



FCC RF Test Report

APPLICANT : Lenovo(Shanghai) Electronics
Technology Co., Ltd.
EQUIPMENT : Portable Tablet Computer
BRAND NAME : Lenovo
MODEL NAME : Lenovo YT-X703F
FCC ID : O57YTX703F
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Jul. 01, 2016 and testing was completed on Aug. 01, 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



TABLE OF CONTENTS

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 of Equipment Under Test	6
1.5	Modification of EUT	6
1.6	Component List	6
1.7	Testing Location	7
1.8	Applicable Standards	7
2	TEST CONFIGURATION OF EQUIPMENT UNDER TEST	8
2.1	Carrier Frequency Channel	8
2.2	Test Mode	9
2.3	Connection Diagram of Test System	10
2.4	Support Unit used in test configuration and system	11
2.5	EUT Operation Test Setup	11
2.6	Measurement Results Explanation Example	11
3	TEST RESULT	12
3.1	6dB and 99% Bandwidth Measurement	12
3.2	Output Power Measurement	14
3.3	Power Spectral Density Measurement	15
3.4	Conducted Band Edges and Spurious Emission Measurement	17
3.5	Radiated Band Edges and Spurious Emission Measurement	30
3.6	AC Conducted Emission Measurement	34
3.7	Antenna Requirements	38
4	LIST OF MEASURING EQUIPMENT	39
5	UNCERTAINTY OF EVALUATION	40
APPENDIX A. CONDUCTED TEST RESULTS		
APPENDIX B. RADIATED TEST RESULTS		
APPENDIX C. DUTY CYCLE PLOTS		
APPENDIX D. SETUP PHOTOGRAPHS		



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR663013-01C	Rev. 01	Initial issue of report	Aug. 08, 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 3.77 dB at 33.340 MHz for Quasi-Peak
3.6	15.207	RSS-GEN 8.8	AC Conducted Emission	15.207(a)	Pass	Under limit 6.51 dB at 26.840 MHz
3.7	15.203 & 15.247(b)	N/A	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

Lenovo(Shanghai) Electronics Technology Co., Ltd.

NO.68 BUILDING, 199 FENJU RD, China (Shanghai) Pilot Free Trade Zone, 200131, CHINA

1.2 Manufacturer

Lenovo PC HK Limited

23/F, Lincoln House, Taikoo Place 979 King's Road, Quarry Bay, Hong Kong

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Portable Tablet Computer
Brand Name	Lenovo
Model Name	Lenovo YT-X703F
FCC ID	O57YTX703F
EUT supports Radios application	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
HW Version	Lenovo Tablet YT-X703F
SW Version	YT-X703F_160817
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 : 19.86 dBm (0.0968 W) 802.11g : 23.18 dBm (0.2080 W) 802.11n HT20 : 23.57 dBm (0.2275 W) 802.11n HT40 : 22.78 dBm (0.1897 W)
99% Occupied Bandwidth	802.11b : 13.54MHz 802.11g : 19.03MHz 802.11n HT20 : 19.63MHz 802.11n HT40 : 36.96MHz
Antenna Type	802.11b/g/n : PIFA Antenna with gain 0.05 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 Component List

Note: There are two types of EUT, the details refer the following table. According to the difference, we evaluate is not affect RF performance, so only choose sample 1 to perform RF test.

Component	Sample 1	Sample 2
Battery	Sunwoda: L16D3K31 3.75 Vdc, 9300 mAh	SCUD: L16D3K31 3.75 Vdc, 9300 mAh
Rear Camera	Qtech: F5695AK	AVC: CCBFL05006
LCM+TP ASM	Ofilm: AUO 10.1 WQXGA IPS+10.1 inch GFF Direct bounding + S7813	GIS: Innolux 10.1 WQXGA IPS+10.1 inch GFF Direct bounding + S7813
DRAM	Samsung: K3QF4F40BM-FGCF	Hynix: H9CKNNNDATMUPR-NUH
EMMC	Samsung: KLMCG4JENB-B041	Toshiba: THGBMFG8C2LBAIL

1.7 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.	
	TH01-KS	CO01-KS

Test Site	SPORTON INTERNATIONAL INC.	
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C. TEL: +886-3-3273456 / FAX: +886-3-3284978	
Test Site No.	Sporton Site No.	FCC/IC Registration No.
	03CH13-HY	TW1098/4086H

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

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 four orthogonal panels, X, Y, Z and laptop. The worst cases (Y plane) were recorded in this report.

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 Test Mode

Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates as below table.

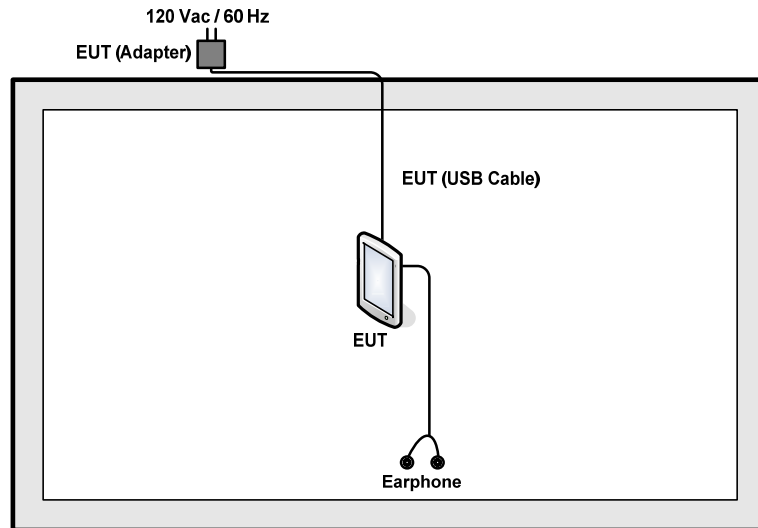
<2.4GHz>

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

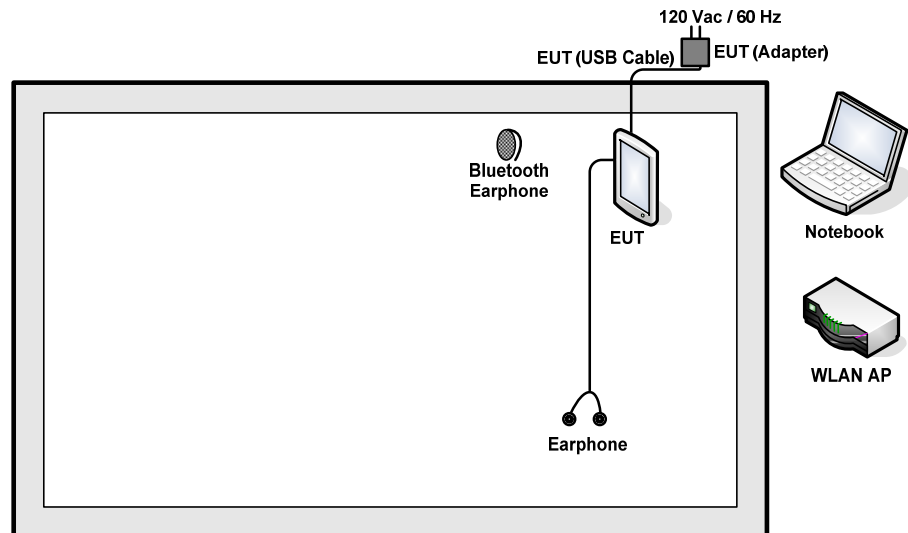
Test Cases	
AC Conducted Emission	Mode 1 : Bluetooth Link + WLAN Link (2.4G) + Earphone + USB Cable (Charging from Adapter 12V) + Battery 1 for Sample 1
	Mode 2 : Bluetooth Link + WLAN Link (2.4G) + Earphone + USB Cable (Charging from Adapter 5.2V) + Battery 2 for Sample 2
Remark: - The worst case of conducted emission is mode 1; only the test data of it was reported. - For Radiated TCs, The tests were performed with Adapter, Earphone, Battery 1, USB Cable, Sample 1	

2.3 Connection Diagram of Test System

<WLAN Tx Mode>



<AC Conducted Emission Mode>



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	D-link	DIR-855	KA2DIR855A2	N/A	Unshielded, 1.8m
2.	Notebook	Lenovo	G480	N/A	N/A	AC I/P: Unshielded, 1.8m DC O/P: Shielded, 1.8 m
3.	Bluetooth Earphone	Lenovo	LBH505	N/A	N/A	N/A
4.	Earphone	Lenovo	LH102	N/A	Unshielded,1.2m	N/A

2.5 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.

2.6 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 5.8 dB.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)}. \\ &= 5.8 \text{ (dB)} \end{aligned}$$

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.

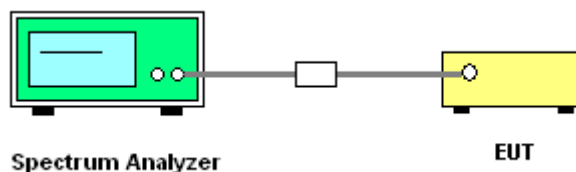
3.1.2 Measuring Instruments

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.

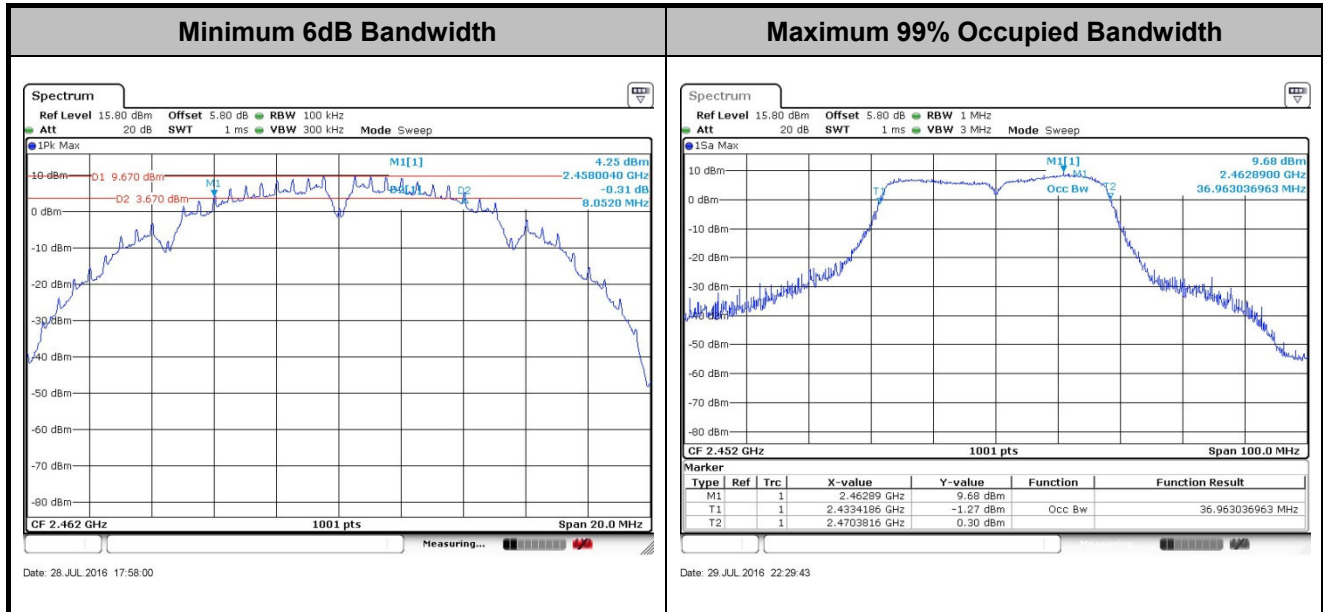
3.1.4 Test Setup





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.

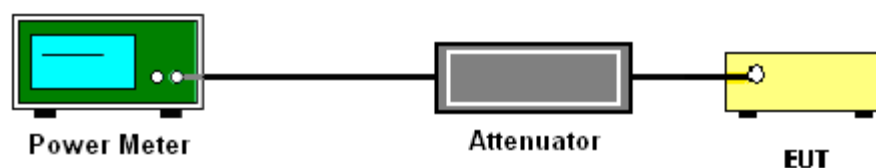
3.2.2 Measuring Instruments

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.

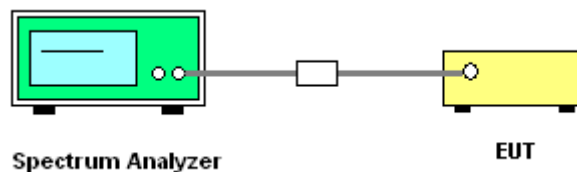
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

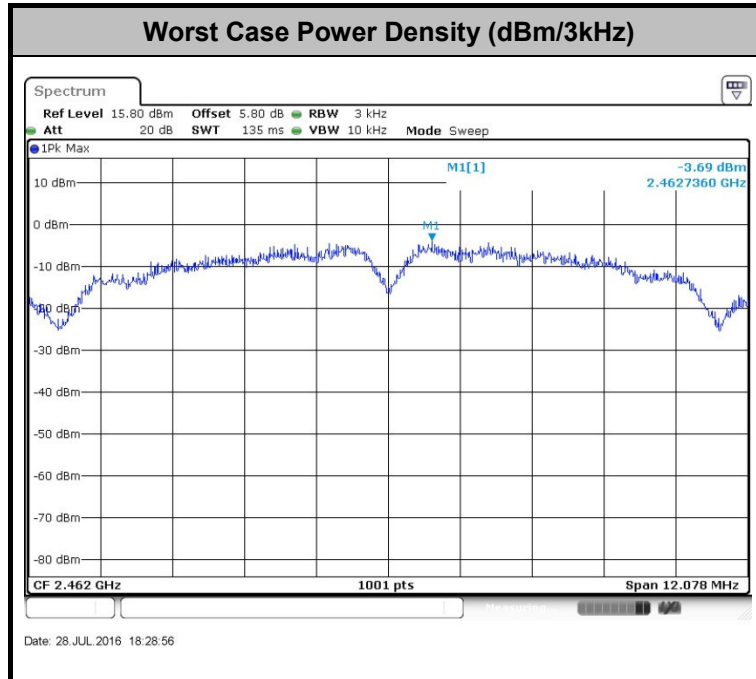
1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum 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).

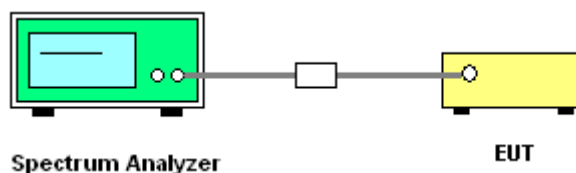
3.4.2 Measuring Instruments

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.

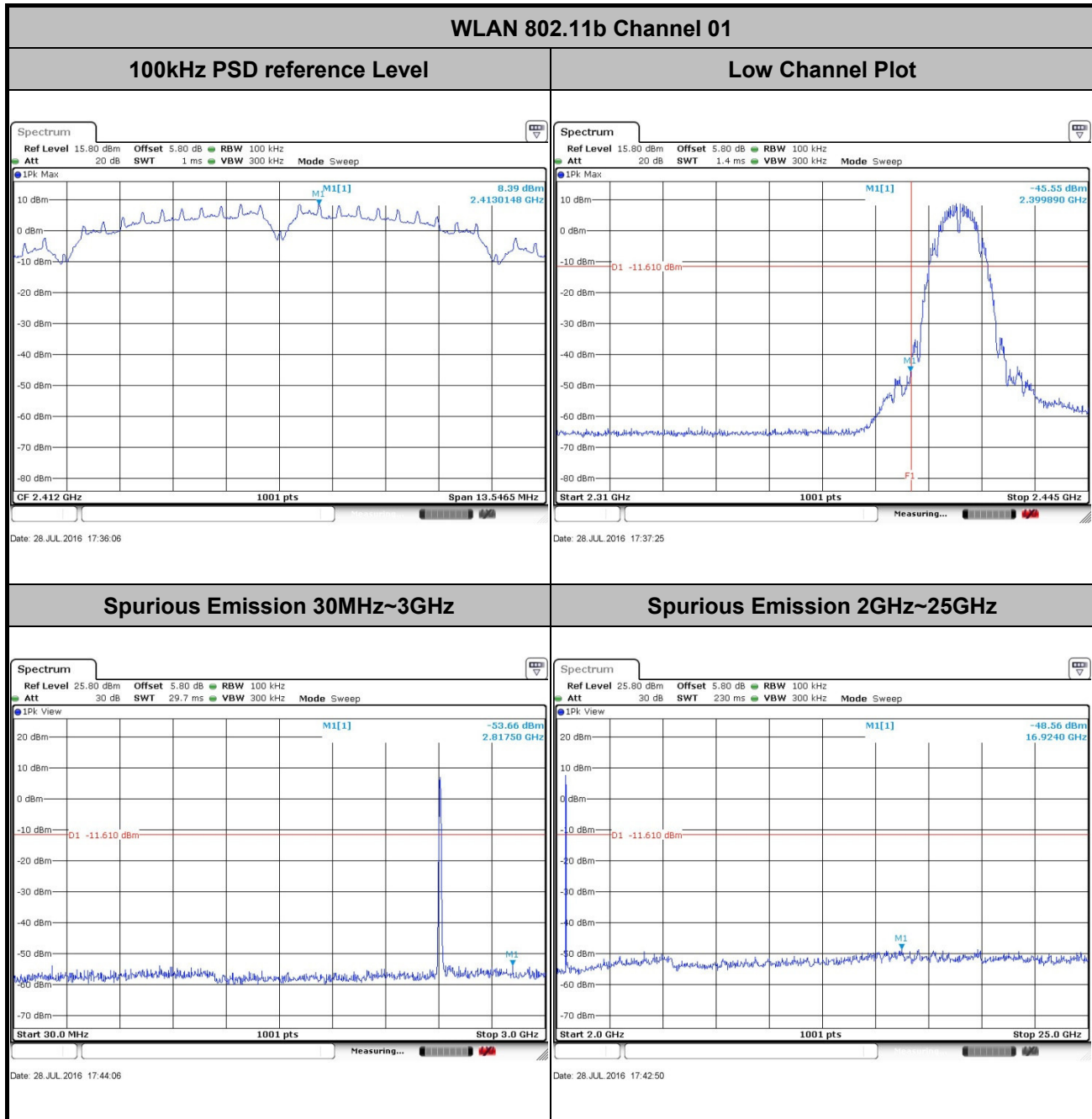
3.4.4 Test Setup





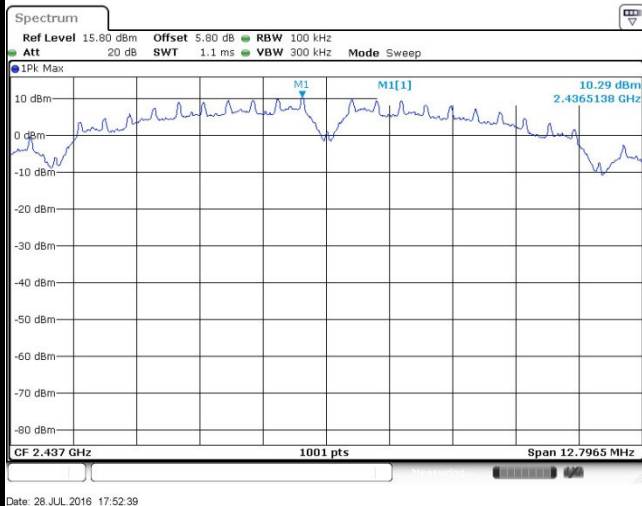
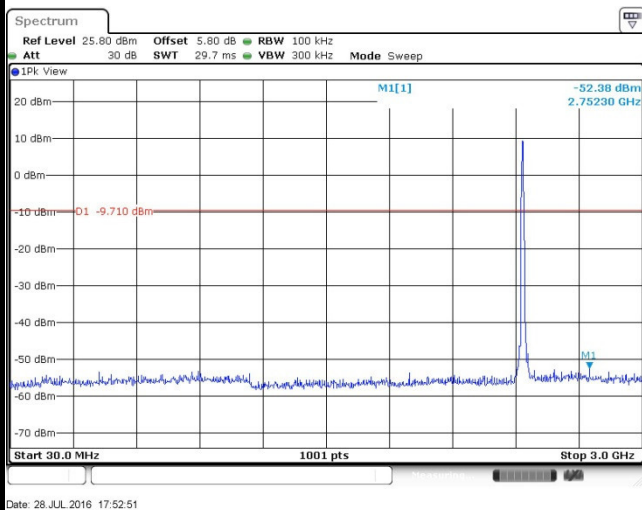
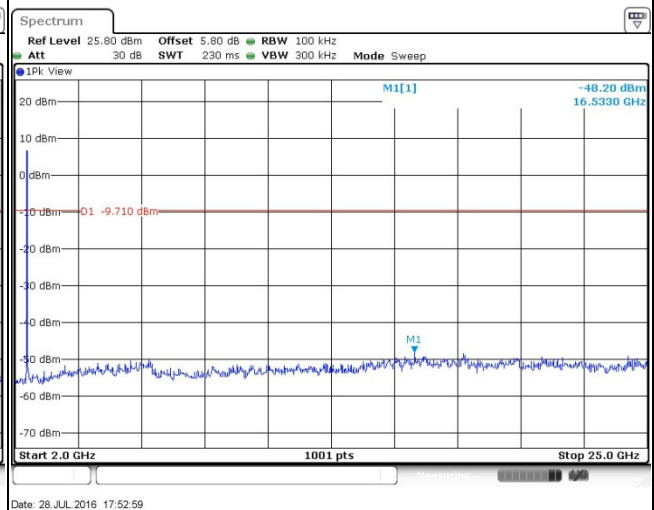
3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Mode :	802.11b	Temperature :	24~25℃
Test Band :	2.4GHz Low	Relative Humidity :	54~55%
Test Channel :	01	Test Engineer :	Ivan Zhang





Test Mode :	802.11b	Temperature :	24~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	54~55%
Test Channel :	06	Test Engineer :	Ivan Zhang

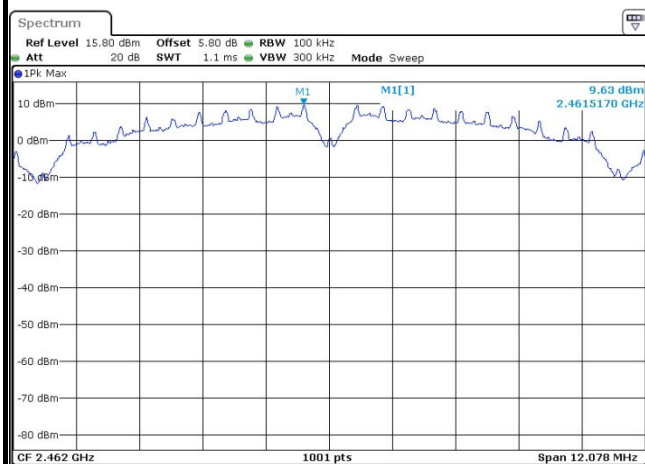
WLAN 802.11b Channel 06**100kHz PSD reference Level****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**



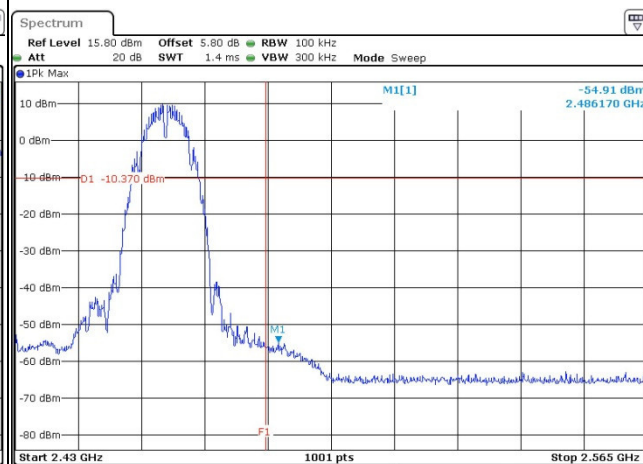
Test Mode :	802.11b	Temperature :	24~25°C
Test Band :	2.4GHz High	Relative Humidity :	54~55%
Test Channel :	11	Test Engineer :	Ivan Zhang

WLAN 802.11b Channel 11

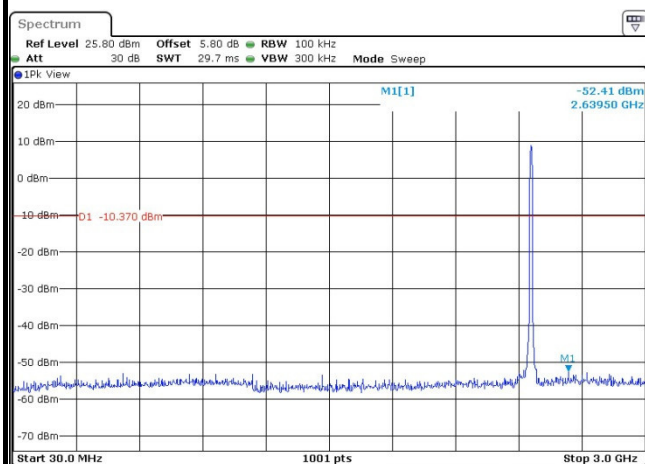
100kHz PSD reference Level



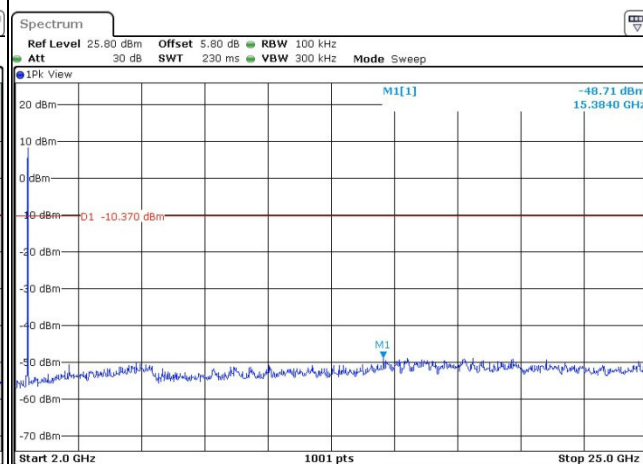
High Channel Plot



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

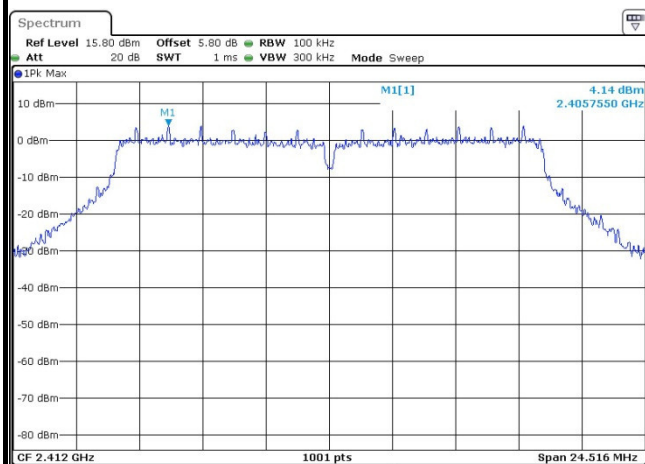




Test Mode :	802.11g	Temperature :	24~25°C
Test Band :	2.4GHz Low	Relative Humidity :	54~55%
Test Channel :	01	Test Engineer :	Ivan Zhang

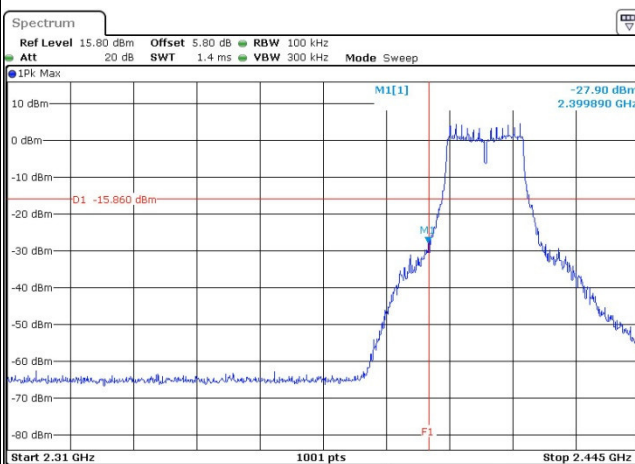
WLAN 802.11g Channel 01

100kHz PSD reference Level



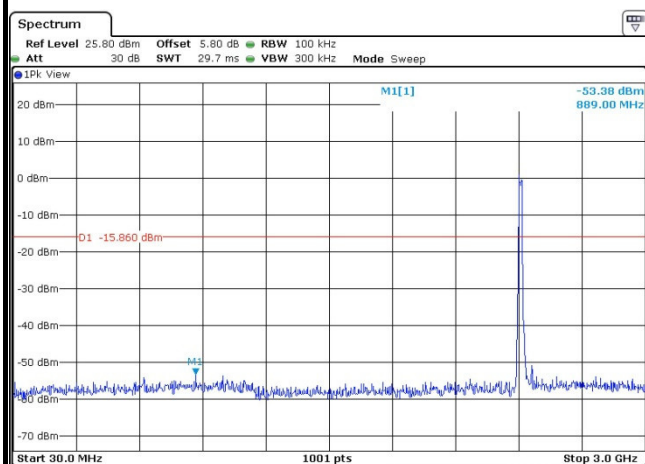
Date: 28 JUL 2016 18:35:37

Low Channel Plot



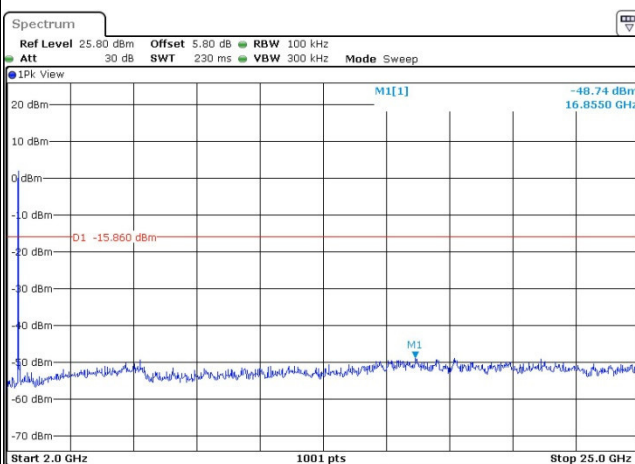
Date: 28 JUL 2016 18:36:16

Spurious Emission 30MHz~3GHz



Date: 28 JUL 2016 19:16:11

Spurious Emission 2GHz~25GHz



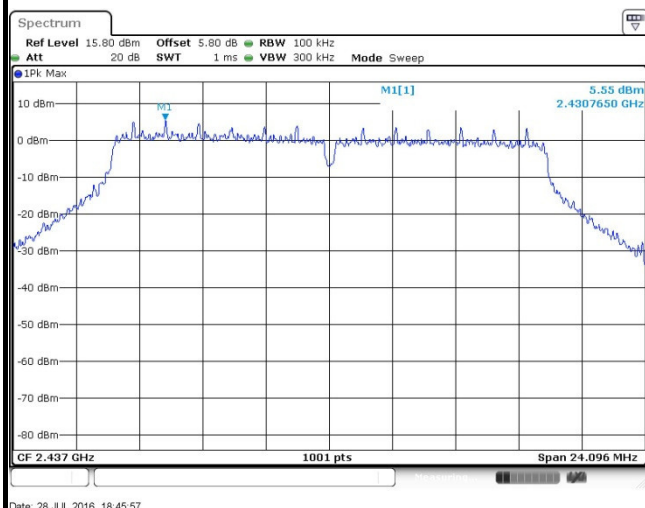
Date: 28 JUL 2016 19:15:38



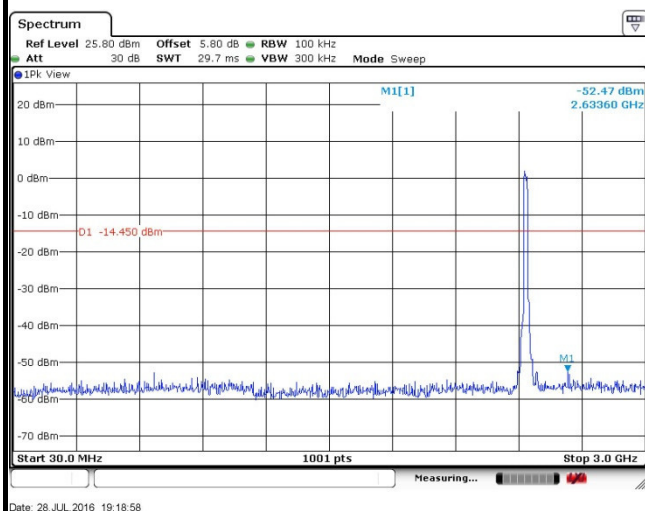
Test Mode :	802.11g	Temperature :	24~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	54~55%
Test Channel :	06	Test Engineer :	Ivan Zhang

WLAN 802.11g Channel 06

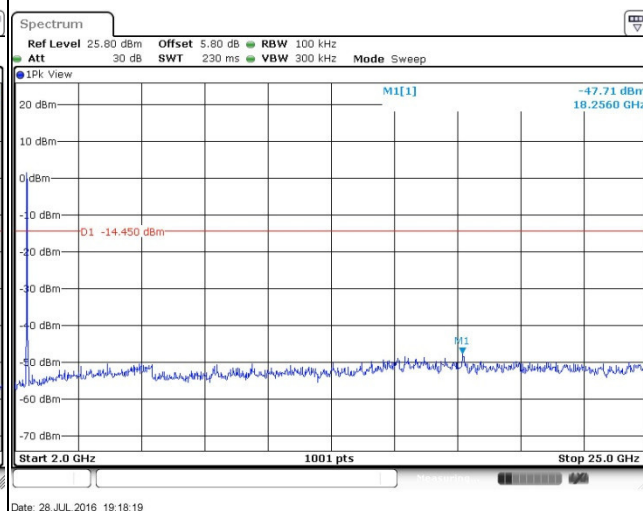
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

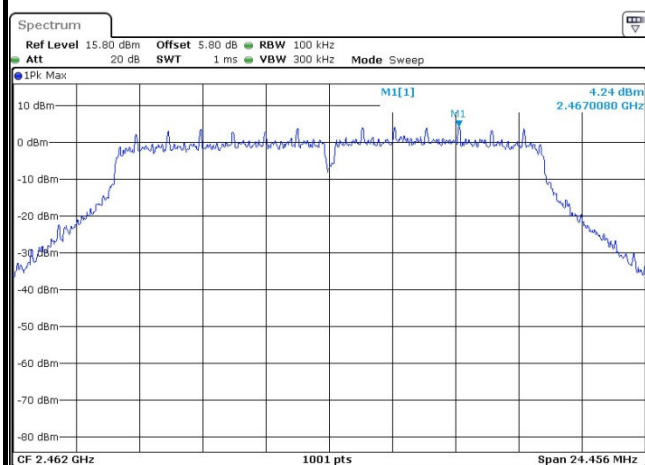




Test Mode :	802.11g	Temperature :	24~25°C
Test Band :	2.4GHz High	Relative Humidity :	54~55%
Test Channel :	11	Test Engineer :	Ivan Zhang

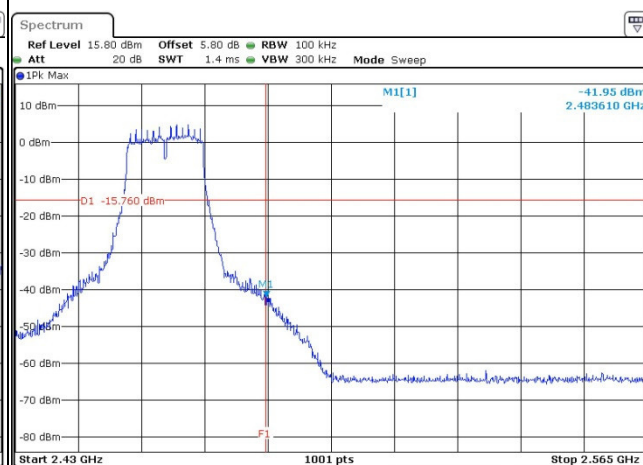
WLAN 802.11g Channel 11

100kHz PSD reference Level



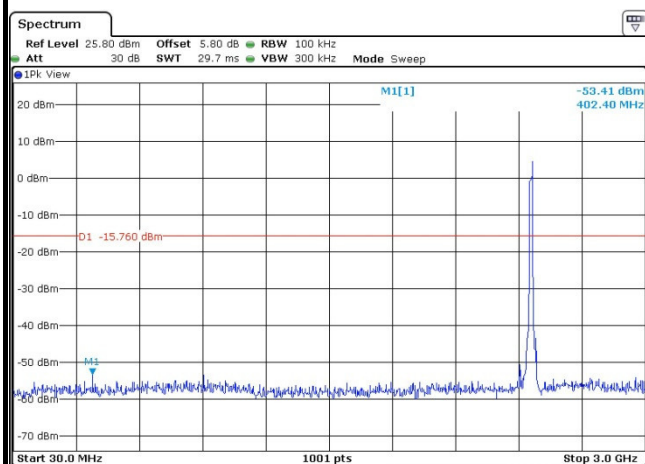
Date: 28 JUL 2016 19:23:39

High Channel Plot



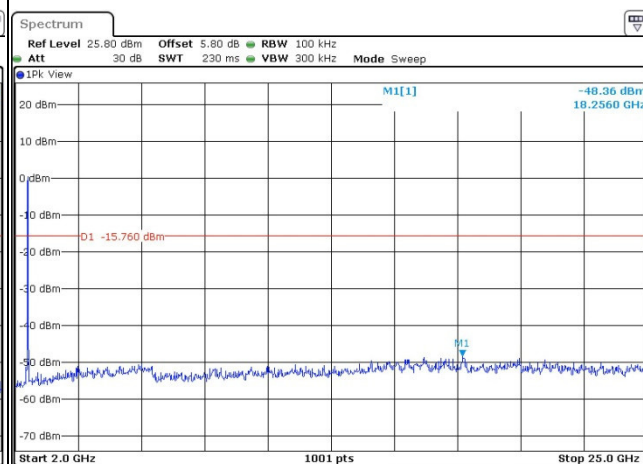
Date: 28 JUL 2016 19:24:28

Spurious Emission 30MHz~3GHz



Date: 28 JUL 2016 19:25:25

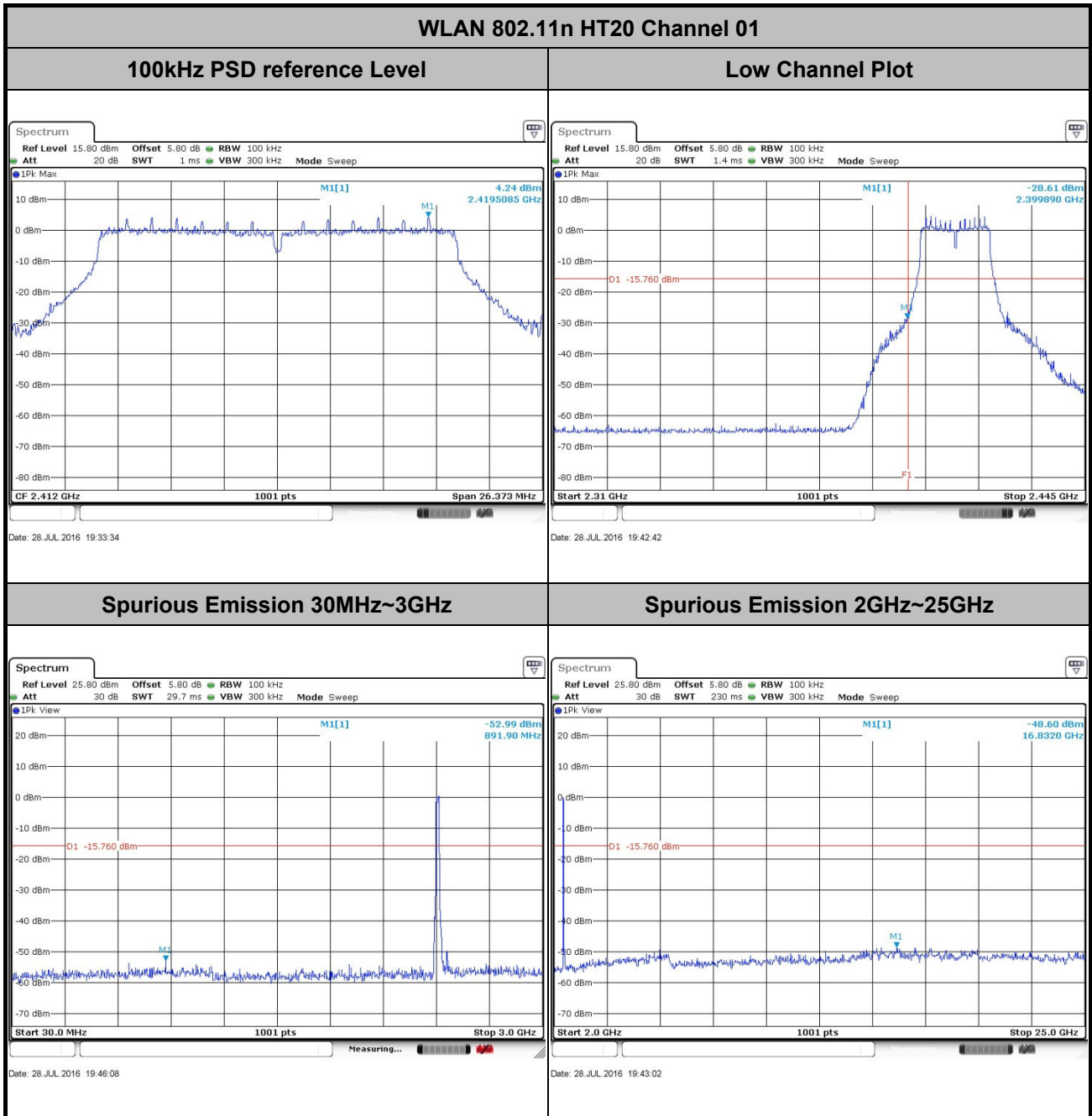
Spurious Emission 2GHz~25GHz



Date: 28 JUL 2016 19:24:49



Test Mode :	802.11n HT20	Temperature :	24~25°C
Test Band :	2.4GHz Low	Relative Humidity :	54~55%
Test Channel :	01	Test Engineer :	Ivan Zhang

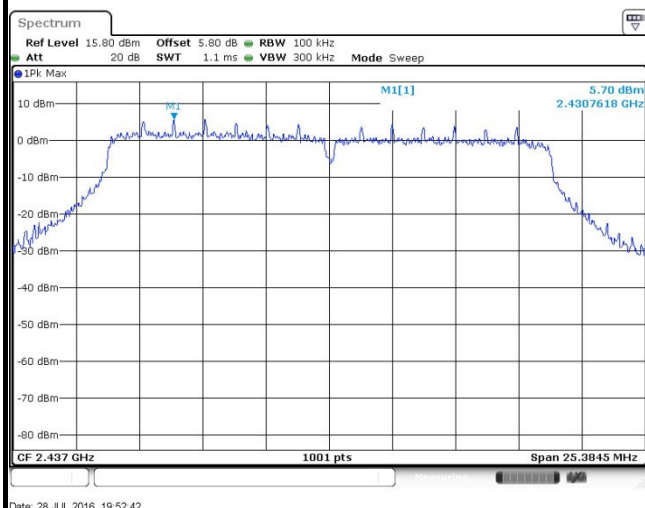




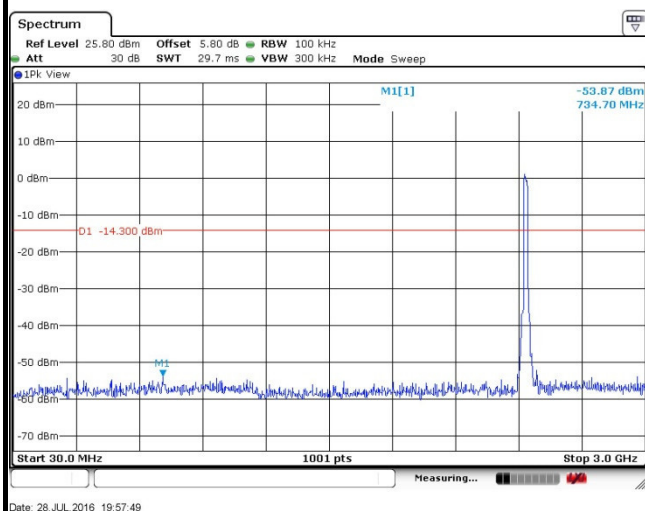
Test Mode :	802.11n HT20	Temperature :	24~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	54~55%
Test Channel :	06	Test Engineer :	Ivan Zhang

WLAN 802.11n HT20 Channel 06

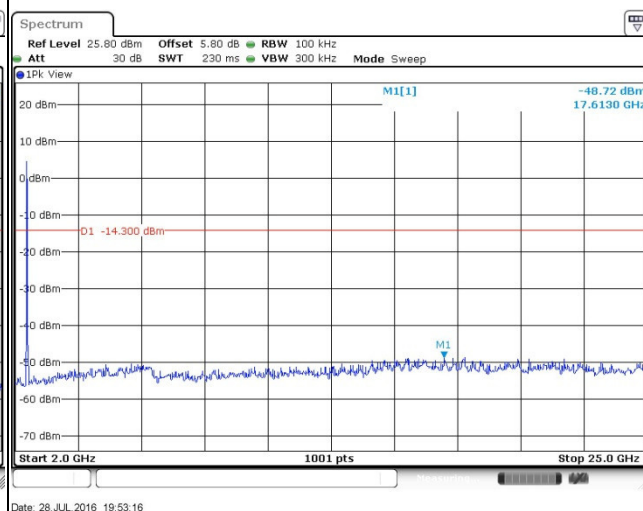
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

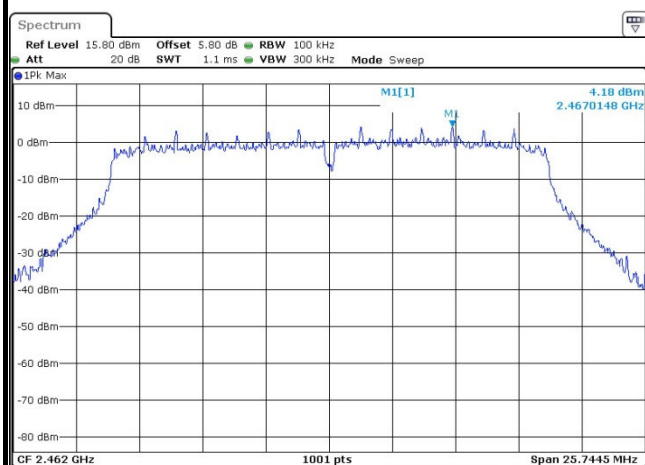




Test Mode :	802.11n HT20	Temperature :	24~25°C
Test Band :	2.4GHz High	Relative Humidity :	54~55%
Test Channel :	11	Test Engineer :	Ivan Zhang

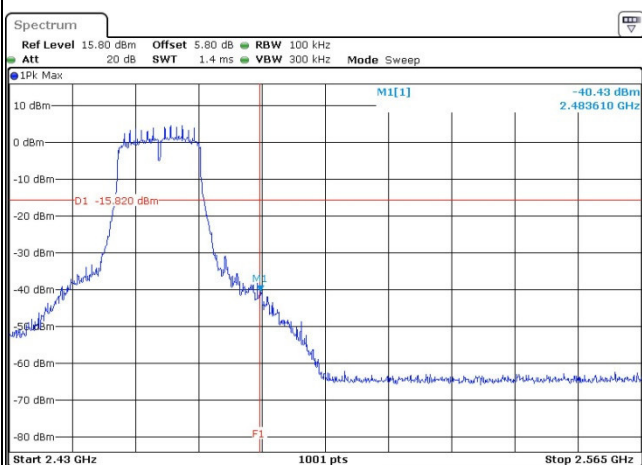
WLAN 802.11n HT20 Channel 11

100kHz PSD reference Level



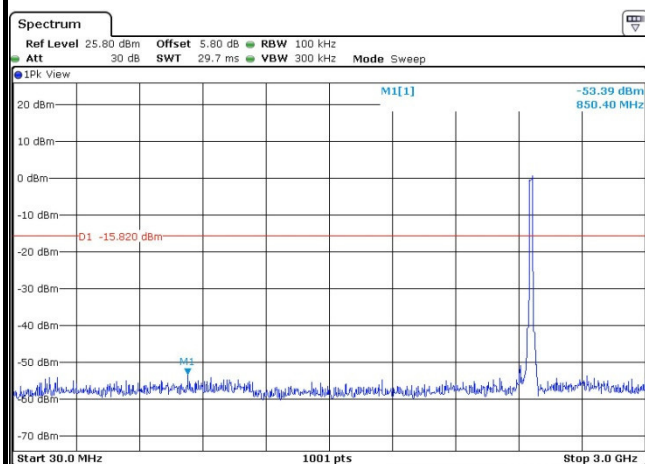
Date: 28 JUL 2016 20:02:01

High Channel Plot



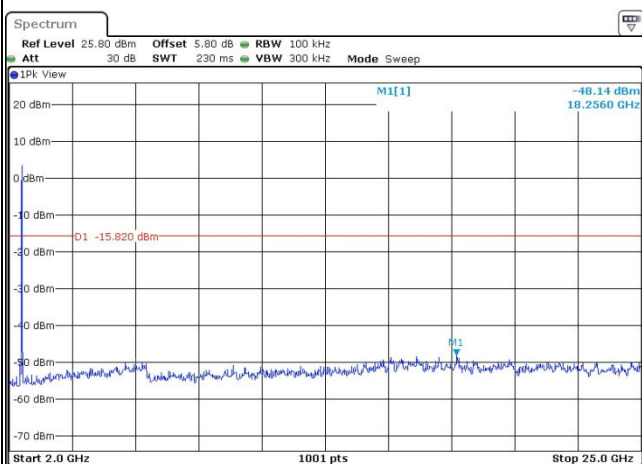
Date: 28 JUL 2016 20:02:42

Spurious Emission 30MHz~3GHz



Date: 28 JUL 2016 20:03:51

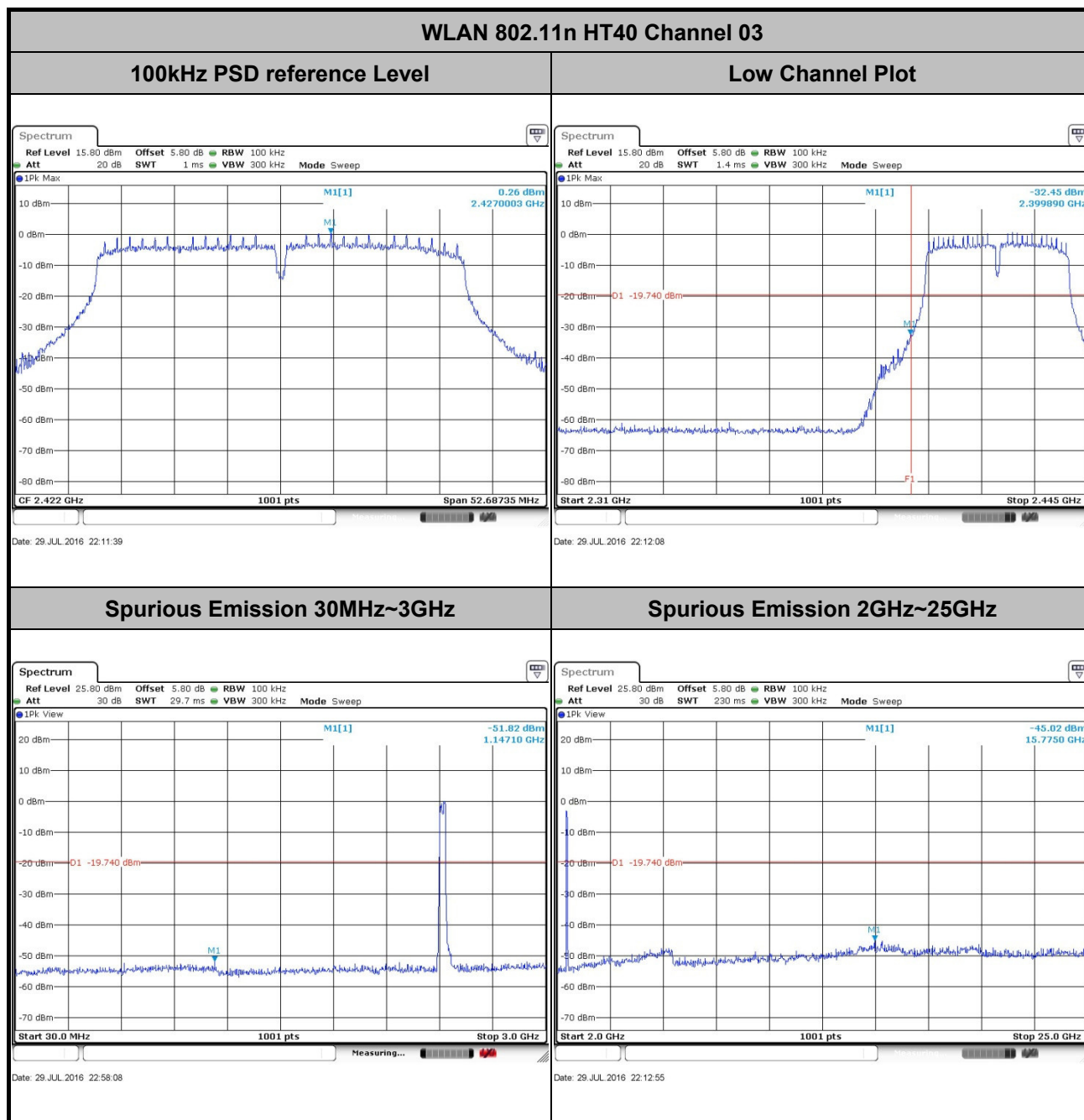
Spurious Emission 2GHz~25GHz



Date: 28 JUL 2016 20:03:04

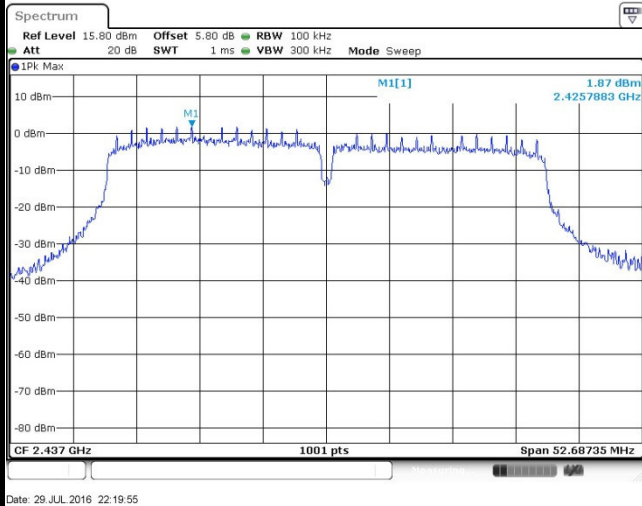
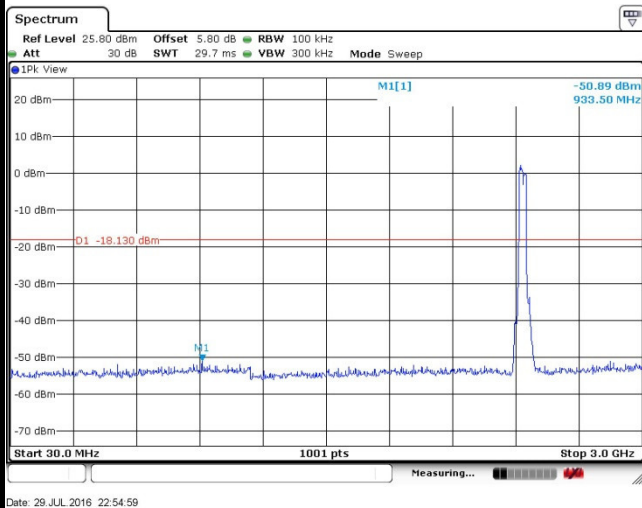
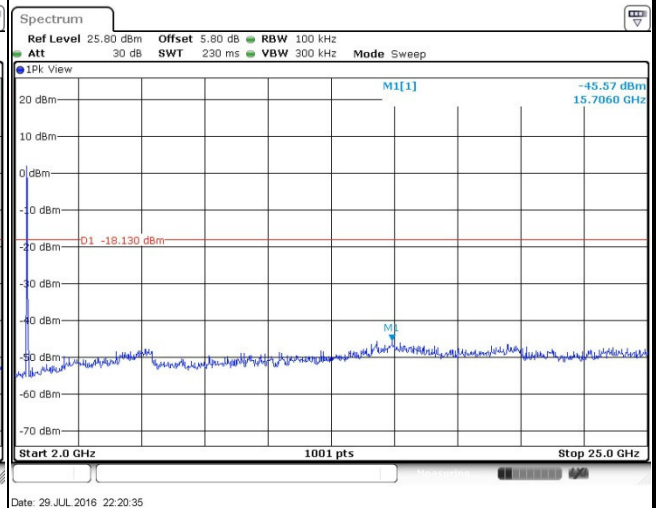


Test Mode :	802.11n HT40	Temperature :	24~25°C
Test Band :	2.4GHz Low	Relative Humidity :	54~55%
Test Channel :	03	Test Engineer :	Ivan Zhang



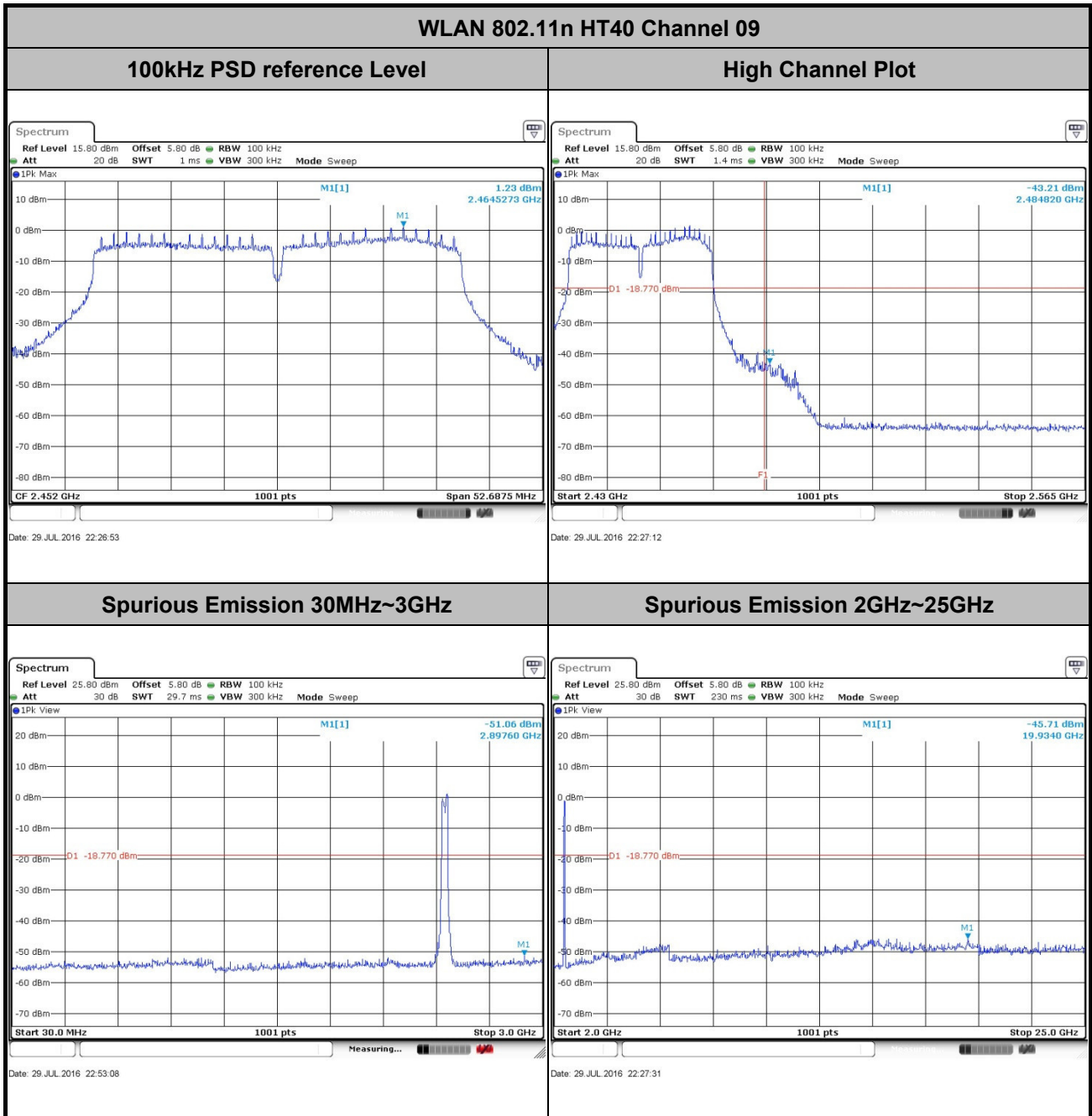


Test Mode :	802.11n HT40	Temperature :	24~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	54~55%
Test Channel :	06	Test Engineer :	Ivan Zhang

WLAN 802.11n HT40 Channel 06**100kHz PSD reference Level****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**



Test Mode :	802.11n HT40	Temperature :	24~25°C
Test Band :	2.4GHz High	Relative Humidity :	54~55%
Test Channel :	09	Test Engineer :	Ivan Zhang



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

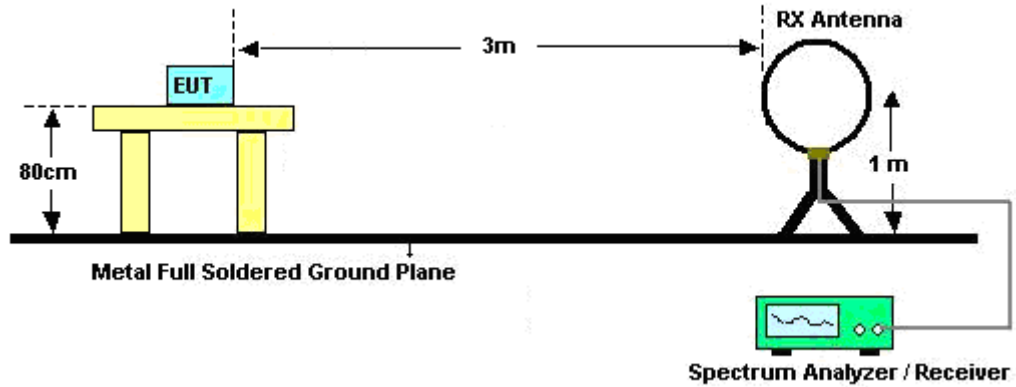
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the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

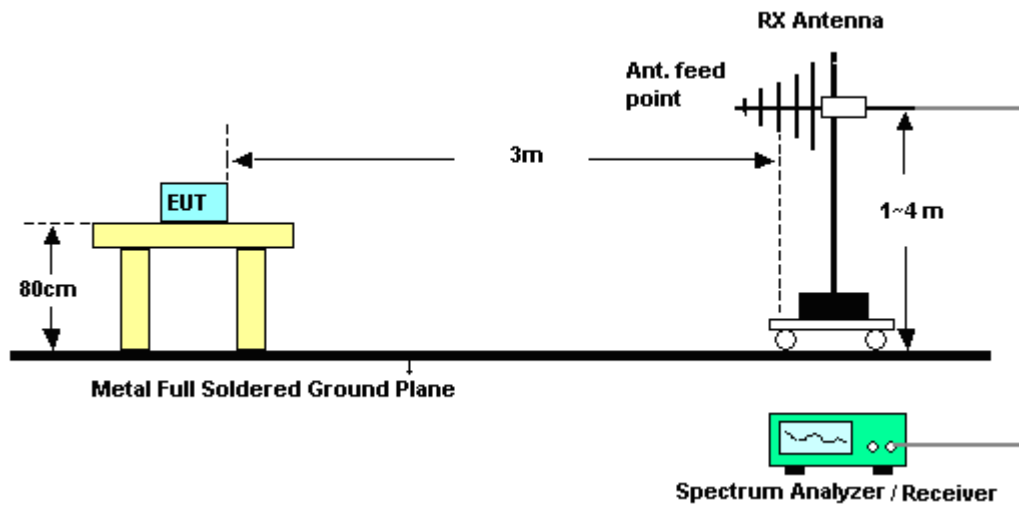
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

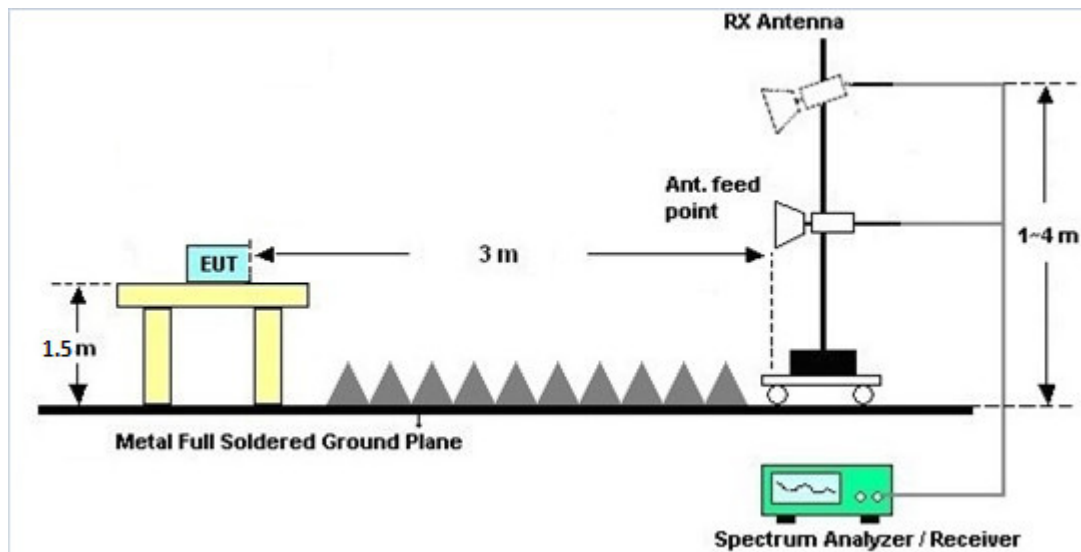
For radiated emissions below 30MHz



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.

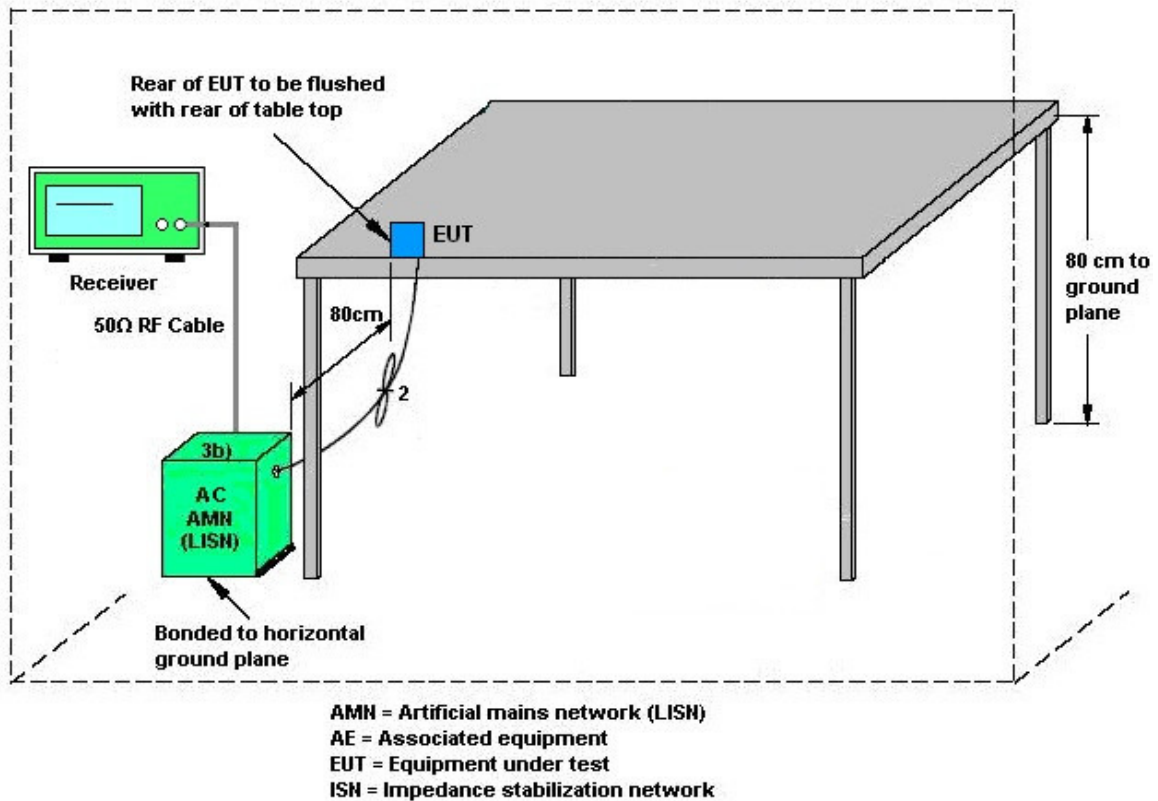
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

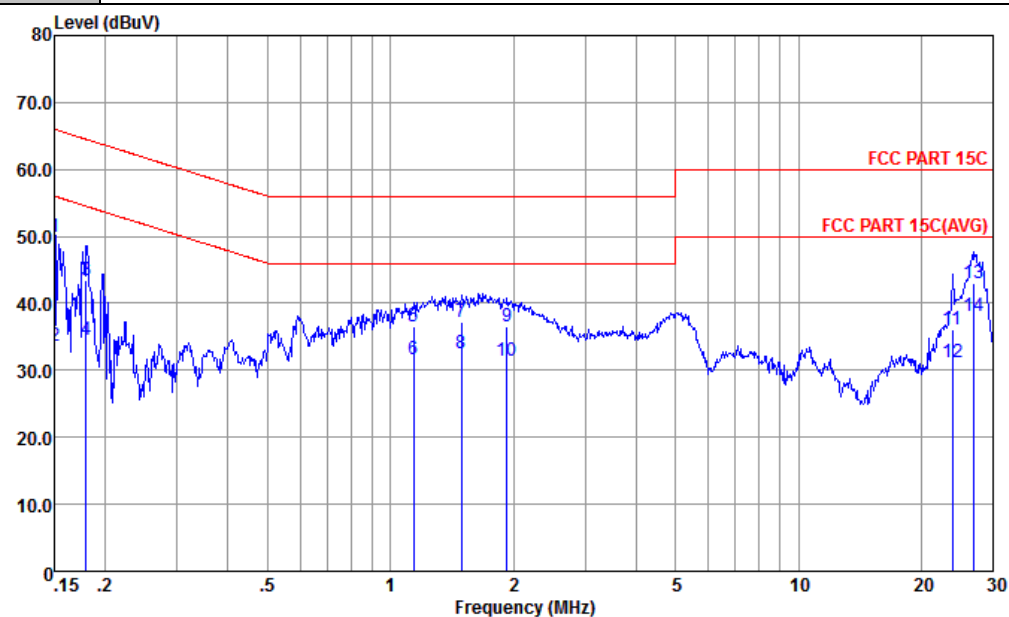
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other 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 :	Bluetooth Link + WLAN Link (2.4G) + Earphone + USB Cable (Charging from Adapter 12V) + Battery 1 for Sample 1		

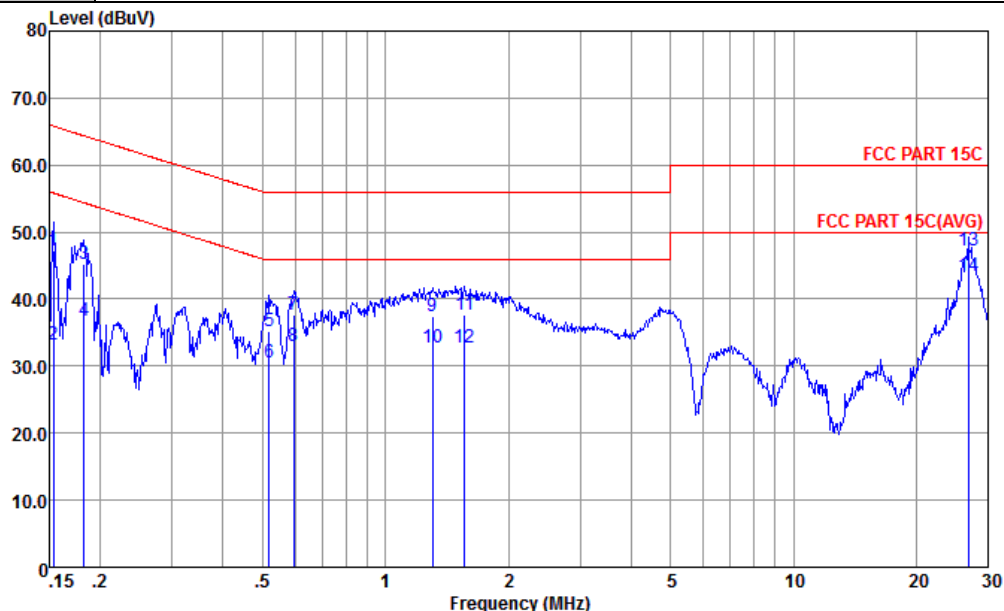


Site : CO01-KS
Condition : FCC PART 15C LISN-L-20151024 LINE
mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15	49.84	-16.16	66.00	39.20	0.53	10.11	QP
2	0.15	33.54	-22.46	56.00	22.90	0.53	10.11	Average
3	0.18	43.36	-21.14	64.50	32.90	0.34	10.12	QP
4	0.18	34.56	-19.94	54.50	24.10	0.34	10.12	Average
5	1.14	36.57	-19.43	56.00	26.19	0.24	10.14	QP
6	1.14	31.57	-14.43	46.00	21.19	0.24	10.14	Average
7	1.50	37.15	-18.85	56.00	26.80	0.21	10.14	QP
8	1.50	32.45	-13.55	46.00	22.10	0.21	10.14	Average
9	1.93	36.52	-19.48	56.00	26.20	0.18	10.14	QP
10	1.93	31.52	-14.48	46.00	21.20	0.18	10.14	Average
11	23.89	36.08	-23.92	60.00	25.20	0.23	10.65	QP
12	23.89	31.18	-18.82	50.00	20.30	0.23	10.65	Average
13	26.84	43.08	-16.92	60.00	32.11	0.22	10.75	QP
14 *	26.84	38.08	-11.92	50.00	27.11	0.22	10.75	Average



Test Mode :	Mode 1	Temperature :	22~24℃
Test Engineer :	Amos Zhang	Relative Humidity :	43~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	Bluetooth Link + WLAN Link (2.4G) + Earphone + USB Cable (Charging from Adapter 12V) + Battery 1 for Sample 1		



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	47.31	-18.51	65.82	36.90	0.30	10.11	QP
2	0.15	33.21	-22.61	55.82	22.80	0.30	10.11	Average
3	0.18	45.23	-19.14	64.37	34.80	0.31	10.12	QP
4	0.18	36.73	-17.64	54.37	26.30	0.31	10.12	Average
5	0.52	35.29	-20.71	56.00	24.81	0.32	10.16	QP
6	0.52	30.59	-15.41	46.00	20.11	0.32	10.16	Average
7	0.59	37.59	-18.41	56.00	27.10	0.33	10.16	QP
8	0.59	33.09	-12.91	46.00	22.60	0.33	10.16	Average
9	1.30	37.41	-18.59	56.00	26.90	0.37	10.14	QP
10	1.30	32.81	-13.19	46.00	22.30	0.37	10.14	Average
11	1.56	37.62	-18.38	56.00	27.10	0.38	10.14	QP
12	1.56	32.82	-13.18	46.00	22.30	0.38	10.14	Average
13	26.84	47.19	-12.81	60.00	36.20	0.24	10.75	QP
14 *	26.84	43.49	-6.51	50.00	32.50	0.24	10.75	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	101040	10Hz~40GHz	Sep. 10, 2015	Jul. 15, 2016~ Jul. 29, 2016	Sep. 09, 2016	Conducted (TH01-KS)
Pulse Power Sensor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 20, 2016	Jul. 15, 2016~ Jul. 29, 2016	Jan. 19, 2017	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 20, 2016	Jul. 15, 2016~ Jul. 29, 2016	Jan. 19, 2017	Conducted (TH01-KS)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Sep. 02, 2015	Jul. 15, 2016 ~ Aug. 01, 2016	Sep. 01, 2016	Radiation (03CH13-HY)
Bilog Antenna	TESEQ	CBL 6111D	40103	30MHz to 1GHz	Jan. 13, 2016	Jul. 15, 2016 ~ Aug. 01, 2016	Jan. 12, 2017	Radiation (03CH13-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1241	1GHz ~ 18GHz	Apr. 25, 2016	Jul. 15, 2016 ~ Aug. 01, 2016	Apr. 24, 2017	Radiation (03CH13-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170584	18GHz- 40GHz	Nov. 02, 2015	Jul. 15, 2016 ~ Aug. 01, 2016	Nov. 01, 2016	Radiation (03CH13-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY55420170	10Hz~44GHz	Mar. 10, 2016	Jul. 15, 2016 ~ Aug. 01, 2016	Mar. 09, 2017	Radiation (03CH13-HY)
Spectrum Analyzer	Keysight	N9010A	MY55370526	10Hz~44GHz	Mar. 14, 2016	Jul. 15, 2016 ~ Aug. 01, 2016	Mar. 13, 2017	Radiation (03CH13-HY)
Amplifier	Sonoma-Instrument	310 N	187282	10MHz~1GHz	Dec. 31, 2015	Jul. 15, 2016 ~ Aug. 01, 2016	Dec. 30, 2016	Radiation (03CH13-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	1GHz~18GHz	Jun. 27, 2016	Jul. 15, 2016 ~ Aug. 01, 2016	Jun. 26, 2017	Radiation (03CH13-HY)
Preamplifier	Keysight	83017A	MY53270147	1GHz~26.5GHz	Jan. 30, 2016	Jul. 15, 2016 ~ Aug. 01, 2016	Jan. 29, 2017	Radiation (03CH13-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	NCR	Jul. 15, 2016 ~ Aug. 01, 2016	NCR	Radiation (03CH13-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	NCR	Jul. 15, 2016 ~ Aug. 01, 2016	NCR	Radiation (03CH13-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	NCR	Jul. 15, 2016 ~ Aug. 01, 2016	NCR	Radiation (03CH13-HY)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz; Max 30dBm	Sep. 10, 2015	Jul. 20, 2016	Sep. 09, 2016	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 24, 2015	Jul. 20, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 24, 2015	Jul. 20, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000811	AC 0V~300V, 45Hz~1000Hz	Oct. 24, 2015	Jul. 20, 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% ($U = 2Uc(y)$)	4.9dB
---	-------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.4dB
---	-------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.3dB
---	-------



Appendix A. Conducted Test Results

A1 - DTS Part

Test Engineer:	Ivan Zhang	Temperature:	24~25	°C
Test Date:	2016/7/15~2016/7/29	Relative Humidity:	54~55	%

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	13.54	9.03	0.50	Pass
11b	1Mbps	1	6	2437	13.34	8.53	0.50	Pass
11b	1Mbps	1	11	2462	12.89	8.05	0.50	Pass
11g	6Mbps	1	1	2412	19.03	16.34	0.50	Pass
11g	6Mbps	1	6	2437	18.58	16.06	0.50	Pass
11g	6Mbps	1	11	2462	18.08	16.30	0.50	Pass
HT20	MCS0	1	1	2412	19.63	17.58	0.50	Pass
HT20	MCS0	1	6	2437	19.58	16.92	0.50	Pass
HT20	MCS0	1	11	2462	18.88	17.16	0.50	Pass
HT40	MCS0	1	3	2422	36.56	35.12	0.50	Pass
HT40	MCS0	1	6	2437	36.66	35.12	0.50	Pass
HT40	MCS0	1	9	2452	36.96	35.13	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	19.05	30.00	0.05	19.10	36.00	Pass
11b	1Mbps	1	6	2437	19.74	30.00	0.05	19.79	36.00	Pass
11b	1Mbps	1	11	2462	19.86	30.00	0.05	19.91	36.00	Pass
11g	6Mbps	1	1	2412	22.69	30.00	0.05	22.74	36.00	Pass
11g	6Mbps	1	6	2437	23.18	30.00	0.05	23.23	36.00	Pass
11g	6Mbps	1	11	2462	22.90	30.00	0.05	22.95	36.00	Pass
HT20	MCS0	1	1	2412	23.03	30.00	0.05	23.08	36.00	Pass
HT20	MCS0	1	6	2437	23.57	30.00	0.05	23.62	36.00	Pass
HT20	MCS0	1	11	2462	23.21	30.00	0.05	23.26	36.00	Pass
HT40	MCS0	1	3	2422	22.28	30.00	0.05	22.33	36.00	Pass
HT40	MCS0	1	6	2437	22.78	30.00	0.05	22.83	36.00	Pass
HT40	MCS0	1	9	2452	22.04	30.00	0.05	22.09	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	16.19
11b	1Mbps	1	6	2437	0.11	16.93
11b	1Mbps	1	11	2462	0.11	17.03
11g	6Mbps	1	1	2412	0.58	13.89
11g	6Mbps	1	6	2437	0.58	14.53
11g	6Mbps	1	11	2462	0.58	14.45
HT20	MCS0	1	1	2412	0.62	14.05
HT20	MCS0	1	6	2437	0.62	14.47
HT20	MCS0	1	11	2462	0.62	14.45
HT40	MCS0	1	3	2422	1.20	12.95
HT40	MCS0	1	6	2437	1.20	13.98
HT40	MCS0	1	9	2452	1.20	12.94

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	-4.85	0.05	8.00	Pass
11b	1Mbps	1	6	2437	-3.84	0.05	8.00	Pass
11b	1Mbps	1	11	2462	-3.69	0.05	8.00	Pass
11g	6Mbps	1	1	2412	-9.97	0.05	8.00	Pass
11g	6Mbps	1	6	2437	-8.74	0.05	8.00	Pass
11g	6Mbps	1	11	2462	-9.85	0.05	8.00	Pass
HT20	MCS0	1	1	2412	-10.31	0.05	8.00	Pass
HT20	MCS0	1	6	2437	-7.79	0.05	8.00	Pass
HT20	MCS0	1	11	2462	-8.85	0.05	8.00	Pass
HT40	MCS0	1	3	2422	-15.35	0.05	8.00	Pass
HT40	MCS0	1	6	2437	-12.75	0.05	8.00	Pass
HT40	MCS0	1	9	2452	-13.86	0.05	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		2362.185	52.21	-21.79	74	49.5	27.07	6.93	31.29	281	297	P	H
		2390	41.91	-12.09	54	39.05	27.15	6.98	31.27	281	297	A	H
	*	2412	101.85	-	-	98.93	27.19	7	31.27	281	297	P	H
	*	2412	98.74	-	-	95.82	27.19	7	31.27	281	297	A	H
		2369.43	52.14	-21.86	74	49.35	27.11	6.96	31.28	103	273	P	V
		2389.695	41.93	-12.07	54	39.08	27.15	6.98	31.28	103	273	A	V
	*	2412	98.86	-	-	95.94	27.19	7	31.27	103	273	P	V
	*	2412	95.55	-	-	92.63	27.19	7	31.27	103	273	A	V
802.11b CH 06 2437MHz		2367.54	52.67	-21.33	74	49.95	27.07	6.93	31.28	308	296	P	H
		2388.4	41.93	-12.07	54	39.08	27.15	6.98	31.28	308	296	A	H
	*	2437	102.2	-	-	99.15	27.28	7.03	31.26	308	296	P	H
	*	2437	98.95	-	-	95.9	27.28	7.03	31.26	308	296	A	H
		2499.44	53.17	-20.83	74	49.92	27.4	7.09	31.24	308	296	P	H
		2484.04	44.68	-9.32	54	41.5	27.36	7.07	31.25	308	296	A	H
		2389.1	52.14	-21.86	74	49.29	27.15	6.98	31.28	102	275	P	V
		2383.08	41.81	-12.19	54	39.02	27.11	6.96	31.28	102	275	A	V
	*	2437	100.35	-	-	97.3	27.28	7.03	31.26	102	275	P	V
	*	2437	97.19	-	-	94.14	27.28	7.03	31.26	102	275	A	V
		2487.19	52.64	-21.36	74	49.46	27.36	7.07	31.25	102	275	P	V
		2492.65	42.68	-11.32	54	39.43	27.4	7.09	31.24	102	275	A	V



802.11b CH 11 2462MHz	*	2462	104.17	-	-	101.06	27.32	7.05	31.26	114	19	P	H
	*	2462	102.87	-	-	99.76	27.32	7.05	31.26	114	19	A	H
		2487.24	52.55	-21.45	74	49.37	27.36	7.07	31.25	114	19	P	H
		2484.2	42.49	-11.51	54	39.31	27.36	7.07	31.25	114	19	A	H
	*	2462	105.08	-	-	101.97	27.32	7.05	31.26	111	258	P	V
	*	2462	101.85	-	-	98.74	27.32	7.05	31.26	111	258	A	V
		2484.12	52.48	-21.52	74	49.3	27.36	7.07	31.25	111	258	P	V
		2484.6	42.7	-11.3	54	39.52	27.36	7.07	31.25	111	258	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		4824	38.52	-35.48	74	1089.7	-500	-500	51.18	100	0	P	H
CH 01		4824	37.82	-36.18	74	1089	-500	-500	51.18	100	0	P	V
2412MHz													
802.11b		4874	36.4	-37.6	74	51.45	31.31	10.11	56.47	100	0	P	H
CH 06		7311	42.27	-31.73	74	50.67	36.27	12.53	57.2	100	0	P	H
2437MHz		4874	38.28	-35.72	74	53.33	31.31	10.11	56.47	100	0	P	V
		7311	42.69	-31.31	74	51.09	36.27	12.53	57.2	100	0	P	V
802.11b		4924	37.26	-36.74	74	52.13	31.39	10.14	56.4	100	0	P	H
CH 11		7386	42.64	-31.36	74	50.73	36.51	12.73	57.33	100	0	P	H
2462MHz		4924	37.25	-36.75	74	52.12	31.39	10.14	56.4	100	0	P	V
		7386	43.52	-30.48	74	51.61	36.51	12.73	57.33	100	0	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		2366.805	52.04	-21.96	74	49.32	27.07	6.93	31.28	308	292	P	H
		2390	42.6	-11.4	54	39.74	27.15	6.98	31.27	308	292	A	H
	*	2412	103.67	-	-	100.75	27.19	7	31.27	308	292	P	H
	*	2412	96.38	-	-	93.46	27.19	7	31.27	308	292	A	H
		2386.545	52.2	-21.8	74	49.35	27.15	6.98	31.28	100	271	P	V
		2364.39	42.34	-11.66	54	39.62	27.07	6.93	31.28	100	271	A	V
	*	2412	101.33	-	-	98.41	27.19	7	31.27	100	271	P	V
	*	2412	93.6	-	-	90.68	27.19	7	31.27	100	271	A	V
802.11g CH 06 2437MHz		2383.08	52.05	-21.95	74	49.26	27.11	6.96	31.28	245	294	P	H
		2373.7	42.52	-11.48	54	39.73	27.11	6.96	31.28	245	294	A	H
	*	2437	103.36	-	-	100.31	27.28	7.03	31.26	245	294	P	H
	*	2437	96.39	-	-	93.34	27.28	7.03	31.26	245	294	A	H
		2489.36	54.71	-19.29	74	51.47	27.4	7.09	31.25	245	294	P	H
		2489.01	44.67	-9.33	54	41.43	27.4	7.09	31.25	245	294	A	H
		2383.22	52.09	-21.91	74	49.3	27.11	6.96	31.28	102	273	P	V
		2370.76	42.27	-11.73	54	39.48	27.11	6.96	31.28	102	273	A	V
	*	2437	102.12	-	-	99.07	27.28	7.03	31.26	102	273	P	V
	*	2437	94.42	-	-	91.37	27.28	7.03	31.26	102	273	A	V
		2489.08	52.93	-21.07	74	49.69	27.4	7.09	31.25	102	273	P	V
		2489.08	44.29	-9.71	54	41.05	27.4	7.09	31.25	102	273	A	V



802.11g CH 11 2462MHz	*	2462	105.7	-	-	102.59	27.32	7.05	31.26	299	290	P	H
	*	2462	98.28	-	-	95.17	27.32	7.05	31.26	299	290	A	H
		2483.76	60.58	-13.42	74	57.4	27.36	7.07	31.25	299	290	P	H
		2483.52	47.75	-6.25	54	44.57	27.36	7.07	31.25	299	290	A	H
	*	2462	103.48	-	-	100.37	27.32	7.05	31.26	100	272	P	V
	*	2462	95.85	-	-	92.74	27.32	7.05	31.26	100	272	A	V
		2483.84	57.83	-16.17	74	54.65	27.36	7.07	31.25	100	272	P	V
		2483.6	45.11	-8.89	54	41.93	27.36	7.07	31.25	100	272	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		4824	38.31	-35.69	74	53.56	31.22	10.07	56.54	100	0	P	H
CH 01		4824	38.31	-35.69	74	53.56	31.22	10.07	56.54	100	0	P	V
2412MHz													
802.11g		4874	36.23	-37.77	74	51.28	31.31	10.11	56.47	100	0	P	H
CH 06		7311	42.67	-31.33	74	51.07	36.27	12.53	57.2	100	0	P	H
2437MHz		4874	36.19	-37.81	74	51.24	31.31	10.11	56.47	100	0	P	V
		7311	41.46	-32.54	74	49.86	36.27	12.53	57.2	100	0	P	V
802.11g		4924	36.41	-37.59	74	51.28	31.39	10.14	56.4	100	0	P	H
CH 11		7386	42.83	-31.17	74	50.92	36.51	12.73	57.33	100	0	P	H
2462MHz		4924	37.55	-36.45	74	52.42	31.39	10.14	56.4	100	0	P	V
		7386	42.72	-31.28	74	50.81	36.51	12.73	57.33	100	0	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	54.66	-19.34	74	51.8	27.15	6.98	31.27	280	297	P	H
		2389.485	43.15	-10.85	54	40.3	27.15	6.98	31.28	280	297	A	H
	*	2412	103.24	-	-	100.32	27.19	7	31.27	280	297	P	H
	*	2412	95.82	-	-	92.9	27.19	7	31.27	280	297	A	H
		2350.53	52.4	-21.6	74	49.75	27.03	6.91	31.29	103	275	P	V
		2390	42.59	-11.41	54	39.73	27.15	6.98	31.27	103	275	A	V
	*	2412	101.31	-	-	98.39	27.19	7	31.27	103	275	P	V
	*	2412	93.67	-	-	90.75	27.19	7	31.27	103	275	A	V
802.11n HT20 CH 06 2437MHz		2375.52	52.36	-21.64	74	49.57	27.11	6.96	31.28	122	227	P	H
		2381.82	42.43	-11.57	54	39.64	27.11	6.96	31.28	122	227	A	H
	*	2437	102	-	-	98.95	27.28	7.03	31.26	122	227	P	H
	*	2437	94.39	-	-	91.34	27.28	7.03	31.26	122	227	A	H
		2488.87	53.18	-20.82	74	49.94	27.4	7.09	31.25	122	227	P	H
		2488.45	44.66	-9.34	54	41.42	27.4	7.09	31.25	122	227	A	H
		2355.22	51.99	-22.01	74	49.28	27.07	6.93	31.29	282	295	P	V
		2380	42.36	-11.64	54	39.57	27.11	6.96	31.28	282	295	A	V
	*	2437	96.5	-	-	93.45	27.28	7.03	31.26	282	295	P	V
	*	2437	88.86	-	-	85.81	27.28	7.03	31.26	282	295	A	V
		2486.84	53.08	-20.92	74	49.9	27.36	7.07	31.25	282	295	P	V
		2488.45	43.45	-10.55	54	40.21	27.4	7.09	31.25	282	295	A	V



802.11n HT20 CH 11 2462MHz	*	2462	105.44	-	-	102.33	27.32	7.05	31.26	345	47	P	H
	*	2462	97.45	-	-	94.34	27.32	7.05	31.26	345	47	A	H
		2484.48	60.8	-13.2	74	57.62	27.36	7.07	31.25	345	47	P	H
		2483.64	46.77	-7.23	54	43.59	27.36	7.07	31.25	345	47	A	H
	*	2462	103.3	-	-	100.19	27.32	7.05	31.26	117	257	P	V
	*	2462	95.21	-	-	92.1	27.32	7.05	31.26	117	257	A	V
		2485.12	57	-17	74	53.82	27.36	7.07	31.25	117	257	P	V
		2483.52	45.57	-8.43	54	42.39	27.36	7.07	31.25	117	257	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	37.84	-36.16	74	53.09	31.22	10.07	56.54	100	0	P	H
		4824	38.18	-35.82	74	53.43	31.22	10.07	56.54	100	0	P	V
802.11n HT20 CH 06 2437MHz		4874	36.28	-37.72	74	51.33	31.31	10.11	56.47	100	0	P	H
		7311	42.93	-31.07	74	51.33	36.27	12.53	57.2	100	0	P	H
		4874	36.43	-37.57	74	51.48	31.31	10.11	56.47	100	0	P	V
		7311	42.66	-31.34	74	51.06	36.27	12.53	57.2	100	0	P	V
802.11n HT20 CH 11 2462MHz		4924	37.36	-36.64	74	52.23	31.39	10.14	56.4	100	0	P	H
		7386	43.71	-30.29	74	51.8	36.51	12.73	57.33	100	0	P	H
		4924	36.89	-37.11	74	51.76	31.39	10.14	56.4	100	0	P	V
		7386	43.25	-30.75	74	51.34	36.51	12.73	57.33	100	0	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		2389.8	57.33	-16.67	74	54.47	27.15	6.98	31.27	109	30	P	H
		2389.94	45.11	-8.89	54	42.25	27.15	6.98	31.27	109	30	A	H
	*	2422	102.45	-	-	99.46	27.23	7.02	31.26	109	30	P	H
	*	2422	95.04	-	-	92.05	27.23	7.02	31.26	109	30	A	H
		2483.55	54.99	-19.01	74	51.81	27.36	7.07	31.25	109	30	P	H
		2483.9	44.73	-9.27	54	41.55	27.36	7.07	31.25	109	30	A	H
		2389.66	55.47	-18.53	74	52.62	27.15	6.98	31.28	100	260	P	V
		2389.52	45.37	-8.63	54	42.52	27.15	6.98	31.28	100	260	A	V
	*	2422	101.22	-	-	98.23	27.23	7.02	31.26	100	260	P	V
	*	2422	93.77	-	-	90.78	27.23	7.02	31.26	100	260	A	V
		2485.93	54.65	-19.35	74	51.47	27.36	7.07	31.25	100	260	P	V
		2483.55	44.51	-9.49	54	41.33	27.36	7.07	31.25	100	260	A	V
802.11n HT40 CH 06 2437MHz		2389.8	54.14	-19.86	74	51.28	27.15	6.98	31.27	400	43	P	H
		2389.94	44.76	-9.24	54	41.9	27.15	6.98	31.27	400	43	A	H
	*	2437	104.55	-	-	101.5	27.28	7.03	31.26	400	43	P	H
	*	2437	97.33	-	-	94.28	27.28	7.03	31.26	400	43	A	H
		2484.04	64.41	-9.59	74	61.23	27.36	7.07	31.25	400	43	P	H
		2483.55	49.25	-4.75	54	46.07	27.36	7.07	31.25	400	43	A	H
		2389.38	53.42	-20.58	74	50.57	27.15	6.98	31.28	100	270	P	V
		2389.8	44.21	-9.79	54	41.35	27.15	6.98	31.27	100	270	A	V
	*	2437	102.55	-	-	99.5	27.28	7.03	31.26	100	270	P	V
	*	2437	95.13	-	-	92.08	27.28	7.03	31.26	100	270	A	V
		2484.6	62.34	-11.66	74	59.16	27.36	7.07	31.25	100	270	P	V
		2483.5	48.61	-5.39	54	45.43	27.36	7.07	31.25	100	270	A	V



802.11n HT40 CH 09 2452MHz		2350.6	52.92	-21.08	74	50.27	27.03	6.91	31.29	337	317	P	H
		2347.24	43.49	-10.51	54	40.84	27.03	6.91	31.29	337	317	A	H
	*	2452	102.09	-	-	99.04	27.28	7.03	31.26	337	317	P	H
	*	2452	94.68	-	-	91.63	27.28	7.03	31.26	337	317	A	H
		2484.88	60.67	-13.33	74	57.49	27.36	7.07	31.25	337	317	P	H
		2484.39	48.99	-5.01	54	45.81	27.36	7.07	31.25	337	317	A	H
		2347.8	52.65	-21.35	74	50	27.03	6.91	31.29	119	263	P	V
		2322.32	43.56	-10.44	54	40.98	26.99	6.89	31.3	119	263	A	V
	*	2452	100.44	-	-	97.39	27.28	7.03	31.26	119	263	P	V
	*	2452	92.94	-	-	89.89	27.28	7.03	31.26	119	263	A	V
		2484.32	60.83	-13.17	74	57.65	27.36	7.07	31.25	119	263	P	V
		2483.5	47.16	-6.84	54	43.98	27.36	7.07	31.25	119	263	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		4844	36.47	-37.53	74	51.66	31.25	10.08	56.52	100	0	P	H
HT40		7266	42.56	-31.44	74	51.07	36.17	12.46	57.14	100	0	P	H
CH 03		4844	36.03	-37.97	74	51.22	31.25	10.08	56.52	100	0	P	V
2422MHz		7266	42.02	-31.98	74	50.53	36.17	12.46	57.14	100	0	P	V
802.11n		4874	37.44	-36.56	74	52.49	31.31	10.11	56.47	100	0	P	H
HT40		7311	42	-32	74	50.4	36.27	12.53	57.2	100	0	P	H
CH 06		4874	37.22	-36.78	74	52.27	31.31	10.11	56.47	100	0	P	V
2437MHz		7311	41.8	-32.2	74	50.2	36.27	12.53	57.2	100	0	P	V
802.11n		4904	37.59	-36.41	74	52.52	31.36	10.13	56.42	100	0	P	H
HT40		7356	43.67	-30.33	74	51.89	36.41	12.65	57.28	100	0	P	H
CH 09		4904	37.2	-36.8	74	52.13	31.36	10.13	56.42	100	0	P	V
2452MHz		7356	42.6	-31.4	74	50.82	36.41	12.65	57.28	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 802.11n 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		94.53	34.57	-8.93	43.5	49.99	15.45	1.02	31.89	-	-	P	H
		246	38.42	-7.58	46	50.17	18.34	1.69	31.78	-	-	P	H
		281.1	42.3	-3.7	46	53.15	19.13	1.78	31.76	125	40	P	H
		302.8	32.2	-13.8	46	42.53	19.59	1.83	31.75	-	-	P	H
		319.6	31.17	-14.83	46	40.92	20.11	1.89	31.75	-	-	P	H
		337.8	36.12	-9.88	46	45.29	20.62	1.96	31.75	-	-	P	H
		33.34	36.23	-3.77	40	43.3	24.22	0.66	31.95	100	11	QP	V
		83.46	36.18	-3.82	40	53.09	14.03	0.96	31.9	-	-	P	V
		185.52	35.01	-8.49	43.5	50.05	15.35	1.43	31.82	-	-	P	V
		339.9	37.97	-8.03	46	47.08	20.68	1.96	31.75	-	-	P	V
		459.6	32.48	-13.52	46	38.81	23.11	2.38	31.82	-	-	P	V
		878.2	30.91	-15.09	46	30.46	28.63	3.44	31.62	-	-	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)

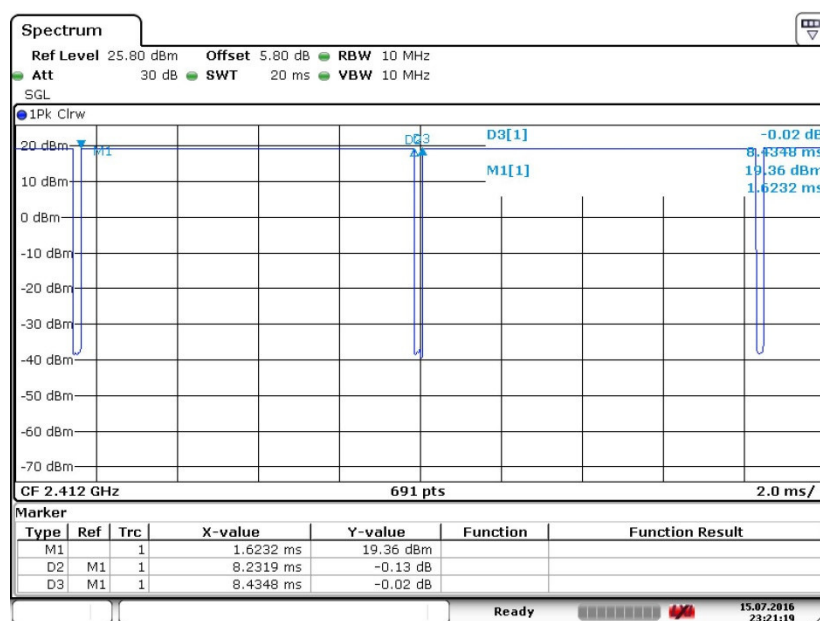
= -10.46(dB)

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

Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	97.594	8.232	0.121	300Hz
802.11g	87.442	1.362	0.734	1kHz
2.4GHz 802.11n HT20	86.700	1.275	0.784	1kHz
2.4GHz 802.11n HT40	75.862	0.638	1.356	3kHz

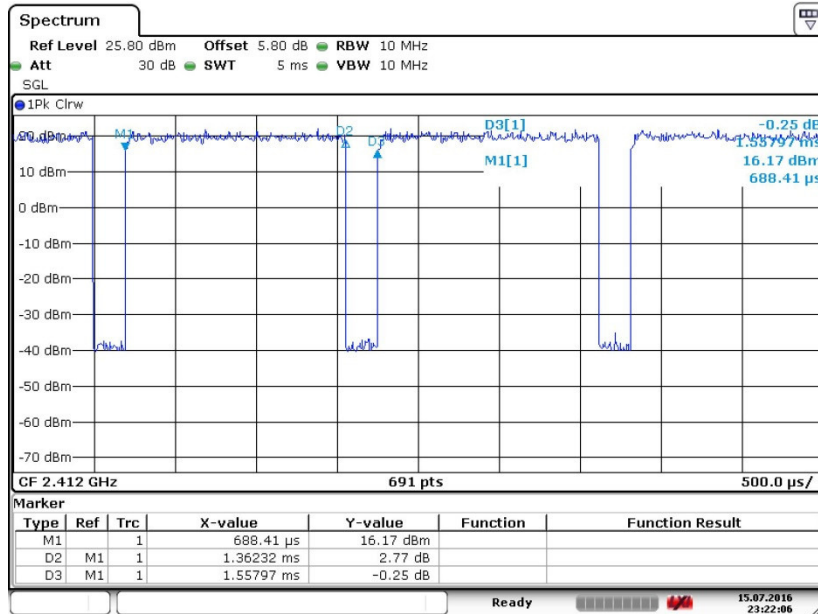
802.11b



Date: 15 JUL 2016 23:21:19

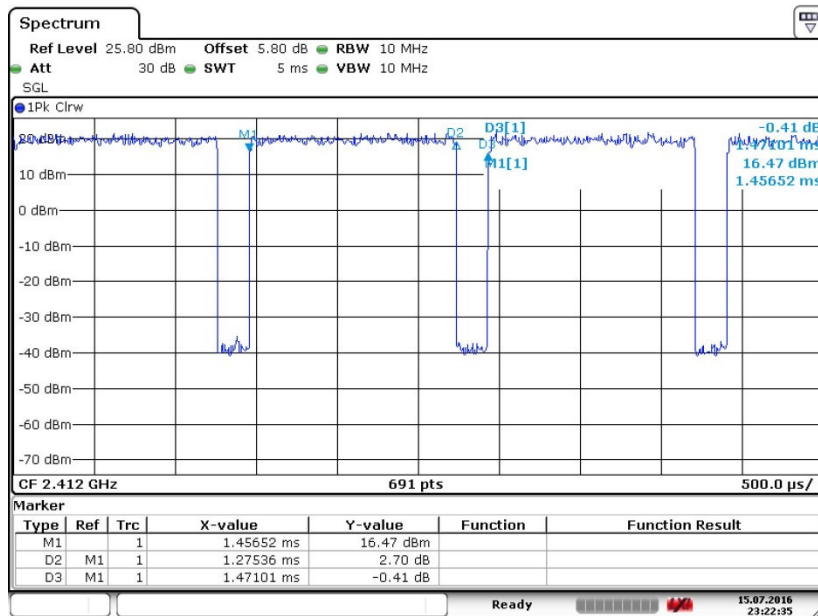


802.11g



Date: 15 JUL 2016 23:22:06

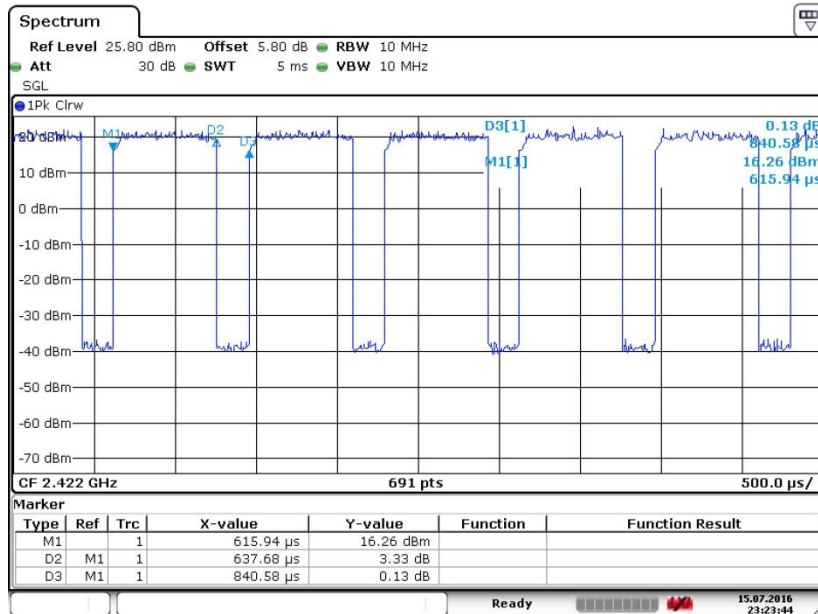
2.4GHz 802.11n HT20



Date: 15 JUL 2016 23:22:35



2.4GHz 802.11n HT40



Date: 15 JUL 2016 23:23:44