-14.13	Pk	Horizontal
7440.284	39.33	-0.68	38.65	54.00	-15.35	AV	Horizontal

Remark: Absolute Level= ReadingLevel+ Factor, Margin= Absolute Level - Limit

4. POWER SPECTRAL DENSITY TEST

4.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

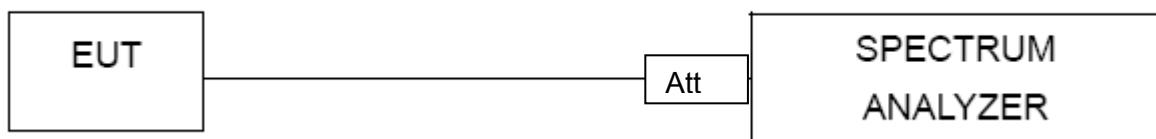
4.1.1 TEST PROCEDURE

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. $3 \text{ kHz} \leq \text{Set the RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

4.1.2 DEVIATION FROM STANDARD

No deviation.

4.1.3 TEST SETUP



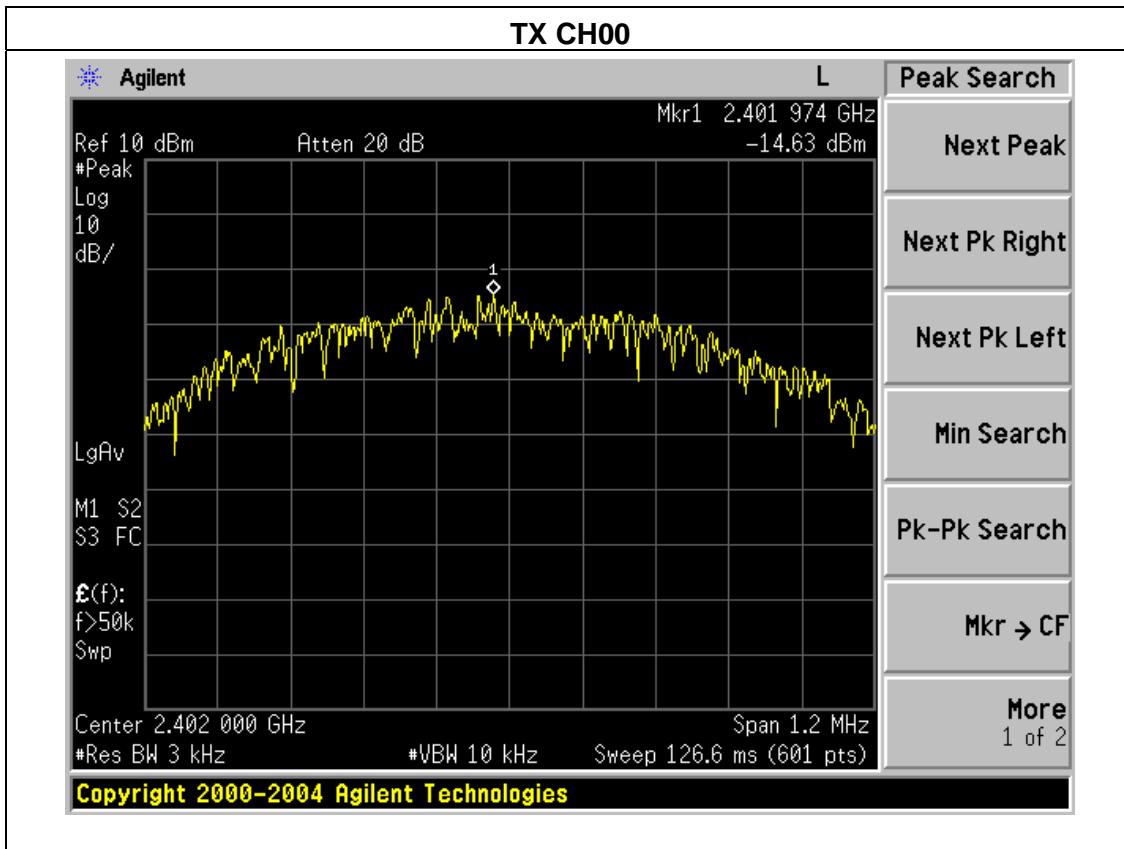
4.1.4 EUT OPERATION CONDITIONS

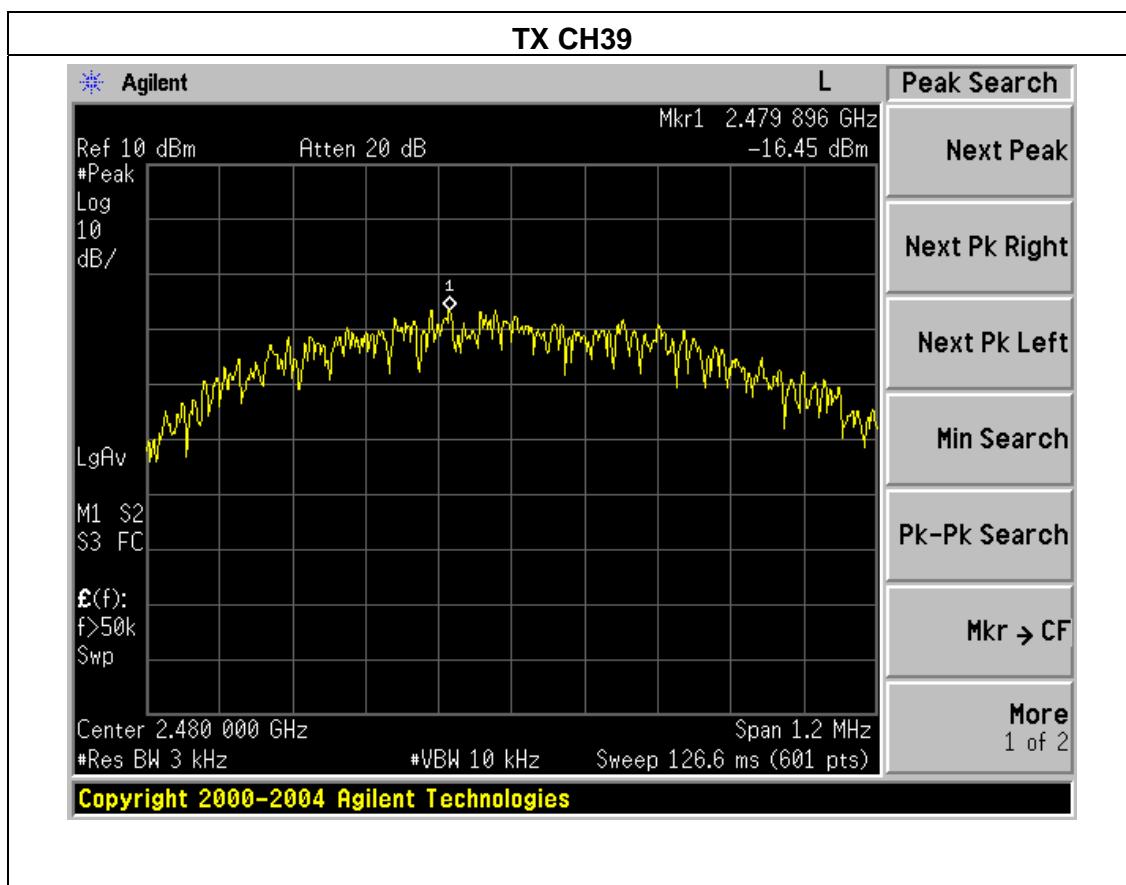
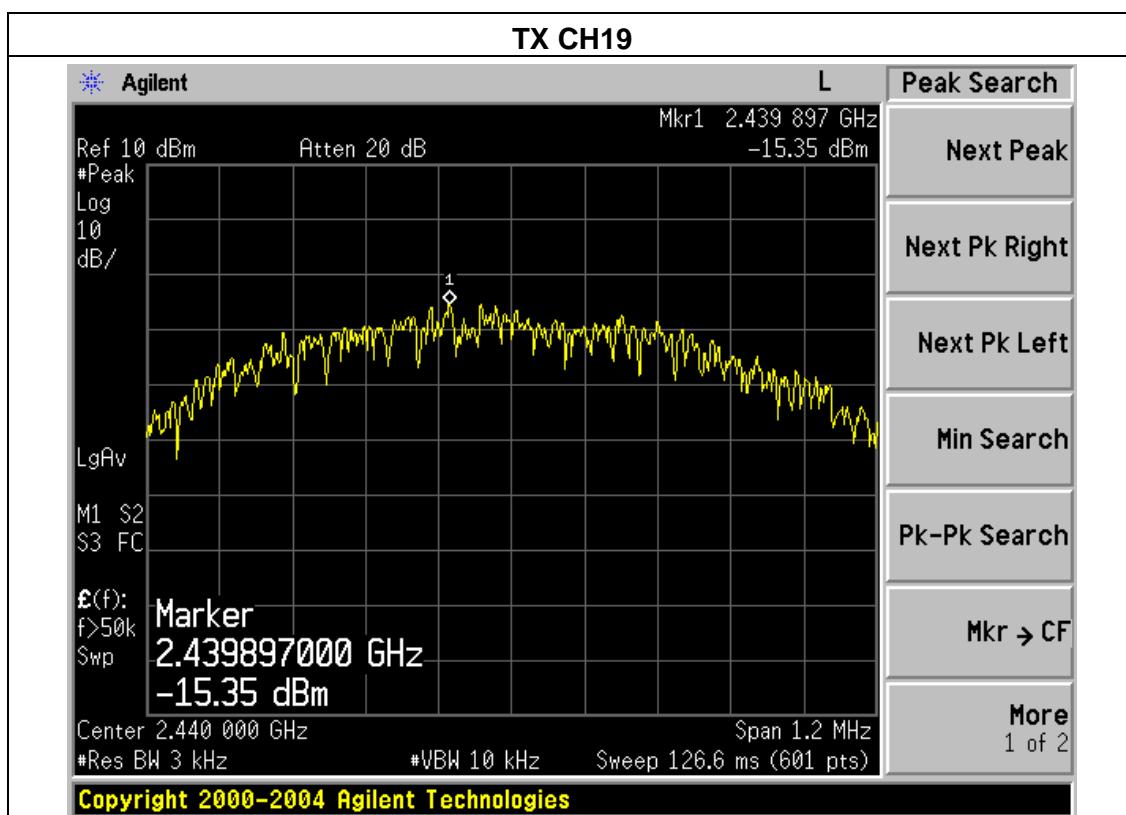
The EUT tested system was configured as the statements of 2.1 Unless otherwise a special operating condition is specified in the follows during the testing.

4.1.5 TEST RESULTS

EUT :	Blue Box	Model Name :	HM03-001
Temperature :	25 °C	Relative Humidity :	56%
Pressure :	1015 hPa	Test Voltage :	DC 5V
Test Mode :	TX Mode /CH00, CH19, CH39		

Frequency	Power Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
2402 MHz	-14.63	8	PASS
2440 MHz	-15.35	8	PASS
2480 MHz	-16.45	8	PASS





5. BANDWIDTH TEST

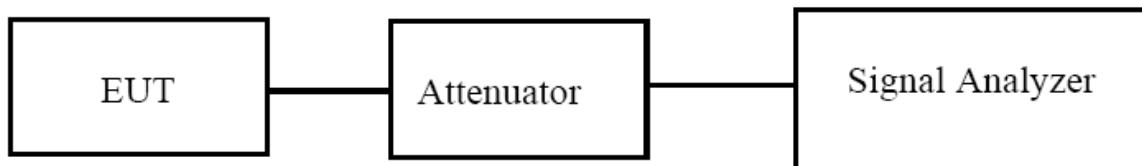
5.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

5.1.1 TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

TEST SETUP



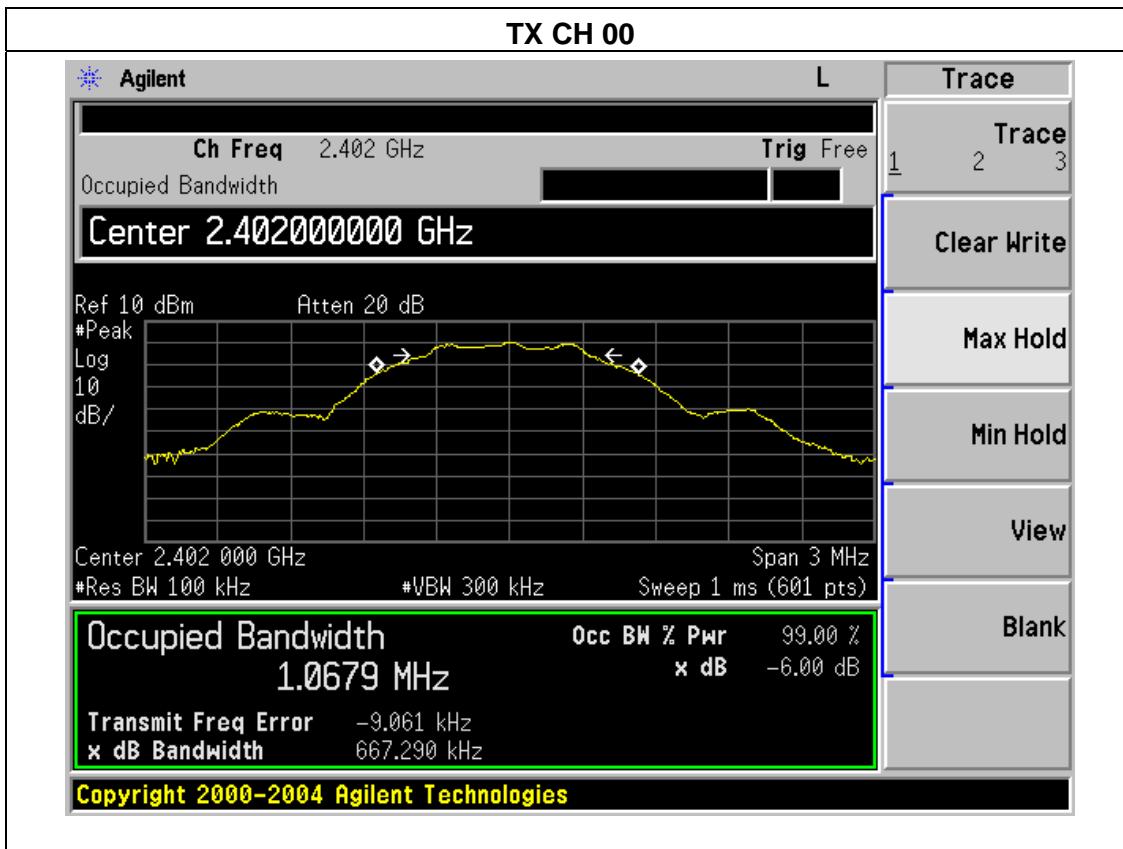
5.1.2 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

5.1.3 TEST RESULTS

EUT :	Blue Box	Model Name :	HM03-001
Temperature :	25 °C	Relative Humidity :	56%
Pressure :	1012 hPa	Test Voltage :	DC 5V
Test Mode :	TX Mode /CH00, CH19, CH39		

Channel	Frequency (MHz)	6dB bandwidth (kHz)	Limit (kHz)	Result
Low	2402	667.290	500	Pass
Middle	2440	677.542	500	Pass
High	2480	693.781	500	Pass





6. PEAK OUTPUT POWER TEST

6.1 APPLIED PROCEDURES / LIMIT

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

6.1.1 TEST PROCEDURE

- The EUT was directly connected to the Power meter

6.1.2 DEVIATION FROM STANDARD

No deviation.

6.1.3 TEST SETUP



6.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

6.1.5 TEST RESULTS

EUT :	Blue Box	Model Name :	HM03-001
Temperature :	25 °C	Relative Humidity :	60%
Pressure :	1012 hPa	Test Voltage :	DC 5V
Test Mode :	TX Mode		

Test Channel	Frequency	Maximum Conducted Output Power(PK)	LIMIT
	(MHz)	(dBm)	(dBm)
CH01	2402	2.13	30
CH20	2440	2.05	30
CH39	2480	2.25	30

7. 100 KHZ BANDWIDTH OF FREQUENCY BAND EDGE

APPLICABLE STANDARD

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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

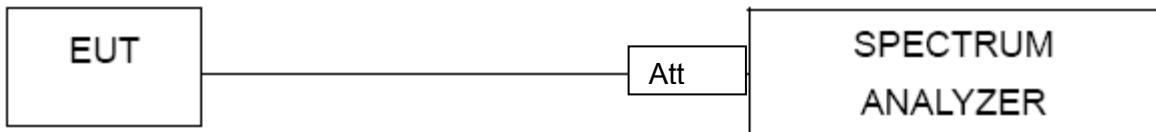
TEST PROCEDURE

- a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- c) Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- d) Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- e) Repeat above procedures until all measured frequencies were complete.

7.1 DEVIATION FROM STANDARD

No deviation.

7.2 TEST SETUP



7.3 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

7.4 TEST RESULTS

EUT :	Blue Box	Model Name :	HM03-001
Temperature :	25 °C	Relative Humidity :	56%
Pressure :	1012 hPa	Test Voltage :	DC 5V

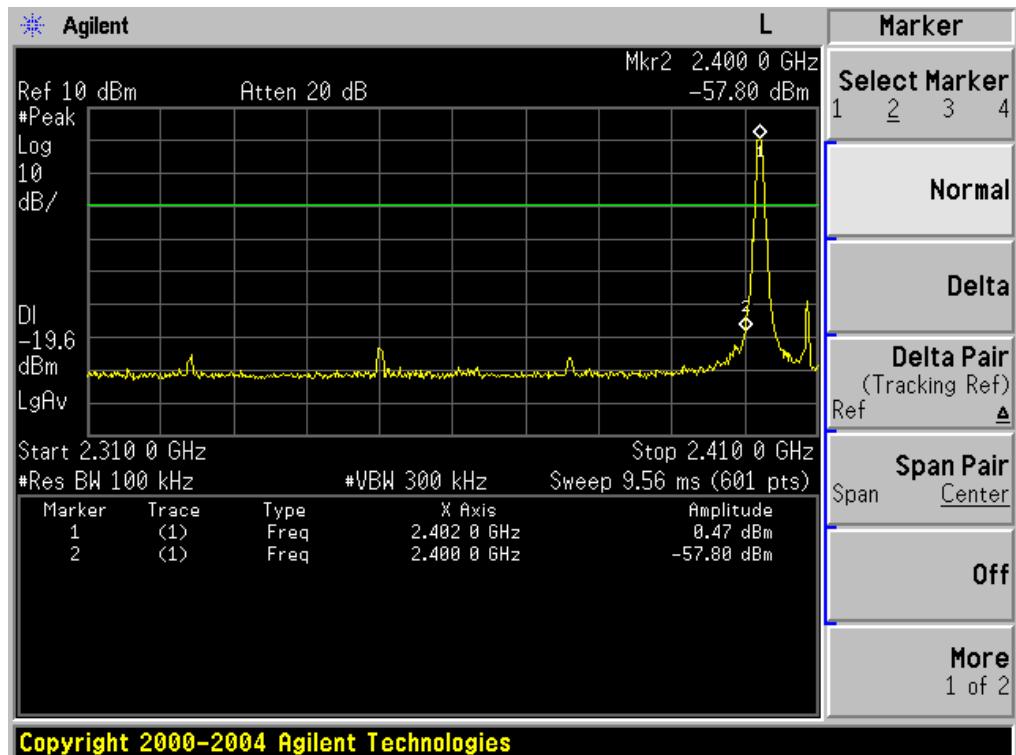
Frequency Band	Delta Peak to band emission (dBc)	> Limit (dBc)	Result
2400	58.27	20	Pass
2483.5	65.32	20	Pass

Radiated band edge:

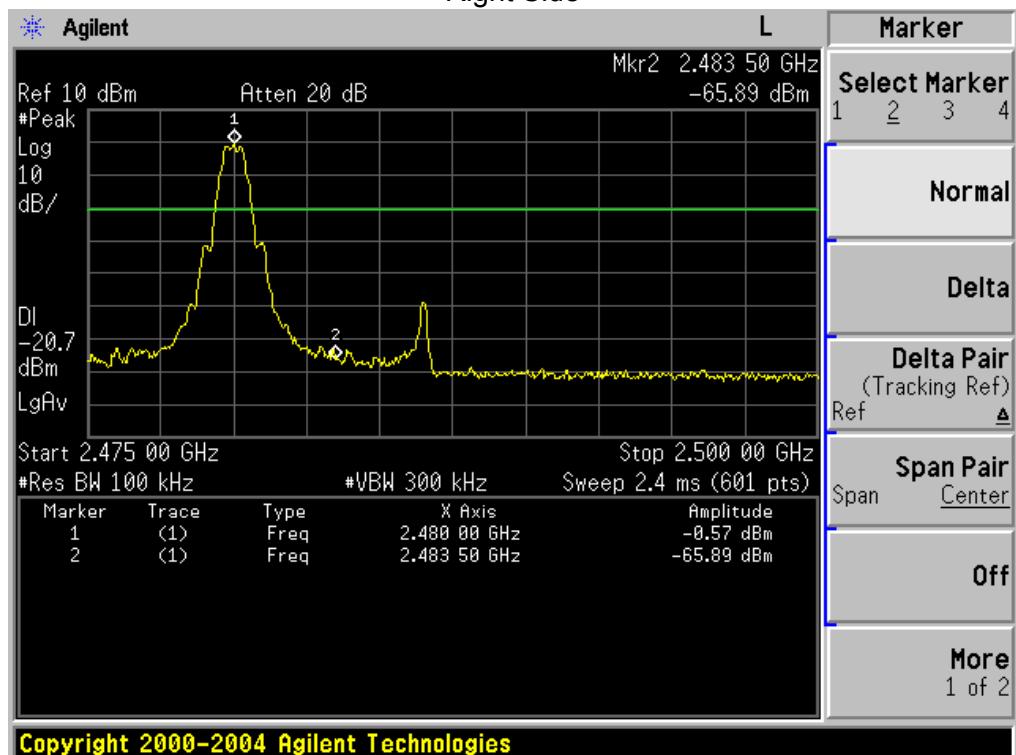
Frequency (MHz)	Meter Reading (dB μ V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type	Comment
2390	57.69	-13.06	44.63	74	-29.37	peak	Vertical
2390	57.84	-13.06	44.78	74	-29.22	peak	Horizontal
2483.5	58.21	-12.78	45.43	74	-28.57	peak	Vertical
2483.5	58.66	-12.78	45.88	74	-28.12	peak	Horizontal

Note: Test method to see chapter 3.2 . When PK value is lower than the Average value limit, average not record.

Left Side



Right Side



8. ANTENNA REQUIREMENT

8.1 STANDARD REQUIREMENT

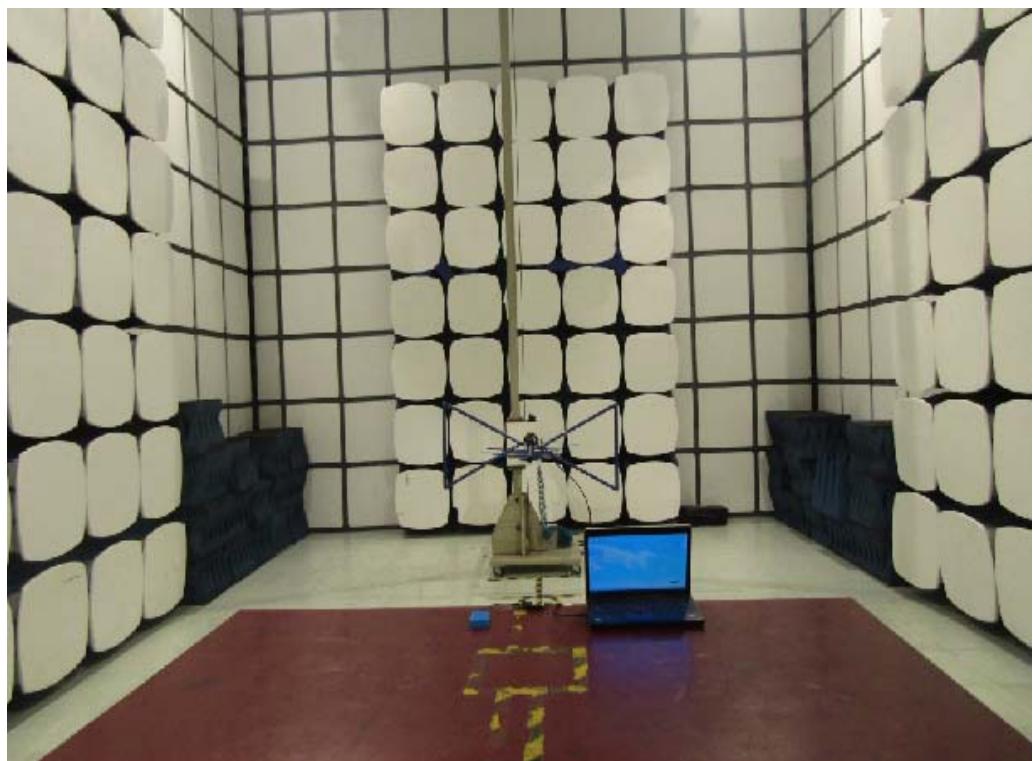
15.203 requirement: For intentional device, according to 15.203: an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

8.2 EUT ANTENNA

The EUT antenna is integrated inside the SIP module(BCM20737S). It comply with the standard requirement.

9. EUT TEST PHOTO

Radiated Measurement Photos



CONDUCTED EMISSION Photos

