



FCC RF Test Report

APPLICANT : Wistron NeWeb Corporation
EQUIPMENT : Zubie Key (LTE version): LTE single-mode
B13/B4 hotspot and GPS tracker
BRAND NAME : Wistron Neweb Corporation
MODEL NAME : D58U2
FCC ID : NKRGL700
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Sep. 14, 2015 and testing was completed on Sep. 22, 2015. We, SPORTON INTERNATIONAL (KUNSHAN) 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 (KUNSHAN) INC., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL (KUNSHAN) INC.

No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China



TABLE OF CONTENTS

REVISION HISTORY.....	3
SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION	5
1.1 Applicant.....	5
1.2 Manufacturer.....	5
1.3 Product Feature of Equipment Under Test.....	5
1.4 Product Specification subjective to this standard	6
1.5 Modification of EUT	6
1.6 Testing Location	7
1.7 Applicable Standards.....	7
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST	8
2.1 Carrier Frequency Channel	8
2.2 Pre-Scanned RF Power.....	9
2.3 Test Mode.....	10
2.4 Connection Diagram of Test System.....	11
2.5 Support Unit used in test configuration and system	11
2.6 EUT Operation Test Setup	11
2.7 Measurement Results Explanation Example.....	12
3 TEST RESULT.....	13
3.1 6dB Bandwidth Measurement	13
3.2 Output Power Measurement.....	15
3.3 Power Spectral Density Measurement	16
3.4 Conducted Band Edges and Spurious Emission Measurement	18
3.5 Radiated Band Edges and Spurious Emission Measurement	31
3.6 Antenna Requirements.....	35
4 LIST OF MEASURING EQUIPMENT	36
5 UNCERTAINTY OF EVALUATION.....	37
APPENDIX A. CONDUCTED TEST RESULTS	
APPENDIX B. RADIATED TEST RESULTS	
APPENDIX C. SETUP PHOTOGRAPHS	



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR591404	Rev. 01	Initial issue of report	Oct. 07, 2015



SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.2	15.247(b)	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	-
3.4	15.247(d)	Conducted Band Edges	$\leq 20\text{dBc}$	Pass	-
		Conducted Spurious Emission		Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 6.01 dB at 2483.520 MHz
3.6	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

Wistron NeWeb Corporation

20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan, R.O.C

1.2 Manufacturer

Wistron NeWeb Corporation

20 Park Avenue II, Hsinchu Science Park, Hsinchu 308, Taiwan, R.O.C

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Zubie Key (LTE version): LTE single-mode B13/B4 hotspot and GPS tracker
Brand Name	Wistron Neweb Corporation
Model Name	D58U2
FCC ID	NKRGL700
EUT supports Radios application	LTE/WLAN2.4GHz 802.11b/g/n HT20/HT40/
IMEI Code	Conducted:354170070008878 Radiation: 354170070008845
HW Version	GL700 V2.0
SW Version	3.3.3.0
EUT Stage	Production Unit

Remark:

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

1.4 Product Specification subjective to this standard

Product Specification subjective to this standard	
Tx/Rx Channel Frequency Range	802.11b/g/n : 2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to Antenna	802.11b : 19.38 dBm (0.0867 W) 802.11g : 22.39 dBm (0.1734 W) 802.11n HT20 : 21.39 dBm (0.1377 W) 802.11n HT40 : 21.57 dBm (0.1435 W)
Antenna Type	802.11b/g/n : PCB Antenna with gain -1.30 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Modification of EUT

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

1.6 Testing Location

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.		
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958		
Test Site No.	Sporton Site No.		FCC Registration No.
	TH01-KS	03CH02-KS	418269

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

1.7 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 v03r03
- ANSI C63.10-2013

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 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: 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 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 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.

2.4GHz 802.11b RF Output Power (dBm)						
Power vs. Channel			Power vs. Data Rate			
Channel	Frequency (MHz)	Data Rate 1Mbps	Channel	2Mbps	5.5Mbps	11Mbps
CH 01	2412 MHz	18.19	CH 06	19.27	18.58	19.14
CH 06	2437 MHz	19.38				
CH 11	2462 MHz	19.32				

2.4GHz 802.11g RF Output Power (dBm)										
Power vs. Channel			Power vs. Data Rate							
Channel	Frequency (MHz)	Data Rate 6Mbps	Channel	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
CH 01	2412 MHz	21.41	CH 06	21.73	21.81	22.32	22.26	22.06	21.89	22.12
CH 06	2437 MHz	22.39								
CH 11	2462 MHz	21.55								

2.4GHz 802.11n HT20 RF Output Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 01	2412 MHz	21.07	CH 06	21.26	21.22	21.31	21.24	21.18	21.17	21.12
CH 06	2437 MHz	21.39								
CH 11	2462 MHz	21.15								

2.4GHz 802.11n HT40 RF Output Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	MCS Index MCS0	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 03	2422 MHz	20.98	CH 06	21.52	21.48	21.53	21.43	21.37	21.45	21.33
CH 06	2437 MHz	21.57								
CH 09	2452 MHz	21.39								



2.3 Test Mode

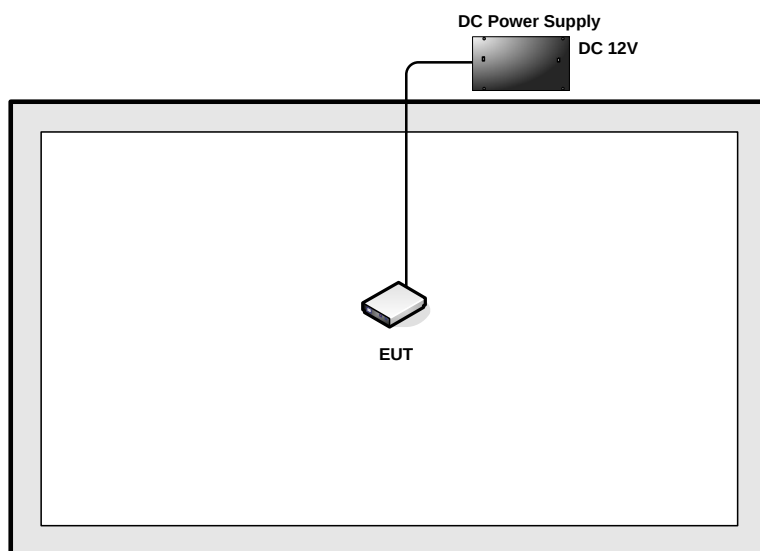
Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates from the power table described in section 2.2.

<2.4GHz>

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0

2.4 Connection Diagram of Test System

<WLAN Tx Mode>



2.5 Support Unit used in test configuration and system

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

2.6 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuously transmit/receive.

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 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.

Offset = RF cable loss.

Following shows an offset computation example with cable loss 5.5 dB.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} \\ &= 5.5 \text{ (dB)}\end{aligned}$$

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.

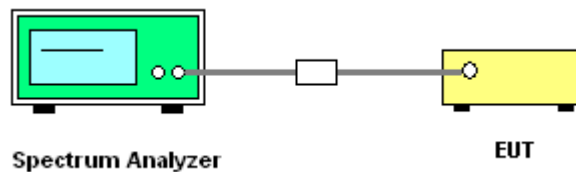
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

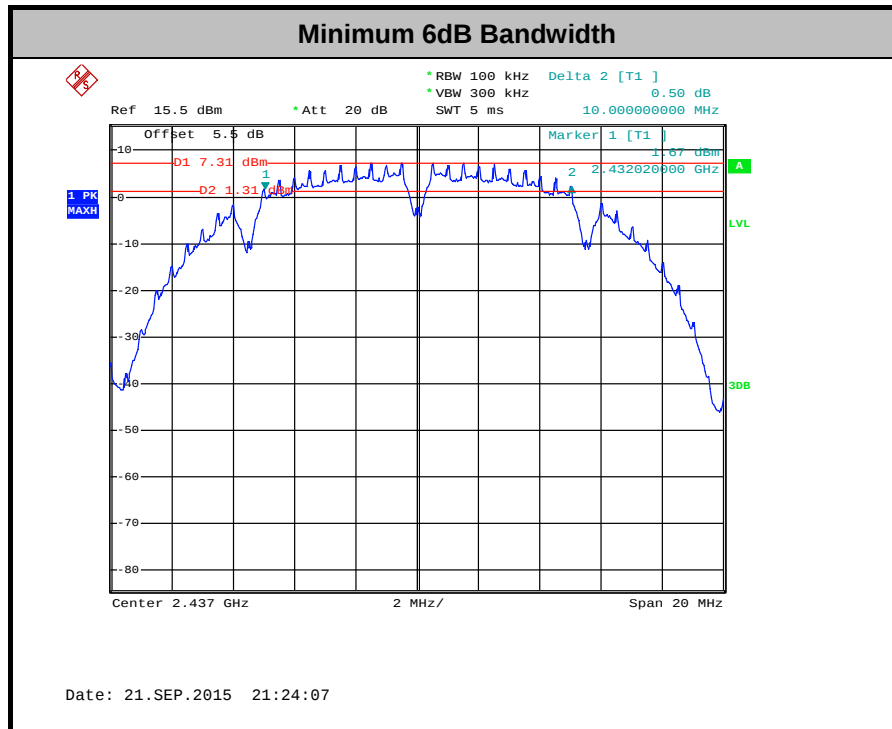
1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v03r03.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit 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.



Note : The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting Antenna of directional gain greater than 6dBi are 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.

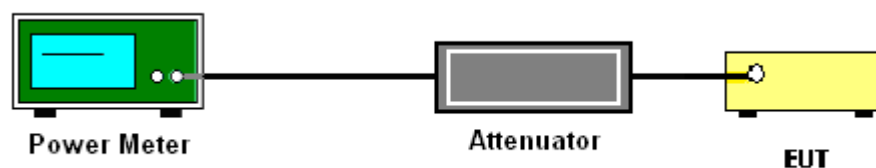
3.2.2 Measuring Instruments

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 v03r03 section 9.1.2 PKPM1 Peak power meter method.
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.

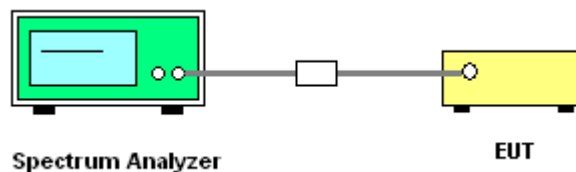
3.3.2 Measuring Instruments

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 v03r03
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.

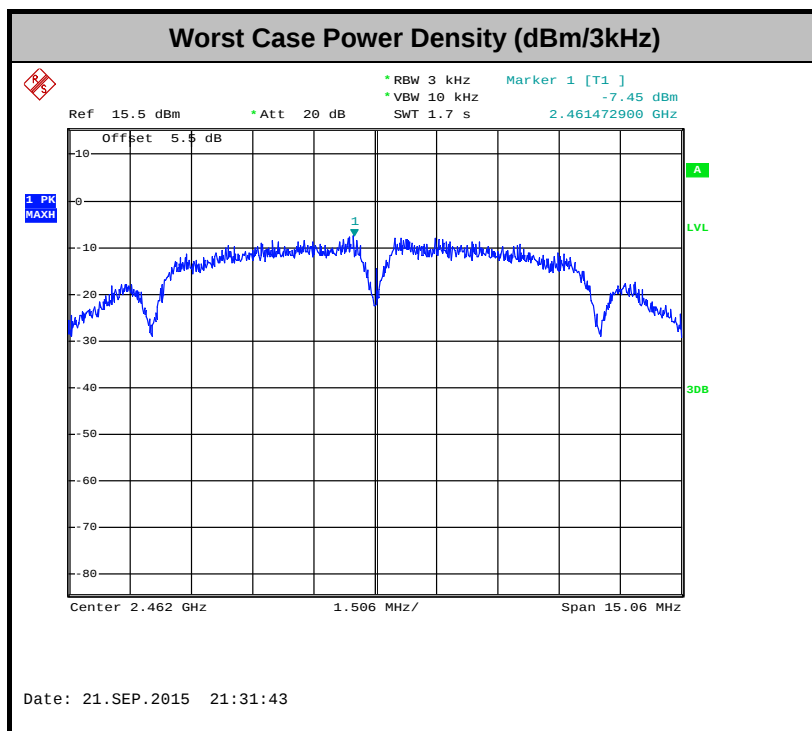
3.3.4 Test Setup





3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A of this test report.



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).

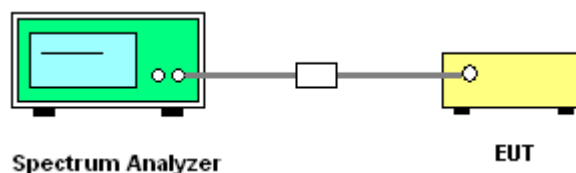
3.4.2 Measuring Instruments

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 v03r03.
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



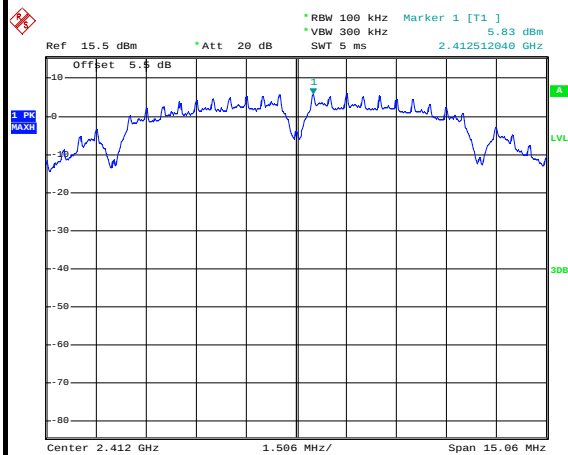


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Mode :	802.11b	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~54%
Test Channel :	01	Test Engineer :	Lvan Zhang

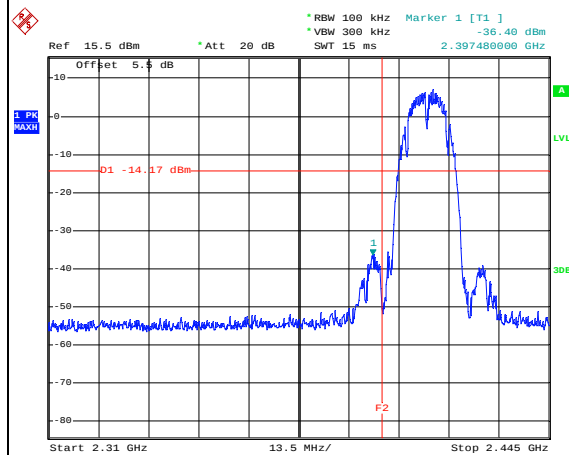
WLAN 802.11b Channel 01

100kHz PSD reference Level



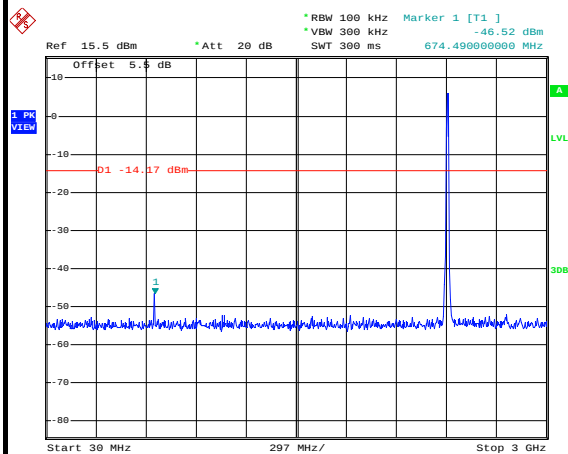
Date: 21.SEP.2015 21:16:59

Low Channel Plot



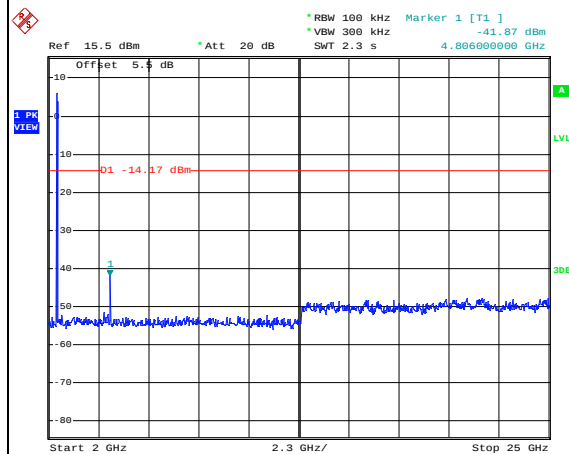
Date: 21.SEP.2015 21:17:48

Spurious Emission 30MHz~3GHz



Date: 21.SEP.2015 21:18:26

Spurious Emission 2GHz~25GHz



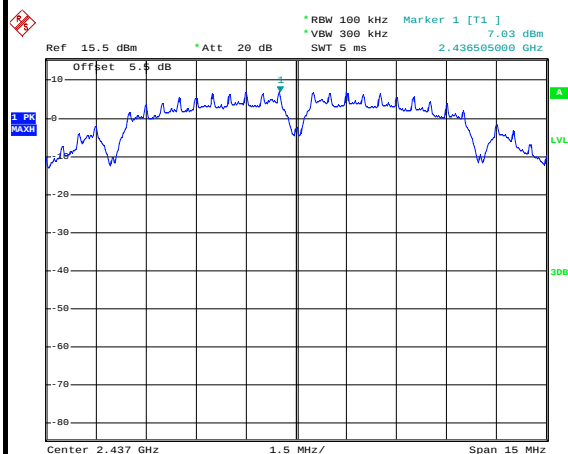
Date: 21.SEP.2015 21:18:44



Test Mode :	802.11b	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~54%
Test Channel :	06	Test Engineer :	Lvan Zhang

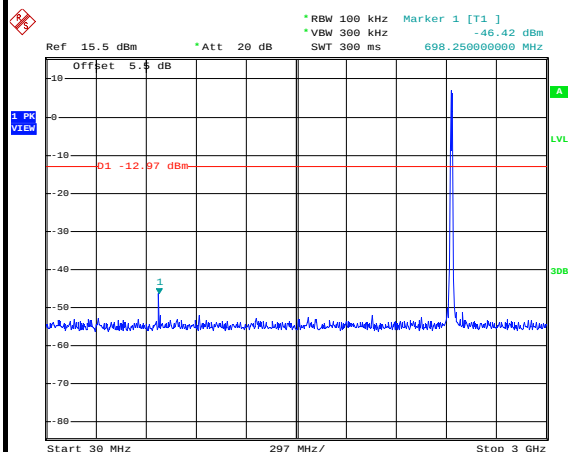
WLAN 802.11b Channel 06

100kHz PSD reference Level



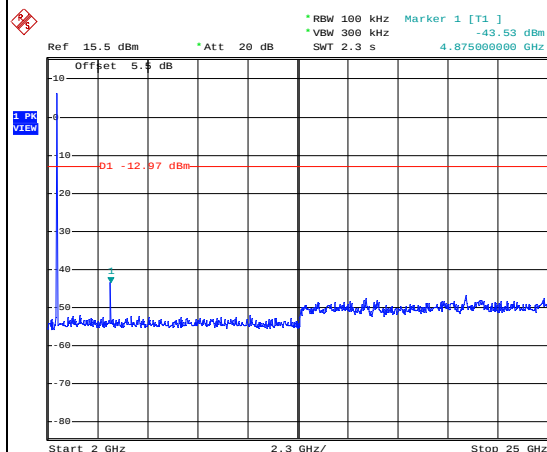
Date: 21.SEP.2015 21:26:00

Spurious Emission 30MHz~3GHz



Date: 21.SEP.2015 21:26:23

Spurious Emission 2GHz~25GHz



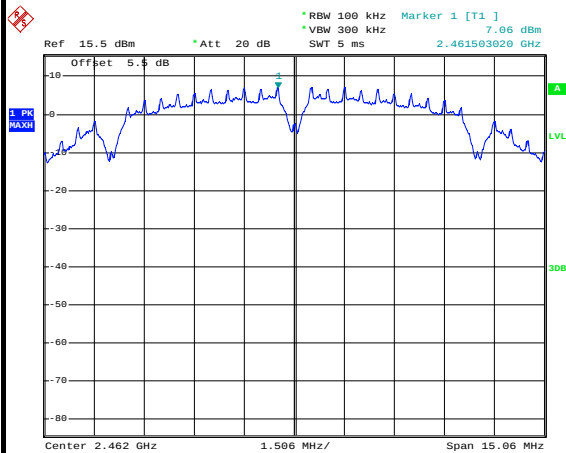
Date: 21.SEP.2015 21:26:41



Test Mode :	802.11b	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~54%
Test Channel :	11	Test Engineer :	Lvan Zhang

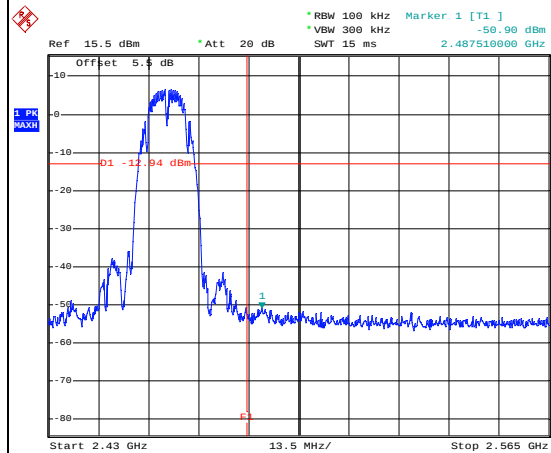
WLAN 802.11b Channel 11

100kHz PSD reference Level



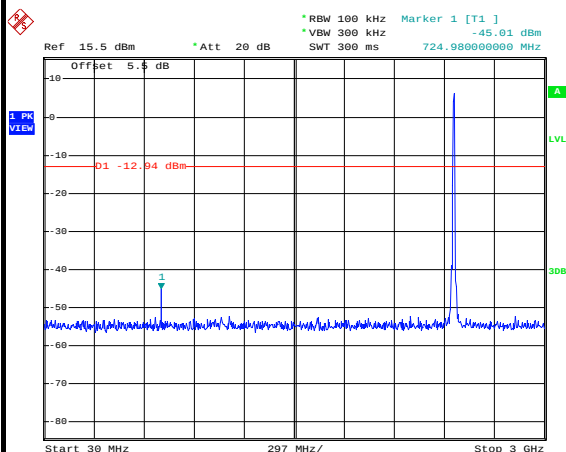
Date: 21.SEP.2015 21:33:01

High Channel Plot



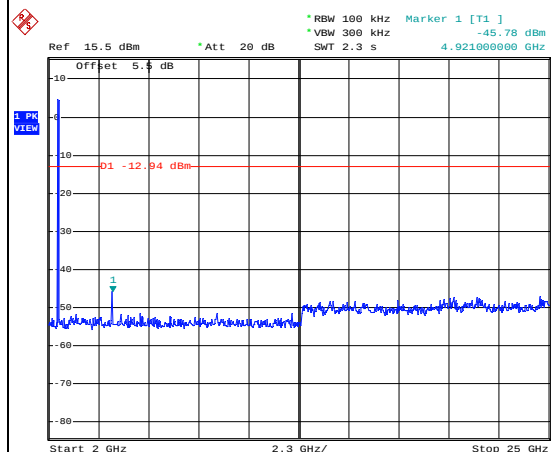
Date: 21.SEP.2015 21:35:30

Spurious Emission 30MHz~3GHz



Date: 21.SEP.2015 21:36:19

Spurious Emission 2GHz~25GHz



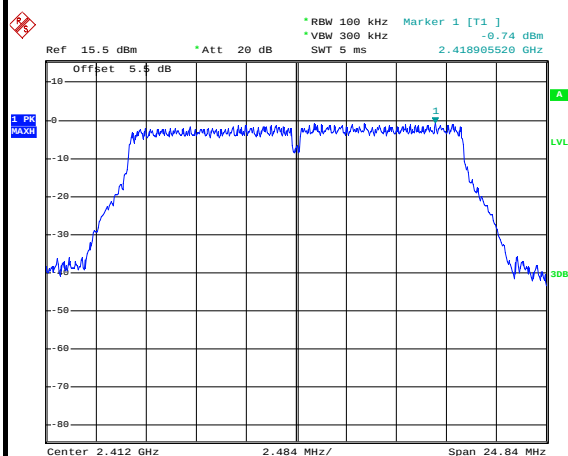
Date: 21.SEP.2015 21:36:37



Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~54%
Test Channel :	01	Test Engineer :	Lvan Zhang

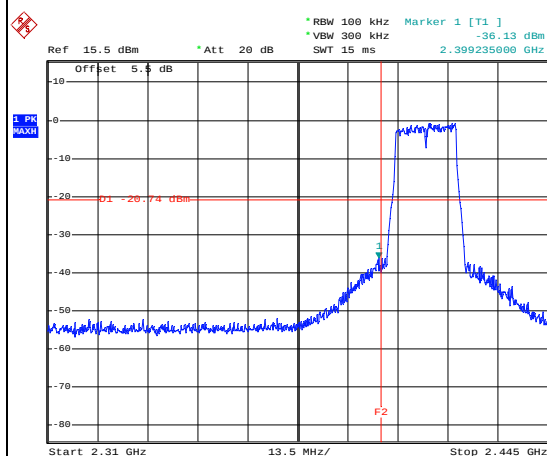
WLAN 802.11g Channel 01

100kHz PSD reference Level



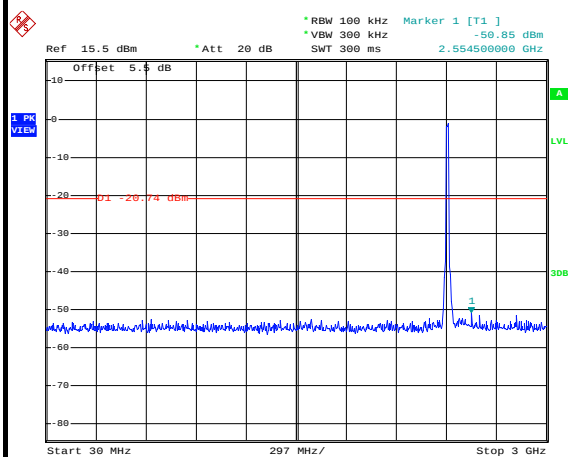
Date: 21.SEP.2015 21:42:50

Low Channel Plot



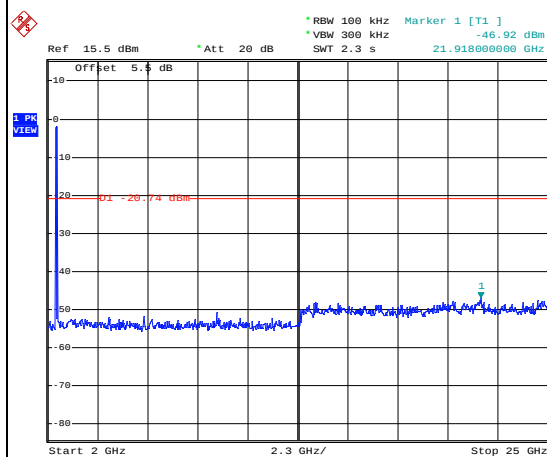
Date: 21.SEP.2015 21:43:09

Spurious Emission 30MHz~3GHz



Date: 21.SEP.2015 21:43:32

Spurious Emission 2GHz~25GHz



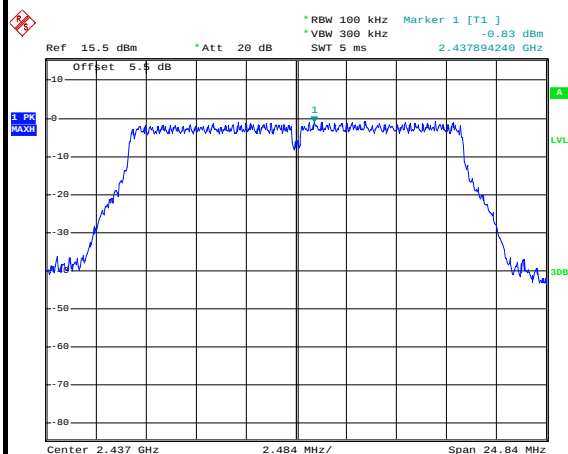
Date: 21.SEP.2015 21:43:50



Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~54%
Test Channel :	06	Test Engineer :	Lvan Zhang

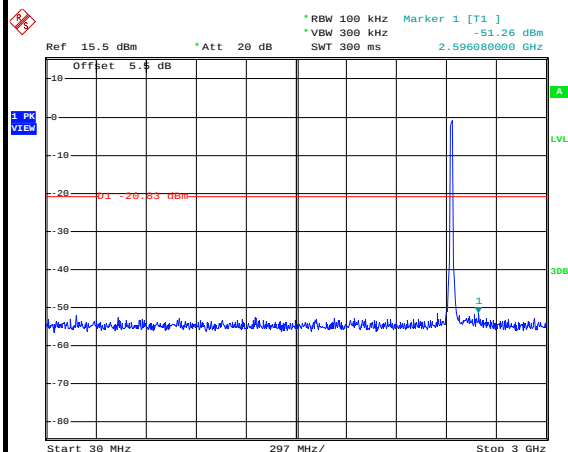
WLAN 802.11g Channel 06

100kHz PSD reference Level



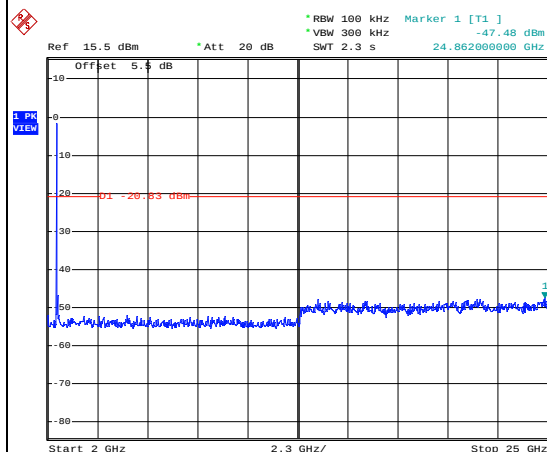
Date: 21.SEP.2015 21:47:44

Spurious Emission 30MHz~3GHz



Date: 21.SEP.2015 21:48:10

Spurious Emission 2GHz~25GHz



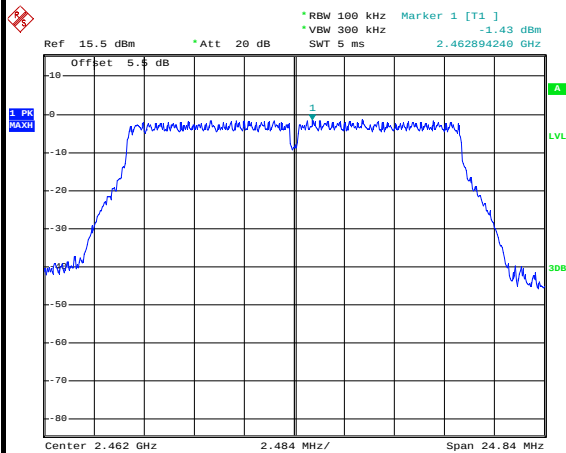
Date: 21.SEP.2015 21:48:28



Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~54%
Test Channel :	11	Test Engineer :	Lvan Zhang

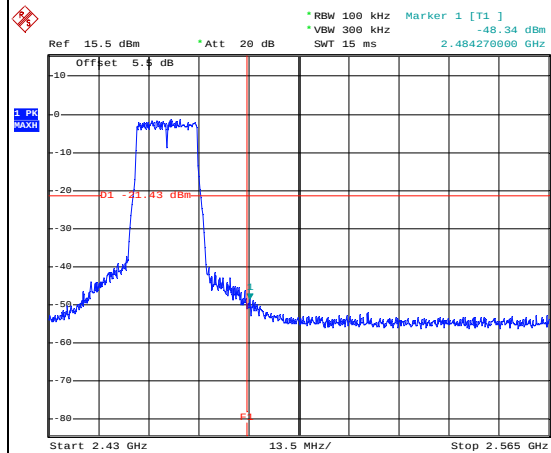
WLAN 802.11g Channel 11

100kHz PSD reference Level



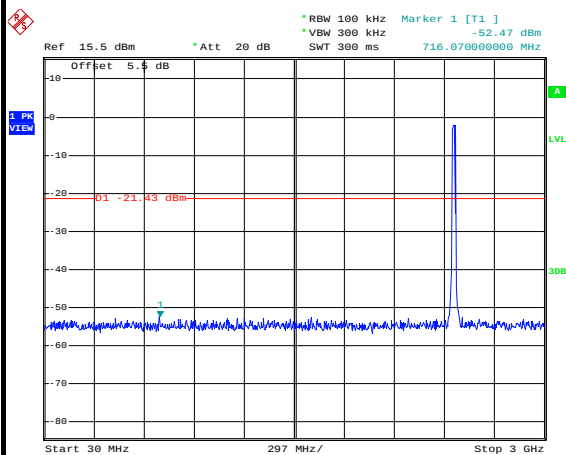
Date: 21.SEP.2015 21:51:44

High Channel Plot



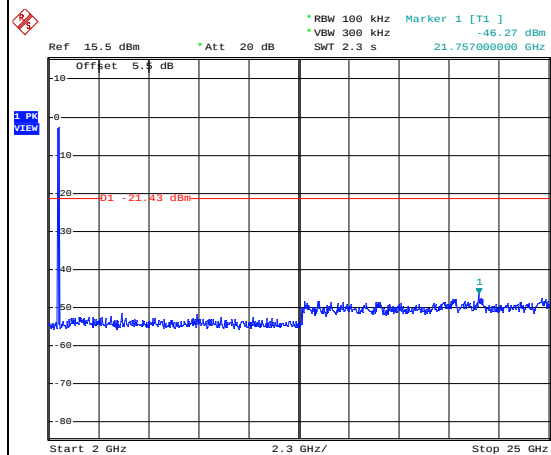
Date: 21.SEP.2015 21:52:03

Spurious Emission 30MHz~3GHz



Date: 21.SEP.2015 21:52:29

Spurious Emission 2GHz~25GHz



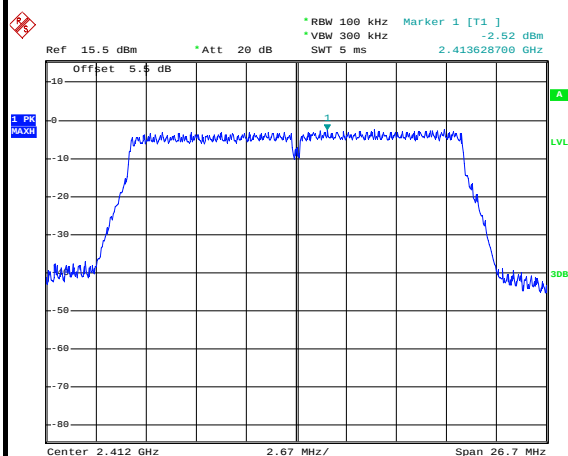
Date: 21.SEP.2015 21:52:47



Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~54%
Test Channel :	01	Test Engineer :	Lvan Zhang

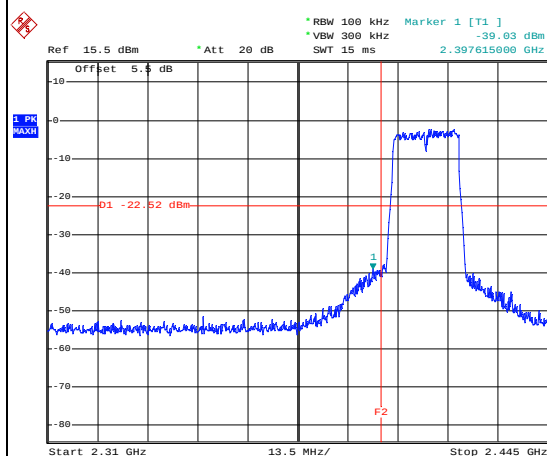
WLAN 802.11n HT20 Channel 01

100kHz PSD reference Level



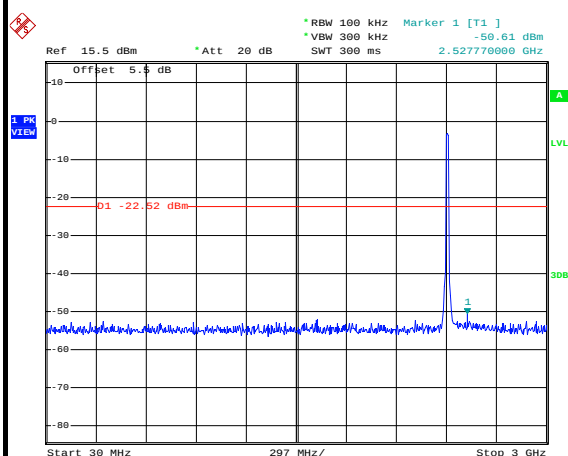
Date: 21.SEP.2015 21:58:15

Low Channel Plot



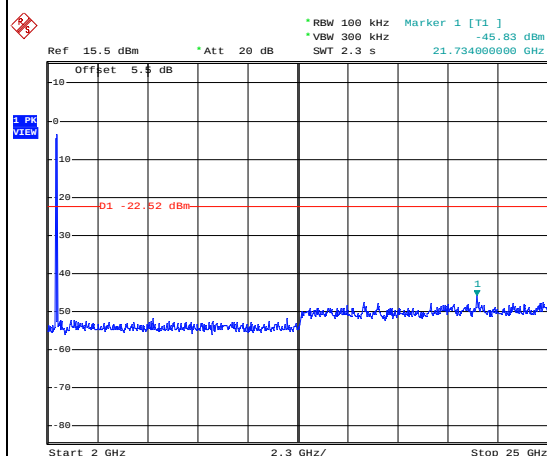
Date: 21.SEP.2015 22:00:17

Spurious Emission 30MHz~3GHz



Date: 21.SEP.2015 21:59:40

Spurious Emission 2GHz~25GHz



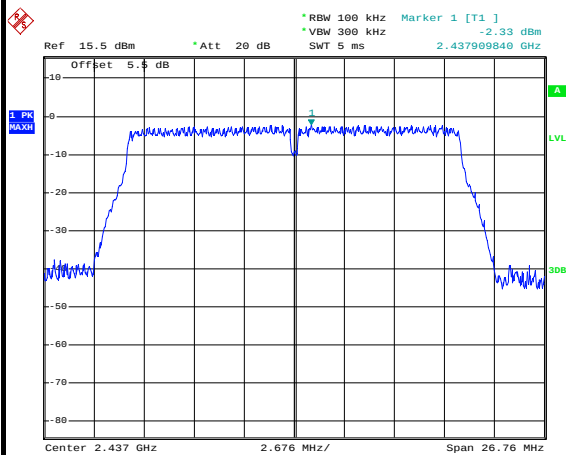
Date: 21.SEP.2015 21:59:58



Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~54%
Test Channel :	06	Test Engineer :	Lvan Zhang

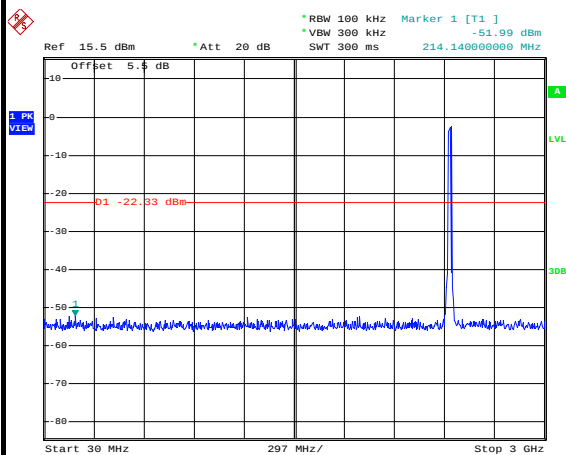
WLAN 802.11n HT20 Channel 06

100kHz PSD reference Level



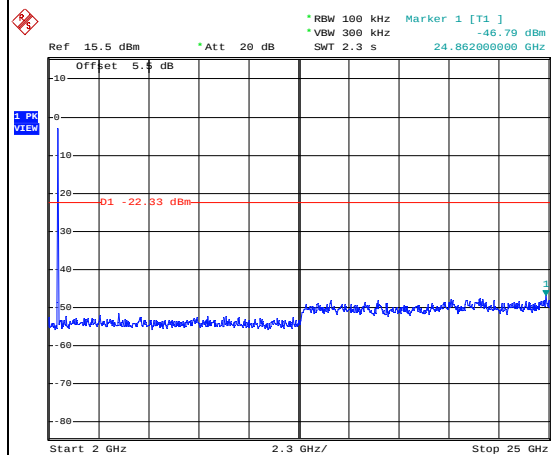
Date: 21.SEP.2015 22:11:19

Spurious Emission 30MHz~3GHz



Date: 21.SEP.2015 22:13:20

Spurious Emission 2GHz~25GHz



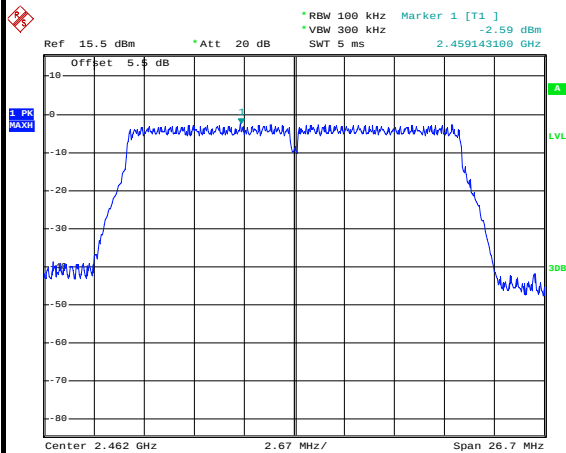
Date: 21.SEP.2015 22:13:38



Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~54%
Test Channel :	11	Test Engineer :	Lvan Zhang

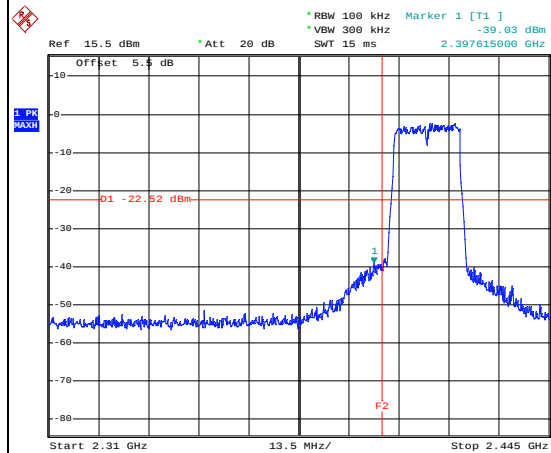
WLAN 802.11n HT20 Channel 11

100kHz PSD reference Level



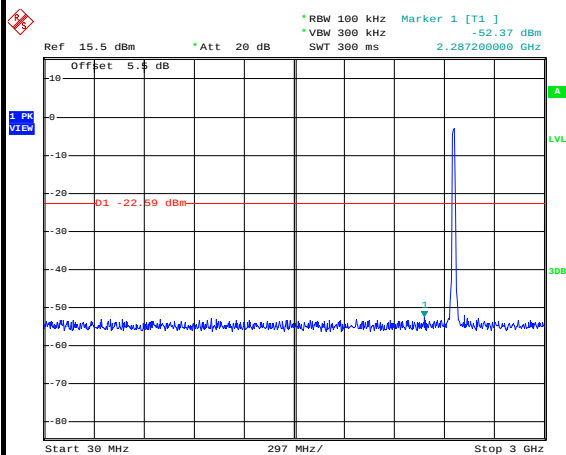
Date: 21.SEP.2015 22:16:59

High Channel Plot



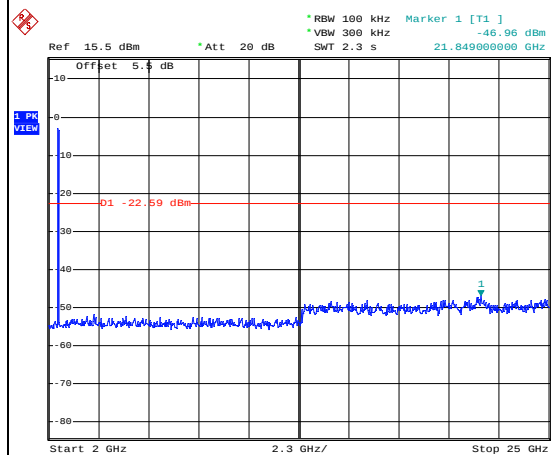
Date: 21.SEP.2015 22:00:17

Spurious Emission 30MHz~3GHz



Date: 21.SEP.2015 22:19:55

Spurious Emission 2GHz~25GHz



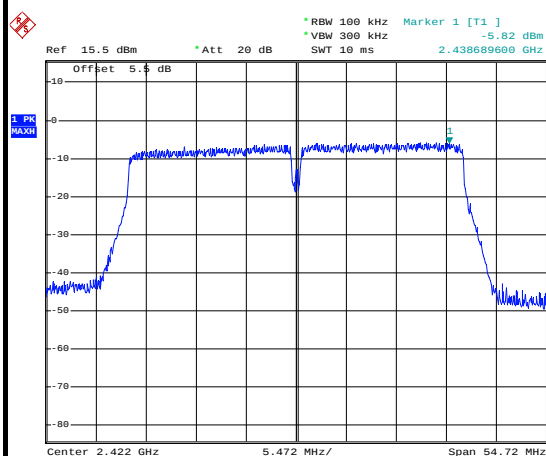
Date: 21.SEP.2015 22:20:13



Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~54%
Test Channel :	03	Test Engineer :	Lvan Zhang

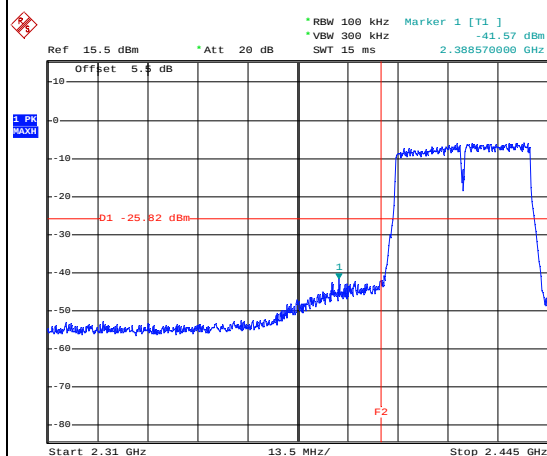
WLAN 802.11n HT40 Channel 03

100kHz PSD reference Level



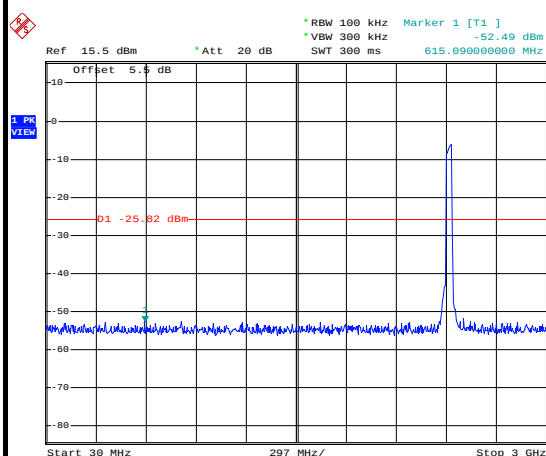
Date: 21.SEP.2015 22:28:16

Low Channel Plot



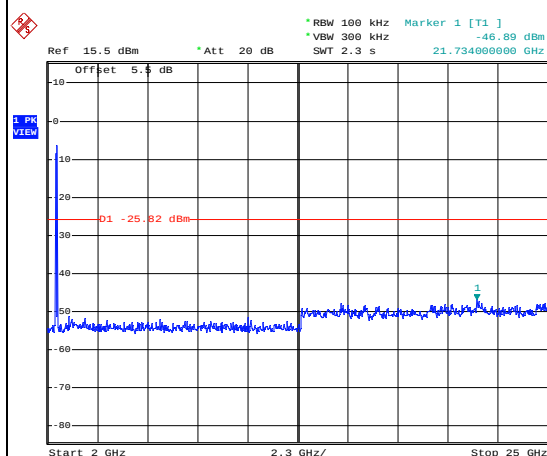
Date: 21.SEP.2015 22:28:35

Spurious Emission 30MHz~3GHz



Date: 21.SEP.2015 22:28:59

Spurious Emission 2GHz~25GHz



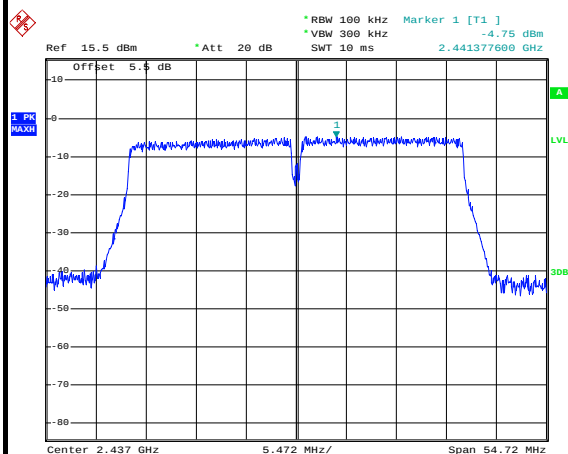
Date: 21.SEP.2015 22:29:17



Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~54%
Test Channel :	06	Test Engineer :	Lvan Zhang

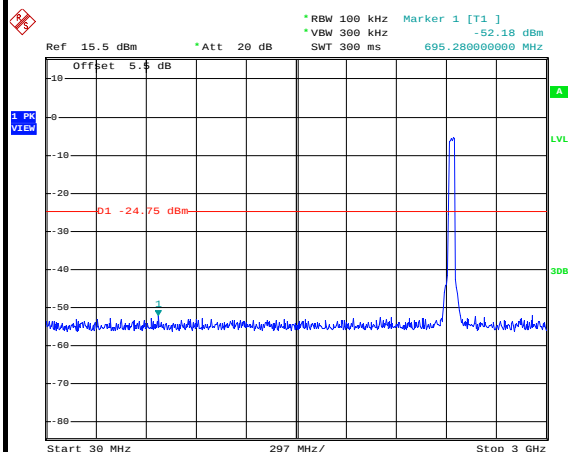
WLAN 802.11n HT40 Channel 06

100kHz PSD reference Level



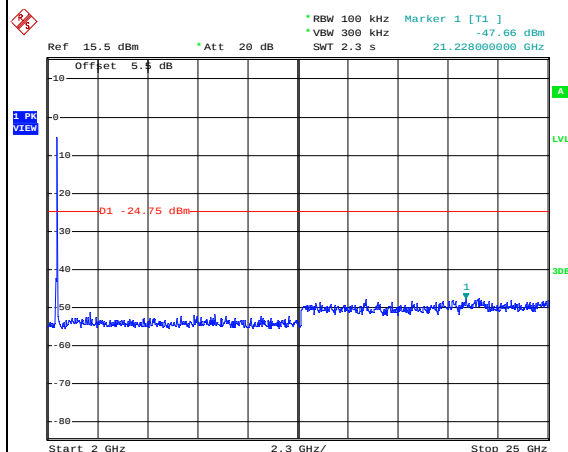
Date: 21.SEP.2015 22:36:18

Spurious Emission 30MHz~3GHz



Date: 21.SEP.2015 22:36:56

Spurious Emission 2GHz~25GHz



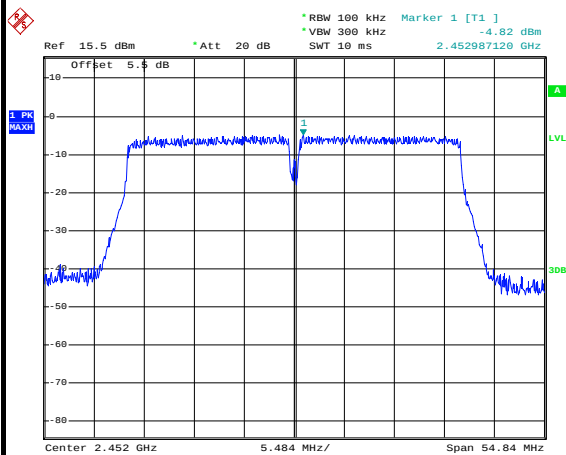
Date: 21.SEP.2015 22:37:14



Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~54%
Test Channel :	09	Test Engineer :	Lvan Zhang

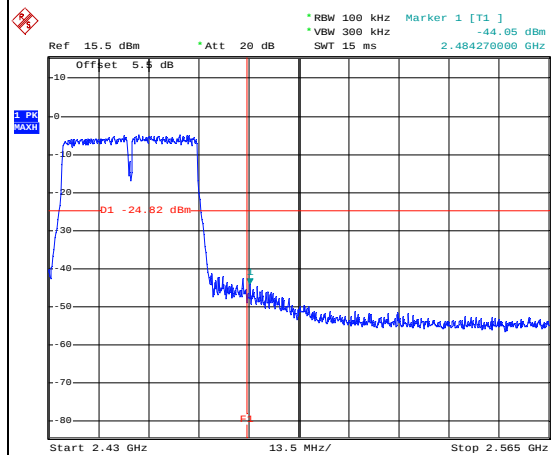
WLAN 802.11n HT40 Channel 09

100kHz PSD reference Level



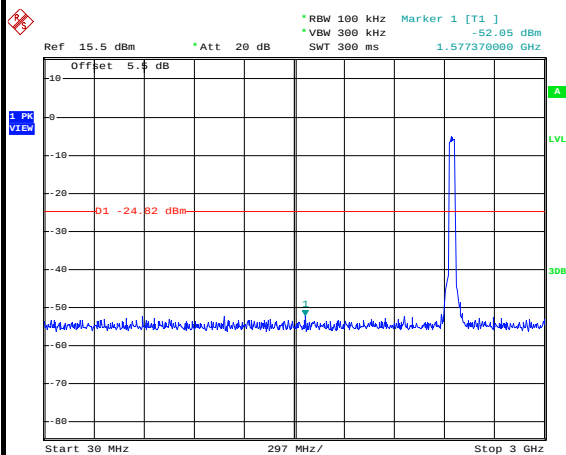
Date: 21.SEP.2015 22:43:56

High Channel Plot



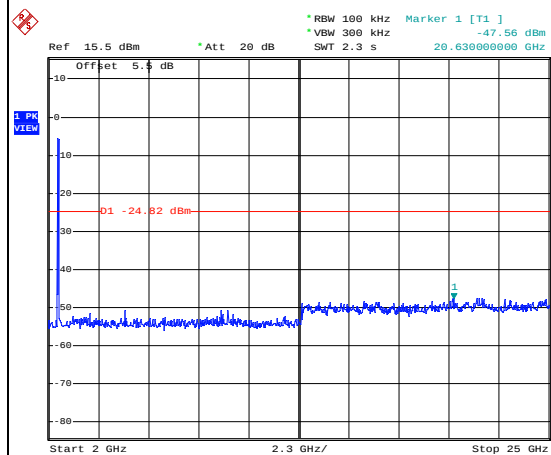
Date: 21.SEP.2015 22:45:45

Spurious Emission 30MHz~3GHz



Date: 21.SEP.2015 22:48:40

Spurious Emission 2GHz~25GHz



Date: 21.SEP.2015 22:48:58

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 Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r03.
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 $\geq$ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \geq 1$ GHz for peak measurement.

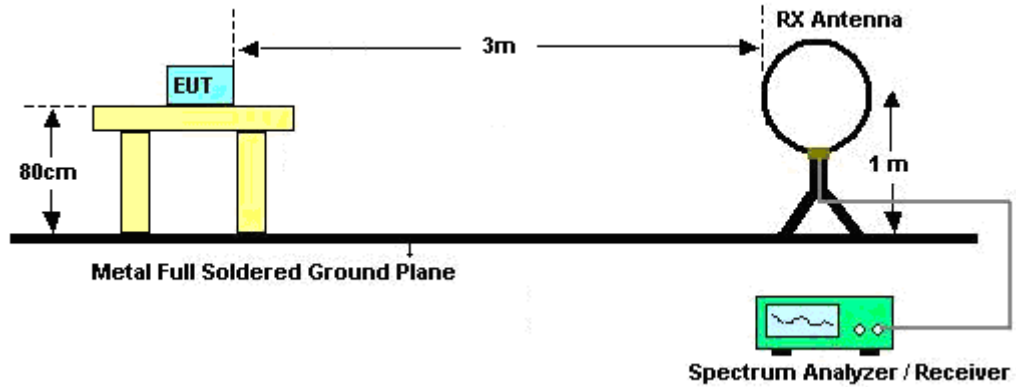
For average measurement:

 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, 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.

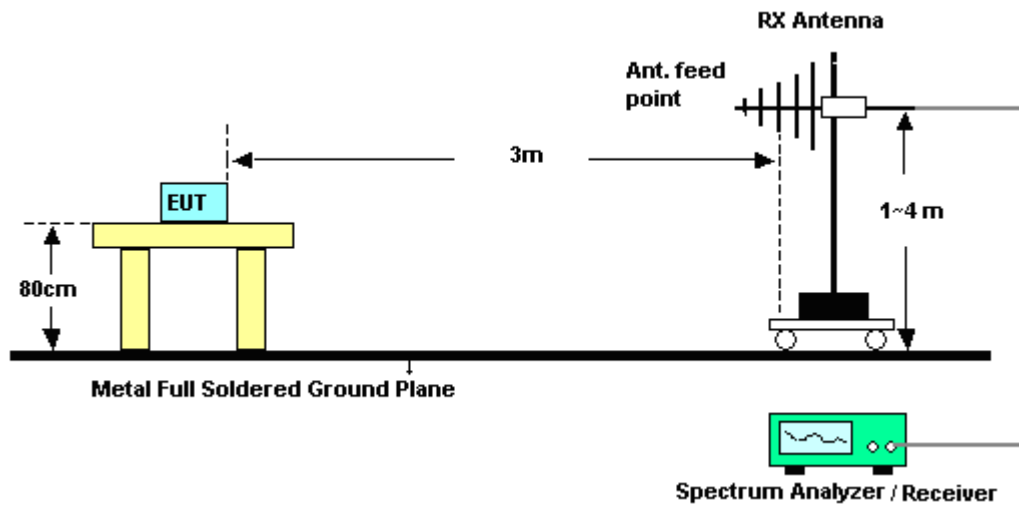
Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	100.00	-	-	10Hz
802.11g	100.00	-	-	10Hz
2.4GHz 802.11n HT20	100.00	-	-	10Hz
2.4GHz 802.11n HT40	100.00	-	-	10Hz

3.5.4 Test Setup

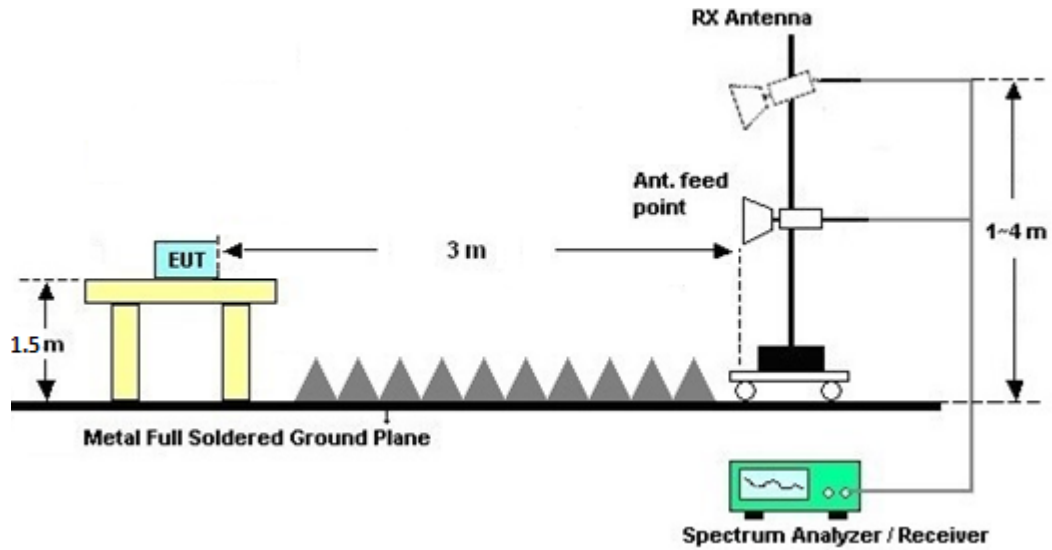
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.5.5 Test Results of Radiated Spurious 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.

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

Please refer to Appendix B.

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	R&S	FSP40	100319	9kHz~40GHz	Oct. 28, 2014	Sep. 21, 2015	Oct. 27, 2015	Conducted (TH01-KS)
Pulse Power Sensor	Anritsu	MA2411B	0917070	30MHz~40GHz	Jan. 23, 2015	Sep. 21, 2015	Jan. 22, 2016	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 23, 2015	Sep. 21, 2015	Jan. 22, 2016	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz; Max 30dBm	Sep. 29, 2014	Sep. 22, 2015	Sep. 28, 2015	Radiation (03CH02-KS)
Spectrum Analyzer	R&S	FSV40	101040	10kHz~40GHz; Max 30dBm	Sep. 25, 2014	Sep. 22, 2015	Sep. 24, 2015	Radiation (03CH02-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 13, 2014	Sep. 22, 2015	Nov. 12, 2015	Radiation (03CH02-KS)
Bilog Antenna	TeseQ	CBL6112D	23182	25MHz~2GHz	Jan. 17, 2015	Sep. 22, 2015	Jan. 16, 2016	Radiation (03CH02-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Nov. 08, 2014	Sep. 22, 2015	Nov. 07, 2015	Radiation (03CH02-KS)
Active Horn Antenna	com-power	AHA-118	701030	1GHz~18GHz	Nov. 08, 2014	Sep. 22, 2015	Nov. 07, 2015	Radiation (03CH02-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA170249	15GHz ~40GHz	Mar. 03, 2015	Sep. 22, 2015	Mar. 02, 2016	Radiation (03CH02-KS)
Amplifier	com-power	PA-103A	161069	1kHz ~1000MHz / 32 dB	May 04, 2015	Sep. 22, 2015	May 03, 2016	Radiation (03CH02-KS)
Amplifier	Agilent	8449B	3008A02384	1GHz~26.5GHz	Oct. 28, 2014	Sep. 22, 2015	Oct. 27, 2015	Radiation (03CH02-KS)
AC Power Source	Chroma	61601	616010002473	N/A	NCR	Sep. 22, 2015	NCR	Radiation (03CH02-KS)
Turn Table	MF	MF7802	N/A	0~360 degree	NCR	Sep. 22, 2015	NCR	Radiation (03CH02-KS)
Antenna Mast	MF	MF7802	N/A	1 m~4 m	NCR	Sep. 22, 2015	NCR	Radiation (03CH02-KS)



5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.1 dB
---	--------



Appendix A. Conducted Test Results

Test Engineer:	Ocean Wang	Temperature:	21~25	°C
Test Date:	2015/9/21	Relative Humidity:	51~54	%

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band								
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	13.80	10.04	0.50	Pass
11b	1Mbps	1	6	2437	13.75	10.00	0.50	Pass
11b	1Mbps	1	11	2462	13.75	10.04	0.50	Pass
11g	6Mbps	1	1	2412	17.60	16.56	0.50	Pass
11g	6Mbps	1	6	2437	17.55	16.56	0.50	Pass
11g	6Mbps	1	11	2462	17.55	16.56	0.50	Pass
HT20	MCS0	1	1	2412	18.50	17.80	0.50	Pass
HT20	MCS0	1	6	2437	18.50	17.84	0.50	Pass
HT20	MCS0	1	11	2462	18.50	17.80	0.50	Pass
HT40	MCS0	1	3	2422	36.60	36.48	0.50	Pass
HT40	MCS0	1	6	2437	36.60	36.48	0.50	Pass
HT40	MCS0	1	9	2452	36.70	36.56	0.50	Pass

TEST RESULTS DATA
Peak Power Table

2.4GHz Band										
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
11b	1Mbps	1	1	2412	18.19	30.00	-1.30	16.89	36.00	Pass
11b	1Mbps	1	6	2437	19.38	30.00	-1.30	18.08	36.00	Pass
11b	1Mbps	1	11	2462	19.32	30.00	-1.30	18.02	36.00	Pass
11g	6Mbps	1	1	2412	21.41	30.00	-1.30	20.11	36.00	Pass
11g	6Mbps	1	6	2437	22.39	30.00	-1.30	21.09	36.00	Pass
11g	6Mbps	1	11	2462	21.55	30.00	-1.30	20.25	36.00	Pass
HT20	MCS0	1	1	2412	21.07	30.00	-1.30	19.77	36.00	Pass
HT20	MCS0	1	6	2437	21.39	30.00	-1.30	20.09	36.00	Pass
HT20	MCS0	1	11	2462	21.15	30.00	-1.30	19.85	36.00	Pass
HT40	MCS0	1	3	2422	20.98	30.00	-1.30	19.68	36.00	Pass
HT40	MCS0	1	6	2437	21.57	30.00	-1.30	20.27	36.00	Pass
HT40	MCS0	1	9	2452	21.39	30.00	-1.30	20.09	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

2.4GHz Band						
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.00	15.58
11b	1Mbps	1	6	2437	0.00	16.78
11b	1Mbps	1	11	2462	0.00	16.72
11g	6Mbps	1	1	2412	0.00	12.55
11g	6Mbps	1	6	2437	0.00	13.33
11g	6Mbps	1	11	2462	0.00	12.61
HT20	MCS0	1	1	2412	0.00	11.89
HT20	MCS0	1	6	2437	0.00	12.41
HT20	MCS0	1	11	2462	0.00	11.92
HT40	MCS0	1	3	2422	0.00	11.66
HT40	MCS0	1	6	2437	0.00	12.45
HT40	MCS0	1	9	2452	0.00	12.37

TEST RESULTS DATA
Peak Power Density

2.4GHz Band								
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
11b	1Mbps	1	1	2412	-8.65	-1.30	8.00	Pass
11b	1Mbps	1	6	2437	-7.62	-1.30	8.00	Pass
11b	1Mbps	1	11	2462	-7.45	-1.30	8.00	Pass
11g	6Mbps	1	1	2412	-12.66	-1.30	8.00	Pass
11g	6Mbps	1	6	2437	-10.67	-1.30	8.00	Pass
11g	6Mbps	1	11	2462	-14.57	-1.30	8.00	Pass
HT20	MCS0	1	1	2412	-12.17	-1.30	8.00	Pass
HT20	MCS0	1	6	2437	-13.72	-1.30	8.00	Pass
HT20	MCS0	1	11	2462	-14.43	-1.30	8.00	Pass
HT40	MCS0	1	3	2422	-17.10	-1.30	8.00	Pass
HT40	MCS0	1	6	2437	-15.96	-1.30	8.00	Pass
HT40	MCS0	1	9	2452	-15.93	-1.30	8.00	Pass



Appendix B. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11b (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)
802.11b CH 01 2412MHz	*	2413.444	101.82	-	-	106.08	27.13	5.61	37	272	237	P	H
	*	2412.775	98.19	-	-	102.45	27.13	5.61	37	272	237	A	H
		2386.5	49.47	-24.53	74	53.9	27	5.59	37.02	272	237	P	H
		2386.32	40.73	-13.27	54	45.16	27	5.59	37.02	272	237	A	H
	*	2413.444	100.34	-	-	104.6	27.13	5.61	37	150	304	P	V
	*	2411.272	96.81	-	-	101.07	27.13	5.61	37	150	304	A	V
		2386.23	48.59	-25.41	74	53.02	27	5.59	37.02	150	304	P	V
		2386.41	38.88	-15.12	54	43.31	27	5.59	37.02	150	304	A	V
802.11b CH 06 2437MHz	*	2437.074	100.55	-	-	104.48	27.39	5.65	36.97	150	236	P	H
	*	2436.239	97.13	-	-	101.23	27.26	5.63	36.99	150	236	A	H
	*	2436.99	102.12	-	-	106.05	27.39	5.65	36.97	158	310	P	V
	*	2436.239	98.69	-	-	102.79	27.26	5.63	36.99	158	310	A	V
802.11b CH 11 2462MHz	*	2463.376	104.57	-	-	108.35	27.51	5.67	36.96	257	213	P	H
	*	2462.792	100.93	-	-	104.71	27.51	5.67	36.96	257	213	A	H
		2487.96	54.24	-19.76	74	57.69	27.77	5.71	36.93	257	213	P	H
		2487.76	47	-7	54	50.45	27.77	5.71	36.93	257	213	A	H
	*	2463.376	104.91	-	-	108.69	27.51	5.67	36.96	190	309	P	V
	*	2461.206	101.54	-	-	105.32	27.51	5.67	36.96	190	309	A	V
		2488.12	54.33	-19.67	74	57.78	27.77	5.71	36.93	190	309	P	V
		2487.76	46.98	-7.02	54	50.43	27.77	5.71	36.93	190	309	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI Ant. 1	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)
802.11b CH 01 2412MHz		4824	44.11	-29.89	74	41.43	31.51	7.85	36.68	150	30	P	H
		4824	46.47	-27.53	74	43.79	31.51	7.85	36.68	150	199	P	V
802.11b CH 06 2437MHz		4875	42.1	-31.9	74	39.28	31.59	7.89	36.66	150	114	P	H
		7311	45.15	-28.85	74	38.23	34.03	9.58	36.69	150	229	P	H
		4875	44.14	-29.86	74	41.32	31.59	7.89	36.66	150	237	P	V
		7311	44.94	-29.06	74	38.02	34.03	9.58	36.69	150	0	P	V
802.11b CH 11 2462MHz		4923	41.55	-32.45	74	38.61	31.67	7.92	36.65	150	31	P	H
		7386	44.57	-29.43	74	37.3	34.29	9.76	36.78	150	194	P	H
		4923	42.91	-31.09	74	39.97	31.67	7.92	36.65	150	313	P	V
		7386	44.97	-29.03	74	37.7	34.29	9.76	36.78	150	176	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz
WIFI 802.11g (Band Edge @ 3m)

WIFI Ant. 1	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)
802.11g CH 01 2412MHz	*	2418.955	101.88	-	-	106.14	27.13	5.61	37	210	210	P	H
	*	2419.122	91.98	-	-	96.24	27.13	5.61	37	210	210	A	H
		2389.65	56.21	-17.79	74	60.64	27	5.59	37.02	210	210	P	H
		2390	40.26	-13.74	54	44.69	27	5.59	37.02	210	210	A	H
	*	2418.955	98.84	-	-	103.1	27.13	5.61	37	196	337	P	V
	*	2419.122	88.92	-	-	93.18	27.13	5.61	37	196	337	A	V
		2388.57	52.15	-21.85	74	56.58	27	5.59	37.02	196	337	P	V
		2390	37.11	-16.89	54	41.54	27	5.59	37.02	196	337	A	V
802.11g CH 06 2437MHz	*	2434.068	102.03	-	-	106.13	27.26	5.63	36.99	172	208	P	H
	*	2438.744	91.74	-	-	95.67	27.39	5.65	36.97	172	208	A	H
	*	2443.754	100.76	-	-	104.69	27.39	5.65	36.97	163	328	P	V
	*	2444.088	90.84	-	-	94.77	27.39	5.65	36.97	163	328	A	V
802.11g CH 11 2462MHz	*	2459.034	101.85	-	-	105.63	27.51	5.67	36.96	182	210	P	H
	*	2463.794	91.62	-	-	95.4	27.51	5.67	36.96	182	210	A	H
		2483.56	60.46	-13.54	74	64.07	27.64	5.69	36.94	182	210	P	H
		2483.52	43.09	-10.91	54	46.7	27.64	5.69	36.94	182	210	A	H
	*	2459.034	100.63	-	-	104.41	27.51	5.67	36.96	150	329	P	V
	*	2463.794	90.27	-	-	94.05	27.51	5.67	36.96	150	329	A	V
		2483.52	58.7	-15.3	74	62.31	27.64	5.69	36.94	150	329	P	V
		2483.52	41.59	-12.41	54	45.2	27.64	5.69	36.94	150	329	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI Ant. 1	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)
802.11g CH 01 2412MHz		4824	42.23	-31.77	74	39.55	31.51	7.85	36.68	150	311	P	H
		4824	42.09	-31.91	74	39.41	31.51	7.85	36.68	150	118	P	V
802.11g CH 06 2437MHz		4875	41.69	-32.31	74	38.87	31.59	7.89	36.66	150	133	P	H
		7311	45.99	-28.01	74	39.07	34.03	9.58	36.69	150	219	P	H
		4875	42.14	-31.86	74	39.32	31.59	7.89	36.66	150	82	P	V
		7311	45.04	-28.96	74	38.12	34.03	9.58	36.69	150	325	P	V
802.11g CH 11 2462MHz		4923	41.24	-32.76	74	38.3	31.67	7.92	36.65	150	133	P	H
		7386	45.27	-28.73	74	38	34.29	9.76	36.78	150	219	P	H
		4923	43.02	-30.98	74	40.08	31.67	7.92	36.65	150	82	P	V
		7386	44.41	-29.59	74	37.14	34.29	9.76	36.78	150	325	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz
WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 1	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)
802.11n HT20 CH 01 2412MHz	*	2416.199	100.48	-	-	104.74	27.13	5.61	37	185	208	P	H
	*	2418.537	89.96	-	-	94.22	27.13	5.61	37	185	208	A	H
		2389.92	57.8	-16.2	74	62.23	27	5.59	37.02	185	208	P	H
		2390	39.38	-14.62	54	43.81	27	5.59	37.02	185	208	A	H
	*	2419.539	97.4	-	-	101.5	27.26	5.63	36.99	170	329	P	V
	*	2419.623	87.3	-	-	91.4	27.26	5.63	36.99	170	329	A	V
		2388.48	53.46	-20.54	74	57.89	27	5.59	37.02	170	329	P	V
		2390	36.37	-17.63	54	40.8	27	5.59	37.02	170	329	A	V
802.11n HT20 CH 06 2437MHz	*	2441.249	101.72	-	-	105.65	27.39	5.65	36.97	228	212	P	H
	*	2444.589	91.3	-	-	95.23	27.39	5.65	36.97	228	212	A	H
	*	2441.249	97.05	-	-	100.98	27.39	5.65	36.97	150	316	P	V
	*	2444.673	86.73	-	-	90.66	27.39	5.65	36.97	150	316	A	V
802.11n HT20 CH 11 2462MHz	*	2466.216	101.66	-	-	105.44	27.51	5.67	36.96	251	212	P	H
	*	2464.128	91.24	-	-	95.02	27.51	5.67	36.96	251	212	A	H
		2485.12	63.37	-10.63	74	66.98	27.64	5.69	36.94	251	212	P	H
		2483.52	43.62	-10.38	54	47.23	27.64	5.69	36.94	251	212	A	H
	*	2466.132	99.38	-	-	103.16	27.51	5.67	36.96	150	327	P	V
	*	2460.371	89.12	-	-	92.9	27.51	5.67	36.96	150	327	A	V
		2484.96	61.32	-12.68	74	64.93	27.64	5.69	36.94	150	327	P	V
		2483.52	42.07	-11.93	54	45.68	27.64	5.69	36.94	150	327	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI Ant. 1	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)
802.11n HT20 CH 01 2412MHz		4824	42.11	-31.89	74	39.43	31.51	7.85	36.68	150	25	P	H
		4824	42.23	-31.77	74	39.55	31.51	7.85	36.68	150	347	P	V
802.11n HT20 CH 06 2437MHz		4875	42.9	-31.1	74	40.08	31.59	7.89	36.66	150	54	P	H
		7311	45.35	-28.65	74	38.43	34.03	9.58	36.69	150	216	P	H
		4875	41.46	-32.54	74	38.64	31.59	7.89	36.66	150	247	P	V
		7311	44.16	-29.84	74	37.24	34.03	9.58	36.69	150	13	P	V
802.11n HT20 CH 11 2462MHz		4923	41.24	-32.76	74	38.3	31.67	7.92	36.65	150	25	P	H
		7386	44.88	-29.12	74	37.61	34.29	9.76	36.78	150	207	P	H
		4923	40.45	-33.55	74	37.51	31.67	7.92	36.65	150	347	P	V
		7386	45.36	-28.64	74	38.09	34.29	9.76	36.78	150	161	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz
WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant. 1	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)
802.11n HT40 CH 03 2422MHz	*	2432.398	98.96	-	-	103.06	27.26	5.63	36.99	226	211	P	H
	*	2437.909	88.56	-	-	92.49	27.39	5.65	36.97	226	211	A	H
		2389.92	62.14	-11.86	74	66.57	27	5.59	37.02	226	211	P	H
		2390	43.28	-10.72	54	47.71	27	5.59	37.02	226	211	A	H
		2487.08	51.45	-22.55	74	55.06	27.64	5.69	36.94	226	211	P	H
		2483.52	35.79	-18.21	54	39.4	27.64	5.69	36.94	226	211	A	H
	*	2438.41	96.19	-	-	100.12	27.39	5.65	36.97	169	346	P	V
	*	2437.491	86.02	-	-	89.95	27.39	5.65	36.97	169	346	A	V
		2390	58.23	-15.77	74	62.66	27	5.59	37.02	169	346	P	V
		2390	40.05	-13.95	54	44.48	27	5.59	37.02	169	346	A	V
		2490.72	51.59	-22.41	74	55.04	27.77	5.71	36.93	169	346	P	V
		2483.68	34.96	-19.04	54	38.57	27.64	5.69	36.94	169	346	A	V
802.11n HT40 CH 06 2437MHz	*	2447.344	98.84	-	-	102.77	27.39	5.65	36.97	209	213	P	H
	*	2450.852	88.19	-	-	92.12	27.39	5.65	36.97	209	213	A	H
		2387.31	54.88	-19.12	74	59.31	27	5.59	37.02	209	213	P	H
		2390	38.54	-15.46	54	42.97	27	5.59	37.02	209	213	A	H
		2485.92	58.66	-15.34	74	62.27	27.64	5.69	36.94	209	213	P	H
		2483.52	41.27	-12.73	54	44.88	27.64	5.69	36.94	209	213	A	H
	*	2439.496	96.47	-	-	100.4	27.39	5.65	36.97	168	333	P	V
	*	2450.685	85.76	-	-	89.69	27.39	5.65	36.97	168	333	A	V
		2389.74	52.83	-21.17	74	57.26	27	5.59	37.02	168	333	P	V
		2390	35.55	-18.45	54	39.98	27	5.59	37.02	168	333	A	V
		2485.64	57.02	-16.98	74	60.63	27.64	5.69	36.94	168	333	P	V
		2483.52	39.95	-14.05	54	43.56	27.64	5.69	36.94	168	333	A	V



802.11n HT40 CH 09 2452MHz	*	2453.857	99.34	-	-	103.12	27.51	5.67	36.96	217	212	P	H
	*	2454.191	88.48	-	-	92.26	27.51	5.67	36.96	217	212	A	H
		2389.56	53.26	-20.74	74	57.69	27	5.59	37.02	217	212	P	H
		2390	34.17	-19.83	54	38.6	27	5.59	37.02	217	212	A	H
		2483.88	67.98	-6.02	74	71.59	27.64	5.69	36.94	217	212	P	H
		2483.52	47.99	-6.01	54	51.6	27.64	5.69	36.94	217	212	A	H
	*	2454.442	97.5	-	-	101.28	27.51	5.67	36.96	168	333	P	V
	*	2454.024	86.28	-	-	90.06	27.51	5.67	36.96	168	333	A	V
		2385.87	48.58	-25.42	74	53.01	27	5.59	37.02	168	333	P	V
		2389.83	32.53	-21.47	54	36.96	27	5.59	37.02	168	333	A	V
		2484.04	66.58	-7.42	74	70.19	27.64	5.69	36.94	168	333	P	V
		2483.52	46.22	-7.78	54	49.83	27.64	5.69	36.94	168	333	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz
WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 1	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)
802.11n HT40 CH 03 2422MHz		4845	41.25	-32.75	74	38.54	31.53	7.86	36.68	150	128	P	H
		7266	43.83	-30.17	74	37.05	33.93	9.51	36.66	150	145	P	H
		4845	41.81	-32.19	74	39.1	31.53	7.86	36.68	150	360	P	V
		7266	43.57	-30.43	74	36.79	33.93	9.51	36.66	150	103	P	V
802.11n HT40 CH 06 2437MHz		4875	41.42	-32.58	74	38.6	31.59	7.89	36.66	150	48	P	H
		7311	46	-28	74	39.08	34.03	9.58	36.69	150	360	P	H
		4875	42.1	-31.9	74	39.28	31.59	7.89	36.66	150	124	P	V
		7311	44.59	-29.41	74	37.67	34.03	9.58	36.69	150	120	P	V
802.11n HT40 CH 09 2452MHz		4905	40.95	-33.05	74	38.05	31.64	7.91	36.65	150	128	P	H
		7356	45.65	-28.35	74	38.52	34.19	9.69	36.75	150	145	P	H
		4905	42.01	-31.99	74	39.11	31.64	7.91	36.65	150	360	P	V
		7356	43.78	-30.22	74	36.65	34.19	9.69	36.75	150	103	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz WIFI 802.11b (LF)

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)
2.4GHz 802.11b LF		30.97	20.05	-19.95	40	31.99	18.46	0.66	31.06	100	215	P	H
		38.73	17.76	-22.24	40	32.97	14.94	0.75	30.9	-	-	P	H
		65.89	11.08	-28.92	40	33.36	7.34	0.98	30.6	-	-	P	H
		79.47	19.15	-20.85	40	39.3	9.27	1.08	30.5	-	-	P	H
		88.2	15	-28.5	43.5	33.14	11.22	1.14	30.5	-	-	P	H
		103.72	15.46	-28.04	43.5	31.48	13.15	1.23	30.4	-	-	P	H
		32.91	23.43	-16.57	40	35.54	18.18	0.69	30.98	100	214	P	V
		50.37	19.93	-20.07	40	40.56	9.3	0.85	30.78	-	-	P	V
		59.1	17.51	-22.49	40	40.26	6.96	0.91	30.62	-	-	P	V
		78.5	15.7	-24.3	40	35.89	9.23	1.08	30.5	-	-	P	V
		101.78	15.83	-27.67	43.5	31.88	13.13	1.22	30.4	-	-	P	V
		117.3	14.03	-29.47	43.5	29.79	13.34	1.3	30.4	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



Emission below 1GHz

2.4GHz WIFI 802.11g (LF)

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)
2.4GHz 802.11g LF		30.97	19.05	-20.95	40	30.99	18.46	0.66	31.06	110	214	P	H
		40.67	16.55	-23.45	40	32.74	13.92	0.77	30.88	-	-	P	H
		79.47	17.15	-22.85	40	37.3	9.27	1.08	30.5	-	-	P	H
		84.32	14.79	-25.21	40	34.16	10.02	1.11	30.5	-	-	P	H
		88.2	13	-30.5	43.5	31.14	11.22	1.14	30.5	-	-	P	H
		100.81	14.89	-28.61	43.5	30.96	13.11	1.22	30.4	-	-	P	H
		32.91	24.43	-15.57	40	36.54	18.18	0.69	30.98	100	214	P	V
		38.73	20.81	-19.19	40	36.02	14.94	0.75	30.9	-	-	P	V
		50.37	20.93	-19.07	40	41.56	9.3	0.85	30.78	-	-	P	V
		59.1	18.51	-21.49	40	41.26	6.96	0.91	30.62	-	-	P	V
		62.01	17.15	-22.85	40	39.85	6.96	0.94	30.6	-	-	P	V
		78.5	16.7	-23.3	40	36.89	9.23	1.08	30.5	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



Emission below 1GHz

2.4GHz WIFI 802.11n HT20 (LF)

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)
2.4GHz 802.11n HT20 LF		30.97	21.05	-18.95	40	32.99	18.46	0.66	31.06	121	69	P	H
		40.67	16.55	-23.45	40	32.74	13.92	0.77	30.88	-	-	P	H
		78.5	20.13	-19.87	40	40.32	9.23	1.08	30.5	-	-	P	H
		84.32	14.79	-25.21	40	34.16	10.02	1.11	30.5	-	-	P	H
		100.81	19.89	-23.61	43.5	35.96	13.11	1.22	30.4	-	-	P	H
		116.33	13.75	-29.75	43.5	29.52	13.33	1.3	30.4	-	-	P	H
		32.91	25.43	-14.57	40	538.23	18.18	-500	30.98	100	210	P	V
		38.73	20.81	-19.19	40	536.77	14.94	-500	30.9	-	-	P	V
		53.28	20.4	-19.6	40	542.84	8.28	-500	30.72	-	-	P	V
		62.01	18.15	-21.85	40	541.79	6.96	-500	30.6	-	-	P	V
		78.5	15.7	-24.3	40	536.97	9.23	-500	30.5	-	-	P	V
		94.02	22.61	-20.89	43.5	540.57	12.46	-500	30.42	-	-	P	V
Remark	1. No other spurious found.												
	2. All results are PASS against limit line.												



Emission below 1GHz

2.4GHz WIFI 802.11n HT40 (LF)

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)
2.4GHz 802.11n HT40 LF		30.97	20.05	-19.95	40	31.99	18.46	0.66	31.06	100	214	P	H
		40.67	17.55	-22.45	40	33.74	13.92	0.77	30.88	-	-	P	H
		79.47	18.15	-21.85	40	38.3	9.27	1.08	30.5	-	-	P	H
		84.32	14.79	-25.21	40	34.16	10.02	1.11	30.5	-	-	P	H
		100.81	15.89	-27.61	43.5	31.96	13.11	1.22	30.4	-	-	P	H
		556.71	20.6	-25.4	46	29.53	18.41	2.95	30.29	-	-	P	H
		32.91	23.43	-16.57	40	35.54	18.18	0.69	30.98	100	35	P	V
		52.31	20.35	-19.65	40	41.6	8.62	0.87	30.74	-	-	P	V
		59.1	17.51	-22.49	40	40.26	6.96	0.91	30.62	-	-	P	V
		78.5	15.7	-24.3	40	35.89	9.23	1.08	30.5	-	-	P	V
		94.02	20.61	-22.89	43.5	37.4	12.46	1.17	30.42	-	-	P	V
		101.78	15.83	-27.67	43.5	31.88	13.13	1.22	30.4	-	-	P	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.
!	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		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		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”.