FCC RF Test Report

APPLICANT	:	Brightstar Corporation
EQUIPMENT	:	Mobile Phone
BRAND NAME	:	Avvio
MODEL NAME	:	Avvio Q145D, Avvio Q145
FCC ID	:	WVBAQ145X
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System

The product was received on Feb. 28, 2017 and testing was completed on Mar. 14, 2017. We, SPORTON International (ShenZhen) 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 (ShenZhen) INC., the test report shall not be reproduced except in full.

Prepared by: Eric Shih / Manager

Approved by: Jones Tsai / Manager

Testing Laboratory
2353

SPORTON International (ShenZhen) INC.
1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan District, Shenzhen City, Guangdong Province, China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR722807C	Rev. 01	Initial issue of report	Mar. 24, 2017

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.2	15.247(b)	Power Output Measurement	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
		Conducted Spurious Emission		Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 0.10 dB at 4874.000 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 15.76 dB at 0.150 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-

1 General Description

1.1 Applicant

Brightstar Corporation
9725 NW 117th Ave., Miami, Florida, FL 33178, United States

1.2 Manufacturer

Shenzhen Crave Communication Co.,Ltd.
Floor 3, Bldg 8, Dongfangming Industrial City, No.83 Dabao Rd., 33 District, Shenzhen, China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Phone
Brand Name	Avvio
Model Name	Avvio Q145D, Avvio Q145
FCC ID	WVBAQ145X
EUT supports Radios application	GSM/GPRS/EGPRS(Downlink only)/WCDMA/HSPA/ HSPA+ (16QAM uplink is not supported) WLAN 2.4GHz 802.11b/g/n HT20/HT40 Bluetooth v3.0 + EDR/ Bluetooth v4.0 LE
IMEI Code	Conducted: 359535070140282/359535070140290 Conduction: 359535070140308/359535070140316 Radiation: 359535070140340/359535070140357
HW Version	V13-MB-V1.2
SW Version	Avvio-Q145-V01-20170215
EUT Stage	Production Unit

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 : 14.34 dBm (0.0272 W) 802.11g : 21.52 dBm (0.1419 W) 802.11n HT20 : 21.56 dBm (0.1432 W) 802.11n HT40 : 21.66 dBm (0.1466 W)
Antenna Type / Gain	PIFA Antenna with gain 0.5 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.5 Modification of EUT

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

1.6 Testing Location

Test Site	SPORTON International (ShenZhen) INC.	
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan District, Shenzhen City, Guangdong Province, China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595	
Test Site No.	**Sporton Site No.**	
	TH01-SZ	CO01-SZ

Test Site	SPORTON International (ShenZhen) INC.	
Test Site Location	No. 3 Building, the third floor of south, Shahe River west, Fengzeyuan warehouse, Nanshan District, Shenzhen, Guangdong, P. R. China TEL: +86-755- 3320-2398	
Test Site No.	**Sporton Site No.**	**FCC Registration No.**
	03CH03-SZ	565805

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

1.7 Applicable Standards

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

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

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.

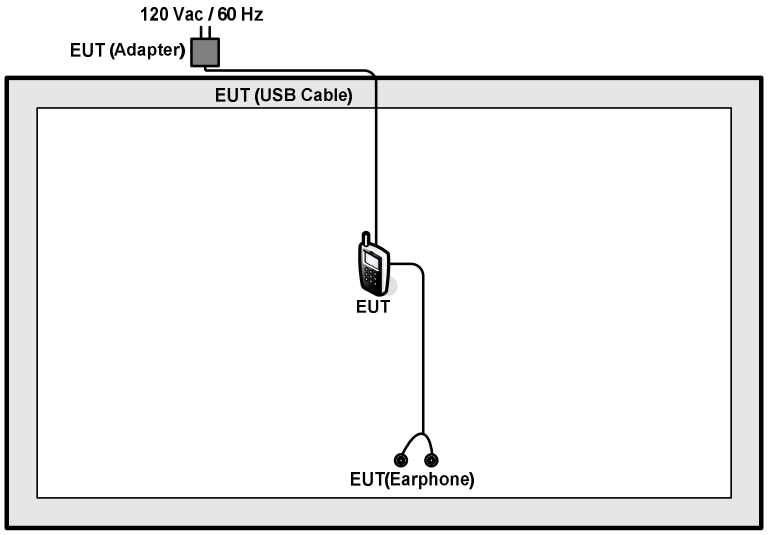
<2.4GHz>

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

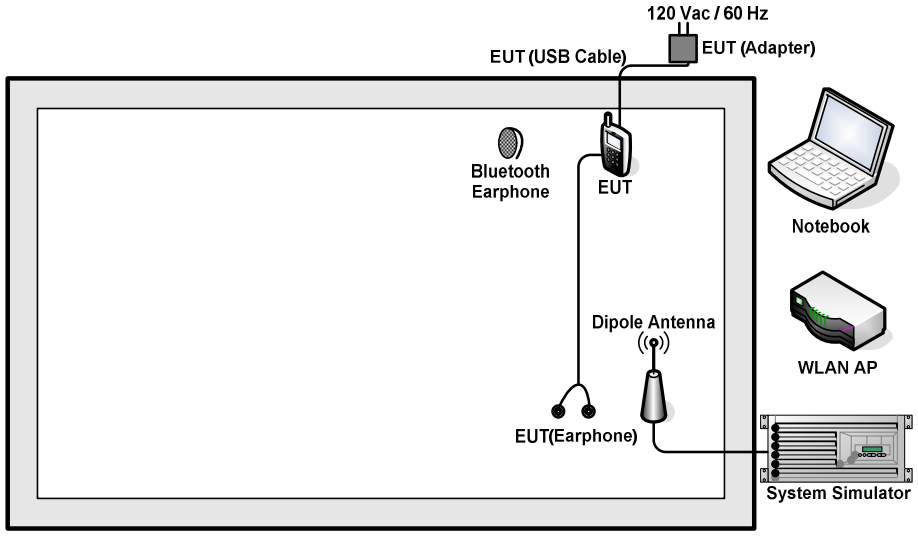
Test Cases	
AC Conducted Emission	Mode 1 : GSM1900 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable (Charging from Adapter)
Remark: For radiated test cases, the tests were performed with Adapter, Earphone and USB cable.	

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	Dlink	DIR-820L	KA2IR820LA1	N/A	Unshielded, 1.8 m
3.	Notebook	Lenovo	E540	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Nokia	BH-108	PYAHS-107W	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 and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 5.0 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 5.0 + 10 = 15.0 (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.

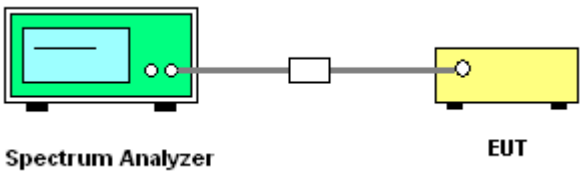
3.1.2 Measuring Instruments

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 v03r05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. Measure and record the results in the test report.

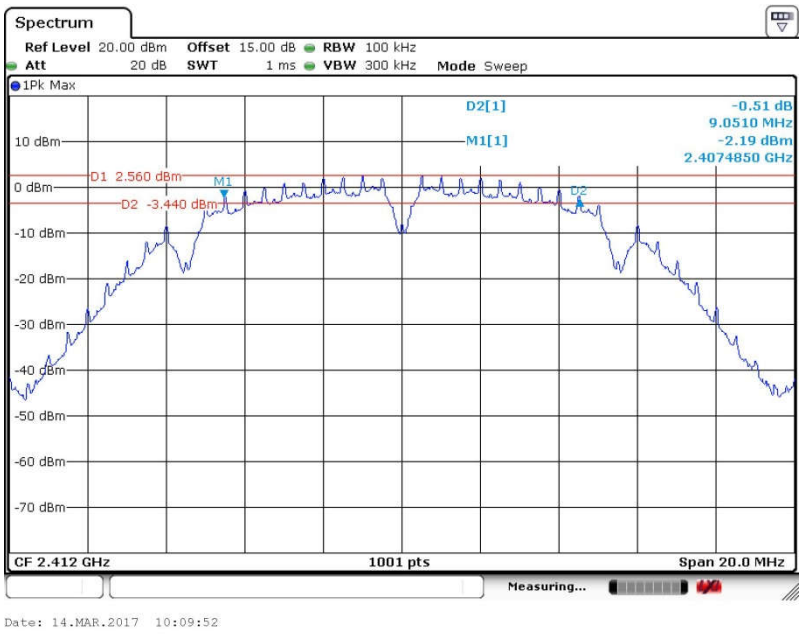
3.1.4 Test Setup



3.1.5 Test Result of 6dB Occupied Bandwidth

Please refer to Appendix A.

Minimum 6dB Bandwidth



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

3.2 Output Power Measurement

3.2.1 Limit of Output Power

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

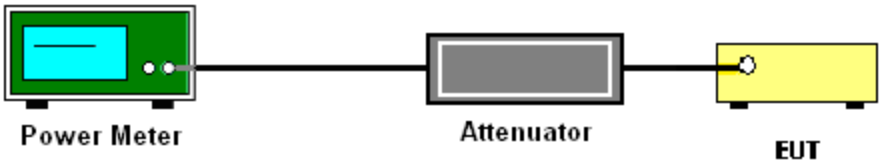
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v03r05 section 9.1.2 PKPM1 Peak power meter method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

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.

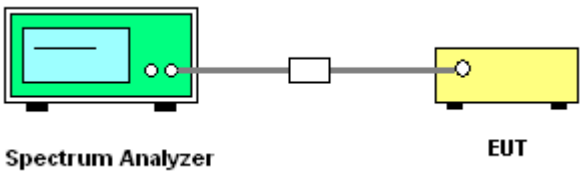
3.3.2 Measuring Instruments

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 v03r05
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.

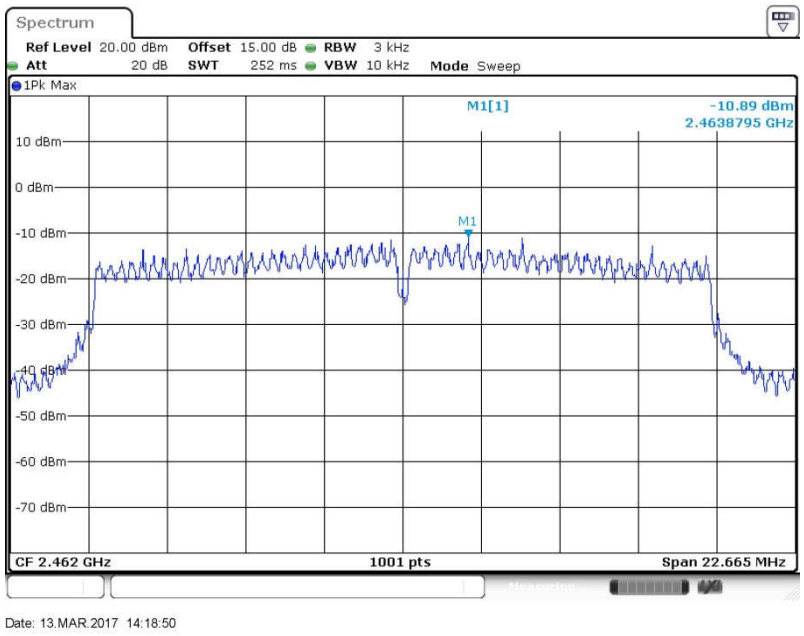
3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

Worst Case Power Density (dBm/3kHz)



3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

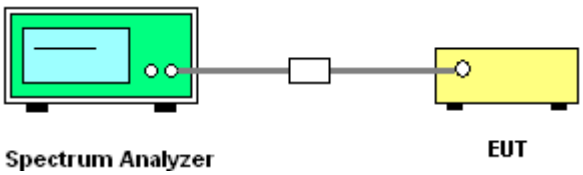
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup

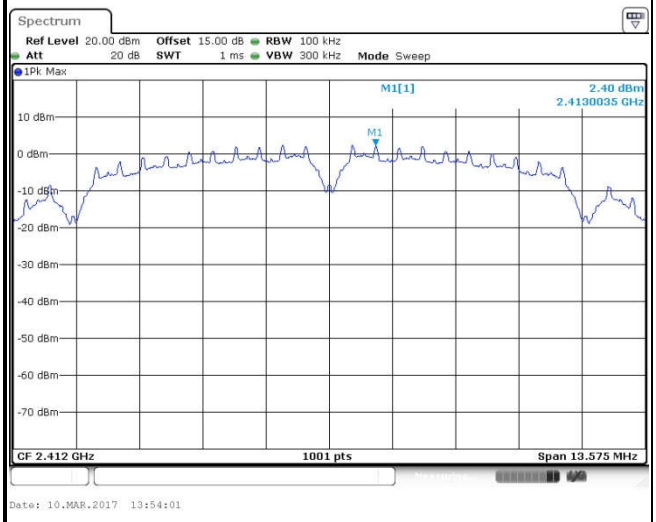


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

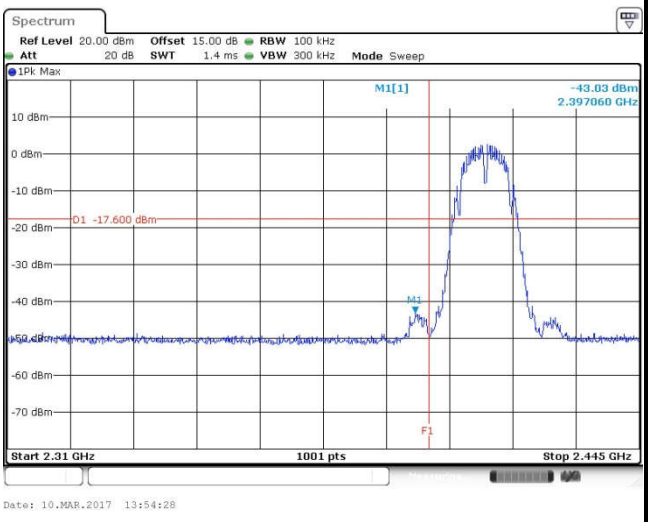
Test Mode :	802.11b	**Temperature :**	24~26℃
Test Band :	2.4GHz Low	**Relative Humidity :**	50~53%
Test Channel :	01	**Test Engineer :**	Sam Zheng

WLAN 802.11b Channel 01

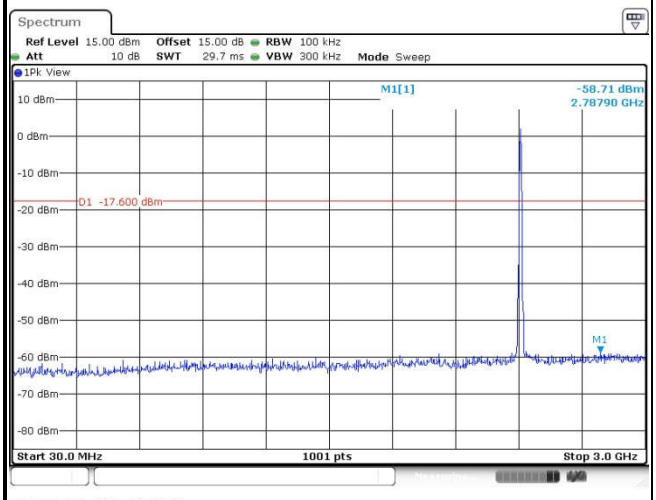
100kHz PSD reference Level



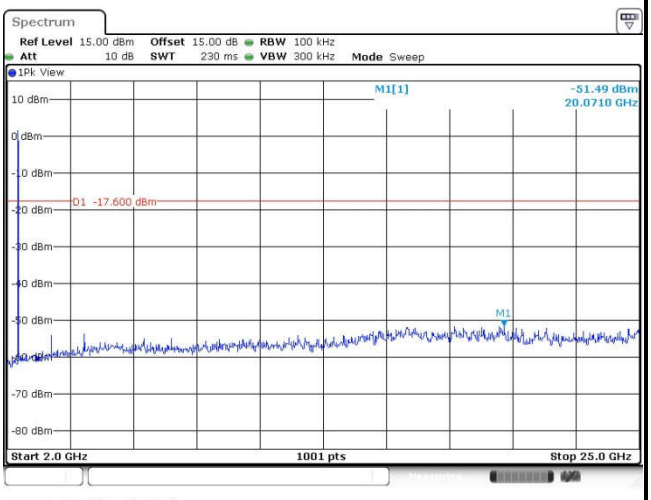
Low Channel Plot



Spurious Emission 30MHz~3GHz



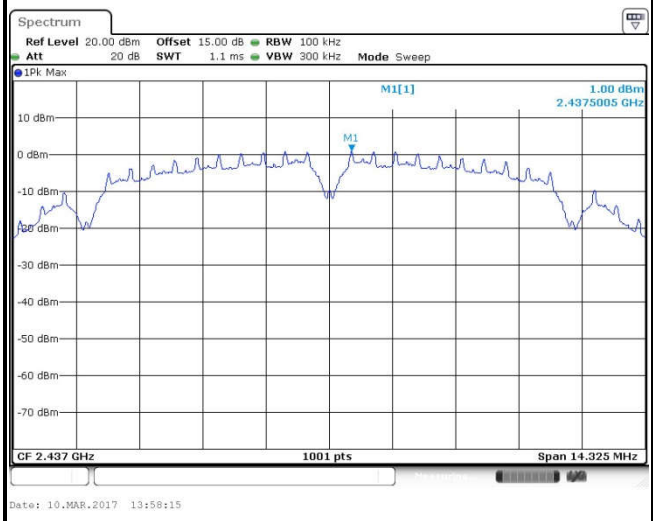
Spurious Emission 2GHz~25GHz



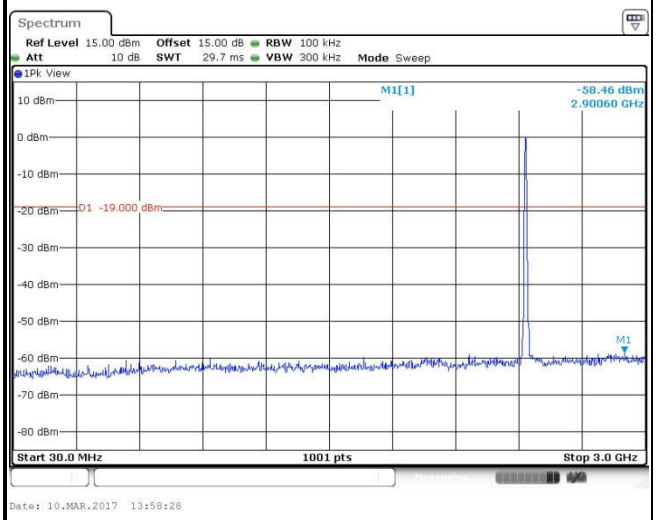
Test Mode :	802.11b	Temperature :	24~26℃
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Sam Zheng

WLAN 802.11b Channel 06

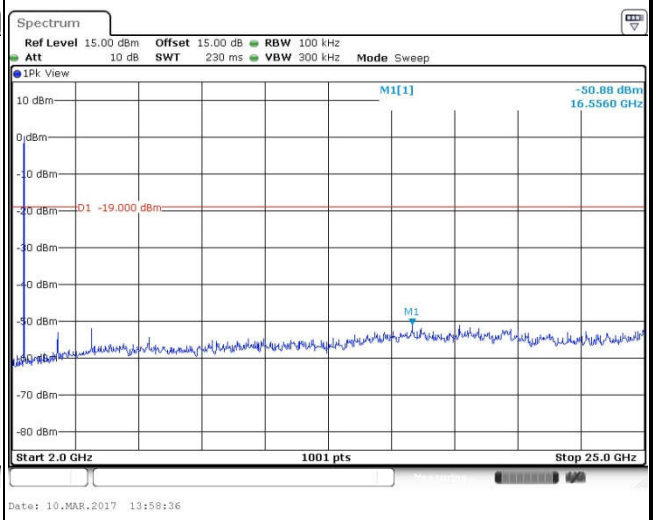
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



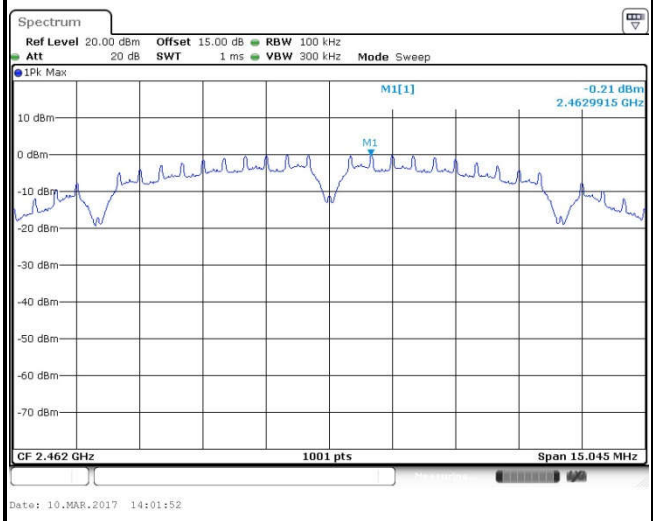
Spurious Emission 2GHz~25GHz



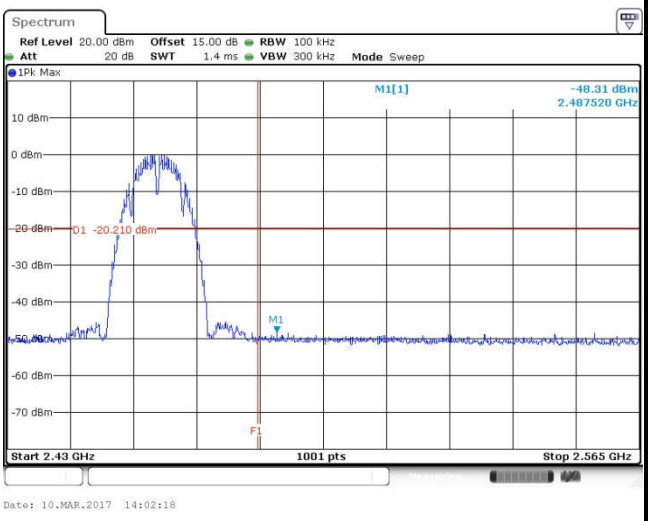
Test Mode :	802.11b	Temperature :	24~26℃
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Sam Zheng

WLAN 802.11b Channel 11

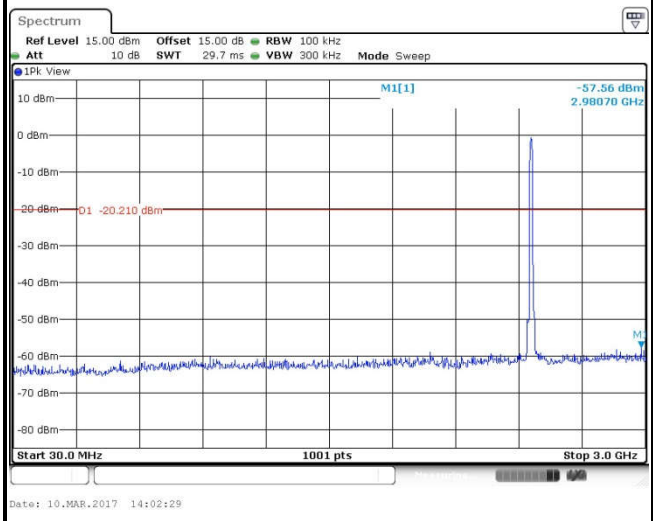
100kHz PSD reference Level



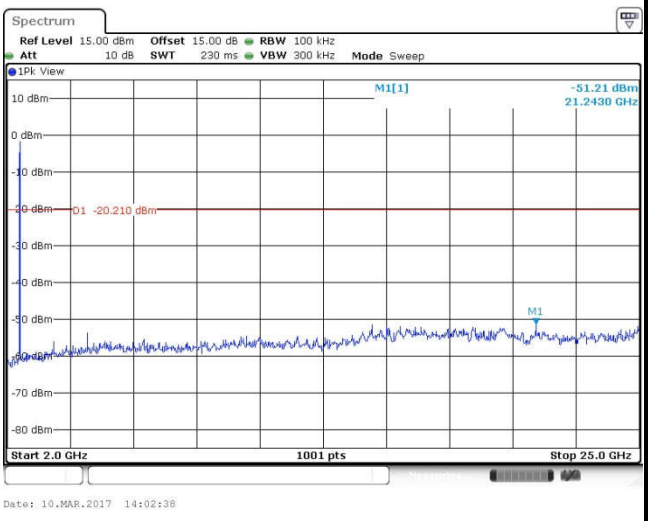
High Channel Plot



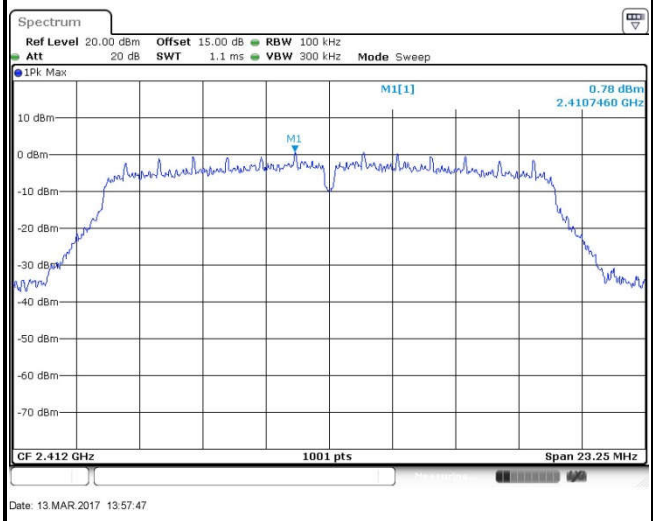
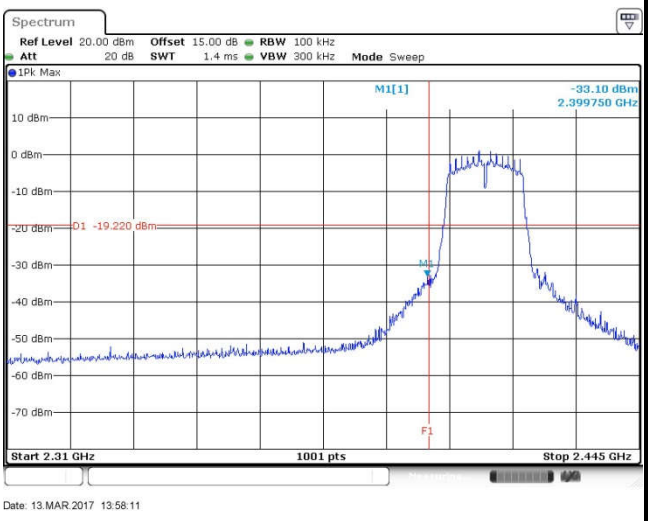
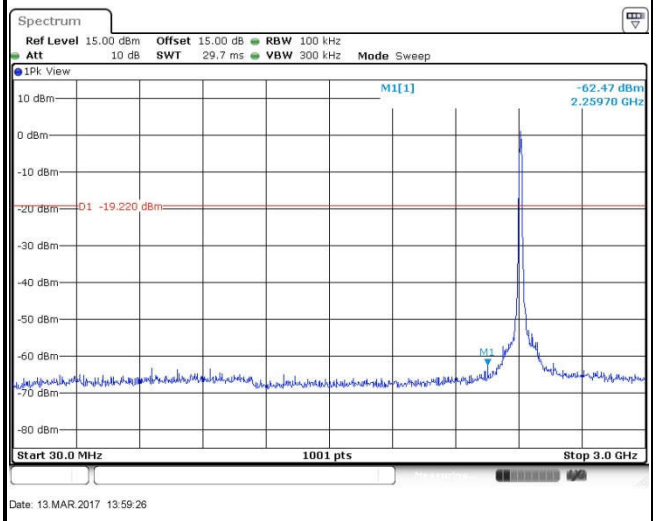
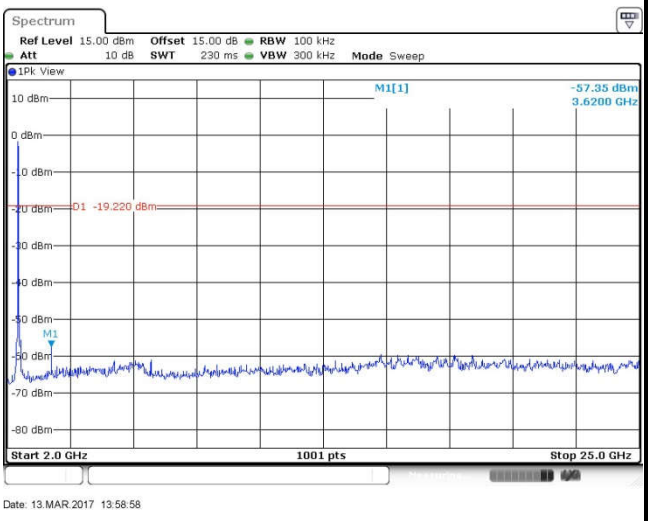
Spurious Emission 30MHz~3GHz



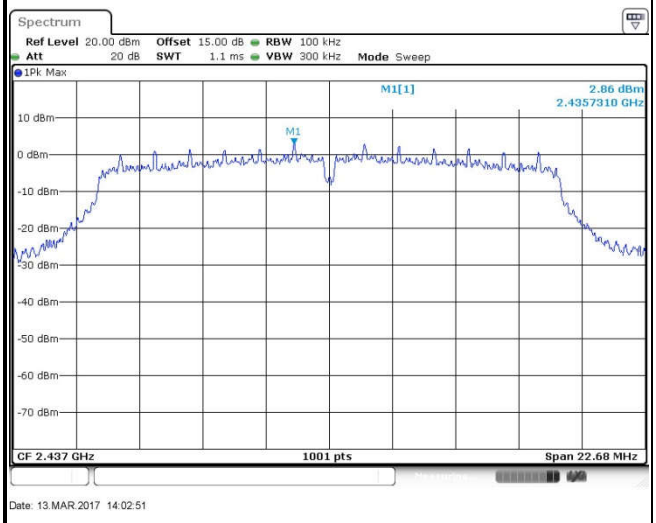
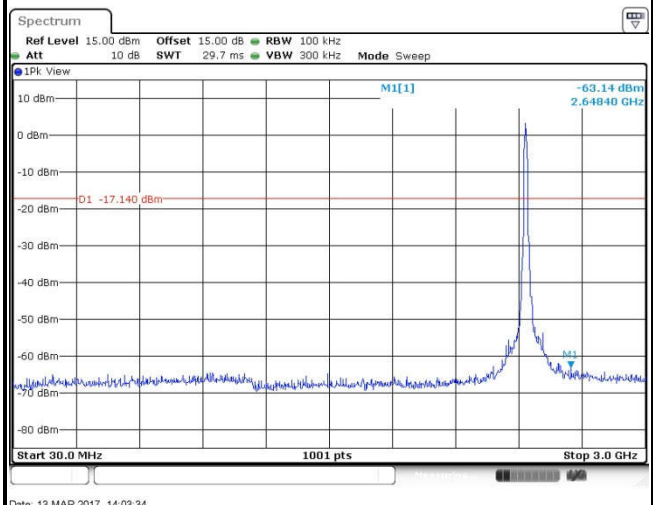
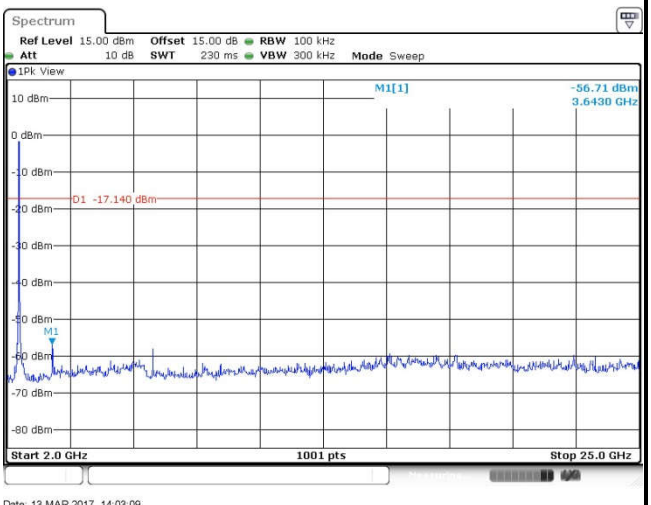
Spurious Emission 2GHz~25GHz



Test Mode :	802.11g	Temperature :	24~26℃
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Sam Zheng

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

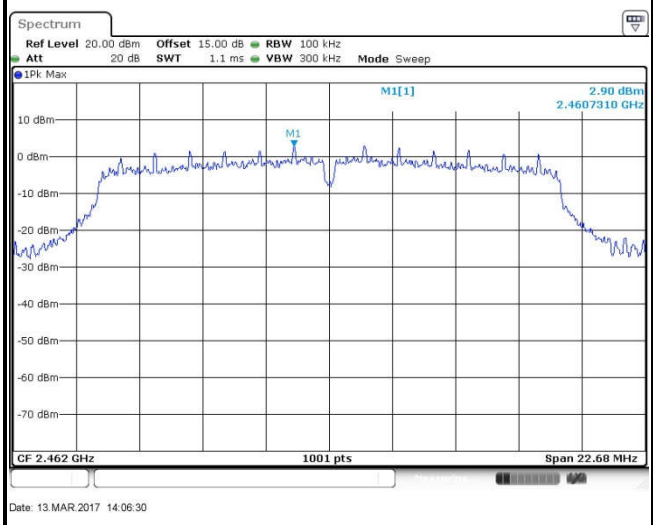
Test Mode :	802.11g	Temperature :	24~26℃
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Sam Zheng

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

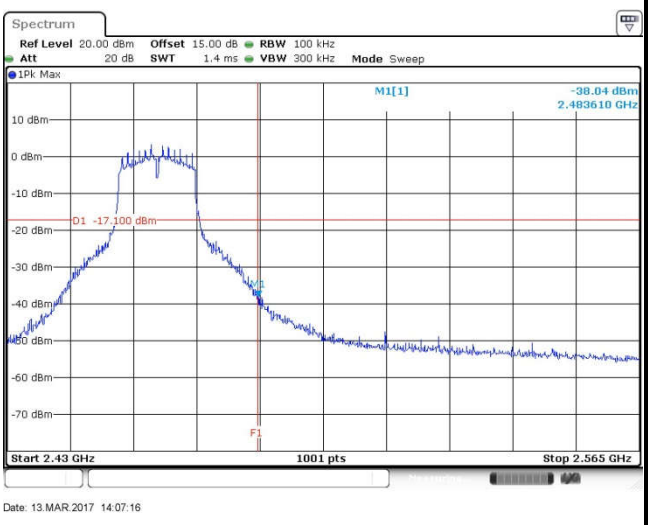
Test Mode :	802.11g	Temperature :	24~26℃
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Sam Zheng

WLAN 802.11g Channel 11

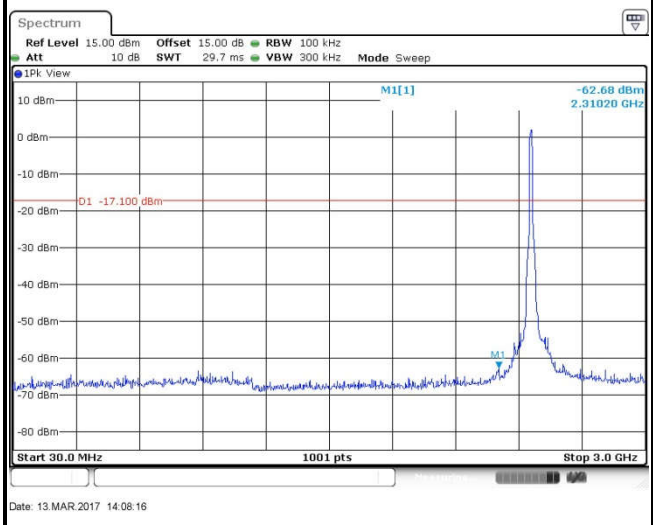
100kHz PSD reference Level



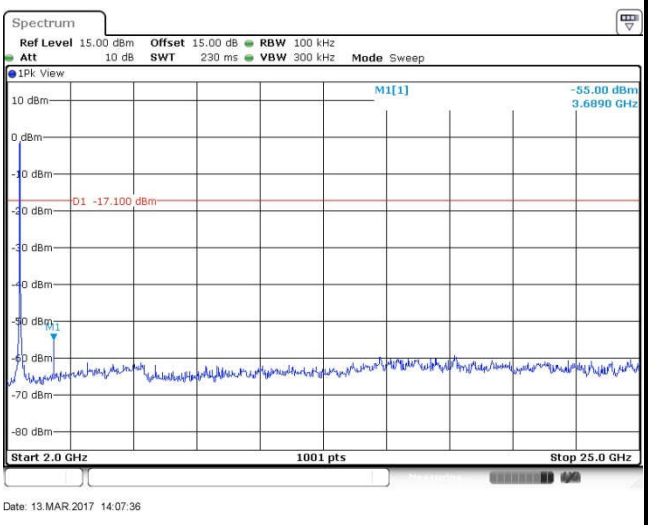
High Channel Plot



Spurious Emission 30MHz~3GHz



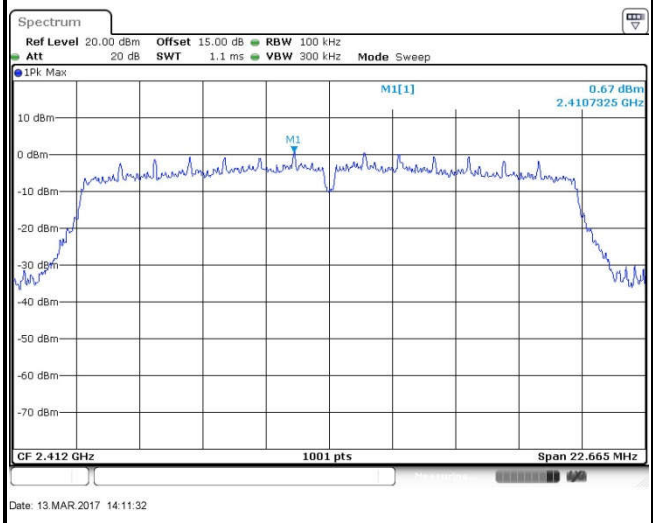
Spurious Emission 2GHz~25GHz



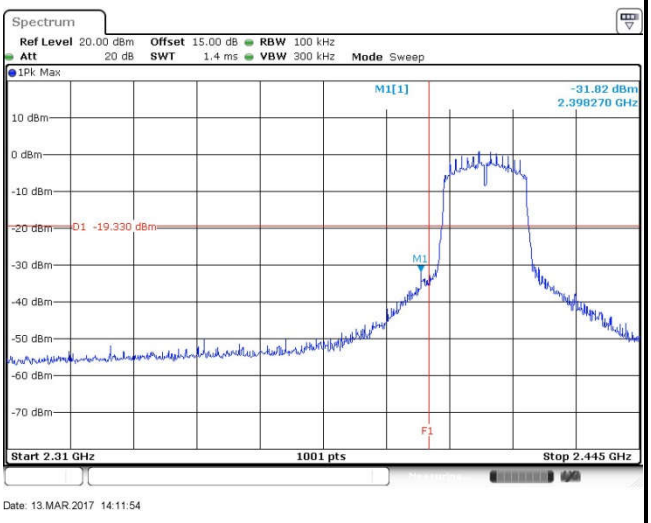
Test Mode :	802.11n HT20	Temperature :	24~26℃
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	01	Test Engineer :	Sam Zheng

WLAN 802.11n HT20 Channel 01

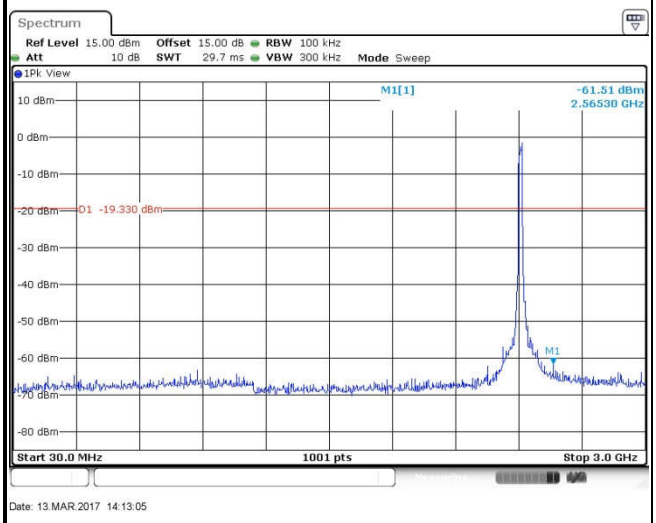
100kHz PSD reference Level



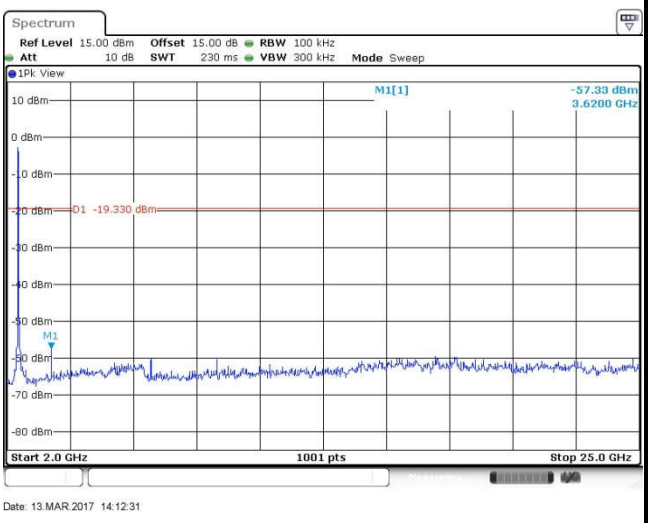
Low Channel Plot



Spurious Emission 30MHz~3GHz



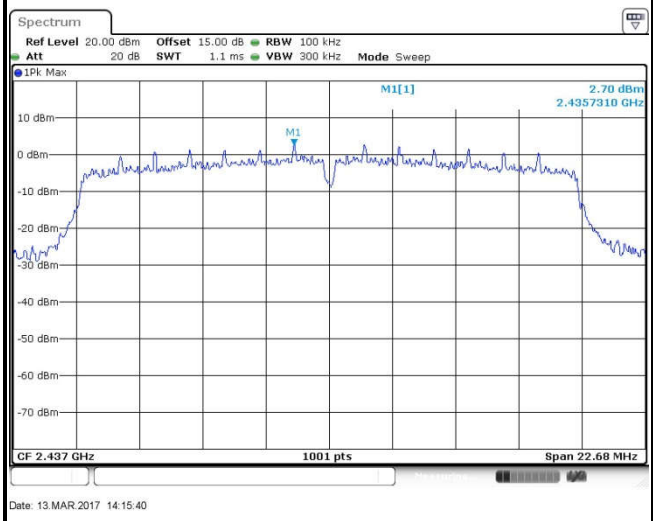
Spurious Emission 2GHz~25GHz



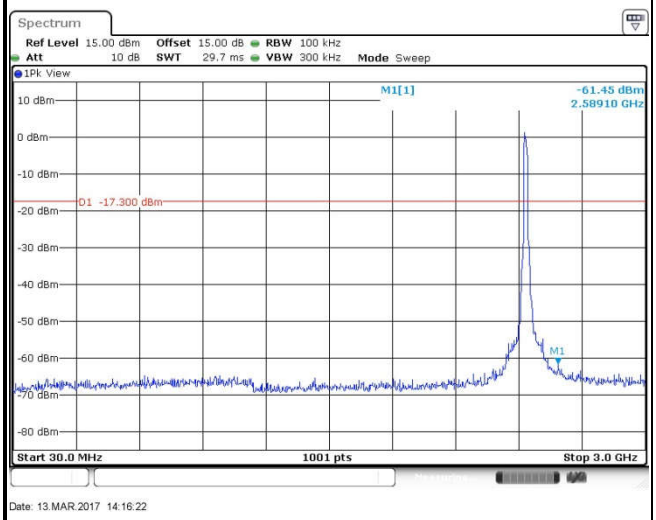
Test Mode :	802.11n HT20	Temperature :	24~26℃
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Sam Zheng

WLAN 802.11n HT20 Channel 06

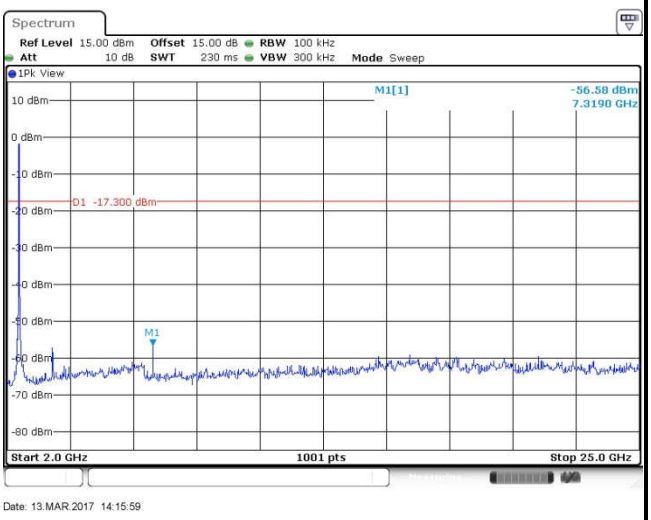
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



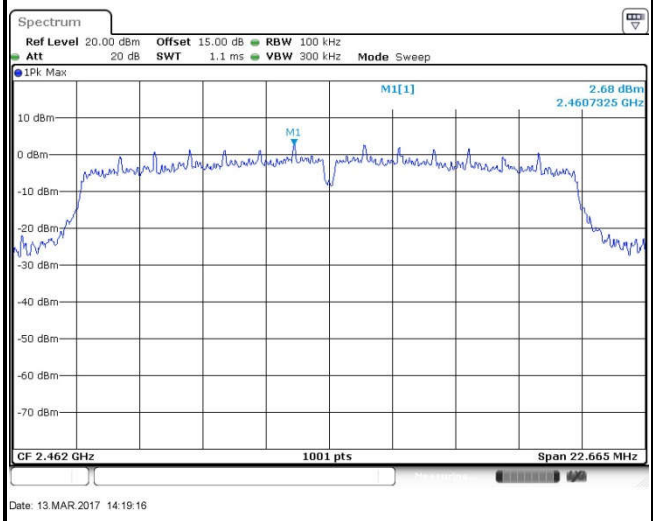
Spurious Emission 2GHz~25GHz



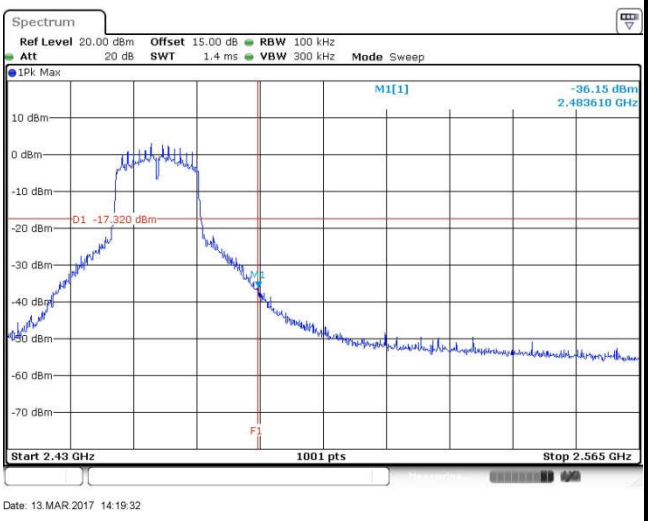
Test Mode :	802.11n HT20	Temperature :	24~26℃
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	11	Test Engineer :	Sam Zheng

WLAN 802.11n HT20 Channel 11

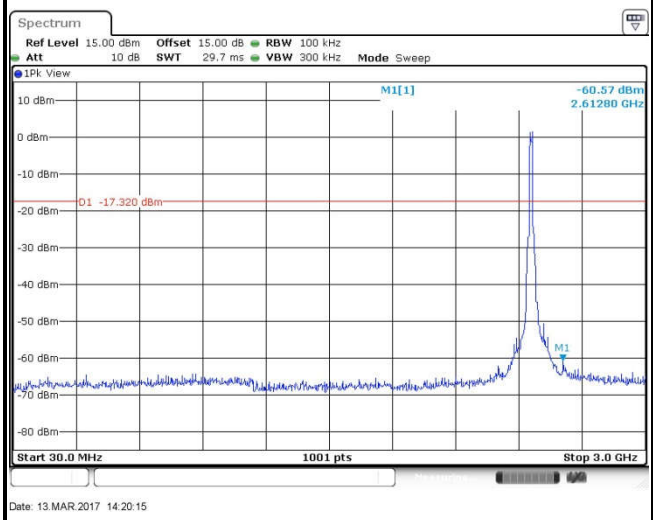
100kHz PSD reference Level



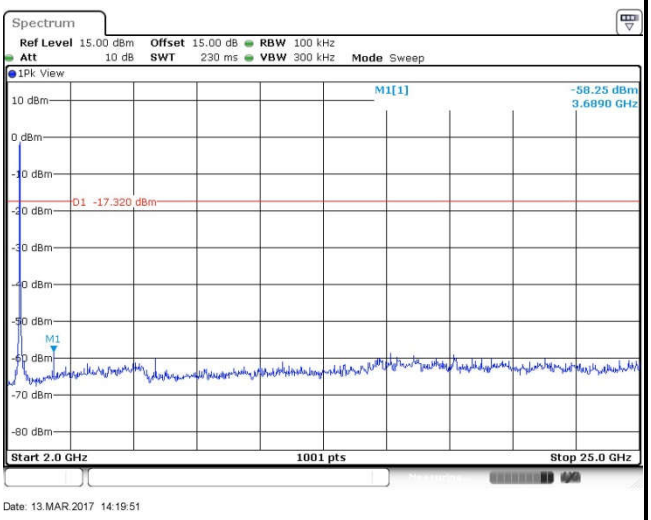
High Channel Plot



Spurious Emission 30MHz~3GHz



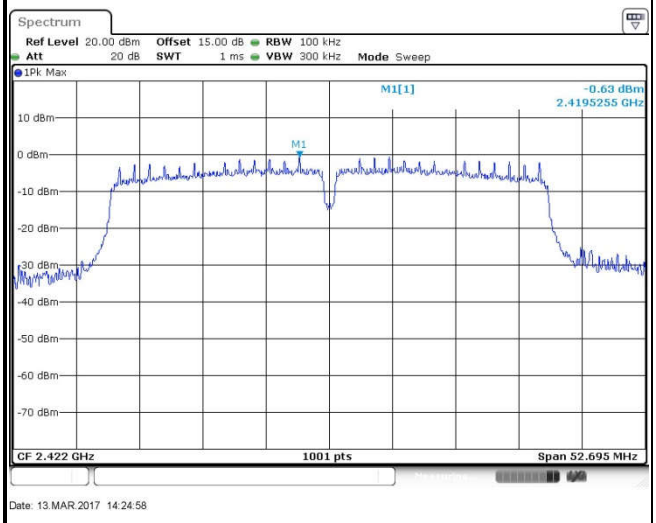
Spurious Emission 2GHz~25GHz



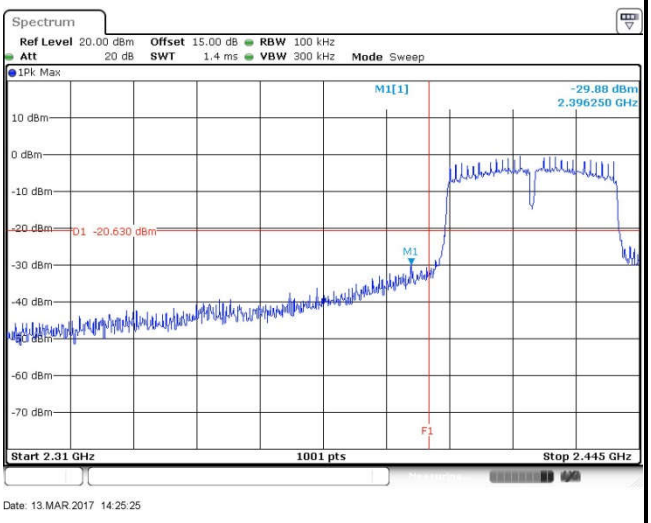
Test Mode :	802.11n HT40	Temperature :	24~26℃
Test Band :	2.4GHz Low	Relative Humidity :	50~53%
Test Channel :	03	Test Engineer :	Sam Zheng

WLAN 802.11n HT40 Channel 03

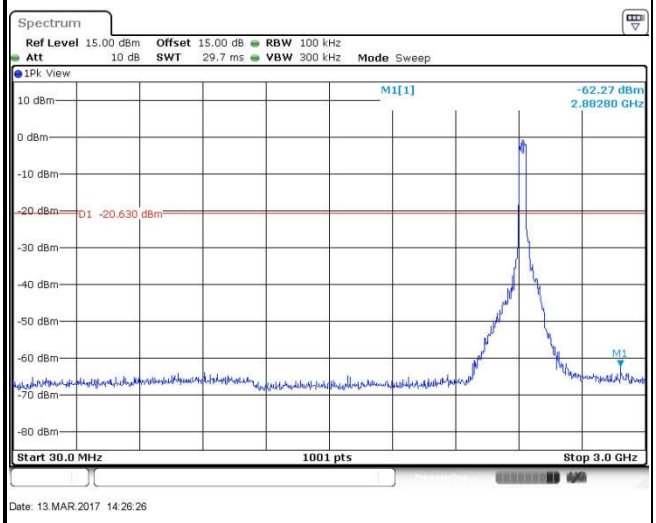
100kHz PSD reference Level



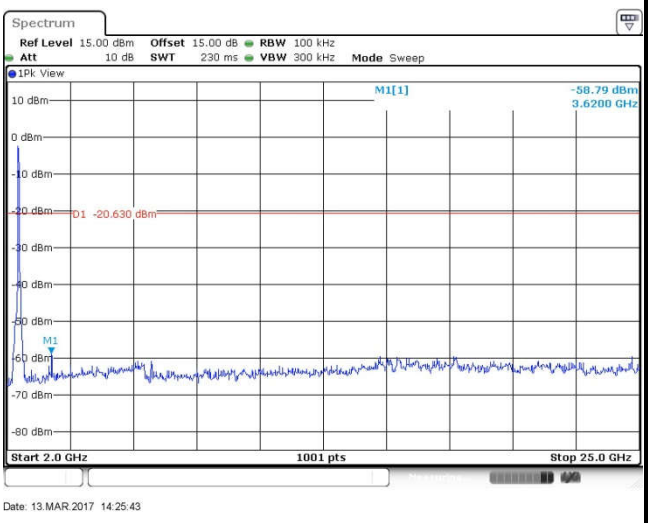
Low Channel Plot



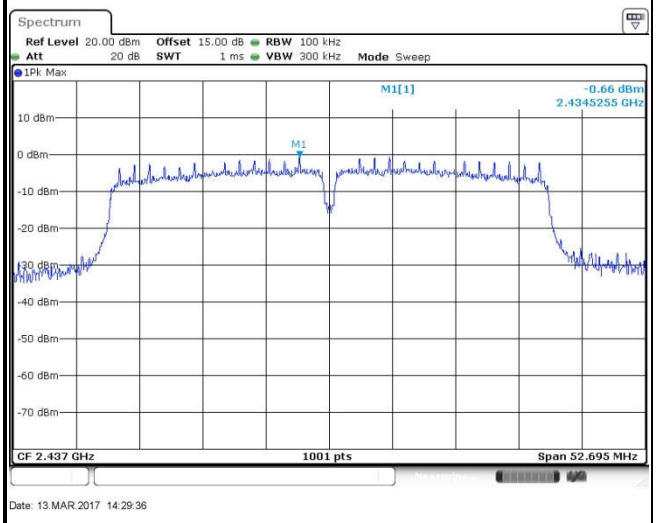
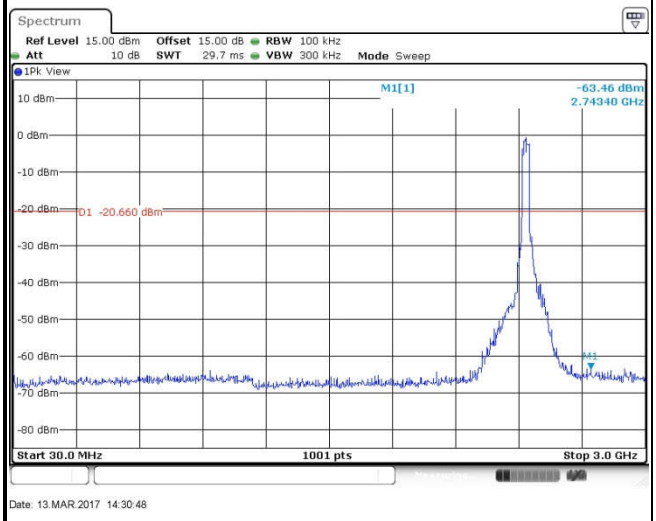
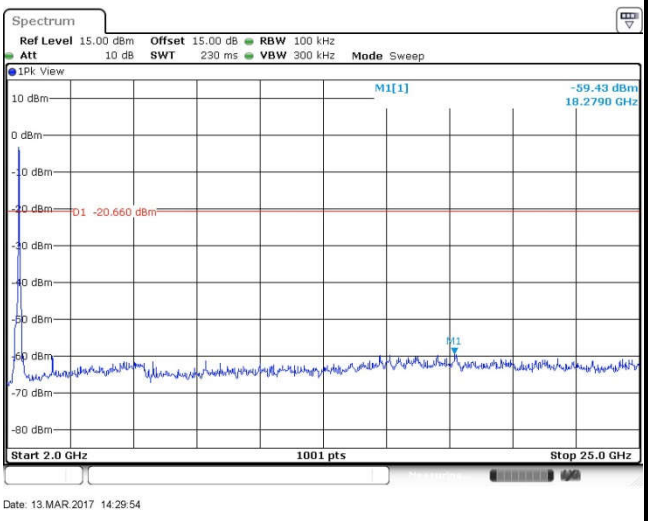
Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz



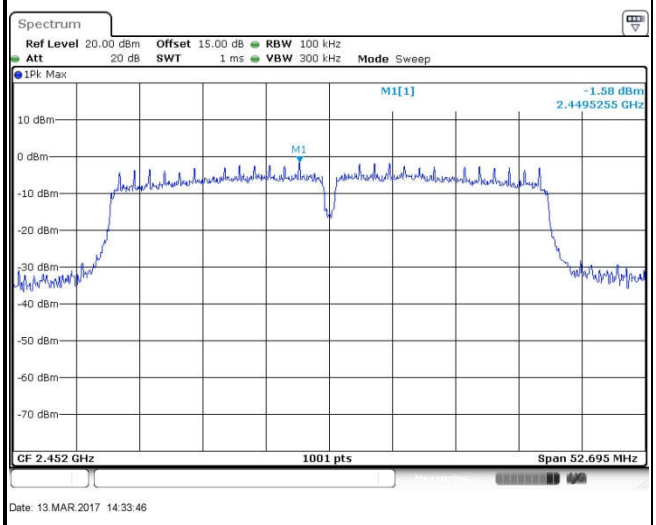
Test Mode :	802.11n HT40	Temperature :	24~26℃
Test Band :	2.4GHz Mid	Relative Humidity :	50~53%
Test Channel :	06	Test Engineer :	Sam Zheng

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

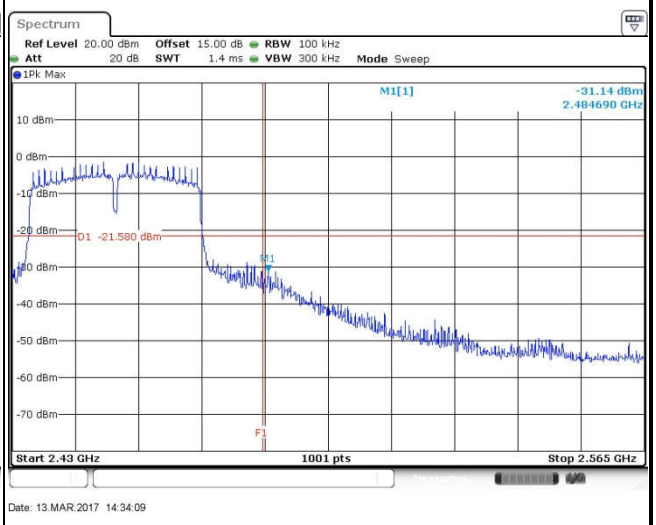
Test Mode :	802.11n HT40	Temperature :	24~26℃
Test Band :	2.4GHz High	Relative Humidity :	50~53%
Test Channel :	09	Test Engineer :	Sam Zheng

WLAN 802.11n HT40 Channel 09

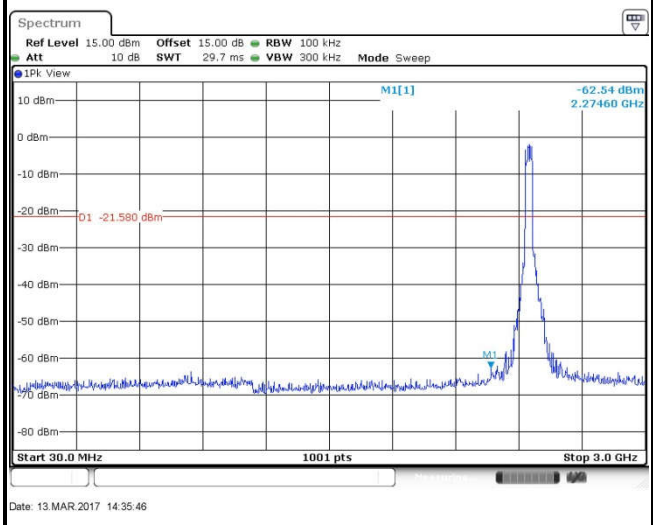
100kHz PSD reference Level



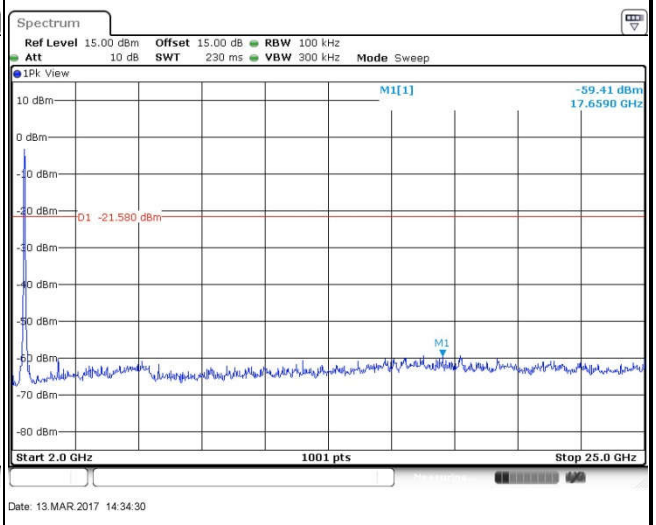
High Channel Plot



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz



3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.5.2 Measuring Instruments

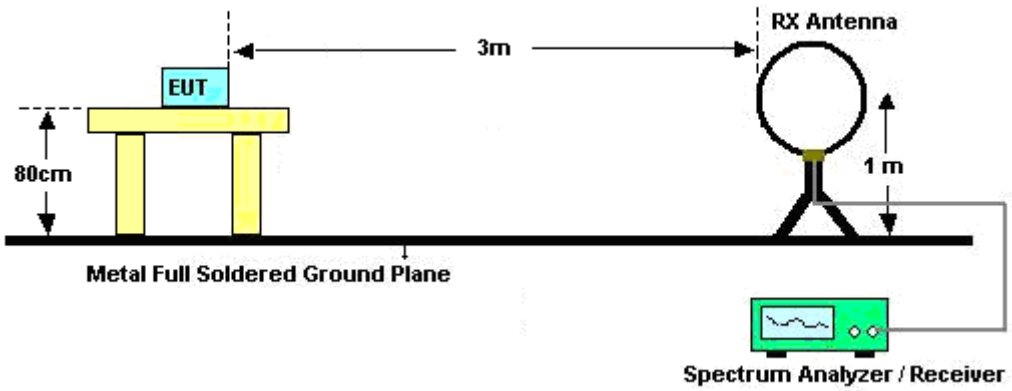
The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

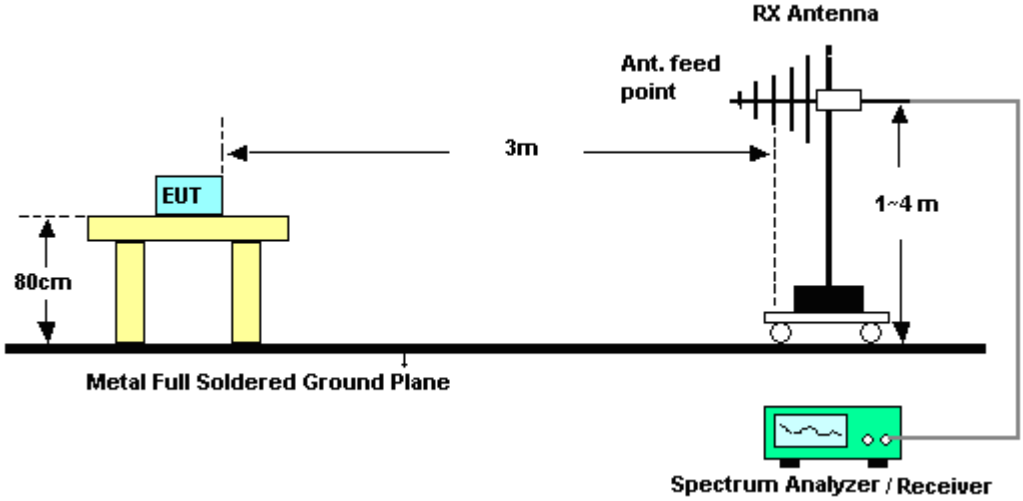
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

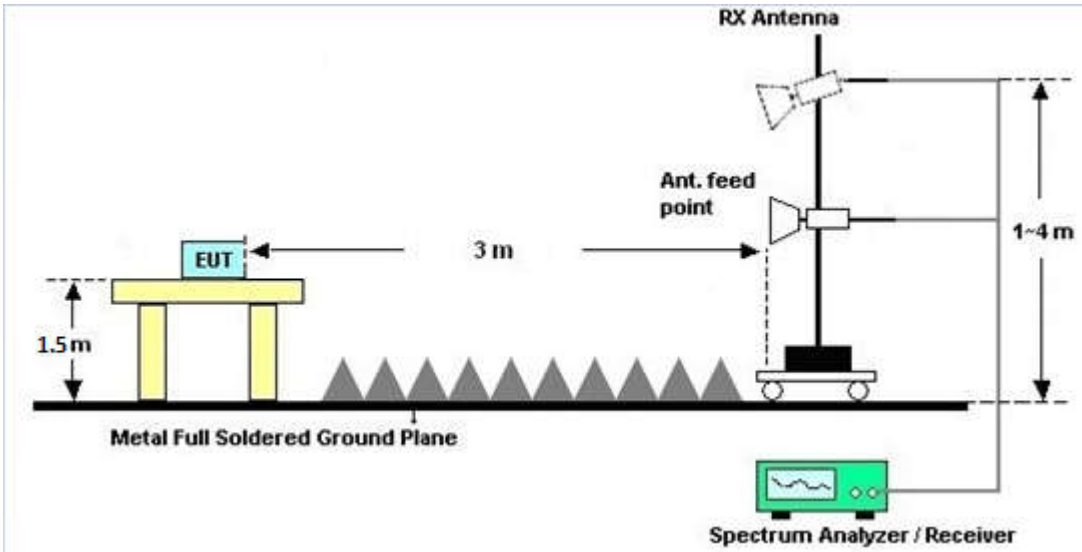
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.5.5 Test Results of Radiated Spurious Emissions (9kHz ~ 30MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B.

3.5.7 Duty Cycle

Please refer to Appendix C.

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

Please refer to Appendix B.

3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

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

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	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.

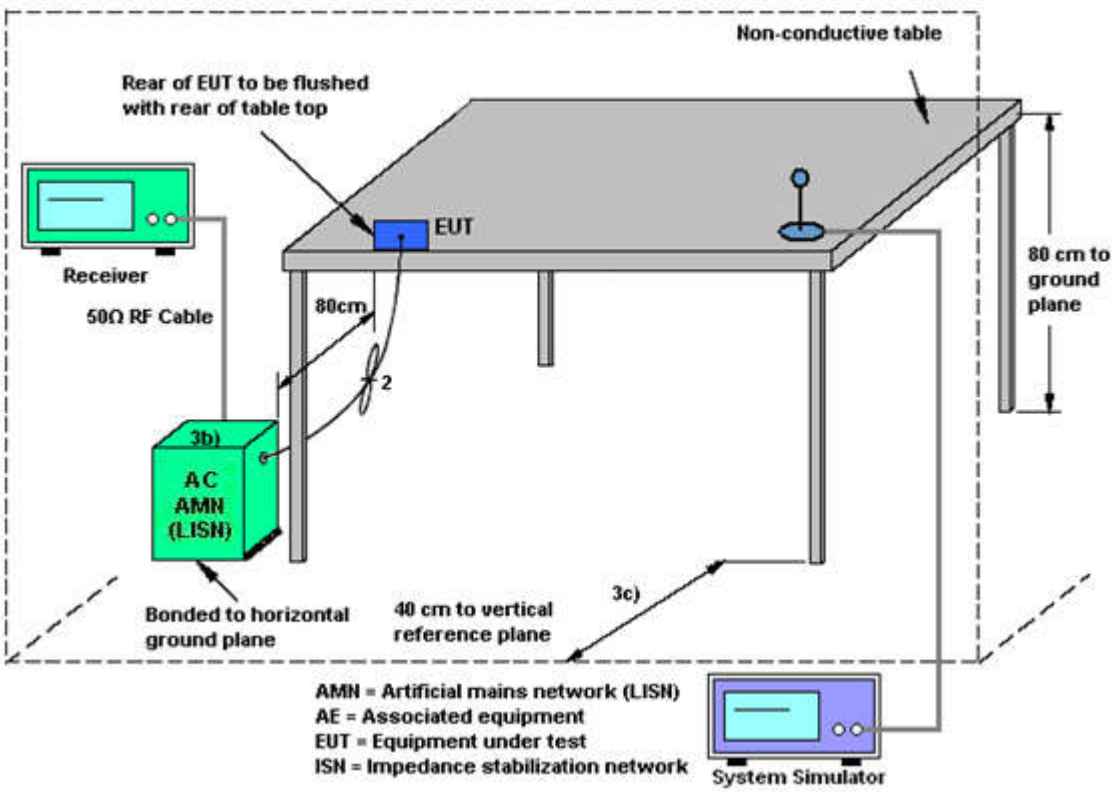
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

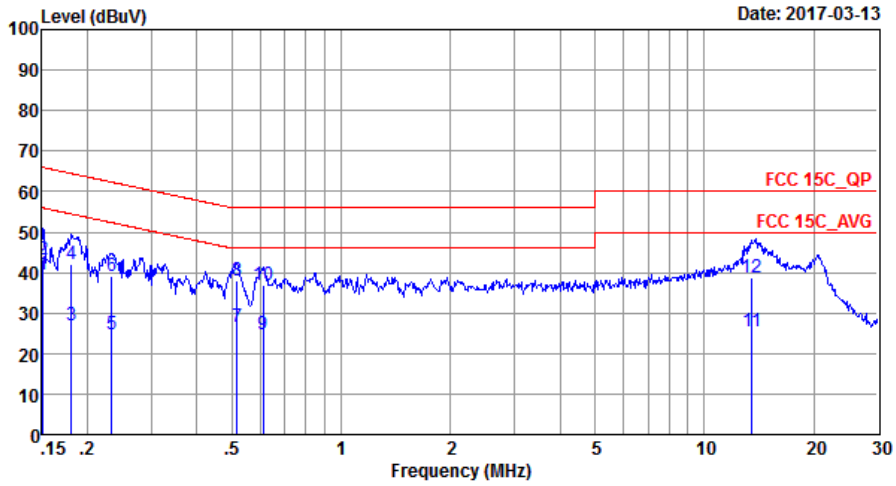
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other 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 :**	21~23℃
Test Engineer :	Tao Cheng	**Relative Humidity :**	41~43%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	GSM1900 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable (Charging from Adapter)		

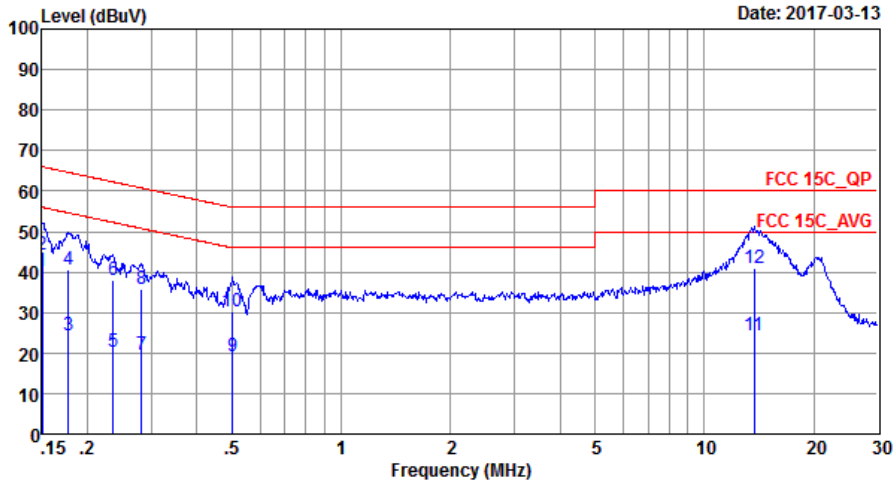


Site : CO01-SZ
Condition: FCC 15C_QP LISN_20170301_L LINE

Mode : Mode 1
IMEI : 359535070140308/359535070140316

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1 *	0.15	39.54	-16.42	55.96	29.10	0.03	10.41	Average
2	0.15	43.04	-22.92	65.96	32.60	0.03	10.41	QP
3	0.18	26.82	-27.64	54.46	16.50	0.03	10.29	Average
4	0.18	42.02	-22.44	64.46	31.70	0.03	10.29	QP
5	0.23	24.65	-27.70	52.35	14.40	0.03	10.22	Average
6	0.23	38.95	-23.40	62.35	28.70	0.03	10.22	QP
7	0.52	26.70	-19.30	46.00	16.50	0.02	10.18	Average
8	0.52	38.10	-17.90	56.00	27.90	0.02	10.18	QP
9	0.61	24.89	-21.11	46.00	14.70	0.02	10.17	Average
10	0.61	36.89	-19.11	56.00	26.70	0.02	10.17	QP
11	13.55	25.60	-24.40	50.00	14.80	0.47	10.33	Average
12	13.55	38.90	-21.10	60.00	28.10	0.47	10.33	QP

Test Mode :	Mode 1	Temperature :	21~23℃
Test Engineer :	Tao Cheng	Relative Humidity :	41~43%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM1900 Idle + Bluetooth Link + WLAN Link + Earphone + USB Cable (Charging from Adapter)		



Site : CO01-SZ
Condition: FCC 15C_QP LISN_20170301_N NEUTRAL

Mode : Mode 1
IMEI : 359535070140308/359535070140316

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	*	0.15	40.24	-15.76	56.00	29.80	0.03	10.41	Average
2		0.15	44.14	-21.86	66.00	33.70	0.03	10.41	QP
3		0.18	24.23	-30.36	54.59	13.90	0.03	10.30	Average
4		0.18	40.63	-23.96	64.59	30.30	0.03	10.30	QP
5		0.24	20.15	-32.11	52.26	9.90	0.03	10.22	Average
6		0.24	38.05	-24.21	62.26	27.80	0.03	10.22	QP
7		0.28	19.65	-31.11	50.76	9.40	0.03	10.22	Average
8		0.28	35.95	-24.81	60.76	25.70	0.03	10.22	QP
9		0.50	19.10	-26.90	46.00	8.90	0.02	10.18	Average
10		0.50	30.20	-25.80	56.00	20.00	0.02	10.18	QP
11		13.70	24.21	-25.79	50.00	13.60	0.29	10.32	Average
12		13.70	41.11	-18.89	60.00	30.50	0.29	10.32	QP

3.7 Antenna Requirements

3.7.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	9kHz~40GHz	May 07, 2016	Mar. 10, 2017~ Mar. 14, 2017	May 06, 2017	Conducted (TH01-SZ)
Spectrum Analyzer	R&S	FSP30	101400	9kHz~30GHz	Jan. 06, 2017	Mar. 10, 2017~ Mar. 14, 2017	Jan. 05, 2018	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1207253	30MHz~40GHz	Jan. 06, 2017	Mar. 10, 2017~ Mar. 14, 2017	Jan. 05, 2018	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Jan. 06, 2017	Mar. 10, 2017~ Mar. 14, 2017	Jan. 05, 2018	Conducted (TH01-SZ)
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY54450083	20Hz~8.4GHz	May 07, 2016	Mar. 14, 2017	May 06, 2017	Radiation (03CH03-SZ)
EXA Spectrum Anaiyzer	KEYSIGHT	N9010A	MY55150246	10Hz~44GHz	May 07, 2016	Mar. 14, 2017	May 06, 2017	Radiation (03CH03-SZ
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 07, 2016	Mar. 14, 2017	May 06, 2017	Radiation (03CH03-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz~2GHz	May 21, 2016	Mar. 14, 2017	May 20, 2017	Radiation (03CH03-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1355	1GHz~18GHz	May 07, 2016	Mar. 14, 2017	May 06, 2017	Radiation (03CH03-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18GHz~40GHz	Aug. 10, 2016	Mar. 14, 2017	Aug. 09, 2017	Radiation (03CH03-SZ)
Amplifier	Burgeon	BPA-530	102210	0.01Hz ~3000MHz	Oct. 11, 2016	Mar. 14, 2017	Oct. 10, 2017	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 11, 2016	Mar. 14, 2017	Oct. 10, 2017	Radiation (03CH03-SZ)
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Jan. 06, 2017	Mar. 14, 2017	Jan. 05, 2018	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 16, 2016	Mar. 14, 2017	Jul. 15, 2017	Radiation (03CH03-SZ
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Mar. 14, 2017	NCR	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Mar. 14, 2017	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Mar. 14, 2017	NCR	Radiation (03CH03-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jan. 06, 2017	Mar. 13, 2017	Jan. 05, 2018	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103892	9kHz~30MHz	Jan. 05, 2017	Mar. 13, 2017	Jan. 04, 2018	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	MessTec	3816/2SH	00103912	9kHz~30MHz	Jan. 05, 2017	Mar. 13, 2017	Jan. 04, 2018	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 16, 2016	Mar. 13, 2017	Jul. 15, 2017	Conduction (CO01-SZ)
Pulse Limiter	COM-POWER	LIT-153 Transient Limiter	53139	150kHz~30MHz	Oct. 11, 2016	Mar. 13, 2017	Oct. 10, 2017	Conduction (CO01-SZ)

NCR: No Calibration Required

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.5dB

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1GHz)

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

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

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

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

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

Appendix A. Conducted Test Results

A1 - DTS Part

Test Engineer:	Sam Zheng	Temperature:	24~26	°C
Test Date:	2017/3/10~2017/3/14	Relative Humidity:	50~53	%

TEST RESULTS DATA
6dB Occupied Bandwidth

2.4GHz Band							
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	9.05	0.50	Pass
11b	1Mbps	1	6	2437	9.55	0.50	Pass
11b	1Mbps	1	11	2462	10.03	0.50	Pass
11g	6Mbps	1	1	2412	15.50	0.50	Pass
11g	6Mbps	1	6	2437	15.13	0.50	Pass
11g	6Mbps	1	11	2462	15.13	0.50	Pass
HT20	MCS0	1	1	2412	15.11	0.50	Pass
HT20	MCS0	1	6	2437	15.13	0.50	Pass
HT20	MCS0	1	11	2462	15.11	0.50	Pass
HT40	MCS0	1	3	2422	35.13	0.50	Pass
HT40	MCS0	1	6	2437	35.13	0.50	Pass
HT40	MCS0	1	9	2452	35.13	0.50	Pass

TEST RESULTS DATA
Peak Power Table

2.4GHz Band										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
11b	1Mbps	1	1	2412	14.13	30.00	0.50	14.63	36.00	Pass
11b	1Mbps	1	6	2437	14.34	30.00	0.50	14.84	36.00	Pass
11b	1Mbps	1	11	2462	11.94	30.00	0.50	12.44	36.00	Pass
11g	6Mbps	1	1	2412	20.78	30.00	0.50	21.28	36.00	Pass
11g	6Mbps	1	6	2437	21.52	30.00	0.50	22.02	36.00	Pass
11g	6Mbps	1	11	2462	21.48	30.00	0.50	21.98	36.00	Pass
HT20	MCS0	1	1	2412	21.03	30.00	0.50	21.53	36.00	Pass
HT20	MCS0	1	6	2437	21.56	30.00	0.50	22.06	36.00	Pass
HT20	MCS0	1	11	2462	21.29	30.00	0.50	21.79	36.00	Pass
HT40	MCS0	1	3	2422	21.66	30.00	0.50	22.16	36.00	Pass
HT40	MCS0	1	6	2437	21.65	30.00	0.50	22.15	36.00	Pass
HT40	MCS0	1	9	2452	20.94	30.00	0.50	21.44	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

2.4GHz Band						
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
11b	1Mbps	1	1	2412	0.00	11.02
11b	1Mbps	1	6	2437	0.00	11.22
11b	1Mbps	1	11	2462	0.00	9.98
11g	6Mbps	1	1	2412	0.10	12.15
11g	6Mbps	1	6	2437	0.10	14.22
11g	6Mbps	1	11	2462	0.10	14.60
HT20	MCS0	1	1	2412	0.11	12.37
HT20	MCS0	1	6	2437	0.11	14.20
HT20	MCS0	1	11	2462	0.11	13.99
HT40	MCS0	1	3	2422	0.22	13.83
HT40	MCS0	1	6	2437	0.22	13.57
HT40	MCS0	1	9	2452	0.22	12.96

TEST RESULTS DATA
Peak Power Density

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
11b	1Mbps	1	1	2412	-11.75	0.50	8.00	Pass
11b	1Mbps	1	6	2437	-10.97	0.50	8.00	Pass
11b	1Mbps	1	11	2462	-14.27	0.50	8.00	Pass
11g	6Mbps	1	1	2412	-12.75	0.50	8.00	Pass
11g	6Mbps	1	6	2437	-11.74	0.50	8.00	Pass
11g	6Mbps	1	11	2462	-11.48	0.50	8.00	Pass
HT20	MCS0	1	1	2412	-13.40	0.50	8.00	Pass
HT20	MCS0	1	6	2437	-11.75	0.50	8.00	Pass
HT20	MCS0	1	11	2462	-10.89	0.50	8.00	Pass
HT40	MCS0	1	3	2422	-14.28	0.50	8.00	Pass
HT40	MCS0	1	6	2437	-14.67	0.50	8.00	Pass
HT40	MCS0	1	9	2452	-15.59	0.50	8.00	Pass

Appendix B. Radiated Spurious Emission

15C 2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2389.38	46.24	-27.76	74	41.26	31.38	6.81	33.21	150	167	P	H
		2386.02	36.29	-17.71	54	31.31	31.38	6.81	33.21	150	167	A	H
	*	2412	92.26	-	-	87.14	31.5	6.81	33.19	150	167	P	H
	*	2412	90.51	-	-	85.39	31.5	6.81	33.19	150	167	A	H
		2389.275	46.3	-27.70	74	41.32	31.38	6.81	33.21	150	66	P	V
		2386.02	36.6	-17.40	54	31.62	31.38	6.81	33.21	150	66	A	V
	*	2412	91.83	-	-	86.71	31.5	6.81	33.19	150	66	P	V
	*	2412	90.38	-	-	85.26	31.5	6.81	33.19	150	66	A	V
802.11b CH 06 2437MHz		2372.02	45.07	-28.93	74	40.31	31.26	6.73	33.23	242	51	P	H
		2383.08	34.65	-19.35	54	29.89	31.26	6.73	33.23	242	51	A	H
	*	2437	92.51	-	-	87.06	31.74	6.86	33.15	242	51	P	H
	*	2437	90.82	-	-	85.37	31.74	6.86	33.15	242	51	A	H
		2483.97	45.58	-28.42	74	39.81	31.98	6.91	33.12	242	51	P	H
		2495.31	35.04	-18.96	54	29.13	32.1	6.91	33.1	242	51	A	H
		2373.98	44.69	-29.31	74	39.93	31.26	6.73	33.23	150	129	P	V
		2383.22	34.35	-19.65	54	29.59	31.26	6.73	33.23	150	129	A	V
	*	2437	90.65	-	-	85.2	31.74	6.86	33.15	150	129	P	V
	*	2437	89	-	-	83.55	31.74	6.86	33.15	150	129	A	V
		2492.79	45.19	-28.81	74	39.28	32.1	6.91	33.1	150	129	P	V
		2494.96	34.91	-19.09	54	29	32.1	6.91	33.1	150	129	A	V

802.11b CH 11 2462MHz	*	2462	92.16	-	-	86.58	31.86	6.86	33.14	250	51	P	H
	*	2462	90.65	-	-	85.07	31.86	6.86	33.14	250	51	A	H
		2486.8	46.23	-27.77	74	40.46	31.98	6.91	33.12	250	51	P	H
		2486.4	35.53	-18.47	54	29.76	31.98	6.91	33.12	250	51	A	H
	*	2462	90.44	-	-	84.86	31.86	6.86	33.14	164	47	P	V
	*	2462	88.72	-	-	83.14	31.86	6.86	33.14	164	47	A	V
		2499.48	46.39	-27.61	74	40.48	32.1	6.91	33.1	164	47	P	V
		2496.8	35.24	-18.76	54	29.33	32.1	6.91	33.1	164	47	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

15C 2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		4824	55.86	-18.14	74	68.27	33.3	10.89	56.6	250	241	P	H
		4824	53.37	-0.63	54	65.78	33.3	10.89	56.6	250	241	A	H
		4824	53.94	-20.06	74	66.35	33.3	10.89	56.6	150	0	P	V
		4824	51.74	-2.26	54	64.15	33.3	10.89	56.6	150	0	A	V
802.11b CH 06 2437MHz		4874	56.16	-17.84	74	68.82	33.33	10.92	56.91	250	240	P	H
		4874	53.9	-0.10	54	66.56	33.33	10.92	56.91	250	240	A	H
		7311	48.91	-25.09	74	58.22	35.4	13.29	58	174	100	P	H
		4874	54.61	-19.39	74	67.27	33.33	10.92	56.91	150	360	P	V
		4874	52.39	-1.61	54	65.05	33.33	10.92	56.91	150	360	A	V
		7311	49.84	-24.16	74	59.15	35.4	13.29	58	174	100	P	V
802.11b CH 11 2462MHz		4924	54.94	-19.06	74	66.67	33.36	10.99	56.08	150	307	P	H
		4924	53.38	-0.62	54	65.11	33.36	10.99	56.08	150	307	A	H
		7386	47.4	-26.60	74	57.02	35.27	13.12	58.01	150	274	P	H
		4924	53.26	-20.74	74	64.99	33.36	10.99	56.08	150	354	P	V
		4924	51.15	-2.85	54	62.88	33.36	10.99	56.08	150	354	A	V
		7386	48.7	-25.30	74	58.32	35.27	13.12	58.01	150	274	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

15C 2.4GHz 2400~2483.5MHz

WIFI 802.11g (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)
802.11g CH 01 2412MHz		2382.765	54.04	-19.96	74	49.28	31.26	6.73	33.23	153	61	P	H
		2389.065	40.39	-13.61	54	35.41	31.38	6.81	33.21	153	61	A	H
	*	2412	97.4	-	-	92.28	31.5	6.81	33.19	153	61	P	H
	*	2412	91.57	-	-	86.45	31.5	6.81	33.19	153	61	A	H
		2389.8	49.56	-24.44	74	44.58	31.38	6.81	33.21	150	106	P	V
		2389.8	39.91	-14.09	54	34.93	31.38	6.81	33.21	150	106	A	V
	*	2412	96.53	-	-	91.41	31.5	6.81	33.19	150	106	P	V
	*	2412	89.52	-	-	84.4	31.5	6.81	33.19	150	106	A	V
802.11g CH 06 2437MHz		2380.84	45.99	-28.01	74	41.23	31.26	6.73	33.23	150	319	P	H
		2389.94	36.42	-17.58	54	31.44	31.38	6.81	33.21	150	319	A	H
	*	2437	96.01	-	-	90.56	31.74	6.86	33.15	150	319	P	H
	*	2437	89.88	-	-	84.43	31.74	6.86	33.15	150	319	A	H
		2487.89	46.09	-27.91	74	40.18	32.1	6.91	33.1	150	319	P	H
		2492.93	36.82	-17.18	54	30.91	32.1	6.91	33.1	150	319	A	H
		2363.34	46.63	-27.37	74	42.01	31.13	6.73	33.24	150	104	P	V
		2388.96	36.83	-17.17	54	31.85	31.38	6.81	33.21	150	104	A	V
	*	2437	97.52	-	-	92.07	31.74	6.86	33.15	150	104	P	V
	*	2437	91.24	-	-	85.79	31.74	6.86	33.15	150	104	A	V
		2488.59	46.87	-27.13	74	40.96	32.1	6.91	33.1	150	104	P	V
		2485.23	36.85	-17.15	54	31.08	31.98	6.91	33.12	150	104	A	V

802.11g CH 11 2462MHz	*	2462	97.43	-	-	91.85	31.86	6.86	33.14	240	55	P	H
	*	2462	90.89	-	-	85.31	31.86	6.86	33.14	240	55	A	H
		2484.08	60.72	-13.28	74	54.95	31.98	6.91	33.12	240	55	P	H
		2483.52	47.77	-6.23	54	42	31.98	6.91	33.12	240	55	A	H
	*	2462	94.69	-	-	89.11	31.86	6.86	33.14	185	46	P	V
	*	2462	88.3	-	-	82.72	31.86	6.86	33.14	185	46	A	V
		2483.64	58.05	-15.95	74	52.28	31.98	6.91	33.12	185	46	P	V
		2483.56	45.29	-8.71	54	39.52	31.98	6.91	33.12	185	46	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

15C 2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 01 2412MHz		4824	47.31	-26.69	74	59.72	33.3	10.89	56.6	150	360	P	H
		4824	46.18	-27.82	74	58.59	33.3	10.89	56.6	150	360	P	V
802.11g CH 06 2437MHz		4874	45.38	-28.62	74	58.04	33.33	10.92	56.91	150	360	P	H
		7311	48.66	-25.34	74	57.97	35.4	13.29	58	174	100	P	H
		4874	46.03	-27.97	74	58.69	33.33	10.92	56.91	150	360	P	V
		7311	48.2	-25.80	74	57.51	35.4	13.29	58	174	100	P	V
802.11g CH 11 2462MHz		4924	46.85	-27.15	74	58.58	33.36	10.99	56.08	150	347	P	H
		7386	47.81	-26.19	74	57.43	35.27	13.12	58.01	150	274	P	H
		4924	45.69	-28.31	74	57.42	33.36	10.99	56.08	150	347	P	V
		7386	48.43	-25.57	74	58.05	35.27	13.12	58.01	150	274	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

15C 2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		2389.275	55.95	-18.05	74	50.97	31.38	6.81	33.21	250	67	P	H
		2389.695	42.45	-11.55	54	37.47	31.38	6.81	33.21	250	67	A	H
802.11n	*	2412	96.68	-	-	91.56	31.5	6.81	33.19	250	67	P	H
HT20	*	2412	90.28	-	-	85.16	31.5	6.81	33.19	250	67	A	H
CH 01		2388.54	51.26	-22.74	74	46.28	31.38	6.81	33.21	150	99	P	V
2412MHz		2389.8	39.99	-14.01	54	35.01	31.38	6.81	33.21	150	99	A	V
	*	2412	94.37	-	-	89.25	31.5	6.81	33.19	150	99	P	V
	*	2412	88.06	-	-	82.94	31.5	6.81	33.19	150	99	A	V
		2387	46.52	-27.48	74	41.54	31.38	6.81	33.21	150	32	P	H
		2389.66	37.01	-16.99	54	32.03	31.38	6.81	33.21	150	32	A	H
	*	2437	97.97	-	-	92.52	31.74	6.86	33.15	150	32	P	H
	*	2437	91.16	-	-	85.71	31.74	6.86	33.15	150	32	A	H
802.11n		2485.51	46.8	-27.20	74	41.03	31.98	6.91	33.12	150	32	P	H
HT20		2483.51	37.19	-16.81	54	31.42	31.98	6.91	33.12	150	32	A	H
CH 06		2334.64	45.81	-28.19	74	41.41	31.01	6.65	33.26	150	106	P	V
2437MHz		2356.9	36.08	-17.92	54	31.46	31.13	6.73	33.24	150	106	A	V
	*	2437	96.49	-	-	91.04	31.74	6.86	33.15	150	106	P	V
	*	2437	89.89	-	-	84.44	31.74	6.86	33.15	150	106	A	V
		2494.26	46.66	-27.34	74	40.75	32.1	6.91	33.1	150	106	P	V
		2483.9	36.87	-17.13	54	31.1	31.98	6.91	33.12	150	106	A	V

802.11n HT20 CH 11 2462MHz	*	2462	96.78	-	-	91.2	31.86	6.86	33.14	239	57	P	H
	*	2462	90.14	-	-	84.56	31.86	6.86	33.14	239	57	A	H
		2485.76	61.77	-12.23	74	56	31.98	6.91	33.12	239	57	P	H
		2483.68	48.72	-5.28	54	42.95	31.98	6.91	33.12	239	57	A	H
	*	2462	94.77	-	-	89.19	31.86	6.86	33.14	217	0	P	V
	*	2462	88.01	-	-	82.43	31.86	6.86	33.14	217	0	A	V
		2484.24	56.38	-17.62	74	50.61	31.98	6.91	33.12	217	0	P	V
		2483.56	43.58	-10.42	54	37.81	31.98	6.91	33.12	217	0	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

15C 2.4GHz 2400~2483.5MHz

WIFI 802.11n HT20 (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT20 CH 01 2412MHz		4824	46.29	-27.71	74	58.7	33.3	10.89	56.6	150	360	P	H
		4824	46.09	-27.91	74	58.5	33.3	10.89	56.6	150	360	P	V
802.11n HT20 CH 06 2437MHz		4874	46.5	-27.50	74	59.16	33.33	10.92	56.91	150	360	P	H
		7311	49.25	-24.75	74	58.56	35.4	13.29	58	174	100	P	H
		4874	46.34	-27.66	74	59	33.33	10.92	56.91	150	360	P	V
		7311	48.68	-25.32	74	57.99	35.4	13.29	58	174	100	P	V
802.11n HT20 CH 11 2462MHz		4924	46.56	-27.44	74	58.29	33.36	10.99	56.08	150	347	P	H
		7386	47.09	-26.91	74	56.71	35.27	13.12	58.01	150	274	P	H
		4924	46.06	-27.94	74	57.79	33.36	10.99	56.08	150	347	P	V
		7386	46.94	-27.06	74	56.56	35.27	13.12	58.01	150	274	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

15C 2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		2389.94	65.49	-8.51	74	60.51	31.38	6.81	33.21	150	329	P	H
		2389.52	49.89	-4.11	54	44.91	31.38	6.81	33.21	150	329	A	H
	*	2422	93.41	-	-	88.15	31.62	6.81	33.17	150	329	P	H
	*	2422	86.76	-	-	81.5	31.62	6.81	33.17	150	329	A	H
802.11n		2491.11	54.5	-19.50	74	48.59	32.1	6.91	33.1	150	329	P	H
HT40		2488.03	40.8	-13.20	54	34.89	32.1	6.91	33.1	150	329	A	H
CH 03		2389.38	66.69	-7.31	74	61.71	31.38	6.81	33.21	150	329	P	V
2422MHz		2389.66	51.72	-2.28	54	46.74	31.38	6.81	33.21	150	329	A	V
	*	2422	94.14	-	-	88.88	31.62	6.81	33.17	150	329	P	V
	*	2422	87.41	-	-	82.15	31.62	6.81	33.17	150	329	A	V
		2484.74	57.51	-16.49	74	51.74	31.98	6.91	33.12	150	329	P	V
		2488.31	42.22	-11.78	54	36.31	32.1	6.91	33.1	150	329	A	V
		2368.1	62.42	-11.58	74	57.8	31.13	6.73	33.24	227	62	P	H
		2385.18	49.54	-4.46	54	44.7	31.26	6.81	33.23	227	62	A	H
	*	2437	95.97	-	-	90.52	31.74	6.86	33.15	227	62	P	H
	*	2437	89.74	-	-	84.29	31.74	6.86	33.15	227	62	A	H
802.11n		2483.5	61.74	-12.26	74	55.97	31.98	6.91	33.12	227	62	P	H
HT40		2483.5	50.86	-3.14	54	45.09	31.98	6.91	33.12	227	62	A	H
CH 06		2368.1	58.47	-15.53	74	53.85	31.13	6.73	33.24	169	126	P	V
2437MHz		2385.18	45.18	-8.82	54	40.34	31.26	6.81	33.23	169	126	P	V
	*	2437	94.88	-	-	89.43	31.74	6.86	33.15	169	126	P	V
	*	2437	88.22	-	-	82.77	31.74	6.86	33.15	169	126	A	V
		2484.18	59.28	-14.72	74	53.51	31.98	6.91	33.12	169	126	P	V
		2484.18	47.6	-6.40	54	41.83	31.98	6.91	33.12	169	126	A	V

802.11n HT40 CH 09 2452MHz		2381.4	58.32	-15.68	74	53.56	31.26	6.73	33.23	250	295	P	H
		2389.66	39.73	-14.27	54	34.75	31.38	6.81	33.21	250	295	A	H
	*	2452	93.59	-	-	88.14	31.74	6.86	33.15	250	295	P	H
	*	2452	86.59	-	-	81.14	31.74	6.86	33.15	250	295	A	H
		2484.67	67.24	-6.76	74	61.47	31.98	6.91	33.12	250	295	P	H
		2483.5	53.11	-0.89	54	47.34	31.98	6.91	33.12	250	295	A	H
		2383.22	62.08	-11.92	74	57.32	31.26	6.73	33.23	250	303	P	V
		2389.8	41.69	-12.31	54	36.71	31.38	6.81	33.21	250	303	A	V
	*	2452	94.26	-	-	88.81	31.74	6.86	33.15	250	303	P	V
	*	2452	87.49	-	-	82.04	31.74	6.86	33.15	250	303	A	V
		2484.6	66.4	-7.60	74	60.63	31.98	6.91	33.12	250	303	P	V
		2484.53	52.59	-1.41	54	46.82	31.98	6.91	33.12	250	303	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

15C 2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n		4844	46.74	-27.26	74	59.09	33.31	10.92	56.58	150	360	P	H
HT40		7266	48.28	-25.72	74	57.71	35.46	13.38	58.27	200	360	P	H
CH 03		4844	45.96	-28.04	74	58.31	33.31	10.92	56.58	150	360	P	V
2422MHz		7266	49.91	-24.09	74	59.34	35.46	13.38	58.27	200	360	P	V
802.11n		4874	45.96	-28.04	74	58.62	33.33	10.92	56.91	150	163	P	H
HT40		7311	48.36	-25.64	74	57.67	35.4	13.29	58	150	360	P	H
CH 06		4874	45.34	-28.66	74	58	33.33	10.92	56.91	150	163	P	V
2437MHz		7311	48.82	-25.18	74	58.13	35.4	13.29	58	150	360	P	V
802.11n		4904	46.93	-27.07	74	58.98	33.35	10.95	56.35	150	360	P	H
HT40		7356	48.92	-25.08	74	58.35	35.32	13.21	57.96	150	320	P	H
CH 09		4904	45.69	-28.31	74	57.74	33.35	10.95	56.35	150	360	P	V
2452MHz		7356	47.93	-26.07	74	57.36	35.32	13.21	57.96	150	320	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

15C Emission below 1GHz

2.4GHz WIFI 802.11b (LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11b LF		30	26.05	-13.95	40	30.92	26.6	0.23	31.7	-	-	P	H
		164.83	29.51	-13.99	43.5	41.94	17.51	1.4	31.34	-	-	P	H
		338.46	33.85	-12.15	46	43.01	19.96	2.18	31.3	100	212	P	H
		442.25	28.54	-17.46	46	32.89	24.41	2.54	31.3	-	-	P	H
		746.83	30.31	-15.69	46	30.43	27.93	3.45	31.5	-	-	P	H
		947.62	32.3	-13.70	46	30.21	29.65	3.94	31.5	-	-	P	H
		30.97	28.97	-11.03	40	34.12	26.3	0.25	31.7	100	0	P	V
		40.67	28.58	-11.42	40	37.62	22.02	0.39	31.45	-	-	P	V
		169.68	25.32	-18.18	43.5	37.89	17.32	1.43	31.32	-	-	P	V
		338.46	25.21	-20.79	46	34.37	19.96	2.18	31.3	-	-	P	V
		778.84	31.41	-14.59	46	31.3	28.06	3.55	31.5	-	-	P	V
		947.62	32.63	-13.37	46	30.54	29.65	3.94	31.5	-	-	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 per 15.209(c).
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

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

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
1+2		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		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)

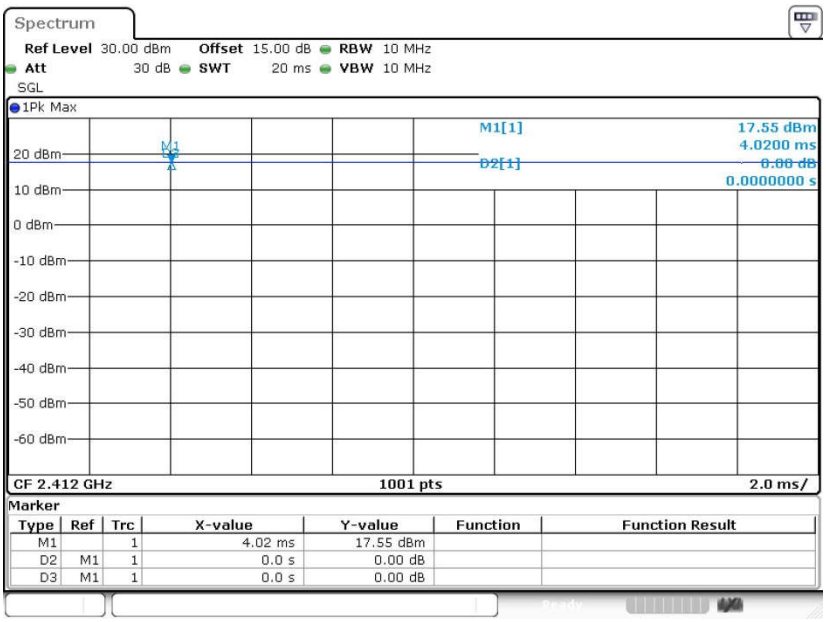
= -10.46(dB)

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

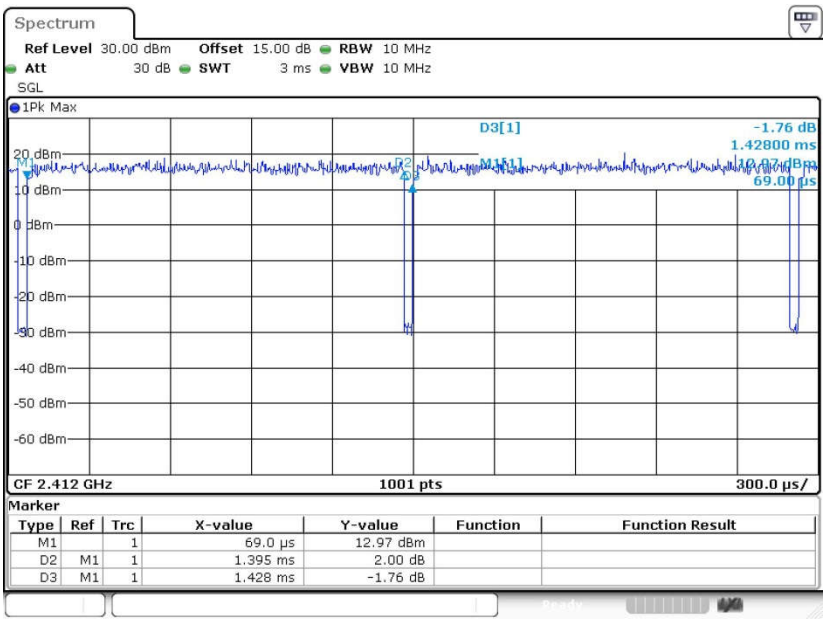
Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	100	-	-	10Hz
802.11g	97.69	1.395	0.717	1kHz
802.11n HT20	97.45	1.298	0.770	1kHz
802.11n HT40	95.03	0.650	1.538	3kHz

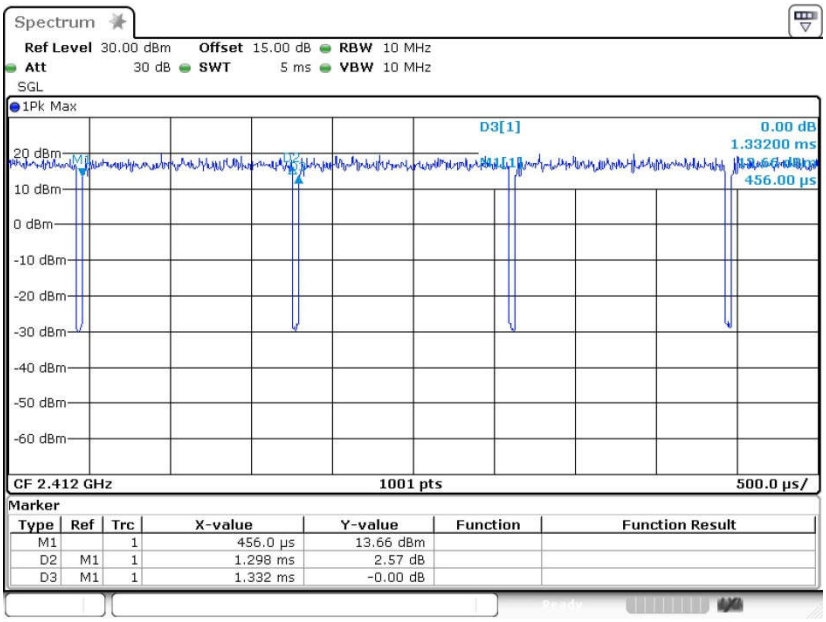
802.11b



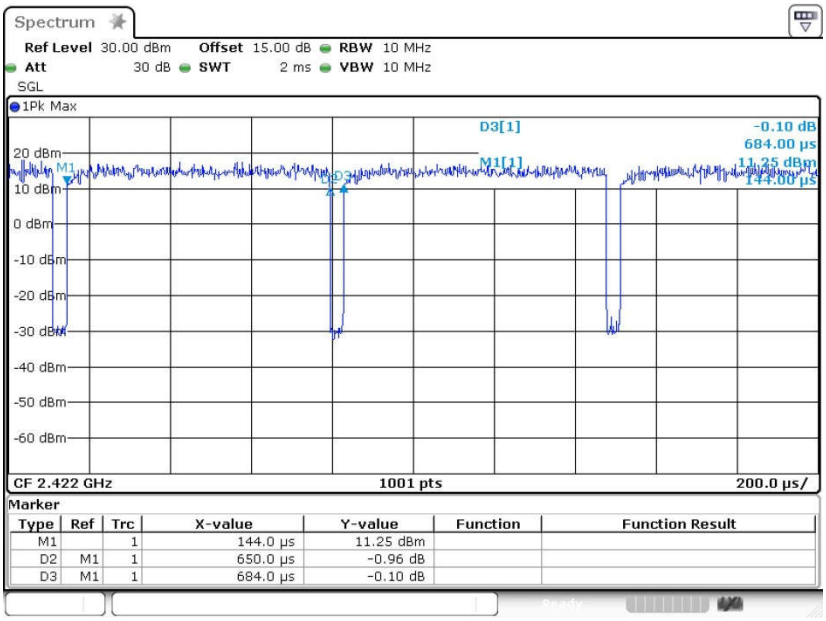
802.11g



802.11n20



802.11n40


Spectrum
Ref Level 30.00 dBm Offset 15.00 dB RBW 10 MHz
Att 30 dB SWT 2 ms VBW 10 MHz
SGL
1Pk Max
D3[1] -0.10 dB
684.00 µs
M1[1] 11.25 dBm
144.00 µs
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
CF 2.422 GHz
1001 pts
200.0 µs/
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 144.0 µs 11.25 dBm
D2 M1 1 650.0 µs -0.96 dB
D3 M1 1 684.0 µs -0.10 dB