TEST REPORT

of

FCC Part 15 Subpart C

☒ New Application; ☐ Class I PC; ☐ Class II PC

Limited Modular Approval for Notebook Model V100-G4/V200-G2

Product :	**Wireless LAN Module**
Brand:	**Getac**
Model:	**Advanced-N 6235**
Model Difference:	**N/A**
FCC ID:	**MAU046**
FCC Rule Part:	**§15.247, Cat: DTS**
Applicant:	**Getac Technology Corporation**
Address:	**5F., Building A, No. 209, Sec. 1, Nangang Rd., Nangang Dist., Taipei City 11568, Taiwan, R.O.C.**

Test Performed by:
International Standards Laboratory
<Lung-Tan LAB>
*Site Registration No.
BSMI: SL2-IN-E-0013; MRA TW1036; TAF: 0997; IC4067B-3;

*Address:
No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd.
Lung-Tan Hsiang, Tao Yuan County 325, Taiwan
*Tel : 886-3-407-1718; Fax: 886-3-407-1738

Report No.: **ISL-12LR098FCW**
Issue Date : **2012/07/16**

Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.
This report MUST not be used to claim product endorsement by TAF, NVLAP or any agency of the Government.
This test report shall not be reproduced except in full, without the written approval of International Standards Laboratory.

VERIFICATION OF COMPLIANCE

Applicant:	Getac Technology Corporation
Product Description:	Wireless LAN Module
Brand Name:	Getac
Model No.:	Advanced-N 6235
Model Difference:	N/A
FCC ID:	MAU046
Date of test:	2012/05/16 ~ 2012/06/28
Date of EUT Received:	2012/05/16

We hereby certify that:

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Test By:	Dion Chen	***Date:***	2012/07/16
	Dion Chang / Engineer		
Prepared By:	Eva Kao	***Date:***	2012/07/16
	Eva Kao / Technical Supervisor		
Approved By:	Vincent Su	***Date:***	2012/07/16
	Vincent Su / Technical Manager		

Version

Version No.	Date	Description
00	2012/07/16	Initial creation of document

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1 GENERAL INFORMATION

1.1 Product Description

General:

Product Name	Wireless LAN Module
Brand Name	Getac
Model Name	Advanced-N 6235
Model Difference	N/A

Notebook Platform Information:

Model Name	V100-G4/ V200-G2	
Model Difference	V100-G4: panel size 10”, V200-G2: panel size 12”	
Power Supply	10.8Vdc from Li-ion Battery or 19Vdc AC/DC Adapter or Car Charge	
	Adapter:	Model: ADM-6019M, Supplier: Getac

Bluetooth:

Bluetooth Version	V2.1 + EDR (GFSK + π /4 DQPSK + 8DPSK)	V4.0(GFSK)
Frequency Range:	2402 – 2480MHz	2402 – 2480MHz
Channel number:	79 channels	40 channels
Modulation type:	Frequency Hopping Spread Spectrum	Digital Modulation (Direct Sequence Spread Spectrum)
Transmit Power:	5.36 dBm	5.50dBm
Dwell Time:	<= 0.4s	N/A
Operating Mode:	Point-to-Point	
Antenna Designation:	PIFA Antenna, 2.6dBi P/N: 422125500011	

The EUT is compliance with Bluetooth EDR V2.1 +V4.0 Standard.

WLAN: 2X2 MIMO

Wi-Fi	Frequency Range (MHz)	Channels	Rated Power	Modulation Technology
802.11b	2412 – 2462(DTS)	11	15.33dBm	DSSS
802.11g	2412 – 2462(DTS)	11	15.34dBm	DSSS, OFDM
802.11n	HT20 2412 – 2462(DTS)	11	17.58dBm	OFDM
	HT20 5180 – 5240(NII)	4	11.44dBm	
	HT20 5260 – 5320(NII)	4	12.69dBm	
	HT20 5500 – 5700(NII)	8	12.99dBm	
	HT20 5745 – 5825(DTS)	5	15.85dBm	
	HT40 2422 – 2452(DTS)	7	17.84dBm	
	HT40 5190 – 5230(NII)	2	11.75dBm	
	HT40 5270 – 5310(NII)	2	12.90dBm	
	HT40 5510 – 5670(NII)	4	13.39dBm	
	HT40 5755 – 5795(DTS)	2	15.98dBm	
802.11a	5180 – 5240(NII)	4	11.83dBm	OFDM
	5260 – 5320(NII)	4	12.87dBm	
	5500 – 5700(NII)	8	12.87dBm	
	5745 – 5825(DTS)	5	15.65dBm	
Modulation type		CCK, DQPSK, DBPSK for DSSS 64QAM. 16QAM, QPSK, BPSK for OFDM		
Transition Rate:		Upto 300Mbps		
Antenna Designation:		PIFA Antenna R Site P/N: 422125500010; L Site P/N: 422125500011 R Site: 1.61dBi / L Site: 2.60dBi for 2.4GHz R Site: 2.45dBi / L Site: 3.97dBi for 5GHz		

The EUT is compliance with IEEE 802.11 a/b/g/n Standard.

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

This report applies for frequency bands 2402MHz– 2480MHz BT LE, 2412MHz– 2462MHz Wifi, and 5745MHz– 5825MHz Wifi.

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: MAU046** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. The composite system (digital device) is compliance with Subpart B is authorized under a DoC procedure.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003) and RSS-Gen: 2010. Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with KDB558074

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 **International Standards Laboratory** <Lung-Tan LAB> No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd., Lung-Tan Hsiang, Tao Yuan County 325, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003. FCC Registration Number is: TW1036, Canada Registration Number: 4067B-3.

1.5 Special Accessories

Not available for this EUT intended for grant.

1.6 Equipment Modifications

Not available for this EUT intended for grant.

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

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

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 requirements in Section 7 and 13 of ANSI C63.4-2003.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

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 according to the requirements in Section 8 and 13 of ANSI C63.4-2003.

2.4 Configuration of Tested System

Fig. 2-1 AC Power line and Radiated Emission Configuration

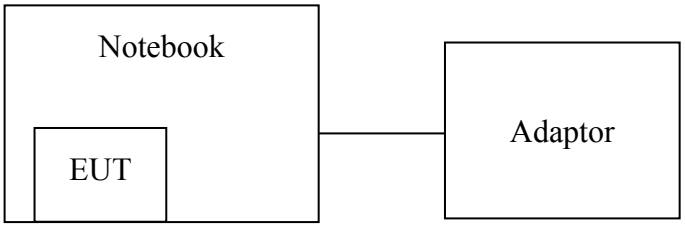


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1	Notebook	Getac	V100-G4	N/A	Un-Shielding	Shielding
2	Adapter	Getac	ADM-6019M	N/A	N/A	Shielding

3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3),(4)	Peak Output Power	Compliant
§15.247(d)	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.247(d)	Spurious Emission	Compliant
§15.203	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

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

2.4GHz:
802.11 b mode: Channel low (2412MHz)、mid (2437MHz) and high (2462MHz) with 1Mbps lowest data rate are chosen for pre-test testing of radiated emissions.
802.11 g mode: Channel low (2412MHz)、mid (2437MHz) and high (2462MHz) with 6Mbps lowest data rate are chosen for pre-test testing of radiated emissions.
802.11 n HT20: Channel low (2412MHz)、mid (2437MHz) and high (2462MHz) with 6.5Mbps lowest data rate are chosen for pre-test testing of radiated emissions.
802.11 n HT40: Channel low (2422MHz)、mid (2437MHz) and high (2452MHz) with 13.5Mbps lowest data rate are chosen for pre-test testing of radiated emissions.

BT LE mode: Channel low (2402MHz)、mid (2441MHz) and high (2480MHz) were chosen for pre-test testing of radiated emissions.

5GHz:
802.11a mode: Channel low (5745MHz)、mid (5785MHz) and high (5825MHz) with 1Mbps lowest data rate are chosen for pre-test testing of radiated emissions.
802.11 n HT20: Channel low (5745MHz)、mid (5785MHz) and high (5825MHz) with 6.5Mbps lowest data rate are chosen for pre-test testing of radiated emissions.
802.11 n HT40: Channel low (5755MHz) and high (5795MHz) with 13.5Mbps lowest data rate are chosen for pre-test testing of radiated emissions.

The spurious radiation emission were measured for both host model V100-G4/V200-G2 as EUT notebook position (H) and tablet position (E1) for testing with power adaptors.

The worst case 802.11 n HT40 (2.4GHz) of host V100-G4was reported for Radiated Emission

5 CONDUCTED EMISSION TEST

5.1 Standard Applicable:

According to §15.207, frequency range within 150KHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

5.2 Measurement Equipment Used:

AC Power Line Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Conduction 03 -1 Cable	WOKEN	CFD 300-NL	Conduction 0-1	06/27/2011	06/27/2012
EMI Receiver 12	ROHDE & SCHWARZ	ESCI	100804	07/12/2011	07/12/2012
LISN 07	FCC Inc.	FCC-LISN-50-100-4-02	07040	07/13/2011	07/13/2012
LISN 08	FCC	FCC-LISN50-25-2-01	07039	07/13/2011	07/13/2012

5.3 EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2003.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

5.4 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

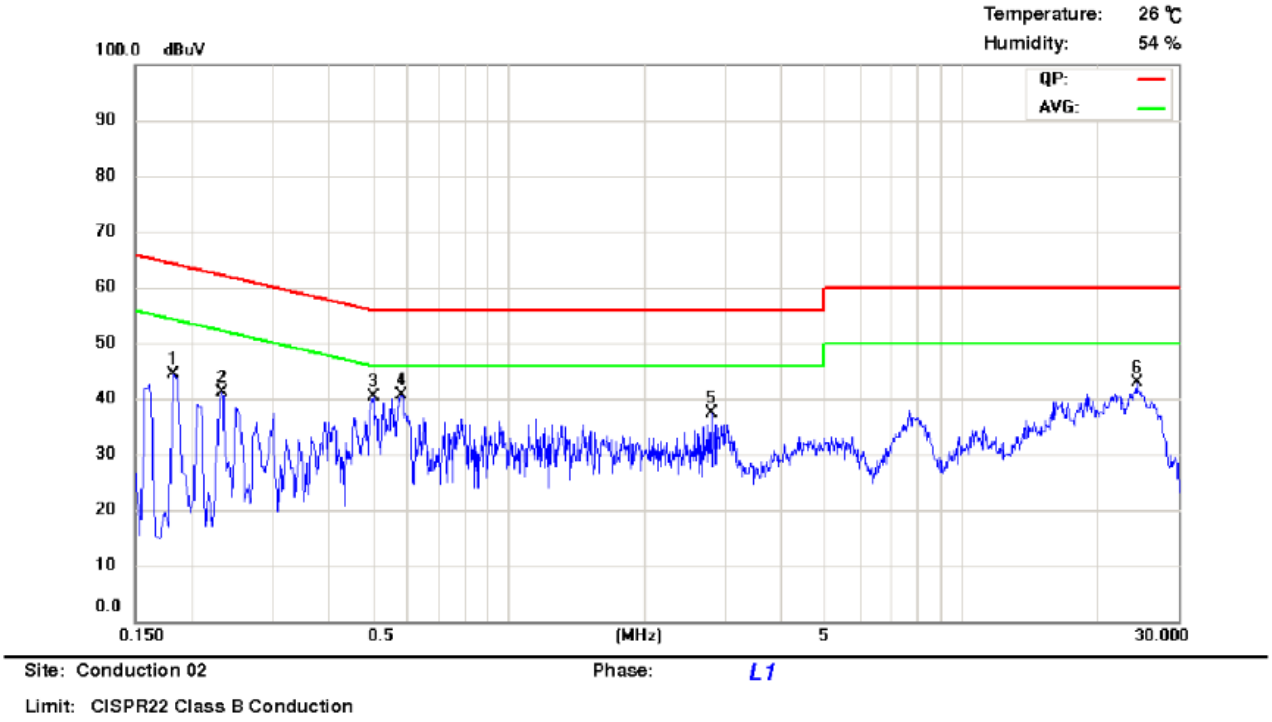
5.5 Measurement Result:

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

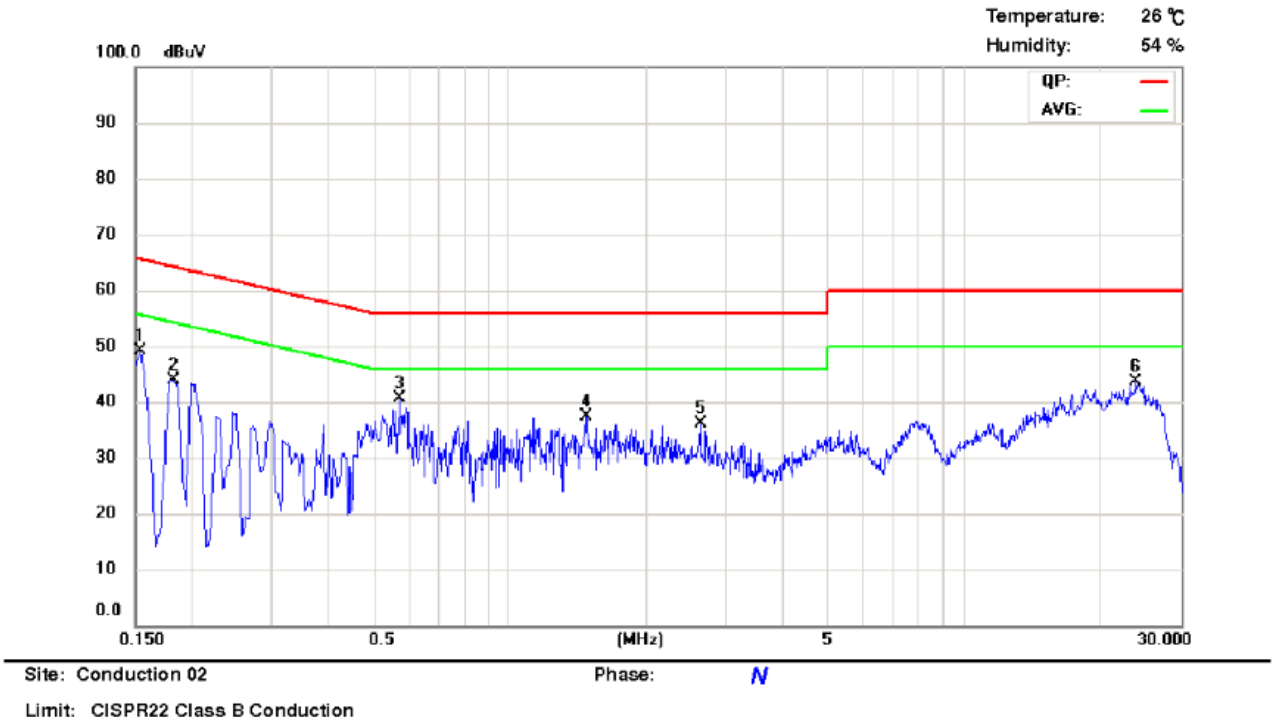
Note: Refer to next page for measurement data and plots.

AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation Mode	Test Date:	2012/6/22
Test By:	Lake		



No.	Frequency MHz	LISN Loss dB	Cable Loss dB	QP Correct. dBuV	QP Limit dBuV	QP Margin dB	AVG Correct. dBuV	AVG Limit dBuV	AVG Margin dB	Note
1	0.1820	9.64	0.01	43.27	64.39	-21.12	27.44	54.39	-26.95	
2	0.2340	9.64	0.02	37.05	62.31	-25.26	24.15	52.31	-28.16	
3	0.5020	9.62	0.03	37.37	56.00	-18.63	29.55	46.00	-16.45	
4	0.5820	9.62	0.03	38.19	56.00	-17.81	27.21	46.00	-18.79	
5	2.8060	9.63	0.1	30.14	56.00	-25.86	20.89	46.00	-25.11	
6	24.3060	9.65	0.27	37.57	60.00	-22.43	31.64	50.00	-18.36	



Site: Conduction 02 Phase: N

Limit: CISPR22 Class B Conduction

No.	Frequency MHz	LISN Loss dB	Cable Loss dB	QP Correct. dBuV	QP Limit dBuV	QP Margin dB	AVG Correct. dBuV	AVG Limit dBuV	AVG Margin dB	Note
1	0.1540	9.5	0.01	47.36	65.78	-18.42	27.02	55.78	-28.76	
2	0.1820	9.55	0.01	42.84	64.39	-21.55	25.65	54.39	-28.74	
3	0.5740	9.61	0.03	38.67	56.00	-17.33	27.40	46.00	-18.60	
4	1.4780	9.61	0.06	31.97	56.00	-24.03	22.16	46.00	-23.84	
5	2.6340	9.61	0.09	27.86	56.00	-28.14	19.84	46.00	-26.16	
6	23.9940	9.7	0.27	38.77	60.00	-21.23	32.93	50.00	-17.07	

6 PEAK OUTPUT POWER MEASUREMENT

6.1 Standard Applicable:

According to §15.247(b)(3),(4)(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.

(c) Operation with directional antenna gains greater than 6 dBi.

(1) Fixed point-to-point operation:

(i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

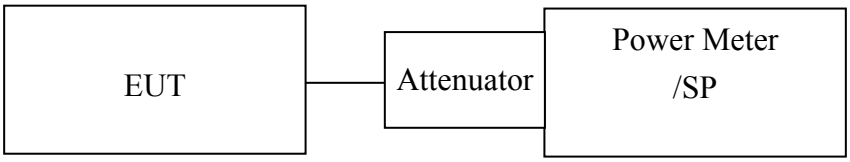
(ii) Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

6.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Power Meter 05	Anritsu	ML2495A	1116010	04/17/2012	04/16/2013
Power Sensor 05	Anritsu	MA2411B	34NKF50	04/16/2012	04/15/2013
Temperature Chamber	KSON	THS-B4H100	2287	03/03/2012	03/02/2013
DC Power supply	ABM	51850	N/A	06/17/2012	06/16/2013
AC Power supply	EXTECH	CFC105W	NA	12/19/2011	12/18/2012
Splitter	MCLI	PS4-199	12465	07/18/2012	07/17/2013
Spectrum analyzer	Agilent	N9030A	MY51360021	03/11/2012	03/10/2013

6.3 Test Set-up:

Conducted Power



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
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

6.5 Measurement Result:

BT LE Mode

Frequency (MHz)	Reading Power (dBm)	Cable Loss	Output Power (dBm)	Output Power (W)	Limit (W)
2402.00	4.38	0.00	4.38	0.00274	1
2440.00	5.16	0.00	5.16	0.00328	1
2480.00	5.50	0.00	5.50	0.00355	1

offset: 0.5dB

802.11b

Cable loss = 0		Output Power		Limit (dBm)
CH	Frequency (MHz)	Detector		
		PK (dBm)	AV (dBm)	
1	2412	15.01	11.89	30
6	2437	15.33	12.21	
11	2462	15.12	12.04	

802.11g

Cable loss = 0		Output Power		Limit (dBm)
CH	Frequency (MHz)	Detector		
		PK (dBm)	AV (dBm)	
1	2412	14.87	9.12	30
6	2437	15.34	9.75	
11	2462	14.62	9.02	

802.11n for 2.4GHz

Peak Measurement:

2*2 MIMO

Channel		Frequency (MHz)	Output Chain (dBm)		Combined Output Power (dBm)	Limit(dBm)	Result
			Chain A	chain B			
N HT20	1	2412	14.52	14.61	17.58	30	Pass
	6	2437	14.56	14.57	17.58	30	Pass
	11	2462	14.14	14.22	17.19	30	Pass
N HT40	3	2422	14.23	14.21	17.23	30	Pass
	6	2437	14.62	14.32	17.48	30	Pass
	9	2452	15.01	14.65	17.84	30	Pass

Average Measurement

2*2 MIMO

Channel		Frequency (MHz)	Output Chain (dBm)		Combined Output Power (dBm)	Limit(dBm)	Result
			Chain A	chain B			
N HT20	1	2412	8.85	9.02	11.95	30	Pass
	6	2437	8.90	8.95	11.94	30	Pass
	11	2462	7.51	8.92	11.28	30	Pass
N HT40	3	2422	8.76	8.84	11.81	30	Pass
	6	2437	9.21	8.86	12.05	30	Pass
	9	2452	9.70	9.02	12.38	30	Pass

802.11a(5G)

Cable loss = 0		Output Power		Limit (dBm)
CH	Frequency (MHz)	Detector		
		PK (dBm)	AV (dBm)	
149	5745	15.56	10.35	30
153	5765	15.65	10.11	
157	5785	15.50	9.93	
161	5805	15.31	9.55	
165	5825	15.14	9.22	

802.11n for 5GHz

Peak Measurement:

2*2 MIMO

Channel		Frequency (MHz)	Output Chain (dBm)		Combined Output Power (dBm)	Limit(dBm)	Result
			Chain A	chain B			
N HT20	149	5745	12.39	12.95	15.80	30	Pass
	153	5765	12.21	12.84	15.55	30	Pass
	157	5785	12.92	12.75	15.85	30	Pass
	161	5805	12.93	12.62	15.79	30	Pass
	165	5825	12.01	12.47	15.26	30	Pass
N HT40	151	5755	12.75	12.33	15.56	30	Pass
	159	5795	12.62	13.29	15.98	30	Pass

Average Measurement

2*2 MIMO

Channel		Frequency (MHz)	Output Chain (dBm)		Combined Output Power (dBm)	Limit(dBm)	Result
			Chain A	chain B			
N HT20	149	5745	7.52	7.77	10.66	30	Pass
	153	5765	7.22	7.64	10.45	30	Pass
	157	5785	7.89	7.52	10.72	30	Pass
	161	5805	6.41	6.92	9.68	30	Pass
	165	5825	6.52	6.72	9.63	30	Pass
N HT40	151	5755	7.33	8.01	10.69	30	Pass
	159	5795	7.65	8.04	10.86	30	Pass

7 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

7.1 Standard Applicable:

According to §15.247(c), 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 100KHz 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).

7.2 Measurement Equipment Used:

7.2.1 Conducted Emission at antenna port:

Refer to section 6.2 for details.

7.2.2 Radiated emission:

Chamber 14(966)					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY49060537	07/18/2011	07/17/2012
Spectrum Analyzer 20(6.5GHz)	Agilent	E4443A	MY48250315	05/24/2012	05/23/2013
Spectrum Analyzer 22(43GHz)	R&S	FSU43	100143	04/25/2012	04/24/2013
Loop Antenna9K-30M	A.H.SYSTEM	SAS-564	294	02/28/2011	02/27/2013
Bilog Antenna30-1G	Schaffner	CBL 6111B	2756	12/27/2011	12/26/2012
Horn antenna1-18G	COM-POWER	AH118	2011071401	03/01/2012	02/29/2013
Horn antenna1-18G(06)	EMCO	3117	0006665	09/21/2011	09/20/2012
Horn antenna26-40G(05)	Com-power	AH-640	100A	01/11/2011	01/10/2013
Horn antenna18-26G(04)	Com-power	AH-826	081001	05/04/2011	05/03/2013
Preamplifier9-1000M	HP	8447D	NA	02/10/2012	02/09/2013
Preamplifier1-18G	MITEQ	AFS44-00101800-25-10P-44	1329256	07/19/2011	07/18/2012
Preamplifier1-26G	EM	EM01M26G	NA	02/21/2012	02/20/2013
Preamplifier26-40G	MITEQ	JS-26004000-27-5A	818471	05/21/2011	05/20/2013
Cable1-18G	HUBER SUHNER	Sucoflex 106	NA	02/10/2012	02/09/2013
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	12/14/2011	12/13/2012
SUCOFLEX 1GHz~40GHz cable	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	09/21/2011	09/20/2012
2.4G Filter	Micro-Tronics	Brm50702	76	10/22/2011	10/21/2012
5G Filter	Micro-Tronics	Brm50716	005	10/22/2011	10/21/2012

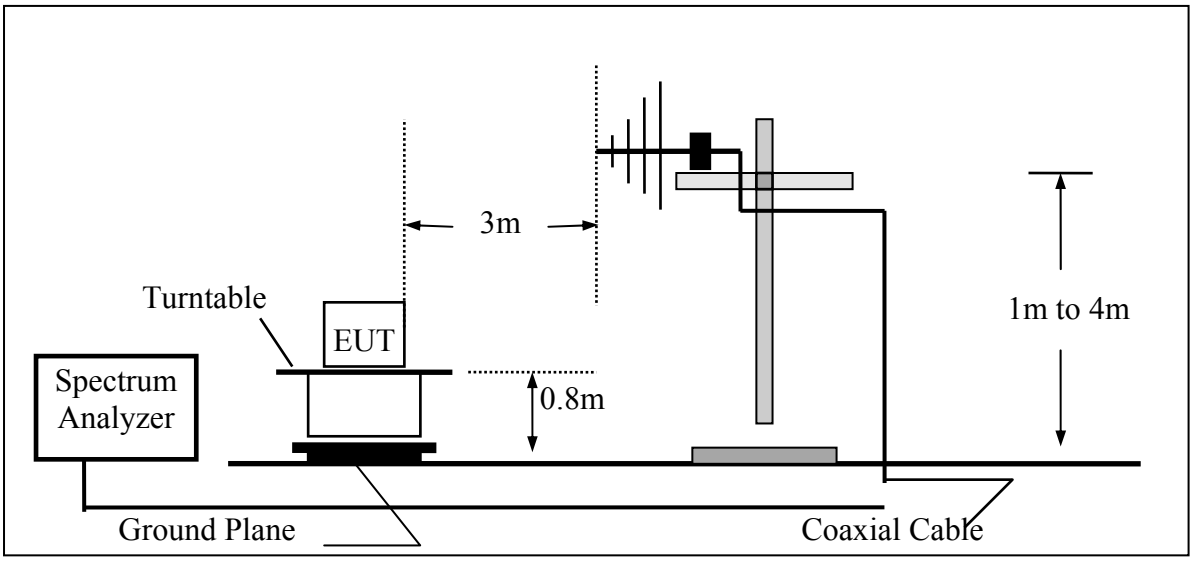
7.3 Test SET-UP:

7.3.1 Conducted Emission at antenna port:

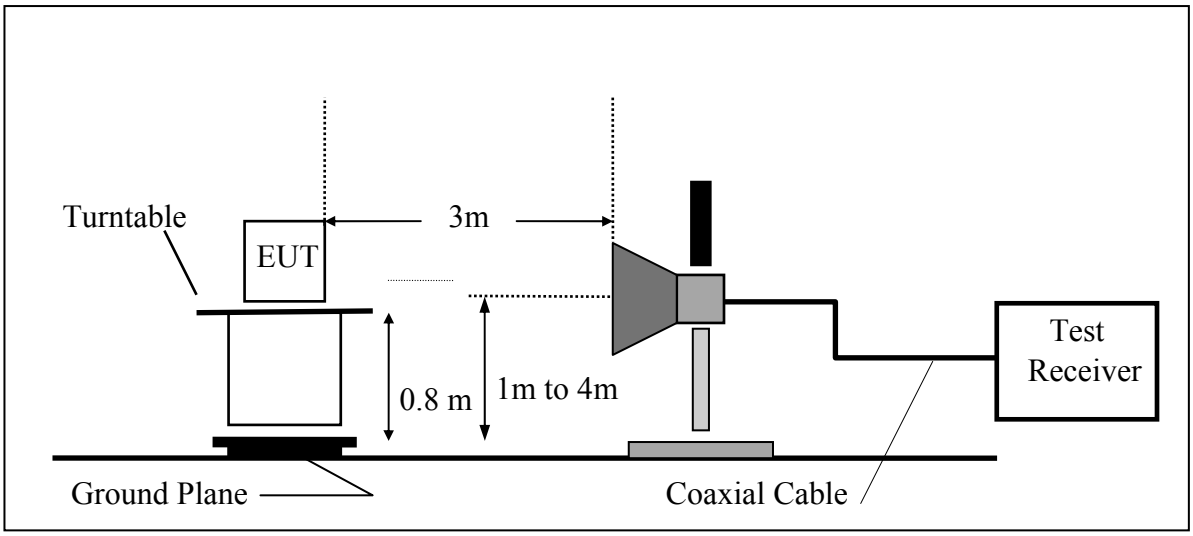
Refer to section 6.3 for details.

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:

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 center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=25MHz, Sweep = auto
5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
6. Repeat above procedures until all frequency measured were complete.

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 spectrum analyzer data chart and tabular data sheets.

Radiated Emission: 802.11n HT40 mode for 2.4GHz (worst case)

Operation Mode	TX CH Low	Test Date	2012/06/15
Fundamental Frequency	2422 MHz	Test By	Lake
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2390.00	57.52	-11.48	46.04	54.00	-7.96	Average	VERTICAL
2	2390.00	72.14	-11.48	60.66	74.00	-13.34	Peak	VERTICAL
1	2390.00	59.52	-11.48	48.04	54.00	-5.96	Average	HORIZONTAL
2	2390.00	74.09	-11.48	62.61	74.00	-11.39	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2012/06/15
Fundamental Frequency	2452 MHz	Test By	Lake
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2483.50	54.37	-11.25	43.12	54.00	-10.88	Average	VERTICAL
2	2483.50	69.23	-11.25	57.98	74.00	-16.02	Peak	VERTICAL
1	2483.50	58.53	-11.25	47.28	54.00	-6.72	Average	HORIZONTAL
2	2483.50	73.20	-11.25	61.95	74.00	-12.05	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

8 SPURIOUS RADIATED EMISSION TEST

8.1 Standard Applicable

According to §15.247(c), all other emissions outside these bands shall not exceed the general radiated emission limits specified in §15.209(a). 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.

8.2 Measurement Equipment Used:

8.2.1 Conducted Emission at antenna port:

Refer to section 6.2 for details.

8.2.2 Radiated emission:

Refer to section 7.2 for details.

8.3 Test SET-UP:

8.3.1 Conducted Emission at antenna port:

Refer to section 6.3 for details.

8.3.2 Radiated emission:

Refer to section 7.3 for details.

8.4 Measurement Procedure:

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. Repeat above procedures until all frequency measured were complete.

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 spectrum analyzer data chart and tabular data sheets.

Radiated Spurious Emission Measurement Result (below 1GHz) (worst case)

Operation Mode	802.11n HT40 TX CH Low for 2.4GHz	Test Date	2012/06/15
Fundamental Frequency	2422MHz	Test By	Lake
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	225.94	42.73	-15.02	27.71	46.00	-18.29	Peak	VERTICAL
2	257.95	40.76	-12.18	28.58	46.00	-17.42	Peak	VERTICAL
3	387.93	39.83	-9.82	30.01	46.00	-15.99	Peak	VERTICAL
4	409.27	39.21	-9.52	29.69	46.00	-16.31	Peak	VERTICAL
5	456.80	39.45	-9.16	30.29	46.00	-15.71	Peak	VERTICAL
6	519.85	39.03	-8.35	30.68	46.00	-15.32	Peak	VERTICAL
1	258.92	43.51	-12.10	31.41	46.00	-14.59	Peak	HORIZONTAL
2	387.93	40.60	-9.82	30.78	46.00	-15.22	Peak	HORIZONTAL
3	409.27	42.21	-9.52	32.69	46.00	-13.31	Peak	HORIZONTAL
4	456.80	40.57	-9.16	31.41	46.00	-14.59	Peak	HORIZONTAL
5	505.30	40.23	-8.64	31.59	46.00	-14.41	Peak	HORIZONTAL
6	649.83	35.23	-6.80	28.43	46.00	-17.57	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	802.11n HT40 TX CH Mid for 2.4GHz	Test Date	2012/06/15
Fundamental Frequency	2437MHz	Test By	Lake
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	258.92	43.97	-12.10	31.87	46.00	-14.13	Peak	VERTICAL
2	360.77	39.96	-10.34	29.62	46.00	-16.38	Peak	VERTICAL
3	387.93	41.84	-9.82	32.02	46.00	-13.98	Peak	VERTICAL
4	409.27	40.46	-9.52	30.94	46.00	-15.06	Peak	VERTICAL
5	456.80	39.32	-9.16	30.16	46.00	-15.84	Peak	VERTICAL
6	649.83	35.41	-6.80	28.61	46.00	-17.39	Peak	VERTICAL
1	256.01	43.66	-12.38	31.28	46.00	-14.72	Peak	HORIZONTAL
2	387.93	41.51	-9.82	31.69	46.00	-14.31	Peak	HORIZONTAL
3	409.27	42.60	-9.52	33.08	46.00	-12.92	Peak	HORIZONTAL
4	456.80	41.27	-9.16	32.11	46.00	-13.89	Peak	HORIZONTAL
5	522.76	46.70	-8.28	38.42	46.00	-7.58	Peak	HORIZONTAL
6	774.96	32.46	-5.65	26.81	46.00	-19.19	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Mode	802.11n HT40 TX CH High for 2.4GHz	Test Date	2012/06/15
Fundamental Frequency	2452MHz	Test By	Lake
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	225.94	43.85	-15.02	28.83	46.00	-17.17	Peak	VERTICAL
2	258.92	40.72	-12.10	28.62	46.00	-17.38	Peak	VERTICAL
3	387.93	42.18	-9.82	32.36	46.00	-13.64	Peak	VERTICAL
4	409.27	40.70	-9.52	31.18	46.00	-14.82	Peak	VERTICAL
5	456.80	39.54	-9.16	30.38	46.00	-15.62	Peak	VERTICAL
6	519.85	41.17	-8.35	32.82	46.00	-13.18	Peak	VERTICAL
1	258.92	44.90	-12.10	32.80	46.00	-13.20	Peak	HORIZONTAL
2	387.93	40.53	-9.82	30.71	46.00	-15.29	Peak	HORIZONTAL
3	409.27	42.53	-9.52	33.01	46.00	-12.99	Peak	HORIZONTAL
4	456.80	41.23	-9.16	32.07	46.00	-13.93	Peak	HORIZONTAL
5	505.30	41.82	-8.64	33.18	46.00	-12.82	Peak	HORIZONTAL
6	649.83	32.42	-6.80	25.62	46.00	-20.38	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (above 1GHz) (worst case)

Operation Mode	802.11n HT40 TX CH Low for 2.4GHz	Test Date	2012/06/15
Fundamental Frequency	2422MHz	Test By	Lake
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	1847.00	49.12	-13.46	35.66	74.00	-38.34	Peak	VERTICAL
2	4844.00	36.86	-2.52	34.34	74.00	-39.66	Peak	VERTICAL
3	7266.00	---						VERTICAL
4	9688.00	---						VERTICAL
5	12110.00	---						VERTICAL
1	1847.00	50.96	-13.46	37.50	74.00	-36.50	Peak	HORIZONTAL
2	4844.00	38.28	-2.52	35.76	74.00	-38.24	Peak	HORIZONTAL
3	7266.00	---						HORIZONTAL
4	9688.00	---						HORIZONTAL
5	12110.00	---						HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	802.11n HT40 TX CH Mid for 2.4GHz	Test Date	2012/06/15
Fundamental Frequency	2437MHz	Test By	Lake
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	1847.00	50.29	-13.46	36.83	74.00	-37.17	Peak	VERTICAL
2	4874.00	36.61	-2.42	34.19	74.00	-39.81	Peak	VERTICAL
3	7311.00	---						VERTICAL
4	9748.00	---						VERTICAL
5	12185.00	---						VERTICAL
1	1847.00	50.89	-13.46	37.43	74.00	-36.57	Peak	HORIZONTAL
2	4874.00	38.05	-2.42	35.63	74.00	-38.37	Peak	HORIZONTAL
3	7311.00	---						HORIZONTAL
4	9748.00	---						HORIZONTAL
5	12185.00	---						HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz)

Operation Mode	802.11n HT40 TX CH High for 2.4GHz	Test Date	2012/06/15
Fundamental Frequency	2452MHz	Test By	Lake
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	1847.00	50.50	-13.46	37.04	74.00	-36.96	Peak	VERTICAL
2	4904.00	37.93	-2.32	35.61	74.00	-38.39	Peak	VERTICAL
3	7356.00	---					Peak	VERTICAL
4	9808.00	---						VERTICAL
5	12260.00	---						VERTICAL
1	1847.00	50.32	-13.46	36.86	74.00	-37.14	Peak	HORIZONTAL
2	4904.00	36.90	-2.31	34.59	74.00	-39.41	Peak	HORIZONTAL
3	7356.00	---						HORIZONTAL
4	9808.00	---						HORIZONTAL
5	12260.00	---						HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

9 ANTENNA REQUIREMENT

9.1 Standard Applicable:

According to §15.203, Antenna requirement.

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 a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

9.2 Antenna Connected Construction:

The directional gins of antenna used for transmitting is R Site: 1.61dBi / L Site: 2.60dBi for 2.4GHz BT LE; R Site: 2.45dBi / L Site: 3.97dBi for 5GHz, and the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.