



FCC RF Test Report

APPLICANT : ZTE CORPORATION
EQUIPMENT : LTE/WCDMA/GSM (GPRS)
Multi-Mode Digital Mobile Phone
BRAND NAME : ZTE
MODEL NAME : Z999
FCC ID : SRQ-Z999
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Jul. 01, 2017 and testing was completed on Aug. 12, 2017. 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.



Approved by: James Huang / Manager

Sporton International (Kunshan) Inc.
No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335
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 4.65 dB at 61.040 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 6.83 dB at 0.853 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

ZTE CORPORATION

ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

1.2 Manufacturer

ZTE CORPORATION

ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	LTE/WCDMA/GSM (GPRS) Multi-Mode Digital Mobile Phone
Brand Name	ZTE
Model Name	Z999
FCC ID	SRQ-Z999
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA / HSPA+(16QAM uplink is not supported)/LTE/NFC/ WLAN 2.4GHz 802.11b/g/n HT20/HT40/ WLAN 5GHz 802.11a/n HT20/HT40/ WLAN5GHz 802.11ac VHT20/VHT40/VHT80/ Bluetooth v3.0 + EDR/ Bluetooth v 4.0 LE/ Bluetooth v4.1 LE
IMEI Code	Conducted: 865800030006115 Conduction: 865800030006719 Radiation: 865800030007386
HW Version	Z999HWV1.0
SW Version	Z999V1.0.0B02
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	2412 MHz ~ 2462 MHz									
Maximum (Peak) Output Power to antenna	<Ant. 1> 802.11b : 17.81 dBm (0.0604 W) 802.11g : 19.08 dBm (0.0809 W) 802.11n HT20 : 18.36 dBm (0.0685 W) 802.11n HT40 : 19.04 dBm (0.0802 W) MIMO <Ant. 1 + 2> 802.11n HT20 : 21.54 dBm (0.1426 W) 802.11n HT40 : 21.64 dBm (0.1459 W)									
99% Occupied Bandwidth	<Ant. 1> 802.11b : 13.19MHz 802.11g : 17.08MHz 802.11n HT20 : 18.23MHz 802.11n HT40 : 36.56MHz MIMO <Ant. 1 + 2> 802.11n HT20 : 18.18 MHz 802.11n HT40 : 36.66 MHz									
Antenna Type / Gain	Ant. 1: PIFA Antenna with gain -4.15 dBi Ant. 2: PIFA Antenna with gain 3.57 dBi									
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)									
Antenna Function for Transmitter	<table border="1"> <thead> <tr> <th></th> <th>Ant. 1</th> <th>Ant. 2</th> </tr> </thead> <tbody> <tr> <td>802.11 b/g/n SISO</td> <td>V</td> <td>-</td> </tr> <tr> <td>802.11 n MIMO</td> <td>V</td> <td>V</td> </tr> </tbody> </table>		Ant. 1	Ant. 2	802.11 b/g/n SISO	V	-	802.11 n MIMO	V	V
	Ant. 1	Ant. 2								
802.11 b/g/n SISO	V	-								
802.11 n MIMO	V	V								

Note: MIMO Ant. 1+2 is a calculated result from sum of the power MIMO Ant. 1 and MIMO Ant. 2.

1.5 Modification of EUT

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



1.6 Testing Location

Sporton Lab is accredited to ISO 17025 by National Voluntary Laboratory Accreditation Program (NVLAP code: 600155-0) and the FCC designation No is CN5013.

Test Site	Sporton International (Kunshan) Inc.			
Test Site Location	No.3-2 Ping-Xiang Rd, Kunshan Development Zone Kunshan City Jiangsu Province 215335 China TEL : +86-512-57900158 FAX : +86-512-57900958			
Test Site No.	Sporton Site No.			FCC Test Firm Registration No.
	TH01-KS	03CH03-KS	CO01-KS	630927

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 v04
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ 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 three orthogonal panels, X, Y, Z. The worst cases were recorded in this report.

2.1 Carrier Frequency and Channel

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



2.2 Test Mode

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

Single Antenna

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

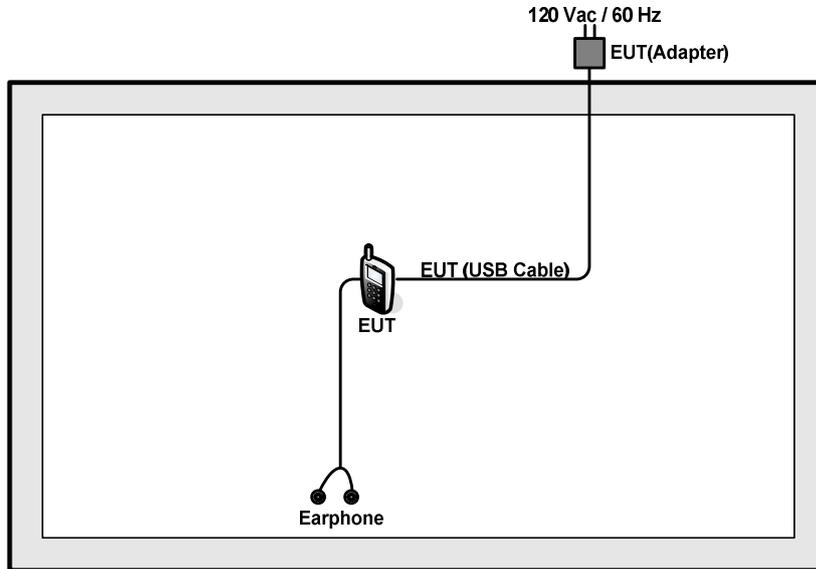
MIMO Antenna

Modulation	Data Rate
802.11n HT20	MCS0
802.11n HT40	MCS0

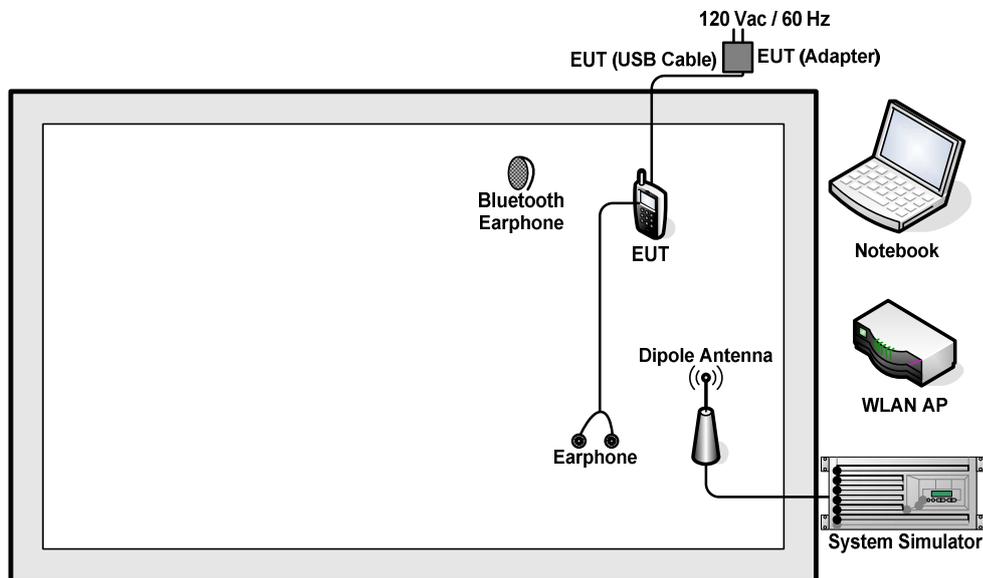
Test Cases	
AC Conducted Emission	Mode 1 :GSM850 Idle + Bluetooth Link + WLAN Link(2.4G) + Earphone + USB Cable (Charging from Adapter)

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	KA2IR855A2	N/A	Unshielded, 1.8 m
2.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
3.	Notebook	Lenovo	G480	N/A	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Lenovo	LBH308	N/A	N/A	N/A
5.	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 5.5dB.

Offset(dB) = RF cable loss(dB).

= 5.5(dB)

3 Test Result

3.1 6dB Bandwidth Measurement

3.1.1 Limit of 6dB Bandwidth

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

3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance v04.
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.

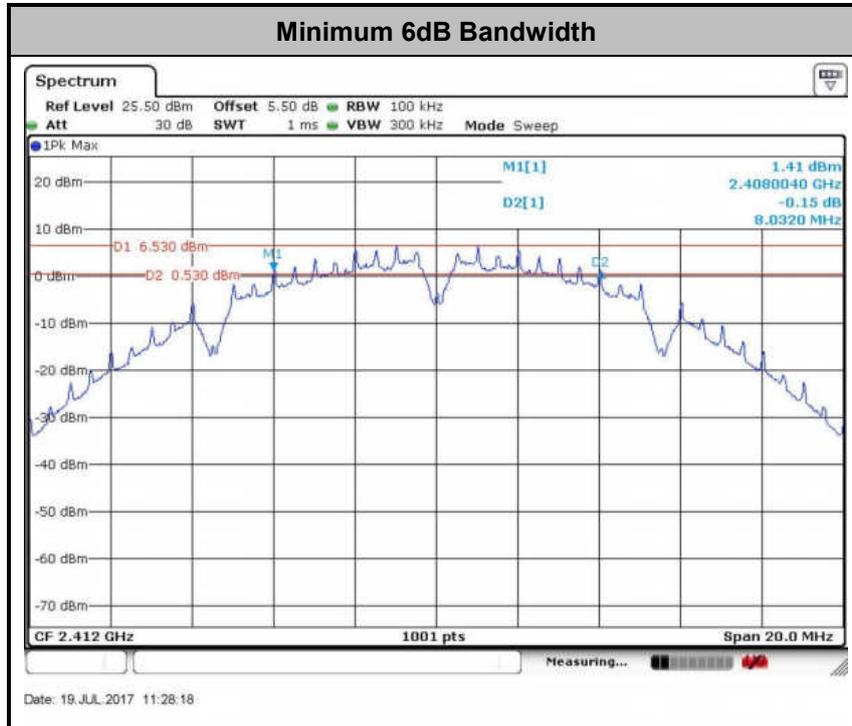
3.1.4 Test Setup





3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.



3.2 Peak Output Power Measurement

3.2.1 Limit of Peak Output Power

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

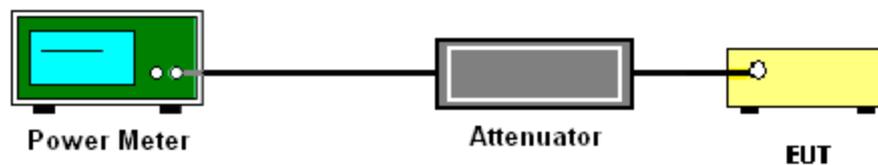
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04 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.
5. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

3.2.4 Test Setup





3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.2.6 Test Result of Average output Power (Reporting Only)

Please refer to Appendix A



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 v04.
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.
7. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

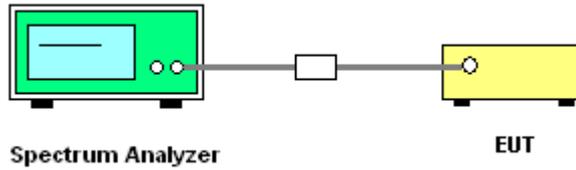
If measurements performed using method (2) plus $10 \log(N)$ exceeds the emission limit, the test should choose method (1) before declaring that the device fails the emission limit.

Method (1): Measure and sum the spectra across the outputs.

The total final Power Spectral Density is from a device with 2 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points, the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 to obtain the value for the first frequency bin of the summed spectrum.

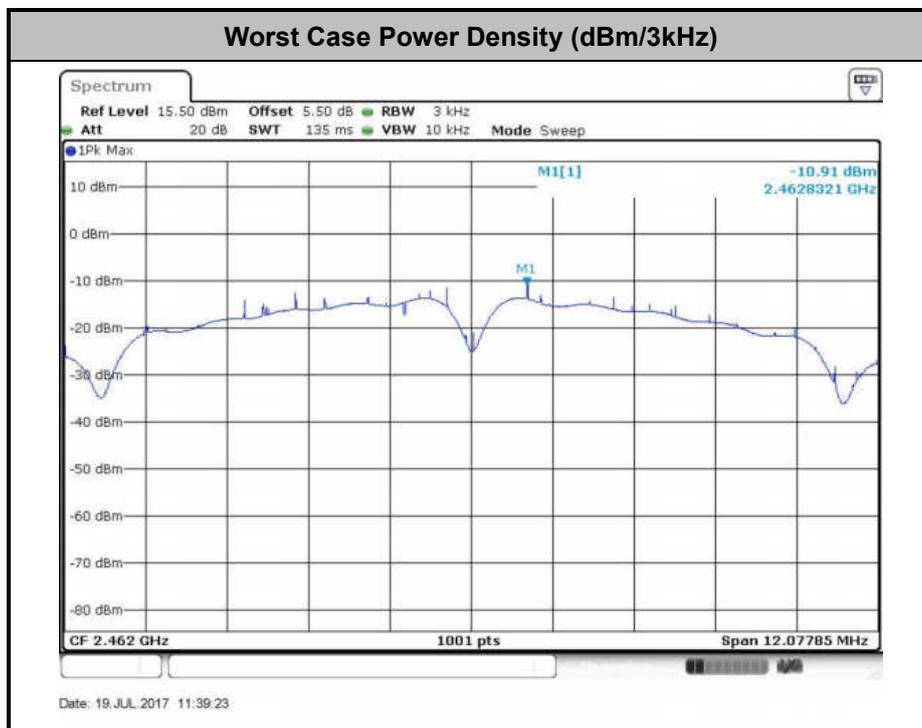
Method (2): Measure and add $10 \log(N)$ dB, where N is the number of outputs. (N=2)

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.



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.

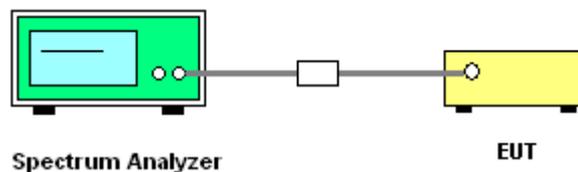
3.4.2 Measuring Instruments

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 v04.
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.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup





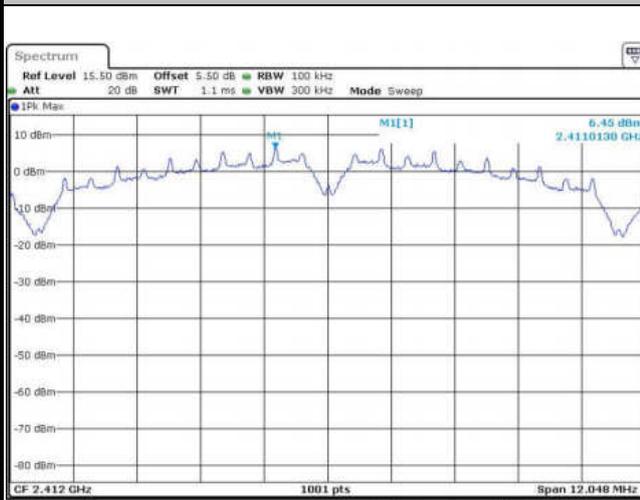
3.4.5 Test Result of Conducted Band Edges and Spurious Emission

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

Number of TX	1	Ant. :	1
Test Mode :	802.11b	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	49~55%
Test Channel :	01	Test Engineer :	Silent Hai

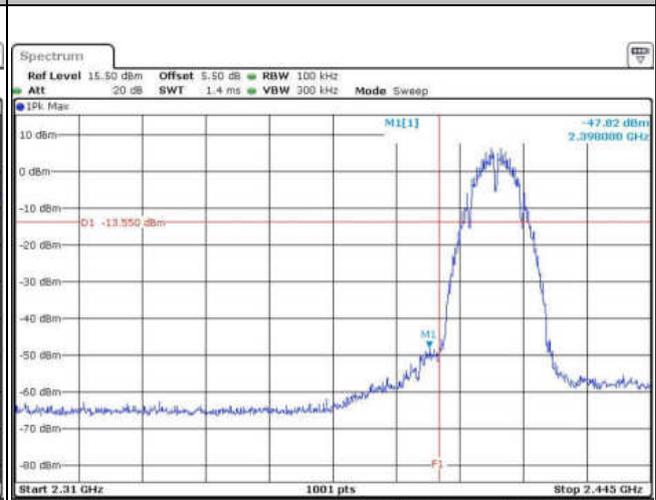
WLAN 802.11b Channel 01

100kHz PSD reference Level



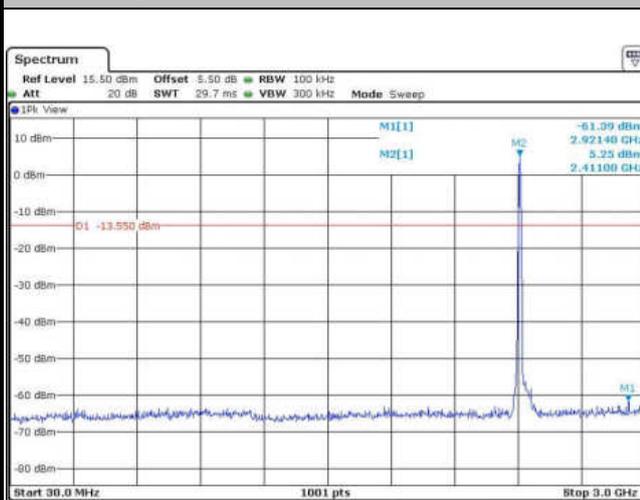
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Low Channel Plot



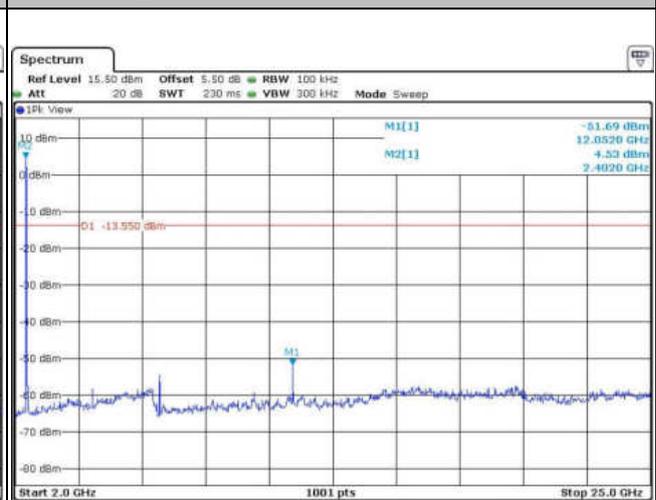
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Spurious Emission 30MHz~3GHz



Date: 19 JUL 2017 11:31:44

Spurious Emission 2GHz~25GHz



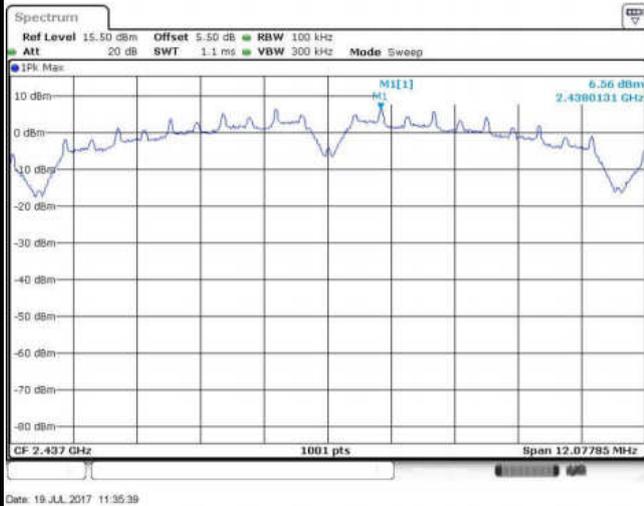
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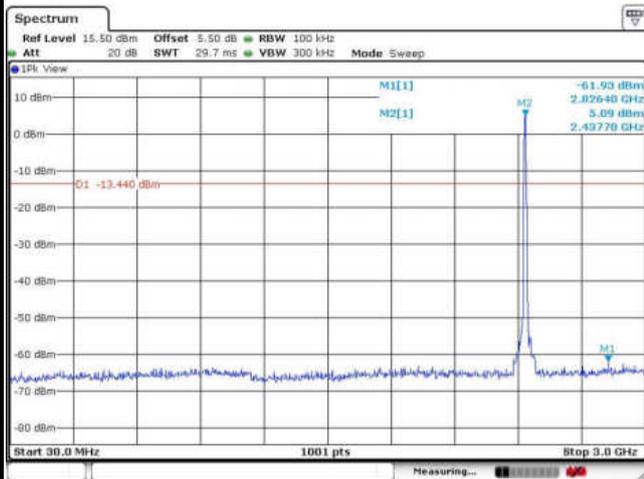
Number of TX :	1	Ant. :	1
Test Mode :	802.11b	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	49~55%
Test Channel :	06	Test Engineer :	Silent Hai

WLAN 802.11b Channel 06

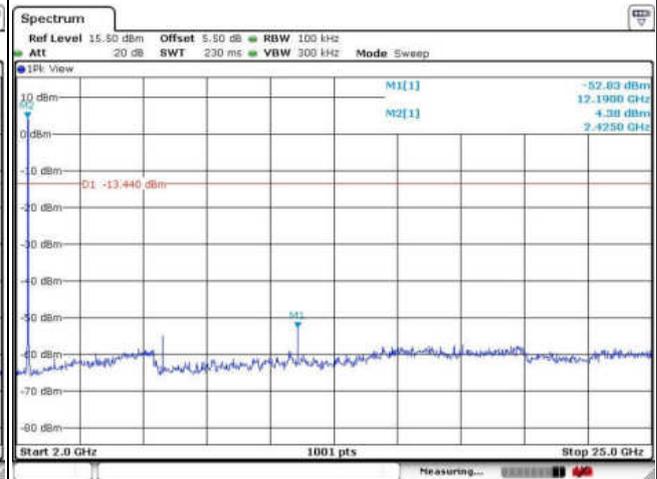
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

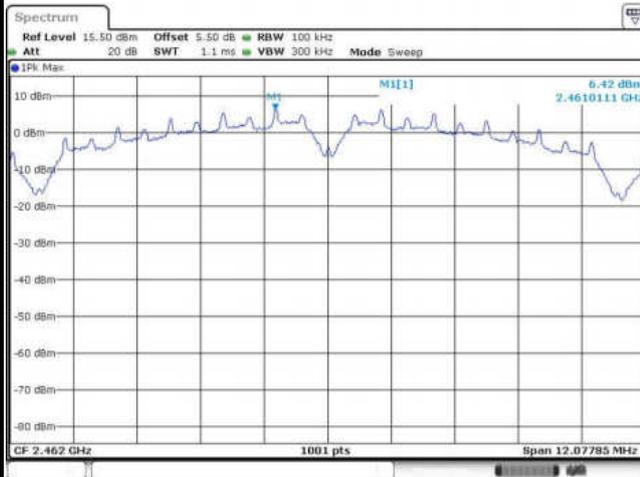




Number of TX :	1	Ant. :	1
Test Mode :	802.11b	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	49~55%
Test Channel :	11	Test Engineer :	Silent Hai

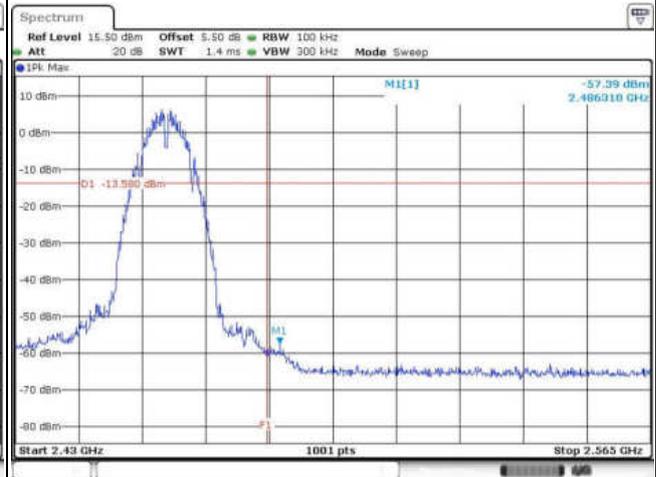
WLAN 802.11b Channel 11

100kHz PSD reference Level



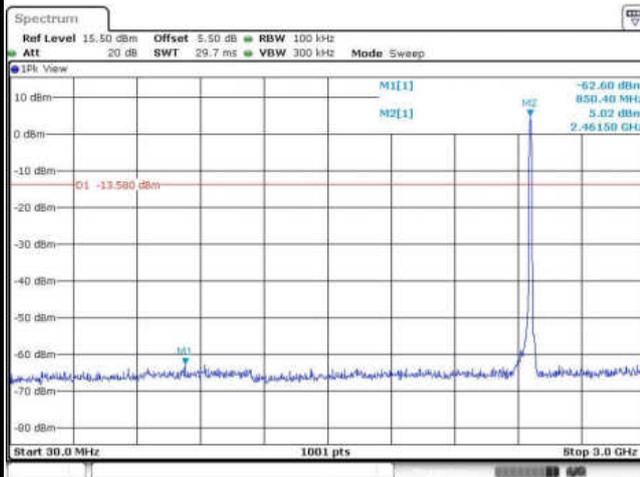
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High Channel Plot



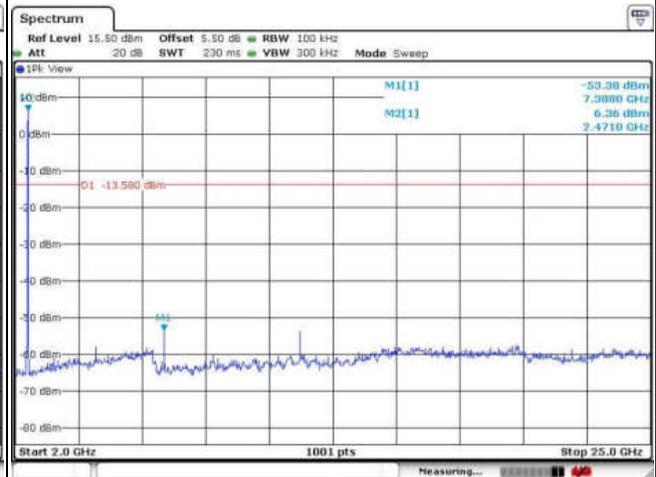
Date: 19 JUL 2017 11:39:51

Spurious Emission 30MHz~3GHz



Date: 19 JUL 2017 11:40:29

Spurious Emission 2GHz~25GHz



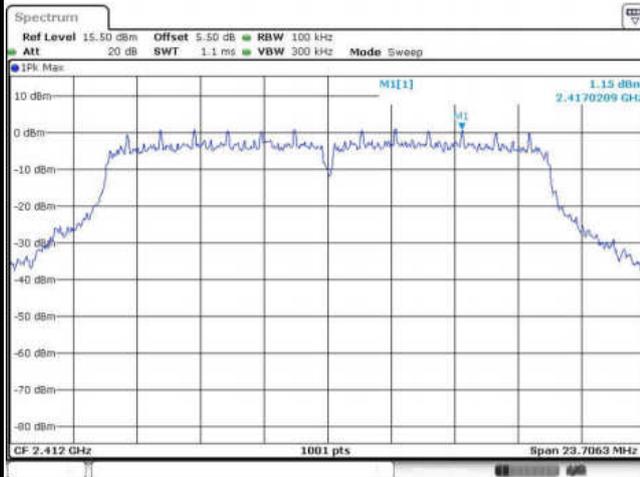
Date: 19 JUL 2017 11:41:13



Number of TX :	1	Ant. :	1
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	49~55%
Test Channel :	01	Test Engineer :	Silent Hai

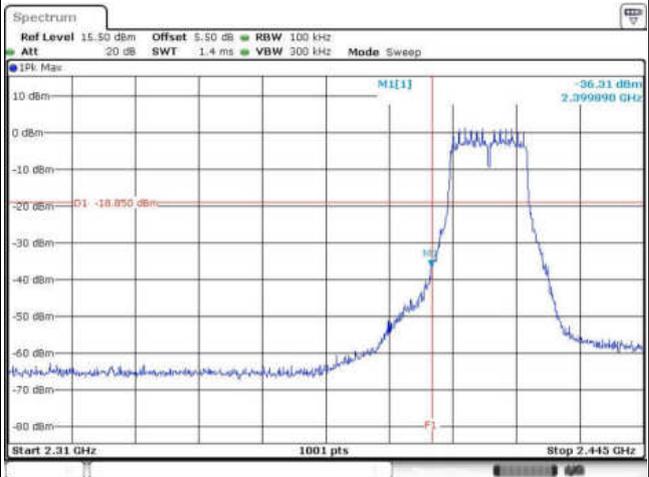
WLAN 802.11g Channel 01

100kHz PSD reference Level



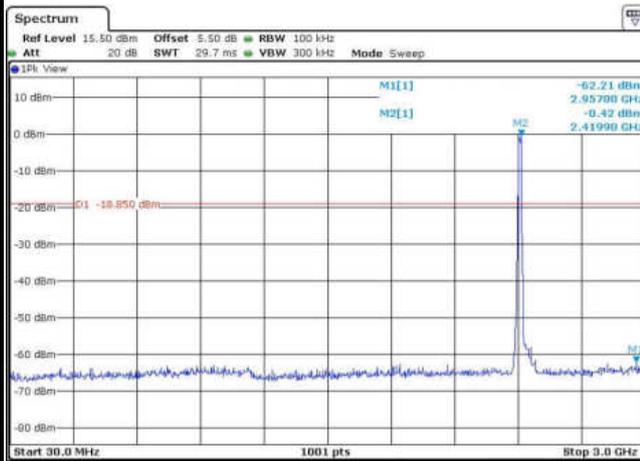
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Low Channel Plot



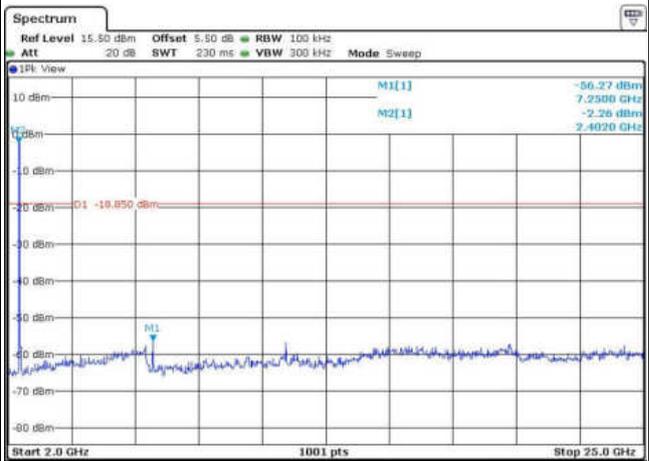
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Spurious Emission 30MHz~3GHz



Date: 19 JUL 2017 11:48:10

Spurious Emission 2GHz~25GHz



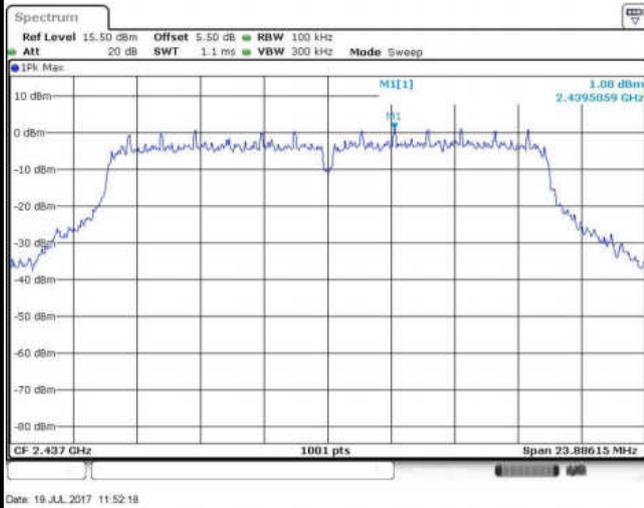
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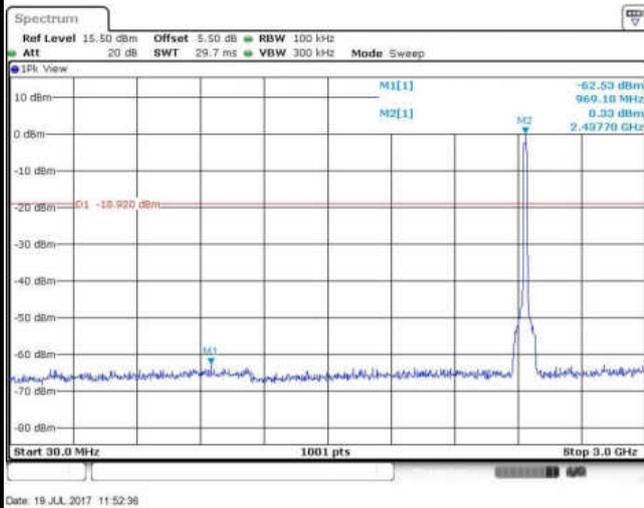
Number of TX :	1	Ant. :	1
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	49~55%
Test Channel :	06	Test Engineer :	Silent Hai

WLAN 802.11g Channel 06

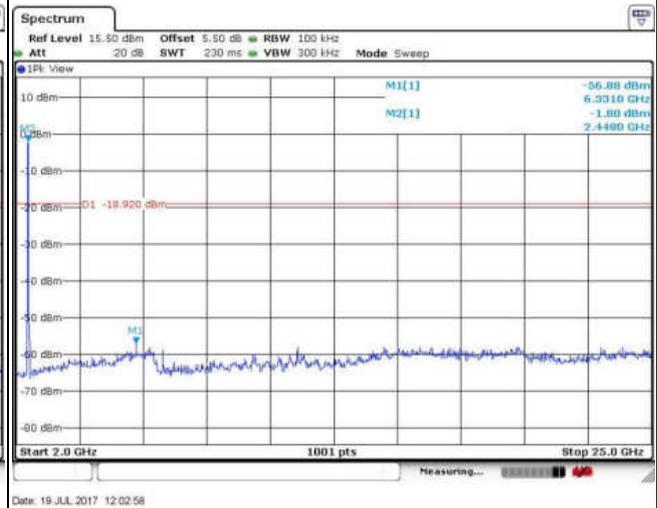
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

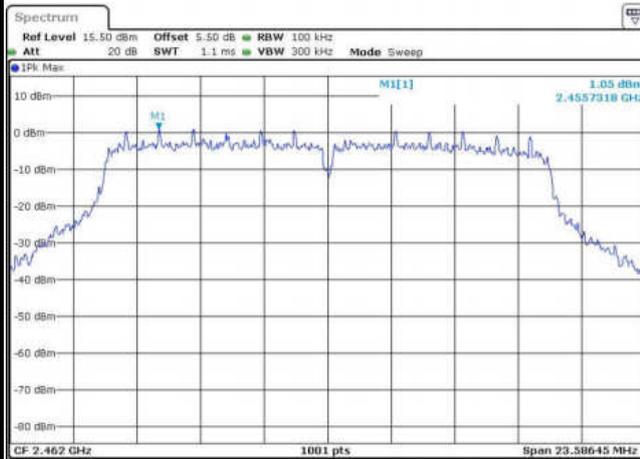




Number of TX :	1	Ant. :	1
Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	49~55%
Test Channel :	11	Test Engineer :	Silent Hai

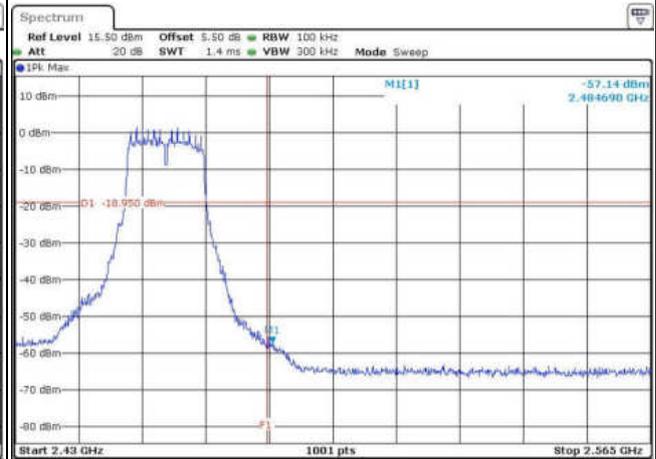
WLAN 802.11g Channel 11

100kHz PSD reference Level



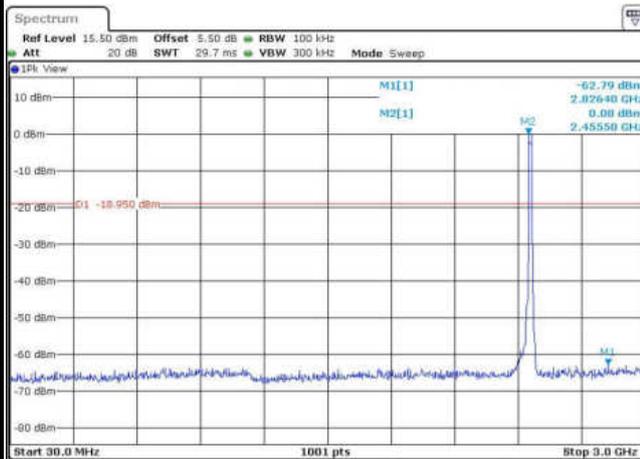
Date: 19 JUL 2017 12:04:50

High Channel Plot



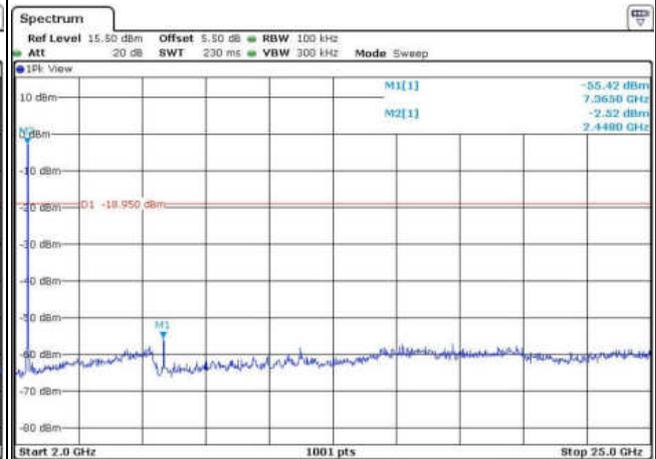
Date: 19 JUL 2017 12:05:18

Spurious Emission 30MHz~3GHz



Date: 19 JUL 2017 12:06:10

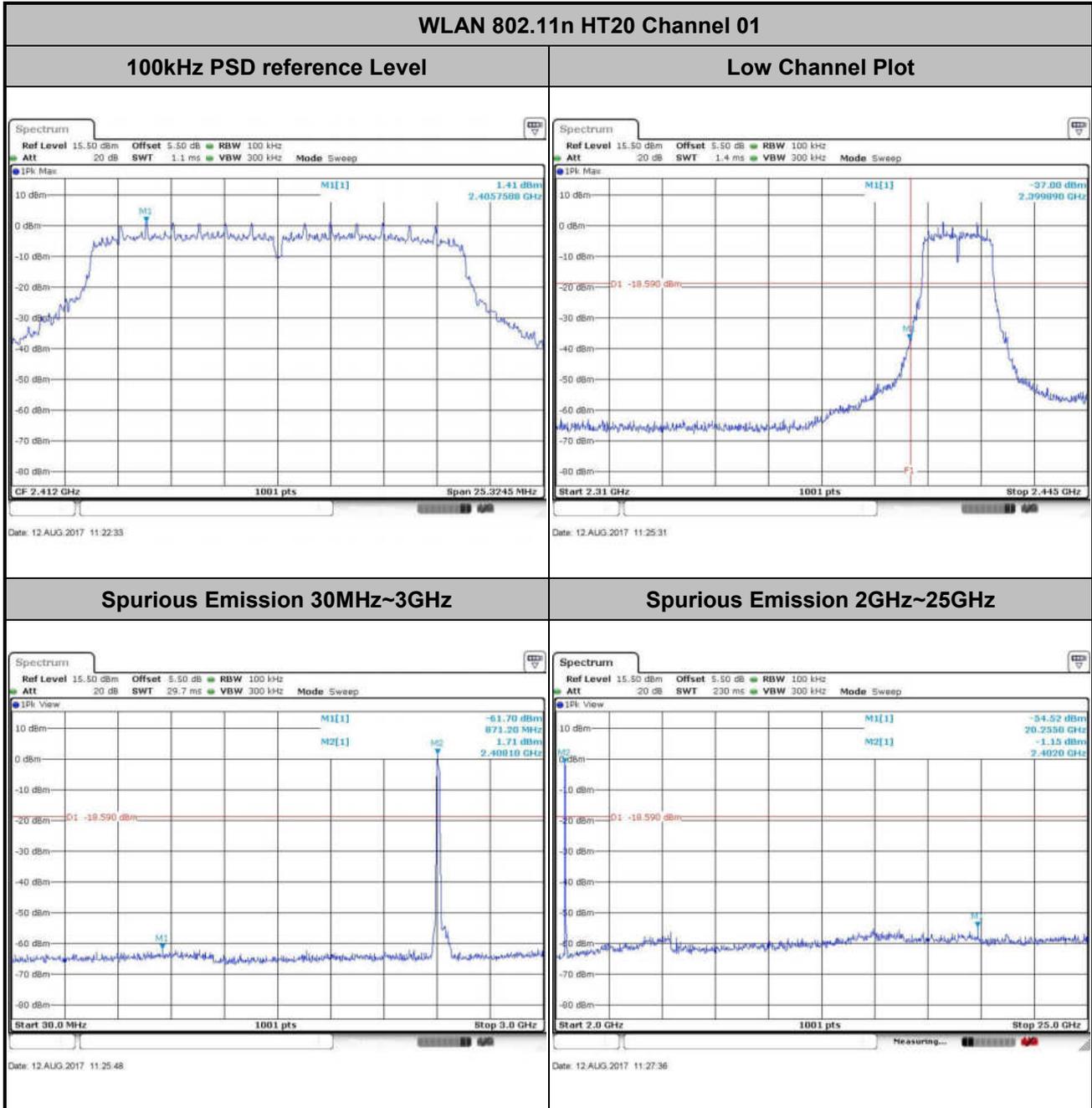
Spurious Emission 2GHz~25GHz



Date: 19 JUL 2017 12:06:42



Number of TX :	1	Ant. :	1
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	49~55%
Test Channel :	01	Test Engineer :	Silent Hai

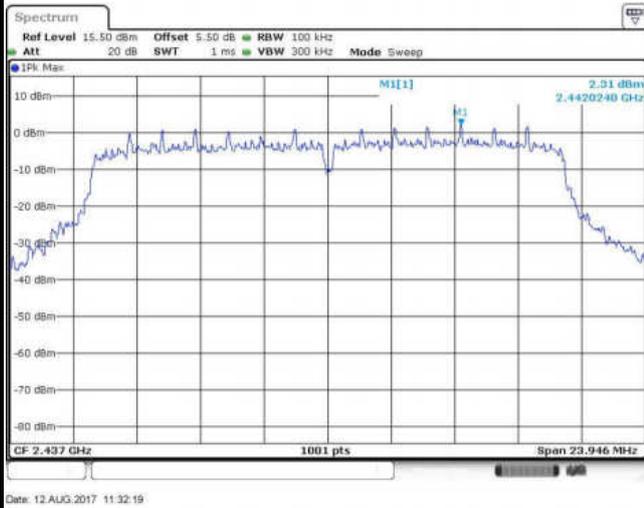




Number of TX :	1	Ant. :	1
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	49~55%
Test Channel :	06	Test Engineer :	Silent Hai

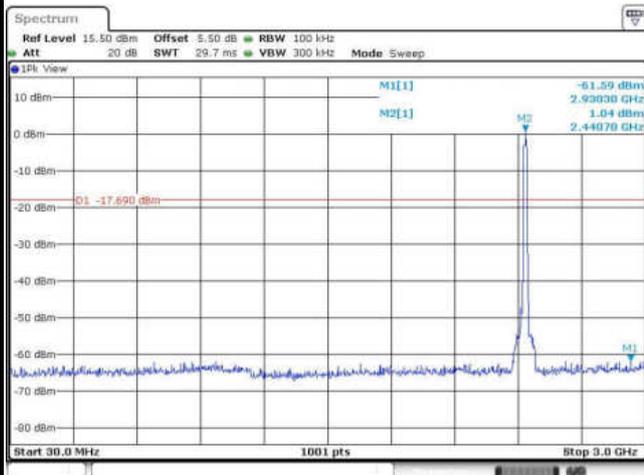
WLAN 802.11n HT20 Channel 06

100kHz PSD reference Level



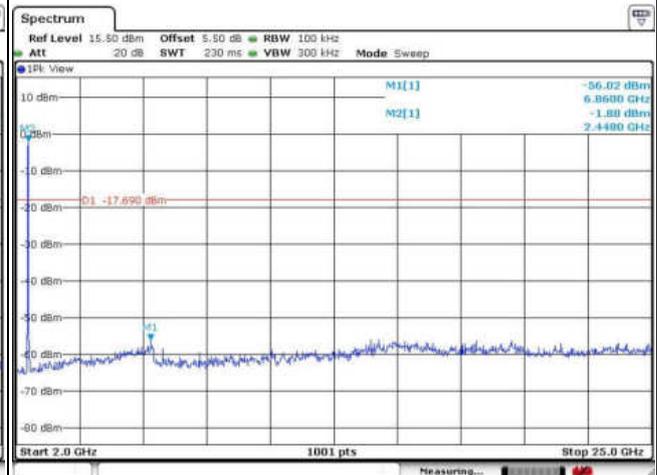
Date: 12.AUG.2017 11:32:19

Spurious Emission 30MHz~3GHz



Date: 12.AUG.2017 11:33:00

Spurious Emission 2GHz~25GHz



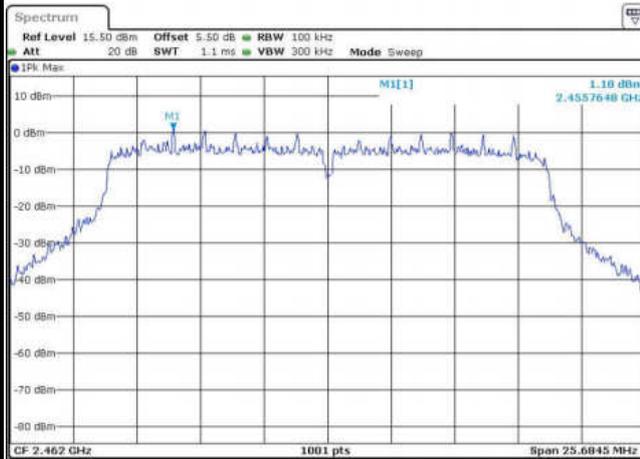
Date: 12.AUG.2017 11:34:03



Number of TX :	1	Ant. :	1
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	49~55%
Test Channel :	11	Test Engineer :	Silent Hai

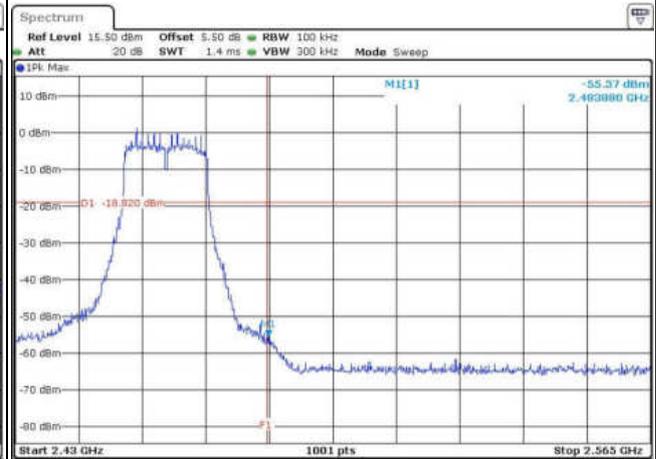
WLAN 802.11n HT20 Channel 11

100kHz PSD reference Level



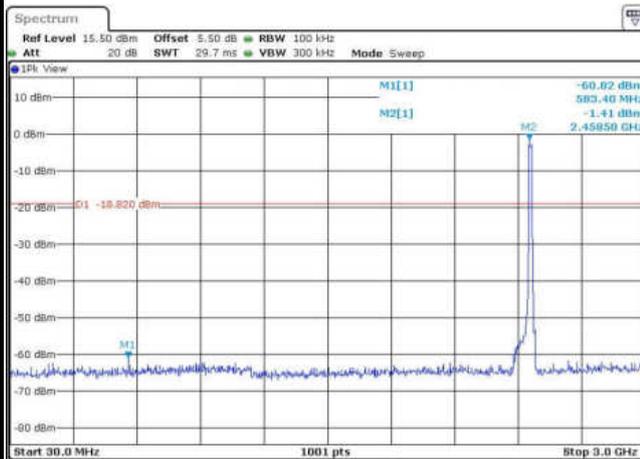
Date: 12.AUG.2017 15:20:04

High Channel Plot



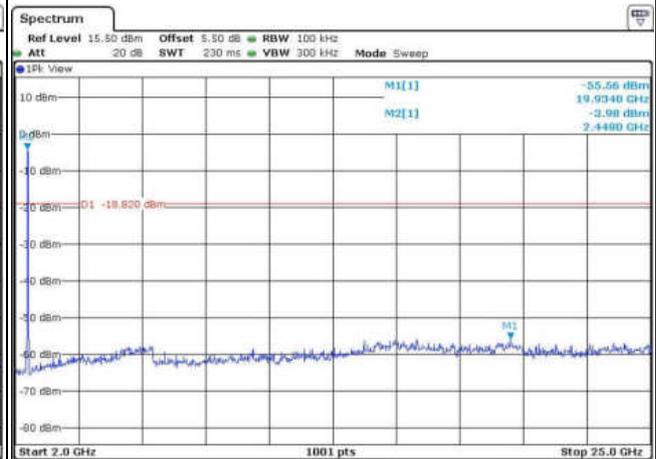
Date: 12.AUG.2017 15:20:12

Spurious Emission 30MHz~3GHz



Date: 12.AUG.2017 15:20:25

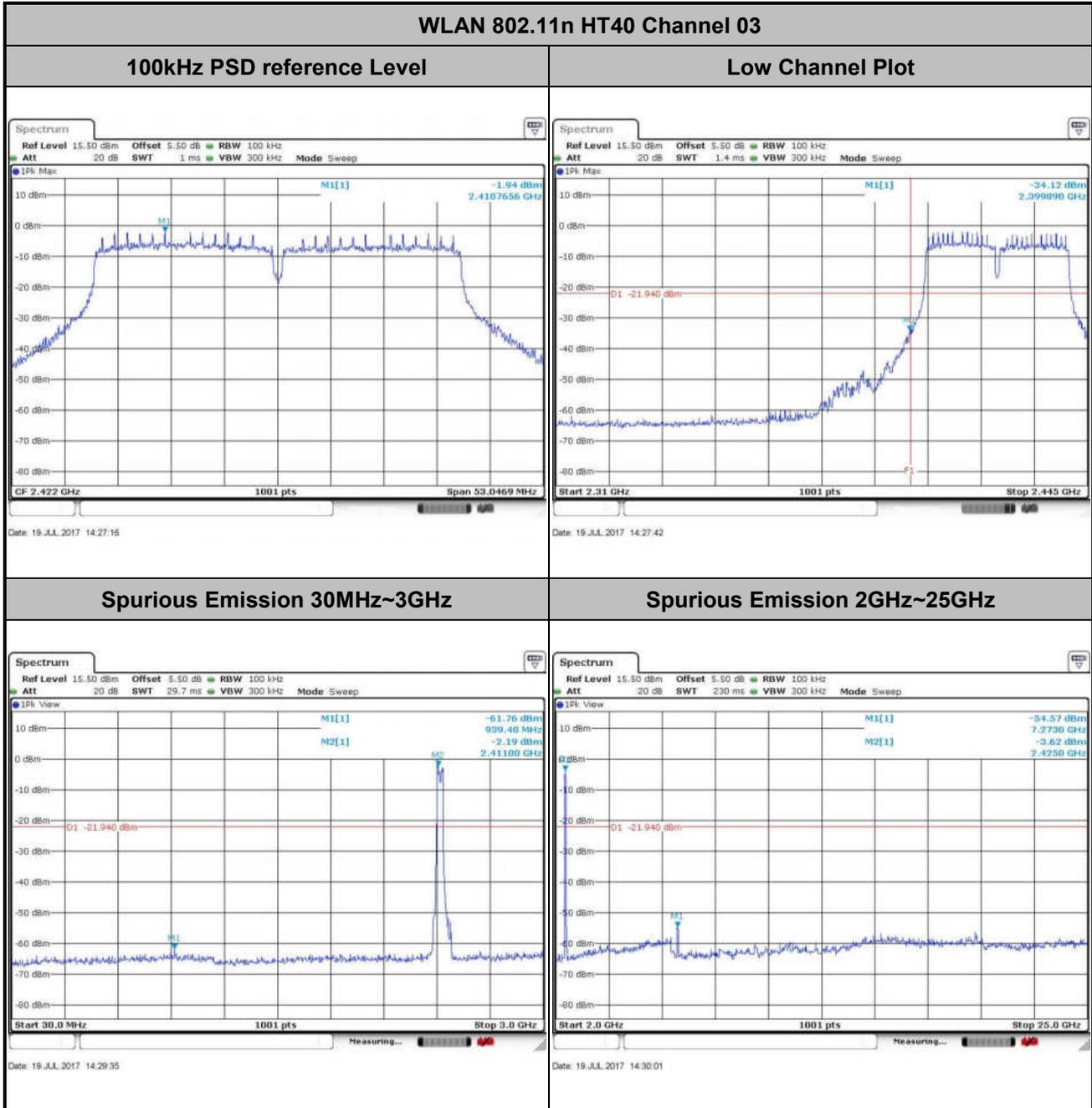
Spurious Emission 2GHz~25GHz



Date: 12.AUG.2017 15:21:22



Number of TX :	1	Ant. :	1
Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	49~55%
Test Channel :	03	Test Engineer :	Silent Hai

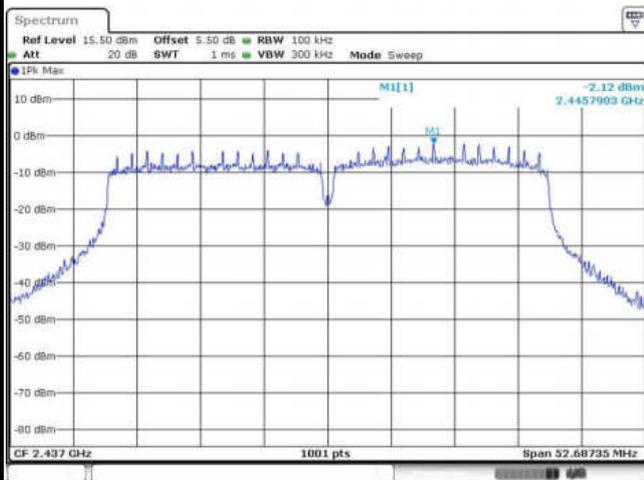




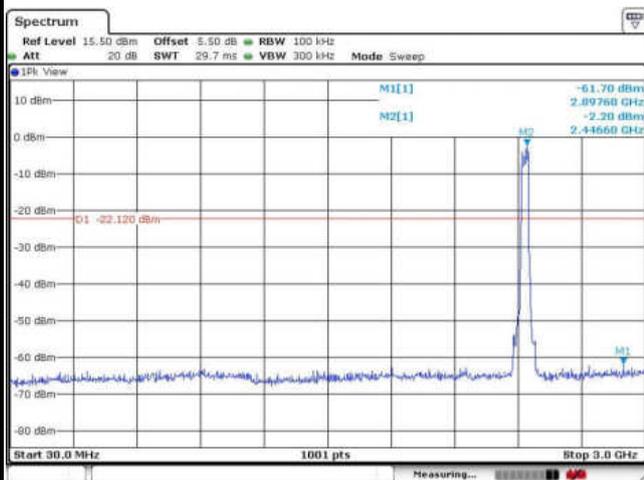
Number of TX :	1	Ant. :	1
Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	49~55%
Test Channel :	06	Test Engineer :	Silent Hai

WLAN 802.11n HT40 Channel 06

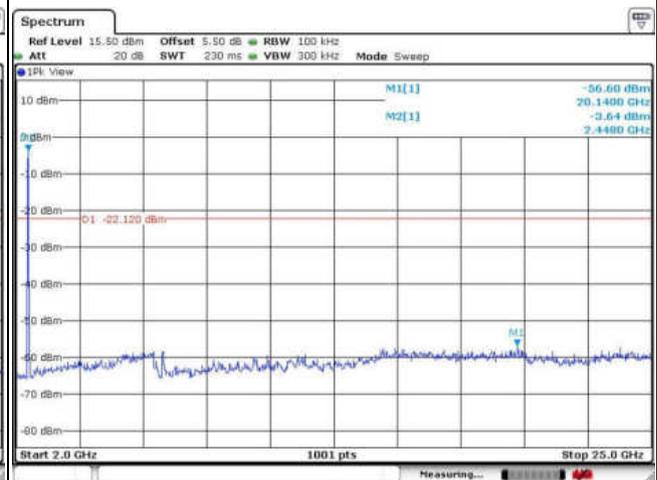
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz

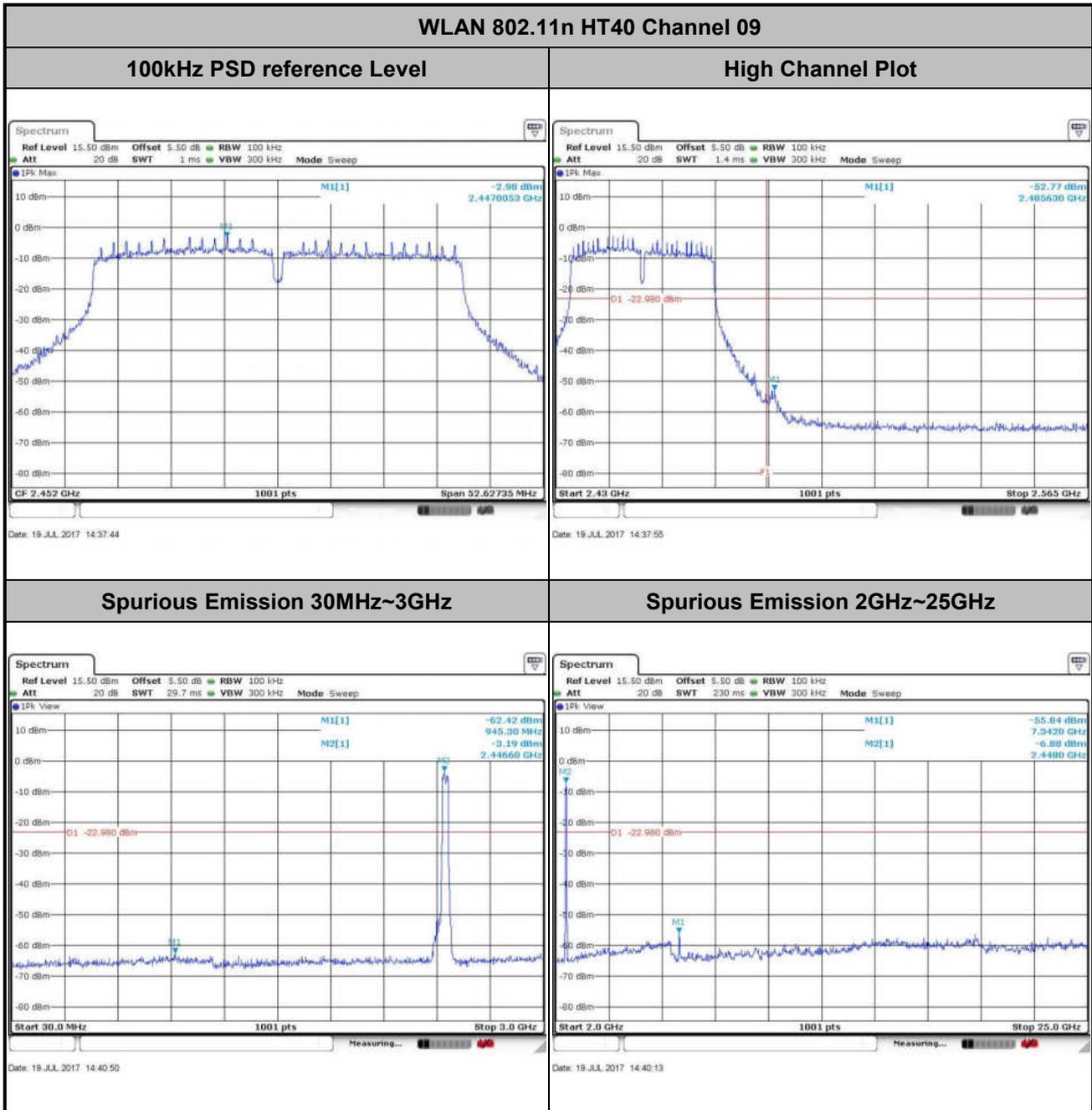


Spurious Emission 2GHz~25GHz





Number of TX :	1	Ant. :	1
Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	49~55%
Test Channel :	09	Test Engineer :	Silent Hai



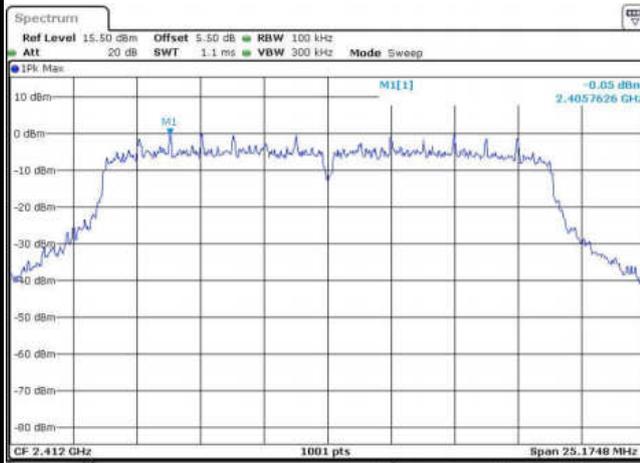


Number of TX = 2, Ant. 1 (Measured)

Number of TX :	2	Ant. :	1
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	49~55%
Test Channel :	01	Test Engineer :	Silent Hai

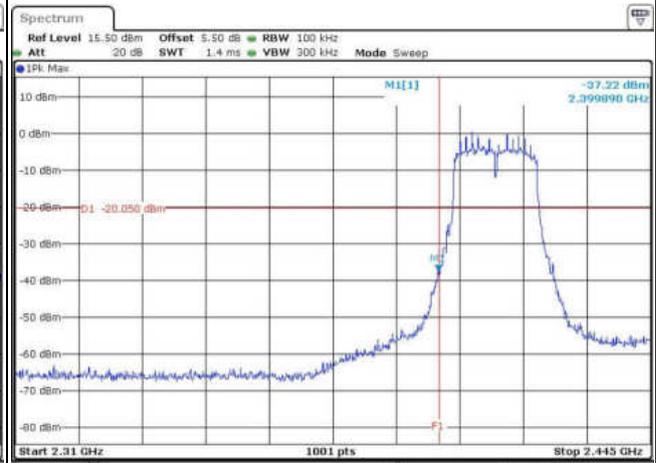
WLAN 802.11n HT20 Channel 01

100kHz PSD reference Level



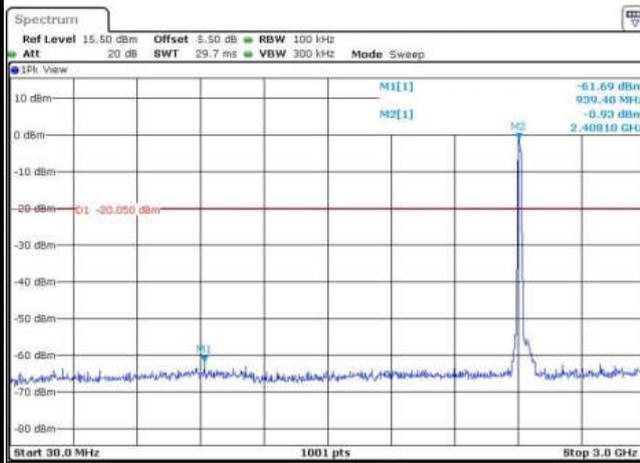
Date: 19.JUL.2017 14:46:31

Low Channel Plot



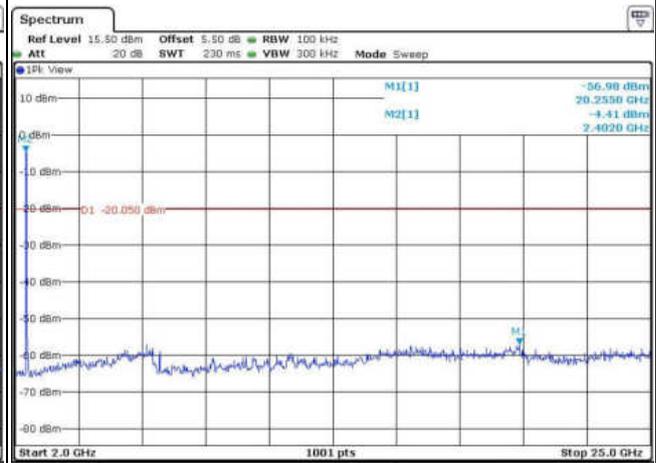
Date: 19.JUL.2017 14:47:12

Spurious Emission 30MHz~3GHz



Date: 19.JUL.2017 14:47:46

Spurious Emission 2GHz~25GHz



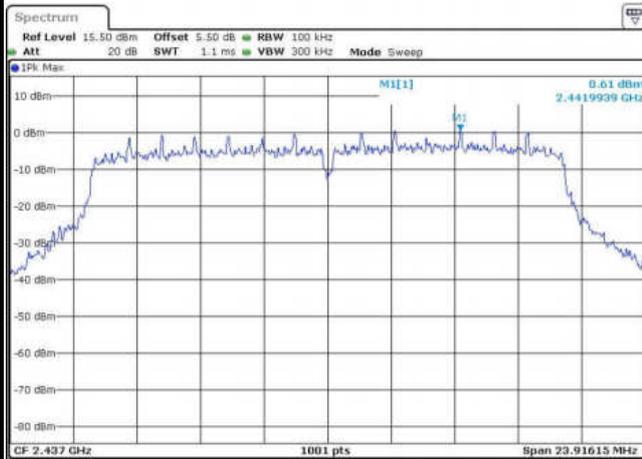
Date: 19.JUL.2017 14:48:40



Number of TX :	2	Ant. :	1
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	49~55%
Test Channel :	06	Test Engineer :	Silent Hai

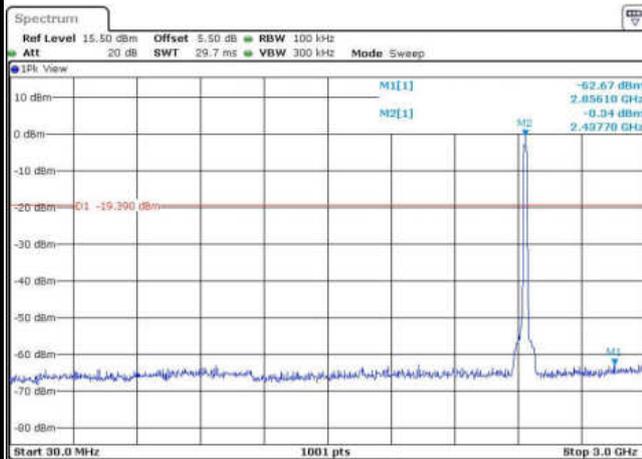
WLAN 802.11n HT20 Channel 06

100kHz PSD reference Level



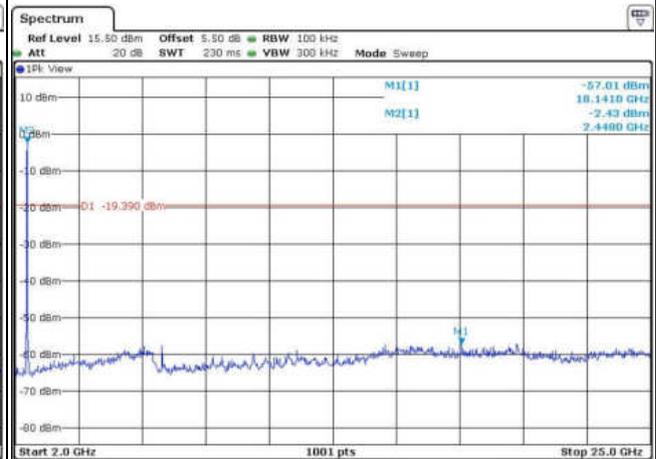
Date: 19.JUL.2017 14:51:01

Spurious Emission 30MHz~3GHz



Date: 19.JUL.2017 14:51:10

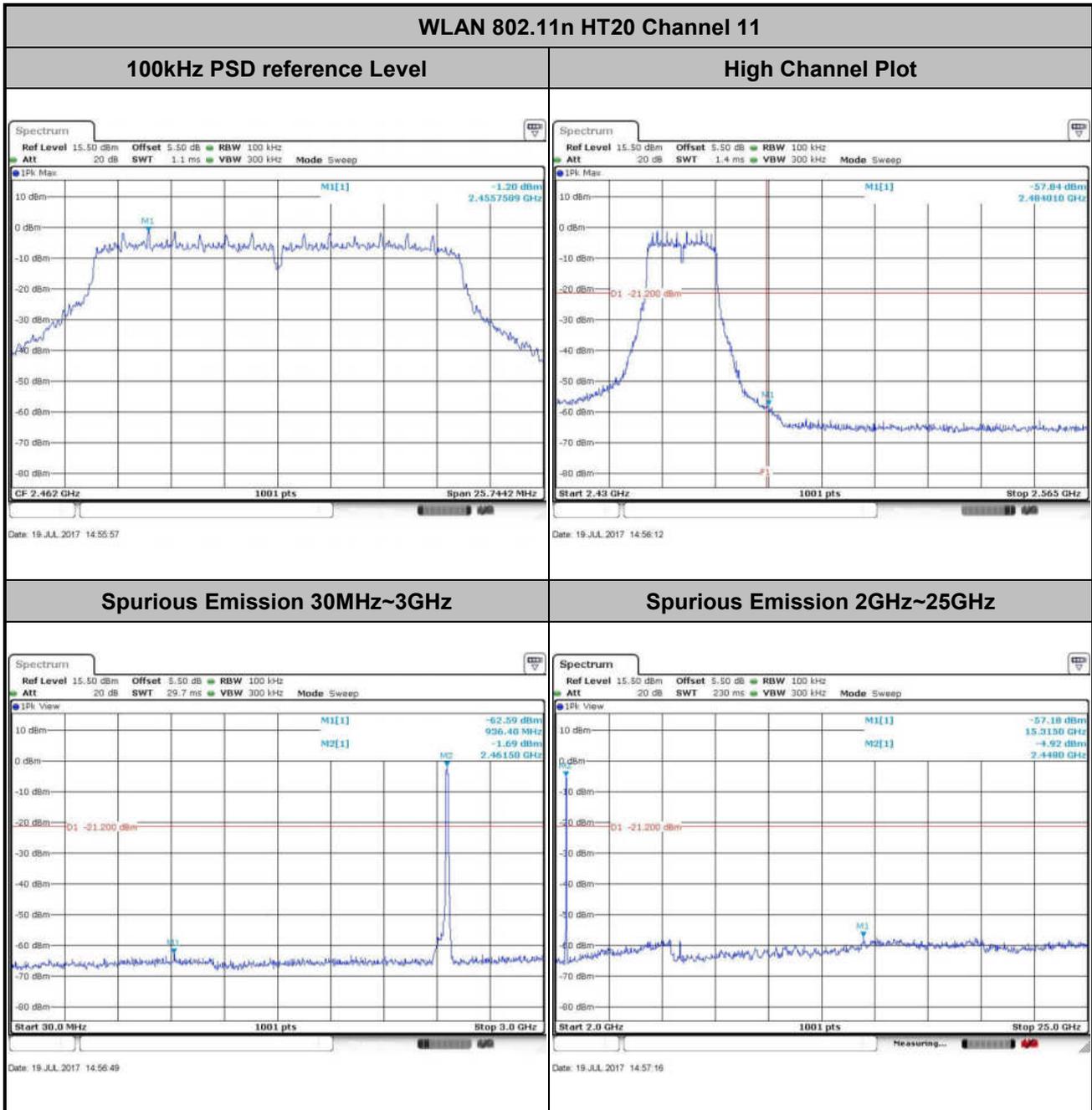
Spurious Emission 2GHz~25GHz



Date: 19.JUL.2017 14:51:46

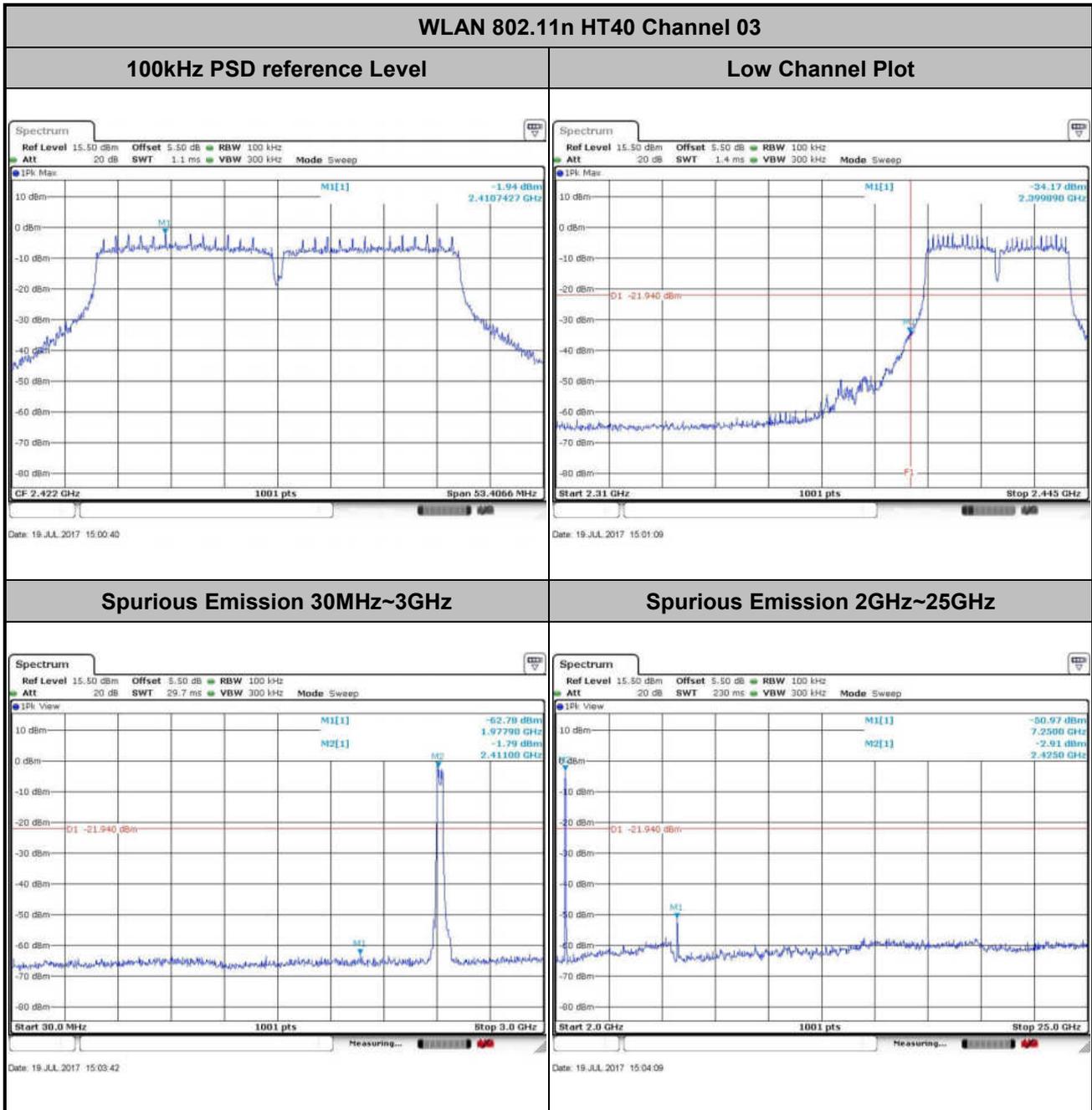


Number of TX :	2	Ant. :	1
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	49~55%
Test Channel :	11	Test Engineer :	Silent Hai





Number of TX :	2	Ant. :	1
Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	49~55%
Test Channel :	03	Test Engineer :	Silent Hai

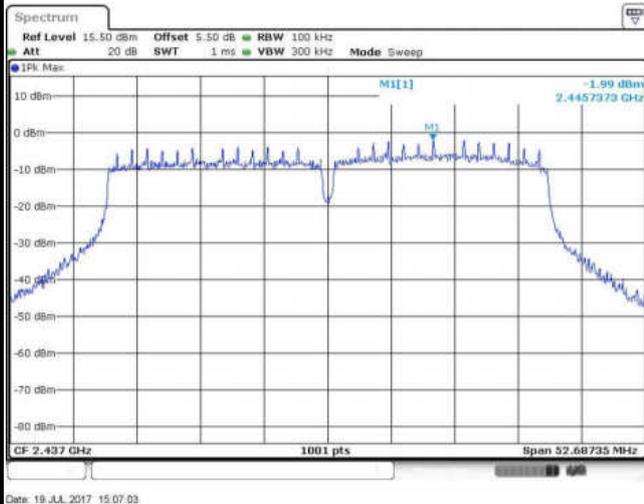




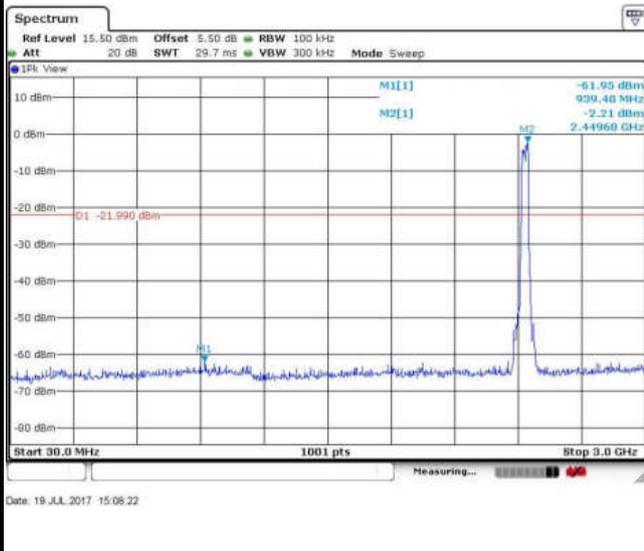
Number of TX :	2	Ant. :	1
Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	49~55%
Test Channel :	06	Test Engineer :	Silent Hai

WLAN 802.11n HT40 Channel 06

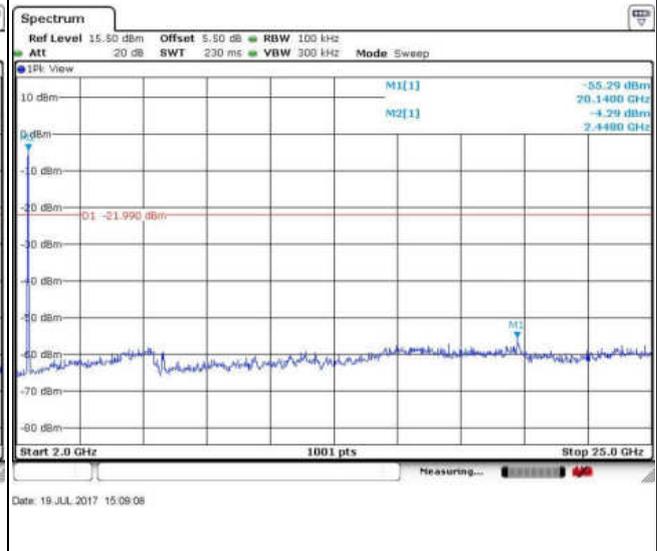
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz

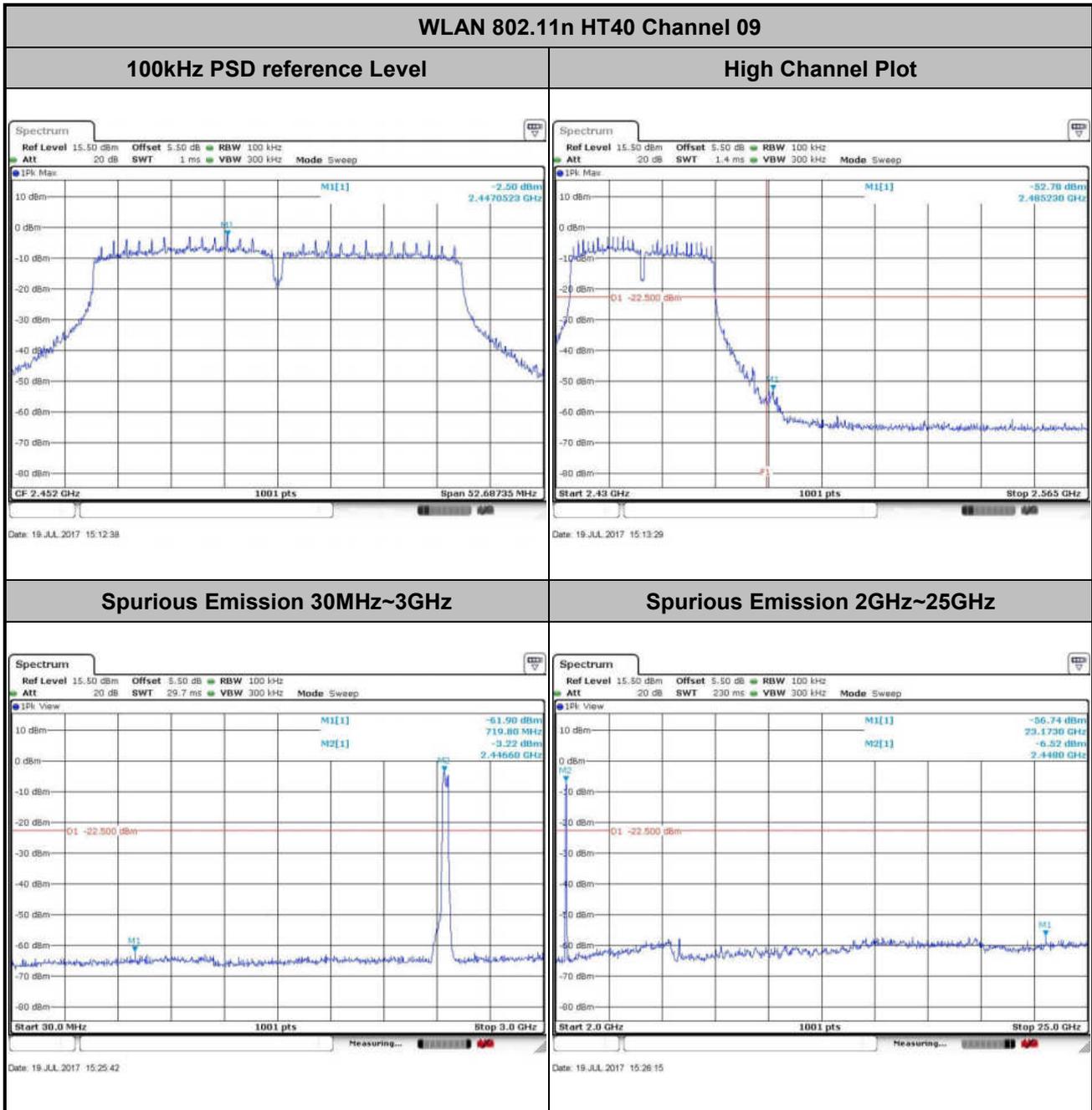


Spurious Emission 2GHz~25GHz





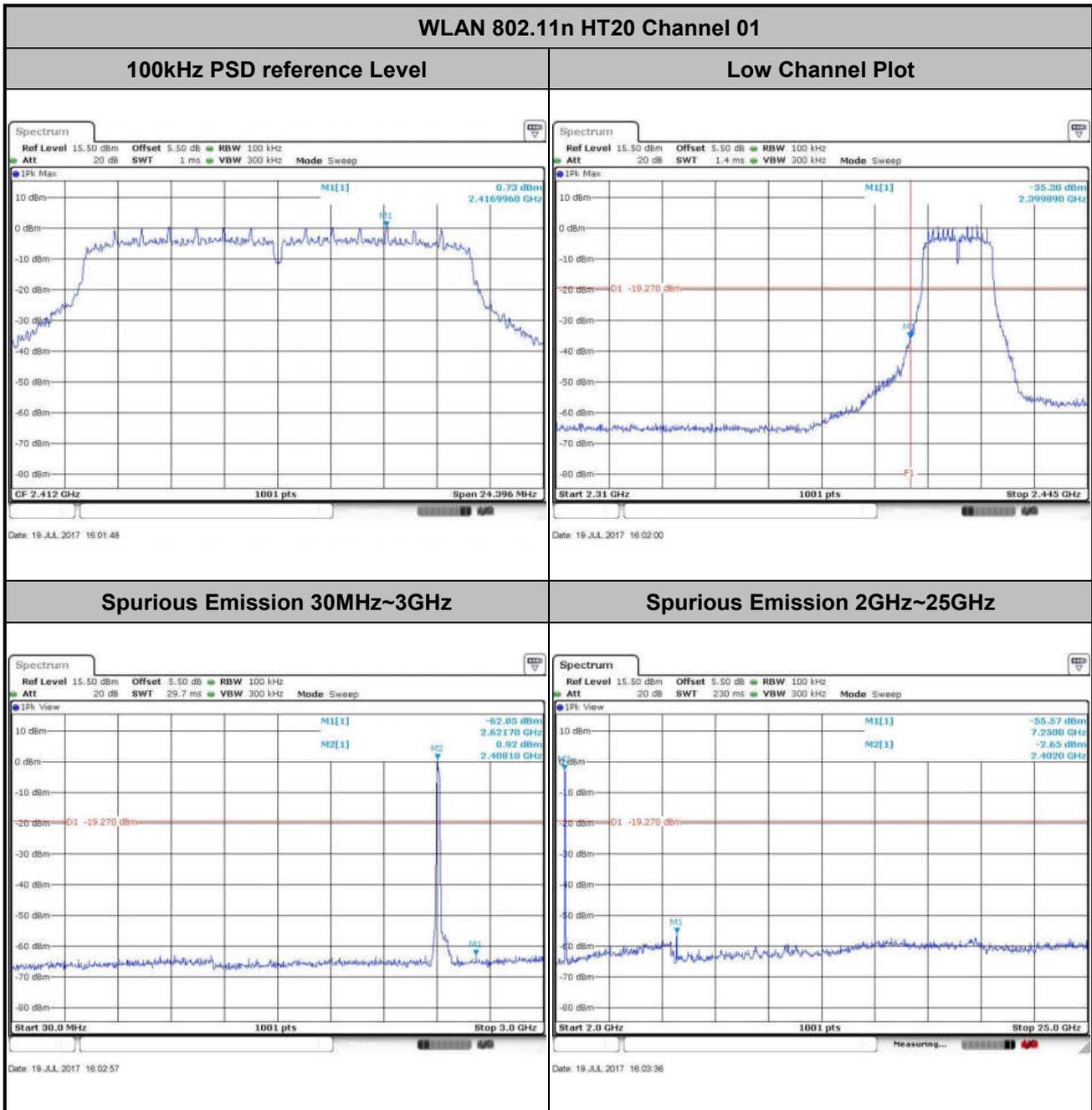
Number of TX :	2	Ant. :	1
Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	49~55%
Test Channel :	09	Test Engineer :	Silent Hai





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

Number of TX :	2	Ant. :	2
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	49~55%
Test Channel :	01	Test Engineer :	Silent Hai

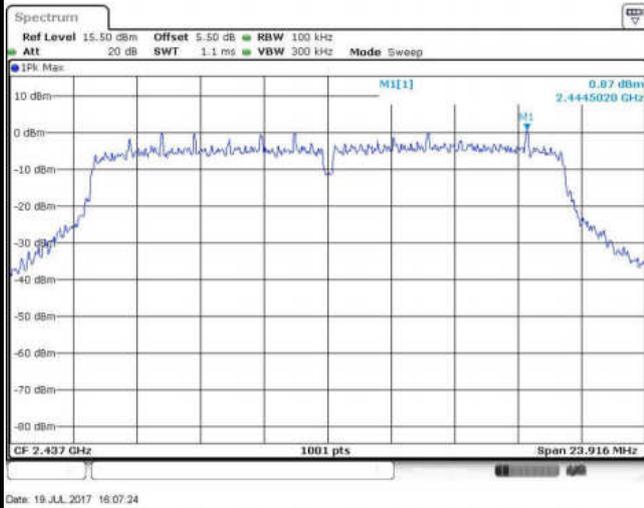




Number of TX :	2	Ant. :	2
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	49~55%
Test Channel :	06	Test Engineer :	Silent Hai

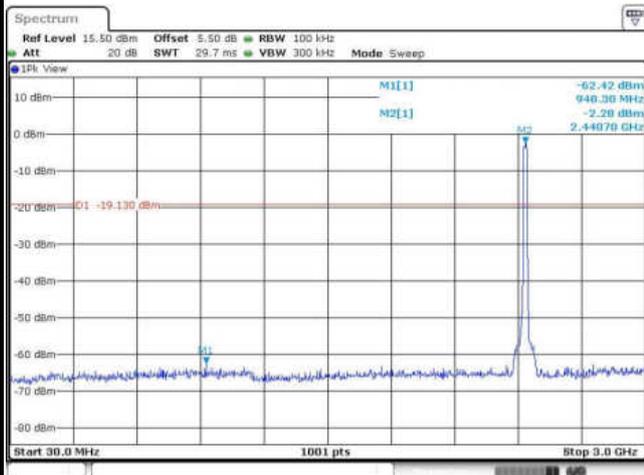
WLAN 802.11n HT20 Channel 06

100kHz PSD reference Level



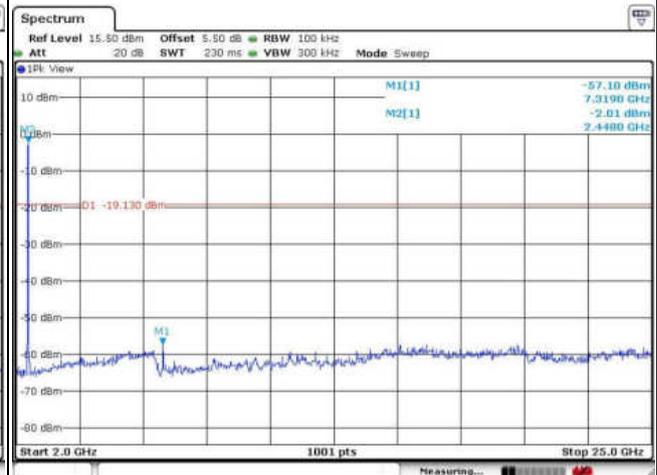
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Spurious Emission 30MHz~3GHz



Date: 19.JUL.2017 16:07:39

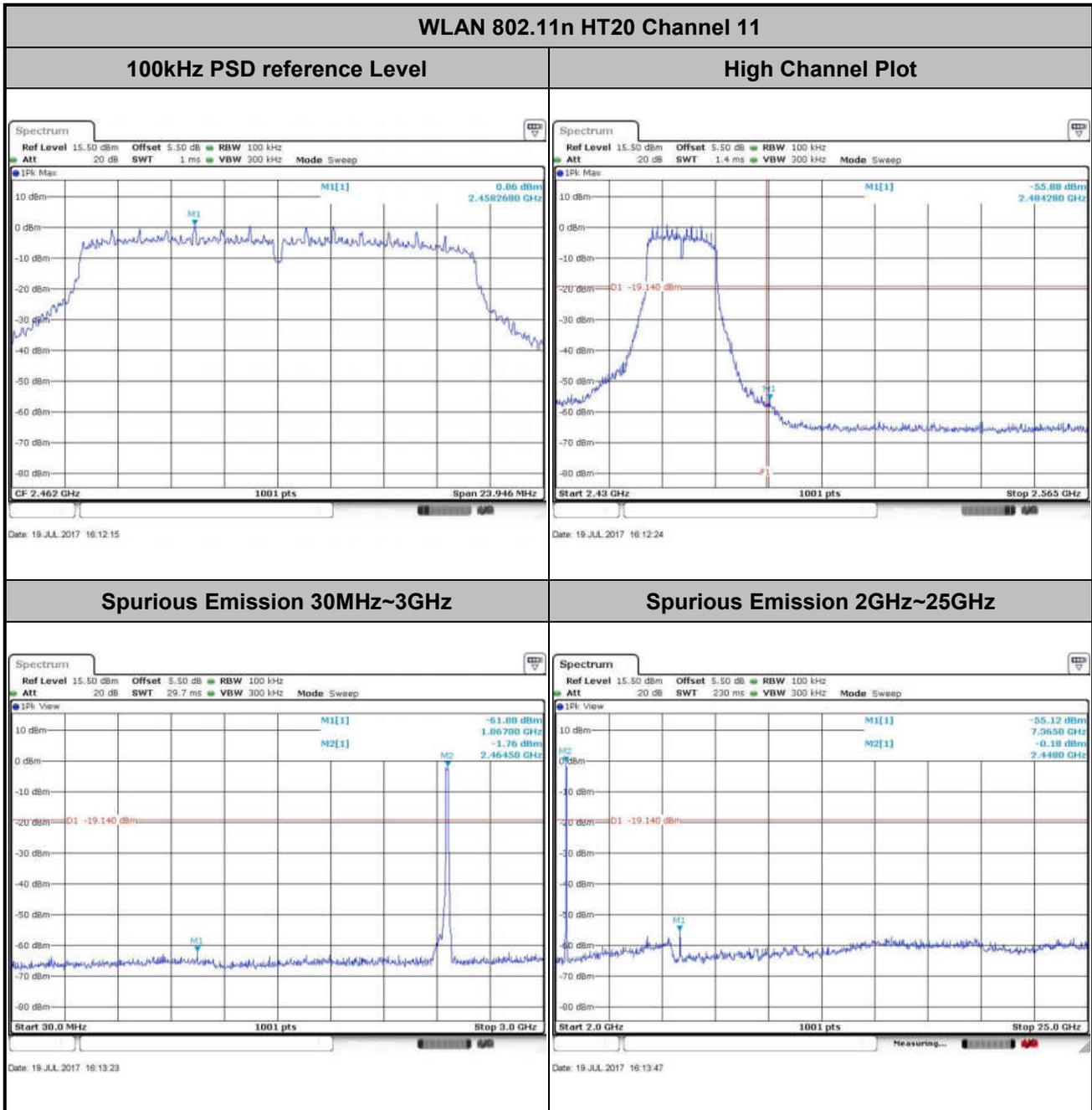
Spurious Emission 2GHz~25GHz



Date: 19.JUL.2017 16:08:28

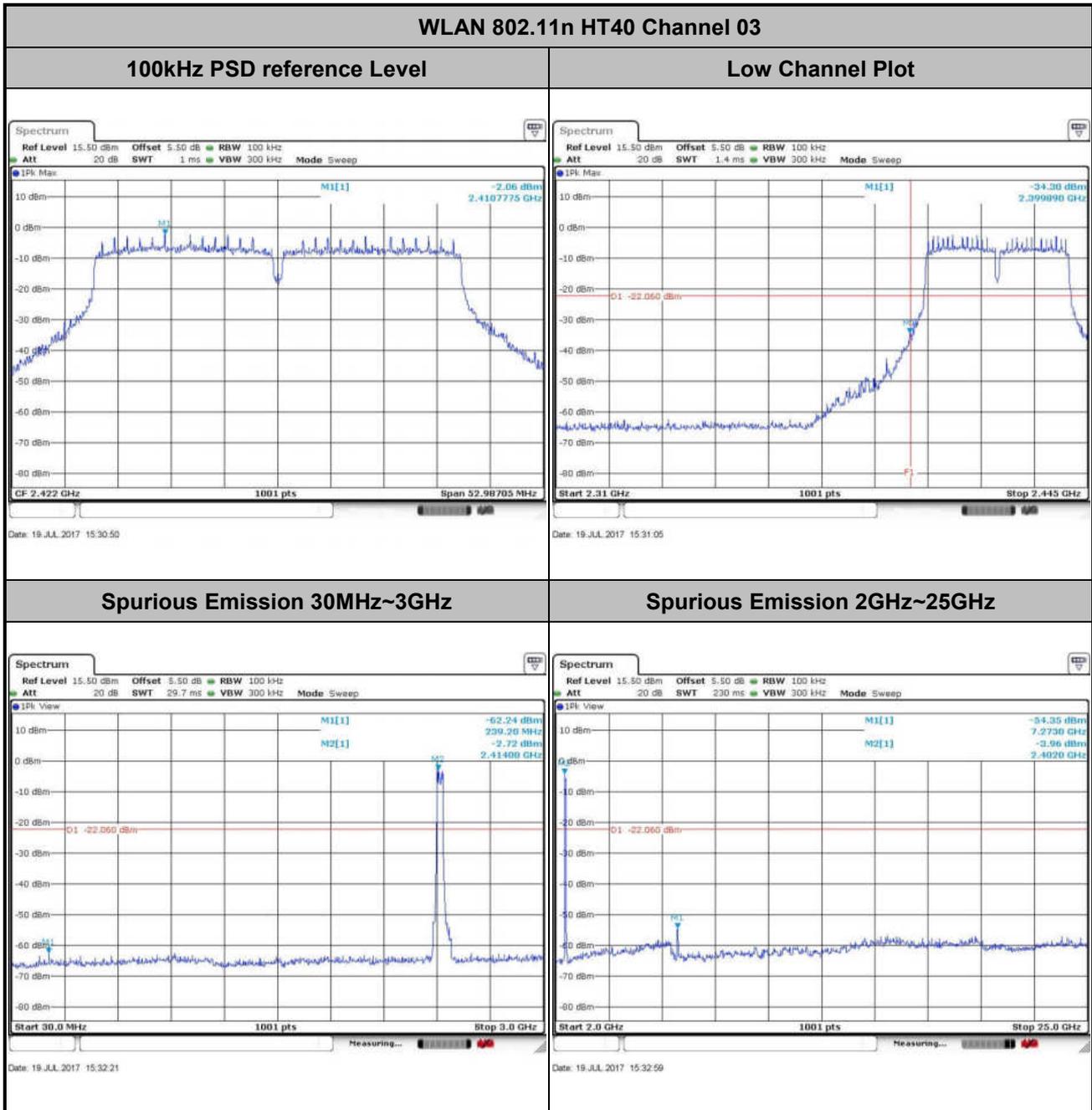


Number of TX :	2	Ant. :	2
Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	49~55%
Test Channel :	11	Test Engineer :	Silent Hai





Number of TX :	2	Ant. :	2
Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	49~55%
Test Channel :	03	Test Engineer :	Silent Hai

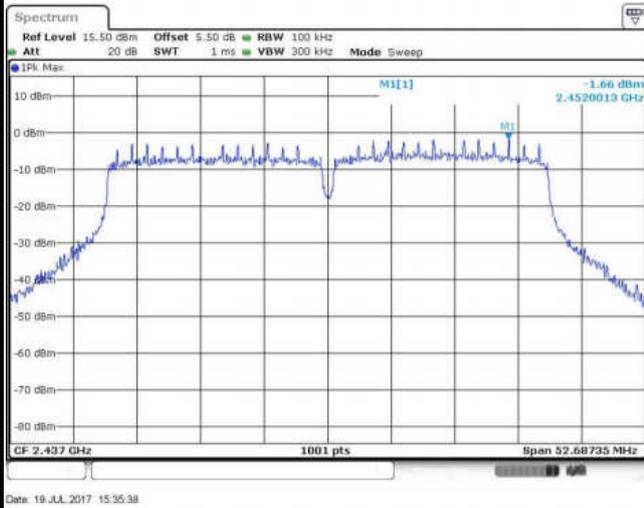




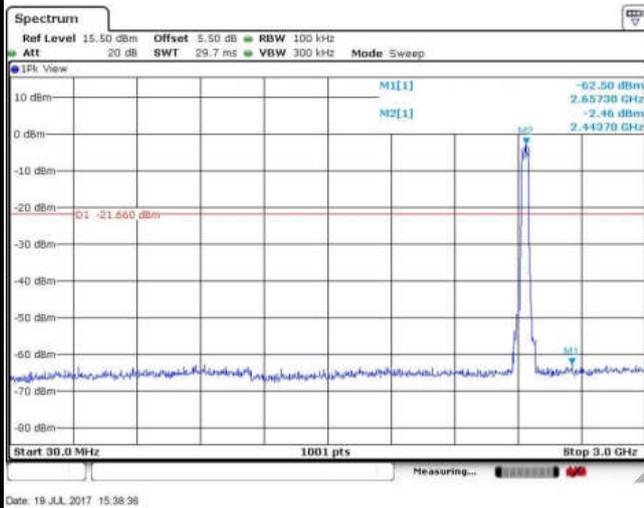
Number of TX :	2	Ant. :	2
Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	49~55%
Test Channel :	06	Test Engineer :	Silent Hai

WLAN 802.11n HT40 Channel 06

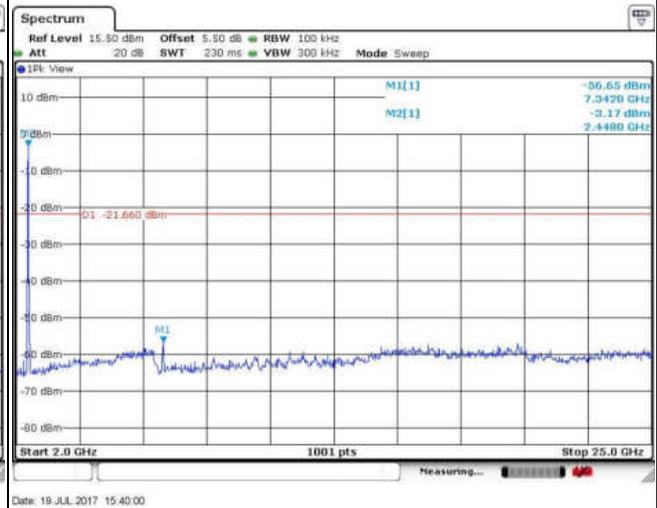
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz

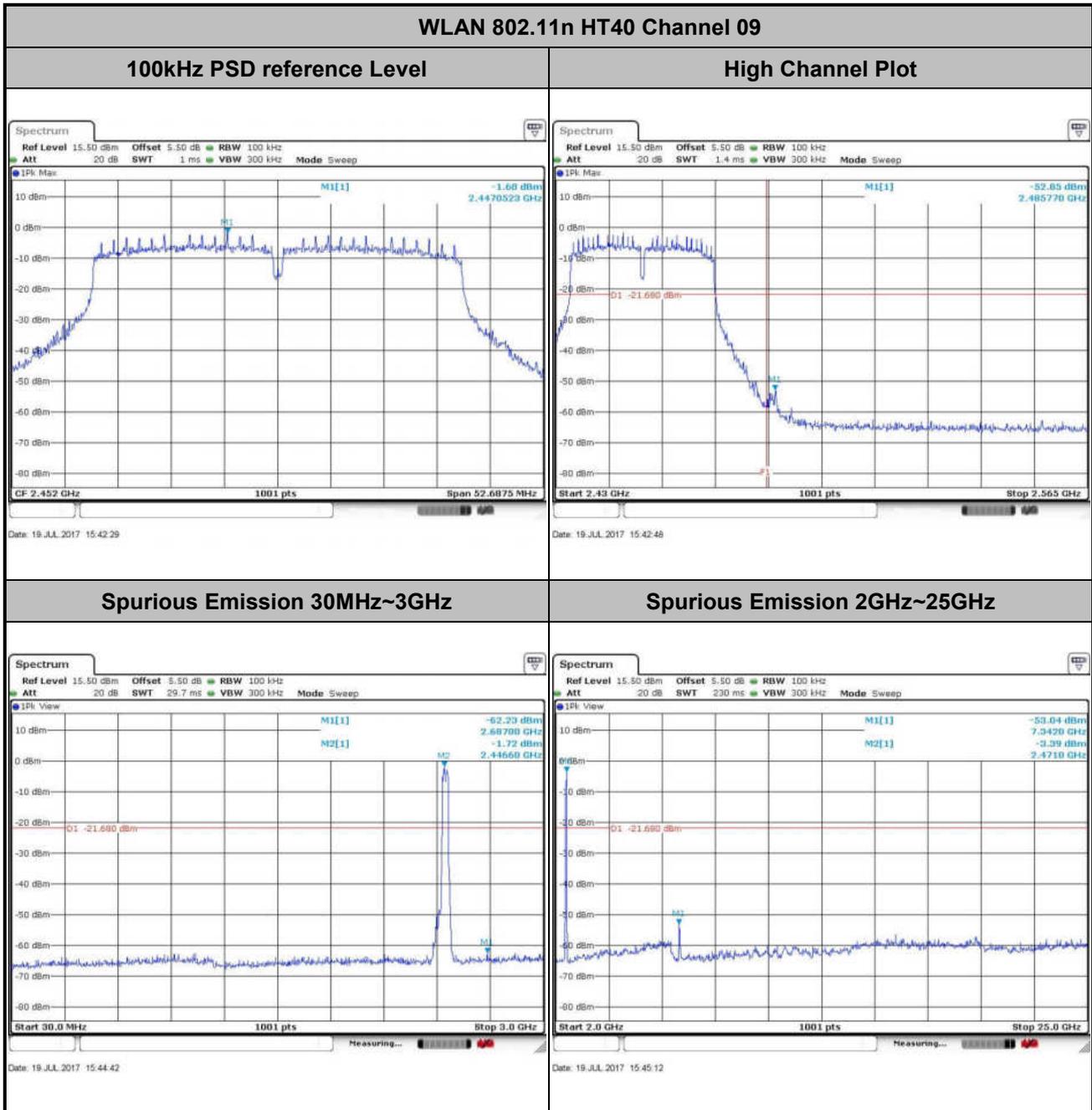


Spurious Emission 2GHz~25GHz





Number of TX :	2	Ant. :	2
Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	49~55%
Test Channel :	09	Test Engineer :	Silent Hai





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 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.

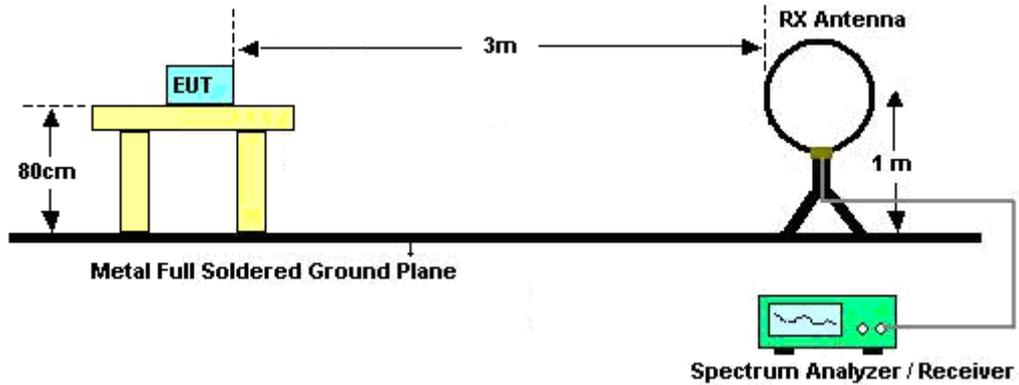


3.5.3 Test Procedures

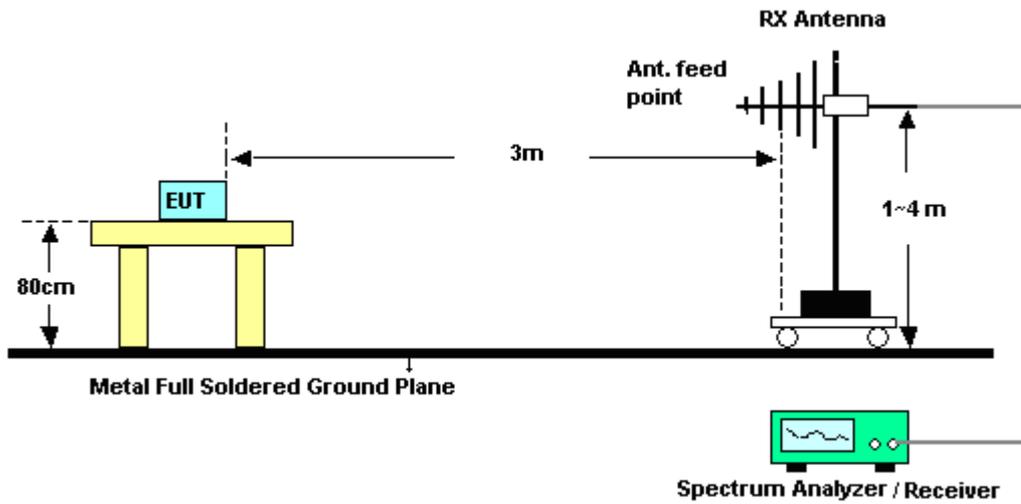
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test 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

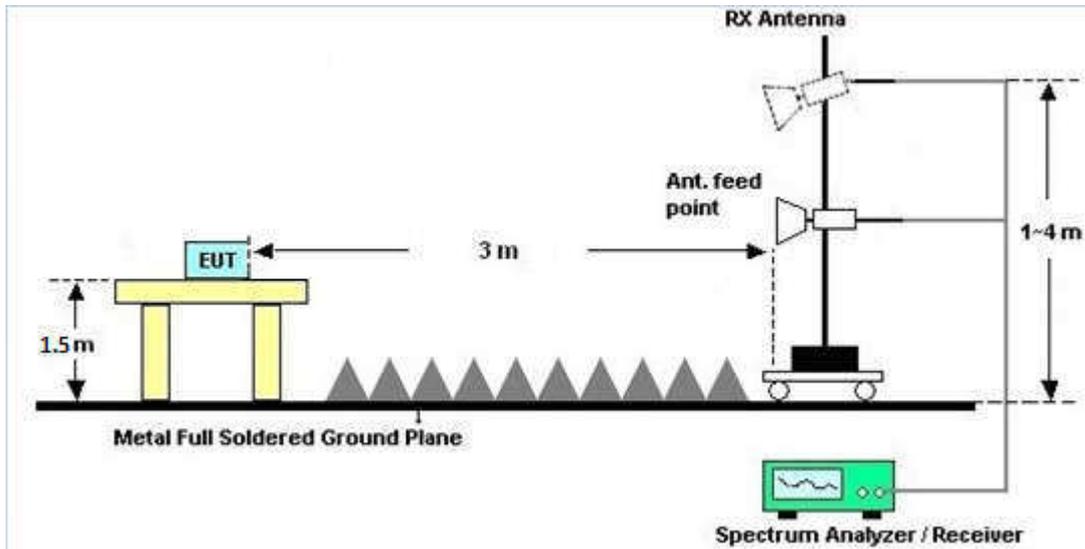
For radiated emissions below 30MHz



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 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.

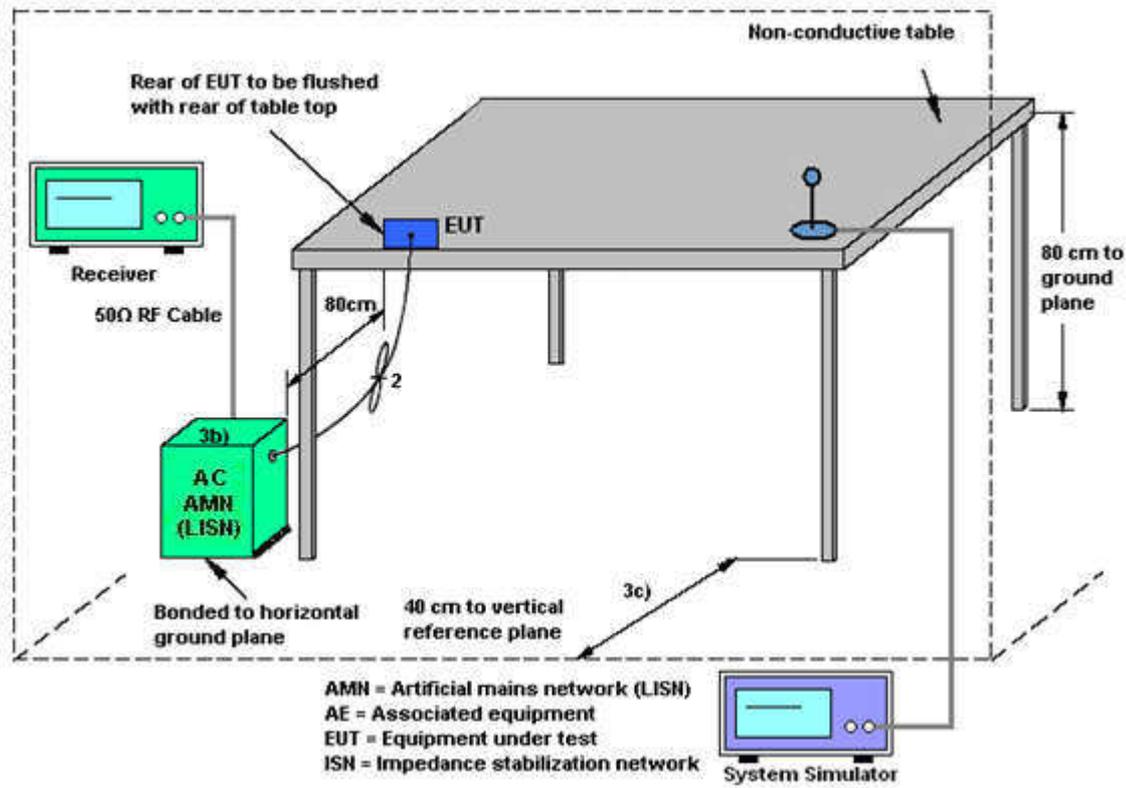
3.6.2 Measuring Instruments

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.

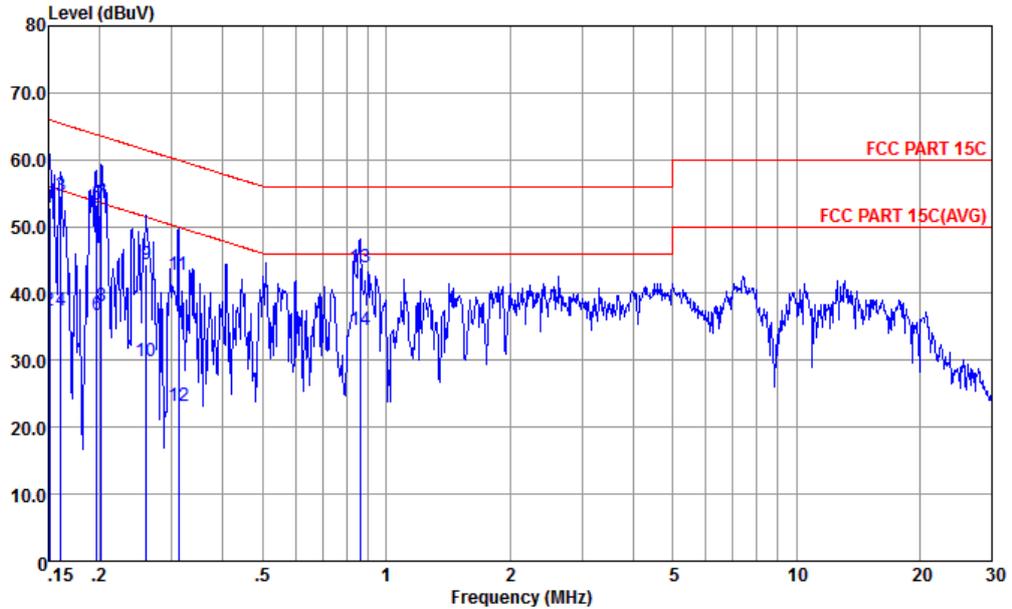
3.6.4 Test Setup





3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	22~24°C
Test Engineer :	Amos Zhang	Relative Humidity :	42~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link(2.4G) + Earphone + USB Cable (Charging from Adapter)		



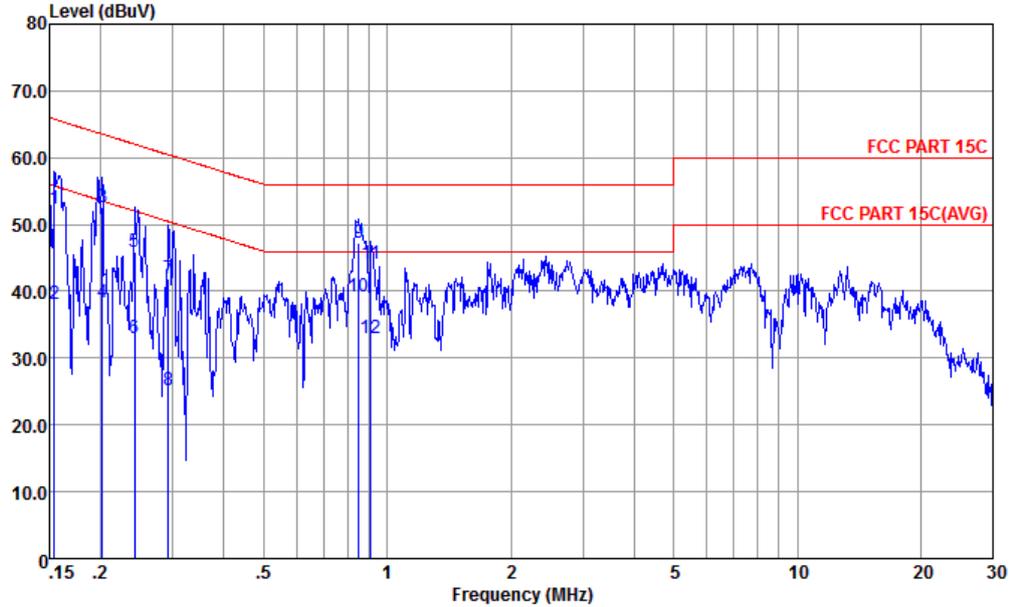
Site : CO01-KS
Condition : FCC PART 15C LISN-L-161017-060103 LINE

mode : Mode 1
: 865800030006719 #8

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.151	52.74	-13.22	65.96	41.80	0.55	10.39	QP
2	0.151	37.54	-18.42	55.96	26.60	0.55	10.39	Average
3	0.161	54.67	-10.76	65.43	43.80	0.49	10.38	QP
4	0.161	37.47	-17.96	55.43	26.60	0.49	10.38	Average
5	0.197	53.22	-10.54	63.76	42.59	0.29	10.34	QP
6	0.197	36.82	-16.94	53.76	26.19	0.29	10.34	Average
7 *	0.202	53.40	-10.14	63.54	42.80	0.27	10.33	QP
8	0.202	38.10	-15.44	53.54	27.50	0.27	10.33	Average
9	0.260	44.35	-17.07	61.42	33.80	0.27	10.28	QP
10	0.260	29.75	-21.67	51.42	19.20	0.27	10.28	Average
11	0.312	42.72	-17.21	59.93	32.20	0.27	10.25	QP
12	0.312	23.12	-26.81	49.93	12.60	0.27	10.25	Average
13	0.862	43.93	-12.07	56.00	33.49	0.26	10.18	QP
14	0.862	34.63	-11.37	46.00	24.19	0.26	10.18	Average



Test Mode :	Mode 1	Temperature :	22~24°C
Test Engineer :	Amos Zhang	Relative Humidity :	42~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 Idle + Bluetooth Link + WLAN Link(2.4G) + Earphone + USB Cable (Charging from Adapter)		



Site : CO01-KS
 Condition : FCC PART 15C LISN-N-161017-060103 NEUTRAL
 mode : Mode 1
 : 865800030006719 #8

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.154	52.33	-13.45	65.78	41.60	0.34	10.39	QP
2	0.154	38.03	-17.75	55.78	27.30	0.34	10.39	Average
3	0.202	52.56	-10.98	63.54	41.90	0.33	10.33	QP
4	0.202	38.26	-15.28	53.54	27.60	0.33	10.33	Average
5	0.242	45.84	-16.20	62.04	35.20	0.34	10.30	QP
6	0.242	32.94	-19.10	52.04	22.30	0.34	10.30	Average
7	0.292	41.91	-18.55	60.46	31.30	0.35	10.26	QP
8	0.292	25.21	-25.25	50.46	14.60	0.35	10.26	Average
9	0.853	47.17	-8.83	56.00	36.60	0.39	10.18	QP
10 *	0.853	39.17	-6.83	46.00	28.60	0.39	10.18	Average
11	0.914	44.08	-11.92	56.00	33.50	0.40	10.18	QP
12	0.914	32.88	-13.12	46.00	22.30	0.40	10.18	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 rule.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain = $G_{ANT} + \text{Array Gain}$, where Array Gain is as follows.

For power spectral density (PSD) measurements on all devices,

Array Gain = $10 \log(N_{ANT}/N_{SS}=1)$ dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$.

Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain;

The EUT supports CDD mode.

For power, the directional gain G_{ANT} is set equal to the antenna having the highest gain, i.e., F)2)f)i).

For PSD, the directional gain calculation is following F)2)f)ii) of KDB 662911 D01 v02r01.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain "DG" is calculated as following table.

	Ant. 1 (dBi)	Ant. 2 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
2.4 GHz	-4.15	3.57	3.57	3.55	0.00	0.00

$Power\ Limit\ Reduction = DG(Power) - 6dBi, (min = 0)$

$PSD\ Limit\ Reduction = DG(PSD) - 6dBi, (min = 0)$



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV30	101338	10Hz~30GHz	May 25, 2017	Jul. 19, 2017~ Aug. 12, 2017	May 24, 2018	Conducted (TH01-KS)
Pulse Power Sensor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 19, 2017	Jul. 19, 2017~ Aug. 12, 2017	Jan. 18, 2018	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 19, 2017	Jul. 19, 2017~ Aug. 12, 2017	Jan. 18, 2018	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY564000 04	3Hz~8.5GHz;M ax 30dBm	Oct. 22, 2016	Aug. 01, 2017	Oct. 21, 2017	Radiation (03CH03-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY551502 44	10Hz-44GHz	Apr. 18, 2017	Aug. 01, 2017	Apr. 17, 2018	Radiation (03CH03-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Nov. 23, 2016	Aug. 01, 2017	Nov. 22, 2017	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	35406	25MHz-2GHz	Apr. 22, 2017	Aug. 01, 2017	Apr. 21, 2018	Radiation (03CH03-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-135 6	1GHz~18GHz	Apr. 22, 2017	Aug. 01, 2017	Apr. 21, 2018	Radiation (03CH03-KS)
SHF-EHF Horn	com-power	AH-840	101070	18GHz ~40GHz	Oct. 19, 2016	Aug. 01, 2017	Oct. 18, 2017	Radiation (03CH03-KS)
Amplifier	com-power	PA-103A	161069	1MHz ~1000MHz / 32 dB	Apr. 18, 2017	Aug. 01, 2017	Apr. 17, 2018	Radiation (03CH03-KS)
Amplifier	MITEQ	TTA1840-35- HG	1887435	18~40GHz	Oct. 13, 2016	Aug. 01, 2017	Oct. 12, 2017	Radiation (03CH03-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	2025788	1Ghz-18Ghz	Apr. 18, 2017	Aug. 01, 2017	Apr. 17, 2018	Radiation (03CH03-KS)
Amplifier	Agilent	8449B	3008A023 70	1GHz~26.5GHz	Oct. 13, 2016	Aug. 01, 2017	Oct. 12, 2017	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F1040900 04	N/A	NCR	Aug. 01, 2017	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Aug. 01, 2017	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Aug. 01, 2017	NCR	Radiation (03CH03-KS)
EMI Receiver	R&S	ESC17	100768	9kHz~7GHz;	Apr. 20, 2017	Jul. 24, 2017	Apr. 19, 2018	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2016	Jul. 24, 2017	Oct. 12, 2017	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 13, 2016	Jul. 24, 2017	Oct. 12, 2017	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000 0811	AC 0V~300V, 45Hz~1000Hz	Oct. 13, 2016	Jul. 24, 2017	Oct. 12, 2017	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
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.6dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.5dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.7dB
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Appendix A. Conducted Test Results

Report Number : FR760101C

Test Engineer:	Silent Hai	Temperature:	21~25	°C
Test Date:	2017/7/19 ~ 2017/8/12	Relative Humidity:	49~55	%

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
					Ant 1	Ant 2	Ant 1	Ant 2		
11b	1Mbps	1	1	2412	12.99	-	8.03	-	0.50	Pass
11b	1Mbps	1	6	2437	13.19	-	8.05	-	0.50	Pass
11b	1Mbps	1	11	2462	12.94	-	8.05	-	0.50	Pass
11g	6Mbps	1	1	2412	17.03	-	15.80	-	0.50	Pass
11g	6Mbps	1	6	2437	17.08	-	15.92	-	0.50	Pass
11g	6Mbps	1	11	2462	17.03	-	15.72	-	0.50	Pass
HT20	MCS0	1	1	2412	18.03	-	16.88	-	0.50	Pass
HT20	MCS0	1	6	2437	18.13	-	15.96	-	0.50	Pass
HT20	MCS0	1	11	2462	18.23	-	17.12	-	0.50	Pass
HT40	MCS0	1	3	2422	36.56	-	35.36	-	0.50	Pass
HT40	MCS0	1	6	2437	36.46	-	35.12	-	0.50	Pass
HT40	MCS0	1	9	2452	36.26	-	35.08	-	0.50	Pass
HT20	MCS0	2	1	2412	18.03	18.08	16.78	16.26	0.50	Pass
HT20	MCS0	2	6	2437	18.08	18.13	15.94	15.94	0.50	Pass
HT20	MCS0	2	11	2462	18.18	18.03	17.16	15.96	0.50	Pass
HT40	MCS0	2	3	2422	36.66	36.46	35.60	35.32	0.50	Pass
HT40	MCS0	2	6	2437	36.46	36.46	35.12	35.12	0.50	Pass
HT40	MCS0	2	9	2452	36.36	36.06	35.12	35.13	0.50	Pass

TEST RESULTS DATA
Peak Output Power

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
					Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	Ant 1	Ant 2	
11b	1Mbps	1	1	2412	17.14	-		30.00	30.00	-4.15	3.57	12.99	-	36.00	36.00	Pass
11b	1Mbps	1	6	2437	17.81	-		30.00	30.00	-4.15	3.57	13.66	-	36.00	36.00	Pass
11b	1Mbps	1	11	2462	16.52	-		30.00	30.00	-4.15	3.57	12.37	-	36.00	36.00	Pass
11g	6Mbps	1	1	2412	18.76	-		30.00	30.00	-4.15	3.57	14.61	-	36.00	36.00	Pass
11g	6Mbps	1	6	2437	19.08	-		30.00	30.00	-4.15	3.57	14.93	-	36.00	36.00	Pass
11g	6Mbps	1	11	2462	17.81	-		30.00	30.00	-4.15	3.57	13.66	-	36.00	36.00	Pass
HT20	MCS0	1	1	2412	18.29	-		30.00	30.00	-4.15	3.57	14.14	-	36.00	36.00	Pass
HT20	MCS0	1	6	2437	18.36	-		30.00	30.00	-4.15	3.57	14.21	-	36.00	36.00	Pass
HT20	MCS0	1	11	2462	17.41	-		30.00	30.00	-4.15	3.57	13.26	-	36.00	36.00	Pass
HT40	MCS0	1	3	2422	19.04	-		30.00	30.00	-4.15	3.57	14.89	-	36.00	36.00	Pass
HT40	MCS0	1	6	2437	18.62	-		30.00	30.00	-4.15	3.57	14.47	-	36.00	36.00	Pass
HT40	MCS0	1	9	2452	18.06	-		30.00	30.00	-4.15	3.57	13.91	-	36.00	36.00	Pass
HT20	MCS0	2	1	2412	17.81	18.57	21.22	30.00		3.57		24.79		36.00		Pass
HT20	MCS0	2	6	2437	18.16	18.87	21.54	30.00		3.57		25.11		36.00		Pass
HT20	MCS0	2	11	2462	17.73	18.79	21.30	30.00		3.57		24.87		36.00		Pass
HT40	MCS0	2	3	2422	18.77	18.37	21.58	30.00		3.57		25.15		36.00		Pass
HT40	MCS0	2	6	2437	18.37	18.88	21.64	30.00		3.57		25.21		36.00		Pass
HT40	MCS0	2	9	2452	18.13	18.74	21.46	30.00		3.57		25.03		36.00		Pass

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

TEST RESULTS DATA
Average Output Power

2.4GHz Band									
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)		
					Ant 1	Ant 2	Ant 1	Ant 2	SUM
11b	1Mbps	1	1	2412	0.05	-	14.66	-	-
11b	1Mbps	1	6	2437	0.05	-	14.97	-	
11b	1Mbps	1	11	2462	0.05	-	14.12	-	
11g	6Mbps	1	1	2412	0.22	-	12.38	-	
11g	6Mbps	1	6	2437	0.22	-	12.85	-	
11g	6Mbps	1	11	2462	0.22	-	11.47	-	
HT20	MCS0	1	1	2412	0.22	-	11.68	-	
HT20	MCS0	1	6	2437	0.22	-	11.99	-	
HT20	MCS0	1	11	2462	0.22	-	10.92	-	
HT40	MCS0	1	3	2422	0.47	-	11.99	-	
HT40	MCS0	1	6	2437	0.47	-	11.56	-	
HT40	MCS0	1	9	2452	0.47	-	10.95	-	
HT20	MCS0	2	1	2412	0.25	0.25	11.13	11.92	
HT20	MCS0	2	6	2437	0.25	0.25	11.71	12.09	14.92
HT20	MCS0	2	11	2462	0.25	0.25	11.01	11.98	14.54
HT40	MCS0	2	3	2422	0.50	0.50	12.11	11.74	14.94
HT40	MCS0	2	6	2437	0.50	0.50	11.42	11.91	14.68
HT40	MCS0	2	9	2452	0.50	0.50	10.92	11.83	14.41

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

TEST RESULTS DATA
Peak Power Spectral 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
					Ant 1	Ant 2	Worse + 3.01	Ant 1	Ant 2	Ant 1	Ant 2	
11b	1Mbps	1	1	2412	-11.49	-	-	-4.15	3.57	8.00	8.00	Pass
11b	1Mbps	1	6	2437	-12.13	-		-4.15	3.57	8.00	8.00	Pass
11b	1Mbps	1	11	2462	-10.91	-		-4.15	3.57	8.00	8.00	Pass
11g	6Mbps	1	1	2412	-15.62	-		-4.15	3.57	8.00	8.00	Pass
11g	6Mbps	1	6	2437	-14.92	-		-4.15	3.57	8.00	8.00	Pass
11g	6Mbps	1	11	2462	-15.32	-		-4.15	3.57	8.00	8.00	Pass
HT20	MCS0	1	1	2412	-13.59	-		-4.15	3.57	8.00	8.00	Pass
HT20	MCS0	1	6	2437	-13.85	-		-4.15	3.57	8.00	8.00	Pass
HT20	MCS0	1	11	2462	-15.10	-		-4.15	3.57	8.00	8.00	Pass
HT40	MCS0	1	3	2422	-18.46	-		-4.15	3.57	8.00	8.00	Pass
HT40	MCS0	1	6	2437	-18.31	-		-4.15	3.57	8.00	8.00	Pass
HT40	MCS0	1	9	2452	-19.39	-		-4.15	3.57	8.00	8.00	Pass
HT20	MCS0	2	1	2412	-16.34	-15.22	-12.21	3.55		8.00		Pass
HT20	MCS0	2	6	2437	-15.52	-15.47	-12.46	3.55		8.00		Pass
HT20	MCS0	2	11	2462	-16.82	-15.45	-12.44	3.55		8.00		Pass
HT40	MCS0	2	3	2422	-17.27	-18.72	-14.26	3.55		8.00		Pass
HT40	MCS0	2	6	2437	-19.07	-17.47	-14.46	3.55		8.00		Pass
HT40	MCS0	2	9	2452	-19.60	-18.24	-15.23	3.55		8.00		Pass

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



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		2354.98	49.74	-24.26	74	55.27	25.55	5.43	36.51	269	236	P	H
		2389.17	38.42	-15.58	54	43.57	25.8	5.47	36.42	269	236	A	H
	*	2412	92.72	-	-	97.85	25.83	5.47	36.43	269	236	P	H
	*	2412	89.62	-	-	94.75	25.83	5.47	36.43	269	236	A	H
		2374.61	50	-24	74	55.34	25.67	5.45	36.46	277	329	P	V
		2389.56	38.32	-15.68	54	43.47	25.8	5.47	36.42	277	329	A	V
	*	2412	90.19	-	-	95.32	25.83	5.47	36.43	277	329	P	V
	*	2412	87.06	-	-	92.19	25.83	5.47	36.43	277	329	A	V
802.11b CH 06 2437MHz		2372.92	49.58	-24.42	74	54.92	25.67	5.45	36.46	268	235	P	H
		2389.82	38.3	-15.7	54	43.45	25.8	5.47	36.42	268	235	A	H
	*	2438	93.67	-	-	98.74	25.89	5.49	36.45	268	235	P	H
	*	2438	90.56	-	-	95.63	25.89	5.49	36.45	268	235	A	H
		2496.46	49.69	-24.31	74	54.68	25.97	5.52	36.48	268	235	P	H
		2486.74	38.44	-15.56	54	43.46	25.94	5.51	36.47	268	235	A	H
		2366.42	49.44	-24.56	74	54.97	25.55	5.43	36.51	252	326	P	V
		2388.91	38.27	-15.73	54	43.42	25.8	5.47	36.42	252	326	A	V
	*	2438	90.59	-	-	95.66	25.89	5.49	36.45	252	326	P	V
	*	2438	87.51	-	-	92.58	25.89	5.49	36.45	252	326	A	V
		2489.14	49.55	-24.45	74	54.54	25.97	5.52	36.48	252	326	P	V
	2486.38	38.38	-15.62	54	43.4	25.94	5.51	36.47	252	326	A	V	



802.11b CH 11 2462MHz	*	2464	94.65	-	-	99.7	25.91	5.5	36.46	256	235	P	H
	*	2464	91.69	-	-	96.74	25.91	5.5	36.46	256	235	A	H
		2487.1	50.74	-23.26	74	55.76	25.94	5.51	36.47	256	235	P	H
		2484.04	40.1	-13.9	54	45.12	25.94	5.51	36.47	256	235	A	H
	*	2464	91.14	-	-	96.19	25.91	5.5	36.46	241	334	P	V
	*	2464	88.18	-	-	93.23	25.91	5.5	36.46	241	334	A	V
		2499.1	50.26	-23.74	74	55.25	25.97	5.52	36.48	241	334	P	V
		2483.74	39.09	-14.91	54	44.11	25.94	5.51	36.47	241	334	A	V
Remark	<ol style="list-style-type: none"> No other spurious found. All results are PASS against Peak and Average limit line. 												



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

Table with 14 columns: 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). Rows include data for 802.11b CH 01 (2412MHz), CH 06 (2437MHz), and CH 11 (2462MHz).

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		2384.1	49.83	-24.17	74	55.17	25.67	5.45	36.46	313	39	P	H
		2389.82	39.96	-14.04	54	45.11	25.8	5.47	36.42	313	39	A	H
	*	2410	91.41	-	-	96.54	25.83	5.47	36.43	313	39	P	H
	*	2410	83.45	-	-	88.58	25.83	5.47	36.43	313	39	A	H
		2366.16	49.32	-24.68	74	54.85	25.55	5.43	36.51	100	126	P	V
		2389.3	39.07	-14.93	54	44.22	25.8	5.47	36.42	100	126	A	V
	*	2410	91.46	-	-	96.59	25.83	5.47	36.43	100	126	P	V
	*	2408	83.34	-	-	88.47	25.83	5.47	36.43	100	126	A	V
802.11g CH 06 2437MHz		2371.88	49.95	-24.05	74	55.29	25.67	5.45	36.46	100	315	P	H
		2380.98	39.15	-14.85	54	44.49	25.67	5.45	36.46	100	315	A	H
	*	2444	93.91	-	-	98.98	25.89	5.49	36.45	100	315	P	H
	*	2444	85.67	-	-	90.74	25.89	5.49	36.45	100	315	A	H
		2497.72	50	-24	74	54.99	25.97	5.52	36.48	100	315	P	H
		2490.16	39.21	-14.79	54	44.2	25.97	5.52	36.48	100	315	A	H
		2351.34	49.43	-24.57	74	55.15	25.42	5.41	36.55	100	125	P	V
		2383.58	39.16	-14.84	54	44.5	25.67	5.45	36.46	100	125	A	V
	*	2444	94.85	-	-	99.92	25.89	5.49	36.45	100	125	P	V
	*	2444	86.75	-	-	91.82	25.89	5.49	36.45	100	125	A	V
		2496.28	49.55	-24.45	74	54.54	25.97	5.52	36.48	100	125	P	V
		2487.76	39.3	-14.7	54	44.29	25.97	5.52	36.48	100	125	A	V



802.11g CH 11 2462MHz	*	2468	91.98	-	-	97.03	25.91	5.5	36.46	100	316	P	H
	*	2468	84.49	-	-	89.54	25.91	5.5	36.46	100	316	A	H
		2489.26	49.79	-24.21	74	54.78	25.97	5.52	36.48	100	316	P	H
		2494.18	39.39	-14.61	54	44.38	25.97	5.52	36.48	100	316	A	H
	*	2470	92.46	-	-	97.51	25.91	5.5	36.46	100	117	P	V
	*	2468	84.86	-	-	89.91	25.91	5.5	36.46	100	117	A	V
		2491.96	49.69	-24.31	74	54.68	25.97	5.52	36.48	100	117	P	V
		2492.08	39.4	-14.6	54	44.39	25.97	5.52	36.48	100	117	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)

Table with 14 columns: 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). Rows include data for CH 01 (2412MHz) and CH 06 (2437MHz).



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+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT20 CH 01 2412MHz		2389.82	50.6	-23.4	74	55.75	25.8	5.47	36.42	300	258	P	H
		2389.95	40.05	-13.95	54	45.2	25.8	5.47	36.42	300	258	A	H
	*	2414	98.02	-	-	103.15	25.83	5.47	36.43	300	258	P	H
	*	2408	89.69	-	-	94.82	25.83	5.47	36.43	300	258	A	H
		2388.78	51.21	-22.79	74	56.36	25.8	5.47	36.42	336	323	P	V
		2389.82	40.69	-13.31	54	45.84	25.8	5.47	36.42	336	323	A	V
	*	2408	102.63	-	-	107.76	25.83	5.47	36.43	336	323	P	V
	*	2408	94.07	-	-	99.2	25.83	5.47	36.43	336	323	A	V
802.11n HT20 CH 06 2437MHz		2386.44	49.18	-24.82	74	54.33	25.8	5.47	36.42	322	249	P	H
		2389.17	39.49	-14.51	54	44.64	25.8	5.47	36.42	322	249	A	H
	*	2442	99.97	-	-	105.04	25.89	5.49	36.45	322	249	P	H
	*	2444	92.15	-	-	97.22	25.89	5.49	36.45	322	249	A	H
		2484.46	50.27	-23.73	74	55.29	25.94	5.51	36.47	322	249	P	H
		2484.16	39.5	-14.5	54	44.52	25.94	5.51	36.47	322	249	A	H
		2377.47	49.54	-24.46	74	54.88	25.67	5.45	36.46	300	312	P	V
		2389.43	39.53	-14.47	54	44.68	25.8	5.47	36.42	300	312	A	V
	*	2442	103.32	-	-	108.39	25.89	5.49	36.45	300	312	P	V
	*	2440	95.6	-	-	100.67	25.89	5.49	36.45	300	312	A	V
	2483.74	50.05	-23.95	74	55.07	25.94	5.51	36.47	300	312	P	V	
	2483.86	39.76	-14.24	54	44.78	25.94	5.51	36.47	300	312	A	V	



802.11n HT20 CH 11 2462MHz	*	2464	99.17	-	-	104.22	25.91	5.5	36.46	306	248	P	H
	*	2466	91.47	-	-	96.52	25.91	5.5	36.46	306	248	A	H
		2484.64	50.6	-23.4	74	55.62	25.94	5.51	36.47	306	248	P	H
		2484.52	40.25	-13.75	54	45.27	25.94	5.51	36.47	306	248	A	H
	*	2466	103.06	-	-	108.11	25.91	5.5	36.46	303	315	P	V
	*	2466	94.81	-	-	99.86	25.91	5.5	36.46	303	315	A	V
		2484.34	50.71	-23.29	74	55.73	25.94	5.51	36.47	303	315	P	V
		2483.8	40.89	-13.11	54	45.91	25.94	5.51	36.47	303	315	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+2	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	40.53	-33.47	74	38.64	30.68	7.72	36.51	100	360	P	H
		4824	40.12	-33.88	74	38.23	30.68	7.72	36.51	100	360	P	V
802.11n HT20 CH 06 2437MHz		4872	40.93	-33.07	74	38.85	30.85	7.76	36.53	100	360	P	H
		7308	47	-27	74	38.68	34.81	9.76	36.25	100	360	P	H
		4872	41.49	-32.51	74	39.41	30.85	7.76	36.53	100	360	P	V
		7308	46.56	-27.44	74	38.24	34.81	9.76	36.25	100	360	P	V
802.11n HT20 CH 11 2462MHz		4926	41.85	-32.15	74	39.59	31.02	7.8	36.56	100	360	P	H
		7386	45.83	-28.17	74	37.22	35.03	9.86	36.28	100	360	P	H
		4926	41.38	-32.62	74	39.12	31.02	7.8	36.56	100	360	P	V
		7386	47.06	-26.94	74	38.45	35.03	9.86	36.28	100	360	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



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

Table with 14 columns: WIFI Ant. 1+2, 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). Rows include data for 802.11n HT40 CH 03 (2422MHz) and 802.11n HT40 CH 06 (2437MHz).



802.11n HT40 CH 09 2452MHz		2378.64	50.1	-23.9	74	55.44	25.67	5.45	36.46	328	40	P	H
		2362.39	39.94	-14.06	54	45.47	25.55	5.43	36.51	328	40	A	H
	*	2444	94.74	-	-	99.81	25.89	5.49	36.45	328	40	P	H
	*	2444	87.25	-	-	92.32	25.89	5.49	36.45	328	40	A	H
		2484.76	54.98	-19.02	74	60	25.94	5.51	36.47	328	40	P	H
		2484.4	41.22	-12.78	54	46.24	25.94	5.51	36.47	328	40	A	H
		2385.4	55.88	-18.12	74	61.22	25.67	5.45	36.46	281	294	P	V
		2387.61	41.69	-12.31	54	46.84	25.8	5.47	36.42	281	294	A	V
	*	2448	100.18	-	-	105.25	25.89	5.49	36.45	281	294	P	V
	*	2444	92.93	-	-	98	25.89	5.49	36.45	281	294	A	V
		2485.18	61.88	-12.12	74	66.9	25.94	5.51	36.47	281	294	P	V
		2485.12	44.31	-9.69	54	49.33	25.94	5.51	36.47	281	294	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)

Table with 14 columns: WIFI Ant. 1+2, 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). Rows include data for 802.11n HT40 CH 03 (2422MHz) and 802.11n HT40 CH 06 (2437MHz).

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+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11n HT40 LF		34.85	30.71	-9.29	40	36.8	25.5	0.71	32.3	100	360	P	H
		52.31	30.53	-9.47	40	46.42	15.5	0.87	32.26	-	-	P	H
		103.72	32.19	-11.31	43.5	44.41	18.82	1.23	32.27	-	-	P	H
		191.02	35.79	-7.71	43.5	50.2	16.17	1.68	32.26	-	-	P	H
		282.2	29.85	-16.15	46	41.61	18.33	1.99	32.08	-	-	P	H
		848.68	29.88	-16.12	46	28.73	28.98	3.71	31.54	-	-	P	H
		36.79	35.31	-4.69	40	42.66	24.18	0.73	32.26	-	-	P	V
		61.04	35.35	-4.65	40	53.58	13.06	0.93	32.22	100	101	P	V
		95.96	30.97	-12.53	43.5	43.46	18.58	1.18	32.25	-	-	P	V
		191.99	30.83	-12.67	43.5	45.27	16.13	1.69	32.26	-	-	P	V
		676.99	27.38	-18.62	46	29.6	26.19	3.28	31.69	-	-	P	V
	847.71	29.82	-16.18	46	28.69	28.96	3.71	31.54	-	-	P	V	
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



2.4GHz 2400~2483.5MHz

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	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.	
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

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

For Peak Limit @ 2390MHz:

- 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)
- Over Limit(dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

For Average Limit @ 2390MHz:

- 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)
- 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

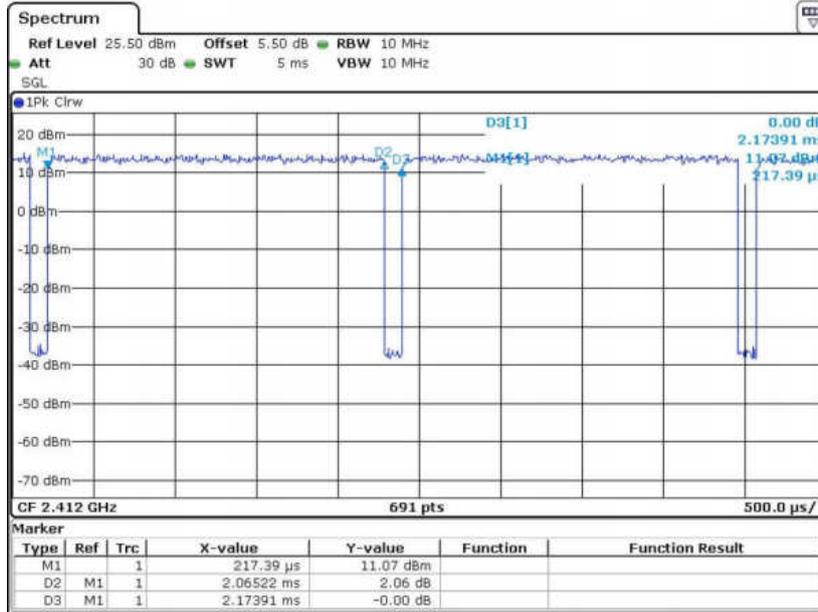
Antenna	Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
1	802.11 b	98.96	-	-	10Hz
1	802.11 g	95.00	2.065	0.484	1KHz
1+2	802.11n HT20	94.33	1.928	0.519	1KHz
1+2	802.11n HT40	89.12	0.949	1.053	3kHz

802.11b Ant.1

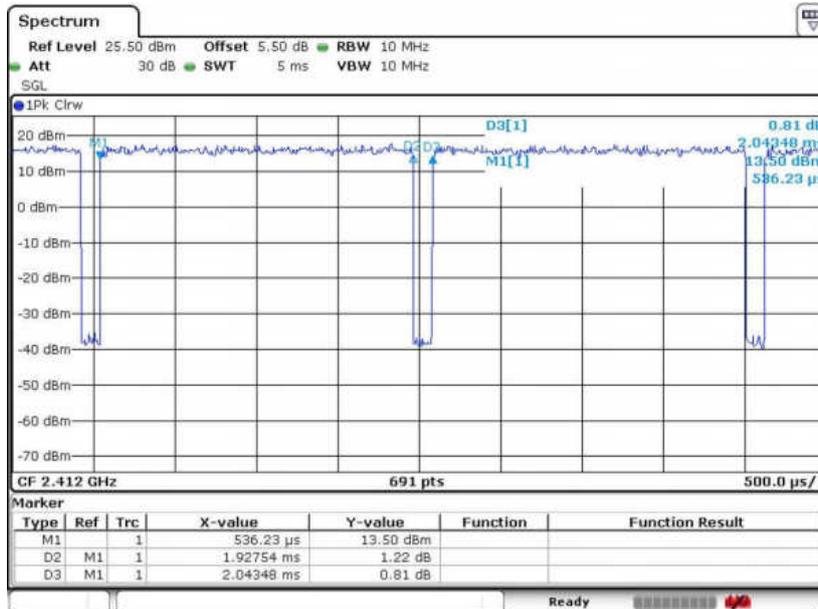




802.11g Ant.1



802.11n20 Ant.1+2





802.11n40 Ant.1+2

