FCC RF Test Report

APPLICANT	:	Bullitt Group
EQUIPMENT	:	Rugged Smart Phone
BRAND NAME	:	Motorola
MODEL NAME	:	BM2S1E
FCC ID	:	ZL5BM2S1EE
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System
TEST DATE(S)	:	Nov. 08, 2022 ~ Dec. 26, 2022

We, Sporton International Inc. (Shenzhen), 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 Inc. (Shenzhen), the test report shall not be reproduced except in full.

Jason Jia

Approved by: Jason Jia

ACCREDITED Cert #5145.01

Sporton International Inc. (ShenZhen)

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People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR322807-01C	Rev. 01	Initial issue of report	Mar. 13, 2023

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.1	-	99% Bandwidth	-	Report Only	-
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 1.32 dB at 2389.52 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 17.67 dB at 0.20 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

Note: This is the change FCC ID report. Since no changes have been made to this device, therefore, all test cases were leveraged from original report (FR2O1410-01C).

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Applicant

Bullitt Group
One Valpy, Valpy Street, Reading, Berkshire, RG1 1AR, United Kingdom

1.2 Manufacturer

Bullitt Mobile Limited
One Valpy, Valpy Street, Reading, Berkshire, RG1 1AR, United Kingdom

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Rugged Smart Phone
Brand Name	Motorola
Model Name	BM2S1E
FCC ID	ZL5BM2S1EE
IMEI Code	Conducted: 351416010000076/351416010002072 Conduction: 351416010000043/351416010002049 Radiation: 351416010000050/351416010002056
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 : 21.24 dBm (0.1330 W) 802.11g : 25.83 dBm (0.3828 W) 802.11n HT20 : 25.88 dBm (0.3873 W) 802.11n HT40 : 25.82 dBm (0.3819 W)
99% Occupied Bandwidth	802.11b : 13.44 MHz 802.11g : 16.93 MHz 802.11n HT20 : 17.88 MHz 802.11n HT40 : 36.56 MHz
Antenna Type / Gain	IFA Antenna type with gain -1.50 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 Inc. (ShenZhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International Inc. (ShenZhen)		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-SZ TH01-SZ	CN1256	421272

Test Firm	Sporton International Inc. (ShenZhen)		
Test Site Location	101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City Guangdong Province China 518103 TEL: +86-755-33202398		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH01-SZ	CN1256	421272

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH01-SZ	AUDIX	E3	6.2009-8-24
2.	CO01-SZ	AUDIX	E3	6.120613b

1.8 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 v05r02
- 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 (X 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

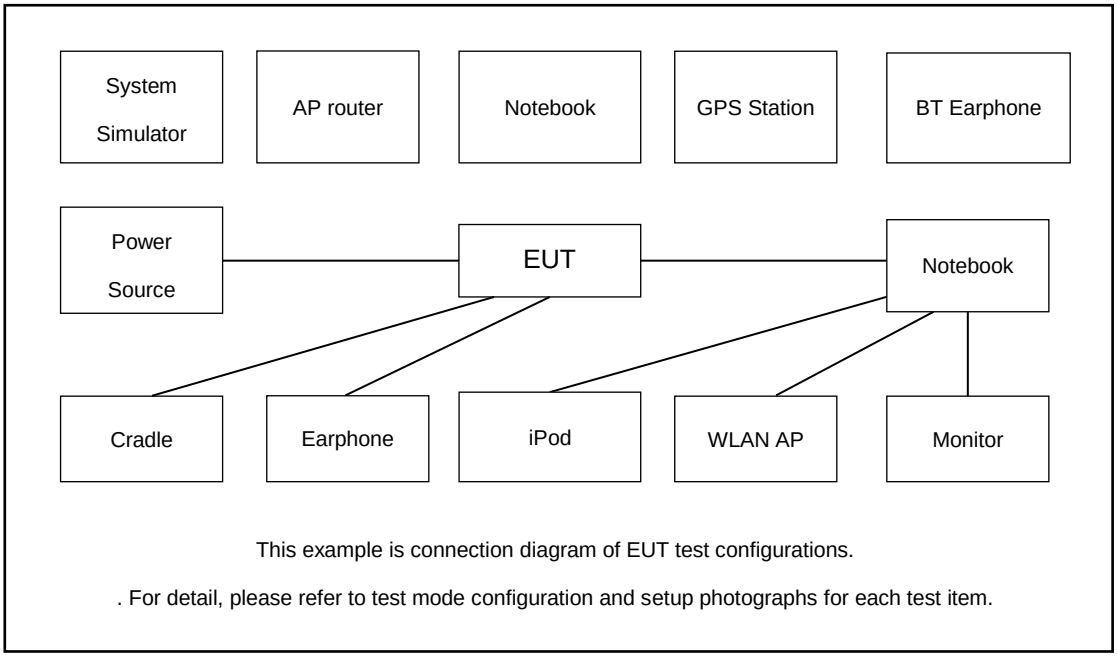
Final test modes are considering the modulation and worse data rates as below table.

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

Test Cases	
AC Conducted Emission	Mode 1 :GSM 850 Idle + WLAN Link(2.4G) + USB Cable1 (Charging from Adapter) + Battery 1
Remark: **1.** The worst case of conducted emission is mode 2. **2.** For Radiated Test Cases, The tests were performance with Adapter, Battery 1, and USB Cable 1	

Simultaneous transmission
802.11nHT40 Tx_Ch03 + GSM 850 Link For Sample 1
802.11nHT40 Tx_Ch03 + NTN Band 23 Link For Sample 1
802.11nHT40 Tx_Ch03 + GSM 850 Link For Sample 2

2.3 Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded,1.8m
2.	Base Station	R&S	CMW500	Fcc DoC	N/A	Shielded, 1.5m
3.	Base Station	R&S	CBT32	N/A	N/A	Unshielded,1.8m
4.	WLAN AP	Dlink	DIR-820L	KA2IR820LA1	N/A	Unshielded,1.8m
5.	Bluetooth Earphone	Samsung	EO-MG900	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.

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 1.50 dB and 10dB attenuator.

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

= 1.50 + 10 = 11.50 (dB)

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

3.1.2 Measuring Instruments

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

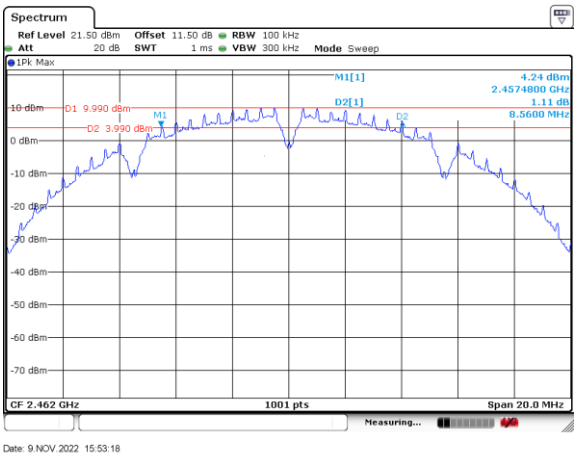
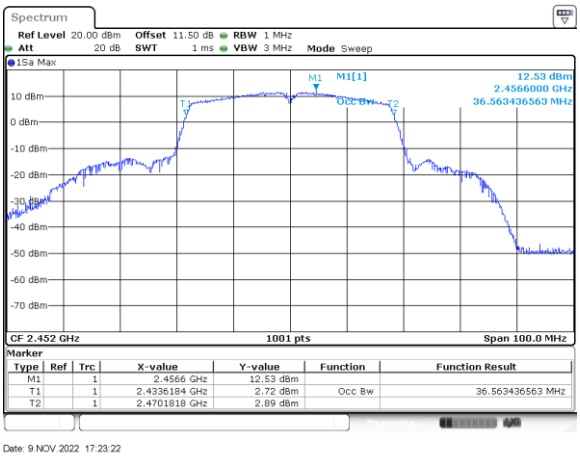
3.1.3 Test Procedures

1. The testing follows 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. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 1%~5% of OBW and set the Video bandwidth (VBW) = 3MHz.
6. Measure and record the results in the test report.

3.1.4 Test Setup

3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A.

Minimum 6dB Bandwidth	Maximum 99% Occupied 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 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.

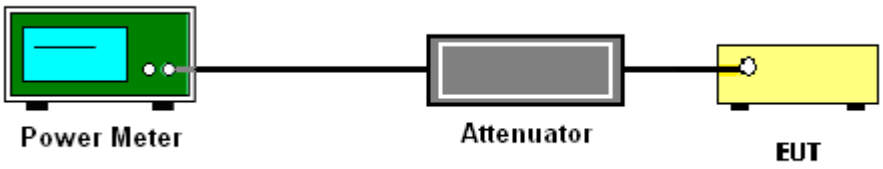
3.2.2 Measuring Instruments

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 or ANSI C63.10-2013 clause 11.9.2.3.1 Method AVGPM 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

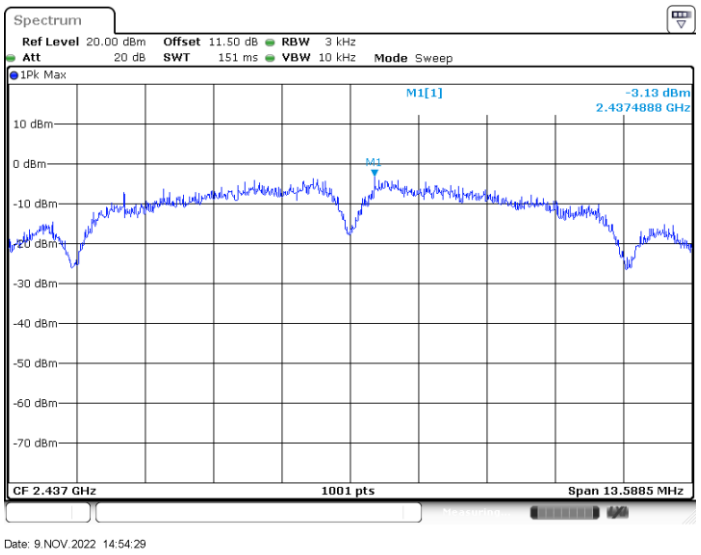
1. The testing follows Measurement Procedure of ANSI C63.10-2013 clause 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the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

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 relative to the maximum PSD level in 100 kHz by RF conducted measurement.

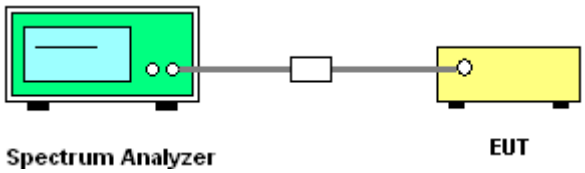
3.4.2 Measuring Instruments

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

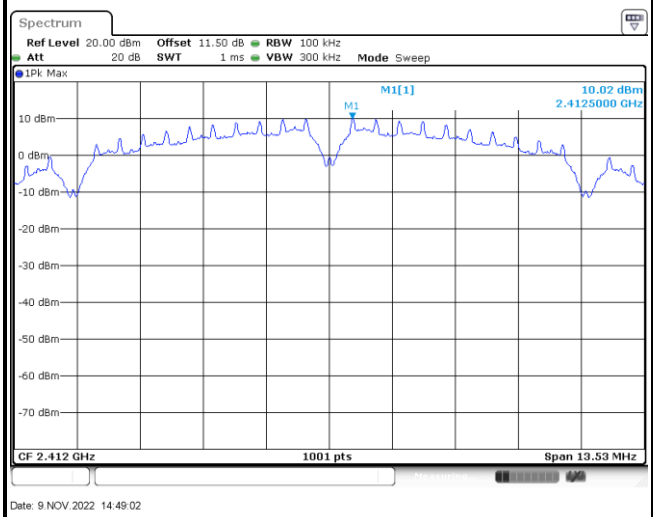


3.4.5 Test Result of Conducted Band Edges and Spurious Emission

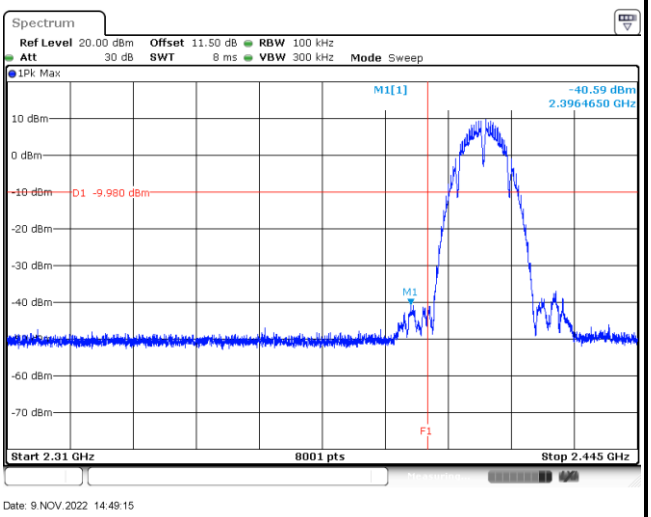
Test Engineer :	Chen Ran	**Temperature :**	24~26℃
		Relative Humidity :	50~53%

Test Mode :	802.11b	**Test Channel :**	01

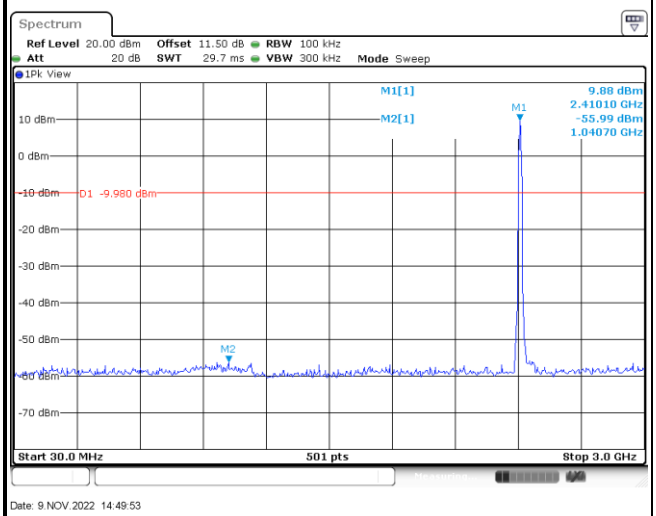
100kHz PSD reference Level



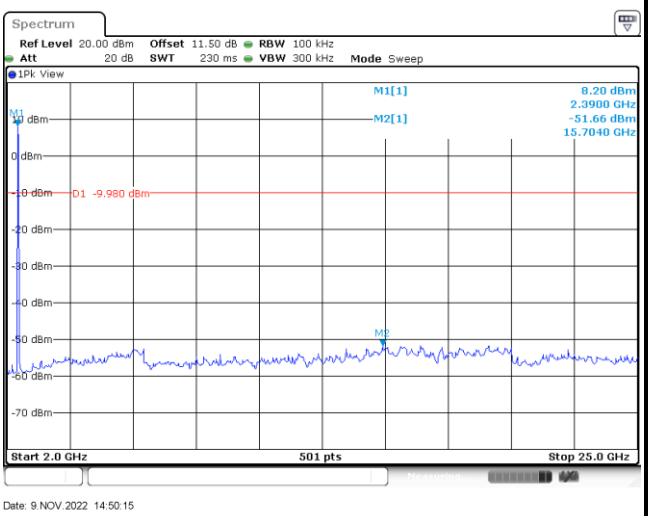
Channel Plot



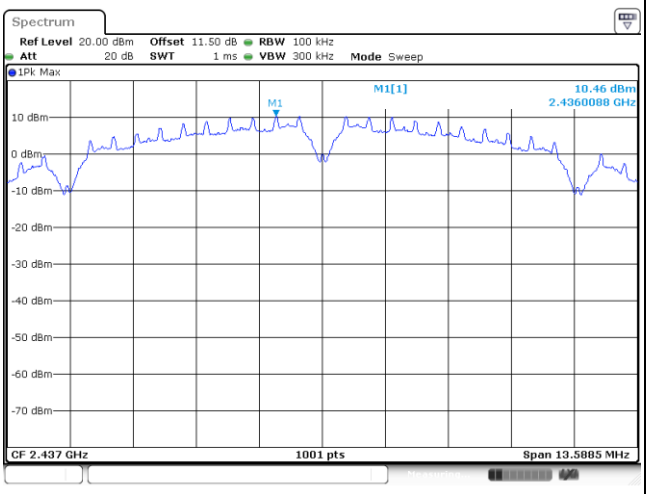
Spurious Emission 30MHz~3GHz

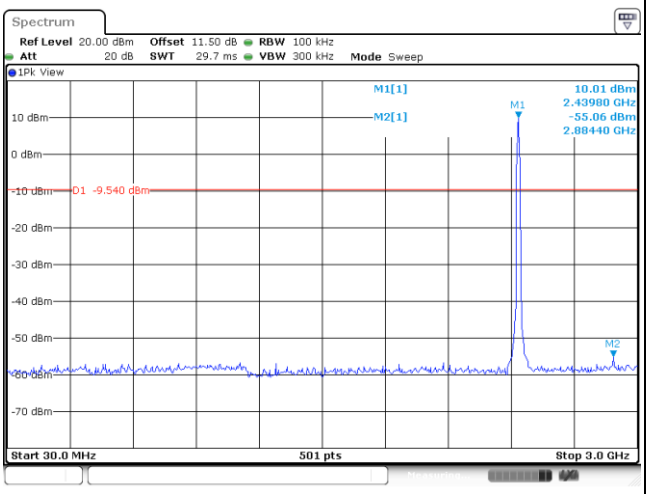
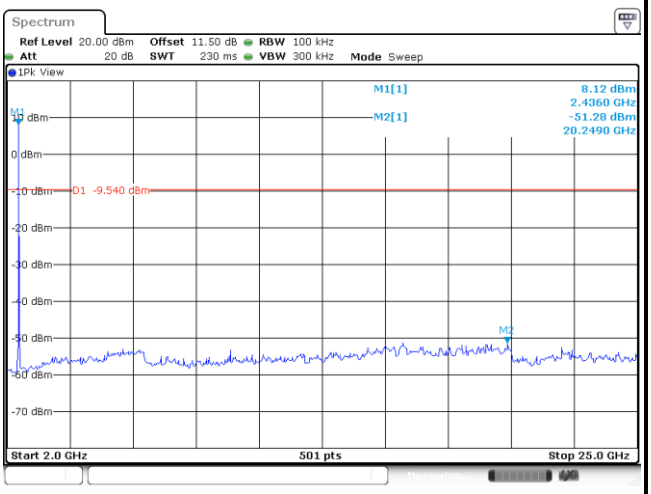


Spurious Emission 2GHz~25GHz

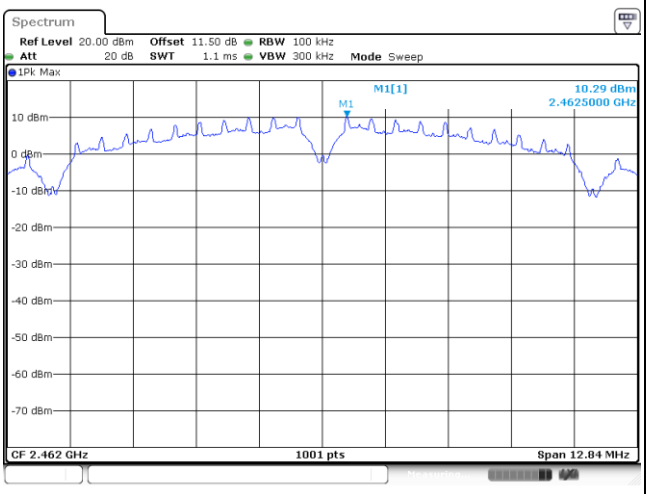
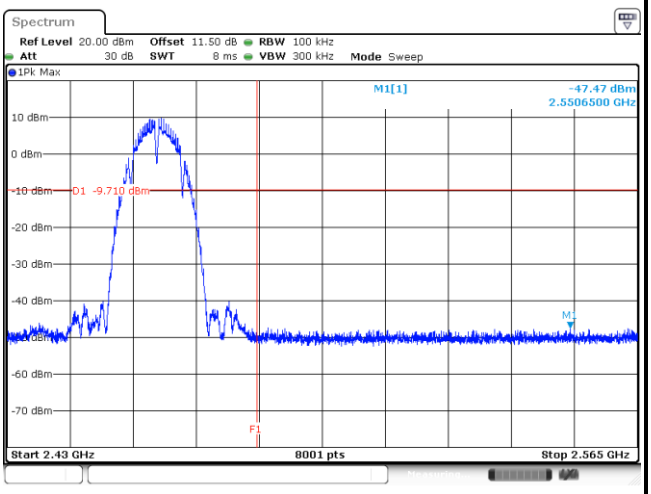
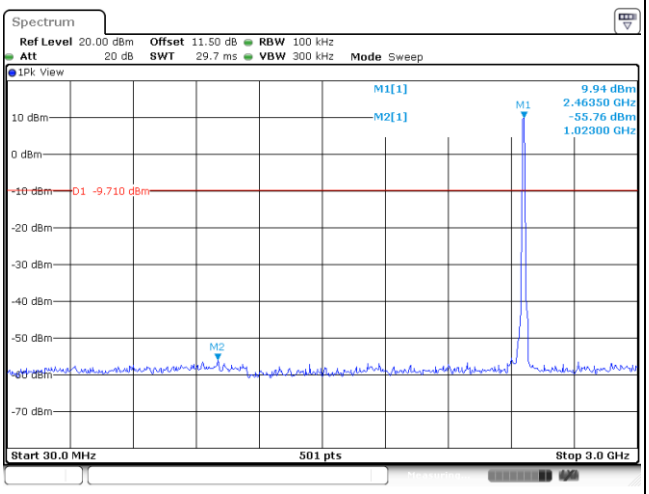
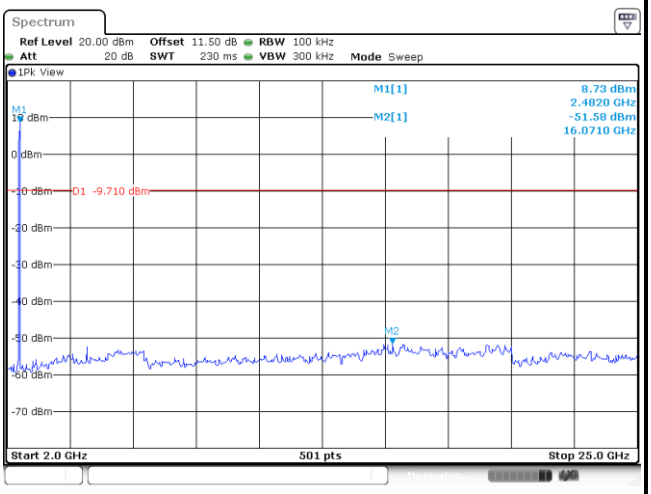


Test Mode :	802.11b	Test Channel :	06

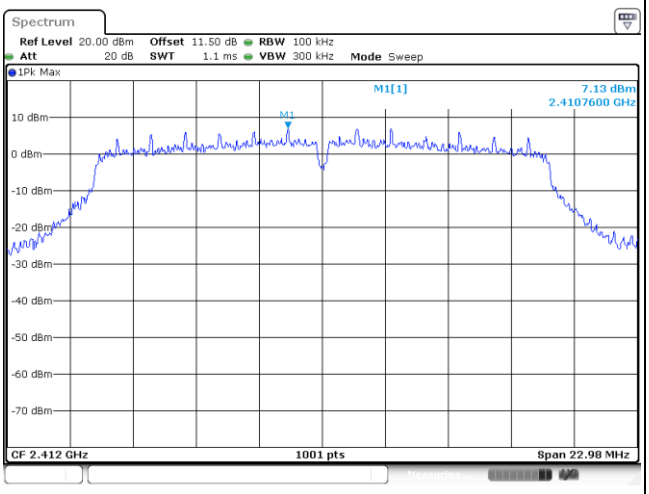
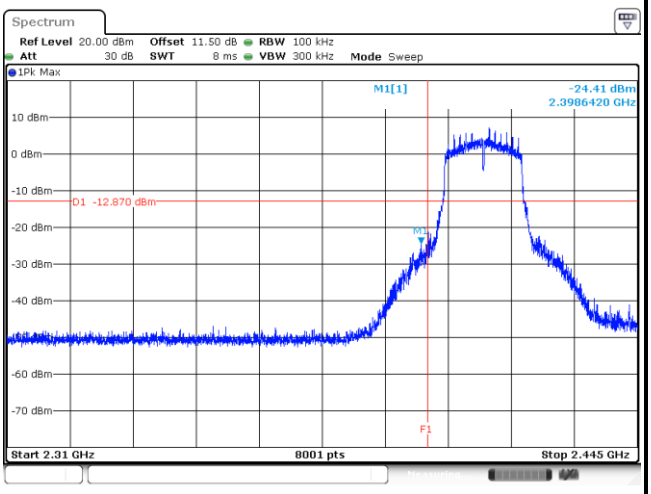
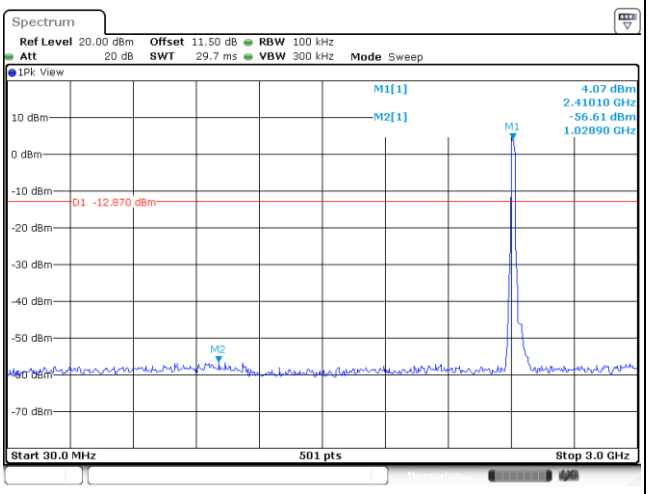
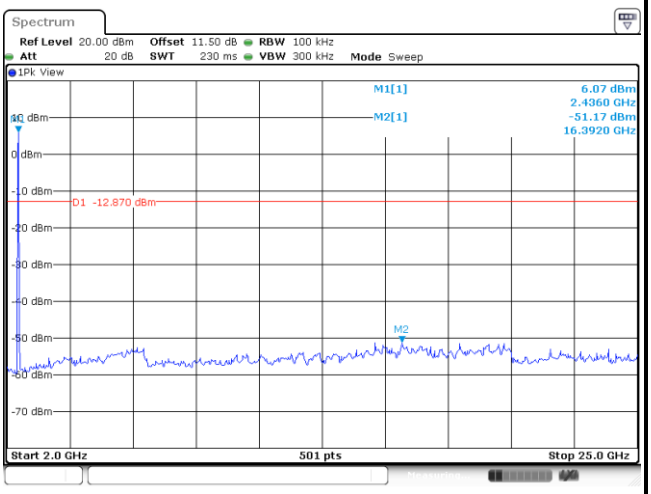
100kHz PSD reference Level	Channel Plot
	-

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

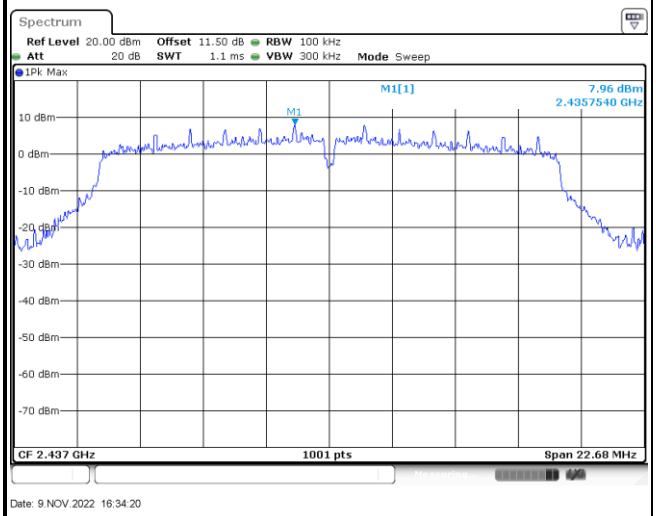
Test Mode :	802.11b	Test Channel :	11

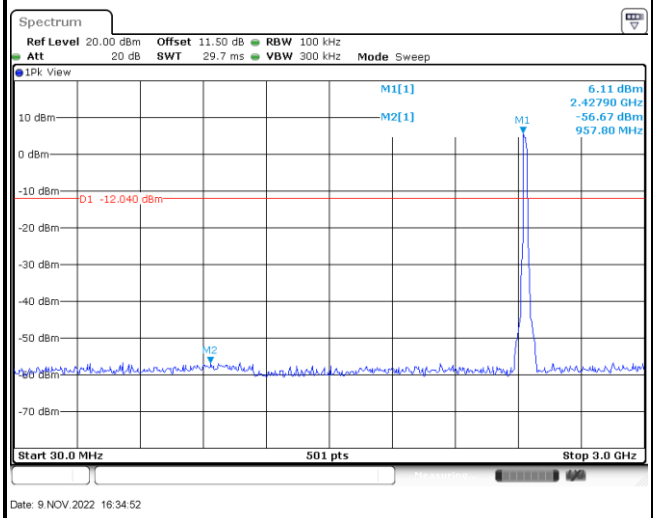
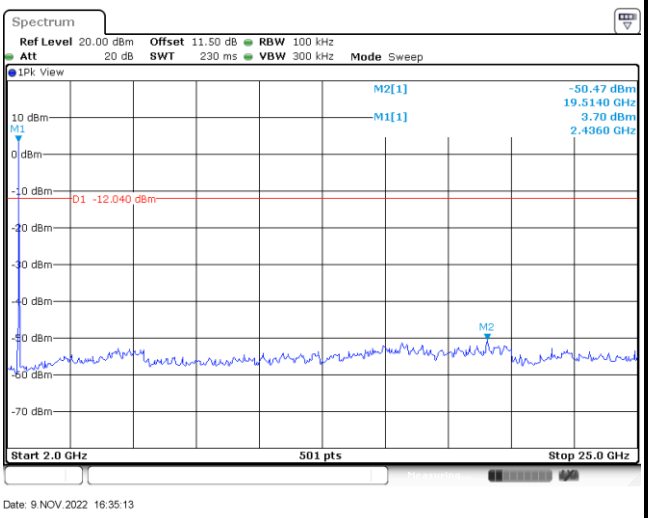
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11g	Test Channel :	01

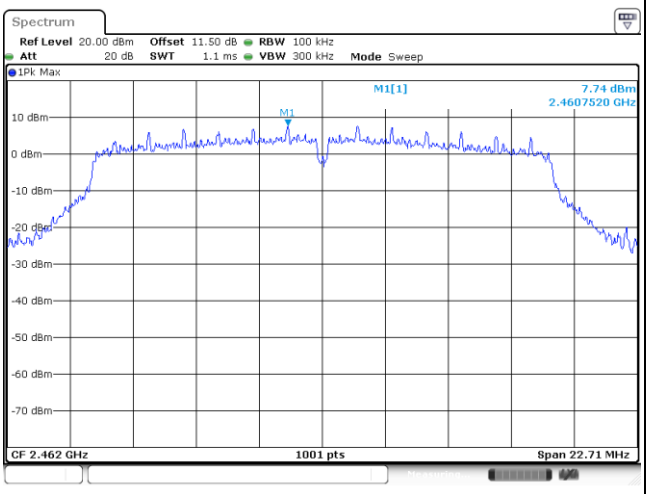
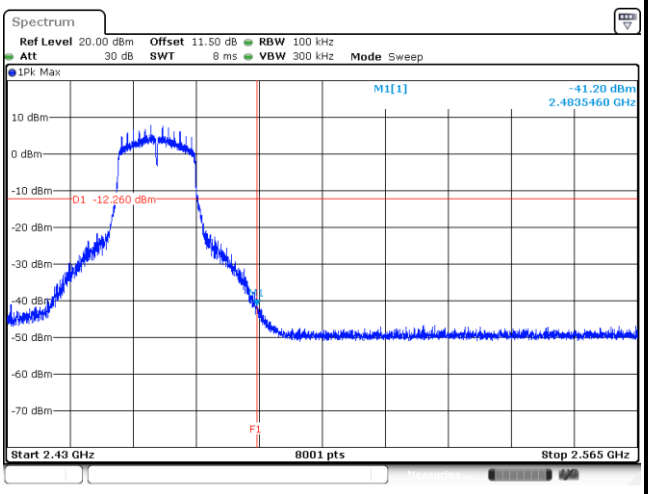
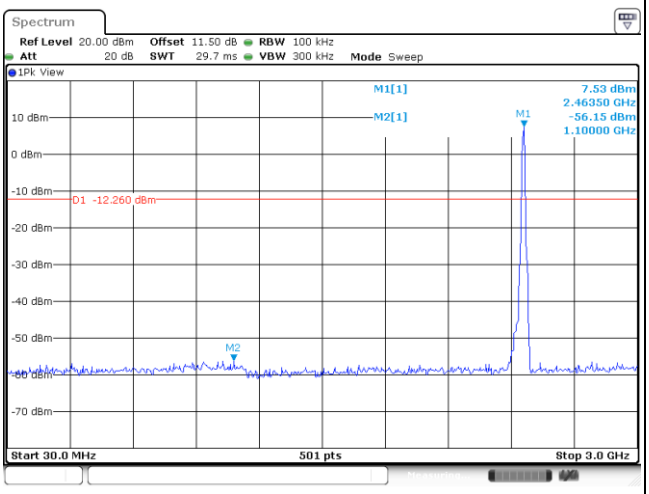
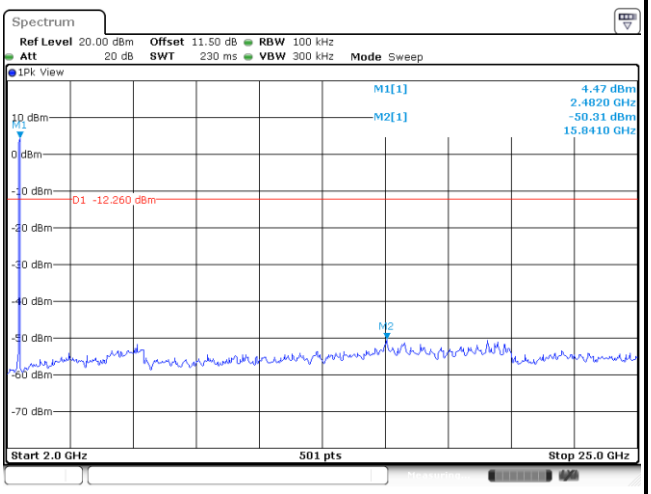
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11g	Test Channel :	06

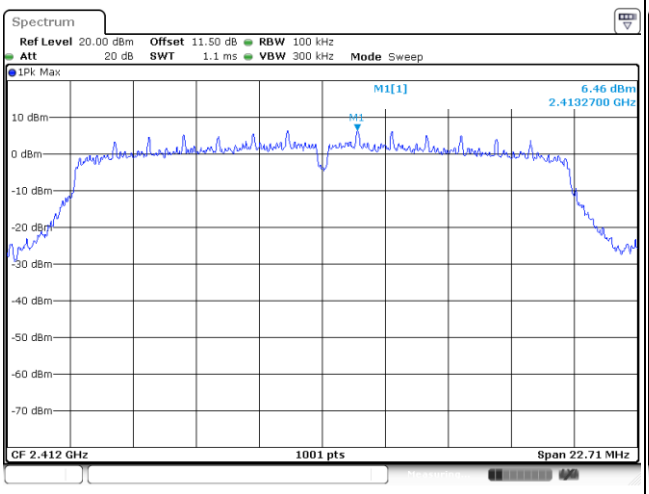
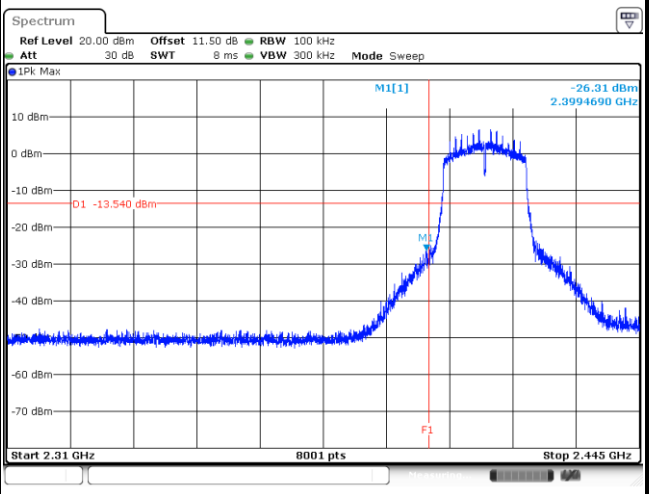
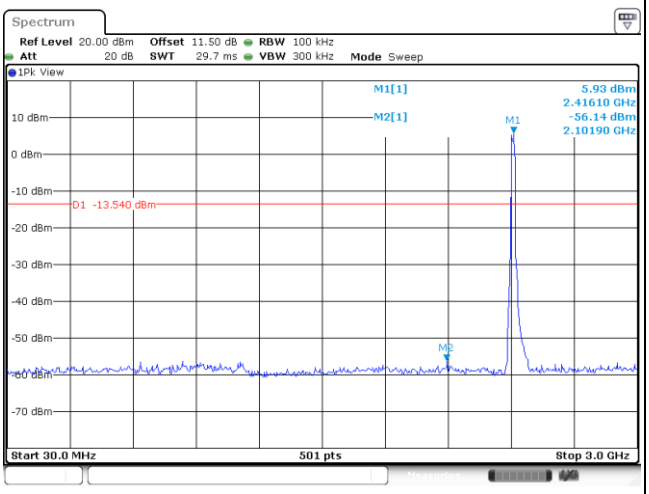
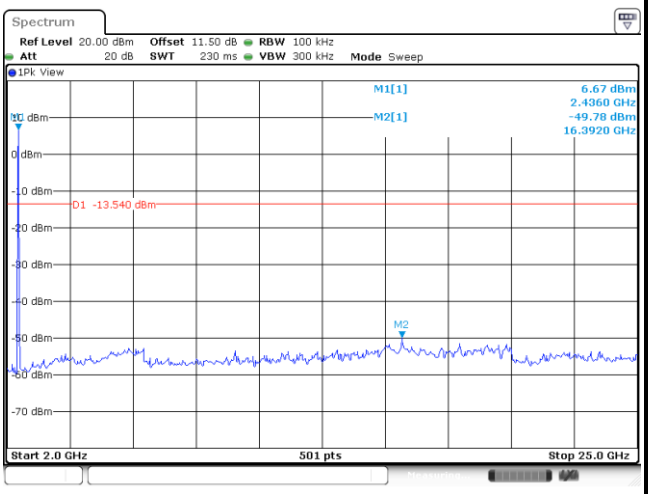
100kHz PSD reference Level	Channel Plot
	-

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

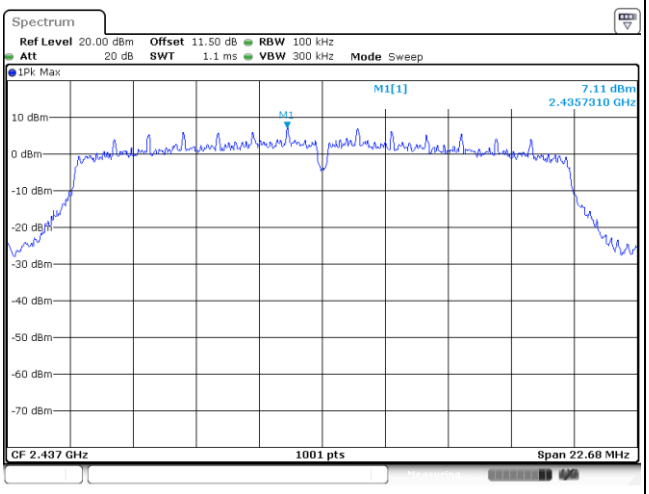
Test Mode :	802.11g	Test Channel :	11

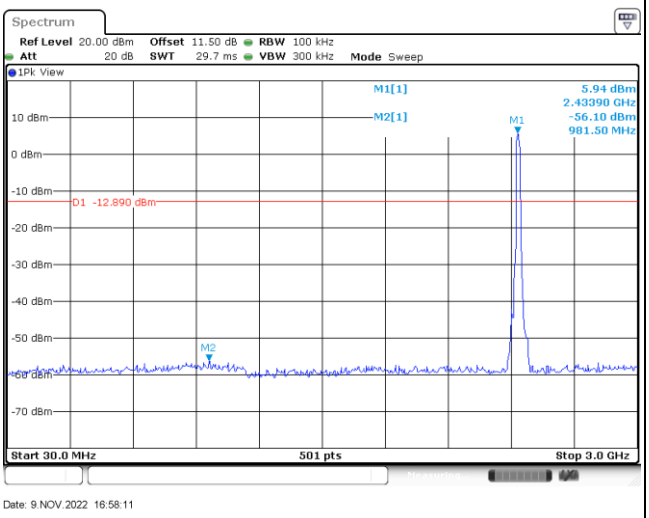
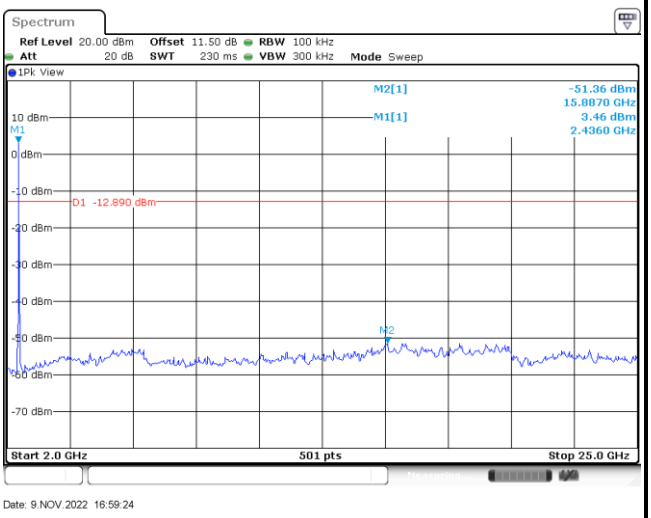
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	01

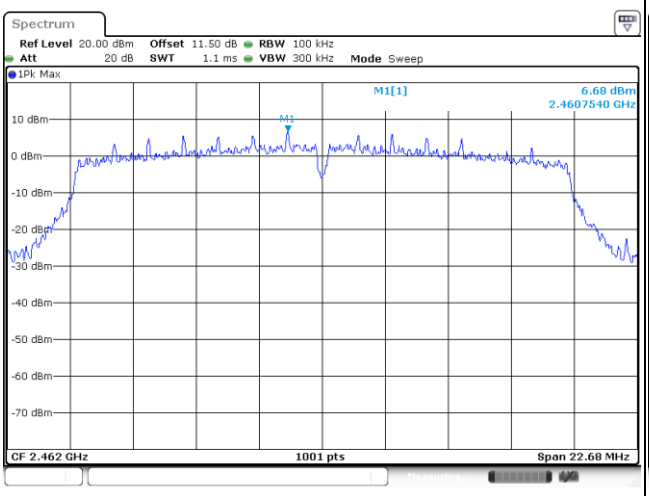
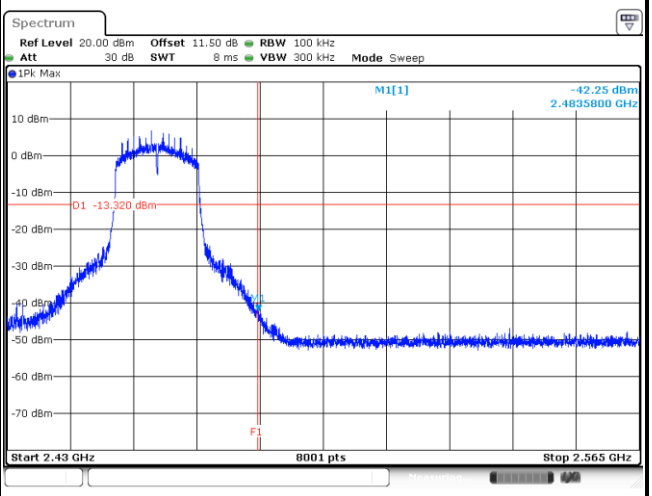
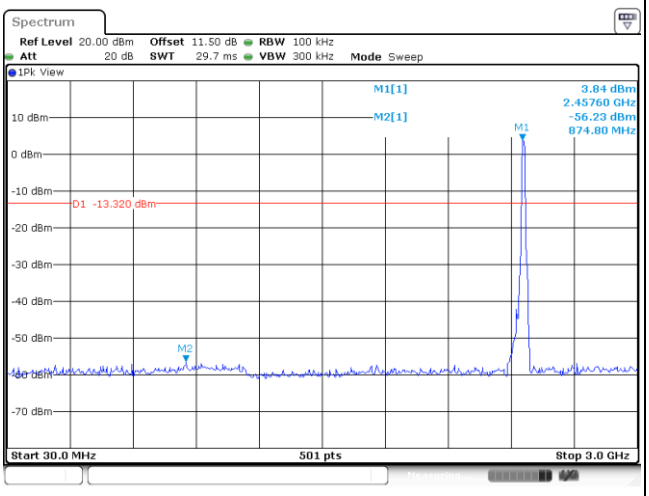
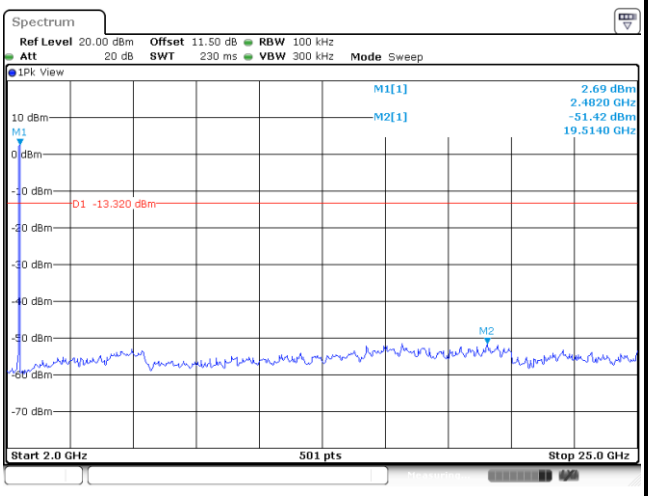
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	

Test Mode :	802.11n HT20	Test Channel :	06

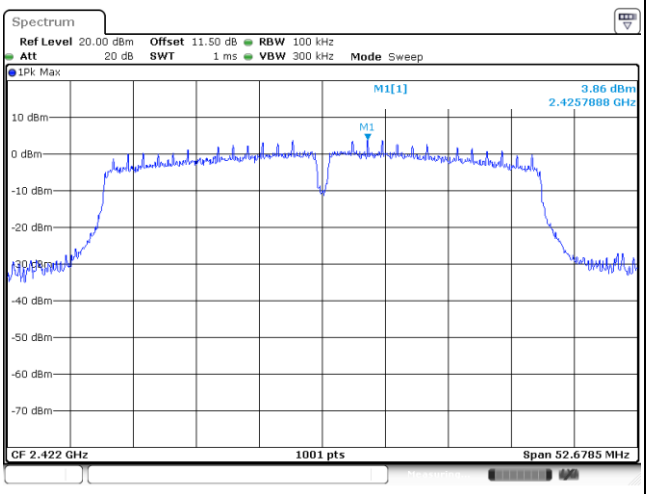
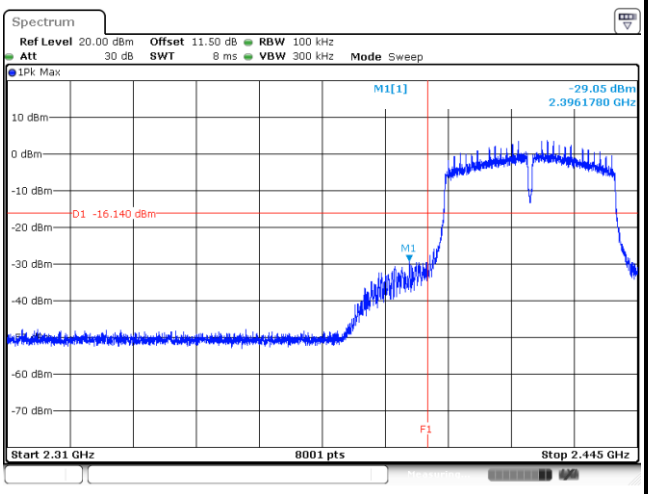
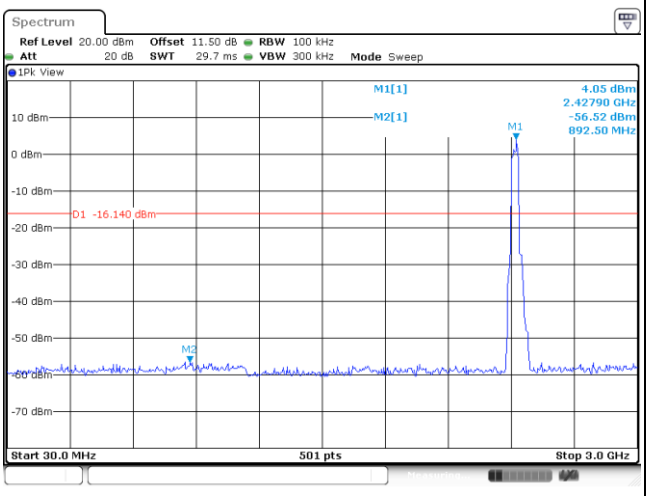
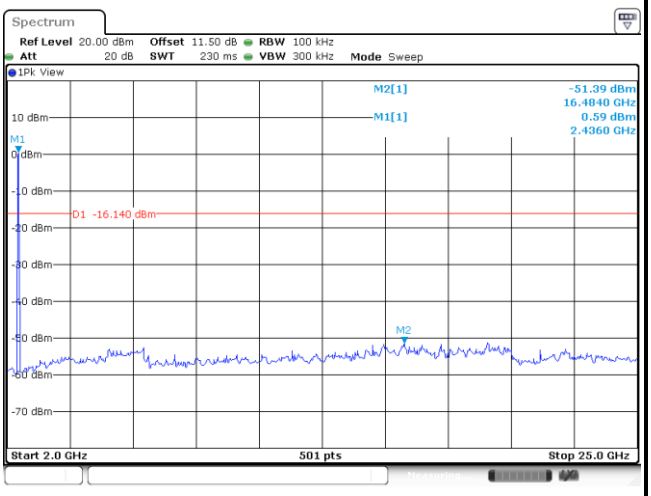
100kHz PSD reference Level	Channel Plot
	-

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

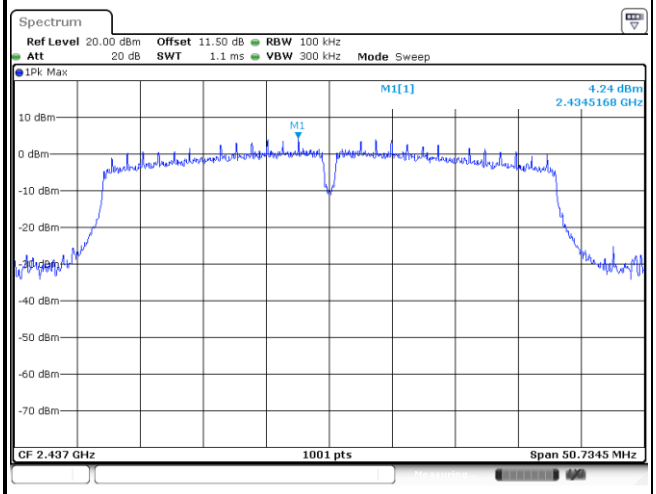
Test Mode :	802.11n HT20	Test Channel :	11

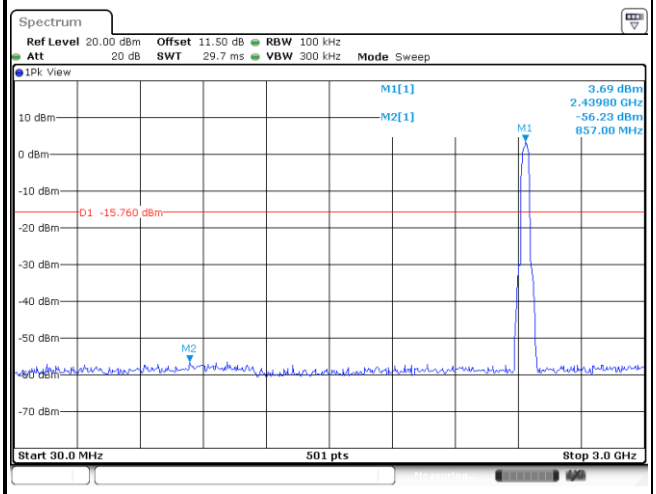
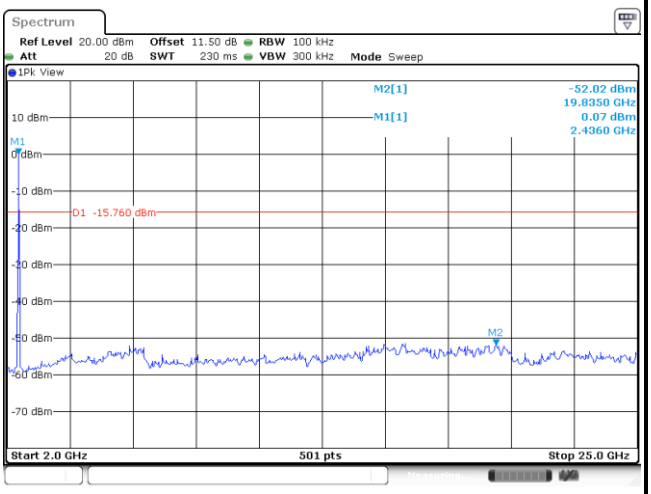
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

Test Mode :	802.11n HT40	Test Channel :	03

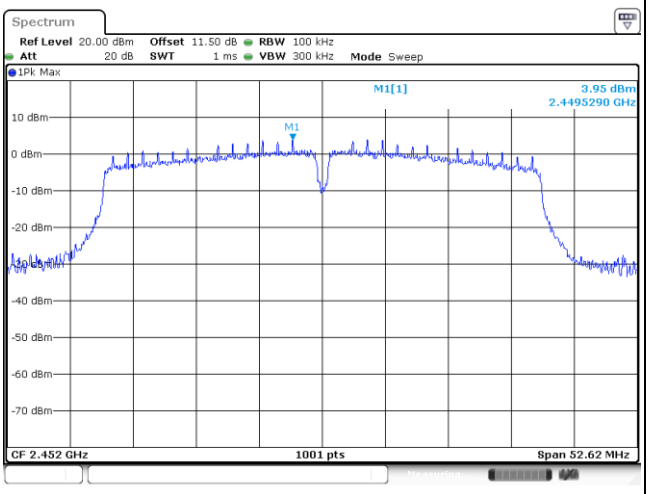
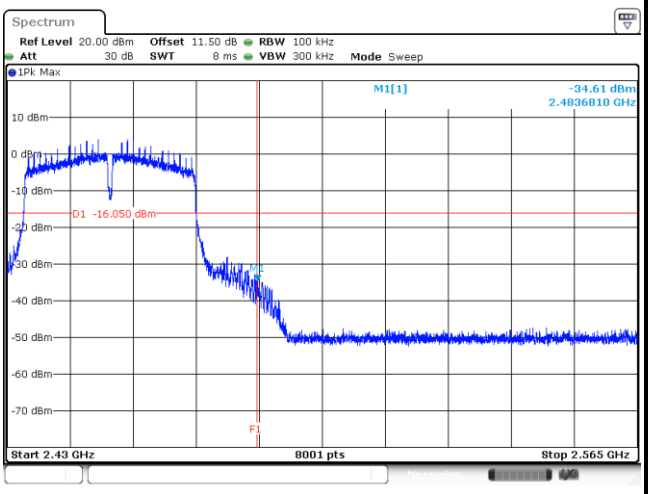
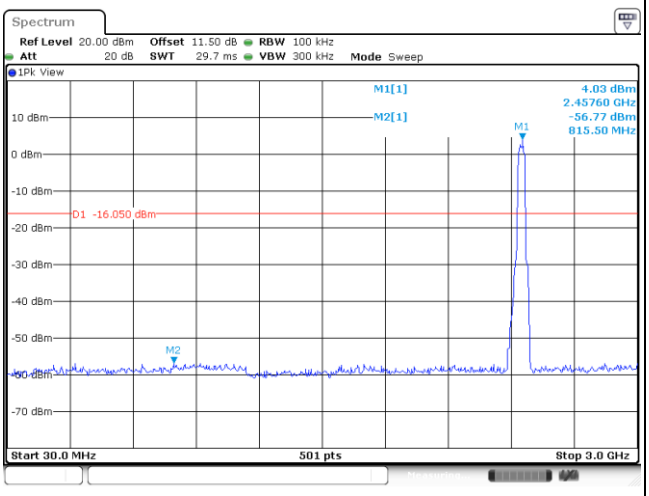
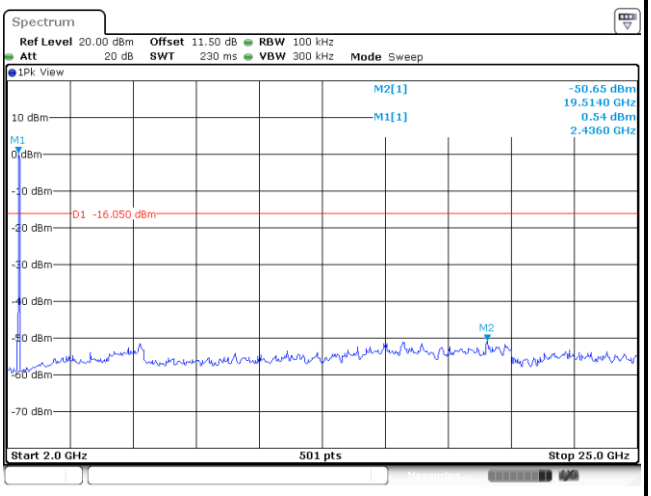
100kHz PSD reference Level	Channel Plot
	
Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

Test Mode :	802.11n HT40	Test Channel :	06

100kHz PSD reference Level	Channel Plot
	-

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

Test Mode :	802.11n HT40	Test Channel :	09

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

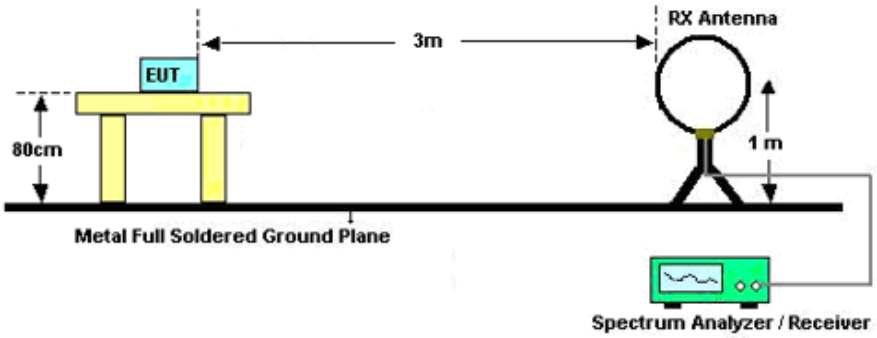
The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

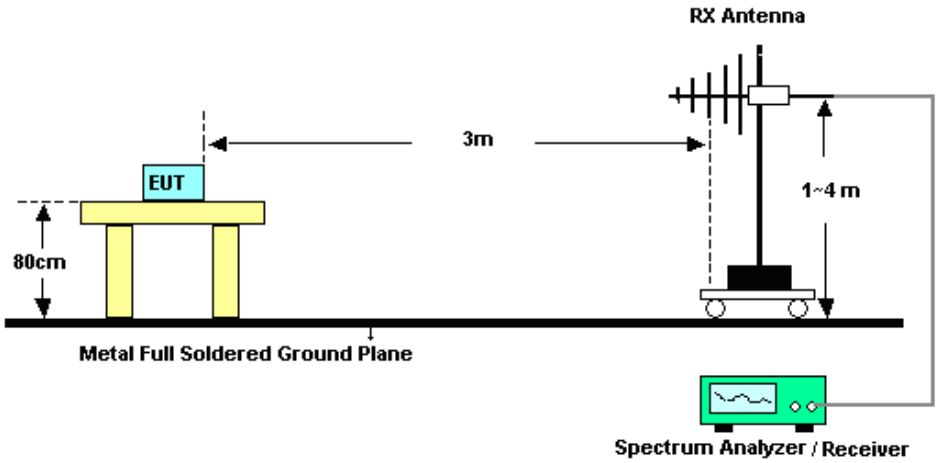
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better 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 peak 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 ≥ 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

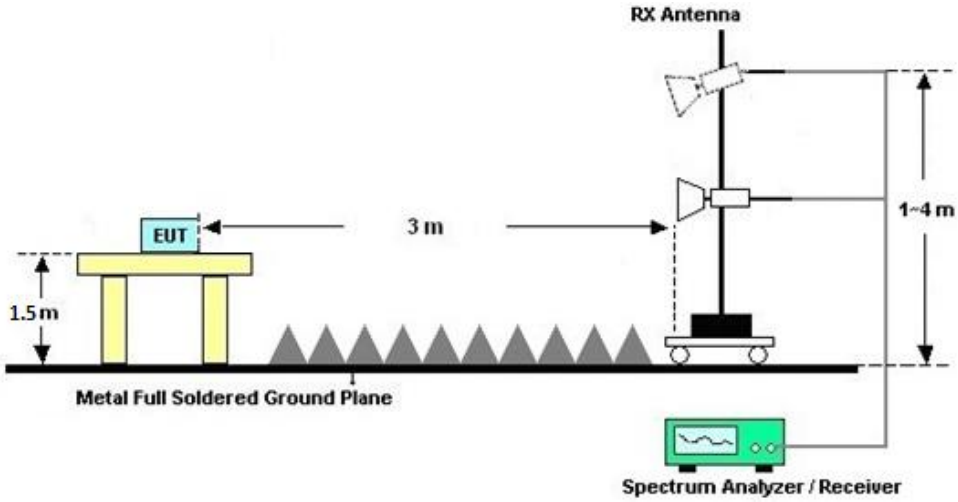
For radiated emissions below 30MHz



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 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 or 40GHz, whichever is lower)

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 (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.

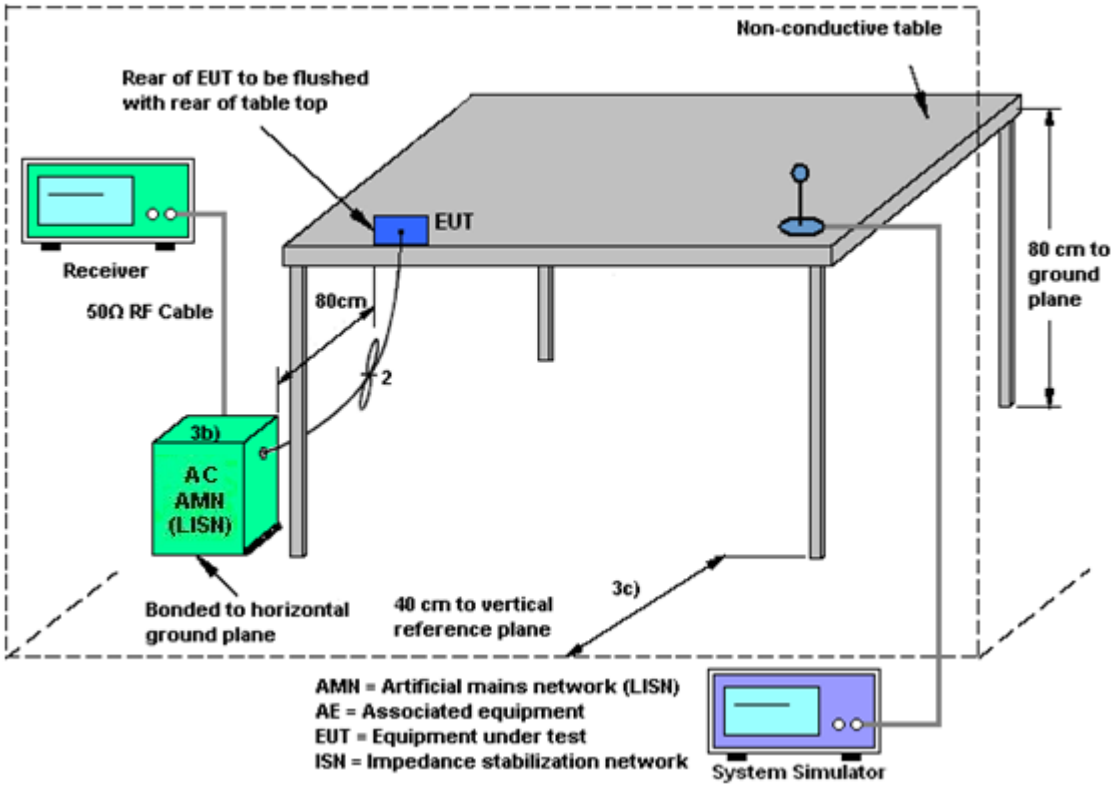
3.6.2 Measuring Instruments

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

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	10Hz~40GHz	Apr. 07, 2022	Nov. 08, 2022~ Dec. 07, 2022	Apr. 08, 2023	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 28, 2021	Nov. 08, 2022~ Dec. 07, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 28, 2021	Nov. 08, 2022~ Dec. 07, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
EMI Test Receiver&SA	Agilent	N9038A	MY52260185	20Hz~26.5GHz	Dec.27, 2021	Nov. 08, 2022~ Dec. 23, 2022	Dec.26, 2022	Radiation (03CH01-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Jul. 07, 2022	Nov. 08, 2022~ Dec. 23, 2022	Jul.06, 2023	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jul. 28, 2022	Nov. 08, 2022~ Dec. 23, 2022	Jun. 27, 2024	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz-2GHz	Sep. 28, 2021	Nov. 08, 2022~ Dec. 23, 2022	Sep. 27, 2023	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00119436	1GHz~18GHz	Jul.0 7, 2022	Nov. 08, 2022~ Dec. 23, 2022	Jul. 06, 2023	Radiation (03CH01-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Apr.10, 2022	Nov. 08, 2022~ Dec. 23, 2022	Apr.09 2023	Radiation (03CH01-SZ)
LF Amplifier	Burgeon	BPA-530	102209	0.01~3000Mhz	Apr. 06, 2022	Nov. 08, 2022~ Dec. 23, 2022	Apr. 05, 2023	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct.19,2022	Nov. 08, 2022~ Dec. 23, 2022	Oct.18,2023	Radiation (03CH01-SZ)
HF Amplifier	KEYSIGHT	83017A	MY53270105	0.5GHz~26.5Ghz	Oct.19,2022	Nov. 08, 2022~ Dec. 23, 2022	Oct.18,2023	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 06. 2022	Nov. 08, 2022~ Dec. 23, 2022	Jul. 05. 2023	Radiation (03CH01-SZ)
AC Power Source	Chroma	61601	616010001985	N/A	Nov.10.2022	Nov. 08, 2022~ Dec. 23, 2022	Nov.09.2023	Radiation (03CH01-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Nov. 08, 2022~ Dec. 23, 2022	NCR	Radiation (03CH01-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Nov. 08, 2022~ Dec. 23, 2022	NCR	Radiation (03CH01-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jul. 07, 2022	Nov. 17, 2022~ Nov. 18, 2022	Jul. 06 2023	Conduction (CO01-SZ)
AC LISN	R&S	ENV216	100063	9kHz~30MHz	Sept. 15, 2022	Nov. 17, 2022~ Nov. 18, 2022	Sept. 14, 2023	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 17, 2022	Nov. 17, 2022~ Nov. 18, 2022	Oct. 16, 2023	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 Measurement

Test Item	Uncertainty
Conducted Power	±1.34 dB
Conducted Emissions	±1.34 dB
Occupied Channel Bandwidth	±0.13 %
Conducted Power Spectral Density	±1.32 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.2dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.2dB

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

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

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.3dB

---------- THE END ----------

Appendix A. Conducted Test Results

Test Engineer:	Chen Ran	Temperature:	21~25	°C
Test Date:	2022/11/22	Relative Humidity:	51~54	%

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
					Ant 8	Ant 8		
11b	1Mbps	1	1	2412	13.44	9.02	0.50	Pass
11b	1Mbps	1	6	2437	13.29	9.06	0.50	Pass
11b	1Mbps	1	11	2462	13.24	8.56	0.50	Pass
11g	6Mbps	1	1	2412	16.93	15.32	0.50	Pass
11g	6Mbps	1	6	2437	16.83	15.12	0.50	Pass
11g	6Mbps	1	11	2462	16.83	15.14	0.50	Pass
HT20	MCS0	1	1	2412	17.88	15.14	0.50	Pass
HT20	MCS0	1	6	2437	17.78	15.12	0.50	Pass
HT20	MCS0	1	11	2462	17.73	15.12	0.50	Pass
HT40	MCS0	1	3	2422	36.46	35.12	0.50	Pass
HT40	MCS0	1	6	2437	36.56	33.82	0.50	Pass
HT40	MCS0	1	9	2452	36.56	35.08	0.50	Pass

TEST RESULTS DATA
Peak Output Power

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
					Ant 8	Ant 8	Ant 8	Ant 8	Ant 8	
11b	1Mbps	1	1	2412	20.75	30.00	-1.50	19.25	36.00	Pass
11b	1Mbps	1	6	2437	21.24	30.00	-1.50	19.74	36.00	Pass
11b	1Mbps	1	11	2462	21.23	30.00	-1.50	19.73	36.00	Pass
11g	6Mbps	1	1	2412	25.16	30.00	-1.50	23.66	36.00	Pass
11g	6Mbps	1	6	2437	25.83	30.00	-1.50	24.33	36.00	Pass
11g	6Mbps	1	11	2462	25.78	30.00	-1.50	24.28	36.00	Pass
HT20	MCS0	1	1	2412	25.00	30.00	-1.50	23.50	36.00	Pass
HT20	MCS0	1	6	2437	25.88	30.00	-1.50	24.38	36.00	Pass
HT20	MCS0	1	11	2462	25.77	30.00	-1.50	24.27	36.00	Pass
HT40	MCS0	1	3	2422	24.27	30.00	-1.50	22.77	36.00	Pass
HT40	MCS0	1	6	2437	25.82	30.00	-1.50	24.32	36.00	Pass
HT40	MCS0	1	9	2452	25.61	30.00	-1.50	24.11	36.00	Pass

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

TEST RESULTS DATA
Average Output Power

2.4GHz Band										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
					Ant 8	Ant 8	Ant 8	Ant 8	Ant 8	
11b	1Mbps	1	1	2412	18.80	30.00	-1.50	17.30	36.00	Pass
11b	1Mbps	1	6	2437	19.30	30.00	-1.50	17.80	36.00	Pass
11b	1Mbps	1	11	2462	19.20	30.00	-1.50	17.70	36.00	Pass
11g	6Mbps	1	1	2412	17.20	30.00	-1.50	15.70	36.00	Pass
11g	6Mbps	1	6	2437	18.60	30.00	-1.50	17.10	36.00	Pass
11g	6Mbps	1	11	2462	18.50	30.00	-1.50	17.00	36.00	Pass
HT20	MCS0	1	1	2412	16.30	30.00	-1.50	14.80	36.00	Pass
HT20	MCS0	1	6	2437	17.60	30.00	-1.50	16.10	36.00	Pass
HT20	MCS0	1	11	2462	17.50	30.00	-1.50	16.00	36.00	Pass
HT40	MCS0	1	3	2422	13.40	30.00	-1.50	11.90	36.00	Pass
HT40	MCS0	1	6	2437	17.10	30.00	-1.50	15.60	36.00	Pass
HT40	MCS0	1	9	2452	15.50	30.00	-1.50	14.00	36.00	Pass

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

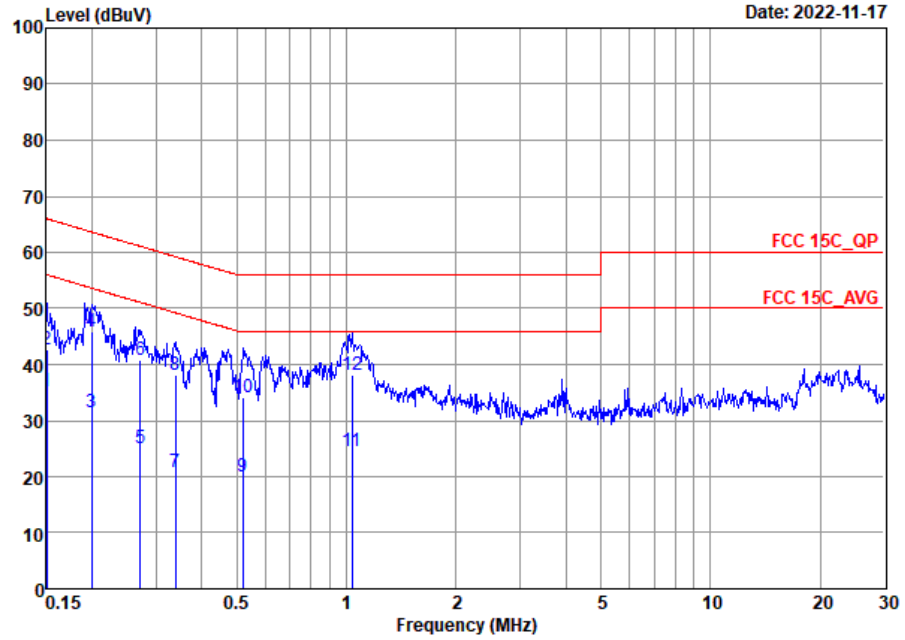
TEST RESULTS DATA
Peak Power Spectral Density

2.4GHz Band								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm/3kHz)	DG (dBi)	Peak PSD Limit (dBm/3kHz)	Pass/Fail
					Ant 8	Ant 8	Ant 8	
11b	1Mbps	1	1	2412	-4.04	-1.50	8.00	Pass
11b	1Mbps	1	6	2437	-3.13	-1.50	8.00	Pass
11b	1Mbps	1	11	2462	-3.26	-1.50	8.00	Pass
11g	6Mbps	1	1	2412	-6.62	-1.50	8.00	Pass
11g	6Mbps	1	6	2437	-5.06	-1.50	8.00	Pass
11g	6Mbps	1	11	2462	-4.70	-1.50	8.00	Pass
HT20	MCS0	1	1	2412	-7.96	-1.50	8.00	Pass
HT20	MCS0	1	6	2437	-6.55	-1.50	8.00	Pass
HT20	MCS0	1	11	2462	-7.06	-1.50	8.00	Pass
HT40	MCS0	1	3	2422	-9.80	-1.50	8.00	Pass
HT40	MCS0	1	6	2437	-10.34	-1.50	8.00	Pass
HT40	MCS0	1	9	2452	-9.04	-1.50	8.00	Pass

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

Appendix B. AC Conducted Emission Test Results

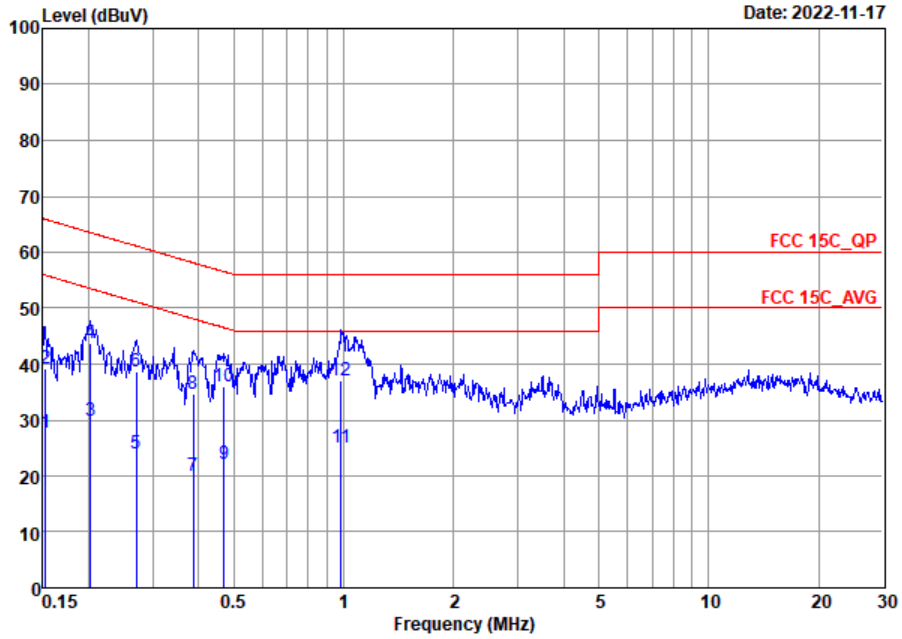
Test Engineer :	Lily Qiu	**Temperature :**	21~24℃
		Relative Humidity :	39~43%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-SZ
Condition: FCC 15C_QP LISN_20220811_ L LINE

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.15	35.15	-20.85	56.00	14.10	10.20	10.85	Average
2		0.15	42.75	-23.25	66.00	21.70	10.20	10.85	QP
3		0.20	31.45	-22.17	53.62	11.10	10.20	10.15	Average
4	*	0.20	45.95	-17.67	63.62	25.60	10.20	10.15	QP
5		0.27	25.00	-26.07	51.07	4.10	10.17	10.73	Average
6		0.27	40.80	-20.27	61.07	19.90	10.17	10.73	QP
7		0.34	20.73	-28.49	49.22	-0.50	10.10	11.13	Average
8		0.34	38.13	-21.09	59.22	16.90	10.10	11.13	QP
9		0.52	20.08	-25.92	46.00	-1.81	10.12	11.77	Average
10		0.52	34.08	-21.92	56.00	12.19	10.12	11.77	QP
11		1.04	24.65	-21.35	46.00	4.30	10.12	10.23	Average
12		1.04	38.05	-17.95	56.00	17.70	10.12	10.23	QP

Test Engineer :	Lily Qiu	**Temperature :**	21~24℃
		Relative Humidity :	39~43%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-SZ
Condition: FCC 15C_QP LISN_20220811_ N NEUTRAL

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.15	27.82	-28.05	55.87	6.70	10.31	10.81	Average
2		0.15	39.12	-26.75	65.87	18.00	10.31	10.81	QP
3		0.20	29.86	-23.63	53.49	9.40	10.28	10.18	Average
4		0.20	43.76	-19.73	63.49	23.30	10.28	10.18	QP
5		0.27	23.94	-27.18	51.12	3.00	10.23	10.71	Average
6		0.27	38.54	-22.58	61.12	17.60	10.23	10.71	QP
7		0.39	19.98	-28.14	48.12	-1.60	10.19	11.39	Average
8		0.39	34.58	-23.54	58.12	13.00	10.19	11.39	QP
9		0.47	22.04	-24.45	46.49	0.10	10.19	11.75	Average
10		0.47	35.94	-20.55	56.49	14.00	10.19	11.75	QP
11		0.98	24.97	-21.03	46.00	4.50	10.20	10.27	Average
12	*	0.98	37.07	-18.93	56.00	16.60	10.20	10.27	QP

Note:

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)

Appendix C. Radiated Spurious Emission

Test Engineer :	Zhaohui Liang	Temperature :	24~25°C
		Relative Humidity :	48~49%

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
8		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2387.385	51.37	-22.63	74	43.39	32.25	7.8	32.07	100	278	P	H
		2386.02	41.65	-12.35	54	33.67	32.25	7.8	32.07	100	278	A	H
	*	2412	108.36	-	-	100.33	32.31	7.8	32.08	100	278	P	H
	*	2412	106.8	-	-	98.77	32.31	7.8	32.08	100	278	A	H
		2387.49	50.93	-23.07	74	42.95	32.25	7.8	32.07	360	238	P	V
		2387.385	40	-14	54	32.02	32.25	7.8	32.07	360	238	A	V
	*	2412	104.18	-	-	96.15	32.31	7.8	32.08	360	238	P	V
	*	2412	102.51	-	-	94.48	32.31	7.8	32.08	360	238	A	V
802.11b CH 11 2462MHz	*	2462	107.91	-	-	99.74	32.42	7.84	32.09	107	272	P	H
	*	2462	106.22	-	-	98.05	32.42	7.84	32.09	107	272	A	H
		2487.56	50.07	-23.93	74	41.81	32.47	7.88	32.09	107	272	P	H
		2486.32	39.62	-14.38	54	31.36	32.47	7.88	32.09	107	272	A	H
	*	2462	104.23	-	-	96.06	32.42	7.84	32.09	390	239	P	V
	*	2462	101.62	-	-	93.45	32.42	7.84	32.09	390	239	A	V
		2485.56	49.22	-24.78	74	40.96	32.47	7.88	32.09	390	239	P	V
		2483.52	37.93	-16.07	54	29.68	32.46	7.88	32.09	390	239	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. 8	Note	Frequency (MHz)	Level (dBµV/m)	Margin (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg.(P/A)	Pol. (H/V)
802.11b CH 01 2412MHz		4824	47.85	-26.15	74	53.51	34.83	11.08	51.57	-	-	P	H
		4824	47.63	-26.37	74	53.29	34.83	11.08	51.57	-	-	P	V
802.11b CH 06 2437MHz		4874	47.37	-26.63	74	52.98	34.85	11.09	51.55	100	300	P	H
		7311	49.4	-24.6	74	51.16	36.32	13.08	51.16	100	0	P	H
		4874	46.59	-27.41	74	52.2	34.85	11.09	51.55	100	64	P	V
		7311	49.26	-24.74	74	51.02	36.32	13.08	51.16	100	301	P	V
802.11b CH 11 2462MHz		4924	48.4	-25.6	74	53.93	34.87	11.13	51.53	124	292	P	H
		7386	48.47	-25.53	74	50.16	36.35	13.14	51.18	100	0	P	H
		4924	47.42	-26.58	74	52.95	34.87	11.13	51.53	100	69	P	V
		7386	49.55	-24.45	74	51.24	36.35	13.14	51.18	100	117	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. 8	Note	Frequency (MHz)	Level (dBµV/m)	Margin (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		2389.485	62.73	-11.27	74	54.74	32.26	7.8	32.07	100	267	P	H
		2389.905	50.18	-3.82	54	42.2	32.26	7.8	32.08	100	267	A	H
	*	2412	106.66	-	-	98.63	32.31	7.8	32.08	100	267	P	H
	*	2412	100.09	-	-	92.06	32.31	7.8	32.08	100	267	A	H
		2389.905	59.77	-14.23	74	51.79	32.26	7.8	32.08	352	242	P	V
		2389.8	45.53	-8.47	54	37.55	32.26	7.8	32.08	352	242	A	V
	*	2412	103.63	-	-	95.6	32.31	7.8	32.08	352	242	P	V
	*	2412	96.65	-	-	88.62	32.31	7.8	32.08	352	242	A	V
802.11g CH 11 2462MHz	*	2462	106.34	-	-	98.17	32.42	7.84	32.09	100	267	P	H
	*	2462	99.03	-	-	90.86	32.42	7.84	32.09	100	267	A	H
		2483.52	62.97	-11.03	74	54.72	32.46	7.88	32.09	100	267	P	H
		2483.68	48.96	-5.04	54	40.71	32.46	7.88	32.09	100	267	A	H
	*	2462	105.41	-	-	97.24	32.42	7.84	32.09	341	224	P	V
	*	2462	97.16	-	-	88.99	32.42	7.84	32.09	341	224	A	V
		2483.64	59.34	-14.66	74	51.09	32.46	7.88	32.09	341	224	P	V
		2483.52	44.72	-9.28	54	36.47	32.46	7.88	32.09	341	224	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. 8	Note	Frequency (MHz)	Level (dBµV/m)	Margin (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg.(P/A)	Pol. (H/V)
802.11g CH 01 2412MHz		4824	45.72	-28.28	74	51.38	34.83	11.08	51.57	-	-	P	H
		4824	45.81	-28.19	74	51.47	34.83	11.08	51.57	-	-	P	V
802.11g CH 06 2437MHz		4874	45.12	-28.88	74	50.73	34.85	11.09	51.55	-	-	P	H
		7311	48.08	-25.92	74	49.84	36.32	13.08	51.16	-	-	P	H
		4874	45.61	-28.39	74	51.22	34.85	11.09	51.55	-	-	P	V
		7311	47.86	-26.14	74	49.62	36.32	13.08	51.16	-	-	P	V
802.11g CH 11 2462MHz		4924	46.24	-27.76	74	51.77	34.87	11.13	51.53	-	-	P	H
		7386	49.59	-24.41	74	51.28	36.35	13.14	51.18	-	-	P	H
		4924	45.3	-28.7	74	50.83	34.87	11.13	51.53	-	-	P	V
		7386	49	-25	74	50.69	36.35	13.14	51.18	-	-	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. 8	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		2388.96	64.06	-9.94	74	56.07	32.26	7.8	32.07	100	267	P	H
		2389.905	50.44	-3.56	54	42.46	32.26	7.8	32.08	100	267	A	H
802.11n	*	2412	106.45	-	-	98.42	32.31	7.8	32.08	100	267	P	H
HT20	*	2412	99.35	-	-	91.32	32.31	7.8	32.08	100	267	A	H
CH 01		2389.695	61.46	-12.54	74	53.47	32.26	7.8	32.07	352	242	P	V
2412MHz		2389.8	46.31	-7.69	54	38.33	32.26	7.8	32.08	352	242	A	V
	*	2412	102.39	-	-	94.36	32.31	7.8	32.08	352	242	P	V
	*	2412	95.77	-	-	87.74	32.31	7.8	32.08	352	242	A	V
	*	2462	105.62	-	-	97.45	32.42	7.84	32.09	100	265	P	H
	*	2462	98.23	-	-	90.06	32.42	7.84	32.09	100	265	A	H
802.11n		2483.56	64.74	-9.26	74	56.49	32.46	7.88	32.09	100	265	P	H
HT20		2483.56	48.43	-5.57	54	40.18	32.46	7.88	32.09	100	265	A	H
CH 11	*	2462	103.22	-	-	95.05	32.42	7.84	32.09	390	235	P	V
2462MHz	*	2462	96.32	-	-	88.15	32.42	7.84	32.09	390	235	A	V
		2483.92	61.45	-12.55	74	53.2	32.46	7.88	32.09	390	235	P	V
		2483.72	44.94	-9.06	54	36.69	32.46	7.88	32.09	390	235	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. 8	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path 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	46.4	-27.6	74	52.06	34.83	11.08	51.57	-	-	P	H
		4824	46.63	-27.37	74	52.29	34.83	11.08	51.57	-	-	P	V
802.11n HT20 CH 06 2437MHz		4874	44.34	-29.66	74	49.95	34.85	11.09	51.55	-	-	P	H
		7311	48.79	-25.21	74	50.55	36.32	13.08	51.16	-	-	P	H
		4874	44.97	-29.03	74	50.58	34.85	11.09	51.55	-	-	P	V
		7311	49.12	-24.88	74	50.88	36.32	13.08	51.16	-	-	P	V
802.11n HT20 CH 11 2462MHz		4924	45.61	-28.39	74	51.14	34.87	11.13	51.53	-	-	P	H
		7386	48.23	-25.77	74	49.92	36.35	13.14	51.18	-	-	P	H
		4924	45.06	-28.94	74	50.59	34.87	11.13	51.53	-	-	P	V
		7386	47.91	-26.09	74	49.6	36.35	13.14	51.18	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant. 8	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 03 2422MHz		2389.8	65.67	-8.33	74	57.69	32.26	7.8	32.08	100	275	P	H
		2389.52	52.68	-1.32	54	44.69	32.26	7.8	32.07	100	275	A	H
	*	2422	102.8	-	-	94.75	32.33	7.8	32.08	100	275	P	H
	*	2422	96.11	-	-	88.06	32.33	7.8	32.08	100	275	A	H
		2484.6	49.14	-24.86	74	40.88	32.47	7.88	32.09	100	275	P	H
		2484.25	40.33	-13.67	54	32.07	32.47	7.88	32.09	100	275	A	H
		2389.8	61.62	-12.38	74	53.64	32.26	7.8	32.08	400	238	P	V
		2389.66	49.52	-4.48	54	41.53	32.26	7.8	32.07	400	238	A	V
	*	2422	97.48	-	-	89.43	32.33	7.8	32.08	400	238	P	V
	*	2422	91.11	-	-	83.06	32.33	7.8	32.08	400	238	A	V
		2495.8	48.24	-25.76	74	39.97	32.49	7.88	32.1	400	238	P	V
		2484.81	39.13	-14.87	54	30.87	32.47	7.88	32.09	400	238	A	V
802.11n HT40 CH 09 2452MHz		2388.68	49.94	-24.06	74	41.95	32.26	7.8	32.07	100	266	P	H
		2389.8	41.46	-12.54	54	33.48	32.26	7.8	32.08	100	266	A	H
	*	2452	102.4	-	-	94.26	32.39	7.84	32.09	100	266	P	H
	*	2452	95.71	-	-	87.57	32.39	7.84	32.09	100	266	A	H
		2483.55	64.34	-9.66	74	56.09	32.46	7.88	32.09	100	266	P	H
		2484.46	50.57	-3.43	54	42.31	32.47	7.88	32.09	100	266	A	H
		2389.8	49.33	-24.67	74	41.35	32.26	7.8	32.08	391	232	P	V
		2387.56	39.34	-14.66	54	31.36	32.25	7.8	32.07	391	232	A	V
	*	2452	98.49	-	-	90.35	32.39	7.84	32.09	391	232	P	V
	*	2452	91.96	-	-	83.82	32.39	7.84	32.09	391	232	A	V
		2483.55	59.21	-14.79	74	50.96	32.46	7.88	32.09	391	232	P	V
		2484.39	45.76	-8.24	54	37.5	32.47	7.88	32.09	391	232	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 8	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n		4844	44.92	-29.08	74	50.55	34.84	11.09	51.56	-	-	P	H
HT40		7266	47.96	-26.04	74	49.75	36.31	13.06	51.16	-	-	P	H
CH 03		4844	45.69	-28.31	74	51.32	34.84	11.09	51.56	-	-	P	V
2422MHz		7266	47.73	-26.27	74	49.52	36.31	13.06	51.16	-	-	P	V
802.11n		4874	45.37	-28.63	74	50.98	34.85	11.09	51.55	-	-	P	H
HT40		7311	47.68	-26.32	74	49.44	36.32	13.08	51.16	-	-	P	H
CH 06		4874	45.19	-28.81	74	50.8	34.85	11.09	51.55	-	-	P	V
2437MHz		7311	49.28	-24.72	74	51.04	36.32	13.08	51.16	-	-	P	V
802.11n		4904	46.3	-27.7	74	51.86	34.86	11.11	51.53	-	-	P	H
HT40		7356	47.67	-26.33	74	49.39	36.34	13.11	51.17	-	-	P	H
CH 09		4904	45.91	-28.09	74	51.47	34.86	11.11	51.53	-	-	P	V
2452MHz		7356	47.99	-26.01	74	49.71	36.34	13.11	51.17	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission below 1GHz

2.4GHz WIFI 802.11n HT40 (LF)

WIFI	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
8		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz 802.11n HT40 LF		67.83	20.53	-19.47	40	36.09	17.43	1.83	34.82	-	-	P	H
		182.29	27.41	-16.09	43.5	42.53	17.05	2.53	34.7	-	-	P	H
		246.31	28.75	-17.25	46	43.01	17.45	2.99	34.7	-	-	P	H
		318.09	29.25	-16.75	46	41.04	19.52	3.29	34.6	-	-	P	H
		468.44	23.39	-22.61	46	31.48	22.97	3.44	34.5	-	-	P	H
		641.1	27.08	-18.92	46	31.72	26.22	3.66	34.52	-	-	P	H
		34.85	30.39	-9.61	40	45.22	18.68	1.29	34.8	-	-	P	V
		67.83	26.15	-13.85	40	41.71	17.43	1.83	34.82	-	-	P	V
		162.89	26.7	-16.8	43.5	40.78	18.22	2.4	34.7	-	-	P	V
		252.13	26.48	-19.52	46	40.53	17.63	3.02	34.7	-	-	P	V
		521.79	24.64	-21.36	46	31.99	23.72	3.43	34.5	-	-	P	V
		760.41	27.95	-18.05	46	30.82	27.64	3.87	34.38	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Co-colation For Sample 1

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
8		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT40 CH 03 2422MHz & GSM850 Co-colation		2389.94	65.72	-8.28	74	57.74	32.26	7.8	32.08	100	265	P	H
		2389.38	52.35	-1.65	54	44.36	32.26	7.8	32.07	100	265	A	H
	*	2422	102.95	-	-	94.9	32.33	7.8	32.08	100	265	P	H
	*	2422	95.68	-	-	87.63	32.33	7.8	32.08	100	265	A	H
		2483.69	49.91	-24.09	74	41.66	32.46	7.88	32.09	100	265	A	H
		2483.58	40.93	-13.07	54	32.68	32.46	7.88	32.09	100	265	A	H
		2389.8	61.89	-12.11	74	53.91	32.26	7.8	32.08	400	240	P	V
		2389.66	49.39	-4.61	54	41.4	32.26	7.8	32.07	400	240	A	V
	*	2422	97.87	-	-	89.82	32.33	7.8	32.08	400	240	P	V
	*	2422	90.95	-	-	82.9	32.33	7.8	32.08	400	240	A	H
		2483.69	49.7	-24.3	74	41.45	32.46	7.88	32.09	400	240	A	V
		2494.26	39.92	-14.08	54	31.65	32.49	7.88	32.1	400	240	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 8	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 03 2422MHz & GSM850 Co-colation		1672.8	47.94	-26.06	74	43.89	29.96	6.57	32.48	-	-	P	H
		2509.2	50.71	-23.29	74	42.37	32.53	7.91	32.1	-	-	P	H
		3345.6	45.14	-28.86	74	53.4	34.61	9.03	51.9	-	-	P	H
		4844	46.24	-27.76	74	51.87	34.84	11.09	51.56	-	-	P	H
		7266	47.67	-26.33	74	49.46	36.31	13.06	51.16	-	-	P	H
		1672.8	46.46	-27.54	74	42.41	29.96	6.57	32.48	-	-	P	V
		2509.2	50.32	-23.68	74	41.98	32.53	7.91	32.1	-	-	P	V
		3345.6	45.78	-28.22	74	54.04	34.61	9.03	51.9	-	-	P	V
		4844	46.29	-27.71	74	51.92	34.84	11.09	51.56	-	-	P	V
		7266	48.17	-25.83	74	49.96	36.31	13.06	51.16	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Margin	Limit	Read	Antenna	Cable	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
8		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT40 CH 03 2422MHz & NTN B23 Co-colation		2389.8	64.68	-9.32	74	56.7	32.26	7.8	32.08	100	275	P	H
		2389.52	52.44	-1.56	54	44.45	32.26	7.8	32.07	100	275	A	H
	*	2422	101.12	-	-	93.07	32.33	7.8	32.08	100	275	P	H
	*	2422	94.64	-	-	86.59	32.33	7.8	32.08	100	275	A	H
		2483.76	49.32	-24.68	74	41.07	32.46	7.88	32.09	100	275	P	H
		2483.76	39.89	-14.11	54	31.64	32.46	7.88	32.09	100	275	A	H
		2389.66	62.3	-11.7	74	54.31	32.26	7.8	32.07	352	240	P	V
		2389.66	49.94	-4.06	54	41.95	32.26	7.8	32.07	352	240	A	V
	*	2422	98.11	-	-	90.06	32.33	7.8	32.08	352	240	P	V
	*	2422	91.93	-	-	83.88	32.33	7.8	32.08	352	240	A	H
		2494.75	49.05	-24.95	74	40.78	32.49	7.88	32.1	352	240	P	V
		2485.93	39.38	-14.62	54	31.12	32.47	7.88	32.09	352	240	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 8	Note	Frequency (MHz)	Level (dBµV/m)	Margin (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 03 2422MHz & NTN B23 Co-colation		4020	44.53	-29.47	74	51.79	34.51	10.02	51.79			P	H
		4844	44.58	-29.42	74	50.21	34.84	11.09	51.56			P	H
		6030	46.69	-27.31	74	51.41	35.52	11.45	51.69			P	H
		7266	48.35	-25.65	74	50.14	36.31	13.06	51.16			P	H
		8040	47.87	-26.13	74	48.92	36.86	13.26	51.17			P	H
		4020	45.11	-28.89	74	52.37	34.51	10.02	51.79			P	V
		4844	44.33	-29.67	74	49.96	34.84	11.09	51.56			P	V
		6030	45.71	-28.29	74	50.43	35.52	11.45	51.69			P	V
		7266	48	-26	74	49.79	36.31	13.06	51.16			P	V
		8040	47.81	-26.19	74	48.86	36.86	13.26	51.17			P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Co-colation For Sample 2

22.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Band Edge @ 3m)

WIFI Ant.	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
8		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11n HT40 CH 03 2422MHz & GSM850 Co-colation	*	2389.66	64.52	-9.48	74	56.53	32.26	7.8	32.07	100	276	P	H
	*	2389.38	52.53	-1.47	54	44.54	32.26	7.8	32.07	100	276	A	H
		2422	101.22	-	-	93.17	32.33	7.8	32.08	100	276	P	H
		2422	94.33	-	-	86.28	32.33	7.8	32.08	100	276	A	H
		2483.83	50.91	-23.09	74	42.66	32.46	7.88	32.09	100	276	A	H
		2486.42	41.46	-12.54	54	33.2	32.47	7.88	32.09	100	276	A	H
	*	2389.94	61.36	-12.64	74	53.38	32.26	7.8	32.08	400	204	P	V
	*	2389.38	49.39	-4.61	54	41.4	32.26	7.8	32.07	400	204	A	V
		2422	100.24	-	-	92.19	32.33	7.8	32.08	400	204	P	V
		2422	92.74	-	-	84.69	32.33	7.8	32.08	400	204	A	H
		2486.28	50.57	-23.43	74	42.31	32.47	7.88	32.09	400	204	A	V
		2484.74	40.99	-13.01	54	32.73	32.47	7.88	32.09	400	204	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11n HT40 (Harmonic @ 3m)

WIFI Ant. 8	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11n HT40 CH 03 2422MHz & GSM850 Co-colation		1672.8	47.35	-26.65	74	43.3	29.96	6.57	32.48	-	-	P	H
		2509.2	49.78	-24.22	74	41.44	32.53	7.91	32.1	-	-	P	H
		3345.6	45.98	-28.02	74	54.24	34.61	9.03	51.9	-	-	P	H
		4844	45.49	-28.51	74	51.12	34.84	11.09	51.56	-	-	P	H
		7266	47.62	-26.38	74	49.41	36.31	13.06	51.16	-	-	P	H
		1672.8	48.18	-25.82	74	44.13	29.96	6.57	32.48	-	-	P	V
		2509.2	50.32	-23.68	74	41.98	32.53	7.91	32.1	-	-	P	V
		3345.6	46.89	-27.11	74	55.15	34.61	9.03	51.9	-	-	P	V
		4844	45.73	-28.27	74	51.36	34.84	11.09	51.56	-	-	P	V
		7266	47.53	-26.47	74	49.32	36.31	13.06	51.16	-	-	P	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average 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 **Margin** 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	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
8		(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. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =

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

3. Margin (dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path 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. Margin (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) + Path 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. Margin (dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

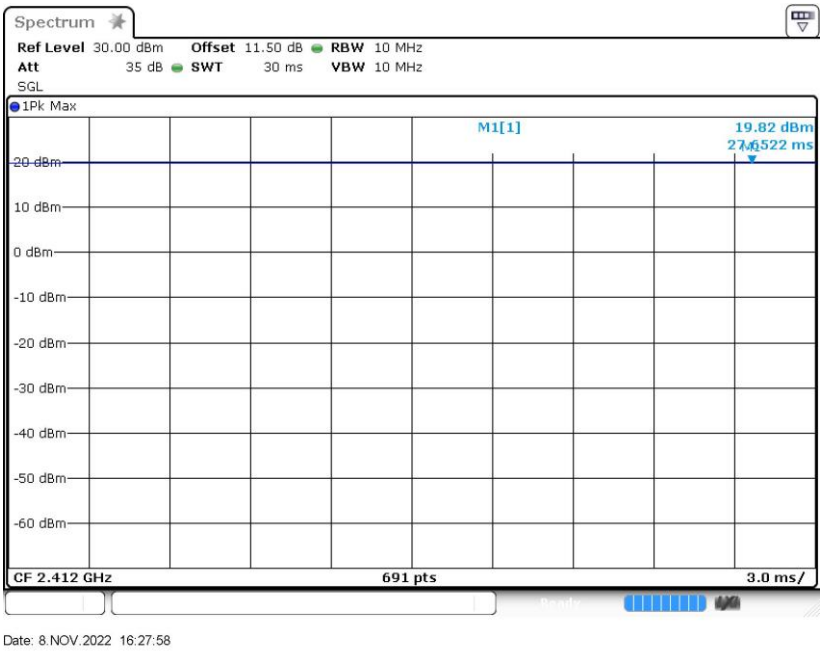
= -10.46(dB)

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

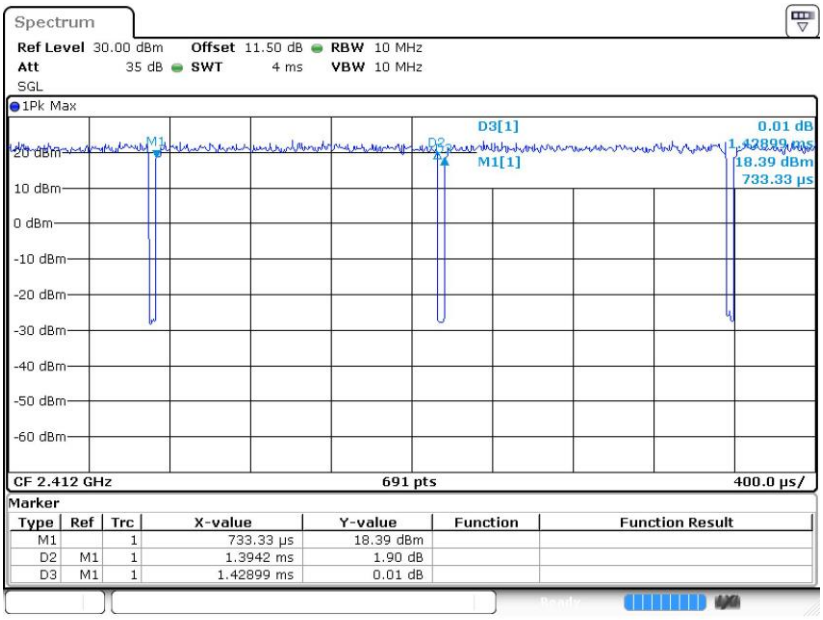
Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
802.11b	100	-	-	10Hz
802.11g	97.57	1.394	0.717	1KHz
802.11n HT20	97.29	1.303	0.768	1KHz
802.11n HT40	95.13	0.651	1.537	3KHz

802.11b



802.11g



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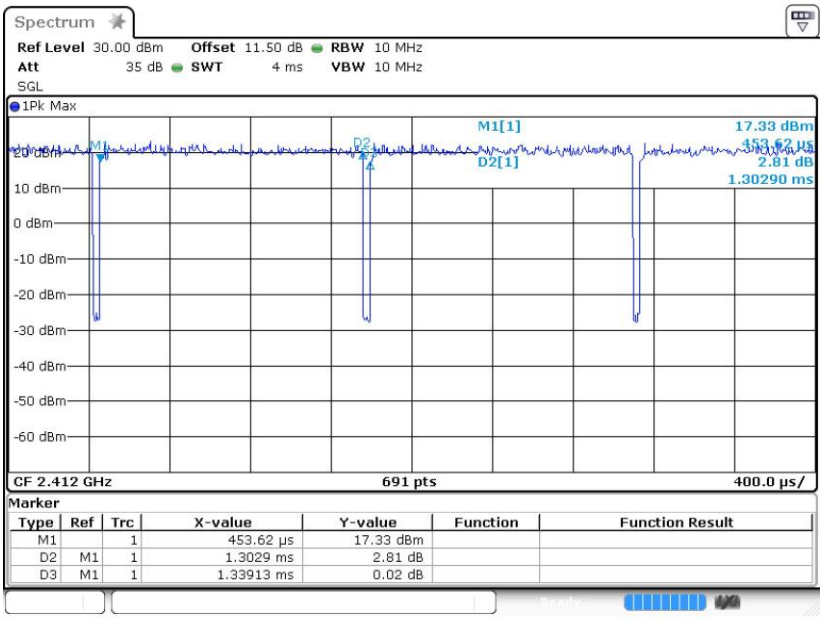
802.11n HT20



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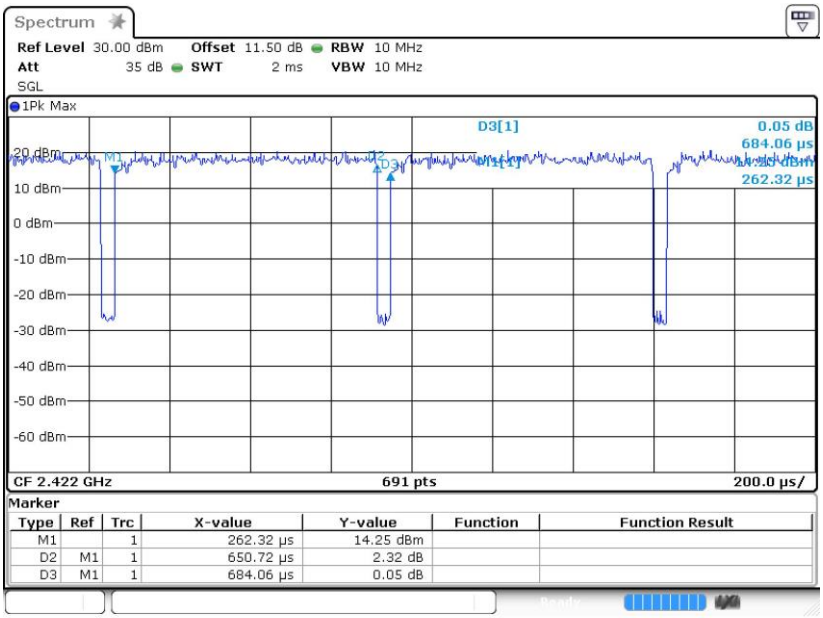
802.11n HT40



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