

FCC RF Test Report

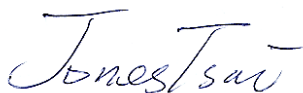
APPLICANT : SAMSUNG ELECTRONICS CO., LTD.
EQUIPMENT : Smart Phone
BRAND NAME : SAMSUNG
MODEL NAME : SM-G3508
FCC ID : A3LSMG3508
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DSS) Spread Spectrum Transmitter

The product was received on Aug. 14, 2013 and completely tested on Aug. 18, 2013. We, SPORTON INTERNATIONAL (SHENZHEN) 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 (SHENZHEN) INC., the test report shall not be reproduced except in full.



Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL (SHENZHEN) INC.

**No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District,
Shenzhen, Guangdong, P.R.C.**

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR381405A	Rev. 01	Initial issue of report	Aug. 23, 2013

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(1)	Number of Channels	$\geq 15\text{Chs}$	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	$\geq 2/3$ of 20dB BW	Pass	-
3.3	15.247(a)(1)	Dwell Time of Each Channel	$\leq 0.4\text{sec}$ in 31.6sec period	Pass	-
3.4	15.247(a)(1)	20dB Bandwidth	NA	Pass	-
3.5	15.247(b)(1)	Peak Output Power	$\leq 1\text{ W}$ for 1Mbps $\leq 125\text{ mW}$ for 2, 3Mbps	Pass	-
3.6	15.247(d)	Conducted Band Edges	$\leq 20\text{dBc}$	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	$\leq 20\text{dBc}$	Pass	-
3.8	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 8.16 dB at 600.36 MHz
3.9	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 4.27 dB at 2.820 MHz
3.10	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

SAMSUNG ELECTRONICS CO., LTD.

416 MAETAN 3-DONG, YEONGTONG-GU, SUWON-CITY, GYEONGGI-DO, 443-742 KOREA

1.2 Manufacturer

SAMSUNG ELECTRONICS CO., LTD.

416 MAETAN 3-DONG, YEONGTONG-GU, SUWON-CITY, GYEONGGI-DO, 443-742 KOREA

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	Smart Phone
Brand Name	SAMSUNG
Model Name	SM-G3508
FCC ID	A3LSMG3508
EUT supports Radios application	GSM/GPRS/EGPRS/WLAN 2.4GHz 802.11bgn HT20/ Bluetooth v3.0 + EDR
HW Version	REV1.0
SW Version	G3508.01
EUT Stage	Production Unit

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	2402 MHz ~ 2480 MHz
Number of Channels	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Maximum Output Power to Antenna	Bluetooth v3.0 + BR (1Mbps) : 13.20 dBm (0.0209 W) Bluetooth v3.0 + EDR (2Mbps) : 13.25 dBm (0.0211 W) Bluetooth v3.0 + EDR (3Mbps) : 13.48 dBm (0.0223 W)
Antenna Type	FPCB Antenna with gain -6.34 dBi
Type of Modulation	Bluetooth v3.0 + EDR : GFSK, $\pi/4$ -DQPSK, 8-DPSK

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Site

Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.			
Test Site Location	No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P.R.C. TEL: +86-755- 3320-2398			
Test Site No.	Sporton Site No.			FCC Registration No.
	TH01-SZ	CO01-SZ	03CH01-SZ	831040

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

1.7 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 C63.4-2003

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.

2 Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

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

Channel	Frequency	Bluetooth RF Output Power		
		Data Rate / Modulation		
		GFSK	$\pi/4$ -DQPSK	8-DPSK
		1Mbps	2Mbps	3Mbps
Ch00	2402MHz	13.10 dBm	13.05 dBm	13.33 dBm
Ch39	2441MHz	12.94 dBm	12.95 dBm	13.22 dBm
Ch78	2480MHz	13.20 dBm	13.25 dBm	13.48 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.
- a. The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). Pre-scanned tests, X, Y, Z in three orthogonal panels, and different data rates were conducted to determine the final configuration (Z plane as worst plane) from all possible combinations, and the worst mode of radiated spurious emissions is Bluetooth 3Mbps mode, and recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

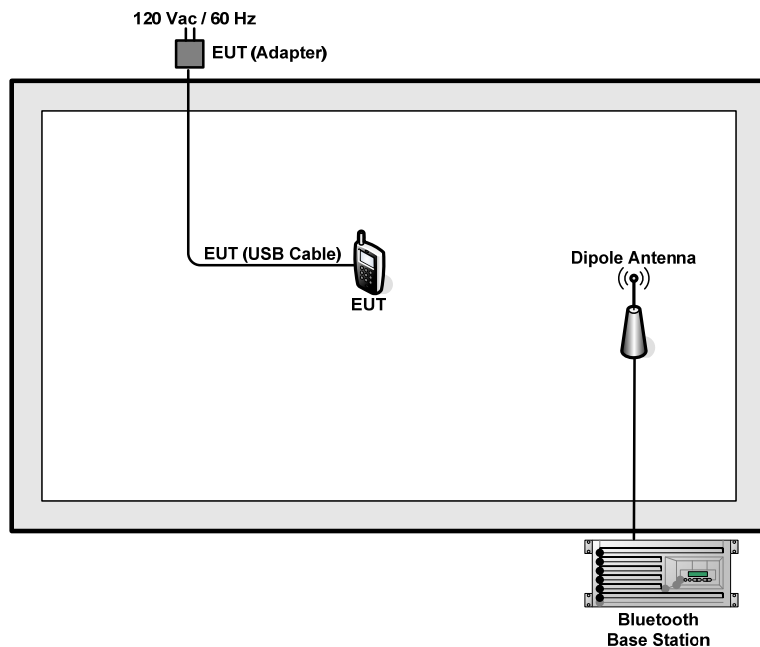
2.2 Test Mode

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

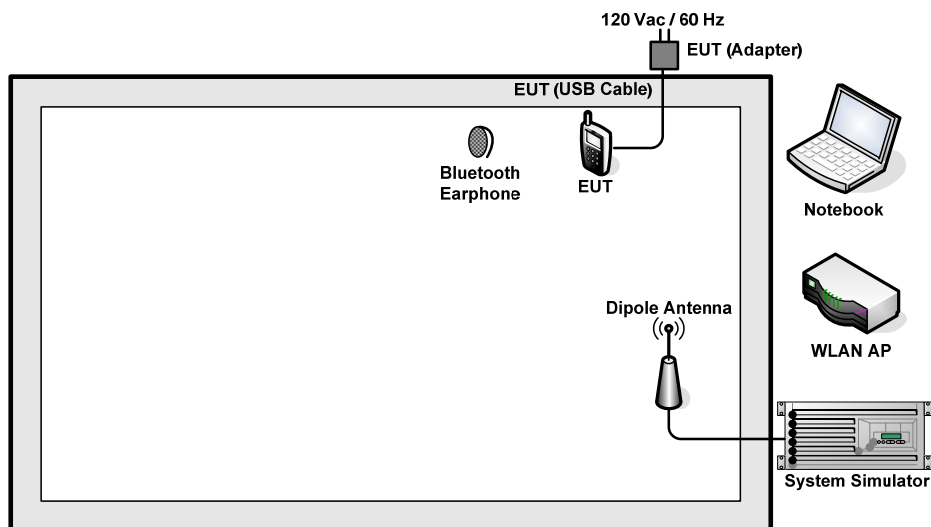
Summary table of Test Cases			
Test Item	Data Rate / Modulation		
	Bluetooth BR 1Mbps GFSK	Bluetooth EDR 2Mbps $\pi/4$ -DQPSK	Bluetooth EDR 3Mbps 8-DPSK
Conducted Test Cases	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	Mode 4: CH00_2402 MHz Mode 5: CH39_2441 MHz Mode 6: CH78_2480 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: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz		
AC Conducted Emission	Mode 1 :GSM1900 Idle + Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter)		
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 no other significantly frequencies found in conducted spurious emission .			

2.3 Connection Diagram of Test System

<Bluetooth Tx Mode>



<AC Conducted Emission Mode>



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Agilent	E5515C	N/A	N/A	Unshielded, 1.8 m
2.	Bluetooth Base Station	ANRITSU	MT8852B	N/A	N/A	Unshielded, 1.8 m
3.	DC Power Supply	TOPWORD	3303DR	N/A	N/A	Unshielded, 1.8 m
4.	WLAN AP	D-Link	DIR-855	KA2DIR855A2	N/A	Unshielded, 1.8 m
5.	Notebook	DELL	P08S	QDS-BRCM1030	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
6.	Bluetooth Earphone	Nokia	BH-106	QTLBH-106	N/A	N/A

2.5 Description of RF Function Operation Test Setup

For Bluetooth function, the engineering test program was provided and enabled to make EUT connect with Bluetooth base station to continuous transmit/receive.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 7.5 dB and 10dB attenuator.

$$\begin{aligned}
 \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\
 &= 7.5 + 10 = 17.5 \text{ (dB)}
 \end{aligned}$$

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

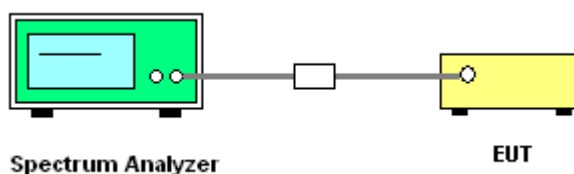
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedure

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. 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.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation; RBW $\geq$ 1% of the span; VBW $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. The number of hopping frequency used is defined as the number of total channel.
7. Record the measurement data derived from spectrum analyzer.

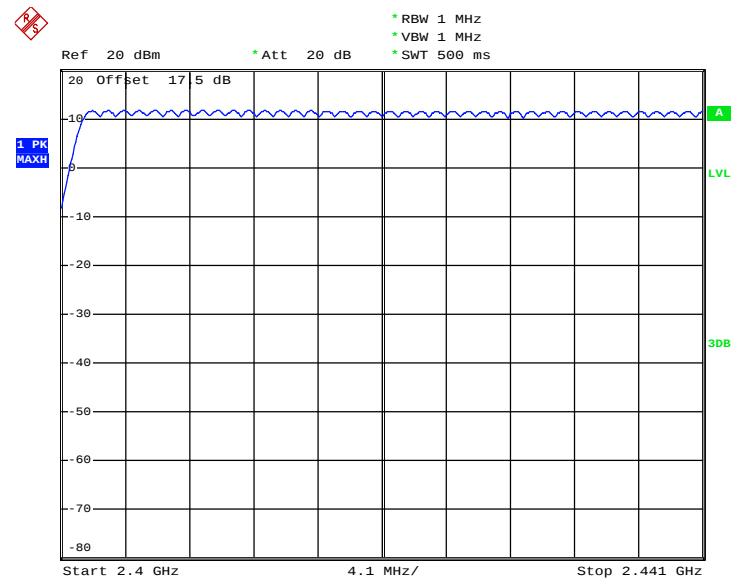
3.1.4 Test Setup



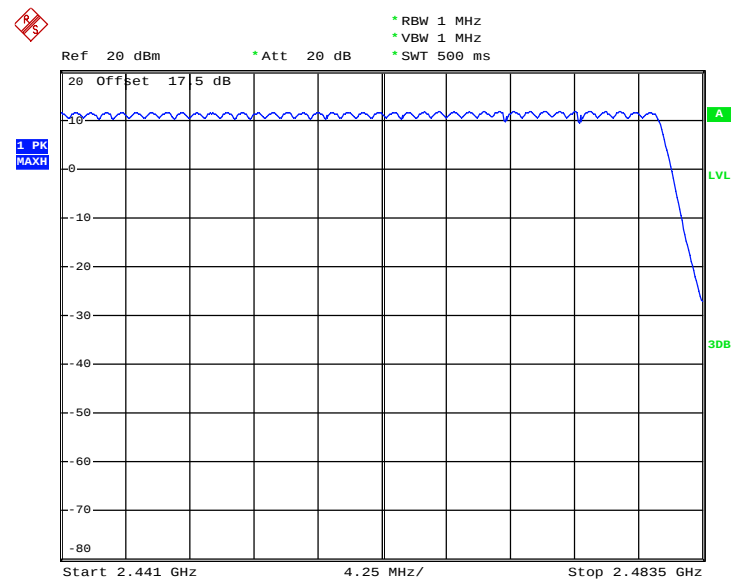
3.1.5 Test Result of Number of Hopping Frequency

Test Mode :	3Mbps	Temperature :	24~26°C
Test Engineer :	Fly Liang	Relative Humidity :	50~53%
Number of Hopping (Channel)	Adaptive Frequency Hopping (Channel)	Limits (Channel)	Pass/Fail
79	20	> 15	Pass

Number of Hopping Channel Plot on Channel 00 - 78



Date: 16.AUG.2013 21:36:35



Date: 16.AUG.2013 21:40:13

3.2 Hopping Channel Separation Measurement

3.2.1 Limit of Hopping Channel Separation

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

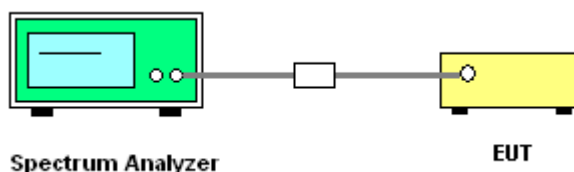
3.2.2 Measuring Instruments

See list of measuring instruments of this test report.

3.2.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. 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.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels; $RBW \geq 1\%$ of the span;
 $VBW \geq RBW$; Sweep = auto; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.2.4 Test Setup

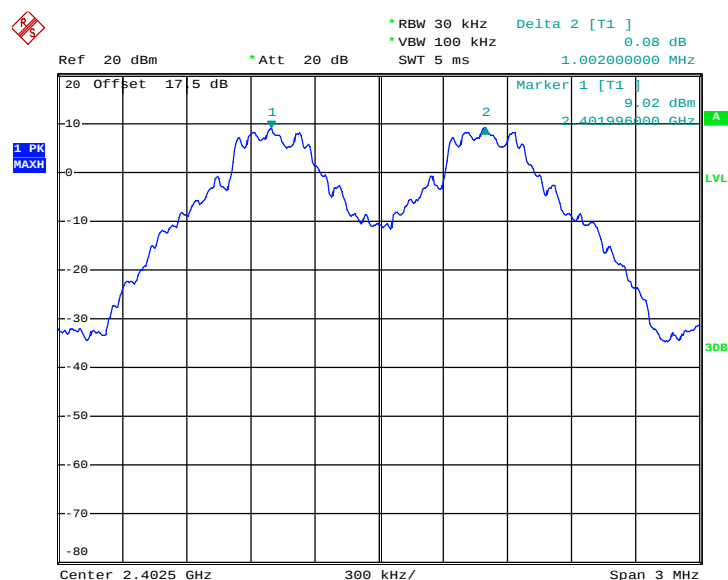


3.2.5 Test Result of Hopping Channel Separation

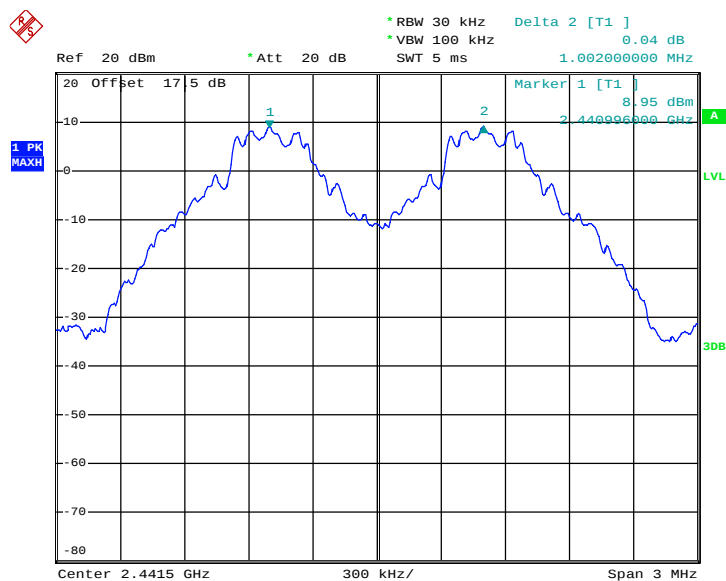
Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Fly Liang	Relative Humidity :	50~53%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.6027	Pass
39	2441	1.002	0.6000	Pass
78	2480	1.002	0.6027	Pass

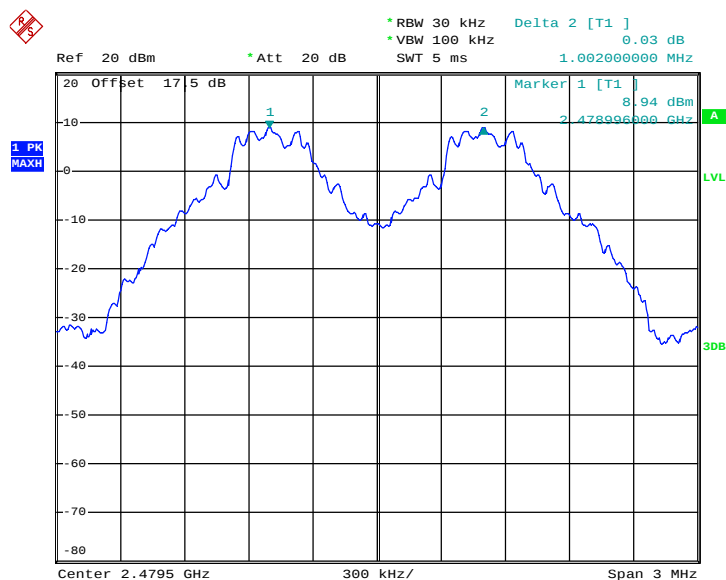
Channel Separation Plot on Channel 00 - 01



Date: 16.AUG.2013 20:55:16

Channel Separation Plot on Channel 39 - 40


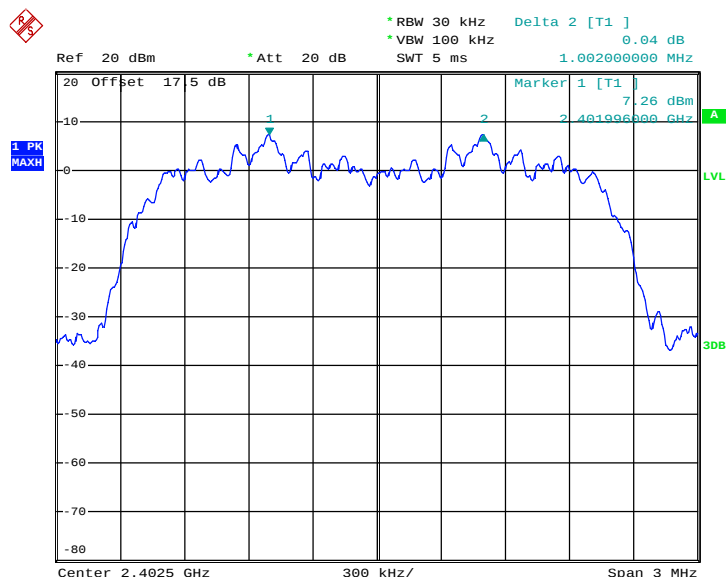
Date: 16.AUG.2013 20:56:04

Channel Separation Plot on Channel 77 - 78


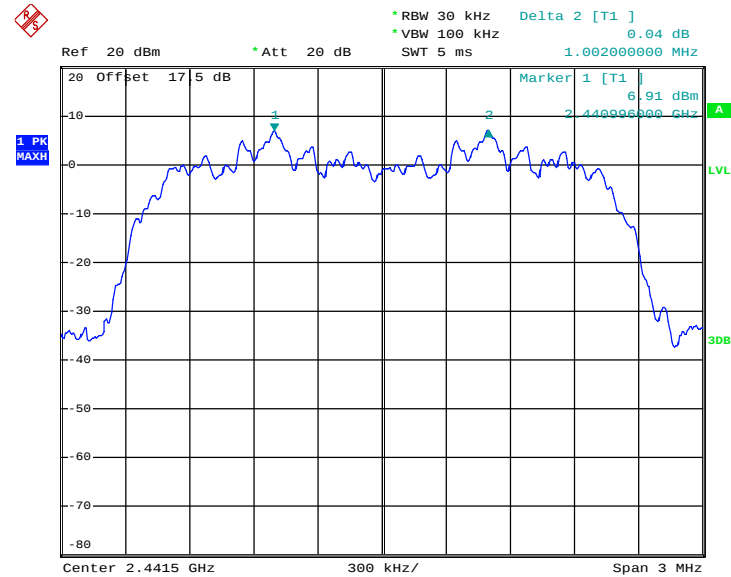
Date: 16.AUG.2013 20:56:46

Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Fly Liang	Relative Humidity :	50~53%

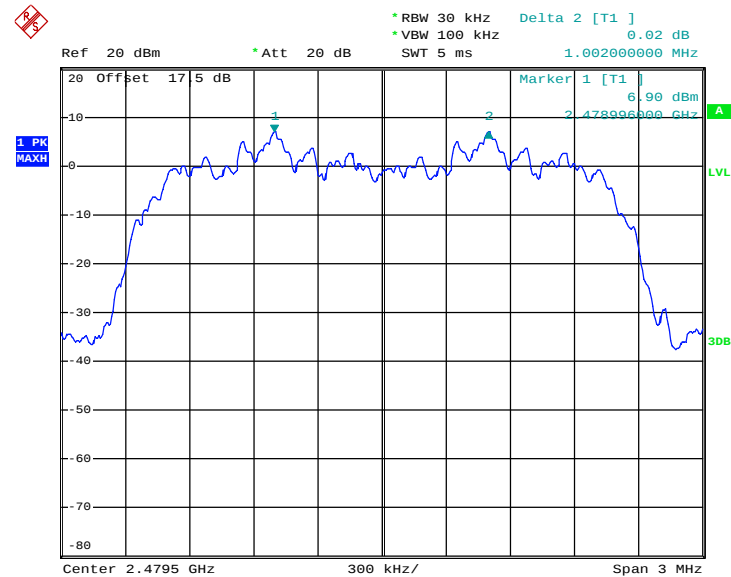
Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.002	0.8960	Pass
39	2441	1.002	0.9000	Pass
78	2480	1.002	0.9000	Pass

Channel Separation Plot on Channel 00 - 01


Date: 16.AUG.2013 23:07:06

Channel Separation Plot on Channel 39 - 40


Date: 16.AUG.2013 20:58:35

Channel Separation Plot on Channel 77 - 78


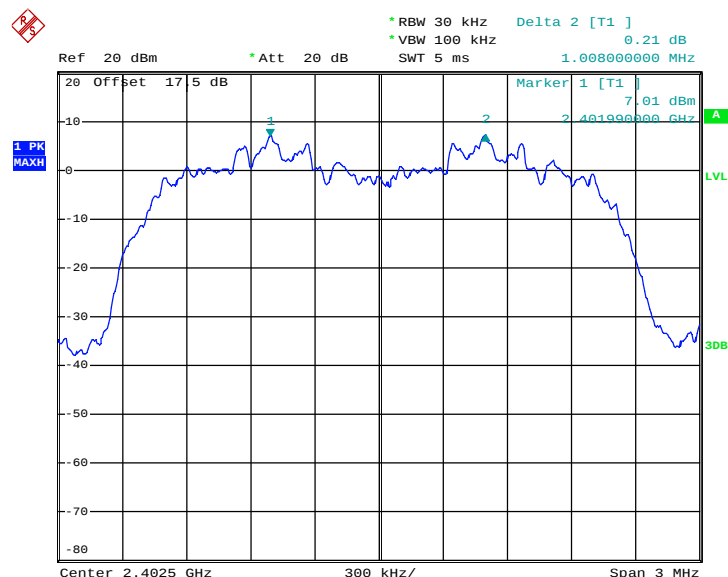
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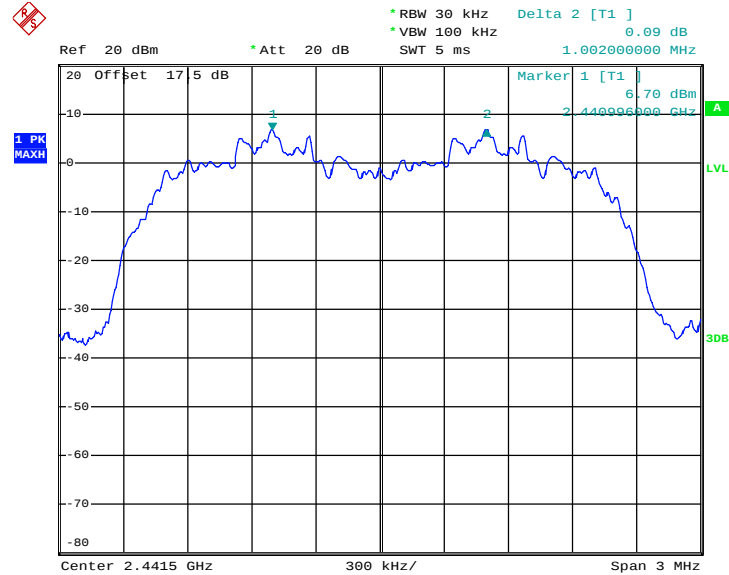
Test Mode :	3Mbps	Temperature :	24~26°C
Test Engineer :	Fly Liang	Relative Humidity :	50~53%

Channel	Frequency (MHz)	Frequency Separation (MHz)	(2/3 of 20dB BW) Limits (MHz)	Pass/Fail
00	2402	1.008	0.8600	Pass
39	2441	1.002	0.8600	Pass
78	2480	1.008	0.8560	Pass

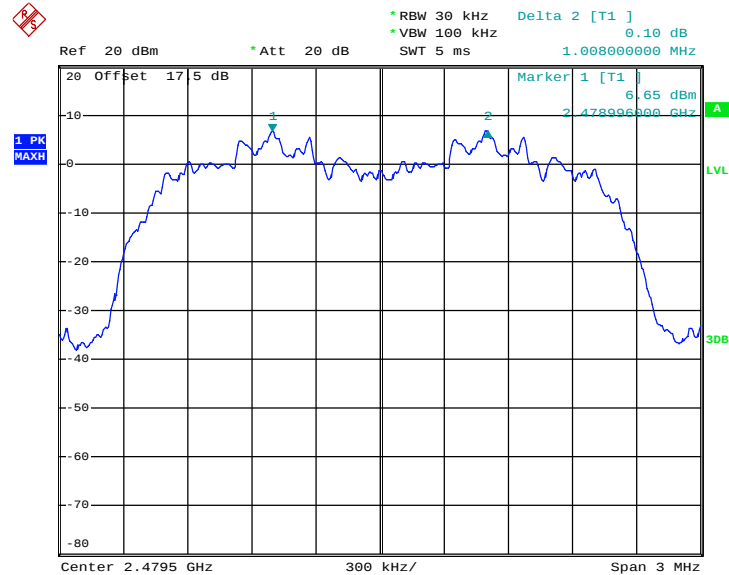
Channel Separation Plot on Channel 00 - 01



Date: 16.AUG.2013 21:01:16

Channel Separation Plot on Channel 39 - 40


Date: 16.AUG.2013 21:03:16

Channel Separation Plot on Channel 77 - 78


Date: 16.AUG.2013 21:03:58

3.3 Dwell Time Measurement

3.3.1 Limit of Dwell Time

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.

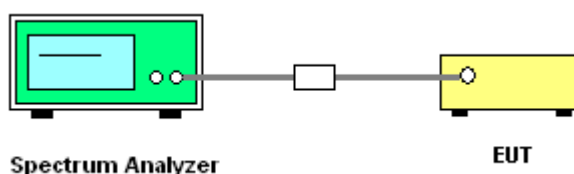
3.3.2 Measuring Instruments

See list of measuring instruments of this test report.

3.3.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. 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.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW $\geq$ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.3.4 Test Setup



3.3.5 Test Result of Dwell Time

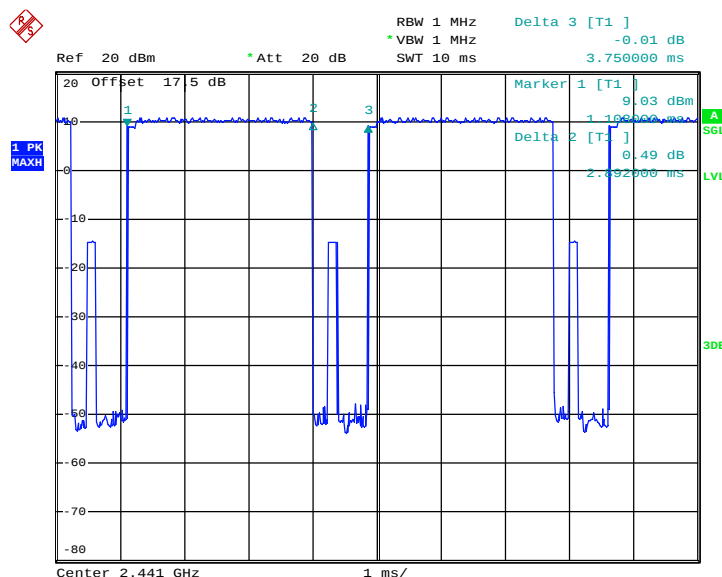
Test Mode :	3DH5	Temperature :	24~26℃
Test Engineer :	Fly Liang	Relative Humidity :	50~53%

Mode	Hopping Channel Number	Hops Over Occupancy Time(hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Normal	79	106.67	2.892	0.31	0.4	Pass
AFH	20	53.33	2.892	0.15	0.4	Pass

Remark:

- In normal mode, hopping rate is 1600hops/s with 6 slots in 79 hopping channels.
With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s),
Hops Over Occupancy Time comes to (1600 / 6 / 79) x (0.4 x 79) = 106.67 hops.
- In AFH mode, hopping rate is 800hops/s with 6 slots in 20 hopping channels.
With channel hopping rate (800 / 6 / 20) in Occupancy Time Limit (0.4 x 20) (s),
Hops Over Occupancy Time comes to (800 / 6 / 20) x (0.4 x 20) = 53.33 hops.
- Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

Package Transfer Time Plot



Date: 15.AUG.2013 12:46:42

3.4 20dB Bandwidth Measurement

3.4.1 Limit of 20dB Bandwidth

Reporting only

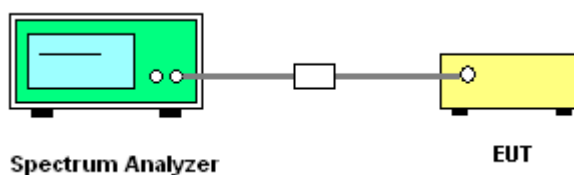
3.4.2 Measuring Instruments

See list of measuring instruments of this test report.

3.4.3 Test Procedures

1. The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
2. 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.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.
Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel;
RBW $\geq$ 1% of the 20 dB bandwidth; VBW $\geq$ RBW; Sweep = auto; Detector function = peak;
Trace = max hold.
5. Measure and record the results in the test report.

3.4.4 Test Setup

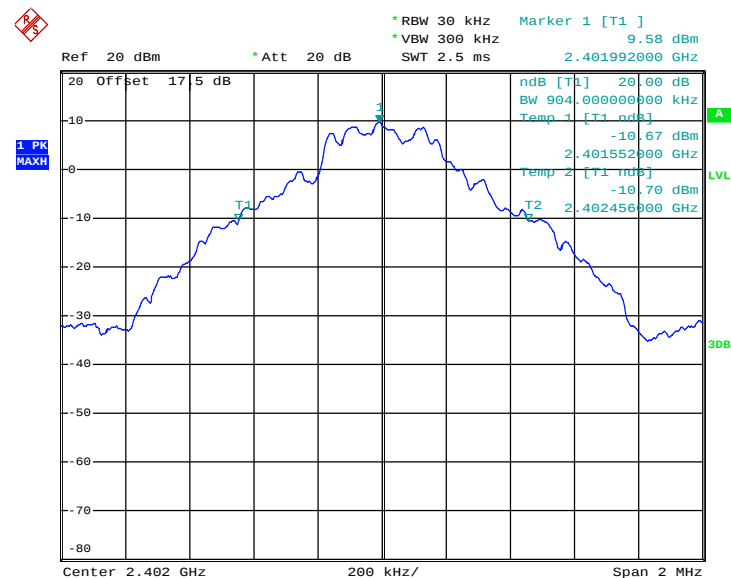


3.4.5 Test Result of 20dB Bandwidth

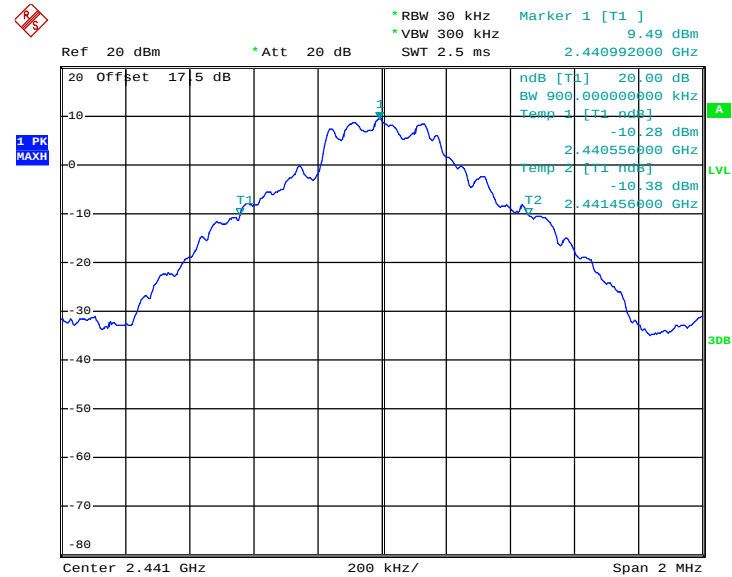
Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Fly Liang	Relative Humidity :	50~53%

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	0.904
39	2441	0.900
78	2480	0.904

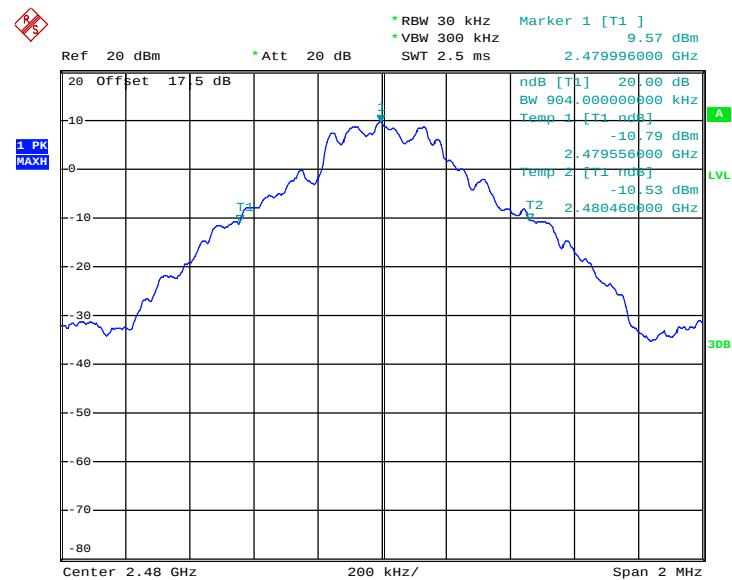
20 dB Bandwidth Plot on Channel 00



Date: 16.AUG.2013 21:07:56

20 dB Bandwidth Plot on Channel 39


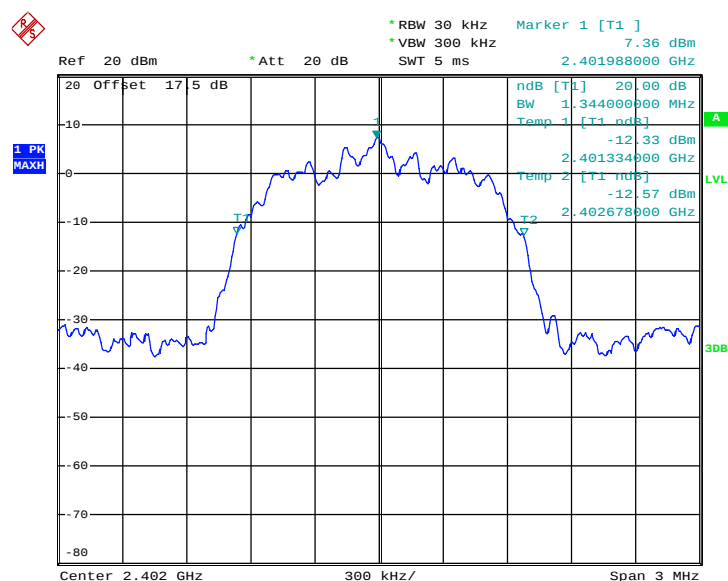
Date: 16.AUG.2013 21:08:29

20 dB Bandwidth Plot on Channel 78


Date: 16.AUG.2013 21:08:55

Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Fly Liang	Relative Humidity :	50~53%

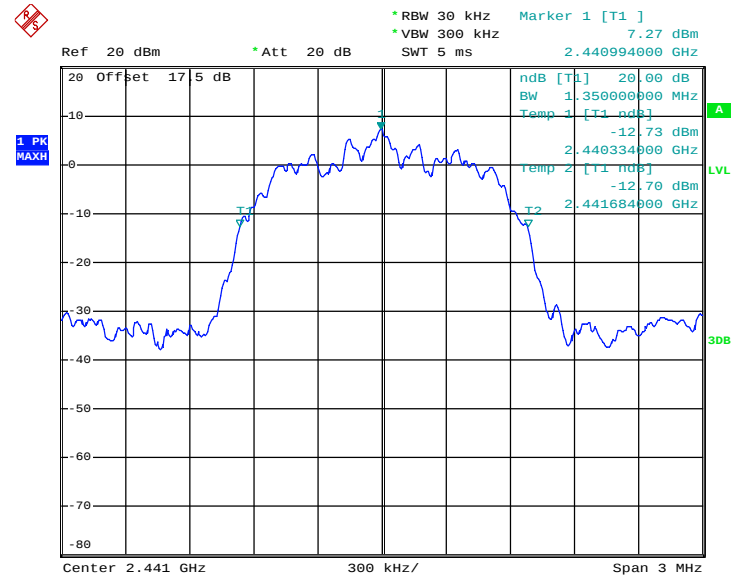
Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.344
39	2441	1.350
78	2480	1.350

20 dB Bandwidth Plot on Channel 00


Date: 16.AUG.2013 21:09:33

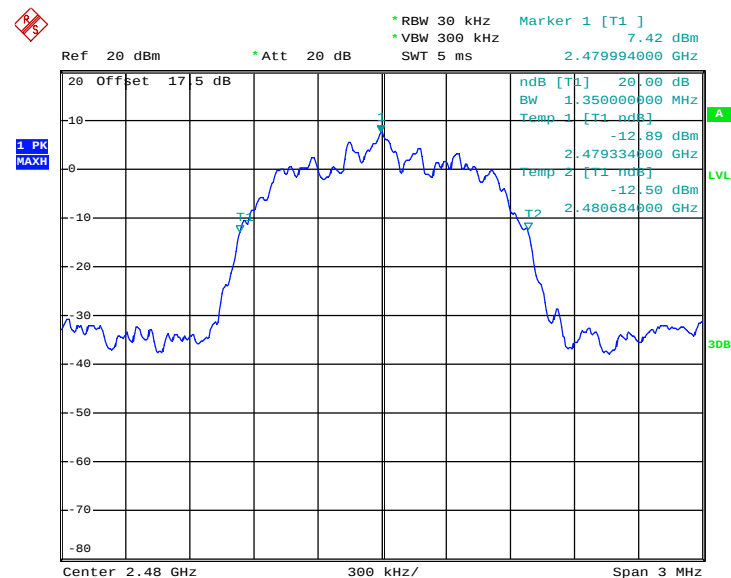


20 dB Bandwidth Plot on Channel 39



Date: 16.AUG.2013 21:10:11

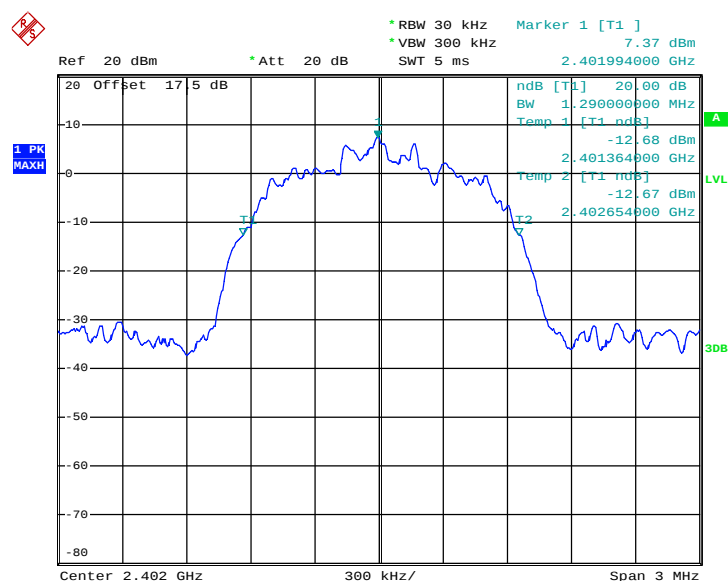
20 dB Bandwidth Plot on Channel 78



Date: 16.AUG.2013 21:11:07

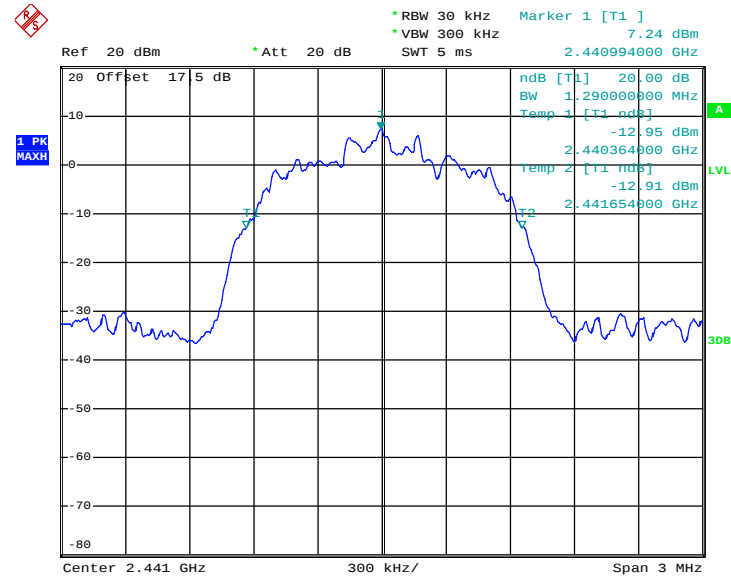
Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Fly Liang	Relative Humidity :	50~53%

Channel	Frequency (MHz)	20dB Bandwidth (MHz)
00	2402	1.290
39	2441	1.290
78	2480	1.284

20 dB Bandwidth Plot on Channel 00


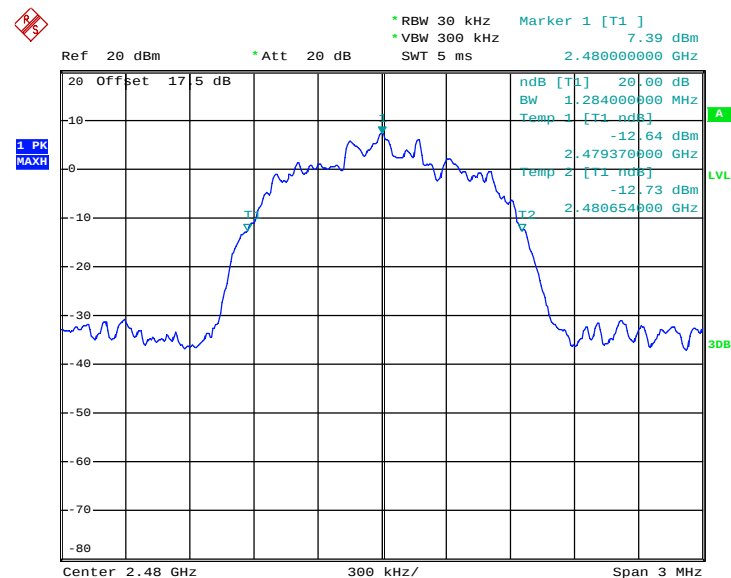
Date: 16.AUG.2013 21:12:03

20 dB Bandwidth Plot on Channel 39



Date: 16.AUG.2013 21:12:31

20 dB Bandwidth Plot on Channel 78



Date: 16.AUG.2013 21:13:04

3.5 Peak Output Power Measurement

3.5.1 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.

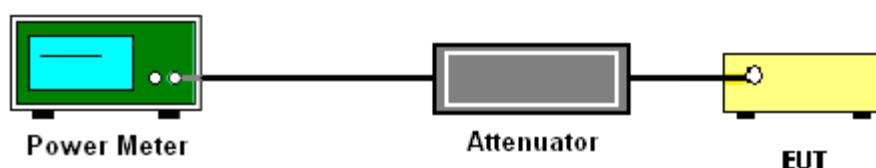
3.5.2 Measuring Instruments

See list of measuring instruments of this test report.

3.5.3 Test Procedures

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

3.5.4 Test Setup



3.5.5 Test Result of Peak Output Power

Test Mode :	1Mbps	Temperature :	24~26℃
Test Engineer :	Fly Liang	Relative Humidity :	50~53%

Channel	Frequency (MHz)	RF Power (dBm)		
		GFSK	Max. Limits (dBm)	Pass/Fail
		1 Mbps		
00	2402	13.10	30.00	Pass
39	2441	12.94	30.00	Pass
78	2480	13.20	30.00	Pass

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

Test Mode :	2Mbps	Temperature :	24~26℃
Test Engineer :	Fly Liang	Relative Humidity :	50~53%

Channel	Frequency (MHz)	RF Power (dBm)		
		$\pi/4$ -DQPSK	Max. Limits (dBm)	Pass/Fail
		2 Mbps		
00	2402	13.05	20.97	Pass
39	2441	12.95	20.97	Pass
78	2480	13.25	20.97	Pass

Test Mode :	3Mbps	Temperature :	24~26℃
Test Engineer :	Fly Liang	Relative Humidity :	50~53%

Channel	Frequency (MHz)	RF Power (dBm)		
		8-DPSK	Max. Limits (dBm)	Pass/Fail
		3 Mbps		
00	2402	13.33	20.97	Pass
39	2441	13.22	20.97	Pass
78	2480	13.48	20.97	Pass

3.6 Conducted Band Edges Measurement

3.6.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

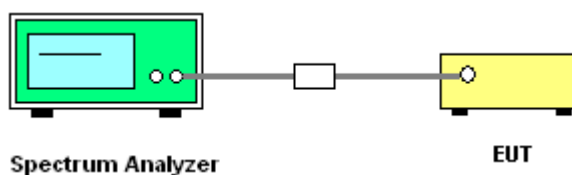
3.6.2 Measuring Instruments

See list of measuring instruments of this test report.

3.6.3 Test Procedures

1. The testing follows the guidelines in Band-edge Compliance of RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 300kHz ($\geq 1\%$ span=30MHz), VBW = 300kHz ($\geq$ RBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 300kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
4. Enable hopping function of the EUT and then repeat step 2. and 3.
5. Measure and record the results in the test report.

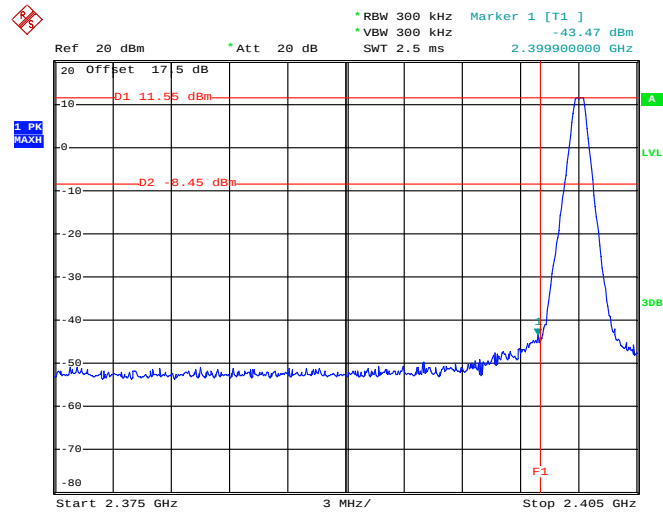
3.6.4 Test Setup



3.6.5 Test Result of Conducted Band Edges

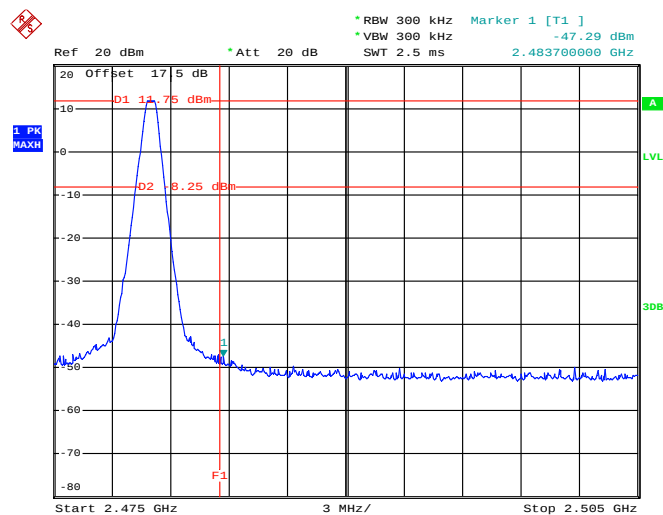
Test Mode :	1Mbps	Temperature :	24~26°C
Test Channel :	00 and 78	Relative Humidity :	50~53%
		Test Engineer :	Fly Liang

Low Band Edge Plot on Channel 00



Date: 16.AUG.2013 22:49:24

High Band Edge Plot on Channel 78

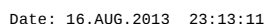


Date: 16.AUG.2013 21:15:00



Report No. : FR381405A

Low Band Edge Plot on Channel 00



Ref 20 dBm * Att 20 dB SWT 2.5 ms

Marker 1 [T1] -46.97 dBm
2.483700000 GHz

20 Offset 17.5 dB

1 PK
MAXH

01 0.58 dBm

02 10.92 dBm

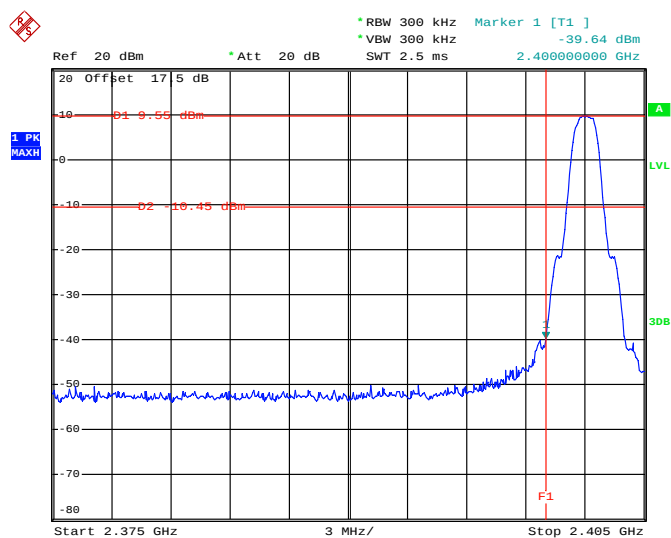
F1

Start 2.475 GHz 3 MHz/ Stop 2.505 GHz

Date: 16.AUG.2013 21:16:55

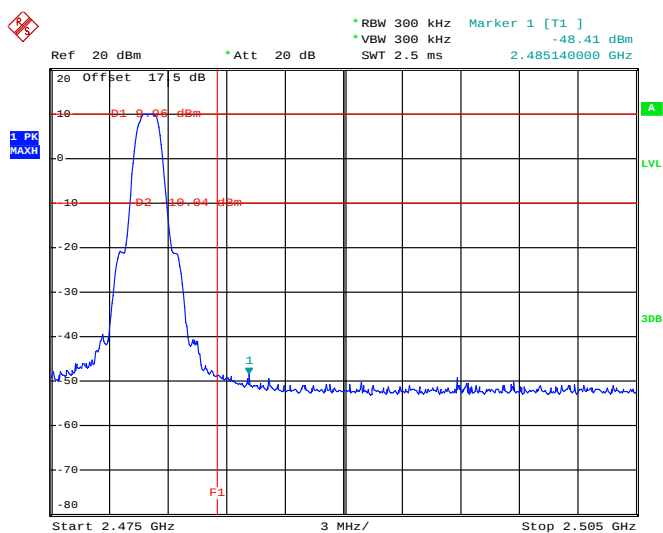
Test Mode :	3Mbps	Temperature :	24~26℃
Test Channel :	00 and 78	Relative Humidity :	50~53%
		Test Engineer :	Fly Liang

Low Band Edge Plot on Channel 00



Date: 16.AUG.2013 23:15:07

High Band Edge Plot on Channel 78

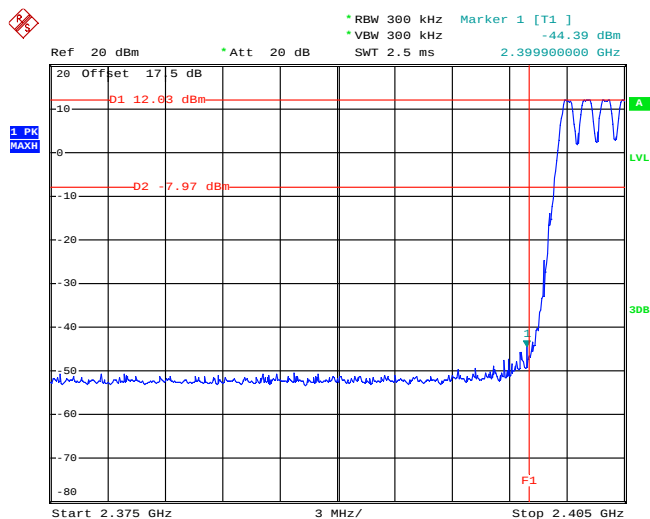


Date: 16.AUG.2013 21:18:50

3.6.6 Test Result of Conducted Hopping Mode Band Edges

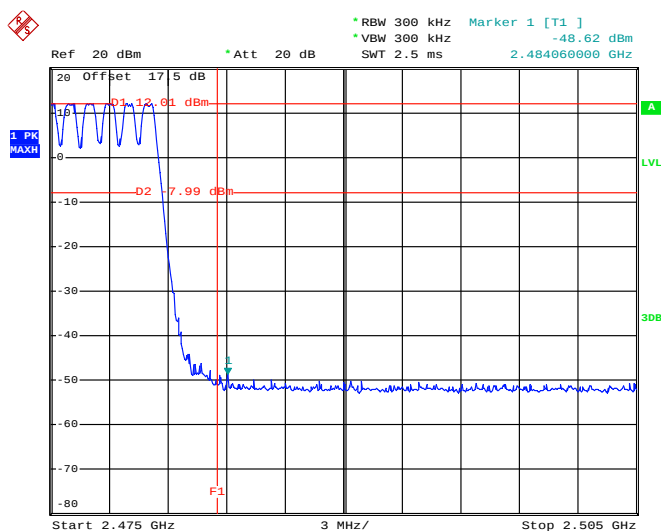
Test Mode :	1Mbps	Temperature :	24~26℃
Test Channel :	00 and 78	Relative Humidity :	50~53%
		Test Engineer :	Fly Liang

1Mbps Hopping Mode Low Band Edge Plot



Date: 16.AUG.2013 22:20:50

1Mbps Hopping Mode High Band Edge Plot

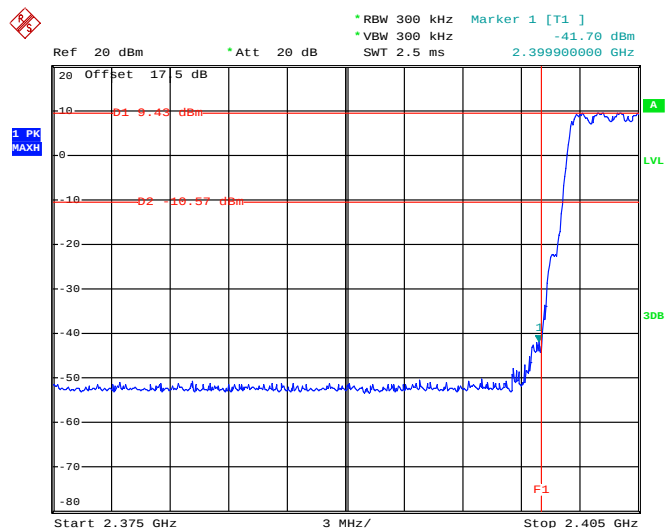


Date: 16.AUG.2013 22:36:17



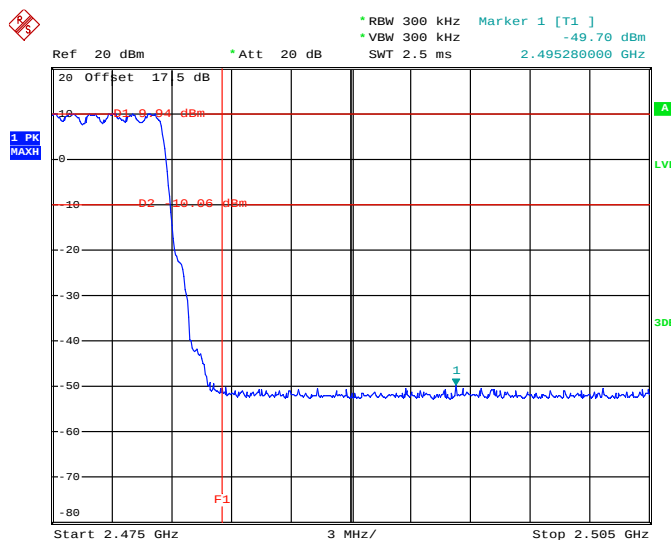
Test Mode :	2Mbps	Temperature :	24~26℃
Test Channel :	00 and 78	Relative Humidity :	50~53%
		Test Engineer :	Fly Liang

2Mbps Hopping Mode Low Band Edge Plot



Date: 16.AUG.2013 22:54:34

2Mbps Hopping Mode High Band Edge Plot

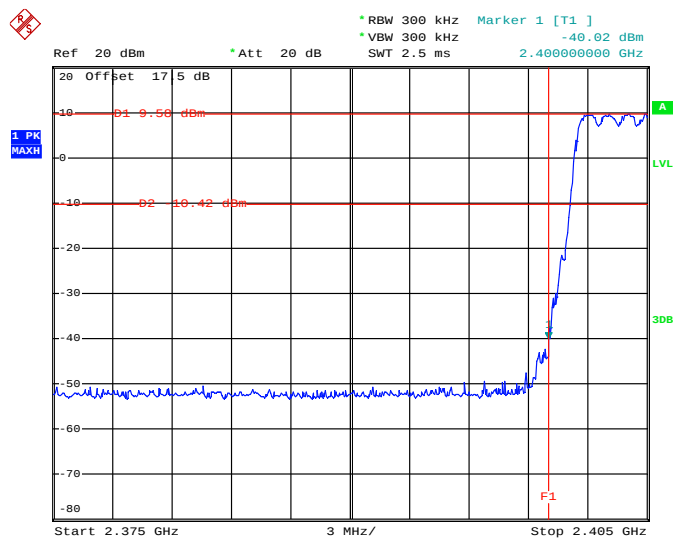


Date: 16.AUG.2013 22:34:17



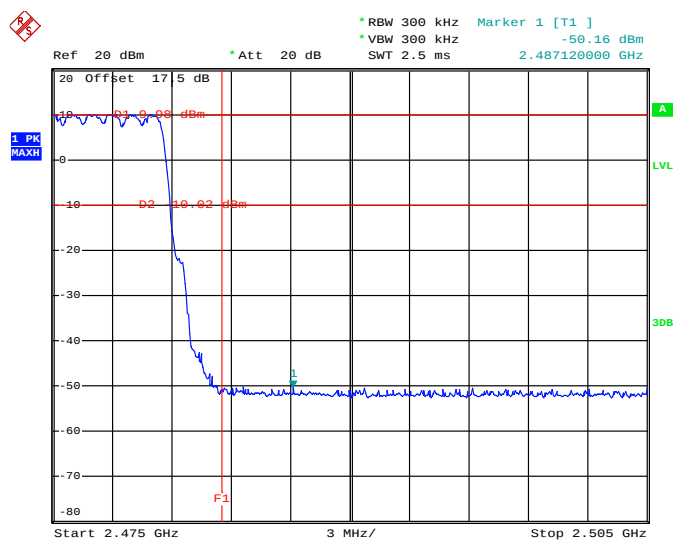
Test Mode :	3Mbps	Temperature :	24~26℃
Test Channel :	00 and 78	Relative Humidity :	50~53%
		Test Engineer :	Fly Liang

3Mbps Hopping Mode Low Band Edge Plot



Date: 16.AUG.2013 23:17:52

3Mbps Hopping Mode High Band Edge Plot



Date: 16.AUG.2013 22:32:14

3.7 Conducted Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

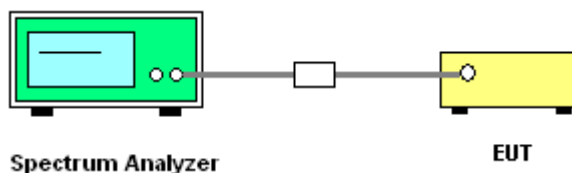
3.7.2 Measuring Instruments

See list of measuring instruments of this test report.

3.7.3 Test Procedure

1. The testing follows the guidelines in Spurious RF Conducted Emissions of FCC Public Notice DA 00-705 Measurement Guidelines
2. 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.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

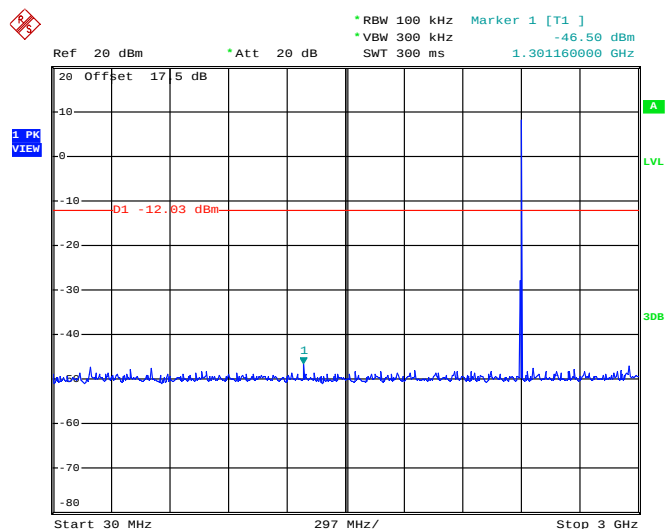
3.7.4 Test Setup



3.7.5 Test Result of Conducted Spurious Emission

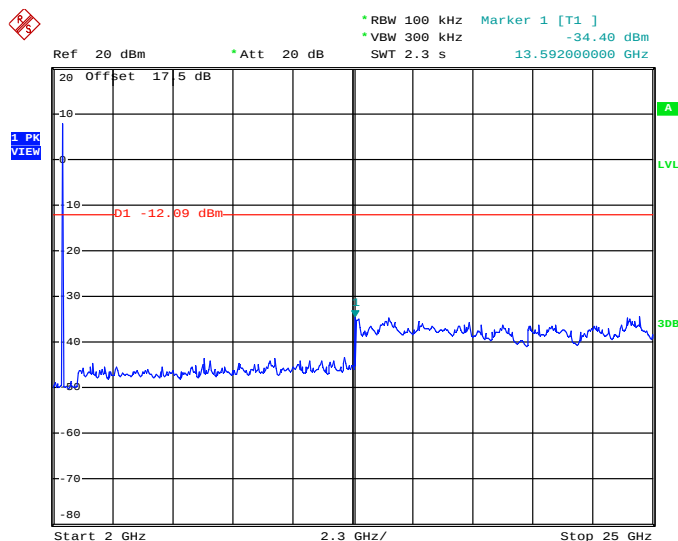
Test Mode :	1Mbps	Temperature :	24~26℃
Test Channel :	00	Relative Humidity :	50~53%
		Test Engineer :	Fly Liang

1Mbps CSE Plot on Ch 00 between 30MHz ~ 3 GHz



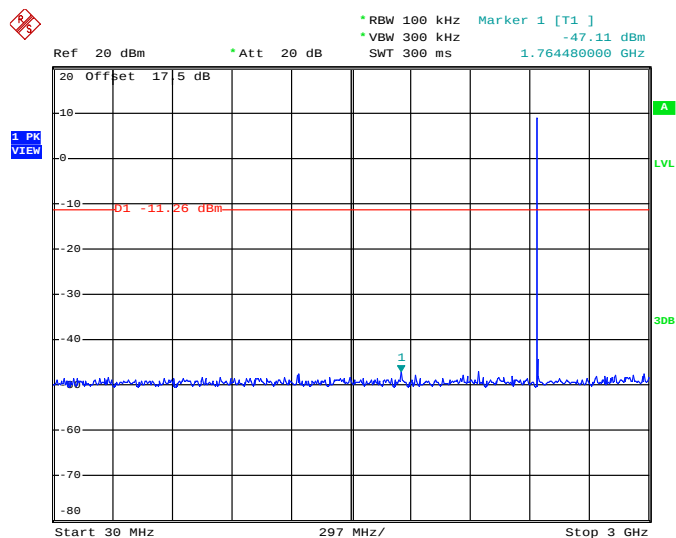
Date: 17.AUG.2013 00:59:56

1Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz

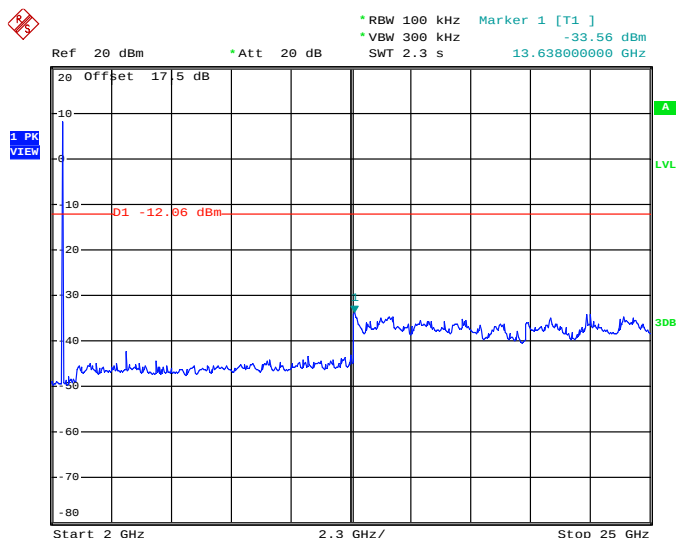


Date: 17.AUG.2013 01:00:17

Test Mode :	1Mbps	Temperature :	24~26°C
Test Channel :	39	Relative Humidity :	50~53%
		Test Engineer :	Fly Liang

1Mbps CSE Plot on Ch 39 between 30MHz ~ 3 GHz


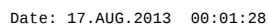
Date: 16.AUG.2013 23:59:44

1Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz


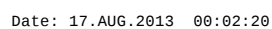
Date: 17.AUG.2013 00:00:36



1Mbps CSE Plot on Ch 78 between 30MHz ~ 3 GHz



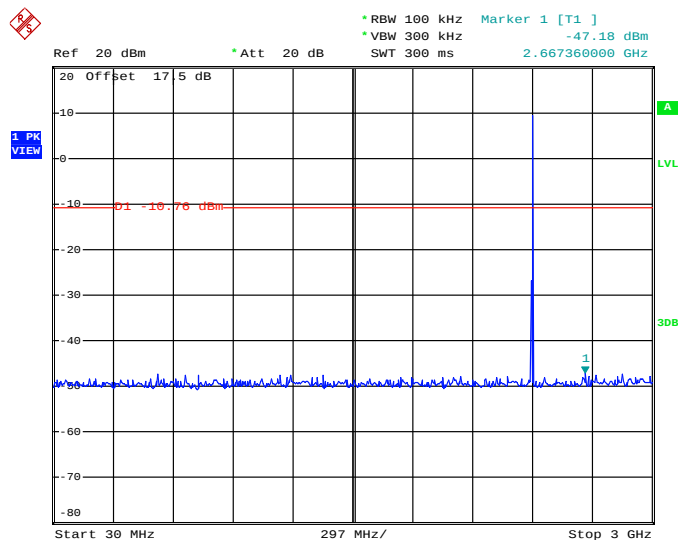
1Mbps CSE Plot on Ch 78 between 2 GHz ~ 25 GHz





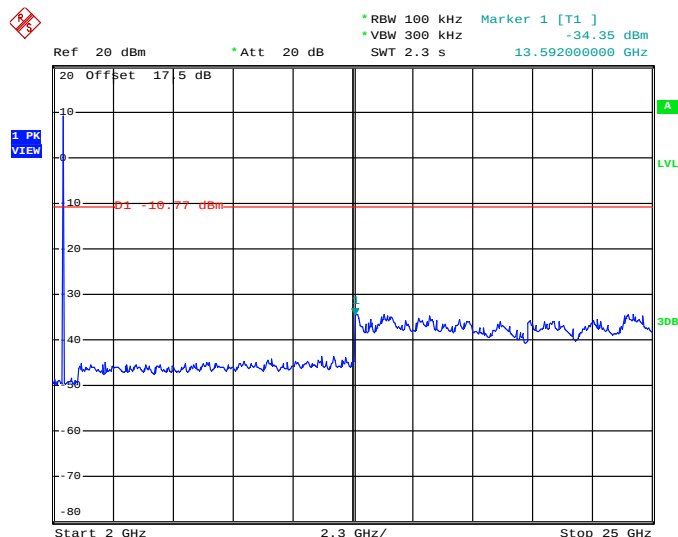
Test Mode :	2Mbps	Temperature :	24~26℃
Test Channel :	00	Relative Humidity :	50~53%
		Test Engineer :	Fly Liang

2Mbps CSE Plot on Ch 00 between 30MHz ~ 3 GHz



Date: 16.AUG.2013 23:52:22

2Mbps CSE Plot on Ch 00 between 2 GHz ~ 25 GHz

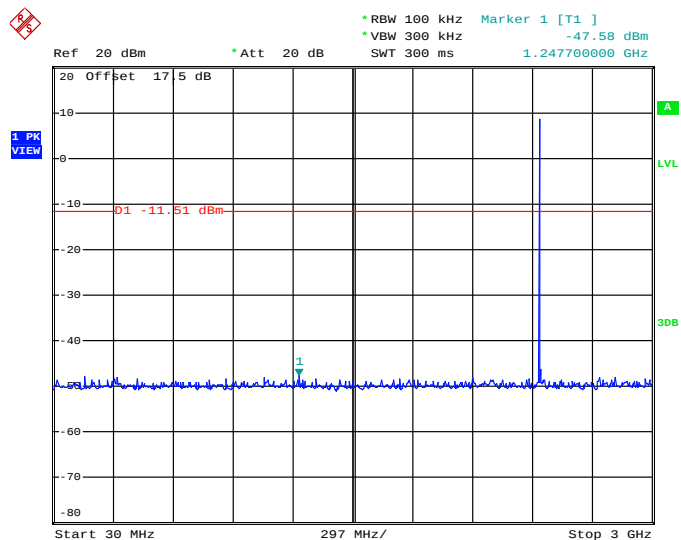


Date: 16.AUG.2013 23:53:14



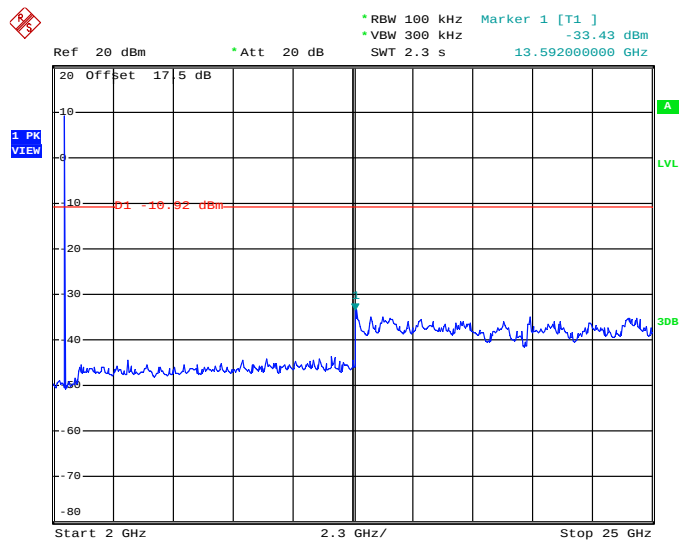
Test Mode :	2Mbps	Temperature :	24~26°C
Test Channel :	39	Relative Humidity :	50~53%
		Test Engineer :	Fly Liang

2Mbps CSE Plot on Ch 39 between 30MHz ~ 3 GHz



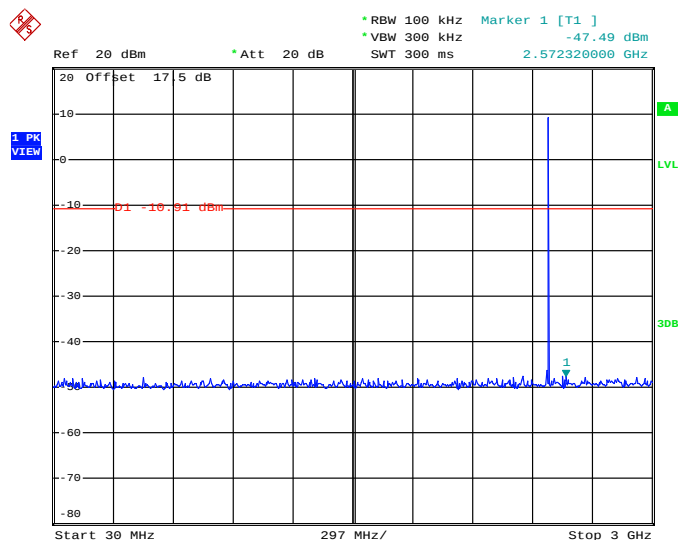
Date: 17.AUG.2013 00:53:28

2Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz

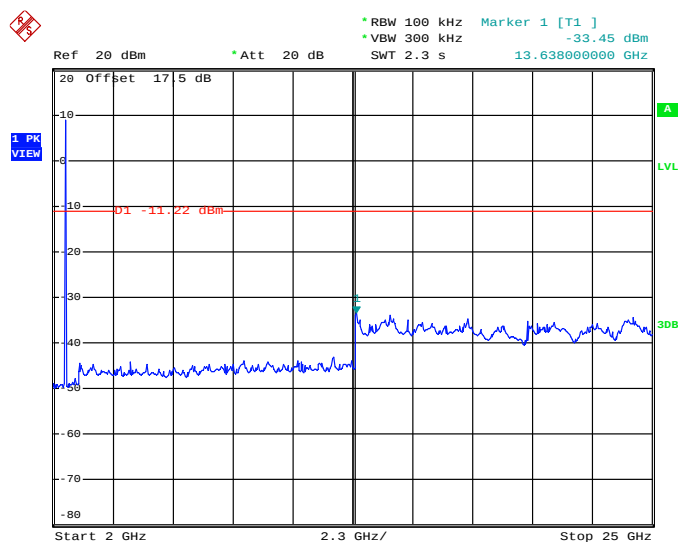


Date: 17.AUG.2013 00:53:50

Test Mode :	2Mbps	Temperature :	24~26°C
Test Channel :	78	Relative Humidity :	50~53%
		Test Engineer :	Fly Liang

2Mbps CSE Plot on Ch 78 between 30MHz ~ 3 GHz


Date: 16.AUG.2013 23:55:49

2Mbps CSE Plot on Ch 78 between 2 GHz ~ 25 GHz


Date: 16.AUG.2013 23:56:41



Report No. : FR381405A

Test Mode :	3Mbps	Temperature :	24~26℃
Test Channel :	00	Relative Humidity :	50~53%
		Test Engineer :	Fly Liang

Ref 20 dBm Att 20 dB RBW 100 kHz VBW 300 kHz SWT 300 ms Marker 1 [T1] -47.01 dBm 2.946540000 GHz

20 Offset 17.5 dB

1 PK VIEW

D1 -8.27 dBm

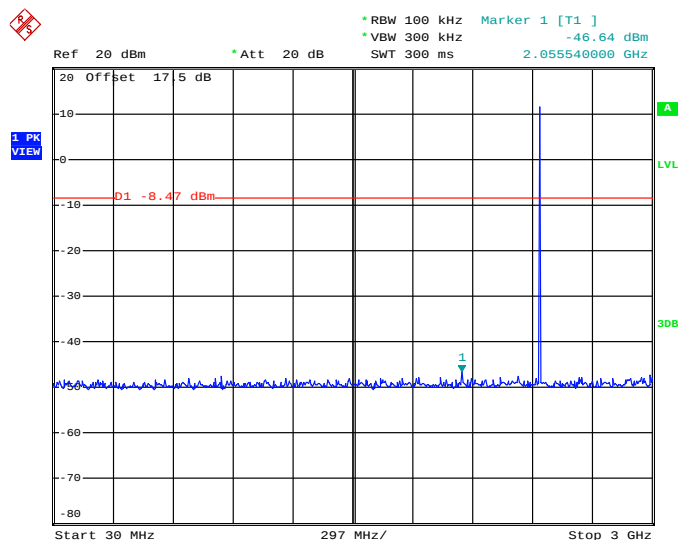
Start 30 MHz 297 MHz/ Stop 3 GHz

Date: 16.AUG.2013 23:38:43

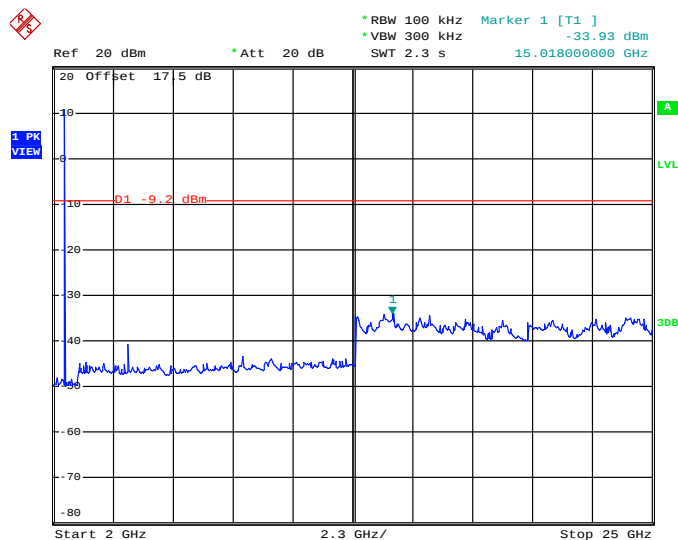
The screenshot shows a Spectrum Analyzer interface. The top status bar displays the following parameters: RBW 100 kHz, VBW 300 kHz, SWT 2.3 s, and a frequency of 21.18200000 GHz. The main display area shows a spectrum plot with a blue trace representing the signal. The y-axis is labeled '1 PK VIEW' and ranges from -80 to 0 dBm. The x-axis is labeled 'Start 2 GHz', '2.3 GHz/', and 'Stop 25 GHz'. A red horizontal line is drawn at -9.15 dBm, labeled 'D1 -9.15 dBm'. A green vertical line is drawn at 2.3 GHz, labeled 'Marker 1 [T1]'. The signal trace shows a noise floor around -50 dBm and a signal peak at 2.3 GHz reaching approximately -33.68 dBm.

Date: 16.AUG.2013 23:39:35

Test Mode :	3Mbps	Temperature :	24~26°C
Test Channel :	39	Relative Humidity :	50~53%
		Test Engineer :	Fly Liang

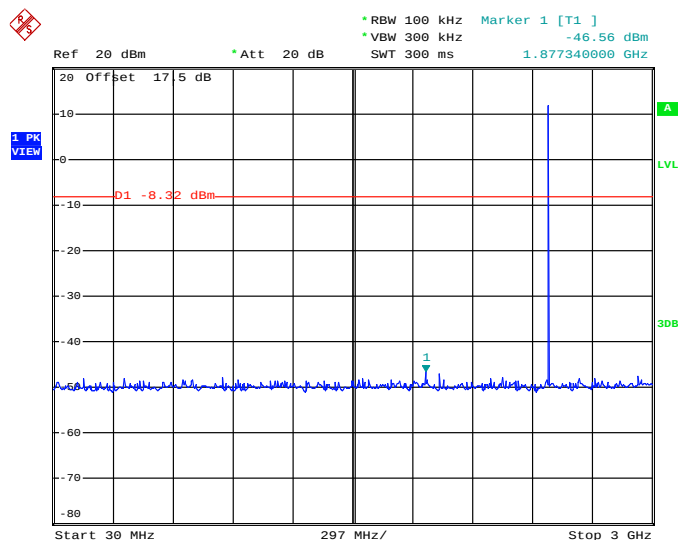
3Mbps CSE Plot on Ch 39 between 30MHz ~ 3 GHz


Date: 16.AUG.2013 23:40:27

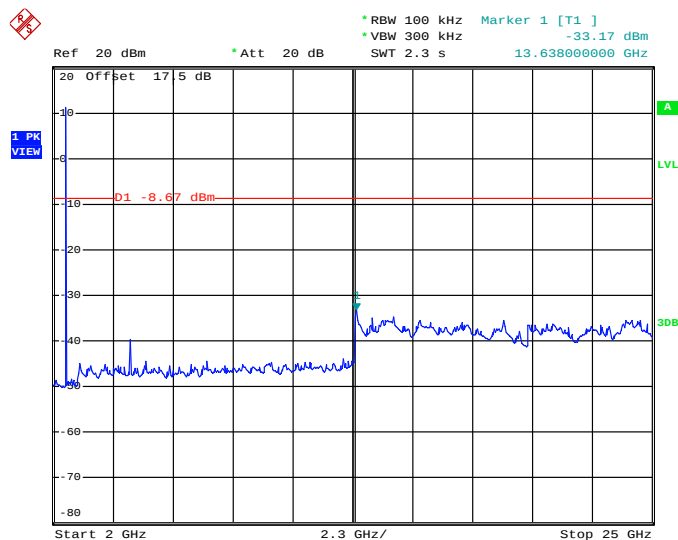
3Mbps CSE Plot on Ch 39 between 2 GHz ~ 25 GHz


Date: 16.AUG.2013 23:41:19

Test Mode :	3Mbps	Temperature :	24~26°C
Test Channel :	78	Relative Humidity :	50~53%
		Test Engineer :	Fly Liang

3Mbps CSE Plot on Ch 78 between 30MHz ~ 3 GHz


Date: 17.AUG.2013 00:46:43

3Mbps CSE Plot on Ch 78 between 2 GHz ~ 25 GHz


Date: 17.AUG.2013 00:50:46

3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 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

3.8.2 Measuring Instruments

See list of measuring instruments of this test report.

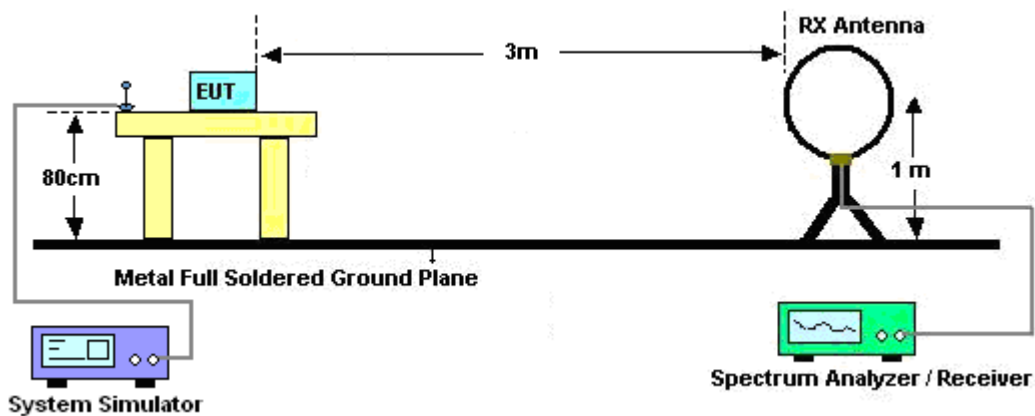
3.8.3 Test Procedures

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 $f > 1$ GHz ; VBW $\geq$ 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 = $N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$
Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
Average Emission Level = Peak Emission Level + $20 * \log(\text{Duty cycle})$
7. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

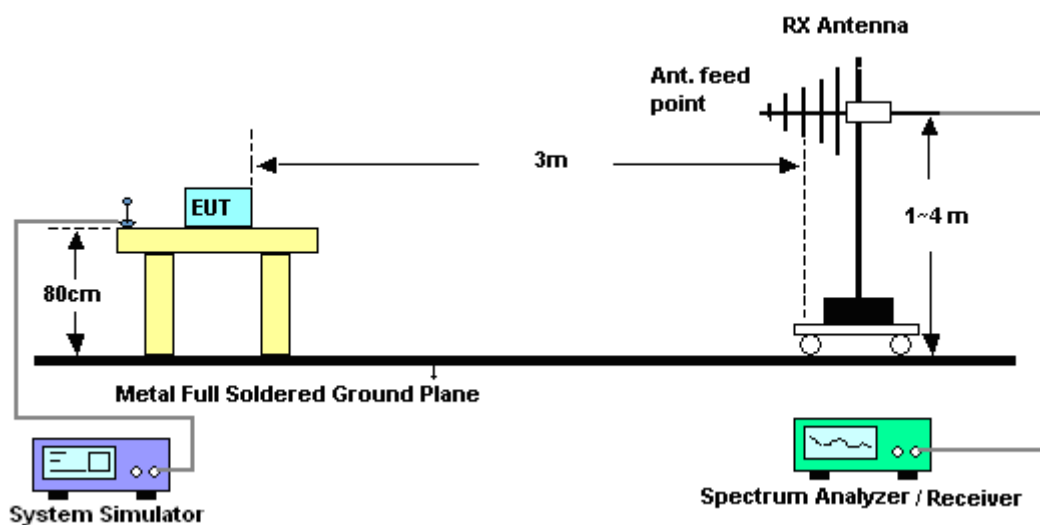
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (24.76dB) derived from $20 \log(\text{dwell time})$.

3.8.4 Test Setup

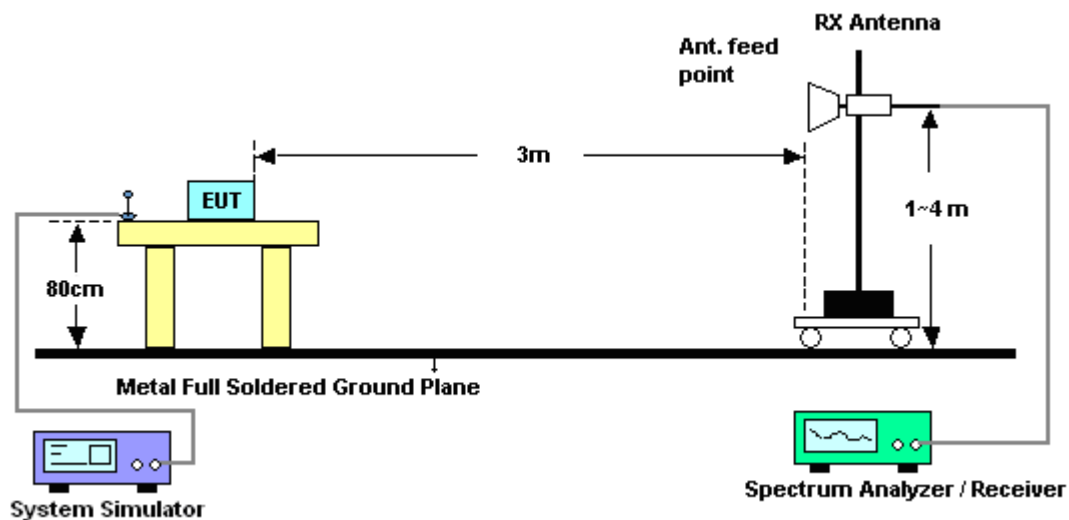
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz

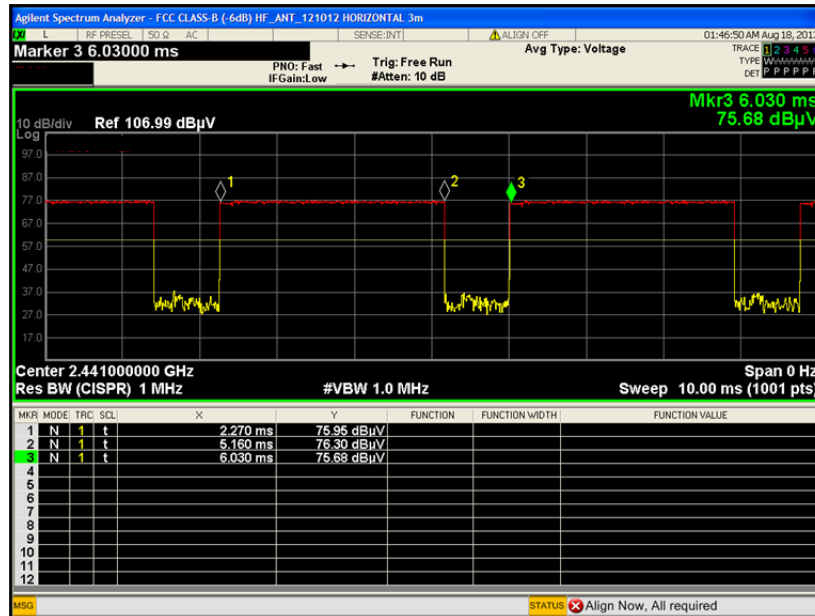


3.8.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

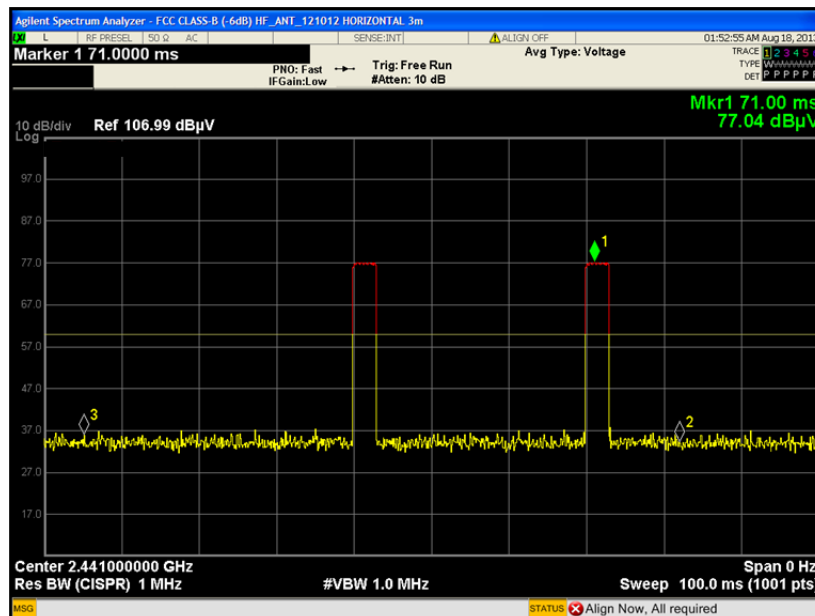
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

3.8.6 Duty cycle correction factor for average measurement

3DH5 on time (One Pulse) Plot on Channel 39



3DH5 on time (Count Pulses) Plot on Channel 39



Note:

1. Worst case Duty cycle = on time/100 milliseconds = $2 * 2.89 / 100 = 5.78 \%$
2. Worst case Duty cycle correction factor = $20 * \log(\text{Duty cycle}) = -24.76 \text{ dB}$
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

$$2.89 \text{ ms} \times 20 \text{ channels} = 57.8 \text{ ms}$$

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. $[100\text{ms} / 57.6\text{ms}] = 2 \text{ hops}$

Thus, the maximum possible ON time:

$$2.89 \text{ ms} \times 2 = 5.78 \text{ ms}$$

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

$$20 \times \log(5.78 \text{ ms}/100\text{ms}) = -24.76 \text{ dB}$$

3.8.7 Test Result of Radiated Spurious at Band Edges

Test Mode :	3Mbps	Temperature :	23~25°C
Test Channel :	00	Relative Humidity :	49~53%
		Test Engineer :	Gavin Zhang

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
2369.31	46.05	-27.95	74	38.13	32.12	5.59	29.79	100	63	Peak
2369.31	21.29	-32.71	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
2358.33	46.57	-27.43	74	38.7	32.1	5.56	29.79	119	40	Peak
2358.33	21.81	-32.19	54	-	-	-	-	-	-	Average

Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (24.76dB) derived from $20\log(\text{dwell time}/100\text{ms})$.

For example: Average level = 46.05dBμV/m – 24.76 (dB) = 21.29dBμV/m.

Test Mode :	3Mbps	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	49~53%
		Test Engineer :	Gavin Zhang

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
2487.32	46.44	-27.56	74	38.22	32.27	5.71	29.76	117	151	Peak
2487.32	21.68	-32.32	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
2483.52	48.34	-25.66	74	40.12	32.27	5.71	29.76	105	178	Peak
2483.52	23.58	-30.42	54	-	-	-	-	-	-	Average

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

Note: Pre-scanned all test modes and only choose the worst case mode recorded in the test report for radiated spurious emission below 1GHz.

Test Mode :	3Mbps	Temperature :	23~25°C
Test Channel :	00	Relative Humidity :	49~53%
Test Engineer :	Gavin Zhang	Polarization :	Horizontal
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 7206 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level. For example, 97.97dBuV/m - 20dB = 77.97dBuV/m.		

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
39.7	24.05	-15.95	40	43.65	10.1	0.85	30.55	-	-	Peak
191.02	23.14	-20.36	43.5	42.18	9.67	1.65	30.36	-	-	Peak
266.68	22.55	-23.45	46	37.73	13.03	1.9	30.11	-	-	Peak
399.57	33.65	-12.35	46	44.53	16.5	2.29	29.67	125	245	Peak
600.36	33.41	-12.59	46	40.89	18.96	2.76	29.2	-	-	Peak
932.1	26.5	-19.5	46	30	21.86	3.4	28.76	-	-	Peak
2402	97.97	-	-	89.99	32.14	5.62	29.78	100	63	Peak
2402	73.21	-	-	-	-	-	-	100	63	Average
4804	43.85	-30.15	74	59.18	33.63	8.33	57.29	151	219	Peak
4804	19.09	-34.91	54	-	-	-	-	151	219	Average
7206	40.23	-37.74	77.97	52.3	35.27	9.95	57.29	156	302	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	Temperature :	23~25°C
Test Channel :	00	Relative Humidity :	49~53%
Test Engineer :	Gavin Zhang	Polarization :	Vertical
Remark :	1. 2402 MHz is fundamental signal which can be ignored. 2. 7206 MHz is not within a restricted band, and its limit line is 20dB below the highest emission level.		

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
104.69	17.3	-26.2	43.5	34.86	11.8	1.29	30.65	-	-	Peak
384.05	28.76	-17.24	46	40.15	16.08	2.25	29.72	-	-	Peak
458.74	22.99	-23.01	46	33.23	16.8	2.43	29.47	-	-	Peak
600.36	37.84	-8.16	46	45.32	18.96	2.76	29.2	110	125	Peak
768.17	27.05	-18.95	46	32.55	20.38	3.1	28.98	-	-	Peak
938.89	27.34	-18.66	46	30.61	22.04	3.44	28.75	-	-	Peak
2402	100.95	-	-	92.97	32.14	5.62	29.78	119	40	Peak
2402	76.19	-	-	-	-	-	-	119	40	Average
4804	55.38	-18.62	74	70.71	33.63	8.33	57.29	100	316	Peak
4804	30.62	-23.38	54	-	-	-	-	100	316	Average
7206	40.3	-40.65	80.95	52.37	35.27	9.95	57.29	135	125	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	Temperature :	23~25°C
Test Channel :	39	Relative Humidity :	49~53%
Test Engineer :	Gavin Zhang	Polarization :	Horizontal
Remark :	1. 2441 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

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
2441	98.23	-	-	90.09	32.22	5.68	29.76	102	61	Peak
2441	73.47	-	-	-	-	-	-	102	61	Average
4882	42.47	-31.53	74	57.43	33.8	8.41	57.17	115	258	Peak
4882	17.71	-36.29	54	-	-	-	-	115	258	Average
7323	42.67	-31.33	74	54.49	35.32	10	57.14	152	309	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	Temperature :	23~25°C
Test Channel :	39	Relative Humidity :	49~53%
Test Engineer :	Gavin Zhang	Polarization :	Vertical
Remark :	1. 2441 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

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
2441	101.99	-	-	93.85	32.22	5.68	29.76	142	348	Peak
2441	77.23	-	-	-	-	-	-	142	348	Average
4882	55.08	-18.92	74	70.04	33.8	8.41	57.17	100	328	Peak
4882	30.32	-23.68	54	-	-	-	-	100	328	Average
7323	40.84	-33.16	74	52.66	35.32	10	57.14	125	214	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	49~53%
Test Engineer :	Gavin Zhang	Polarization :	Horizontal
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

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
2480	97.22	-	-	89	32.27	5.71	29.76	117	151	Peak
2480	72.46	-	-	-	-	-	-	117	151	Average
4960	41.67	-32.33	74	56.19	34.01	8.49	57.02	118	289	Peak
4960	16.91	-37.09	54	-	-	-	-	118	289	Average
7440	42.02	-31.98	74	53.6	35.37	10.04	56.99	158	273	Peak

Note: Other harmonics are lower than background noise.

Test Mode :	3Mbps	Temperature :	23~25°C
Test Channel :	78	Relative Humidity :	49~53%
Test Engineer :	Gavin Zhang	Polarization :	Vertical
Remark :	1. 2480 MHz is fundamental signal which can be ignored. 2. Average measurement was not performed if peak level went lower than the average limit.		

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
2480	100.98	-	-	92.76	32.27	5.71	29.76	105	178	Peak
2480	76.22	-	-	-	-	-	-	105	178	Average
4960	52.17	-21.83	74	66.69	34.01	8.49	57.02	109	336	Peak
4960	27.41	-26.59	54	-	-	-	-	109	336	Average
7440	42.19	-31.81	74	53.77	35.37	10.04	56.99	110	245	Peak

Note: Other harmonics are lower than background noise.

3.9 AC Conducted Emission Measurement

3.9.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

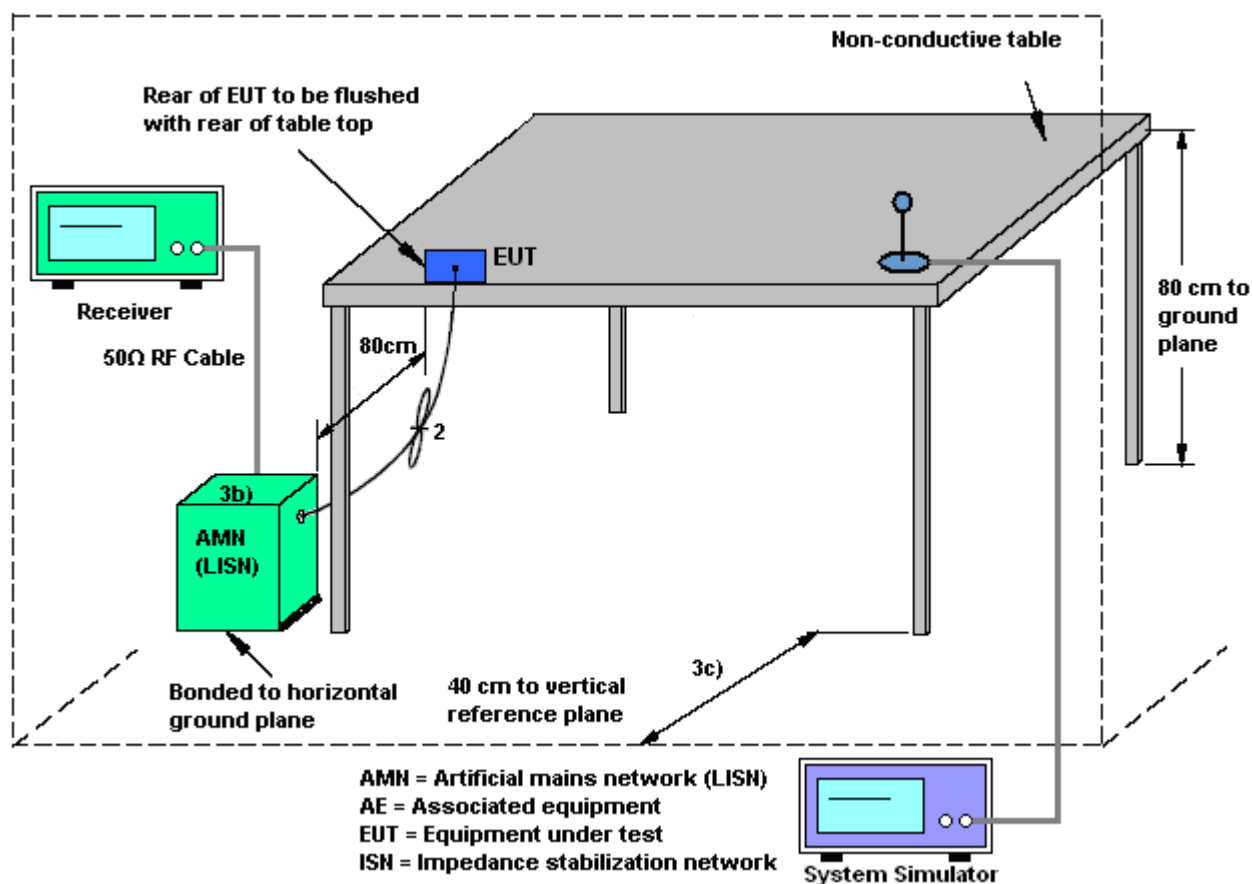
3.9.2 Measuring Instruments

See list of measuring instruments of this test report.

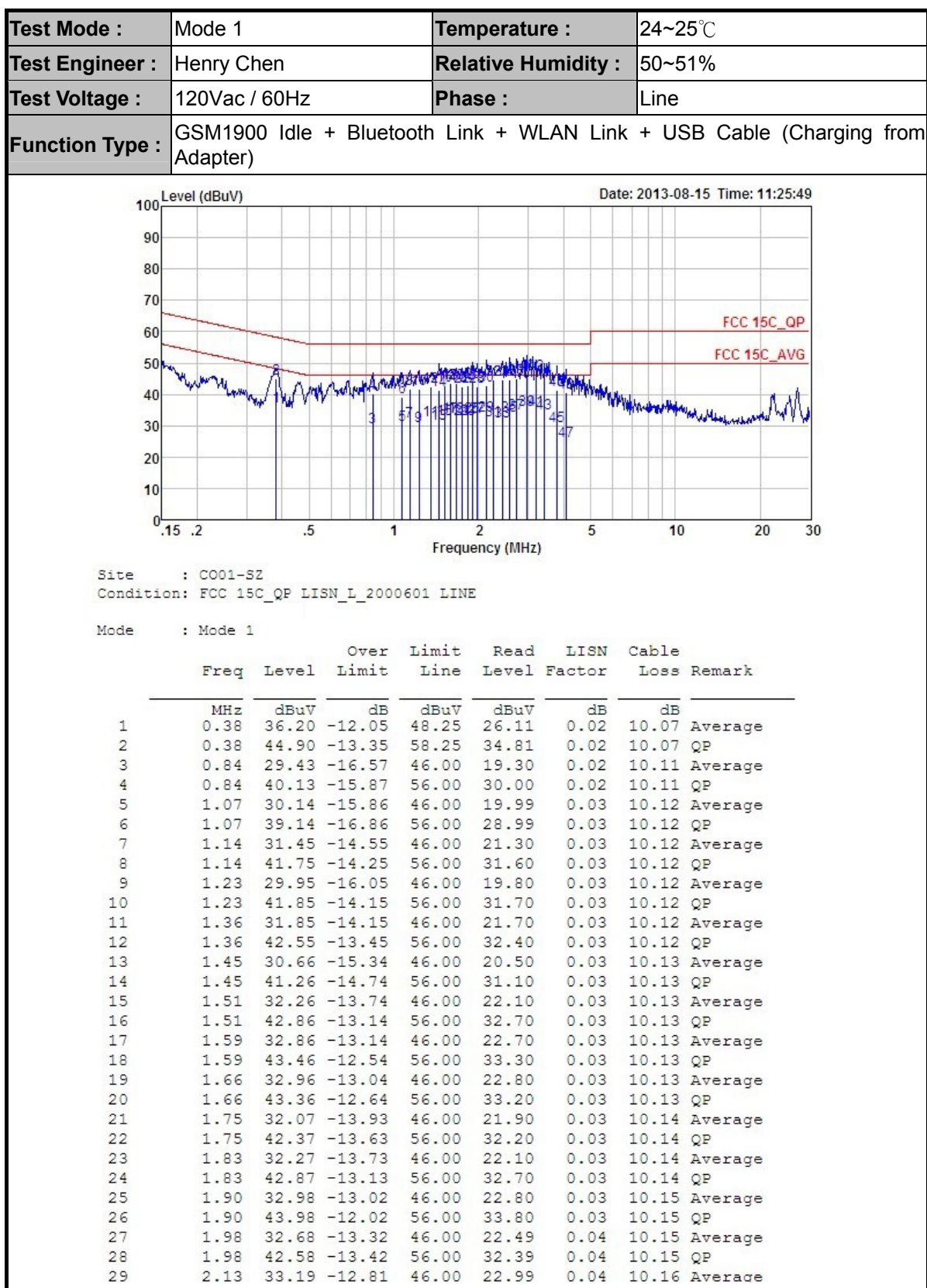
3.9.3 Test Procedures

1. The test follows the guidelines in ANSI C63.4-2003 test site requirement.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connecting to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 kHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

3.9.4 Test Setup

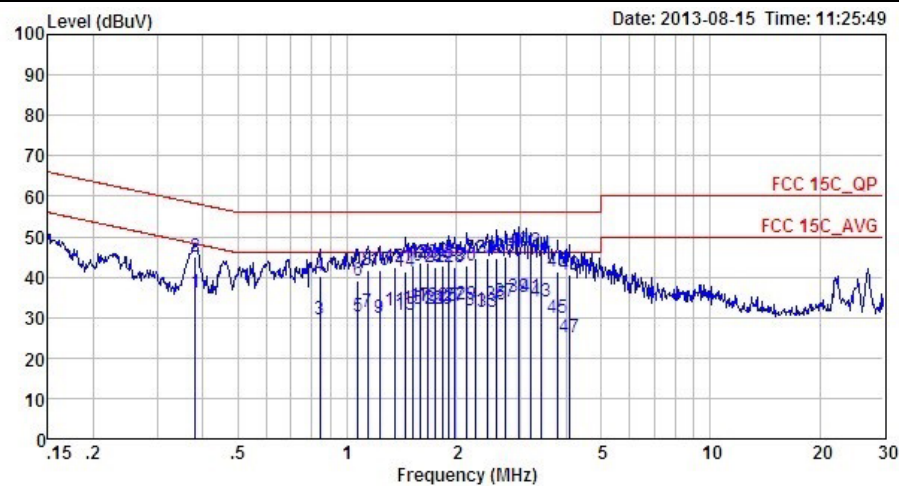


3.9.5 Test Result of AC Conducted Emission





Test Mode :	Mode 1	Temperature :	24~25°C
Test Engineer :	Henry Chen	Relative Humidity :	50~51%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM1900 Idle + Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter)		



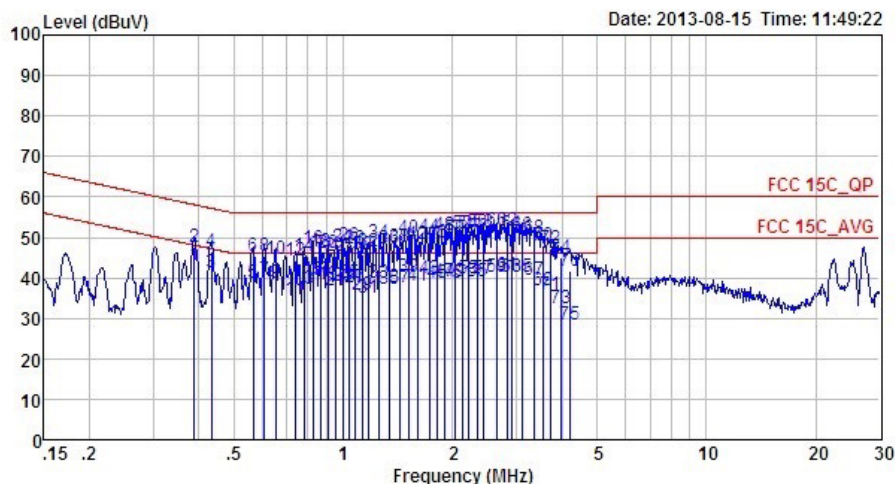
Site : C001-SZ
Condition: FCC 15C QP LISN_L_2000601 LINE

Mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
30	2.13	42.89	-13.11	56.00	32.69	0.04	10.16	QP
31	2.26	31.90	-14.10	46.00	21.70	0.04	10.16	Average
32	2.26	44.80	-11.20	56.00	34.60	0.04	10.16	QP
33	2.43	31.41	-14.59	46.00	21.20	0.04	10.17	Average
34	2.43	44.81	-11.19	56.00	34.60	0.04	10.17	QP
35	2.58	33.22	-12.78	46.00	23.00	0.04	10.18	Average
36	2.58	44.62	-11.38	56.00	34.40	0.04	10.18	QP
37	2.74	33.82	-12.18	46.00	23.60	0.04	10.18	Average
38	2.74	44.92	-11.08	56.00	34.70	0.04	10.18	QP
39	2.96	34.93	-11.07	46.00	24.70	0.04	10.19	Average
40	2.96	46.33	-9.67	56.00	36.10	0.04	10.19	QP
41	3.19	35.24	-10.76	46.00	25.00	0.05	10.19	Average
42 *	3.19	46.54	-9.46	56.00	36.30	0.05	10.19	QP
43	3.44	33.84	-12.16	46.00	23.60	0.05	10.19	Average
44	3.44	45.24	-10.76	56.00	35.00	0.05	10.19	QP
45	3.80	29.95	-16.05	46.00	19.71	0.05	10.19	Average
46	3.80	41.25	-14.75	56.00	31.01	0.05	10.19	QP
47	4.11	24.95	-21.05	46.00	14.70	0.06	10.19	Average
48	4.11	40.65	-15.35	56.00	30.40	0.06	10.19	QP



Test Mode :	Mode 1	Temperature :	24~25°C
Test Engineer :	Henry Chen	Relative Humidity :	50~51%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM1900 Idle + Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter)		



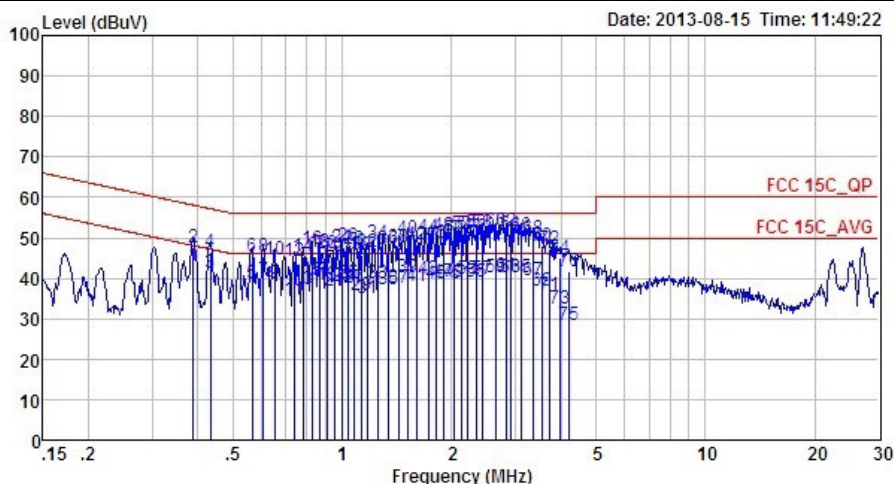
Site : CO01-SZ
Condition: FCC 15C_QP LISN_N_2000601 NEUTRAL

Mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.39	43.19	-4.89	48.08	33.10	0.02	10.07	Average
2	0.39	47.69	-10.39	58.08	37.60	0.02	10.07	QP
3	0.43	41.49	-5.71	47.20	31.39	0.02	10.08	Average
4	0.43	46.39	-10.81	57.20	36.29	0.02	10.08	QP
5	0.56	38.71	-7.29	46.00	28.60	0.02	10.09	Average
6	0.56	45.31	-10.69	56.00	35.20	0.02	10.09	QP
7	0.61	39.61	-6.39	46.00	29.50	0.02	10.09	Average
8	0.61	45.51	-10.49	56.00	35.40	0.02	10.09	QP
9	0.65	38.92	-7.08	46.00	28.80	0.02	10.10	Average
10	0.65	44.62	-11.38	56.00	34.50	0.02	10.10	QP
11	0.74	34.62	-11.38	46.00	24.50	0.02	10.10	Average
12	0.74	44.32	-11.68	56.00	34.20	0.02	10.10	QP
13	0.78	37.12	-8.88	46.00	27.00	0.02	10.10	Average
14	0.78	45.32	-10.68	56.00	35.20	0.02	10.10	QP
15	0.83	39.43	-6.57	46.00	29.30	0.02	10.11	Average
16	0.83	47.23	-8.77	56.00	37.10	0.02	10.11	QP
17	0.87	39.43	-6.57	46.00	29.30	0.02	10.11	Average
18	0.87	46.63	-9.37	56.00	36.50	0.02	10.11	QP
19	0.91	38.33	-7.67	46.00	28.20	0.02	10.11	Average
20	0.91	46.13	-9.87	56.00	36.00	0.02	10.11	QP
21	0.95	36.93	-9.07	46.00	26.80	0.02	10.11	Average
22	0.95	45.53	-10.47	56.00	35.40	0.02	10.11	QP
23	1.00	37.83	-8.17	46.00	27.70	0.02	10.11	Average
24	1.00	47.73	-8.27	56.00	37.60	0.02	10.11	QP
25	1.04	38.74	-7.26	46.00	28.60	0.02	10.12	Average
26	1.04	48.14	-7.86	56.00	38.00	0.02	10.12	QP
27	1.08	37.74	-8.26	46.00	27.60	0.02	10.12	Average
28	1.08	47.24	-8.76	56.00	37.10	0.02	10.12	QP
29	1.13	35.74	-10.26	46.00	25.60	0.02	10.12	Average



Test Mode :	Mode 1	Temperature :	24~25°C
Test Engineer :	Henry Chen	Relative Humidity :	50~51%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM1900 Idle + Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter)		



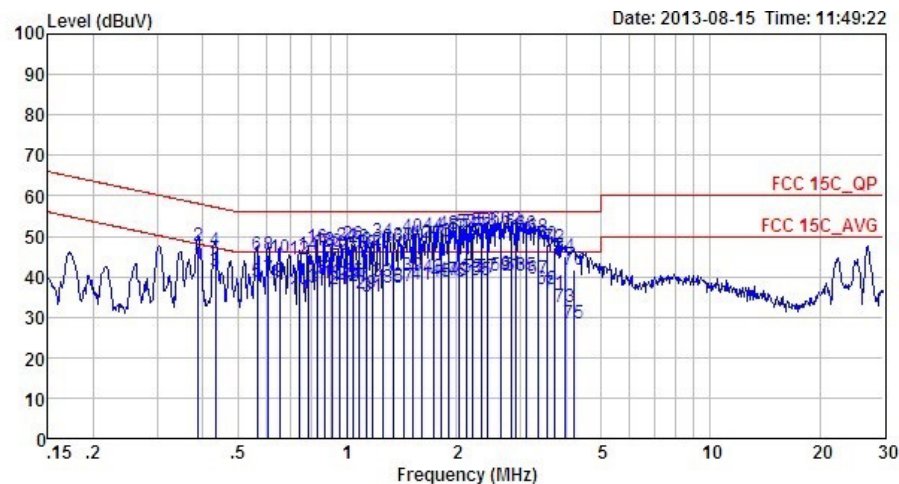
Site : CO01-SZ
Condition: FCC 15C_QP LISN_N_2000601 NEUTRAL

Mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
30	1.13	45.74	-10.26	56.00	35.60	0.02	10.12	QP
31	1.17	35.14	-10.86	46.00	25.00	0.02	10.12	Average
32	1.17	46.34	-9.66	56.00	36.20	0.02	10.12	QP
33	1.26	38.65	-7.35	46.00	28.51	0.02	10.12	Average
34	1.26	48.65	-7.35	56.00	38.51	0.02	10.12	QP
35	1.34	37.15	-8.85	46.00	27.00	0.03	10.12	Average
36	1.34	47.35	-8.65	56.00	37.20	0.03	10.12	QP
37	1.43	37.75	-8.25	46.00	27.59	0.03	10.13	Average
38	1.43	47.75	-8.25	56.00	37.59	0.03	10.13	QP
39	1.52	40.15	-5.85	46.00	29.99	0.03	10.13	Average
40	1.52	49.95	-6.05	56.00	39.79	0.03	10.13	QP
41	1.60	38.16	-7.84	46.00	28.00	0.03	10.13	Average
42	1.60	48.46	-7.54	56.00	38.30	0.03	10.13	QP
43	1.73	39.97	-6.03	46.00	29.80	0.03	10.14	Average
44	1.73	50.17	-5.83	56.00	40.00	0.03	10.14	QP
45	1.82	38.57	-7.43	46.00	28.40	0.03	10.14	Average
46	1.82	48.67	-7.33	56.00	38.50	0.03	10.14	QP
47	1.91	38.98	-7.02	46.00	28.80	0.03	10.15	Average
48	1.91	50.48	-5.52	56.00	40.30	0.03	10.15	QP
49	2.03	39.19	-6.81	46.00	29.01	0.03	10.15	Average
50	2.03	49.79	-6.21	56.00	39.61	0.03	10.15	QP



Test Mode :	Mode 1	Temperature :	24~25°C
Test Engineer :	Henry Chen	Relative Humidity :	50~51%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM1900 Idle + Bluetooth Link + WLAN Link + USB Cable (Charging from Adapter)		



Site : CO01-SZ
Condition: FCC 15C_QP LISN_N_2000601 NEUTRAL

Mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
51	2.13	38.89	-7.11	46.00	28.69	0.04	10.16	Average
52	2.13	50.99	-5.01	56.00	40.79	0.04	10.16	QP
53	2.21	39.80	-6.20	46.00	29.60	0.04	10.16	Average
54	2.21	51.10	-4.90	56.00	40.90	0.04	10.16	QP
55	2.35	39.21	-6.79	46.00	29.00	0.04	10.17	Average
56	2.35	51.21	-4.79	56.00	41.00	0.04	10.17	QP
57	2.43	39.91	-6.09	46.00	29.70	0.04	10.17	Average
58	2.43	51.11	-4.89	56.00	40.90	0.04	10.17	QP
59	2.65	40.32	-5.68	46.00	30.10	0.04	10.18	Average
60	2.65	51.52	-4.48	56.00	41.30	0.04	10.18	QP
61	2.82	40.53	-5.47	46.00	30.31	0.04	10.18	Average
62 *	2.82	51.73	-4.27	56.00	41.51	0.04	10.18	QP
63	2.92	40.33	-5.67	46.00	30.09	0.05	10.19	Average
64	2.92	51.03	-4.97	56.00	40.79	0.05	10.19	QP
65	3.12	40.34	-5.66	46.00	30.10	0.05	10.19	Average
66	3.12	50.64	-5.36	56.00	40.40	0.05	10.19	QP
67	3.35	39.34	-6.66	46.00	29.10	0.05	10.19	Average
68	3.35	49.64	-6.36	56.00	39.40	0.05	10.19	QP
69	3.57	37.05	-8.95	46.00	26.80	0.06	10.19	Average
70	3.57	48.05	-7.95	56.00	37.80	0.06	10.19	QP
71	3.74	35.95	-10.05	46.00	25.70	0.06	10.19	Average
72	3.74	47.25	-8.75	56.00	37.00	0.06	10.19	QP
73	3.99	32.66	-13.34	46.00	22.41	0.06	10.19	Average
74	3.99	44.96	-11.04	56.00	34.71	0.06	10.19	QP
75	4.22	28.46	-17.54	46.00	18.20	0.07	10.19	Average
76	4.22	41.76	-14.24	56.00	31.50	0.07	10.19	QP

3.10 Antenna Requirements

3.10.1 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.

3.10.2 Antenna Connected Construction

Non-standard connector used.

3.10.3 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	FSP30	101400	9kHz~30GHz	Mar. 28, 2013	Aug. 15, 2013~ Aug. 17, 2013	Mar. 27, 2014	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	N/A	Mar. 28, 2013	Aug. 15, 2013~ Aug. 17, 2013	Mar. 27, 2014	Conducted (TH01-SZ)
Power Sensor	Anritsu	MA2411B	1207253	N/A	Mar. 28, 2013	Aug. 15, 2013~ Aug. 17, 2013	Mar. 27, 2014	Conducted (TH01-SZ)
ESCI TEST Receiver	R&S	ESCI	100724	9kHz~3GHz	Mar. 28, 2013	Aug. 18, 2013	Mar. 27, 2014	Radiation (03CH01-SZ)
Spectrum Analyzer	R&S	FSP30	101362	9kHz~30GHz	Oct. 11, 2012	Aug. 18, 2013	Oct. 10, 2013	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS Lindgren	3117	00119436	1GHz~18GHz	Oct. 12, 2012	Aug. 18, 2013	Oct. 11, 2013	Radiation (03CH01-SZ)
Bilog Antenna	SCHAFFNER	CBL6112B	2614	30MHz ~2GHz	Nov. 03, 2012	Aug. 18, 2013	Nov. 02, 2013	Radiation (03CH01-SZ)
Amplifier	ADVANTEST	BB525C	E9007003	9 kHz-3000MHz GAIN 30db	Mar. 28, 2013	Aug. 18, 2013	Mar. 27, 2014	Radiation (03CH01-SZ)
Amplifier	Yiai	AV3860B	04030	2GHz~26.5GHz	Mar. 28, 2013	Aug. 18, 2013	Mar. 27, 2014	Radiation (03CH01-SZ)
SHF-EHF-Horn	Schwarzbeck	BBHA9170	BBHA9170249	14GHz~40GHz	Nov. 23, 2012	Aug. 18, 2013	Nov. 22, 2013	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 22, 2012	Aug. 18, 2013	Oct. 21, 2013	Radiation (03CH01-SZ)
Turn Table	EM Electronics	EM 1000	N/A	0~360 degree	N/A	Aug. 18, 2013	N/A	Radiation (03CH01-SZ)
Antenna Mast	EM Electronics	EM 1000	N/A	1 m~4 m	N/A	Aug. 18, 2013	N/A	Radiation (03CH01-SZ)
AC LISN	ETS-LINDGREN	3816/2SH	00103912	0.1MHz~108MHz	Feb. 28, 2013	Aug. 15, 2013	Feb. 27, 2014	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	ETS-LINDGREN	3816/2SH	00103892	0.1MHz~108MHz	Feb. 28, 2013	Aug. 15, 2013	Feb. 27, 2014	Conduction (CO01-SZ)
ESCIO TEST Receiver	R&S	1142.8007.0 3	100724	9kHz~3GHz	Mar. 08, 2013	Aug. 15, 2013	Mar. 07, 2014	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891 N/A	N/A	Oct. 12, 2012	Aug. 15, 2013	Oct. 11, 2013	Conduction (CO01-SZ)

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.26
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2U_c(y)$)	2.54
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

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