



FCC RF Test Report

APPLICANT : ASUSTeK COMPUTER INC.
EQUIPMENT : ASUS Phone (Mobile Phone)
BRAND NAME : ASUS
MODEL NAME : ASUS_X018D
FCC ID : MSQX018D
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Aug. 31, 2017 and testing was completed on Nov. 13, 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.

This report contains data that were produced under subcontract by Laboratory SPORTON INTERNATIONAL INC .

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



TABLE OF CONTENTS

REVISION HISTORY	3
SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION	5
1.1 Applicant	5
1.2 Manufacturer	5
1.3 Product Feature of Equipment Under Test	5
1.4 Product Specification of Equipment Under Test	6
1.5 Modification of EUT	6
1.6 Testing Location	7
1.7 Applicable Standards	8
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST	9
2.1 Carrier Frequency and Channel	9
2.2 Test Mode	10
2.3 Connection Diagram of Test System	11
2.4 Support Unit used in test configuration and system	12
2.5 EUT Operation Test Setup	12
2.6 Measurement Results Explanation Example	12
3 TEST RESULT	13
3.1 6dB and 99% Bandwidth Measurement	13
3.2 Output Power Measurement	15
3.3 Power Spectral Density Measurement	16
3.4 Conducted Band Edges and Spurious Emission Measurement	18
3.5 Radiated Band Edges and Spurious Emission Measurement	31
3.6 AC Conducted Emission Measurement	35
3.7 Antenna Requirements	39
4 LIST OF MEASURING EQUIPMENT	40
5 UNCERTAINTY OF EVALUATION	41
APPENDIX A. CONDUCTED TEST RESULTS	
APPENDIX B. RADIATED SPURIOUS EMISSION	
APPENDIX C. DUTY CYCLE PLOTS	
APPENDIX D. SETUP PHOTOGRAPHS	



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR783105C	Rev. 01	Initial issue of report	Nov. 17, 2017



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	-
3.1	-	99% Bandwidth	-	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 5.79 dB at 2496.24 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 11.59 dB at 0.151 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

ASUSTeK COMPUTER INC.

4F, No. 150, LI-TE RD., PEITOU, TAIPEI, TAIWAN

1.2 Manufacturer

ASUSTeK COMPUTER INC

4F, No. 150, LI-TE RD., PEITOU, TAIPEI, TAIWAN

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	ASUS Phone (Mobile Phone)
Brand Name	ASUS
Model Name	ASUS_X018D
FCC ID	MSQX018D
EUT supports Radios application	GSM/GPRS/EGPRS/WCDMA/HSPA/HSPA+/DC-HSDPA/LTE WLAN 2.4GHz 802.11b/g/n HT20/HT40 Bluetooth v3.0+EDR/ Bluetooth v4.0 LE
IMEI Code	Conducted: 353427090003345/353427090008736 Conduction: 353427090021484/353427090021492 Radiation: 353427090020924/353427090020932
HW Version	WIUMA1A2-2
SW Version	WW_14.02.1709.8_20170930
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	802.11b : 19.13 dBm (0.0818 W) 802.11g : 22.92 dBm (0.1959 W) 802.11n HT20 : 21.82 dBm (0.1521 W) 802.11n HT40 : 22.65 dBm (0.1841 W)
99% Occupied Bandwidth	802.11b : 12.59MHz 802.11g : 17.83MHz 802.11n HT20 : 18.53MHz 802.11n HT40 : 36.46MHz
Antenna Type / Gain	LDS Antenna with gain 1.0 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

Sporton International (Kunshan) Inc. 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	CO01-KS	630927

SPORTON INTERNATIONAL INC. is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW0007 under the FCC-recognized accredited testing laboratories by Mutual Recognition Agreement (MRA) in FCC Test.

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No.58, Aly. 75, Ln. 564 Wenhua 3rd Rd. Guishan Dist. TEL: +886-3-327-3456 FAX: +886-3-328-4978		
Test Site No.	Sporton Site No.		FCC Test Firm Registration No.
	03CH11-HY		214511

Note:

1. The test site complies with ANSI C63.4 2014 requirement.
2. Test data subcontracted: radiated spurious emissions for section 3.5 of this report.



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
- ♦ 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 (Z plane) 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

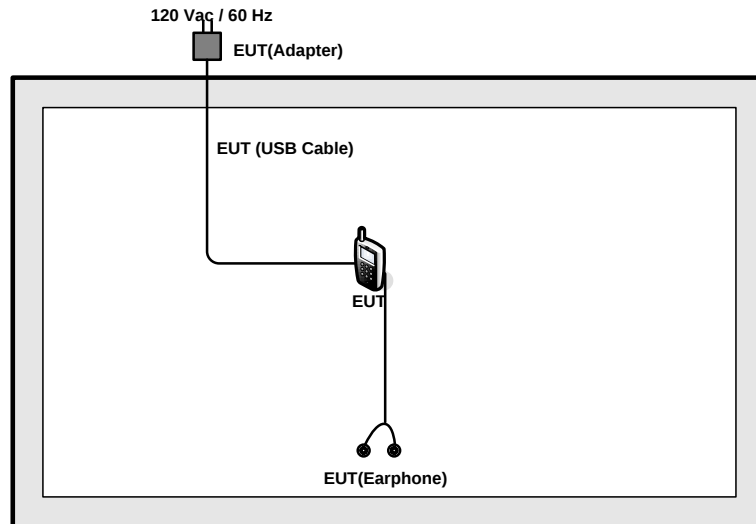
Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates as below table.

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

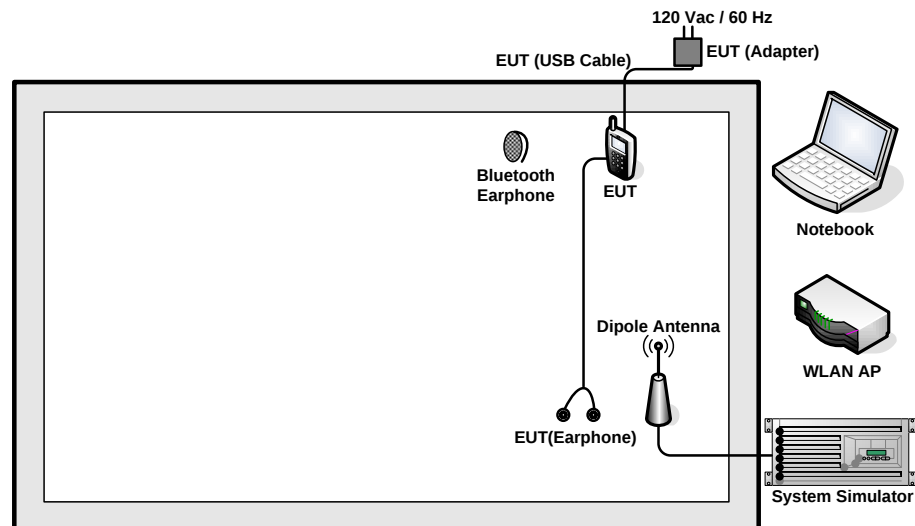
Test Cases	
AC Conducted Emission	Mode 1: GSM850 Idle + Bluetooth Idle + WLAN Idle + USB Cable (Charging from Adapter) + Earphone

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.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-link	DIR-855	KA2DIR855A2	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	LBH308	N/A	N/A	N/A
5.	SD Card	Kingston	8GB	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For WLAN RF test items, an 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 5.3 dB.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)}. \\ &= 5.3 \text{ (dB)} \end{aligned}$$

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

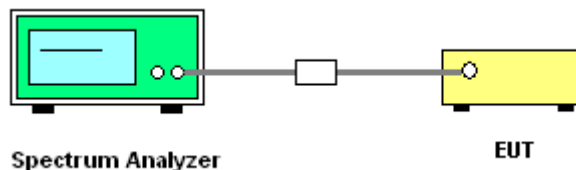
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 DTS D01 Meas. Guidance 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. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 1MHz and set the Video bandwidth (VBW) = 3MHz.
6. Measure and record the results in the test report.

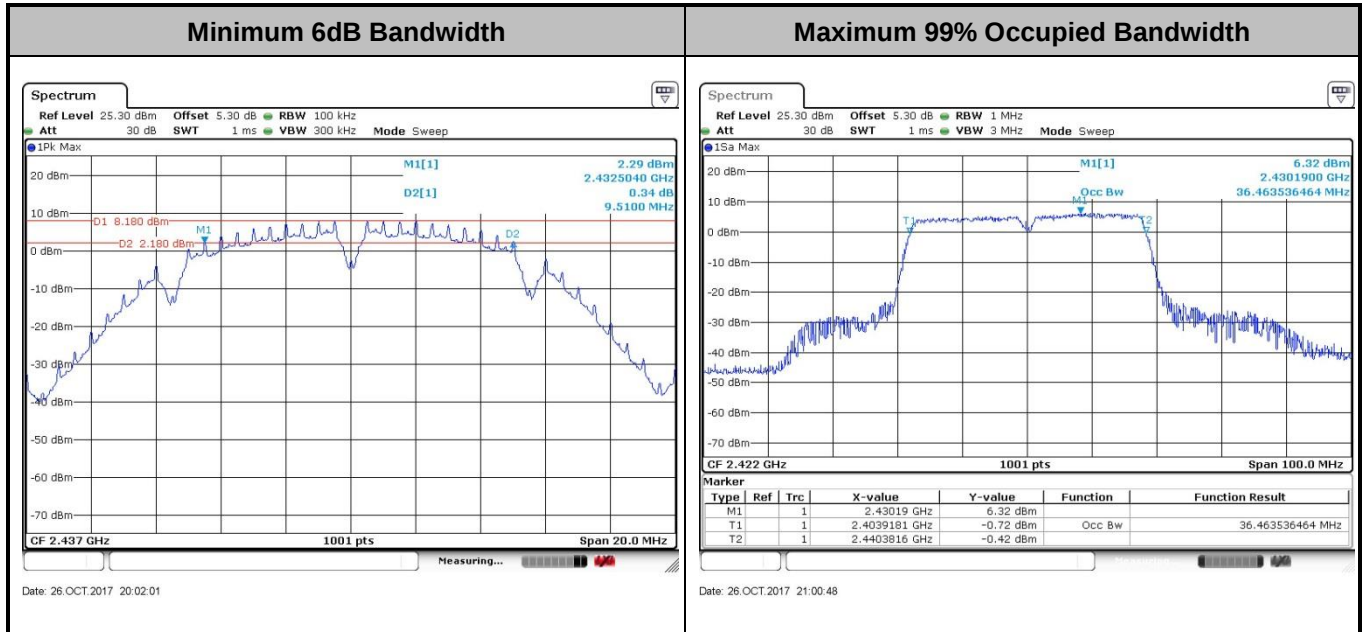
3.1.4 Test Setup





3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A.



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

3.2 Output Power Measurement

3.2.1 Limit of Output Power

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

3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance 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.

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.

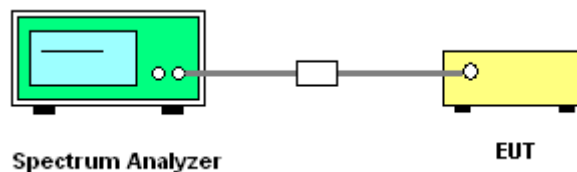
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

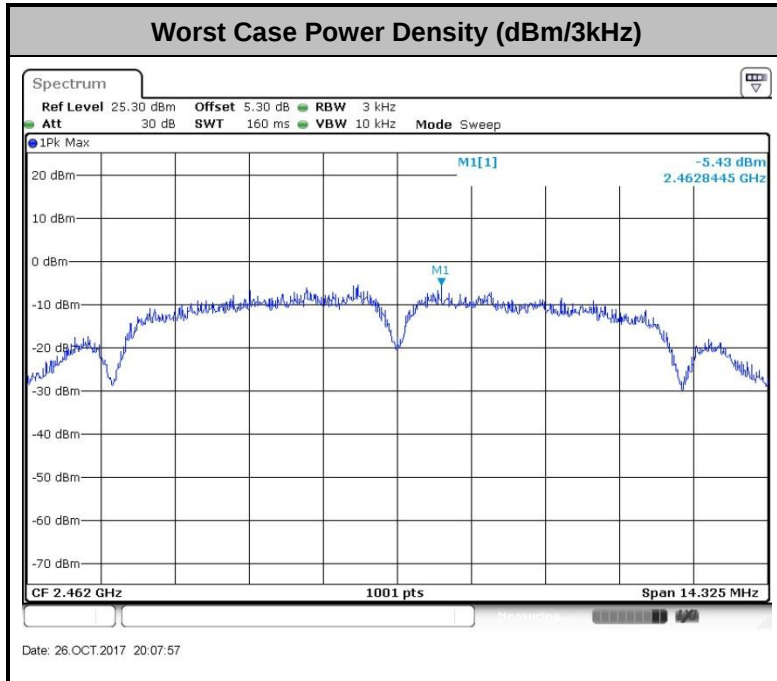
1. The testing follows Measurement Procedure 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum 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.

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.

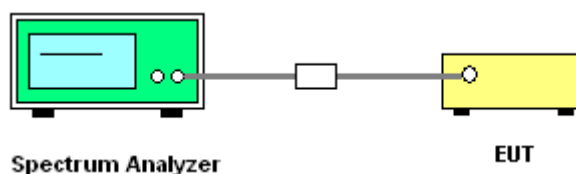
3.4.2 Measuring Instruments

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.

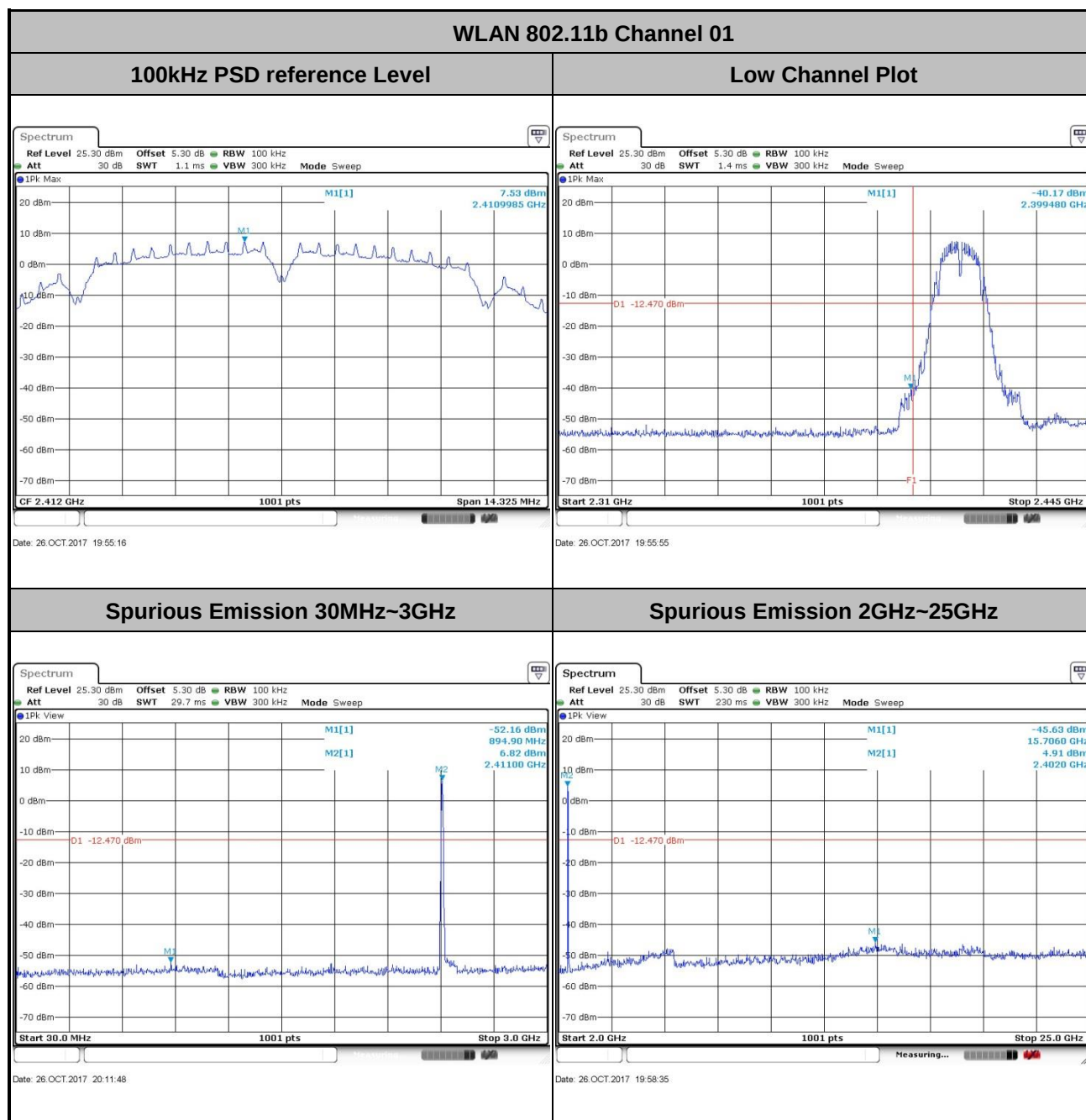
3.4.4 Test Setup





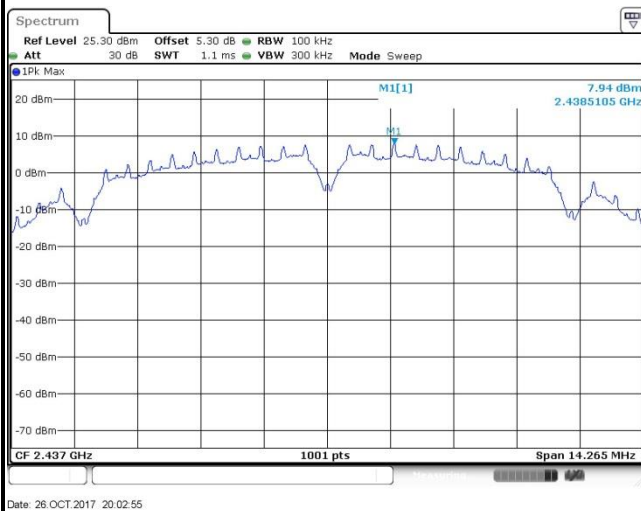
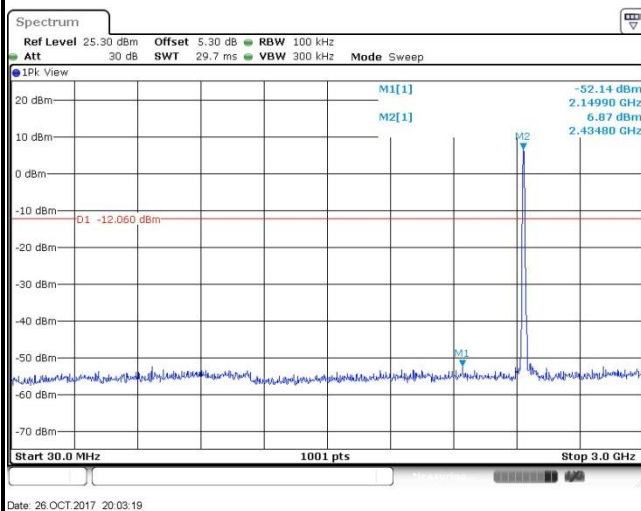
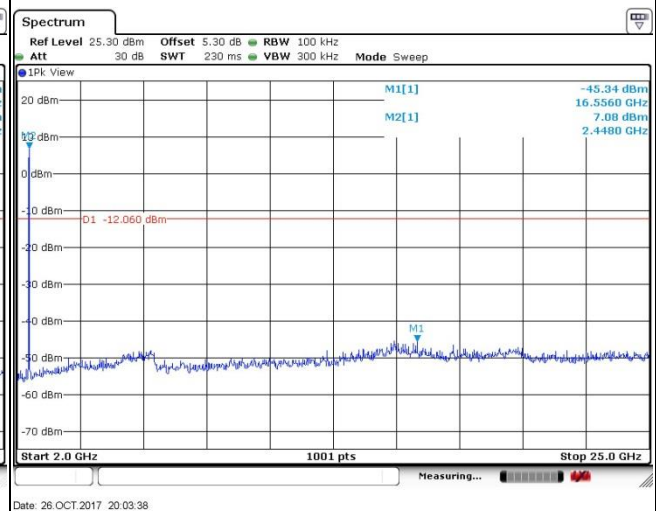
3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Mode :	802.11b	Temperature :	21~25℃
Test Band :	2.4GHz Low	Relative Humidity :	51~55%
Test Channel :	01	Test Engineer :	Silent Hai





Test Mode :	802.11b	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~55%
Test Channel :	06	Test Engineer :	Silent Hai

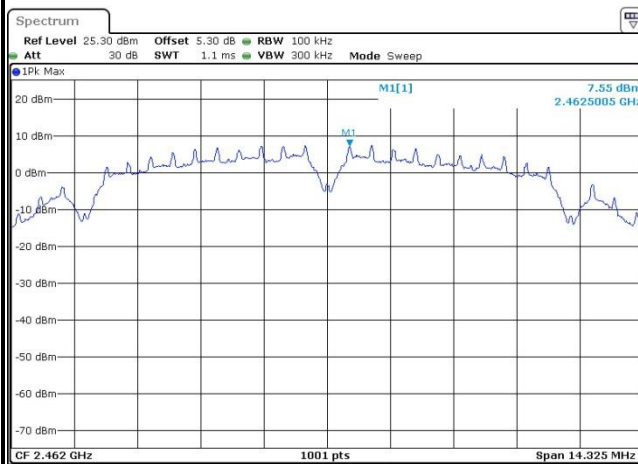
WLAN 802.11b Channel 06**100kHz PSD reference Level****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**



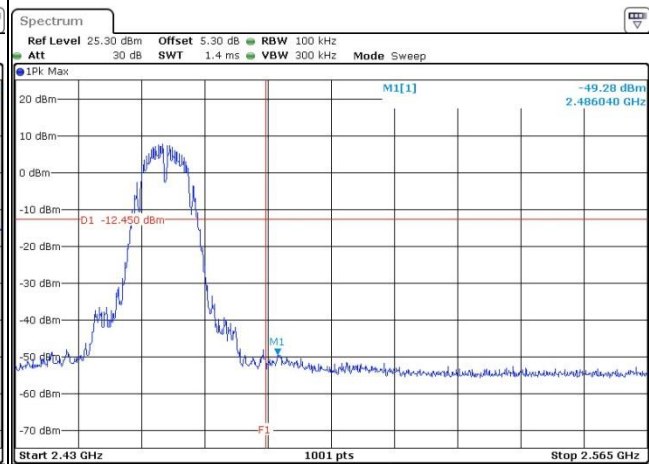
Test Mode :	802.11b	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~55%
Test Channel :	11	Test Engineer :	Silent Hai

WLAN 802.11b Channel 11

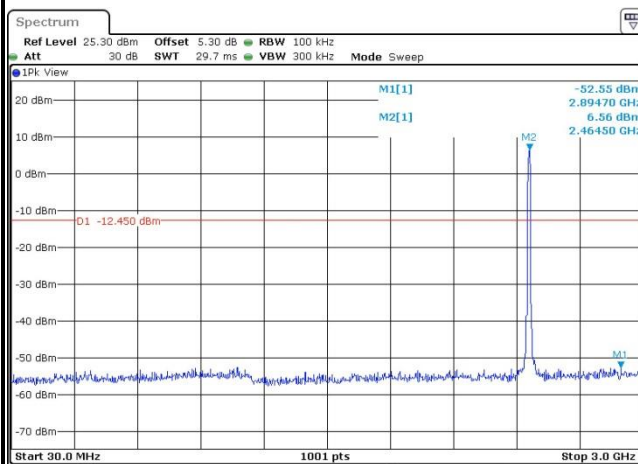
100kHz PSD reference Level



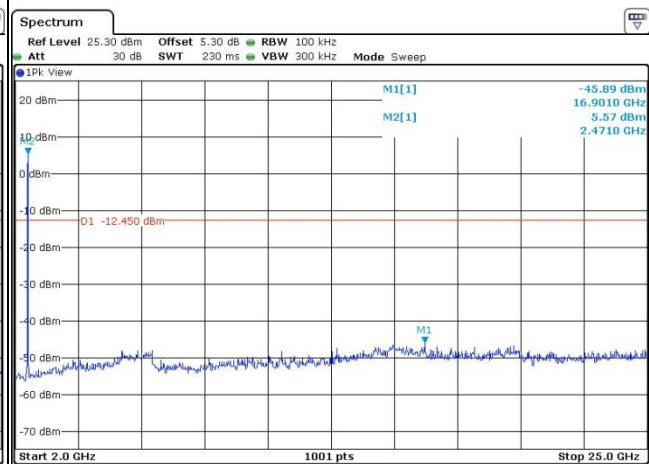
High Channel Plot



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

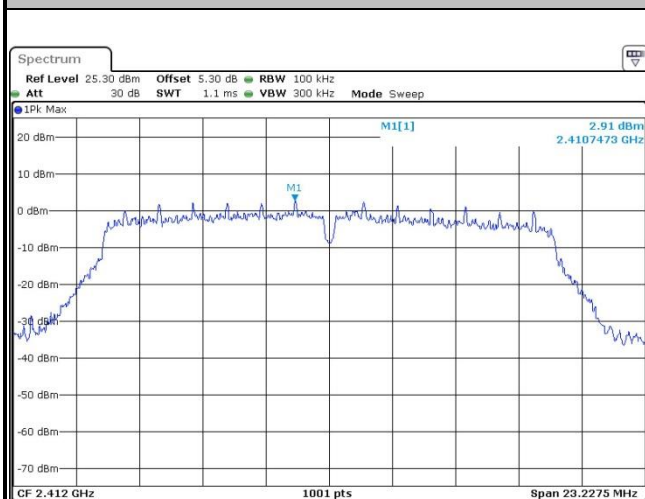




Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~55%
Test Channel :	01	Test Engineer :	Silent Hai

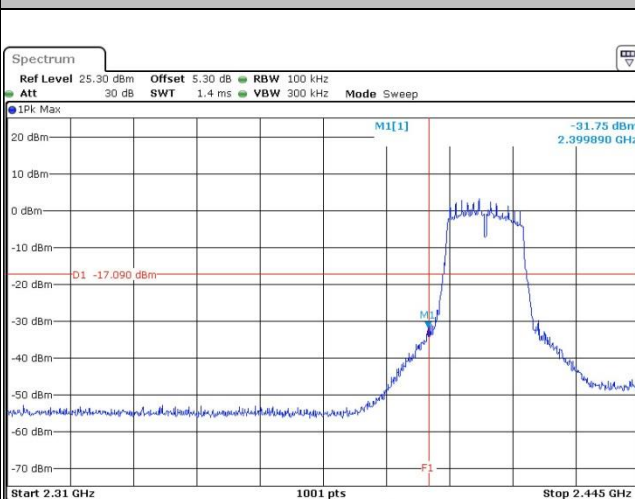
WLAN 802.11g Channel 01

100kHz PSD reference Level



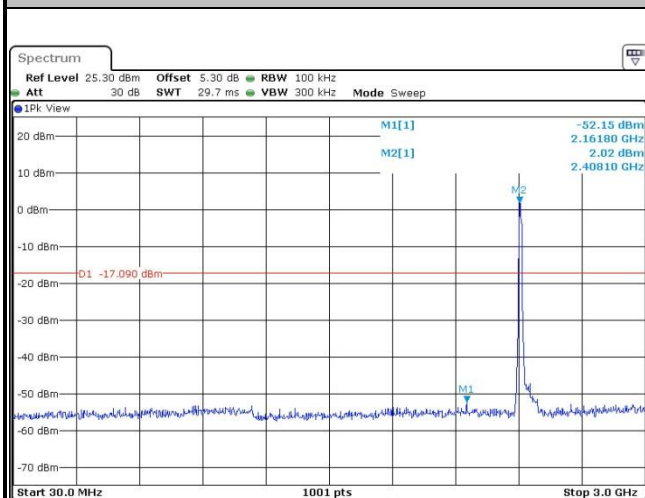
Date: 26.OCT.2017 20:19:30

Low Channel Plot



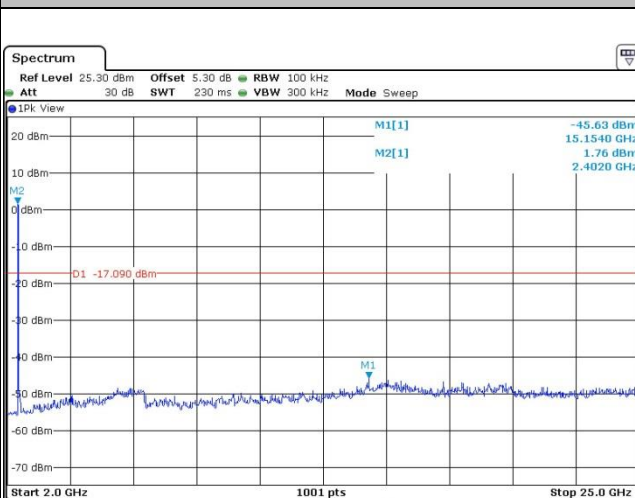
Date: 26.OCT.2017 20:19:47

Spurious Emission 30MHz~3GHz



Date: 26.OCT.2017 20:23:59

Spurious Emission 2GHz~25GHz



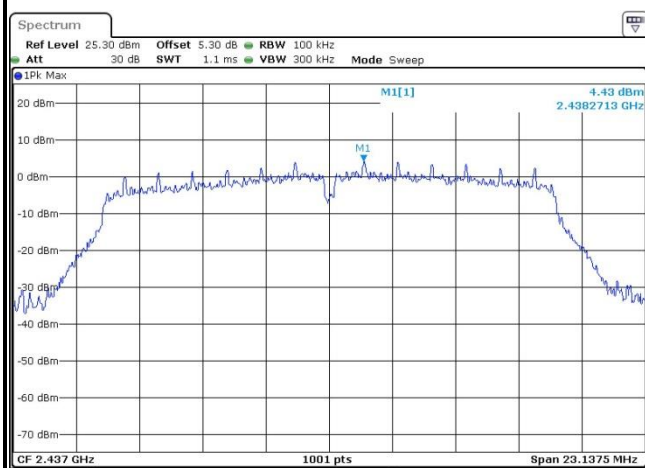
Date: 26.OCT.2017 20:20:14



Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~55%
Test Channel :	06	Test Engineer :	Silent Hai

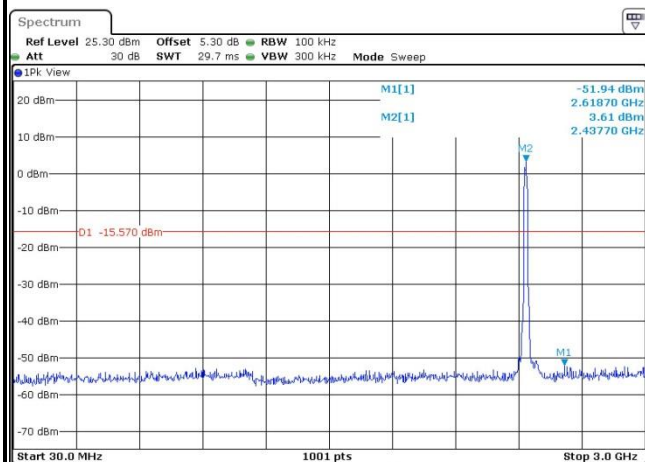
WLAN 802.11g Channel 06

100kHz PSD reference Level



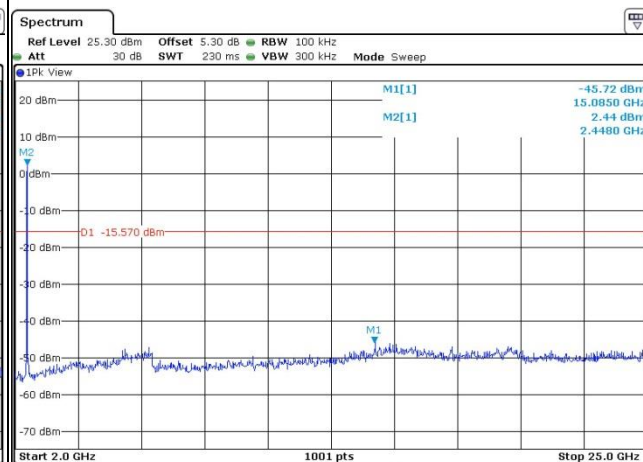
Date: 26.OCT.2017 20:27:08

Spurious Emission 30MHz~3GHz



Date: 26.OCT.2017 20:27:22

Spurious Emission 2GHz~25GHz



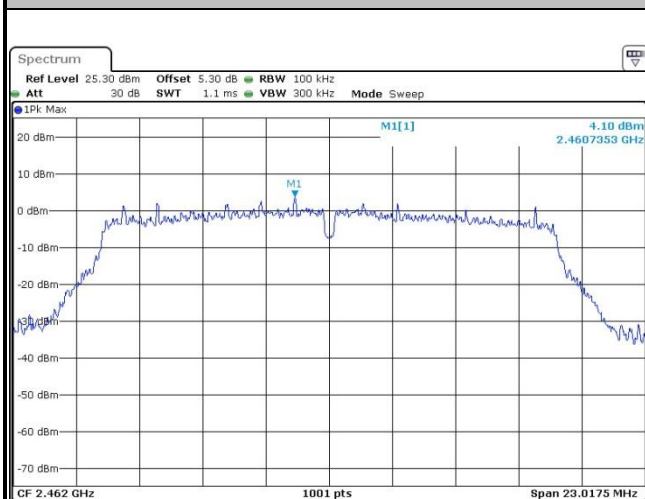
Date: 26.OCT.2017 20:27:51



Test Mode :	802.11g	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~55%
Test Channel :	11	Test Engineer :	Silent Hai

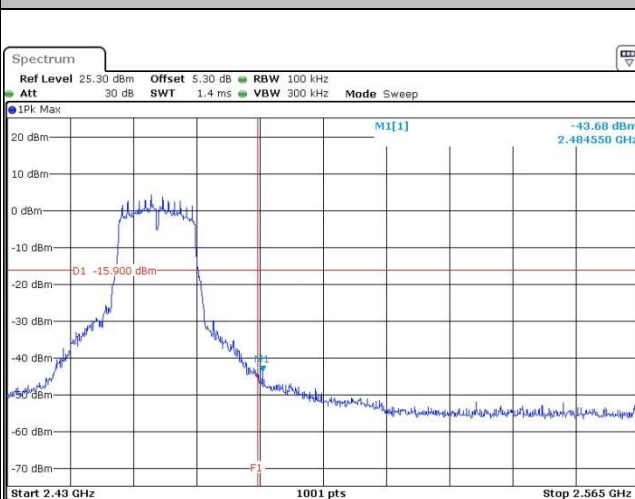
WLAN 802.11g Channel 11

100kHz PSD reference Level



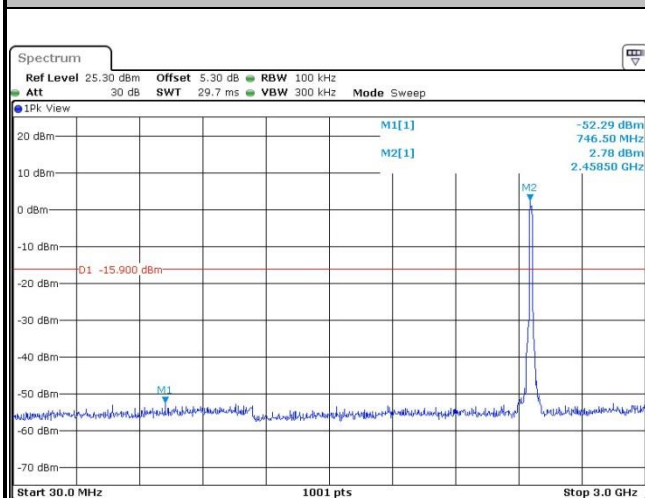
Date: 26.OCT.2017 20:32:41

High Channel Plot



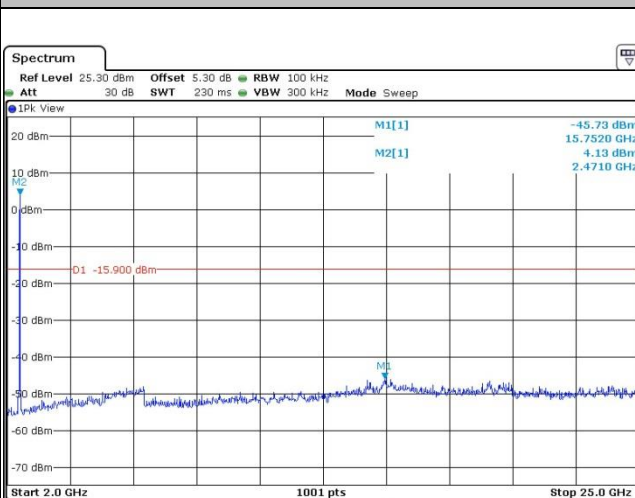
Date: 26.OCT.2017 20:32:53

Spurious Emission 30MHz~3GHz



Date: 26.OCT.2017 20:33:06

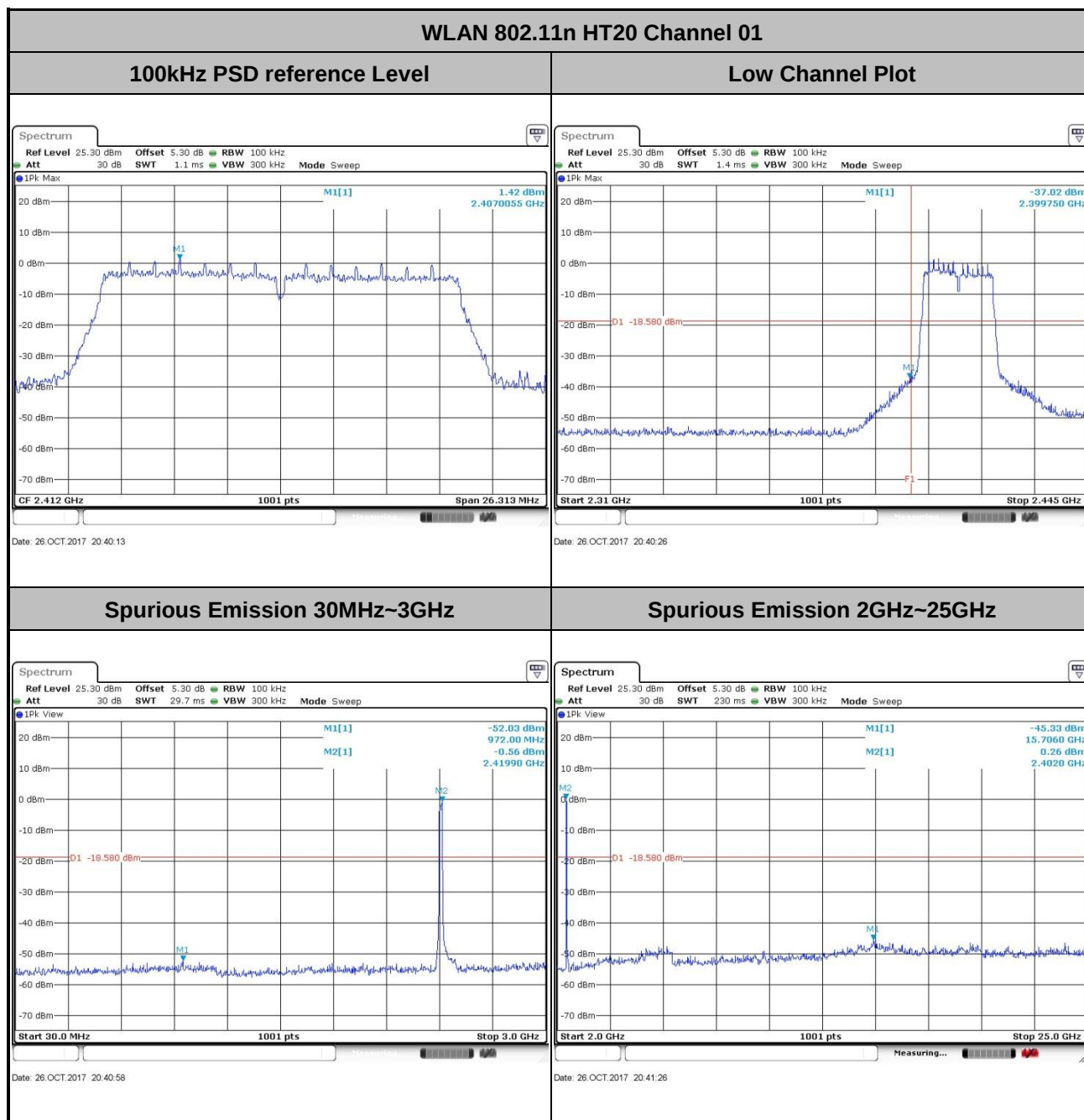
Spurious Emission 2GHz~25GHz



Date: 26.OCT.2017 20:33:23

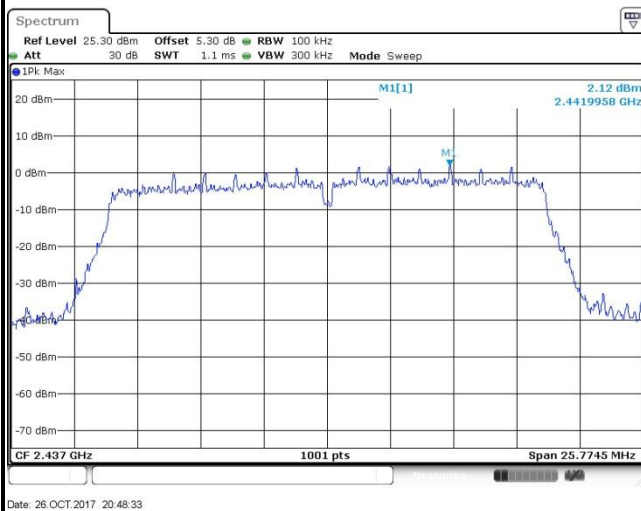
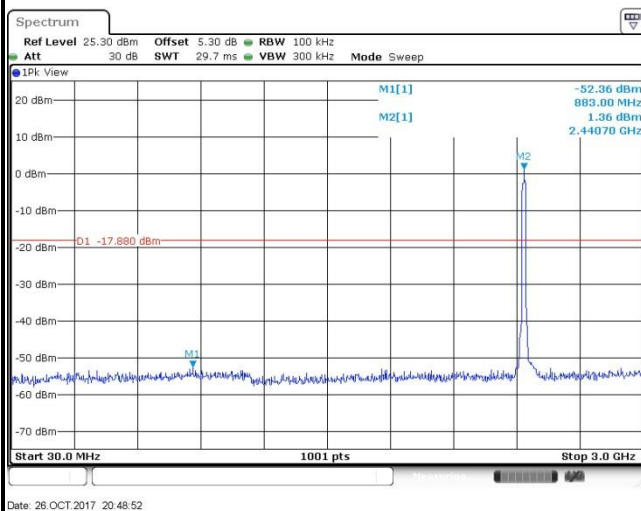
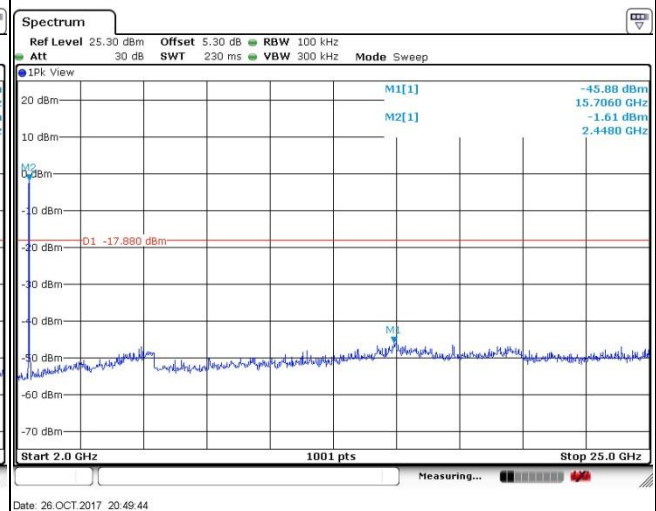


Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~55%
Test Channel :	01	Test Engineer :	Silent Hai



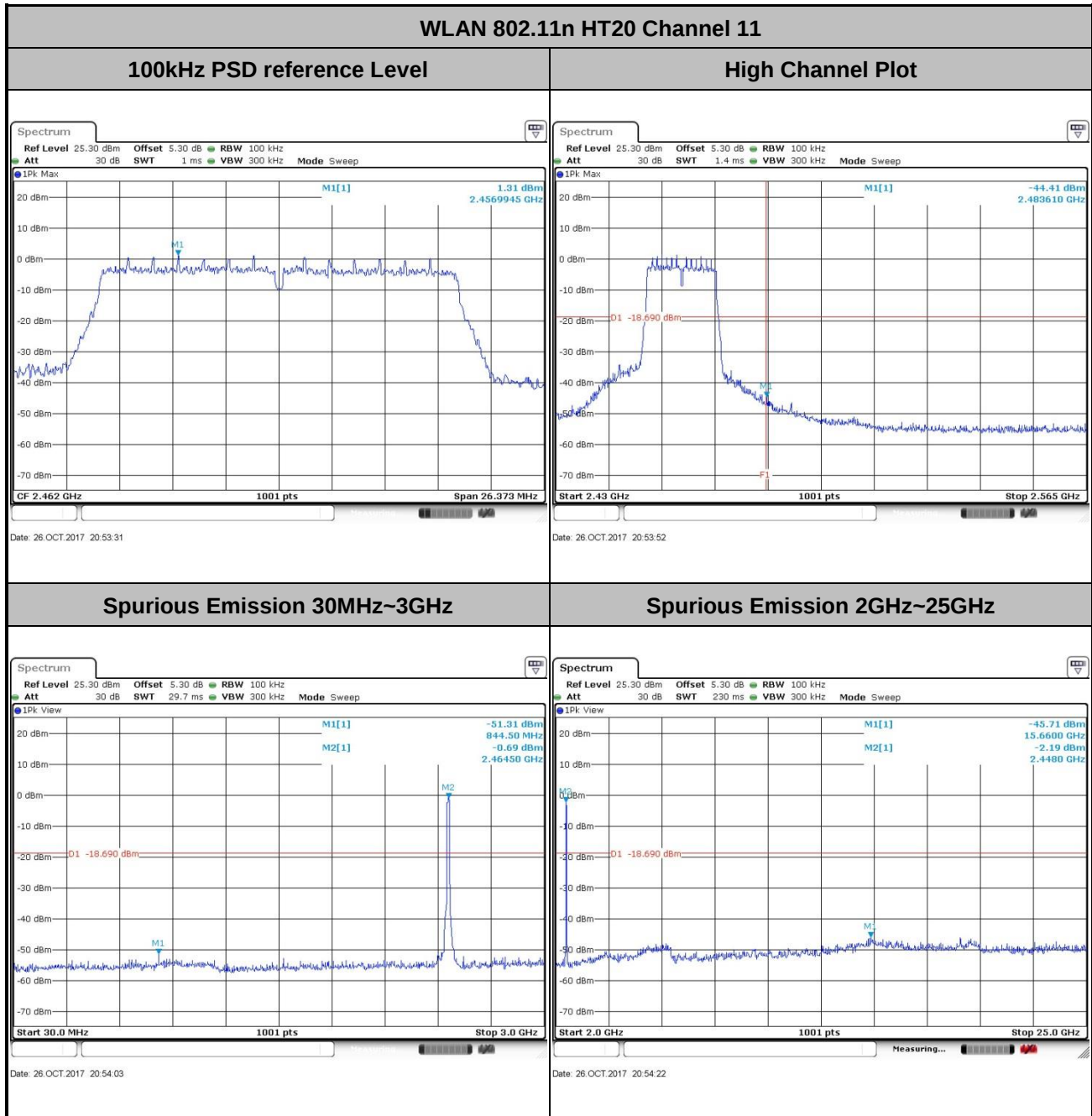


Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~55%
Test Channel :	06	Test Engineer :	Silent Hai

WLAN 802.11n HT20 Channel 06**100kHz PSD reference Level****Spurious Emission 30MHz~3GHz****Spurious Emission 2GHz~25GHz**

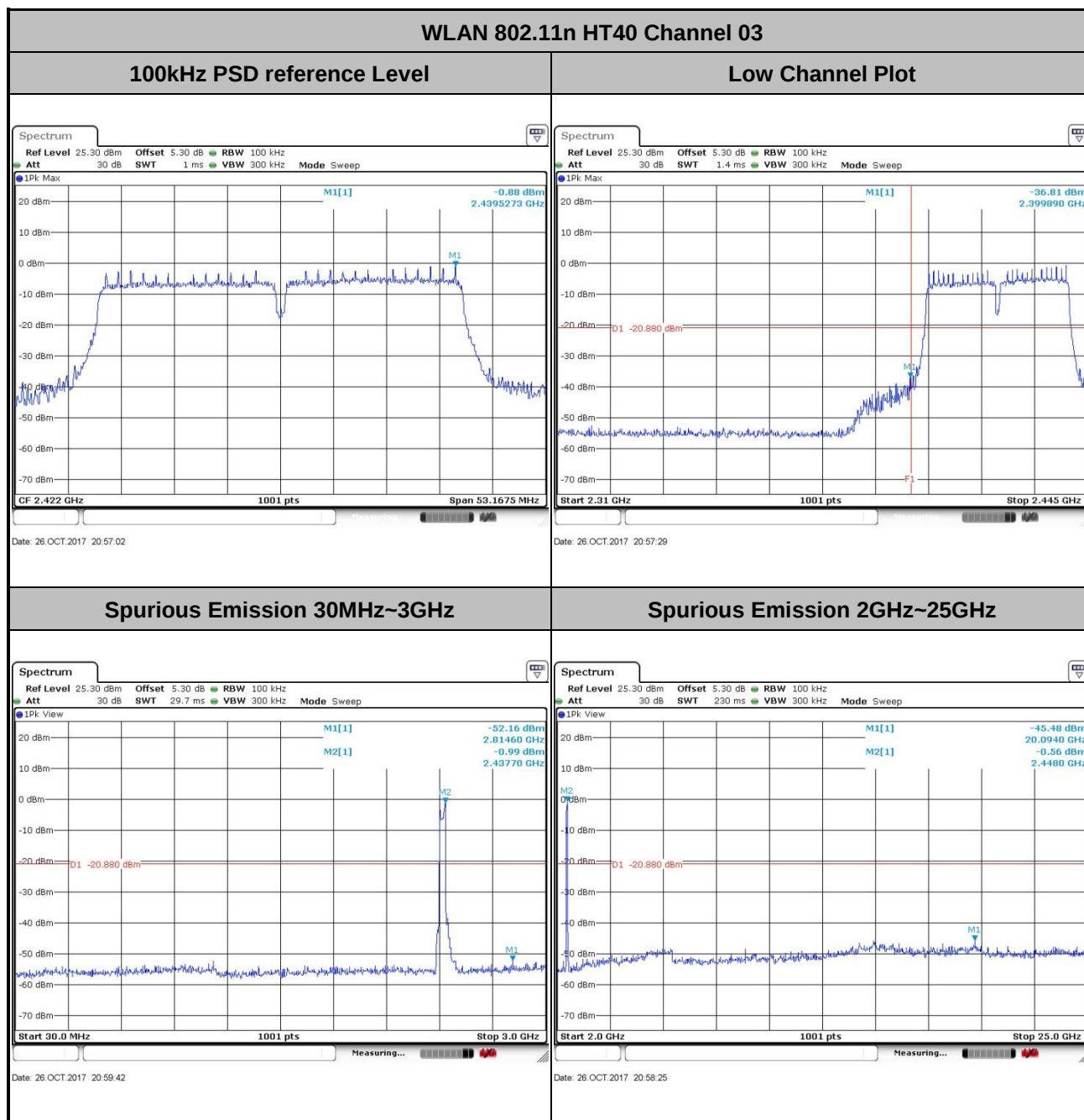


Test Mode :	802.11n HT20	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~55%
Test Channel :	11	Test Engineer :	Silent Hai



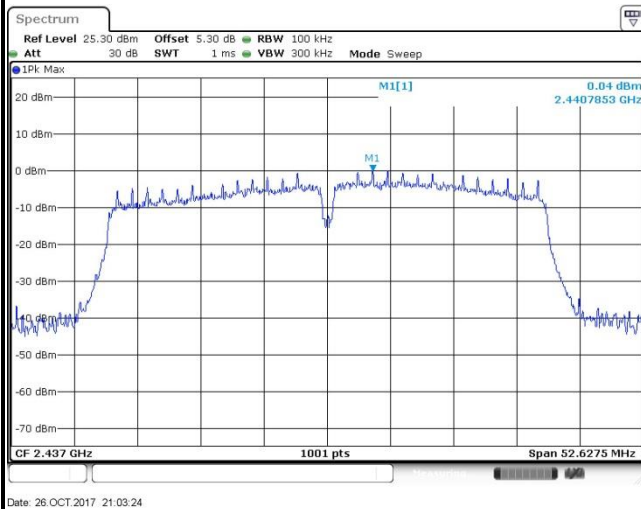
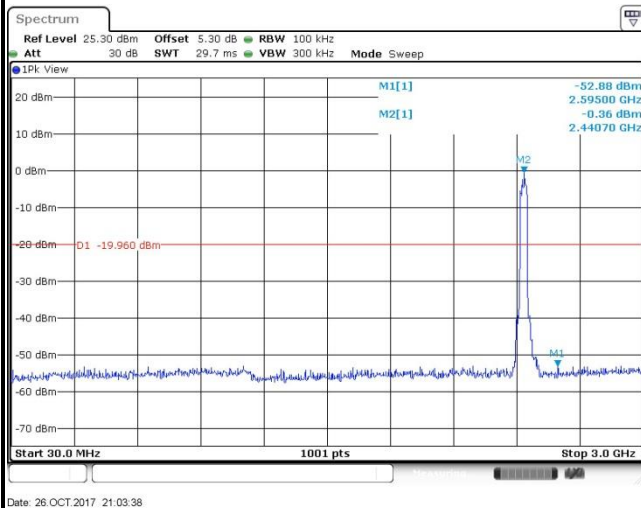
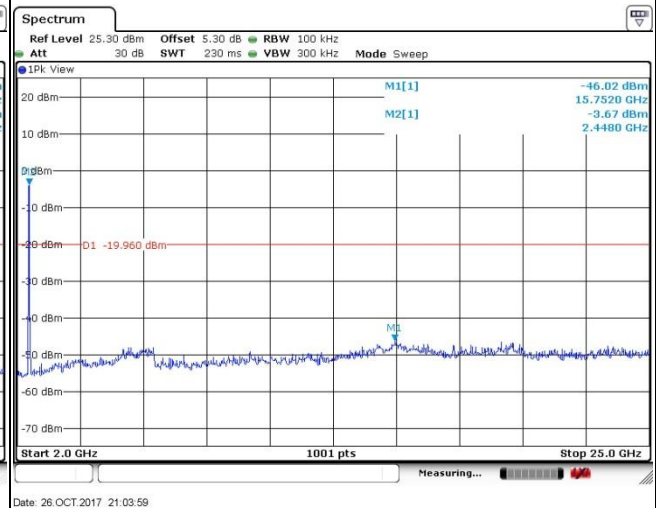


Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz Low	Relative Humidity :	51~55%
Test Channel :	03	Test Engineer :	Silent Hai



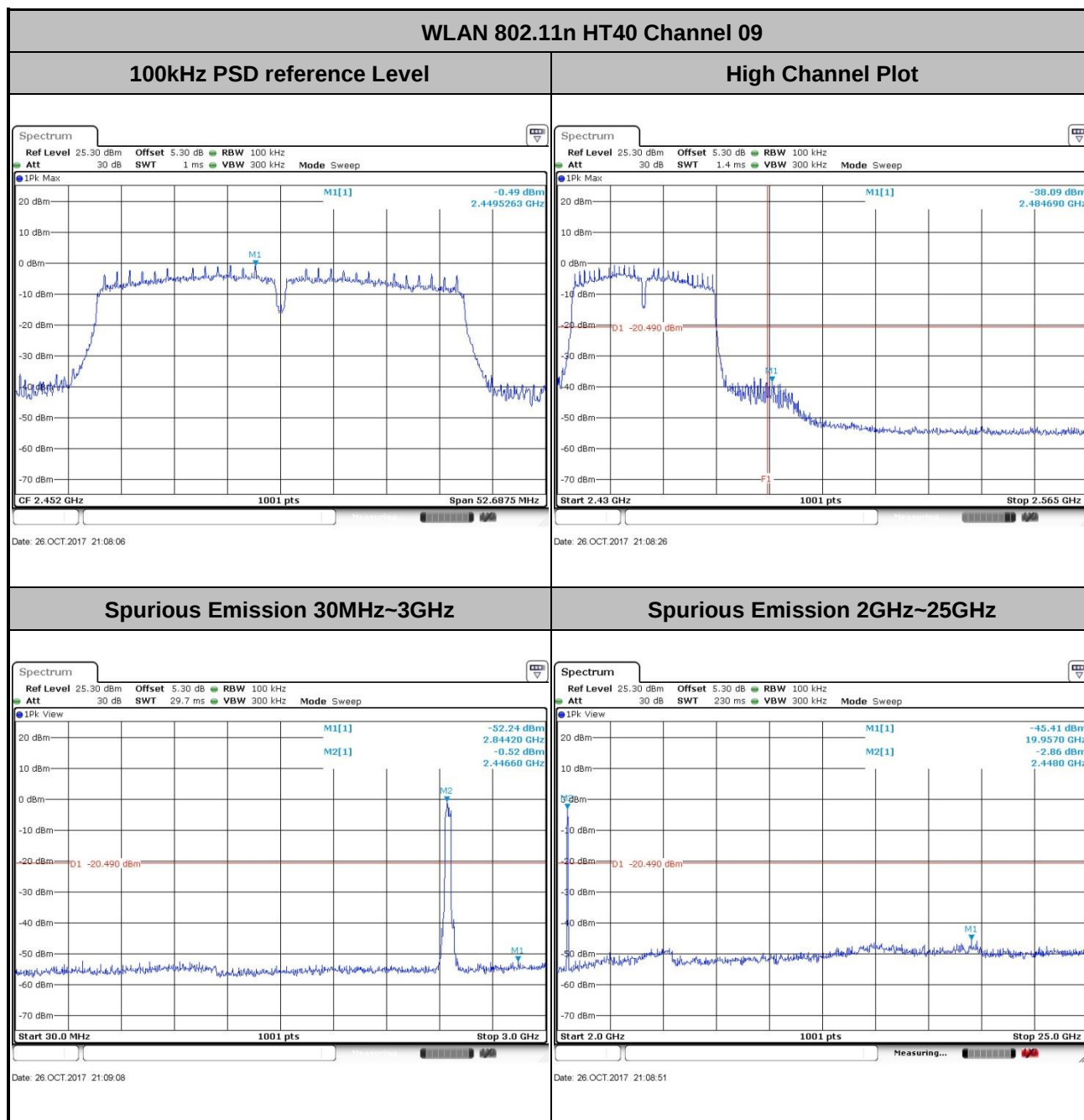


Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz Mid	Relative Humidity :	51~55%
Test Channel :	06	Test Engineer :	Silent Hai

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



Test Mode :	802.11n HT40	Temperature :	21~25°C
Test Band :	2.4GHz High	Relative Humidity :	51~55%
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

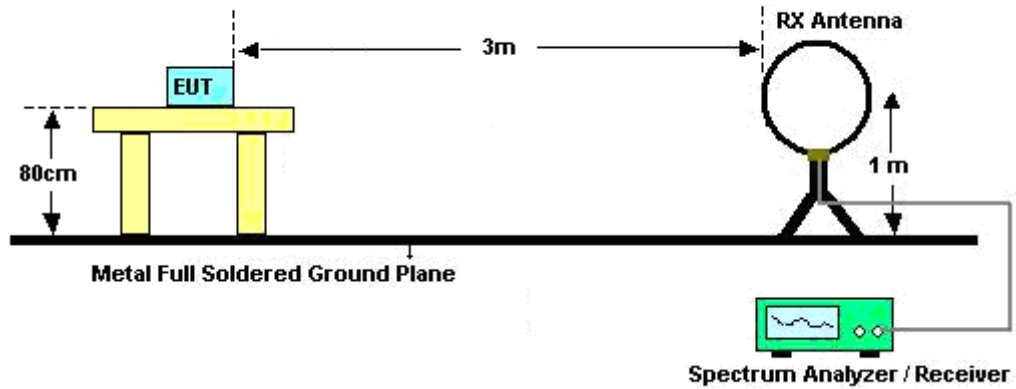
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test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

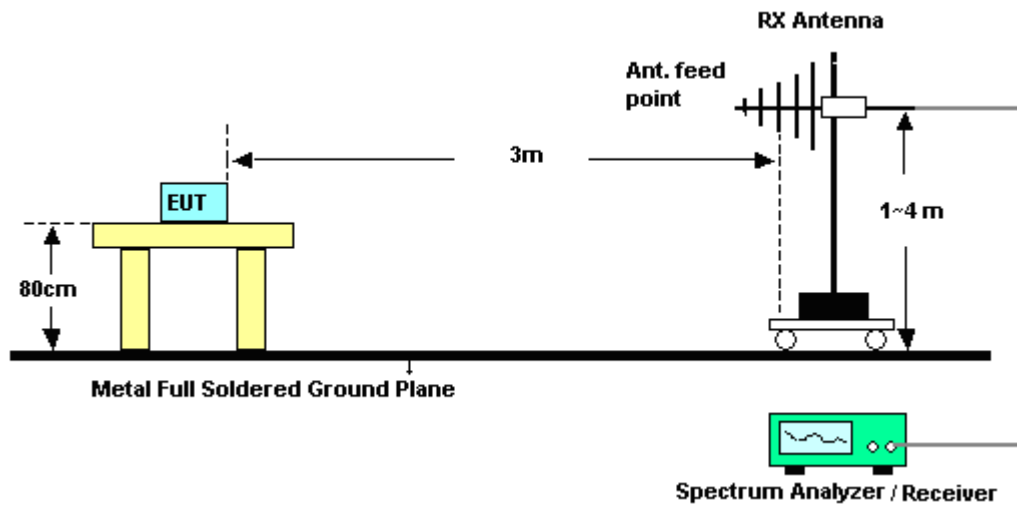
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

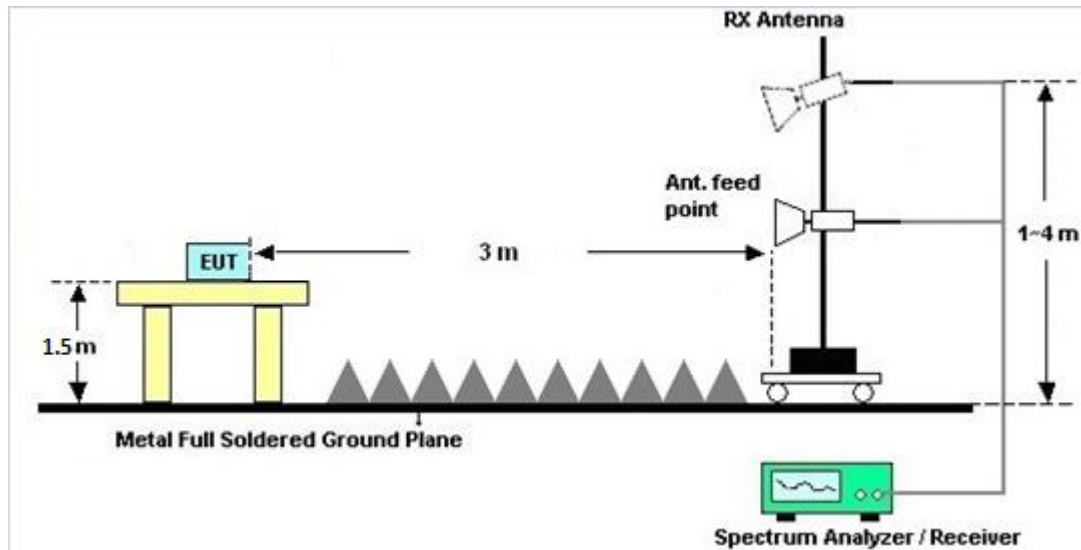
For radiated emissions below 30MHz



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.

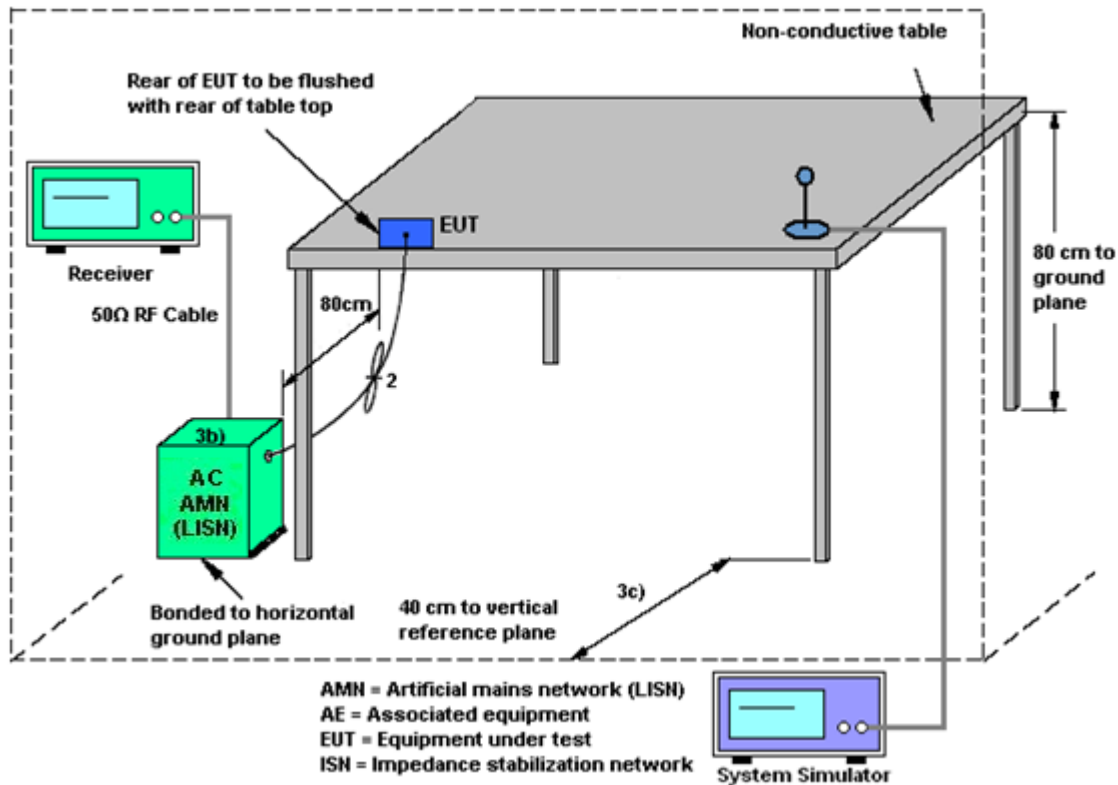
3.6.2 Measuring Instruments

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.

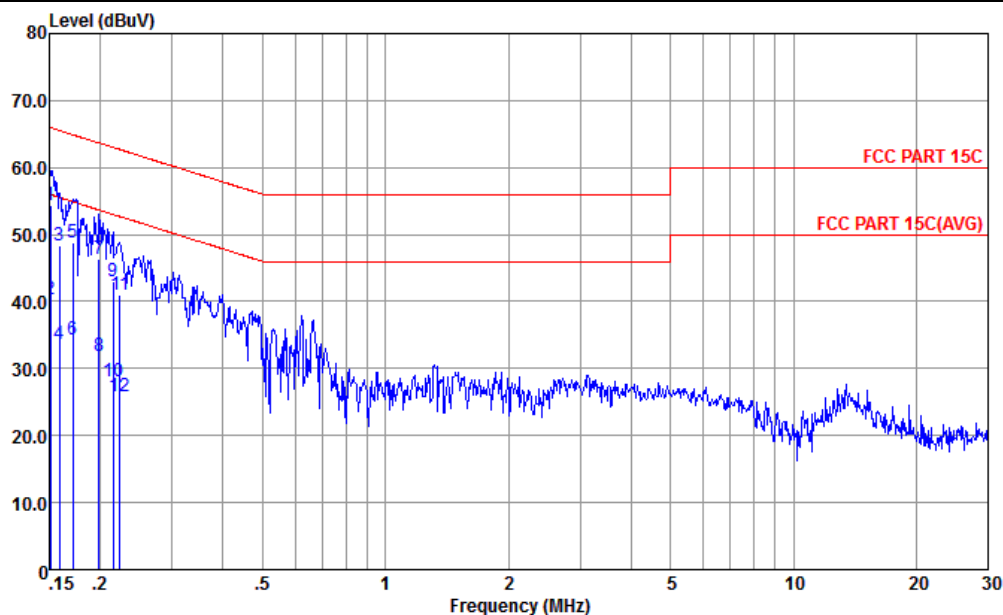
3.6.4 Test Setup





3.6.5 Test Result of AC Conducted Emission

Test Mode :	Mode 1	Temperature :	22~24℃
Test Engineer :	Amos Zhang	Relative Humidity :	42~46%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM850 Idle + Bluetooth Idle + WLAN Idle + USB Cable (Charging from Adapter) + Earphone		



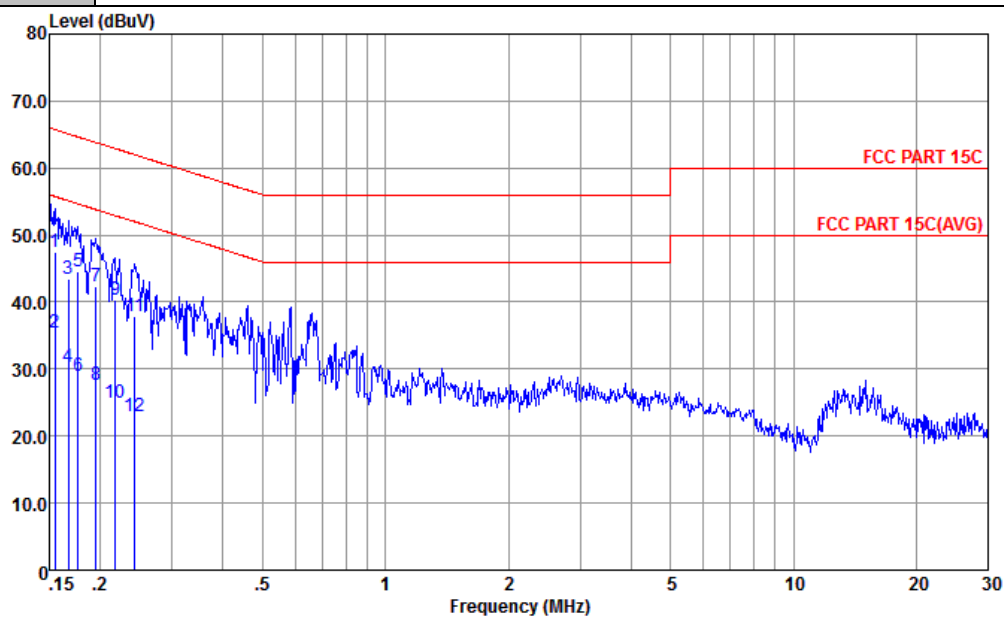
Site : CO01-KS
Condition : FCC PART 15C LISN-L-161017-060103 LINE

mode : Mode 1
: 353427090021484/353427090021492 #54

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 *	0.151	54.37	-11.59	65.96	43.20	0.55	10.62	QP
2	0.151	40.37	-15.59	55.96	29.20	0.55	10.62	Average
3	0.159	48.38	-17.14	65.52	37.30	0.49	10.59	QP
4	0.159	33.68	-21.84	55.52	22.60	0.49	10.59	Average
5	0.171	48.77	-16.13	64.90	37.80	0.42	10.55	QP
6	0.171	34.27	-20.63	54.90	23.30	0.42	10.55	Average
7	0.199	46.34	-17.33	63.67	35.60	0.28	10.46	QP
8	0.199	31.94	-21.73	53.67	21.20	0.28	10.46	Average
9	0.215	43.02	-19.99	63.01	32.30	0.27	10.45	QP
10	0.215	28.02	-24.99	53.01	17.30	0.27	10.45	Average
11	0.223	41.02	-21.68	62.70	30.30	0.27	10.45	QP
12	0.223	25.92	-26.78	52.70	15.20	0.27	10.45	Average



Test Mode :	Mode 1	Temperature :	22~24℃
Test Engineer :	Amos Zhang	Relative Humidity :	42~46%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM850 Idle + Bluetooth Idle + WLAN Idle + USB Cable (Charging from Adapter) + Earphone		



Site : CO01-KS
Condition : FCC PART 15C LISN-N-161017-060103 NEUTRAL

mode : Mode 1
: 353427090021484/353427090021492 #54

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 *	0.155	47.54	-18.20	65.74	36.60	0.34	10.60	QP
2	0.155	35.54	-20.20	55.74	24.60	0.34	10.60	Average
3	0.167	43.49	-21.63	65.12	32.59	0.34	10.56	QP
4	0.167	30.39	-24.73	55.12	19.49	0.34	10.56	Average
5	0.177	44.46	-20.18	64.64	33.60	0.33	10.53	QP
6	0.177	29.06	-25.58	54.64	18.20	0.33	10.53	Average
7	0.195	42.40	-21.40	63.80	31.60	0.33	10.47	QP
8	0.195	27.60	-26.20	53.80	16.80	0.33	10.47	Average
9	0.217	40.38	-22.54	62.92	29.60	0.33	10.45	QP
10	0.217	24.98	-27.94	52.92	14.20	0.33	10.45	Average
11	0.243	37.98	-24.02	62.00	27.20	0.34	10.44	QP
12	0.243	22.98	-29.02	52.00	12.20	0.34	10.44	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

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	Aug. 08, 2017	Oct. 26, 2017	Aug. 07, 2018	Conducted (TH01-KS)
Pulse Power Sensor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 19, 2017	Oct. 26, 2017	Jan. 19, 2018	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 19, 2017	Oct. 26, 2017	Jan. 19, 2018	Conducted (TH01-KS)
EMI Test Receiver	Agilent	N9038A(MXE)	MY53290053	20Hz to 26.5GHz	Jan. 12, 2017	Nov. 10, 2017~Nov. 13, 2017	Jan. 11, 2018	Radiation (03CH11-HY)
Spectrum Analyzer	Keysight	N9010A	MY53470118	10Hz ~ 44GHz	Apr. 17, 2017	Nov. 10, 2017~Nov. 13, 2017	Apr. 16, 2018	Radiation (03CH11-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Oct. 20, 2016	Nov. 10, 2017~Nov. 13, 2017	Oct. 19, 2017	Radiation (03CH11-HY)
Bilog Antenna	TESEQ	CBL 6111D&N-6-06	40103&04	30MHz~1GHz	Jan. 07, 2017	Nov. 10, 2017~Nov. 13, 2017	Jan. 06, 2018	Radiation (03CH11-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1326	1GHz ~ 18GHz	Mar. 16, 2017	Nov. 10, 2017~Nov. 13, 2017	Mar. 15, 2018	Radiation (03CH11-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170576	18GHz- 40GHz	Apr. 27, 2017	Nov. 10, 2017~Nov. 13, 2017	Apr. 26, 2018	Radiation (03CH11-HY)
Amplifier	SONOMA	310N	187282	9kHz~1GHz	Dec. 21, 2016	Nov. 10, 2017~Nov. 13, 2017	Dec. 20, 2017	Radiation (03CH11-HY)
Preamplifier	Keysight	83017A	MY53270147	1GHz~26.5GHz	Jan. 09, 2017	Nov. 10, 2017~Nov. 13, 2017	Jan. 08, 2018	Radiation (03CH11-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1902247	1GHz~18GHz	Jun. 23, 2017	Nov. 10, 2017~Nov. 13, 2017	Jun. 22, 2018	Radiation (03CH11-HY)
Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz, VSWR : 2.5:1 max	Jul. 18, 2017	Nov. 10, 2017~Nov. 13, 2017	Jul. 17, 2018	Radiation (03CH11-HY)
Controller	EMEC	EM 1000	N/A	Control Turn table & Ant Mast	NCR	Nov. 10, 2017~Nov. 13, 2017	NCR	Radiation (03CH11-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1~4m	NCR	Nov. 10, 2017~Nov. 13, 2017	NCR	Radiation (03CH11-HY)
Turn Table	EMEC	TT 2000	N/A	0~360 Degree	NCR	Nov. 10, 2017~Nov. 13, 2017	NCR	Radiation (03CH11-HY)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 20, 2017	Oct. 31, 2017	Apr. 19, 2018	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2017	Oct. 31, 2017	Oct. 12, 2018	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060105	9kHz~30MHz	Oct. 13, 2017	Oct. 31, 2017	Oct. 12, 2018	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2017	Oct. 31, 2017	Oct. 11, 2018	Conduction (CO01-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.2dB
--	-------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.5dB
--	-------

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.2dB
--	-------



Appendix A. Conducted Test Results

A1 - DTS Part

Test Engineer:	Silent Hai	Temperature:	21~25	°C
Test Date:	2017/10/26	Relative Humidity:	51~55	%

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	12.59	9.55	0.50	Pass
11b	1Mbps	1	6	2437	12.34	9.51	0.50	Pass
11b	1Mbps	1	11	2462	12.49	9.55	0.50	Pass
11g	6Mbps	1	1	2412	17.83	15.49	0.50	Pass
11g	6Mbps	1	6	2437	17.33	15.43	0.50	Pass
11g	6Mbps	1	11	2462	17.68	15.35	0.50	Pass
HT20	MCS0	1	1	2412	18.53	17.54	0.50	Pass
HT20	MCS0	1	6	2437	18.43	17.18	0.50	Pass
HT20	MCS0	1	11	2462	18.48	17.58	0.50	Pass
HT40	MCS0	1	3	2422	36.46	35.45	0.50	Pass
HT40	MCS0	1	6	2437	35.86	35.09	0.50	Pass
HT40	MCS0	1	9	2452	36.16	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	18.61	30.00	1.00	19.61	36.00	Pass
11b	1Mbps	1	6	2437	19.13	30.00	1.00	20.13	36.00	Pass
11b	1Mbps	1	11	2462	19.06	30.00	1.00	20.06	36.00	Pass
11g	6Mbps	1	1	2412	22.08	30.00	1.00	23.08	36.00	Pass
11g	6Mbps	1	6	2437	22.92	30.00	1.00	23.92	36.00	Pass
11g	6Mbps	1	11	2462	22.81	30.00	1.00	23.81	36.00	Pass
HT20	MCS0	1	1	2412	21.26	30.00	1.00	22.26	36.00	Pass
HT20	MCS0	1	6	2437	21.82	30.00	1.00	22.82	36.00	Pass
HT20	MCS0	1	11	2462	21.63	30.00	1.00	22.63	36.00	Pass
HT40	MCS0	1	3	2422	22.33	30.00	1.00	23.33	36.00	Pass
HT40	MCS0	1	6	2437	22.42	30.00	1.00	23.42	36.00	Pass
HT40	MCS0	1	9	2452	22.65	30.00	1.00	23.65	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

2.4GHz Band						
Mod.	Data Rate	N _{TX}	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.00	15.54
11b	1Mbps	1	6	2437	0.00	16.12
11b	1Mbps	1	11	2462	0.00	16.09
11g	6Mbps	1	1	2412	0.13	13.06
11g	6Mbps	1	6	2437	0.13	14.10
11g	6Mbps	1	11	2462	0.13	14.05
HT20	MCS0	1	1	2412	0.12	11.44
HT20	MCS0	1	6	2437	0.12	12.07
HT20	MCS0	1	11	2462	0.12	11.99
HT40	MCS0	1	3	2422	0.24	11.79
HT40	MCS0	1	6	2437	0.24	12.03
HT40	MCS0	1	9	2452	0.24	12.13

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	-7.29	1.00	8.00	Pass
11b	1Mbps	1	6	2437	-6.21	1.00	8.00	Pass
11b	1Mbps	1	11	2462	-5.43	1.00	8.00	Pass
11g	6Mbps	1	1	2412	-11.70	1.00	8.00	Pass
11g	6Mbps	1	6	2437	-10.03	1.00	8.00	Pass
11g	6Mbps	1	11	2462	-10.25	1.00	8.00	Pass
HT20	MCS0	1	1	2412	-13.70	1.00	8.00	Pass
HT20	MCS0	1	6	2437	-12.29	1.00	8.00	Pass
HT20	MCS0	1	11	2462	-13.07	1.00	8.00	Pass
HT40	MCS0	1	3	2422	-15.13	1.00	8.00	Pass
HT40	MCS0	1	6	2437	-15.25	1.00	8.00	Pass
HT40	MCS0	1	9	2452	-15.05	1.00	8.00	Pass



Appendix B. Radiated Spurious Emission

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2369.22	51.76	-22.24	74	42.05	27.09	6.29	33.6	363	45	P	H
		2388.54	41.39	-12.61	54	31.57	27.13	6.36	33.6	363	45	A	H
	*	2412	102.81	-	-	92.92	27.18	6.37	33.59	363	45	P	H
	*	2412	99.78	-	-	89.89	27.18	6.37	33.59	363	45	A	H
		2387.7	51.78	-22.22	74	41.96	27.13	6.36	33.6	139	78	P	V
		2388.54	41.58	-12.42	54	31.76	27.13	6.36	33.6	139	78	A	V
	*	2412	103.39	-	-	93.5	27.18	6.37	33.59	139	78	P	V
	*	2412	100.43	-	-	90.54	27.18	6.37	33.59	139	78	A	V
802.11b CH 06 2437MHz		2367.12	51.89	-22.11	74	42.23	27.04	6.29	33.6	357	44	P	H
		2389.52	41	-13	54	31.18	27.13	6.36	33.6	357	44	A	H
	*	2437	104.47	-	-	94.48	27.27	6.38	33.59	357	44	P	H
	*	2437	101.31	-	-	91.32	27.27	6.38	33.59	357	44	A	H
		2493.56	52.43	-21.57	74	42.28	27.4	6.39	33.57	357	44	P	H
		2489.85	41.78	-12.22	54	31.64	27.4	6.39	33.58	357	44	A	H
		2344.86	53.07	-20.93	74	43.52	27	6.22	33.6	112	92	P	V
		2389.8	41.03	-12.97	54	31.2	27.13	6.36	33.59	112	92	A	V
	*	2437	105.56	-	-	95.57	27.27	6.38	33.59	112	92	P	V
	*	2437	102.33	-	-	92.34	27.27	6.38	33.59	112	92	A	V
		2489.64	52.47	-21.53	74	42.33	27.4	6.39	33.58	112	92	P	V
		2489.92	41.92	-12.08	54	31.78	27.4	6.39	33.58	112	92	A	V



802.11b CH 11 2462MHz	*	2462	104.15	-	-	94.11	27.31	6.38	33.58	351	43	P	H
	*	2462	101.26	-	-	91.22	27.31	6.38	33.58	351	43	A	H
		2496.44	52.93	-21.07	74	42.78	27.4	6.39	33.57	351	43	P	H
		2498.12	42.01	-11.99	54	31.86	27.4	6.39	33.57	351	43	A	H
	*	2462	105.79	-	-	95.75	27.31	6.38	33.58	110	92	P	V
	*	2462	102.85	-	-	92.81	27.31	6.38	33.58	110	92	A	V
		2485.24	52.7	-21.3	74	42.6	27.36	6.39	33.58	110	92	P	V
		2496.32	42.3	-11.7	54	32.15	27.4	6.39	33.57	110	92	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		4824	39.14	-34.86	74	60.81	31.29	9.59	62.98	100	0	P	H
		4824	38.77	-35.23	74	60.44	31.29	9.59	62.98	100	0	P	V
802.11b CH 06 2437MHz		4874	39.78	-34.22	74	61.28	31.38	9.56	62.87	100	0	P	H
		7311	42.72	-31.28	74	57.36	36.28	11.31	62.69	100	0	P	H
		4874	38.76	-35.24	74	60.26	31.38	9.56	62.87	100	0	P	V
		7311	43.24	-30.76	74	57.88	36.28	11.31	62.69	100	0	P	V
802.11b CH 11 2462MHz		4924	39.46	-34.54	74	60.74	31.48	9.55	62.75	100	0	P	H
		7386	43.45	-30.55	74	58.04	36.47	11.3	62.74	100	0	P	H
		4924	39.01	-34.99	74	60.29	31.48	9.55	62.75	100	0	P	V
		7386	43.08	-30.92	74	57.67	36.47	11.3	62.74	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



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

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		2389.485	55.09	-18.91	74	45.27	27.13	6.36	33.6	364	48	P	H
		2389.905	44.1	-9.9	54	34.27	27.13	6.36	33.59	364	48	A	H
	*	2412	102.51	-	-	92.62	27.18	6.37	33.59	364	48	P	H
	*	2412	94.74	-	-	84.85	27.18	6.37	33.59	364	48	A	H
		2389.905	56.16	-17.84	74	46.33	27.13	6.36	33.59	139	79	P	V
		2389.8	44.49	-9.51	54	34.66	27.13	6.36	33.59	139	79	A	V
	*	2412	102.7	-	-	92.81	27.18	6.37	33.59	139	79	P	V
	*	2412	95.23	-	-	85.34	27.18	6.37	33.59	139	79	A	V
802.11g CH 06 2437MHz		2380.84	51.62	-22.38	74	41.84	27.09	6.36	33.6	355	43	P	H
		2388.96	41.94	-12.06	54	32.12	27.13	6.36	33.6	355	43	A	H
	*	2437	104.27	-	-	94.28	27.27	6.38	33.59	355	43	P	H
	*	2437	96.87	-	-	86.88	27.27	6.38	33.59	355	43	A	H
		2491.11	52.92	-21.08	74	42.78	27.4	6.39	33.58	355	43	P	H
		2495.31	43.41	-10.59	54	33.26	27.4	6.39	33.57	355	43	A	H
		2343.74	51.63	-22.37	74	42.08	27	6.22	33.6	111	93	P	V
		2383.22	42.12	-11.88	54	32.34	27.09	6.36	33.6	111	93	A	V
	*	2437	105.74	-	-	95.75	27.27	6.38	33.59	111	93	P	V
	*	2437	98.2	-	-	88.21	27.27	6.38	33.59	111	93	A	V
		2492.16	53.81	-20.19	74	43.66	27.4	6.39	33.57	111	93	P	V
		2495.66	43.84	-10.16	54	33.69	27.4	6.39	33.57	111	93	A	V



802.11g CH 11 2462MHz	*	2462	103.86	-	-	93.82	27.31	6.38	33.58	351	43	P	H
	*	2462	96.3	-	-	86.26	27.31	6.38	33.58	351	43	A	H
		2484.32	55.4	-18.6	74	45.3	27.36	6.39	33.58	351	43	P	H
		2483.68	44.71	-9.29	54	34.62	27.36	6.38	33.58	351	43	A	H
	*	2462	105.86	-	-	95.82	27.31	6.38	33.58	110	93	P	V
	*	2462	98.28	-	-	88.24	27.31	6.38	33.58	110	93	A	V
		2483.68	55.67	-18.33	74	45.58	27.36	6.38	33.58	110	93	P	V
		2483.64	45.29	-8.71	54	35.2	27.36	6.38	33.58	110	93	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		4824	39.33	-34.67	74	61	31.29	9.59	62.98	100	0	P	H
		4824	38.81	-35.19	74	60.48	31.29	9.59	62.98	100	0	P	V
802.11g CH 06 2437MHz		4874	39.73	-34.27	74	61.23	31.38	9.56	62.87	100	0	P	H
		7311	41.95	-32.05	74	56.59	36.28	11.31	62.69	100	0	P	H
		4874	39.04	-34.96	74	60.54	31.38	9.56	62.87	100	0	P	V
		7311	42.33	-31.67	74	56.97	36.28	11.31	62.69	100	0	P	V
802.11g CH 11 2462MHz		4924	39.64	-34.36	74	60.92	31.48	9.55	62.75	100	0	P	H
		7386	41.99	-32.01	74	56.58	36.47	11.3	62.74	100	0	P	H
		4924	39.64	-34.36	74	60.92	31.48	9.55	62.75	100	0	P	V
		7386	41.86	-32.14	74	56.45	36.47	11.3	62.74	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		2389.905	56.45	-17.55	74	46.62	27.13	6.36	33.59	374	351	P	H
		2389.695	43.71	-10.29	54	33.89	27.13	6.36	33.6	374	351	A	H
	*	2412	99.55	-	-	89.66	27.18	6.37	33.59	374	351	P	H
	*	2412	92.13	-	-	82.24	27.18	6.37	33.59	374	351	A	H
		2388.54	59.61	-14.39	74	49.79	27.13	6.36	33.6	128	72	P	V
		2390	46.11	-7.89	54	36.28	27.13	6.36	33.59	128	72	A	V
	*	2412	102.25	-	-	92.36	27.18	6.37	33.59	128	72	P	V
	*	2412	94.63	-	-	84.74	27.18	6.37	33.59	128	72	A	V
802.11n HT20 CH 06 2437MHz		2389.52	51.62	-22.38	74	41.8	27.13	6.36	33.6	315	35	P	H
		2374.54	41.85	-12.15	54	32.14	27.09	6.29	33.6	315	35	A	H
	*	2437	101.17	-	-	91.18	27.27	6.38	33.59	315	35	P	H
	*	2437	93.48	-	-	83.49	27.27	6.38	33.59	315	35	A	H
		2498.67	52.72	-21.28	74	42.57	27.4	6.39	33.57	315	35	P	H
		2491.95	42.96	-11.04	54	32.81	27.4	6.39	33.57	315	35	A	H
		2375.52	51.77	-22.23	74	42.06	27.09	6.29	33.6	105	128	P	V
		2388.12	41.95	-12.05	54	32.13	27.13	6.36	33.6	105	128	A	V
	*	2437	103.51	-	-	93.52	27.27	6.38	33.59	105	128	P	V
	*	2437	95.93	-	-	85.94	27.27	6.38	33.59	105	128	A	V
		2494.05	53.17	-20.83	74	43.02	27.4	6.39	33.57	105	128	P	V
		2496.85	43.29	-10.71	54	33.14	27.4	6.39	33.57	105	128	A	V



802.11n HT20 CH 11 2462MHz	*	2462	103.6	-	-	93.56	27.31	6.38	33.58	351	46	P	H
	*	2462	96.16	-	-	86.12	27.31	6.38	33.58	351	46	A	H
		2484.84	56.02	-17.98	74	45.92	27.36	6.39	33.58	351	46	P	H
		2483.64	44.28	-9.72	54	34.19	27.36	6.38	33.58	351	46	A	H
	*	2462	105.22	-	-	95.18	27.31	6.38	33.58	108	94	P	V
	*	2462	97.57	-	-	87.53	27.31	6.38	33.58	108	94	A	V
		2484.28	57.87	-16.13	74	47.77	27.36	6.39	33.58	108	94	P	V
		2483.52	44.93	-9.07	54	34.84	27.36	6.38	33.58	108	94	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



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

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT20 CH 01 2412MHz		4824	39.04	-34.96	74	60.71	31.29	9.59	62.98	100	0	P	H
		4824	38.8	-35.2	74	60.47	31.29	9.59	62.98	100	0	P	V
802.11n HT20 CH 06 2437MHz		4874	38.69	-35.31	74	60.19	31.38	9.56	62.87	100	0	P	H
		7311	41.89	-32.11	74	56.53	36.28	11.31	62.69	100	0	P	H
		4874	38.55	-35.45	74	60.05	31.38	9.56	62.87	100	0	P	V
		7311	42.36	-31.64	74	57	36.28	11.31	62.69	100	0	P	V
802.11n HT20 CH 11 2462MHz		4924	39.98	-34.02	74	61.26	31.48	9.55	62.75	100	0	P	H
		7386	43.25	-30.75	74	57.84	36.47	11.3	62.74	100	0	P	H
		4924	39.83	-34.17	74	61.11	31.48	9.55	62.75	100	0	P	V
		7386	42.76	-31.24	74	57.35	36.47	11.3	62.74	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 03 2422MHz		2388.54	53.44	-20.56	74	43.62	27.13	6.36	33.6	318	34	P	H
		2389.24	43.06	-10.94	54	33.24	27.13	6.36	33.6	318	34	A	H
	*	2422	99.52	-	-	89.59	27.22	6.37	33.59	318	34	P	H
	*	2422	92.52	-	-	82.59	27.22	6.37	33.59	318	34	A	H
		2490.88	52.59	-21.41	74	42.45	27.4	6.39	33.58	318	34	P	H
		2496.88	43.44	-10.56	54	33.29	27.4	6.39	33.57	318	34	A	H
		2389.24	56.15	-17.85	74	46.33	27.13	6.36	33.6	104	127	P	V
		2389.94	43.82	-10.18	54	33.99	27.13	6.36	33.59	104	127	A	V
	*	2422	102.25	-	-	92.32	27.22	6.37	33.59	104	127	P	V
	*	2422	95.03	-	-	85.1	27.22	6.37	33.59	104	127	A	V
		2485.2	53.55	-20.45	74	43.45	27.36	6.39	33.58	104	127	P	V
		2496	43.71	-10.29	54	33.56	27.4	6.39	33.57	104	127	A	V
802.11n HT40 CH 06 2437MHz		2324.28	52.03	-21.97	74	42.61	26.95	6.15	33.61	318	36	P	H
		2386.86	42.86	-11.14	54	33.04	27.13	6.36	33.6	318	36	A	H
	*	2437	100.97	-	-	90.98	27.27	6.38	33.59	318	36	P	H
	*	2437	93.6	-	-	83.61	27.27	6.38	33.59	318	36	A	H
		2487.28	52.91	-21.09	74	42.81	27.36	6.39	33.58	318	36	P	H
		2494.8	43.83	-10.17	54	33.68	27.4	6.39	33.57	318	36	A	H
		2385.04	52.27	-21.73	74	42.49	27.09	6.36	33.6	109	127	P	V
		2386.72	42.71	-11.29	54	32.89	27.13	6.36	33.6	109	127	A	V
	*	2437	103.34	-	-	93.35	27.27	6.38	33.59	109	127	P	V
	*	2437	95.84	-	-	85.85	27.27	6.38	33.59	109	127	A	V
		2496.08	52.72	-21.28	74	42.57	27.4	6.39	33.57	109	127	P	V
		2498.88	43.9	-10.1	54	33.75	27.4	6.39	33.57	109	127	A	V



802.11n HT40 CH 09 2452MHz		2364.32	51.88	-22.12	74	42.22	27.04	6.29	33.6	342	42	P	H
		2330.58	42.64	-11.36	54	33.15	26.95	6.22	33.61	342	42	A	H
	*	2452	100.04	-	-	90.04	27.27	6.38	33.58	342	42	P	H
	*	2452	92.87	-	-	82.87	27.27	6.38	33.58	342	42	A	H
		2496.24	61.47	-12.53	74	51.32	27.4	6.39	33.57	342	42	P	H
		2494.8	47	-7	54	36.85	27.4	6.39	33.57	342	42	A	H
		2371.74	51.51	-22.49	74	41.8	27.09	6.29	33.6	112	93	P	V
		2375.24	42.58	-11.42	54	32.87	27.09	6.29	33.6	112	93	A	V
	*	2452	101.63	-	-	91.63	27.27	6.38	33.58	112	93	P	V
	*	2452	94.16	-	-	84.16	27.27	6.38	33.58	112	93	A	V
		2491.52	60.46	-13.54	74	50.32	27.4	6.39	33.58	112	93	P	V
		2496.24	48.21	-5.79	54	38.06	27.4	6.39	33.57	112	93	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



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

WIFI Ant. 1	Note	Frequency (MHz)	Level (dBμV/m)	Over Limit (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n		4844	38.7	-35.3	74	60.31	31.32	9.58	62.94	100	0	P	H
HT40		7266	42	-32	74	56.64	36.21	11.32	62.67	100	0	P	H
CH 03		4844	38.1	-35.9	74	59.71	31.32	9.58	62.94	100	0	P	V
2422MHz		7266	42.4	-31.6	74	57.04	36.21	11.32	62.67	100	0	P	V
802.11n		4874	38.78	-35.22	74	60.28	31.38	9.56	62.87	100	0	P	H
HT40		7311	42.4	-31.6	74	57.04	36.28	11.31	62.69	100	0	P	H
CH 06		4874	38.26	-35.74	74	59.76	31.38	9.56	62.87	100	0	P	V
2437MHz		7311	42.38	-31.62	74	57.02	36.28	11.31	62.69	100	0	P	V
802.11n		4904	39.16	-34.84	74	60.52	31.44	9.56	62.79	100	0	P	H
HT40		7356	42.46	-31.54	74	57.07	36.4	11.3	62.72	100	0	P	H
CH 09		4904	38.69	-35.31	74	60.05	31.44	9.56	62.79	100	0	P	V
2452MHz		7356	41.49	-32.51	74	56.1	36.4	11.3	62.72	100	0	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												



Emission below 1GHz

2.4GHz WIFI 802.11n HT40 (LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11n HT40 LF		101.01	23.68	-19.82	43.5	38.57	16.18	1.39	32.48	-	-	P	H
		196.05	30.69	-12.81	43.5	46.46	14.86	1.69	32.39	-	-	P	H
		217.11	32.12	-13.88	46	47.56	15.17	1.72	32.39	-	-	P	H
		739.6	30.91	-15.09	46	31.7	28.03	3.4	32.35	-	-	P	H
		860	32.15	-13.85	46	30.78	29.42	3.67	31.87	-	-	P	H
		937	33.55	-12.45	46	30.63	30.25	3.82	31.32	100	0	P	H
		38.91	32.94	-7.06	40	44.75	19.85	0.82	32.49	100	0	P	V
		73.2	21.83	-18.17	40	40.64	12.44	1.22	32.49	-	-	P	V
		217.65	25.72	-20.28	46	41.16	15.17	1.72	32.39	-	-	P	V
		846	31.64	-14.36	46	30.75	29.08	3.6	31.94	-	-	P	V
		923.7	32.32	-13.68	46	30.11	29.7	3.79	31.44	-	-	P	V
		944.7	34.46	-11.54	46	31.15	30.57	3.82	31.25	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

**Note symbol**

*	Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is not under limit 6dB
P/A	P eak or A verage
H/V	H orizontal or V ertical



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

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
CH 01													
2412MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

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

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

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

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

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

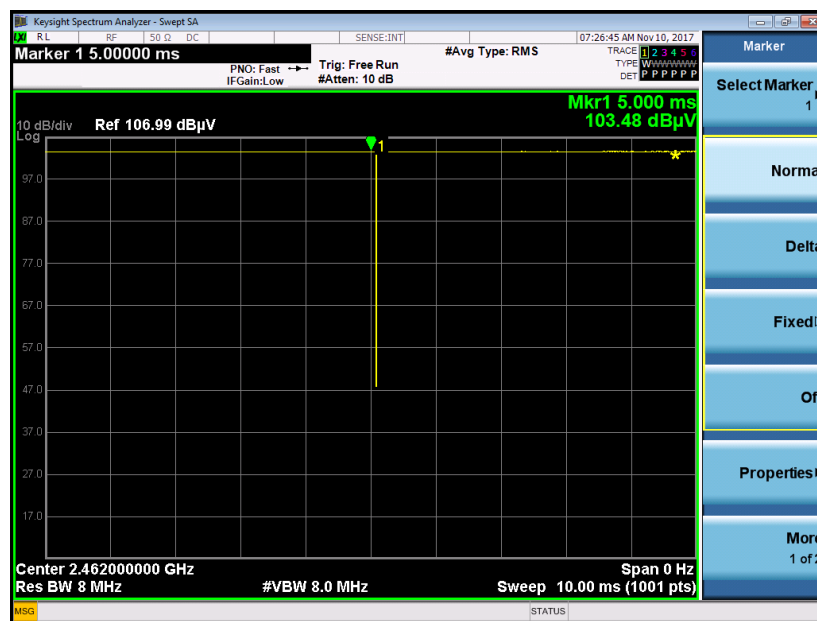


Appendix C. Duty Cycle Plots

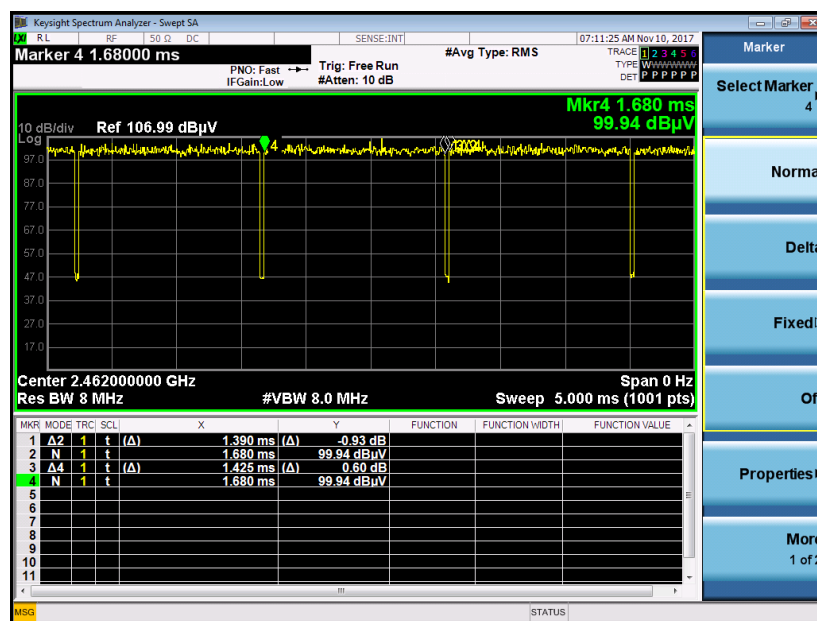
Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	100	-	-	10Hz
802.11g	97.54	1.390	0.719	1kHz
802.11n HT20	97.38	1.300	0.769	1kHz
802.11n HT40	94.74	0.648	1.543	3kHz



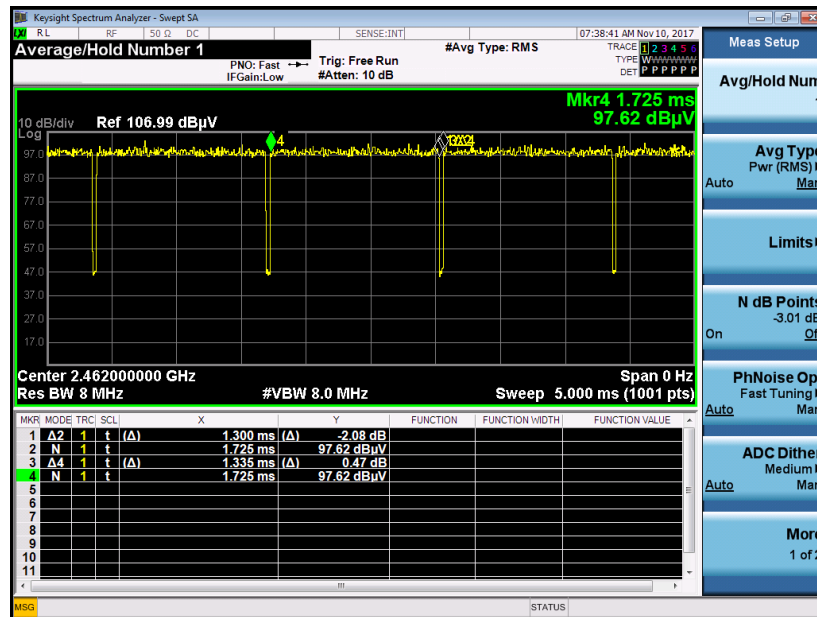
802.11b



802.11g



802.11n HT20



802.11n HT40

