FCC RF Test Report

APPLICANT	**:**	**Lucca Sol Bene Limited Liability Company**
EQUIPMENT	**:**	**Wireless Controller**
MODEL NAME	**:**	**DE38UR**
FCC ID	**:**	**2ADU7-5487**
STANDARD	**:**	**FCC Part 15 Subpart C §15.247**
CLASSIFICATION	**:**	**(DTS) Digital Transmission System**

The testing completed on Apr. 10, 2015. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory
1190

SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.

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APPENDIX A. CONDUCTED TEST RESULTS

APPENDIX B. RADIATED TEST RESULTS

REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR511218-01	Rev. 01	Initial issue of report	Apr. 14, 2015
FR511218-01	Rev. 02	Revising the applicable standard and adding chapter of duty cycle	May 13, 2015

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	RSS-210 A8.2(a)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.2	15.247(b)	RSS-210 A8.4	Power Output Measurement	≤ 30dBm	Pass	-
3.3	15.247(e)	RSS-210 A8.2(b)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	RSS-210 A8.5	Conducted Band Edges	≤ 20dBc	Pass	-
			Conducted Spurious Emission		Pass	-
3.5	15.247(d)	RSS-210 A8.5	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 2.51 dB at 2390.000 MHz
-	15.207	RSS-Gen 8.8	AC Conducted Emission	15.207(a)	Not Required	EUT doesn't have a power port
3.6	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Lucca Sol Bene Limited Liability Company
100 Chesterfield Business Parkway, Suite 200, Chesterfield, St. Louis, Missouri 63005

1.2 Product Feature of Equipment Under Test

Product Feature	
Equipment	Wireless Controller
Model Name	DE38UR
FCC ID	2ADU7-5487
EUT supports Radios application	WLAN 11a/g

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

1.3 Product Specification subjective to this standard

Product Specification subjective to this standard	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz
Maximum Output Power to antenna	**<Ant 1>**: 11.31 dBm (0.0135 W) **<Ant 2>**: 11.79 dBm (0.0151 W)
Antenna Type	**<Ant 1>**: Fixed Internal Antenna with gain 2.35 dBi **<Ant 2>**: Fixed Internal Antenna with gain 3.47 dBi
Type of Modulation	OFDM (BPSK / QPSK / 16QAM /64QAM)

1.4 Modification of EUT

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

1.5 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978	
Test Site No.	**Sporton Site No.**	
	TH02-HY	03CH07-HY

Note: The test site complies with ANSI C63.4 2009 requirement.

1.6 Applicable Standards

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

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02
- ANSI C63.10-2009

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. FCC permits the use of the 1.5 meter table for frequency above 1GHz as an alternative in C63.10-2013 through inquiry tracking number 961829.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conducted emission (150 kHz to 30 MHz) and radiated emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Y plane for Ant. 1 and X plane for Ant. 2) were recorded in this report.

The final configuration from all the combinations and the worst-case data rates were investigated by measuring the maximum power across all the data rates and modulation modes under section 2.2.

Based on the worst configuration found above, the RF power setting is set individually to meet FCC compliance limit for the final conducted and radiated tests shown in section 2.3.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

2.2 Pre-Scanned RF Power

Preliminary tests were performed in different data rate and data rate associated with the highest power were chosen for full test shown in the following tables.

<Ant. 1>

802.11g					
Data Rate (MHz)	**6M bps**	**9M bps**	**12M bps**	**18M bps**	**24M bps**
Peak Power (dBm)	**11.31**	10.81	10.67	10.85	11.01

<Ant. 2>

802.11g					
Data Rate (MHz)	**6M bps**	**9M bps**	**12M bps**	**18M bps**	**24M bps**
Peak Power (dBm)	**11.79**	11.31	11.36	11.40	11.52

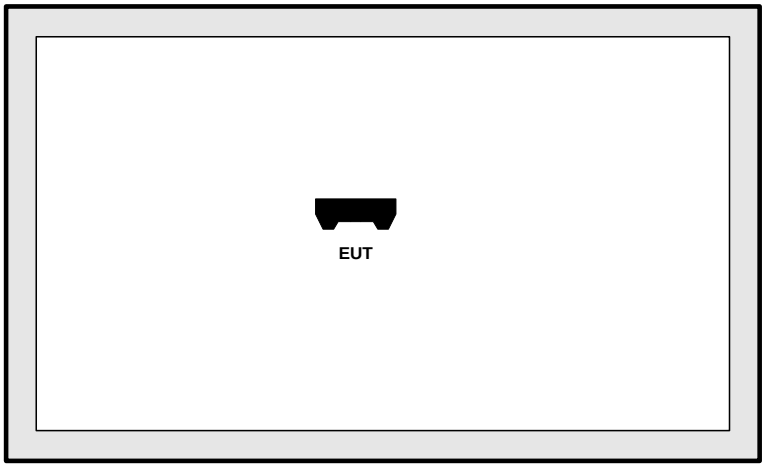
2.3 Test Mode

Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates from the power table described in section 2.2.

Single Antenna

Modulation	Data Rate
802.11g	6 Mbps

2.4 Connection Diagram of Test System



2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	AA Battery	N/A	N/A	N/A	N/A	N/A

2.6 EUT Operation Test Setup

For WLAN function, programmed RF utility, “Tera Term” installed in the notebook make the EUT provide functions like channel selection and power level for continuous transmitting and receiving signals.

2.7 Measurement Results Explanation Example

For all conducted test items:

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

Example:

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

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 6dB Bandwidth Measurement

3.1.1 Limit of 6dB Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

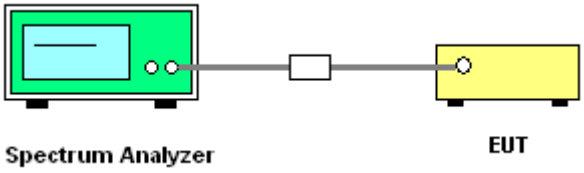
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r02.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. Measure and record the results in the test report.

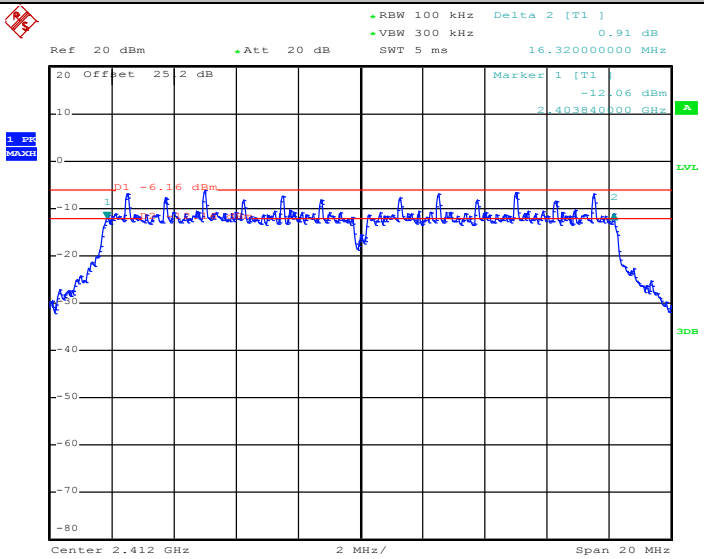
3.1.4 Test Setup



3.1.5 Test Result of 6dB Occupied Bandwidth

Please refer to Appendix A of this test report.

Minimum 6dB Bandwidth



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3.2 Peak Output Power Measurement

3.2.1 Limit of Peak Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna with directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

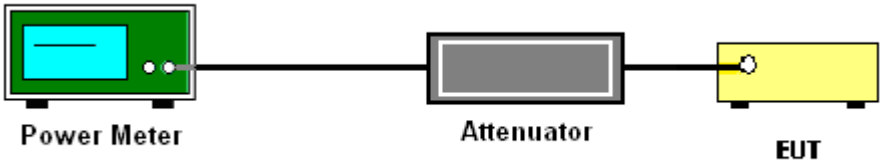
3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v03r02.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A of this test report.

3.2.6 Test Result of Average output Power (Reporting Only)

Please refer to Appendix A of this test report.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

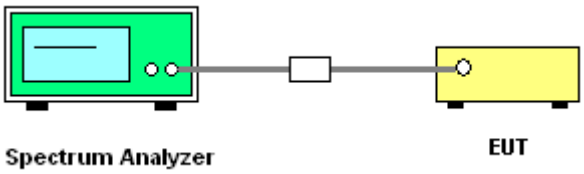
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.

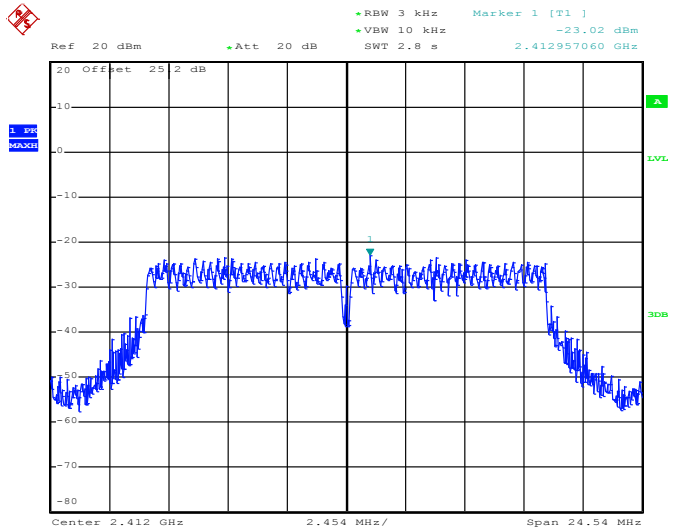
3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A of this test report.

Worst Case Power Density (dBm/3kHz)



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3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

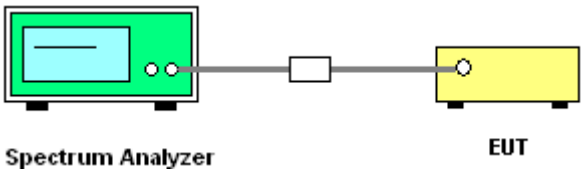
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup



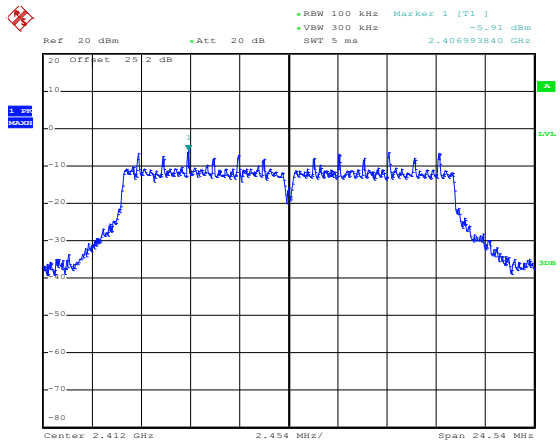
3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Number of TX = 1, Ant. 1 (Measured)

Number of TX	1	**Ant. :**	1
Test Mode :	802.11g	**Temperature :**	21~25℃
Test Band :	2.4GHz Low	**Relative Humidity :**	51~54%
Test Channel :	01	**Test Engineer :**	Tommy Lee

WLAN 802.11g Channel 01

100kHz PSD reference Level



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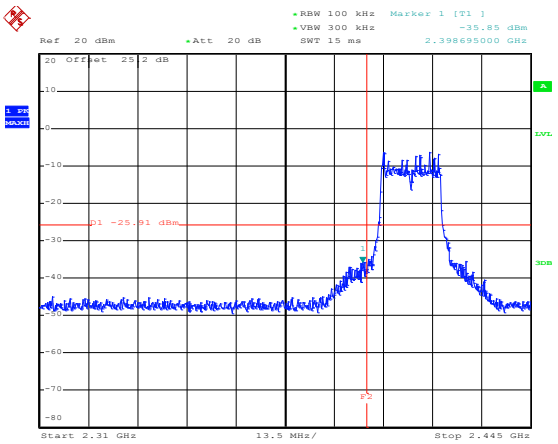
Low Channel Plot



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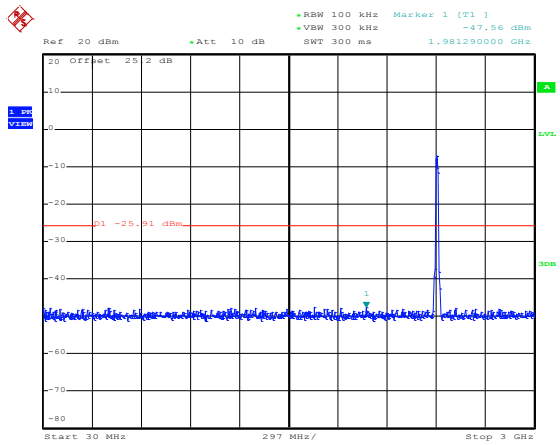
Spurious Emission 30MHz~3GHz



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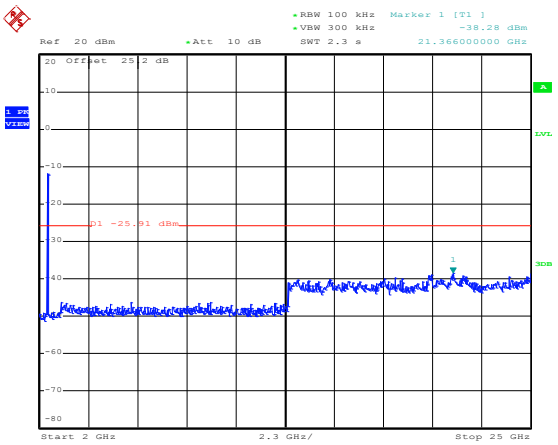
Spurious Emission 2GHz~25GHz



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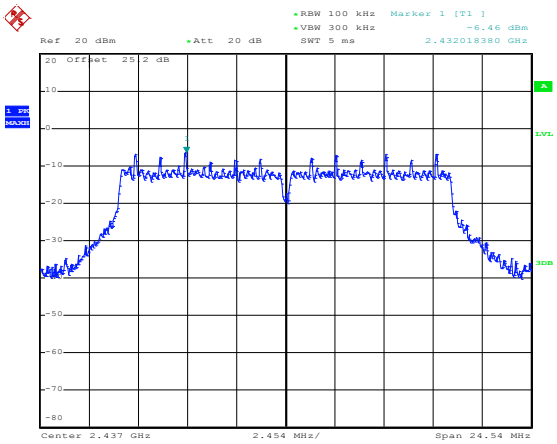
Number of TX :	1	**Ant. :**	1
Test Mode :	802.11g	**Temperature :**	21~25℃
Test Band :	2.4GHz Mid.	**Relative Humidity :**	51~54%
Test Channel :	06	**Test Engineer :**	Tommy Lee

WLAN 802.11g Channel 06

100kHz PSD reference Level



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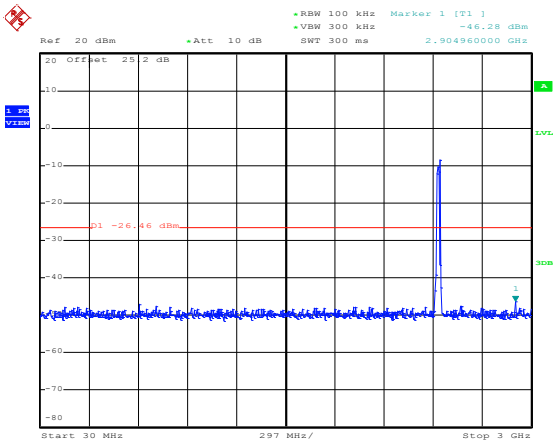
Spurious Emission 30MHz~3GHz



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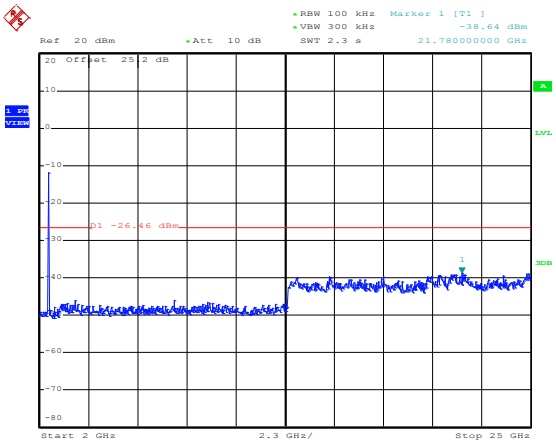
Spurious Emission 2GHz~25GHz

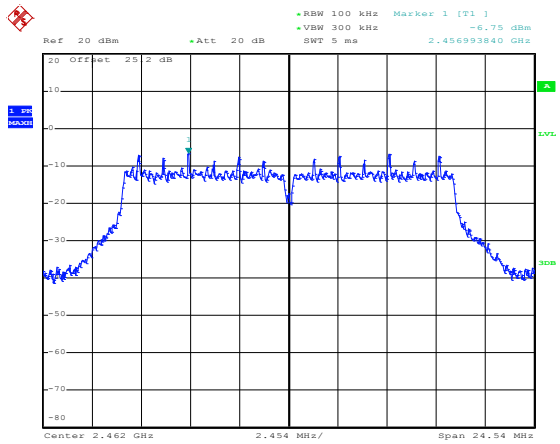


Date: 7.APR.2015 11:10:53

Number of TX :	1	**Ant. :**	1
Test Mode :	802.11g	**Temperature :**	21~25℃
Test Band :	2.4GHz High	**Relative Humidity :**	51~54%
Test Channel :	11	**Test Engineer :**	Tommy Lee

WLAN 802.11g Channel 11

100kHz PSD reference Level



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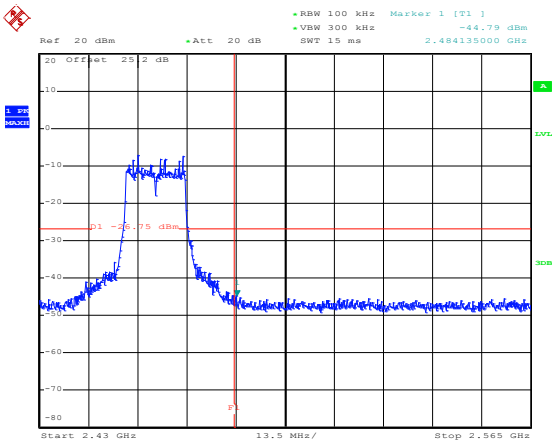
High Channel Plot



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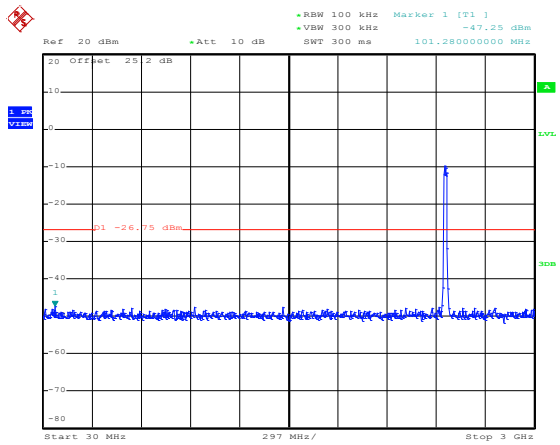
Spurious Emission 30MHz~3GHz



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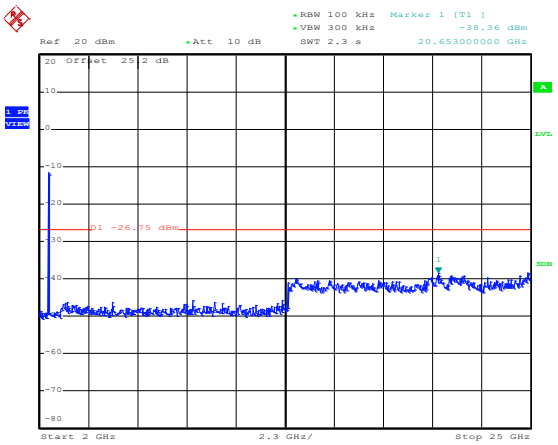
Spurious Emission 2GHz~25GHz



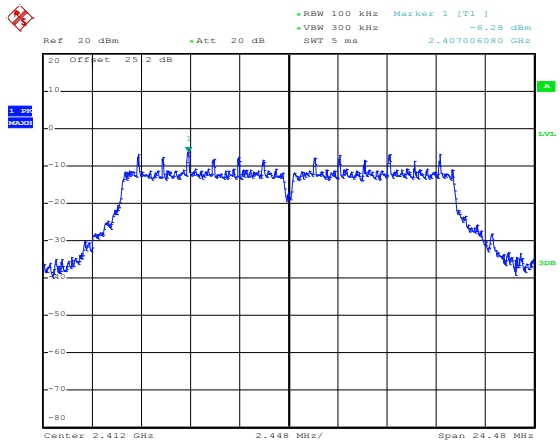
Date: 7.APR.2015 11:18:15

Number of TX = 1, Ant. 2 (Measured)

Number of TX :	1	**Ant. :**	2
Test Mode :	802.11g	**Temperature :**	21~25℃
Test Band :	2.4GHz Low	**Relative Humidity :**	51~54%
Test Channel :	01	**Test Engineer :**	Tommy Lee

WLAN 802.11g Channel 01

100kHz PSD reference Level



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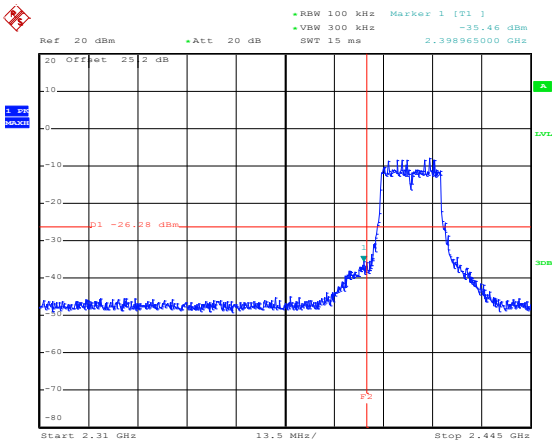
Low Channel Plot



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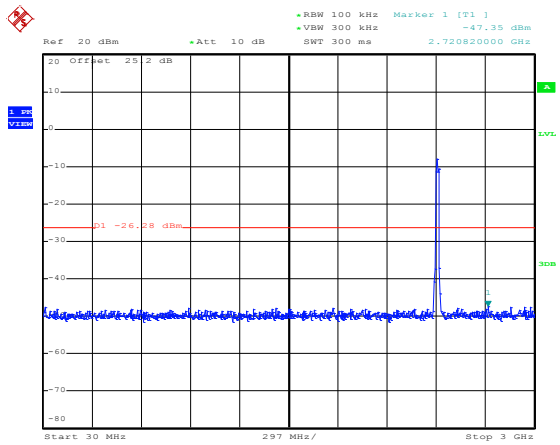
Spurious Emission 30MHz~3GHz



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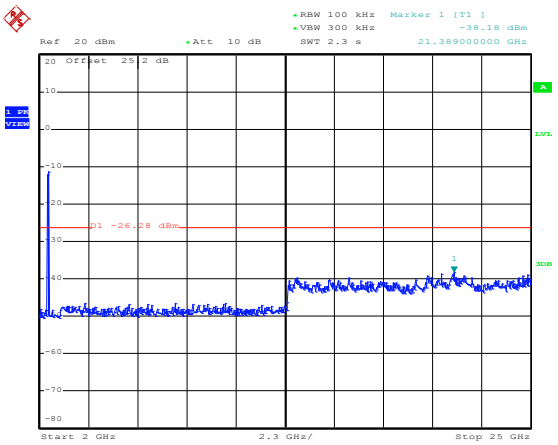
Spurious Emission 2GHz~25GHz

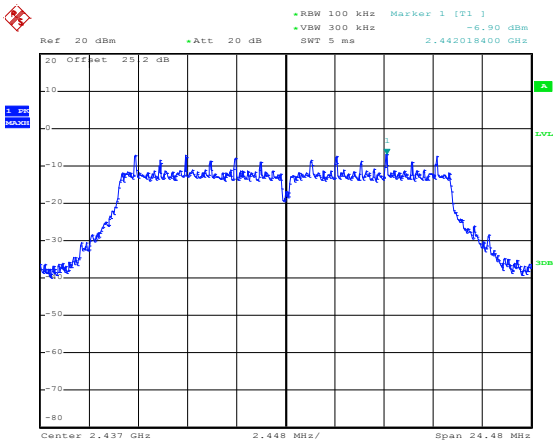


Date: 7.APR.2015 16:15:38

Number of TX :	1	**Ant. :**	2
Test Mode :	802.11g	**Temperature :**	21~25℃
Test Band :	2.4GHz Mid.	**Relative Humidity :**	51~54%
Test Channel :	06	**Test Engineer :**	Tommy Lee

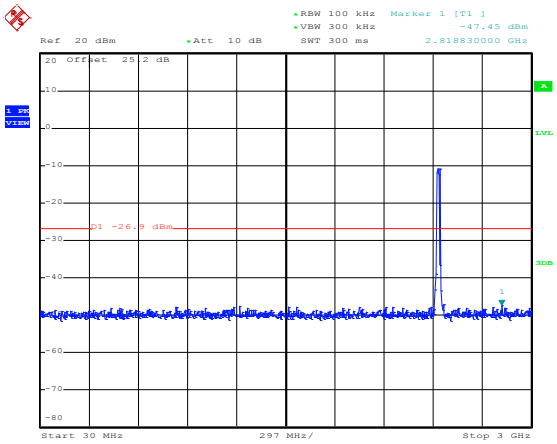
WLAN 802.11g Channel 06

100kHz PSD reference Level



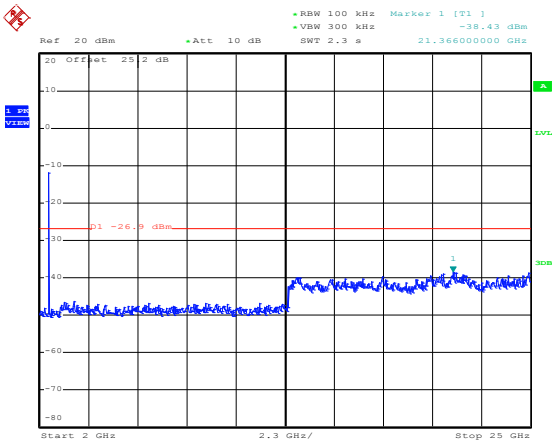
Date: 7.APR.2015 16:20:35

Spurious Emission 30MHz~3GHz



Date: 7.APR.2015 16:21:21

Spurious Emission 2GHz~25GHz

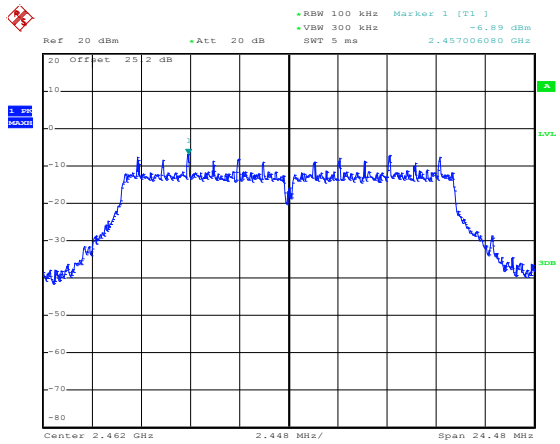


Date: 7.APR.2015 16:21:39

Number of TX :	1	**Ant. :**	2
Test Mode :	802.11g	**Temperature :**	21~25℃
Test Band :	2.4GHz High	**Relative Humidity :**	51~54%
Test Channel :	11	**Test Engineer :**	Tommy Lee

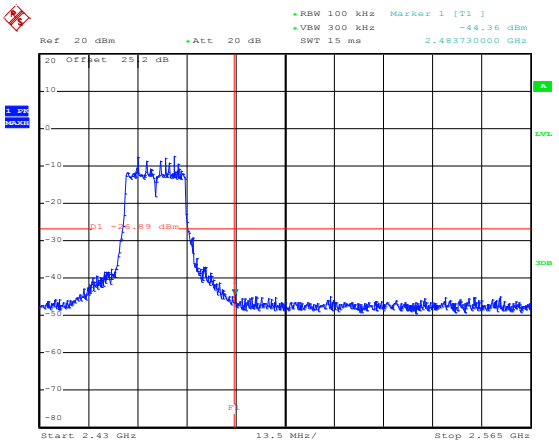
WLAN 802.11g Channel 11

100kHz PSD reference Level



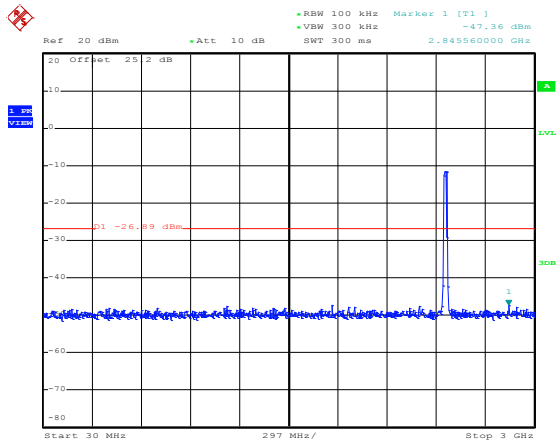
Date: 7.APR.2015 16:27:01

High Channel Plot



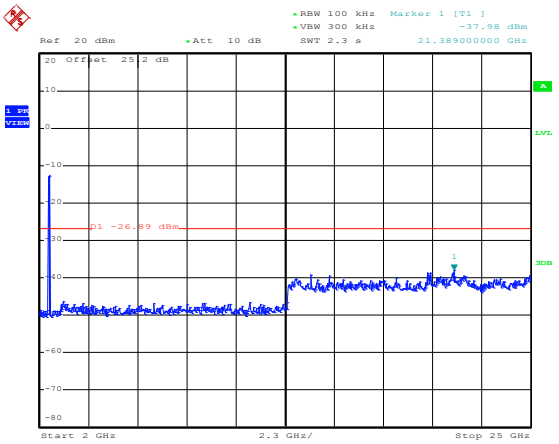
Date: 7.APR.2015 16:27:24

Spurious Emission 30MHz~3GHz



Date: 7.APR.2015 16:27:59

Spurious Emission 2GHz~25GHz



Date: 7.APR.2015 16:28:17

3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

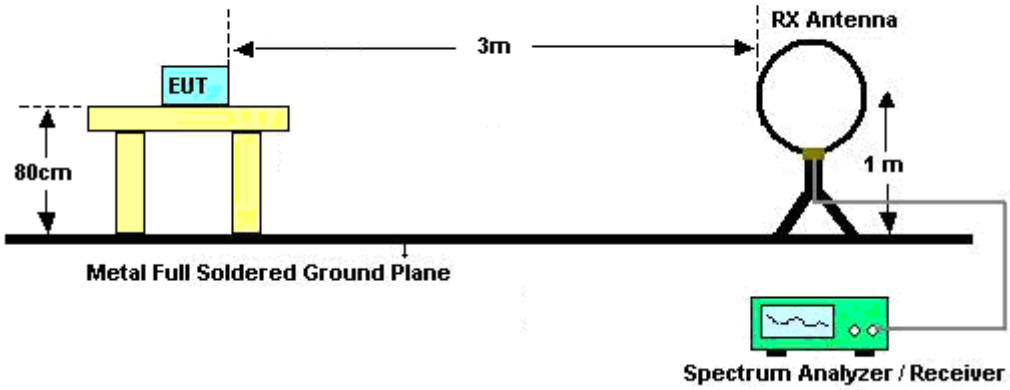
3.5.3 Test Procedure

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

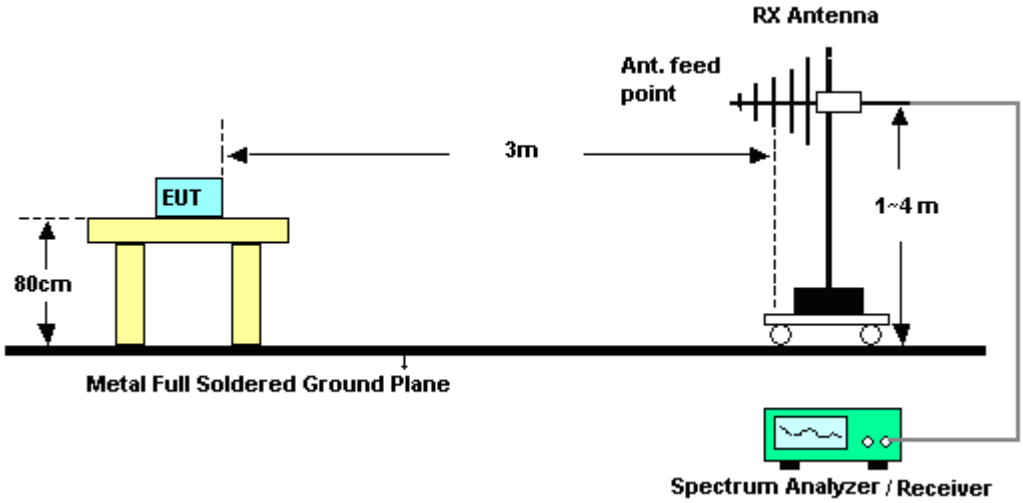
Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
1	802.11g for Ant 1	51.47	1400.00	0.71	1kHz
2	802.11g for Ant 2	53.58	1400.00	0.71	

3.5.4 Test Setup

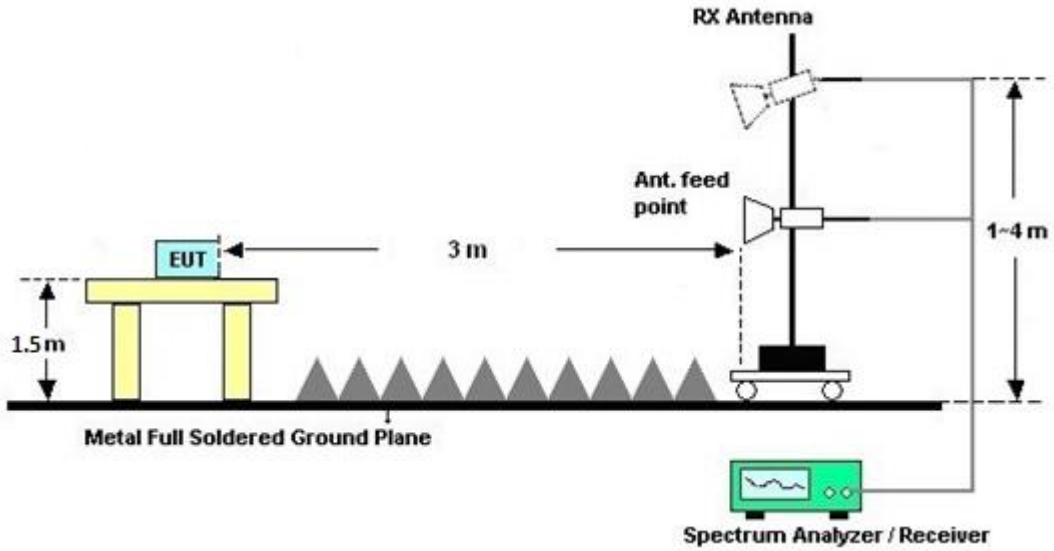
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

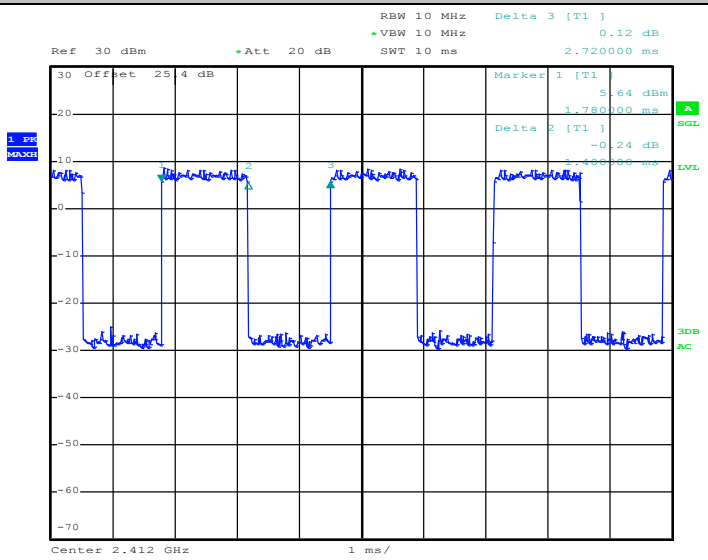
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B of this test report.

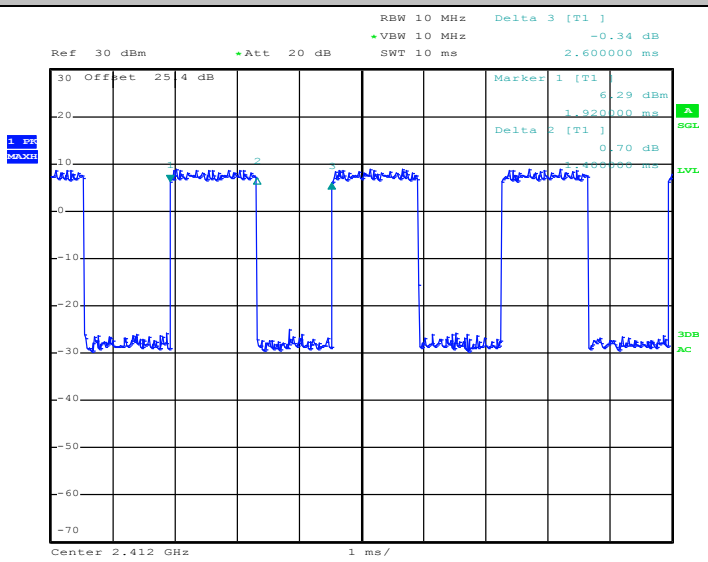
3.5.7 Duty cycle

802.11g for Ant 1



Date: 24.MAR.2015 21:36:31

802.11g for Ant 2



Date: 24.MAR.2015 21:51:28

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

Please refer to Appendix B of this test report.

3.6 Antenna Requirements

3.6.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.6.3 Antenna Gain

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

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 09, 2014	Mar. 24, 2015~ Apr. 07, 2015	Jun. 08, 2015	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	1036004	300MHz~40GHz	Aug. 09, 2014	Mar. 24, 2015~ Apr. 07, 2015	Aug. 08, 2015	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Aug. 09, 2014	Mar. 24, 2015~ Apr. 07, 2015	Aug. 08, 2015	Conducted (TH02-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI 7	100724	9 kHz~7 GHz	Aug. 30, 2014	Apr. 08, 2015~ Apr. 10, 2015	Aug. 29, 2015	Radiation (03CH07-HY)
Signal Analyzer	Rohde & Schwarz	FSV 30	100895	9kHz~30GHz	Mar. 24, 2015	Apr. 08, 2015~ Apr. 10, 2015	Mar. 23, 2016	Radiation (03CH07-HY)
Loop Antenna	R&S	HFH2-Z2	100315	9 kHz~30 MHz	Jul. 28, 2014	Apr. 08, 2015~ Apr. 10, 2015	Jul. 27, 2015	Radiation (03CH07-HY)
Bilog Antenna	Schaffner	CBL6111C	2726	30MHz ~ 1GHz	Sep. 27, 2014	Apr. 08, 2015~ Apr. 10, 2015	Sep. 26, 2015	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	75962	1GHz~18GHz	Aug. 19, 2014	Apr. 08, 2015~ Apr. 10, 2015	Aug. 18, 2015	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170 251	18GHz~40GHz	Oct. 02, 2014	Apr. 08, 2015~ Apr. 10, 2015	Oct. 01, 2015	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	10 MHz ~ 1000MHz	Mar. 12, 2015	Apr. 08, 2015~ Apr. 10, 2015	Mar. 11, 2016	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A023 62	1 GHz~26.5 GHz	Oct. 21, 2014	Apr. 08, 2015~ Apr. 10, 2015	Oct. 20, 2015	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	DC~18 GHz	Jul. 07, 2014	Apr. 08, 2015~ Apr. 10, 2015	Jul. 06, 2015	Radiation (03CH07-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590075	DC~18 GHz	Apr. 21, 2014	Apr. 08, 2015~ Apr. 10, 2015	Apr. 20, 2015	Radiation (03CH07-HY)
Turn Table	ChainTek	ChainTek 3000	N/A	0 ~ 360 degree	N/A	Apr. 08, 2015~ Apr. 10, 2015	N/A	Radiation (03CH07-HY)
Antenna Mast	ChainTek	ChainTek 3000	N/A	N/A	N/A	Apr. 08, 2015~ Apr. 10, 2015	N/A	Radiation (03CH07-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.50**

Appendix A. Conducted Test Results

Test Engineer:	Tommy Lee	Temperature:	21~25	°C
Test Date:	2015/3/24~2015/4/7	Relative Humidity:	51~54	%

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	6dB BW (MHz)		6dB BW Limit (MHz)	Pass/Fail
					Ant 1	Ant 2		
11g	6Mbps	1	1	2412	16.36	16.32	0.50	Pass
11g	6Mbps	1	6	2437	16.36	16.32	0.50	Pass
11g	6Mbps	1	11	2462	16.36	16.32	0.50	Pass

2.4GHz Band																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
11g	6Mbps	1	1	2412	11.31	11.79	-	30.00	30.00	2.35	3.47	13.66	15.26	36.00	36.00	Pass
11g	6Mbps	1	6	2437	11.23	11.57		30.00	30.00	2.35	3.47	13.58	15.04	36.00	36.00	Pass
11g	6Mbps	1	11	2462	11.04	11.44		30.00	30.00	2.35	3.47	13.39	14.91	36.00	36.00	Pass

Note: Measured power (dBm) has offset with cable loss.

2.4GHz Band									
Mod.	Data Rate	N_{TX}	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)		
					Ant 1	Ant 2	Ant 1	Ant 2	SUM
11g	6Mbps	1	1	2412	2.88	2.71	4.43	5.65	-
11g	6Mbps	1	6	2437	2.88	2.71	4.29	4.52	
11g	6Mbps	1	11	2462	2.88	2.71	4.15	4.22	

Note: Measured power (dBm) has offset with cable loss.

2.4GHz Band												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm/3kHz)			DG (dBi)		Peak PSD Limit (dBm/3kHz)		Pass/Fail
					Ant 1	Ant 2	Worse + 3.01	Ant 1	Ant 2	Ant 1	Ant 2	
11g	6Mbps	1	1	2412	-23.02	-23.69	-	2.35	3.47	8.00	8.00	Pass
11g	6Mbps	1	6	2437	-23.37	-23.38		2.35	3.47	8.00	8.00	Pass
11g	6Mbps	1	11	2462	-23.16	-24.65		2.35	3.47	8.00	8.00	Pass

Measured power density (dBm) has offset with cable loss.

Appendix B. Radiated Spurious Emission

15C 2.4GHz 2400~2483.5MHz

WIFI 802.11g (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 01 2412MHz		2389.65	61.01	-12.99	74	55.35	32.18	7.75	34.27	113	224	P	H
		2390	48.14	-5.86	54	42.51	32.18	7.75	34.3	113	224	A	H
	*	2412	97.79	-	-	92.14	32.2	7.75	34.3	113	224	P	H
	*	2412	86.69	-	-	81.04	32.2	7.75	34.3	113	224	A	H
													H
													H
		2389.83	62.3	-11.7	74	56.67	32.18	7.75	34.3	120	276	P	V
		2390	48.13	-5.87	54	42.5	32.18	7.75	34.3	120	276	A	V
	*	2412	99.76	-	-	94.11	32.2	7.75	34.3	120	276	P	V
	*	2412	88.65	-	-	83	32.2	7.75	34.3	120	276	A	V
													V
													V
802.11g CH 06 2437MHz		2368.59	59.44	-14.56	74	53.87	32.16	7.68	34.27	112	226	P	H
		2376.33	45.82	-8.18	54	40.25	32.16	7.68	34.27	112	226	A	H
	*	2437	97.84	-	-	92.12	32.24	7.83	34.35	112	226	P	H
	*	2437	86.91	-	-	81.19	32.24	7.83	34.35	112	226	A	H
		2485.8	59.93	-14.07	74	54.17	32.28	7.91	34.43	112	226	P	H
		2498.76	45.94	-8.06	54	40.21	32.3	7.91	34.48	112	226	A	H
		2318.82	59.91	-14.09	74	54.44	32.09	7.6	34.22	148	209	P	V
		2329.53	45.72	-8.28	54	40.25	32.09	7.6	34.22	148	209	A	V
	*	2437	98.49	-	-	92.77	32.24	7.83	34.35	148	209	P	V
	*	2437	87.29	-	-	81.57	32.24	7.83	34.35	148	209	A	V
		2484.8	59.29	-14.71	74	53.53	32.28	7.91	34.43	148	209	P	V
		2485.24	45.96	-8.04	54	40.2	32.28	7.91	34.43	148	209	A	V

802.11g CH 11 2462MHz	*	2462	97.01	-	-	91.23	32.26	7.91	34.39	150	222	P	H
	*	2462	85.89	-	-	80.11	32.26	7.91	34.39	150	222	A	H
		2483.8	60.63	-13.37	74	54.87	32.28	7.91	34.43	150	222	P	H
		2483.88	47.38	-6.62	54	41.62	32.28	7.91	34.43	150	222	A	H
													H
													H
	*	2462	98.37	-	-	92.59	32.26	7.91	34.39	124	294	P	V
	*	2462	88.17	-	-	82.39	32.26	7.91	34.39	124	294	A	V
		2483.88	62.42	-11.58	74	56.66	32.28	7.91	34.43	124	294	P	V
		2483.88	48.41	-5.59	54	42.65	32.28	7.91	34.43	124	294	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

15C 2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 01 2412MHz		4824	44.85	-29.15	74	58.36	34.26	11.16	58.93	100	0	P	H
													H
													H
													H
		4824	43.64	-30.36	74	57.15	34.26	11.16	58.93	100	0	P	V
													V
													V
													V
802.11g CH 06 2437MHz		4872	42.93	-31.07	74	56.25	34.3	11.21	58.83	100	0	P	H
		7311	44.91	-29.09	74	51.96	35.6	15.08	57.73	100	0	P	H
													H
													H
		4874	42.68	-31.32	74	56	34.3	11.21	58.83	100	0	P	V
		7308	44.57	-29.43	74	51.62	35.6	15.08	57.73	100	0	P	V
													V
													V
802.11g CH 11 2462MHz		4926	43.81	-30.19	74	56.93	34.34	11.27	58.73	100	0	P	H
		7386	43.91	-30.09	74	50.97	35.6	15.14	57.8	100	0	P	H
													H
													H
		4924	43.68	-30.32	74	56.8	34.34	11.27	58.73	100	0	P	V
		7386	43.97	-30.03	74	51.03	35.6	15.14	57.8	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

15C Emission below 1GHz

2.4GHz WIFI 802.11g (LF)

WIFI Ant.	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
1													
2.4GHz 802.11g LF		106.14	12.84	-30.66	43.5	31.06	10.56	2.38	31.16	-	-	P	H
		201.99	14.44	-29.06	43.5	33.73	9.12	2.69	31.1	-	-	P	H
		264.09	16.75	-29.25	46	31.03	13.56	3.16	31	-	-	P	H
		412	21.54	-24.46	46	32.56	16.3	3.52	30.84	-	-	P	H
		579.3	23.37	-22.63	46	30.43	19.61	4.01	30.68	154	255	P	H
		974.1	29.9	-24.1	54	30.39	24.88	4.94	30.31	-	-	P	H
													H
													H
													H
													H
													H
													H
		66.45	16.11	-23.89	40	39.13	6.16	2.06	31.24	-	-	P	V
		131.52	14.06	-29.44	43.5	30.98	11.8	2.38	31.1	-	-	P	V
		271.65	17.99	-28.01	46	32.93	12.88	3.16	30.98	-	-	P	V
		456.8	21	-25	46	30.78	17.37	3.63	30.78	-	-	P	V
		691.3	24.6	-21.4	46	30.15	20.52	4.35	30.42	122	87	P	V
		976.2	29.64	-24.36	54	30.07	24.92	4.94	30.29	-	-	P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency per 15.209(c).
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is "PASS".

15C 2.4GHz 2400~2483.5MHz

WIFI 802.11g (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
2		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 01 2412MHz		2390	68.38	-5.62	74	62.75	32.18	7.75	34.3	100	118	P	H
		2390	51.49	-2.51	54	45.86	32.18	7.75	34.3	100	118	A	H
	*	2410	98.07	-	-	92.42	32.2	7.75	34.3	100	118	P	H
	*	2413.11	87.36	-	-	81.71	32.2	7.75	34.3	100	118	A	H
													H
													H
		2389.65	63.67	-10.33	74	58.01	32.18	7.75	34.27	100	113	P	V
		2390	48.62	-5.38	54	42.99	32.18	7.75	34.3	100	113	A	V
	*	2410	95.79	-	-	90.14	32.2	7.75	34.3	100	113	P	V
	*	2410	84.99	-	-	79.34	32.2	7.75	34.3	100	113	A	V
													V
													V
802.11g CH 06 2437MHz		2369.49	59.35	-14.65	74	53.78	32.16	7.68	34.27	100	120	P	H
		2332.32	45.87	-8.13	54	40.4	32.09	7.6	34.22	100	120	A	H
	*	2435	98.71	-	-	93.01	32.22	7.83	34.35	100	120	P	H
	*	2435	87.79	-	-	82.09	32.22	7.83	34.35	100	120	A	H
		2484	60.15	-13.85	74	54.39	32.28	7.91	34.43	100	120	P	H
		2489.28	46.01	-7.99	54	40.23	32.3	7.91	34.43	100	120	A	H
		2379.3	58.9	-15.1	74	53.33	32.16	7.68	34.27	100	115	P	V
		2363.91	45.95	-8.05	54	40.39	32.13	7.68	34.25	100	115	A	V
	*	2435	95.74	-	-	90.04	32.22	7.83	34.35	100	115	P	V
	*	2436	84.68	-	-	78.98	32.22	7.83	34.35	100	115	A	V
		2490.4	59.31	-14.69	74	53.53	32.3	7.91	34.43	100	115	P	V
		2487.8	45.93	-8.07	54	40.15	32.3	7.91	34.43	100	115	A	V

802.11g CH 11 2462MHz	*	2460	98.04	-	-	92.34	32.26	7.83	34.39	114	122	P	H
	*	2460	86.98	-	-	81.28	32.26	7.83	34.39	114	122	A	H
		2483.76	61.95	-12.05	74	56.19	32.28	7.91	34.43	114	122	P	H
		2483.52	47.82	-6.18	54	42.06	32.28	7.91	34.43	114	122	A	H
													H
													H
	*	2460	94.86	-	-	89.16	32.26	7.83	34.39	115	99	P	V
	*	2460	83.86	-	-	78.16	32.26	7.83	34.39	115	99	A	V
		2484.8	59.89	-14.11	74	54.13	32.28	7.91	34.43	115	99	P	V
		2483.64	46.98	-7.02	54	41.22	32.28	7.91	34.43	115	99	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

15C 2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
2		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 01 2412MHz		4824	43.49	-30.51	74	57	34.26	11.16	58.93	100	0	P	H
													H
													H
													H
		4824	42.98	-31.02	74	56.49	34.26	11.16	58.93	100	0	P	V
													V
													V
													V
802.11g CH 06 2437MHz		4872	47.06	-26.94	74	60.38	34.3	11.21	58.83	100	0	P	H
		7311	45.17	-28.83	74	52.22	35.6	15.08	57.73	100	0	P	H
													H
													H
		4872	46.61	-27.39	74	59.93	34.3	11.21	58.83	100	0	P	V
		7311	44.97	-29.03	74	52.02	35.6	15.08	57.73	100	0	P	V
													V
													V
802.11g CH 11 2462MHz		4926	45.87	-28.13	74	58.99	34.34	11.27	58.73	100	0	P	H
		7386	43.33	-30.67	74	50.39	35.6	15.14	57.8	100	0	P	H
													H
													H
		4926	46.19	-27.81	74	59.31	34.34	11.27	58.73	100	0	P	V
		7386	44.01	-29.99	74	51.07	35.6	15.14	57.8	100	0	P	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

15C Emission below 1GHz

2.4GHz WIFI 802.11g (LF)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
2		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11g LF		95.88	12.34	-31.16	43.5	31.94	9.44	2.06	31.1	-	-	P	H
		183.09	13.43	-30.07	43.5	32.86	8.84	2.69	30.96	-	-	P	H
		273.27	16.18	-29.82	46	31.12	12.86	3.16	30.96	-	-	P	H
		430.9	21.96	-24.04	46	32.17	16.91	3.63	30.75	-	-	P	H
		638.1	24.51	-21.49	46	30.41	20.4	4.22	30.52	154	77	P	H
		989.5	30.48	-23.52	54	30.87	24.82	5.03	30.24	-	-	P	H
													H
													H
													H
													H
													H
													H
		31.35	25.1	-14.9	40	36.47	18.28	1.77	31.42	144	178	P	V
		125.85	18.72	-24.78	43.5	35.76	11.68	2.38	31.1	-	-	P	V
		263.28	17.06	-28.94	46	31.23	13.67	3.16	31	-	-	P	V
		451.2	22.01	-23.99	46	31.82	17.31	3.63	30.75	-	-	P	V
		721.4	25.87	-20.13	46	30.35	21.51	4.41	30.4	-	-	P	V
		931.4	28.99	-17.01	46	30.25	24.3	4.8	30.36	-	-	P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency per 15.209(c).
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is "PASS".