



FCC RF Test Report

APPLICANT : Lenovo(Shanghai) Electronics
Technology Co., Ltd.
EQUIPMENT : Portable Tablet Computer
BRAND NAME : Lenovo
MODEL NAME : Lenovo TB-7703X
FCC ID : O57TB7703X
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on May 20, 2016 and testing was completed on Jun. 19, 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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SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.2	15.247(b)	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	-
3.4	15.247(d)	Conducted Band Edges	$\leq 20\text{dBc}$	Pass	-
		Conducted Spurious Emission		Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 0.37 dB at 2489.240 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 12.32 dB at 0.500 MHz
3.7	15.203 & 15.247(b)	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 TB-7703X
FCC ID	O57TB7703X
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/HSPA+/LTE WLAN 2.4GHz 802.11b/g/n HT20/HT40 Bluetooth v3.0+EDR/Bluetooth v4.0 LE/
IMEI Code	Conducted: 861663030002912/861663030027919 Radiation: 861663030003522/ 861663030028529 Conduction: 861663030002813/861663030027810 for Sample 1 861663030003506/861663030028503 for Sample 2
HW Version	LenovoPad TB-7703X
SW Version	TB-7703X_160818
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 : 17.78 dBm (0.0600 W) 802.11g : 21.52 dBm (0.1419 W) 802.11n HT20 : 20.47 dBm (0.1114 W) 802.11n HT40 : 20.52 dBm (0.1127 W)
Antenna Type	802.11b/g/n : PIFA Antenna with gain 0 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Modification of EUT

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

1.6 Testing Location

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.	
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958	
Test Site No.	Sporton Site No.	
	TH01-KS	CO01-KS

Test Site	SPORTON INTERNATIONAL (SHENZHEN) INC.	
Test Site Location	No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755- 3320-2398	
Test Site No.	Sporton Site No.	FCC Registration No.
	03CH02-SZ	566869

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



1.7 Applicable Standards

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

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance 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.

1.8 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. We choose 32GB capacity sample to test.

Component	Sample 1	Sample 2
Battery	Sunwoda: L14D1P31 3.8V,3500mAh	SCUD: L14D1P31 3.8V,3500mAh
Rear Camera	O-film: L545A00	Qtech: FH545AB
Speaker	Honghua: SB9578CA	Lianchuanghongsheng: MBQD7822A121000
vibrator	AWA: LC-B318	Chaoying: CY-1027M (3.0V)
memory	Samsung: KMQX10013M-B419(32G) KMQE10013M-B318(16G)	Hynix: H9TQ26ABJTACUR(32G) H9TQ17ABJTACUR(16G)
receiver	Lianchuanghongsheng: MRFD1506A557039	Honghua:R0615A27C



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	Channel	2Mbps	5.5Mbps	11Mbps
		1Mbps				
CH 01	2412	16.91	CH 06	17.73	17.77	17.67
CH 06	2437	17.78				
CH 11	2462	17.32				

2.4GHz 802.11g RF Output Power (dBm)										
Power vs. Channel			Power vs. Data Rate							
Channel	Frequency (MHz)	Data Rate	Channel	9Mbps	12Mbps	18Mbps	24Mbps	36Mbps	48Mbps	54Mbps
		6Mbps								
CH 01	2412	20.91	CH 06	21.30	21.25	21.31	21.26	21.33	21.27	21.36
CH 06	2437	21.52								
CH 11	2462	21.28								

2.4GHz 802.11n HT20 RF Output Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	Data Index	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0								
CH 01	2412	19.94	CH 06	20.32	20.41	20.36	20.22	20.23	20.19	20.33
CH 06	2437	20.47								
CH 11	2462	20.17								

2.4GHz 802.11n HT40 RF Output Power (dBm)										
Power vs. Channel			Power vs. MCS Index							
Channel	Frequency (MHz)	Data Index	Channel	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
		MCS0								
CH 03	2422 MHz	19.94	CH 06	20.38	20.21	20.29	20.14	20.34	20.29	20.32
CH 06	2437 MHz	20.52								
CH 09	2452 MHz	20.47								



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.

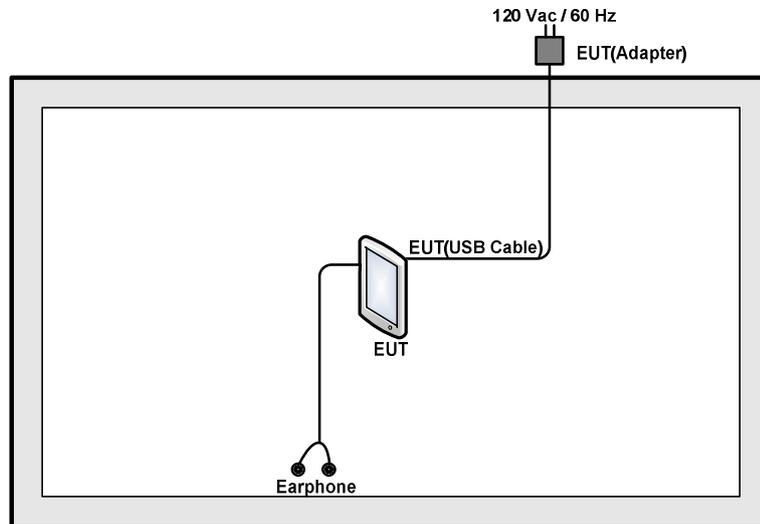
<2.4GHz>

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

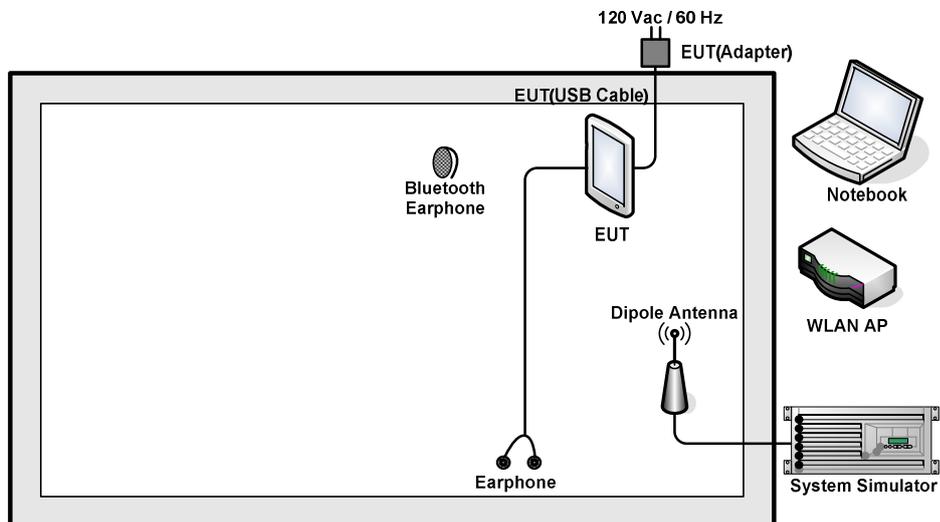
Test Cases	
AC Conducted Emission	<p>Mode 1 : GSM850 Idle + Bluetooth Link + WLAN Link(2.4G) + Earphone + Battery 1 + USB Cable (Charging from Adapter 1) for Sample 1</p> <p>Mode 2 : GSM850 Idle + Bluetooth Link + WLAN Link(2.4G) + Earphone + Battery 2 + USB Cable (Charging from Adapter 2) for Sample 2</p>
<p>Remark:</p> <ol style="list-style-type: none"> For Radiated Test Cases, The tests were performed with Adapter 1, Battery 1, Earphone, Sample 1 and USB Cable. The worst case of conducted emission is mode 1; only the test data of it was reported. 	

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, 1.8m
2.	WLAN AP	LINKSYS	WRT600N	Q87-WRT600NV11	N/A	Unshielded, 1.8m
3.	Notebook	Lenovo	G480	N/A	N/A	AC I/P: Unshielded, 1.8m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Lenovo	LBH505	N/A	N/A	N/A
5.	Earphone	Lenovo	LH102	N/A	Unshielded,1.2m	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.

Offset = RF cable loss.

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

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

3 Test Result

3.1 6dB Bandwidth Measurement

3.1.1 Limit of 6dB Bandwidth

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

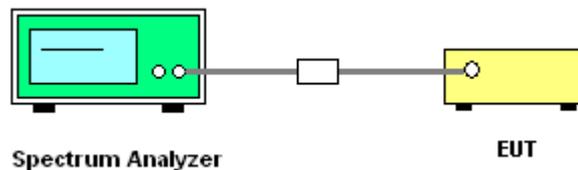
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance 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. Measure and record the results in the test report.

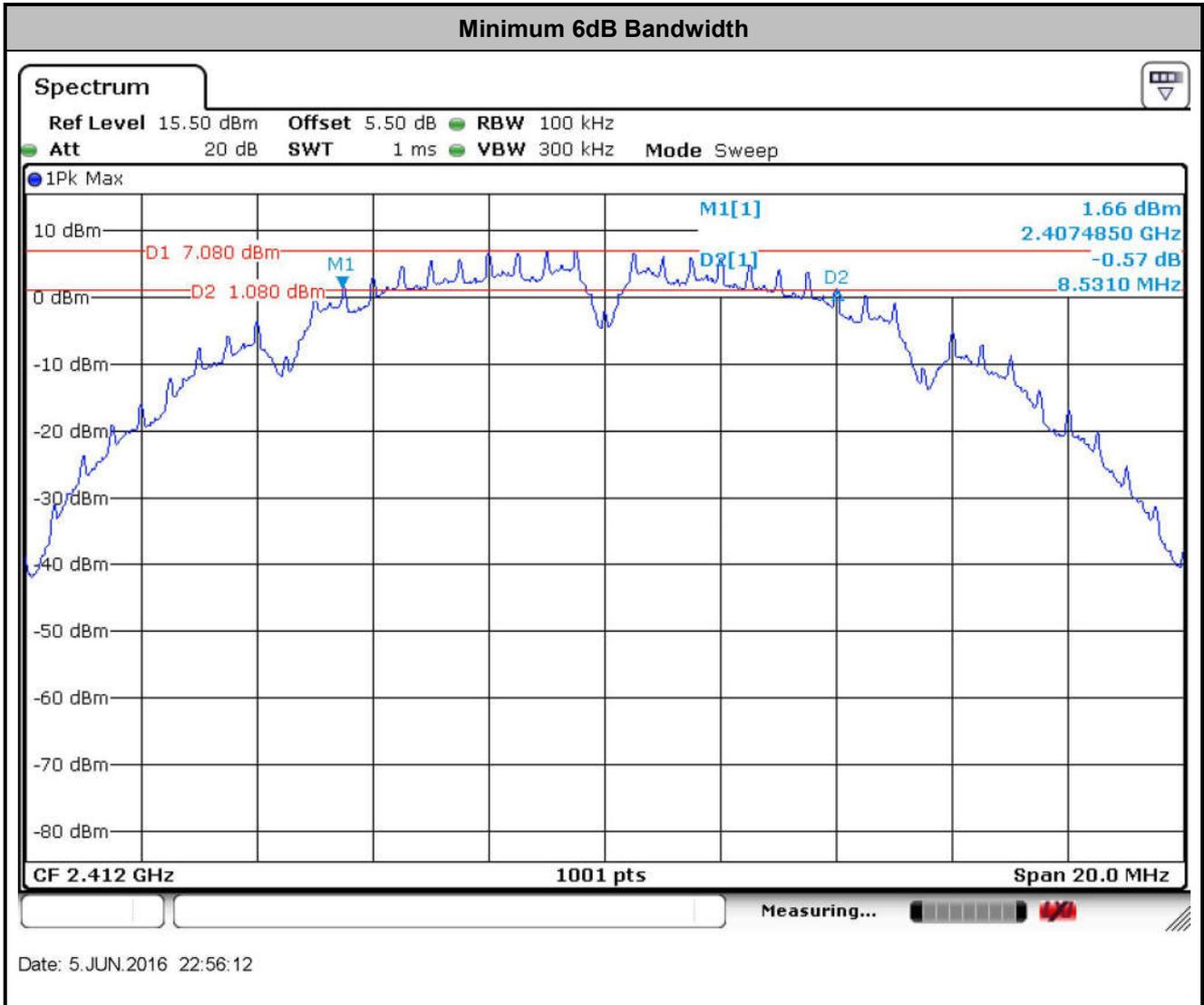
3.1.4 Test Setup





3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A of this test report.



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.

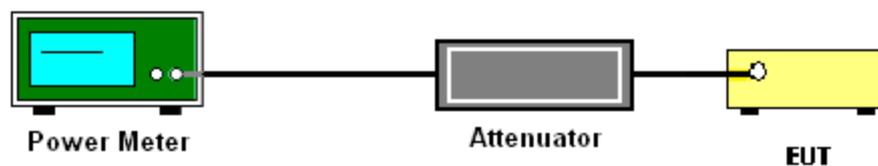
3.2.2 Measuring Instruments

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.

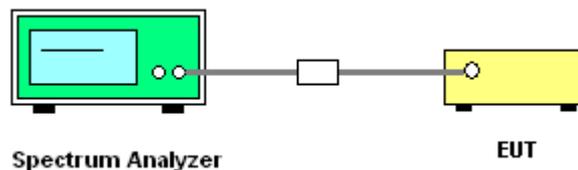
3.3.2 Measuring Instruments

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.

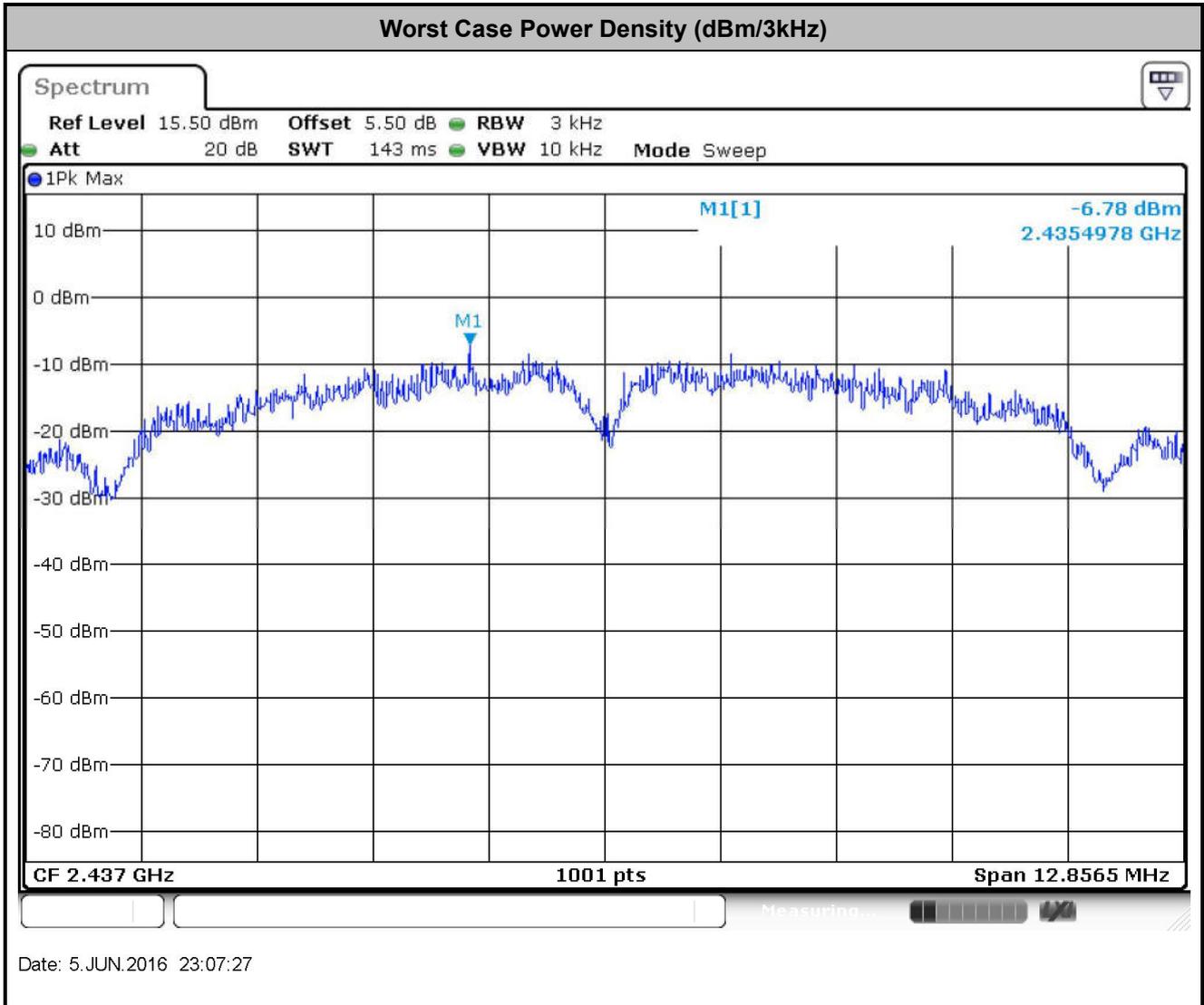
3.3.4 Test Setup





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).

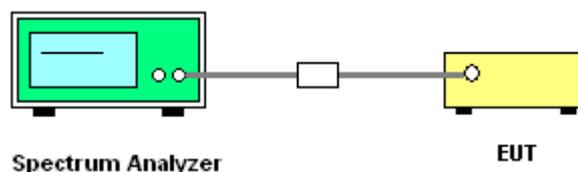
3.4.2 Measuring Instruments

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



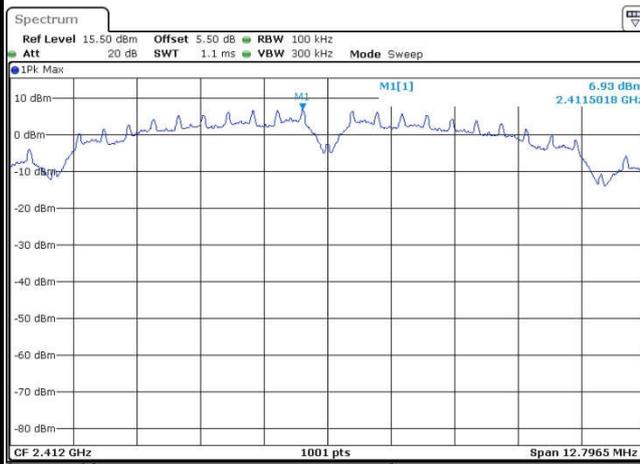


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

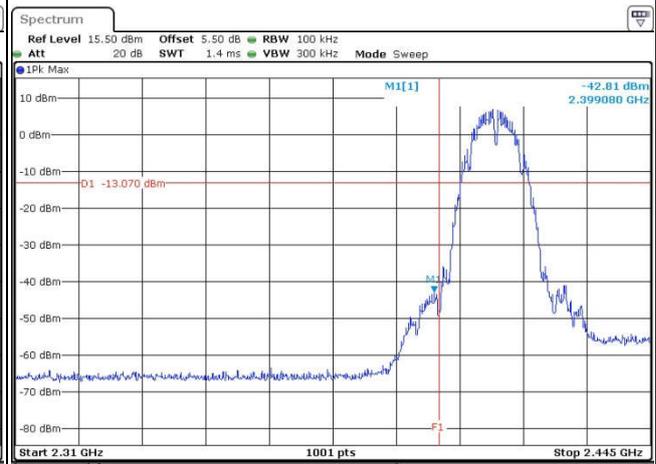
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Test Band :	2.4GHz Low	Relative Humidity :	54~55%
Test Channel :	01	Test Engineer :	Ivan Zhang

WLAN 802.11b Channel 01

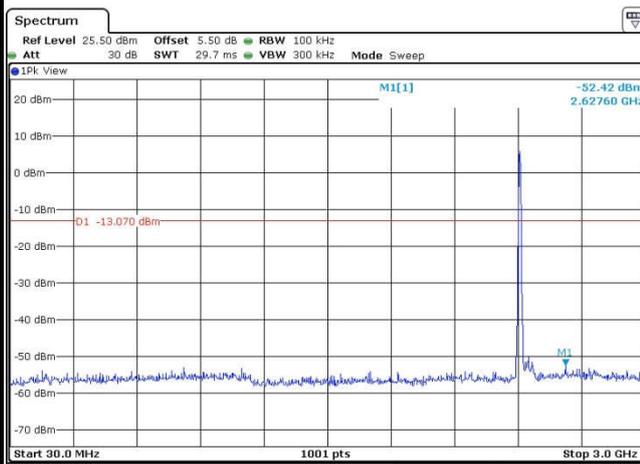
100kHz PSD reference Level



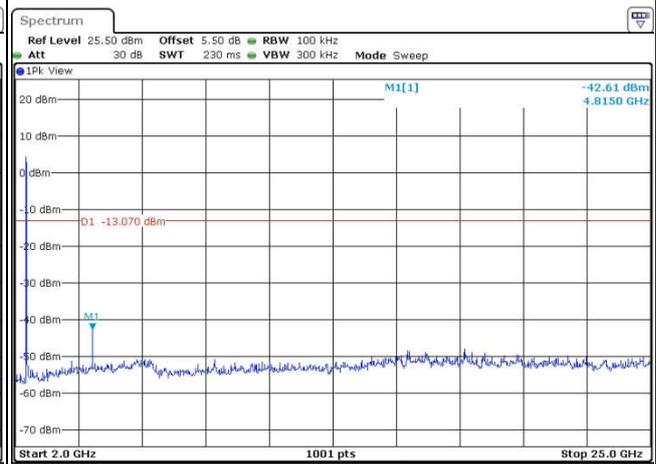
Low Channel Plot



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

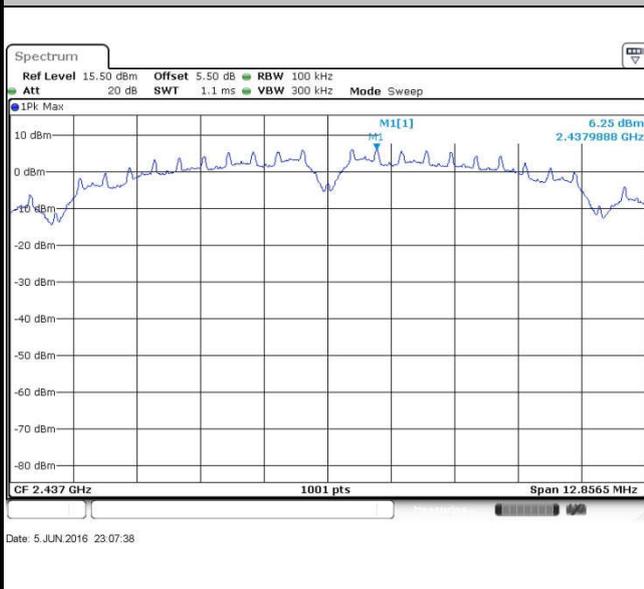




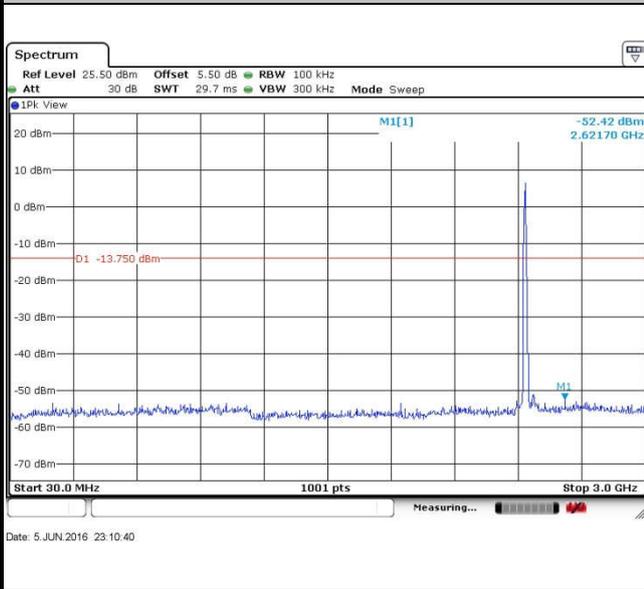
Test Mode :	802.11b	Temperature :	24~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	54~55%
Test Channel :	06	Test Engineer :	Ivan Zhang

WLAN 802.11b Channel 06

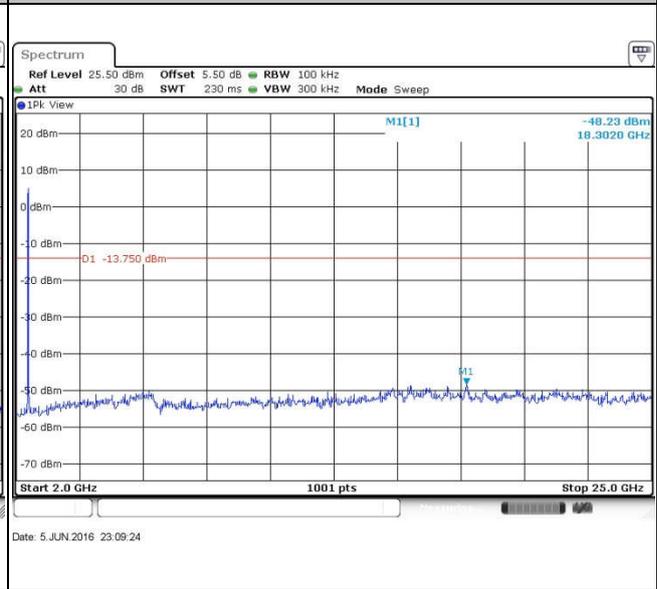
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

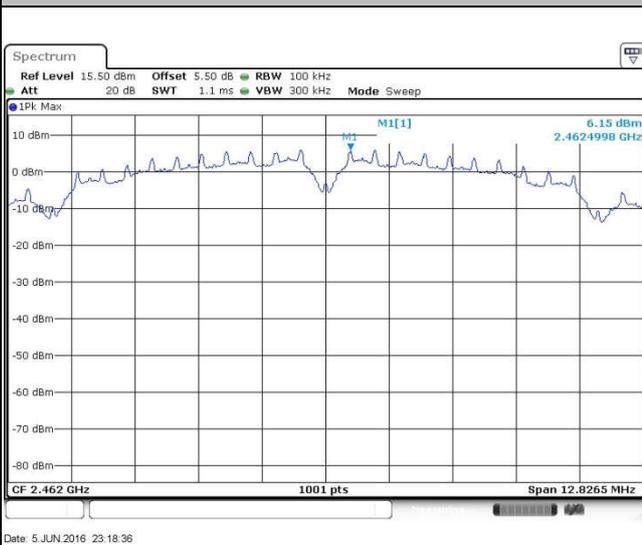




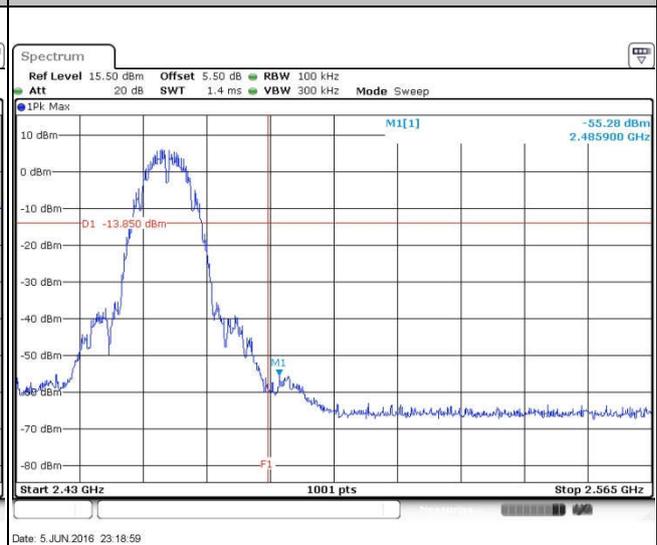
Test Mode :	802.11b	Temperature :	24~25°C
Test Band :	2.4GHz High	Relative Humidity :	54~55%
Test Channel :	11	Test Engineer :	Ivan Zhang

WLAN 802.11b Channel 11

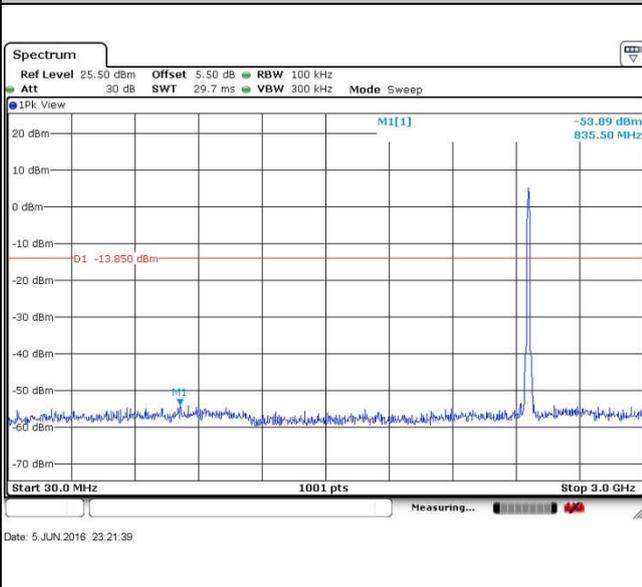
100kHz PSD reference Level



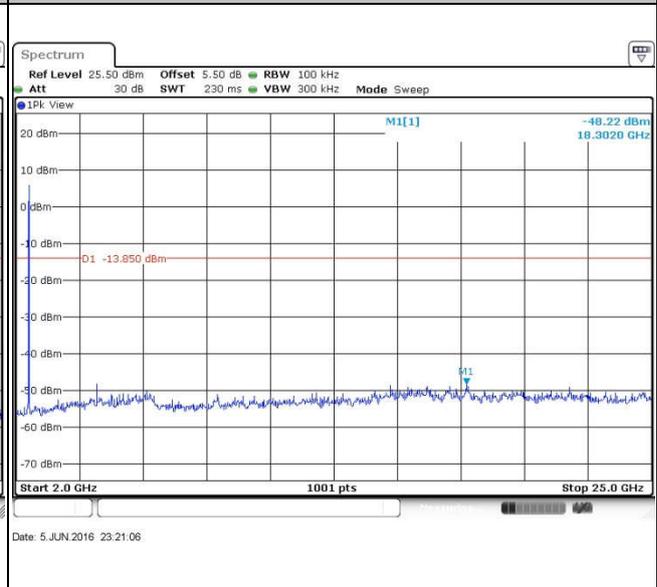
High Channel Plot



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

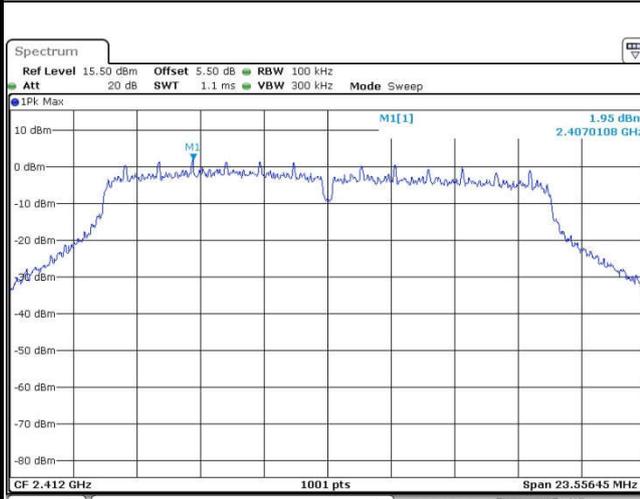




Test Mode :	802.11g	Temperature :	24~25°C
Test Band :	2.4GHz Low	Relative Humidity :	54~55%
Test Channel :	01	Test Engineer :	Ivan Zhang

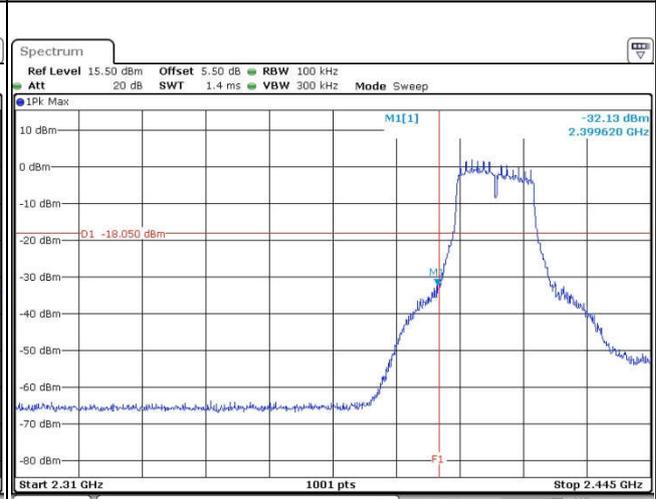
WLAN 802.11g Channel 01

100kHz PSD reference Level



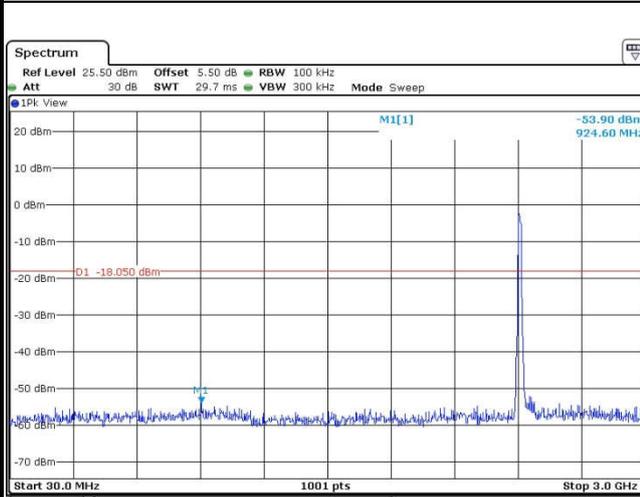
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Low Channel Plot



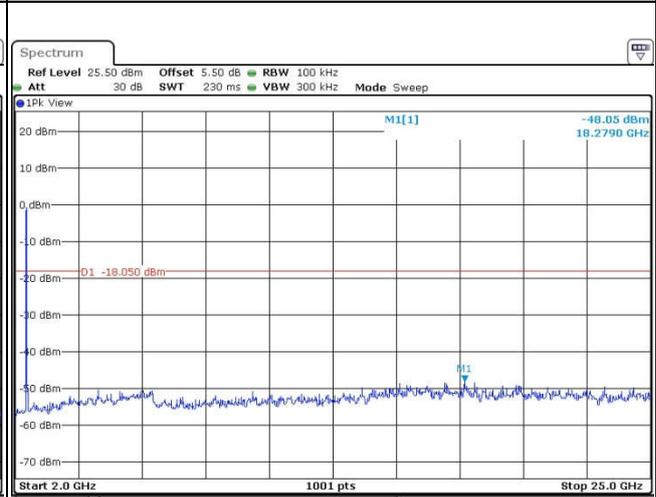
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Spurious Emission 30MHz~3GHz



Date: 16 JUN 2016 02:29:12

Spurious Emission 2GHz~25GHz



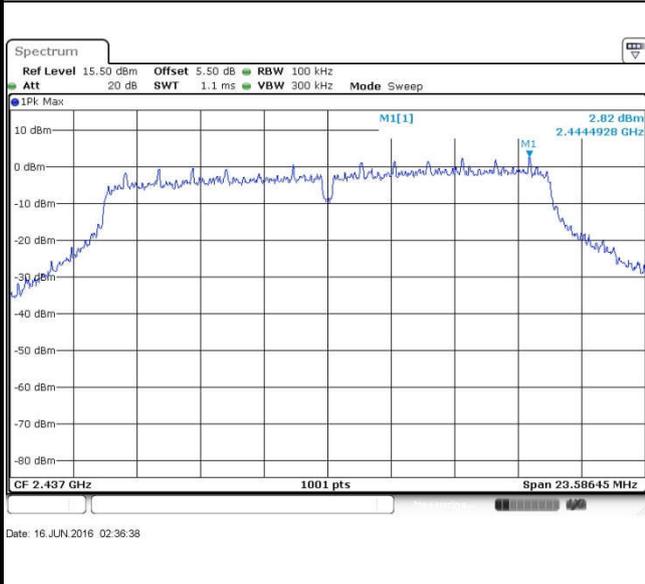
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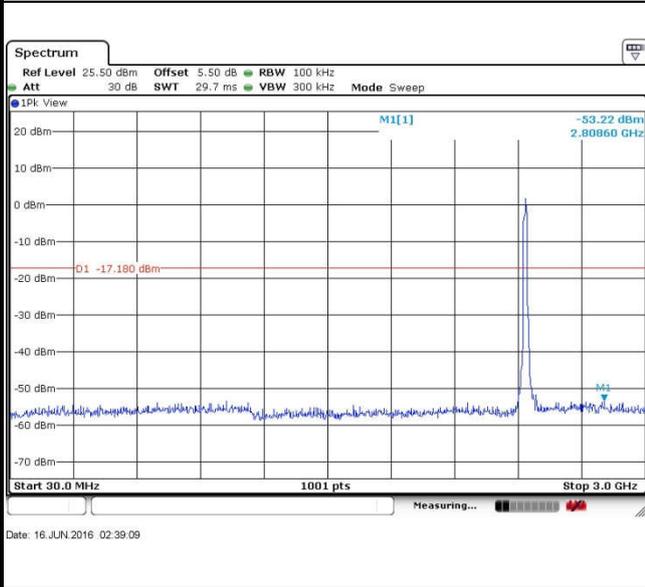
Test Mode :	802.11g	Temperature :	24~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	54~55%
Test Channel :	06	Test Engineer :	Ivan Zhang

WLAN 802.11g Channel 06

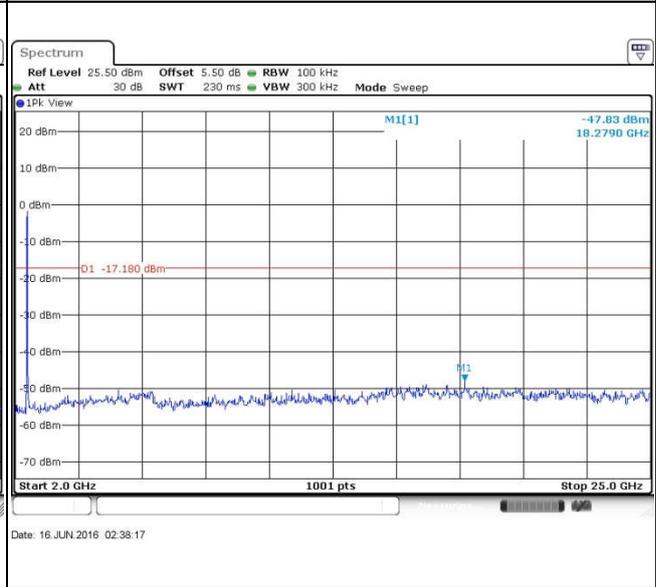
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

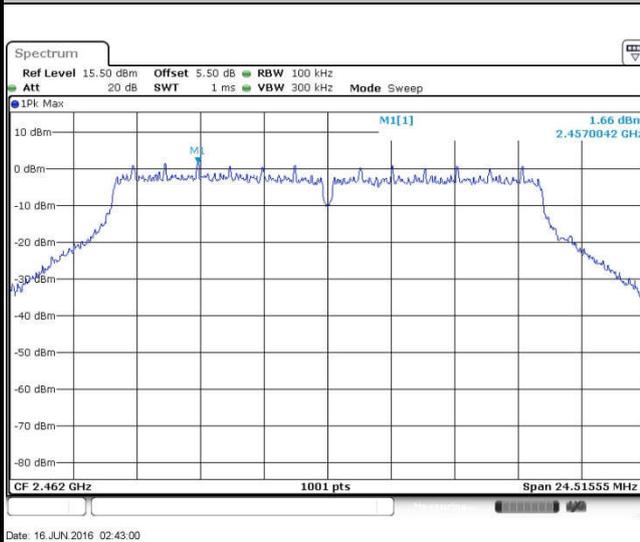




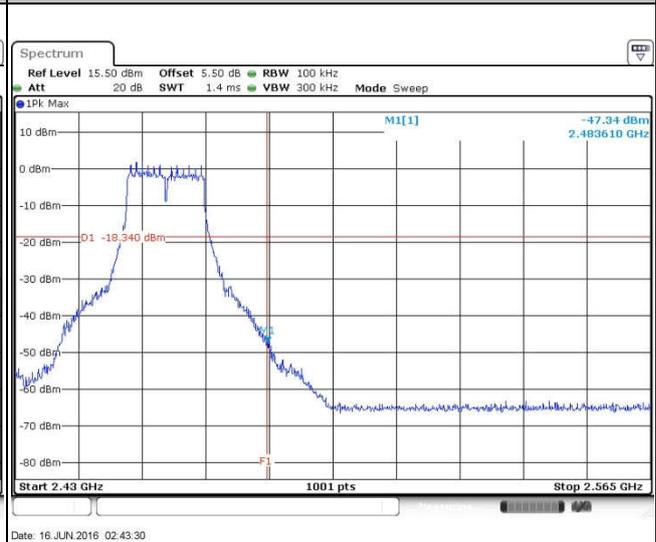
Test Mode :	802.11g	Temperature :	24~25°C
Test Band :	2.4GHz High	Relative Humidity :	54~55%
Test Channel :	11	Test Engineer :	Ivan Zhang

WLAN 802.11g Channel 11

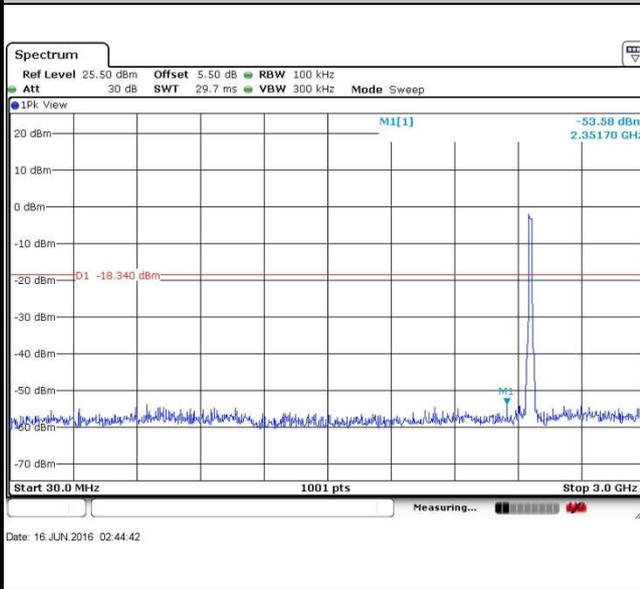
100kHz PSD reference Level



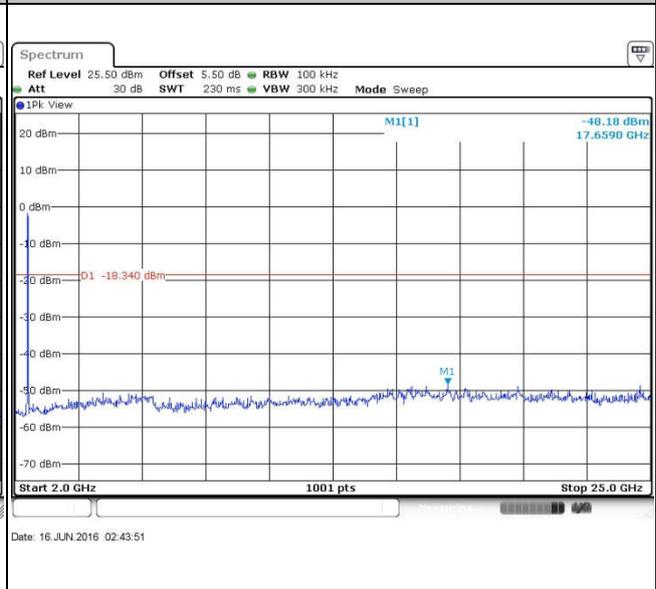
High Channel Plot



Spurious Emission 30MHz~3GHz

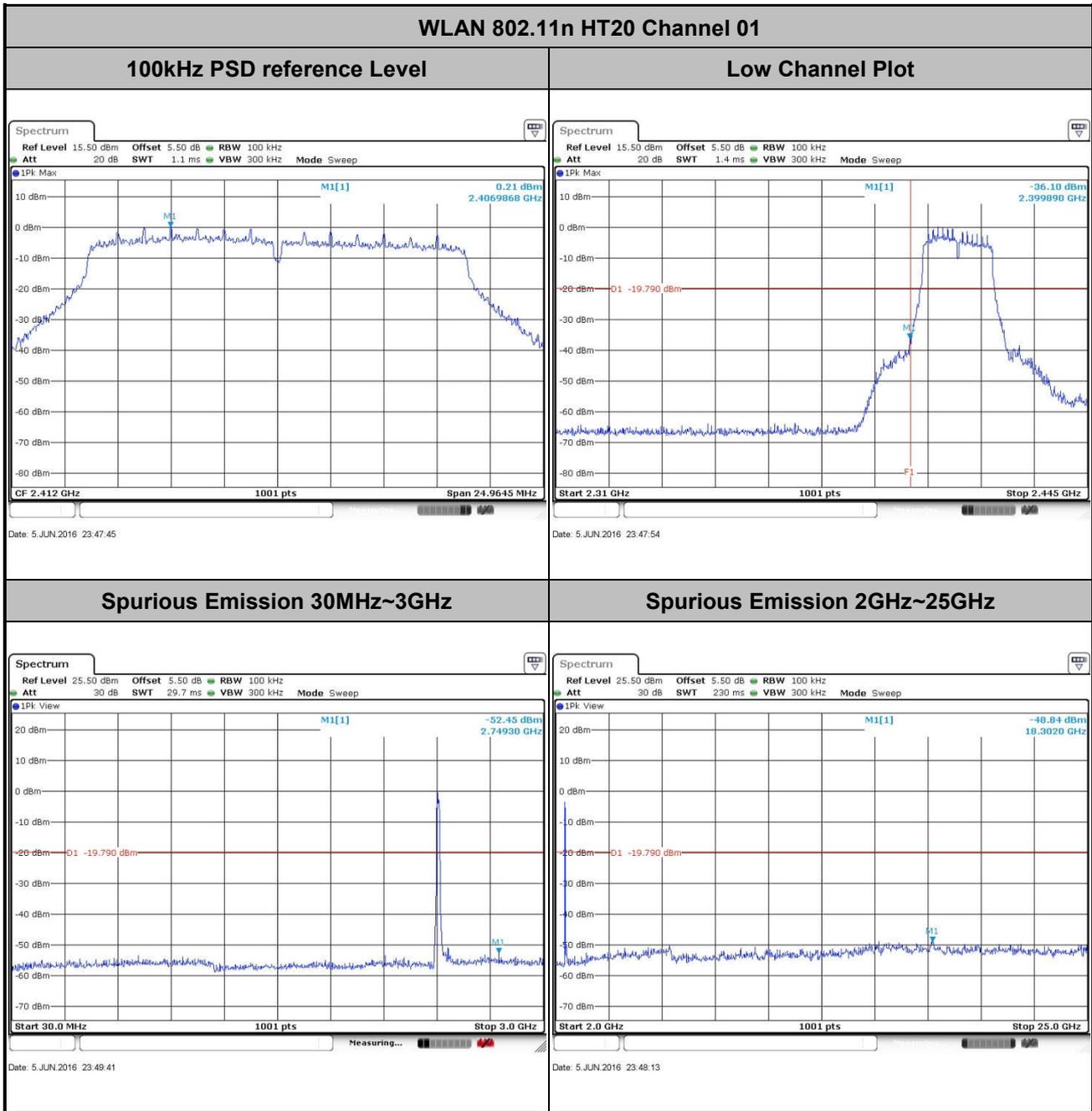


Spurious Emission 2GHz~25GHz





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

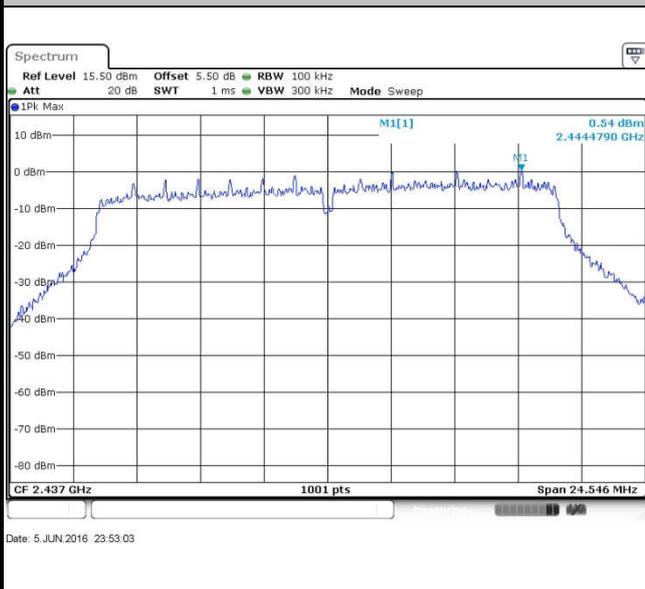




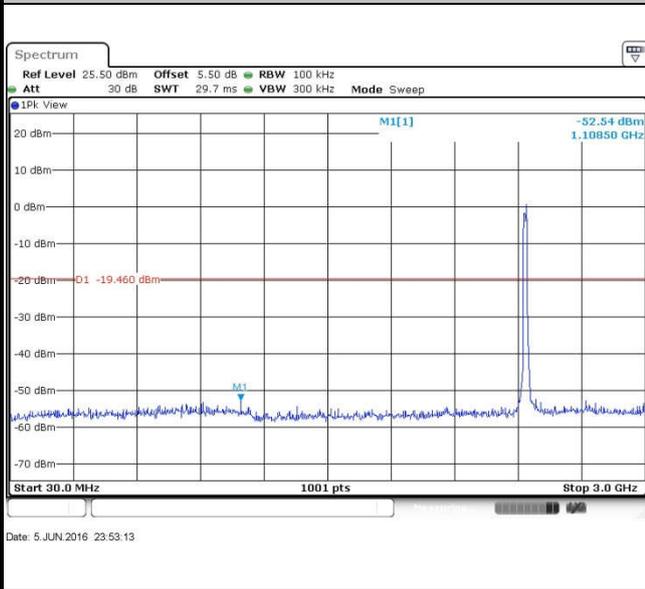
Test Mode :	802.11n HT20	Temperature :	24~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	54~55%
Test Channel :	06	Test Engineer :	Ivan Zhang

WLAN 802.11n HT20 Channel 06

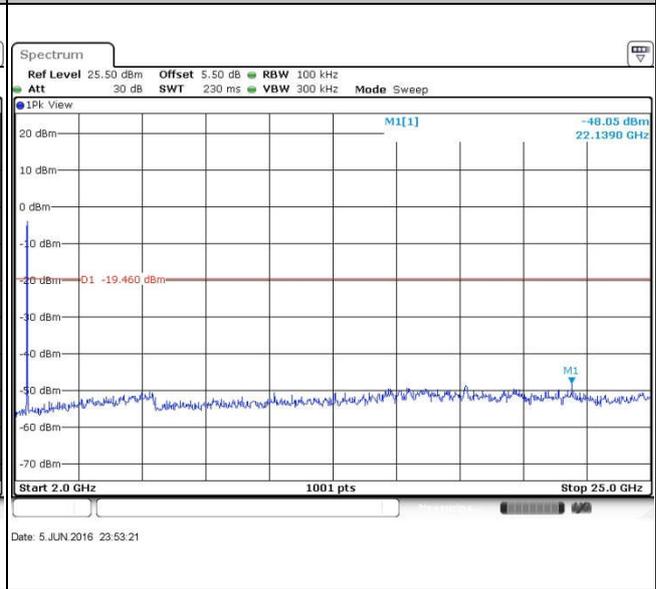
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz

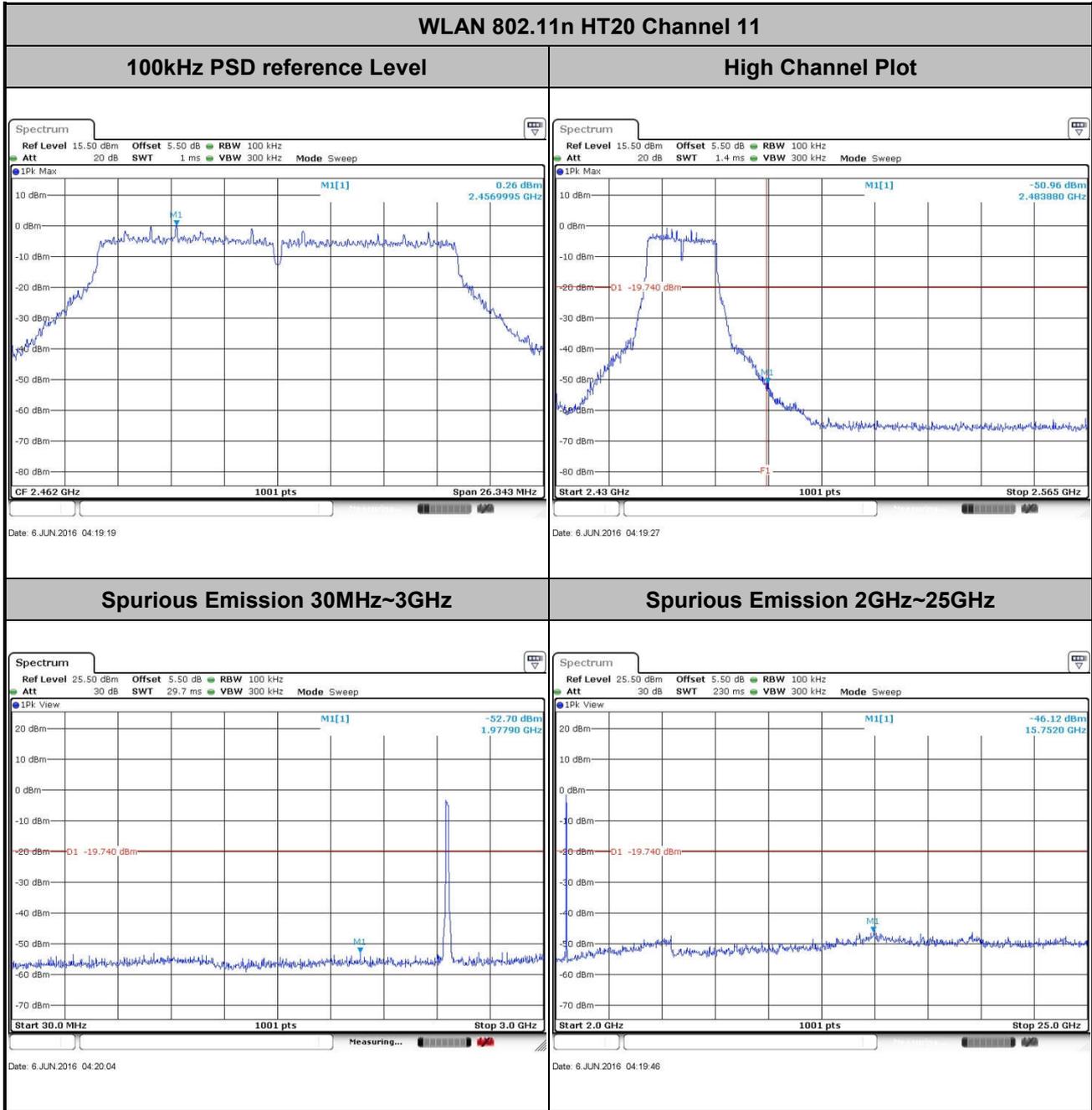


Spurious Emission 2GHz~25GHz



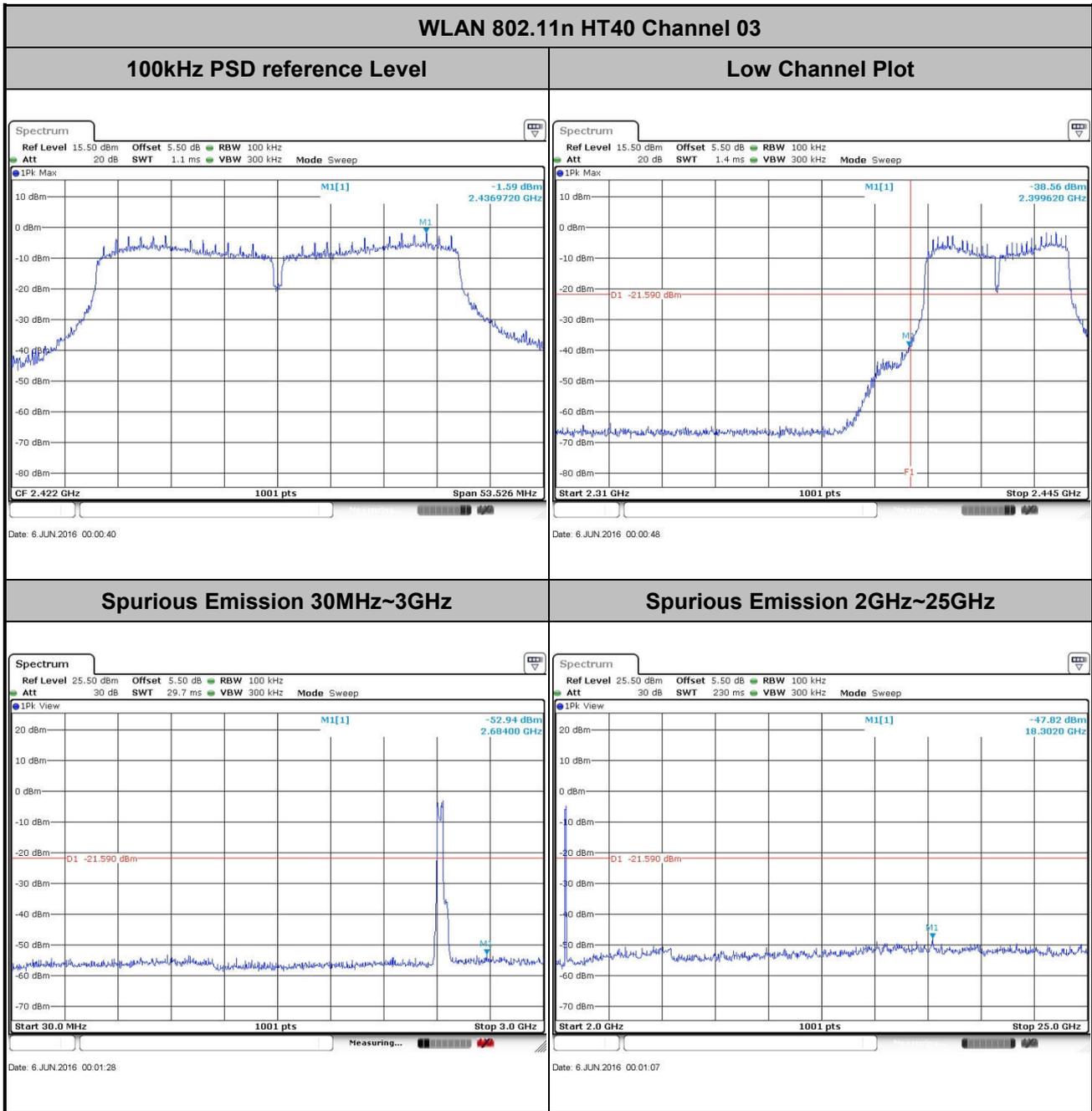


Test Mode :	802.11n HT20	Temperature :	24~25°C
Test Band :	2.4GHz High	Relative Humidity :	54~55%
Test Channel :	11	Test Engineer :	Ivan Zhang





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

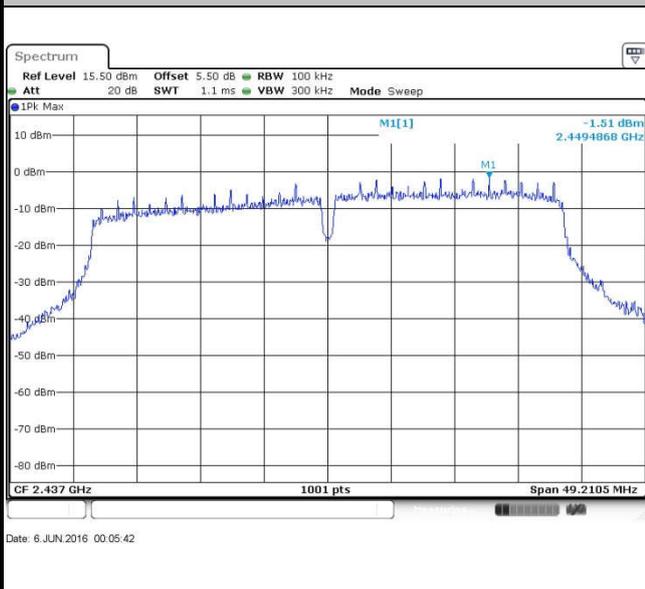




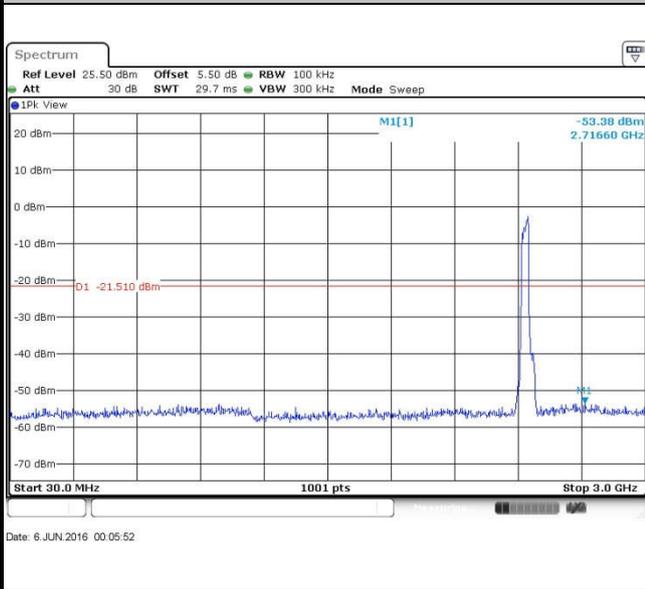
Test Mode :	802.11n HT40	Temperature :	24~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	54~55%
Test Channel :	06	Test Engineer :	Ivan Zhang

WLAN 802.11n HT40 Channel 06

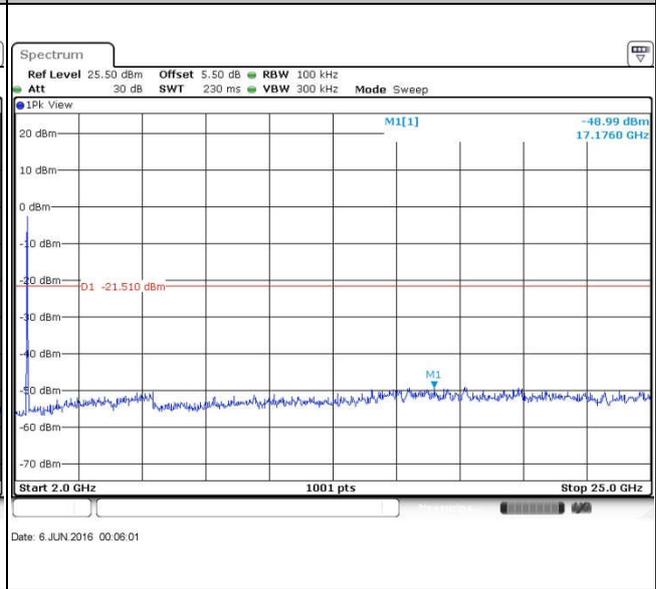
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz

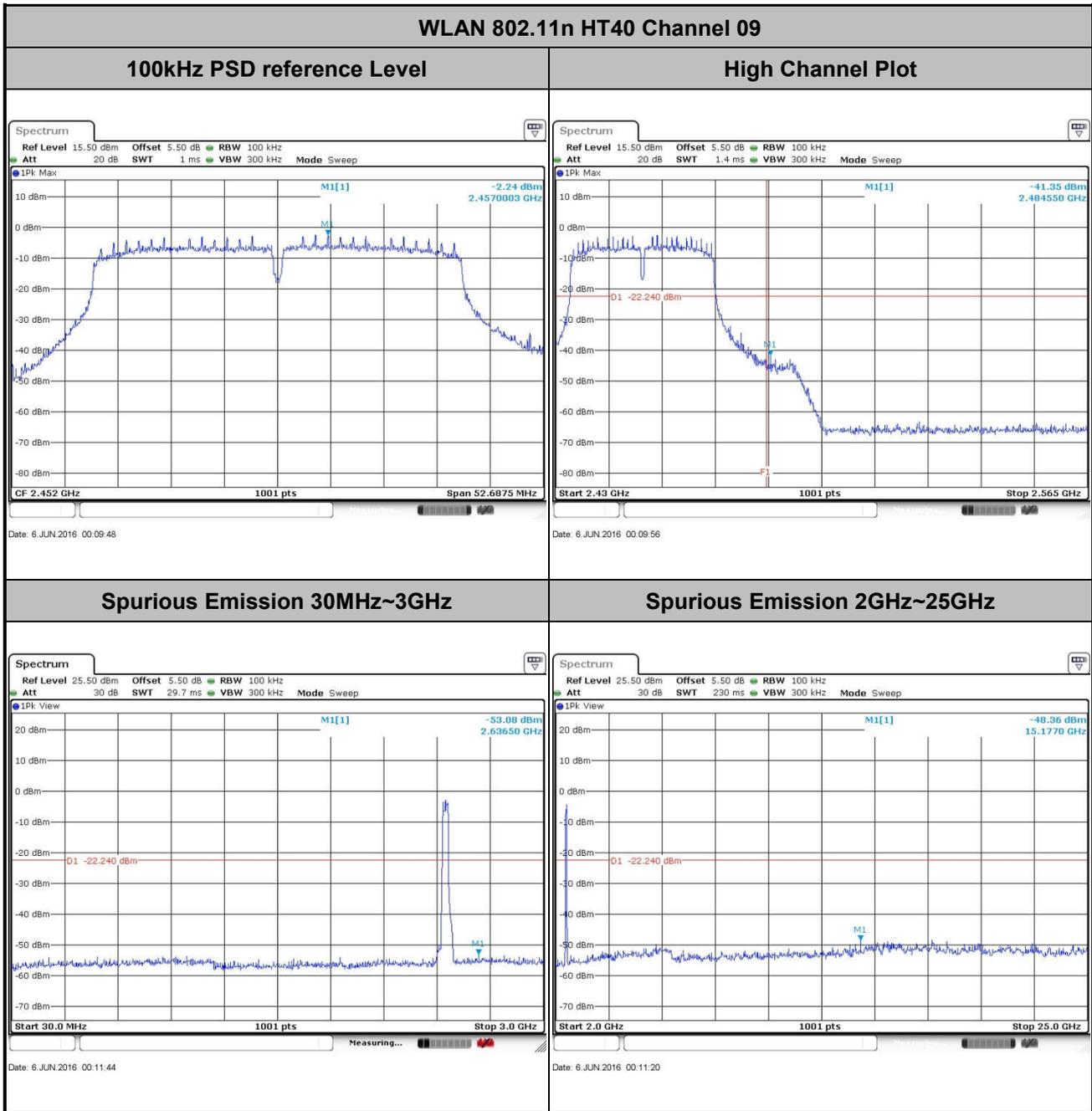


Spurious Emission 2GHz~25GHz





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.

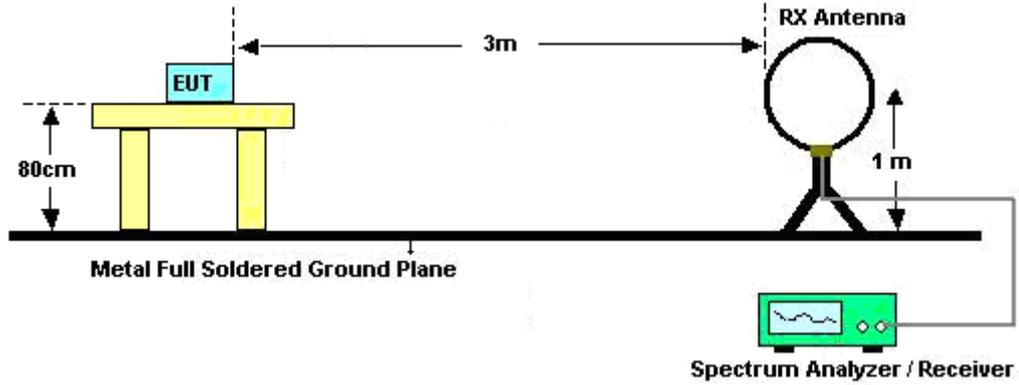


3.5.3 Test Procedures

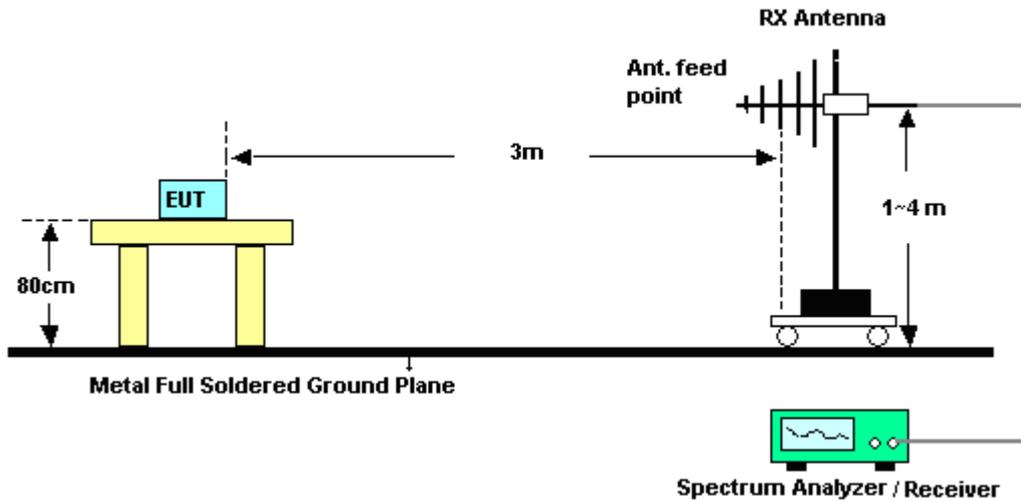
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the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

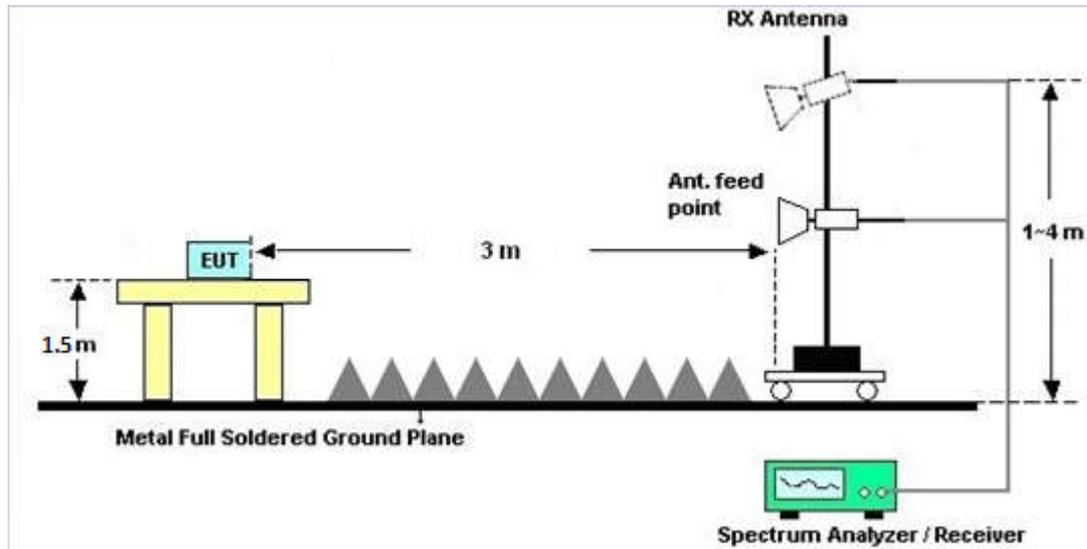
For radiated emissions below 30MHz



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.

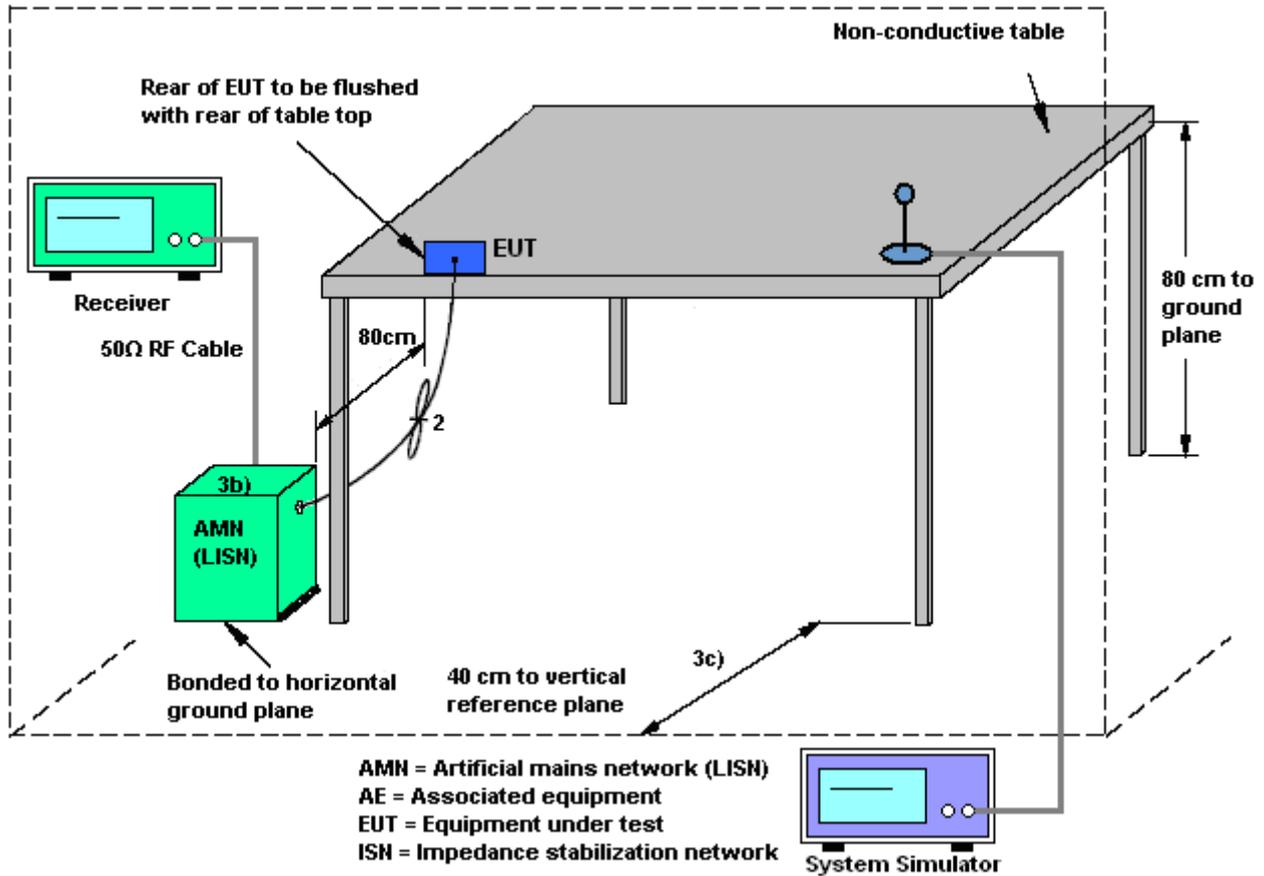
3.6.2 Measuring Instruments

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.

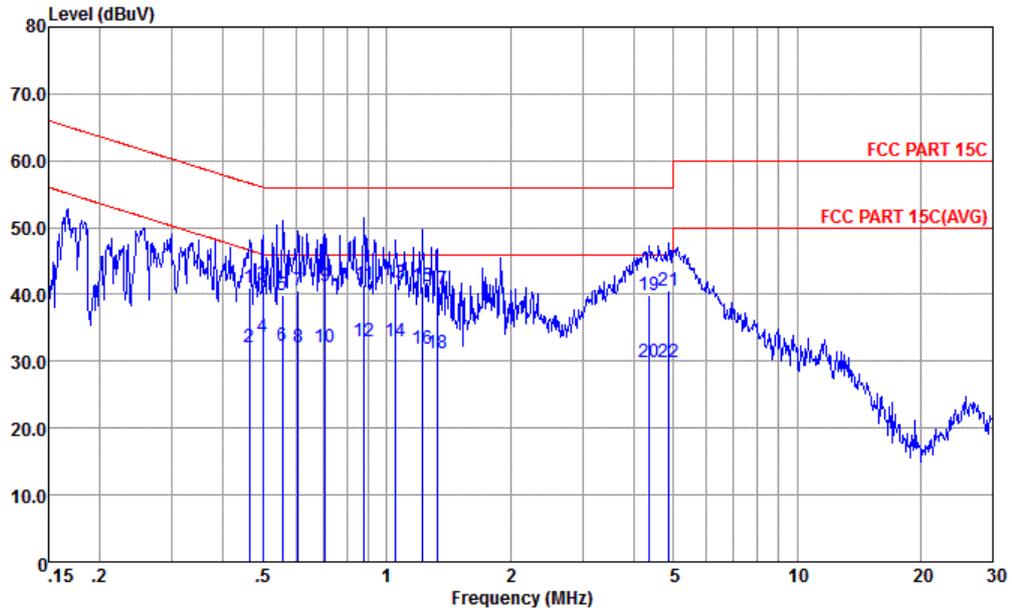
3.6.4 Test Setup





3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	22~24°C
Test Engineer :	Amos Zhang	Relative Humidity :	43~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link(2.4G) + Earphone + Battery 1 + USB Cable (Charging from Adapter 1) for Sample 1		



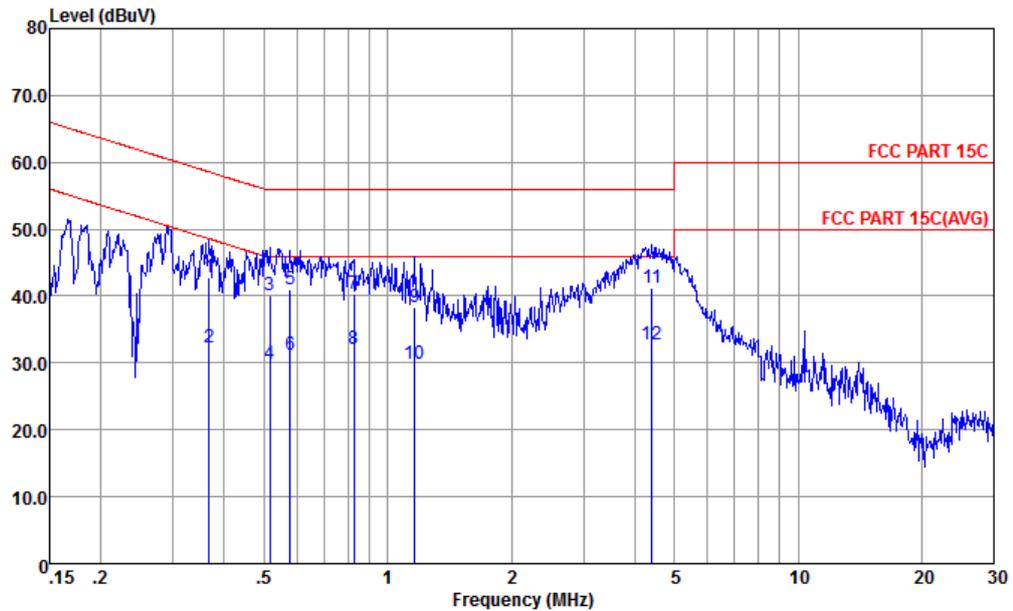
Condition : FCC PART 15C LISN-L-20151024 LINE

mode : Mode 1
: 861663030002813/861663030027810 #5

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.46	40.99	-15.64	56.63	30.60	0.23	10.16	QP
2	0.46	31.99	-14.64	46.63	21.60	0.23	10.16	Average
3	0.50	41.49	-14.52	56.01	31.10	0.23	10.16	QP
4 *	0.50	33.69	-12.32	46.01	23.30	0.23	10.16	Average
5	0.56	39.99	-16.01	56.00	29.60	0.23	10.16	QP
6	0.56	32.29	-13.71	46.00	21.90	0.23	10.16	Average
7	0.61	40.59	-15.41	56.00	30.19	0.24	10.16	QP
8	0.61	31.99	-14.01	46.00	21.59	0.24	10.16	Average
9	0.71	41.29	-14.71	56.00	30.90	0.24	10.15	QP
10	0.71	31.99	-14.01	46.00	21.60	0.24	10.15	Average
11	0.88	41.49	-14.51	56.00	31.10	0.25	10.14	QP
12	0.88	32.99	-13.01	46.00	22.60	0.25	10.14	Average
13	1.05	41.68	-14.32	56.00	31.29	0.25	10.14	QP
14	1.05	32.98	-13.02	46.00	22.59	0.25	10.14	Average
15	1.22	41.17	-14.83	56.00	30.80	0.23	10.14	QP
16	1.22	31.97	-14.03	46.00	21.60	0.23	10.14	Average
17	1.32	40.86	-15.14	56.00	30.50	0.22	10.14	QP
18	1.32	31.26	-14.74	46.00	20.90	0.22	10.14	Average
19	4.36	39.96	-16.04	56.00	29.60	0.19	10.17	QP
20	4.36	29.96	-16.04	46.00	19.60	0.19	10.17	Average
21	4.87	40.57	-15.43	56.00	30.20	0.19	10.18	QP
22	4.87	29.97	-16.03	46.00	19.60	0.19	10.18	Average



Test Mode :	Mode 1	Temperature :	22~24°C
Test Engineer :	Amos Zhang	Relative Humidity :	43~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link(2.4G) + Earphone + Battery 1 + USB Cable (Charging from Adapter 1) for Sample 1		



Condition : FCC PART 15C LISN-N-20151024 NEUTRAL

mode : Mode 1
: 861663030002813/861663030027810 #5

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.37	42.78	-15.78	58.56	32.30	0.32	10.16	QP
2	0.37	32.38	-16.18	48.56	21.90	0.32	10.16	Average
3	0.52	40.09	-15.91	56.00	29.61	0.32	10.16	QP
4	0.52	29.79	-16.21	46.00	19.31	0.32	10.16	Average
5	0.58	41.09	-14.91	56.00	30.60	0.33	10.16	QP
6	0.58	31.09	-14.91	46.00	20.60	0.33	10.16	Average
7	0.83	40.40	-15.60	56.00	29.91	0.35	10.14	QP
8	0.83	32.10	-13.90	46.00	21.61	0.35	10.14	Average
9	1.17	38.41	-17.59	56.00	27.90	0.37	10.14	QP
10	1.17	29.81	-16.19	46.00	19.30	0.37	10.14	Average
11	4.41	41.14	-14.86	56.00	30.61	0.36	10.17	QP
12 *	4.41	32.74	-13.26	46.00	22.21	0.36	10.17	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	Jun. 02, 2016~ Jun. 19, 2016	Sep. 09, 2016	Conducted (TH01-KS)
Pulse Power Sensor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 20, 2016	Jun. 02, 2016~ Jun. 19, 2016	Jan. 19, 2017	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 20, 2016	Jun. 02, 2016~ Jun. 19, 2016	Jan. 19, 2017	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz; Max 30dBm	Oct. 20, 2015	Jun. 02, 2016~ Jun. 19, 2016	Oct. 19, 2016	Radiation (03CH02-SZ)
Spectrum Analyzer	R&S	FSV40	101041	10kHz~40GHz; Max 30dBm	Oct. 20, 2015	Jun. 02, 2016~ Jun. 19, 2016	Oct. 19, 2016	Radiation (03CH02-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 07, 2016	Jun. 02, 2016~ Jun. 19, 2016	May 06, 2017	Radiation (03CH02-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz~2GHz	May 21, 2016	Jun. 02, 2016~ Jun. 19, 2016	May 20, 2017	Radiation (03CH02-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-128 5	1GHz~18GHz	Jan. 11, 2016	Jun. 02, 2016~ Jun. 19, 2016	Jan. 10, 2017	Radiation (03CH02-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18GHz~40GHz	Aug. 17, 2015	Jun. 02, 2016~ Jun. 19, 2016	Aug. 16, 2016	Radiation (03CH02-SZ)
Amplifier	HP	8447F	3113A046 22	9kHz~1300MHz / 30 dB	Aug. 07, 2015	Jun. 02, 2016~ Jun. 19, 2016	Aug. 06, 2016	Radiation (03CH02-SZ)
Amplifier	Agilent	8449B	3008A010 23	1GHz~26.5GHz	Oct. 20, 2015	Jun. 02, 2016~ Jun. 19, 2016	Oct. 19, 2016	Radiation (03CH02-SZ)
AC Power Source	Chroma	61601	616010002 470	N/A	NCR	Jun. 02, 2016~ Jun. 19, 2016	NCR	Radiation (03CH02-SZ)
Turn Table	Chaintek	T-200	N/A	0~360 degree	NCR	Jun. 02, 2016~ Jun. 19, 2016	NCR	Radiation (03CH02-SZ)
Antenna Mast	Chaintek	MBS-400	N/A	1 m~4 m	NCR	Jun. 02, 2016~ Jun. 19, 2016	NCR	Radiation (03CH02-SZ)
EMI Test Receiver	R&S	ESR7	101403	9kHz~7GHz; Max 30dBm	Sep. 10, 2015	Jun. 06, 2016	Sep. 09, 2016	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 24, 2015	Jun. 06, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 24, 2015	Jun. 06, 2016	Oct. 23, 2016	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000 0811	AC 0V~300V, 45Hz~1000Hz	Oct. 24, 2015	Jun. 06, 2016	Oct. 23, 2016	Conduction (CO01-KS)

NCR: No Calibration Required



5 Uncertainty of Evaluation

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0dB
---	-------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.9dB
---	-------

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

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



Appendix A. Conducted Test Results

A1 - DTS Part

Test Engineer:	Ivan Zhang	Temperature:	24~25	°C
Test Date:	2016/6/2~2016/6/19	Relative Humidity:	54~55	%

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band								
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	13.29	8.53	0.50	Pass
11b	1Mbps	1	6	2437	13.34	8.57	0.50	Pass
11b	1Mbps	1	11	2462	13.64	8.55	0.50	Pass
11g	6Mbps	1	1	2412	18.13	15.70	0.50	Pass
11g	6Mbps	1	6	2437	18.43	15.72	0.50	Pass
11g	6Mbps	1	11	2462	18.78	16.34	0.50	Pass
HT20	MCS0	1	1	2412	18.78	16.64	0.50	Pass
HT20	MCS0	1	6	2437	18.88	16.36	0.50	Pass
HT20	MCS0	1	11	2462	19.28	17.56	0.50	Pass
HT40	MCS0	1	3	2422	36.86	35.68	0.50	Pass
HT40	MCS0	1	6	2437	36.26	32.81	0.50	Pass
HT40	MCS0	1	9	2452	36.26	35.13	0.50	Pass

TEST RESULTS DATA
Peak Power Table

2.4GHz Band										
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
11b	1Mbps	1	1	2412	16.91	30.00	0.00	16.91	36.00	Pass
11b	1Mbps	1	6	2437	17.78	30.00	0.00	17.78	36.00	Pass
11b	1Mbps	1	11	2462	17.32	30.00	0.00	17.32	36.00	Pass
11g	6Mbps	1	1	2412	20.91	30.00	0.00	20.91	36.00	Pass
11g	6Mbps	1	6	2437	21.52	30.00	0.00	21.52	36.00	Pass
11g	6Mbps	1	11	2462	21.28	30.00	0.00	21.28	36.00	Pass
HT20	MCS0	1	1	2412	19.94	30.00	0.00	19.94	36.00	Pass
HT20	MCS0	1	6	2437	20.47	30.00	0.00	20.47	36.00	Pass
HT20	MCS0	1	11	2462	20.17	30.00	0.00	20.17	36.00	Pass
HT40	MCS0	1	3	2422	19.94	30.00	0.00	19.94	36.00	Pass
HT40	MCS0	1	6	2437	20.52	30.00	0.00	20.52	36.00	Pass
HT40	MCS0	1	9	2452	20.47	30.00	0.00	20.47	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

2.4GHz Band						
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.11	14.04
11b	1Mbps	1	6	2437	0.11	14.89
11b	1Mbps	1	11	2462	0.11	14.50
11g	6Mbps	1	1	2412	0.60	12.01
11g	6Mbps	1	6	2437	0.60	13.03
11g	6Mbps	1	11	2462	0.60	12.72
HT20	MCS0	1	1	2412	0.63	10.44
HT20	MCS0	1	6	2437	0.63	11.18
HT20	MCS0	1	11	2462	0.63	10.85
HT40	MCS0	1	3	2422	1.23	10.71
HT40	MCS0	1	6	2437	1.23	11.11
HT40	MCS0	1	9	2452	1.23	11.01

TEST RESULTS DATA
Peak Power Density

2.4GHz Band								
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
11b	1Mbps	1	1	2412	-7.98	0.00	8.00	Pass
11b	1Mbps	1	6	2437	-6.78	0.00	8.00	Pass
11b	1Mbps	1	11	2462	-8.67	0.00	8.00	Pass
11g	6Mbps	1	1	2412	-12.09	0.00	8.00	Pass
11g	6Mbps	1	6	2437	-11.25	0.00	8.00	Pass
11g	6Mbps	1	11	2462	-12.71	0.00	8.00	Pass
HT20	MCS0	1	1	2412	-13.22	0.00	8.00	Pass
HT20	MCS0	1	6	2437	-13.67	0.00	8.00	Pass
HT20	MCS0	1	11	2462	-14.17	0.00	8.00	Pass
HT40	MCS0	1	3	2422	-16.84	0.00	8.00	Pass
HT40	MCS0	1	6	2437	-16.49	0.00	8.00	Pass
HT40	MCS0	1	9	2452	-17.46	0.00	8.00	Pass



Appendix B. Radiated Spurious Emission

15C 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		2326.74	50.42	-23.58	74	42.18	32.53	4.98	29.27	248	227	P	H
		2389.92	40.14	-13.86	54	31.85	32.6	5.07	29.38	248	227	A	H
	*	2412	105.15	-	-	96.8	32.61	5.12	29.38	248	227	P	H
	*	2412	103.45	-	-	95.1	32.61	5.12	29.38	248	227	A	H
		2334.12	51.24	-22.76	74	42.95	32.53	5.03	29.27	150	88	P	V
		2343.66	40.36	-13.64	54	32.1	32.54	5.03	29.31	150	88	A	V
	*	2412	101.54	-	-	93.19	32.61	5.12	29.38	150	88	P	V
	*	2412	99.61	-	-	91.26	32.61	5.12	29.38	150	88	A	V
802.11b CH 06 2437MHz		2359.68	50.59	-23.41	74	42.31	32.56	5.03	29.31	246	230	P	H
		2367.24	40.09	-13.91	54	31.84	32.56	5.03	29.34	246	230	A	H
	*	2437	105.79	-	-	97.37	32.65	5.12	29.35	246	230	P	H
	*	2437	103.34	-	-	94.92	32.65	5.12	29.35	246	230	A	H
		2498.64	51.73	-22.27	74	43.1	32.7	5.21	29.28	246	230	P	H
		2492.6	41.37	-12.63	54	32.74	32.7	5.21	29.28	246	230	A	H
		2357.7	51.46	-22.54	74	43.18	32.56	5.03	29.31	150	109	P	V
		2329.8	40.73	-13.27	54	32.44	32.53	5.03	29.27	150	109	A	V
	*	2437	104.09	-	-	95.67	32.65	5.12	29.35	150	109	P	V
	*	2437	102.46	-	-	94.04	32.65	5.12	29.35	150	109	A	V
		2499.56	53.27	-20.73	74	44.64	32.7	5.21	29.28	150	109	P	V
	2499.2	42.03	-11.97	54	33.4	32.7	5.21	29.28	150	109	A	V	



802.11b CH 11 2462MHz	*	2462	105.06	-	-	96.56	32.67	5.16	29.33	240	228	P	H
	*	2462	103.43	-	-	94.93	32.67	5.16	29.33	240	228	A	H
		2485.28	53.8	-20.2	74	45.27	32.68	5.16	29.31	240	228	P	H
		2488.8	41.46	-12.54	54	32.86	32.7	5.21	29.31	240	228	A	H
	*	2462	101.75	-	-	93.25	32.67	5.16	29.33	150	81	P	V
	*	2462	99.9	-	-	91.4	32.67	5.16	29.33	150	81	A	V
		2491.92	53.11	-20.89	74	44.48	32.7	5.21	29.28	150	81	P	V
		2488.68	43.51	-10.49	54	34.91	32.7	5.21	29.31	150	81	A	V

Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.
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15C 2.4GHz 2400~2483.5MHz
WIFI 802.11b (Harmonic @ 3m)

Table with 14 columns: WIFI, Note, Frequency, Level, Over, Limit, Read, Antenna, Cable, Preamp, Ant, Table, Peak, Pol. It contains test results for channels 01, 06, and 11.



15C 2.4GHz 2400~2483.5MHz
WIFI 802.11g (Band Edge @ 3m)

Table with 14 columns: WIFI, Note, Frequency, Level, Over, Limit, Read, Antenna, Cable, Preamp, Ant, Table, Peak, Pol. It contains two main sections of data for 802.11g channels 01 and 06.



802.11g CH 11 2462MHz	*	2462	104.31	-	-	95.81	32.67	5.16	29.33	211	228	P	H
	*	2462	98.51	-	-	90.01	32.67	5.16	29.33	211	228	A	H
		2484.04	66.24	-7.76	74	57.71	32.68	5.16	29.31	211	228	P	H
		2483.6	52.75	-1.25	54	44.22	32.68	5.16	29.31	211	228	A	H
	*	2462	101.47	-	-	92.97	32.67	5.16	29.33	158	108	P	V
	*	2462	95.31	-	-	86.81	32.67	5.16	29.33	158	108	A	V
		2483.72	62.07	-11.93	74	53.54	32.68	5.16	29.31	158	108	P	V
		2483.52	46.99	-7.01	54	38.46	32.68	5.16	29.31	158	108	A	V

Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.
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**15C 2.4GHz 2400~2483.5MHz
WIFI 802.11g (Harmonic @ 3m)**

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g		4824	38.81	-35.19	74	53.55	34.4	7.46	56.6	150	360	P	H
CH 01 2412MHz		4824	40.21	-33.79	74	54.95	34.4	7.46	56.6	150	360	P	V
802.11g		4874	40.5	-33.5	74	55.49	34.43	7.49	56.91	150	360	P	H
CH 06		7311	43.46	-30.54	74	55.54	36.22	9.7	58	174	100	P	H
2437MHz		4874	39.56	-34.44	74	54.55	34.43	7.49	56.91	150	360	P	V
		7311	45.08	-28.92	74	57.16	36.22	9.7	58	174	100	P	V
802.11g		4924	38.94	-35.06	74	53.03	34.46	7.53	56.08	150	347	P	H
CH 11		7386	44.07	-29.93	74	56.02	36.26	9.8	58.01	150	274	P	H
2462MHz		4924	38.49	-35.51	74	52.58	34.46	7.53	56.08	150	347	P	V
		7386	45.06	-28.94	74	57.01	36.26	9.8	58.01	150	274	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**15C 2.4GHz 2400~2483.5MHz
WIFI 802.11n HT20 (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)
802.11n HT20 CH 01 2412MHz		2389.47	53.73	-20.27	74	45.4	32.6	5.07	29.34	219	227	P	H
		2389.92	43.59	-10.41	54	35.3	32.6	5.07	29.38	219	227	A	H
	*	2412	102.68	-	-	94.33	32.61	5.12	29.38	219	227	P	H
	*	2412	96.52	-	-	88.17	32.61	5.12	29.38	219	227	A	H
		2389.74	52.1	-21.9	74	43.77	32.6	5.07	29.34	153	114	P	V
		2389.92	41.81	-12.19	54	33.52	32.6	5.07	29.38	153	114	A	V
	*	2412	102.93	-	-	94.58	32.61	5.12	29.38	153	114	P	V
	*	2412	94.99	-	-	86.64	32.61	5.12	29.38	153	114	A	V
802.11n HT20 CH 06 2437MHz		2316.3	50.74	-23.26	74	42.52	32.51	4.98	29.27	214	227	P	H
		2369.04	40.46	-13.54	54	32.15	32.58	5.07	29.34	214	227	A	H
	*	2437	103.51	-	-	95.09	32.65	5.12	29.35	214	227	P	H
	*	2437	96.86	-	-	88.44	32.65	5.12	29.35	214	227	A	H
		2488.52	53.47	-20.53	74	44.87	32.7	5.21	29.31	214	227	P	H
		2488.88	43.75	-10.25	54	35.15	32.7	5.21	29.31	214	227	A	H
		2356.98	50.63	-23.37	74	42.35	32.56	5.03	29.31	152	109	P	V
		2332.59	41.49	-12.51	54	33.2	32.53	5.03	29.27	152	109	A	V
	*	2437	102.72	-	-	94.3	32.65	5.12	29.35	152	109	P	V
	*	2437	95.91	-	-	87.49	32.65	5.12	29.35	152	109	A	V
		2499.72	52.65	-21.35	74	44.02	32.7	5.21	29.28	152	109	P	V
		2488.68	43.16	-10.84	54	34.56	32.7	5.21	29.31	152	109	A	V



802.11n HT20 CH 11 2462MHz	*	2462	102.84	-	-	94.34	32.67	5.16	29.33	211	224	P	H
	*	2462	95.95	-	-	87.45	32.67	5.16	29.33	211	224	A	H
		2483.52	65.6	-8.4	74	57.07	32.68	5.16	29.31	211	224	P	H
		2483.56	50.77	-3.23	54	42.24	32.68	5.16	29.31	211	224	A	H
	*	2462	100.97	-	-	92.47	32.67	5.16	29.33	158	109	P	V
	*	2462	94.26	-	-	85.76	32.67	5.16	29.33	158	109	A	V
		2483.76	60.07	-13.93	74	51.54	32.68	5.16	29.31	158	109	P	V
		2483.56	46.95	-7.05	54	38.42	32.68	5.16	29.31	158	109	A	V

Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.
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**15C 2.4GHz 2400~2483.5MHz
WIFI 802.11n HT20 (Harmonic @ 3m)**

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT20 CH 01 2412MHz		4824	39.74	-34.26	74	54.48	34.4	7.46	56.6	150	360	P	H
		4824	39.56	-34.44	74	54.3	34.4	7.46	56.6	150	360	P	V
802.11n HT20 CH 06 2437MHz		4874	38.12	-35.88	74	53.11	34.43	7.49	56.91	150	360	P	H
		7311	43.63	-30.37	74	55.71	36.22	9.7	58	174	100	P	H
		4874	39.71	-34.29	74	54.7	34.43	7.49	56.91	150	360	P	V
		7311	43.45	-30.55	74	55.53	36.22	9.7	58	174	100	P	V
802.11n HT20 CH 11 2462MHz		4924	38.35	-35.65	74	52.44	34.46	7.53	56.08	150	347	P	H
		7386	43.79	-30.21	74	55.74	36.26	9.8	58.01	150	274	P	H
		4924	38.54	-35.46	74	52.63	34.46	7.53	56.08	150	347	P	V
		7386	44.77	-29.23	74	56.72	36.26	9.8	58.01	150	274	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**15C 2.4GHz 2400~2483.5MHz
WIFI 802.11n HT40 (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)
802.11n HT40 CH 03 2422MHz		2389.65	55.34	-18.66	74	47.01	32.6	5.07	29.34	243	229	P	H
		2389.92	45.91	-8.09	54	37.62	32.6	5.07	29.38	243	229	A	H
	*	2422	101.11	-	-	92.71	32.63	5.12	29.35	243	229	P	H
	*	2422	93.59	-	-	85.19	32.63	5.12	29.35	243	229	A	H
		2489.64	53.75	-20.25	74	45.15	32.7	5.21	29.31	243	229	P	H
		2489.48	42.35	-11.65	54	33.75	32.7	5.21	29.31	243	229	A	H
		2389.11	53.89	-20.11	74	45.56	32.6	5.07	29.34	158	107	P	V
		2389.74	43.94	-10.06	54	35.61	32.6	5.07	29.34	158	107	A	V
	*	2422	97.64	-	-	89.24	32.63	5.12	29.35	158	107	P	V
	*	2422	91.65	-	-	83.25	32.63	5.12	29.35	158	107	A	V
		2499.48	54.04	-19.96	74	45.41	32.7	5.21	29.28	158	107	P	V
		2492.72	43.15	-10.85	54	34.52	32.7	5.21	29.28	158	107	A	V
802.11n HT40 CH 06 2437MHz		2351.76	50.1	-23.9	74	41.82	32.56	5.03	29.31	244	228	P	H
		2358.51	41.07	-12.93	54	32.79	32.56	5.03	29.31	244	228	A	H
	*	2437	102.54	-	-	94.12	32.65	5.12	29.35	244	228	P	H
	*	2437	95.05	-	-	86.63	32.65	5.12	29.35	244	228	A	H
		2485.08	54.75	-19.25	74	46.22	32.68	5.16	29.31	244	228	P	H
		2483.92	44.14	-9.86	54	35.61	32.68	5.16	29.31	244	228	A	H
		2321.79	51.1	-22.9	74	42.86	32.53	4.98	29.27	152	109	P	V
		2316.57	41.54	-12.46	54	33.32	32.51	4.98	29.27	152	109	A	V
	*	2437	99.89	-	-	91.47	32.65	5.12	29.35	152	109	P	V
	*	2437	93.64	-	-	85.22	32.65	5.12	29.35	152	109	A	V
		2495.92	53.64	-20.36	74	45.01	32.7	5.21	29.28	152	109	P	V
		2499.28	43.62	-10.38	54	34.99	32.7	5.21	29.28	152	109	A	V



802.11n HT40 CH 09 2452MHz		2352.48	50.79	-23.21	74	42.51	32.56	5.03	29.31	245	229	P	H
		2329.98	41.1	-12.9	54	32.81	32.53	5.03	29.27	245	229	A	H
	*	2452	102.16	-	-	93.68	32.65	5.16	29.33	245	229	P	H
	*	2452	95.34	-	-	86.86	32.65	5.16	29.33	245	229	A	H
		2489.84	66.6	-7.4	74	58	32.7	5.21	29.31	245	229	P	H
		2489.24	53.63	-0.37	54	45.03	32.7	5.21	29.31	245	229	A	H
		2357.88	52.05	-21.95	74	43.77	32.56	5.03	29.31	155	109	P	V
		2343.75	41.81	-12.19	54	33.55	32.54	5.03	29.31	155	109	A	V
	*	2452	98.7	-	-	90.22	32.65	5.16	29.33	155	109	P	V
	*	2452	92.5	-	-	84.02	32.65	5.16	29.33	155	109	A	V
		2488.76	61.37	-12.63	74	52.77	32.7	5.21	29.31	155	109	P	V
		2488.44	49.14	-4.86	54	40.54	32.7	5.21	29.31	155	109	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



**15C 2.4GHz 2400~2483.5MHz
WIFI 802.11n HT40 (Harmonic @ 3m)**

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n		4844	39.71	-34.29	74	54.42	34.41	7.46	56.58	150	360	P	H
HT40		7266	43.1	-30.9	74	55.51	36.21	9.65	58.27	200	360	P	H
CH 03		4844	38.97	-35.03	74	53.68	34.41	7.46	56.58	150	360	P	V
2422MHz		7266	42.87	-31.13	74	55.28	36.21	9.65	58.27	200	360	P	V
802.11n		4874	39.58	-34.42	74	54.57	34.43	7.49	56.91	150	163	P	H
HT40		7311	44.23	-29.77	74	56.31	36.22	9.7	58	150	360	P	H
CH 06		4874	39.21	-34.79	74	54.2	34.43	7.49	56.91	150	163	P	V
2437MHz		7311	43.94	-30.06	74	56.02	36.22	9.7	58	150	360	P	V
802.11n		4904	39.57	-34.43	74	53.94	34.45	7.53	56.35	150	360	P	H
HT40		7356	43.37	-30.63	74	55.34	36.24	9.75	57.96	150	320	P	H
CH 09		4904	39.93	-34.07	74	54.3	34.45	7.53	56.35	150	360	P	V
2452MHz		7356	43.36	-30.64	74	55.33	36.24	9.75	57.96	150	320	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



15C Emission below 1GHz
2.4GHz WIFI 802.11n HT40 (LF)

Table with 14 columns: WIFI, Note, Frequency, Level, Over, Limit, Read, Antenna, Cable, Preamp, Ant, Table, Peak, Pol. It contains 11 rows of test data for 2.4GHz WIFI 802.11n HT40 LF.

Remark table with 2 rows: 1. No other spurious found. 2. All results are PASS against limit line.



Note symbol

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



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

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		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)

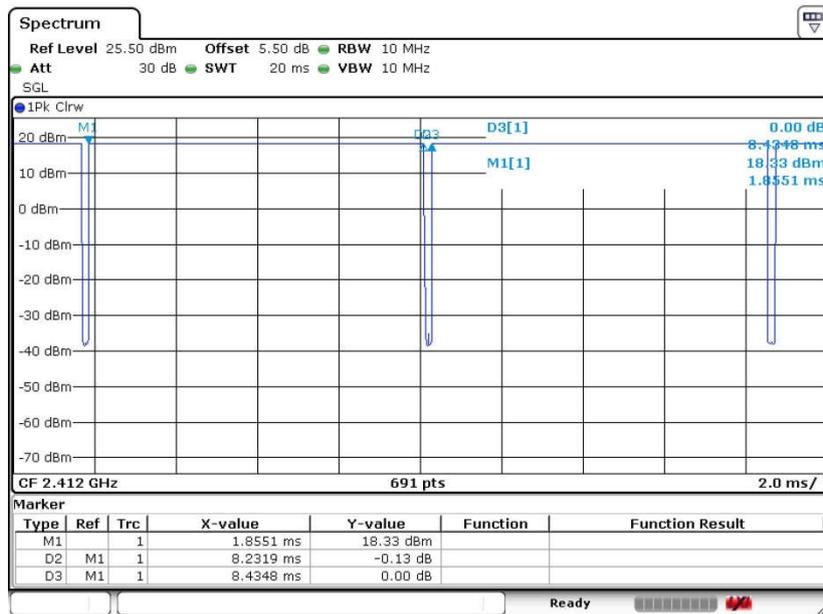
Both peak and average measured complies with the limit line, so test result is “PASS”.



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	87.037	1.362	0.734	1kHz
2.4GHz 802.11n HT20	86.529	1.275	0.784	1kHz
2.4GHz 802.11n HT40	75.390	0.630	1.586	3kHz

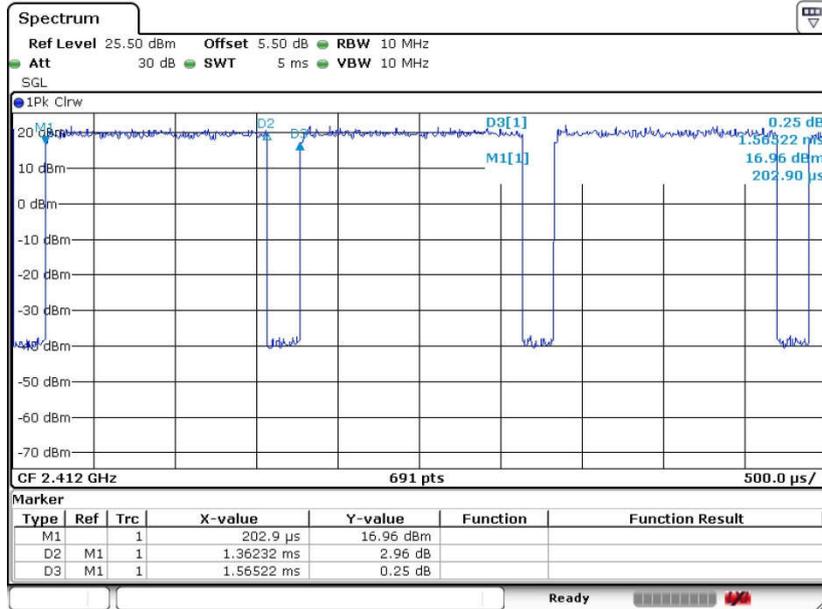
802.11b



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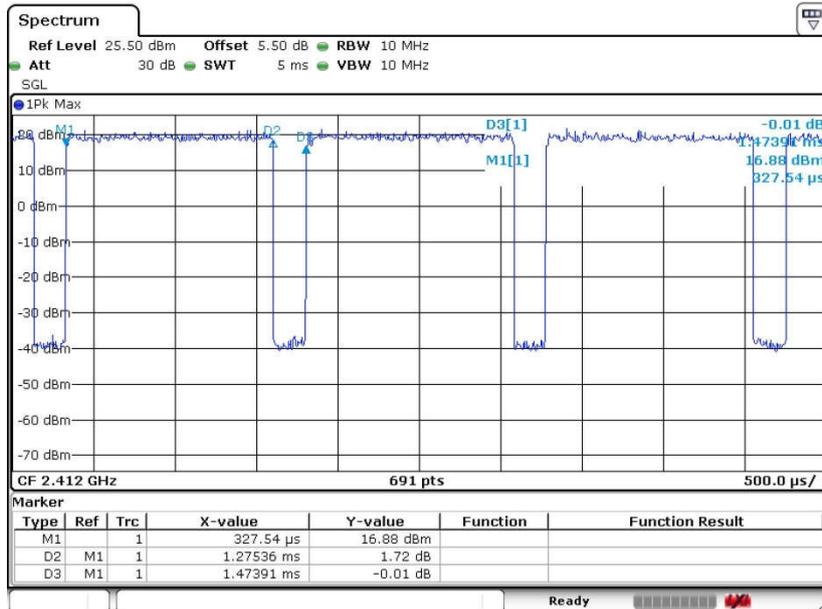


802.11g



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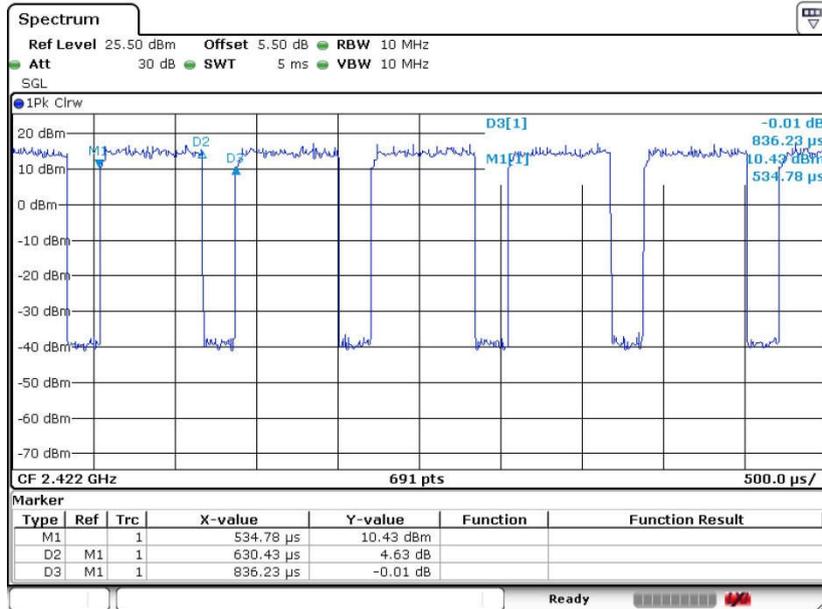
2.4GHz 802.11n HT20



Date: 2.JUN.2016 19:48:41



2.4GHz 802.11n HT40



Date: 2.JUN.2016 16:15:43