



FCC RF Test Report

APPLICANT : BLU Products, Inc.
EQUIPMENT : Mobile Phone
BRAND NAME : BLU
MODEL NAME : G9
FCC ID : YHLBLUG9
STANDARD : FCC Part 15 Subpart C §15.247
CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Jan. 16, 2019 and testing was completed on Feb. 15, 2019. 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.

Eric Shih

Approved by: Eric Shih / Manager



Sporton International (Shenzhen) Inc.

**1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen City,
Guangdong Province 518055, China**



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR911616C	Rev. 01	Initial issue of report	Mar. 01, 2019

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	$\geq 0.5\text{MHz}$	Pass	-
3.2	15.247(b)	Power Output Measurement	$\leq 30\text{dBm}$	Pass	-
3.3	15.247(e)	Power Spectral Density	$\leq 8\text{dBm}/3\text{kHz}$	Pass	-
3.4	15.247(d)	Conducted Band Edges	$\leq 20\text{dBc}$	Pass	-
		Conducted Spurious Emission		Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 8.96 dB at 2484.08 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 14.40 dB at 0.670 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	N/A	Pass	-



1 General Description

1.1 Applicant

BLU Products, Inc.
10814 NW 33rd St # 100 Doral, FL 33172

1.2 Manufacturer

BLU Products, Inc.
10814 NW 33rd St # 100 Doral, FL 33172

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Phone
Brand Name	BLU
Model Name	G9
FCC ID	YHLBLUG9
EUT supports Radios application	GSM/WCDMA/LTE WLAN 2.4GHz 802.11b/g/n HT20 Bluetooth BR/EDR/LE
IMEI Code	Conducted: 866713035511758/866713035511733 Conduction: 866713035511659/866713035511550 Radiation: 866713035511642/866713035511634
HW Version	K6203Q_03
SW Version	BLU_G0130WW_V9.0.02.01_GENERIC_20190130_1136.zip
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 : 17.11 dBm (0.0514 W) 802.11g : 22.71 dBm (0.1866 W) 802.11n HT20 : 23.30 dBm (0.2138 W)
Antenna Type / Gain	PIFA Antenna type with gain 2.80 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 (Shenzhen) Inc. is accredited to ISO 17025 by National Voluntary Laboratory Accreditation Program (NVLAP code: 600156-0).

Test Site	Sporton International (Shenzhen) Inc.		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen City, Guangdong Province 518055, China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595		
Test Site No.	Sporton Site No.	FCC designation No.	FCC Test Firm Registration No.
	TH01-SZ CO01-SZ	CN5018	337463

Test Site	Sporton International (Shenzhen) Inc.		
Test Site Location	No. 3 Bldg the third floor of south, Shahe River west, Fengzeyuan Warehouse, Nanshan District, Shenzhen City, Guangdong Province 518055, China TEL: +86-755- 3320-2398		
Test Site No.	Sporton Site No.	FCC designation No.	FCC Test Firm Registration No.
	03CH03-SZ	CN5019	577730

1.7 Applicable Standards

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

- ♦ 47 CFR Part 15 Subpart C §15.247
- ♦ FCC KDB 558074 D01 15.247 Meas Guidance v05r01
- ♦ 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

- a. 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: conduction emission (150 kHz to 30 MHz), radiation 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.
- b. AC power line Conducted Emission was tested under maximum output power.

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		

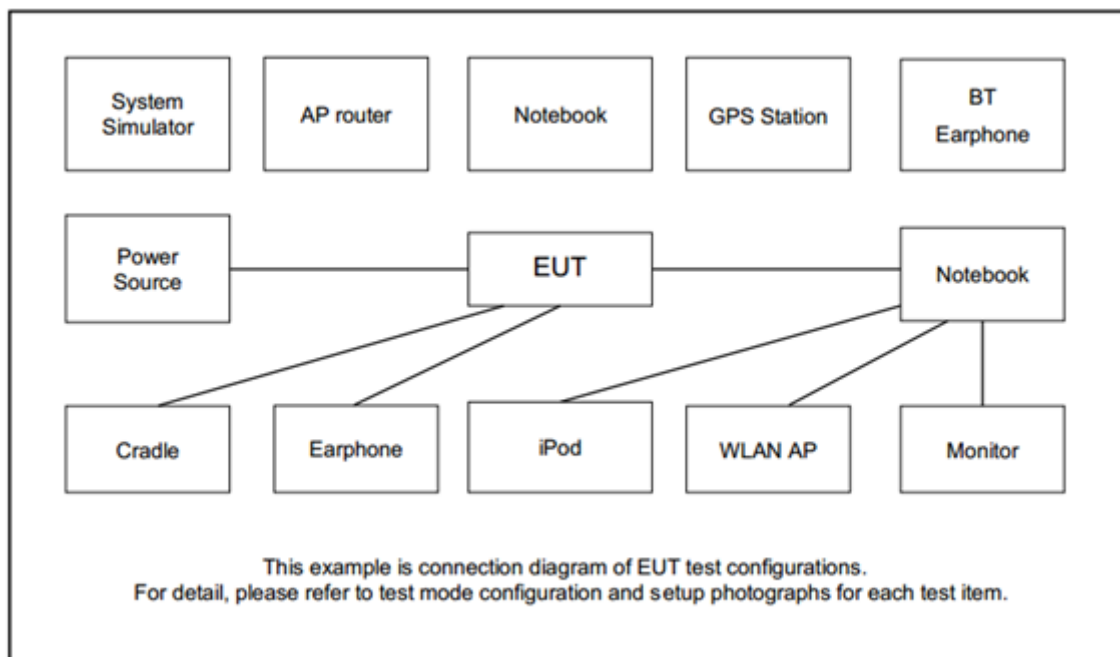
2.2 Test Mode

Final test modes 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

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

2.3 Connection Diagram of Test System



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	Anritsu	MT8820C	N/A	N/A	Unshielded,1.8m
2.	WLAN AP	D-Link	DIR-820L	KA2IR820LA1	N/A	Unshielded,1.8m
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	Samsung	EO-MG900	N/A	N/A	N/A



2.5 EUT Operation Test Setup

For WLAN function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss 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.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 5.0 + 10 = 15.0 \text{ (dB)}\end{aligned}$$

3 Test Result

3.1 6dB Bandwidth Measurement

3.1.1 Limit of 6dB Bandwidth

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

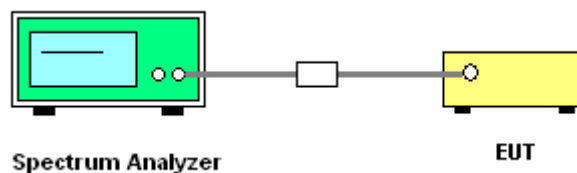
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.8
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. Measure and record the results in the test report.

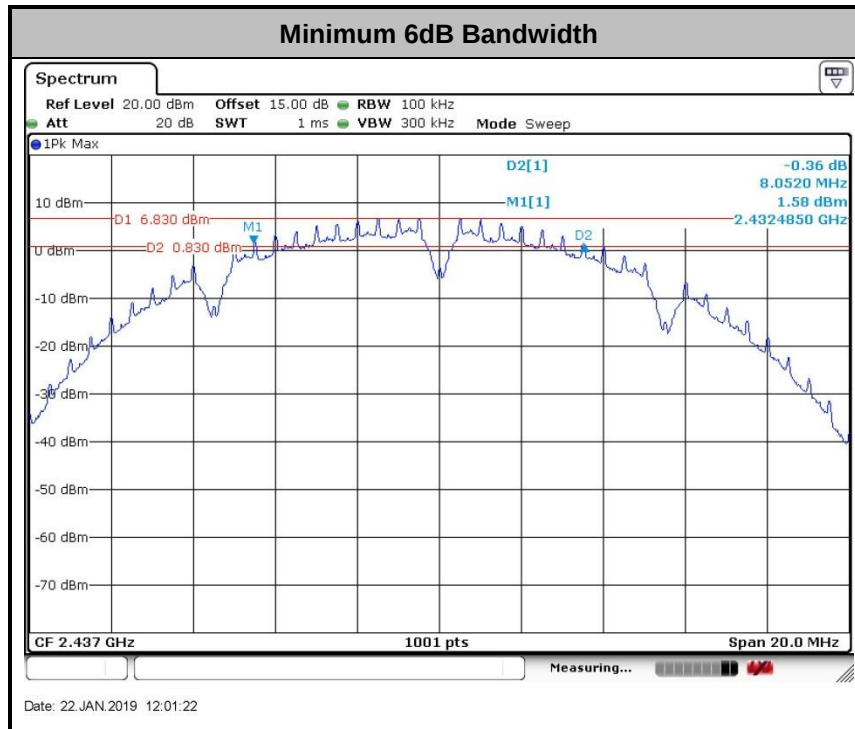
3.1.4 Test Setup





3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.



3.2 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 with directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

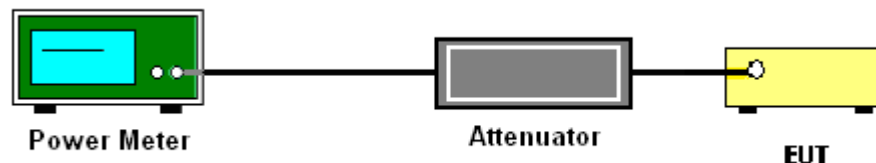
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 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.

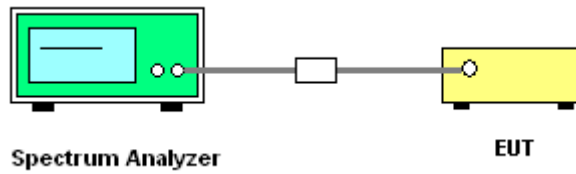
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

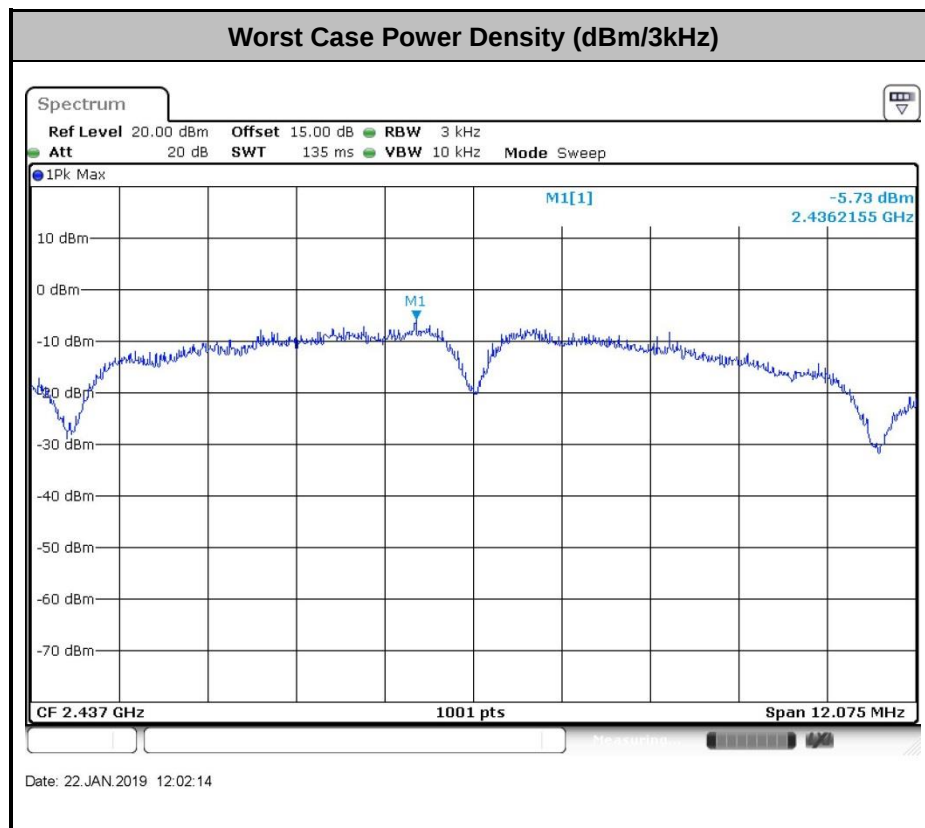
1. The testing follows Measurement Procedure of ANSI C63.10-2013 clause 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the 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.

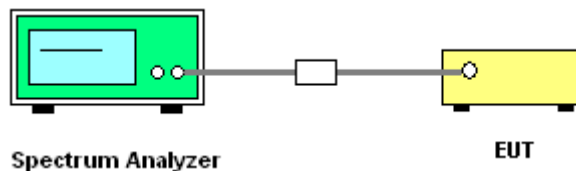
3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.13
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

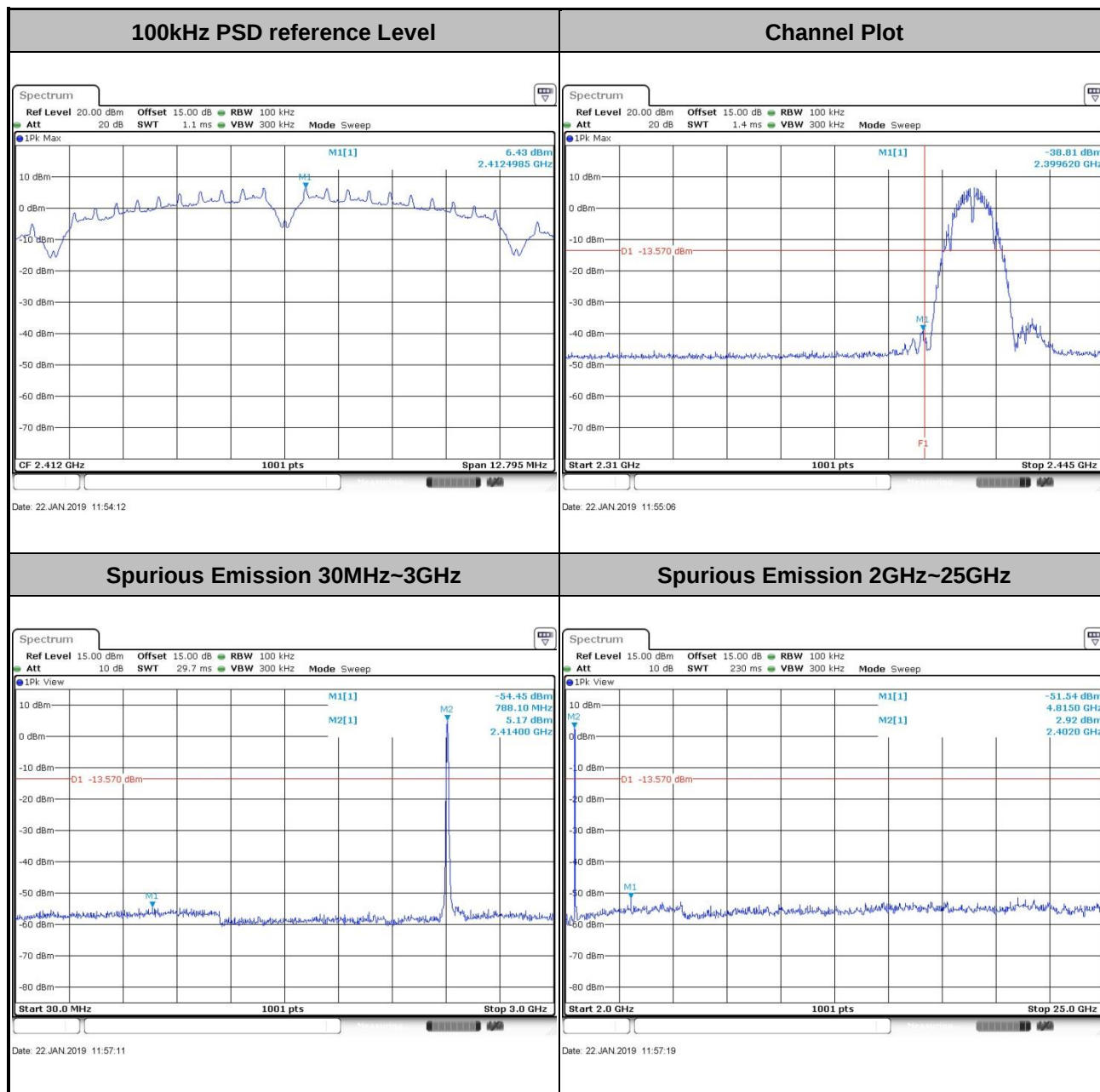




3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Test Engineer :	Zheng Quan	Temperature :	24~26°C
		Relative Humidity :	50~53%

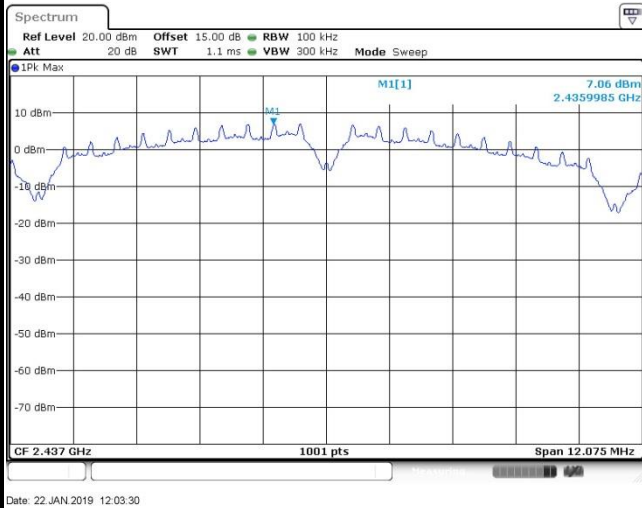
Test Mode :	802.11b	Test Channel :	01
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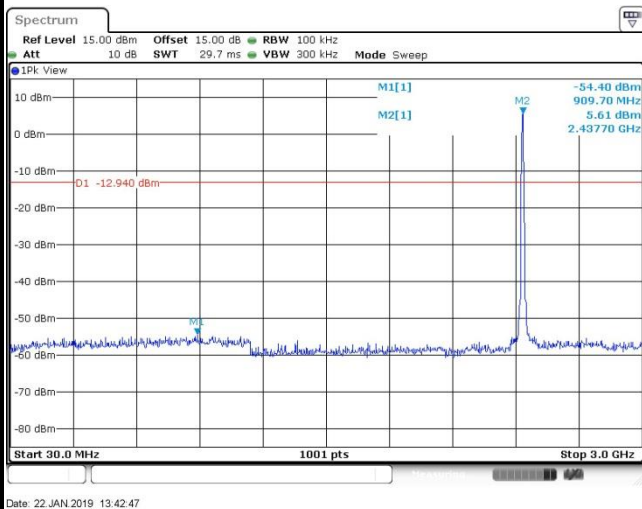


Test Mode :	802.11b	Test Channel :	06
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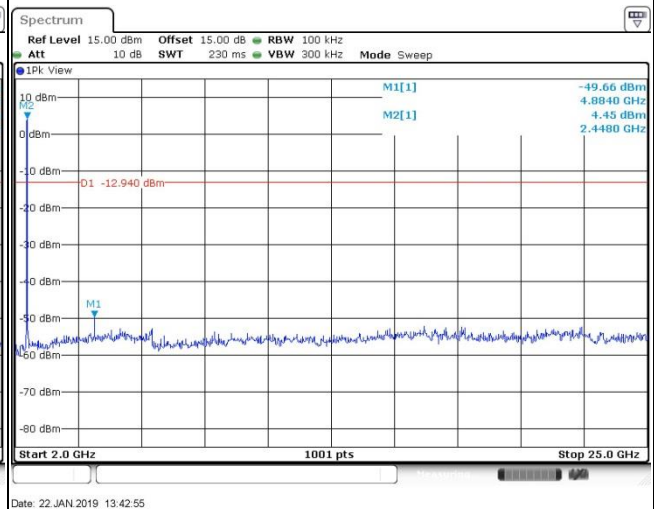
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz

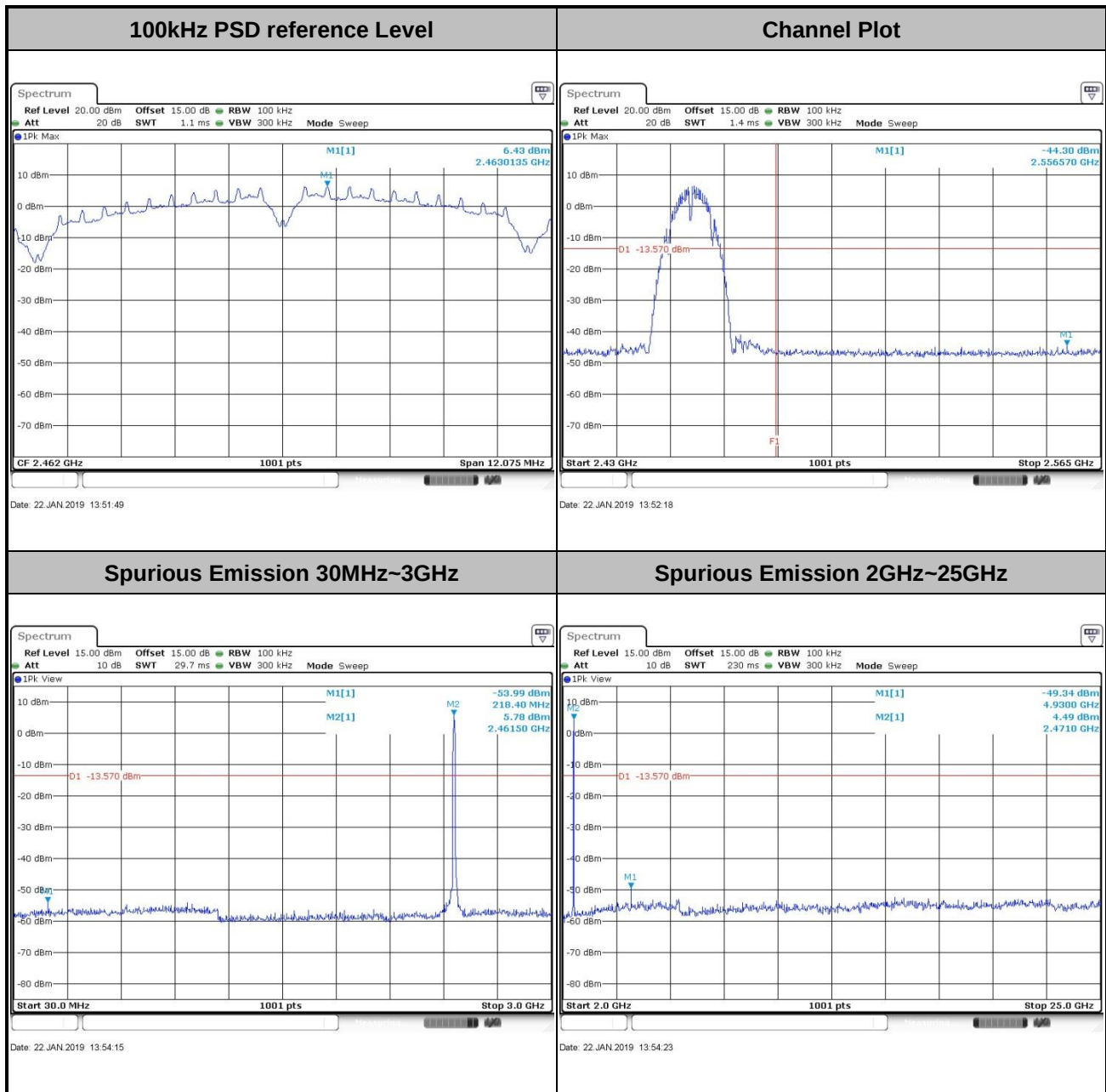


Spurious Emission 2GHz~25GHz



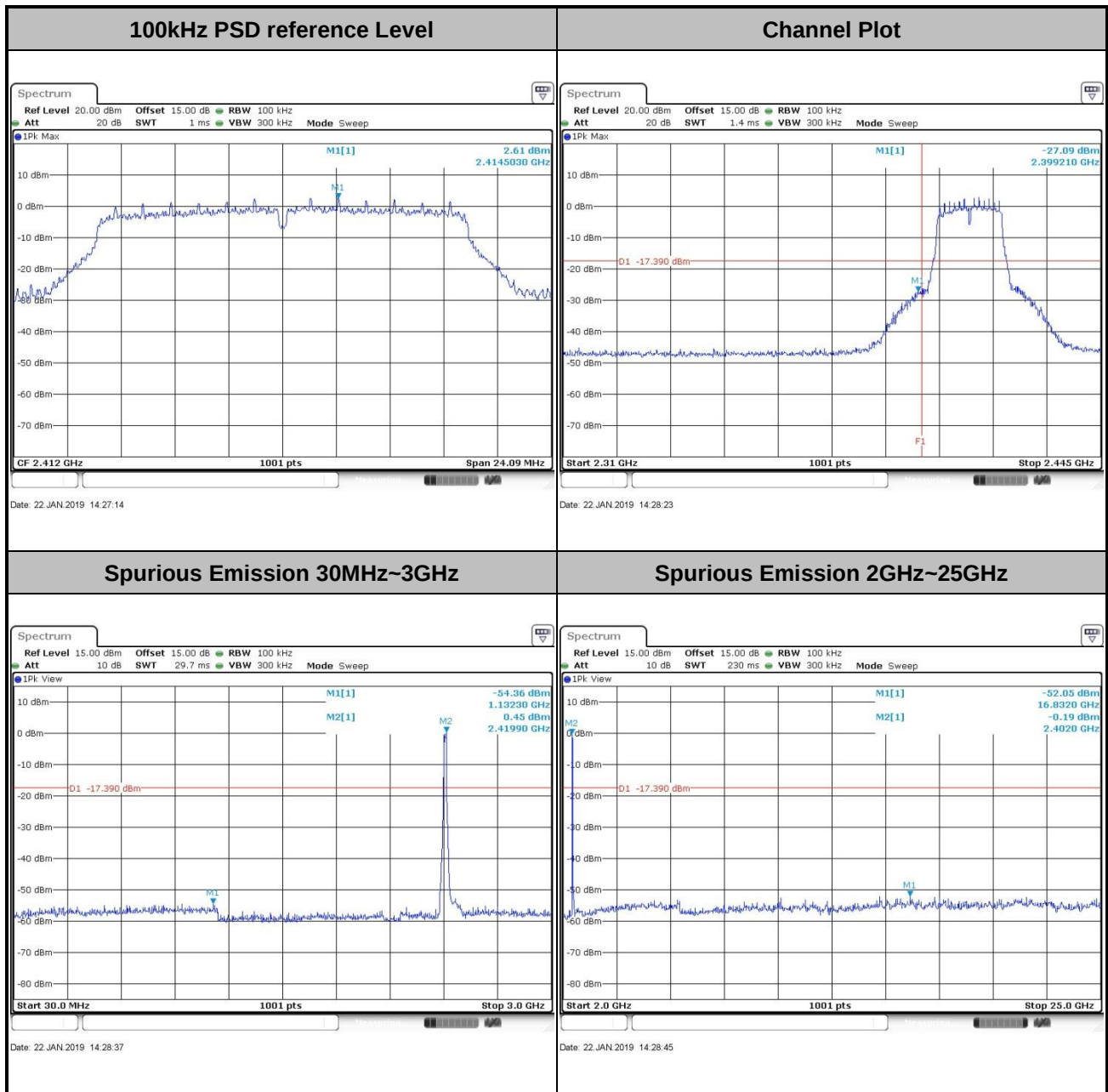


Test Mode :	802.11b	Test Channel :	11
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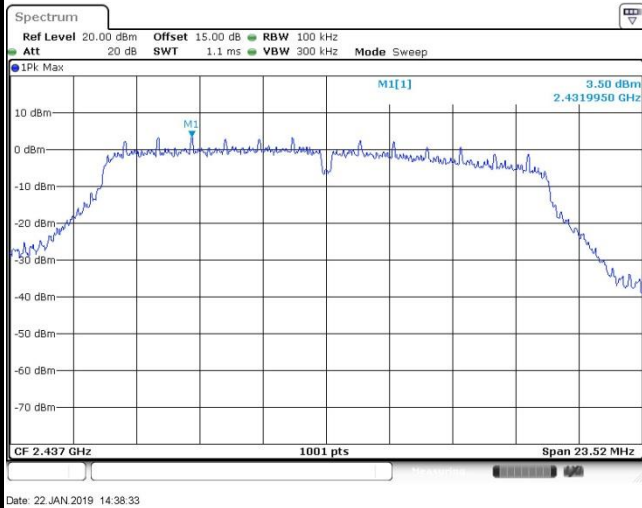
Test Mode :	802.11g	Test Channel :	01
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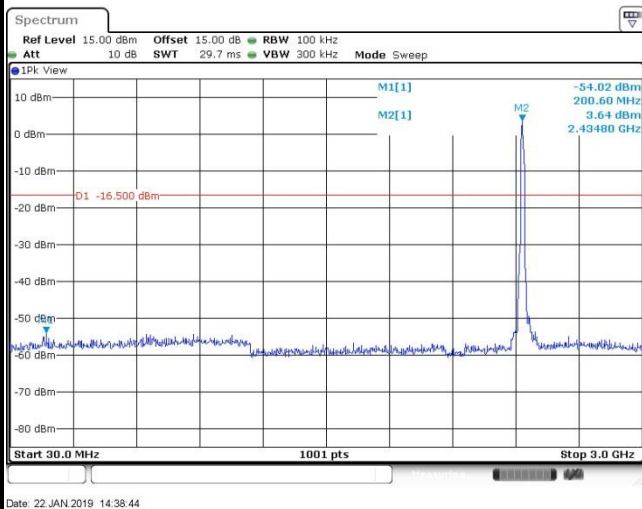


Test Mode :	802.11g	Test Channel :	06
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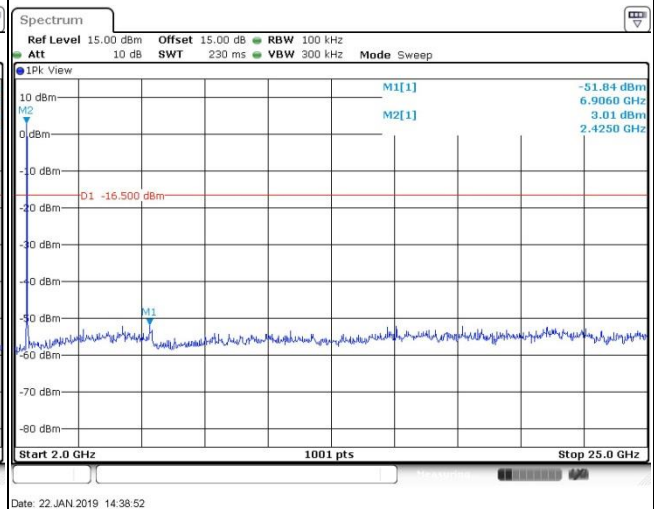
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz

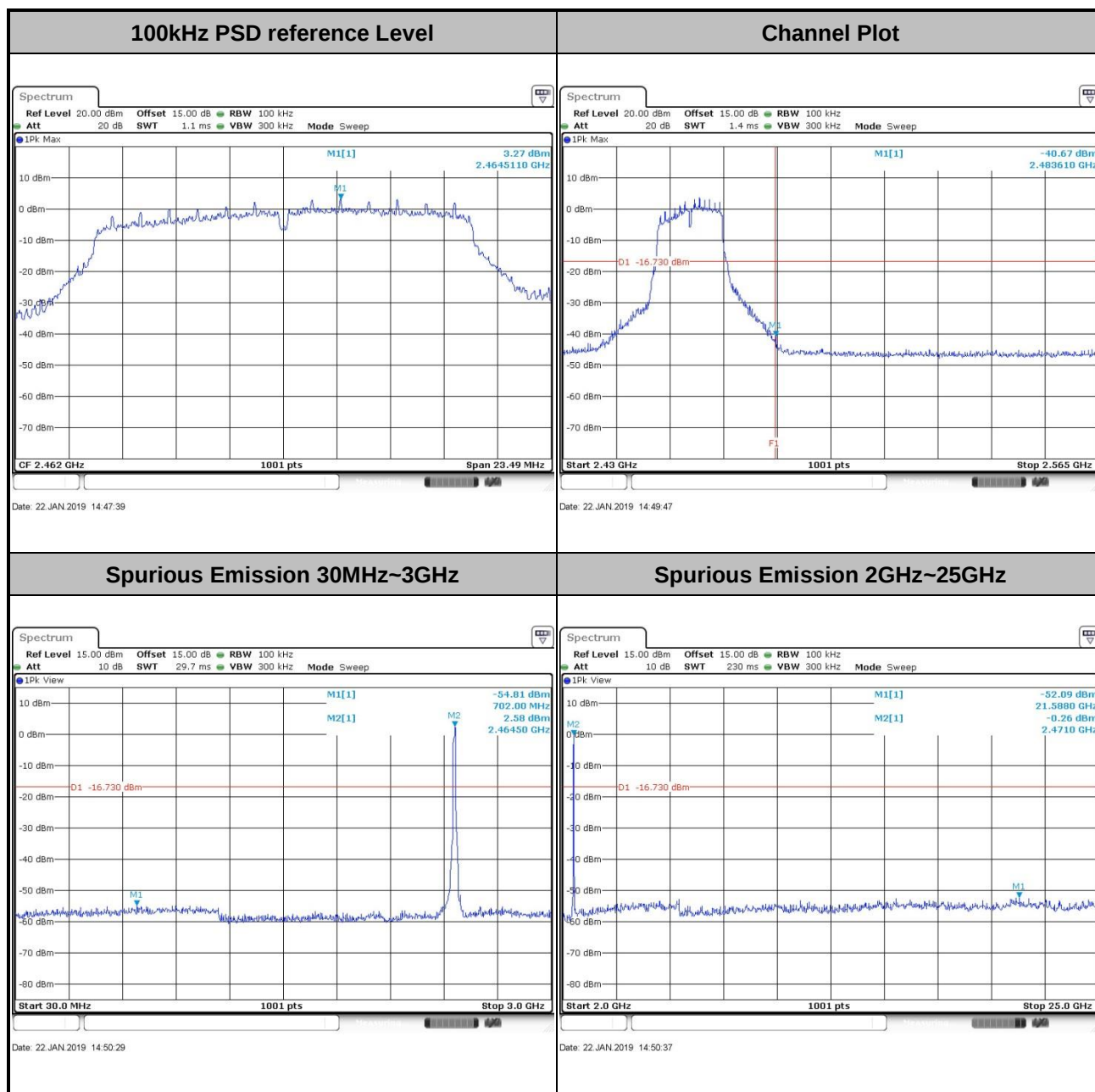


Spurious Emission 2GHz~25GHz



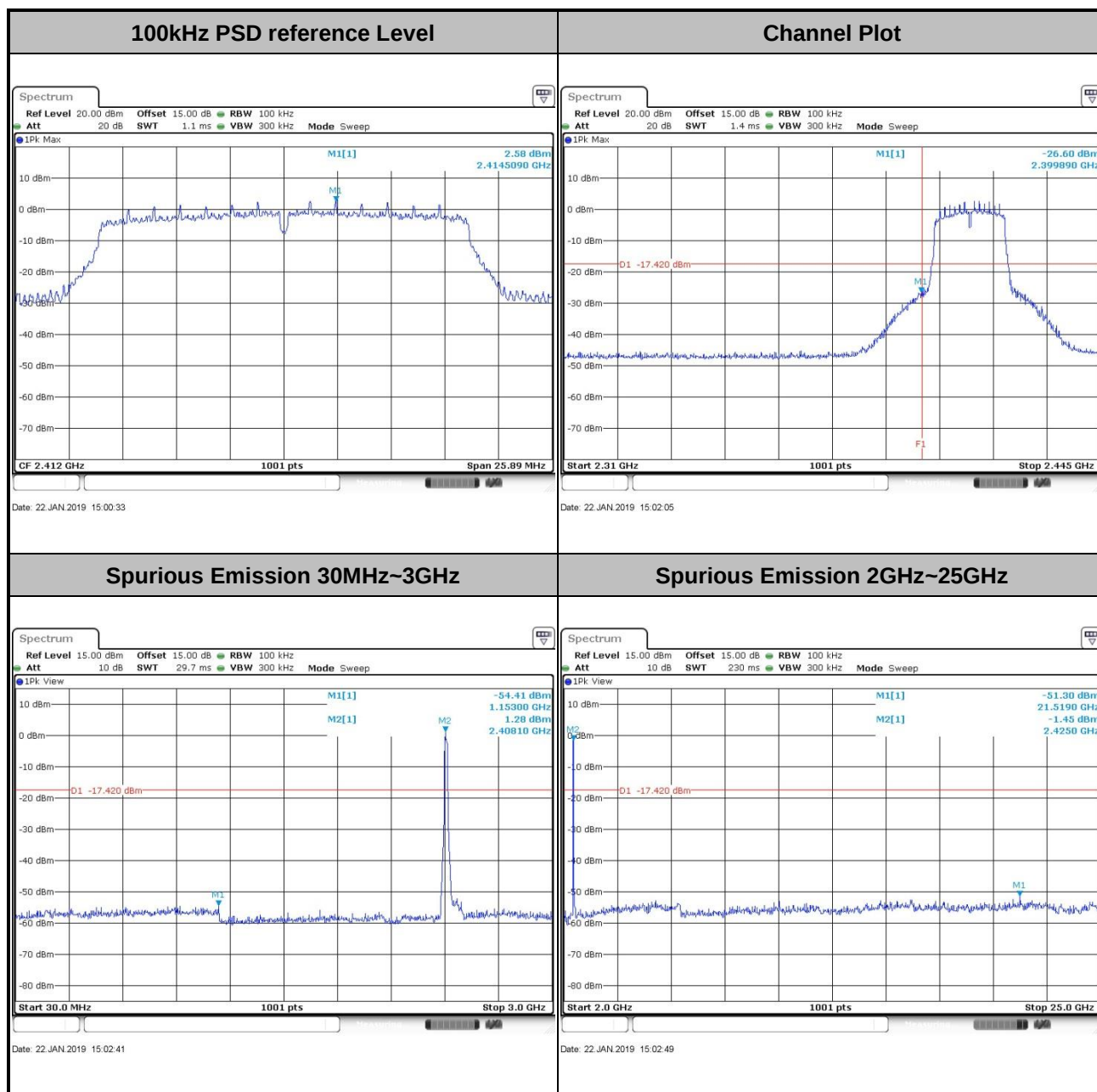


Test Mode :	802.11g	Test Channel :	11
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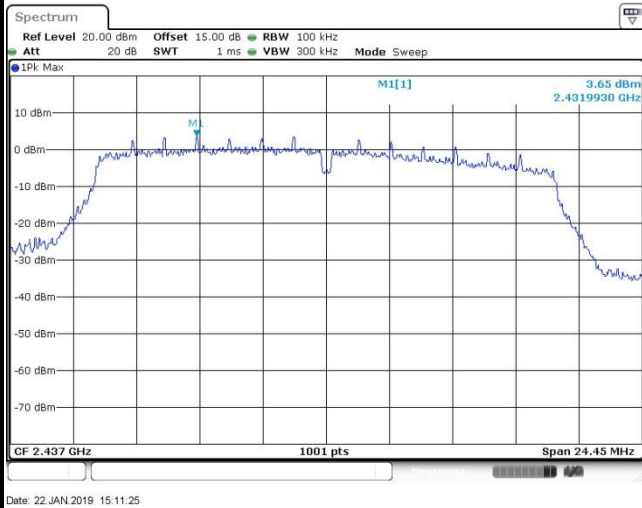
Test Mode :	802.11n HT20	Test Channel :	01
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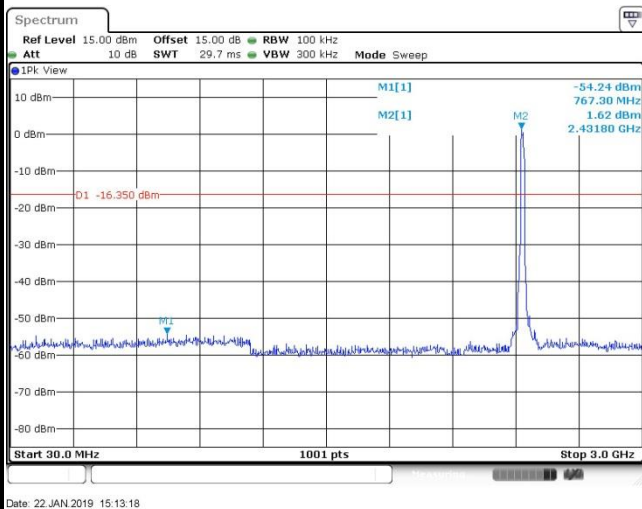


Test Mode :	802.11n HT20	Test Channel :	06
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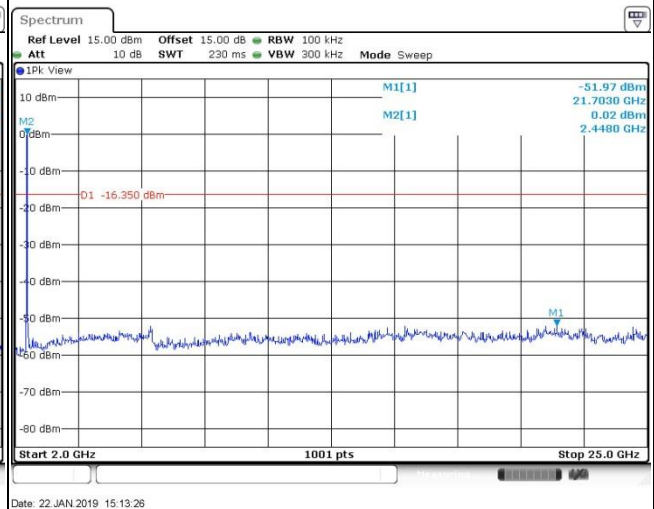
100kHz PSD reference Level



Spurious Emission 30MHz~3GHz



Spurious Emission 2GHz~25GHz

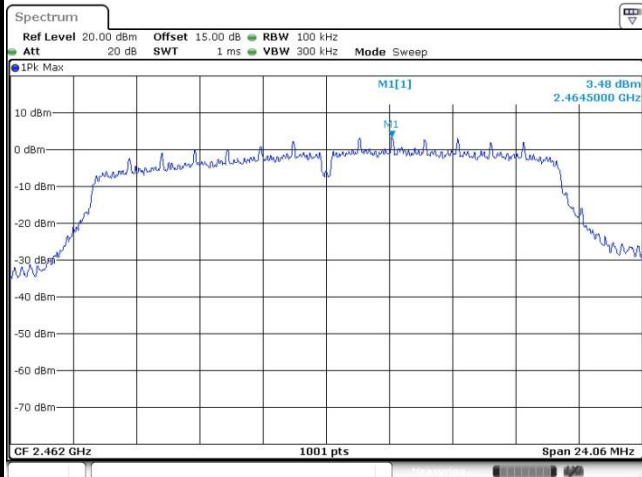




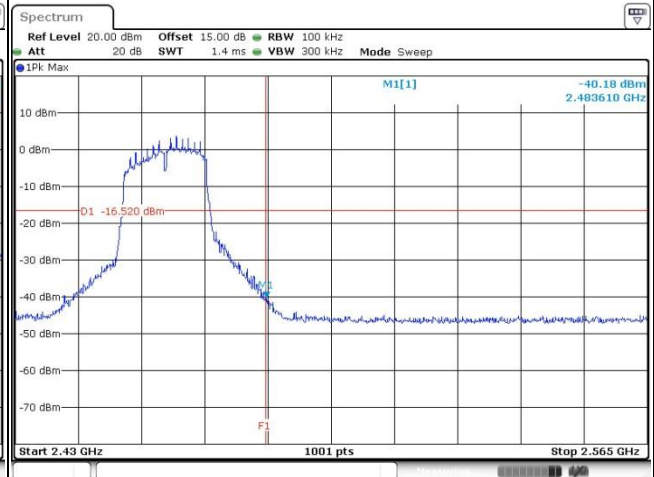
Test Mode : 802.11n HT20

Test Channel : 11

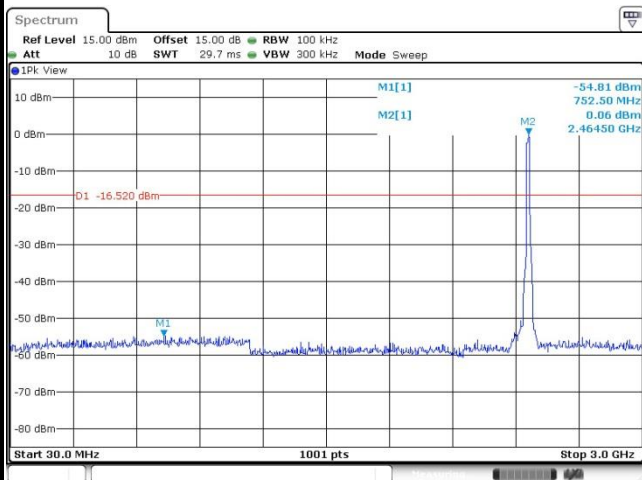
100kHz PSD reference Level



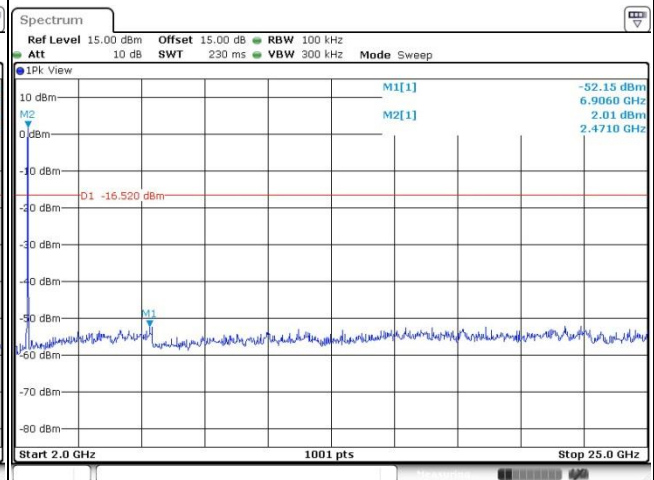
Channel Plot



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 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

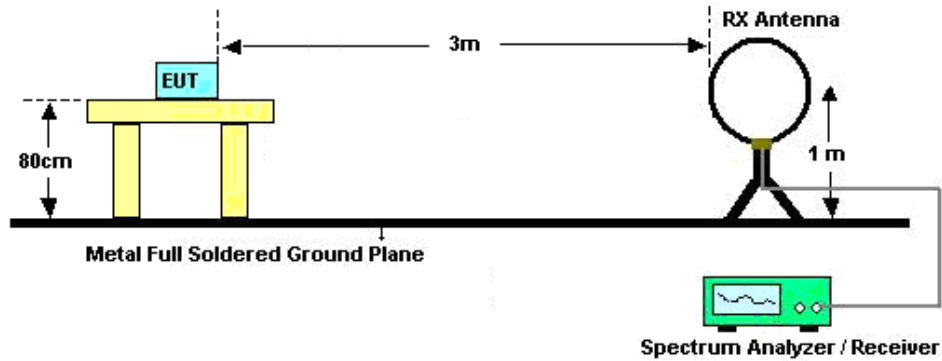
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better 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 testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. 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:

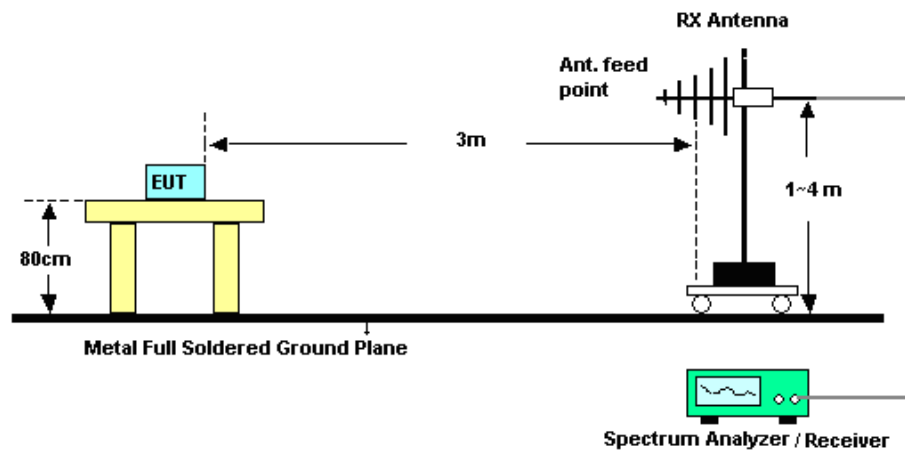
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

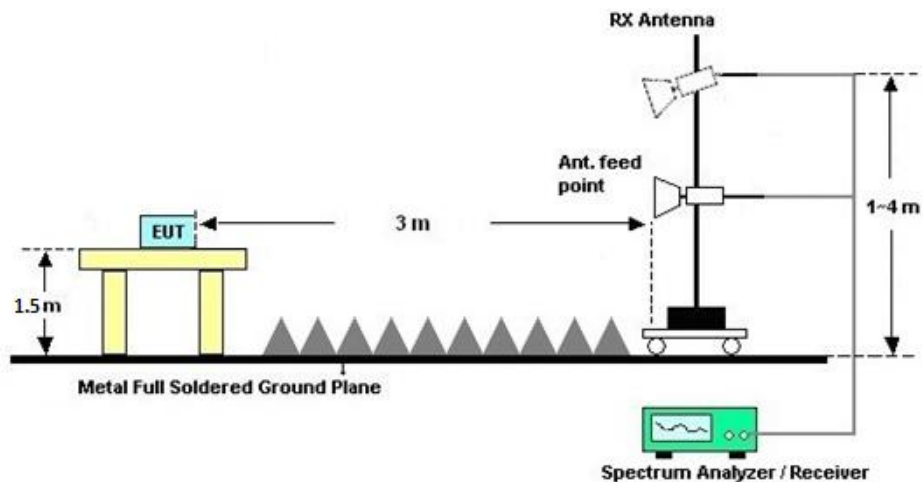
For radiated emissions below 30MHz



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.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C.

3.5.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix C.

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.

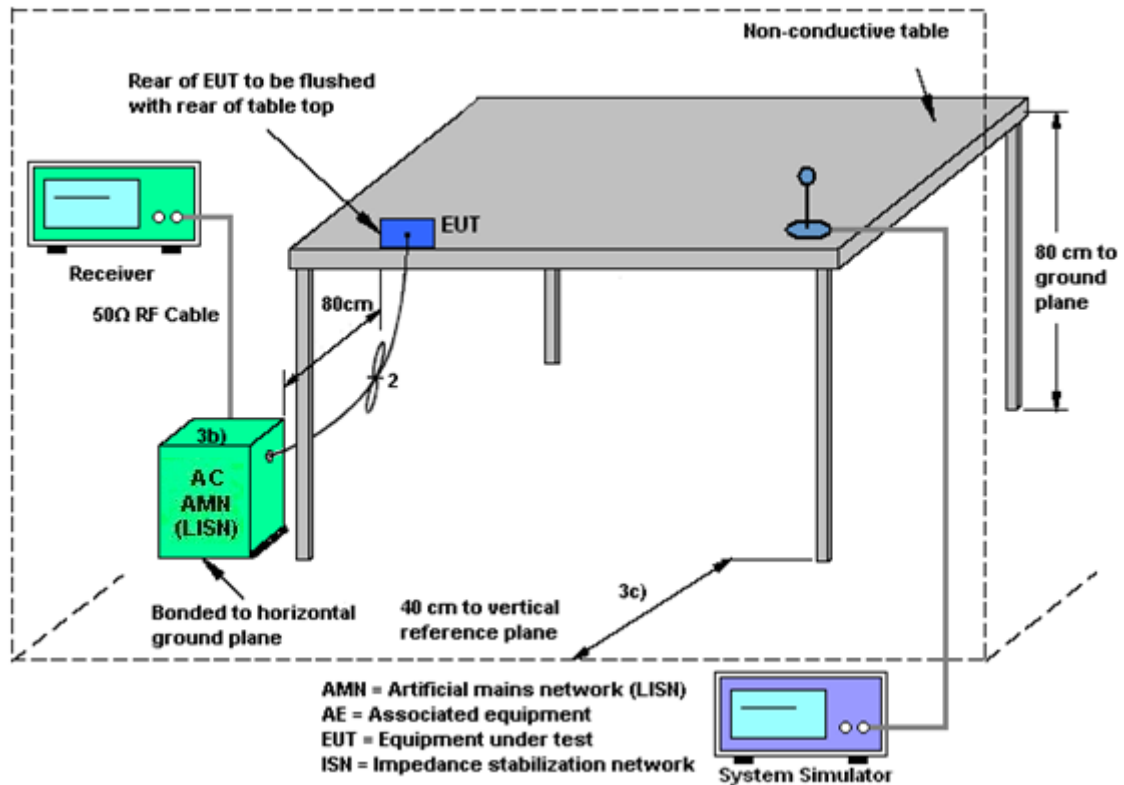
3.6.2 Measuring Instruments

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

Please refer to Appendix B.



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. 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	101078	9kHz~40GHz	Apr. 19, 2018	Jan. 22, 2019	Apr. 18, 2019	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1207253	30MHz~40GHz	Dec. 22, 2018	Jan. 22, 2019	Dec. 21, 2019	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1218010	50MHz Bandwidth	Dec. 22, 2018	Jan. 22, 2019	Dec. 21, 2019	Conducted (TH01-SZ)
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY54450083	20Hz~8.4GHz	Apr. 19, 2018	Feb. 15, 2019	Apr. 18, 2019	Radiation (03CH03-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150246	10Hz~44GHz;	Apr. 19, 2018	Feb. 15, 2019	Apr. 18, 2019	Radiation (03CH03-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	May 14, 2018	Feb. 15, 2019	May 13, 2019	Radiation (03CH03-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz~2GHz	Apr. 19, 2018	Feb. 15, 2019	Apr. 18, 2019	Radiation (03CH03-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1355	1GHz~18GHz	Mar. 29, 2018	Feb. 15, 2019	Mar. 28, 2019	Radiation (03CH03-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18GHz~40GHz	Mar. 30, 2018	Feb. 15, 2019	Mar. 29, 2019	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 30, 2018	Feb. 15, 2019	Jul. 29, 2019	Radiation (03CH03-SZ)
Amplifier	Burgeon	BPA-530	102210	0.01Hz~3000MHz	Oct. 18, 2018	Feb. 15, 2019	Oct. 17, 2019	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 18, 2018	Feb. 15, 2019	Oct. 17, 2019	Radiation (03CH03-SZ)
Amplifier	Agilent Technologies	83017A	MY39501302	500MHz~26.5GHz	Dec. 23, 2018	Feb. 15, 2019	Dec. 22, 2019	Radiation (03CH03-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	NCR	Feb. 15, 2019	NCR	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Feb. 15, 2019	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Feb. 15, 2019	NCR	Radiation (03CH03-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Dec. 23, 2018	Jan. 22, 2019	Dec. 22, 2019	Conduction (CO01-SZ)
AC LISN	EMCO	3816/2SH	00103912	9kHz~30MHz	Oct. 18, 2018	Jan. 22, 2019	Oct. 17, 2019	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Dec. 23, 2018	Jan. 22, 2019	Dec. 22, 2019	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 18, 2018	Jan. 22, 2019	Jul. 17, 2019	Conduction (CO01-SZ)

NCR: No Calibration Required

5 Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage $K=2$ to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.6 dB
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	5.0 dB
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Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.8 dB
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Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.6 dB
---	--------



Appendix A. Conducted test results

A1 - DTS Part

Test Engineer:	Zheng Quan	Temperature:	24~26	°C
Test Date:	2019/1/22	Relative Humidity:	50~53	%

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	14.37
11b	1Mbps	1	6	2437	0.00	14.85
11b	1Mbps	1	11	2462	0.00	14.31
11g	6Mbps	1	1	2412	0.12	13.39
11g	6Mbps	1	6	2437	0.12	13.67
11g	6Mbps	1	11	2462	0.12	13.19
HT20	MCS0	1	1	2412	0.15	13.32
HT20	MCS0	1	6	2437	0.15	13.56
HT20	MCS0	1	11	2462	0.15	13.10

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	16.66	30.00	2.80	19.46	36.00	Pass
11b	1Mbps	1	6	2437	17.11	30.00	2.80	19.91	36.00	Pass
11b	1Mbps	1	11	2462	16.63	30.00	2.80	19.43	36.00	Pass
11g	6Mbps	1	1	2412	22.54	30.00	2.80	25.34	36.00	Pass
11g	6Mbps	1	6	2437	22.71	30.00	2.80	25.51	36.00	Pass
11g	6Mbps	1	11	2462	22.30	30.00	2.80	25.10	36.00	Pass
HT20	MCS0	1	1	2412	23.30	30.00	2.80	26.10	36.00	Pass
HT20	MCS0	1	6	2437	23.11	30.00	2.80	25.91	36.00	Pass
HT20	MCS0	1	11	2462	22.89	30.00	2.80	25.69	36.00	Pass

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

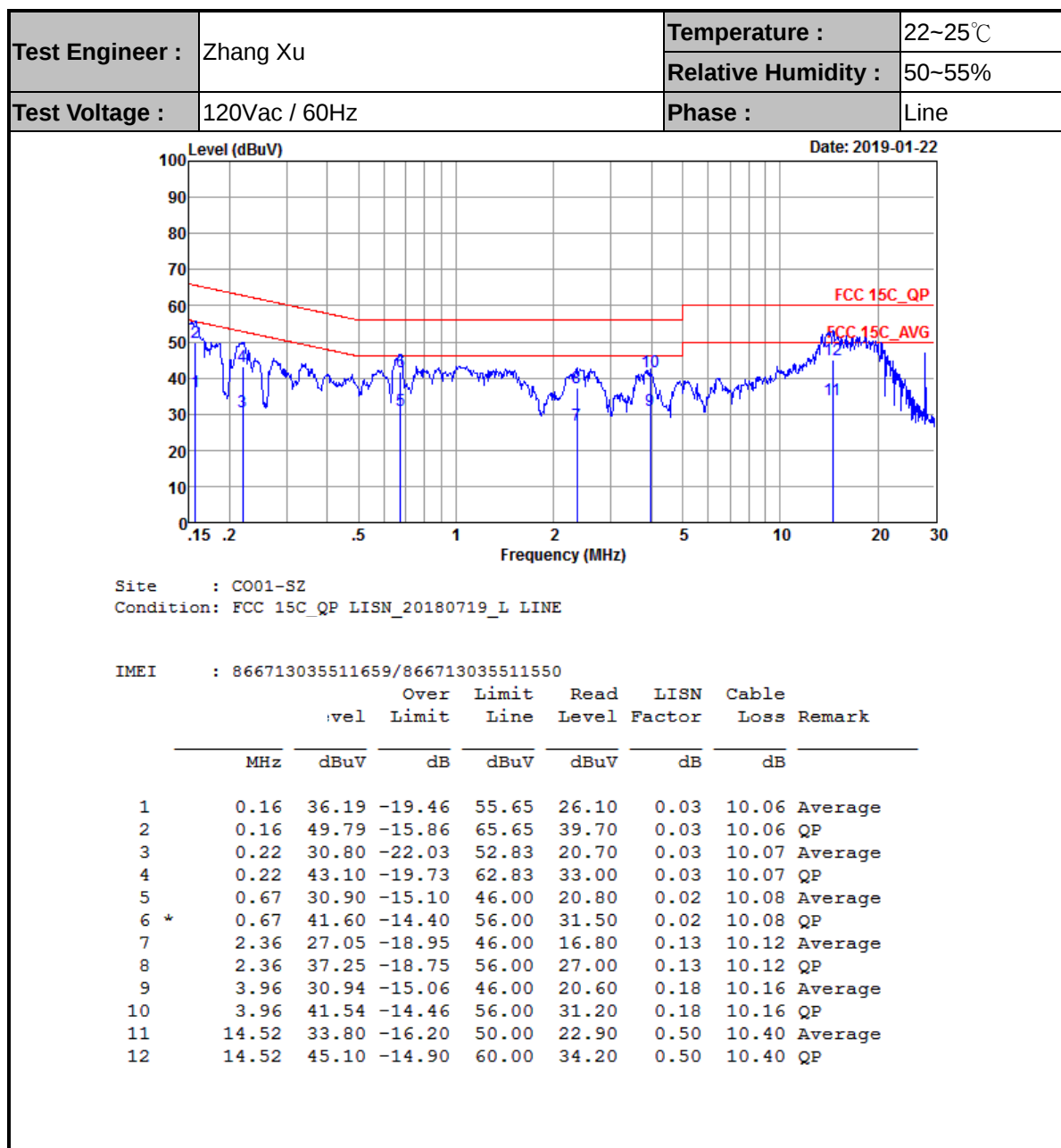
2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
11b	1Mbps	1	1	2412	13.39	8.53	0.50	Pass
11b	1Mbps	1	6	2437	13.04	8.05	0.50	Pass
11b	1Mbps	1	11	2462	12.99	8.05	0.50	Pass
11g	6Mbps	1	1	2412	18.38	16.06	0.50	Pass
11g	6Mbps	1	6	2437	17.98	15.68	0.50	Pass
11g	6Mbps	1	11	2462	17.88	15.66	0.50	Pass
HT20	MCS0	1	1	2412	19.03	17.26	0.50	Pass
HT20	MCS0	1	6	2437	18.98	16.30	0.50	Pass
HT20	MCS0	1	11	2462	18.68	16.04	0.50	Pass

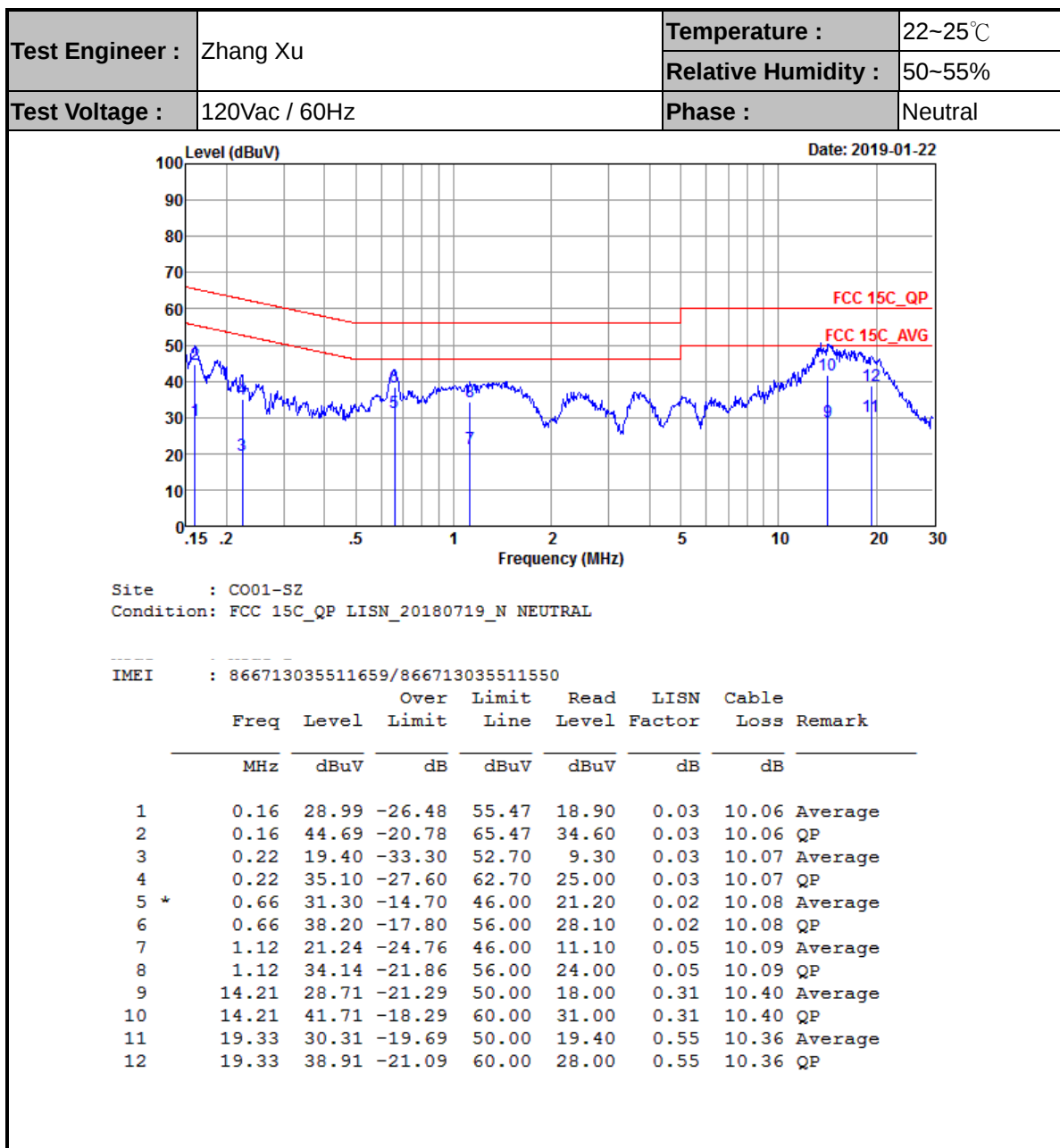
TEST RESULTS DATA
Peak Power Density

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	-6.85	2.80	8.00	Pass
11b	1Mbps	1	6	2437	-5.73	2.80	8.00	Pass
11b	1Mbps	1	11	2462	-6.98	2.80	8.00	Pass
11g	6Mbps	1	1	2412	-10.24	2.80	8.00	Pass
11g	6Mbps	1	6	2437	-8.81	2.80	8.00	Pass
11g	6Mbps	1	11	2462	-10.48	2.80	8.00	Pass
HT20	MCS0	1	1	2412	-11.07	2.80	8.00	Pass
HT20	MCS0	1	6	2437	-10.74	2.80	8.00	Pass
HT20	MCS0	1	11	2462	-9.51	2.80	8.00	Pass



Appendix B. AC Conducted Emission Test Results







Appendix C. 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		2356.1	49.66	-24.34	74	51.03	27.85	5.02	34.24	104	229	P	H
		2358.09	38.53	-15.47	54	39.9	27.85	5.02	34.24	104	229	A	H
	*	2412	93.94	-	-	95.31	27.77	5.06	34.2	104	229	P	H
	*	2412	91.35	-	-	92.72	27.77	5.06	34.2	104	229	A	H
		2373.84	49.64	-24.36	74	51.01	27.83	5.02	34.22	133	231	P	V
		2358.72	38.48	-15.52	54	39.85	27.85	5.02	34.24	133	231	A	V
	*	2412	96.02	-	-	97.39	27.77	5.06	34.2	133	231	P	V
	*	2412	92.41	-	-	93.78	27.77	5.06	34.2	133	231	A	V
802.11b CH 06 2437MHz		2367.26	49.19	-24.81	74	50.54	27.85	5.02	34.22	137	223	P	H
		2342.34	38.51	-15.49	54	39.89	27.88	4.98	34.24	137	223	A	H
	*	2437	92.52	-	-	93.87	27.71	5.12	34.18	137	223	P	H
	*	2437	90.75	-	-	92.1	27.71	5.12	34.18	137	223	A	H
		2490.13	48.78	-25.22	74	50.09	27.63	5.19	34.13	137	223	P	H
		2487.26	38.51	-15.49	54	39.79	27.66	5.19	34.13	137	223	A	H
		2327.78	49.18	-24.82	74	50.55	27.91	4.98	34.26	217	239	P	V
		2328.34	38.45	-15.55	54	39.82	27.91	4.98	34.26	217	239	A	V
	*	2437	95.85	-	-	97.2	27.71	5.12	34.18	217	239	P	V
	*	2437	92.11	-	-	93.46	27.71	5.12	34.18	217	239	A	V
		2486.91	49.42	-24.58	74	50.7	27.66	5.19	34.13	217	239	P	V
		2487.54	38.54	-15.46	54	39.85	27.63	5.19	34.13	217	239	A	V



802.11b CH 11 2462MHz	*	2462	91.33	-	-	92.67	27.69	5.12	34.15	134	219	P	H
	*	2462	87.52	-	-	88.86	27.69	5.12	34.15	134	219	A	H
		2491.4	47.86	-26.14	74	49.17	27.63	5.19	34.13	134	219	P	H
		2488.4	37.35	-16.65	54	38.66	27.63	5.19	34.13	134	219	A	H
	*	2462	95.97	-	-	97.31	27.69	5.12	34.15	137	308	P	V
	*	2462	91.13	-	-	92.47	27.69	5.12	34.15	137	308	A	V
		2486.72	48.56	-25.44	74	49.84	27.66	5.19	34.13	137	308	P	V
		2488.08	37.61	-16.39	54	38.92	27.63	5.19	34.13	137	308	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	39.96	-34.04	74	57.73	31.12	8.59	57.48	145	274	P	H
		4824	43.52	-30.48	74	61.29	31.12	8.59	57.48	191	220	P	V
802.11b CH 06 2437MHz		4874	42.18	-31.82	74	59.93	31.17	8.6	57.52	112	229	P	H
		7311	46.13	-27.87	74	58.78	36.03	10.24	58.92	174	100	P	H
		4874	44.64	-29.36	74	62.39	31.17	8.6	57.52	156	360	P	V
		7311	45.5	-28.5	74	58.15	36.03	10.24	58.92	120	106	P	V
802.11b CH 11 2462MHz		4924	41.62	-32.38	74	59.31	31.22	8.64	57.55	133	180	P	H
		7386	45.28	-28.72	74	57.75	36.29	10.2	58.96	145	274	P	H
		4924	42.86	-31.14	74	60.55	31.22	8.64	57.55	156	360	P	V
		7386	44.74	-29.26	74	57.21	36.29	10.2	58.96	166	210	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		2333.84	49.45	-24.55	74	50.82	27.91	4.98	34.26	107	221	P	H
		2386.13	39.42	-14.58	54	40.78	27.8	5.06	34.22	107	221	A	H
	*	2412	92.06	-	-	93.43	27.77	5.06	34.2	107	221	P	H
	*	2412	85.81	-	-	87.18	27.77	5.06	34.2	107	221	A	H
		2389.59	53.08	-20.92	74	54.44	27.8	5.06	34.22	164	254	P	V
		2390	39.9	-14.1	54	41.24	27.8	5.06	34.2	164	254	A	V
	*	2412	99.46	-	-	100.83	27.77	5.06	34.2	164	254	P	V
	*	2412	91.82	-	-	93.19	27.77	5.06	34.2	164	254	A	V
802.11g CH 06 2437MHz		2385.88	48.96	-25.04	74	50.32	27.8	5.06	34.22	280	217	P	H
		2389.38	39.68	-14.32	54	41.04	27.8	5.06	34.22	280	217	A	H
	*	2437	95	-	-	96.35	27.71	5.12	34.18	280	217	P	H
	*	2437	88.45	-	-	89.8	27.71	5.12	34.18	280	217	A	H
		2485.79	50.6	-23.4	74	51.88	27.66	5.19	34.13	280	217	P	H
		2487.75	39.75	-14.25	54	41.06	27.63	5.19	34.13	280	217	A	H
		2334.64	50.87	-23.13	74	52.27	27.88	4.98	34.26	156	255	P	V
		2388.54	39.52	-14.48	54	40.88	27.8	5.06	34.22	156	255	A	V
	*	2437	99.22	-	-	100.57	27.71	5.12	34.18	156	255	P	V
	*	2437	93.05	-	-	94.4	27.71	5.12	34.18	156	255	A	V
		2484.74	50.18	-23.82	74	51.46	27.66	5.19	34.13	156	255	P	V
		2486.56	40.55	-13.45	54	41.83	27.66	5.19	34.13	156	255	A	V



802.11g CH 11 2462MHz	*	2462	94.86	-	-	96.2	27.69	5.12	34.15	240	216	P	H
	*	2462	88.17	-	-	89.51	27.69	5.12	34.15	240	216	A	H
		2483.72	53.46	-20.54	74	54.74	27.66	5.19	34.13	240	216	P	H
		2483.52	41.44	-12.56	54	42.72	27.66	5.19	34.13	240	216	A	H
	*	2462	99.54	-	-	100.88	27.69	5.12	34.15	130	256	P	V
	*	2462	92.92	-	-	94.26	27.69	5.12	34.15	130	256	A	V
		2484.08	57.06	-16.94	74	58.34	27.66	5.19	34.13	130	256	P	V
		2483.6	44.23	-9.77	54	45.51	27.66	5.19	34.13	130	256	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	40.43	-33.57	74	58.2	31.12	8.59	57.48	145	274	P	H
		4824	40.12	-33.88	74	57.89	31.12	8.59	57.48	191	220	P	V
802.11g CH 06 2437MHz		4874	39.65	-34.35	74	57.4	31.17	8.6	57.52	112	229	P	H
		7311	45.34	-28.66	74	57.99	36.03	10.24	58.92	174	100	P	H
		4874	40.02	-33.98	74	57.77	31.17	8.6	57.52	156	360	P	V
		7311	45.62	-28.38	74	58.27	36.03	10.24	58.92	120	106	P	V
802.11g CH 11 2462MHz		4924	41.49	-32.51	74	59.18	31.22	8.64	57.55	133	180	P	H
		7386	46.38	-27.62	74	58.85	36.29	10.2	58.96	145	274	P	H
		4924	39.84	-34.16	74	57.53	31.22	8.64	57.55	156	360	P	V
		7386	45.87	-28.13	74	58.34	36.29	10.2	58.96	166	210	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		2388.23	54.49	-19.51	74	55.85	27.8	5.06	34.22	367	221	P	H
		2389.7	39.66	-14.34	54	41.02	27.8	5.06	34.22	367	221	A	H
	*	2412	92.56	-	-	93.93	27.77	5.06	34.2	367	221	P	H
	*	2412	86.29	-	-	87.66	27.77	5.06	34.2	367	221	A	H
		2389.59	57.64	-16.36	74	59	27.8	5.06	34.22	164	253	P	V
		2388.44	40.77	-13.23	54	42.13	27.8	5.06	34.22	164	253	A	V
	*	2412	97.51	-	-	98.88	27.77	5.06	34.2	164	253	P	V
	*	2412	90.82	-	-	92.19	27.77	5.06	34.2	164	253	A	V
802.11n HT20 CH 06 2437MHz		2310	49.04	-24.96	74	50.41	27.94	4.98	34.29	277	213	P	H
		2348.36	39.34	-14.66	54	40.68	27.88	5.02	34.24	277	213	A	H
	*	2437	94.29	-	-	95.64	27.71	5.12	34.18	277	213	P	H
	*	2437	87.13	-	-	88.48	27.71	5.12	34.18	277	213	A	H
		2487.82	49.15	-24.85	74	50.46	27.63	5.19	34.13	277	213	P	H
		2487.19	39.7	-14.3	54	40.98	27.66	5.19	34.13	277	213	A	H
		2388.54	49.35	-24.65	74	50.71	27.8	5.06	34.22	156	254	P	V
		2386.86	39.66	-14.34	54	41.02	27.8	5.06	34.22	156	254	A	V
	*	2437	98.19	-	-	99.54	27.71	5.12	34.18	156	254	P	V
	*	2437	90.9	-	-	92.25	27.71	5.12	34.18	156	254	A	V
		2484.53	49.96	-24.04	74	51.24	27.66	5.19	34.13	156	254	P	V
		2487.82	40.53	-13.47	54	41.84	27.63	5.19	34.13	156	254	A	V



802.11n HT20 CH 11 2462MHz	*	2462	93.69	-	-	95.03	27.69	5.12	34.15	157	175	P	H
	*	2462	87.49	-	-	88.83	27.69	5.12	34.15	157	175	A	H
		2483.68	54.42	-19.58	74	55.7	27.66	5.19	34.13	157	175	P	H
		2483.6	42.72	-11.28	54	44	27.66	5.19	34.13	157	175	A	H
	*	2462	98.25	-	-	99.59	27.69	5.12	34.15	132	253	P	V
	*	2462	91.09	-	-	92.43	27.69	5.12	34.15	132	253	A	V
		2483.56	59.05	-14.95	74	60.33	27.66	5.19	34.13	132	253	P	V
		2484.08	45.04	-8.96	54	46.32	27.66	5.19	34.13	132	253	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	39.49	-34.51	74	57.26	31.12	8.59	57.48	145	274	P	H
		4824	39.83	-34.17	74	57.6	31.12	8.59	57.48	191	220	P	V
802.11n HT20 CH 06 2437MHz		4874	39.96	-34.04	74	57.71	31.17	8.6	57.52	112	229	P	H
		7311	46.43	-27.57	74	59.08	36.03	10.24	58.92	174	100	P	H
		4874	40.13	-33.87	74	57.88	31.17	8.6	57.52	156	360	P	V
		7311	45.57	-28.43	74	58.22	36.03	10.24	58.92	120	106	P	V
802.11n HT20 CH 11 2462MHz		4924	40.38	-33.62	74	58.07	31.22	8.64	57.55	133	180	P	H
		7386	45.03	-28.97	74	57.5	36.29	10.2	58.96	145	274	P	H
		4924	42.07	-31.93	74	59.76	31.22	8.64	57.55	157	360	P	V
		7386	44.96	-29.04	74	57.43	36.29	10.2	58.96	166	210	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 HT20 (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 HT20 LF		30	22.32	-17.68	40	29.96	24.3	0.56	32.5	-	-	P	H
		142.52	23.58	-19.92	43.5	37.04	17.2	1.24	31.9	-	-	P	H
		195.87	22.82	-20.68	43.5	37.66	15.52	1.45	31.81	-	-	P	H
		274.44	25.54	-20.46	46	36.48	19.21	1.74	31.89	-	-	P	H
		353.01	31.7	-14.3	46	40.97	20.53	1.99	31.79	133	55	P	H
		404.42	26.75	-19.25	46	34.52	21.79	2.13	31.69	-	-	P	H
		30	26.5	-13.5	40	34.14	24.3	0.56	32.5	120	78	P	V
		43.58	21.78	-18.22	40	36.15	16.76	0.67	31.8	-	-	P	V
		57.16	22.82	-17.18	40	41.72	12.78	0.77	32.45	-	-	P	V
		85.29	18.47	-21.53	40	35.71	13.6	0.96	31.8	-	-	P	V
		358.83	27.52	-18.48	46	36.62	20.68	2	31.78	-	-	P	V
		893.3	29.35	-16.65	46	30.43	26.67	3.3	31.05	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												



Note symbol

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



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

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

1. Level(dBμV/m) =

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

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

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

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

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

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

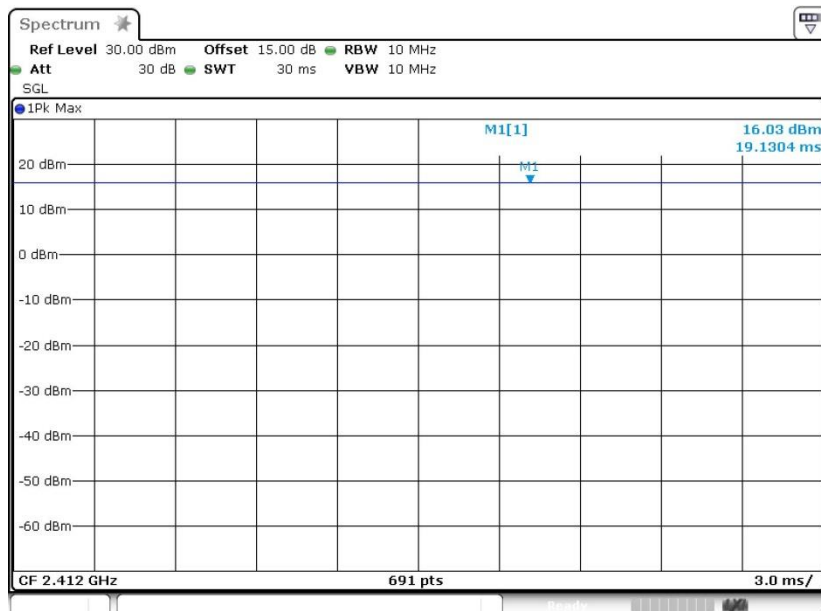
= -10.46(dB)

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

Appendix D. Duty Cycle Plots

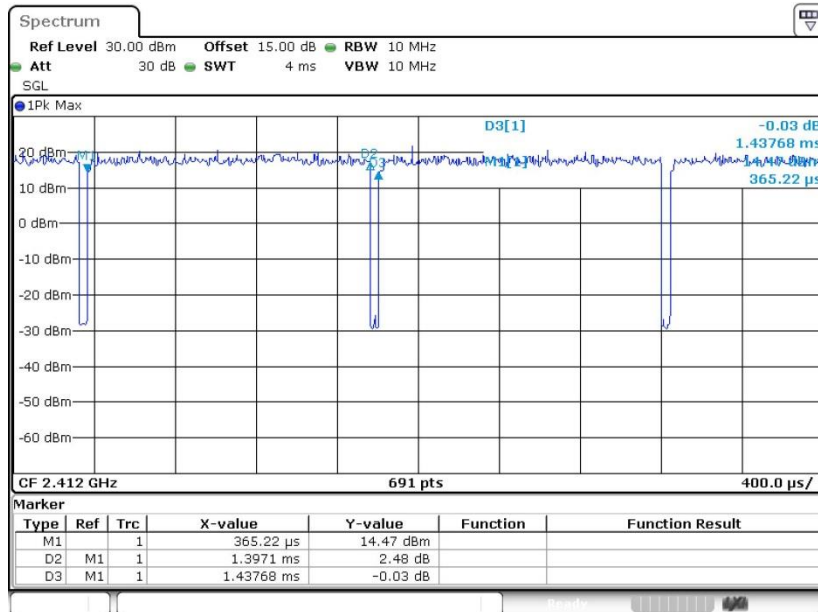
Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	100.00	-	-	10Hz
802.11g	97.18	1.397	0.716	1KHz
802.11n HT20	96.57	1.304	0.767	1KHz

802.11b





802.11g



802.11n HT20

