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FCC RADIO TEST REPORT

Applicant's company	**Realtek Semiconductor Corp.**
Applicant Address	No. 2,Innovation Road II, Hsinchu Science Park, Hsinchu 300,Taiwan
FCC ID	**TX2-RTL8821AE**
Manufacturer's company	**Realtek Semiconductor Corp.**
Manufacturer Address	No. 2,Innovation Road II, Hsinchu Science Park, Hsinchu 300,Taiwan

Product Name	802.11a/b/g/n/ac RTL8821AE Combo module
Brand Name	REALTEK
Model Name	RTL8821AE
Test Rule	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Apr. 26, 2013
Final Test Date	Jun. 12, 2013
Submission Type	Original Equipment

Statement

Test result included is only for the Bluetooth LE part of the product.

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2009**, **47 CFR FCC Part 15 Subpart C** and **KDB 558074 D01 v03**.

The test equipment used to perform the test is calibrated and traceable to NML/ROC.

Testing Laboratory
1190

Table of Contents

History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR342603AD	Rev. 01	Initial issue of report	Jul. 02, 2013

Certificate No.: CB10206137

1. CERTIFICATE OF COMPLIANCE

Product Name	:	802.11a/b/g/n/ac RTL8821AE Combo module
Brand Name	:	REALTEK
Model No.	:	RTL8821AE
Applicant	:	Realtek Semiconductor Corp.
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart C § 15.247

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Apr. 26, 2013 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

Sam Chen

Sam Chen

SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.207	AC Power Line Conducted Emissions	Complies	10.97 dB
4.2	15.247(b)(3)	Maximum Conducted Output Power	Complies	21.91 dB
4.3	15.247(e)	Power Spectral Density	Complies	15 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	3.17 dB
4.6	15.247(d)	Band Edge Emissions	Complies	0.35 dB
4.7	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Power Type	From host sysytem
Modulation	DSSS
Data Rate (Mbps)	GFSK: 1
Frequency Range	2400 ~ 2483.5MHz
Channel Number	40 (37 hopping + 3 advertising channel)
Channel Band Width (99%)	1.17 MHz
Maximum Conducted Output Power	8.09 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

3.2. Accessories

N/A

3.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	
					2.4GHz	5GHz
1	LYNwave	ALA110-222050-300011	PIFA Antenna	I-PEX MHF4	3.5	5.0
2	LYNwave	ALA110-222050-300010	PIFA Antenna	I-PEX	3.5	5.0
3	JOYMAX	TWF-614XMPXX-500	Dipole Antenna	I-PEX	3.0	5.0
4	Realtek	PANT-001	SLOT Antenna	I-PEX	3.33	4.52
5	Realtek	PANT-002	SLOT Antenna	I-PEX MHF4	3.33	4.52

There are six configurations of EUT. The more information is listed as below table.

Configuration	Type	Power Type	Antenna Variety	Type of Antenna
1	HMC	PCI-E	Diversity	PIFA with I-PEX connector
				Dipole with I-PEX connector
				SLOT with I-PEX connector
2	HMC	PCI-E	Fixed	PIFA with I-PEX connector
				Dipole with I-PEX connector
				SLOT with I-PEX connector
3	NGFF	PCI-E	Diversity	PIFA with I-PEX MHF4 connector
				SLOT with I-PEX MHF4 connector
4	NGFF	SDIO	Diversity	PIFA with I-PEX MHF4 connector
				SLOT with I-PEX MHF4 connector
5	NGFF	PCI-E	Fixed	PIFA with I-PEX MHF4 connector
				SLOT with I-PEX MHF4 connector
6	NGFF	SDIO	Fixed	PIFA with I-PEX MHF4 connector
				SLOT with I-PEX MHF4 connector

Note: The more detail information of diversity type and fixed type is listed as below.

For diversity type: (Both of those two antenna connectors can be used.)

<For 2.4GHz Band:>

The EUT supports the antenna with TX/RX diversity function for 2.4GHz WLAN and Bluetooth, but only one of them will be used at the same time.

Base on WLAN's operation mode to select the other antenna to work.

(Ex. Assume Main port was selected to conduct transmitting function in 2.4GHz WLAN, so AUX port was selected in Bluetooth Mode. Vice versa.)

<For 5GHz Band:>

The EUT supports the antenna with TX/RX diversity function for 5GHz WLAN and Bluetooth, and both them can transmit and receive signal simultaneously.

For WLAN function (1TX, 1RX):

Both of Chain 1 and Chain 2 can be used as transmitting/receiving functions, but only one antenna can be used as transmitting/receiving functions at the same time.

Chain 1 generated the worst case than Chain 2, so it is tested and recorded in the report.

For Bluetooth function (1TX, 1RX):

Both of Chain 1 and Chain 2 can be used as transmitting/receiving functions, but only one antenna can be used as transmitting/receiving functions at the same time.

Chain 1 generated the worst case than Chain 2, so it is tested and recorded in the report.

For fixed type: (Chain 1 is designated for 2.4GHz WLAN function, Chain 2 is designated for 5GHz WLAN and Bluetooth Functions.)

For 2.4GHz WLAN function (1TX, 1RX):

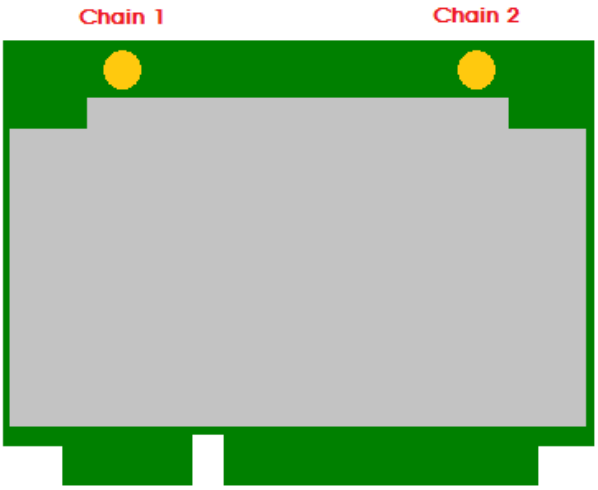
Only Chain 1 can be used as transmitting/receiving functions.

For 5GHz WLAN function (1TX, 1RX):

Only Chain 2 can be used as transmitting/receiving functions.

For Bluetooth function (1TX, 1RX):

Only Chain 2 can be used as transmitting/receiving functions.



3.4. Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400~2483.5MHz	0	2402 MHz	20	2442 MHz
	1	2404 MHz	:	:
	2	2406 MHz	37	2476 MHz
	:	:	38	2478 MHz
	18	2438 MHz	39	2480 MHz
	19	2440 MHz	-	-

3.5. Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel	Chain
AC Power Line Conducted Emissions	Normal Link	-	-	-
Maximum Conducted Output Power Power Spectral Density	GFSK	1 Mbps	0/20/39	1
6dB Spectrum Bandwidth	GFSK	1 Mbps	0/20/39	1
Radiated Emissions 9kHz~1GHz	Normal Link	-	-	-
Radiated Emissions 1GHz~10th Harmonic	GFSK	1 Mbps	0/20/39	1
Band Edge Emissions	GFSK	1 Mbps	0/20/39	1

The following test modes were performed for all tests:

For Conducted Emission test:

The mode "diversity + SLOT antenna" has been evaluated to be the worst case for Radiated emission below 1GHz test.

Consequently, measurement for Conducted emission test will follow this same test mode.

Mode 1. HMC + PCI-E + Diversity + SLOT antenna (I-PEX connector)

Mode 2. NGFF + PCI-E + Diversity + SLOT antenna (I-PEX MHF4 connector)

Mode 3. NGFF + SDIO + Diversity + SLOT antenna (I-PEX MHF4 connector)

Mode 2 is found as the worst case among Mode 1 ~ Mode 3, so it was recorded in the report.

For Radiated Emission below 1GHz test:

Mode 1. HMC + PCI-E + Diversity + SLOT antenna (I-PEX connector)

Mode 2. HMC + PCI-E + Fixed + SLOT antenna (I-PEX connector)

Mode 1 is found as the worse case between Mode 1 and Mode 2, thus the measurement (Diversity type) for Mode 3 ~ Mode 8 will follow this same test mode.

Mode 3. HMC + PCI-E + Diversity + PIFA antenna (I-PEX connector)

Mode 4. HMC + PCI-E + Diversity + Dipole antenna (I-PEX connector)

Mode 5. NGFF + SDIO + Diversity + SLOT antenna (I-PEX MHF4 connector)

Mode 6. NGFF + PCI-E + Diversity + SLOT antenna (I-PEX MHF4 connector)

Mode 7. NGFF + SDIO + Diversity + PIFA antenna (I-PEX MHF4 connector)

Mode 8. NGFF + PCI-E + Diversity + PIFA antenna (I-PEX MHF4 connector)

Mode 1 is the worst case, so it was selected to record in this test report.

For Radiated Emission above1GHz test:

Mode 1. HMC + PCI-E + Diversity + SLOT antenna (I-PEX connector)

Mode 2. HMC + PCI-E + Fixed + SLOT antenna (I-PEX connector)

Mode 3. NGFF + PCI-E + Diversity + SLOT antenna (I-PEX MHF4 connector)

Mode 4. NGFF + SDIO + Diversity + SLOT antenna (I-PEX MHF4 connector)

Mode 5. NGFF + PCI-E + Fixed + SLOT antenna (I-PEX MHF4 connector)

Mode 6. NGFF + SDIO + Fixed + SLOT antenna (I-PEX MHF4 connector)

Mode 7. HMC + PCI-E + Diversity + PIFA antenna (I-PEX connector)

Mode 8. HMC + PCI-E + Fixed + PIFA antenna (I-PEX connector)

Mode 9. NGFF + PCI-E + Diversity + PIFA antenna (I-PEX MHF4 connector)

Mode 10. NGFF + SDIO + Diversity + PIFA antenna (I-PEX MHF4 connector)

Mode 11. NGFF + PCI-E + Fixed + PIFA antenna (I-PEX MHF4 connector)

Mode 12. NGFF + SDIO + Fixed + PIFA antenna (I-PEX MHF4 connector)

Mode 13. HMC + PCI-E + Diversity + Dipole antenna (I-PEX connector)

Mode 14. HMC + PCI-E + Fixed + Dipole antenna (I-PEX connector)

Mode 3, Mode 9 and Mode 13 generated the worst test result, so these three modes were recorded in the report.

For Other Tests:

After pre-testing, the mode “Configuration 3 + SLOT antenna” has been evaluated to be the worst case for Conducted output power test.

Therefore, it was selected to perform other test items and record in the report.

Mode 1. NGFF + PCI-E + Diversity + SLOT antenna (I-PEX MHF4 connector)

For Co-location Test:

The mode “PCI-E + diversity” has been evaluated to be the worst case for Radiated emission above 1GHz test.

Consequently, measurement for Co-location test will follow this same test mode.

Mode 1. NGFF + PCI-E + Diversity + SLOT antenna (I-PEX MHF4 connector) / 2.4GHz WLAN + Bluetooth

Mode 2. NGFF + PCI-E + Diversity + SLOT antenna (I-PEX MHF4 connector) / 5GHz WLAN + Bluetooth

Mode 3. NGFF + PCI-E + Diversity + PIFA antenna (I-PEX MHF4 connector) / 2.4GHz WLAN + Bluetooth

Mode 4. NGFF + PCI-E + Diversity + PIFA antenna (I-PEX MHF4 connector) / 5GHz WLAN + Bluetooth

Mode 5. HMC + PCI-E + Diversity + Dipole antenna (I-PEX connector) / 2.4GHz WLAN + Bluetooth

Mode 6. HMC + PCI-E + Diversity + Dipole antenna (I-PEX connector) / 5GHz WLAN + Bluetooth

All the test result were recorded in the report.

The EUT could be applied with WLAN function and Bluetooth function; therefore Maximum Permissible Exposure (Please refer to Appendix B) and Co-location (please refer to Appendix C) tests are added for simultaneously transmit between WLAN function and Bluetooth function.

3.6. Table for Testing Locations

Test Site No.	Site Category	Location	FCC Reg. No.	IC File No.
03CH01-CB	SAC	Hsin Chu	262045	IC 4086D
CO01-CB	Conduction	Hsin Chu	262045	IC 4086D
TH01-CB	OVEN Room	Hsin Chu	-	-

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC); Fully Anechoic Chamber (FAC).

Please refer section 6 for Test Site Address.

3.7. Table for Supporting Units

Test Site: CO01-CB

Support Unit	Brand	Model	FCC ID
Wireless AP	Planex	GW-AP54SGX	N/A
Notebook	DELL	E6430	QDS-BRCM1049LE
Notebook	DELL	E6220	QDS-BRCM1049LE
Mouse	Logitech	M-U0026	DoC
Earphone	SHYARO CHI	MIC-04	N/A
Test Fixture (For HMC type)	REALTEK	PCIE Adapter	N/A
Test Fixture (For NGFF type)	REALTEK	PCIE & SDIO Adapter	N/A

Test Site: 03CH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	QDS-BRCM1049LE
Mouse	Logitech	M-U0026	DoC
Earphone	E-BOOKI	E-EPC040	N/A
Wireless AP	Planex	GW-AP54SGX	N/A
Notebook	DELL	E6430	QDS-BRCM1049LE
Test Fixture (For HMC type)	REALTEK	PCIE Adapter	N/A
Test Fixture (For NGFF type)	REALTEK	PCIE & SDIO Adapter	N/A

Test Site: TH01-CB

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6220	D2A62L1989V5
Test Fixture (For HMC type)	REALTEK	PCIE Adapter	N/A
Test Fixture (For NGFF type)	REALTEK	PCIE & SDIO Adapter	N/A

3.8. Table for Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. 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.

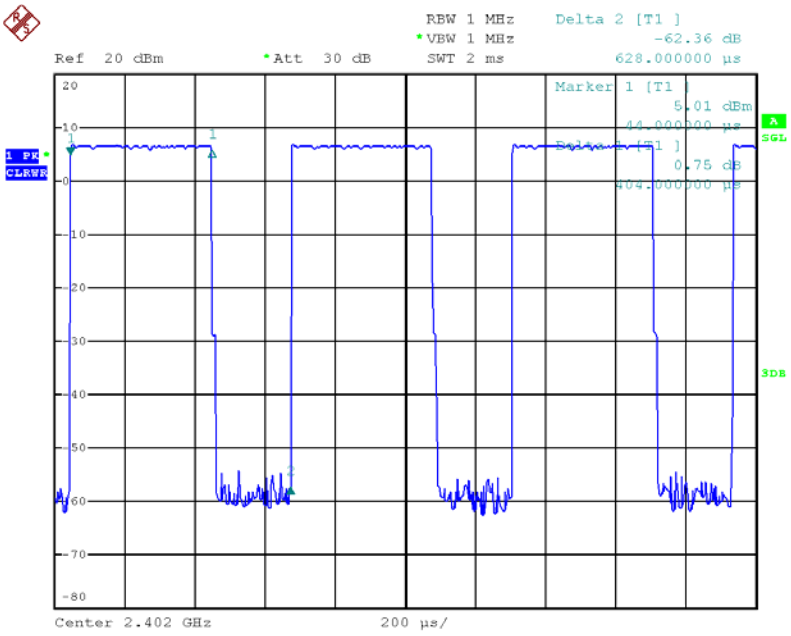
Power Parameters:

Test Software Version	Realtek Bluetooth MP v2.862 --- RTL8821a		
Frequency	2402 MHz	2442 MHz	2480 MHz
Power Parameters	Default	Default	Default

3.9. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.10. Duty Cycle



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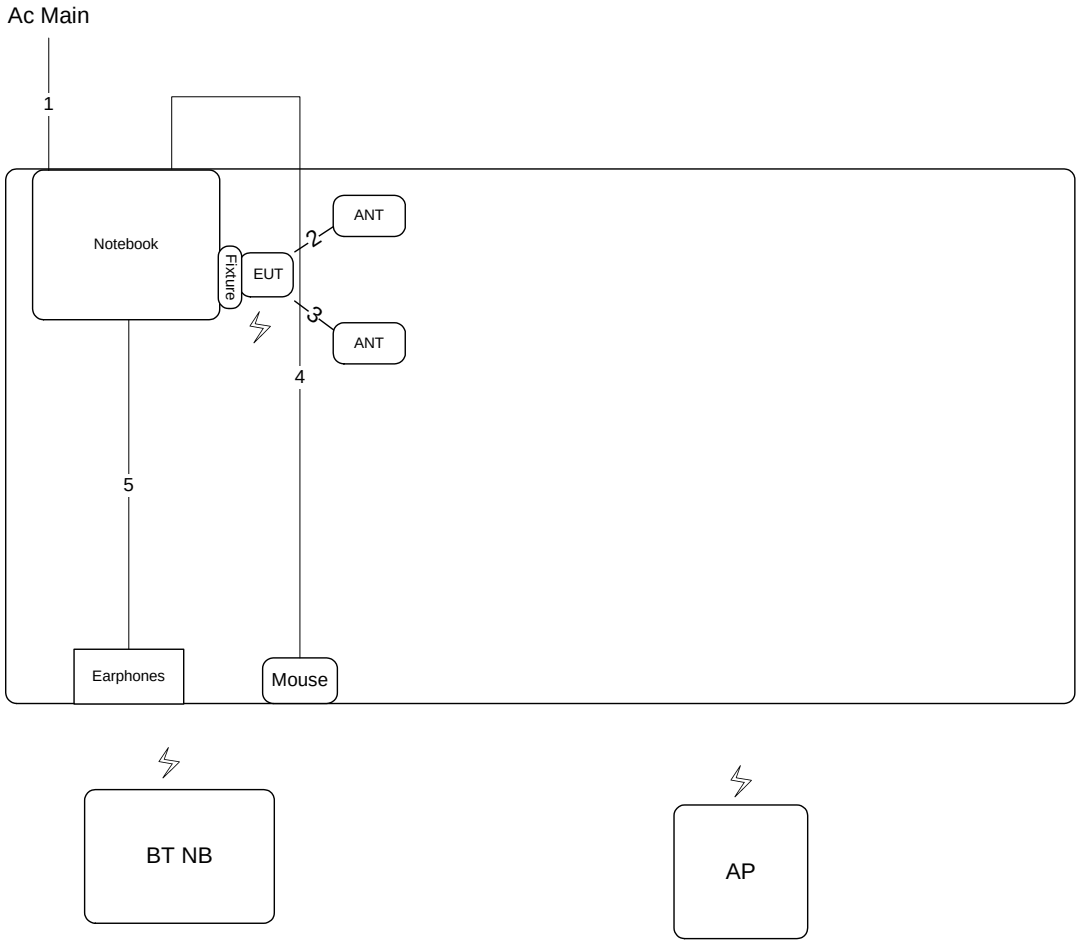
3.11. Test Configurations

3.11.1. AC Power Line Conduction Emissions Test Configuration

Test Mode: Mode 2

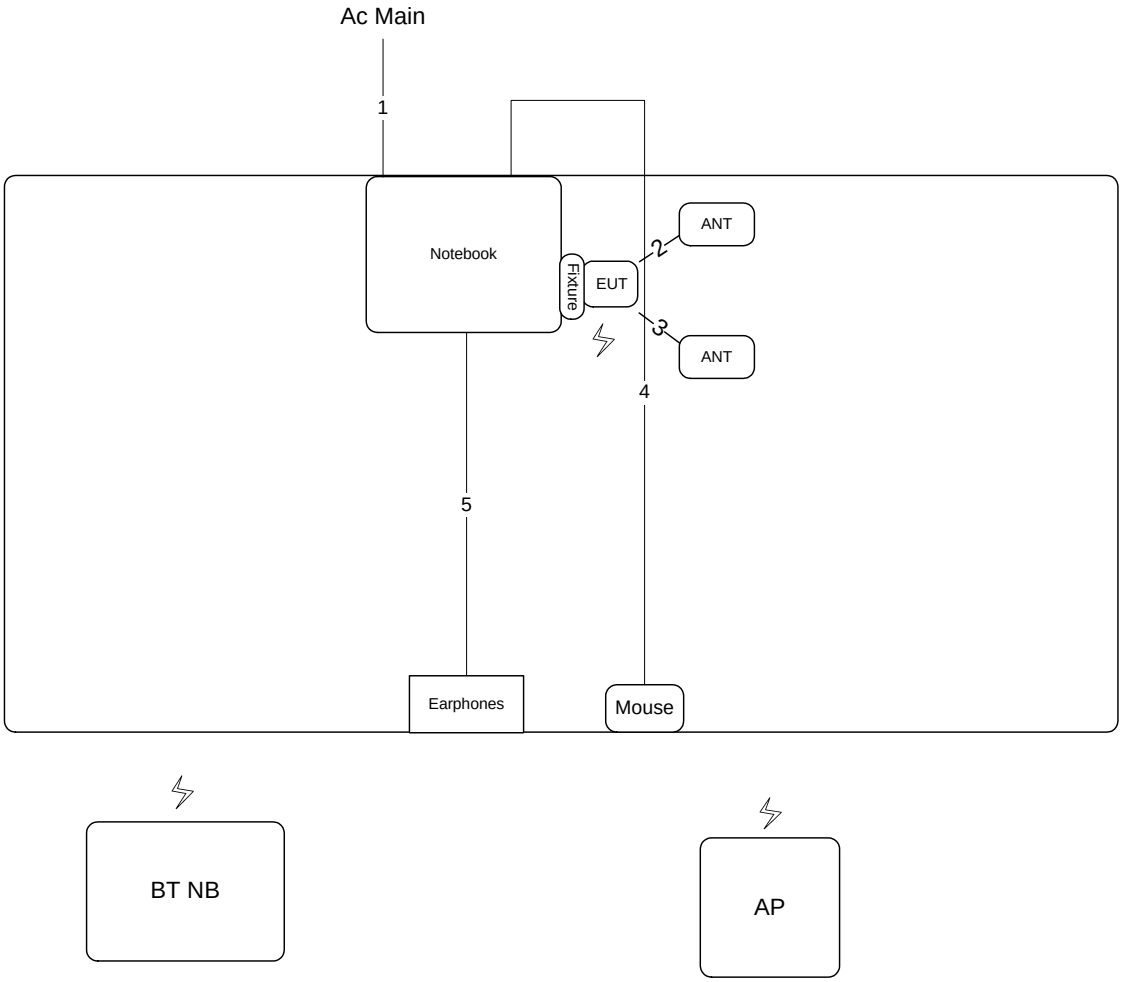


Item	Connection	Shield	Length	Remark
1	Power cable	No	2.6m	-
2	ANT cable	Yes	0.3m	-
3	ANT cable	Yes	0.3m	-
4	USB cable	No	1.8m	-
5	Audio cable	No	1.1m	-

3.11.2. Radiation Emissions Test Configuration

Test Configuration: 30MHz~1GHz

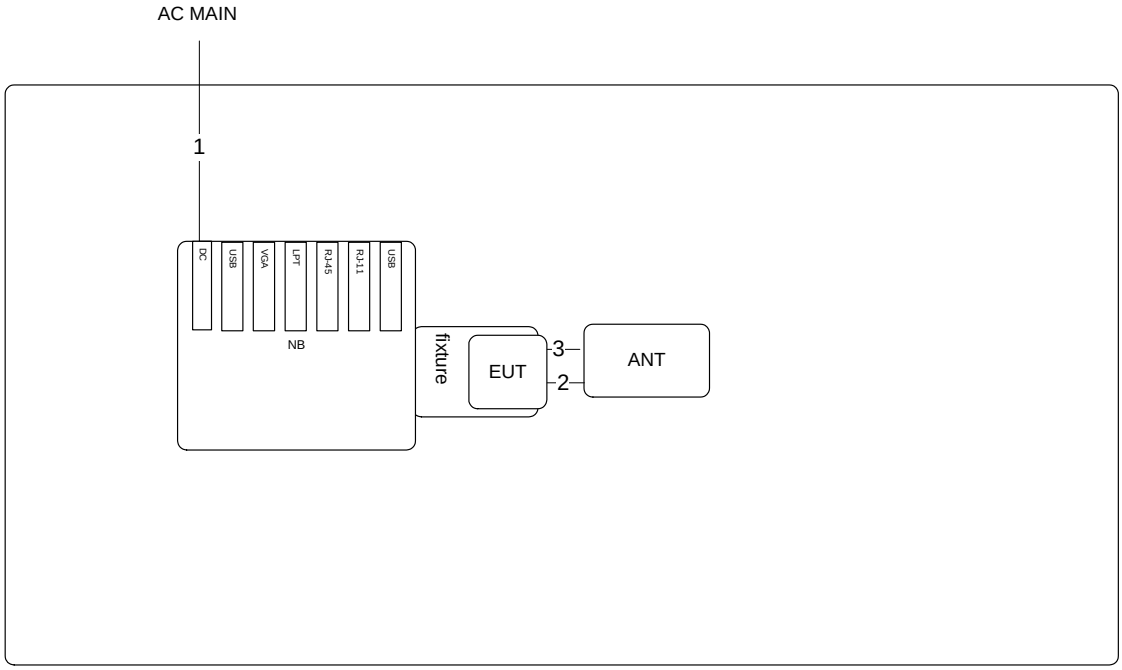
Test Mode: Mode 1



Item	Connection	Shield	Length	Remark
1	Power cable	No	2.6m	-
2	ANT cable	Yes	0.3m	-
3	ANT cable	Yes	0.3m	-
4	USB cable	No	1.8m	-
5	Audio cable	No	1.1m	-

Test Configuration: Radiated emission above 1GHz

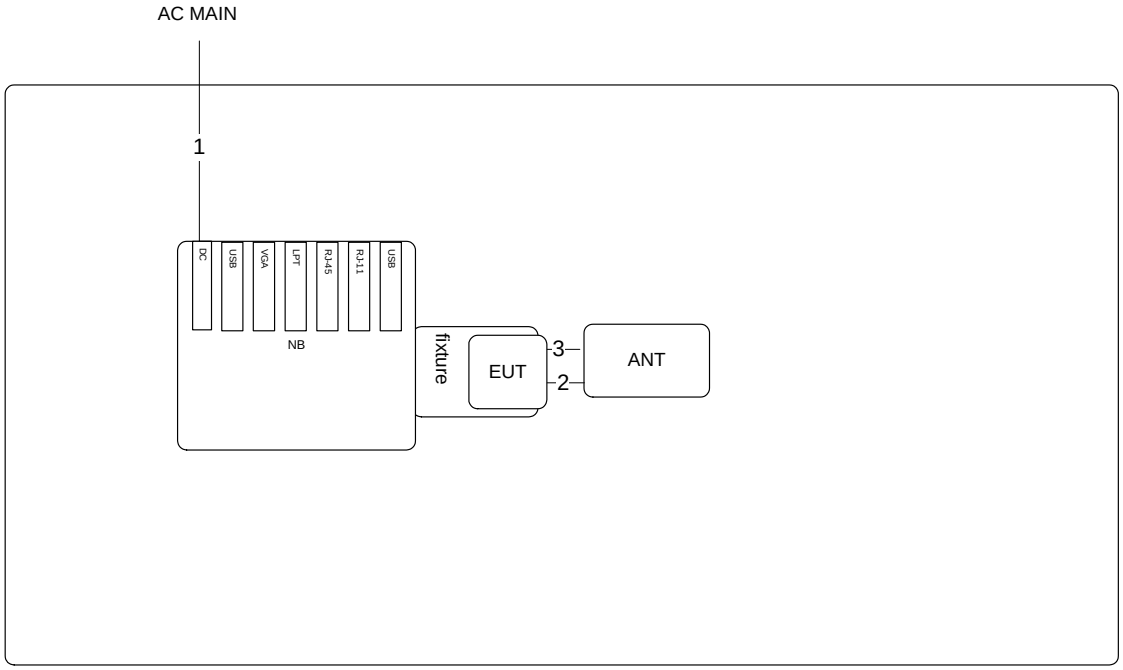
Test Mode: Mode 3 / Mode 9



Item	Connection	Shield	Length	Remark
1	Power cable	No	2.6m	-
2	ANT cable	No	0.3m	-
3	ANT cable	No	0.3m	-

Test Configuration: Radiated emission above 1GHz

Test Mode: Mode 13



Item	Connection	Shield	Length	Remark
1	Power cable	No	2.6m	-
2	ANT cable	No	0.18m	-
3	ANT cable	No	0.18m	-

4. TEST RESULT

4.1. AC Power Line Conducted Emissions Measurement

4.1.1. Limit

For this product which is designed to be connected to the 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 below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

4.1.2. Measuring Instruments and Setting

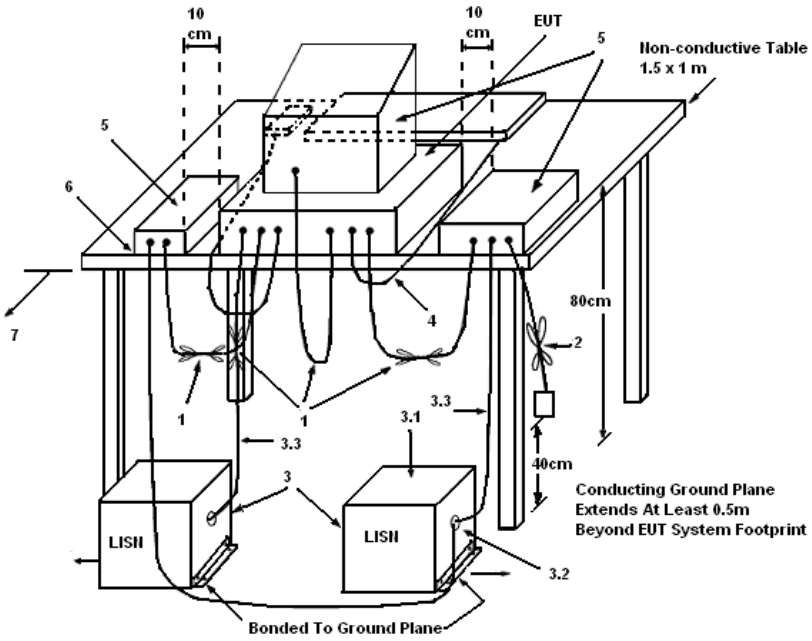
Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

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

4.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 KHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

4.1.4. Test Setup Layout



LEGEND:

(1) 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.

(2) 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.

(3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference ground plane.

(3.1) All other equipment powered from additional LISN(s).

(3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.

(3.3) LISN at least 80 cm from nearest part of EUT chassis.

(4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.

(5) Non-EUT components of EUT system being tested.

(6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.

(7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

4.1.5. Test Deviation

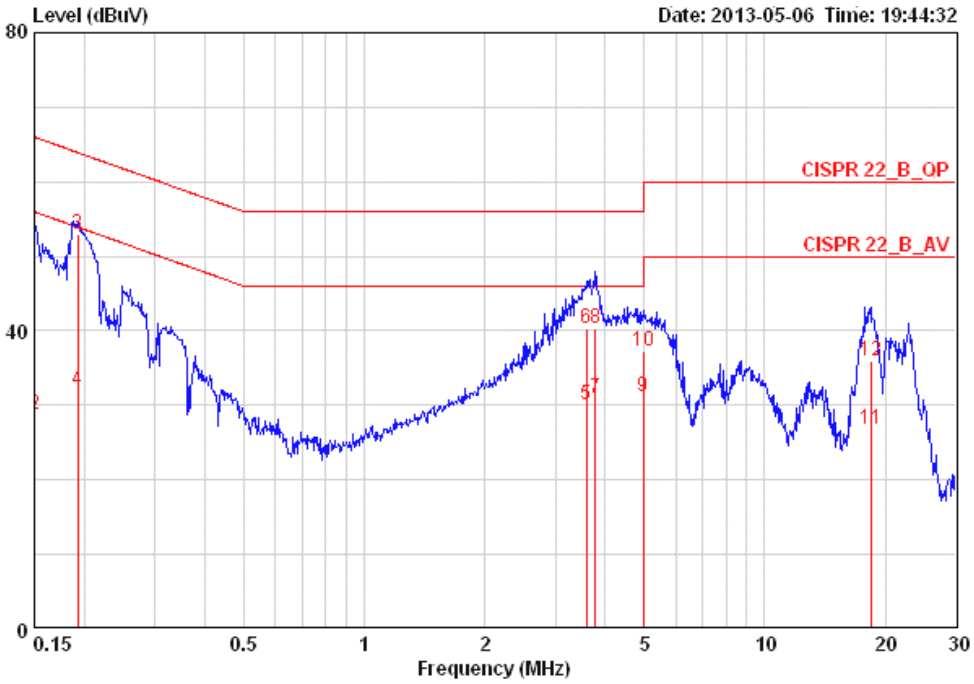
There is no deviation with the original standard.

4.1.6. EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

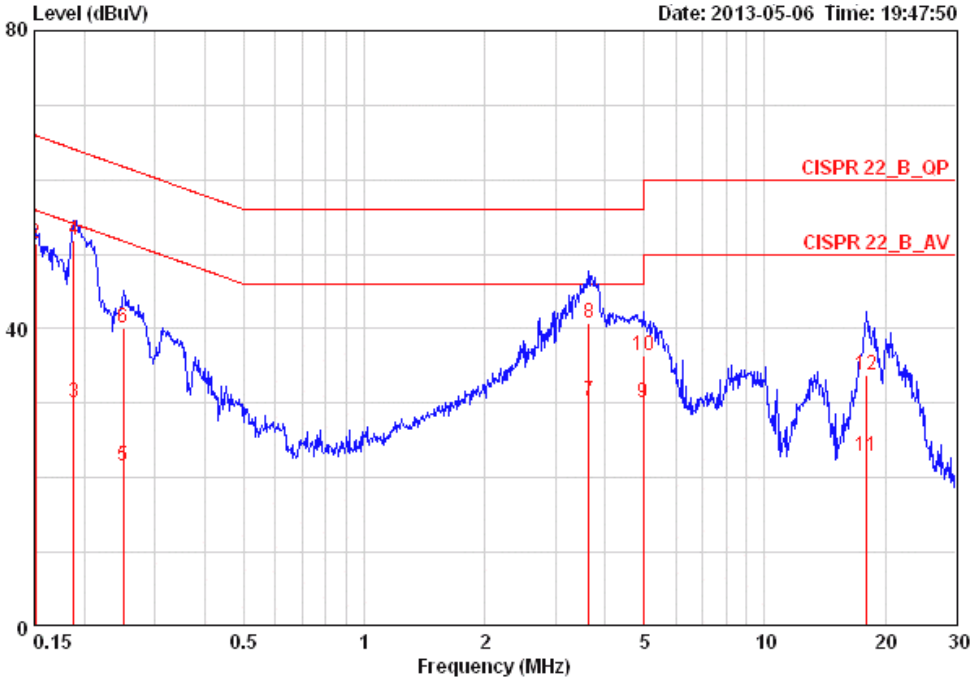
4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	25°C	Humidity	60%
Test Engineer	Kane Liu	Phase	Line
Configuration	Normal Link	Test Mode	Mode 2



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.15000	45.07	-20.93	66.00	44.73	0.16	0.18	LINE	QP
2	0.15000	28.87	-27.13	56.00	28.53	0.16	0.18	LINE	AVERAGE
3 @	0.19242	52.96	-10.97	63.93	52.61	0.15	0.20	LINE	QP
4	0.19242	32.06	-21.87	53.93	31.71	0.15	0.20	LINE	AVERAGE
5	3.584	30.19	-15.81	46.00	29.69	0.21	0.28	LINE	AVERAGE
6	3.584	40.30	-15.70	56.00	39.80	0.21	0.28	LINE	QP
7	3.779	30.86	-15.14	46.00	30.35	0.22	0.29	LINE	AVERAGE
8	3.779	40.36	-15.64	56.00	39.85	0.22	0.29	LINE	QP
9	4.978	31.14	-14.86	46.00	30.58	0.24	0.32	LINE	AVERAGE
10	4.978	37.27	-18.73	56.00	36.71	0.24	0.32	LINE	QP
11	18.426	26.90	-23.10	50.00	25.95	0.46	0.49	LINE	AVERAGE
12	18.426	36.01	-23.99	60.00	35.06	0.46	0.49	LINE	QP

Temperature	25°C	Humidity	60%
Test Engineer	Kane Liu	Phase	Neutral
Configuration	Normal Link	Test Mode	Mode 2



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.15080	32.19	-23.77	55.96	31.93	0.08	0.18	NEUTRAL	AVERAGE
2	0.15080	51.40	-14.56	65.96	51.14	0.08	0.18	NEUTRAL	QP
3	0.18838	30.12	-23.99	54.11	29.84	0.08	0.20	NEUTRAL	AVERAGE
4	0.18838	51.89	-12.22	64.11	51.61	0.08	0.20	NEUTRAL	QP
5	0.25078	21.57	-30.16	51.73	21.29	0.08	0.20	NEUTRAL	AVERAGE
6	0.25078	40.21	-21.52	61.73	39.93	0.08	0.20	NEUTRAL	QP
7	3.642	30.28	-15.72	46.00	29.87	0.13	0.28	NEUTRAL	AVERAGE
8	3.642	40.69	-15.31	56.00	40.28	0.13	0.28	NEUTRAL	QP
9	4.978	30.11	-15.89	46.00	29.64	0.15	0.32	NEUTRAL	AVERAGE
10	4.978	36.37	-19.63	56.00	35.90	0.15	0.32	NEUTRAL	QP
11	17.944	22.89	-27.11	50.00	22.05	0.36	0.48	NEUTRAL	AVERAGE
12	17.944	33.77	-26.23	60.00	32.93	0.36	0.48	NEUTRAL	QP

Note: Level = Read Level + LISN Factor + Cable Loss.

4.2. Maximum Conducted Output Power Measurement

4.2.1. Limit

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. The limited has to be reduced by the amount in dB that the gain of the antenna exceed 6dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

4.2.2. Measuring Instruments and Setting

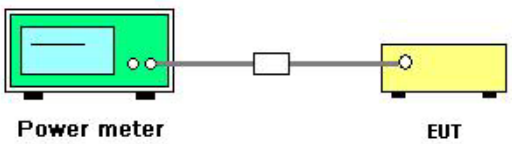
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Bandwidth	50MHz bandwidth is greater than the EUT emission bandwidth
Detector	Average

4.2.3. Test Procedures

1. Test procedures refer KDB 558074 D01 v03 section 9.2.2.
2. This procedure provides an alternative for determining the RMS output power using a broadband RF average power meter with a thermocouple detector.

4.2.4. Test Setup Layout



4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.2.7. Test Result of Maximum Conducted Output Power

Temperature	25°C	Humidity	56%
Test Engineer	Benson Peng	Configurations	GFSK
Test Mode	Mode 1	Test Date	May 30, 2013

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
0	2402 MHz	8.09	30.00	Complies
20	2442 MHz	7.65	30.00	Complies
39	2480 MHz	6.78	30.00	Complies

4.3. Power Spectral Density Measurement

4.3.1. Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.3.2. Measuring Instruments and Setting

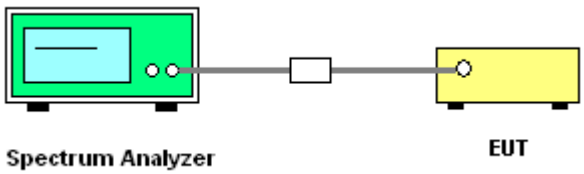
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	5-30 % greater than the DTS channel bandwidth.
RBW	3 kHz ≤ RBW ≤ 100kHz
VBW	≥ 3 x RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto couple

4.3.3. Test Procedures

1. Test procedures refer KDB 558074 D01 v03 section 10.2
2. Spectrum analyzer must be capable of utilizing a number of measurement points in each sweep that is greater than or equal to twice the span/RBW in order to ensure bin-to-bin spacing of ≤ RBW/2 so that narrowband signals are not lost between frequency bins.
3. Use this procedure when the maximum conducted output power in the fundamental emission is used to demonstrate compliance. The EUT must be configured to transmit continuously at full power over the measurement duration.
4. Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW (use of a greater number of measurement points than this minimum requirement is recommended).
5. Use the peak marker function to determine the maximum level in any 3 kHz band segment within the fundamental EBW.
6. The resulting PSD level must be ≤ 8 dBm.

4.3.4. Test Setup Layout



4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.3.7. Test Result of Power Spectral Density

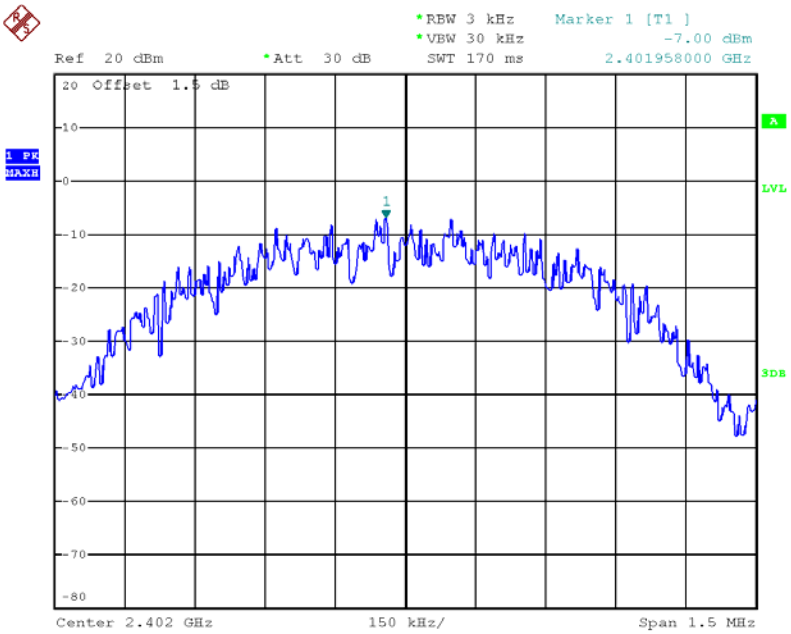
Temperature	25°C	Humidity	56%
Test Engineer	Benson Peng	Configurations	GFSK
Test Mode	Mode 1		

Channel	Frequency	Power Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
0	2402 MHz	-7.00	8.00	Complies
20	2442 MHz	-7.73	8.00	Complies
39	2480 MHz	-8.91	8.00	Complies

Note: All the test values were listed in the report.

For plots, only the channel with maximum results was shown.

Power Density Plot on Configuration Bluetooth / 2402 MHz



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4.4. 6dB Spectrum Bandwidth Measurement

4.4.1. Limit

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz.

4.4.2. Measuring Instruments and Setting

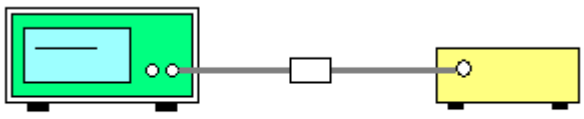
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RBW	100kHz
VBW	≥ 3 x RBW
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.4.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. Test was performed in accordance with KDB 558074 D01 v03 for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 5.1.1 EBW Measurement Procedure
3. Measured the spectrum width with power higher than 6dB below carrier.

4.4.4. Test Setup Layout



4.4.5. Test Deviation

There is no deviation with the original standard.

4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Test Result of 6dB Spectrum Bandwidth

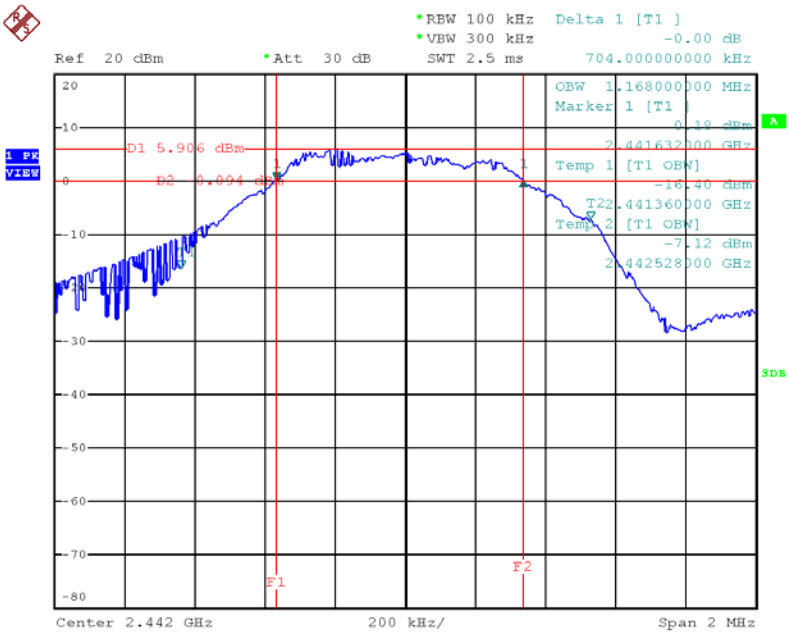
Temperature	25°C	Humidity	56%
Test Engineer	Benson Peng	Configurations	GFSK
Test Mode	Mode 1		

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
0	2402 MHz	0.74	1.16	500	Complies
20	2442 MHz	0.70	1.17	500	Complies
39	2480 MHz	0.72	1.14	500	Complies

Note: All the test values were listed in the report.

For plots, only the channel with maximum results was shown.

6 dB Bandwidth Plot on Configuration Bluetooth / 2442 MHz



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4.5. Radiated Emissions Measurement

4.5.1. Limit

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

4.5.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average
RBW / VBW (Emission in non-restricted band)	100kHz / 300kHz for peak

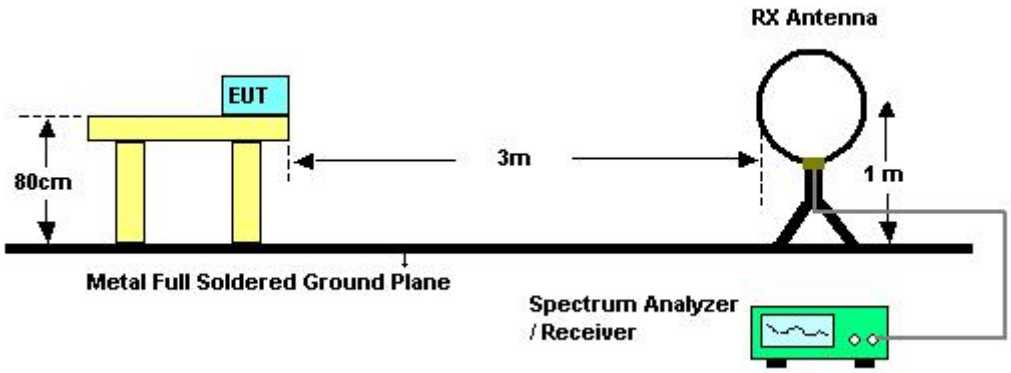
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.5.3. Test Procedures

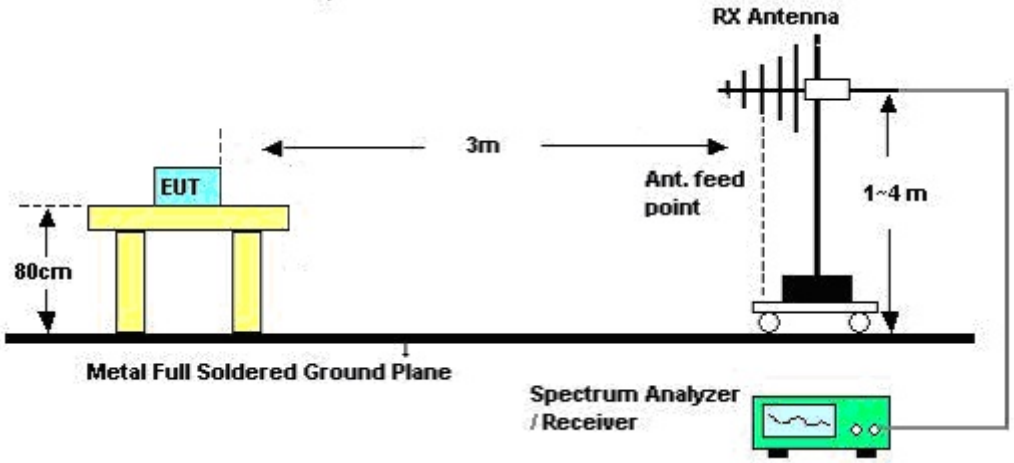
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

4.5.4. Test Setup Layout

For radiated emissions below 1GHz



For radiated emissions above 1GHz



4.5.5. Test Deviation

There is no deviation with the original standard.

4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.5.7. Results of Radiated Emissions (9kHz~30MHz)

Temperature	24.5°C	Humidity	60%
Test Engineer	Kenneth Huang	Test Date	May 23, 2013
Configurations	Normal Link	Test Mode	Mode 1

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

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

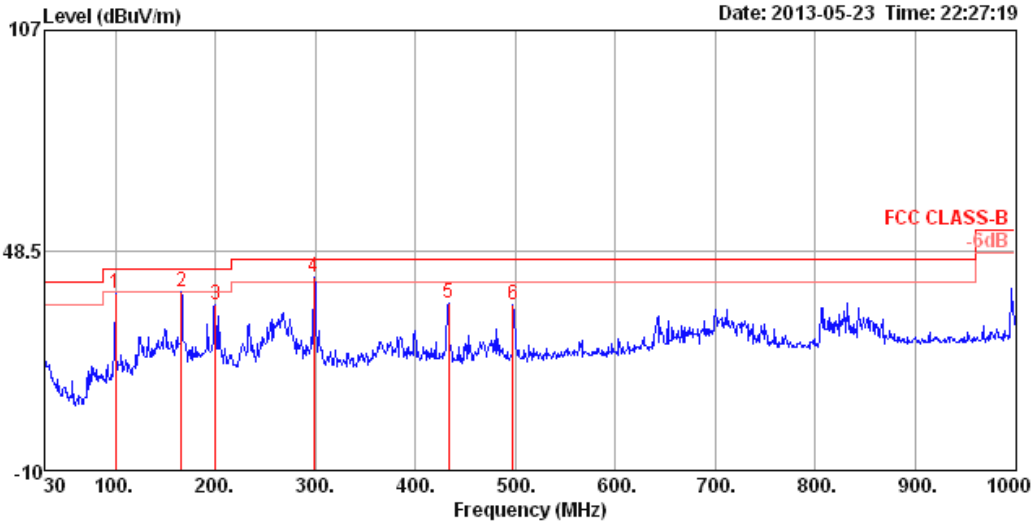
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

4.5.8. Results of Radiated Emissions (30MHz~1GHz)

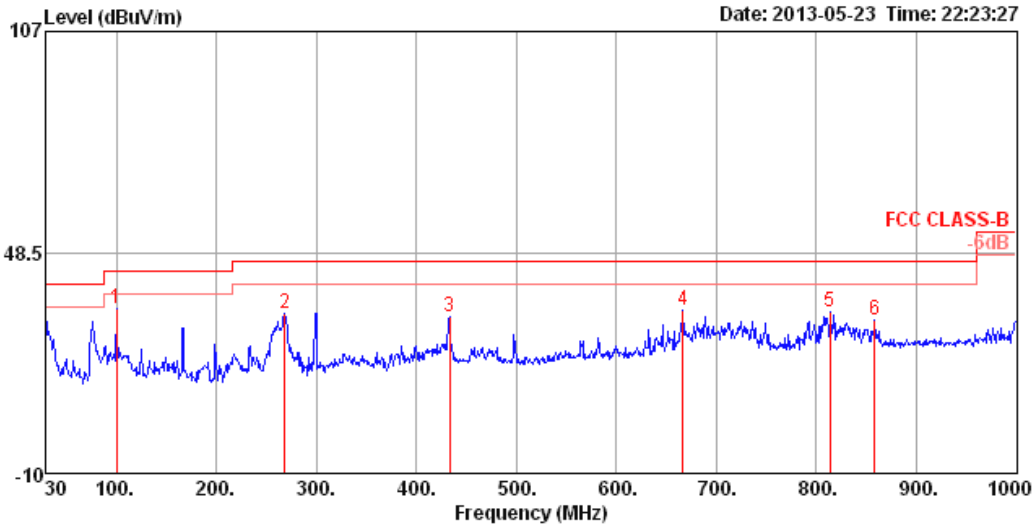
Temperature	24.5°C	Humidity	60%
Test Engineer	Kenneth Huang	Configurations	Normal Link
Test Mode	Mode 1		

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	99.84	37.13	43.50	-6.37	57.25	1.18	10.31	31.61	400	357	HORIZONTAL	Peak
2	165.80	37.46	43.50	-6.04	58.06	1.56	9.38	31.54	300	179	HORIZONTAL	Peak
3	199.75	33.95	43.50	-9.55	55.01	1.70	8.75	31.51	150	174	HORIZONTAL	Peak
4 pp	298.69	41.22	46.00	-4.78	57.55	2.12	12.98	31.43	100	126	HORIZONTAL	Peak
5	433.52	34.65	46.00	-11.35	47.04	2.59	16.17	31.15	100	285	HORIZONTAL	Peak
6	497.54	33.83	46.00	-12.17	45.53	2.81	16.88	31.39	100	130	HORIZONTAL	Peak

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1 pp	99.84	33.59	43.50	-9.91	53.71	1.18	10.31	31.61	150	242	VERTICAL	Peak
2	268.62	32.23	46.00	-13.77	49.39	1.98	12.41	31.55	150	2	VERTICAL	Peak
3	433.52	31.58	46.00	-14.42	43.97	2.59	16.17	31.15	125	112	VERTICAL	Peak
4	666.32	33.03	46.00	-12.97	42.31	3.31	18.81	31.40	125	315	VERTICAL	Peak
5	813.76	32.90	46.00	-13.10	40.20	3.70	20.21	31.21	100	133	VERTICAL	Peak
6	858.38	30.44	46.00	-15.56	37.51	3.84	20.28	31.19	150	121	VERTICAL	Peak

Note:

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

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

4.5.9. Results for Radiated Emissions (1GHz~10th Harmonic)

Temperature	23°C	Humidity	64%
Test Engineer	Kenneth Huang	Configurations	Channel 0
Test Mode	Mode 3	Test Date	Jun. 12, 2013

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 p	3202.61	51.51	74.00	-22.49	53.33	3.39	34.81	29.60	Peak	306	151	HORIZONTAL
2 a	3202.66	47.48	54.00	-6.52	49.30	3.39	34.81	29.60	Average	306	151	HORIZONTAL
3	4804.02	35.37	54.00	-18.63	33.35	4.20	34.70	32.52	Average	238	100	HORIZONTAL
4	4804.42	45.25	74.00	-28.75	43.23	4.20	34.70	32.52	Peak	238	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 a	3202.66	38.77	54.00	-15.23	40.59	3.39	34.81	29.60	Average	244	100	VERTICAL
2 p	3202.69	45.44	74.00	-28.56	47.26	3.39	34.81	29.60	Peak	244	100	VERTICAL
3	4803.72	44.14	74.00	-29.86	42.12	4.20	34.70	32.52	Peak	293	100	VERTICAL
4	4804.32	30.64	54.00	-23.36	28.62	4.20	34.70	32.52	Average	293	100	VERTICAL

Temperature	23°C	Humidity	64%
Test Engineer	Kenneth Huang	Configurations	Channel 20
Test Mode	Mode 3	Test Date	Jun. 12, 2013

Horizontal

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	p	3255.88	53.76	74.00	-20.24	55.40	3.43	34.79	29.72	Peak	267	148	HORIZONTAL
2	a	3256.00	50.83	54.00	-3.17	52.47	3.43	34.79	29.72	Average	267	148	HORIZONTAL
3		4883.53	45.70	74.00	-28.30	43.49	4.22	34.67	32.66	Peak	306	115	HORIZONTAL
4		4884.26	33.55	54.00	-20.45	31.34	4.22	34.67	32.66	Average	306	115	HORIZONTAL
5		7325.64	49.04	74.00	-24.96	41.64	5.35	34.94	36.99	Peak	270	100	HORIZONTAL
6		7326.12	35.78	54.00	-18.22	28.38	5.35	34.94	36.99	Average	270	100	HORIZONTAL

Vertical

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1		3255.58	45.62	74.00	-28.38	47.26	3.43	34.79	29.72	Peak	242	100	VERTICAL
2	a	3256.02	37.51	54.00	-16.49	39.15	3.43	34.79	29.72	Average	242	100	VERTICAL
3		4883.75	30.73	54.00	-23.27	28.52	4.22	34.67	32.66	Average	263	100	VERTICAL
4		4883.88	43.76	74.00	-30.24	41.55	4.22	34.67	32.66	Peak	263	100	VERTICAL
5	p	7326.06	49.15	74.00	-24.85	41.75	5.35	34.94	36.99	Peak	305	100	VERTICAL
6		7326.09	35.78	54.00	-18.22	28.38	5.35	34.94	36.99	Average	305	100	VERTICAL

Temperature	23°C	Humidity	64%
Test Engineer	Kenneth Huang	Configurations	Channel 39
Test Mode	Mode 3	Test Date	Jun. 12, 2013

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 a	3306.62	47.98	54.00	-6.02	49.46	3.46	34.78	29.84	Average	305	144	HORIZONTAL
2 p	3306.71	51.53	74.00	-22.47	53.01	3.46	34.78	29.84	Peak	305	144	HORIZONTAL
3	4959.66	44.39	74.00	-29.61	41.97	4.23	34.64	32.83	Peak	284	100	HORIZONTAL
4	4959.97	33.97	54.00	-20.03	31.55	4.23	34.64	32.83	Average	284	100	HORIZONTAL
5	7439.89	36.31	54.00	-17.69	28.78	5.37	34.98	37.14	Average	250	100	HORIZONTAL
6	7440.24	49.24	74.00	-24.76	41.71	5.37	34.98	37.14	Peak	250	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	3306.71	43.12	74.00	-30.88	44.60	3.46	34.78	29.84	Peak	265	100	VERTICAL
2	3306.72	33.59	54.00	-20.41	35.07	3.46	34.78	29.84	Average	265	100	VERTICAL
3	4958.58	31.14	54.00	-22.86	28.72	4.23	34.64	32.83	Average	230	100	VERTICAL
4	4960.52	44.05	74.00	-29.95	41.63	4.23	34.64	32.83	Peak	230	100	VERTICAL
5 a	7439.36	36.35	54.00	-17.65	28.82	5.37	34.98	37.14	Average	304	100	VERTICAL
6 p	7441.19	49.37	74.00	-24.63	41.84	5.37	34.98	37.14	Peak	304	100	VERTICAL

Note:

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

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Temperature	23°C	Humidity	64%
Test Engineer	Kenneth Huang	Configurations	Channel 0
Test Mode	Mode 9	Test Date	Jun. 12, 2013

Horizontal

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	a	3202.63	44.78	54.00	-9.22	46.60	3.39	34.81	29.60	Average	290	148	HORIZONTAL
2	p	3202.69	49.10	74.00	-24.90	50.92	3.39	34.81	29.60	Peak	290	148	HORIZONTAL
3		4803.88	33.30	54.00	-20.70	31.28	4.20	34.70	32.52	Average	321	100	HORIZONTAL
4		4803.90	45.64	74.00	-28.36	43.62	4.20	34.70	32.52	Peak	321	100	HORIZONTAL

Vertical

		Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	a	3202.66	37.55	54.00	-16.45	39.37	3.39	34.81	29.60	Average	313	101	VERTICAL
2	p	3202.69	46.72	74.00	-27.28	48.54	3.39	34.81	29.60	Peak	313	101	VERTICAL
3		4803.74	35.93	54.00	-18.07	33.91	4.20	34.70	32.52	Average	185	100	VERTICAL
4		4804.33	44.50	74.00	-29.50	42.48	4.20	34.70	32.52	Peak	185	100	VERTICAL

Temperature	23°C	Humidity	64%
Test Engineer	Kenneth Huang	Configurations	Channel 20
Test Mode	Mode 9	Test Date	Jun. 12, 2013

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 p	3255.89	50.09	74.00	-23.91	51.73	3.43	34.79	29.72	Peak	284	152	HORIZONTAL
2 a	3255.96	46.22	54.00	-7.78	47.86	3.43	34.79	29.72	Average	284	152	HORIZONTAL
3	4884.05	33.16	54.00	-20.84	30.95	4.22	34.67	32.66	Average	332	100	HORIZONTAL
4	4884.32	43.77	74.00	-30.23	41.56	4.22	34.67	32.66	Peak	332	100	HORIZONTAL
5	7325.75	49.72	74.00	-24.28	42.32	5.35	34.94	36.99	Peak	227	100	HORIZONTAL
6	7326.77	35.95	54.00	-18.05	28.55	5.35	34.94	36.99	Average	227	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	3255.89	42.84	74.00	-31.16	44.48	3.43	34.79	29.72	Peak	263	100	VERTICAL
2	3255.99	34.67	54.00	-19.33	36.31	3.43	34.79	29.72	Average	263	100	VERTICAL
3	4883.51	43.85	74.00	-30.15	41.64	4.22	34.67	32.66	Peak	214	100	VERTICAL
4	4883.72	34.66	54.00	-19.34	32.45	4.22	34.67	32.66	Average	214	100	VERTICAL
5 p	7325.90	48.63	74.00	-25.37	41.23	5.35	34.94	36.99	Peak	306	100	VERTICAL
6 a	7326.70	35.86	54.00	-18.14	28.46	5.35	34.94	36.99	Average	306	100	VERTICAL

Temperature	23°C	Humidity	64%
Test Engineer	Kenneth Huang	Configurations	Channel 39
Test Mode	Mode 9	Test Date	Jun. 12, 2013

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 p	3306.64	50.89	74.00	-23.11	52.37	3.46	34.78	29.84	Peak	263	144	HORIZONTAL
2 a	3306.66	46.62	54.00	-7.38	48.10	3.46	34.78	29.84	Average	263	144	HORIZONTAL
3	4959.36	31.04	54.00	-22.96	28.62	4.23	34.64	32.83	Average	289	100	HORIZONTAL
4	4960.66	44.23	74.00	-29.77	41.81	4.23	34.64	32.83	Peak	289	100	HORIZONTAL
5	7439.06	36.26	54.00	-17.74	28.73	5.37	34.98	37.14	Average	220	100	HORIZONTAL
6	7439.56	49.55	74.00	-24.45	42.02	5.37	34.98	37.14	Peak	220	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	3306.61	44.30	74.00	-29.70	45.78	3.46	34.78	29.84	Peak	252	100	VERTICAL
2 a	3306.63	37.17	54.00	-16.83	38.65	3.46	34.78	29.84	Average	252	100	VERTICAL
3	4959.56	31.97	54.00	-22.03	29.55	4.23	34.64	32.83	Average	248	100	VERTICAL
4	4960.28	44.62	74.00	-29.38	42.20	4.23	34.64	32.83	Peak	248	100	VERTICAL
5	7440.34	36.56	54.00	-17.44	29.03	5.37	34.98	37.14	Average	312	100	VERTICAL
6 p	7440.69	49.44	74.00	-24.56	41.91	5.37	34.98	37.14	Peak	312	100	VERTICAL

Note:

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

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Temperature	23°C	Humidity	64%
Test Engineer	Kenneth Huang	Configurations	Channel 0
Test Mode	Mode 13	Test Date	Jun. 12, 2013

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	3202.66	29.64	54.00	-24.36	31.46	3.39	34.81	29.60	Average	195	100	HORIZONTAL
2	3202.84	41.64	74.00	-32.36	43.46	3.39	34.81	29.60	Peak	195	100	HORIZONTAL
3 a	4803.97	30.83	54.00	-23.17	28.81	4.20	34.70	32.52	Average	241	100	HORIZONTAL
4 p	4804.82	43.88	74.00	-30.12	41.86	4.20	34.70	32.52	Peak	241	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 p	3202.48	48.47	74.00	-25.53	50.29	3.39	34.81	29.60	Peak	281	100	VERTICAL
2 a	3202.69	41.75	54.00	-12.25	43.57	3.39	34.81	29.60	Average	281	100	VERTICAL
3	4803.41	45.10	74.00	-28.90	43.08	4.20	34.70	32.52	Peak	357	100	VERTICAL
4	4803.95	34.02	54.00	-19.98	32.00	4.20	34.70	32.52	Average	357	100	VERTICAL

Temperature	23°C	Humidity	64%
Test Engineer	Kenneth Huang	Configurations	Channel 20
Test Mode	Mode 13	Test Date	Jun. 12, 2013

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	3255.96	43.04	74.00	-30.96	44.68	3.43	34.79	29.72	Peak	255	100	HORIZONTAL
2	3255.98	32.81	54.00	-21.19	34.45	3.43	34.79	29.72	Average	255	100	HORIZONTAL
3	4883.70	30.77	54.00	-23.23	28.56	4.22	34.67	32.66	Average	222	100	HORIZONTAL
4	4884.24	43.87	74.00	-30.13	41.66	4.22	34.67	32.66	Peak	222	100	HORIZONTAL
5 a	7326.27	35.86	54.00	-18.14	28.46	5.35	34.94	36.99	Average	282	100	HORIZONTAL
6 p	7326.36	49.26	74.00	-24.74	41.86	5.35	34.94	36.99	Peak	282	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 a	3256.01	41.77	54.00	-12.23	43.41	3.43	34.79	29.72	Average	324	100	VERTICAL
2	3256.09	47.18	74.00	-26.82	48.82	3.43	34.79	29.72	Peak	324	100	VERTICAL
3	4883.64	33.91	54.00	-20.09	31.70	4.22	34.67	32.66	Average	274	100	VERTICAL
4	4884.36	44.51	74.00	-29.49	42.30	4.22	34.67	32.66	Peak	274	100	VERTICAL
5 p	7326.27	49.32	74.00	-24.68	41.92	5.35	34.94	36.99	Peak	357	100	VERTICAL
6	7326.35	35.99	54.00	-18.01	28.59	5.35	34.94	36.99	Average	357	100	VERTICAL

Temperature	23°C	Humidity	64%
Test Engineer	Kenneth Huang	Configurations	Channel 39
Test Mode	Mode 13	Test Date	Jun. 12, 2013

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	3306.69	31.46	54.00	-22.54	32.94	3.46	34.78	29.84	Average	294	100	HORIZONTAL
2	3306.72	43.11	74.00	-30.89	44.59	3.46	34.78	29.84	Peak	294	100	HORIZONTAL
3	4959.87	30.94	54.00	-23.06	28.52	4.23	34.64	32.83	Average	286	100	HORIZONTAL
4	4960.02	44.39	74.00	-29.61	41.97	4.23	34.64	32.83	Peak	286	100	HORIZONTAL
5 p	7440.20	50.51	74.00	-23.49	42.98	5.37	34.98	37.14	Peak	210	100	HORIZONTAL
6 a	7440.30	36.29	54.00	-17.71	28.76	5.37	34.98	37.14	Average	210	100	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	3306.58	44.46	74.00	-29.54	45.94	3.46	34.78	29.84	Peak	273	100	VERTICAL
2 a	3306.68	38.56	54.00	-15.44	40.04	3.46	34.78	29.84	Average	273	100	VERTICAL
3	4959.92	45.51	74.00	-28.49	43.09	4.23	34.64	32.83	Peak	234	100	VERTICAL
4	4960.19	32.51	54.00	-21.49	30.09	4.23	34.64	32.83	Average	234	100	VERTICAL
5	7439.77	36.34	54.00	-17.66	28.81	5.37	34.98	37.14	Average	339	100	VERTICAL
6 p	7440.01	50.56	74.00	-23.44	43.03	5.37	34.98	37.14	Peak	339	100	VERTICAL

Note:

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

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

4.6. Emissions Measurement

4.6.1. Limit

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

4.6.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average
RBW / VBW (Emission in non-restricted band)	100 kHz / 300 kHz for Peak

4.6.3. Test Procedures

For Radiated band edges Measurement:

1. The test procedure is the same as section 4.5.3, only the frequency range investigated is limited to 100MHz around band edges.

For Radiated Out of Band Emission Measurement:

1. Test was performed in accordance with KDB 558074 D01 v03 for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 10.1 Unwanted Emissions into Non-Restricted Frequency Bands Measurement Procedure
2. The radiated emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit. Only worst data of each operating mode is presented.

4.6.4. Test Setup Layout

For Radiated band edges Measurement:

This test setup layout is the same as that shown in section 4.5.4.

For Radiated Out of Band Emission Measurement:

This test setup layout is the same as that shown in section 4.5.4.

4.6.5. Test Deviation

There is no deviation with the original standard.

4.6.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.6.7. Test Result of Band Edge and Fundamental Emissions

Temperature	23°C	Humidity	64%
Test Engineer	Kenneth Huang	Configurations	Channel 0, 20, 39
Test Mode	Mode 3	Test Date	May 29, 2013 ~ Jun. 12, 2013

Channel 0

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2375.80	44.13	54.00	-9.87	12.56	3.67	27.90	0.00	154	272	HORIZONTAL	Average
2 !	2390.00	70.41	74.00	-3.59	38.83	3.68	27.90	0.00	154	272	HORIZONTAL	Peak
3 pk	2401.90	109.06			77.47	3.69	27.90	0.00	154	272	HORIZONTAL	Peak
4 pp	2402.00	104.77			73.18	3.69	27.90	0.00	154	272	HORIZONTAL	Average

Item 3, 4 are the fundamental frequency at 2402 MHz.

Channel 20

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Pol/Phase	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2388.40	55.65	74.00	-18.35	24.07	3.68	27.90	0.00	179	254	HORIZONTAL	Peak
2	2390.00	40.11	54.00	-13.89	8.53	3.68	27.90	0.00	179	254	HORIZONTAL	Average
3 pk	2441.80	108.73			77.12	3.71	27.90	0.00	179	254	HORIZONTAL	Peak
4 pp	2442.00	104.34			72.73	3.71	27.90	0.00	179	254	HORIZONTAL	Average
5	2483.50	40.32	54.00	-13.68	8.69	3.73	27.90	0.00	179	254	HORIZONTAL	Average
6	2486.90	55.77	74.00	-18.23	24.14	3.73	27.90	0.00	179	254	HORIZONTAL	Peak

Item 3, 4 are the fundamental frequency at 2442 MHz.

Channel 39

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 p	2479.80	111.93			81.24	2.96	0.00	27.73	Peak	270	149	HORIZONTAL
2 a	2480.00	106.03			75.34	2.96	0.00	27.73	Average	270	149	HORIZONTAL
3	2483.50	66.15	74.00	-7.85	35.46	2.96	0.00	27.73	Peak	270	149	HORIZONTAL
4 !	2483.50	53.65	54.00	-0.35	22.96	2.96	0.00	27.73	Average	270	149	HORIZONTAL

Item 1, 2 are the fundamental frequency at 2480 MHz.

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Temperature	23°C	Humidity	64%
Test Engineer	Kenneth Huang	Configurations	Channel 0, 20, 39
Test Mode	Mode 9	Test Date	Jun. 12, 2013

Channel 0

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	2375.80	44.44	54.00	-9.56	13.65	2.90	0.00	27.89	Average	296	176	HORIZONTAL
2	2390.00	54.03	74.00	-19.97	23.25	2.91	0.00	27.87	Peak	296	176	HORIZONTAL
3 p	2401.80	106.74			75.96	2.91	0.00	27.87	Peak	296	176	HORIZONTAL
4 a	2402.00	101.17			70.39	2.91	0.00	27.87	Average	296	176	HORIZONTAL

Item 3, 4 are the fundamental frequency at 2402 MHz.

Channel 20

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	2387.60	54.16	74.00	-19.84	23.38	2.91	0.00	27.87	Peak	266	173	HORIZONTAL
2	2390.00	43.60	54.00	-10.40	12.82	2.91	0.00	27.87	Average	266	173	HORIZONTAL
3 p	2441.60	105.02			74.30	2.94	0.00	27.78	Peak	266	173	HORIZONTAL
4 a	2442.00	99.65			68.93	2.94	0.00	27.78	Average	266	173	HORIZONTAL
5	2483.50	43.48	54.00	-10.52	12.79	2.96	0.00	27.73	Average	266	173	HORIZONTAL
6	2484.70	55.50	74.00	-18.50	24.81	2.96	0.00	27.73	Peak	266	173	HORIZONTAL

Item 3, 4 are the fundamental frequency at 2442 MHz.

Channel 39

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 p	2479.80	104.37			73.68	2.96	0.00	27.73	Peak	268	173	HORIZONTAL
2 a	2480.00	99.03			68.34	2.96	0.00	27.73	Average	268	173	HORIZONTAL
3	2483.50	58.18	74.00	-15.82	27.49	2.96	0.00	27.73	Peak	268	173	HORIZONTAL
4	2483.50	47.78	54.00	-6.22	17.09	2.96	0.00	27.73	Average	268	173	HORIZONTAL

Item 1, 2 are the fundamental frequency at 2480 MHz.

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Temperature	23°C	Humidity	64%
Test Engineer	Kenneth Huang	Configurations	Channel 0, 20, 39
Test Mode	Mode 13	Test Date	Jun. 12, 2013

Channel 0

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	2375.80	45.41	54.00	-8.59	14.62	2.90	0.00	27.89	Average	321	100	VERTICAL
2	2385.00	54.97	74.00	-19.03	24.18	2.90	0.00	27.89	Peak	321	100	VERTICAL
3 p	2401.80	108.34			77.56	2.91	0.00	27.87	Peak	321	100	VERTICAL
4 a	2402.00	103.03			72.25	2.91	0.00	27.87	Average	321	100	VERTICAL

Item 3, 4 are the fundamental frequency at 2402 MHz.

Channel 20

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1	2387.20	54.51	74.00	-19.49	23.73	2.91	0.00	27.87	Peak	321	100	VERTICAL
2	2390.00	43.87	54.00	-10.13	13.09	2.91	0.00	27.87	Average	321	100	VERTICAL
3 p	2441.60	106.20			75.48	2.94	0.00	27.78	Peak	321	100	VERTICAL
4 a	2442.00	101.04			70.32	2.94	0.00	27.78	Average	321	100	VERTICAL
5	2483.50	43.61	54.00	-10.39	12.92	2.96	0.00	27.73	Average	321	100	VERTICAL
6	2485.50	54.42	74.00	-19.58	23.73	2.96	0.00	27.73	Peak	321	100	VERTICAL

Item 3, 4 are the fundamental frequency at 2442 MHz.

Channel 39

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	T/Pos	A/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB	dB/m		deg	cm	
1 p	2479.80	104.08			73.39	2.96	0.00	27.73	Peak	323	100	VERTICAL
2 a	2480.00	98.92			68.23	2.96	0.00	27.73	Average	323	100	VERTICAL
3	2483.50	55.42	74.00	-18.58	24.73	2.96	0.00	27.73	Peak	323	100	VERTICAL
4	2483.50	47.91	54.00	-6.09	17.22	2.96	0.00	27.73	Average	323	100	VERTICAL

Item 1, 2 are the fundamental frequency at 2480 MHz.

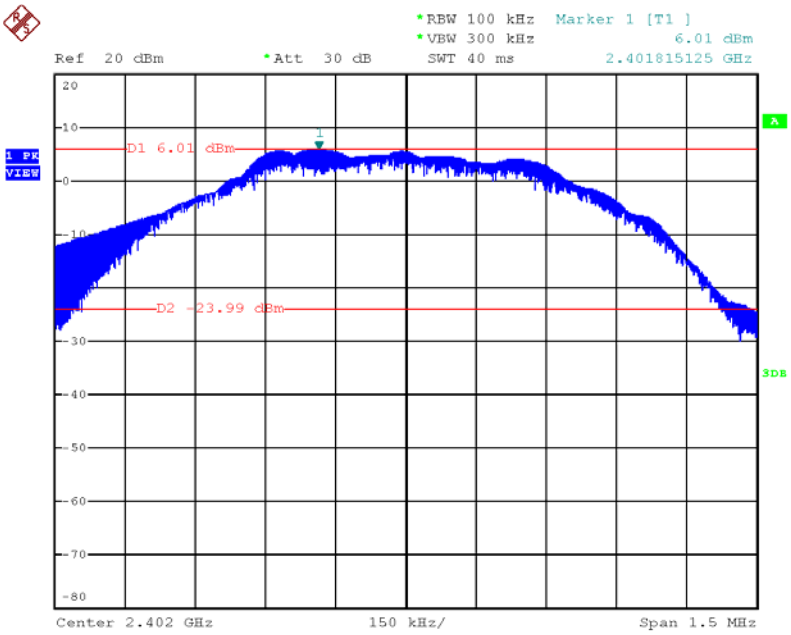
Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

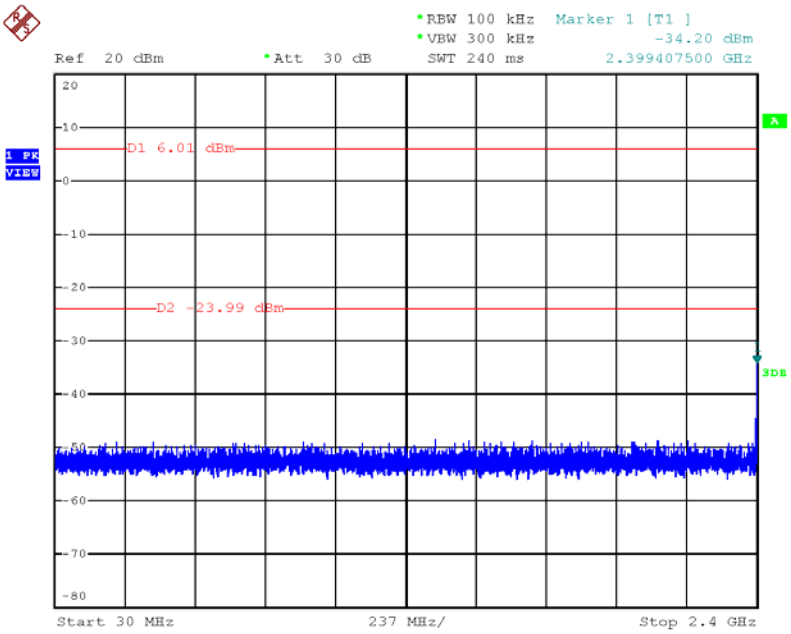
For Emission not in Restricted Band

Plot on Configuration / Reference Level



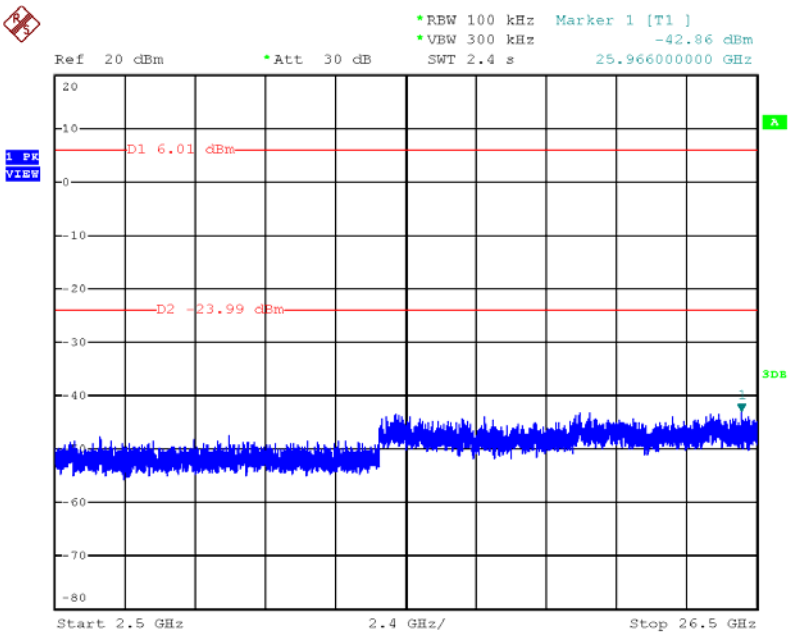
Date: 30.MAY.2013 00:00:46

Plot on Configuration For Bluetooth 4.0 / Channel 0 / 30MHz~2400MHz (down 30dBc)



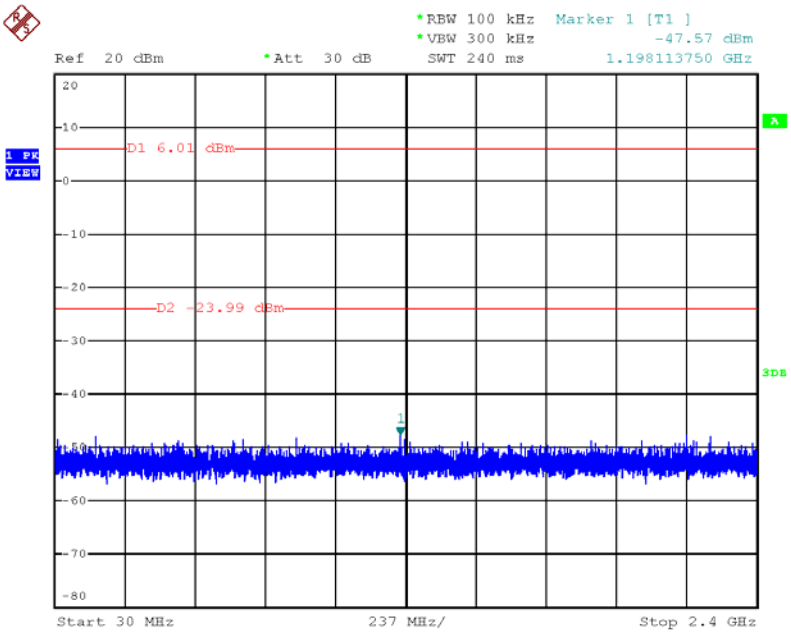
Date: 30.MAY.2013 00:01:24

Plot on Configuration For Bluetooth 4.0 / Channel 0 / 2500MHz~26500MHz (down 30dBc)



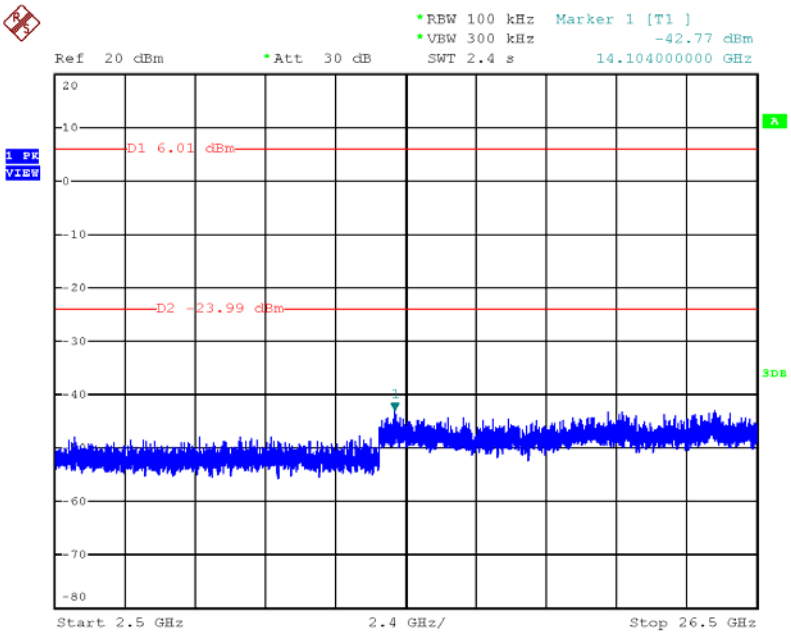
Date: 30.MAY.2013 00:02:10

Plot on Configuration For Bluetooth 4.0 / Channel 39 / 30MHz~2400MHz (down 30dBc)



Date: 30.MAY.2013 00:03:10

Plot on Configuration For Bluetooth 4.0 / Channel 39 / 2500MHz~26500MHz (down 30dBc)



Date: 30.MAY.2013 00:02:45

4.7. Antenna Requirements

4.7.1. Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

4.7.2. Antenna Connector Construction

Please refer to section 3.3 in this test report; antenna connector complied with the requirements.

5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMI Test Receiver	R&S	ESCS 30	100377	9kHz ~ 2.75GHz	Oct. 23, 2012	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Nov. 26, 2012	Conduction (CO01-CB)
V- LISN	Schwarzbeck	NSLK 8127	8127-478	9kHz ~ 30MHz	Jun. 22, 2012	Conduction (CO01-CB)
Impulsbegrenzer Pulse Limiter	Rohde&Schwarz	ESH3-Z2	100430	9kHz~30MHz	Feb. 21, 2013	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	0.15MHz~30MHz	Dec. 04, 2012	Conduction (CO01-CB)
Software	Audix	E3	5.410e	-	-	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Apr. 16, 2013	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Nov. 05, 2012*	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 27, 2012	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 27, 2012	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Nov. 23, 2012	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100056	9KHz~40GHz	Nov. 16, 2012	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS 30	100355	9KHz ~ 2.75GHz	Apr. 15, 2013	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N.C.R	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO2000	N/A	1 m - 4 m	N.C.R	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz - 1 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 18, 2012	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9kHz~40GHz	Oct. 08, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Nov. 28, 2012	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Nov. 27, 2012	Conducted (TH01-CB)

Note: Calibration Interval of instruments listed above is one year.

Note: "*" Calibration Interval of instruments listed above is two years.

6. TEST LOCATION

SHIJR	ADD	:	6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C.
	TEL	:	886-2-2696-2468
	FAX	:	886-2-2696-2255
HWA YA	ADD	:	No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
	TEL	:	886-3-327-3456
	FAX	:	886-3-318-0055
LINKOU	ADD	:	No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C
	TEL	:	886-2-2601-1640
	FAX	:	886-2-2601-1695
DUNGHU	ADD	:	No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C.
	TEL	:	886-2-2631-4739
	FAX	:	886-2-2631-9740
JUNGHE	ADD	:	7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C.
	TEL	:	886-2-8227-2020
	FAX	:	886-2-8227-2626
NEIHU	ADD	:	4Fl., No. 339, Hsin Hu 2nd Rd., Taipei 114, Taiwan, R.O.C.
	TEL	:	886-2-2794-8886
	FAX	:	886-2-2794-9777
JHUBEI	ADD	:	No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.
	TEL	:	886-3-656-9065
	FAX	:	886-3-656-9085

7. MEASUREMENT UNCERTAINTY

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

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	0.026	dB	normal(k=2)	0.013
Cable loss	0.002	dB	normal(k=2)	0.001
AMN/LISN specification	1.200	dB	normal(k=2)	0.600
Mismatch Receiver VSWR 1= AMN/LISN VSWR 2=	-0.080	dB	U-shaped	0.060
combined standard uncertainty Ue(y)	1.2			
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	2.4			

Uncertainty of Conducted Emission Measurement

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Cable loss	0.038	dB	normal(k=2)	0.019
Attenuator	0.047	dB	normal(k=2)	0.024
Power Meter specification	0.300	dB	normal(k=2)	0.150
Power Sensor specification	0.300	dB	normal(k=2)	0.150
Mismatch Receiver VSWR 1= Antenna VSWR 2= Pre Amplifier VSWR 3=	-0.080	dB	U-shaped	0.060
combined standard uncertainty Ue(y)	0.403			
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	0.806			

Uncertainty of Radiated Emission Measurement (30MHz ~ 1,000MHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	0.1727	dB	normal(k=1)	0.1727
Cable loss	0.1736	dB	normal(k=2)	0.0868
Antenna gain	0.1687	dB	normal(k=2)	0.0843
Site imperfection	0.4898	dB	Triangular	0.2
Pre-amplifier gain	0.3661	dB	normal(k=2)	0.183
Transmitter antenna	1.7	dB	rectangular	0.9815
Signal generator	0.5	dB	rectangular	0.2887
Mismatch	0.08	dB	u-shape	0.244
Spectrum analyzer	0.5	dB	rectangular	0.2887
combined standard uncertainty Ue(y)	1.1434			
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	2.2869			

Uncertainty of Radiated Emission Measurement (1GHz ~ 18GHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	0.1908	dB	normal(k=1)	0.1908
Cable loss	0.1685	dB	normal(k=2)	0.0843
Antenna gain	0.1912	dB	normal(k=2)	0.0956
Site imperfection	1.3091	dB	Triangular	0.5344
Pre-amplifier gain	0.3043	dB	normal(k=2)	0.1521
Transmitter antenna	1.7	dB	rectangular	0.9815
Signal generator	0.5	dB	rectangular	0.2887
Mismatch	0.08	dB	u-shape	0.244
Spectrum analyzer	0.8	dB	rectangular	0.4619
combined standard uncertainty Ue(y)	1.2965			
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	2.593			

Uncertainty of Radiated Emission Measurement (18GHz ~ 40GHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	0.1864	dB	normal(k=1)	0.1864
Cable loss	0.1666	dB	normal(k=2)	0.0833
Antenna gain	0.1904	dB	normal(k=2)	0.0952
Site imperfection	0.4882	dB	Triangular	0.1993
Pre-amplifier gain	0.2688	dB	normal(k=2)	0.1344
Transmitter antenna	1.7	dB	rectangular	0.9815
Signal generator	0.5	dB	rectangular	0.2887
Mismatch	0.08	dB	u-shape	0.244
Spectrum analyzer	0.8	dB	rectangular	0.4619
combined standard uncertainty Ue(y)	1.1874			
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	2.3749			