CFR 47 FCC PART 15 SUBPART C
ISED RSS-247 ISSUE 2

TEST REPORT

For

Ultra Short Throw Laser Projector

FCC MODEL NUMBER: AL-UK535A, AL-UK** (* may be 0-9, A-Z)**
ISED MODEL NUMBER: AL-UK535A

REPORT NUMBER: 4790678406-1-RF-3

ISSUE DATE: January 17, 2023

FCC ID:2ALQL-AL-UK535A
IC:28783-ALUK535A

Prepared for

APPOTRONICS CO., LTD
20F to 22F, High-Tech Zone Union Tower, No.63 Xuefu Road, Nanshan District
Shenzhen 518051 China

Prepared by

UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch

Building 10, Innovation Technology Park, No. 1, Li Bin Road, Song Shan Lake Hi-Tech Development Zone Dongguan, 523808, People's Republic of China

Tel: +86 769 22038881
Fax: +86 769 33244054
Website: www.ul.com

The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products.

Revision History

Rev.	Issue Date	Revisions	Revised By
V0	January 17, 2023	Initial Issue	

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

Summary of Test Results

Test Item	Clause	Limit/Requirement	Result
Antenna Requirement	N/A	FCC Part 15.203/15.247 (c) RSS-GEN Clause 6.8	Pass
AC Power Line Conducted Emission	ANSI C63.10-2013, Clause 6.2	FCC Part 15.207 RSS-GEN Clause 8.8	Pass
Conducted Output Power	ANSI C63.10-2013, Clause 11.9.1.3	FCC Part 15.247 (b)(3) RSS-247 Clause 5.4 (d)	Pass
6dB Bandwidth and 99% Occupied Bandwidth	ANSI C63.10-2013, Clause 11.8.1	FCC Part 15.247 (a)(2) RSS-247 Clause 5.2 (a) ISED RSS-Gen Clause 6.7	Pass
Power Spectral Density	ANSI C63.10-2013, Clause 11.10.2	FCC Part 15.247 (e) RSS-247 Clause 5.2 (b)	Pass
Conducted Band edge and spurious emission	ANSI C63.10-2013, Clause 11.11	FCC Part 15.247(d) RSS-247 Clause 5.5	Pass
Radiated Band edge and Spurious Emission	ANSI C63.10-2013, Clause 11.12 & Clause 11.13	FCC Part 15.247 (d) FCC Part 15.205/15.209 RSS-247 Clause 5.5 RSS-GEN Clause 8.9	Pass
Duty Cycle	ANSI C63.10-2013, Clause 11.6	None; for reporting purposes only.	Pass

*This test report is only published to and used by the applicant, and it is not for evidence purpose in China.
*The measurement result for the sample received is <Pass> according to <CFR 47 FCC PART 15 SUBPART C
ISED RSS-247 ISSUE 2> when <Accuracy Method> decision rule is applied.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

CONTENTS

1. ATTESTATION OF TEST RESULTS 6

2. TEST METHODOLOGY 7

3. FACILITIES AND ACCREDITATION 7

4. CALIBRATION AND UNCERTAINTY 8

4.1. MEASURING INSTRUMENT CALIBRATION 8

4.2. MEASUREMENT UNCERTAINTY 8

5. EQUIPMENT UNDER TEST 9

5.1. DESCRIPTION OF EUT 9

5.2. CHANNEL LIST 9

5.3. MAXIMUM EIRP 9

5.4. TEST CHANNEL CONFIGURATION 9

5.5. THE WORSE CASE POWER SETTING PARAMETER 10

5.6. DESCRIPTION OF AVAILABLE ANTENNAS 11

5.7. SUPPORT UNITS FOR SYSTEM TEST 12

6. MEASURING EQUIPMENT AND SOFTWARE USED 14

7. ANTENNA PORT TEST RESULTS 17

7.1. CONDUCTED OUTPUT POWER 17

7.2. 6DB BANDWIDTH AND 99% OCCUPIED BANDWIDTH 18

7.3. POWER SPECTRAL DENSITY 20

7.4. CONDUCTED BAND EDGE AND SPURIOUS EMISSION 22

7.5. DUTY CYCLE 24

8. RADIATED TEST RESULTS 25

8.1. RESTRICTED BANDEDGE 33

8.2. SPURIOUS EMISSIONS(1 GHZ~3 GHZ) 47

8.3. SPURIOUS EMISSIONS(3 GHZ~18 GHZ) 53

8.4. SPURIOUS EMISSIONS(9 KHZ~30 MHZ) 71

8.5. SPURIOUS EMISSIONS(18 GHZ~26 GHZ) 74

8.6. SPURIOUS EMISSIONS(30 MHZ~1 GHZ) 76

9. ANTENNA REQUIREMENT 78

10. AC POWER LINE CONDUCTED EMISSION 79

11. TEST DATA 82

11.1. APPENDIX A: DTS BANDWIDTH 82

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

11.1.1. Test Result 82
11.1.2. Test Graphs 83

11.2. APPENDIX B: OCCUPIED CHANNEL BANDWIDTH 89
11.2.1. Test Result 89
11.2.2. Test Graphs 90

11.3. APPENDIX C: MAXIMUM CONDUCTED OUTPUT POWER 96
11.3.1. Test Result 96

11.4. APPENDIX D: MAXIMUM POWER SPECTRAL DENSITY 97
11.4.1. Test Result 97
11.4.2. Test Graphs 98

11.5. APPENDIX E: BAND EDGE MEASUREMENTS 104
11.5.1. Test Result 104
11.5.2. Test Graphs 105

11.6. APPENDIX F: CONDUCTED SPURIOUS EMISSION 109
11.6.1. Test Result 109
11.6.2. Test Graphs 110

11.7. APPENDIX G: DUTY CYCLE 128
11.7.1. Test Result 128
11.7.2. Test Graphs 129

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	APPOTRONICS CO., LTD
Address:	20F to 22F, High-Tech Zone Union Tower, No.63 Xuefu Road, Nanshan District Shenzhen 518051 China

Manufacturer Information

Company Name:	APPOTRONICS CO., LTD
Address:	20F to 22F, High-Tech Zone Union Tower, No.63 Xuefu Road, Nanshan District Shenzhen 518051 China

EUT Information

EUT Name:	Ultra Short Throw Laser Projector
FCC Model:	AL-UK535A, AL-UK**** (* may be 0-9, A-Z)
ISED Model:	AL-UK535A
Brand:	APPOTRONICS
Sample Received Date:	December 20, 2022
Sample Status:	Normal
Sample ID:	5645955
Date of Tested:	January 12, 2023 to January 16, 2023

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 FCC PART 15 SUBPART C **ISED RSS-247 ISSUE 2**	**Pass**

Prepared By:

Kebo Zhang
Senior Project Engineer

Checked By:

Denny Huang
Senior Project Engineer

Approved By:

Stephen Guo
Operations Manager

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

2. TEST METHODOLOGY

All tests were performed in accordance with the standard CFR 47 FCC PART 15 SUBPART C ISED RSS-247 ISSUE 2, KDB 558074 D01 15.247 Meas Guidance v05r02, KDB 414788 D01 Radiated Test Site v01r01, KDB 662911 D01 Multiple Transmitter Output v02r01, CFR 47 FCC Part 2, CFR 47 FCC Part 15, ANSI C63.10-2013, ISED RSS-247 Issue 2 and ISED RSS-GEN Issue 5

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	**A2LA (Certificate No.: 4102.01)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA. **FCC (FCC Designation No.: CN1187)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules **ISED (Company No.: 21320)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320 and the test lab Conformity Assessment Body Identifier (CABID) is CN0046. **VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011

Note1:
All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, No. 1, Li Bin Road, Song Shan Lake Hi-Tech Development Zone Dongguan, 523808, People’s Republic of China.

Note2:
The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd.
Song Shan Lake Branch had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.

Note3:
For below 30 MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30 MHz had been correlated to measurements performed on an OFS.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Conduction emission	3.62 dB
Radiated Emission (Included Fundamental Emission) (9 kHz ~ 30 MHz)	2.2 dB
Radiated Emission (Included Fundamental Emission) (30 MHz ~ 1 GHz)	4.00 dB
Radiated Emission (Included Fundamental Emission) (1 GHz to 26 GHz)	5.78 dB (1 GHz ~ 18 GHz)
	5.23 dB (18 GHz ~ 26 GHz)
Duty Cycle	±0.028%
DTS and 99% Occupied Bandwidth	±0.0196%
Maximum Conducted Output Power	±0.686 dB
Maximum Power Spectral Density Level	±0.743 dB
Conducted Band-edge Compliance	±1.328 dB
Conducted Unwanted Emissions In Non-restricted Frequency Bands	±0.746 dB (9 kHz ~ 1 GHz)
	±1.328dB (1 GHz ~ 26 GHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name	Ultra Short Throw Laser Projector
FCC Model	AL-UK535A, AL-UK**** (* may be 0-9, A-Z)
ISED Model	AL-UK535A
Model difference	AL-UK**** (* may be 0-9, A-Z) have the same technical construction including circuit diagram, PCB Layout, components and component layout, all electrical construction and mechanical construction with AL-UK535A .The difference lies only the model number. all these changes do not degrade the unwanted emissions of the certified product.

Frequency Range:	2412 MHz to 2462 MHz
Type of Modulation:	IEEE 802.11b: DSSS(CCK, DQPSK, DBPSK) IEEE 802.11g/n HT20: OFDM(64-QAM, 16-QAM, QPSK, BPSK)
Normal Test Voltage:	AC 120V, 60Hz

5.2. CHANNEL LIST

Channel List for 802.11b/g/n (20 MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	4	2427	7	2442	10	2457
2	2417	5	2432	8	2447	11	2462
3	2422	6	2437	9	2452	/	/

5.3. MAXIMUM EIRP

IEEE Std. 802.11	Frequency (MHz)	Channel Number	Maximum Conducted AVG Output Power (dBm)	Maximum AVG EIRP (dBm)
b	2412 ~ 2462	1-11[11]	14.12	16.93
g	2412 ~ 2462	1-11[11]	12.76	15.57
n HT20	2412 ~ 2462	1-11[11]	15.07	17.88

5.4. TEST CHANNEL CONFIGURATION

IEEE Std. 802.11	Test Channel Number	Frequency
b	CH 1(Low Channel), CH 6(MID Channel), CH 11(High Channel)	2412 MHz, 2437 MHz, 2462 MHz
g	CH 1(Low Channel), CH 6(MID Channel), CH 11(High Channel)	2412 MHz, 2437 MHz, 2462 MHz
n HT20	CH 1(Low Channel), CH 6(MID Channel), CH 11(High Channel)	2412 MHz, 2437 MHz, 2462 MHz

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2400 ~ 2483.5MHz Band							
Test Software		RF Test Tool					
Modulation Mode	Transmit Antenna Number	Test Channel					
		NCB: 20MHz			NCB: 40MHz		
		CH 1	CH 6	CH 11	CH 3	CH 6	CH 9
802.11b	1	66	66	66	/		
	2	66	66	66			
802.11g	1	64	64	64			
	2	64	64	64			
802.11n HT20	1	61	61	61			
	2	61	61	61			

WORST-CASE CONFIGURATIONS

The EUT was tested in the following configuration(s):

Controlled in test mode using a software application on the EUT supplied by customer. The application was used to enable a continuous transmission and to select the mode, test channels, bandwidth, data rates as required.

Test channels referring to section 5.4.

Maximum power setting referring to section 5.5.

Worst-case data rates as provided by the client were:

802.11b mode: 1 Mbps
802.11g mode: 6 Mbps
802.11n HT20 mode: MCS0

802.11b/g only support SISO mode.
802.11n HT20 support SISO and MIMO mode.

802.11b/g SISO mode, Antenna 1 and Antenna 2 has the same power setting, so only Antenna 1 worst case test data were recorded in the report.

802.11n SISO mode and MIMO mode have the same power setting, so only the worst case power mode(MIMO) will be record in the report.

The EUT has 2 separate antennas which correspond to 2 separate antenna ports. Core 1 and Core 2 correspond to antenna 1 and antenna 2 respectively.

The measured additional path loss was included in any path loss calculations for all RF cable used during tested.

Conducted output power, power spectral density tests separately on each port with all supported SISO & MIMO port combinations.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

Conducted bandedge and spurious emissions tests were performed with SISO mode, as this port was found to have the worst case in terms of power settings amongst all supported possible SISO & MIMO port combinations.

Radiated emissions tests were performed with the MIMO modes. These were found to be the worst modulation scheme with regards to emissions after preliminary investigations and, as this mode emits the highest conducted output power level, it was deemed to be the worst case.

The EUT support Cyclic Shift Diversity(CDD), Space Time Coding(STBC), Spartial Division Multiplexing(SDM) modes. They use the same conducted power per chain in any given mode, so we only chose the worst case mode CDD for final testing.

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

Antenna	Frequency (MHz)	Antenna Type	MAX Antenna Gain (dBi)
1	2412-2462	FPC	2.47
2	2412-2462	FPC	2.81

The EUT support Cyclic Shift Diversity(CDD) mode.

MIMO output power port and MIMO PSD port summing were performed in accordance with KDB 662911 D01 section F, (2), f. For the CDD results the Directional Gain was calculated in accordance with the following mothed.

For output power measurements:
Directional gain= G_{ANT} + Array Gain = 2.81 dBi
G_{ANT} : equal to the gain of the antenna having the highest gain
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$

For power spectral density (PSD) measurements:
Directional gain= G_{ANT} + Array Gain = 5.82 dBi
Array Gain = 10 log(N_{ANT}/N_{SS}) dB.
N_{ANT} : number of transmit antennas
N_{SS} : number of spatial streams, The worst case directional gain will occur when N_{SS} = 1

Test Mode	Transmit and Receive Mode	Description
IEEE 802.11b	☒1TX, 1RX	ANT 1 or ANT 2 can be used as transmitting/receiving antenna.
IEEE 802.11g	☒1TX, 1RX	ANT 1 or ANT 2 can be used as transmitting/receiving antenna.
IEEE 802.11n HT20	☒2TX, 2RX	ANT 1 and ANT 2 can be used as transmitting/receiving antenna.
Note: 1.BT&WLAN 2.4G, BT & WLAN 5G, WLAN 2.4G & WLAN 5G can't transmit simultaneously. (declared by client)		

Note: The value of the antenna gain was declared by customer.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

5.7. SUPPORT UNITS FOR SYSTEM TEST

SUPPORT EQUIPMENT

Item	Equipment	Mfr/Brand	Model/Type No.	Specification	Series No.
1	Laptop	Lenovo	ThinkPad E480	Type-C 4k	PF-21465Q
2	Speaker	Behringer	Ms20	N/A	S1600511274
3	Load board	N/A	N/A	N/A	N/A
4	Mouse	DELL	MS111-T	N/A	CN-0X9DCG-71616-590-1RAE
5	Keyboard	DELL	KB216t	N/A	CN-0JVMCW-71616-66R-15A8-A03
6	Earphone	apple	N/A	N/A	N/A
7	Flash Disk	SanDisk	N/A	N/A	N/A

I/O CABLES

Item	Type of cable	Shielded Type	Ferrite Core	Length
1	HDMI Cable	YES	NO	1.5m
2	HDMI Cable	YES	NO	1.5m
3	HDMI Cable	YES	NO	2.0m
4	Optical Cable	NO	NO	1.5m
5	AC Cable	NO	NO	1.5m
6	USB Cable for keyboard	YES	NO	1.5m
7	USB Cable for mouse	YES	NO	1.5m
8	RJ45 Cable	NO	NO	5m
9	Audio Cable	NO	NO	1.0m

ACCESSORIES

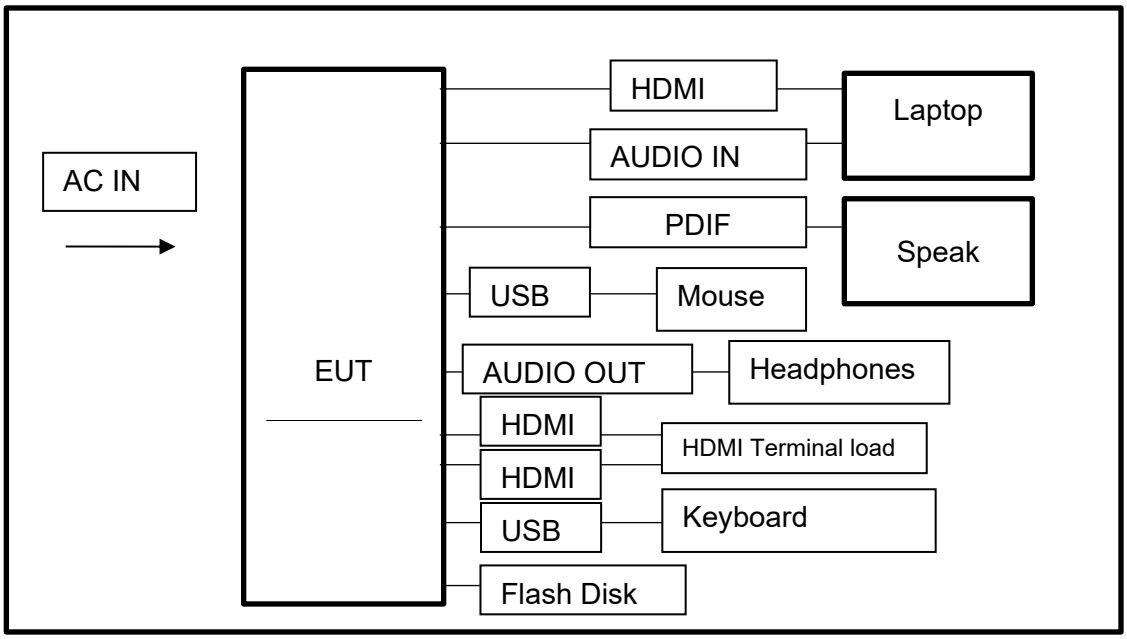
Item	Accessory	Brand Name	Model Name	Description
1	Remote control	N/A	N/A	N/A

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

TEST SETUP

The EUT can work in engineering mode with a software through a Laptop.

SETUP DIAGRAM FOR TESTS



This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

6. MEASURING EQUIPMENT AND SOFTWARE USED

R&S TS 8997 Test System					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due. Date
Power sensor, Power Meter	R&S	OSP120	100921	Apr.02,2022	Apr.01,2023
Vector Signal Generator	R&S	SMBV100A	261637	Oct.17, 2022	Oct.16, 2023
Signal Generator	R&S	SMB100A	178553	Oct.17, 2022	Oct.16, 2023
Signal Analyzer	R&S	FSV40	101118	Oct.17, 2022	Oct.16, 2023

Software			
Description	Manufacturer	Name	Version
For R&S TS 8997 Test System	Rohde & Schwarz	EMC 32	10.60.10

Tonsend RF Test System					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due. Date
Wideband Radio Communication Tester	R&S	CMW500	155523	Oct.17, 2022	Oct.16, 2023
Wireless Connectivity Tester	R&S	CMW270	1201.0002N75-102	Sep.28, 2022	Sep.27, 2023
PXA Signal Analyzer	Keysight	N9030A	MY55410512	Oct.17, 2022	Oct.16, 2023
MXG Vector Signal Generator	Keysight	N5182B	MY56200284	Oct.17, 2022	Oct.16, 2023
MXG Vector Signal Generator	Keysight	N5172B	MY56200301	Oct.17, 2022	Oct.16, 2023
DC power supply	Keysight	E3642A	MY55159130	Oct.17, 2022	Oct.16, 2023
Temperature & Humidity Chamber	SANMOOD	SG-80-CC-2	2088	Oct.17, 2022	Oct.16, 2023

Software			
Description	Manufacturer	Name	Version
Tonsend SRD Test System	Tonsend	JS1120-3 RF Test System	2.6.77.0518

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

Conducted Emissions					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
EMI Test Receiver	R&S	ESR3	101961	Oct.17, 2022	Oct.16, 2023
Two-Line V-Network	R&S	ENV216	101983	Oct.17, 2022	Oct.16, 2023
Artificial Mains Networks	Schwarzbeck	NSLK 8126	8126465	Oct.17, 2022	Oct.16, 2023
Software					
Description			Manufacturer	Name	Version
Test Software for Conducted Emissions			Farad	EZ-EMC	Ver. UL-3A1

Radiated Emissions					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Oct.17, 2022	Oct.16, 2023
Hybrid Log Periodic Antenna	TDK	HLP-3003C	130959	Aug.02, 2021	Aug.01, 2024
Preamplifier	HP	8447D	2944A09099	Oct.17, 2022	Oct.16, 2023
EMI Measurement Receiver	R&S	ESR26	101377	Oct.17, 2022	Oct.16, 2023
Horn Antenna	TDK	HRN-0118	130940	July 20, 2021	July 19, 2024
Preamplifier	TDK	PA-02-0118	TRS-305-00067	Oct.17, 2022	Oct.16, 2023
Horn Antenna	Schwarzbeck	BBHA9170	697	July 20, 2021	July 19, 2024
Preamplifier	TDK	PA-02-2	TRS-307-00003	Oct.17, 2022	Oct.16, 2023
Preamplifier	TDK	PA-02-3	TRS-308-00002	Oct.17, 2022	Oct.16, 2023
Loop antenna	Schwarzbeck	1519B	00008	Dec.14, 2021	Dec.13, 2024
Preamplifier	TDK	PA-02-001-3000	TRS-302-00050	Oct.17, 2022	Oct.16, 2023
Preamplifier	Mini-Circuits	ZX60-83LN-S+	SUP01202035	Oct.17, 2022	Oct.16, 2023
High Pass Filter	Wi	WHKX10-2700-3000-18000-40SS	23	/	/
Highpass Filter	Wainwright	WHKX10-5850-6500-1800-40SS	4	/	/
Band Reject Filter	Wainwright	WRCJV12-5695-5725-5850-5880-40SS	4	/	/
Band Reject Filter	Wainwright	WRCJV20-5120-5150-	2	/	/

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

		5350-5380-60SS			
Band Reject Filter	Wainwright	WRCJV20-5440-5470-5725-5755-60SS	1	/	/
Band Reject Filter	Wainwright	WRCJV8-2350-2400-2483.5-2533.5-40SS	4	/	/
Band Reject Filter	Wainwright	WRCD5-1879-1879.85-1880.15-1881-40SS	1	/	/
Notch Filter	Wainwright	WHJ10-882-980-7000-40SS	1	/	/

Software			
Description	Manufacturer	Name	Version
Test Software for Radiated Emissions	Farad	EZ-EMC	Ver. UL-3A1

Other Instrument					
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Due Date
Temperature humidity probe	OMEGA	ITHX-SD-5	18470007	Oct.22, 2022	Oct.21, 2023
Barometer	Yiyi	Baro	N/A	Oct.24, 2022	Oct.23, 2023
Attenuator	Agilent	8495B	2814a12853	Oct.18, 2022	Oct.17, 2023

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

7. ANTENNA PORT TEST RESULTS

7.1. CONDUCTED OUTPUT POWER

LIMITS

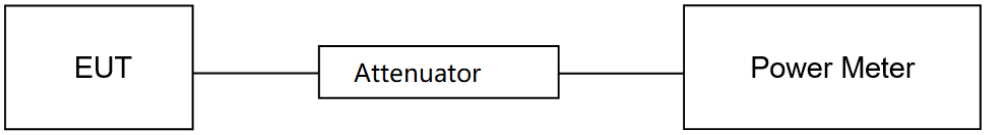
CFR 47 FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247(b)(3) ISED RSS-247 5.4 (d)	AVG Output Power	1 watt or 30 dBm	2400-2483.5

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 11.9.2.3.1.

Connect the EUT to a low loss RF cable from the antenna port to the power sensor (video bandwidth is greater than the occupied bandwidth).
Measure peak emission level, the indicated level is the average output power, after any corrections for external attenuators and cables.
The test result in dBm by adding [10 log (1 / D)], where D is the duty cycle.

TEST SETUP



TEST ENVIRONMENT

Temperature	25.2℃	Relative Humidity	51.9%
Atmosphere Pressure	101.2kPa	Test Voltage	AC 120V 60Hz

TEST DATE / ENGINEER

Test Date	January 16, 2023	Test By	Walker Yuan

TEST RESULTS

Please refer to section "Test Data" - Appendix C

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

7.2. 6DB BANDWIDTH AND 99% OCCUPIED BANDWIDTH

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC 15.247(a)(2) ISED RSS-247 5.2 (a)	6 dB Bandwidth	≥ 500 kHz	2400-2483.5
ISED RSS-Gen Clause 6.7	99 % Occupied Bandwidth	For reporting purposes only.	2400-2483.5

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 11.8 for DTS bandwidth and clause 6.9 for Occupied Bandwidth.

Connect the EUT to the spectrum analyser and use the following settings:

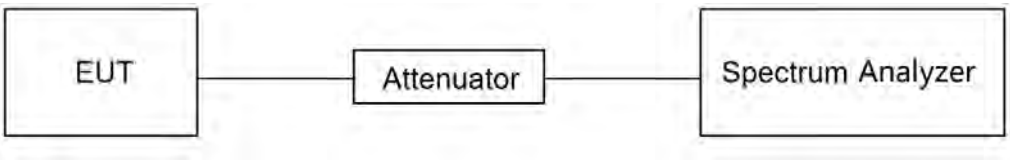
Center Frequency	The center frequency of the channel under test
Frequency Span	For 6 dB Bandwidth: Enough to capture all products of the modulation carrier emission For 99 % Occupied Bandwidth: Between 1.5 times and 5.0 times the OBW
Detector	Peak
RBW	For 6 dB Bandwidth: 100 kHz For 99 % Occupied Bandwidth: 1 % to 5 % of the occupied bandwidth
VBW	For 6 dB Bandwidth: ≥3 × RBW For 99 % Occupied Bandwidth: ≥3 × RBW
Trace	Max hold
Sweep	Auto couple

a) Use the 99 % power bandwidth function of the instrument, allow the trace to stabilize and report the measured bandwidth.

b) Allow the trace to stabilize and measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

TEST SETUP



TEST ENVIRONMENT

Temperature	25.2℃	Relative Humidity	51.9%
Atmosphere Pressure	101.2kPa	Test Voltage	AC 120V 60Hz

TEST DATE / ENGINEER

Test Date	January 16, 2023	Test By	Walker Yuan

TEST RESULTS

Please refer to section "Test Data" - Appendix A&B

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

7.3. POWER SPECTRAL DENSITY

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC §15.247 (e) ISED RSS-247 5.2 (b)	Power Spectral Density	8 dBm in any 3 kHz band	2400-2483.5

TEST PROCEDURE

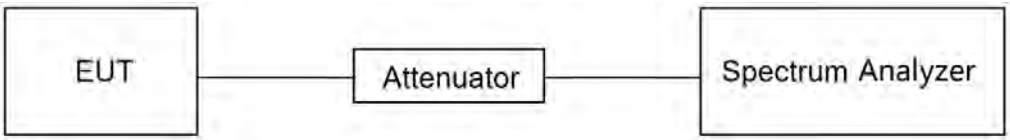
Refer to ANSI C63.10-2013 clause 11.10.5.

Connect the EUT to the spectrum analyser and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	power averaging (rms)
RBW	3 kHz ≤ RBW ≤ 100 kHz
VBW	≥3 × RBW
Span	1.5 x OBW bandwidth
Trace	Average
Sweep time	Auto couple

Allow trace to fully stabilize and use the peak marker function to determine the maximum amplitude level within the RBW.
If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

TEST SETUP



TEST ENVIRONMENT

Temperature	25.2℃	Relative Humidity	51.9%
Atmosphere Pressure	101.2kPa	Test Voltage	AC 120V 60Hz

TEST DATE / ENGINEER

Test Date	January 16, 2023	Test By	Walker Yuan

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

TEST RESULTS

Please refer to section "Test Data" - Appendix D

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

7.4. CONDUCTED BAND EDGE AND SPURIOUS EMISSION

LIMITS

CFR 47 FCC Part15 (15.247) Subpart C ISED RSS-247 ISSUE 2		
Section	Test Item	Limit
CFR 47 FCC §15.247 (d) ISED RSS-247 5.5	Conducted Bandedge and Spurious Emissions	at least 30 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 11.11 and 11.13.

Connect the EUT to the spectrum analyser and use the following settings for reference level measurement:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	100 kHz
VBW	≥3 × RBW
Span	1.5 x DTS bandwidth
Trace	Max hold
Sweep time	Auto couple.

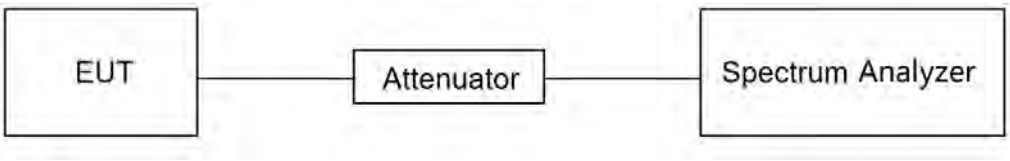
Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level.
Change the settings for emission level measurement:

Span	Set the center frequency and span to encompass frequency range to be measured
Detector	Peak
RBW	100 kHz
VBW	≥3 × RBW
measurement points	≥span/RBW
Trace	Max hold
Sweep time	Auto couple.

Allow trace to fully stabilize and use the peak marker function to determine the maximum PSD level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

TEST SETUP



TEST ENVIRONMENT

Temperature	25.2℃	Relative Humidity	51.9%
Atmosphere Pressure	101.2kPa	Test Voltage	AC 120V 60Hz

TEST DATE / ENGINEER

Test Date	January 16, 2023	Test By	Walker Yuan

TEST RESULTS

Please refer to section "Test Data" - Appendix E&F

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

7.5. DUTY CYCLE

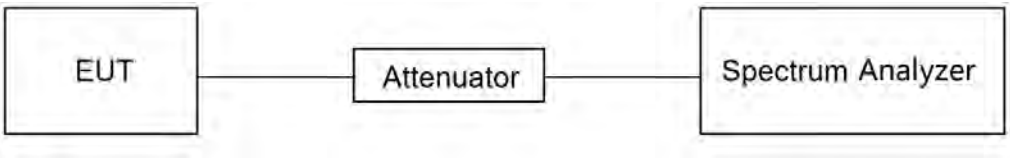
LIMITS

None; for reporting purposes only.

TEST PROCEDURE

Refer to ANSI C63.10-2013 clause 11.6 Zero – Span Spectrum Analyzer method.

TEST SETUP



TEST ENVIRONMENT

Temperature	25.2℃	Relative Humidity	51.9%
Atmosphere Pressure	101.2kPa	Test Voltage	AC 120V 60Hz

TEST DATE / ENGINEER

Test Date	January 16, 2023	Test By	Walker Yuan

TEST RESULTS

Please refer to section "Test Data" - Appendix G

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

8. RADIATED TEST RESULTS

LIMITS

Please refer to CFR 47 FCC §15.205 and §15.209.

Please refer to ISED RSS-GEN Clause 8.9 and Clause 8.10.

Radiation Disturbance Test Limit for FCC (Class B) (9 kHz ~ 1 GHz)

Emissions radiated outside of the specified frequency bands above 30 MHz			
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

FCC Emissions radiated outside of the specified frequency bands below 30 MHz		
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

ISED General field strength limits at frequencies below 30 MHz

Table 6 – General field strength limits at frequencies below 30 MHz		
Frequency	**Magnetic field strength (H-Field) (µA/m)**	**Measurement distance (m)**
9 - 490 kHz[Note 1]	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

ISED Restricted bands please refer to ISED RSS-GEN Clause 8.10

Table 7 – Restricted frequency bands[Note 1]		
MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 – 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 – 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 – 8500	
108 – 138		

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

FCC Restricted bands of operation refer to FCC §15.205 (a):

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

Note: [1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2]Above 38.6c

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

TEST PROCEDURE

Below 30 MHz

The setting of the spectrum analyser

RBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
VBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
Sweep	Auto

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.4.

2. The EUT was arranged to its worst case and then 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. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80 cm above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1 m height antenna tower.

5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

6. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak and average detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak and average detector and reported.

7. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.

8. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω. For example, the measurement frequency X KHz resulted in a level of Y dBuV/m, which is equivalent to Y-51.5 = Z dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

Below 1 GHz and above 30 MHz

The setting of the spectrum analyser

RBW	120 kHz
VBW	300 kHz
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.5.

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. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80 cm 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. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

Above 1G

The setting of the spectrum analyser

RBW	1 MHz
VBW	PEAK: 3 MHz AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.6.

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. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 1.5 m above ground.

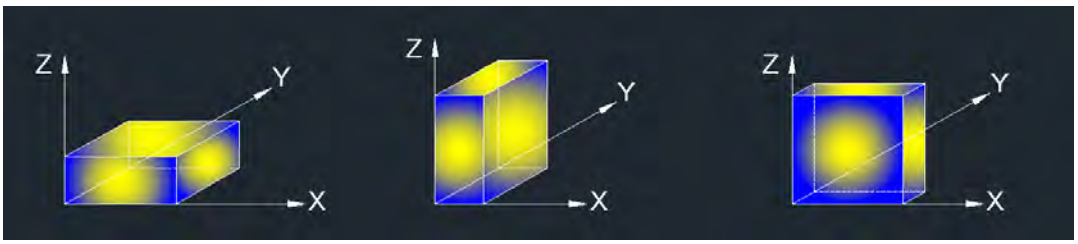
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurement above 1 GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.

6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 7.5.ON TIME AND DUTY CYCLE.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

X axis, Y axis, Z axis positions:



Note 1: The manufacturer has recommended that the EUT only be used in the desktop (horizontal) orientation; therefore, all radiated testing was performed in desktop orientation.

The EUT was placed on normal orientation and all radiated emissions were performed with the EUT shown on the setup photo.

Note 2: The EUT was fully exercised with external accessories during the test. In the case of multiple accessory external ports, an external accessory shall be connected to one of each type of port.

For Band edge note:

1. Measurement = Reading Level + Correct Factor.
2. If the peak values are less than the average limit of 54 dBuV/m, the average result is deemed to comply with average limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.5.
6. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.
7. Horizontal and Vertical have been tested, only the worst data was recorded in the report.
8. All modes, channels and antennas have been tested, only the worst data was recorded in the report.

For Radiate Spurious emission 1GHz-3GHz note:

Note: 1. Measurement = Reading Level + Correct Factor.
2. If the Peak values are less than the Average limit of 54 dBuV/m, the Average result is deemed to comply with Average limit.
3. Peak: Peak detector.
4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.
5. For the transmitting duration, please refer to clause 7.5.
6. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for Band reject filter losses.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.
8. All modes, channels and antennas have been tested, only the worst data was recorded in the report.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

For Radiate Spurious emission 3GHz-18GHz note:

Note: 1. Peak Result = Reading Level + Correct Factor.

2. If the Peak values are less than the Average limit of 54 dBuV/m, the Average result is deemed to comply with Average limit.

3. Peak: Peak detector.

4. AVG: VBW=1/Ton, where: Ton is the transmitting duration.

5. For the transmitting duration, please refer to clause 7.5.

6. Filter losses were only considered in the spurious frequency bands and the authorized band was not corrected for High Pass Filter losses.

7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

8. All modes, channels and antennas have been tested, only the worst data was recorded in the report.

For Radiate Spurious emission 9kHz-30MHz note:

1. Measurement = Reading Level + Correct Factor.

2. If the Peak values are less than the QP limit, the QP result is deemed to comply with QP limit.

3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

4. All modes, channels and antennas have been tested, only the worst data was recorded in the report.

For Radiate Spurious emission 18GHz-26GHz note:

1. Measurement = Reading Level + Correct Factor.

2. If the Peak values are less than the Average limit of 54 dBuV/m, the Average result is deemed to comply with Average limit.

3. Peak: Peak detector.

4. All modes, channels and antennas have been tested, only the worst data was recorded in the report.

For Radiate Spurious emission 30MHz-1GHz note:

1. Result Level = Read Level + Correct Factor.

2. If the Peak values are less than the QP limit, the QP result is deemed to comply with QP limit.

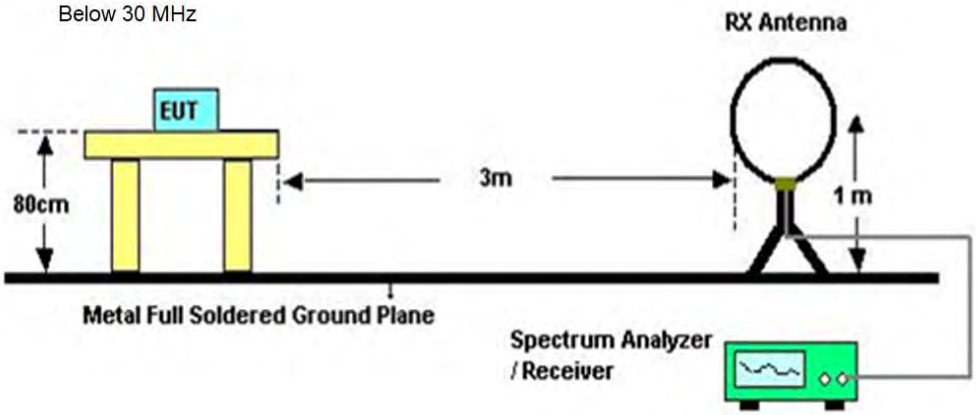
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

4. All modes, channels and antennas have been tested, only the worst data was recorded in the report.

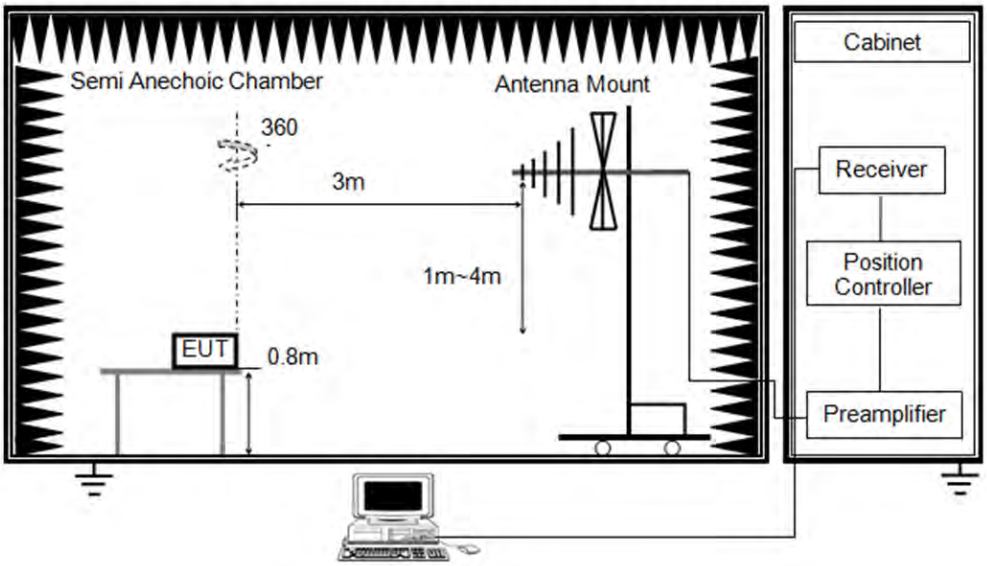
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

TEST SETUP

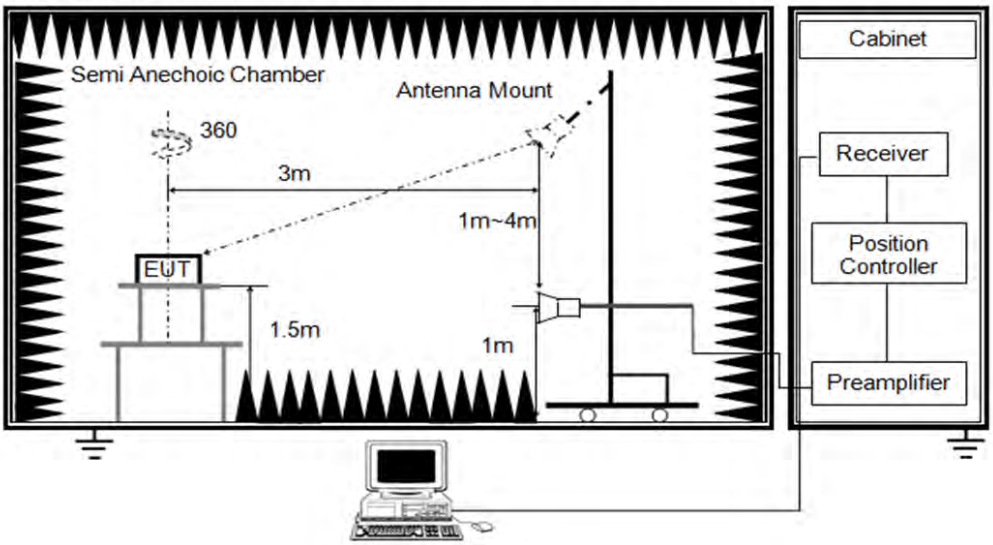
Below 30 MHz



Below 1 GHz and above 30 MHz



Above 1 GHz



This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

TEST ENVIRONMENT

Temperature	25.2℃	Relative Humidity	65%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V 60Hz

TEST DATE / ENGINEER

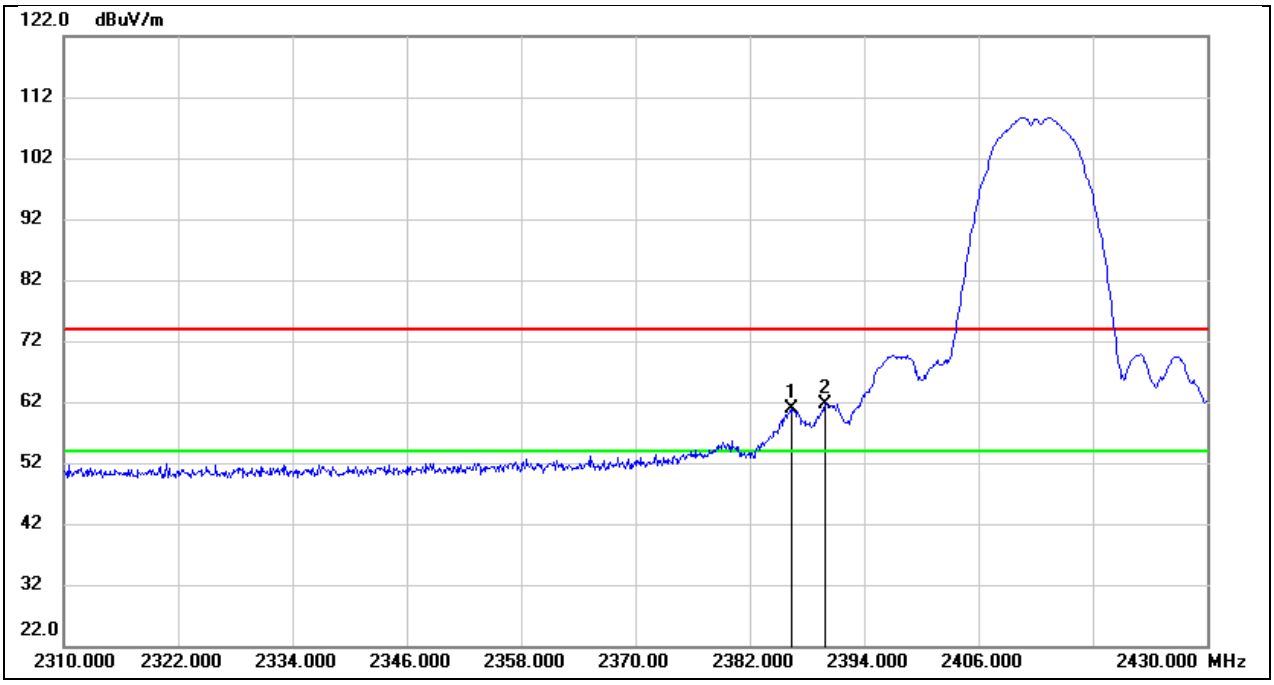
Test Date	January 16, 2023	Test By	Rex Huang

TEST RESULTS

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

8.1. RESTRICTED BANDEDGE

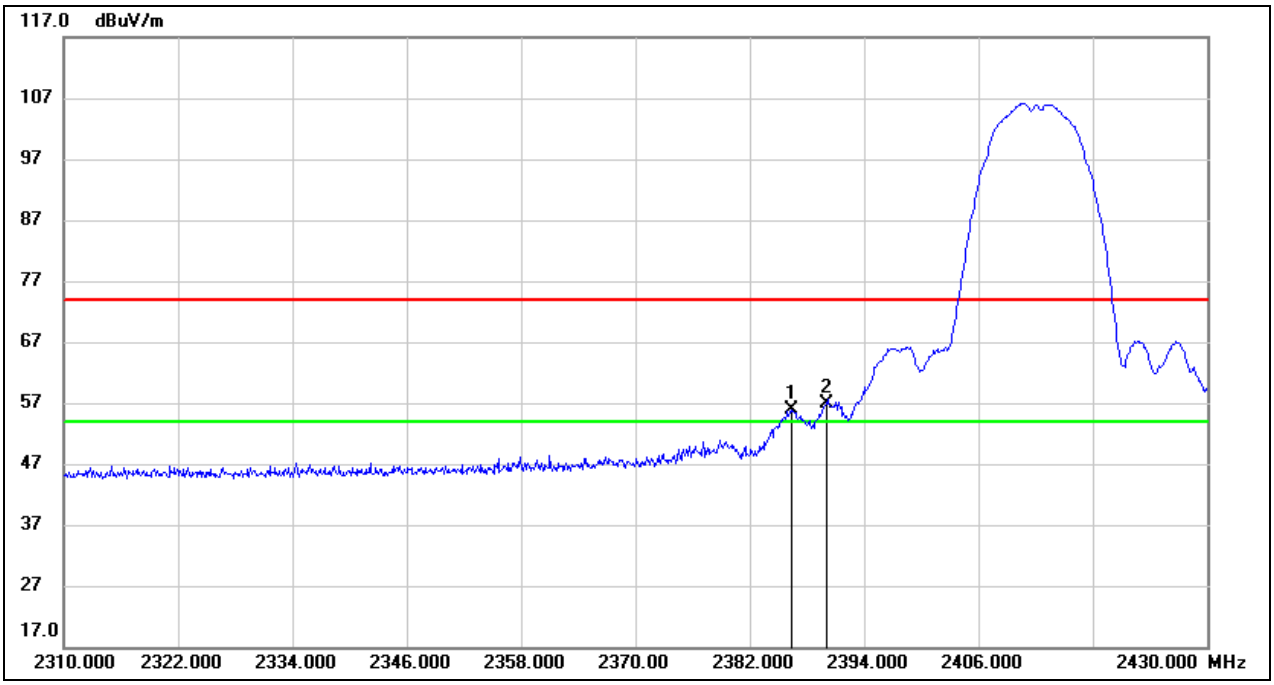
Test Mode:	802.11b PK	Channel:	2412
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2386.320	28.64	32.14	60.78	74.00	-13.22	peak
2	2390.000	29.38	32.16	61.54	74.00	-12.46	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

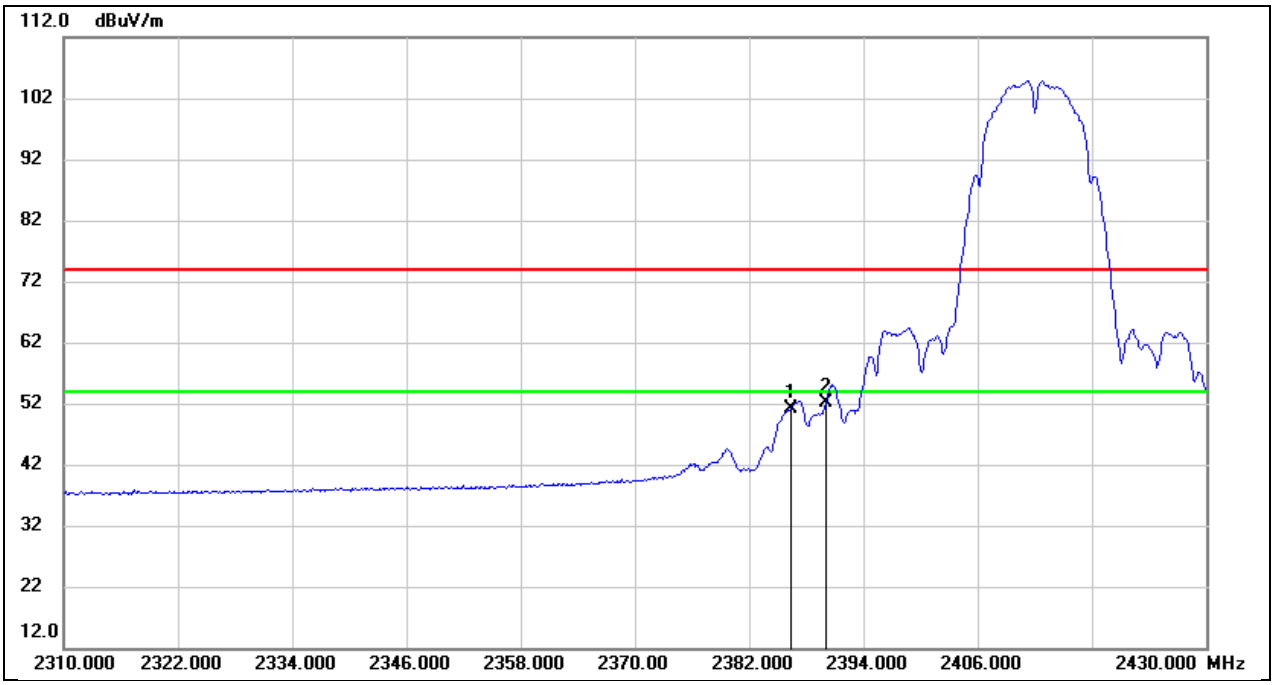
Test Mode:	802.11b PK	Channel:	2412
Polarity:	Vertical	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2386.440	23.63	32.14	55.77	74.00	-18.23	peak
2	2390.000	24.73	32.16	56.89	74.00	-17.11	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

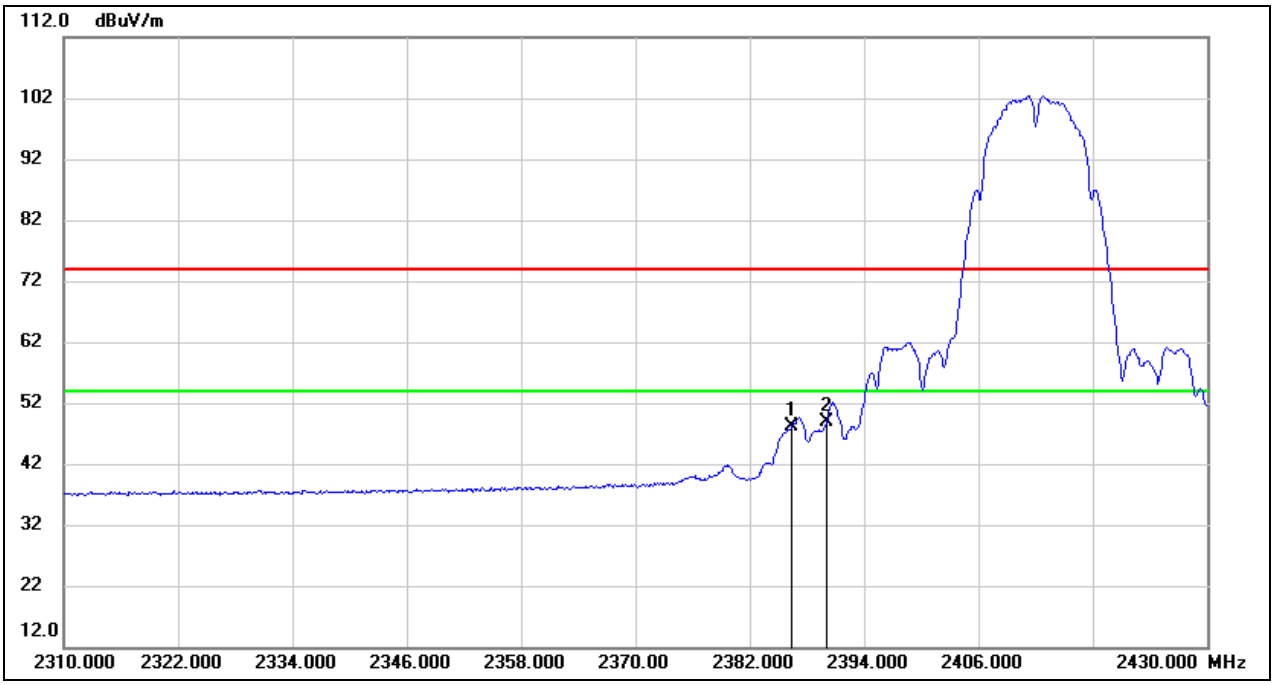
Test Mode:	802.11b AV	Channel:	2412
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2386.320	18.96	32.14	51.10	74.00	-22.90	AVG
2	2390.000	19.89	32.16	52.05	54.00	-1.95	AVG

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

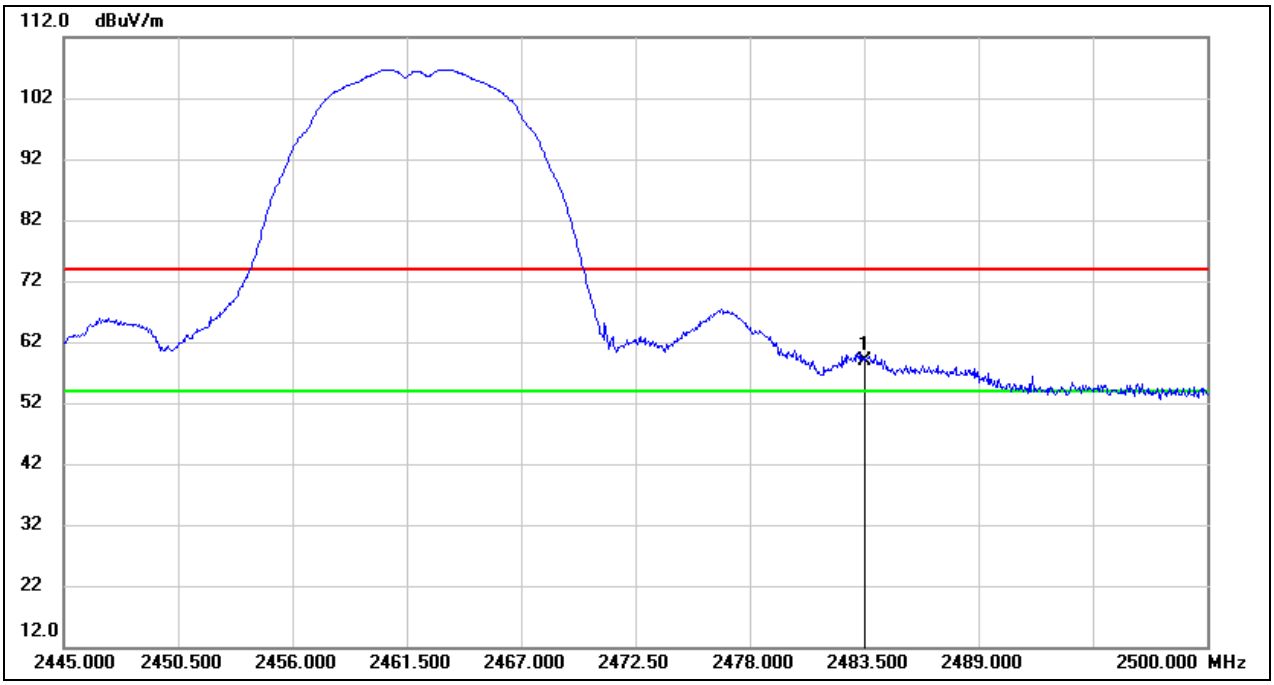
Test Mode:	802.11b AV	Channel:	2412
Polarity:	Vertical	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2386.440	16.05	32.14	48.19	54.00	-5.81	AVG
2	2390.000	16.72	32.16	48.88	54.00	-5.12	AVG

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

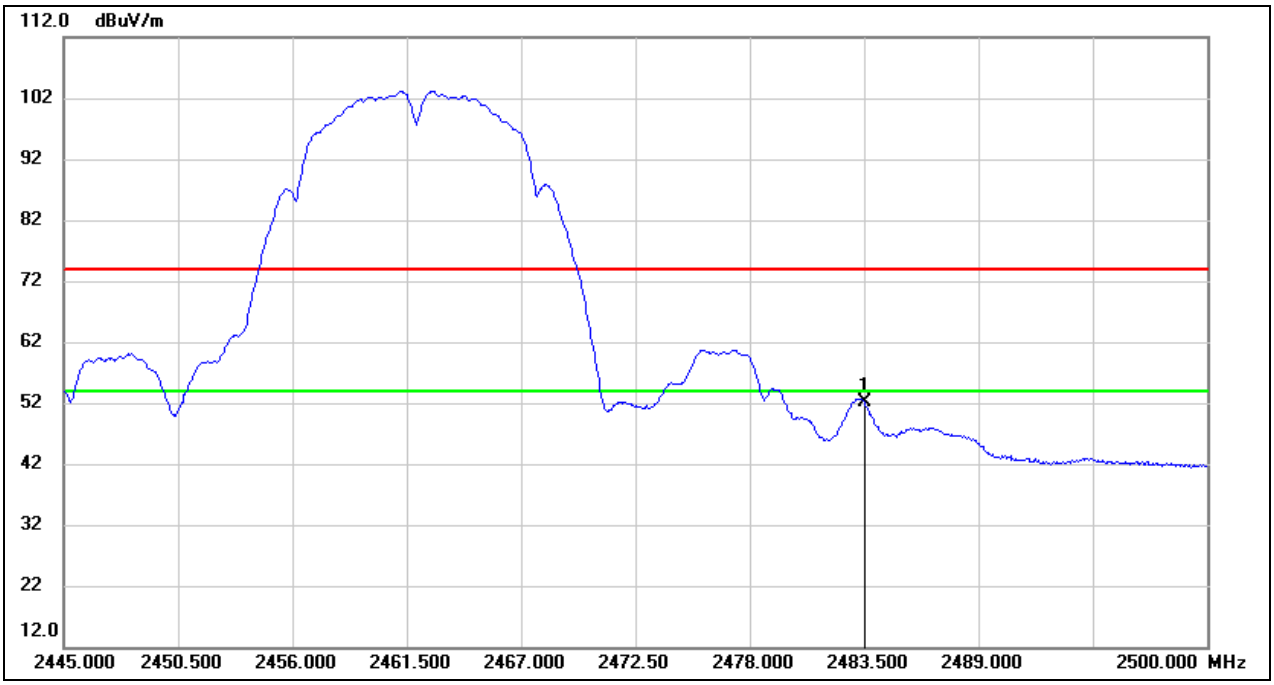
Test Mode:	802.11b PK	Channel:	2462
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	26.34	32.44	58.78	74.00	-15.22	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

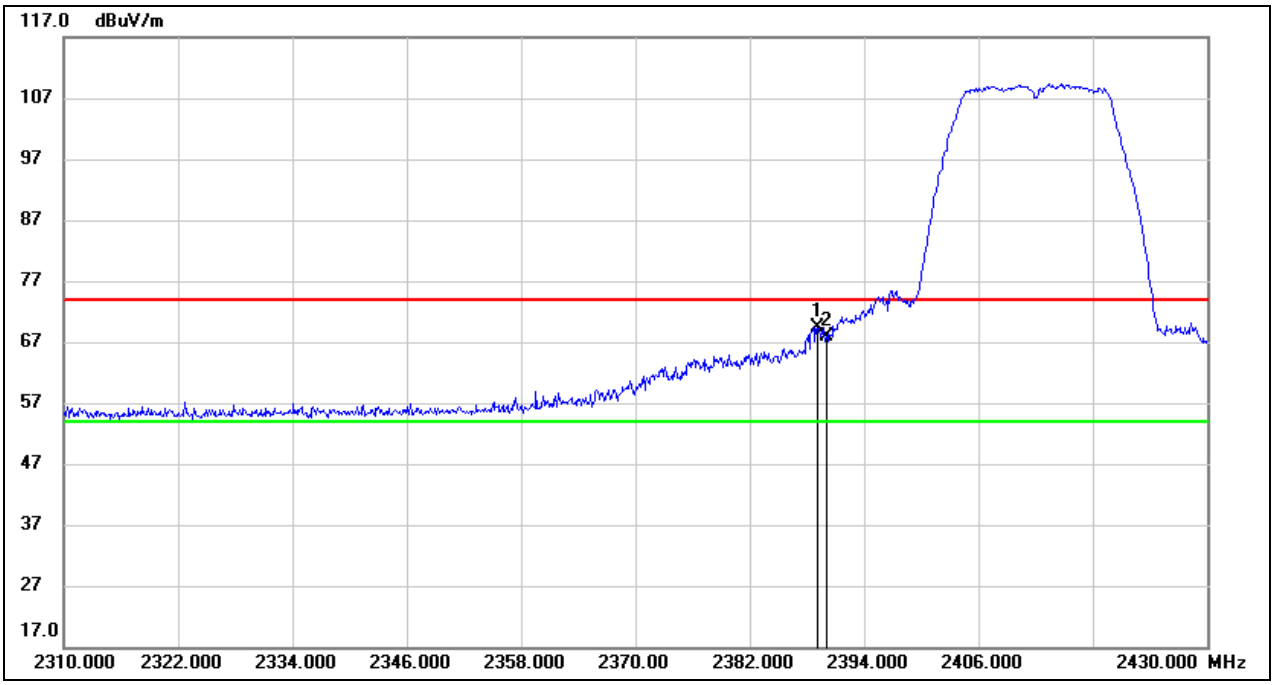
Test Mode:	802.11b AV	Channel:	2462
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	19.60	32.44	52.04	54.00	-1.96	AVG

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

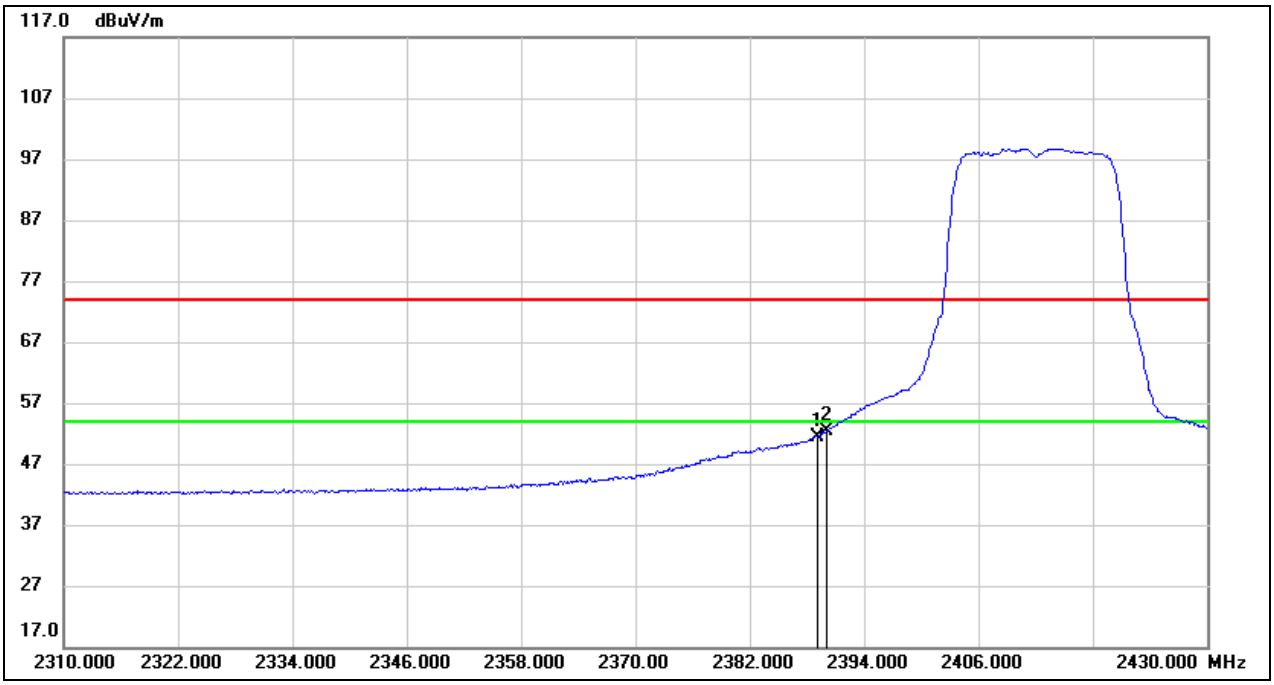
Test Mode:	802.11g PK	Channel:	2412
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2389.080	37.33	32.16	69.49	74.00	-4.51	peak
2	2390.000	35.80	32.16	67.96	74.00	-6.04	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

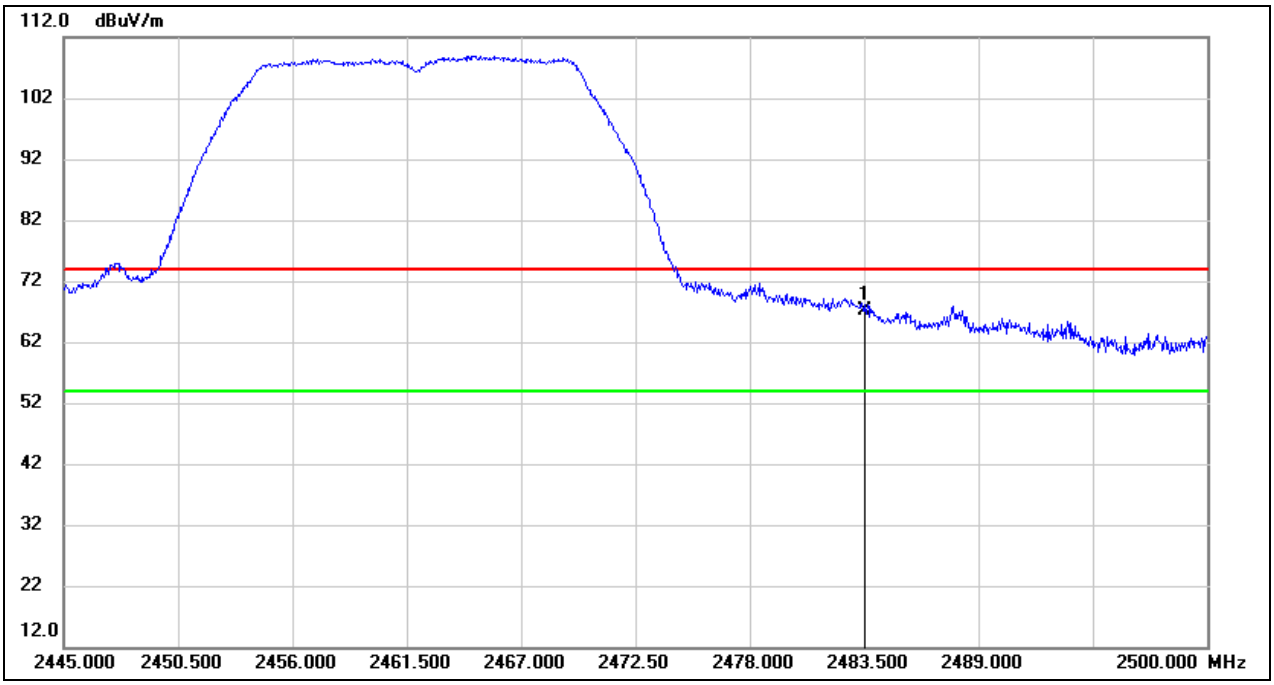
Test Mode:	802.11g AV	Channel:	2412
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2389.080	19.28	32.16	51.44	54.00	-2.56	AVG
2	2390.000	20.20	32.16	52.36	54.00	-1.64	AVG

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

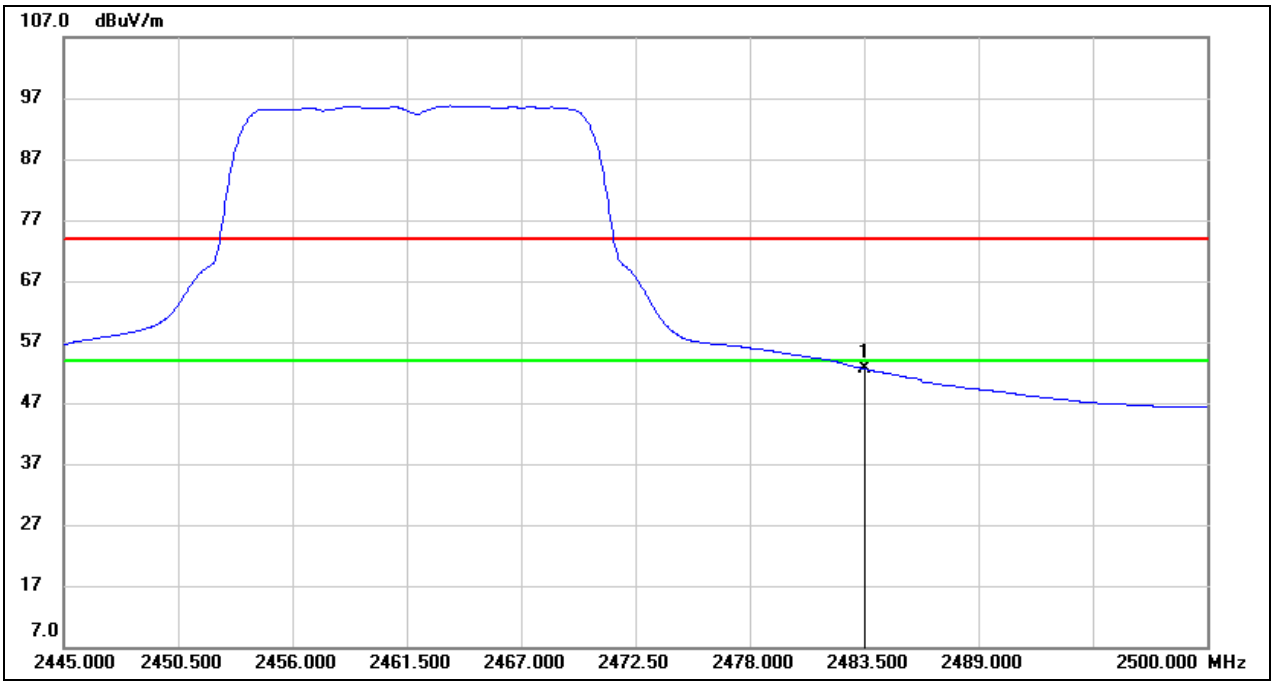
Test Mode:	802.11g PK	Channel:	2462
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	34.79	32.44	67.23	74.00	-6.77	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

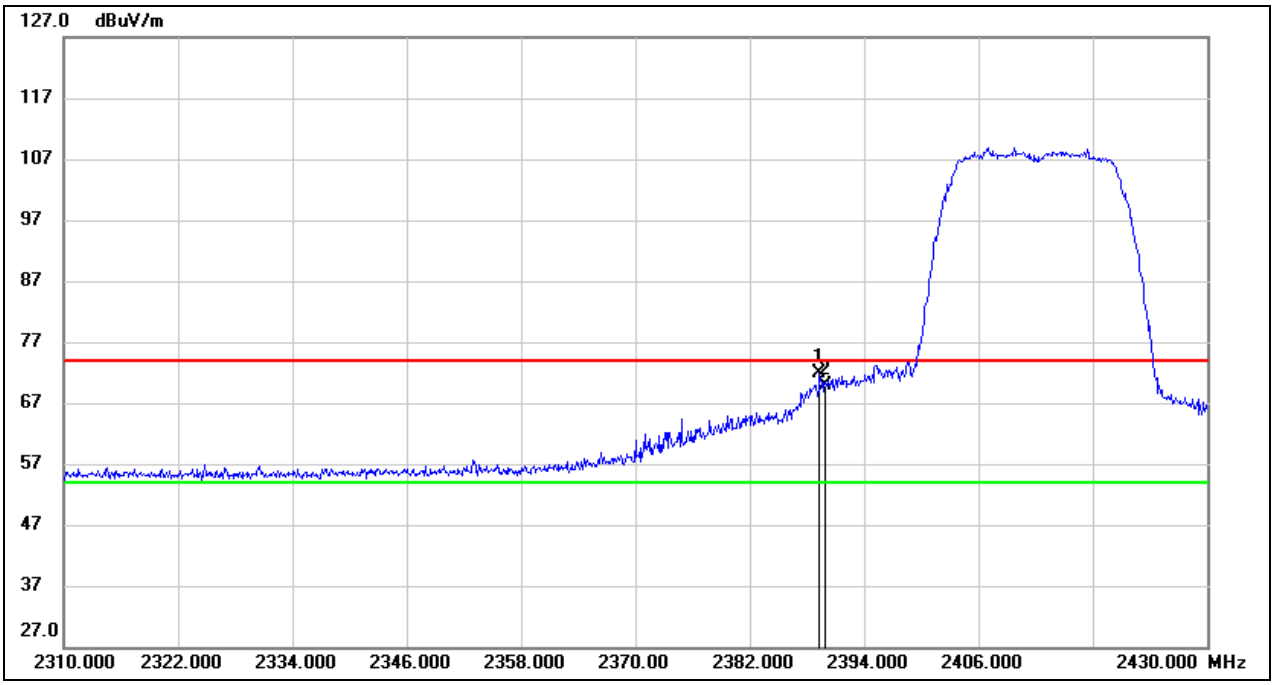
Test Mode:	802.11g AV	Channel:	2462
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	20.16	32.44	52.60	54.00	-1.40	AVG

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

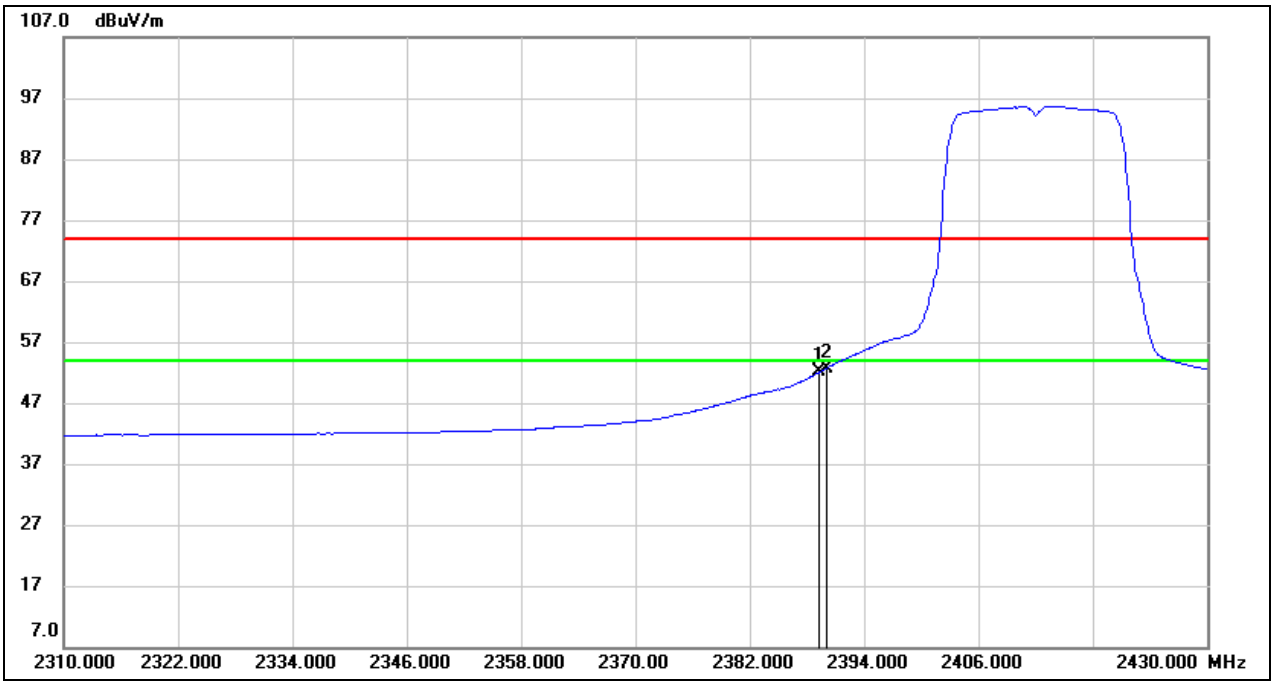
Test Mode:	802.11n HT20 PK	Channel:	2412
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2389.320	39.78	32.16	71.94	74.00	-2.06	peak
2	2390.000	37.75	32.16	69.91	74.00	-4.09	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

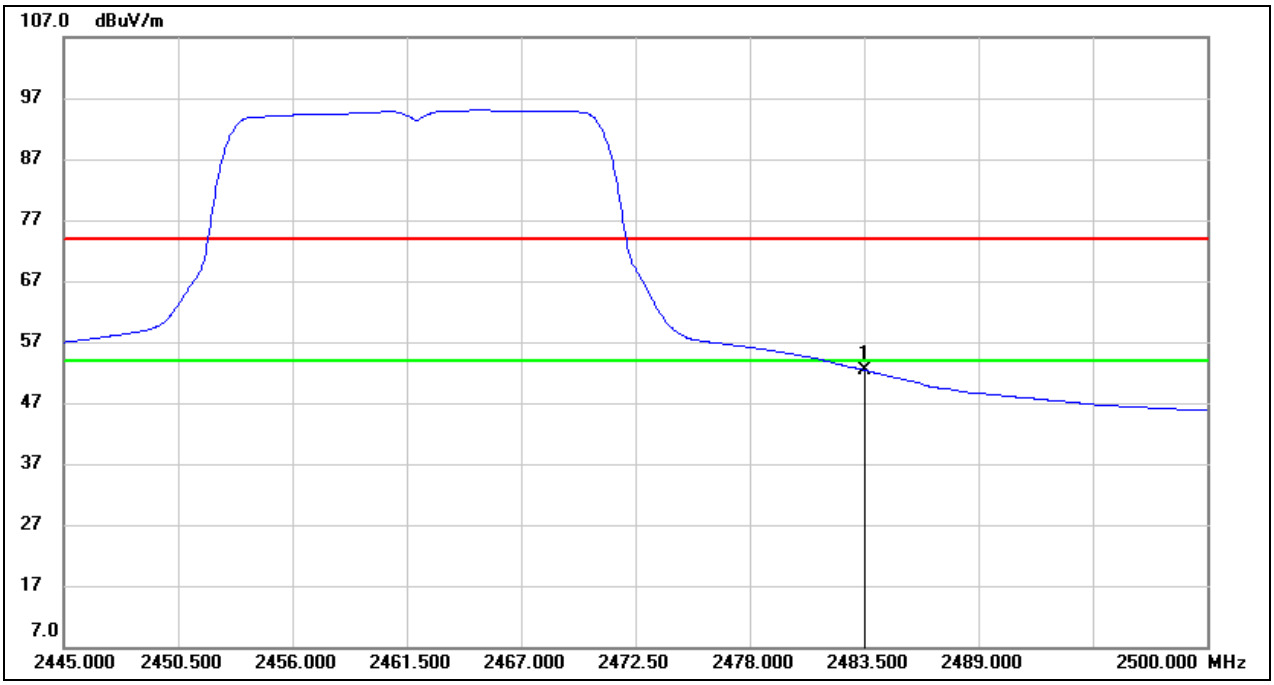
Test Mode:	802.11n HT20 AV	Channel:	2412
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2389.320	19.91	32.16	52.07	54.00	-1.93	AVG
2	2390.000	20.54	32.16	52.70	54.00	-1.30	AVG

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

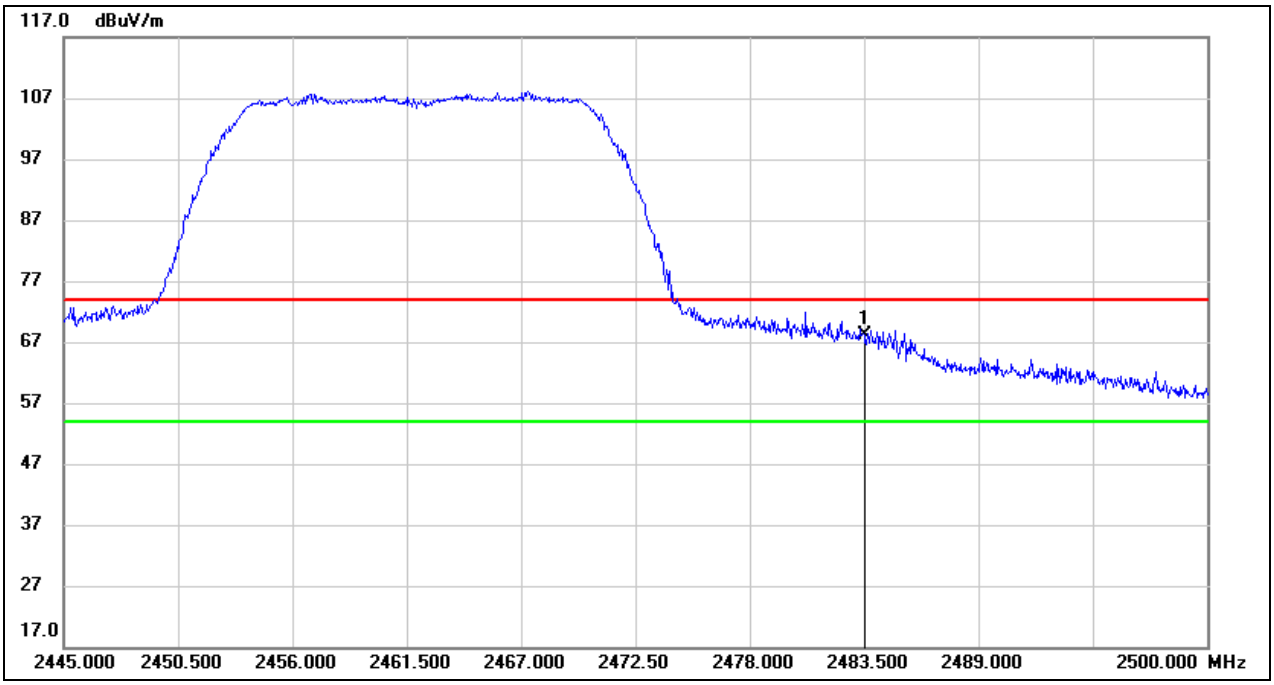
Test Mode:	802.11n HT20 AV	Channel:	2462
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	20.00	32.44	52.44	54.00	-1.56	AVG

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

Test Mode:	802.11n HT20 PK	Channel:	2462
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz

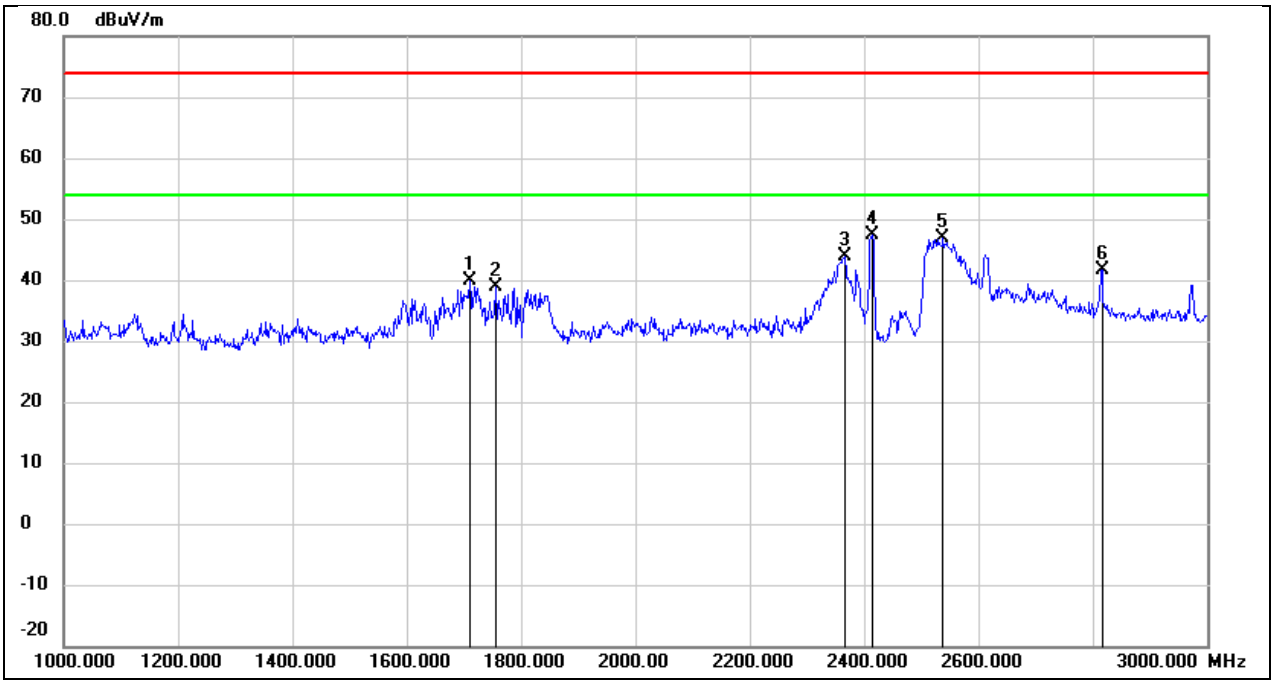


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	35.65	32.44	68.09	74.00	-5.91	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

8.2. SPURIOUS EMISSIONS(1 GHZ~3 GHZ)

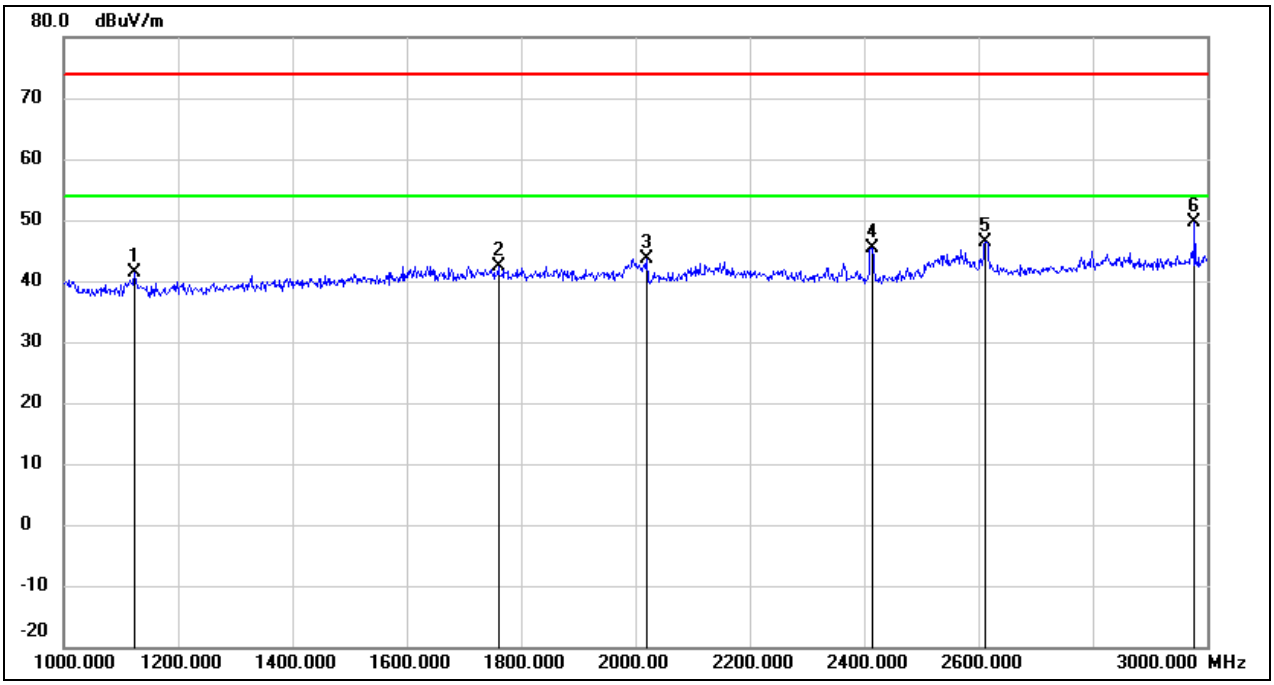
Test Mode:	802.11b	Channel:	2412
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1710.000	51.78	-12.02	39.76	74.00	-34.24	peak
2	1756.000	50.68	-11.87	38.81	74.00	-35.19	peak
3	2366.000	53.11	-9.18	43.93	74.00	-30.07	peak
4	2412.000	56.24	-8.93	47.31	/	/	fundamental
5	2538.000	55.13	-8.37	46.76	74.00	-27.24	peak
6	2816.000	49.22	-7.54	41.68	74.00	-32.32	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

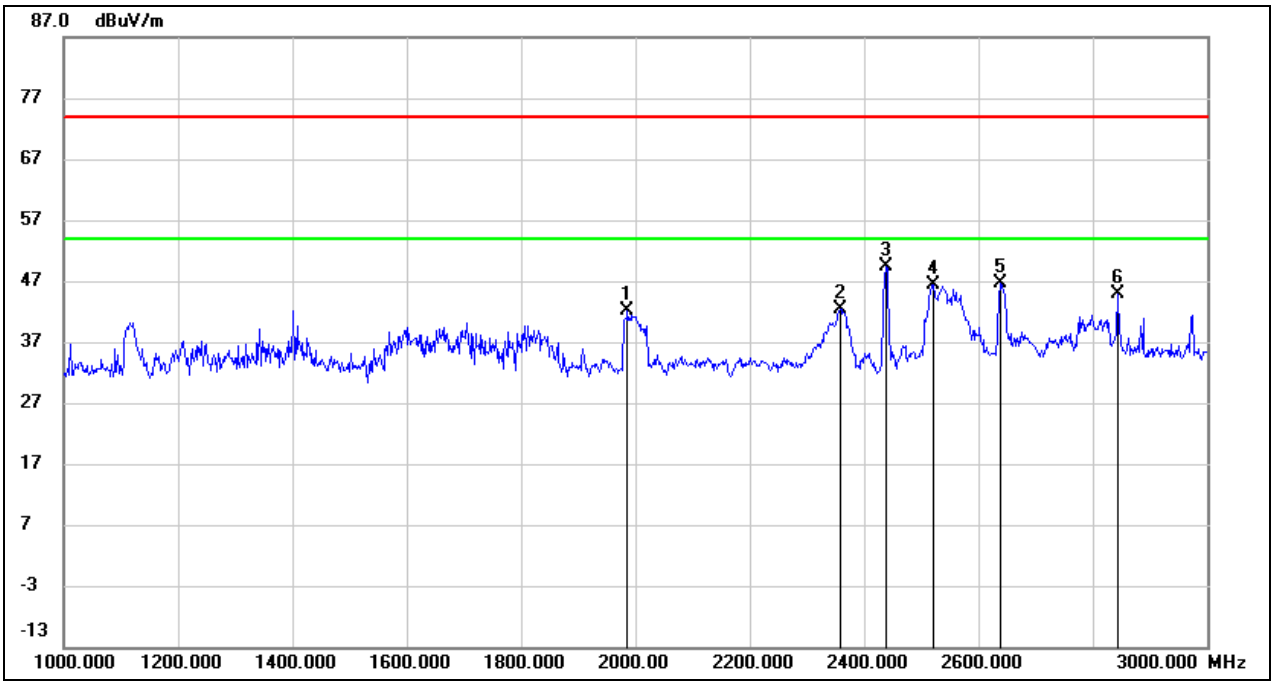
Test Mode:	802.11b	Channel:	2412
Polarity:	Vertical	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1124.000	55.83	-14.46	41.37	74.00	-32.63	peak
2	1760.000	54.34	-11.86	42.48	74.00	-31.52	peak
3	2020.000	54.66	-10.96	43.70	74.00	-30.30	peak
4	2412.000	54.41	-8.93	45.48	/	/	fundamental
5	2612.000	54.45	-8.15	46.30	74.00	-27.70	peak
6	2978.000	56.78	-7.05	49.73	74.00	-24.27	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

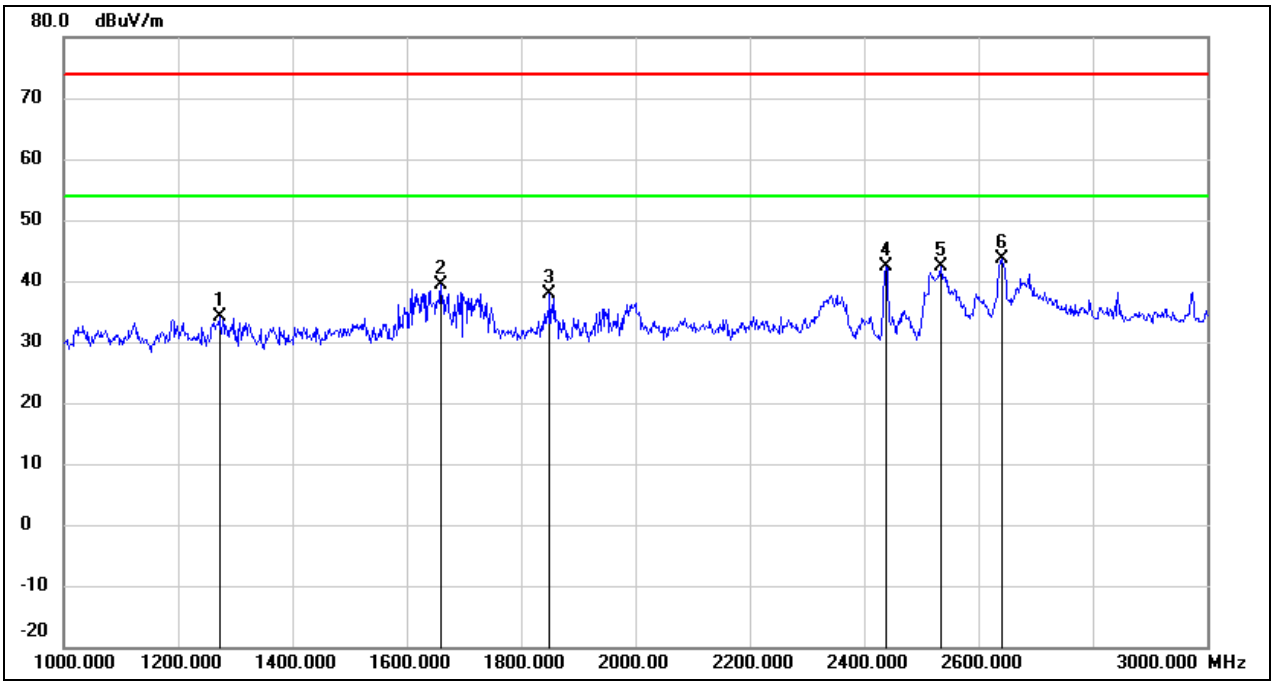
Test Mode:	802.11b	Channel:	2437
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1986.000	53.16	-11.10	42.06	74.00	-31.94	peak
2	2358.000	51.62	-9.22	42.40	74.00	-31.60	peak
3	2437.000	58.20	-8.80	49.40	/	/	fundamental
4	2522.000	54.83	-8.42	46.41	74.00	-27.59	peak
5	2638.000	54.62	-8.07	46.55	74.00	-27.45	peak
6	2844.000	52.29	-7.45	44.84	74.00	-29.16	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

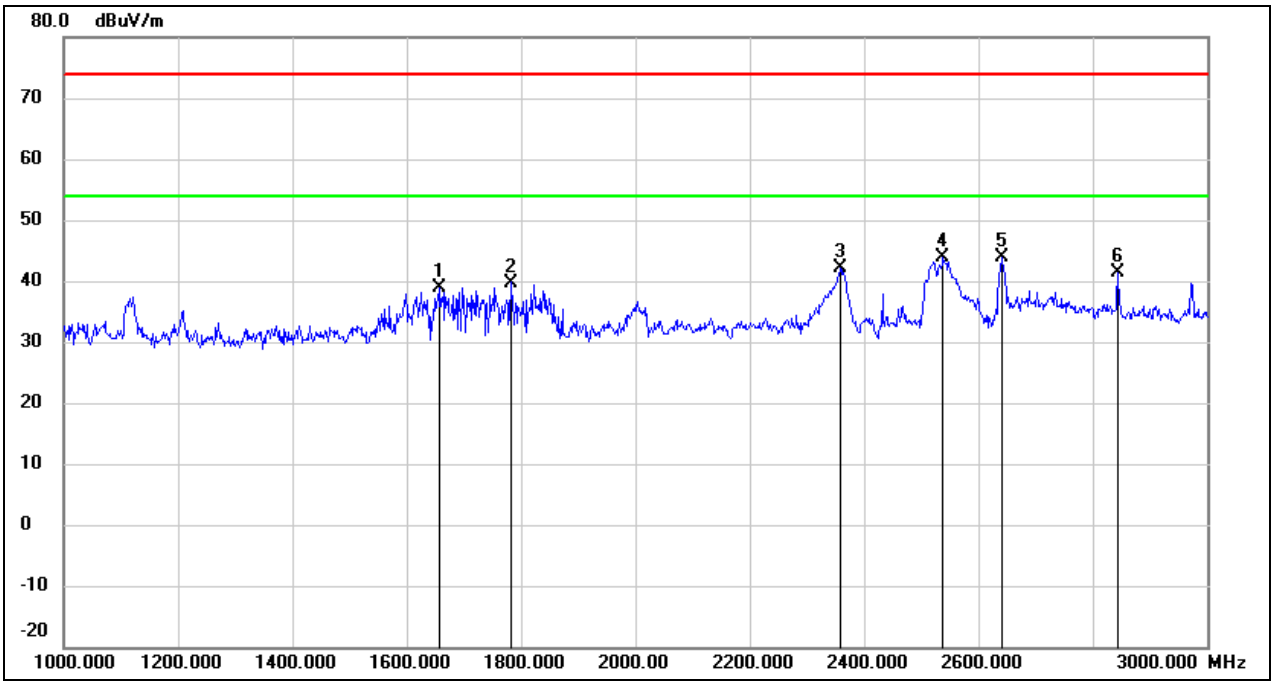
Test Mode:	802.11b	Channel:	2437
Polarity:	Vertical	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1272.000	47.89	-13.77	34.12	74.00	-39.88	peak
2	1660.000	51.65	-12.19	39.46	74.00	-34.54	peak
3	1850.000	49.49	-11.55	37.94	74.00	-36.06	peak
4	2437.000	51.26	-8.80	42.46	/	/	fundamental
5	2534.000	50.67	-8.39	42.28	74.00	-31.72	peak
6	2642.000	51.76	-8.06	43.70	74.00	-30.30	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

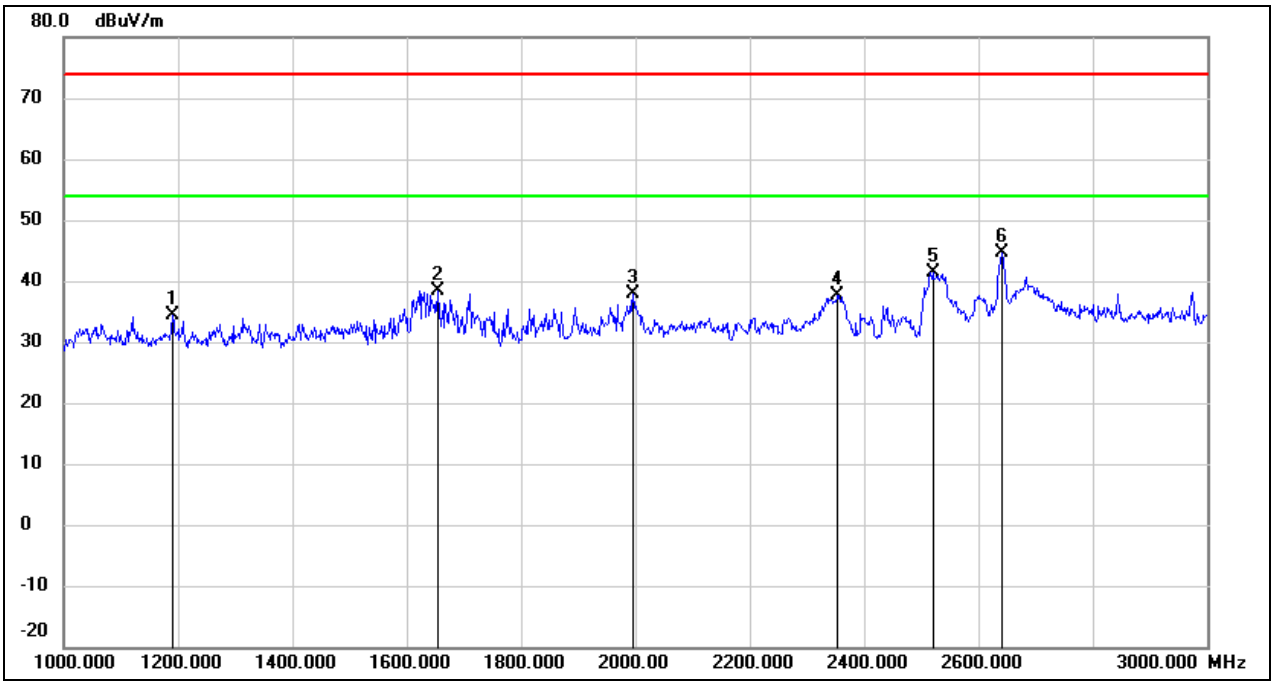
Test Mode:	802.11b	Channel:	2462
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1658.000	51.00	-12.19	38.81	74.00	-35.19	peak
2	1782.000	51.53	-11.78	39.75	74.00	-34.25	peak
3	2358.000	51.39	-9.22	42.17	74.00	-31.83	peak
4	2538.000	52.23	-8.37	43.86	74.00	-30.14	peak
5	2640.000	51.86	-8.07	43.79	74.00	-30.21	peak
6	2844.000	48.72	-7.45	41.27	74.00	-32.73	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

Test Mode:	802.11b	Channel:	2462
Polarity:	Vertical	Test Voltage:	AC 120V_60Hz

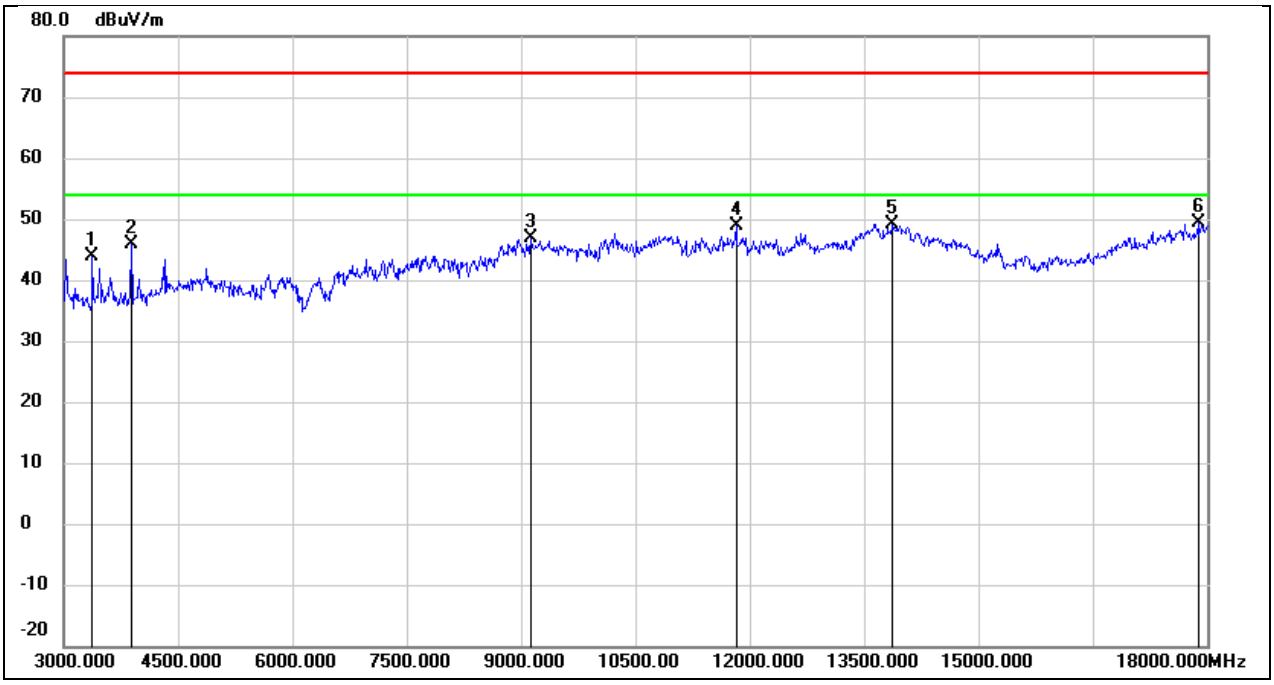


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1190.000	48.63	-14.14	34.49	74.00	-39.51	peak
2	1654.000	50.68	-12.20	38.48	74.00	-35.52	peak
3	1996.000	48.93	-11.07	37.86	74.00	-36.14	peak
4	2354.000	46.82	-9.24	37.58	74.00	-36.42	peak
5	2520.000	49.88	-8.43	41.45	74.00	-32.55	peak
6	2642.000	52.67	-8.06	44.61	74.00	-29.39	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

8.3. SPURIOUS EMISSIONS(3 GHZ~18 GHZ)

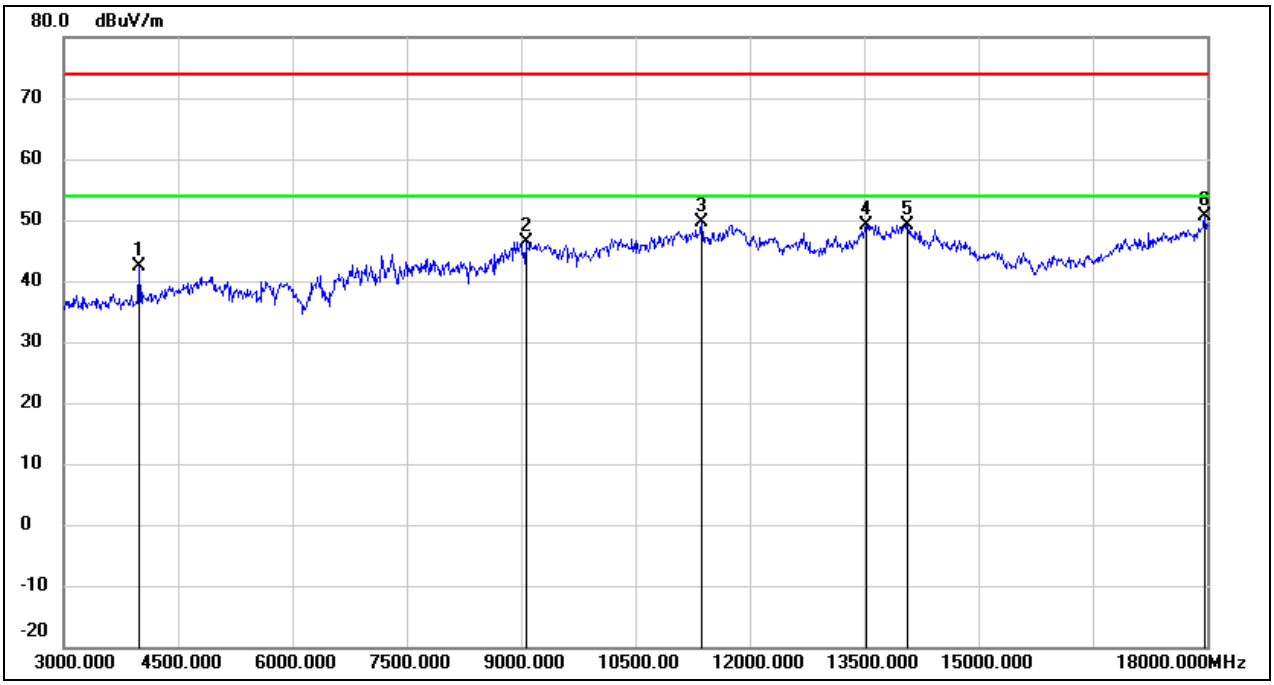
Test Mode:	802.11b	Channel:	2412
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3375.000	48.91	-5.03	43.88	74.00	-30.12	peak
2	3885.000	49.88	-4.07	45.81	74.00	-28.19	peak
3	9120.000	36.42	10.53	46.95	74.00	-27.05	peak
4	11820.000	31.45	17.47	48.92	74.00	-25.08	peak
5	13875.000	27.45	21.70	49.15	74.00	-24.85	peak
6	17880.000	24.40	24.98	49.38	74.00	-24.62	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

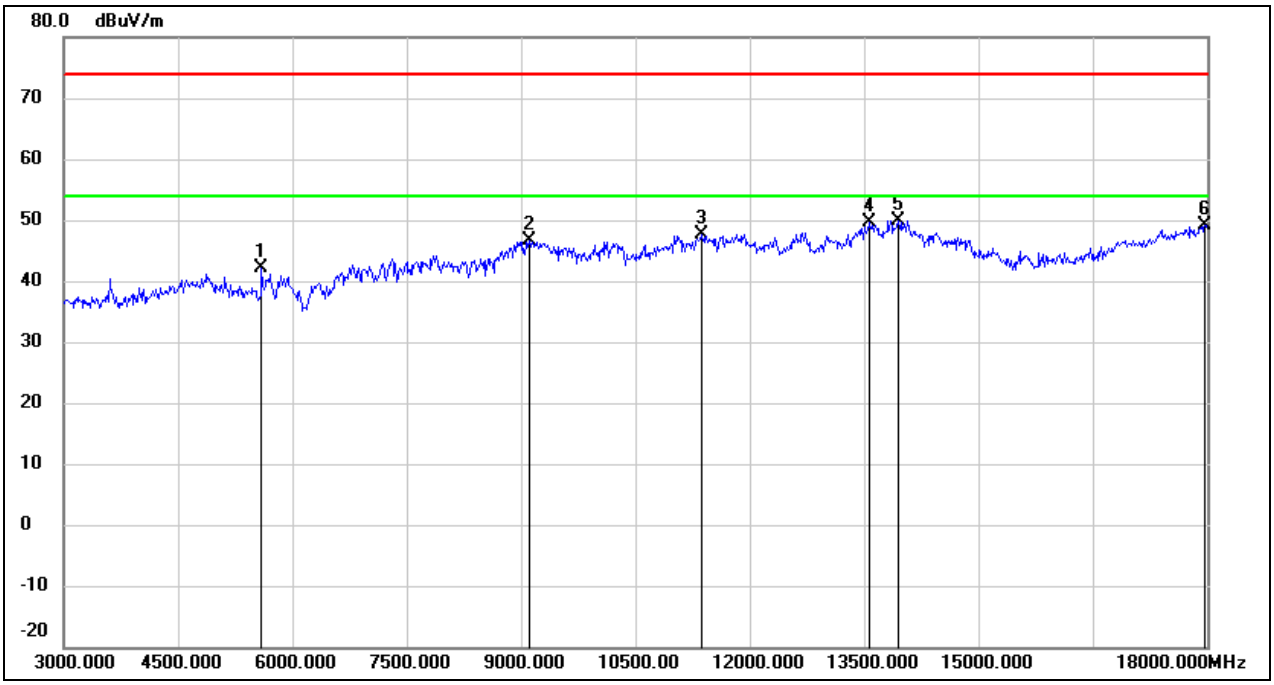
Test Mode:	802.11b	Channel:	2412
Polarity:	Vertical	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3990.000	46.23	-3.82	42.41	74.00	-31.59	peak
2	9060.000	35.93	10.51	46.44	74.00	-27.56	peak
3	11370.000	33.48	16.12	49.60	74.00	-24.40	peak
4	13530.000	28.20	20.96	49.16	74.00	-24.84	peak
5	14070.000	27.46	21.67	49.13	74.00	-24.87	peak
6	17970.000	25.11	25.51	50.62	74.00	-23.38	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

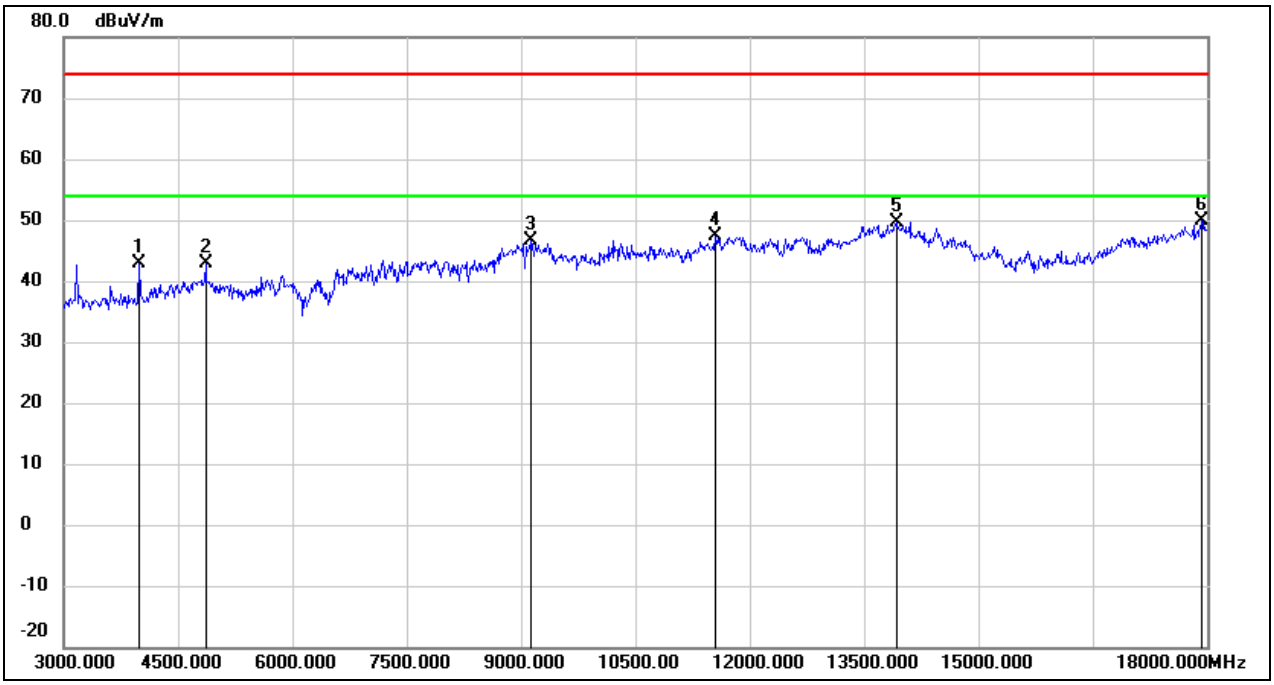
Test Mode:	802.11b	Channel:	2437
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5595.000	40.91	1.12	42.03	74.00	-31.97	peak
2	9105.000	35.99	10.53	46.52	74.00	-27.48	peak
3	11370.000	31.55	16.12	47.67	74.00	-26.33	peak
4	13560.000	28.64	21.04	49.68	74.00	-24.32	peak
5	13950.000	28.12	21.86	49.98	74.00	-24.02	peak
6	17970.000	23.66	25.51	49.17	74.00	-24.83	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

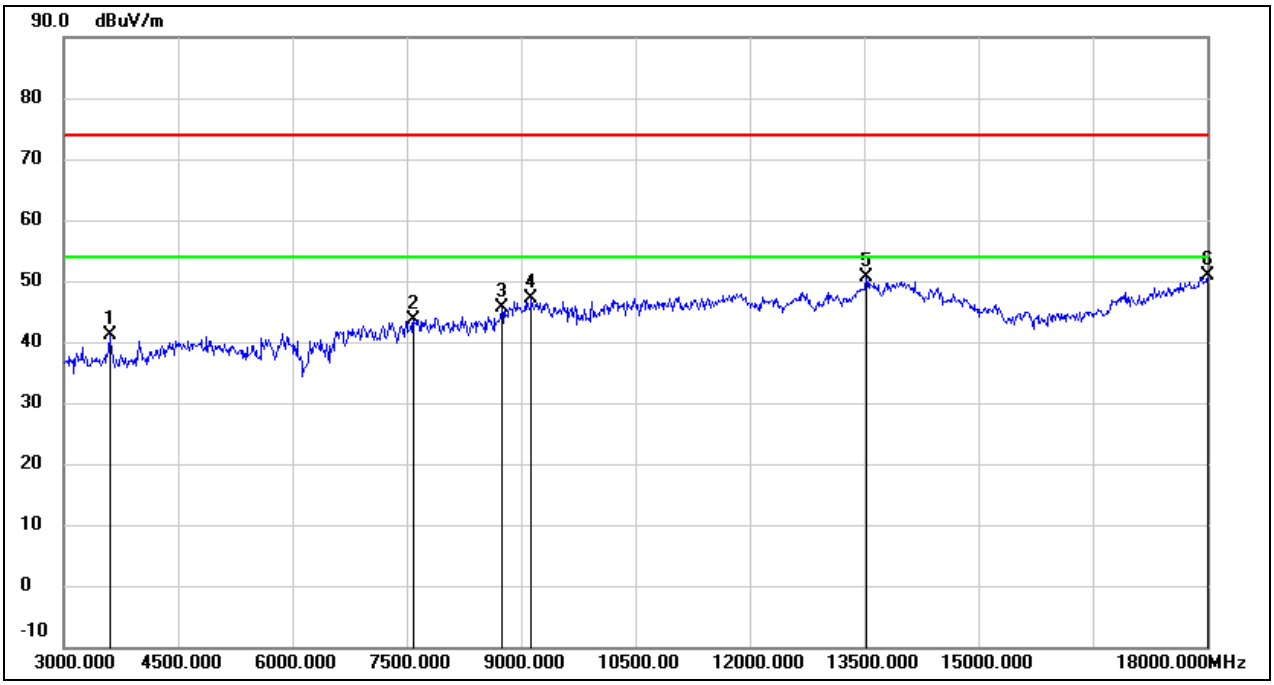
Test Mode:	802.11b	Channel:	2437
Polarity:	Vertical	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3990.000	46.58	-3.82	42.76	74.00	-31.24	peak
2	4860.000	42.88	-0.09	42.79	74.00	-31.21	peak
3	9120.000	36.02	10.53	46.55	74.00	-27.45	peak
4	11550.000	30.54	16.74	47.28	74.00	-26.72	peak
5	13920.000	27.81	21.79	49.60	74.00	-24.40	peak
6	17925.000	24.63	25.25	49.88	74.00	-24.12	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

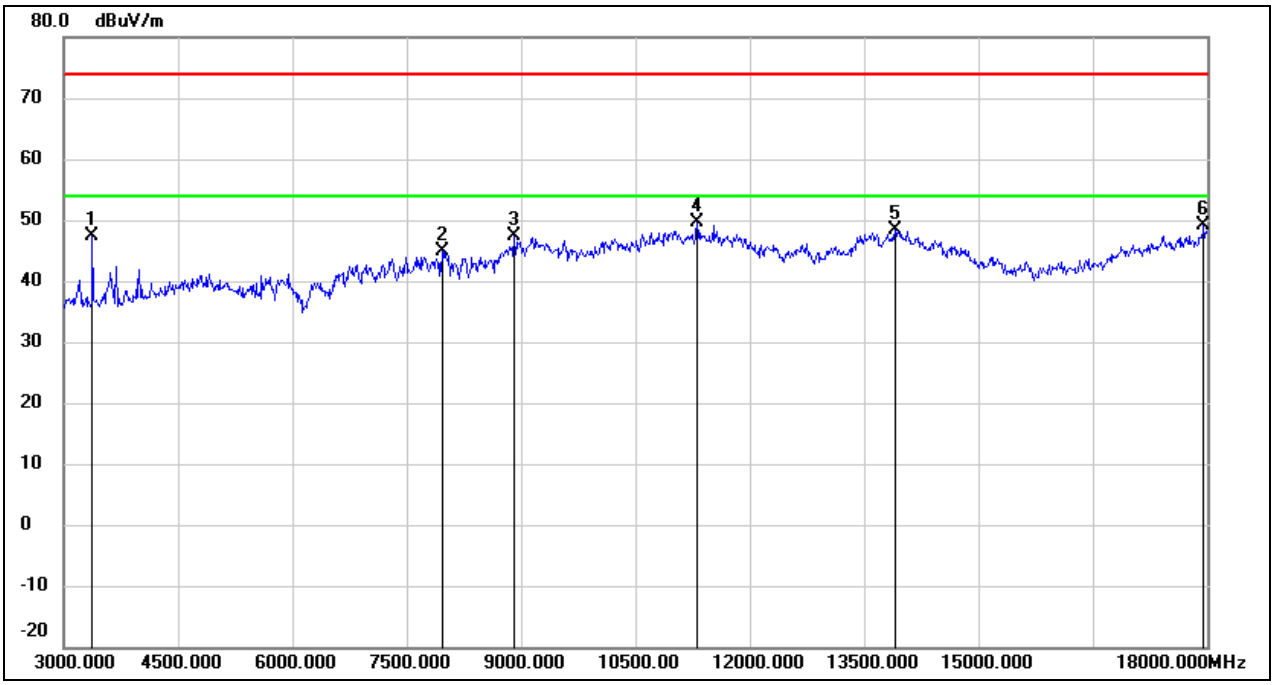
Test Mode:	802.11b	Channel:	2462
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3600.000	45.81	-4.73	41.08	74.00	-32.92	peak
2	7590.000	37.42	6.32	43.74	74.00	-30.26	peak
3	8745.000	36.95	8.62	45.57	74.00	-28.43	peak
4	9135.000	36.69	10.55	47.24	74.00	-26.76	peak
5	13530.000	29.67	20.96	50.63	74.00	-23.37	peak
6	18000.000	25.21	25.69	50.90	74.00	-23.10	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

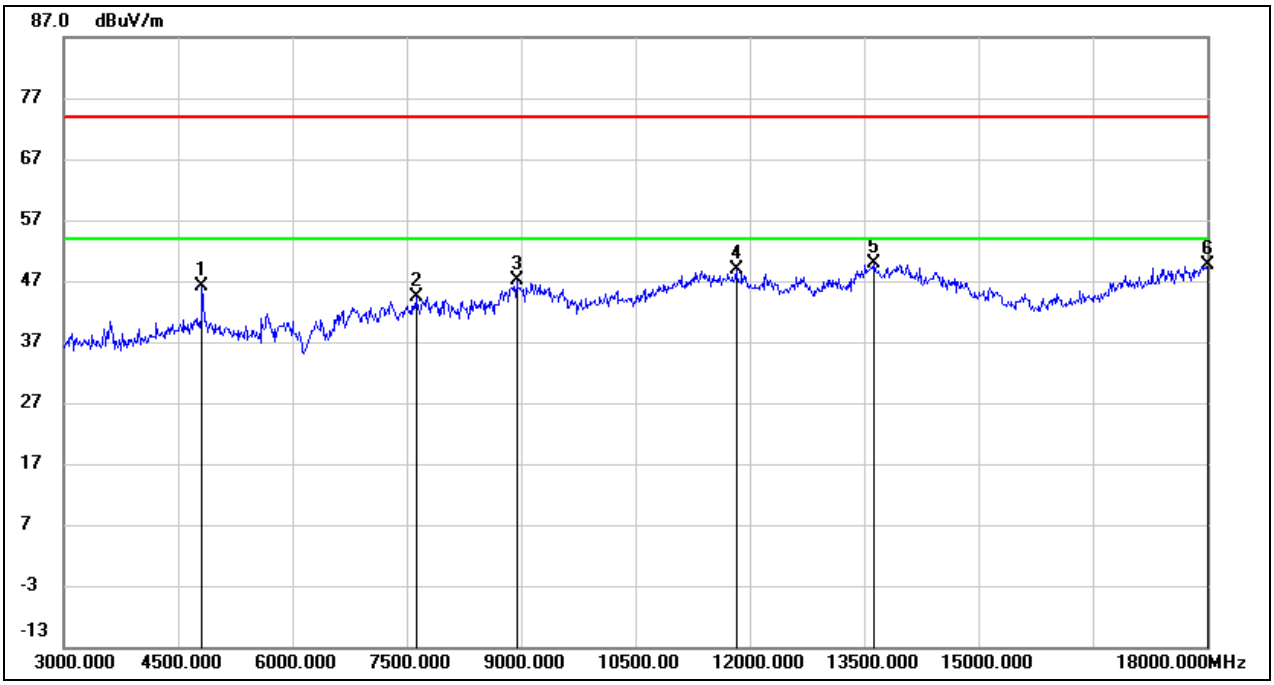
Test Mode:	802.11b	Channel:	2462
Polarity:	Vertical	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3375.000	52.51	-5.03	47.48	74.00	-26.52	peak
2	7965.000	38.61	6.31	44.92	74.00	-29.08	peak
3	8910.000	37.57	9.82	47.39	74.00	-26.61	peak
4	11310.000	33.63	15.91	49.54	74.00	-24.46	peak
5	13905.000	26.56	21.76	48.32	74.00	-25.68	peak
6	17955.000	23.63	25.42	49.05	74.00	-24.95	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

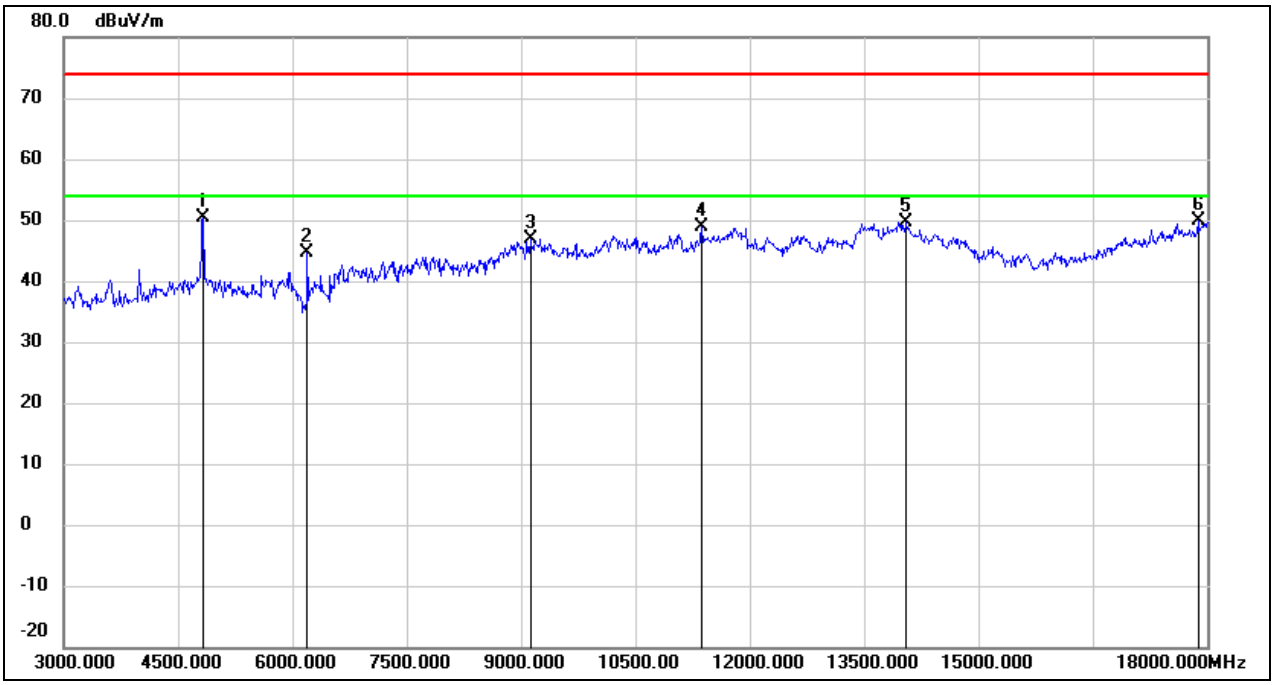
Test Mode:	802.11g	Channel:	2412
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4815.000	46.33	-0.26	46.07	74.00	-27.93	peak
2	7620.000	38.02	6.33	44.35	74.00	-29.65	peak
3	8940.000	37.11	10.04	47.15	74.00	-26.85	peak
4	11820.000	31.43	17.47	48.90	74.00	-25.10	peak
5	13635.000	28.60	21.19	49.79	74.00	-24.21	peak
6	18000.000	23.82	25.69	49.51	74.00	-24.49	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

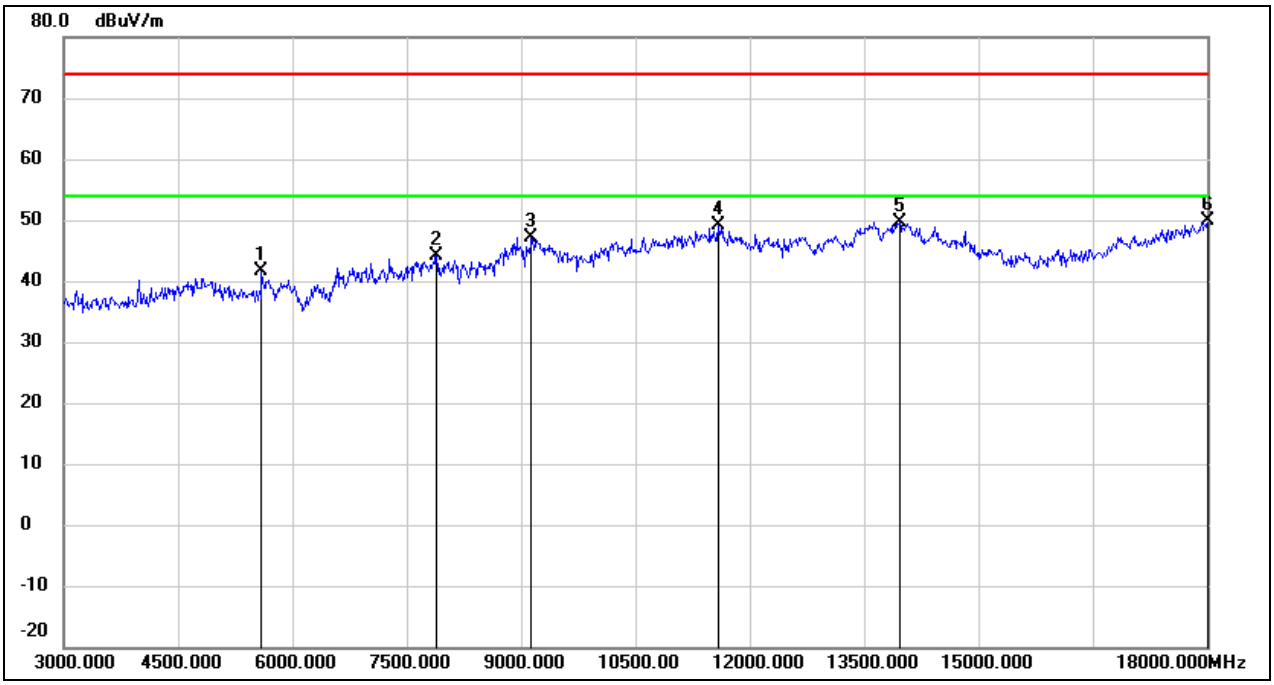
Test Mode:	802.11g	Channel:	2412
Polarity:	Vertical	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4830.000	50.54	-0.20	50.34	74.00	-23.66	peak
2	6195.000	41.49	3.02	44.51	74.00	-29.49	peak
3	9120.000	36.45	10.53	46.98	74.00	-27.02	peak
4	11370.000	32.86	16.12	48.98	74.00	-25.02	peak
5	14055.000	27.98	21.73	49.71	74.00	-24.29	peak
6	17880.000	24.92	24.98	49.90	74.00	-24.10	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

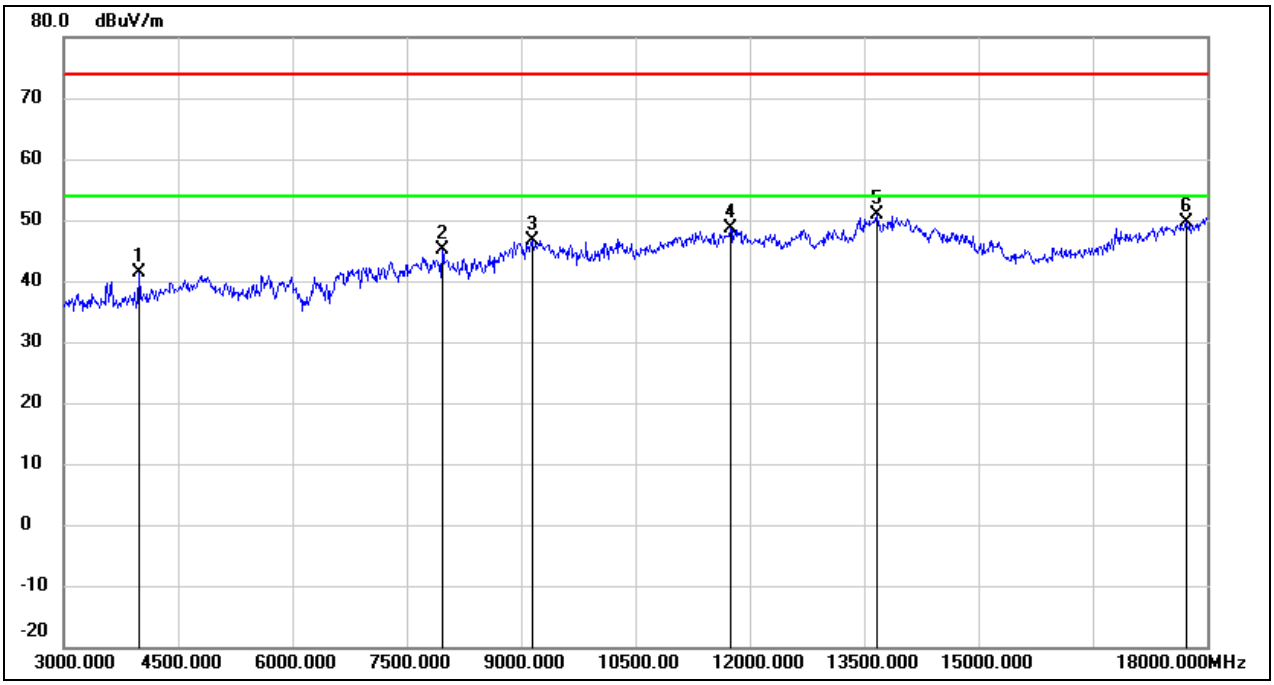
Test Mode:	802.11g	Channel:	2437
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5595.000	40.54	1.12	41.66	74.00	-32.34	peak
2	7890.000	37.79	6.31	44.10	74.00	-29.90	peak
3	9135.000	36.54	10.55	47.09	74.00	-26.91	peak
4	11580.000	32.36	16.82	49.18	74.00	-24.82	peak
5	13965.000	27.82	21.89	49.71	74.00	-24.29	peak
6	18000.000	24.23	25.69	49.92	74.00	-24.08	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

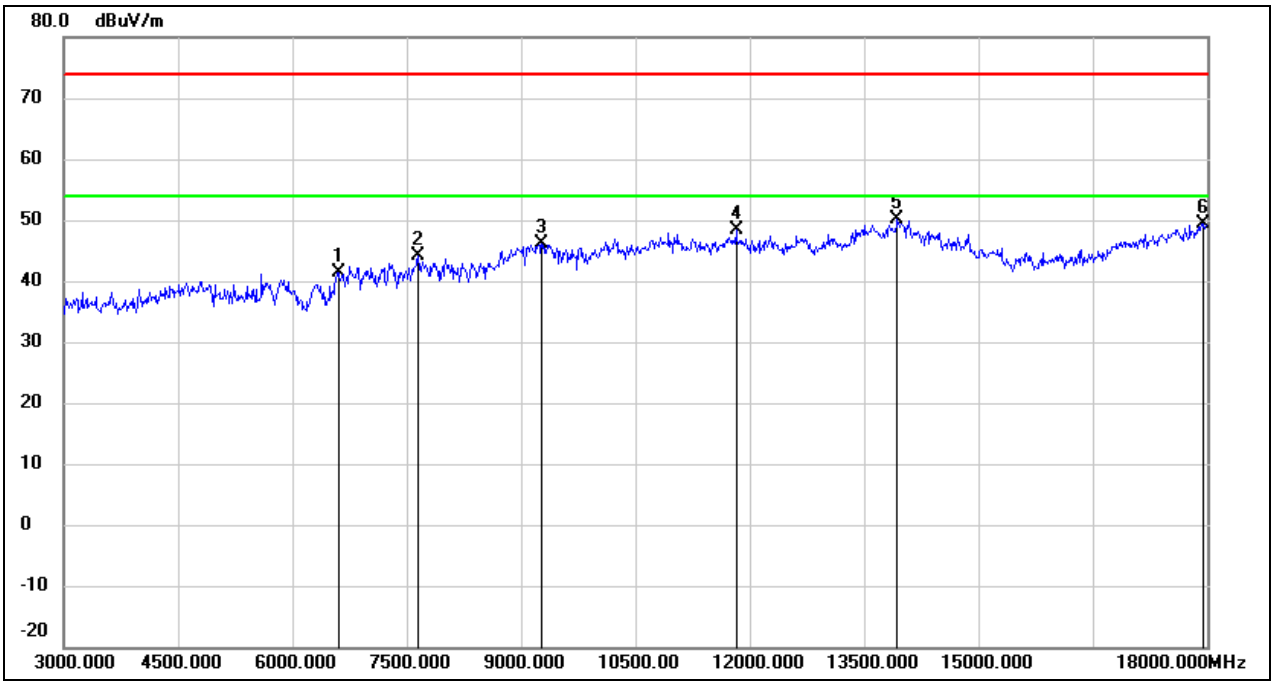
Test Mode:	802.11g	Channel:	2437
Polarity:	Vertical	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3990.000	45.25	-3.82	41.43	74.00	-32.57	peak
2	7965.000	38.83	6.31	45.14	74.00	-28.86	peak
3	9150.000	36.08	10.54	46.62	74.00	-27.38	peak
4	11745.000	31.37	17.27	48.64	74.00	-25.36	peak
5	13665.000	29.63	21.25	50.88	74.00	-23.12	peak
6	17730.000	25.53	24.09	49.62	74.00	-24.38	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

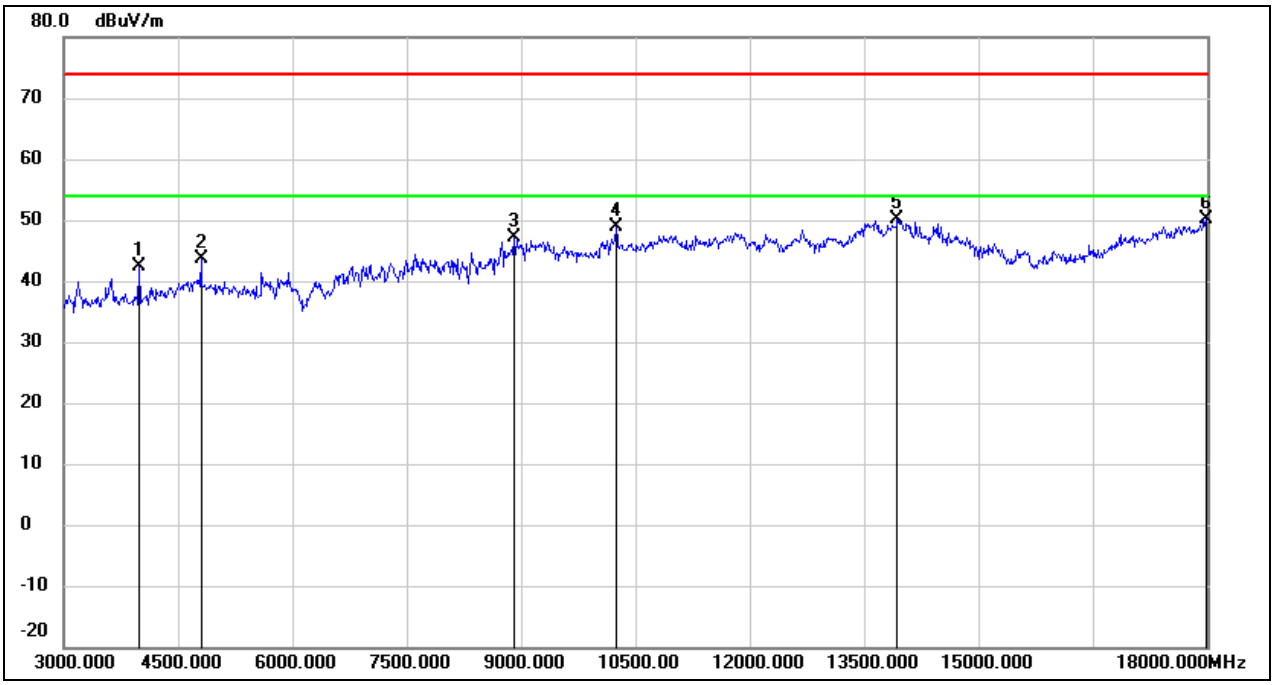
Test Mode:	802.11g	Channel:	2462
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6600.000	36.65	4.71	41.36	74.00	-32.64	peak
2	7650.000	37.73	6.33	44.06	74.00	-29.94	peak
3	9270.000	35.54	10.59	46.13	74.00	-27.87	peak
4	11820.000	30.98	17.47	48.45	74.00	-25.55	peak
5	13935.000	28.30	21.82	50.12	74.00	-23.88	peak
6	17940.000	24.15	25.34	49.49	74.00	-24.51	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

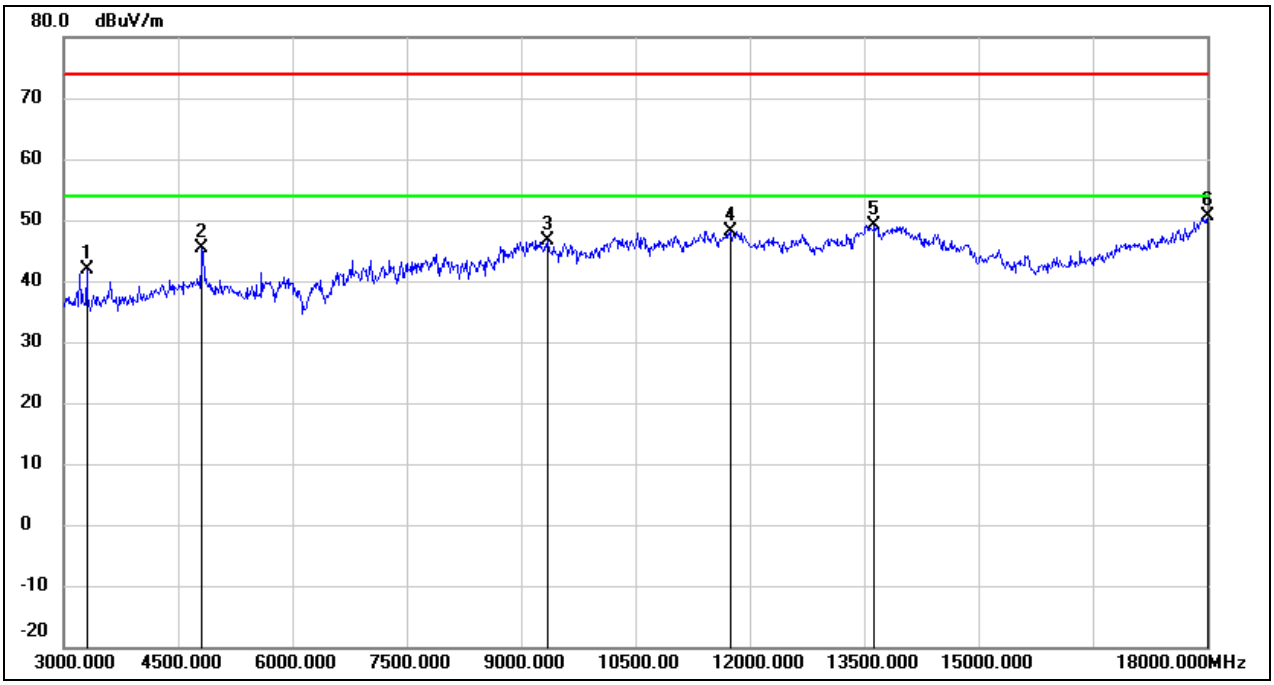
Test Mode:	802.11g	Channel:	2462
Polarity:	Vertical	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3990.000	46.21	-3.82	42.39	74.00	-31.61	peak
2	4800.000	44.01	-0.31	43.70	74.00	-30.30	peak
3	8910.000	37.36	9.82	47.18	74.00	-26.82	peak
4	10245.000	36.31	12.48	48.79	74.00	-25.21	peak
5	13935.000	28.19	21.82	50.01	74.00	-23.99	peak
6	17985.000	24.63	25.60	50.23	74.00	-23.77	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

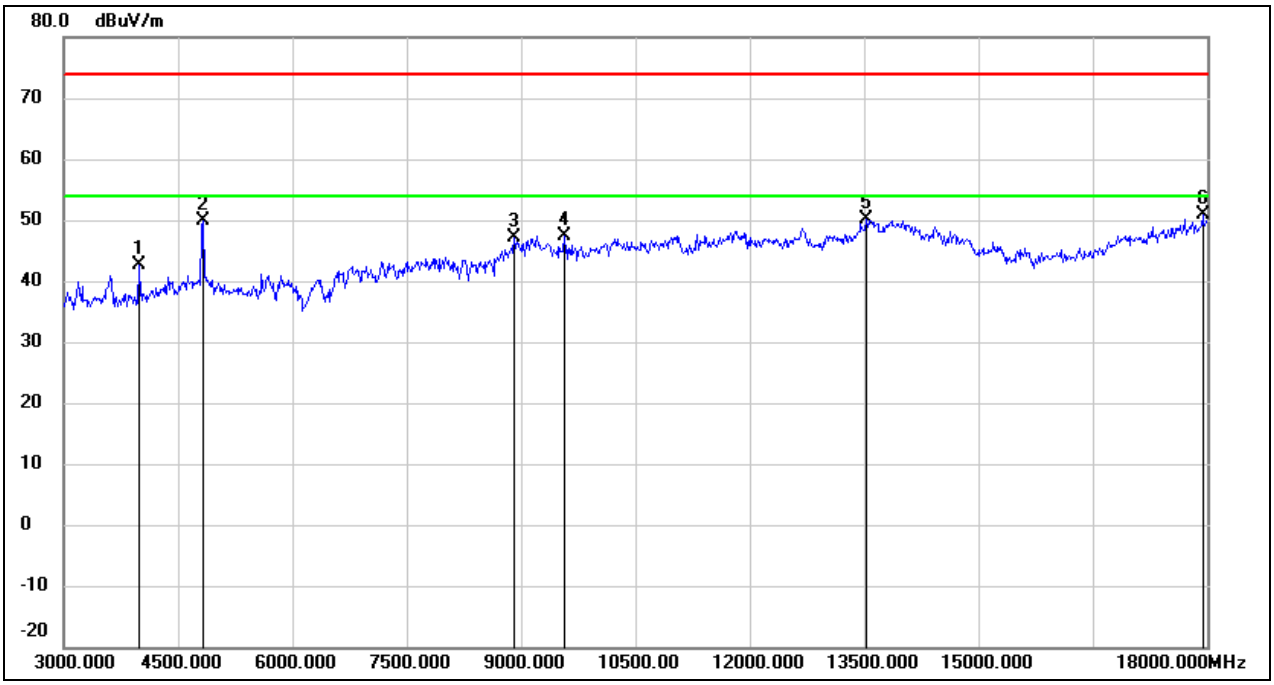
Test Mode:	802.11n HT20	Channel:	2412
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3300.000	47.05	-5.07	41.98	74.00	-32.02	peak
2	4815.000	45.71	-0.26	45.45	74.00	-28.55	peak
3	9345.000	35.97	10.63	46.60	74.00	-27.40	peak
4	11745.000	30.86	17.27	48.13	74.00	-25.87	peak
5	13635.000	27.94	21.19	49.13	74.00	-24.87	peak
6	18000.000	25.03	25.69	50.72	74.00	-23.28	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

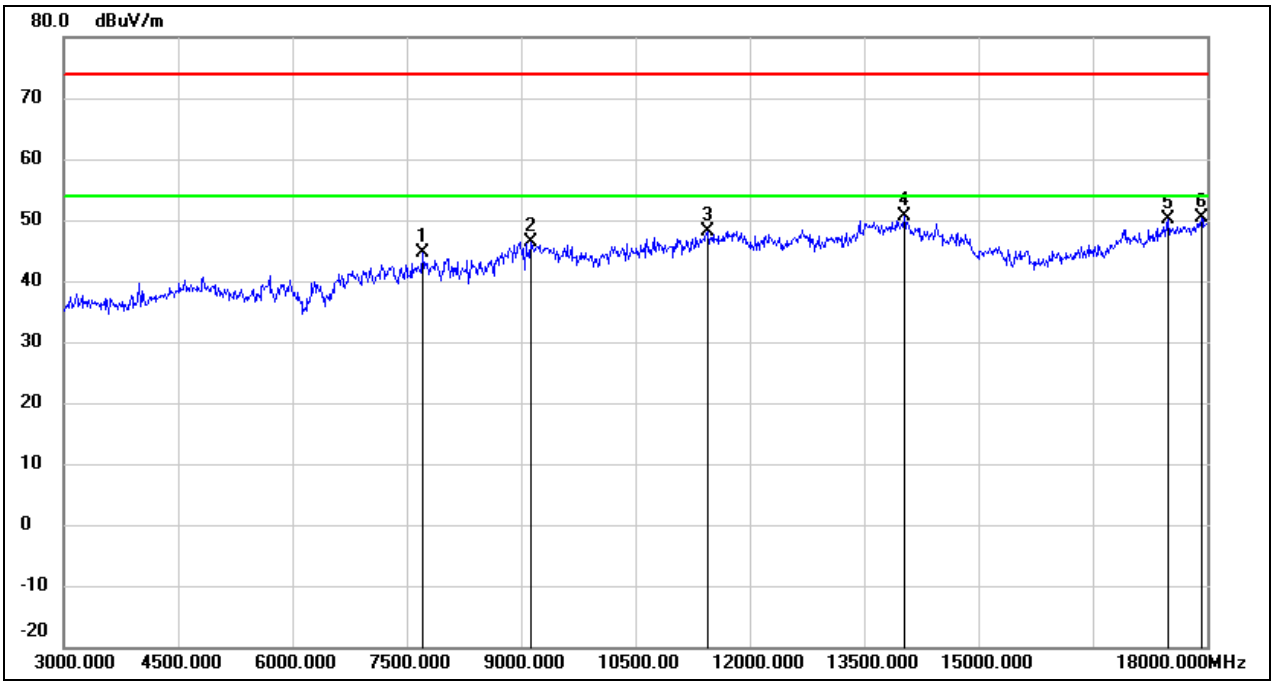
Test Mode:	802.11n HT20	Channel:	2412
Polarity:	Vertical	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3990.000	46.34	-3.82	42.52	74.00	-31.48	peak
2	4830.000	50.16	-0.20	49.96	74.00	-24.04	peak
3	8910.000	37.33	9.82	47.15	74.00	-26.85	peak
4	9570.000	36.55	10.87	47.42	74.00	-26.58	peak
5	13530.000	29.18	20.96	50.14	74.00	-23.86	peak
6	17940.000	25.57	25.34	50.91	74.00	-23.09	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

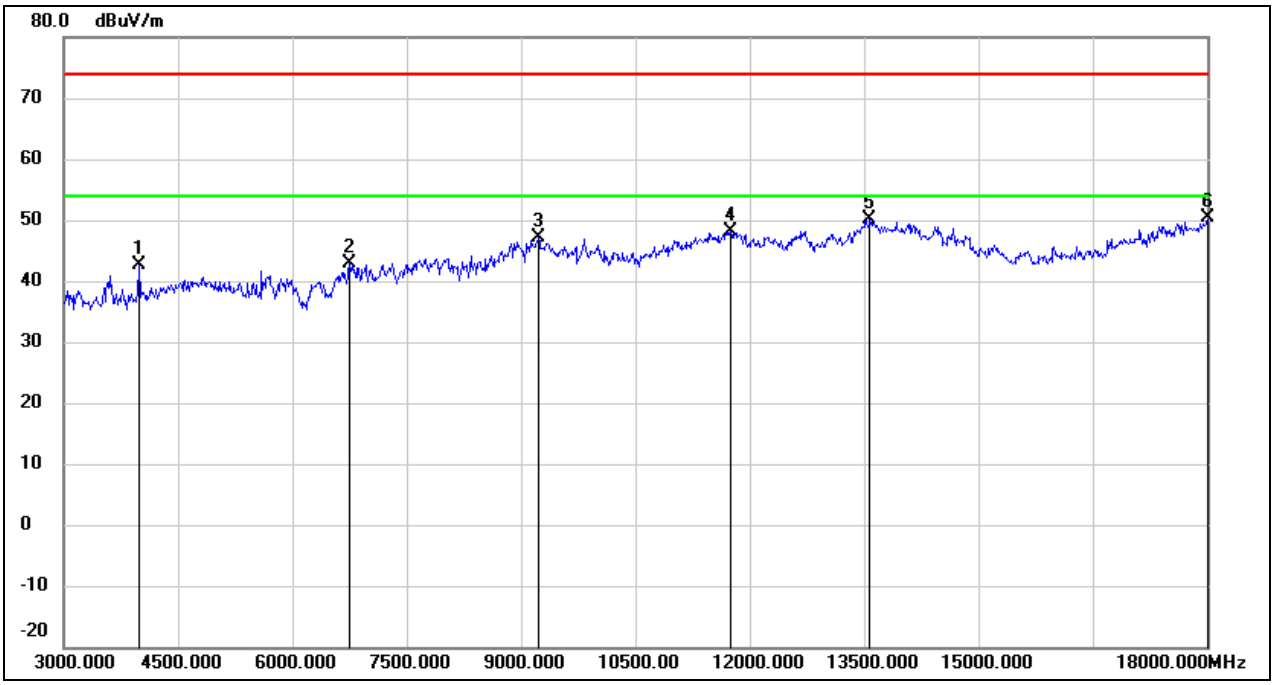
Test Mode:	802.11n HT20	Channel:	2437
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	7710.000	38.18	6.33	44.51	74.00	-29.49	peak
2	9120.000	35.82	10.53	46.35	74.00	-27.65	peak
3	11445.000	31.74	16.41	48.15	74.00	-25.85	peak
4	14025.000	28.79	21.86	50.65	74.00	-23.35	peak
5	17490.000	27.36	22.69	50.05	74.00	-23.95	peak
6	17925.000	25.07	25.25	50.32	74.00	-23.68	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

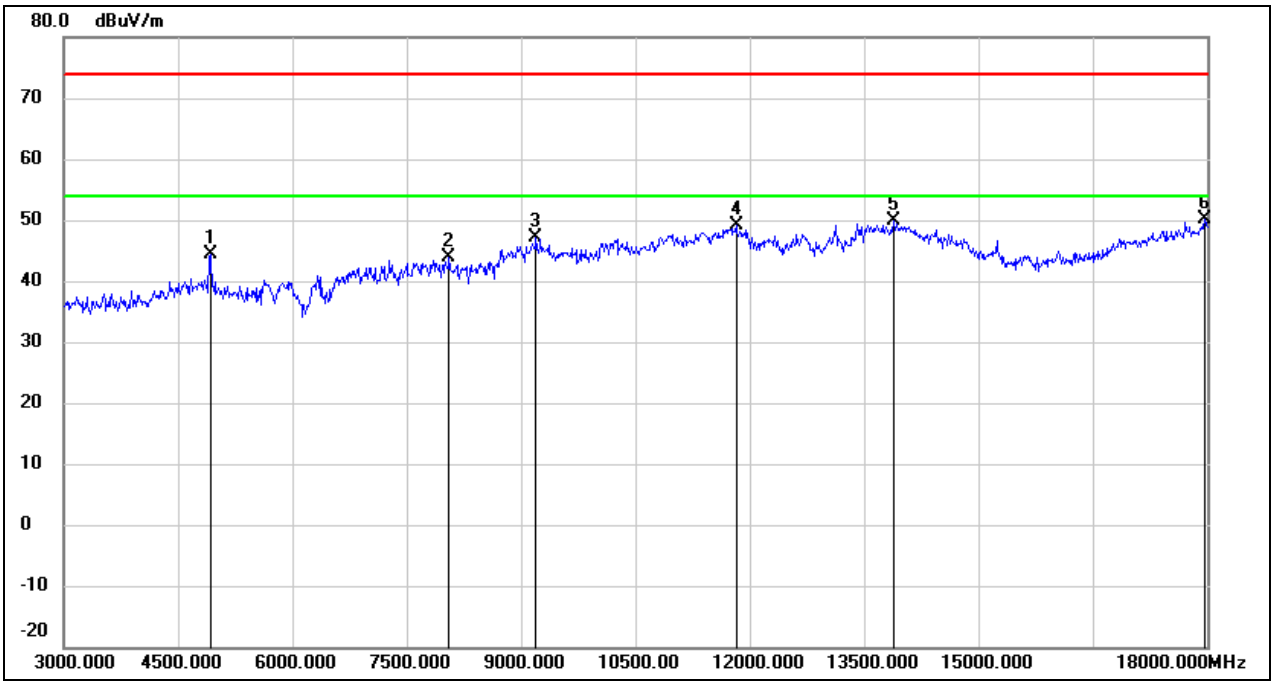
Test Mode:	802.11n HT20	Channel:	2437
Polarity:	Vertical	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3990.000	46.38	-3.82	42.56	74.00	-31.44	peak
2	6750.000	37.41	5.45	42.86	74.00	-31.14	peak
3	9225.000	36.48	10.58	47.06	74.00	-26.94	peak
4	11745.000	30.86	17.27	48.13	74.00	-25.87	peak
5	13575.000	29.07	21.06	50.13	74.00	-23.87	peak
6	18000.000	24.70	25.69	50.39	74.00	-23.61	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

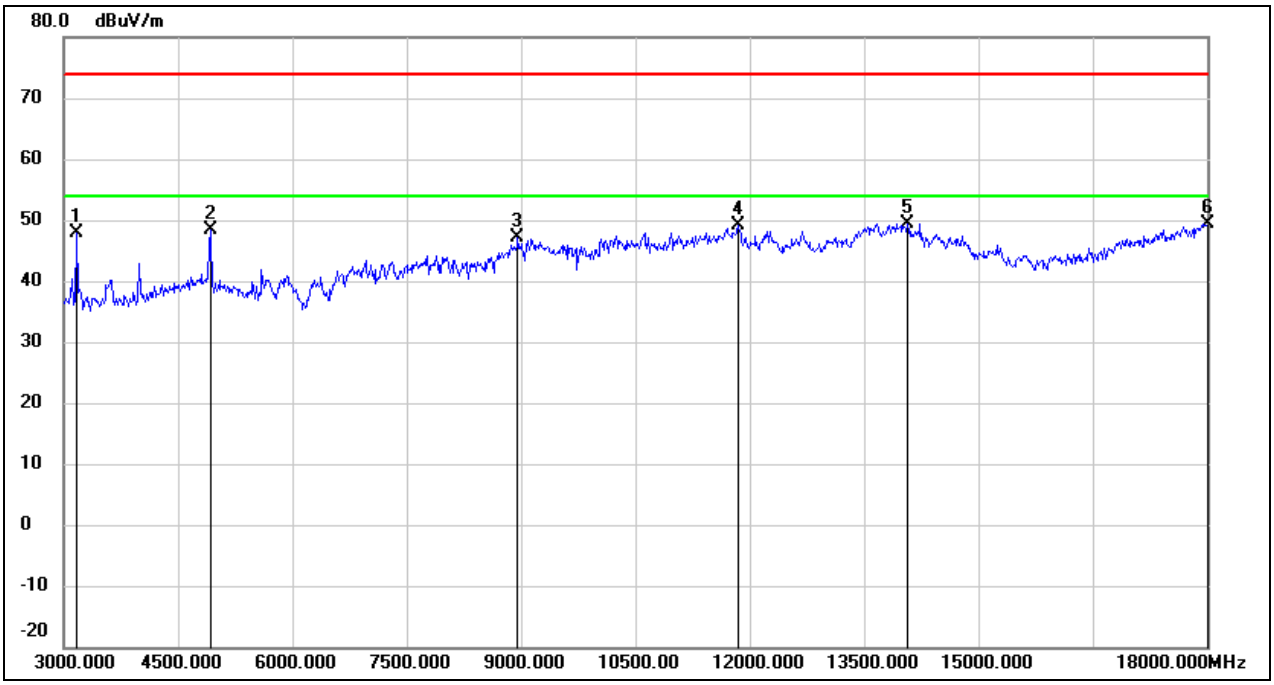
Test Mode:	802.11n HT20	Channel:	2462
Polarity:	Horizontal	Test Voltage:	AC 120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4920.000	44.23	0.14	44.37	74.00	-29.63	peak
2	8055.000	37.40	6.37	43.77	74.00	-30.23	peak
3	9195.000	36.48	10.56	47.04	74.00	-26.96	peak
4	11820.000	31.68	17.47	49.15	74.00	-24.85	peak
5	13890.000	28.11	21.72	49.83	74.00	-24.17	peak
6	17970.000	24.70	25.51	50.21	74.00	-23.79	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

Test Mode:	802.11n HT20	Channel:	2462
Polarity:	Vertical	Test Voltage:	AC 120V_60Hz

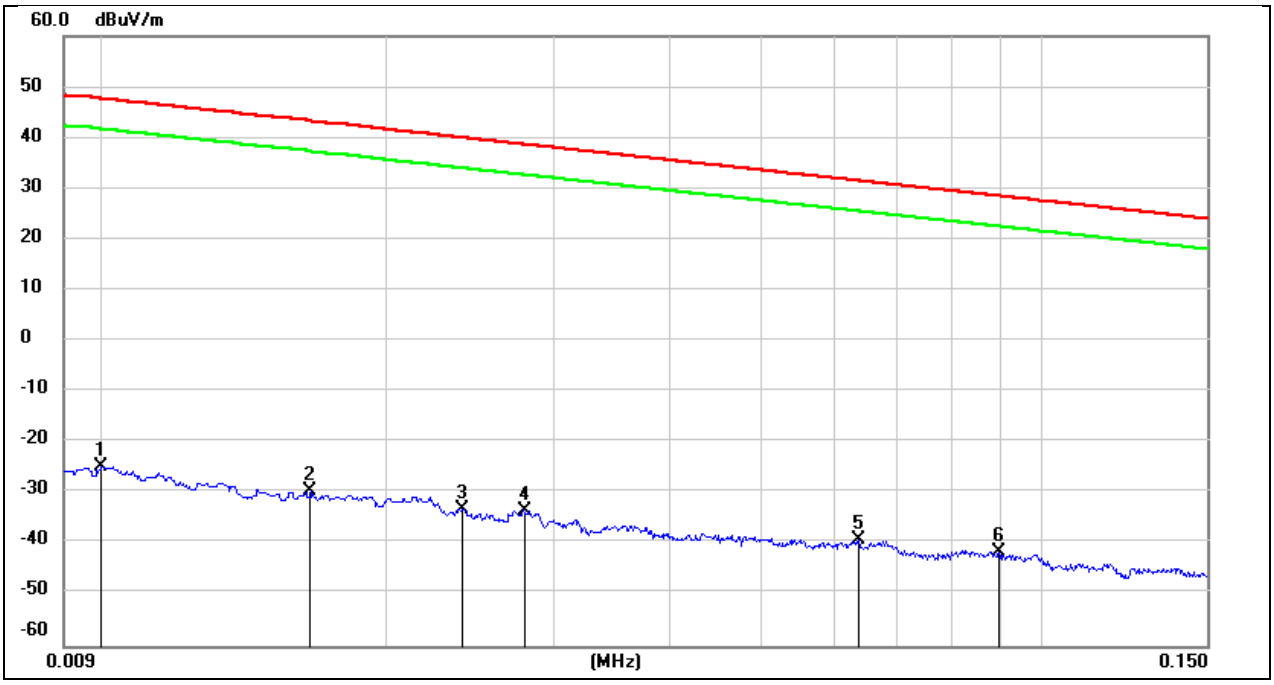


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3165.000	53.01	-5.15	47.86	74.00	-26.14	peak
2	4920.000	48.21	0.14	48.35	74.00	-25.65	peak
3	8955.000	37.08	10.16	47.24	74.00	-26.76	peak
4	11850.000	31.57	17.56	49.13	74.00	-24.87	peak
5	14070.000	27.77	21.67	49.44	74.00	-24.56	peak
6	18000.000	23.62	25.69	49.31	74.00	-24.69	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

8.4. SPURIOUS EMISSIONS(9 KHZ~30 MHZ)

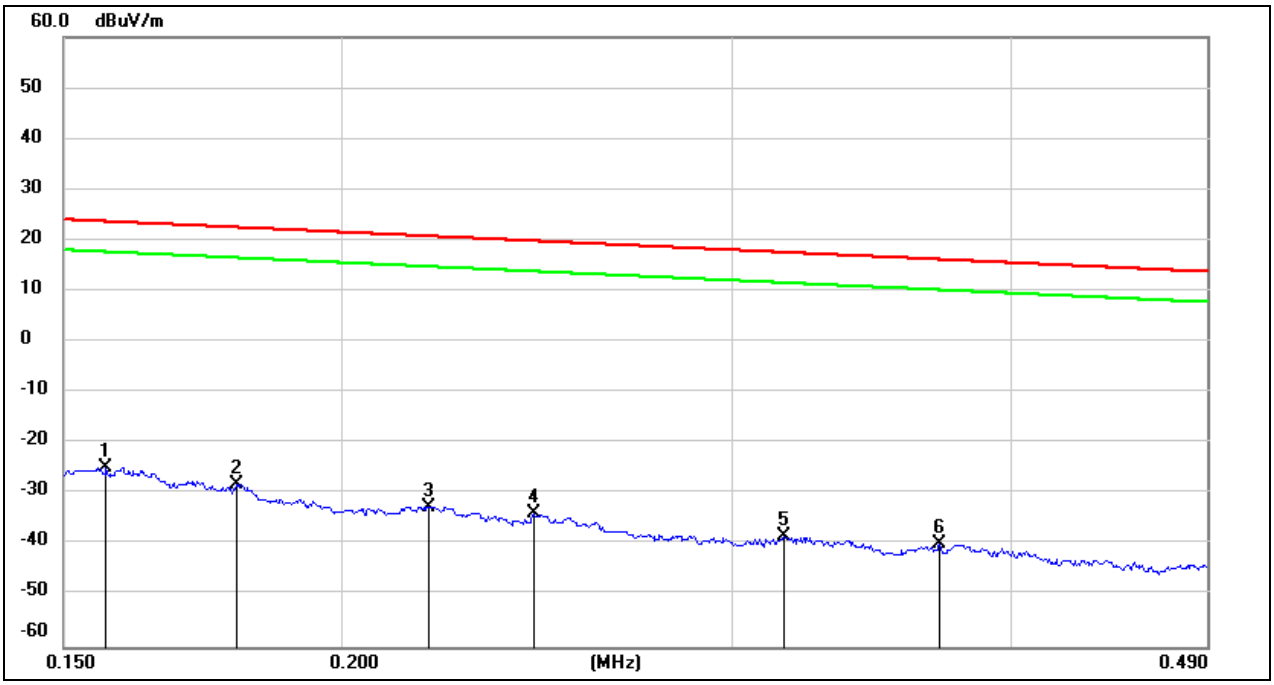
Test Mode:	802.11b	Channel:	2412
Polarity:	Horizontal		



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0100	76.72	-101.40	-24.68	47.60	-72.28	peak
2	0.0165	71.84	-101.37	-29.53	43.25	-72.78	peak
3	0.0240	68.32	-101.36	-33.04	40.00	-73.04	peak
4	0.0280	67.79	-101.38	-33.59	38.66	-72.25	peak
5	0.0636	62.31	-101.54	-39.23	31.53	-70.76	peak
6	0.0898	60.03	-101.71	-41.68	28.54	-70.22	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

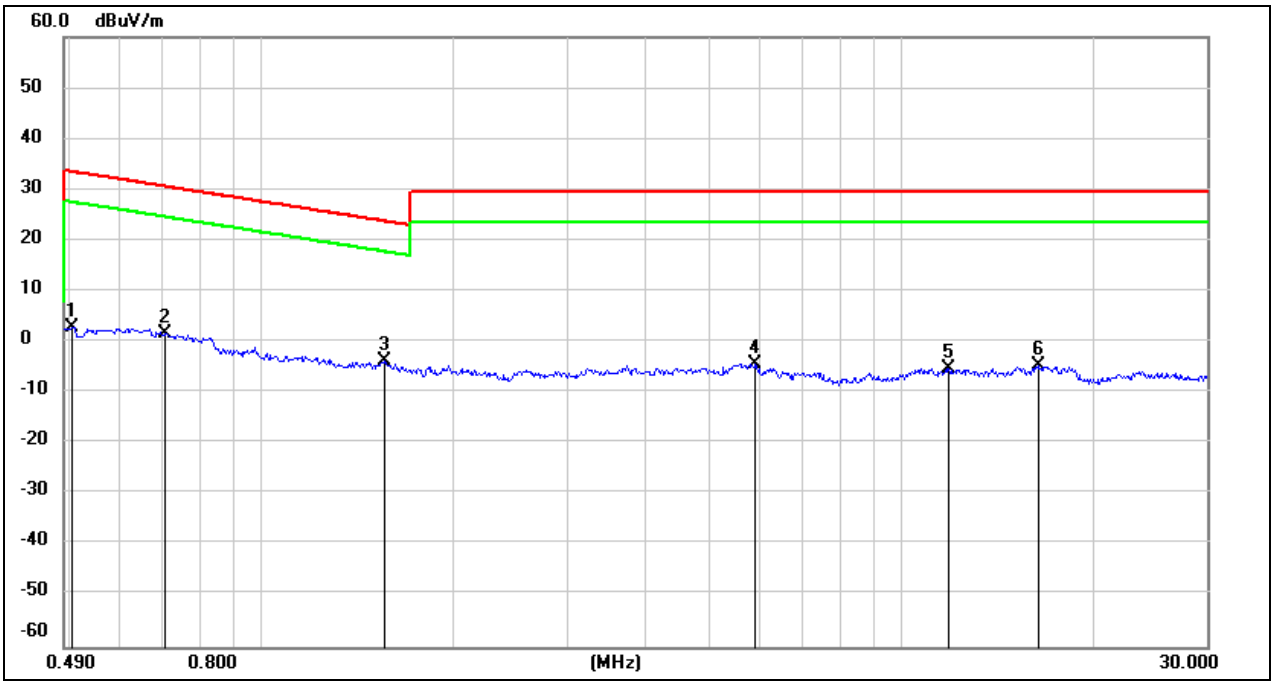
Test Mode:	802.11b	Channel:	2412
Polarity:	Horizontal		



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.1567	76.95	-101.65	-24.70	23.70	-48.40	peak
2	0.1794	73.77	-101.68	-27.91	22.53	-50.44	peak
3	0.2190	69.27	-101.75	-32.48	20.79	-53.27	peak
4	0.2442	68.03	-101.79	-33.76	19.85	-53.61	peak
5	0.3163	63.70	-101.87	-38.17	17.60	-55.77	peak
6	0.3714	62.28	-101.93	-39.65	16.20	-55.85	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

Test Mode:	802.11b	Channel:	2412
Polarity:	Horizontal		

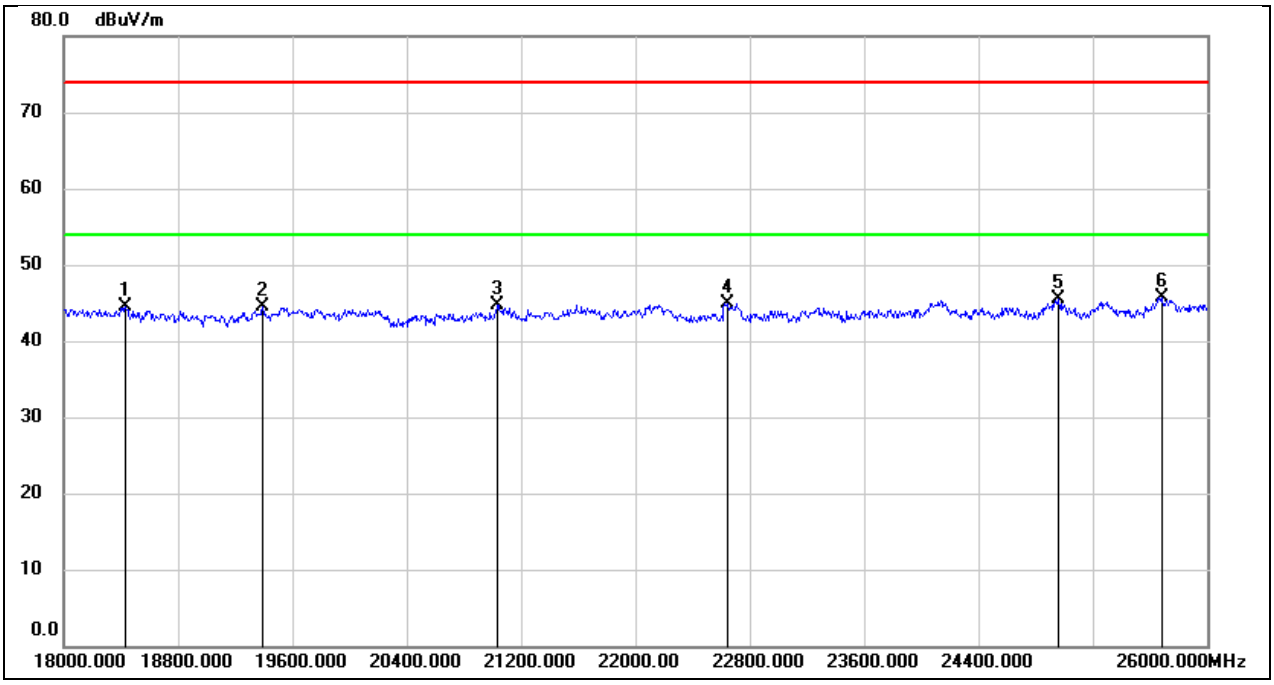


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.5039	64.93	-62.07	2.86	33.56	-30.70	peak
2	0.7066	63.90	-62.11	1.79	30.62	-28.83	peak
3	1.5564	58.18	-62.02	-3.84	23.76	-27.60	peak
4	5.9198	56.93	-61.36	-4.43	29.54	-33.97	peak
5	11.8513	55.56	-60.88	-5.32	29.54	-34.86	peak
6	16.3959	56.17	-60.96	-4.79	29.54	-34.33	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

8.5. SPURIOUS EMISSIONS(18 GHZ~26 GHZ)

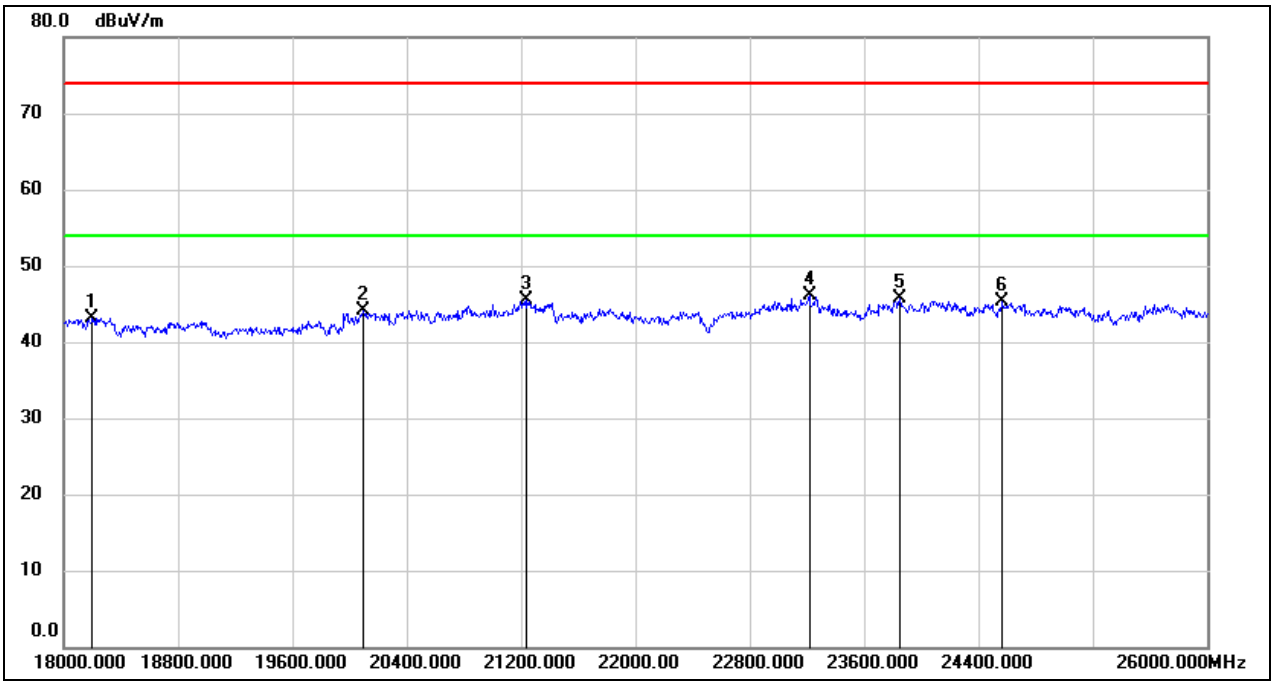
Test Mode:	802.11b	Channel:	2412
Polarity:	Horizontal		



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	18432.000	49.76	-5.34	44.42	74.00	-29.58	peak
2	19392.000	50.12	-5.57	44.55	74.00	-29.45	peak
3	21032.000	49.65	-4.87	44.78	74.00	-29.22	peak
4	22648.000	48.76	-3.77	44.99	74.00	-29.01	peak
5	24960.000	47.64	-2.14	45.50	74.00	-28.50	peak
6	25680.000	46.71	-0.93	45.78	74.00	-28.22	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

Test Mode:	802.11b	Channel:	2412
Polarity:	Vertical		

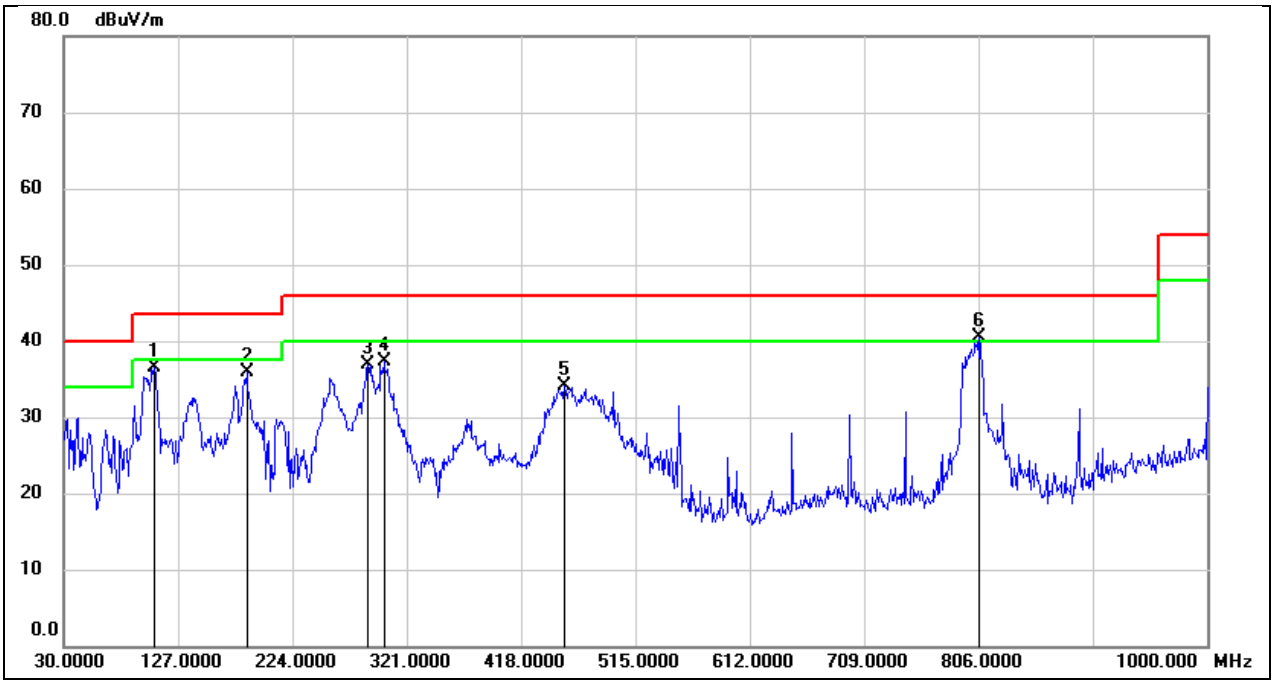


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	18200.000	48.58	-5.52	43.06	74.00	-30.94	peak
2	20096.000	49.60	-5.51	44.09	74.00	-29.91	peak
3	21240.000	50.27	-4.77	45.50	74.00	-28.50	peak
4	23216.000	49.51	-3.38	46.13	74.00	-27.87	peak
5	23848.000	48.68	-3.03	45.65	74.00	-28.35	peak
6	24568.000	47.60	-2.33	45.27	74.00	-28.73	peak

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

8.6. SPURIOUS EMISSIONS(30 MHZ~1 GHZ)

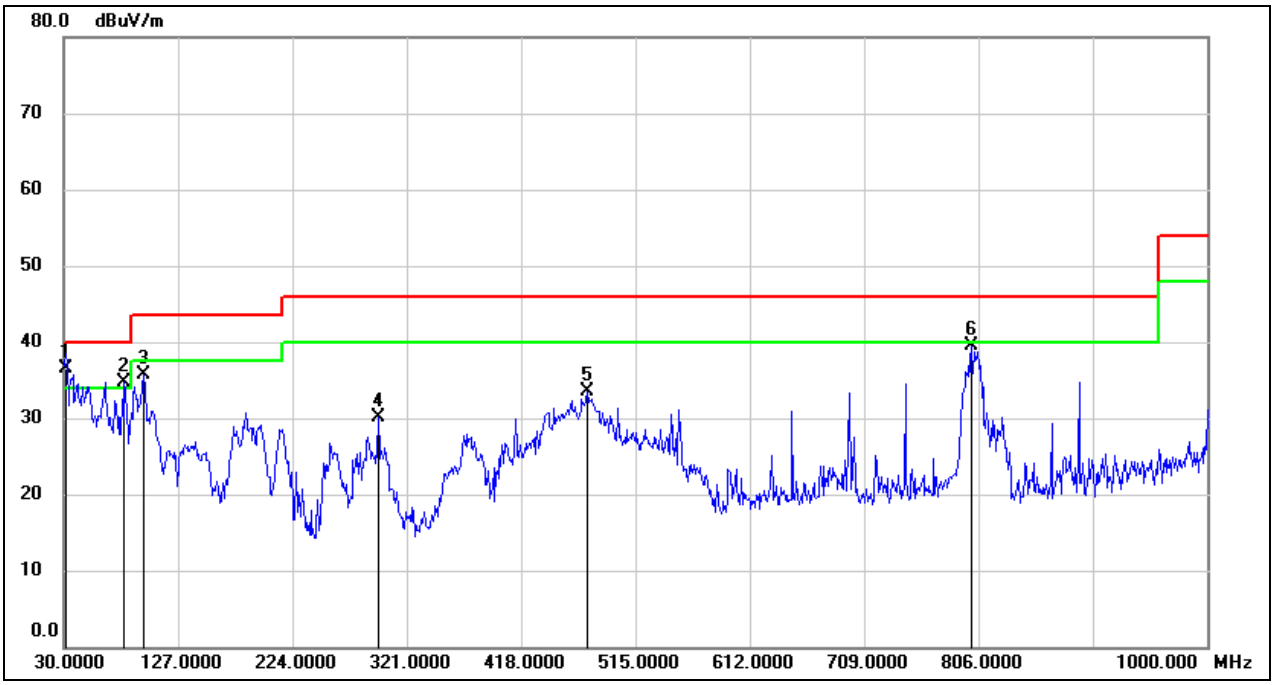
Test Mode:	802.11b	Channel:	2412
Polarity:	Horizontal	Test Voltage:	AC120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	106.6300	57.21	-20.65	36.56	43.50	-6.94	QP
2	185.2000	52.72	-16.75	35.97	43.50	-7.53	QP
3	288.0200	53.06	-16.06	37.00	46.00	-9.00	QP
4	301.6000	52.54	-15.26	37.28	46.00	-8.72	QP
5	454.8600	46.41	-12.31	34.10	46.00	-11.90	QP
6	806.9699	47.62	-7.20	40.42	46.00	-5.58	QP

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

Test Mode:	802.11b	Channel:	2412
Polarity:	Vertical	Test Voltage:	AC120V_60Hz



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	31.9400	55.71	-19.13	36.58	40.00	-3.42	QP
2	81.4100	56.21	-21.44	34.77	40.00	-5.23	QP
3	97.9000	56.94	-21.30	35.64	43.50	-7.86	QP
4	296.7500	45.69	-15.50	30.19	46.00	-15.81	QP
5	474.2600	45.43	-11.93	33.50	46.00	-12.50	QP
6	800.1800	46.90	-7.33	39.57	46.00	-6.43	QP

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

9. ANTENNA REQUIREMENT

REQUIREMENT

Please refer to FCC part 15.203
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Please refer to FCC part 15.247(b)(4)
The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

DESCRIPTION

Pass

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

10. AC POWER LINE CONDUCTED EMISSION

LIMITS

Please refer to CFR 47 FCC §15.207 (a) and ISED RSS-Gen Clause 8.8

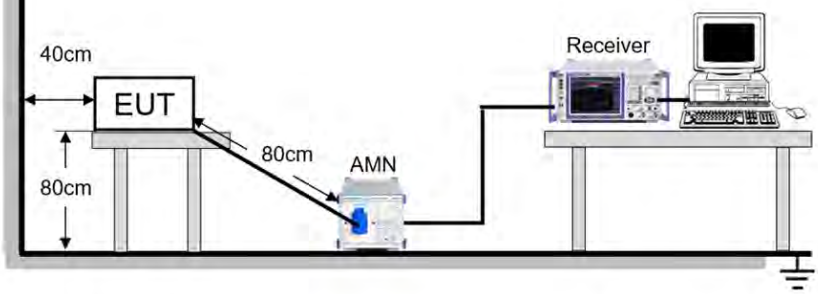
FREQUENCY (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

TEST PROCEDURE

The EUT is put on a table of non-conducting material that is 80 cm high. The vertical conducting wall of shielding is located 40 cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9 kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

TEST SETUP



TEST ENVIRONMENT

Temperature	21.5℃	Relative Humidity	53.2%
Atmosphere Pressure	101kPa	Test Voltage	AC 120V 60Hz

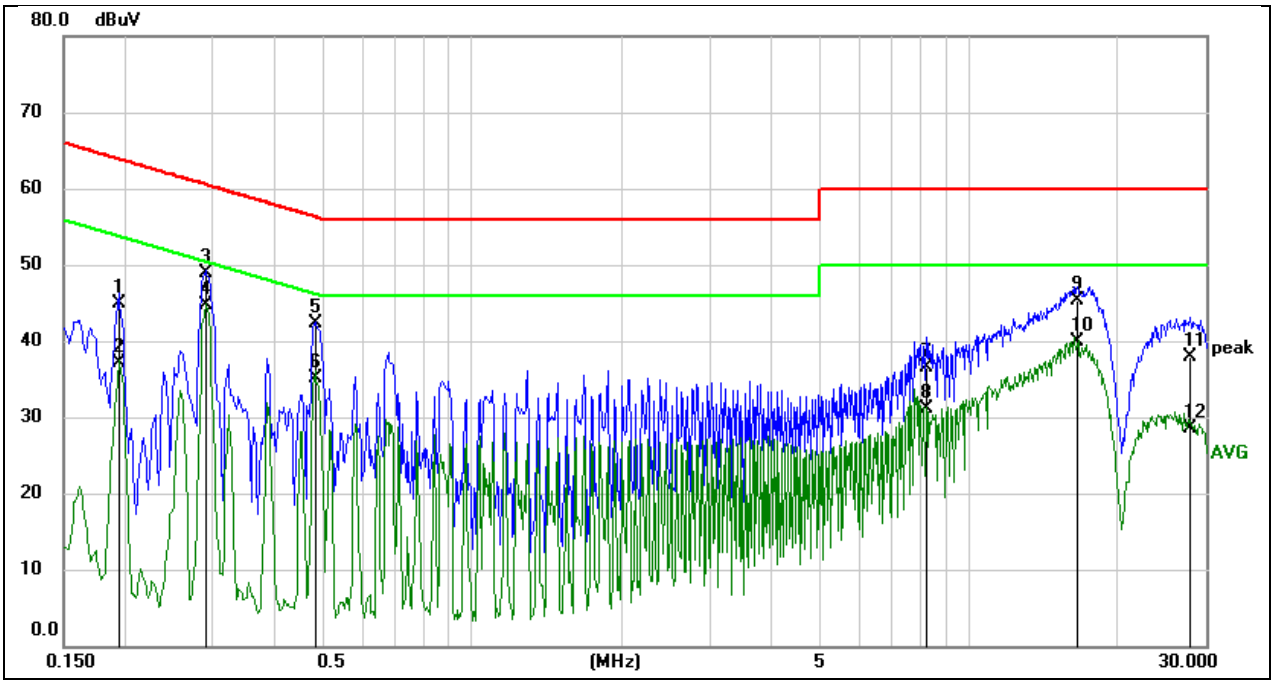
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

TEST DATE / ENGINEER

Test Date	January 16, 2023	Test By	Karl Wu

TEST RESULTS

Test Mode:	802.11b	Channel:	2412
Line:	Line		



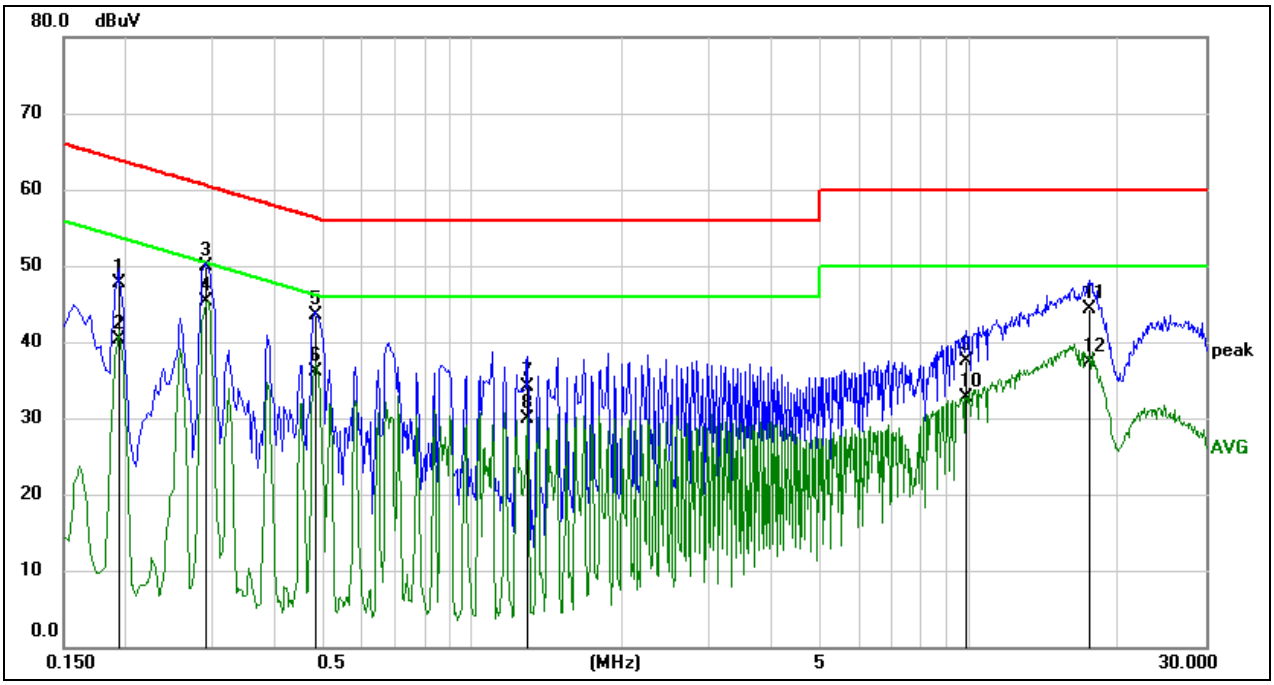
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1928	35.32	9.59	44.91	63.92	-19.01	QP
2	0.1928	27.59	9.59	37.18	53.92	-16.74	AVG
3	0.2904	39.32	9.59	48.91	60.51	-11.60	QP
4	0.2904	35.08	9.59	44.67	50.51	-5.84	AVG
5	0.4848	32.71	9.60	42.31	56.26	-13.95	QP
6	0.4848	25.50	9.60	35.10	46.26	-11.16	AVG
7	8.1988	26.88	9.71	36.59	60.00	-23.41	QP
8	8.1988	21.32	9.71	31.03	50.00	-18.97	AVG
9	16.5239	35.48	9.76	45.24	60.00	-14.76	QP
10	16.5239	30.12	9.76	39.88	50.00	-10.12	AVG
11	27.9488	28.11	9.75	37.86	60.00	-22.14	QP
12	27.9488	18.74	9.75	28.49	50.00	-21.51	AVG

Note:
1. Result = Reading + Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

Note: All the modes have been tested, only the worst data was recorded in the report.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

Test Mode:	802.11b	Channel:	2412
Line:	Neutral		



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1934	38.09	9.59	47.68	63.89	-16.21	QP
2	0.1934	30.73	9.59	40.32	53.89	-13.57	AVG
3	0.2908	40.27	9.59	49.86	60.50	-10.64	QP
4	0.2908	35.72	9.59	45.31	50.50	-5.19	AVG
5	0.4862	33.86	9.60	43.46	56.23	-12.77	QP
6	0.4862	26.54	9.60	36.14	46.23	-10.09	AVG
7	1.2911	24.54	9.61	34.15	56.00	-21.85	QP
8	1.2911	20.28	9.61	29.89	46.00	-16.11	AVG
9	9.8762	27.84	9.72	37.56	60.00	-22.44	QP
10	9.8762	22.90	9.72	32.62	50.00	-17.38	AVG
11	17.4906	34.57	9.79	44.36	60.00	-15.64	QP
12	17.4906	27.61	9.79	37.40	50.00	-12.60	AVG

Note:
1. Result = Reading + Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

Note: All the modes have been tested, only the worst data was recorded in the report.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

11. TEST DATA

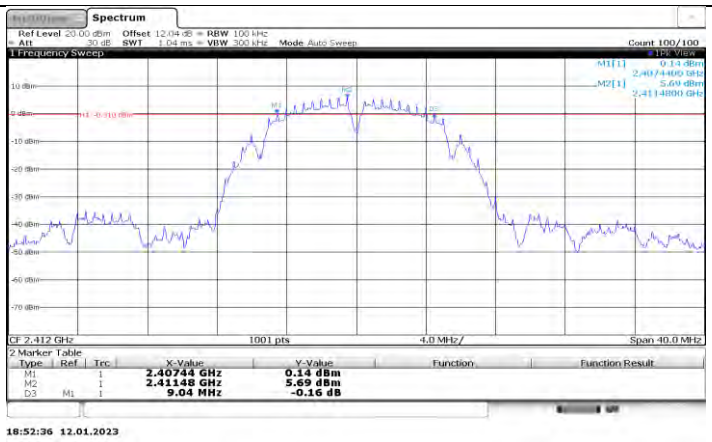
11.1. APPENDIX A: DTS BANDWIDTH

11.1.1. Test Result

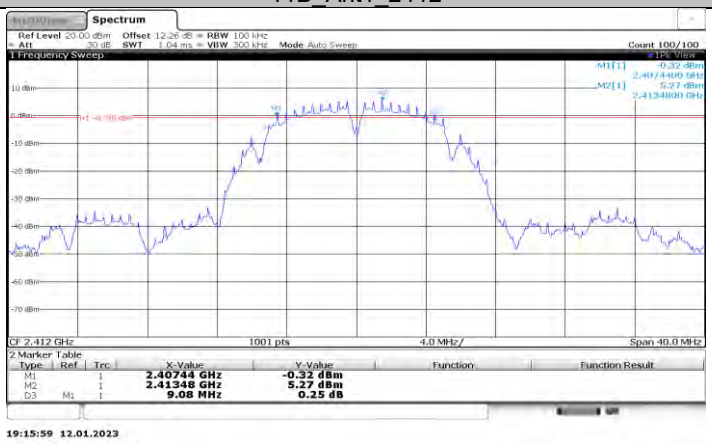
Test Mode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	9.04	2407.44	2416.48	0.5	PASS
	Ant2	2412	9.08	2407.44	2416.52	0.5	PASS
	Ant1	2437	8.56	2432.92	2441.48	0.5	PASS
	Ant2	2437	9.08	2432.44	2441.52	0.5	PASS
	Ant1	2462	9.04	2457.44	2466.48	0.5	PASS
	Ant2	2462	9.04	2457.44	2466.48	0.5	PASS
11G	Ant1	2412	16.32	2403.80	2420.12	0.5	PASS
	Ant2	2412	16.36	2403.80	2420.16	0.5	PASS
	Ant1	2437	16.36	2428.80	2445.16	0.5	PASS
	Ant2	2437	16.36	2428.80	2445.16	0.5	PASS
	Ant1	2462	16.36	2453.80	2470.16	0.5	PASS
	Ant2	2462	16.36	2453.80	2470.16	0.5	PASS
11N20MIMO	Ant1	2412	17.60	2403.16	2420.76	0.5	PASS
	Ant2	2412	16.00	2404.16	2420.16	0.5	PASS
	Ant1	2437	17.56	2428.20	2445.76	0.5	PASS
	Ant2	2437	16.00	2429.16	2445.16	0.5	PASS
	Ant1	2462	17.60	2453.16	2470.76	0.5	PASS
	Ant2	2462	16.04	2454.12	2470.16	0.5	PASS

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

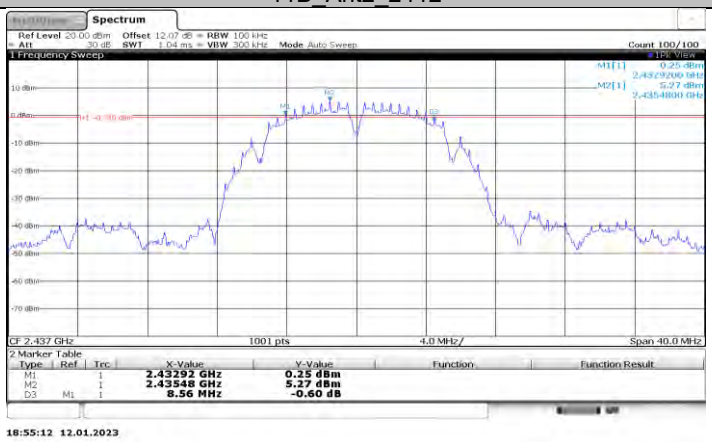
11.1.2. Test Graphs



11B_Ant1_2412

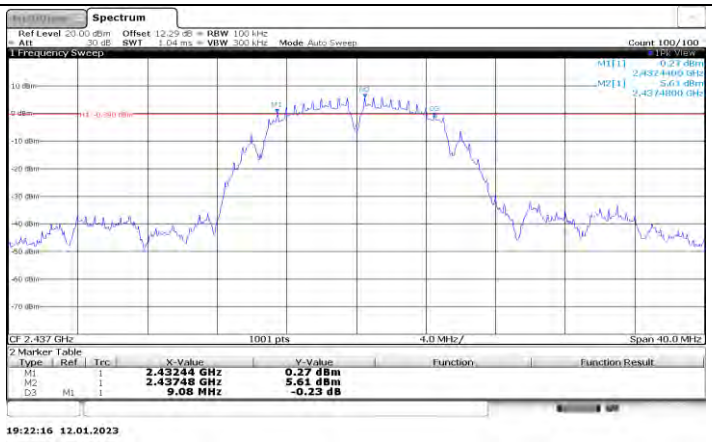


11B_Ant2_2412

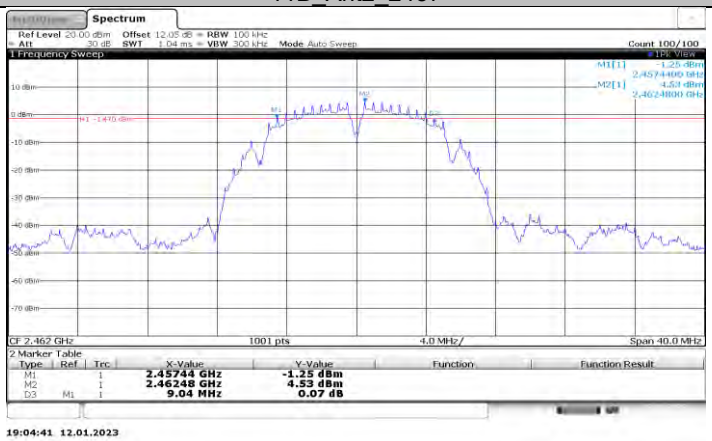


11B_Ant1_2437

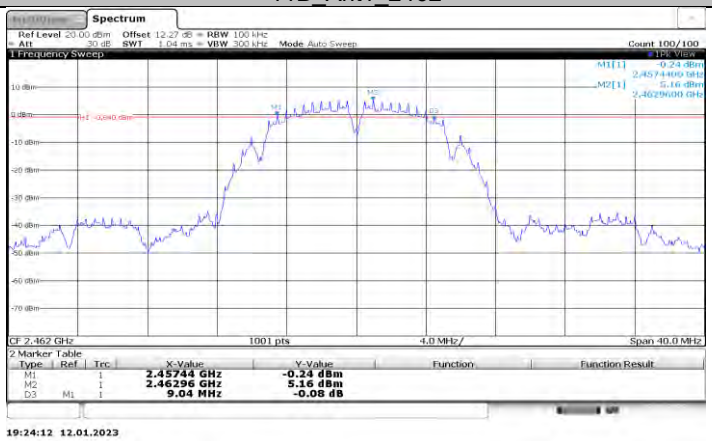
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11B_Ant2_2437

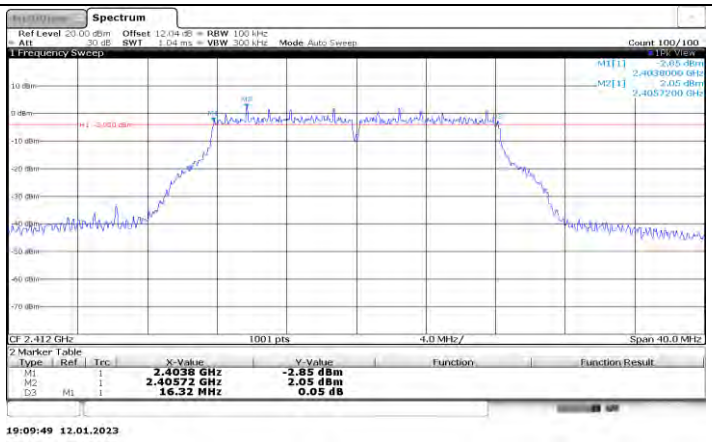


11B_Ant1_2462

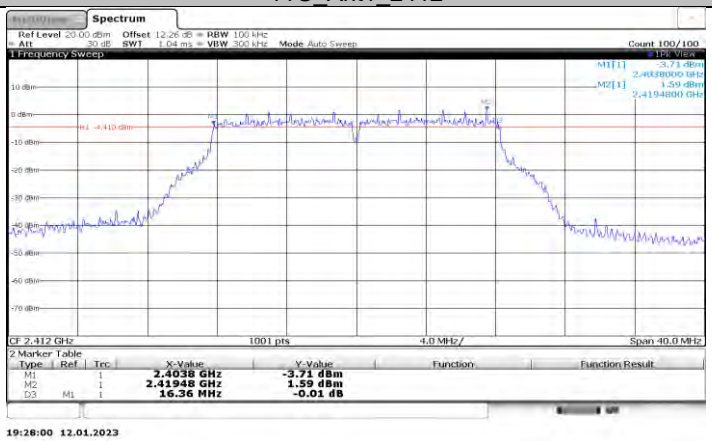


11B_Ant2_2462

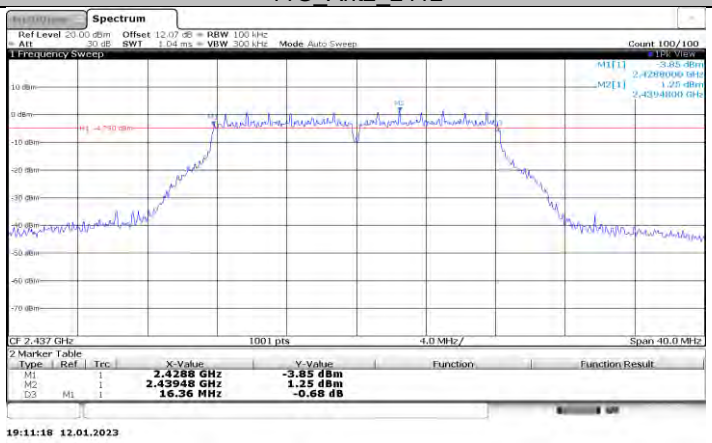
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11G_Ant1_2412

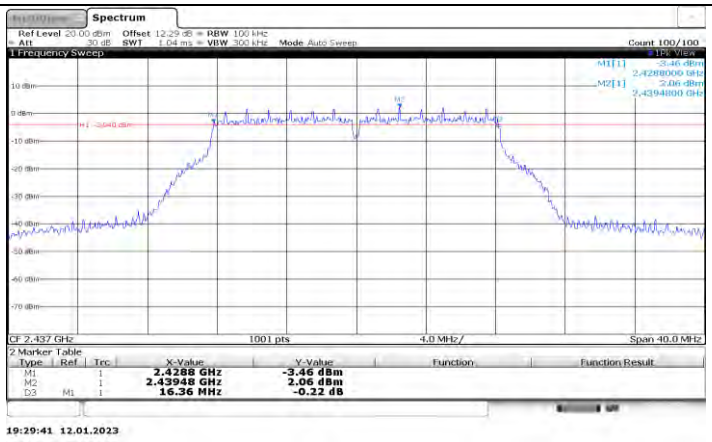


11G_Ant2_2412

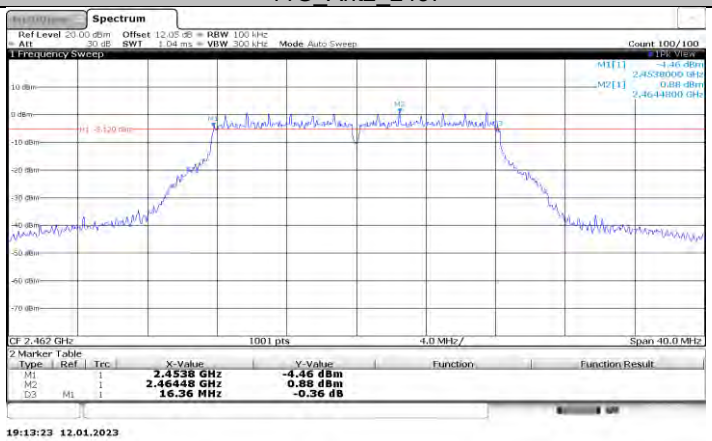


11G_Ant1_2437

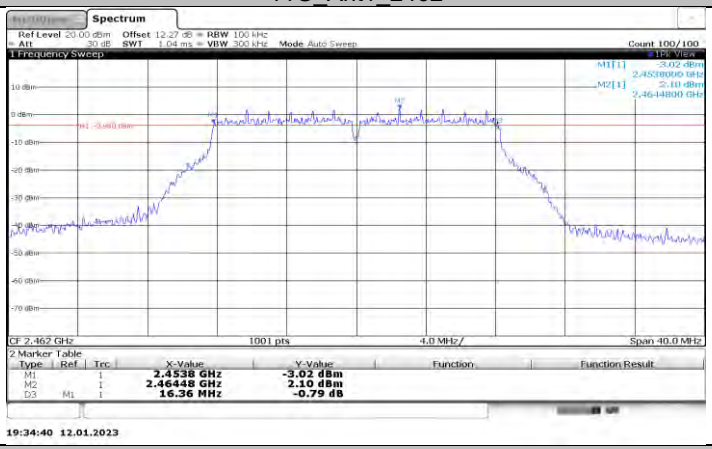
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11G_Ant2_2437

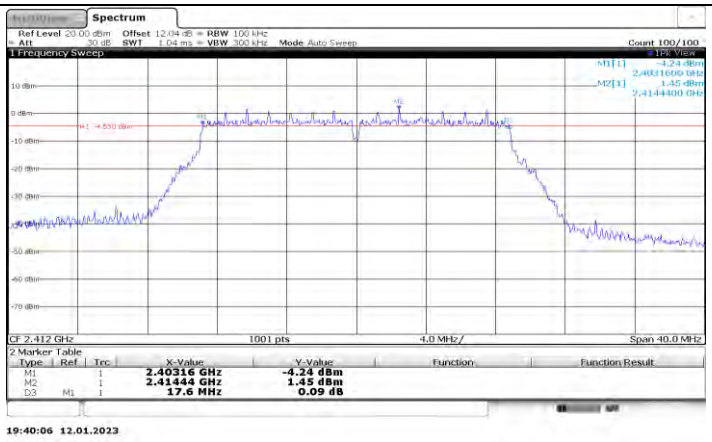


11G_Ant1_2462

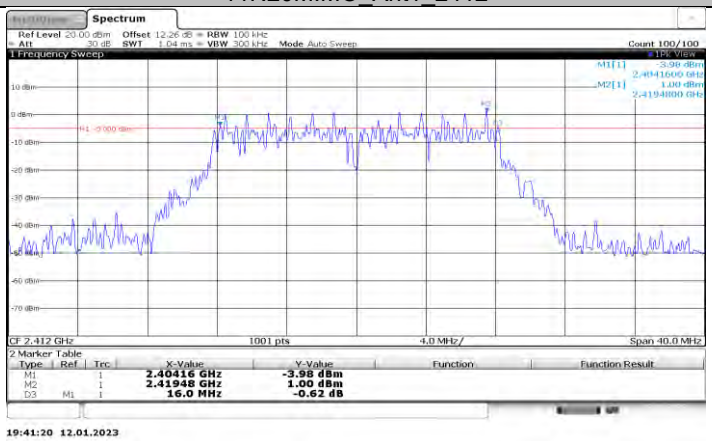


11G_Ant2_2462

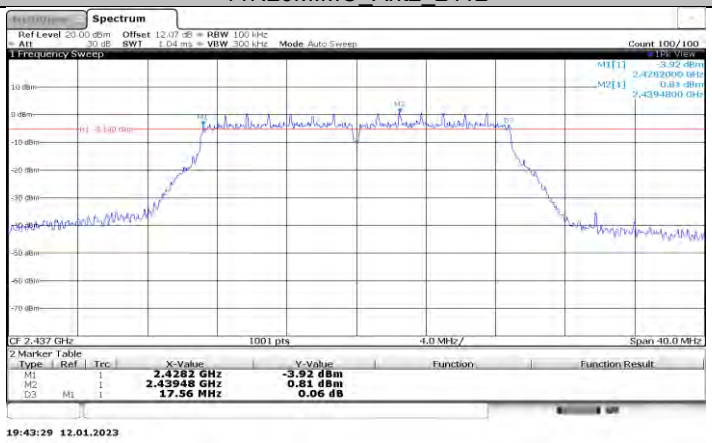
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11N20MIMO_Ant1_2412

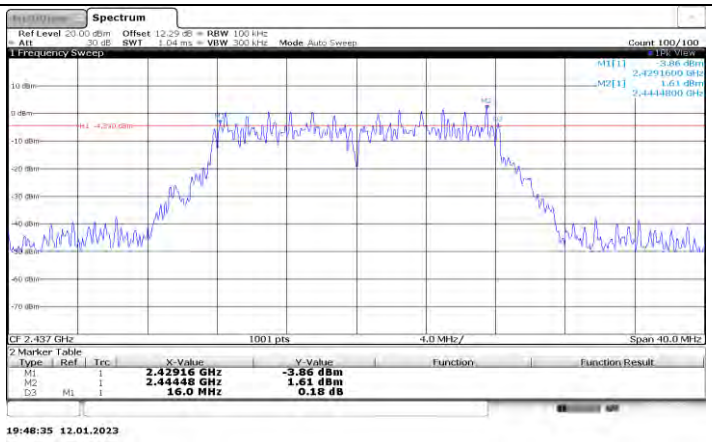


11N20MIMO_Ant2_2412

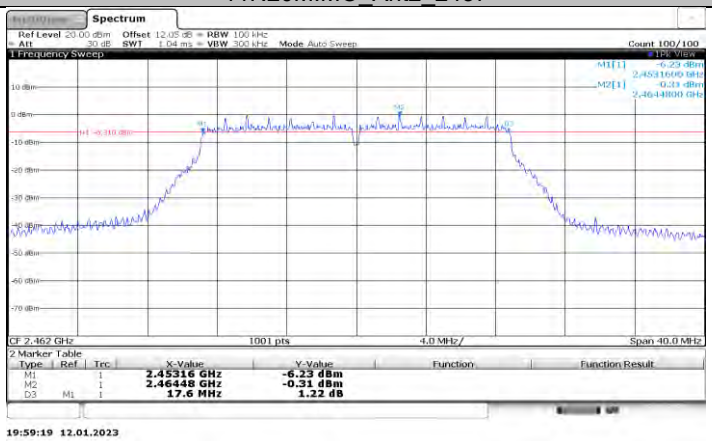


11N20MIMO_Ant1_2437

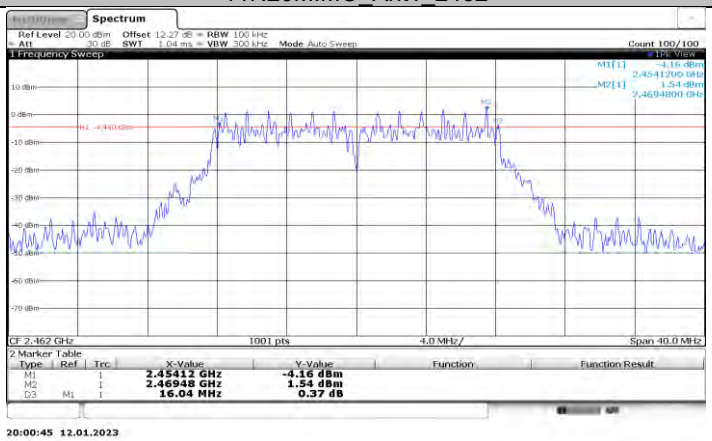
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11N20MIMO_Ant2_2437



11N20MIMO_Ant1_2462



11N20MIMO_Ant2_2462

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

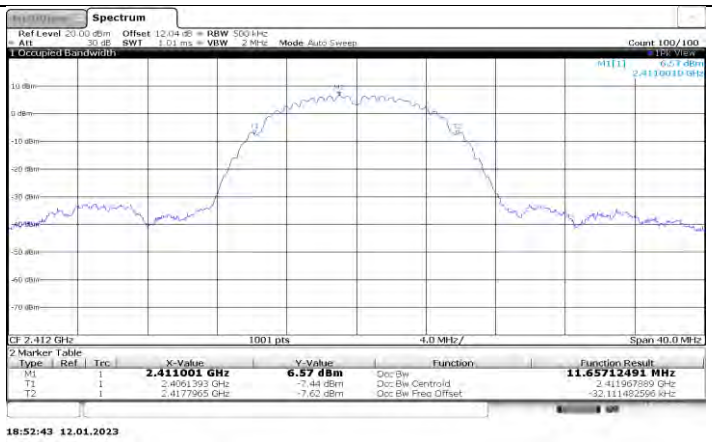
11.2. APPENDIX B: OCCUPIED CHANNEL BANDWIDTH

11.2.1. Test Result

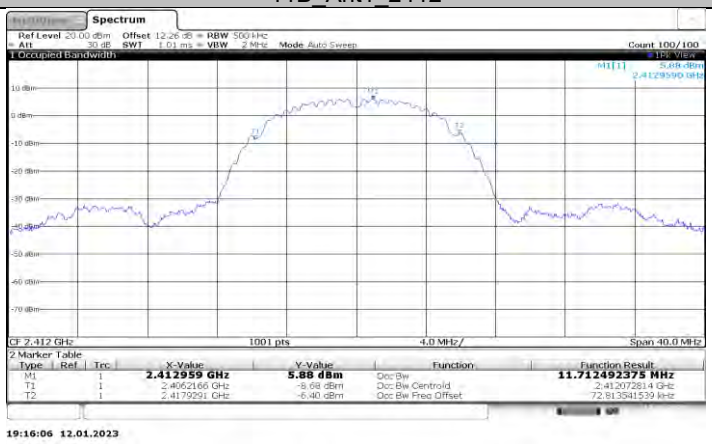
Test Mode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Verdict
11B	Ant1	2412	11.657	2406.1393	2417.7965	PASS
	Ant2	2412	11.712	2406.2166	2417.9291	PASS
	Ant1	2437	11.567	2431.2438	2442.8104	PASS
	Ant2	2437	11.703	2431.2173	2442.9206	PASS
	Ant1	2462	11.493	2456.2870	2467.7802	PASS
	Ant2	2462	11.704	2456.1792	2467.8832	PASS
11G	Ant1	2412	17.784	2403.0035	2420.7877	PASS
	Ant2	2412	17.786	2403.0888	2420.8745	PASS
	Ant1	2437	17.822	2428.0571	2445.8793	PASS
	Ant2	2437	17.805	2428.0810	2445.8862	PASS
	Ant1	2462	17.804	2453.0423	2470.8458	PASS
	Ant2	2462	17.822	2453.0174	2470.8390	PASS
11N20MIMO	Ant1	2412	18.741	2402.5891	2421.3297	PASS
	Ant2	2412	17.391	2403.5024	2420.8934	PASS
	Ant1	2437	18.849	2427.5314	2446.3804	PASS
	Ant2	2437	17.617	2428.4533	2446.0702	PASS
	Ant1	2462	18.767	2452.6221	2471.3895	PASS
	Ant2	2462	17.47	2453.4408	2470.9110	PASS

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

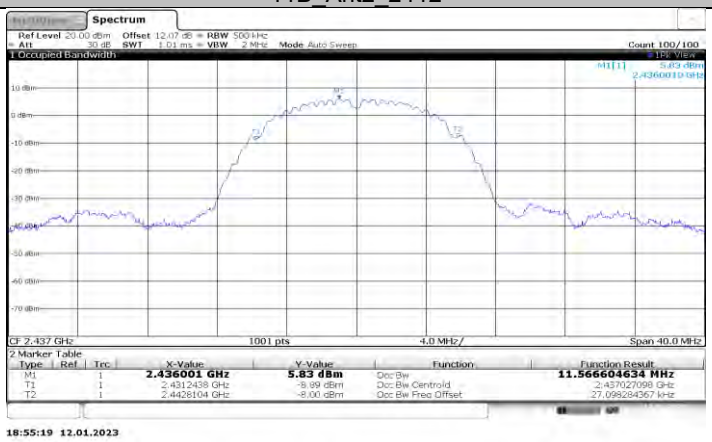
11.2.2. Test Graphs



11B_Ant1_2412

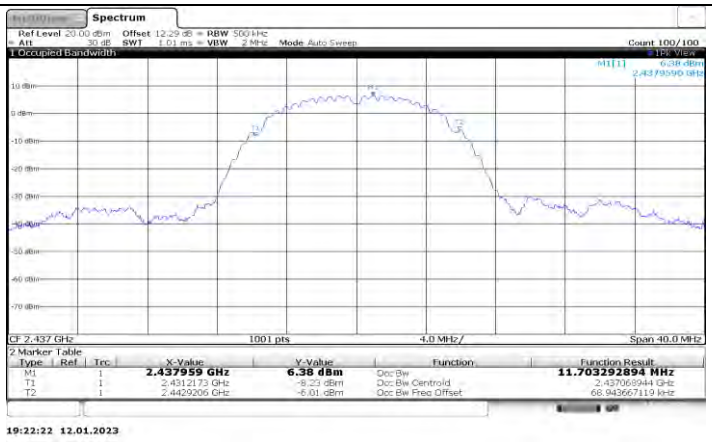


11B_Ant2_2412

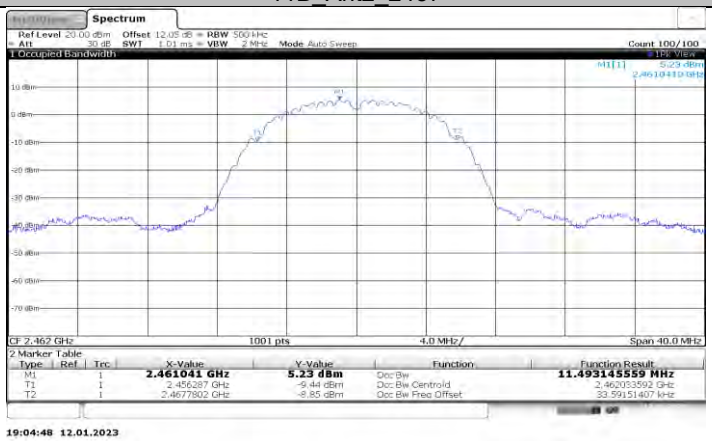


11B_Ant1_2437

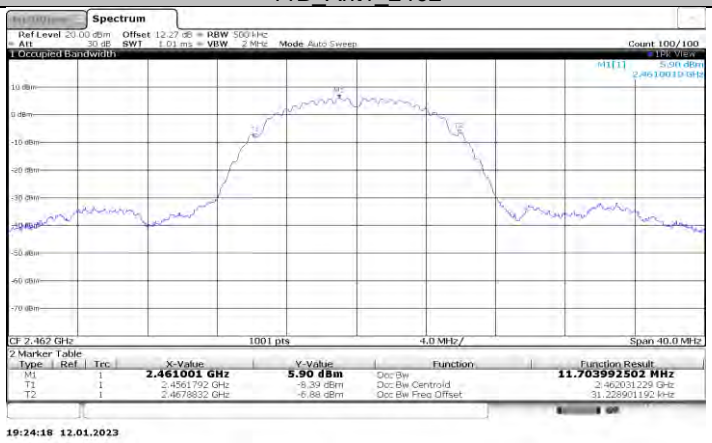
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11B_Ant2_2437

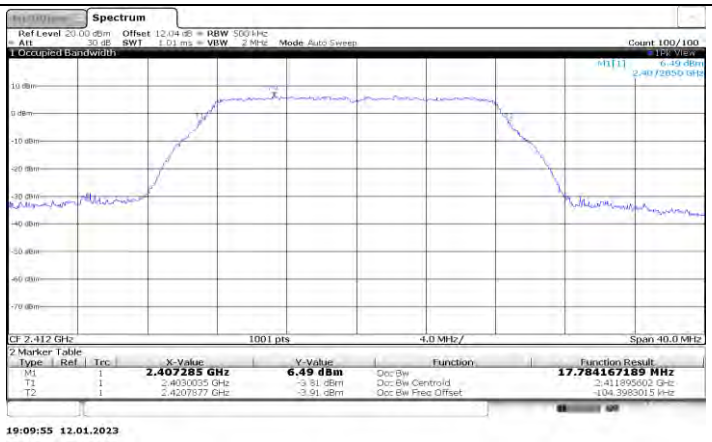


11B_Ant1_2462

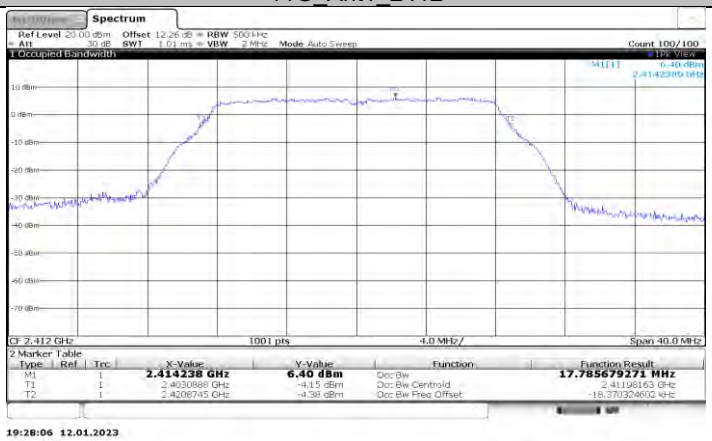


11B_Ant2_2462

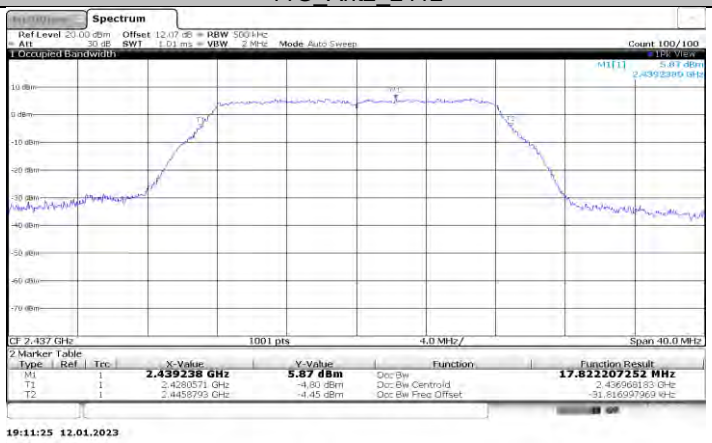
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11G_Ant1_2412

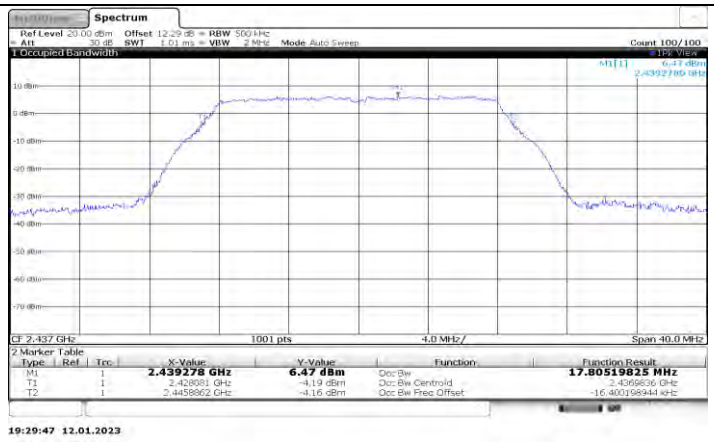


11G_Ant2_2412

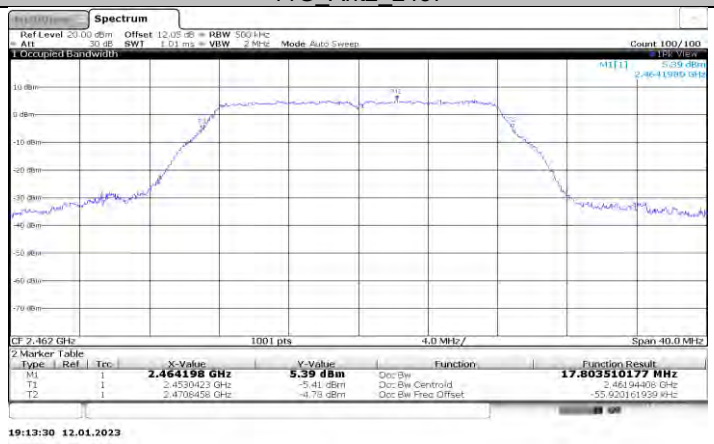


11G_Ant1_2437

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



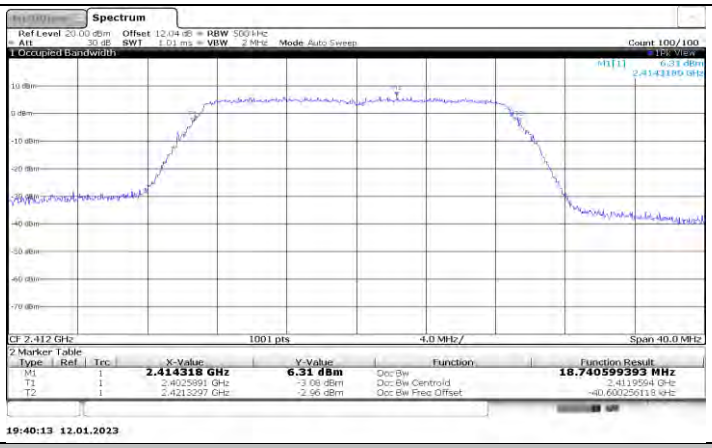
11G_Ant2_2437



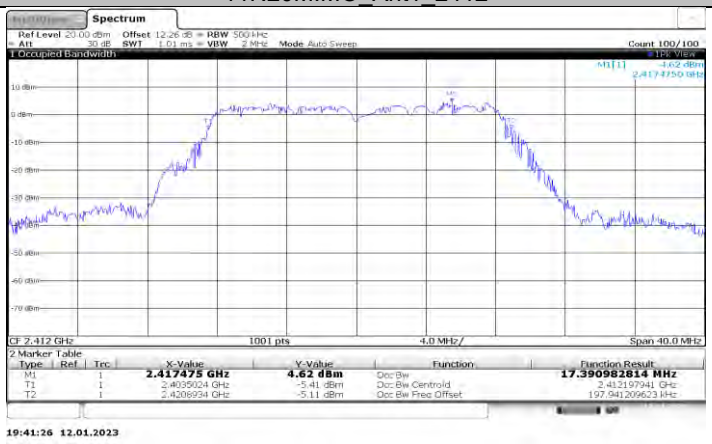
11G_Ant1_2462

11G_Ant2_2462

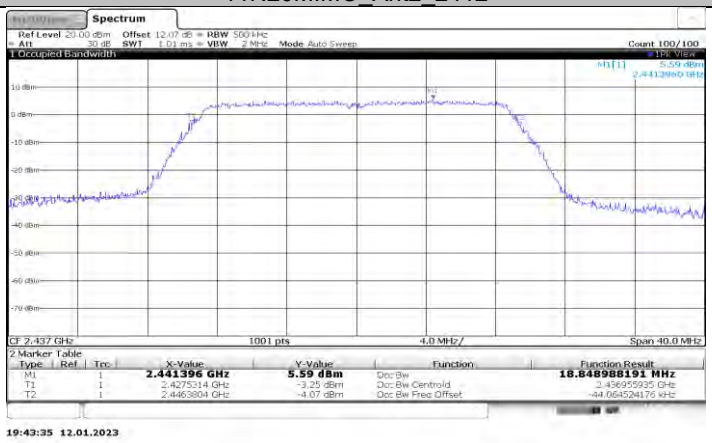
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11N20MIMO_Ant1_2412

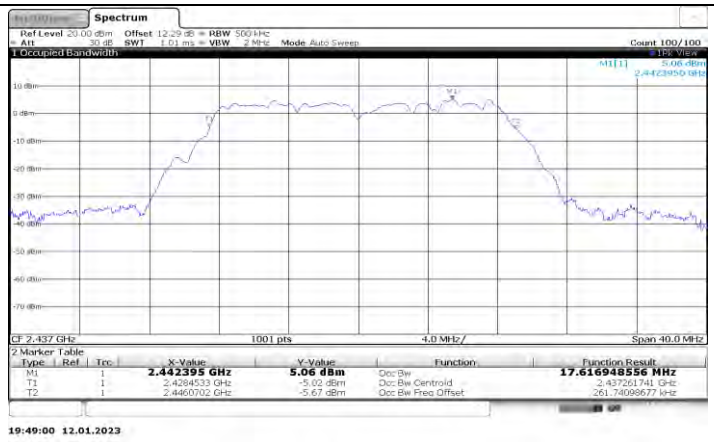


11N20MIMO_Ant2_2412

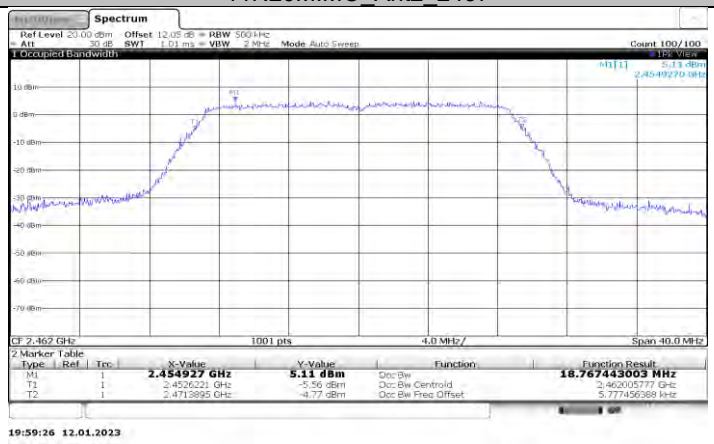


11N20MIMO_Ant1_2437

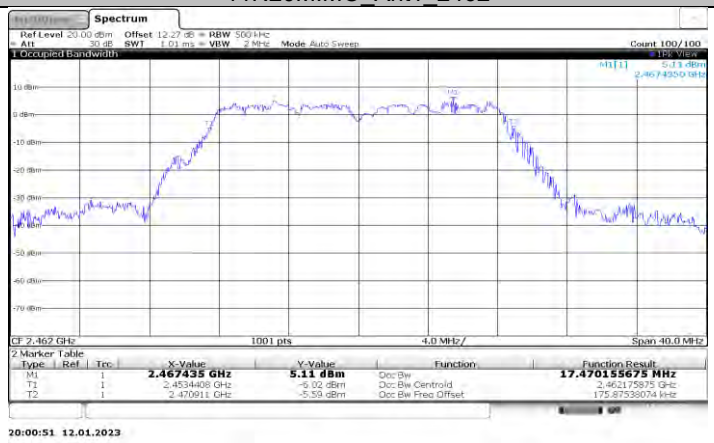
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11N20MIMO_Ant2_2437



11N20MIMO_Ant1_2462



11N20MIMO_Ant2_2462

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

11.3. APPENDIX C: MAXIMUM CONDUCTED OUTPUT POWER

11.3.1. Test Result

Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	2412	14.12	≤30.00	PASS
	Ant2	2412	13.68	≤30.00	PASS
	Ant1	2437	13.37	≤30.00	PASS
	Ant2	2437	14.12	≤30.00	PASS
	Ant1	2462	13.01	≤30.00	PASS
	Ant2	2462	13.68	≤30.00	PASS
11G	Ant1	2412	12.76	≤30.00	PASS
	Ant2	2412	12.43	≤30.00	PASS
	Ant1	2437	12.18	≤30.00	PASS
	Ant2	2437	12.75	≤30.00	PASS
	Ant1	2462	11.66	≤30.00	PASS
	Ant2	2462	12.66	≤30.00	PASS
11N20MIMO	Ant1	2412	11.98	≤30.00	PASS
	Ant2	2412	12.13	≤30.00	PASS
	total	2412	15.07	≤30.00	PASS
	Ant1	2437	11.42	≤30.00	PASS
	Ant2	2437	12.12	≤30.00	PASS
	total	2437	14.79	≤30.00	PASS
	Ant1	2462	10.82	≤30.00	PASS
	Ant2	2462	11.62	≤30.00	PASS
	total	2462	14.25	≤30.00	PASS

Note: 1. Conducted Power=Meas. Level+ Correction Factor
2. The Duty Cycle Factor (refer to section 7.1) had already compensated to the test data.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

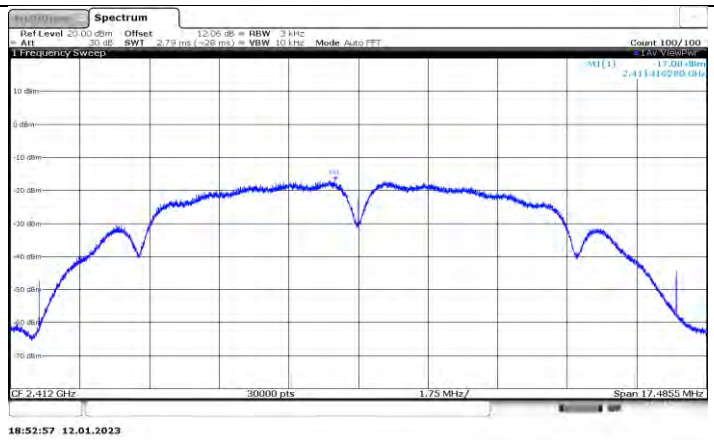
11.4. APPENDIX D: MAXIMUM POWER SPECTRAL DENSITY

11.4.1. Test Result

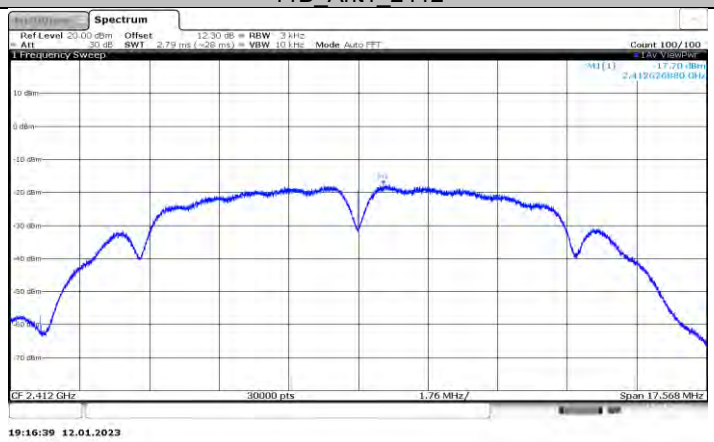
Test Mode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-17.08	≤8.00	PASS
	Ant2	2412	-17.7	≤8.00	PASS
	Ant1	2437	-17.69	≤8.00	PASS
	Ant2	2437	-17.26	≤8.00	PASS
	Ant1	2462	-18.48	≤8.00	PASS
	Ant2	2462	-17.39	≤8.00	PASS
11G	Ant1	2412	-18.03	≤8.00	PASS
	Ant2	2412	-18.32	≤8.00	PASS
	Ant1	2437	-18.54	≤8.00	PASS
	Ant2	2437	-18.07	≤8.00	PASS
	Ant1	2462	-18.77	≤8.00	PASS
	Ant2	2462	-18.05	≤8.00	PASS
11N20MIMO	Ant1	2412	-21.66	≤8.00	PASS
	Ant2	2412	-19.47	≤8.00	PASS
	total	2412	-17.42	≤8.00	PASS
	Ant1	2437	-22.31	≤8.00	PASS
	Ant2	2437	-18.52	≤8.00	PASS
	total	2437	-17.00	≤8.00	PASS
	Ant1	2462	-22.44	≤8.00	PASS
	Ant2	2462	-20.05	≤8.00	PASS
	total	2462	-18.07	≤8.00	PASS

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

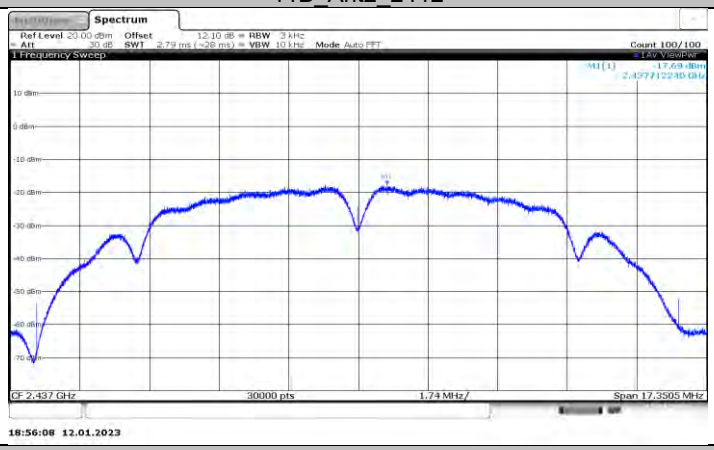
11.4.2. Test Graphs



11B_Ant1_2412

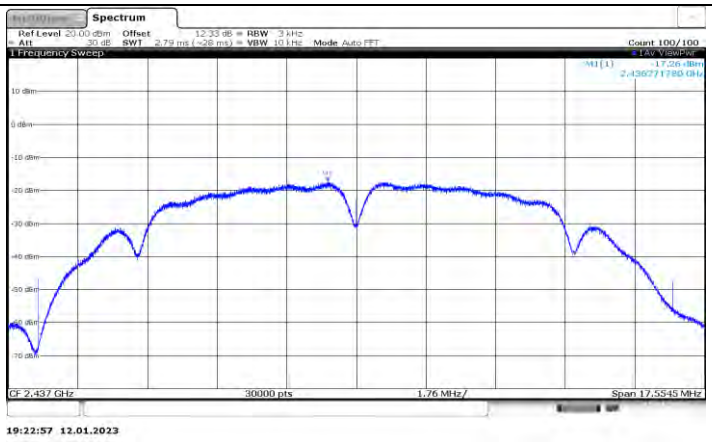


11B_Ant2_2412

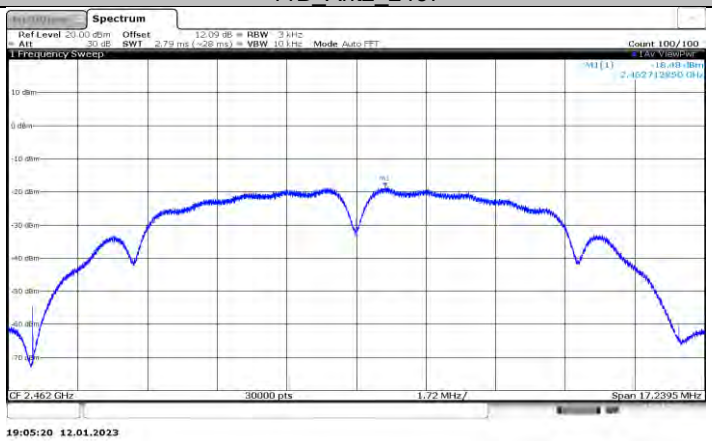


11B_Ant1_2437

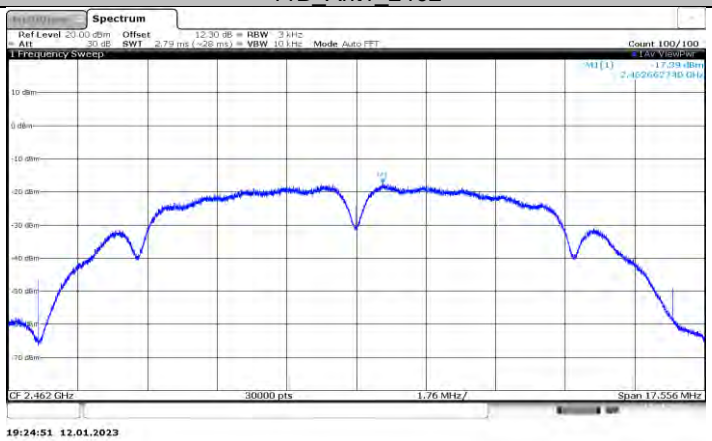
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11B_Ant2_2437

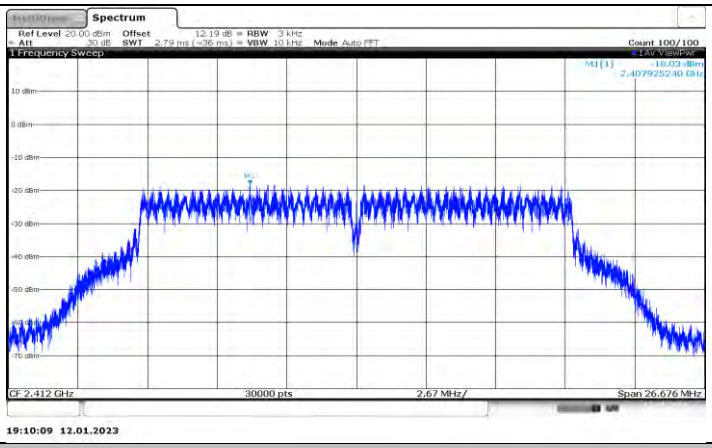


11B_Ant1_2462

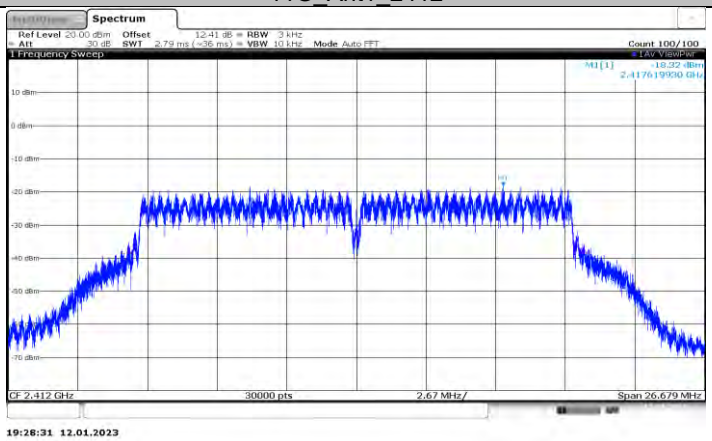


11B_Ant2_2462

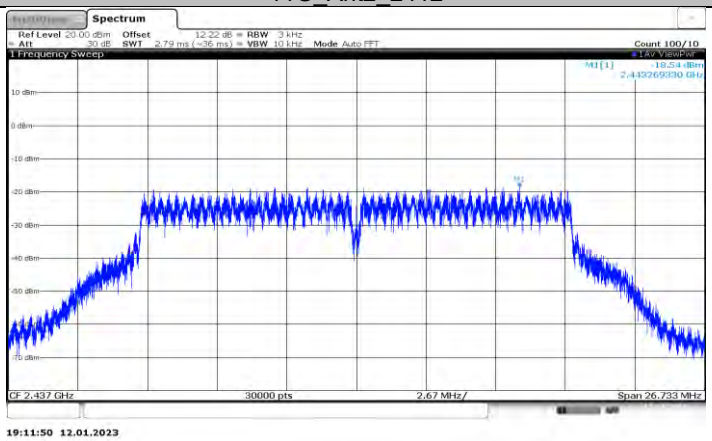
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11G_Ant1_2412

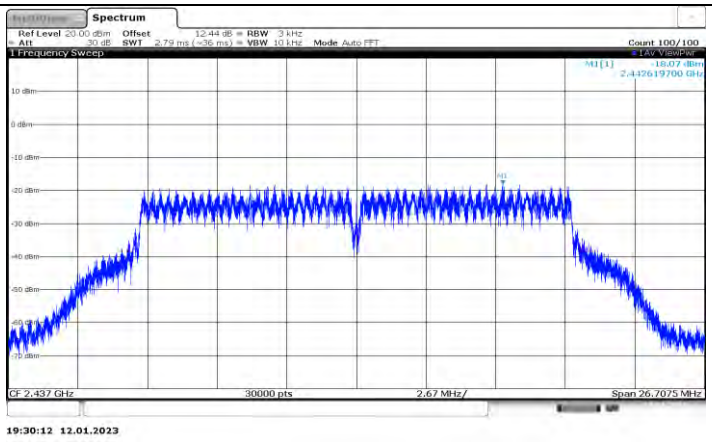


11G_Ant2_2412

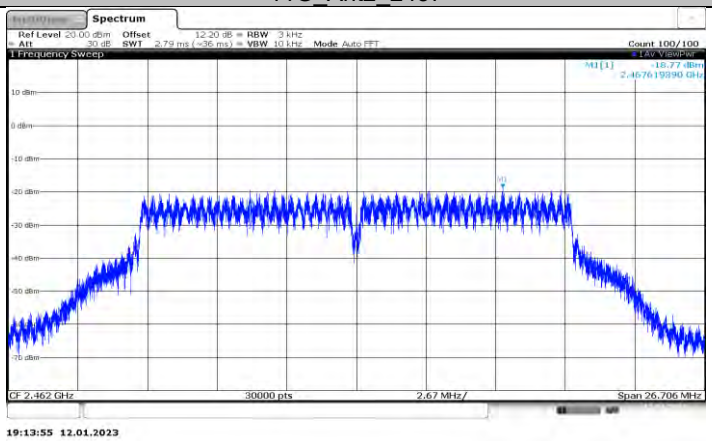


11G_Ant1_2437

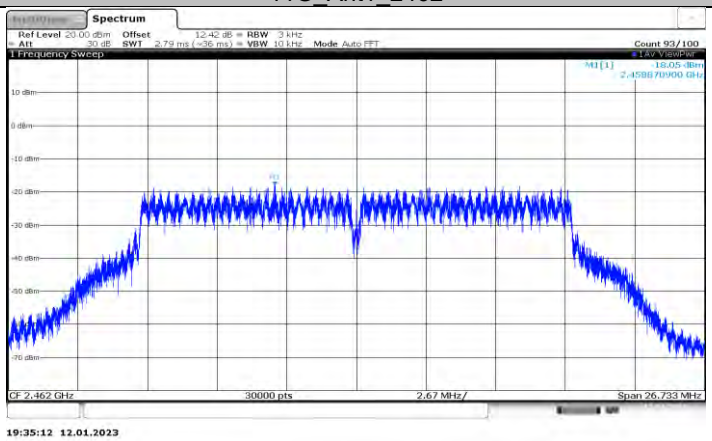
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11G_Ant2_2437

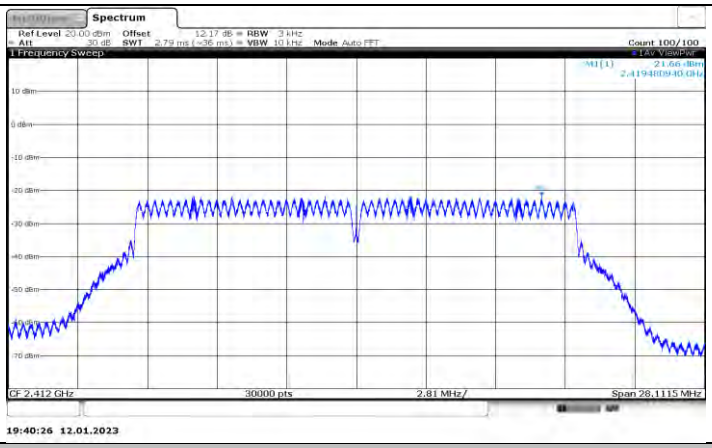


11G_Ant1_2462

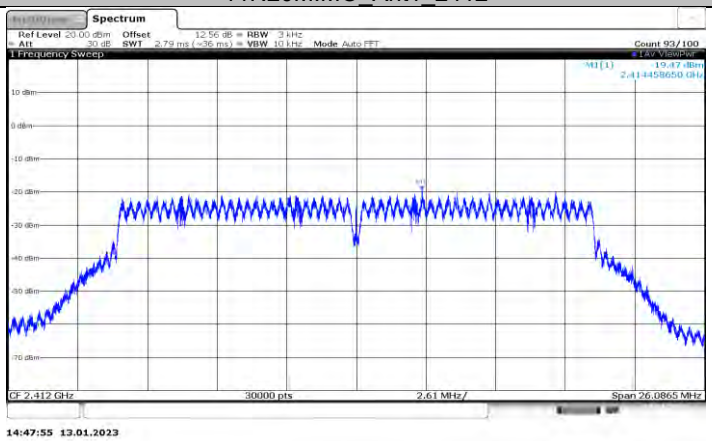


11G_Ant2_2462

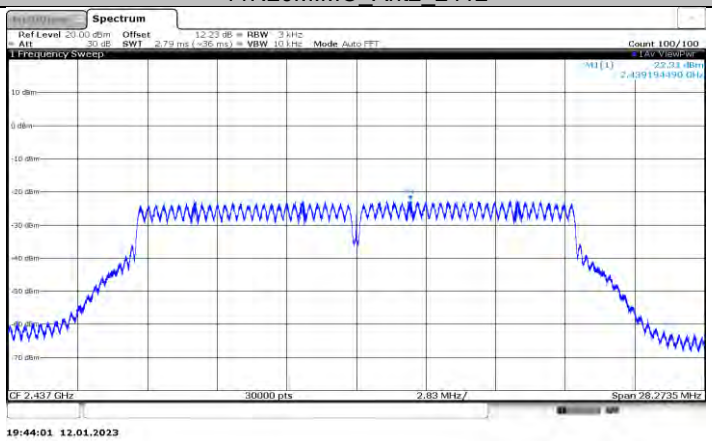
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11N20MIMO_Ant1_2412

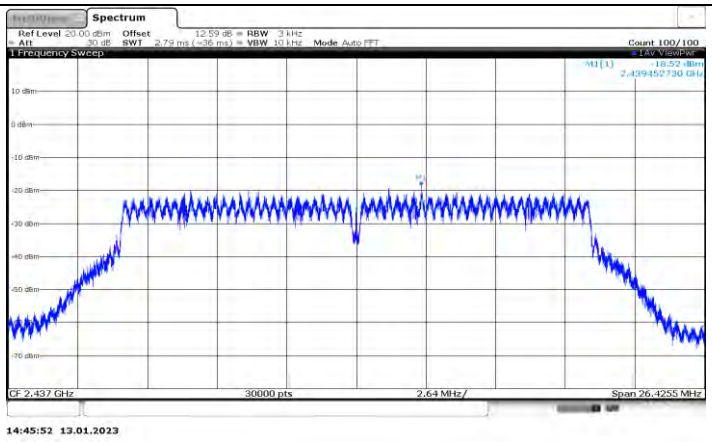


11N20MIMO_Ant2_2412

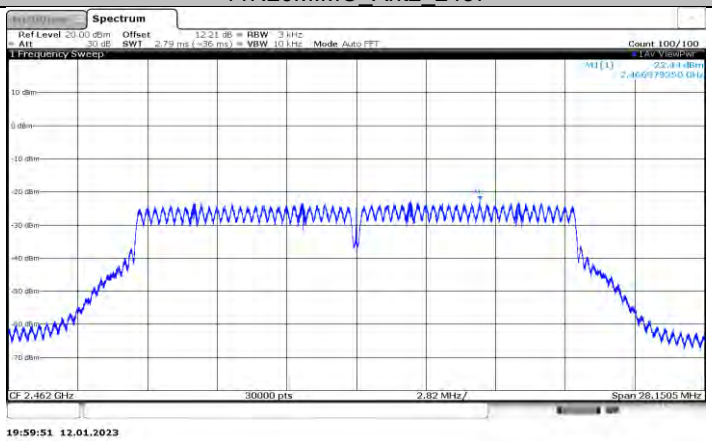


11N20MIMO_Ant1_2437

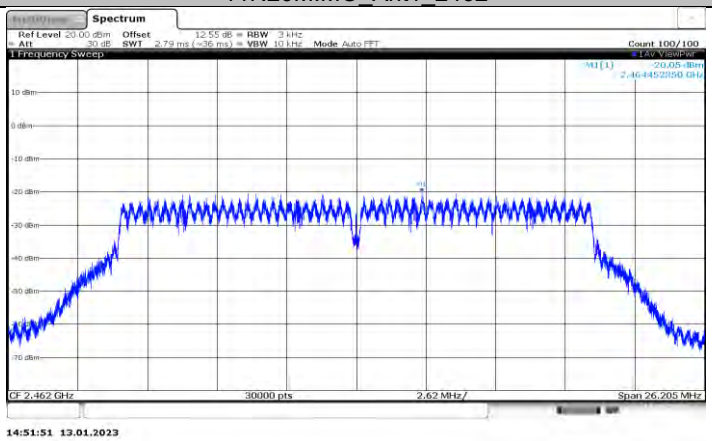
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11N20MIMO_Ant2_2437



11N20MIMO_Ant1_2462



11N20MIMO_Ant2_2462

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

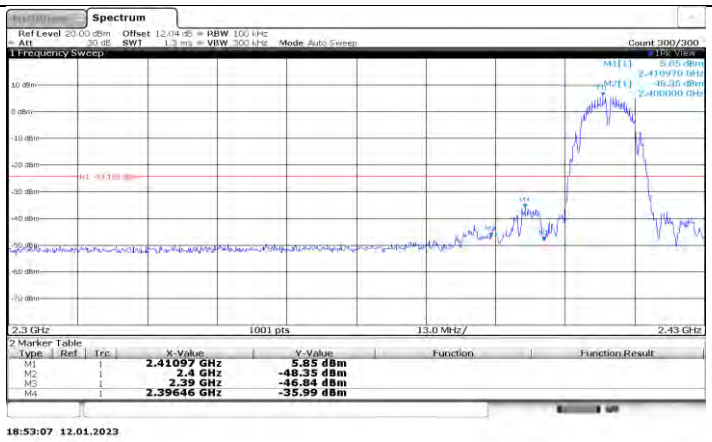
11.5. APPENDIX E: BAND EDGE MEASUREMENTS

11.5.1. Test Result

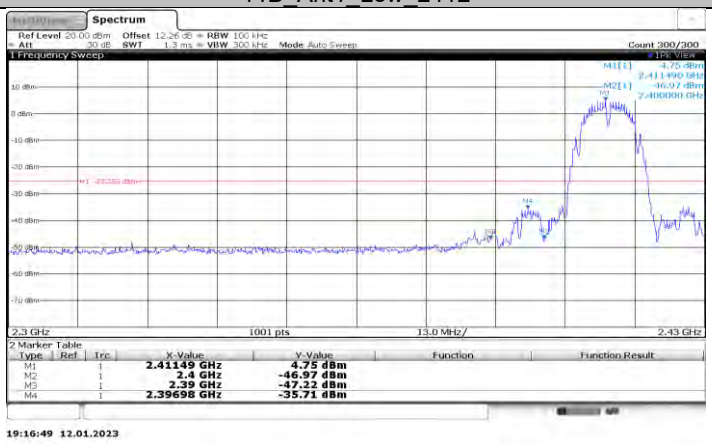
Test Mode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	Low	2412	5.85	-35.99	≤-24.15	PASS
	Ant2	Low	2412	4.75	-35.71	≤-25.25	PASS
	Ant1	High	2462	4.67	-46.86	≤-25.33	PASS
	Ant2	High	2462	5.13	-45.95	≤-24.87	PASS
11G	Ant1	Low	2412	1.45	-34.01	≤-28.55	PASS
	Ant2	Low	2412	1.46	-34.01	≤-28.54	PASS
	Ant1	High	2462	0.58	-45.59	≤-29.42	PASS
	Ant2	High	2462	1.87	-44.52	≤-28.13	PASS
11N20MIMO	Ant1	Low	2412	1.12	-33.91	≤-28.88	PASS
	Ant2	Low	2412	1.45	-34.09	≤-28.55	PASS
	Ant1	High	2462	-0.05	-44.34	≤-30.05	PASS
	Ant2	High	2462	1.07	-42.9	≤-28.93	PASS

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

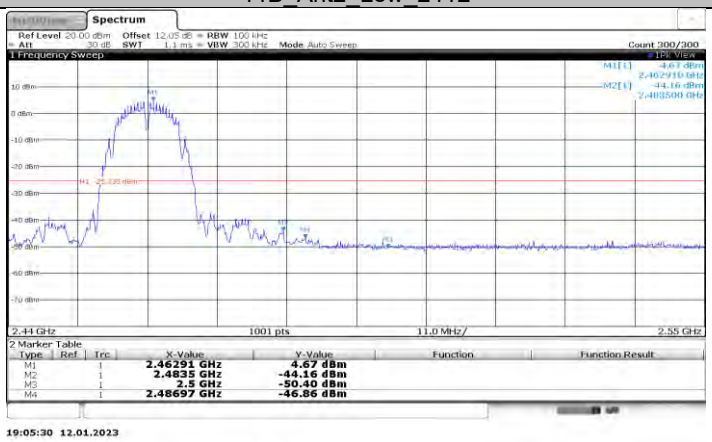
11.5.2. Test Graphs



11B_Ant1_Low_2412

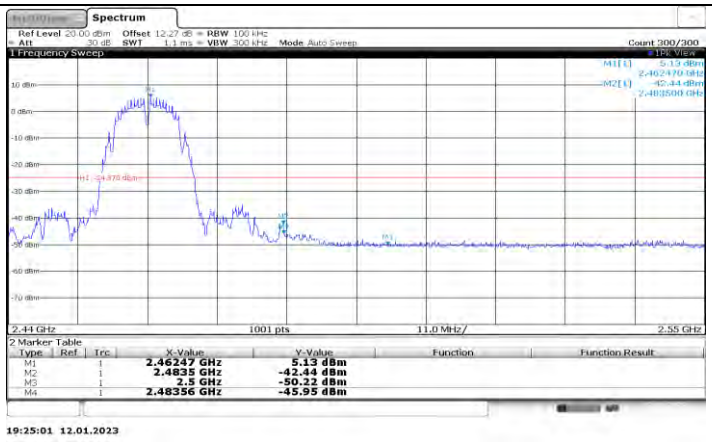


11B_Ant2_Low_2412

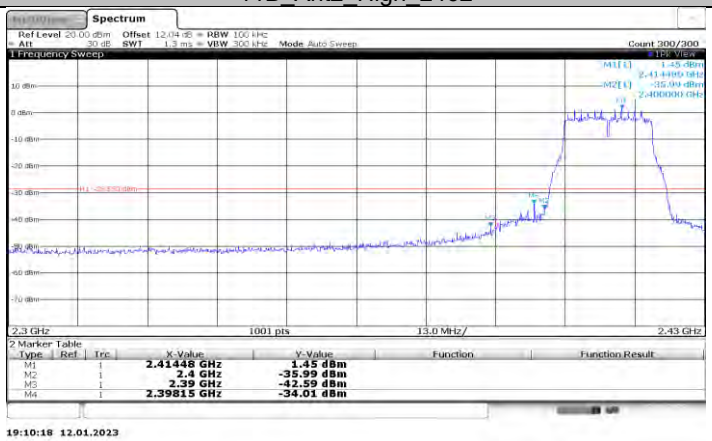


11B_Ant1_High_2462

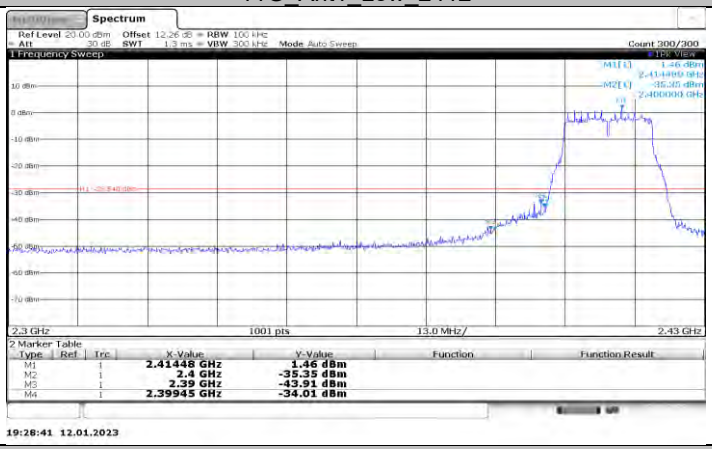
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11B_Ant2_High_2462

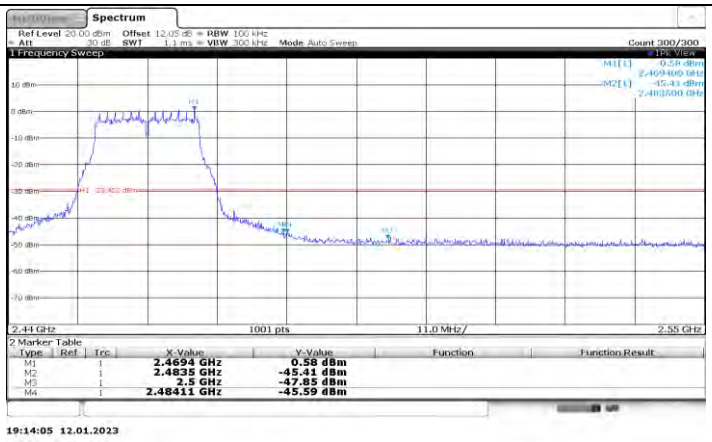


11G_Ant1_Low_2412

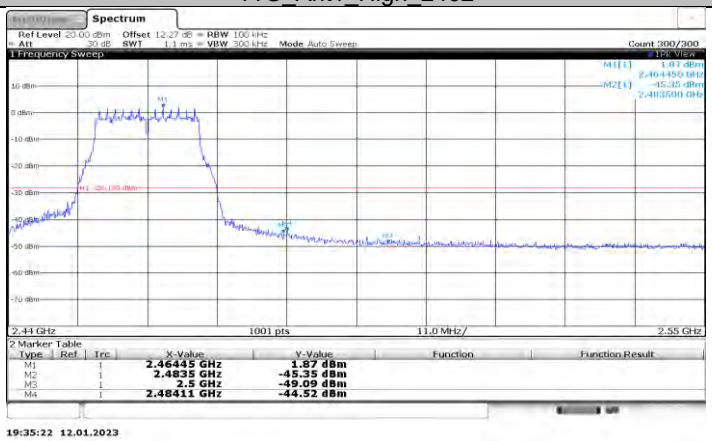


11G_Ant2_Low_2412

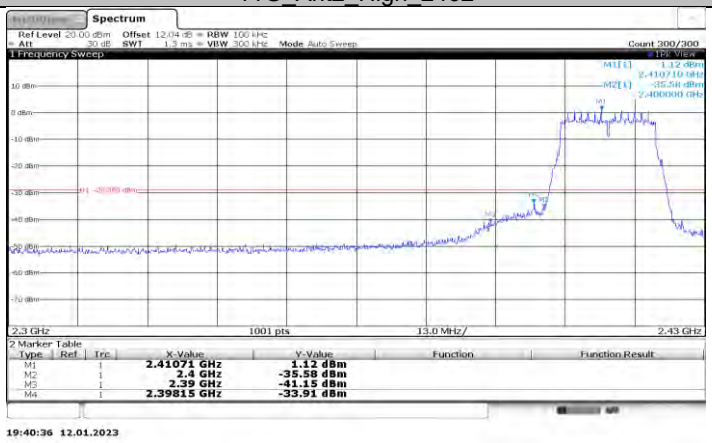
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11G_Ant1_High_2462

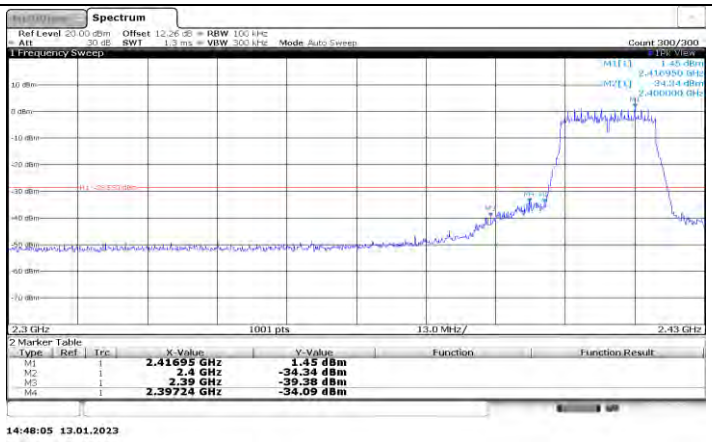


11G_Ant2_High_2462

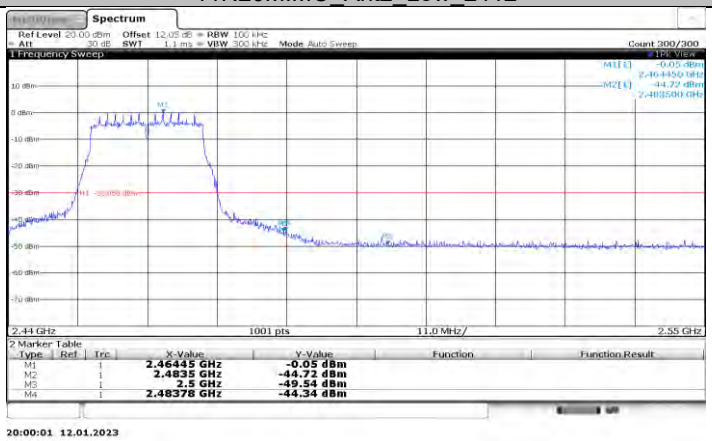


11N20MIMO_Ant1_Low_2412

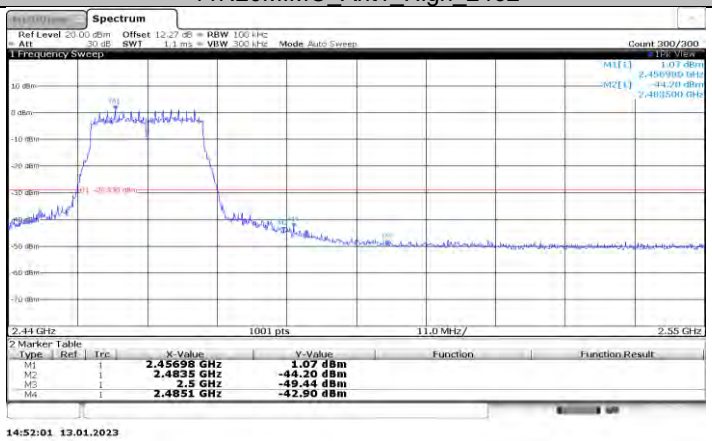
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11N20MIMO_Ant2_Low_2412



11N20MIMO_Ant1_High_2462



11N20MIMO_Ant2_High_2462

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

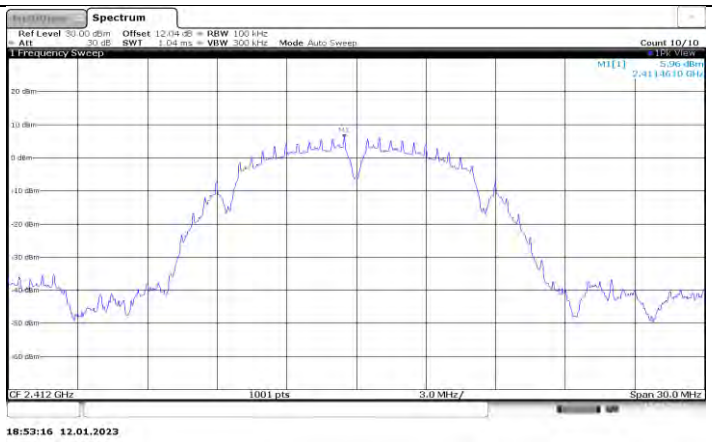
11.6. APPENDIX F: CONDUCTED SPURIOUS EMISSION

11.6.1. Test Result

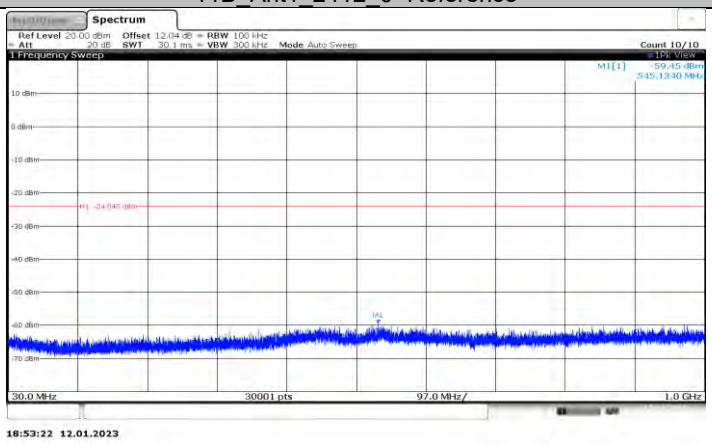
Test Mode	Antenna	Channel	FreqRange [Mhz]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	Reference	5.96	---	PASS
			30~1000	-59.45	≤-24.04	PASS
			1000~26500	-46.68	≤-24.04	PASS
	Ant2	2412	Reference	5.63	---	PASS
			30~1000	-58.44	≤-24.37	PASS
			1000~26500	-48.77	≤-24.37	PASS
	Ant1	2437	Reference	5.27	---	PASS
			30~1000	-59.99	≤-24.73	PASS
			1000~26500	-48	≤-24.73	PASS
	Ant2	2437	Reference	5.97	---	PASS
			30~1000	-59.05	≤-24.03	PASS
			1000~26500	-48.33	≤-24.03	PASS
	Ant1	2462	Reference	4.60	---	PASS
			30~1000	-59.51	≤-25.4	PASS
			1000~26500	-48.64	≤-25.4	PASS
	Ant2	2462	Reference	5.58	---	PASS
			30~1000	-59.45	≤-24.42	PASS
			1000~26500	-48.38	≤-24.42	PASS
11G	Ant1	2412	Reference	2.02	---	PASS
			30~1000	-59.6	≤-27.98	PASS
			1000~26500	-49.53	≤-27.98	PASS
	Ant2	2412	Reference	1.91	---	PASS
			30~1000	-59.43	≤-28.09	PASS
			1000~26500	-47.77	≤-28.09	PASS
	Ant1	2437	Reference	1.24	---	PASS
			30~1000	-59.19	≤-28.76	PASS
			1000~26500	-48.93	≤-28.76	PASS
	Ant2	2437	Reference	1.98	---	PASS
			30~1000	-59.03	≤-28.02	PASS
			1000~26500	-48.33	≤-28.02	PASS
	Ant1	2462	Reference	0.75	---	PASS
			30~1000	-59.54	≤-29.25	PASS
			1000~26500	-48.89	≤-29.25	PASS
	Ant2	2462	Reference	1.91	---	PASS
			30~1000	-58.55	≤-28.09	PASS
			1000~26500	-48.79	≤-28.09	PASS
11N20MIMO	Ant1	2412	Reference	1.77	---	PASS
			30~1000	-59.66	≤-28.23	PASS
			1000~26500	-49.04	≤-28.23	PASS
	Ant2	2412	Reference	1.61	---	PASS
			30~1000	-59.04	≤-28.39	PASS
			1000~26500	-48.02	≤-28.39	PASS
	Ant1	2437	Reference	0.77	---	PASS
			30~1000	-59.13	≤-29.23	PASS
			1000~26500	-48.73	≤-29.23	PASS
	Ant2	2437	Reference	1.65	---	PASS
			30~1000	-59.57	≤-28.35	PASS
			1000~26500	-49.08	≤-28.35	PASS
	Ant1	2462	Reference	-0.08	---	PASS
			30~1000	-59.75	≤-30.08	PASS
			1000~26500	-49.42	≤-30.08	PASS
	Ant2	2462	Reference	1.47	---	PASS
			30~1000	-58.05	≤-28.53	PASS
			1000~26500	-49.25	≤-28.53	PASS

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

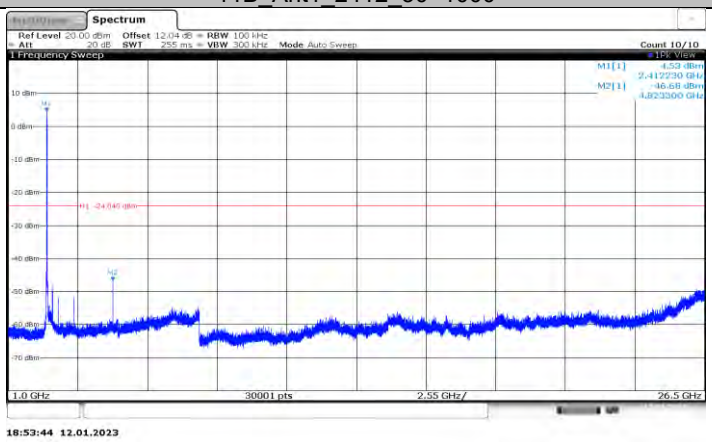
11.6.2. Test Graphs



11B_Ant1_2412_0~Reference

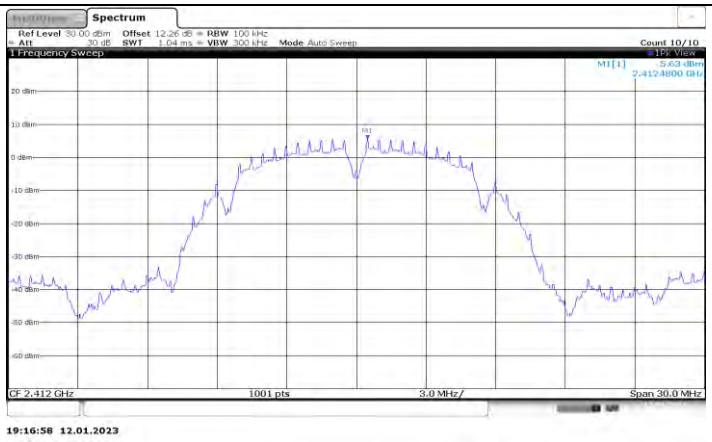


11B_Ant1_2412_30~1000

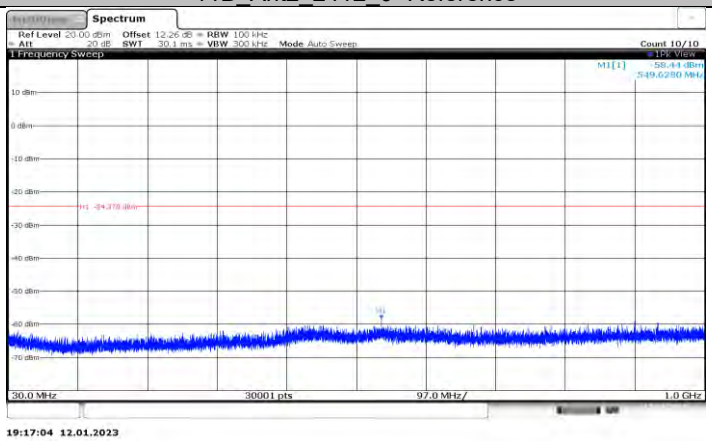


11B_Ant1_2412_1000~26500

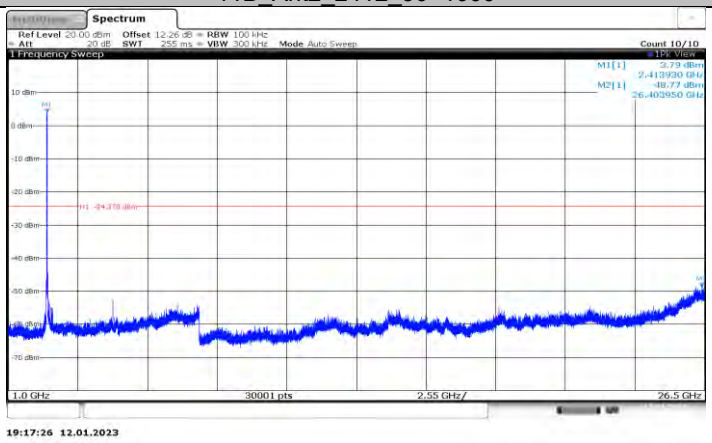
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11B_Ant2_2412_0~Reference

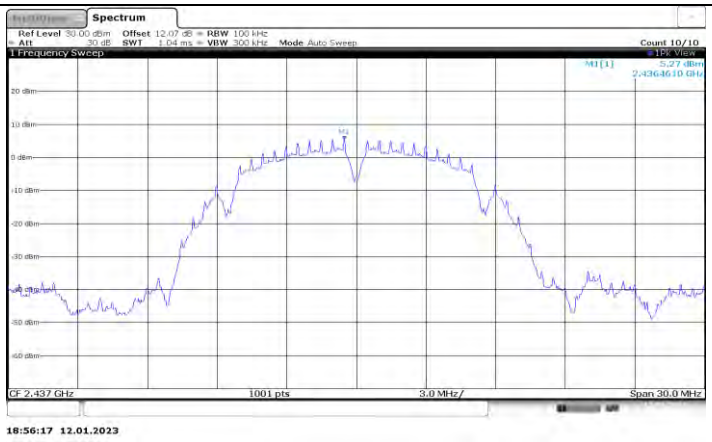


11B_Ant2_2412_30~1000

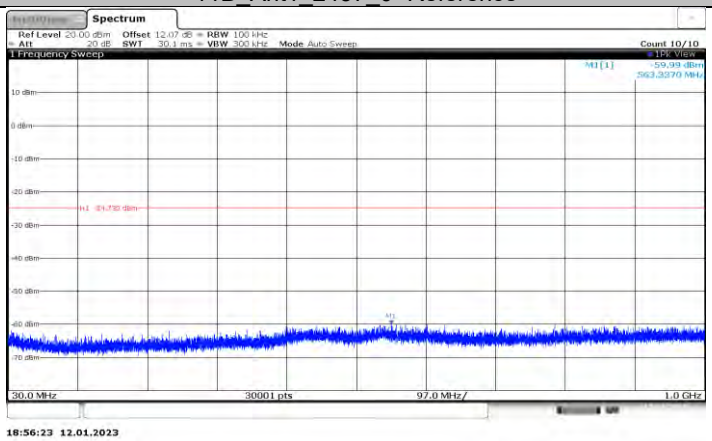


11B_Ant2_2412_1000~26500

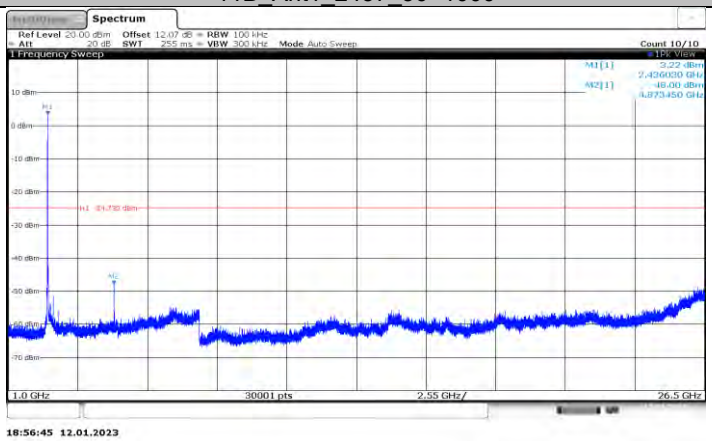
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11B_Ant1_2437_0~Reference

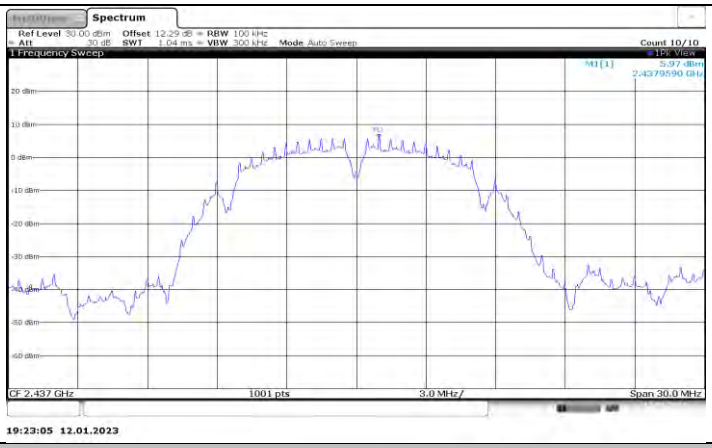


11B_Ant1_2437_30~1000

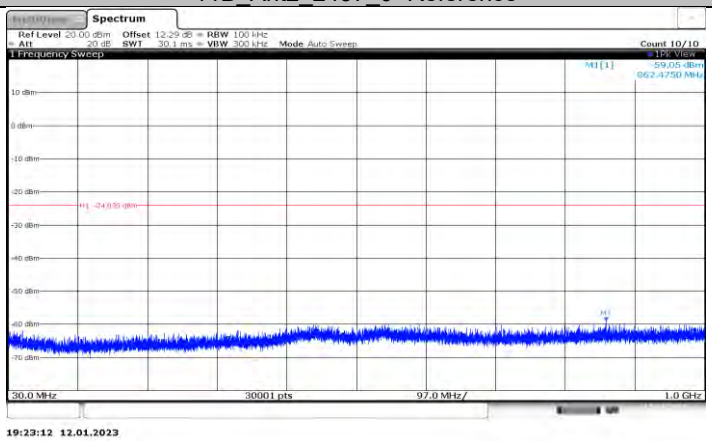


11B_Ant1_2437_1000~26500

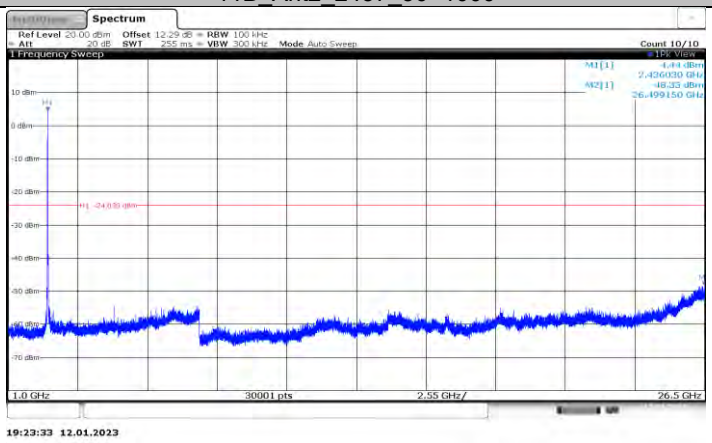
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11B_Ant2_2437_0~Reference

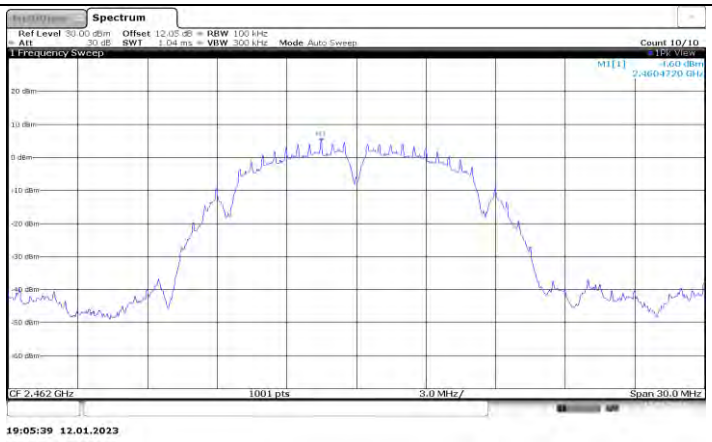


11B_Ant2_2437_30~1000

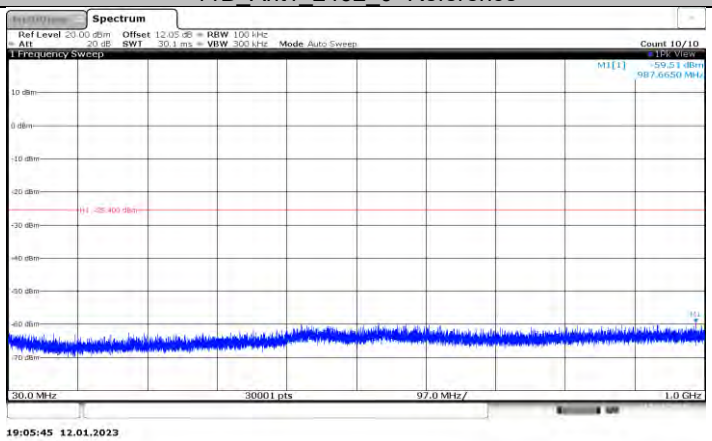


11B_Ant2_2437_1000~26500

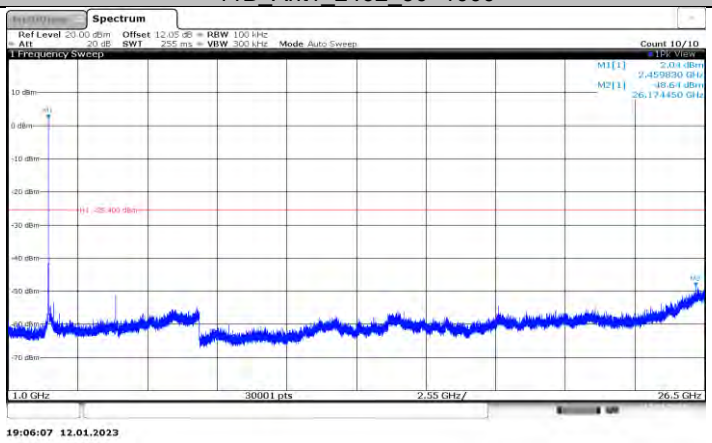
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11B_Ant1_2462_0~Reference

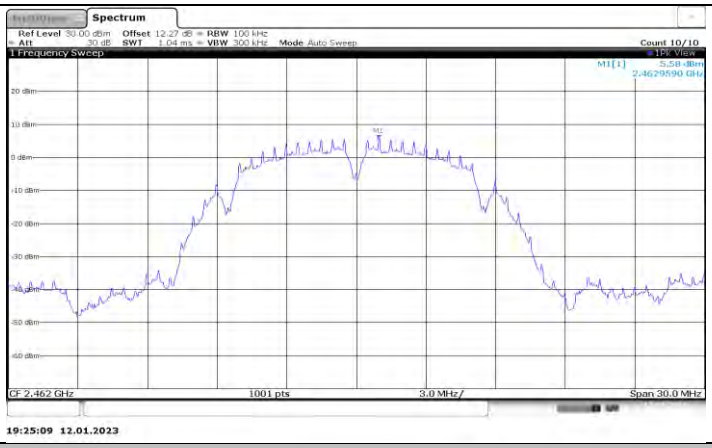


11B_Ant1_2462_30~1000

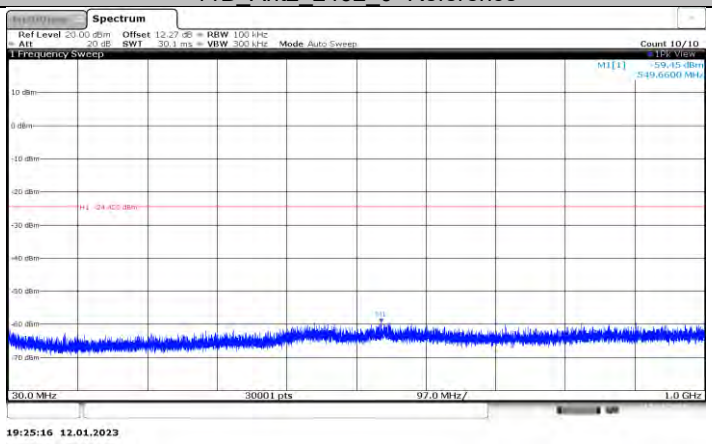


11B_Ant1_2462_1000~26500

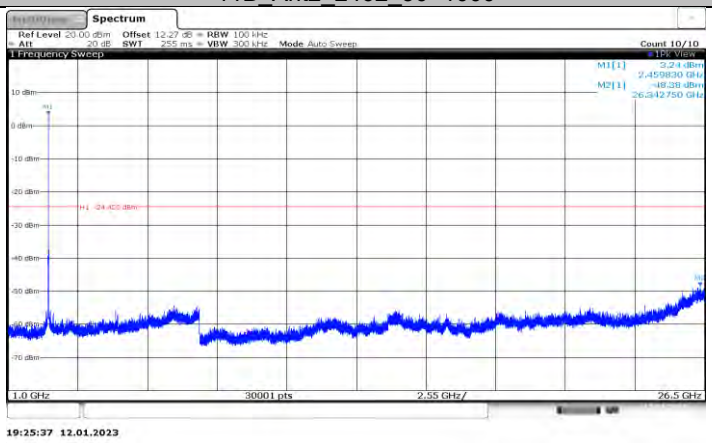
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11B_Ant2_2462_0~Reference

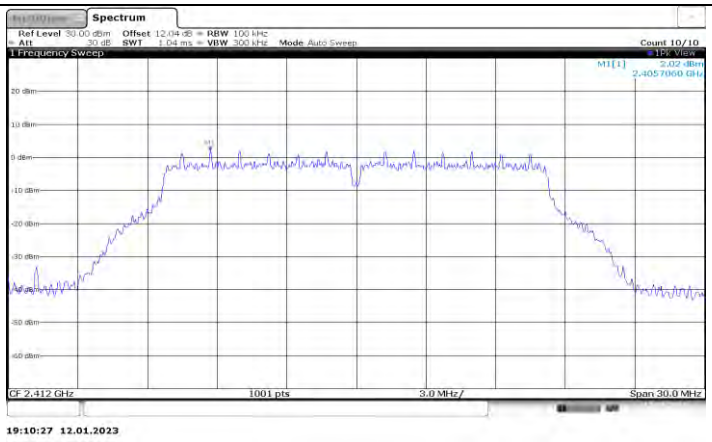


11B_Ant2_2462_30~1000

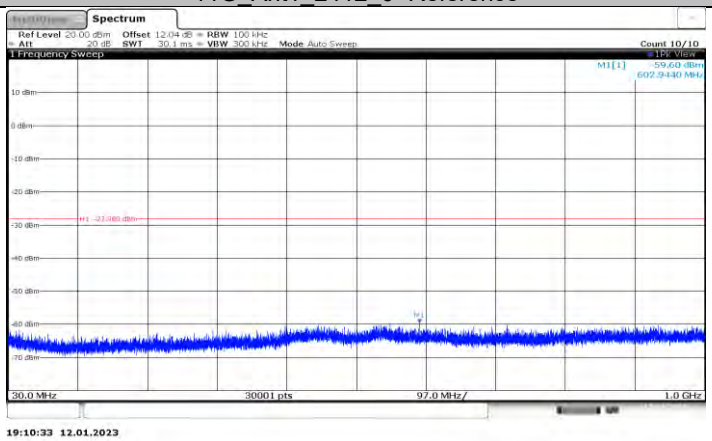


11B_Ant2_2462_1000~26500

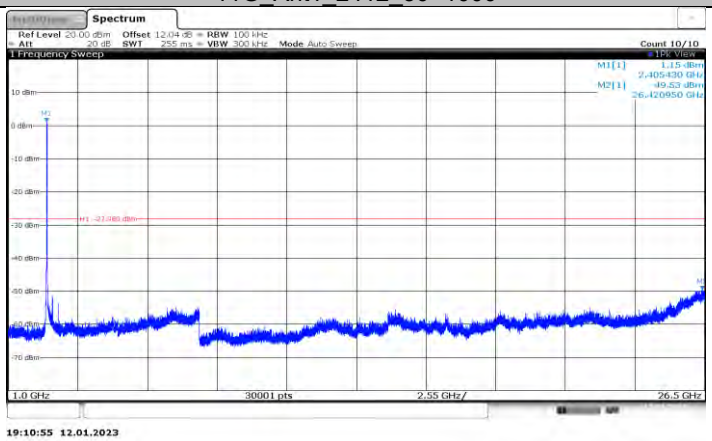
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11G_Ant1_2412_0~Reference

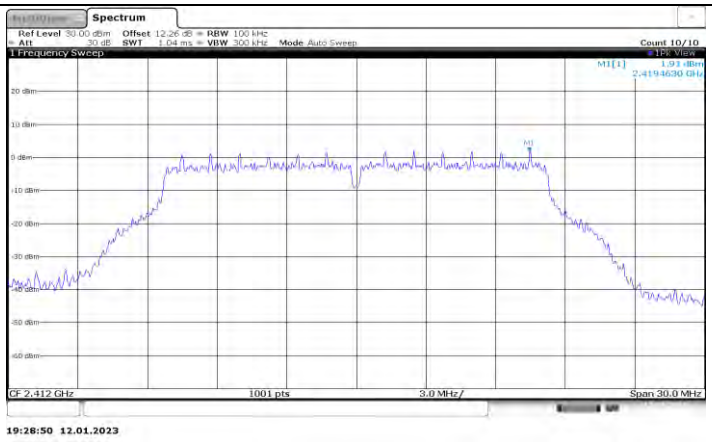


11G_Ant1_2412_30~1000

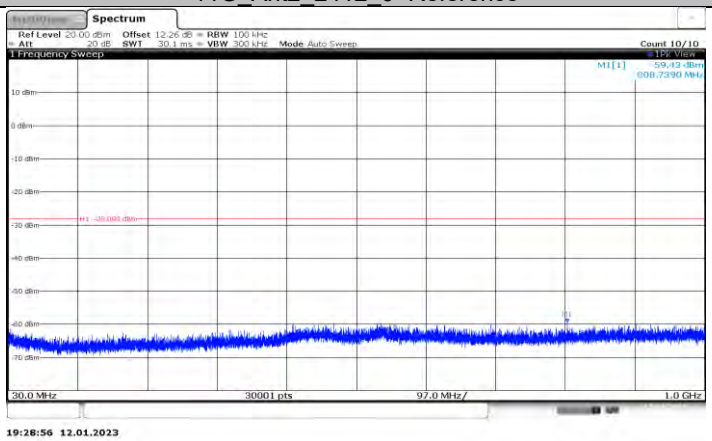


11G_Ant1_2412_1000~26500

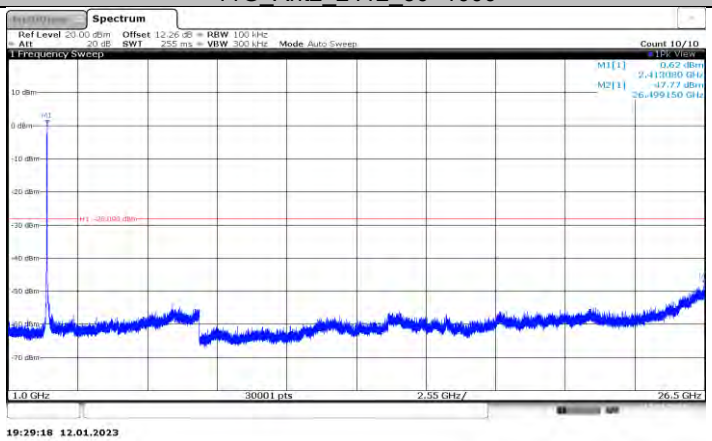
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11G_Ant2_2412_0~Reference

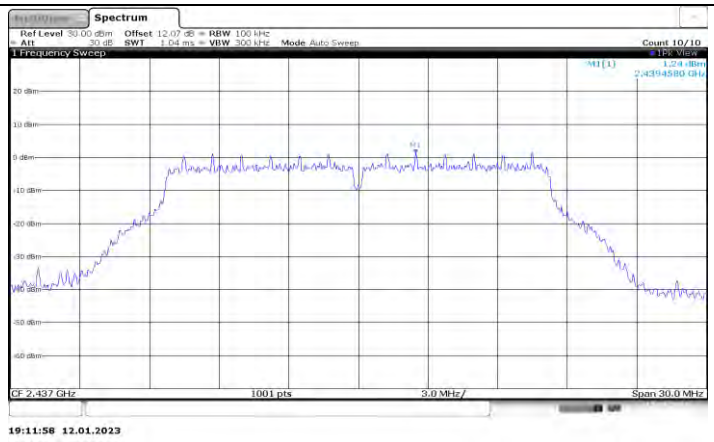


11G_Ant2_2412_30~1000

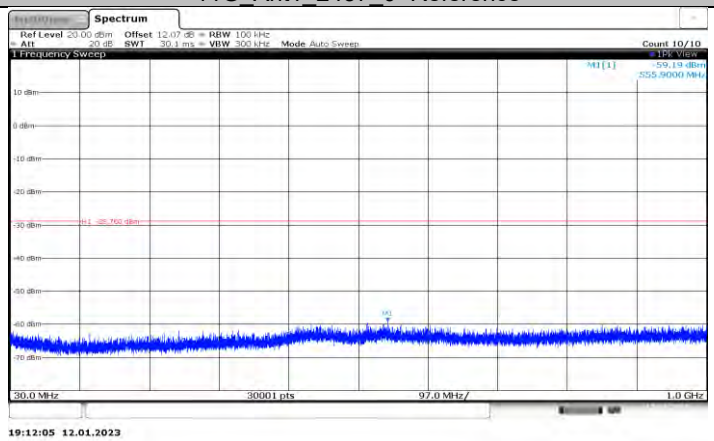


11G_Ant2_2412_1000~26500

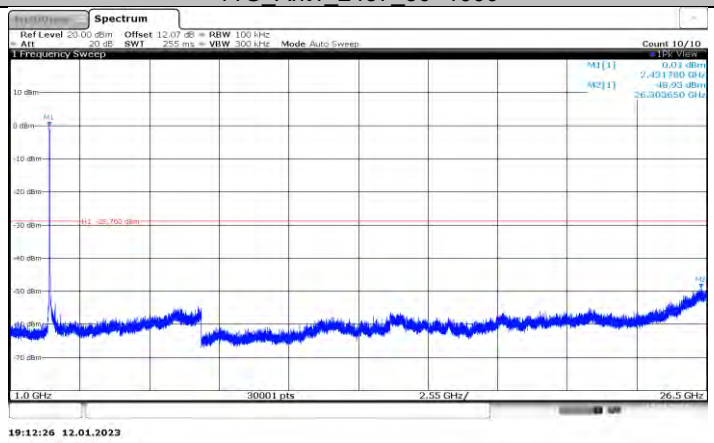
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11G_Ant1_2437_0~Reference

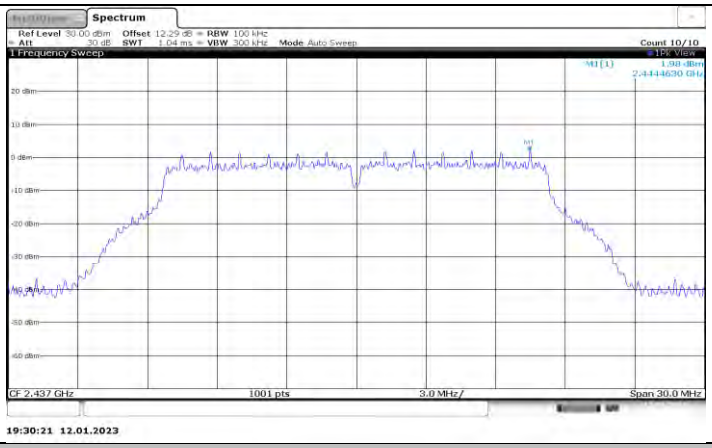


11G_Ant1_2437_30~1000

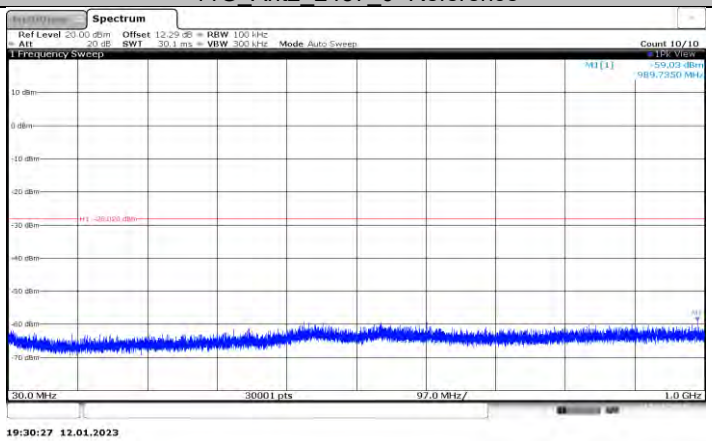


11G_Ant1_2437_1000~26500

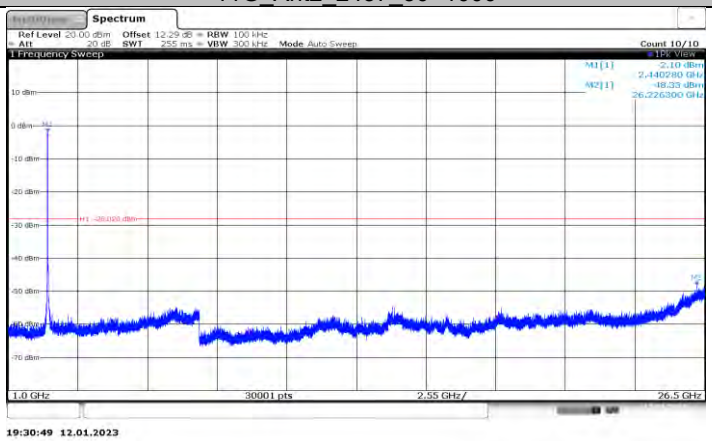
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11G_Ant2_2437_0~Reference

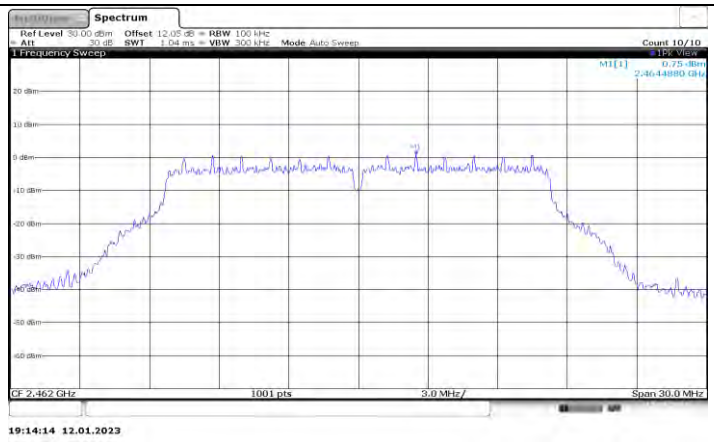


11G_Ant2_2437_30~1000

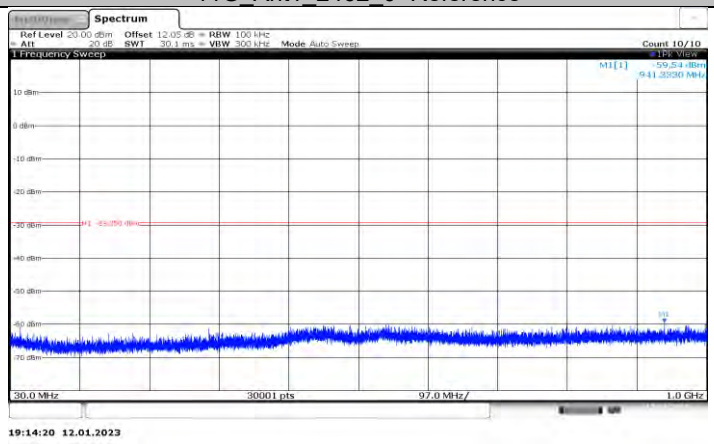


11G_Ant2_2437_1000~26500

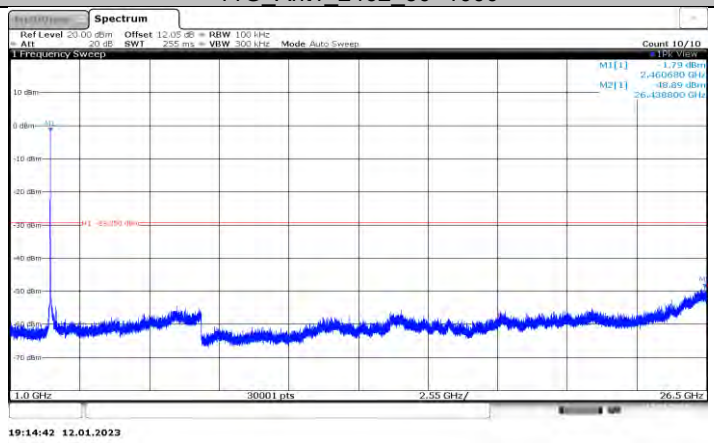
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11G_Ant1_2462_0~Reference

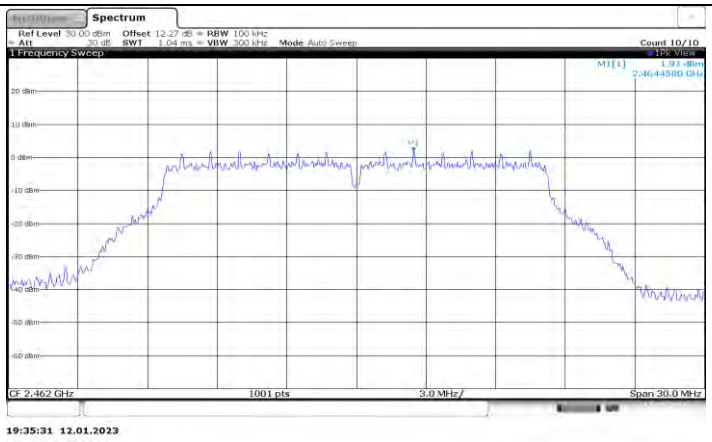


11G_Ant1_2462_30~1000

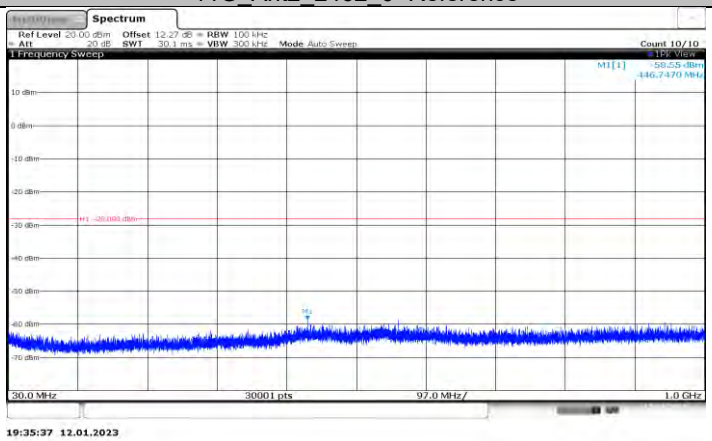


11G_Ant1_2462_1000~26500

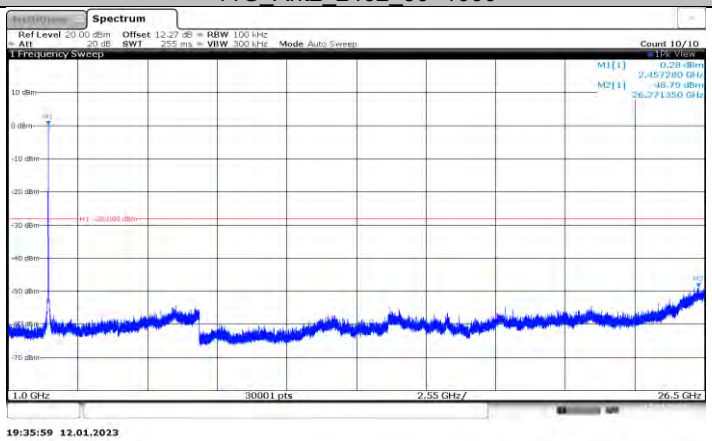
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11G_Ant2_2462_0~Reference

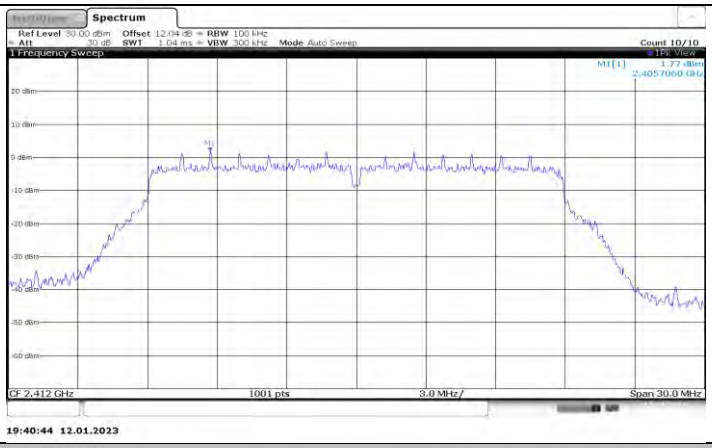


11G_Ant2_2462_30~1000

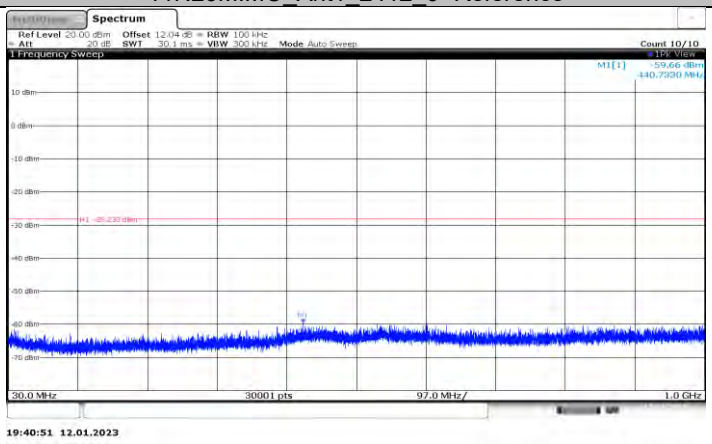


11G_Ant2_2462_1000~26500

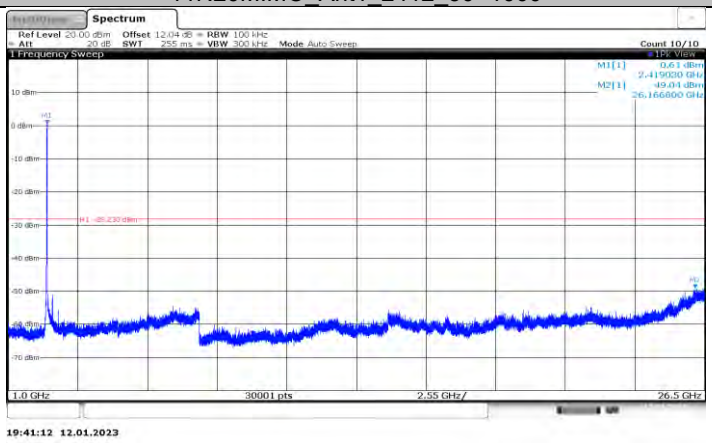
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11N20MIMO_Ant1_2412_0~Reference

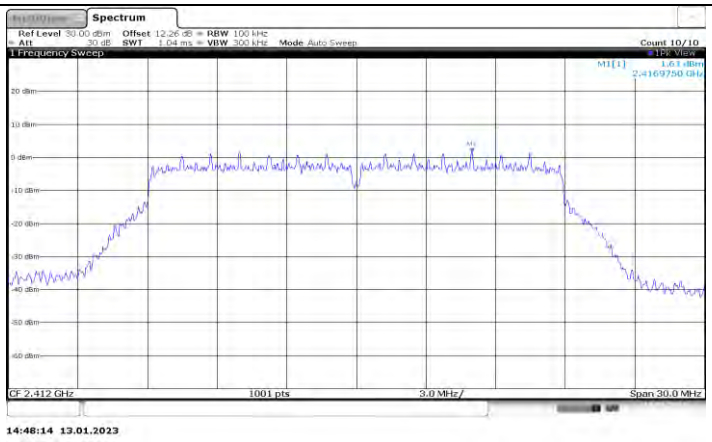


11N20MIMO_Ant1_2412_30~1000

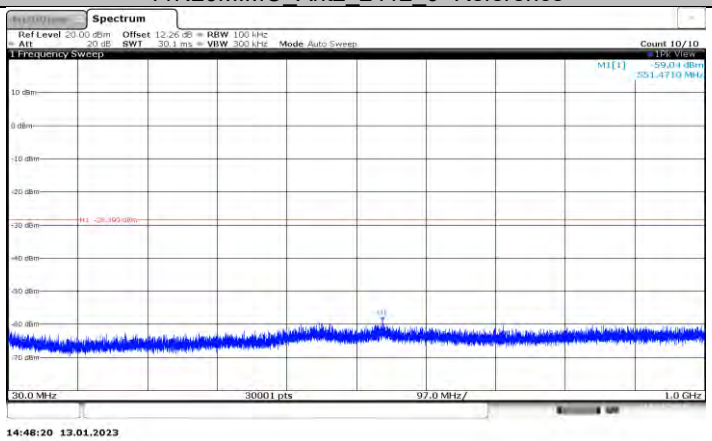


11N20MIMO_Ant1_2412_1000~26500

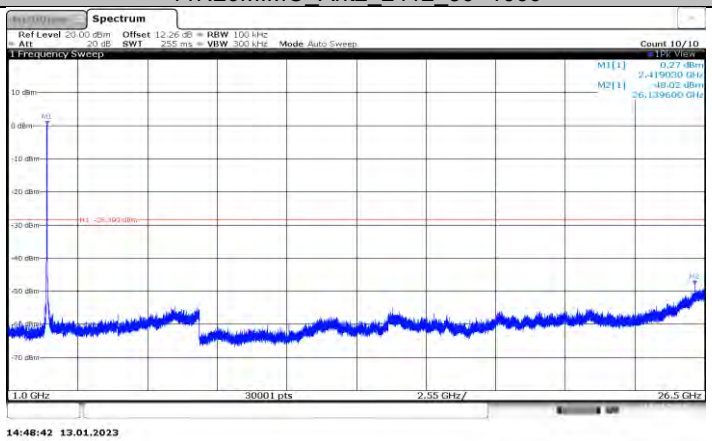
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11N20MIMO_Ant2_2412_0~Reference

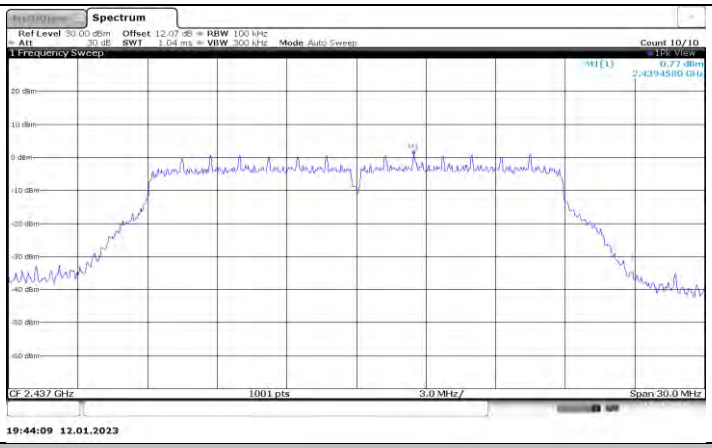


11N20MIMO_Ant2_2412_30~1000

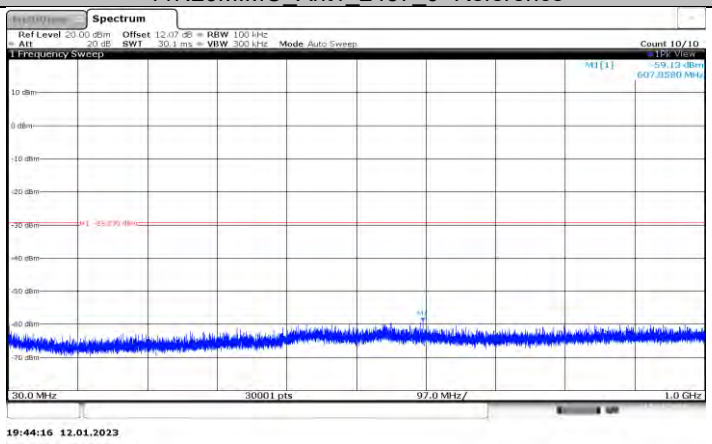


11N20MIMO_Ant2_2412_1000~26500

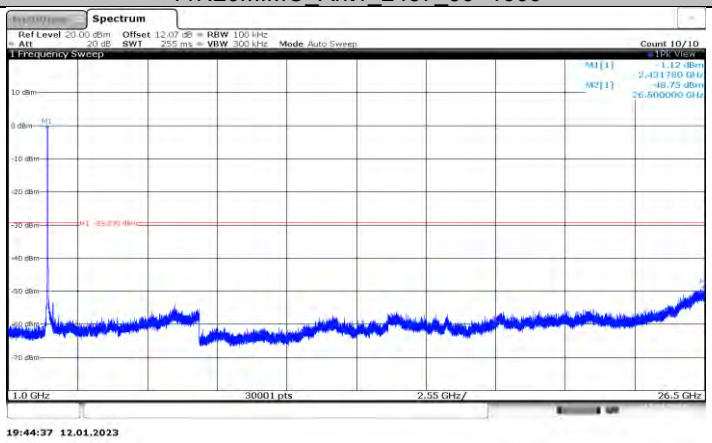
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11N20MIMO_Ant1_2437_0~Reference

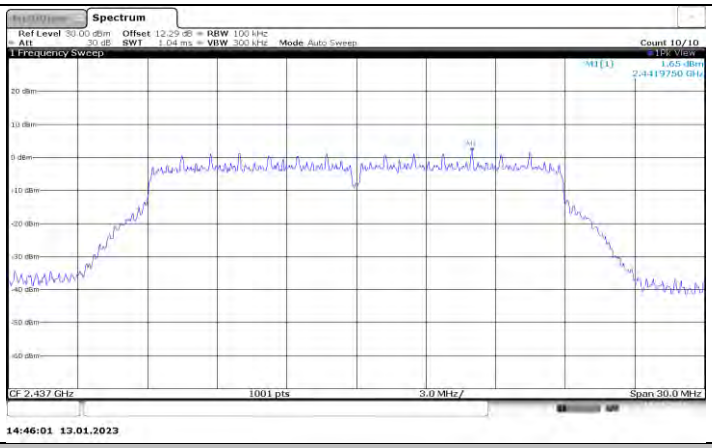


11N20MIMO_Ant1_2437_30~1000

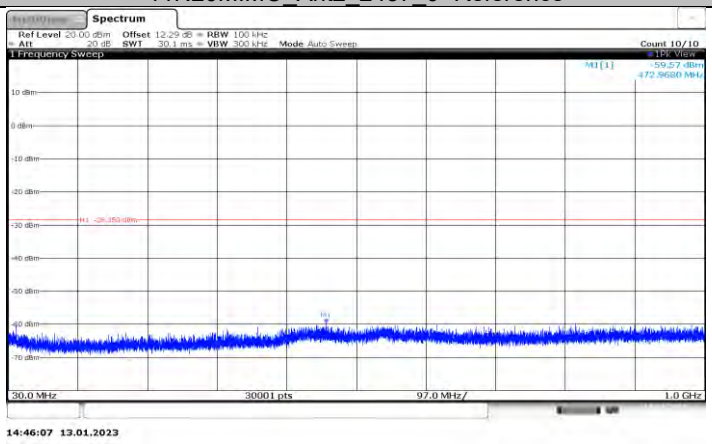


11N20MIMO_Ant1_2437_1000~26500

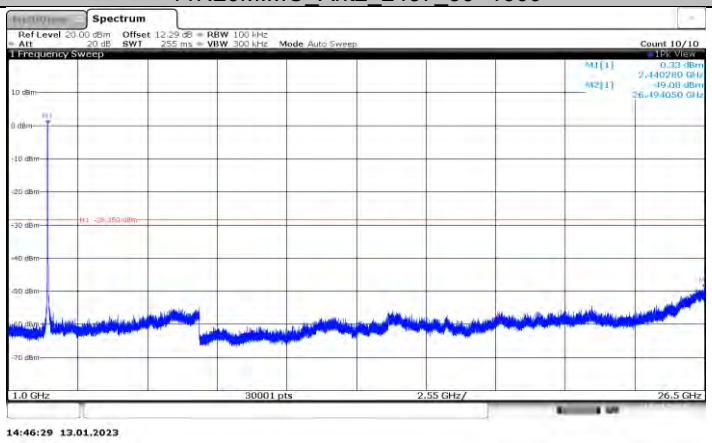
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11N20MIMO_Ant2_2437_0~Reference

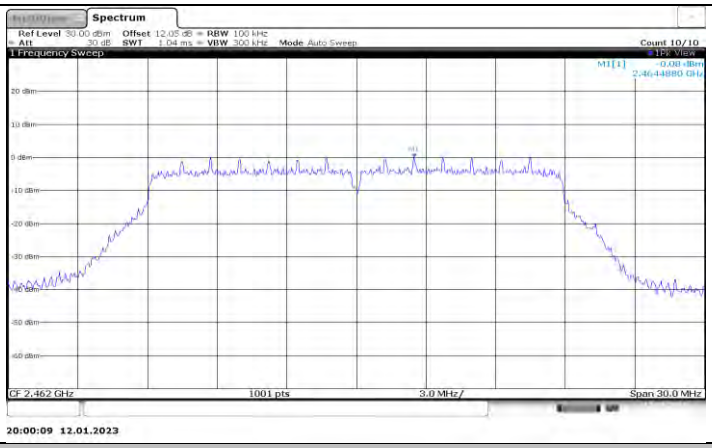


11N20MIMO_Ant2_2437_30~1000

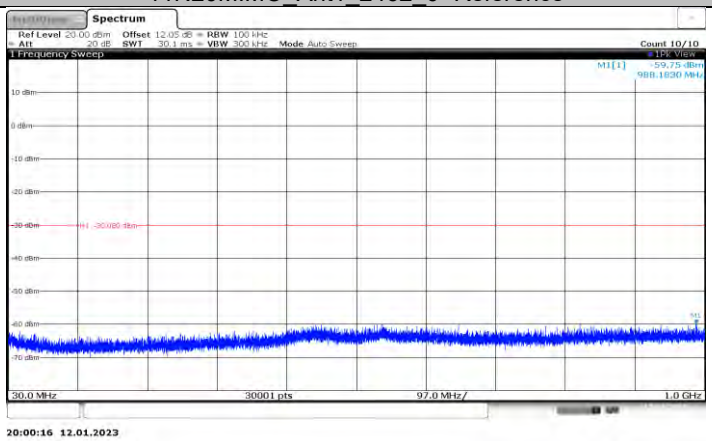


11N20MIMO_Ant2_2437_1000~26500

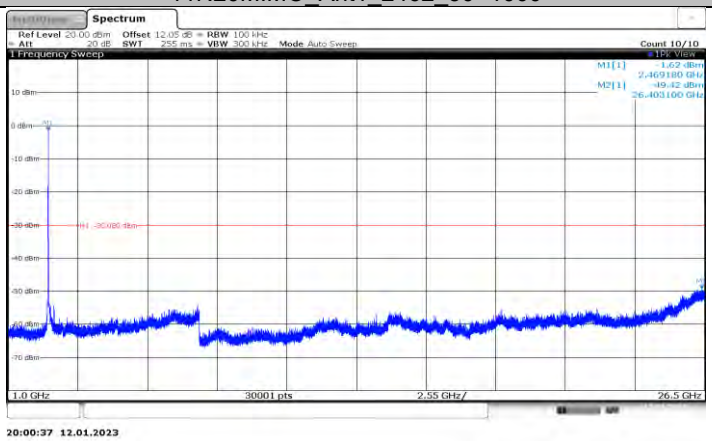
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11N20MIMO_Ant1_2462_0~Reference

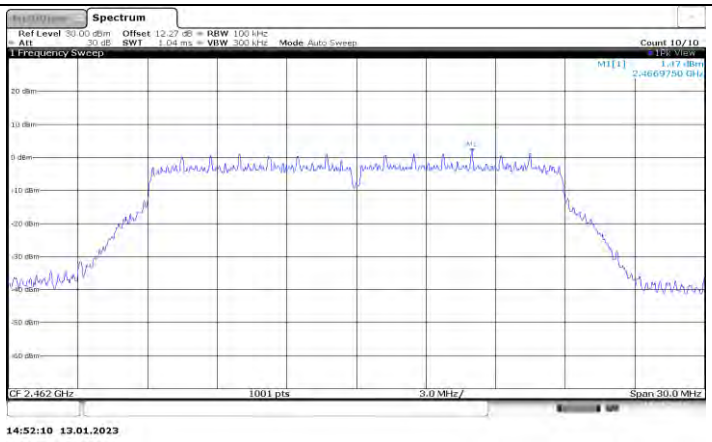


11N20MIMO_Ant1_2462_30~1000

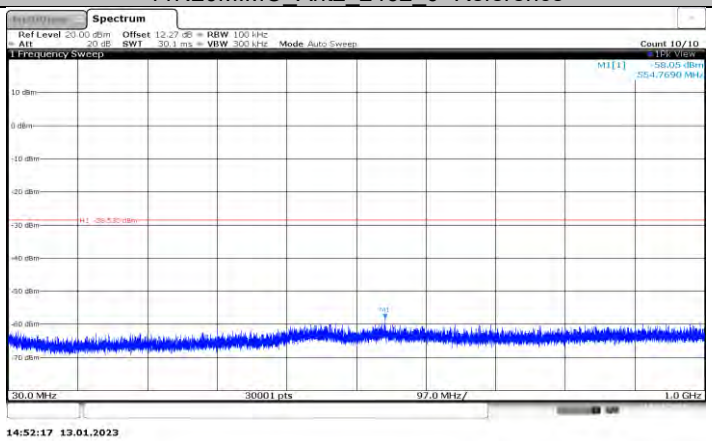


11N20MIMO_Ant1_2462_1000~26500

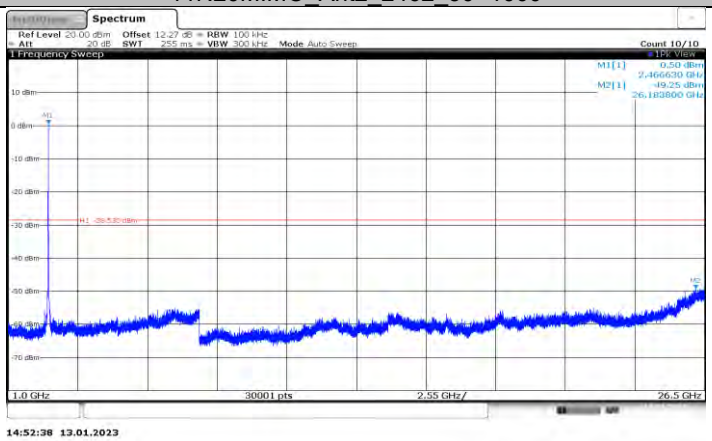
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.



11N20MIMO_Ant2_2462_0~Reference



11N20MIMO_Ant2_2462_30~1000



11N20MIMO_Ant2_2462_1000~26500

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

11.7. APPENDIX G: DUTY CYCLE

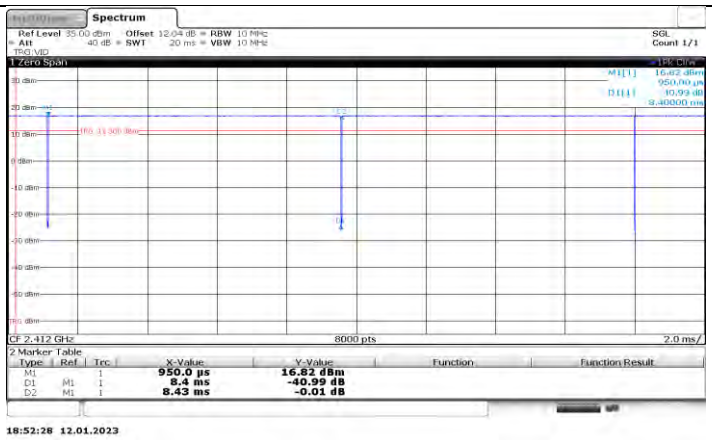
11.7.1. Test Result

Test Mode	On Time	Period	Duty Cycle	Duty Cycle	Duty Cycle	1/T	Final setting
	(msec)	(msec)	x	(%)	Correction Factor	Minimum VBW	For VBW
			(Linear)		(dB)	(kHz)	(kHz)
11B	8.4	8.43	0.9964	99.64	0.02	N/A	0.01
11G	1.39	1.44	0.9653	96.53	0.15	0.72	1
11N20MIMO	1.31	1.35	0.9704	97.04	0.13	0.76	1

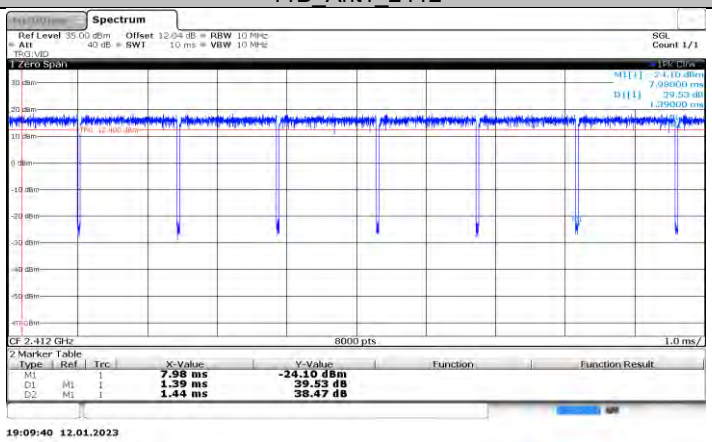
Note:
Duty Cycle Correction Factor=10log (1/x).
Where: x is Duty Cycle (Linear)
Where: T is On Time
If that calculated VBW is not available on the analyzer then the next higher value should be used.
If the EUT is configured to transmit with D ⩾ 98%, then set VBW ⩽ RBW / 100 (i.e., 10 kHz), but not less than 10 Hz.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

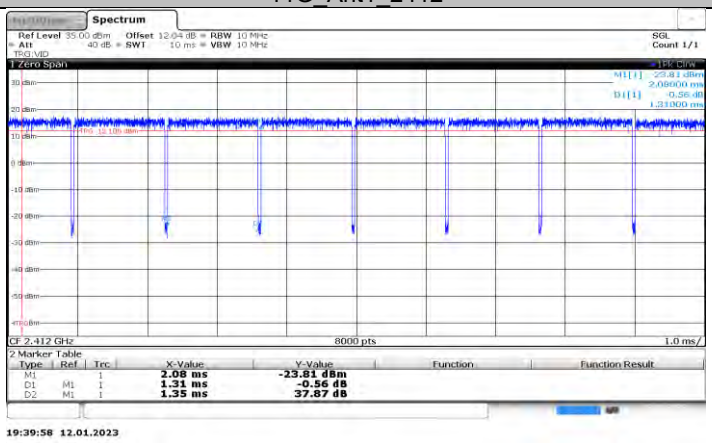
11.7.2. Test Graphs



11B_Ant1_2412



11G_Ant1_2412



11N20MIMO_Ant1_2412

END OF REPORT

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.