Variant FCC/IC RF Test Report

APPLICANT	:	Qualcomm Atheros, Inc.
EQUIPMENT	:	1X1 802.11b/g/n - BT4.0 Combo PCIe minicard
BRAND NAME	:	Qualcomm Atheros
MODEL NAME	:	QCWB335
FCC ID	:	PPD-QCWB335
IC	:	4104A-QCWB335
STANDARD	:	FCC Part 15 Subpart C §15.247 IC RSS-210 issue 8
CLASSIFICATION	:	(DSS) Spread Spectrum Transmitter

This is a variant report which is only valid together with the original test report. The WiFi + Bluetooth module was tested on extended card inserted to a host laptop PC. The product was received on Oct. 17, 2012 and completely tested on Mar. 02, 2013. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

Jones Tsai

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Testing Laboratory 1190

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APPENDIX A. PHOTOGRAPHS OF EUT

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR240322-08A	Rev. 01	This is a variant report. All the test cases were performed on original report which can be referred to Sporton Report No. FR240322A. Detail changes list as below : 1. Shielding change 2. Minor layout change 3. BOM change (Rx path) Based on the changes, only the Peak Output Power and Radiated Band Edges and Radiated Spurious Emission test cases were verified.	Feb. 07, 2013
FR240322-08A	Rev. 02	Update report for revising Conducted power, Radiated Band Edges, and Radiated Spurious Emission Measurement.	Mar. 06, 2013

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(b)(1)	RSS-210 A8.1(b)	Peak Output Power	≤ 125 mW	Pass	-
3.2	15.247(d)	RSS-210 A8.5	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.27 dB at 143.400 MHz
3.3	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Qualcomm Atheros, Inc.
1700 Technology Drive, San Jose, CA95110

1.2 Manufacturer

Qualcomm Atheros, Inc.
1700 Technology Drive, San Jose, CA95110

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	1X1 802.11b/g/n - BT4.0 Combo PCIe minicard
Brand Name	Qualcomm Atheros
Model Name	QCWB335
FCC ID	PPD-QCWB335
IC	4104A-QCWB335
EUT supports Radios application	WLAN 11bgn / Bluetooth 2.1/3.0/4.0
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Product Specification subjective to this standard		
Tx/Rx Frequency Range	2400 MHz ~ 2483.5 MHz	
Number of Channels	79	
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78	
Maximum Output Power to Antenna	**Antenna port 0**	Bluetooth (1Mbps) : 5.94 dBm (0.0039 W) Bluetooth EDR (2Mbps) : 8.06 dBm (0.0064 W) Bluetooth EDR (3Mbps) : 8.18 dBm (0.0066 W)
	Antenna port 1	Bluetooth (1Mbps) : 7.96 dBm (0.0063 W) Bluetooth EDR (2Mbps) : 10.26 dBm (0.0106 W) Bluetooth EDR (3Mbps) : 10.86 dBm (0.0122 W)
Antenna Type	Antenna 1 : PIFA Antenna with gain 3.62 dBi Antenna 2 : Dipole Antenna with gain 3.20 dBi	
Type of Modulation	Bluetooth 2.1 BDR (1Mbps) : GFSK Bluetooth 2.1 EDR (2Mbps) : π/4-DQPSK Bluetooth 2.1 EDR (3Mbps) : 8-DPSK Bluetooth 3.0 BDR (1Mbps) : GFSK Bluetooth 3.0 EDR (2Mbps) : π/4-DQPSK Bluetooth 3.0 EDR (3Mbps) : 8-DPSK	

1.5 Testing Site

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978		
Test Site No.	**Sporton Site No.**		**FCC/IC Registration No.**
	TH02-HY	03CH06-HY	722060/4086B-1

The test site complies with ANSI C63.4 2003 requirement.

1.6 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC Public Notice DA 00-705
- ANSI C63.10-2009
- IC RSS-210 Issue 8
- IC RSS-Gen Issue 3
- NOTICE 2012-DRS0126

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.
3. Per the section 2.2.3 of Notice of 2012-DRS0126, " Receivers Excluded from Industry Canada Requirements", only radiocommunication receivers operating in stand-alone mode within the band 30-960 MHz and scanner receivers are subject to Industry Canada requirements.

2 Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

2.1.1 Peak Power

Preliminary tests were performed in different data rates and recorded the RF output power in the following table:

<For Antenna port 0>

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	π/4-DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	4.91 dBm	7.17 dBm	7.18 dBm
Ch39	2441MHz	5.69 dBm	7.93 dBm	7.94 dBm
Ch78	2480MHz	5.94 dBm	8.06 dBm	**8.18 dBm**

<For Antenna port 1>

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	π/4-DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	7.27 dBm	9.73 dBm	10.23 dBm
Ch39	2441MHz	7.86 dBm	10.26 dBm	10.70 dBm
Ch78	2480MHz	7.96 dBm	10.18 dBm	**10.86 dBm**

Remark:

1. All the test data for each data rate were verified, but only the worst case was reported.
2. The data rate was set in 3Mbps for all the test items due to the highest RF output power.

2.1.2 Average Power (Reporting Only)

<For Antenna port 0>

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	π/4-DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	4.73 dBm	5.06 dBm	4.93 dBm
Ch39	2441MHz	5.68 dBm	5.85 dBm	5.65 dBm
Ch78	2480MHz	5.86 dBm	**5.97 dBm**	5.85 dBm

<For Antenna port 1>

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	π/4-DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	7.20 dBm	6.95 dBm	6.94 dBm
Ch39	2441MHz	7.80 dBm	7.40 dBm	7.39 dBm
Ch78	2480MHz	**7.93 dBm**	7.41 dBm	7.41 dBm

2.2 Antenna Information

Brand / Model Name	Type	Frequency Range (MHz)	Antenna Gain (dBi)
Wistron Neweb Corporation / EBJ Aux	PIFA	2400 ~ 2483.5	3.62
INPAQ / DAMA1BM30000402	Dipole	2400 ~ 2483.5	3.20

	Antenna port 0	Antenna port 1
Single antenna	WLAN/BT timely coexistence	RX diversity or terminated
Dual antenna	WLAN TX/RX	Bluetooth TX/RX

2.3 Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.10-2009 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

For radiated: The EUT's antenna was pre-tested under the following modes:

Test Mode	Description
Mode A	**X-Y axis**
Mode B	Y-Z axis
Mode C	X-Z axis

From the above modes, the worst case was found in Mode A. Therefore only the test data of the mode was recorded in this report.

The details of test channels and bandwidth for RF conductive measurement and Radiated Spurious Emissions are listed next tables.

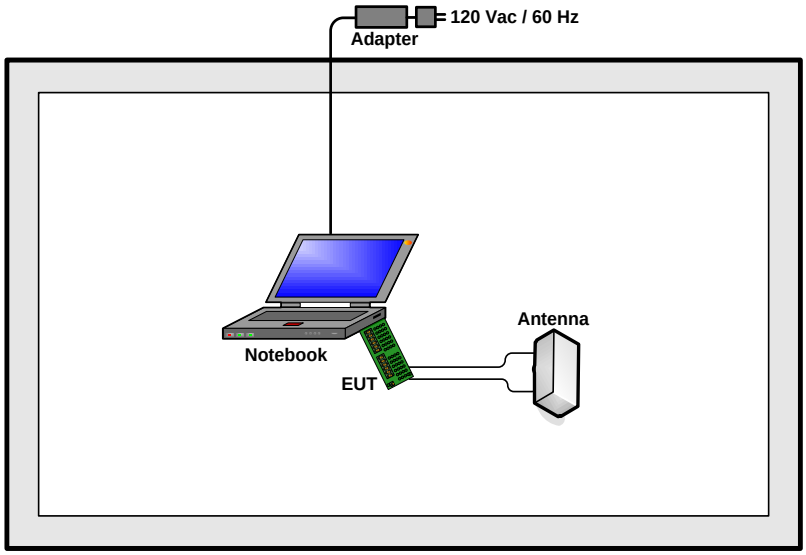
Ant.	Antenna type	Gain (dBi)	Power	Radiated Spurious Emissions	
				RE<1G	RE≥1G
1	**PIFA**	3.62	✓	✓	✓
2	**Dipole**	3.20	✓		

The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases			
Test Item	Data Rate / Modulation		
	Bluetooth 1Mbps GFSK	Bluetooth EDR 2Mbps π/4-DQPSK	Bluetooth EDR 3Mbps 8-DPSK
Conducted Test Cases	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	Mode 4: CH00_2402 MHz Mode 5: CH39_2441 MHz Mode 6: CH78_2480 MHz	Mode 7: CH00_2402 MHz Mode 8: CH39_2441 MHz Mode 9: CH78_2480 MHz
Radiated Test Cases	Bluetooth EDR 3Mbps 8-DPSK		
	Mode 1: CH78_2480 MHz for PIFA Antenna port 1		

Remark: For radiated test cases, the worst mode data rate 3Mbps was reported only, because this data rate has the highest RF output power at preliminary tests, and the conducted spurious emissions and conducted band edge measurement for each data rate are no worse than 3Mbps, and no other significantly frequencies found in conducted spurious emission .

2.4 Connection Diagram of Test System



2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	Lenovo	0769	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

2.6 Description of RF Function Operation Test Setup

The programmed RF utility, execute “BT Test_Aphrodite.exe” is installed in notebook make the EUT to provide channel selection, power level, data rate and the application type. RF Utility can send transmitting signal for all testing. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

2.7 Measurement Results Explanation Example

For radiated band edges and spurious emission test :

Per part 15.35(c), the EUT Bluetooth average emission level could be determined by the peak emission level applying duty cycle correction factor, to represent averaging over the whole pulse train.

The average level is derived from the peak level corrected with “Duty cycle correction factor”.

Average Emission Level(dBμV/m) = Peak Emission Level(dBμV/m) + Duty cycle correction factor(dB)

*Duty cycle correction factor(dB) = 20 * log(Duty cycle).*
Duty cycle = On time / 100 milliseconds
On time = worst case dwell time * hopping number in 100 ms

For example : bluetooth with worst case dwell time 2.9ms and 2 hops in 100 ms, then
Duty cycle correction factor(dB) = 20 * log((2.9 * 2) / 100) = -24.73 dB

Following shows an average computation example with duty cycle correction factor = -24.73dB, and the peak emission level is 45.61 dBμV/m.

Example :
Average Emission Level(dBμV/m) = Peak Emission Level(dBμV/m) + duty cycle correction factor(dB)
= 45.61 + (-24.73) = 20.88 (dBμV/m)

3 Test Result

3.1 Peak Output Power Measurement

3.1.1 Limit of Peak Output Power

Section 15.247 (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following: (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts. The power limit for 1Mbps is 1watt, and for 2Mbps, 3Mbps and AFH are 0.125 watts.

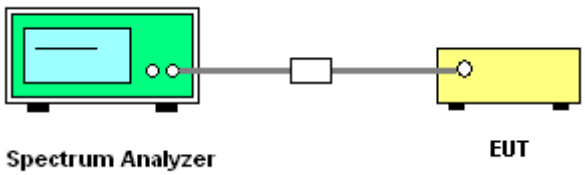
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Measure the conducted output power with cable loss and record the results in the test report.
4. Measure and record the results in the test report.

3.1.4 Test Setup



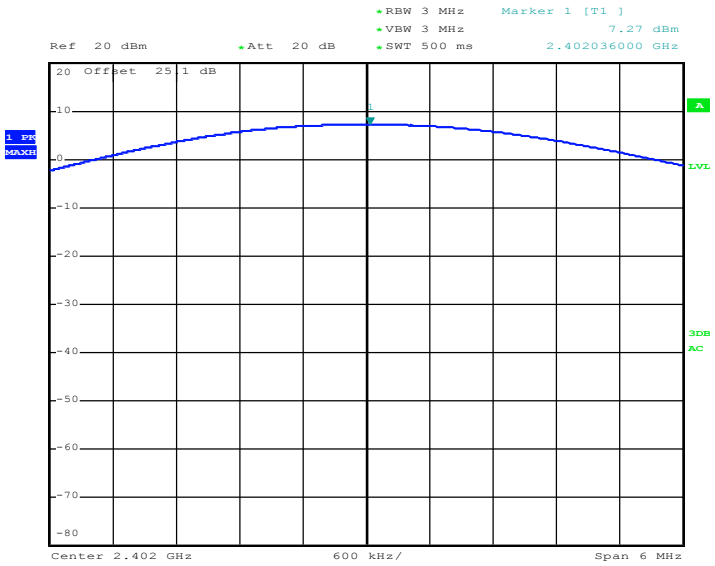
3.1.5 Test Result of Peak Output Power

Test Mode :	1Mbps	Temperature :	23~25℃
Test Engineer :	Rover Lee	Relative Humidity :	55~58%

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	7.27	20.97	Pass
39	2441	7.86	20.97	Pass
78	2480	7.96	20.97	Pass

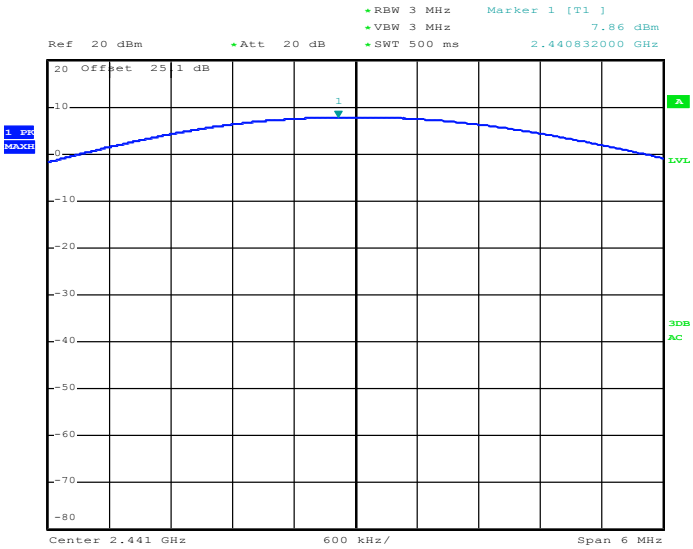
Note: For AFH mode using 20 hopping channels, the maximum output power limit is 20.97dBm.

Peak Output Power Plot on Channel 00



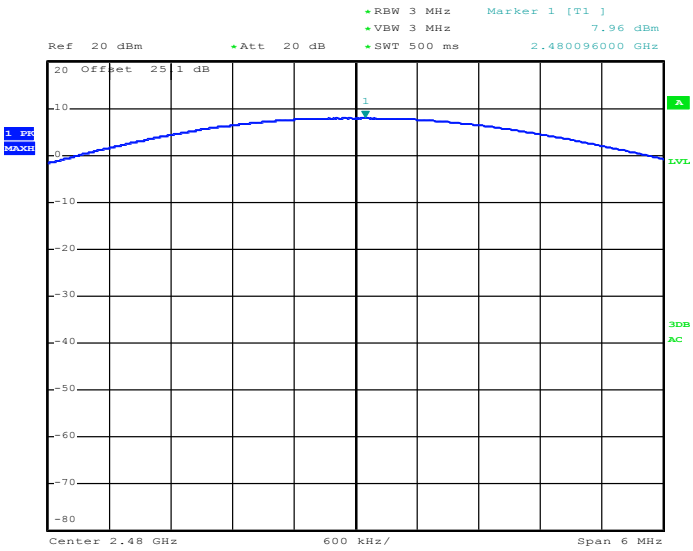
Date: 27.FEB.2013 01:07:33

Peak Output Power Plot on Channel 39



Date: 27.FEB.2013 01:04:53

Peak Output Power Plot on Channel 78

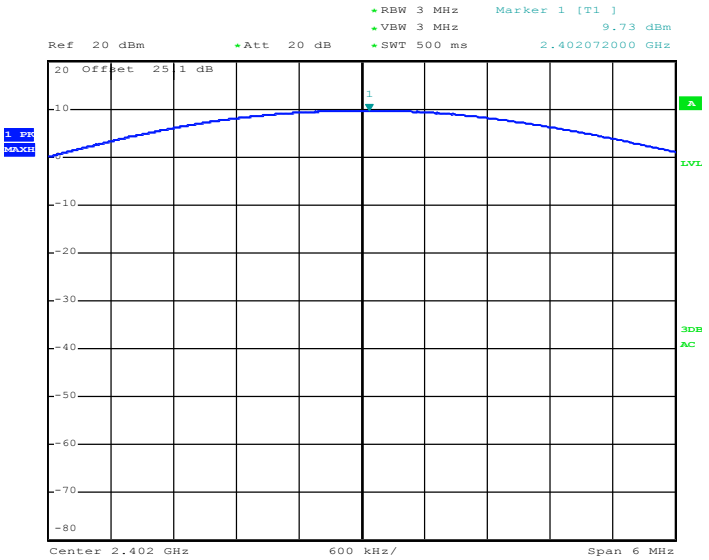


Date: 27.FEB.2013 01:00:35

Test Mode :	2Mbps	Temperature :	23~25℃
Test Engineer :	Rover Lee	Relative Humidity :	55~58%

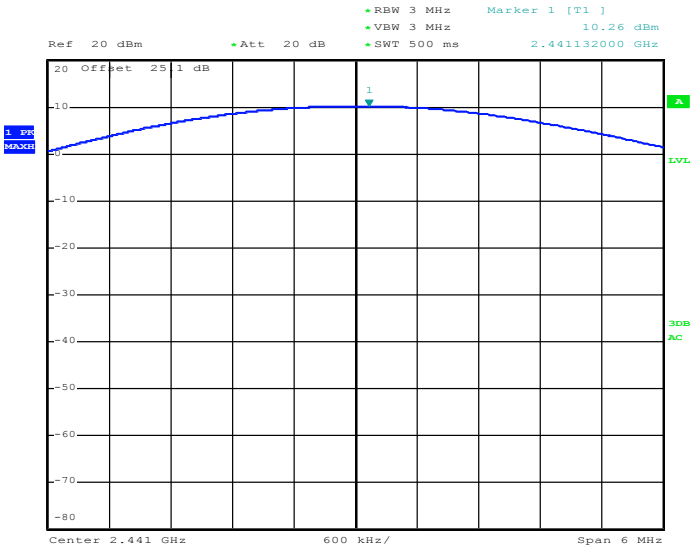
Channel	Frequency (MHz)	RF Power (dBm)		
		π /4-DQPSK 2 Mbps	Max. Limits (dBm)	Pass/Fail
00	2402	9.73	20.97	Pass
39	2441	10.26	20.97	Pass
78	2480	10.18	20.97	Pass

Peak Output Power Plot on Channel 00



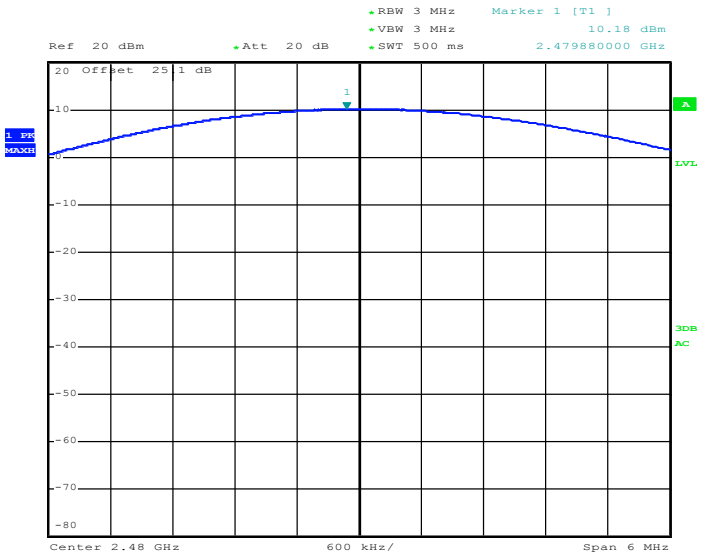
Date: 27.FEB.2013 01:08:20

Peak Output Power Plot on Channel 39



Date: 27.FEB.2013 01:05:38

Peak Output Power Plot on Channel 78

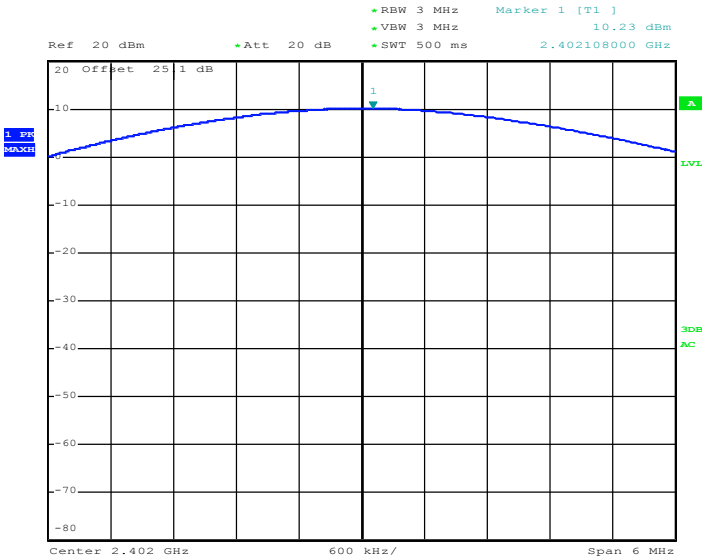


Date: 27.FEB.2013 01:02:34

Test Mode :	3Mbps	Temperature :	23~25℃
Test Engineer :	Rover Lee	Relative Humidity :	55~58%

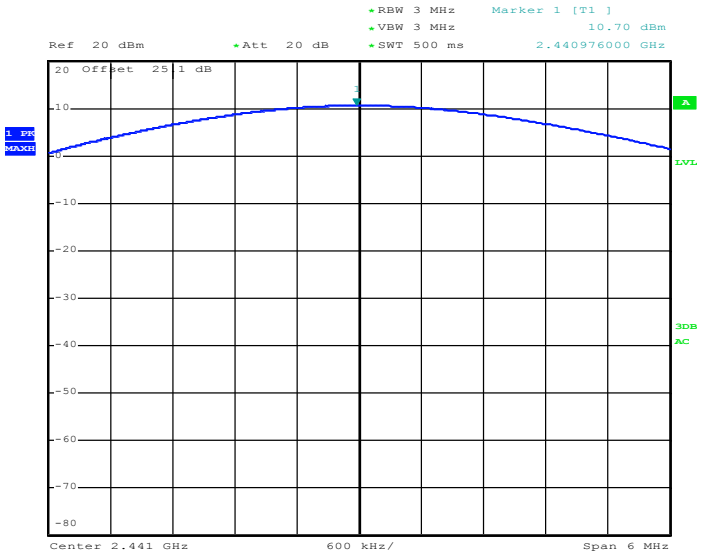
Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits (dBm)	Pass/Fail
		3 Mbps		
00	2402	10.23	20.97	Pass
39	2441	10.70	20.97	Pass
78	2480	10.86	20.97	Pass

Peak Output Power Plot on Channel 00



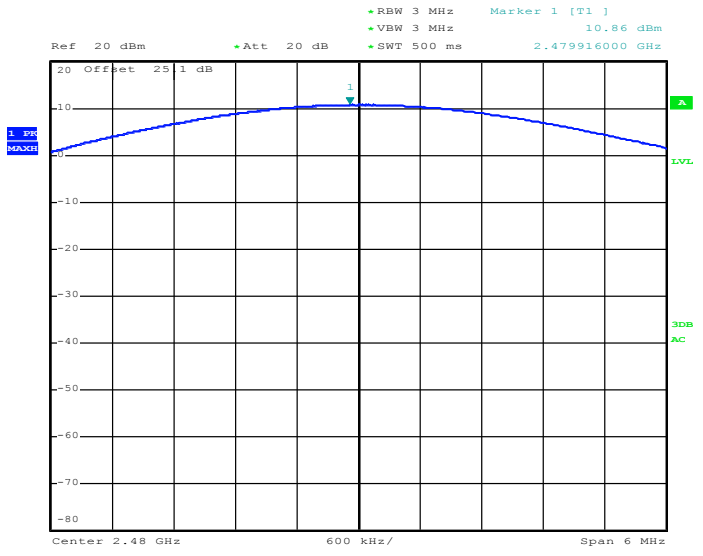
Date: 27.FEB.2013 01:09:29

Peak Output Power Plot on Channel 39



Date: 27.FEB.2013 01:06:47

Peak Output Power Plot on Channel 78



Date: 27.FEB.2013 01:03:39

3.2 Radiated Band Edges and Spurious Emission Measurement

3.2.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 KHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/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

3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The testing follows the guidelines in Spurious Radiated Emissions of FCC Public Notice DA 00-705 Measurement Guidelines and the guidelines in ANSI C63.10-2009.
2. The EUT was placed on a turntable with 0.8 meter above ground.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 KHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
7. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (24.67 dB) derived from 20log (dwell time/100ms).

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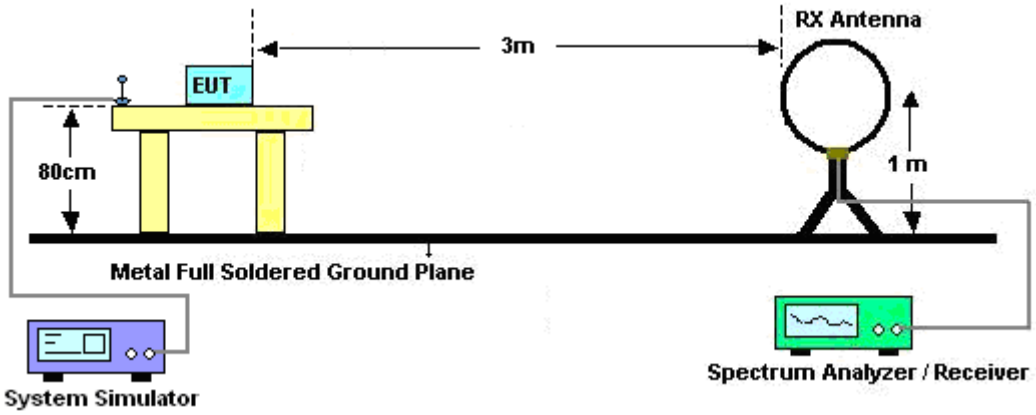
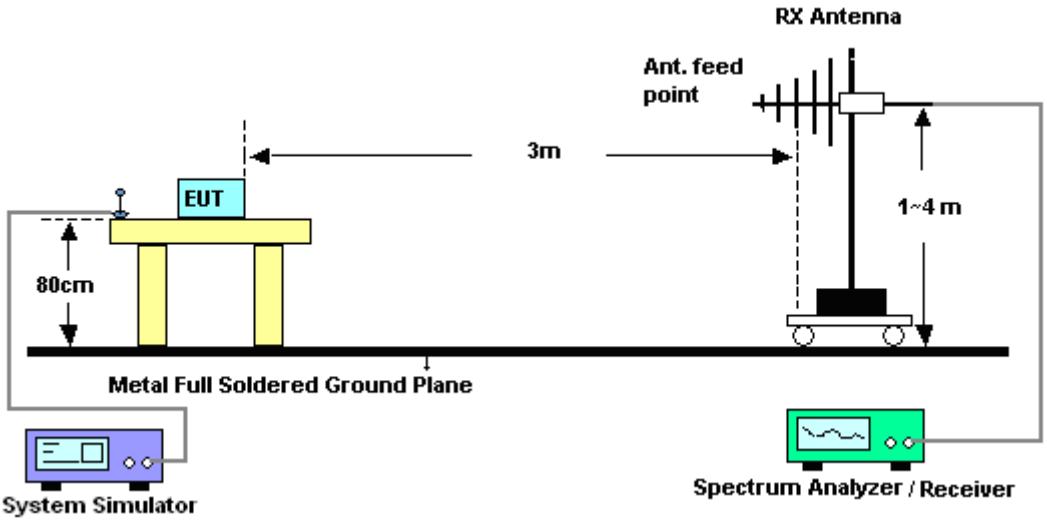
3.2.4 Test Setup

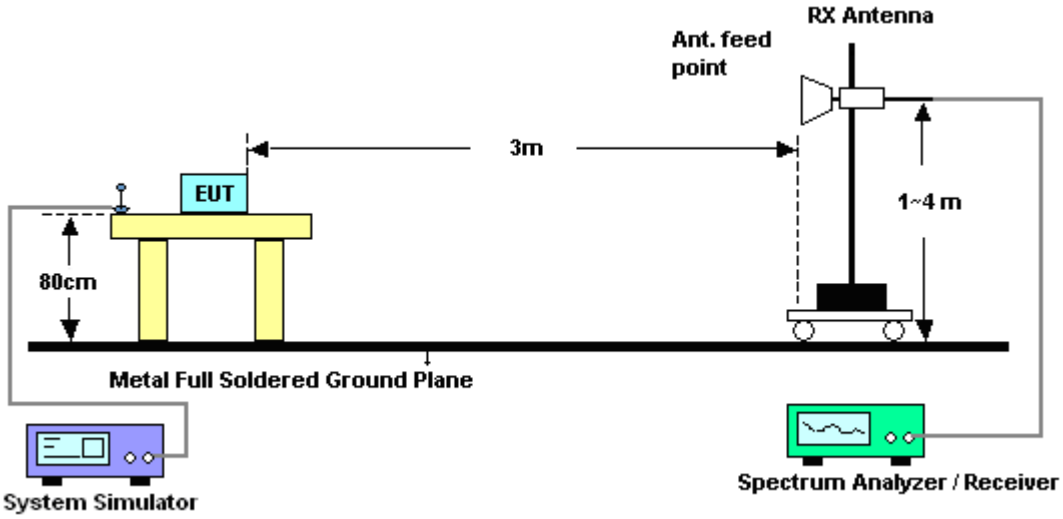
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz

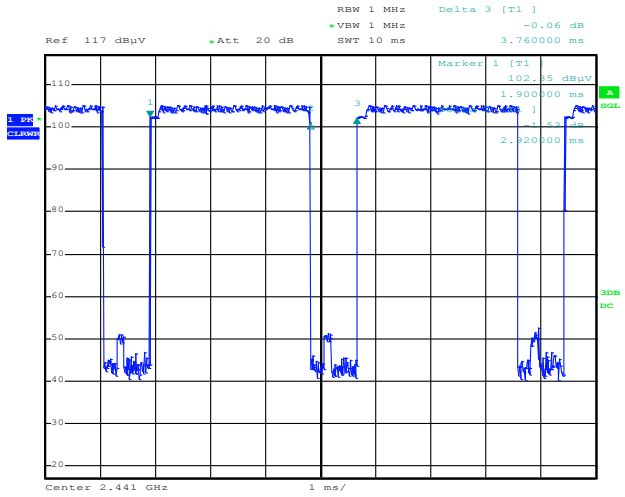


3.2.5 Test Results of Radiated Emissions (9 KHz ~ 30 MHz)

The low frequency, which started from 9 KHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

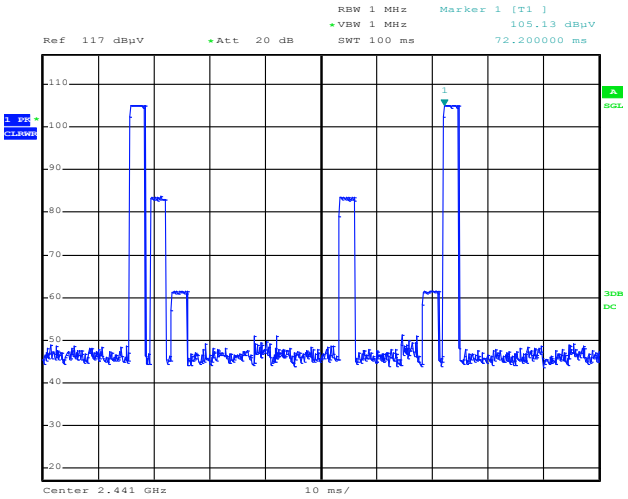
3.2.6 Duty cycle correction factor for average measurement

3DH5 on time/100ms (One Pulse) Plot on Channel 39



Date: 2.MAR.2013 06:37:44

3DH5 on time/100ms (Count Pulses) Plot on Channel 39



Date: 2.MAR.2013 06:40:13

Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.92 / 100 = 5.84 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.67 dB
3. 3DH5 has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the period to have DH5 packet completing one hopping sequence is

2.92ms x 20 channels = 58.4ms

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. [100ms / 57.6ms] = 2 hops

Thus, the maximum possible ON time:

2.92ms x 2 = 5.84ms

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

20 x log(5.84ms/100ms) = -24.67 dB

3.2.7 Test Result of Radiated Band Edges

Test Mode :	3Mbps	Temperature :	21~24°C
Test Channel :	78	Relative Humidity :	53~61%
		Test Engineer :	Timberland Lin and Kai Wang

ANTENNA POLARITY : HORIZONTAL										
Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	70.27	-3.73	74	65.75	32.48	6.59	34.55	182	308	Peak
2483.5	45.6	-8.4	54	-	-	-	-	-	-	Average

ANTENNA POLARITY : VERTICAL										
Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
2483.5	69.35	-4.65	74	64.83	32.48	6.59	34.55	190	4	Peak
2483.5	44.68	-9.32	54	-	-	-	-	-	-	Average

3.2.8 Test Result of Radiated Emission (30 MHz ~ 10th Harmonic)

Test Mode :	3Mbps	**Temperature :**	21~24°C
Test Channel :	78	**Relative Humidity :**	53~61%
Test Engineer :	Timberland Lin and Kai Wang	**Polarization :**	Horizontal
Remark :	2480 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
143.4	40.23	-3.27	43.5	59.72	10.83	1.38	31.7	126	279	Peak
166.35	39.83	-3.67	43.5	60.09	9.88	1.52	31.66	-	-	Peak
179.85	40.01	-3.49	43.5	61.01	9.15	1.54	31.69	-	-	Peak
399.4	35.18	-10.82	46	48.88	15.9	2.19	31.79	-	-	Peak
798.4	34.17	-11.83	46	43.06	19.98	3.11	31.98	-	-	Peak
896.4	42.19	-3.81	46	49.82	20.7	3.29	31.62	-	-	Peak
2480	108.92	-	-	104.4	32.48	6.59	34.55	182	308	Peak
2480	84.25	-	-	-	-	-	-	-	-	Average
4962	47.56	-26.44	74	58.38	34.81	10.21	55.84	100	0	Peak
4962	22.89	-31.11	54	-	-	-	-	-	-	Average
7440	50.39	-23.61	74	59.38	36.11	10.9	56	100	0	Peak
7440	25.72	-28.28	54	-	-	-	-	-	-	Average

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	Temperature :	21~24°C
Test Channel :	78	Relative Humidity :	53~61%
Test Engineer :	Timberland Lin and Kai Wang	Polarization :	Vertical
Remark :	2480 MHz is fundamental signal which can be ignored.		

Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Remark
143.94	29.84	-13.66	43.5	49.33	10.83	1.38	31.7	-	-	Peak
179.04	32.9	-10.6	43.5	53.9	9.15	1.54	31.69	-	-	Peak
216.3	33.01	-12.99	46	54.05	9.02	1.6	31.66	-	-	Peak
324.5	29.05	-16.95	46	45.02	13.65	1.98	31.6	-	-	Peak
499.5	29.4	-16.6	46	41.15	17.6	2.43	31.78	-	-	Peak
898.5	36.55	-9.45	46	44.17	20.7	3.29	31.61	100	248	Peak
2480	104.76	-	-	100.24	32.48	6.59	34.55	190	4	Peak
2480	80.09	-	-	-	-	-	-	-	-	Average
4962	48.19	-25.81	74	59.01	34.81	10.21	55.84	100	0	Peak
4962	23.52	-30.48	54	-	-	-	-	-	-	Average
7440	50.19	-23.81	74	59.18	36.11	10.9	56	100	0	Peak
7440	25.52	-28.48	54	-	-	-	-	-	-	Average

Note: Other harmonics are lower than background noise.

3.3 Antenna Requirements

3.3.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 FCC rule.

3.3.2 Antenna Connected Construction

The antennas type used in this product is Antenna 1 : PIFA Antenna with IPEX connector and Antenna 2 : Dipole Antenna type with Reverse-SMA type RF connector. And it is considered to meet antenna requirement.

3.3.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSP40	100055	9kHz~40GHz	Jun. 06, 2012	Feb. 25, 2013 ~ Feb. 27, 2013	Jun. 05, 2013	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	1036004	300MHz~40GHz	Sep. 08, 2012	Feb. 25, 2013 ~ Feb. 27, 2013	Sep. 07, 2013	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Sep. 08, 2012	Feb. 25, 2013 ~ Feb. 27, 2013	Sep. 07, 2013	Conducted (TH02-HY)
Spectrum Analyzer	R&S	FSP30	101352	9KHz~30GHz	Nov. 07, 2012	Jan. 31, 2013 ~ Mar. 02, 2013	Nov. 06, 2013	Radiation (03CH06-HY)
Spectrum Analyzer	Agilent	E4408B	MY44211030	9KHz ~ 26.5GHz	Nov. 26, 2012	Jan. 31, 2013 ~ Mar. 02, 2013	Nov. 25, 2013	Radiation (03CH06-HY)
EMI Test Receiver	R&S	ESVS10	834468/0003	20MHz ~ 1000MHz	May 04, 2012	Jan. 31, 2013 ~ Mar. 02, 2013	May 03, 2013	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz ~ 2GHz	Oct. 06, 2012	Jan. 31, 2013 ~ Mar. 02, 2013	Oct. 05, 2013	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz ~ 18GHz	Aug. 01, 2012	Jan. 31, 2013 ~ Mar. 02, 2013	Jul. 31, 2013	Radiation (03CH06-HY)
Double Ridge Horn Antenna	COM-POWER	AH-118	071025	1GHz~18GHz	Aug. 09, 2012	Jan. 31, 2013 ~ Mar. 02, 2013	Aug. 08, 2013	Radiation (03CH06-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz ~ 40GHz	Sep. 28, 2012	Jan. 31, 2013 ~ Mar. 02, 2013	Sep. 27, 2013	Radiation (03CH06-HY)
Preamplifier	Agilent	8449B	3008A01917	1GHz ~ 26.5GHz	Apr. 13, 2012	Jan. 31, 2013 ~ Mar. 02, 2013	Apr. 12, 2013	Radiation (03CH06-HY)
Amplifier	Agilent	310N	186713	9KHz ~ 1GHz	Apr. 11, 2012	Jan. 31, 2013 ~ Mar. 02, 2013	Apr. 10, 2013	Radiation (03CH06-HY)
Pre Amplifier	EMCI	EMC051845	SN980048	1GHz ~ 18GHz	Jul. 21, 2012	Jan. 31, 2013 ~ Mar. 02, 2013	Jul. 20, 2013	Radiation (03CH06-HY)
Pre Amplifier	MITEQ	AMF-7D-00101800-30-10P	159087	1GHz~18GHz	Feb. 27, 2012	Jan. 31, 2013 ~Feb. 25, 2013	Feb. 26, 2013	Radiation (03CH06-HY)
Pre Amplifier	MITEQ	AMF-7D-00101800-30-10P	159087	1GHz~18GHz	Feb. 26, 2013	Feb. 26, 2013 ~ Mar. 02, 2013	Feb. 25, 2014	Radiation (03CH06-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9KHz ~ 30MHz	Jul. 03, 2012	Jan. 31, 2013 ~ Mar. 02, 2013	Jul. 02, 2014	Radiation (03CH06-HY)

5 Uncertainty of Evaluation

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.54**

Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.72**

Appendix A. Photographs of EUT

Please refer to Sporton report number EP240322-08 as below.