ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT AND INDUSTRY CANADA RSS 210 CLASS II PC REPORT

OF

Product Name:	**PCIE 802.11a/b/g/n 2.4GHz/5GHz +USB BT 4.0card**
Brand Name:	**Qualcomm Atheros**
Model No.:	**QCNFA222**
Model Difference:	**N/A**
FCC ID:	**PPD-QCNFA222**
IC:	**4104A-QCNFA222**
Report No.:	**E2/2014/90017**
Issue Date:	**Dec. 09, 2014**
FCC Rule Part:	**§15.247, Cat: DTS**
IC Rule Part:	**RSS-210 issue 8 :2010, Annex 8**
Prepared for:	**Qualcomm Atheros, Inc. 1700 Technology Drive, San Jose, CA 95110**
Prepared by:	**SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan Township, Taoyuan County, Taiwan 333**

Testing Laboratory
0513

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VERIFICATION OF COMPLIANCE

Applicant:	Qualcomm Atheros, Inc. 1700 Technology Drive, San Jose, CA 95110
Product Name:	PCIE 802.11a/b/g/n 2.4GHz/5GHz +USB BT 4.0card
Brand Name:	Qualcomm Atheros
Model No.:	QCNFA222
Model Difference:	N/A
FCC ID:	PPD-QCNFA222
IC:	4104A-QCNFA222
File Number:	E2/2014/90017
Date of test:	Sep. 15, 2014 ~ Dec. 09, 2014
Date of EUT Received:	Dec. 09, 2014

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4:2009 and RSS-Gen. issue 3 the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247 and IC RSS 210 issue 8: 2010 Annex 8.
The test results of this report relate only to the tested sample identified in this report.

Test By:	Jazz Huang	***Date***	Dec. 09, 2014
	Jazz Huang / Sr. Engineer		
Prepared By:	Tiffany Kao	***Date***	Dec. 09, 2014
	Tiffany Kao / Clerk		
Approved By:	Jim Chang	***Date***	Dec. 09, 2014
	Jim Chang / Supervisor		

Version

Version No.	Date	Description
00	Dec. 09, 2014	Initial creation of document

Table of Contents

1 GENERAL INFORMATION

1.1 Product description

General Information of Notebook:

Product Name:	Notebook	
Brand Name:	acer	
Model No.:	MS2398	
Model Difference:	N/A	
Hardware Version:	ENG phase	
Software Version:	N/A	
Model No. for BT/WLAN Module:	QCNFA222	
Module FCC ID:	PPD-QCNFA222	
Module IC:	4104A-QCNFA222	
Scope:	The test report covers the radiated emissions requirements of the standards referenced in the report to allow system level approval of the module in this specific host.	
Class II Permissive change:	PCIE 802.11a/b/g/n 2.4GHz/5GHz +USB BT 4.0card (QCNFA222) INSTALLED IN AN Tablet Computer	
Power Supply:	11.4Vdc Rechargeable Li-polymer battery pack or 19Vdc from AC/DC adapter	
	Battery:	Model No.: AC14C8I, Supplier: acer
	Adapter:	Model No.: A13-045N2A, Supplier: CHICONY

WLAN 2.4GHz+5.7GHz:

Wi-Fi	Frequency Range	Channels	Rated Power (Peak)	Modulation Technology	Type of Emission
11b/g	2412-2462	11	b: 18.47dBm(MIMO Chain0) b: 17.86dBm(MIMO Chain1) b: 21.19dBm (MIMO Chain 0+1) g: 23.70dBm(MIMO Chain0) g: 22.20dBm(MIMO Chain1) g: 26.02dBm (MIMO Chain 0+1)	DSSS OFDM	b: 13M7G1D g: 17M5D1D
11n (2.4GHz)	HT20 2412-2462	11	n: 22.82dBm (MIMO Chain0) n: 21.81dBm (MIMO Chain 1) n: 25.35dBm (MIMO Chain 0+1)	OFDM	18M2D1D
11n (2.4GHz)	HT40 2422-2452	11	n: 19.73dBm (MIMO Chain0) n: 17.88dBm (MIMO Chain 1) n: 21.91dBm (MIMO Chain 0+1)	OFDM	38M0D1D

Wi-Fi	Frequency Range	Channels	Rated Power (Avg.)	Modulation Technology	Type of Emission
11a	5725-5850	5	a: 18.62dBm (MIMO Chain0) a: 18.05dBm (MIMO Chain 1) a: 21.27dBm (MIMO Chain 0+1)	OFDM	20M6D1D
11n (5GHz)	HT20 5725-5850	5	n: 18.51dBm (MIMO Chain0) n: 18.02dBm (MIMO Chain 1) n: 21.28dBm (MIMO Chain 0+1)		36M1D1D
11n (5GHz)	HT40 5725-5850	2	n: 17.38dBm (MIMO Chain0) n: 16.87dBm (MIMO Chain 1) n: 20.14dBm (MIMO Chain 0+1)		73M6D1D
Antenna Designation:			PIFA Antenna 1. Antenna Main: 2.4GHz: 2.83dBi / 5GHz: -0.63dBi 2. Antenna Aux: 2.4GHz: 2.80dBi / 5GHz: 0.07dBi		
Modulation type			CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM		
Transition Rate:			802.11 a: 6/9/12/18/24/36/48/54 Mbps; 802.11 b: 1/2/5.5/11 Mbps; 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144Mbps 802.11 n_40MHz: 13.5 – 300Mbps		

The 2.4G max antenna gain is 2.83dBi which was choosing for Radiated Spurious Emission test.

The 5G max antenna gain is 0.07dBi which was choosing for Radiated Spurious Emission test.

The EUT is in compliance with FCC §15.247 at which the frequency band of 2400~2483.5, and 5725~5850MHz has been tested.

IEEE 802.11n Spec:

MCS Index	Nss	Modulation	R	NBPSC	NCBPS		NDBPS		Datarate(Mbps)			
									800nsGI		400nsGI	
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5	7.200	15
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0	14.400	30
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5	21.700	45
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0	28.900	60
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0	43.300	90
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0	57.800	120
6	1	64-QAM	3/4	6	312	648	234	486	58.5	121.5	65.000	135
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0	72.200	150

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPSC	Number of coded bite per single carrier
NCBPS	Number of coded bite per symbol
NDBPS	Number of data bite per symbol
GI	Guard interval

802.11n_HT20 MCS8 -15

MCS Index	Modulation	*R*	$N_{BPSCS(iSS)}$	N_{SD}	N_{SP}	N_{CBPS}	N_{DBPS}	Data rate (Mb/s)	
								800 ns GI	400 ns GI (see NOTE)
8	BPSK	1/2	1	52	4	104	52	13.0	14.4
9	QPSK	1/2	2	52	4	208	104	26.0	28.9
10	QPSK	3/4	2	52	4	208	156	39.0	43.3
11	16-QAM	1/2	4	52	4	416	208	52.0	57.8
12	16-QAM	3/4	4	52	4	416	312	78.0	86.7
13	64-QAM	2/3	6	52	4	624	416	104.0	115.6
14	64-QAM	3/4	6	52	4	624	468	117.0	130.0
15	64-QAM	5/6	6	52	4	624	520	130.0	144.4
NOTE—The 400 ns GI rate values are rounded to 1 decimal place.									

802.11n_HT40 MCS8 -15

MCS Index	Modulation	R	$N_{BPSCS(i_{SS})}$	N_{SD}	N_{SP}	N_{CBPS}	N_{DBPS}	Data rate (Mb/s)	
								800 ns GI	400 ns GI
8	BPSK	1/2	1	108	6	216	108	27.0	30.0
9	QPSK	1/2	2	108	6	432	216	54.0	60.0
10	QPSK	3/4	2	108	6	432	324	81.0	90.0
11	16-QAM	1/2	4	108	6	864	432	108.0	120.0
12	16-QAM	3/4	4	108	6	864	648	162.0	180.0
13	64-QAM	2/3	6	108	6	1296	864	216.0	240.0
14	64-QAM	3/4	6	108	6	1296	972	243.0	270.0
15	64-QAM	5/6	6	108	6	1296	1080	270.0	300.0

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: PPD-QCNFA222** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. And **IC: 4104A-QCNFA222** filing to comply with Industry Canada RSS-210 issue 8: 2010 Annex 8. The composite system (digital device) is compliance with Subpart B under the DoC procedure.

1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4:2009 and RSS-Gen: 2010. Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with June 2014 KDB558074 D01 DTS Meas Guidance v03r02 for compliance to FCC 47CFR 15.247 requirements.

1.4 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan Township, Taoyuan County, Taiwan 333 which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2009. FCC Registration Number is: 990257. Canada Registration Number: 4620A-4.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 &10 meters) and FCC Registration Number: 94644.

1.5 Special Accessories

There are no special accessories used while test was conducted.

1.6 Equipment Modifications

There was no modification incorporated into the EUT.

2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the general criterion in Section 7.1 of ANSI C63.4:2009.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz, and the measurement procedure 7.3 in ANSI 63.4:2009 is followed to carry out the test. The CISPR Quasi-Peak and Average detector mode is employed according to §15.107

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna. according to the requirements in Section 8 and 13 and of ANSI C63.4:2009,

2.4 Configuration of Tested System

Fig. 2-1 Radiated Emission & Conducted (Antenna Port) Configuration

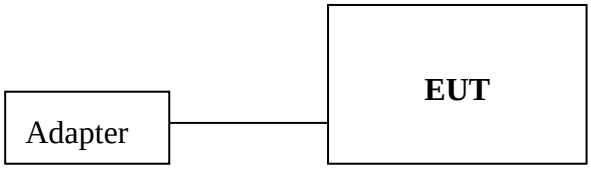


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A

3 SUMMARY OF TEST RESULTS

FCC / IC Rules	Description Of Test	Result
§15.247(b) (3) RSS-210 §A8.4(4)	Peak Output Power	Compliant
§15.247(d) RSS-210 §A8.5	Spurious Emission	Compliant
§15.203 RSS-GEN §7.1.2,	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.
Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

802.11 b mode: Channel low (2412MHz)、mid (2437MHz) and high (2462MHz) with 1Mbps lowest data rate are chosen for full testing.

802.11 g mode: Channel low (2412MHz)、mid (2437MHz) and high (2462MHz) with 6Mbps lowest data rate are chosen for full testing.

802.11 n_20MHz mode: Channel low (2412MHz)、mid (2437MHz) and high (2462MHz) with 6.5Mbps lowest data rate are chosen for full testing.

802.11 n_40MHz: Lowest (2422MHz), Mid(2437MHz) and high (2452MHz) with 13.5 Mbps highest data rate are chosen for above testing.

802.11 a mode: Channel low (5745MHz)、mid (5785MHz) and high (5825MHz) with 6Mbps lowest data rate are chosen for full testing.

802.11 n (5GHz) _20MHz: Lowest (5745MHz), Mid (5785MHz) and high (5825MHz) with 6.5 Mbps lowest data rate are chosen for full testing.

802.11 n (5GHz) _40MHz: Lowest (5755MHz) and high (5795MHz) with 13.5 Mbps lowest data rate are chosen for full testing.

The worst case is determined by the output power that generates the highest emission. As examined in the section of output power measurement, the section 7.5, the lowest data rate at a/b/g/n_HT20/n_HT40 resulted the highest level of fundamental emission, and therefore, the lowest data rate is chosen as the worst-case to conduct the remaining of other mandatory test cases.

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11a/b/g/n WLAN Transmitter for channel Low, Mid and High, the worst case E2 position was tested on 802.11b (2437MHz) and 802.11a (5785MHz) as resulted in pre-scanned measurement.

Pre-scanned was done on Antenna Main and Antenna Aux, and Antenna Main results higher emission at 2.4GHz, and Antenna Aux results higher emission at 5.8GHz. Therefore, the completed set of measurement was done on Antenna Main (2.4GHz); Antenna Aux (5GHz) to be presented on this test repot.

5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 1.55dB (for Spectrum) +/- 1.42 dB (for Power Meter)
6dB Bandwidth	+/- 123.36 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 1.55 dB
Peak Power Density	+/- 1.55 dB
99% Power Bandwidth	+/- 123.36 Hz
Temperature	+/- 0.8 °C
Humidity	+/- 4.7 %
DC / AC Power Source	DC= +/- 1%, AC=+/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : **Vertical**)	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : **Horizontal**)	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

6 PEAK OUTPUT POWER MEASUREMENT

6.1 Standard Applicable:

According to §15.247 (b)

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to RSS-210 issue 8,§A8.4(4), for systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, the maximum peak conducted output power shall not exceed 1 W. Except as provided in Section A8.4 (5), the e.i.r.p. shall not exceed 4 W.

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmitted power delivered to all antennas and antenna elements, averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.

Note:

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

Effective Legacy Gain = 2.83+3.01=5.84dBi (2.4GHz)

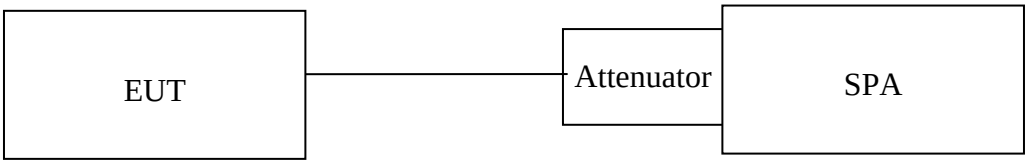
Effective Legacy Gain = 0.07+3.01=3.08dBi (5GHz)

6.2 Measurement Equipment Used:

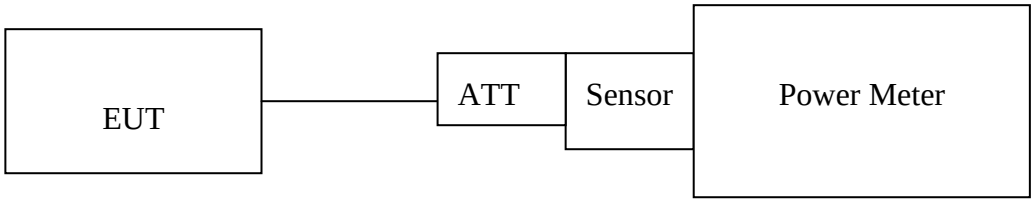
SGS Conducted Room					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer	Agilent	N9010A	MY53400256	2014/10/15	2015/10/14
Power Meter	Anritsu	ML2496A	1326001	2014/06/20	2015/06/19
Power Sensor	Anritsu	MA2411B	1315048	2014/06/20	2015/06/19
Power Sensor	Anritsu	MA2411B	1315049	2014/06/20	2015/06/19
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	2	2014/01/06	2015/01/05
DC Block	Mini-Circuits	BLK-18-S+	4	2014/01/06	2015/01/05
Splitter	RF-LAMBAD	RFLT2W1G18G	11-JSPF412-019	2014/01/06	2015/01/05
Attenuator	WOKEN	218FS-10	7	2014/01/06	2015/01/05
Bluetooth Test Set	Anritsu	8852B	1329002	2014/07/16	2015/07/15

6.3 Test Set-up:

Spectrum:



Power Meter:



6.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (**Peak power setting on Spectrum:** Channel power function, RBW = 1MHz, VBW = 3MHz, Span: 30/60MHz, Detector =peak, Sweep = Auto. Setting on spectrum is adjusted based on the mandatory procedure in 9.1.2 of the KDB558074). Power Meter is used as the auxiliary test equipment to conduct the output power measurement. 9.1.3 in KDB558074 is followed.
(**Avg. power setting on Spectrum:** Channel power function, RBW = 1MHz, VBW = 3MHz, Span: 30/60MHz, Detector =Avg., Trace avg =100, Sweep = Auto, Setting on spectrum is adjusted based on the mandatory procedure in 9.2.2.4 of the KDB558074). Power Meter is used as the auxiliary test equipment to conduct the output power measurement. 9.2.3, option 3 in KDB558074 is followed.
3. Record the max. Reading as observed from Spectrum or Power Meter.
4. Repeat above procedures until all frequency of interest measured was complete.
5. For MIMO operation, measurement is done per chain basis, and then sum the simultaneous transmitting output in linear.

6.5 Measurement Result (Worst Case Data Rate):

802.11b MIMO Chain 0

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		5.5	
1	2412	17.40	1 Watt = 30 dBm
6	2437	**18.47**	1 Watt = 30 dBm
11	2462	16.02	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		5.5	
1	2412	14.93	1 Watt = 30 dBm
6	2437	**16.05**	1 Watt = 30 dBm
11	2462	13.73	1 Watt = 30 dBm

802.11b MIMO Chain 1

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		5.5	
1	2412	16.74	1 Watt = 30 dBm
6	2437	**17.86**	1 Watt = 30 dBm
11	2462	16.12	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		5.5	
1	2412	14.71	1 Watt = 30 dBm
6	2437	**15.81**	1 Watt = 30 dBm
11	2462	13.83	1 Watt = 30 dBm

802.11b MIMO Chain 0+Chain 1

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		5.5	
1	2412	20.09	1 Watt = 30 dBm
6	2437	**21.19**	1 Watt = 30 dBm
11	2462	19.08	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		5.5	
1	2412	17.83	1 Watt = 30 dBm
6	2437	**18.94**	1 Watt = 30 dBm
11	2462	16.79	1 Watt = 30 dBm

802.11g MIMO Chain 0

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
1	2412	18.17	1 Watt = 30 dBm
6	2437	**23.70**	1 Watt = 30 dBm
11	2462	16.53	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
1	2412	8.93	1 Watt = 30 dBm
6	2437	**13.92**	1 Watt = 30 dBm
11	2462	6.71	1 Watt = 30 dBm

802.11g MIMO Chain 1

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
1	2412	19.14	1 Watt = 30 dBm
6	2437	**22.20**	1 Watt = 30 dBm
11	2462	16.85	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
1	2412	8.92	1 Watt = 30 dBm
6	2437	**13.31**	1 Watt = 30 dBm
11	2462	6.89	1 Watt = 30 dBm

802.11g MIMO Chain 0+Chain 1

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		5.5	
1	2412	21.69	1 Watt = 30 dBm
6	2437	**26.02**	1 Watt = 30 dBm
11	2462	19.70	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		5.5	
1	2412	11.94	1 Watt = 30 dBm
6	2437	**16.64**	1 Watt = 30 dBm
11	2462	9.81	1 Watt = 30 dBm

802.11n_20M (2.4G) MIMO Chain 0

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
1	2412	17.33	1 Watt = 30 dBm
6	2437	**22.82**	1 Watt = 30 dBm
11	2462	15.50	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
1	2412	7.44	1 Watt = 30 dBm
6	2437	**14.01**	1 Watt = 30 dBm
11	2462	5.56	1 Watt = 30 dBm

802.11n_20M (2.4G) MIMO Chain 1

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
1	2412	16.25	1 Watt = 30 dBm
6	2437	**21.81**	1 Watt = 30 dBm
11	2462	15.72	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
1	2412	6.34	1 Watt = 30 dBm
6	2437	**12.86**	1 Watt = 30 dBm
11	2462	5.69	1 Watt = 30 dBm

802.11n_20M (2.4G) MIMO Chain 0+Chain 1

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
1	2412	19.83	1 Watt = 30 dBm
6	2437	**25.35**	1 Watt = 30 dBm
11	2462	18.62	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
1	2412	9.94	1 Watt = 30 dBm
6	2437	**16.48**	1 Watt = 30 dBm
11	2462	8.64	1 Watt = 30 dBm

802.11n_40M (2.4G) MIMO Chain 0

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS0	
3	2422	16.10	1 Watt = 30 dBm
6	2437	**19.73**	1 Watt = 30 dBm
9	2452	15.25	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS0	
3	2422	5.91	1 Watt = 30 dBm
6	2437	**8.95**	1 Watt = 30 dBm
9	2452	4.89	1 Watt = 30 dBm

802.11n_40M (2.4G) MIMO Chain 1

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS0	
3	2422	14.77	1 Watt = 30 dBm
6	2437	**17.88**	1 Watt = 30 dBm
9	2452	14.17	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS0	
3	2422	5.24	1 Watt = 30 dBm
6	2437	**8.94**	1 Watt = 30 dBm
9	2452	4.61	1 Watt = 30 dBm

802.11n_40M (2.4G) MIMO Chain 0+Chain 1

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS0	
3	2422	18.50	1 Watt = 30 dBm
6	2437	**21.91**	1 Watt = 30 dBm
9	2452	17.75	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS0	
3	2422	8.60	1 Watt = 30 dBm
6	2437	**11.96**	1 Watt = 30 dBm
9	2452	7.76	1 Watt = 30 dBm

802.11a MIMO Chain 0

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
149	5745	**18.62**	1 Watt = 30 dBm
157	5785	18.51	1 Watt = 30 dBm
165	5825	18.31	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
149	5745	10.14	1 Watt = 30 dBm
157	5785	10.22	1 Watt = 30 dBm
165	5825	**10.37**	1 Watt = 30 dBm

802.11a MIMO Chain 1

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
149	5745	17.79	1 Watt = 30 dBm
157	5785	18.00	1 Watt = 30 dBm
165	5825	**18.05**	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
149	5745	10.04	1 Watt = 30 dBm
157	5785	**10.38**	1 Watt = 30 dBm
165	5825	10.22	1 Watt = 30 dBm

802.11a MIMO Chain 0+Chain 1

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
149	5745	21.24	1 Watt = 30 dBm
157	5785	**21.27**	1 Watt = 30 dBm
165	5825	21.19	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
149	5745	13.10	1 Watt = 30 dBm
157	5785	**13.31**	1 Watt = 30 dBm
165	5825	13.31	1 Watt = 30 dBm

802.11n (5GHz)_20M MIMO Chain 0

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
149	5745	**18.51**	1 Watt = 30 dBm
157	5785	17.67	1 Watt = 30 dBm
165	5825	17.52	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
149	5745	12.29	1 Watt = 30 dBm
157	5785	11.89	1 Watt = 30 dBm
165	5825	**12.50**	1 Watt = 30 dBm

802.11n (5GHz)_20M MIMO Chain 1

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
149	5745	**18.02**	1 Watt = 30 dBm
157	5785	17.45	1 Watt = 30 dBm
165	5825	17.41	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
149	5745	12.03	1 Watt = 30 dBm
157	5785	11.84	1 Watt = 30 dBm
165	5825	**12.31**	1 Watt = 30 dBm

802.11n (5GHz)_20M MIMO Chain 0+ Chain1

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
149	5745	**21.28**	1 Watt = 30 dBm
157	5785	20.57	1 Watt = 30 dBm
165	5825	20.48	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
149	5745	15.17	1 Watt = 30 dBm
157	5785	14.88	1 Watt = 30 dBm
165	5825	**15.42**	1 Watt = 30 dBm

802.11n (5GHz)_40M MIMO Chain 0

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
151	5755	17.38	1 Watt = 30 dBm
159	5795	17.29	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
151	5755	12.17	1 Watt = 30 dBm
159	5795	12.07	1 Watt = 30 dBm

802.11n (5GHz)_40M MIMO Chain 1

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
151	5755	16.87	1 Watt = 30 dBm
159	5795	16.75	1 Watt = 30 dBm

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
151	5755	11.81	1 Watt = 30 dBm
159	5795	11.53	1 Watt = 30 dBm

802.11n (5GHz)_40M MIMO Chain 0+Chain 1

		Peak Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
151	5755	**20.14**	**1 Watt = 30 dBm**
159	5795	20.04	**1 Watt = 30 dBm**

		Average Power Output (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
151	5755	**15.00**	**1 Watt = 30 dBm**
159	5795	14.82	**1 Watt = 30 dBm**

**** Note: The duty cycle factor is compensated back to obtain the maximum value of the measurement in average.***

802.11b MIMO Chain 0

CH	Frequency (MHz)	EIRP (dBm)	
		Data Rate	Required Limit
		5.5	
1	2412	20.77	1 Watt = 30 dBm
6	2437	**21.89**	1 Watt = 30 dBm
11	2462	19.57	1 Watt = 30 dBm

802.11b MIMO Chain 1

CH	Frequency (MHz)	EIRP (dBm)	
		Data Rate	Required Limit
		5.5	
1	2412	20.55	1 Watt = 30 dBm
6	2437	**21.65**	1 Watt = 30 dBm
11	2462	19.67	1 Watt = 30 dBm

802.11b MIMO Chain 0+Chain 1

CH	Frequency (MHz)	EIRP (dBm)	
		Data Rate	Required Limit
		5.5	
1	2412	23.67	1 Watt = 30 dBm
6	2437	**24.78**	1 Watt = 30 dBm
11	2462	22.63	1 Watt = 30 dBm

802.11g MIMO Chain 0

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
1	2412	14.77	1 Watt = 30 dBm
6	2437	**19.76**	1 Watt = 30 dBm
11	2462	12.55	1 Watt = 30 dBm

802.11g MIMO Chain 1

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
1	2412	14.76	1 Watt = 30 dBm
6	2437	**19.15**	1 Watt = 30 dBm
11	2462	12.73	1 Watt = 30 dBm

802.11g MIMO Chain 0+Chain 1

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		5.5	
1	2412	17.78	1 Watt = 30 dBm
6	2437	**22.48**	1 Watt = 30 dBm
11	2462	15.65	1 Watt = 30 dBm

802.11n_20M (2.4G) MIMO Chain 0

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
1	2412	13.28	1 Watt = 30 dBm
6	2437	**19.85**	1 Watt = 30 dBm
11	2462	11.40	1 Watt = 30 dBm

802.11n_20M (2.4G) MIMO Chain 1

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
1	2412	12.18	1 Watt = 30 dBm
6	2437	**18.70**	1 Watt = 30 dBm
11	2462	11.53	1 Watt = 30 dBm

802.11n_20M (2.4G) MIMO Chain 0+Chain 1

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
1	2412	15.78	1 Watt = 30 dBm
6	2437	**22.32**	1 Watt = 30 dBm
11	2462	14.48	1 Watt = 30 dBm

802.11n_40M (2.4G) MIMO Chain 0

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS0	
3	2422	11.75	1 Watt = 30 dBm
6	2437	14.79	1 Watt = 30 dBm
9	2452	10.73	1 Watt = 30 dBm

802.11n_40M (2.4G) MIMO Chain 1

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS0	
3	2422	11.08	1 Watt = 30 dBm
6	2437	14.78	1 Watt = 30 dBm
9	2452	10.45	1 Watt = 30 dBm

802.11n_40M (2.4G) MIMO Chain 0+Chain 1

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS0	
3	2422	14.44	1 Watt = 30 dBm
6	2437	17.80	1 Watt = 30 dBm
9	2452	13.60	1 Watt = 30 dBm

802.11a MIMO Chain 0

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
149	5745	13.22	1 Watt = 30 dBm
157	5785	13.30	1 Watt = 30 dBm
165	5825	13.45	1 Watt = 30 dBm

802.11a MIMO Chain 1

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
149	5745	13.12	1 Watt = 30 dBm
157	5785	13.46	1 Watt = 30 dBm
165	5825	13.30	1 Watt = 30 dBm

802.11a MIMO Chain 0+Chain 1

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		6	
149	5745	16.18	1 Watt = 30 dBm
157	5785	16.39	1 Watt = 30 dBm
165	5825	16.39	1 Watt = 30 dBm

802.11n (5GHz)_20M MIMO Chain 0

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
149	5745	15.37	1 Watt = 30 dBm
157	5785	14.97	1 Watt = 30 dBm
165	5825	**15.58**	1 Watt = 30 dBm

802.11n (5GHz)_20M MIMO Chain 1

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
149	5745	15.11	1 Watt = 30 dBm
157	5785	14.92	1 Watt = 30 dBm
165	5825	**15.39**	1 Watt = 30 dBm

802.11n (5GHz)_20M MIMO Chain 0+ Chain1

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
149	5745	18.25	1 Watt = 30 dBm
157	5785	17.96	1 Watt = 30 dBm
165	5825	**18.50**	1 Watt = 30 dBm

802.11n (5GHz)_40M MIMO Chain 0

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
151	5755	15.25	1 Watt = 30 dBm
159	5795	15.15	1 Watt = 30 dBm

802.11n (5GHz)_40M MIMO Chain 1

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
151	5755	14.89	1 Watt = 30 dBm
159	5795	14.61	1 Watt = 30 dBm

802.11n (5GHz)_40M MIMO Chain 0+Chain 1

		EIRP (dBm)	
CH	Frequency (MHz)	Data Rate	Required Limit
		MCS8	
151	5755	18.08	1 Watt = 30 dBm
159	5795	17.90	1 Watt = 30 dBm

* Note: EIRP = Average Power + Gain, where the nominal gain of the antenna 5.84dBi for 2.4GHz (MIMO) and 3.08dBi for 5GHz (MIMO)), where MIMO gain = directive gain + nominal gain.

7 BAND EDGES MEASUREMENT

7.1 Standard Applicable:

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

According to RSS-Gen §7.2.5 and RSS-210 issue 8,§A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 5 and 6 is not required. In addition, radiated emissions which fall in the restricted bands of Table 3 must also comply with the radiated emission limits specified in Tables 5 and 6.

7.2 Measurement Equipment Used:

7.2.1 Conducted Emission at antenna port:

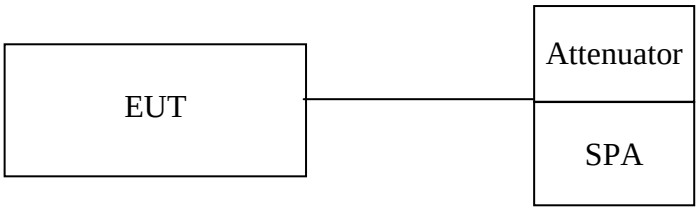
Refer to section 7.2 for details.

7.2.2 Radiated emission:

966 Chamber					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
EMI Test Receiver	R&S	ESU 40	100363	2014/04/12	2015/04/11
Loop Antenna	ETS-Lindgren	6502	00143303	2014/01/16	2015/01/15
Broadband Antenna	TESEQ	CBL 6112D	35240	2014/01/17	2015/01/16
Horn Antenna	ETS-Lindgren	3117	00143272	2014/01/27	2015/01/26
Horn Antenna	ETS-Lindgren	3160-09	00117911	2014/01/22	2015/01/21
Pre Amplifier	R&S	SCU-18	10204	2014/03/26	2015/03/25
Pre Amplifier	R&S	SCU-26	100780	2014/03/26	2015/03/25
Pre Amplifier	EMC Instruments	EMC330	980096	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	RG 214/U	W21.03	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	RG 214/U	W22.03	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17413/4	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17404/4	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17394/4	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17386/4	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17388/4	2014/03/26	2015/03/25
Attenuator	WOKEN	218FS-10	HY-151	2014/01/06	2015/01/05
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Site NSA	SGS	966 Chamber C	SAC-C	2014/03/05	2015/03/04

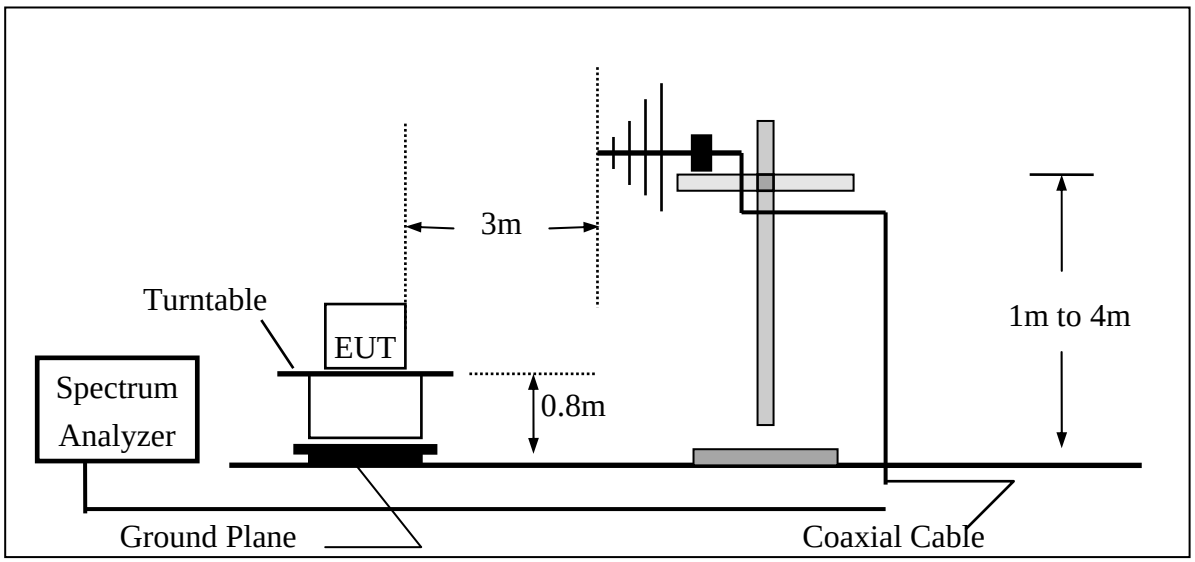
7.3 Test SET-UP:

7.3.1 Conducted Emission at antenna port:

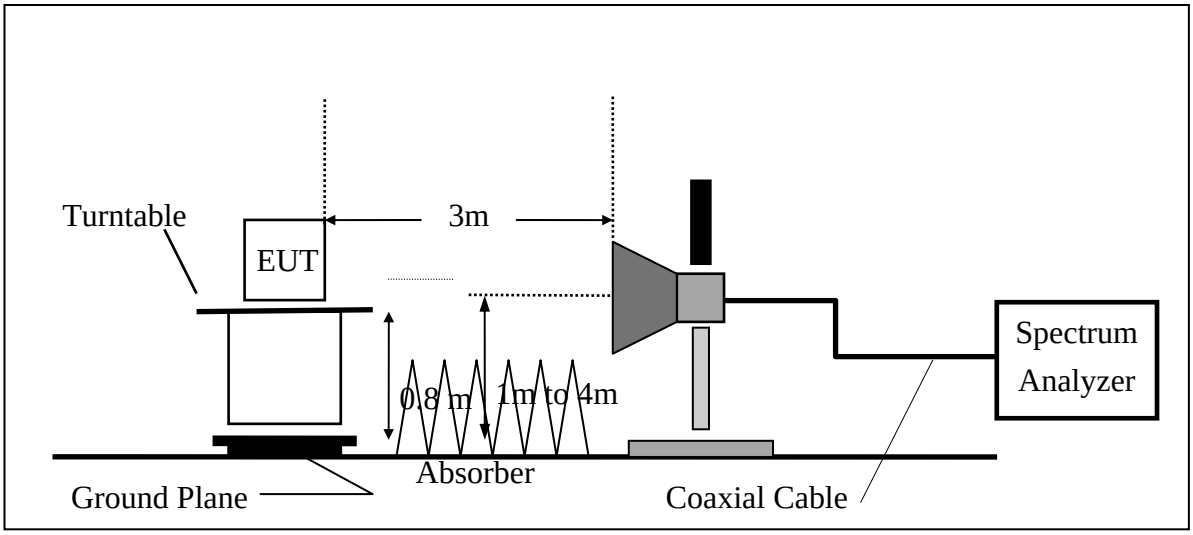


7.3.2 Radiated emission:

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



7.4 Measurement Procedure:

Unwanted Emissions into Non-Restricted Frequency Bands, Measurement Procedure followed by 11.1 of KDB558074 D01

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
4. Set the spectrum analyzer as RBW, VBW=300KHz, Detector = Peak, Sweep = auto
5. Mark the highest reading of the emission as the reference level measurement.
6. Set DL as the limit = reading on marker 1 – 20dBm
7. Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 KHz immediately outside the authorized (2400~2483.5) be attenuated by 20dB at least relative to the maximum emission of power.
8. Repeat above procedures until all default test channel (low, middle, and high) was complete.

Unwanted Emission falling into Restricted Frequency Bands, Measurement Procedure followed by 12.1 of KDB558074 D01

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. On spectrum, following 8.1.2, and RBW = 1MHz, VBW = 3MHz, & Marker 2390MHz, and 2483.5MHz (Peak Measurement). Average Measurement: following 8.2 with the modification span to 1MHz, &RBW = 1MHz, VBW = 3MHz and peak marker function to obtain the highest reading on 2390, and 2483.5MHz.
8. Repeat above procedures until all default test channel (low, middle, and high) was complete

Note: For MIMO operation, directional gain is not subjected to offset back as prescribe in KDB 662911 D01 for relative out-of-band measurement, including conducted bandedge falling into non-restricted frequency band.

7.5 Field Strength Calculation:

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

7.6 Measurement Result:

Note: Refer to next page tabular data sheets.

Radiated Emission:

(Unwanted Emissions into Restricted Frequency Bands): 802.11 b mode

Operation Band	:802.11 b	Test Date	:2014-11-26
Fundamental Frequency	:2412 MHz	Temp./Humi.	:25.4 deg_C / 57 RH
Operation Mode	:Bandedge LOW	Engineer	:Aken
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2386.68	Peak	S	56.17	3.13	59.30	74.00	-14.70
2386.68	Average	S	44.35	3.13	47.48	54.00	-6.52
2390.00	Peak	E	55.40	3.14	58.54	74.00	-15.46
2390.00	Average	E	43.03	3.14	46.17	54.00	-7.83

Operation Band	:802.11 b	Test Date	:2014-11-26
Fundamental Frequency	:2412 MHz	Temp./Humi.	:25.4 deg_C / 57 RH
Operation Mode	:Bandedge LOW	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2386.92	Peak	S	57.83	3.13	60.96	74.00	-13.04
2386.92	Average	S	45.99	3.13	49.12	54.00	-4.88
2390.00	Peak	E	57.66	3.14	60.80	74.00	-13.20
2390.00	Average	E	44.41	3.14	47.55	54.00	-6.45

Operation Band	:802.11 b	Test Date	:2014-11-26
Fundamental Frequency	:2462 MHz	Temp./Humi.	:25.4 deg_C / 57 RH
Operation Mode	:Bandedge HIGH	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2483.50	Peak	E	55.27	3.35	58.63	74.00	-15.37
2483.50	Average	E	41.25	3.35	44.60	54.00	-9.40
2488.30	Peak	S	56.19	3.36	59.55	74.00	-14.45
2488.30	Average	S	41.26	3.36	44.62	54.00	-9.38

Operation Band	:802.11 b	Test Date	:2014-11-26
Fundamental Frequency	:2462 MHz	Temp./Humi.	:25.4 deg_C / 57 RH
Operation Mode	:Bandedge HIGH	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2483.50	Peak	E	56.28	3.35	59.63	74.00	-14.37
2483.50	Average	E	43.36	3.35	46.71	54.00	-7.29
2487.30	Peak	S	57.54	3.36	60.91	74.00	-13.09
2487.30	Average	S	44.87	3.36	48.23	54.00	-5.77

Radiated Emission:

(Unwanted Emissions into Restricted Frequency Bands): 802.11 g mode

Operation Band	:802.11 g	Test Date	:2014-11-26
Fundamental Frequency	:2412 MHz	Temp./Humi.	:25.4 deg_C / 57 RH
Operation Mode	:Bandedge LOW	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2385.84	Peak	S	65.45	3.12	68.58	74.00	-5.42
2385.84	Average	S	40.93	3.12	44.05	54.00	-9.95
2390.00	Peak	E	67.80	3.14	70.94	74.00	-3.06
2390.00	Average	E	45.89	3.14	49.03	54.00	-4.97

Operation Band	:802.11 g	Test Date	:2014-11-26
Fundamental Frequency	:2412 MHz	Temp./Humi.	:25.4 deg_C / 57 RH
Operation Mode	:Bandedge LOW	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2386.80	Peak	S	69.43	3.13	72.56	74.00	-1.44
2386.80	Average	S	43.47	3.13	46.60	54.00	-7.40
2390.00	Peak	E	68.39	3.14	71.53	74.00	-2.47
2390.00	Average	E	45.82	3.14	48.96	54.00	-5.04

Operation Band	:802.11 g	Test Date	:2014-11-26
Fundamental Frequency	:2462 MHz	Temp./Humi.	:25.4 deg_C / 57 RH
Operation Mode	:Bandedge HIGH	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2483.50	Peak	E	55.84	3.35	59.19	74.00	-14.81
2483.50	Average	E	39.31	3.35	42.66	54.00	-11.34

Operation Band	:802.11 g	Test Date	:2014-11-26
Fundamental Frequency	:2462 MHz	Temp./Humi.	:25.4 deg_C / 57 RH
Operation Mode	:Bandedge HIGH	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2483.50	Peak	E	56.64	3.35	59.99	74.00	-14.01
2483.50	Average	E	39.52	3.35	42.87	54.00	-11.13

Radiated Emission:

(Unwanted Emissions into Restricted Frequency Bands): 802.11 n_20M mode

Operation Band	:802.11 n20M	Test Date	:2014-11-26
Fundamental Frequency	:2412 MHz	Temp./Humi.	:25.4 deg_C / 57 RH
Operation Mode	:Bandedge LOW	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2387.88	Peak	S	62.21	3.13	65.34	74.00	-8.66
2387.88	Average	S	42.03	3.13	45.16	54.00	-8.84
2390.00	Peak	E	65.69	3.14	68.83	74.00	-5.17
2390.00	Average	E	44.93	3.14	48.07	54.00	-5.93

Operation Band	:802.11 n20M	Test Date	:2014-11-26
Fundamental Frequency	:2412 MHz	Temp./Humi.	:25.4 deg_C / 57 RH
Operation Mode	:Bandedge LOW	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2388.48	Peak	S	65.46	3.13	68.59	74.00	-5.41
2388.48	Average	S	44.63	3.13	47.76	54.00	-6.24
2390.00	Average	E	47.05	3.14	50.19	54.00	-3.81
2390.00	Peak	E	67.72	3.14	70.86	74.00	-3.14

Operation Band	:802.11 n20M	Test Date	:2014-11-26
Fundamental Frequency	:2462 MHz	Temp./Humi.	:25.4 deg_C / 57 RH
Operation Mode	:Bandedge HIGH	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2483.50	Peak	E	54.49	3.35	57.85	74.00	-16.15
2483.50	Average	E	39.42	3.35	42.77	54.00	-11.23

Operation Band	:802.11 n20M	Test Date	:2014-11-26
Fundamental Frequency	:2462 MHz	Temp./Humi.	:25.4 deg_C / 57 RH
Operation Mode	:Bandedge HIGH	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2483.50	Peak	E	54.95	3.35	58.31	74.00	-15.69
2483.50	Average	E	39.83	3.35	43.18	54.00	-10.82

Radiated Emission:

(Unwanted Emissions into Restricted Frequency Bands): 802.11 n_40M mode

Operation Band	:802.11 n40M	Test Date	:2014-11-26
Fundamental Frequency	:2422 MHz	Temp./Humi.	:22deg_C/52 RH
Operation Mode	:Bandedge LOW	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2390.00	Peak	E	63.07	3.14	66.21	74.00	-7.79
2390.00	Average	E	39.78	3.14	42.92	54.00	-11.08

Operation Band	:802.11 n40M	Test Date	:2014-11-26
Fundamental Frequency	:2422 MHz	Temp./Humi.	:22deg_C/52 RH
Operation Mode	:Bandedge LOW	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2390.00	Peak	E	65.45	3.14	68.59	74.00	-5.41
2390.00	Average	E	41.03	3.14	44.17	54.00	-9.83

Operation Band	:802.11 n40M	Test Date	:2014-11-26
Fundamental Frequency	:2452 MHz	Temp./Humi.	:22deg_C/52 RH
Operation Mode	:Bandedge HIGH	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2483.50	Peak	E	64.42	3.35	67.77	74.00	-6.23
2483.50	Average	E	41.13	3.35	44.48	54.00	-9.52

Operation Band	:802.11 n40M	Test Date	:2014-11-26
Fundamental Frequency	:2452 MHz	Temp./Humi.	:22deg_C/52 RH
Operation Mode	:Bandedge HIGH	Engineer	:Jerry
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we've employed is peak detector.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2483.50	Peak	E	64.53	3.35	67.88	74.00	-6.12
2483.50	Average	E	41.65	3.35	45.00	54.00	-9.00

8 SPURIOUS EMISSION TEST

8.1 Standard Applicable

According to §15.247(d),

Emission at antenna port:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Radiated Spurious Emission

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

And according to §15.33(a) (1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

According to RSS-Gen §7.2.5 and RSS-210 issue 8,§A8.5, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 5 and 6 is not required. In addition, radiated emissions which fall in the restricted bands of Table 3 must also comply with the radiated emission limits specified in Tables 5 and 6 of RSS-GEN.

8.2 Measurement Equipment Used:

8.2.1 Conducted Emission at antenna port:

Refer to section 7.2 for details.

8.2.2 Radiated emission:

Refer to section 9.2.2 for details.

8.3 Test SET-UP:

8.3.1 Conducted Emission at antenna port:

Refer to section 7.3 for details.

8.3.2 Radiated emission:

Refer to section 9.3.2 for details.

8.4 Measurement Procedure:

Radiated Emission:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
7. Repeat above procedures until all default test channel measured were complete.

Conducted Emission:

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 100K & VBW = 300K on Spectrum.
3. Sweep the frequency to determine spurious emission as seen on spectrum from span of 30 to 3G, 3G to 8G, 8G to 13G, 13G to 18G and 18G to 26.5GHz, 18G to 40GHz (applicable if operation mode is 5GHz)
4. Via Software, combine 5 spans of frequency range into one plot
5. Repeat above procedures until all default test channel measured were complete.

Note: For MIMO operation, directional gain is not subjected to offset back as prescribe in KDB 662911 D01 for relative out-of-band measurement, including conducted bandedge falling into non-restricted frequency band.

8.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

8.6 Measurement Result:

Note: Refer to next page for tabular data sheets.

Radiated Spurious Emission Measurement Result (802.11b)(Worst Case)

Operation Band	:802.11 b	Test Date	:2014-11-26
Fundamental Frequency	:2437 MHz	Temp./Humi.	:24 deg_C / 61 RH
Operation Mode	:TX MID	Engineer	:Tai
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2988.00	Peak	S	54.73	-3.47	51.26	74.00	-22.74
2988.00	Average	S	21.46	-3.47	17.99	54.00	-36.01
3247.00	Peak	S	50.66	-2.76	47.90	74.00	-26.10
3247.00	Average	S	29.94	-2.76	27.18	54.00	-26.82
3744.00	Peak	S	47.89	-1.69	46.20	74.00	-27.80
3744.00	Average	S	30.99	-1.69	29.30	54.00	-24.70
3996.00	Peak	S	49.25	-1.10	48.16	74.00	-25.84
3996.00	Average	S	29.56	-1.10	28.46	54.00	-25.54
4874.00	Peak	S	47.32	0.41	47.73	74.00	-26.27
4874.00	Average	S	45.41	0.41	45.82	54.00	-8.18
7311.00	Peak	H	---				
9748.00	Peak	H	---				
12185.00	Peak	H	---				
14622.00	Peak	H	---				
17059.00	Peak	H	---				
19496.00	Peak	H	---				
21933.00	Peak	H	---				
24370.00	Peak	H	---				

Operation Band	:802.11 b	Test Date	:2014-11-26
Fundamental Frequency	:2437 MHz	Temp./Humi.	:24 deg_C / 61 RH
Operation Mode	:TX MID	Engineer	:Tai
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
2988.00	Peak	S	47.70	-4.43	43.27	74.00	-30.73
2988.00	Average	S	21.40	-4.43	16.97	54.00	-37.03
3247.00	Peak	S	52.72	-3.76	48.96	74.00	-25.04
3247.00	Average	S	30.13	-3.76	26.37	54.00	-27.63
3744.00	Peak	S	46.49	-1.71	44.78	74.00	-29.22
3744.00	Average	S	30.97	-1.71	29.26	54.00	-24.74
4874.00	Peak	S	46.53	0.41	46.94	74.00	-27.06
4874.00	Average	S	43.44	0.41	43.85	54.00	-10.15
7311.00	Peak	H	---				
9748.00	Peak	H	---				
12185.00	Peak	H	---				
14622.00	Peak	H	---				
17059.00	Peak	H	---				
19496.00	Peak	H	---				
21933.00	Peak	H	---				
24370.00	Peak	H	---				

Radiated Spurious Emission Measurement Result (802.11a) (Worst Case)

Operation Band	:802.11 a	Test Date	:2014-11-26
Fundamental Frequency	:5785 MHz	Temp./Humi.	:25.6 deg_C/55RH
Operation Mode	:TX MID	Engineer	:Tai
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV / m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBμV	dB	dBμV / m	dBμV / m	dB
11570.00	Peak	H	37.20	18.24	55.44	74.00	-18.56
11570.00	Average	H	24.40	18.24	42.64	54.00	-11.36
17355.00	Peak	H	---				
23140.00	Peak	H	---				
28925.00	Peak	H	---				
34710.00	Peak	H	---				

Operation Band	:802.11 a	Test Date	:2014-11-26
Fundamental Frequency	:5785 MHz	Temp./Humi.	:25.6 deg_C/55RH
Operation Mode	:TX MID	Engineer	:Tai
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBµV / m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV / m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq.	Detector Mode	Note	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	F/H/E/S	dBµV	dB	dBµV / m	dBµV / m	dB
11570.00	Peak	H	37.20	18.24	55.44	74.00	-18.56
11570.00	Average	H	24.43	18.24	42.67	54.00	-11.33
17355.00	Peak	H	---				
23140.00	Peak	H	---				
28925.00	Peak	H	---				
34710.00	Peak	H	---				

9 ANTENNA REQUIREMENT

9.1 Standard Applicable:

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

According to RSS-GEN 7.1.2, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

9.2 Antenna Connected Construction:

The directional gains of antenna used for transmitting is 2.83dBi for 2.4GHz, 0.07dBi for 5725-5850 MHz, and 5.84dBi for 2.4GHz MIMO, and 3.08dBi for 5.8G MIMO. In addition, the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.