



FCC RF Test Report

APPLICANT : BlackBerry Ltd.
EQUIPMENT : GSM Quad-band / UMTS FIVE bands
/ LTE eleven bands mobile phone
BRAND NAME : BlackBerry
MODEL NAME : RJE181LW
MARKETING NAME : DTEK50
FCC ID : L6ARJE180LW
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on May 09, 2016 and testing was completed on Jun. 29, 2016. 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.

Prepared by: James Huang / Manager

Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL (KUNSHAN) INC.
No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR611504-06C	Rev. 01	Initial issue of report	Jul. 12, 2016



SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	RSS-247 5.2(1)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.1	-	RSS-Gen 6.6	99% Bandwidth	-	Pass	-
3.2	15.247(b)	RSS-247 A5.4(4)	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	RSS-247 5.2(2)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	-
3.4	15.247(d)	RSS-247 5.5	Conducted Band Edges	$\leq 20\text{dBc}$	Pass	-
			Conducted Spurious Emission		Pass	-
3.5	15.247(d)	RSS-247 5.5	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 1.88 dB at 7308.000 MHz
3.6	15.207	RSS-GEN 8.8	AC Conducted Emission	15.207(a)	Pass	Under limit 9.31 dB at 0.540 MHz
3.7	15.203 & 15.247(b)	N/A	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

BlackBerry Ltd.

2200 University Ave E., Waterloo, ON, CAN. N2K0A7

1.2 Manufacturer

TCL Communication Ltd

5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park, Pudong Area Shanghai, P. R. China. 201203

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	GSM Quad-band / UMTS FIVE bands / LTE eleven bands mobile phone
Brand Name	BlackBerry
Model Name	RJE181LW
Marketing Name	DTEK50
FCC ID	L6ARJE180LW
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/DC-HSDPA/ HSPA+(16QAM uplink is not supported)/LTE/NFC WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 Bluetooth v3.0 + EDR/Bluetooth v4.0 LE/Bluetooth v4.2 LE
IMEI Code	Conducted: 004402243119934 Radiation: 004402243119926 Conduction: 004402243119983
HW Version	PIO
SW Version	AAF295
EUT Stage	Identical Prototype

Remark: 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 of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	802.11b/g/n : 2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to Antenna	802.11b : 20.14 dBm (0.1033 W) 802.11g : 22.86 dBm (0.1932 W) 802.11n HT20 : 22.72 dBm (0.1871 W) 802.11n HT40 : 22.75 dBm (0.1884 W)
99% Occupied Bandwidth	802.11b : 13.39MHz 802.11g : 18.93MHz 802.11n HT20 : 19.53MHz 802.11n HT40 : 36.66MHz
Antenna Type	802.11b/g/n : IFA Antenna with gain -2.50 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Specification of Accessory

Specification of Accessory				
AC Adapter	Brand Name	N/A	Model Name	UC13US
	Power Rating	I/P: 100 - 240Vac 0.5A, O/P:5V 2.0A		
	Manufacturer	BYD		
	P/N	CBA0059AG4C1		
Battery 1	Brand Name	N/A	Model Name	TLp026EJ
	Power Rating	3.85V 2610mAh		
	Manufacturer	COSLIGHT		
	P/N	CAC2610010CJ		
Battery 2	Brand Name	N/A	Model Name	TLp026E2
	Power Rating	3.84V 2610mAh		
	Manufacturer	SCUD		
	P/N	CAC2610011C2		
USB Cable 1	Brand Name	NA	Model Name	NA
	Signal Line Type	1.0 meter, shielded cable, without ferrite core		
	P/N	CDA0000043C8		
USB Cable 2	Brand Name	NA	Model Name	NA
	Signal Line Type	1.0 meter, shielded cable, without ferrite core		
	P/N	CDA0000043C2		
Earphone	Brand Name	LIANCHUANG	Model Name	NA
	Signal Line Type	1.25 meter, non-shielded cable, without ferrite core		
	P/N	CCB0045A15C3		

1.6 Modification of EUT

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

1.7 Testing Location

Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.		
Test Site Location	1F & 2F, Building A, Morning Business Center, No. 4003 ShiGu Rd., Xili Town, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595		
Test Site No.	Sporton Site No.		
	TH01-SZ		

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/IC Registration No.
	03CH03-KS	CO01-KS	306251/4086E

Note: The test site complies with ANSI C63.4 2014 requirement.

1.8 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 v03r05
- ♦ ANSI C63.10-2013
- ♦ IC RSS-247 Issue 1
- ♦ IC RSS-Gen Issue 4

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. 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 (Z plane) 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	19.50	CH 06	20.06	20.12	20.10
CH 06	2437 MHz	20.14				
CH 11	2462 MHz	18.93				

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	22.25	CH 06	22.59	22.68	22.75	22.76	22.75	22.84	22.70
CH 06	2437 MHz	22.86								
CH 11	2462 MHz	21.99								

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	22.08	CH 06	22.53	22.57	22.64	22.60	22.64	22.45	22.53
CH 06	2437 MHz	22.72								
CH 11	2462 MHz	21.64								

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	22.75	CH 03	22.23	22.25	22.38	22.42	22.26	22.15	21.97
CH 06	2437 MHz	22.62								
CH 09	2452 MHz	22.38								

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.

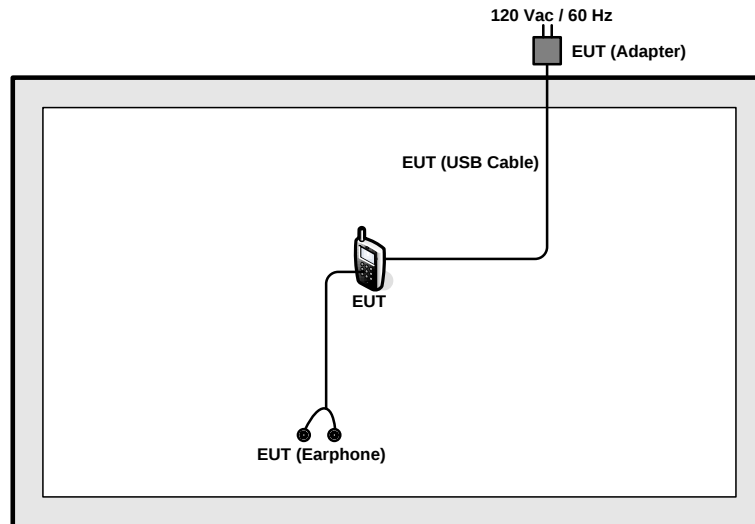
<2.4GHz>

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

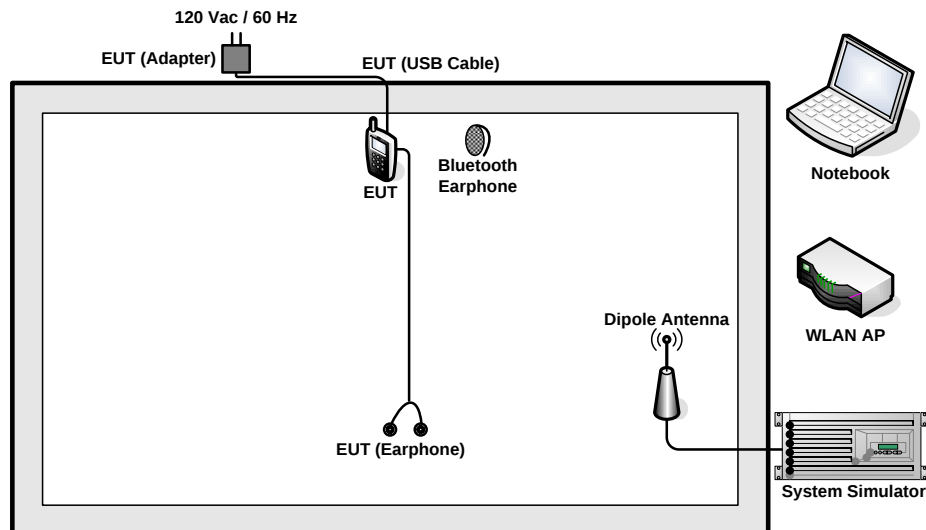
Test Cases	
AC Conducted Emission	Mode 1 : GSM850 Idle + Bluetooth Link + WLAN Link + USB Cable 1 (Charging from Adapter) + Battery 1 + Earphone
Remark: For Radiated TCs, The tests were performed with Adapter, Earphone, Battery 1 and USB Cable 1.	

2.4 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>



2.5 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	LINKSYS	WRT600N	Q87-WRT600NV11	N/A	Unshielded, 1.8 m
3.	Notebook	Lenovo	G480	N/A	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Lenovo	LBH505	N/A	N/A	N/A

2.6 EUT Operation Test Setup

For WLAN function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

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 5.0 dB and 10dB attenuator.

$$\begin{aligned}
 \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\
 &= 5.0 + 10 = 15.0 \text{ (dB)}
 \end{aligned}$$

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% 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 v03r05.
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. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 1MHz and set the Video bandwidth (VBW) = 3MHz.
6. Measure and record the results in the test report.

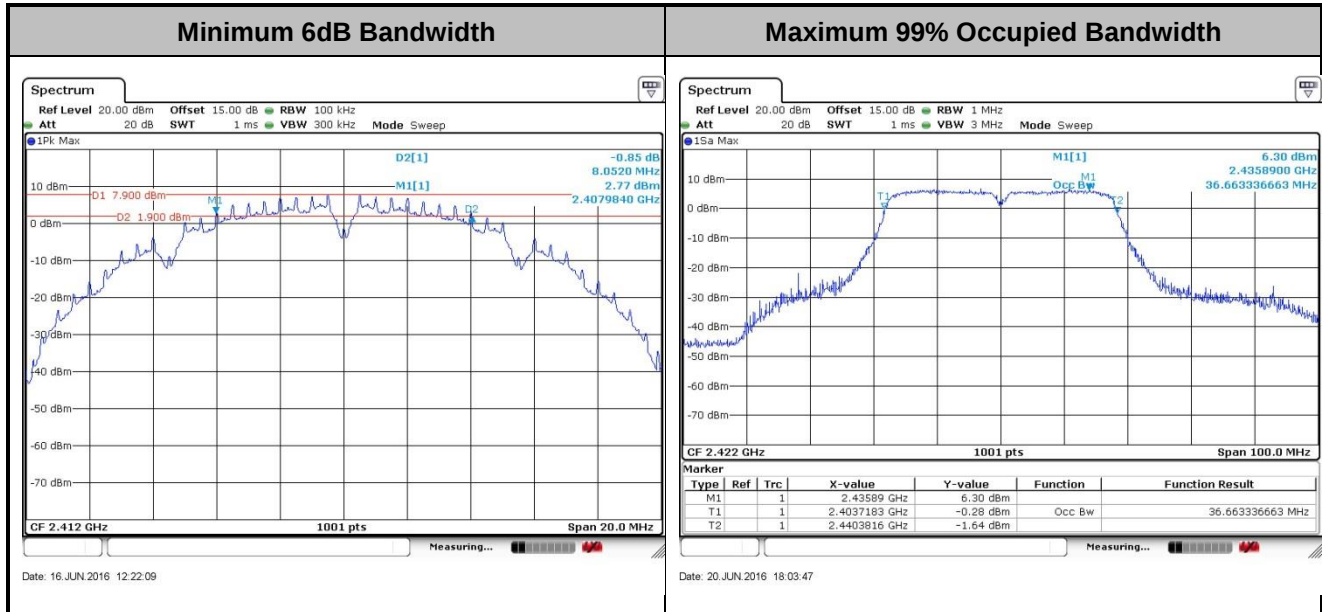
3.1.4 Test Setup





3.1.5 Test Result of 6dB and 99% 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 v03r05 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.

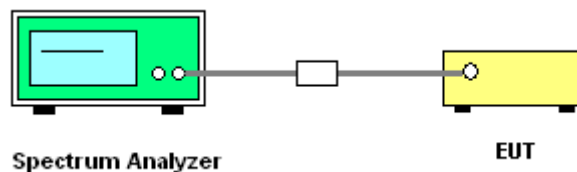
3.3.2 Measuring Instruments

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 v03r05
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.

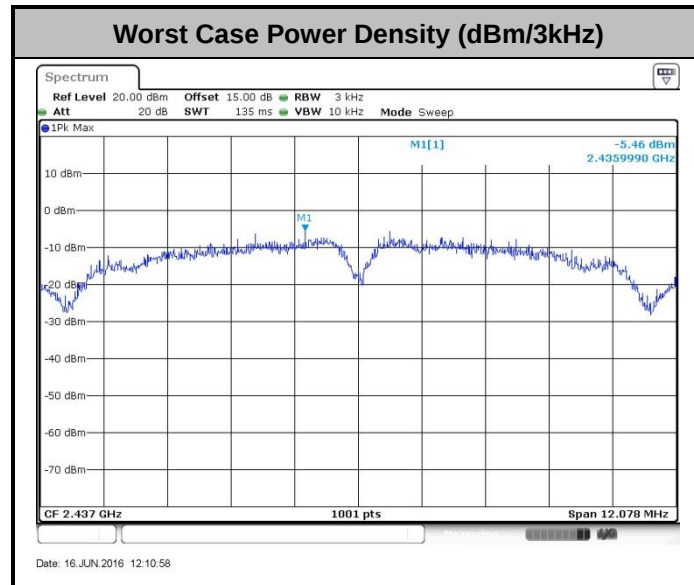
3.3.4 Test Setup





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).

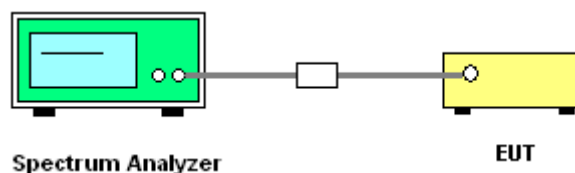
3.4.2 Measuring Instruments

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 v03r05.
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.

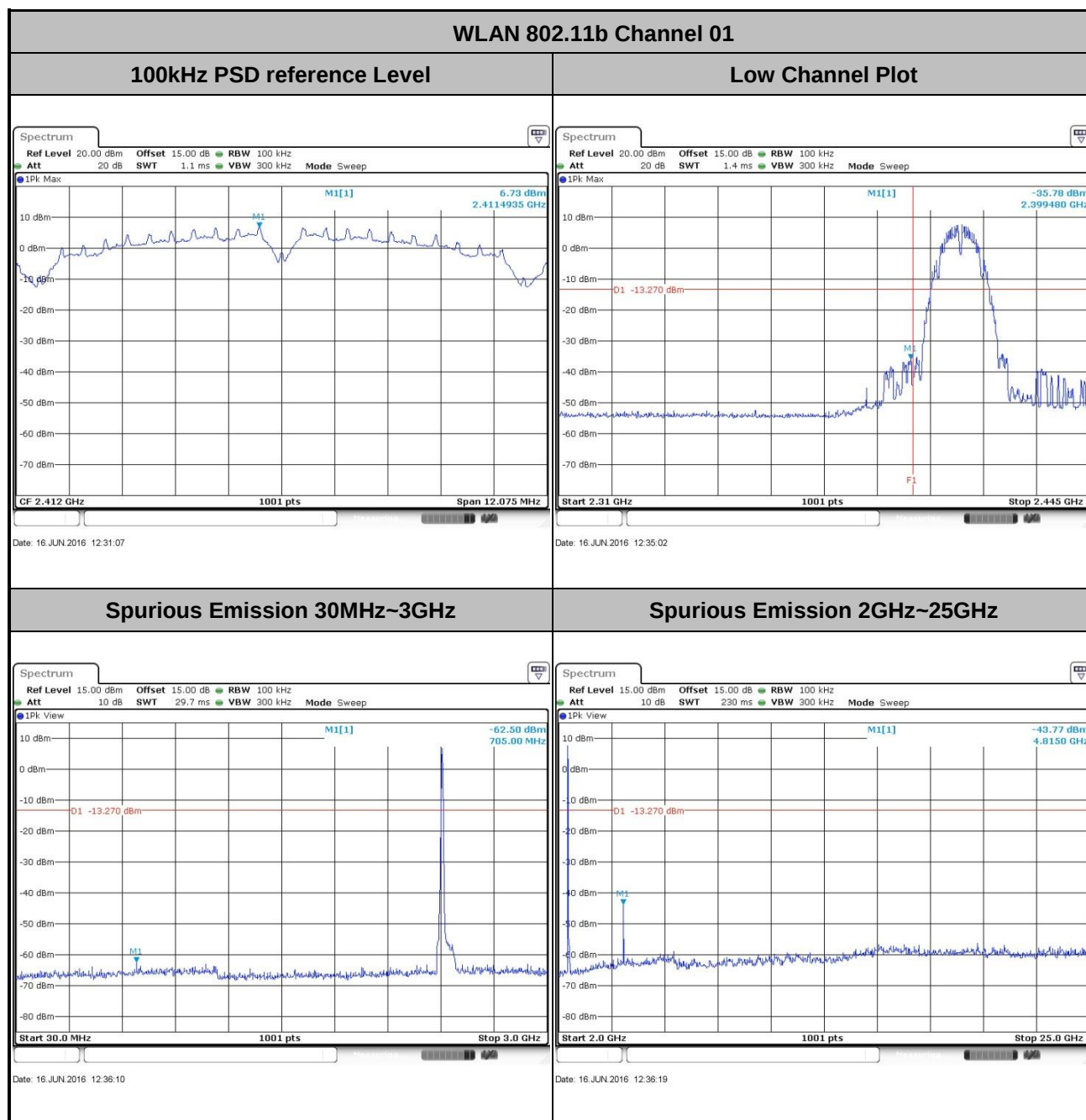
3.4.4 Test Setup





3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Mode :	802.11b	Temperature :	24~26℃
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Bruce Huang

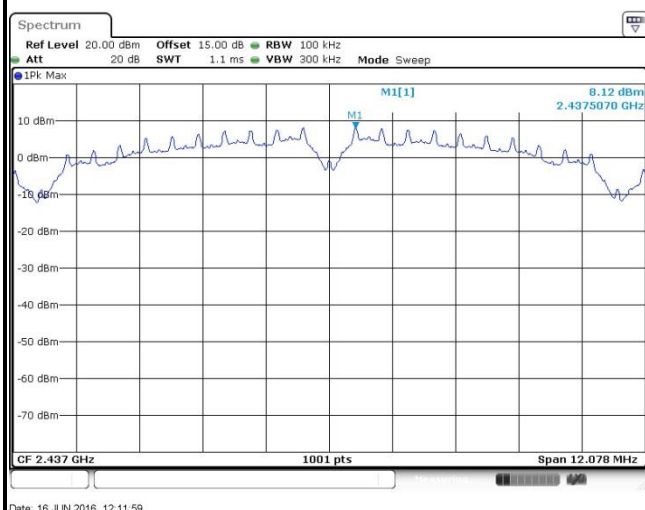




Test Mode :	802.11b	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Bruce Huang

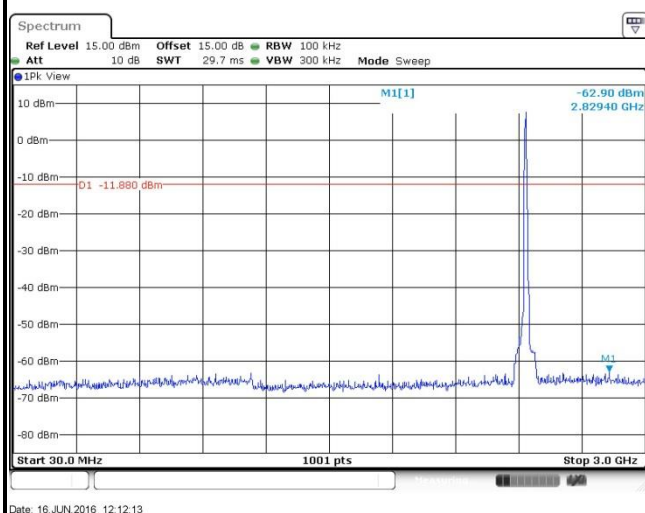
WLAN 802.11b Channel 06

100kHz PSD reference Level

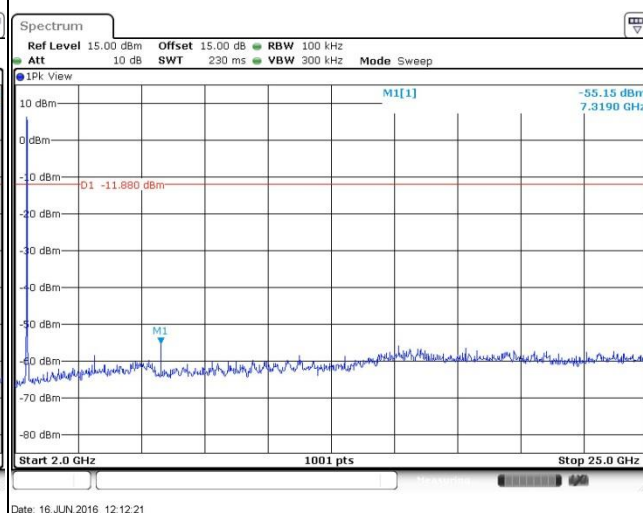


Mid Channel Plot

Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

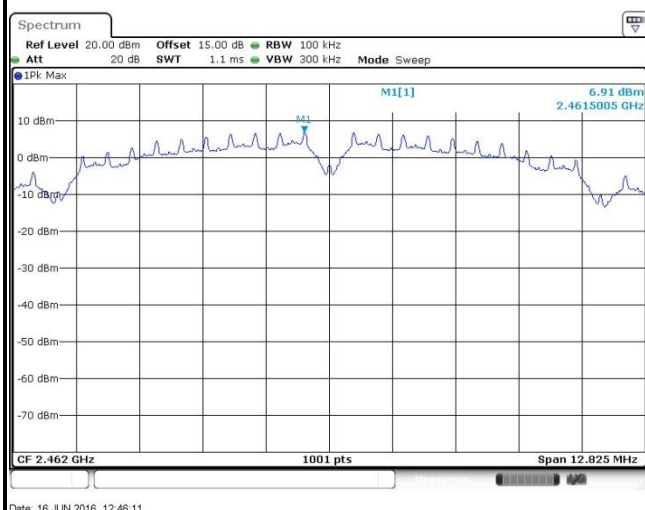




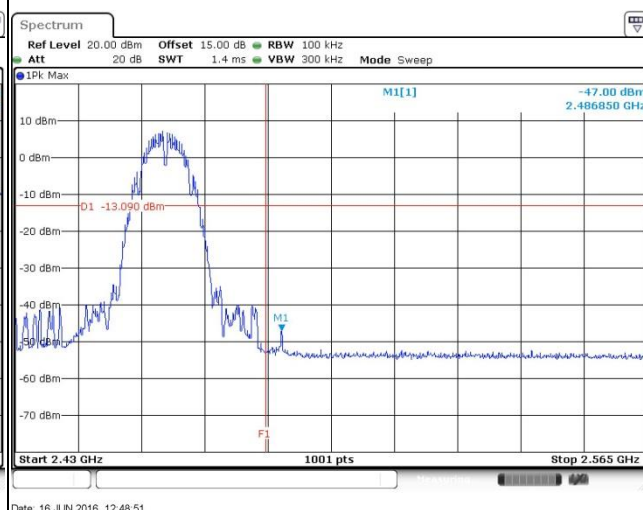
Test Mode :	802.11b	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Bruce Huang

WLAN 802.11b Channel 11

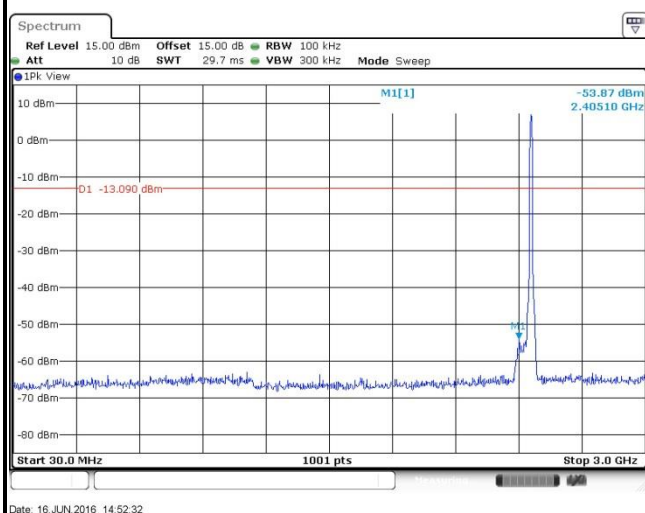
100kHz PSD reference Level



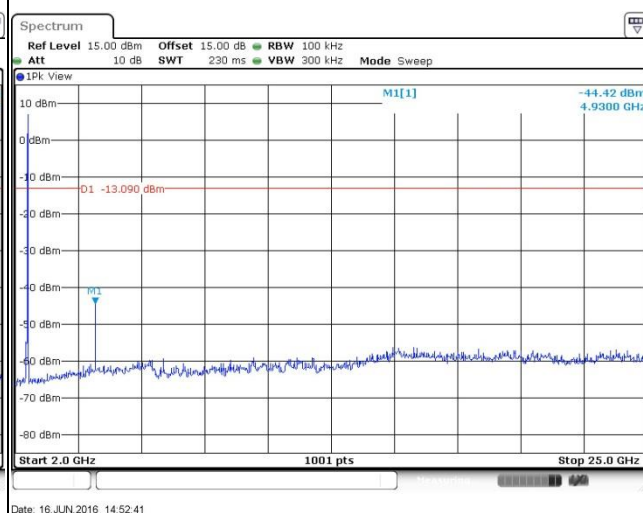
High Channel Plot



Spurious Emission 30MHz~3GHz

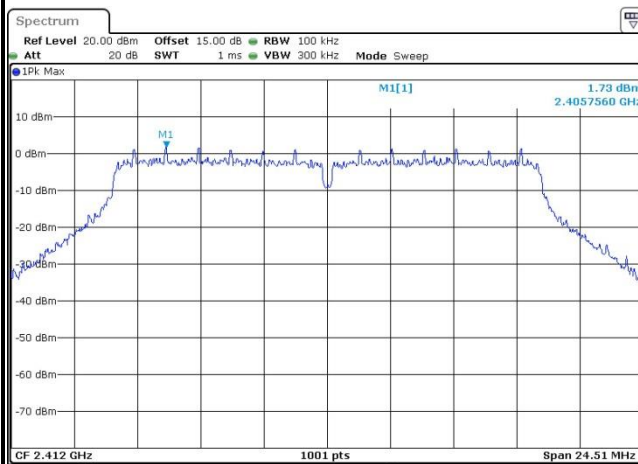
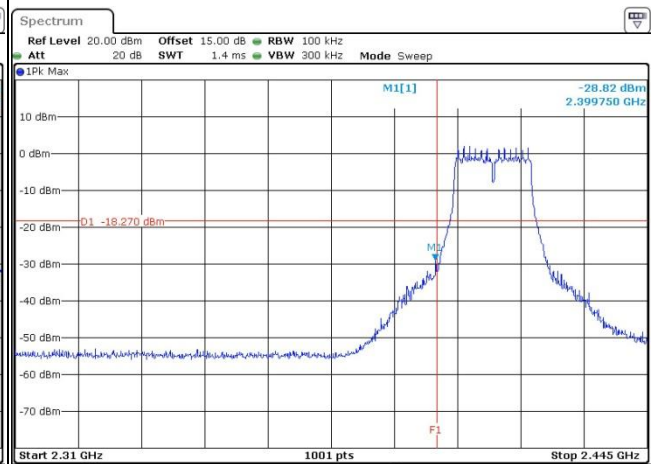
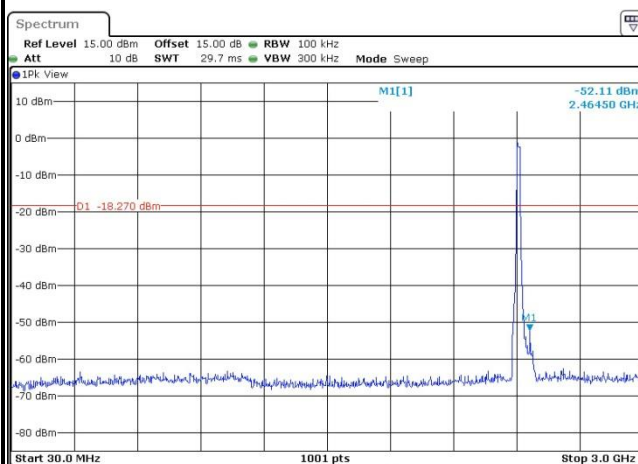
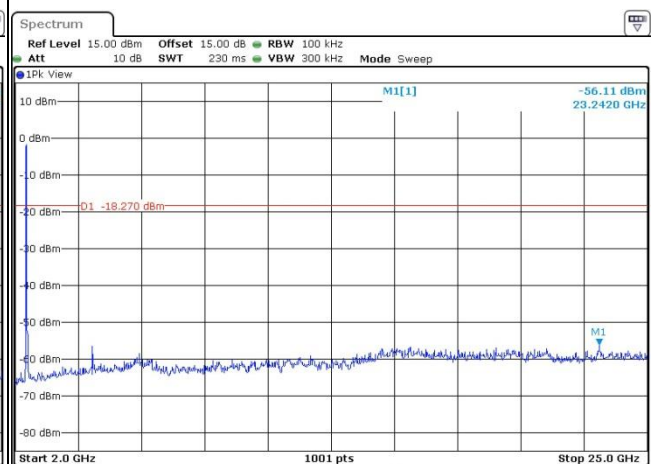


Spurious Emission 2GHz~25GHz





Test Mode :	802.11g	Temperature :	24~26°C
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Bruce Huang

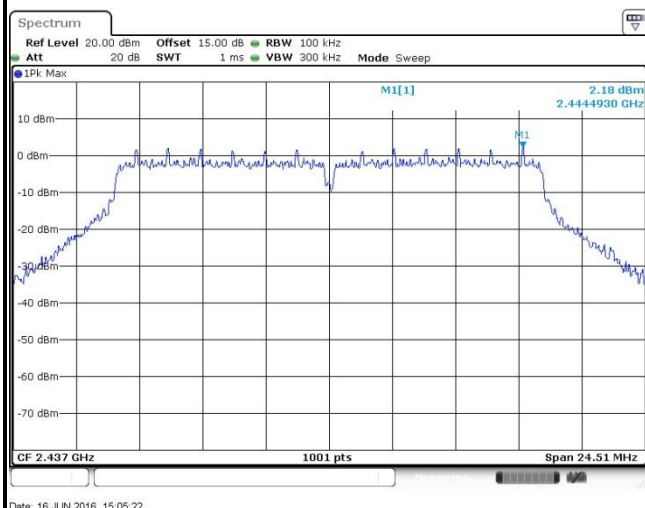
WLAN 802.11g Channel 01**100kHz PSD reference Level****Low Channel Plot****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**



Test Mode :	802.11g	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Bruce Huang

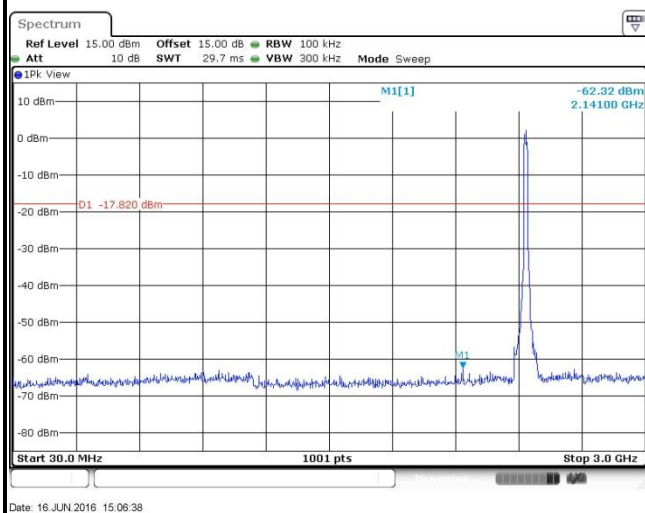
WLAN 802.11g Channel 06

100kHz PSD reference Level

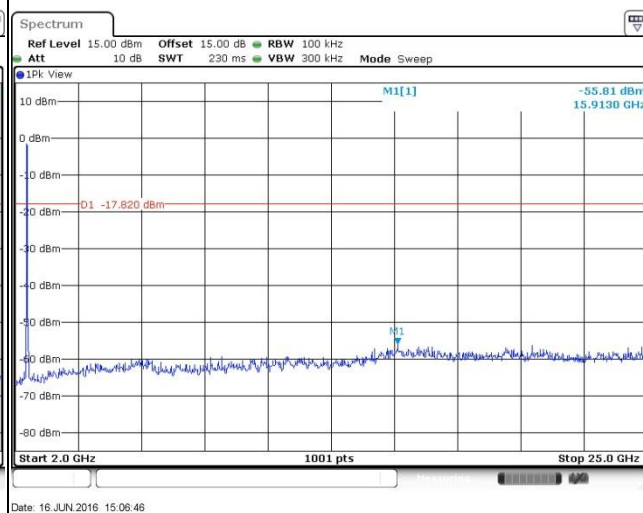


Mid Channel Plot

Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

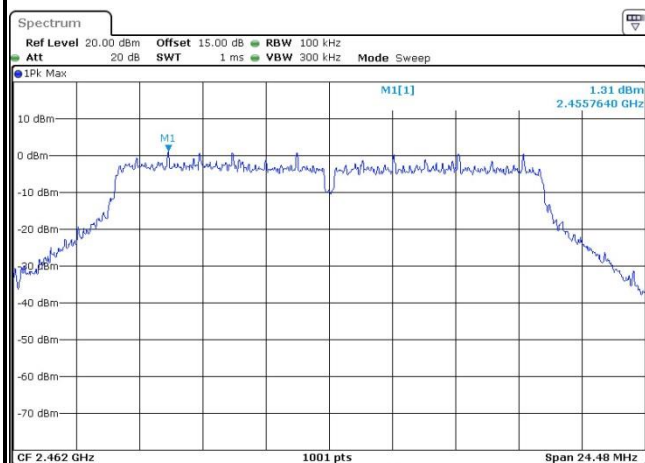




Test Mode :	802.11g	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Bruce Huang

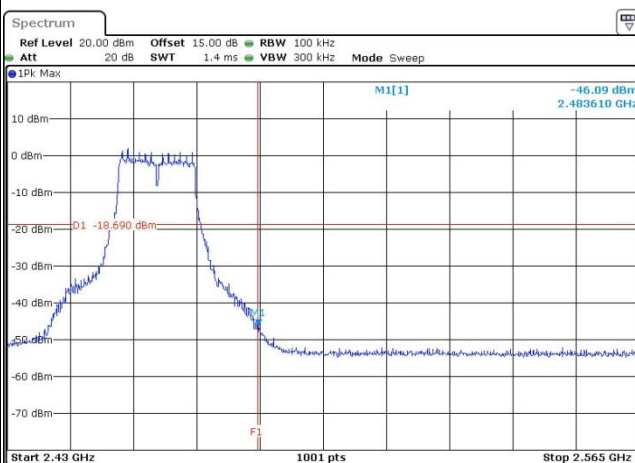
WLAN 802.11g Channel 11

100kHz PSD reference Level



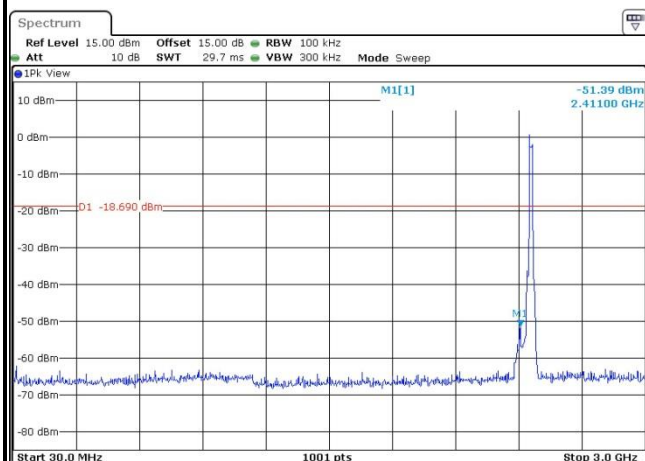
Date: 17 JUN 2016 11:12:02

High Channel Plot



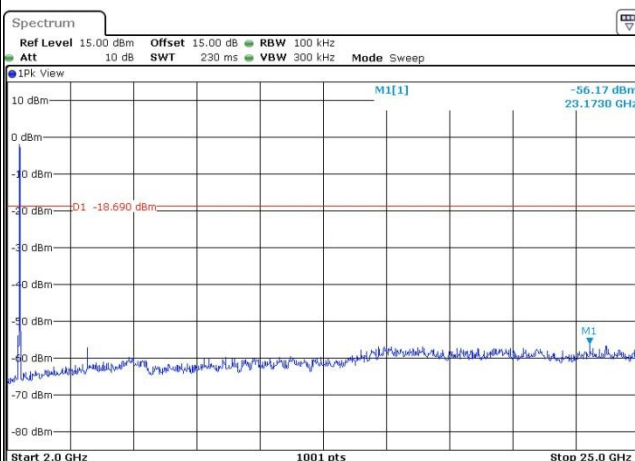
Date: 17 JUN 2016 11:16:20

Spurious Emission 30MHz~3GHz



Date: 17 JUN 2016 11:19:34

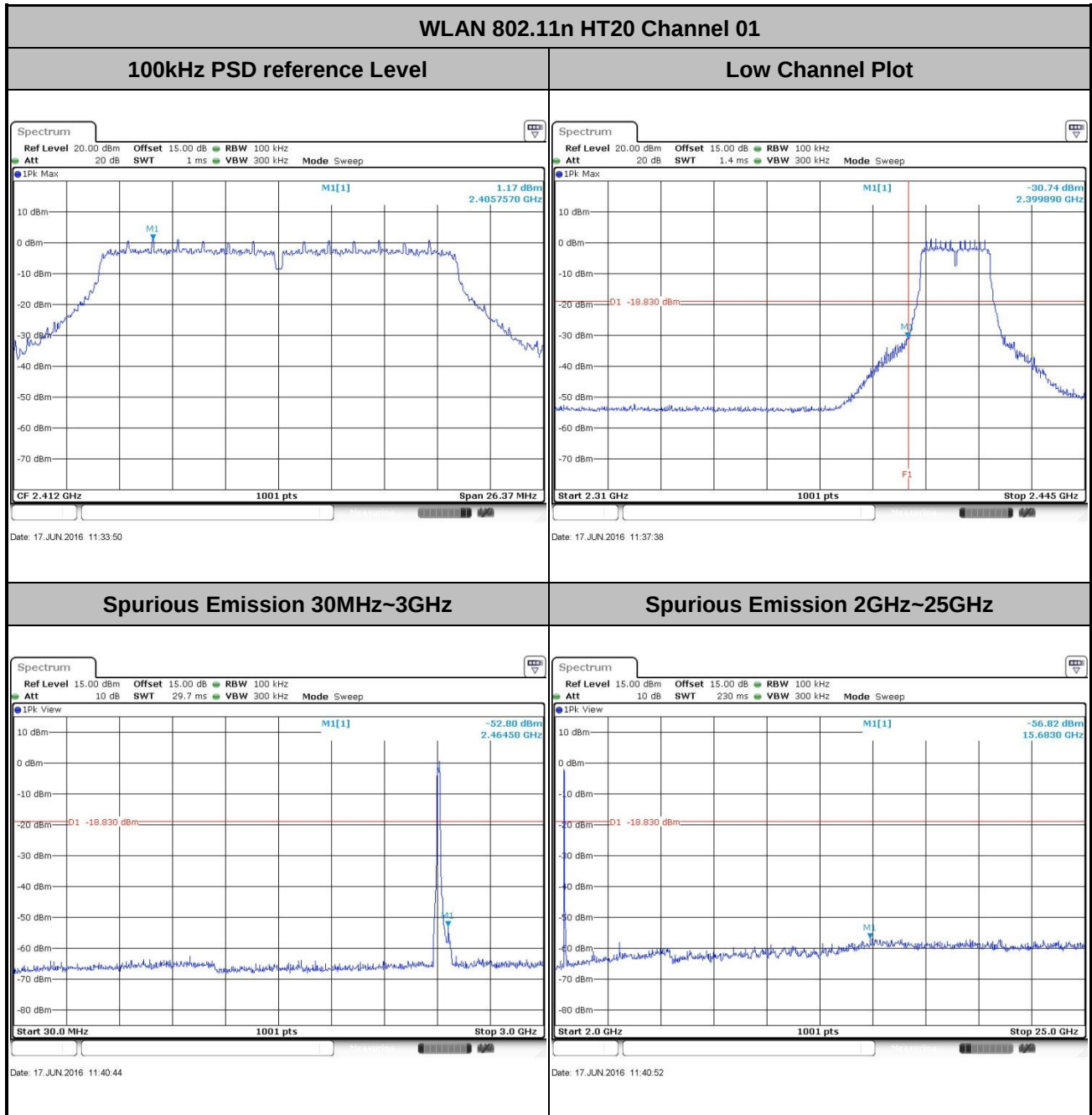
Spurious Emission 2GHz~25GHz



Date: 17 JUN 2016 11:19:43



Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Bruce Huang

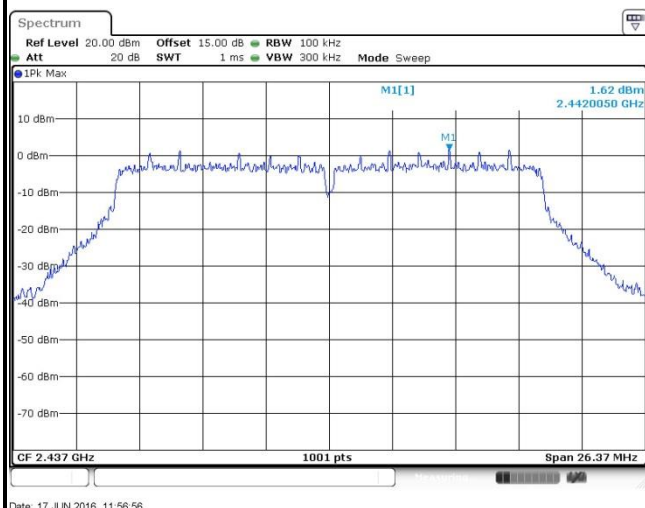




Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Bruce Huang

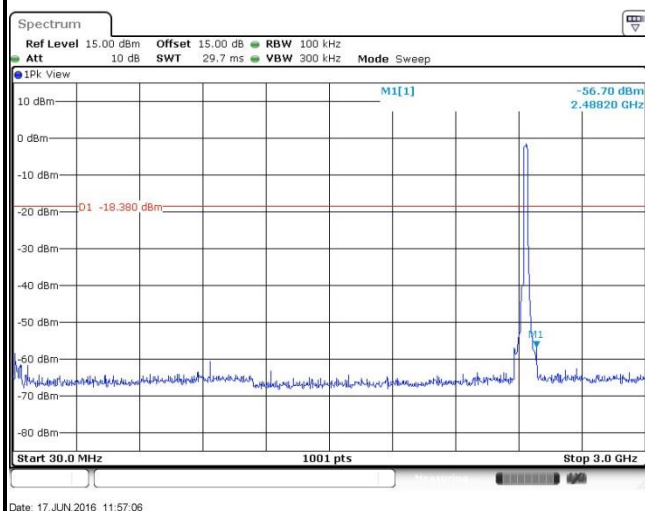
WLAN 802.11n HT20 Channel 06

100kHz PSD reference Level

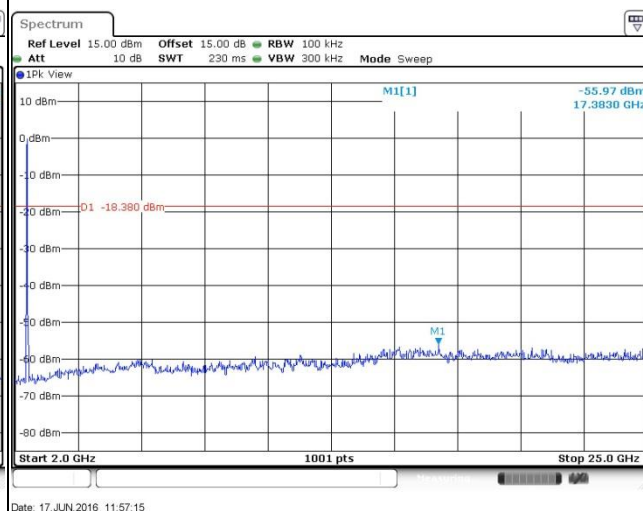


Mid Channel Plot

Spurious Emission 30MHz~3GHz

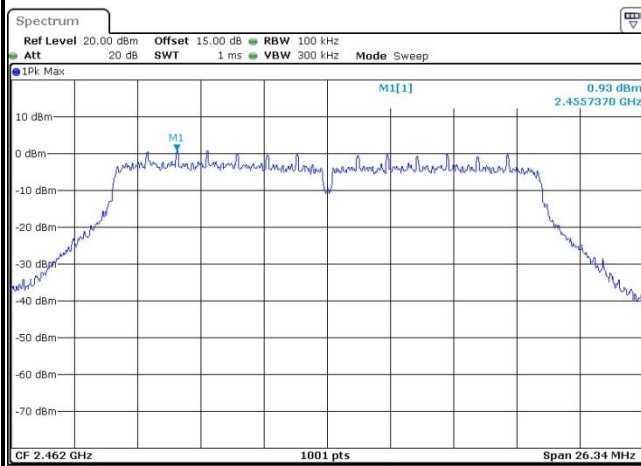


Spurious Emission 2GHz~25GHz

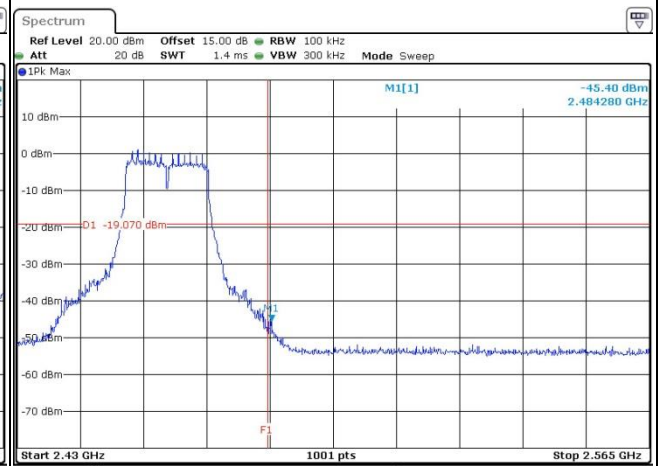




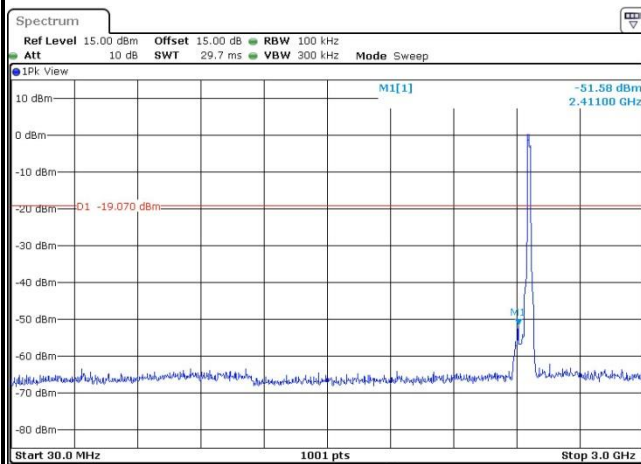
Test Mode :	802.11n HT20	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Bruce Huang

WLAN 802.11n HT20 Channel 11**100kHz PSD reference Level**

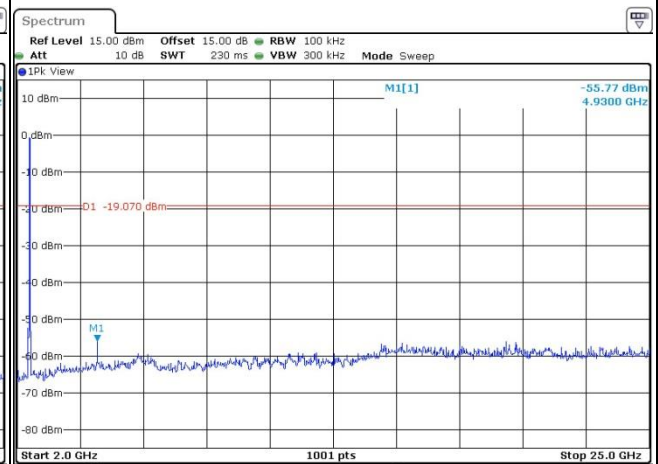
Date: 17 JUN 2016 12:08:29

High Channel Plot

Date: 17 JUN 2016 12:10:10

Spurious Emission 30MHz~3GHz

Date: 17 JUN 2016 12:13:57

Spurious Emission 2GHz~25GHz

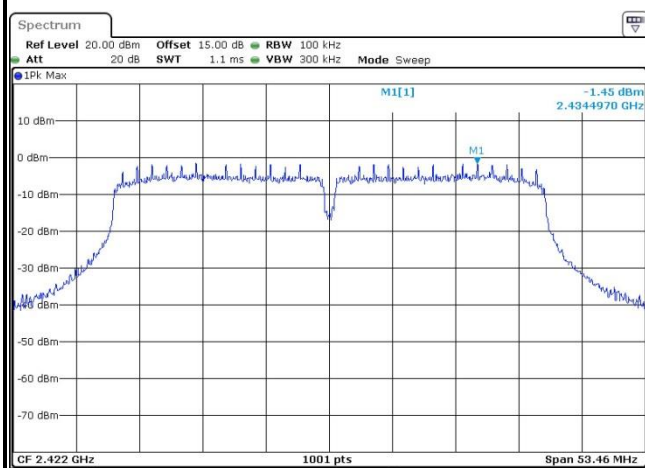
Date: 17 JUN 2016 12:14:06



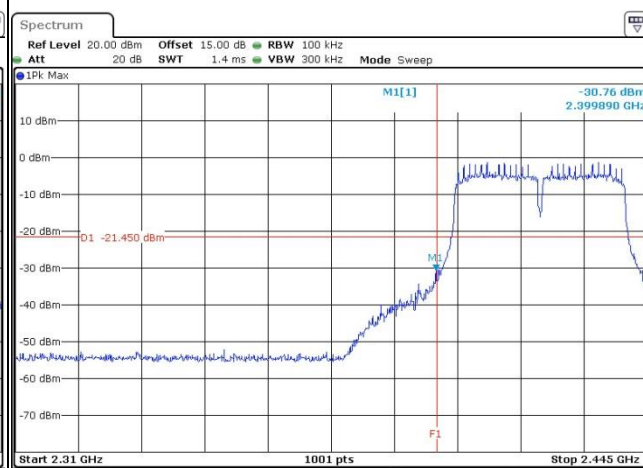
Test Mode :	802.11n HT40	Temperature :	24~26°C
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	03	Test Engineer :	Bruce Huang

WLAN 802.11n HT40 Channel 03

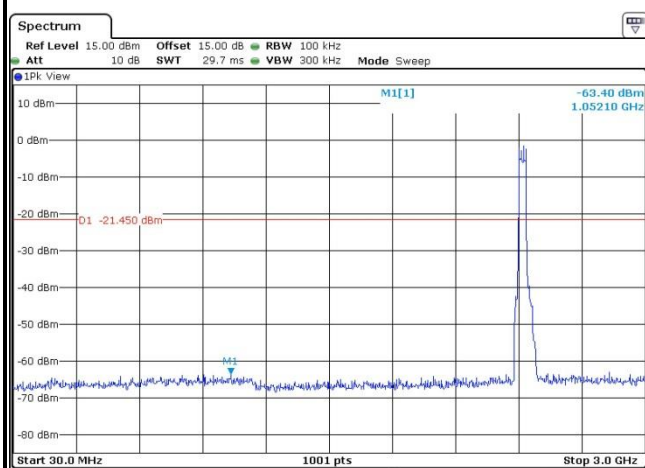
100kHz PSD reference Level



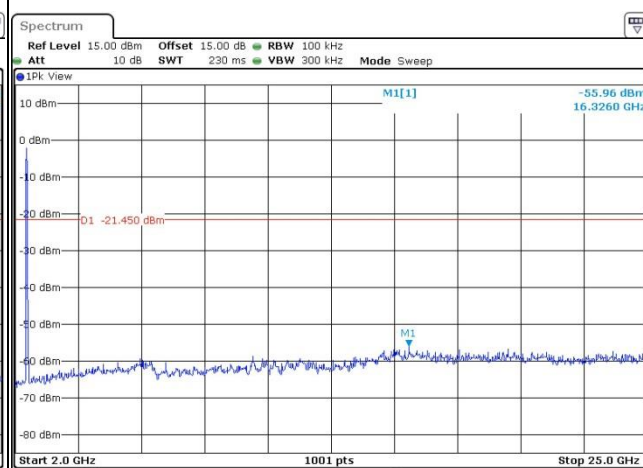
Low Channel Plot



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

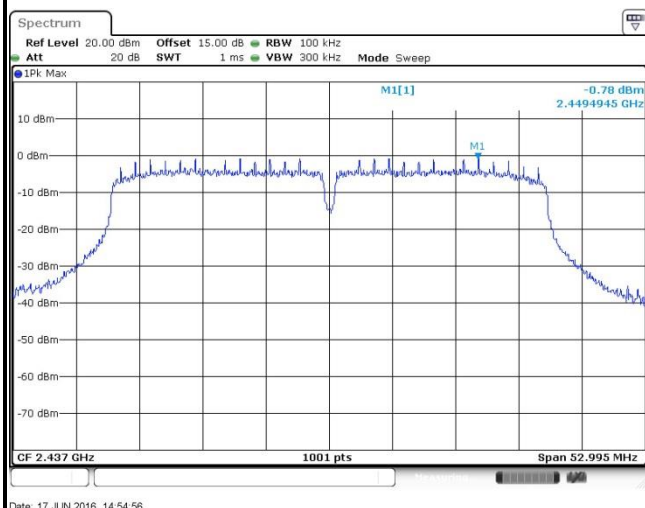




Test Mode :	802.11n HT40	Temperature :	24~26°C
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Bruce Huang

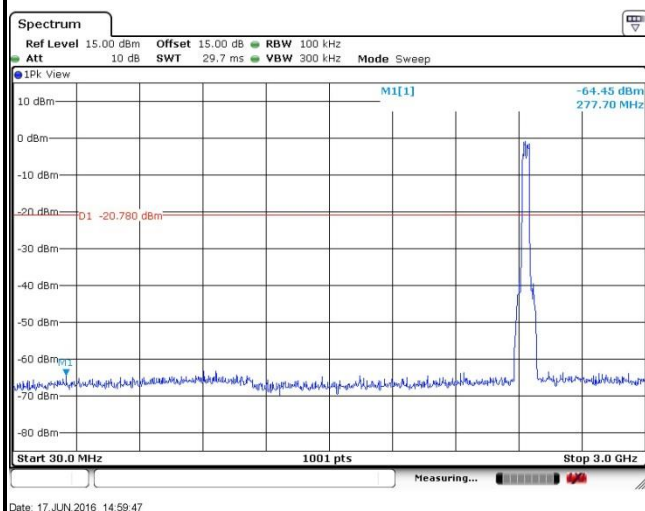
WLAN 802.11n HT40 Channel 06

100kHz PSD reference Level

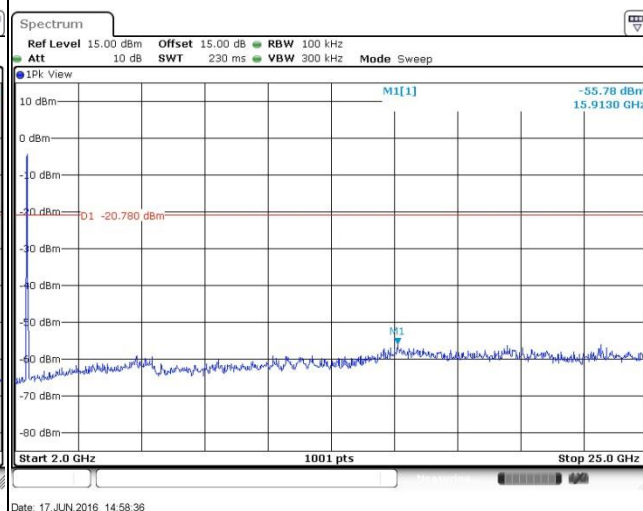


Mid Channel Plot

Spurious Emission 30MHz~3GHz

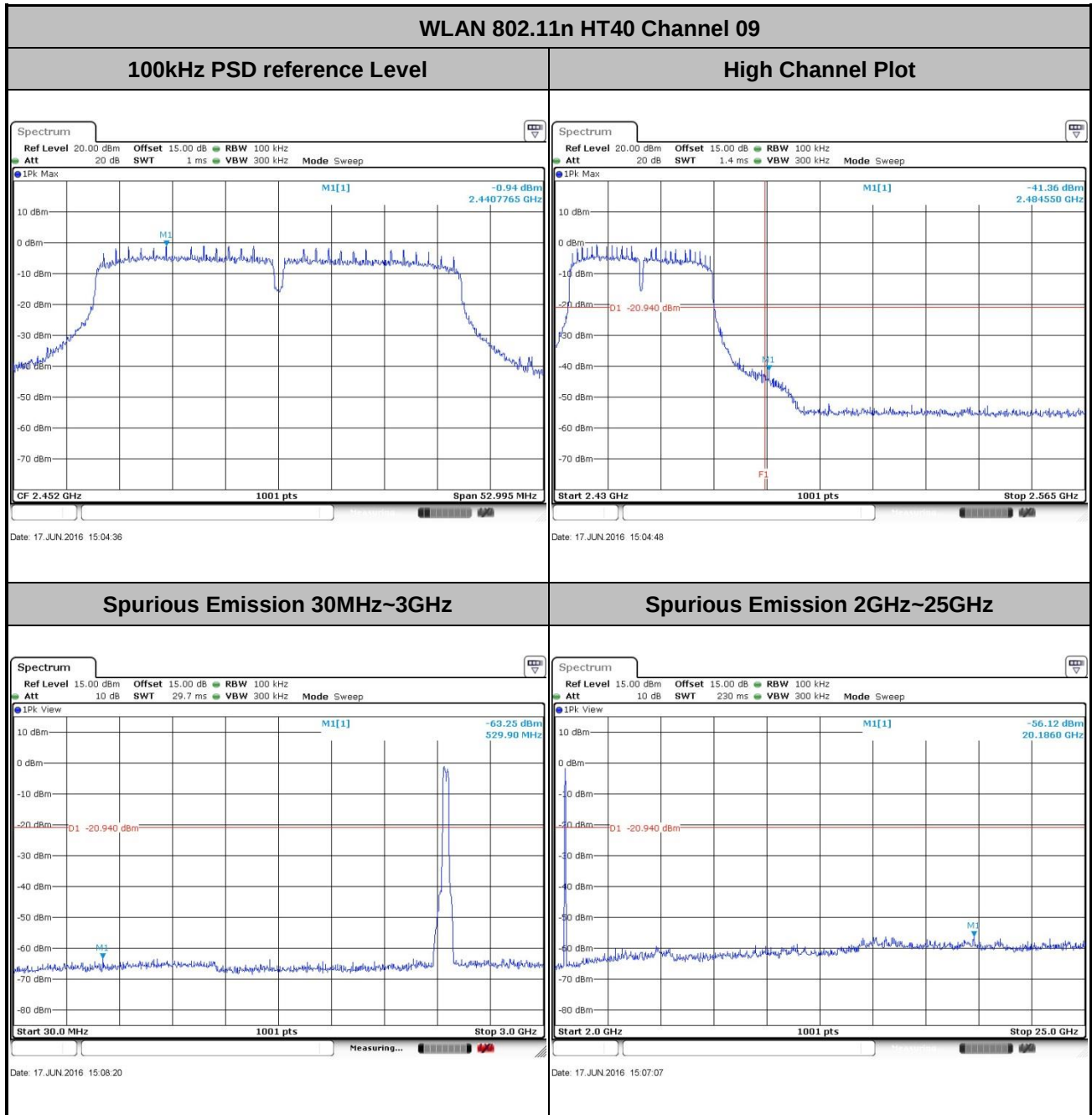


Spurious Emission 2GHz~25GHz





Test Mode :	802.11n HT40	Temperature :	24~26°C
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	09	Test Engineer :	Bruce Huang



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

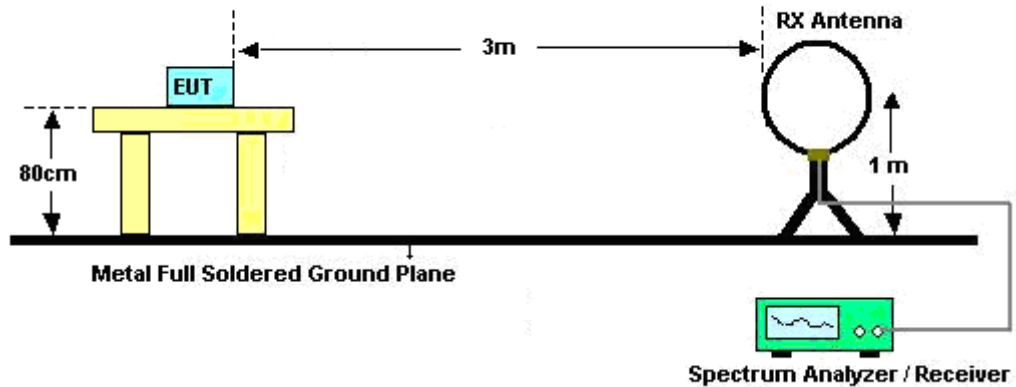
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the 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:

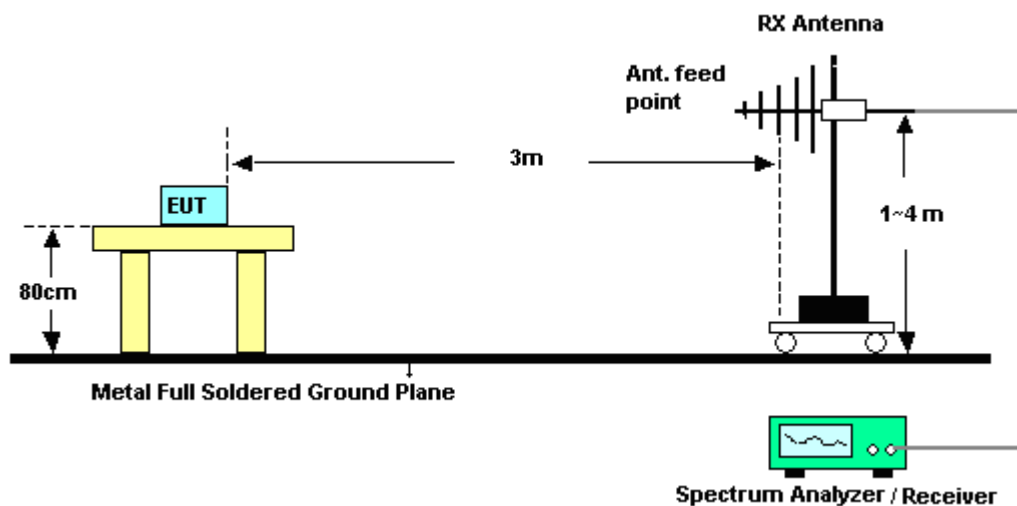
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

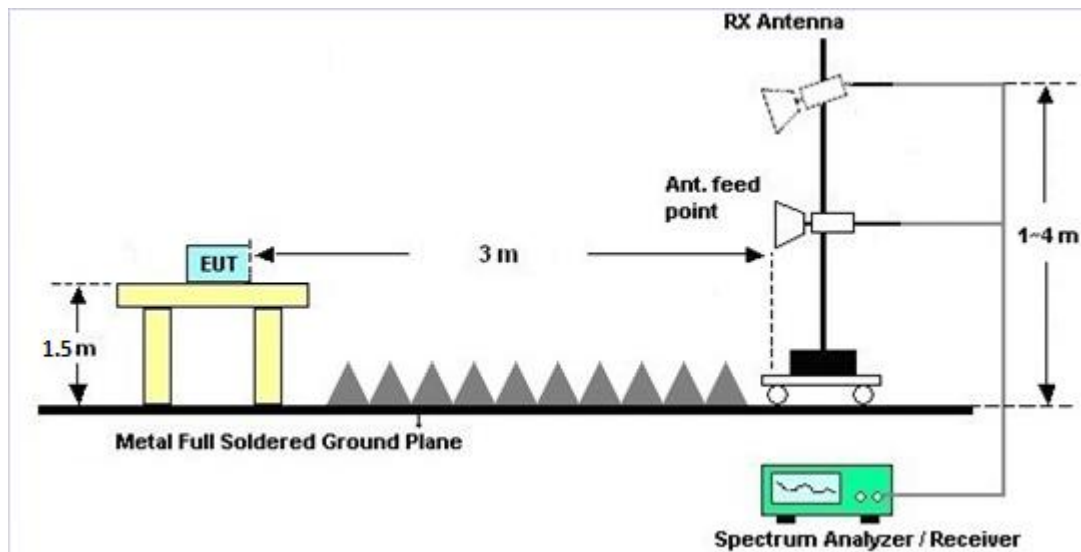
For radiated emissions below 30MHz



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 Duty Cycle

Please refer to Appendix C.

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

Please refer to Appendix B.

3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

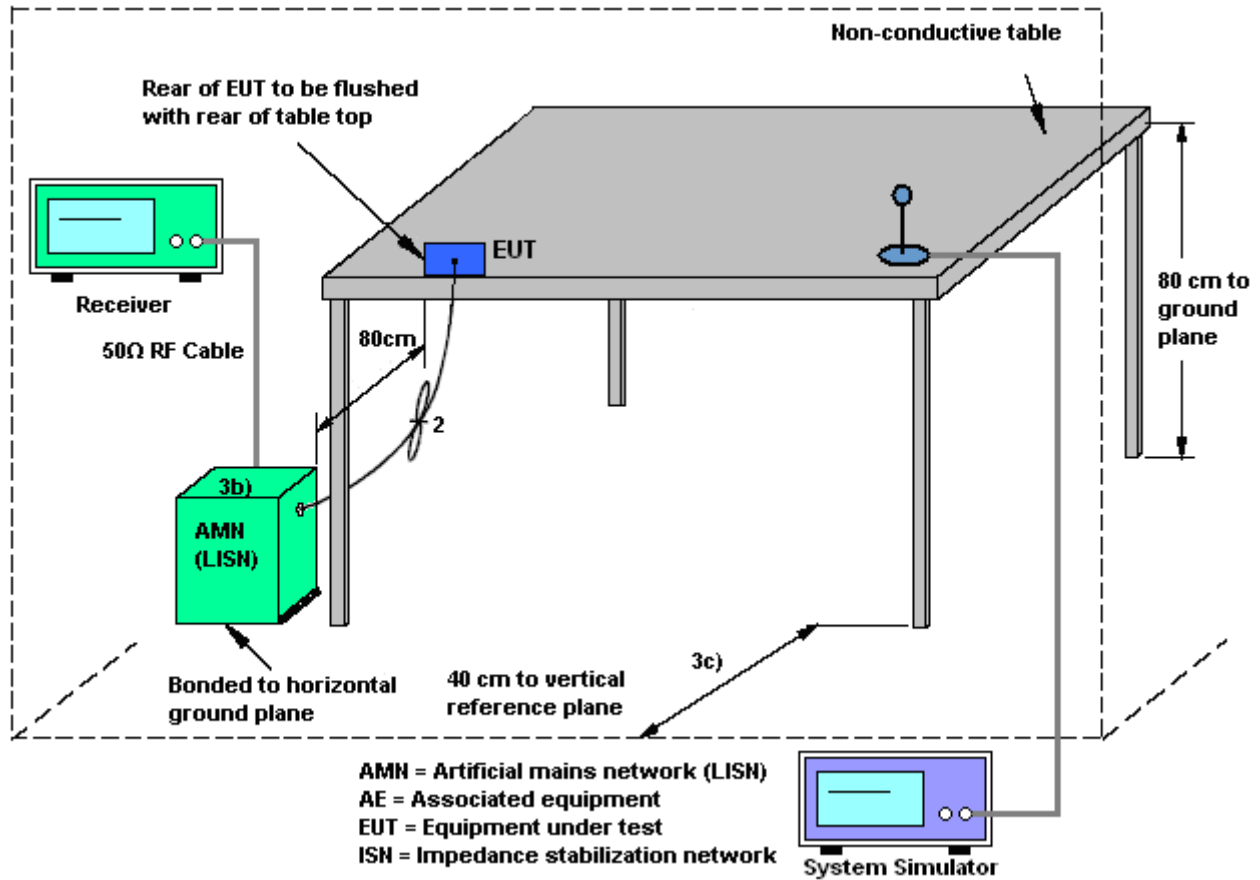
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF bandwidth = 9kHz) with Maximum Hold Mode.

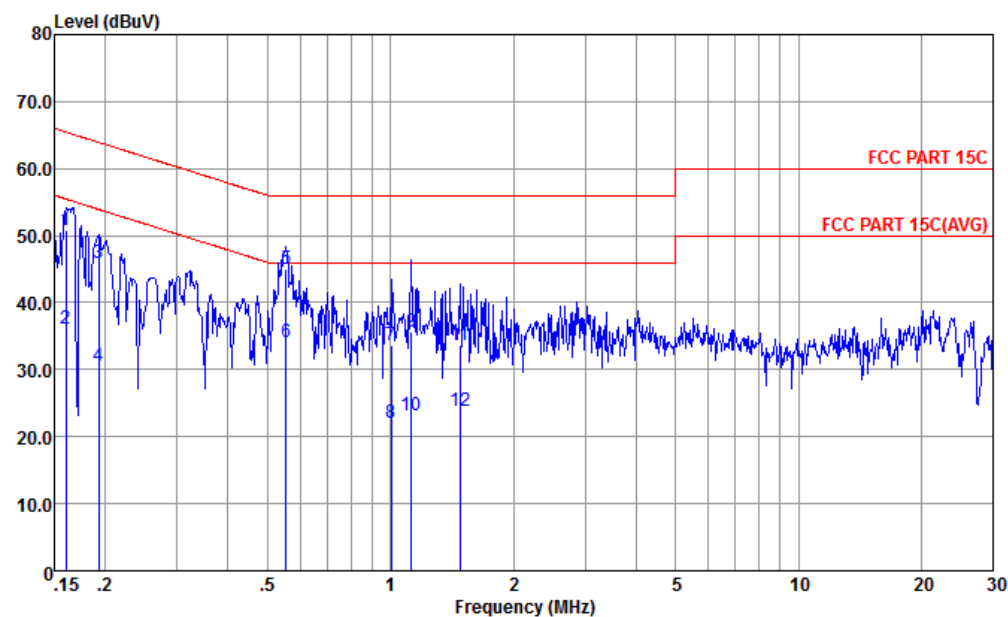
3.6.4 Test Setup





3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	22~24℃
Test Engineer :	Amos Zhang	Relative Humidity :	43~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + USB Cable 1 (Charging from Adapter) + Battery 1 + Earphone		

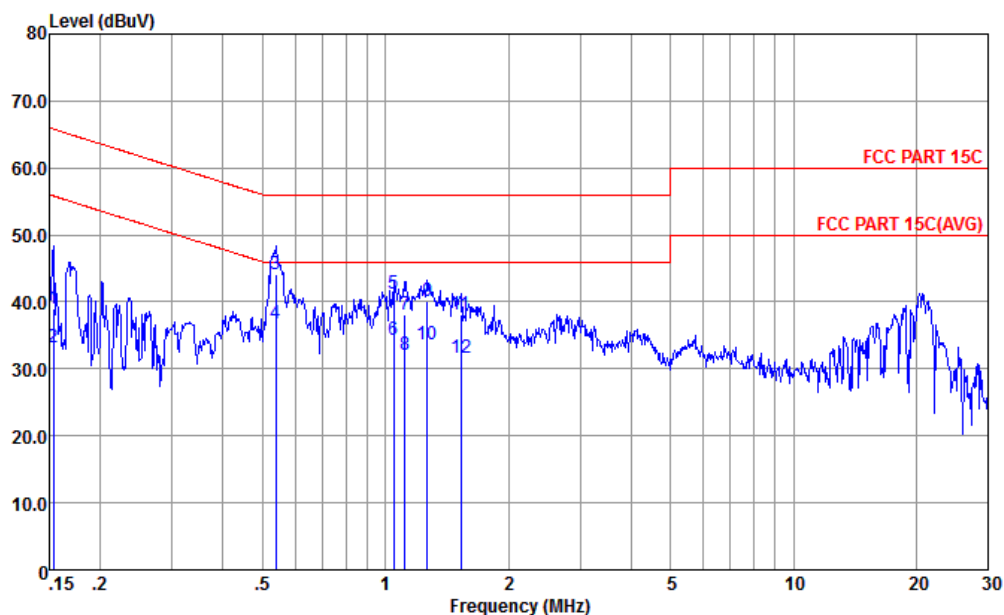


Site : CO01-KS
Condition : FCC PART 15C LISN-L-20151024 LINE
mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.16	50.87	-14.60	65.47	40.30	0.46	10.11	QP
2	0.16	36.17	-19.30	55.47	25.60	0.46	10.11	Average
3	0.19	45.98	-17.95	63.93	35.60	0.26	10.12	QP
4	0.19	30.48	-23.45	53.93	20.10	0.26	10.12	Average
5 *	0.56	44.99	-11.01	56.00	34.60	0.23	10.16	QP
6	0.56	33.99	-12.01	46.00	23.60	0.23	10.16	Average
7	1.00	33.59	-22.41	56.00	23.20	0.25	10.14	QP
8	1.00	21.99	-24.01	46.00	11.60	0.25	10.14	Average
9	1.12	35.58	-20.42	56.00	25.20	0.24	10.14	QP
10	1.12	23.18	-22.82	46.00	12.80	0.24	10.14	Average
11	1.48	33.65	-22.35	56.00	23.30	0.21	10.14	QP
12	1.48	23.95	-22.05	46.00	13.60	0.21	10.14	Average



Test Mode :	Mode 1	Temperature :	22~24℃
Test Engineer :	Amos Zhang	Relative Humidity :	43~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link + USB Cable 1 (Charging from Adapter) + Battery 1 + Earphone		



Site : CO01-KS
Condition : FCC PART 15C LISN-N-20151024 NEUTRAL
mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15	39.01	-26.81	65.82	28.60	0.30	10.11	QP
2	0.15	33.31	-22.51	55.82	22.90	0.30	10.11	Average
3	0.54	44.09	-11.91	56.00	33.61	0.32	10.16	QP
4 *	0.54	36.69	-9.31	46.00	26.21	0.32	10.16	Average
5	1.05	41.31	-14.69	56.00	30.80	0.37	10.14	QP
6	1.05	34.41	-11.59	46.00	23.90	0.37	10.14	Average
7	1.12	38.11	-17.89	56.00	27.60	0.37	10.14	QP
8	1.12	32.01	-13.99	46.00	21.50	0.37	10.14	Average
9	1.27	40.11	-15.89	56.00	29.60	0.37	10.14	QP
10	1.27	33.61	-12.39	46.00	23.10	0.37	10.14	Average
11	1.53	38.12	-17.88	56.00	27.60	0.38	10.14	QP
12	1.53	31.72	-14.28	46.00	21.20	0.38	10.14	Average

3.7 Antenna Requirements

3.7.1 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.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 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	FSV40	101078	9kHz~40GHz	May 07, 2016	Jun. 13, 2016~ Jun. 20, 2016	May 06, 2017	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1207253	30MHz~40GHz	Jan. 12, 2016	Jun. 13, 2016~ Jun. 20, 2016	Jan. 11, 2017	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Jan. 12, 2016	Jun. 13, 2016~ Jun. 20, 2016	Jan. 11, 2017	Conducted (TH01-SZ)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz; Max 30dBm	Sep. 10, 2015	Jun. 13, 2016~ Jun. 29, 2016	Sep. 09, 2016	Radiation (03CH03-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY551502 44	10Hz~44GHz	Apr. 22, 2016	Jun. 13, 2016~ Jun. 29, 2016	Apr. 21, 2017	Radiation (03CH03-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 07, 2015	Jun. 13, 2016~ Jun. 29, 2016	Nov. 06, 2016	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	35406	25MHz-2GHz	Apr. 16, 2016	Jun. 13, 2016~ Jun. 29, 2016	Apr. 15, 2017	Radiation (03CH03-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-135 6	1GHz~18GHz	Apr. 16, 2016	Jun. 13, 2016~ Jun. 29, 2016	Apr. 15, 2017	Radiation (03CH03-KS)
SHF-EHF Horn	Schwarzbeck	BBHA 9170	BBHA1702 49	15GHz ~40GHz	Mar. 03, 2016	Jun. 13, 2016~ Jun. 29, 2016	Mar. 02, 2017	Radiation (03CH03-KS)
Amplifier	Burgeon	BPA-530	102212	0.01MHz-3000M Hz	Aug. 10, 2015	Jun. 13, 2016~ Jun. 29, 2016	Aug. 09, 2016	Radiation (03CH03-KS)
Amplifier	MITEQ	TTA1840-35- HG	1887435	18~40GHz	Aug. 27, 2015	Jun. 13, 2016~ Jun. 29, 2016	Aug. 26, 2016	Radiation (03CH03-KS)
Amplifier	Agilent	8449B	3008A023 70	1GHz~26.5GHz	Oct. 24, 2015	Jun. 13, 2016~ Jun. 29, 2016	Oct. 23, 2016	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F1040900 04	N/A	NCR	Jun. 13, 2016~ Jun. 29, 2016	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jun. 13, 2016~ Jun. 29, 2016	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jun. 13, 2016~ Jun. 29, 2016	NCR	Radiation (03CH03-KS)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz; Max 30dBm	Sep. 10, 2015	Jun. 21, 2016	Sep. 09, 2016	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 24, 2015	Jun. 21, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 24, 2015	Jun. 21, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000 0811	AC 0V~300V, 45Hz~1000Hz	Oct. 24, 2015	Jun. 21, 2016	Oct. 23, 2016	Conduction (CO01-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.3dB
---	-------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.5dB
---	-------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.5dB
---	-------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.6dB
---	-------



Appendix A. Conducted Test Results

A1 - DTS Part

Test Engineer:	Bruce Huang	Temperature:	24~26	°C
Test Date:	2016/6/13~2016/6/20	Relative Humidity:	50~53	%

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	13.29	8.05	0.50	Pass
11b	1Mbps	1	6	2437	13.39	8.05	0.50	Pass
11b	1Mbps	1	11	2462	13.39	8.55	0.50	Pass
11g	6Mbps	1	1	2412	18.93	16.34	0.50	Pass
11g	6Mbps	1	6	2437	18.68	16.34	0.50	Pass
11g	6Mbps	1	11	2462	18.73	16.32	0.50	Pass
HT20	MCS0	1	1	2412	19.08	17.58	0.50	Pass
HT20	MCS0	1	6	2437	19.18	17.58	0.50	Pass
HT20	MCS0	1	11	2462	19.53	17.56	0.50	Pass
HT40	MCS0	1	3	2422	36.66	35.64	0.50	Pass
HT40	MCS0	1	6	2437	36.56	35.33	0.50	Pass
HT40	MCS0	1	9	2452	36.56	35.33	0.50	Pass

TEST RESULTS DATA
Peak Power Table

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
11b	1Mbps	1	1	2412	19.50	30.00	-2.50	17.00	36.00	Pass
11b	1Mbps	1	6	2437	20.14	30.00	-2.50	17.64	36.00	Pass
11b	1Mbps	1	11	2462	18.93	30.00	-2.50	16.43	36.00	Pass
11g	6Mbps	1	1	2412	22.25	30.00	-2.50	19.75	36.00	Pass
11g	6Mbps	1	6	2437	22.86	30.00	-2.50	20.36	36.00	Pass
11g	6Mbps	1	11	2462	21.99	30.00	-2.50	19.49	36.00	Pass
HT20	MCS0	1	1	2412	22.08	30.00	-2.50	19.58	36.00	Pass
HT20	MCS0	1	6	2437	22.72	30.00	-2.50	20.22	36.00	Pass
HT20	MCS0	1	11	2462	21.64	30.00	-2.50	19.14	36.00	Pass
HT40	MCS0	1	3	2422	22.75	30.00	-2.50	20.25	36.00	Pass
HT40	MCS0	1	6	2437	22.62	30.00	-2.50	20.12	36.00	Pass
HT40	MCS0	1	9	2452	22.38	30.00	-2.50	19.88	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

2.4GHz Band						
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.11	16.80
11b	1Mbps	1	6	2437	0.11	17.47
11b	1Mbps	1	11	2462	0.11	16.17
11g	6Mbps	1	1	2412	0.58	13.92
11g	6Mbps	1	6	2437	0.58	14.27
11g	6Mbps	1	11	2462	0.58	12.67
HT20	MCS0	1	1	2412	0.62	13.57
HT20	MCS0	1	6	2437	0.62	13.91
HT20	MCS0	1	11	2462	0.62	12.29
HT40	MCS0	1	3	2422	1.18	13.80
HT40	MCS0	1	6	2437	1.18	13.62
HT40	MCS0	1	9	2452	1.18	13.07

TEST RESULTS DATA
Peak Power Density

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
11b	1Mbps	1	1	2412	-5.99	-2.50	8.00	Pass
11b	1Mbps	1	6	2437	-5.46	-2.50	8.00	Pass
11b	1Mbps	1	11	2462	-5.97	-2.50	8.00	Pass
11g	6Mbps	1	1	2412	-12.00	-2.50	8.00	Pass
11g	6Mbps	1	6	2437	-9.33	-2.50	8.00	Pass
11g	6Mbps	1	11	2462	-11.31	-2.50	8.00	Pass
HT20	MCS0	1	1	2412	-12.87	-2.50	8.00	Pass
HT20	MCS0	1	6	2437	-12.47	-2.50	8.00	Pass
HT20	MCS0	1	11	2462	-12.67	-2.50	8.00	Pass
HT40	MCS0	1	3	2422	-14.80	-2.50	8.00	Pass
HT40	MCS0	1	6	2437	-15.23	-2.50	8.00	Pass
HT40	MCS0	1	9	2452	-14.87	-2.50	8.00	Pass



Appendix B. Radiated Spurious Emission

For USB Cable 1, Battery 1

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2333.22	51.65	-22.35	74	56.34	26.82	5.5	37.01	110	51	P	H
		2389.65	40.96	-13.04	54	45.39	27	5.59	37.02	110	51	A	H
	*	2410.855	97.48	-	-	101.74	27.13	5.61	37	110	51	P	H
	*	2410.855	94.94	-	-	99.2	27.13	5.61	37	110	51	A	H
		2387.4	51.53	-22.47	74	55.96	27	5.59	37.02	312	76	P	V
		2389.92	40.88	-13.12	54	45.31	27	5.59	37.02	312	76	A	V
	*	2410.855	97.59	-	-	101.85	27.13	5.61	37	312	76	P	V
	*	2410.938	95.09	-	-	99.35	27.13	5.61	37	312	76	A	V
802.11b CH 06 2437MHz	*	2436.99	98.54	-	-	102.47	27.39	5.65	36.97	100	61	P	H
	*	2438.159	96.07	-	-	100	27.39	5.65	36.97	100	61	A	H
	*	2438.159	100.38	-	-	104.31	27.39	5.65	36.97	344	92	P	V
	*	2438.159	97.88	-	-	101.81	27.39	5.65	36.97	344	92	A	V
802.11b CH 11 2462MHz	*	2460.788	97.99	-	-	101.77	27.51	5.67	36.96	100	214	P	H
	*	2460.955	95.48	-	-	99.26	27.51	5.67	36.96	100	214	A	H
		2484.12	52.64	-21.36	74	56.25	27.64	5.69	36.94	100	214	P	H
		2485.8	41.43	-12.57	54	45.04	27.64	5.69	36.94	100	214	A	H
	*	2460.872	95.92	-	-	99.7	27.51	5.67	36.96	320	286	P	V
	*	2460.955	93.42	-	-	97.2	27.51	5.67	36.96	320	286	A	V
		2494.88	51.95	-22.05	74	55.4	27.77	5.71	36.93	320	286	P	V
		2486.96	41	-13.00	54	44.61	27.64	5.69	36.94	320	286	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	39.8	-34.20	74	61.26	31.51	9.13	62.1	100	360	P	H
		4824	37.6	-36.40	74	59.06	31.51	9.13	62.1	100	360	P	V
802.11b CH 06 2437MHz		4872	39.28	-34.72	74	60.52	31.59	9.2	62.03	100	360	P	H
		7308	55.52	-18.48	74	69.35	34.03	11.3	59.16	100	360	P	H
	!	7308	52.12	-1.88	54	65.95	34.03	11.3	59.16	100	360	A	H
		4872	37.66	-36.34	74	58.9	31.59	9.2	62.03	100	360	P	V
		7308	53.24	-20.76	74	67.07	34.03	11.3	59.16	100	360	P	V
	!	7308	48.61	-5.39	54	62.44	34.03	11.3	59.16	100	360	A	V
802.11b CH 11 2462MHz		4926	37.31	-36.69	74	58.34	31.67	9.27	61.97	100	360	P	H
		7386	41.82	-32.18	74	55.36	34.29	11.29	59.12	100	360	P	H
		4926	37.44	-36.56	74	58.47	31.67	9.27	61.97	100	360	P	V
		7386	43.36	-30.64	74	56.9	34.29	11.29	59.12	100	360	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		2390	64.76	-9.24	74	69.19	27	5.59	37.02	133	216	P	H
	!	2389.92	48.04	-5.96	54	52.47	27	5.59	37.02	133	216	A	H
	*	2405.845	98.9	-	-	103.16	27.13	5.61	37	133	216	P	H
	*	2406.763	90.32	-	-	94.58	27.13	5.61	37	133	216	A	H
		2390	59.35	-14.65	74	63.78	27	5.59	37.02	332	136	P	V
		2390	44.42	-9.58	54	48.85	27	5.59	37.02	332	136	A	V
	*	2415.531	94.72	-	-	98.98	27.13	5.61	37	332	136	P	V
	*	2406.68	86.18	-	-	90.44	27.13	5.61	37	332	136	A	V
802.11g CH 06 2437MHz	*	2440.832	102.16	-	-	106.09	27.39	5.65	36.97	100	213	P	H
	*	2441.583	93.66	-	-	97.59	27.39	5.65	36.97	100	213	A	H
	*	2438.66	96.38	-	-	100.31	27.39	5.65	36.97	269	274	P	V
	*	2440.915	88.18	-	-	92.11	27.39	5.65	36.97	269	274	A	V
802.11g CH 11 2462MHz	*	2457.949	99.9	-	-	103.68	27.51	5.67	36.96	100	215	P	H
	*	2454.859	92.12	-	-	95.9	27.51	5.67	36.96	100	215	A	H
		2483.56	64.33	-9.67	74	67.94	27.64	5.69	36.94	100	215	P	H
		2483.52	47.71	-6.29	54	51.32	27.64	5.69	36.94	100	215	A	H
	*	2456.697	95.8	-	-	99.58	27.51	5.67	36.96	246	274	P	V
	*	2455.528	87.62	-	-	91.4	27.51	5.67	36.96	246	274	A	V
		2483.76	58.85	-15.15	74	62.46	27.64	5.69	36.94	246	274	P	V
		2483.52	43.77	-10.23	54	47.38	27.64	5.69	36.94	246	274	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	36.63	-37.37	74	58.09	31.51	9.13	62.1	100	360	P	H
		7224	50.56	-23.44	74	64.67	33.77	11.31	59.19	100	360	P	H
		4824	37.59	-36.41	74	59.05	31.51	9.13	62.1	100	360	P	V
		7230	50.75	-23.25	74	64.86	33.77	11.31	59.19	100	360	P	V
802.11g CH 06 2437MHz		4872	37.7	-36.30	74	58.94	31.59	9.2	62.03	300	0	P	H
		7320	52.76	-21.24	74	66.53	34.08	11.3	59.15	100	18	P	H
		7320	41.46	-12.54	54	55.23	34.08	11.3	59.15	100	18	A	H
		4872	37.77	-36.23	74	59.01	31.59	9.2	62.03	100	360	P	V
		7314	53.47	-20.53	74	67.3	34.03	11.3	59.16	100	59	P	V
		7314	41.01	-12.99	54	54.84	34.03	11.3	59.16	100	59	A	V
802.11g CH 11 2462MHz		4926	36.97	-37.03	74	58	31.67	9.27	61.97	100	360	P	H
		7386	43.6	-30.40	74	57.14	34.29	11.29	59.12	100	360	P	H
		4926	36.78	-37.22	74	57.81	31.67	9.27	61.97	100	360	P	V
		7386	40.97	-33.03	74	54.51	34.29	11.29	59.12	100	360	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		2390	67.28	-6.72	74	71.71	27	5.59	37.02	136	29	P	H
		2390	47.28	-6.72	54	51.71	27	5.59	37.02	136	29	A	H
	*	2405.01	96.12	-	-	100.38	27.13	5.61	37	136	29	P	H
	*	2404.676	87.92	-	-	92.18	27.13	5.61	37	136	29	A	H
		2389.92	65.04	-8.96	74	69.47	27	5.59	37.02	301	46	P	V
		2389.92	46.71	-7.29	54	51.14	27	5.59	37.02	301	46	A	V
	*	2406.596	95.54	-	-	99.8	27.13	5.61	37	301	46	P	V
	*	2404.843	87.49	-	-	91.75	27.13	5.61	37	301	46	A	V
802.11n HT20 CH 06 2437MHz	*	2440.331	98.84	-	-	102.77	27.39	5.65	36.97	105	31	P	H
	*	2441.333	90.33	-	-	94.26	27.39	5.65	36.97	105	31	A	H
	*	2433.901	98	-	-	102.1	27.26	5.63	36.99	330	47	P	V
	*	2441.416	89.47	-	-	93.4	27.39	5.65	36.97	330	47	A	V
802.11n HT20 CH 11 2462MHz	*	2456.279	97.63	-	-	101.41	27.51	5.67	36.96	100	29	P	H
	*	2454.275	89.08	-	-	92.86	27.51	5.67	36.96	100	29	A	H
		2483.68	62.21	-11.79	74	65.82	27.64	5.69	36.94	100	29	P	H
		2483.6	45.97	-8.03	54	49.58	27.64	5.69	36.94	100	29	A	H
	*	2454.275	96.42	-	-	100.2	27.51	5.67	36.96	334	52	P	V
	*	2454.525	88.44	-	-	92.22	27.51	5.67	36.96	334	52	A	V
		2483.96	60.09	-13.91	74	63.7	27.64	5.69	36.94	334	52	P	V
		2483.56	43.93	-10.07	54	47.54	27.64	5.69	36.94	334	52	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	36.08	-37.92	74	57.54	31.51	9.13	62.1	100	360	P	H
		7236	47.93	-26.07	74	61.99	33.82	11.31	59.19	100	360	P	H
		4824	36.34	-37.66	74	57.8	31.51	9.13	62.1	100	360	P	V
		7224	55.54	-18.46	74	69.65	33.77	11.31	59.19	126	6	P	V
		7224	43.99	-10.01	54	58.1	33.77	11.31	59.19	126	6	A	V
802.11n HT20 CH 06 2437MHz		4824	36.24	-37.76	74	57.7	31.51	9.13	62.1	100	360	P	H
		7308	45.78	-28.22	74	59.61	34.03	11.3	59.16	100	360	P	H
		4824	37.38	-36.62	74	58.84	31.51	9.13	62.1	100	360	P	V
		7314	49.09	-24.91	74	62.92	34.03	11.3	59.16	100	360	P	V
802.11n HT20 CH 11 2462MHz		4926	37.97	-36.03	74	59	31.67	9.27	61.97	100	360	P	H
		7386	40.36	-33.64	74	53.9	34.29	11.29	59.12	100	360	P	H
		4926	36.39	-37.61	74	57.42	31.67	9.27	61.97	100	360	P	V
		7386	43.66	-30.34	74	57.2	34.29	11.29	59.12	100	360	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		2390	60.31	-13.69	74	64.74	27	5.59	37.02	100	284	P	H
		2389.65	47.37	-6.63	54	51.8	27	5.59	37.02	100	284	A	H
	*	2436.99	92.74	-	-	96.67	27.39	5.65	36.97	100	284	P	H
	*	2437.074	84.96	-	-	88.89	27.39	5.65	36.97	100	284	A	H
		2494.2	51.9	-22.10	74	55.35	27.77	5.71	36.93	100	284	P	H
		2486.08	41.77	-12.23	54	45.38	27.64	5.69	36.94	100	284	A	H
		2389.65	58.57	-15.43	74	63	27	5.59	37.02	100	177	P	V
		2389.74	46.79	-7.21	54	51.22	27	5.59	37.02	100	177	A	V
	*	2433.985	88.3	-	-	92.4	27.26	5.63	36.99	100	177	P	V
	*	2434.987	80.57	-	-	84.67	27.26	5.63	36.99	100	177	A	V
		2485.92	51.43	-22.57	74	55.04	27.64	5.69	36.94	100	177	P	V
		2488.36	41.75	-12.25	54	45.2	27.77	5.71	36.93	100	177	A	V
802.11n HT40 CH 06 2437MHz		2389.29	53.84	-20.16	74	58.27	27	5.59	37.02	151	339	P	H
		2389.2	41.84	-12.16	54	46.27	27	5.59	37.02	151	339	A	H
	*	2442.418	93.53	-	-	97.46	27.39	5.65	36.97	151	339	P	H
	*	2439.412	85.65	-	-	89.58	27.39	5.65	36.97	151	339	A	H
		2485.04	57.8	-16.20	74	61.41	27.64	5.69	36.94	151	339	P	H
		2483.6	44.31	-9.69	54	47.92	27.64	5.69	36.94	151	339	A	H
		2389.65	51.91	-22.09	74	56.34	27	5.59	37.02	100	183	P	V
		2389.38	41.39	-12.61	54	45.82	27	5.59	37.02	100	183	A	V
	*	2448.096	90.31	-	-	94.24	27.39	5.65	36.97	100	183	P	V
	*	2440.999	81.78	-	-	85.71	27.39	5.65	36.97	100	183	A	V
		2484.56	55.1	-18.90	74	58.71	27.64	5.69	36.94	100	183	P	V
		2483.64	43.06	-10.94	54	46.67	27.64	5.69	36.94	100	183	A	V



802.11n HT40 CH 09 2452MHz		2389.29	50.84	-23.16	74	55.27	27	5.59	37.02	148	212	P	H
		2389.74	41.27	-12.73	54	45.7	27	5.59	37.02	148	212	A	H
	*	2440.164	94.13	-	-	98.06	27.39	5.65	36.97	148	212	P	H
	*	2440.915	86.57	-	-	90.5	27.39	5.65	36.97	148	212	A	H
		2484.76	61.11	-12.89	74	64.72	27.64	5.69	36.94	148	212	P	H
		2483.56	47.71	-6.29	54	51.32	27.64	5.69	36.94	148	212	A	H
		2325.39	50.77	-23.23	74	55.46	26.82	5.5	37.01	100	185	P	V
		2387.4	40.83	-13.17	54	45.26	27	5.59	37.02	100	185	A	V
	*	2439.663	90.63	-	-	94.56	27.39	5.65	36.97	100	185	P	V
	*	2439.913	82.29	-	-	86.22	27.39	5.65	36.97	100	185	A	V
		2484.36	59.41	-14.59	74	63.02	27.64	5.69	36.94	100	185	P	V
		2483.56	46.36	-7.64	54	49.97	27.64	5.69	36.94	100	185	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		4844	36.04	-37.96	74	57.44	31.53	9.15	62.08	100	0	P	H
		7260	46.94	-27.06	74	60.93	33.88	11.31	59.18	100	26	P	H
		7260	39.27	-14.73	54	53.26	33.88	11.31	59.18	100	26	A	H
		4842	36.54	-37.46	74	57.94	31.53	9.15	62.08	100	0	P	V
		7266	50.59	-23.41	74	64.52	33.93	11.31	59.17	100	76	P	V
		7266	40.27	-13.73	54	54.2	33.93	11.31	59.17	100	76	A	V
802.11n HT40 CH 06 2437MHz		4872	37.08	-36.92	74	58.32	31.59	9.2	62.03	100	360	P	H
		7308	44.83	-29.17	74	58.66	34.03	11.3	59.16	100	360	P	H
		4872	36.24	-37.76	74	57.48	31.59	9.2	62.03	100	360	P	V
		7308	46.88	-27.12	74	60.71	34.03	11.3	59.16	100	360	P	V
802.11n HT40 CH 09 2452MHz		4902	36.86	-37.14	74	57.96	31.64	9.25	61.99	100	0	P	H
		7356	43.49	-30.51	74	57.14	34.19	11.29	59.13	100	0	P	H
		4904	37.34	-36.66	74	58.44	31.64	9.25	61.99	100	0	P	V
		7356	43.13	-30.87	74	56.78	34.19	11.29	59.13	100	0	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		55.22	33.61	-6.39	40	57.72	7.6	0.89	32.6	100	64	P	H
		74.62	27.27	-12.73	40	49.61	9.1	1.05	32.49	-	-	P	H
		105.66	24.29	-19.21	43.5	42.17	13.18	1.24	32.3	-	-	P	H
		200.72	28.32	-15.18	43.5	48.29	10.75	1.73	32.45	-	-	P	H
		233.7	29.04	-16.96	46	47.31	12.38	1.73	32.38	-	-	P	H
		287.05	32.21	-13.79	46	47.9	14.47	2.03	32.19	-	-	P	H
		74.62	33.8	-6.20	40	56.14	9.1	1.05	32.49	100	154	P	V
		105.66	33.3	-10.20	43.5	51.18	13.18	1.24	32.3	-	-	P	V
		166.77	23.86	-19.64	43.5	41.97	12.77	1.56	32.44	-	-	P	V
		229.82	27.14	-18.86	46	45.55	12.19	1.73	32.33	-	-	P	V
		323.91	25.98	-20.02	46	40.68	15.33	2.21	32.24	-	-	P	V
		423.82	23.67	-22.33	46	36.07	17.19	2.55	32.14	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



For USB Cable 2, Battery 2

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preampl Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 06 2437MHz	*	2438.243	95.04	-	-	98.97	27.39	5.65	36.97	114	124	P	H
	*	2438.243	92.5	-	-	96.43	27.39	5.65	36.97	114	124	A	H
	*	2438.326	97.89	-	-	101.82	27.39	5.65	36.97	100	242	P	V
	*	2438.159	95.37	-	-	99.3	27.39	5.65	36.97	100	242	A	V

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preampl Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 06 2437MHz	*	4872	37.77	-36.23	74	59.01	31.59	9.2	62.03	100	360	P	H
	*	7308	45.36	-28.64	74	59.19	34.03	11.3	59.16	100	360	A	H
	*	4872	37.81	-36.19	74	59.05	31.59	9.2	62.03	100	360	P	V
	*	7308	44.85	-29.15	74	58.68	34.03	11.3	59.16	100	360	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average 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)

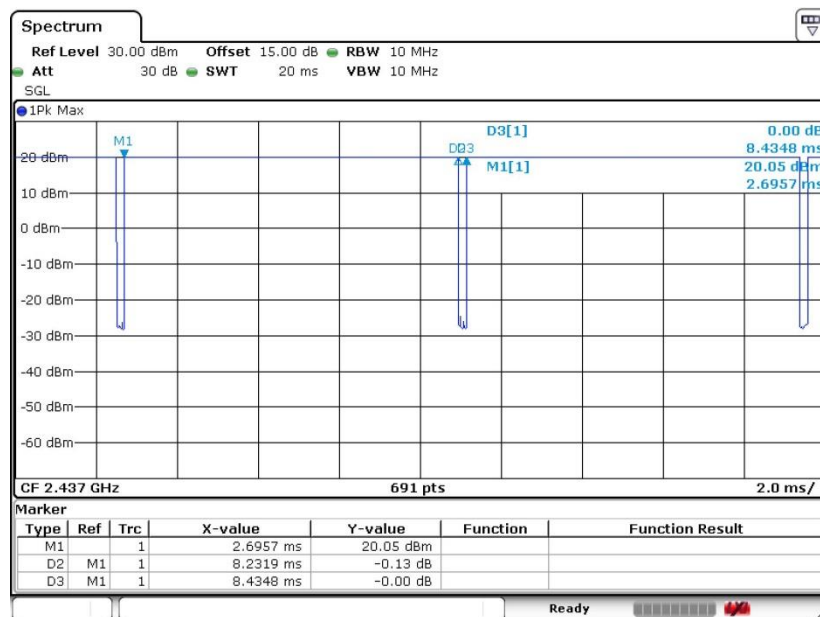
Both peak and average measured complies with the limit line, so test result is “PASS”.



Appendix C. Duty Cycle Plots

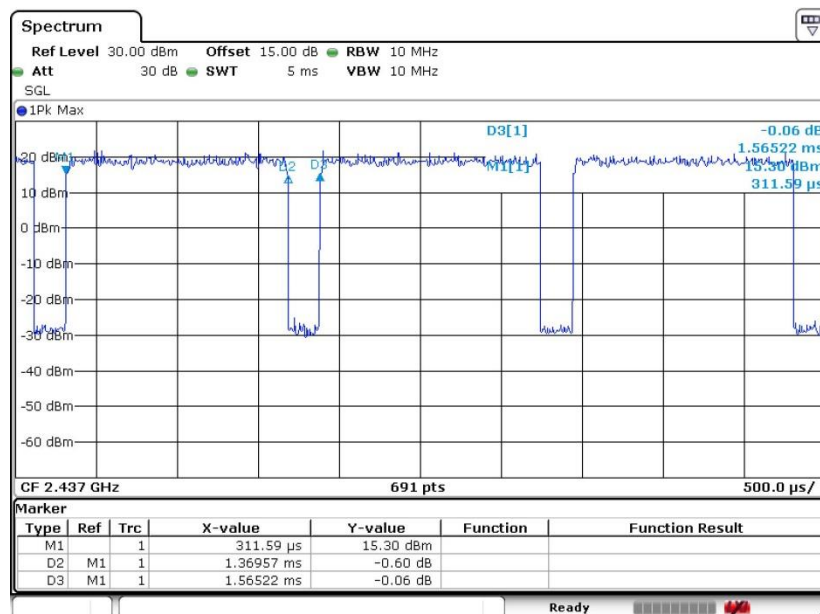
Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	97.59	8.23	0.12	300Hz
802.11g	87.50	1.37	0.73	1kHz
2.4GHz 802.11n HT20	86.78	1.28	0.78	1kHz
2.4GHz 802.11n HT40	76.12	0.64	1.56	3kHz

802.11b



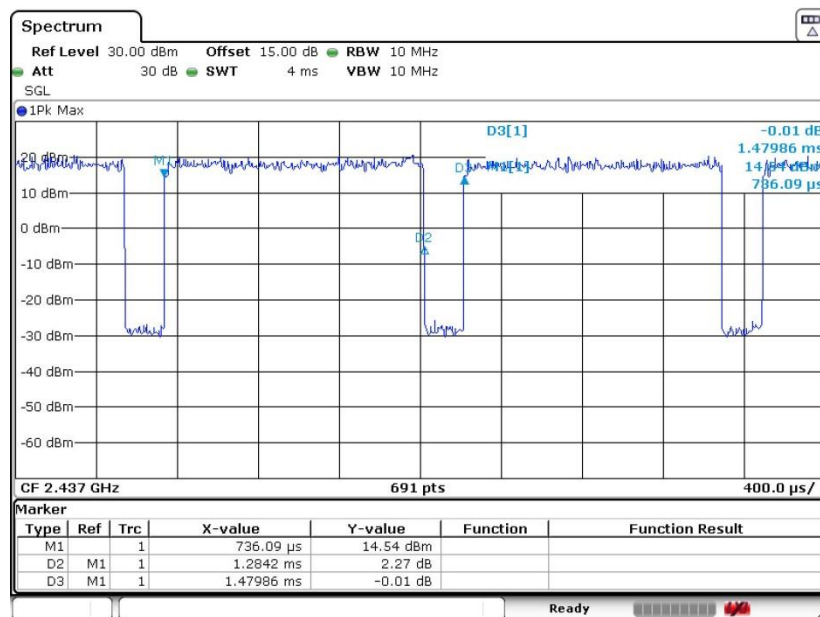
Date: 13 JUN 2016 15:15:23

802.11g



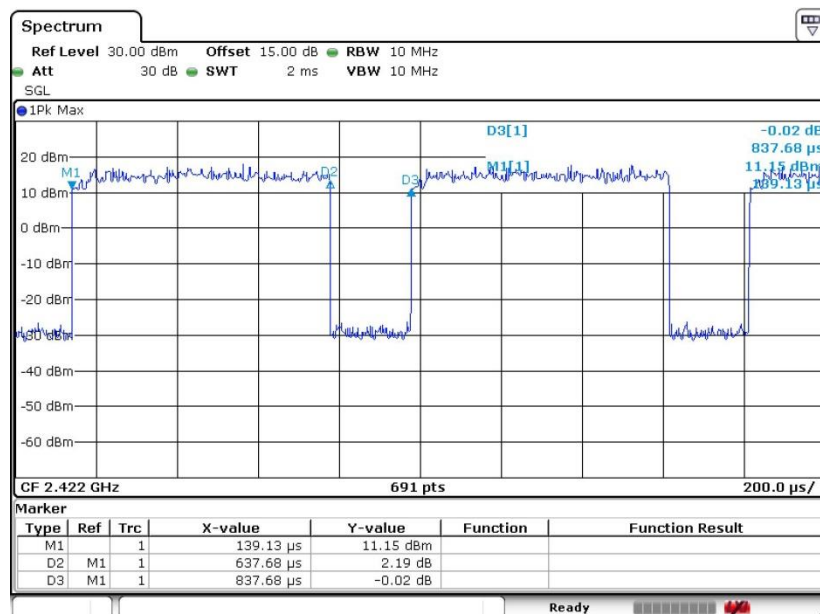
Date: 13 JUN 2016 15:23:46

802.11n HT20



Date: 13 JUN 2016 16:43:18

802.11n HT40



Date: 15 JUN 2016 10:27:36