FCC / ISED - TEST REPORT

Report Number	:	**64.790.21.02849.01-R1**	Date of Issue:	**October 22, 2021**

Model	:	GRJWB05-J5
Product Type	:	WiFi Module
Applicant	:	Gree Electric Appliances, Inc. of Zhuhai
Address of applicant	:	Jinji West Rd, Qianshan, Zhuhai, Guangdong,519070, P. R. China
Manufacturer	:	Gree Electric Appliances, Inc. of Zhuhai

Test Result	:	■ **Positive**	☐ **Negative**
Total pages including Appendices	:	45	

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch is a subcontractor to TÜV SÜD Product Service GmbH according to the principles outlined in ISO 17025.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch reports apply only to the specific samples tested under stated test conditions. Construction of the actual test samples has been documented. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. The manufacturer/importer is responsible to the Competent Authorities in Europe for any modifications made to the production units which result in non-compliance to the relevant regulations. TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch issued reports.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

1 Table of Contents

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

2 Details about the Test Laboratory

Details about the Test Laboratory
Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint Road 2, Nanshan District, Shenzhen City, 518052, P. R. China
FCC Registration Number:	514049
IC Registration Number:	10320A
Telephone:	86 755 8828 6998
Fax:	86 755 8828 5299

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

3 Description of the Equipment under Test

Product:	WiFi Module
PMN:	WiFi Module
Model no.:	GRJWB05-J5
HVIN:	GRJWB05-J5
FVIN:	N/A
FCC ID:	2ADAP-GRJWB05J5
IC:	12478A-GRJWB05J5
Options and accessories:	N/A
Rating:	DC 3.3V
RF Transmission Frequency:	2412-2462MHz
No. of Operated Channel:	11
Modulation:	CCK, DQPSK, DBPSK for 802.11b QPSK, BPSK for 802.11g/n
Antenna Type:	PCB Antenna
Antenna Gain:	1.5dBi
Description of the EUT:	Product is a RF Module with WIFI and Bluetooth function.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

4 Summary of Test Standards

Test Standards	
RSS-Gen Issue 5 April 2018 / Amendment 1 (March 2019) / Amendment 2 (February 2021)	General Requirements for Compliance of Radio Apparatus
RSS-247 Issue 2 February 2017	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
FCC Part 15 Subpart C 10-1-2020 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB558074 D01 v05r02 DTS Measurement Guidance and ANSI C63.10 (2013).

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

5 Summary of Test Results

Technical Requirements				
FCC Part 15 Subpart C, RSS 247				
Test Condition			Pages	Test Result
§15.207	RSS-GEN 8.8	Conducted emission AC power port	10	Pass
§15.247(b)(1)	RSS-247 Clause 5.4(d)	Conducted peak output power	13	Pass
§15.247(a)(2)	RSS-247 Clause 5.2(a)	6dB bandwidth and 99% Occupied Bandwidth	14	Pass
§15.247(e)	RSS-247 Clause 5.2(b)	Power spectral density	22	Pass
§15.247(d)	RSS-247 Clause 5.5	Spurious RF conducted emissions	26	Pass
§15.247(d)	RSS-247 Clause 5.5	Band edge	37	Pass
§15.247(d) & §15.209 &	RSS-247 Clause 5.5 & RSS-GEN 6.13	Spurious radiated emissions for transmitter	40	Pass
§15.203	RSS-GEN 6.8	Antenna requirement	See note 1	Pass

Remark 1: N/A – Not Applicable.
Note 1: The EUT uses a PCB antenna, which gain is 1.5dBi. According to §15.203 & RSS-Gen 6.8, it is considered sufficiently to comply with the provisions of this section.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID:2ADAP-GRJWB05J5 complies with Section 15.207, 15.209, 15.205, 15.247 of the FCC Part 15, Subpart C rules; and IC:12478A-GRJWB05J5 complies with RSS-GEN issue 5 and RSS-247 issue 2.
This report is only for the WIFI part.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date: 2021-06-01

Testing Start Date: 2021-06-19

Testing End Date: 2021-10-09

- TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch -

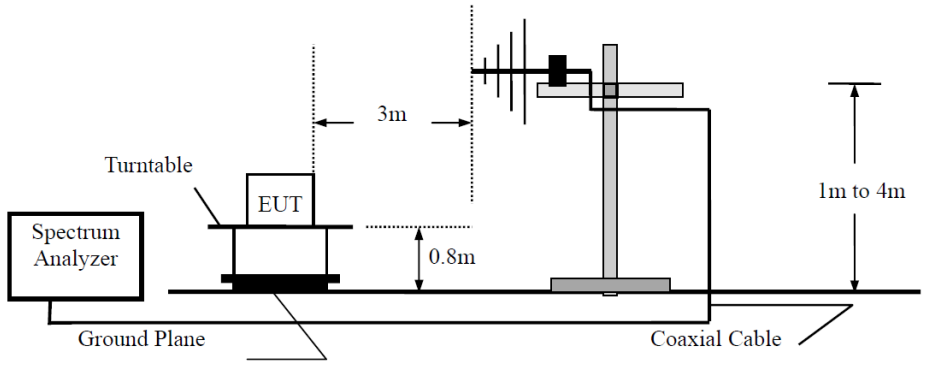
Reviewed by:	Prepared by:	Tested by:
Tony Liu	Kevin Ouyang	Louise Liu
Reviewer	Project Handler	EMC Test Engineer

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

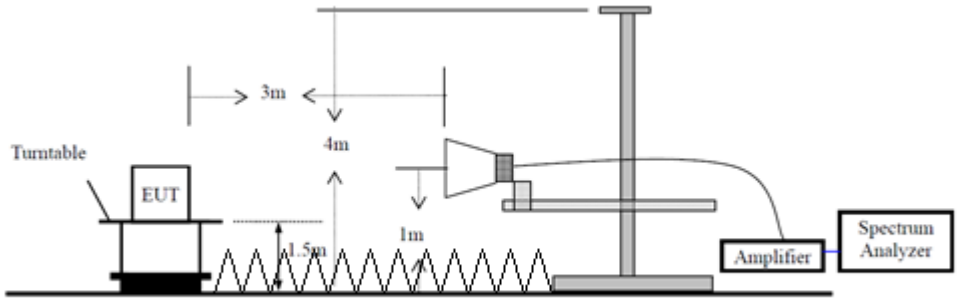
7 Test Setups

7.1 Radiated test setups

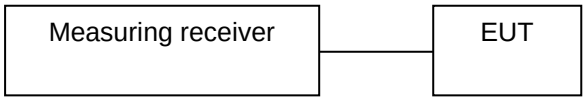
Below 1GHz



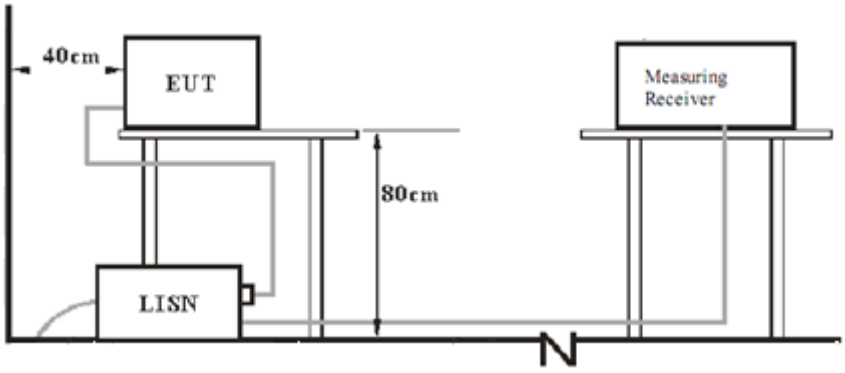
Above 1GHz



7.2 Conducted RF test setups



7.3 AC Power Line Conducted Emission test setups



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Mobile Phone	Apple	iPhone 6	---
APP	Gree+	Gree	---
Electric control board of air-conditioner	Gree	/	---
Laptop	Lenovo	X240	L34015282
Software	AmebaZ2_mptool_1	V3	---

The system was configured to channel 1, 6 and 11 for the test.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

According to §15.207, conducted emissions limit as below:

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

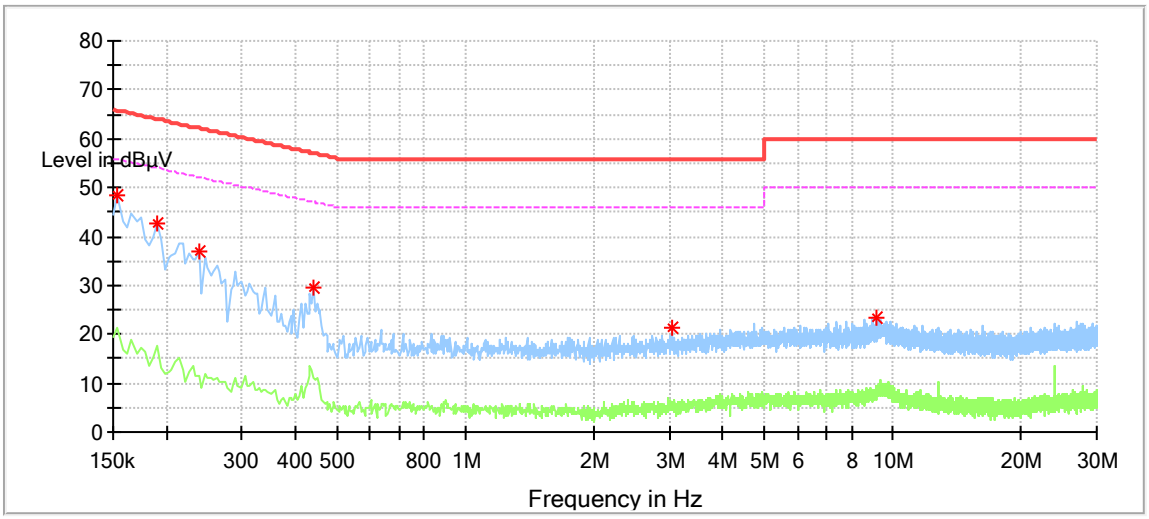
Remark: “*” Decreasing linearly with logarithm of the frequency

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Conducted Emission Test 150kHz – 30MHz

M/N: GRJWB05-J5
Op Cond.: WIFI communication mode.
Test Spec.: Power Line, Live

Temperature (°C): 22.5 Relative Humidity (%): 46.7 Atmospheric Pressure(mbar) : 1012



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.154000	48.27	---	65.78	17.52	L1	9.25
0.190000	42.64	---	64.04	21.40	L1	9.24
0.238000	37.12	---	62.17	25.04	L1	9.23
0.442000	29.71	---	57.02	27.32	L1	9.20
3.034000	21.19	---	56.00	34.81	L1	9.25
9.194000	23.39	---	60.00	36.61	L1	9.39

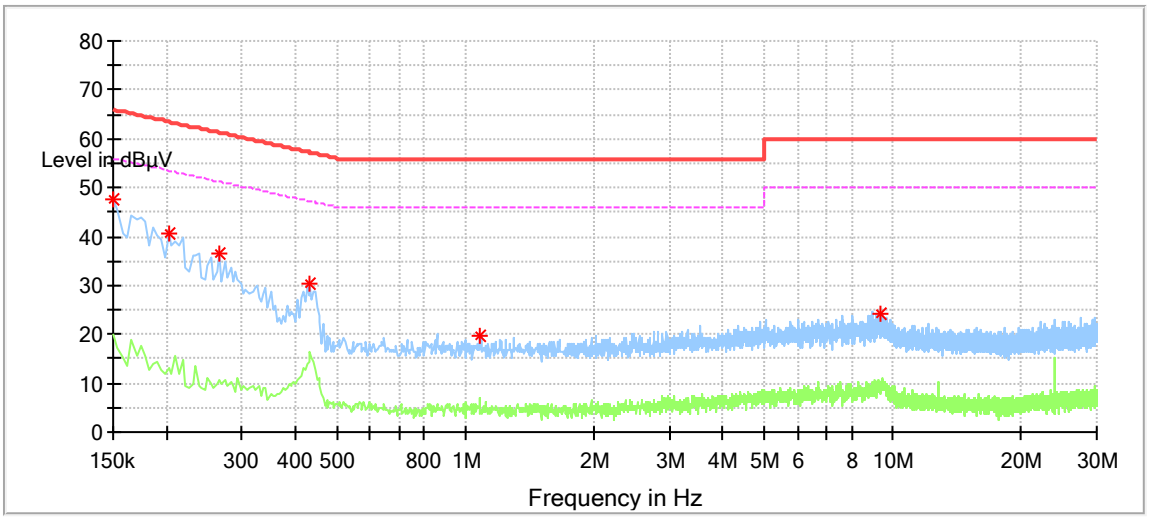
Remark： Correct factor=cable loss + LISN factor

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Conducted Emission Test 150kHz – 30MHz

M/N: GRJWB05-J5
Op Cond.: WIFI communication mode.
Test Spec.: Power Line, Neutral

Temperature (°C): 22.5 Relative Humidity (%): 46.7 Atmospheric Pressure(mbar) : 1012



Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.150000	47.43	---	66.00	18.57	N	9.40
0.202000	40.50	---	63.53	23.03	N	9.39
0.266000	36.44	---	61.24	24.80	N	9.39
0.434000	30.51	---	57.18	26.67	N	9.39
1.082000	19.82	---	56.00	36.18	N	9.40
9.330000	24.19	---	60.00	35.81	N	9.60

Remark： Correct factor=cable loss + LISN factor

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

9.2 Conducted peak output power

Test Method

1. Connect the power meter to the EUT
   a) The EUT is configured to transmit continuously, or to transmit with a constant duty factor.
   b) At all times the EUT is transmitting at its maximum power control level.
   c) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
3. Adjust the measurement in dBm by adding 10log (1/x), where x is the duty cycle to the measurement result.

Limits

Conducted Peak Output Power Limit:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

EIRP Limit :

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤4	≤36

Test result as below table

Conducted Peak Output Power

TestMode	Channel(MHz)	Result(dBm)	Limit(dBm)	Verdict
11B	2412	14.1	≤30	PASS
	2437	16.3	≤30	PASS
	2462	16.4	≤30	PASS
11G	2412	13.3	≤30	PASS
	2437	13.5	≤30	PASS
	2462	13.7	≤30	PASS
11N20SISO	2412	13.6	≤30	PASS
	2437	12.0	≤30	PASS
	2462	12.1	≤30	PASS

EIRP

TestMode	Channel(MHz)	EIRP(dBm)	Limit(dBm)	Verdict
11B	2412	15.6	≤36	PASS
	2437	17.8	≤36	PASS
	2462	17.9	≤36	PASS
11G	2412	14.8	≤36	PASS
	2437	15.0	≤36	PASS
	2462	15.2	≤36	PASS
11N20SISO	2412	15.1	≤36	PASS
	2437	13.5	≤36	PASS
	2462	13.6	≤36	PASS

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

9.3 6dB and 99% bandwidth

Test Method

1. Connect EUT test port to spectrum analyzer.
2. Use the following spectrum analyzer settings:
   Set RBW ≥ 1% of the 99% bandwidth, VBW ≥ RBW.
   Sweep = auto, Detector function = peak, Trace = max hold
3. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
4. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

Limit [kHz]
≥500

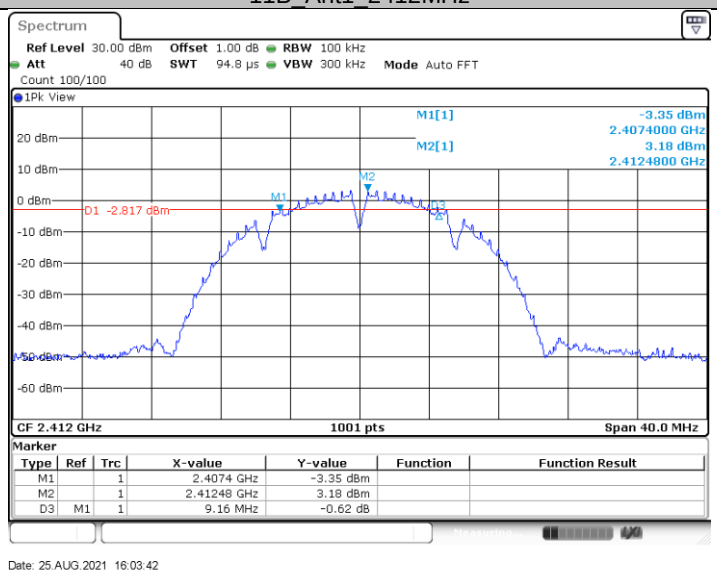
Test result

6dB bandwidth

TestMode	Channel[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	2412	9.160	2407.400	2416.560	0.5	PASS
	2437	9.600	2432.400	2442.000	0.5	PASS
	2462	9.600	2457.400	2467.000	0.5	PASS
11G	2412	16.640	2403.640	2420.280	0.5	PASS
	2437	16.640	2428.640	2445.280	0.5	PASS
	2462	16.640	2453.640	2470.280	0.5	PASS
11N20SISO	2412	17.880	2403.040	2420.920	0.5	PASS
	2437	17.880	2428.040	2445.920	0.5	PASS
	2462	17.880	2453.040	2470.920	0.5	PASS

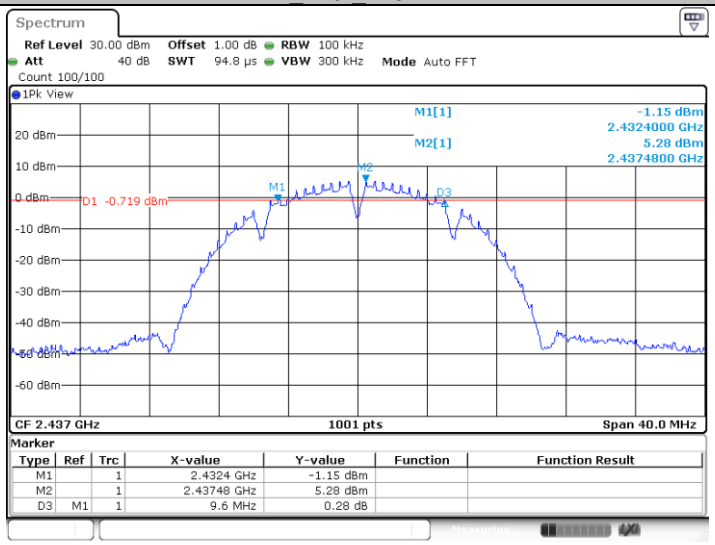
Test Graphs

11B_Ant1_2412MHz



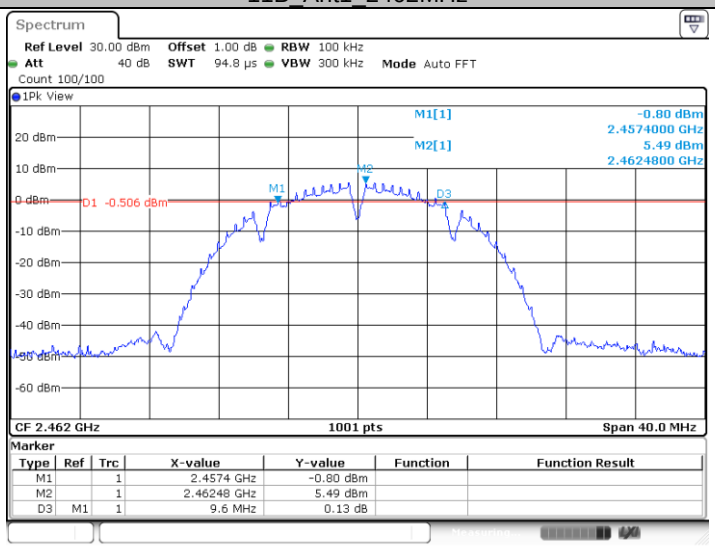
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11B_Ant1_2437MHz



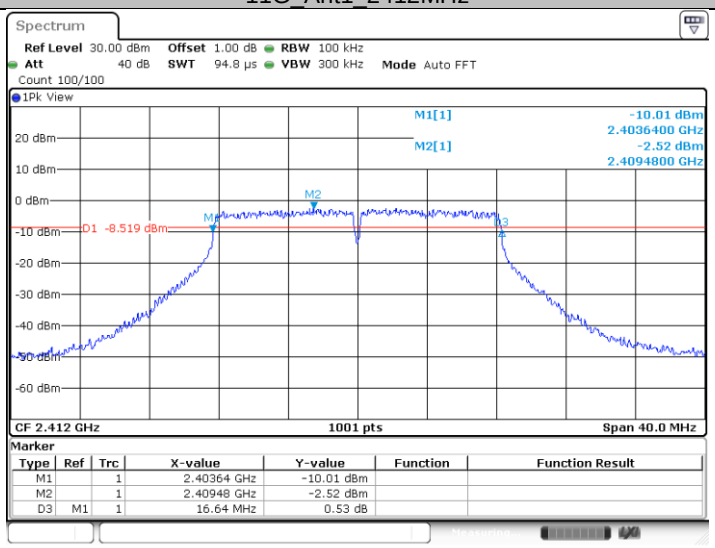
Date: 25.AUG.2021 16:06:34

11B_Ant1_2462MHz



Date: 25.AUG.2021 16:09:02

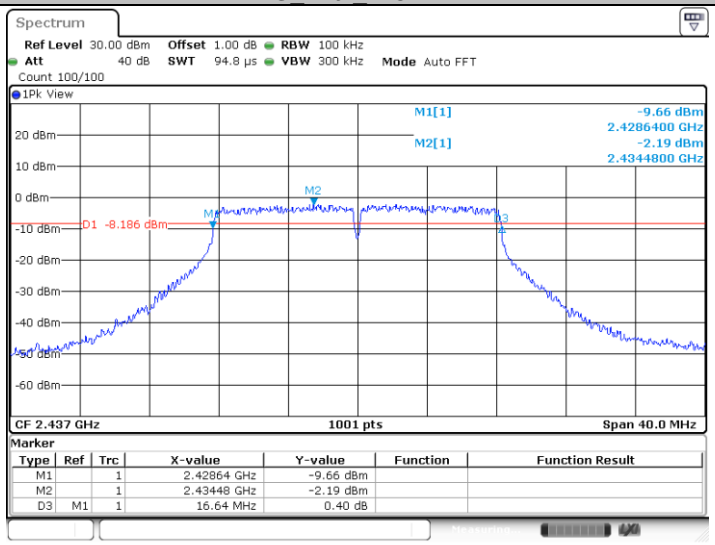
11G_Ant1_2412MHz



Date: 25.AUG.2021 16:11:40

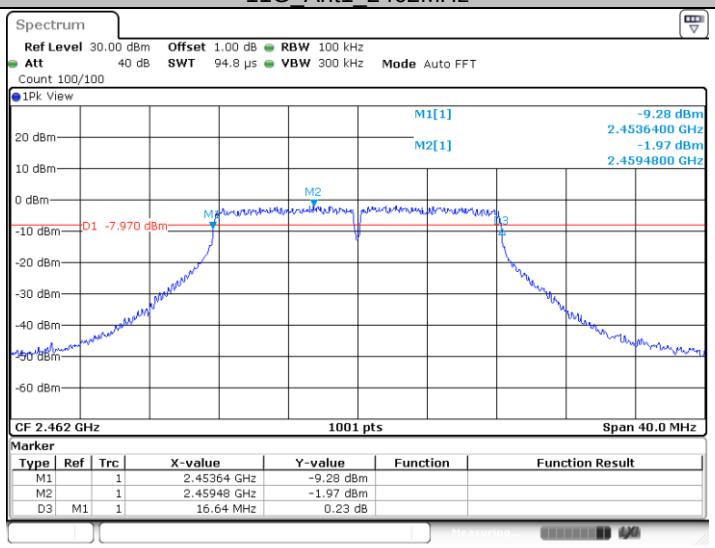
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11G_Ant1_2437MHz



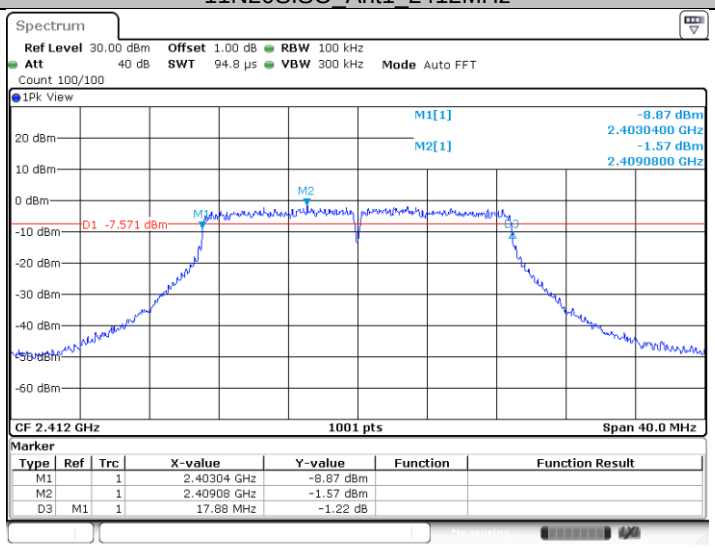
Date: 25.AUG.2021 16:14:56

11G_Ant1_2462MHz



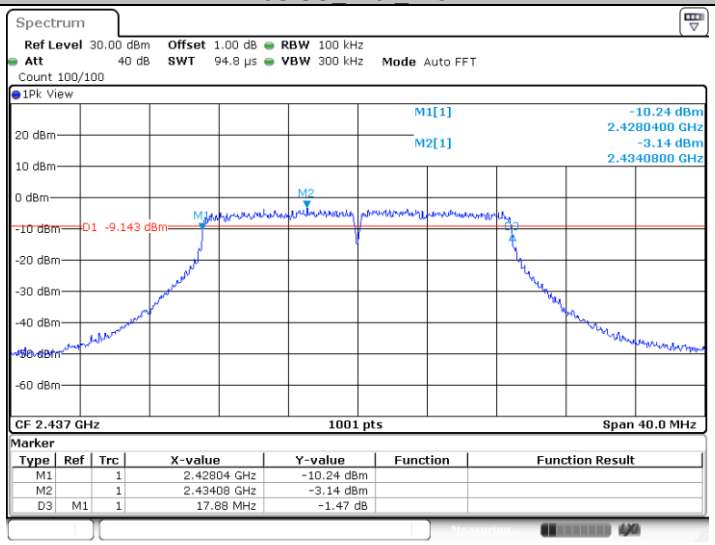
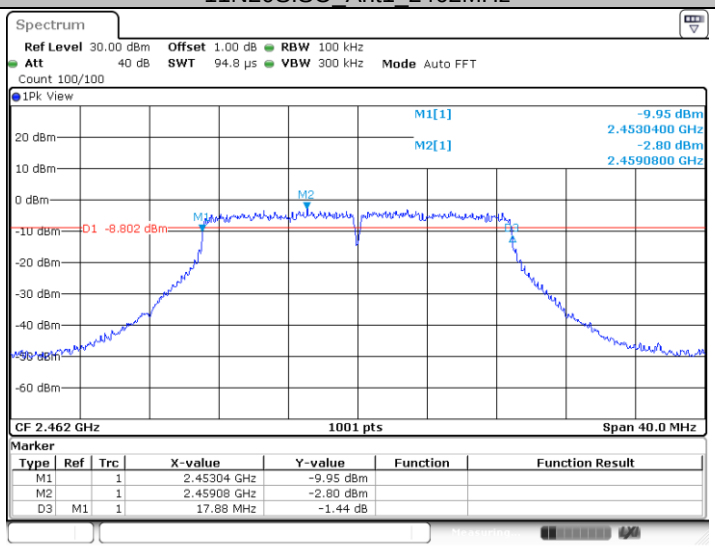
Date: 25.AUG.2021 16:18:16

11N20SISO_Ant1_2412MHz



Date: 25.AUG.2021 16:21:53

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11N20SISO_Ant1_2437MHz
 Date: 25.AUG.2021 16:25:41
11N20SISO_Ant1_2462MHz
 Date: 25.AUG.2021 16:30:28

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

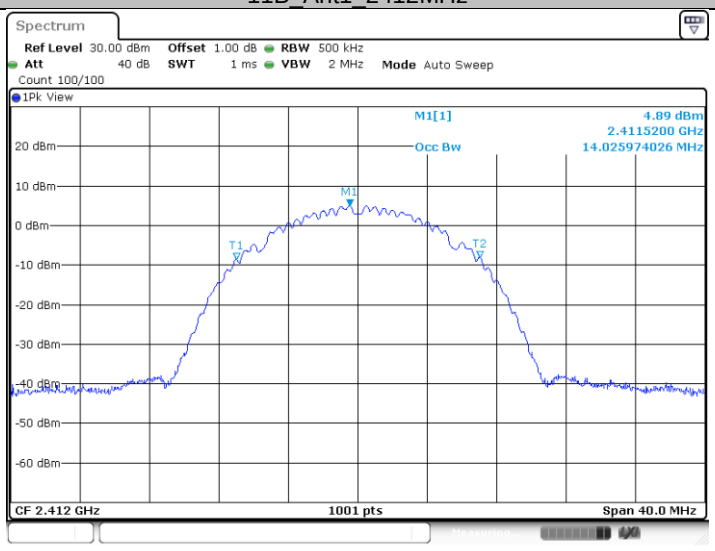
99% bandwidth

Test Result

TestMode	Channel[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	2412	14.026	2405.007	2419.033	---	PASS
	2437	14.026	2430.007	2444.033	---	PASS
	2462	14.026	2455.007	2469.033	---	PASS
11G	2412	17.582	2403.009	2420.591	---	PASS
	2437	17.542	2428.009	2445.551	---	PASS
	2462	17.542	2453.009	2470.551	---	PASS
11N20SISO	2412	18.462	2402.729	2421.191	---	PASS
	2437	18.501	2427.689	2446.191	---	PASS
	2462	18.501	2452.689	2471.191	---	PASS

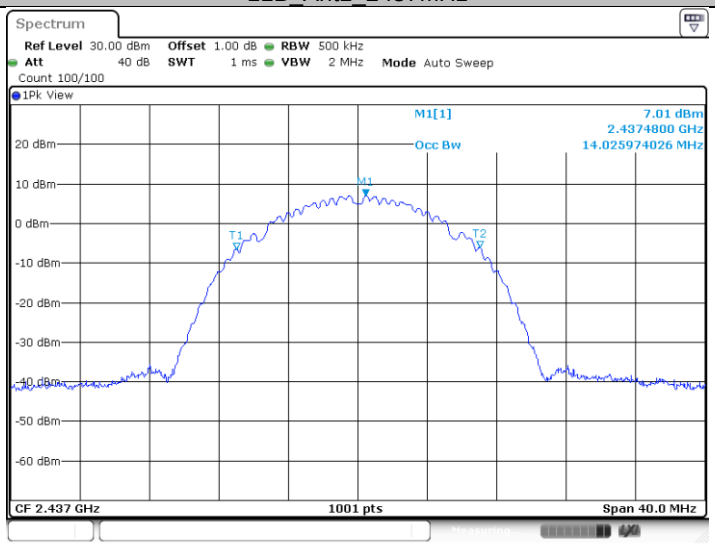
Test Graphs

11B_Ant1_2412MHz



Date: 25.AUG.2021 16:03:53

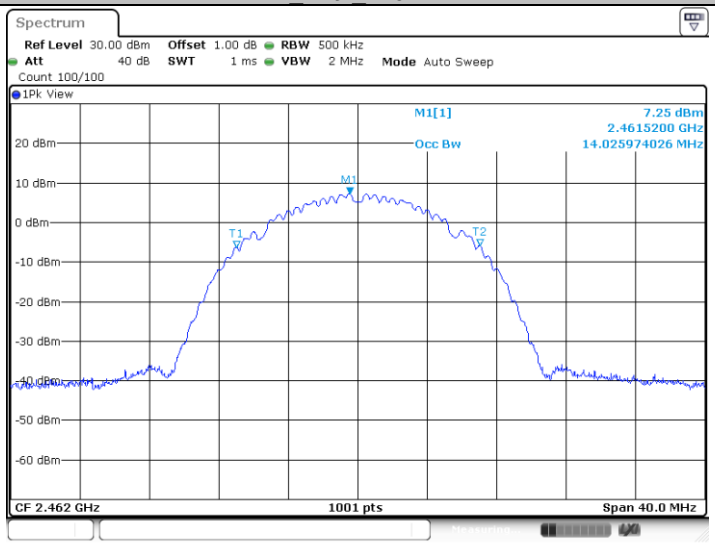
11B_Ant1_2437MHz



Date: 25.AUG.2021 16:06:44

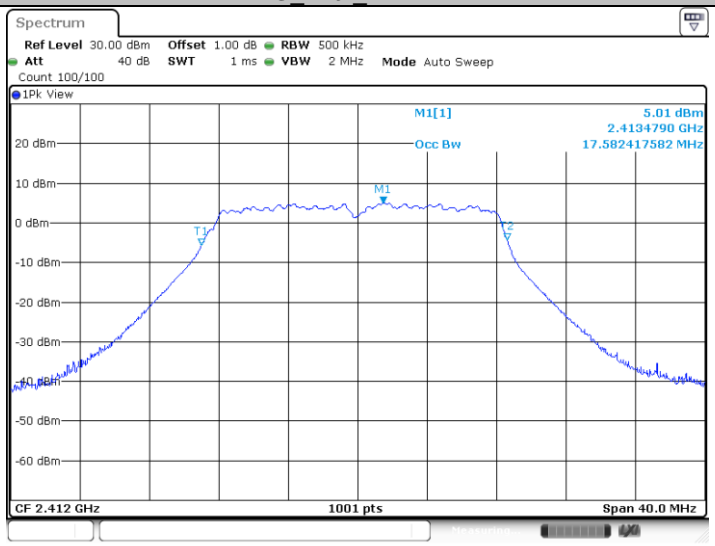
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11B_Ant1_2462MHz



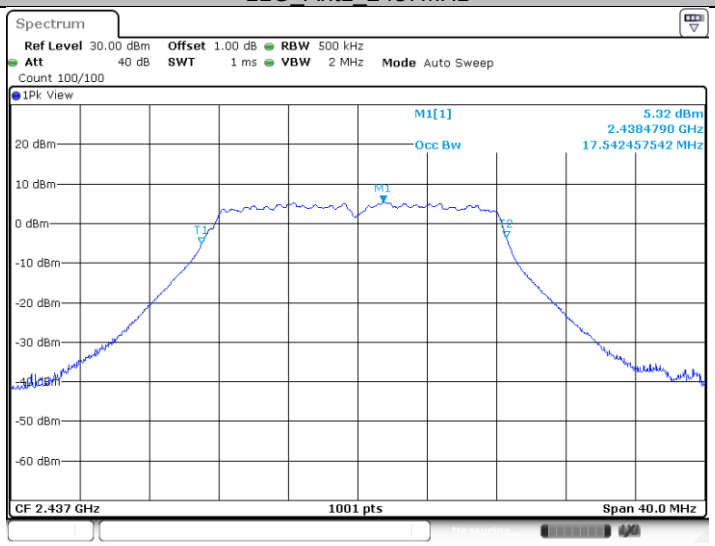
Date: 25.AUG.2021 16:09:13

11G_Ant1_2412MHz



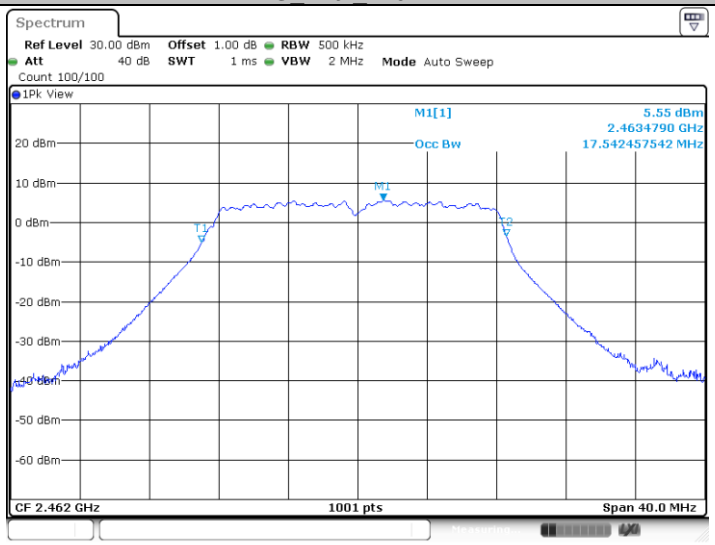
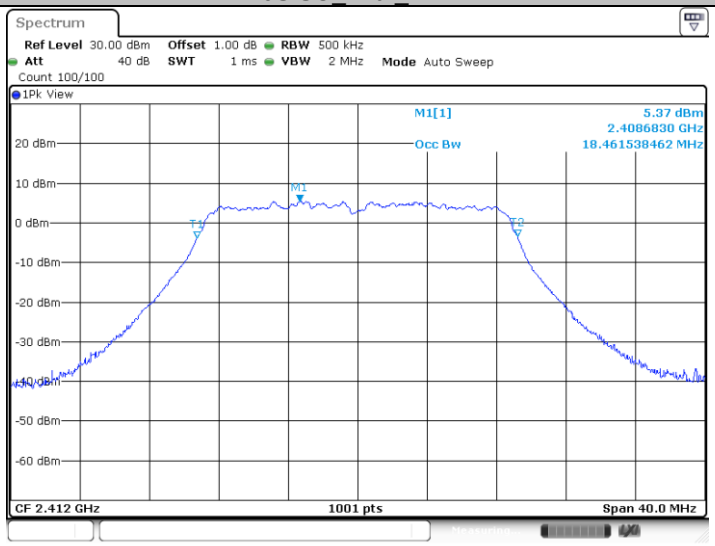
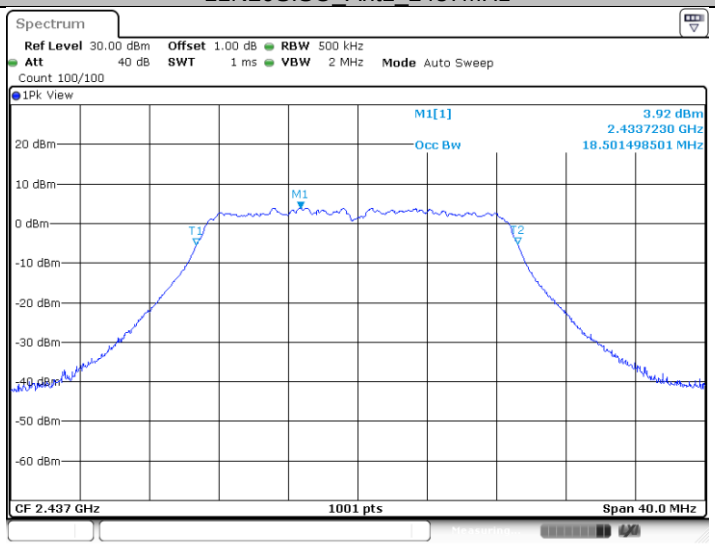
Date: 25.AUG.2021 16:11:51

11G_Ant1_2437MHz

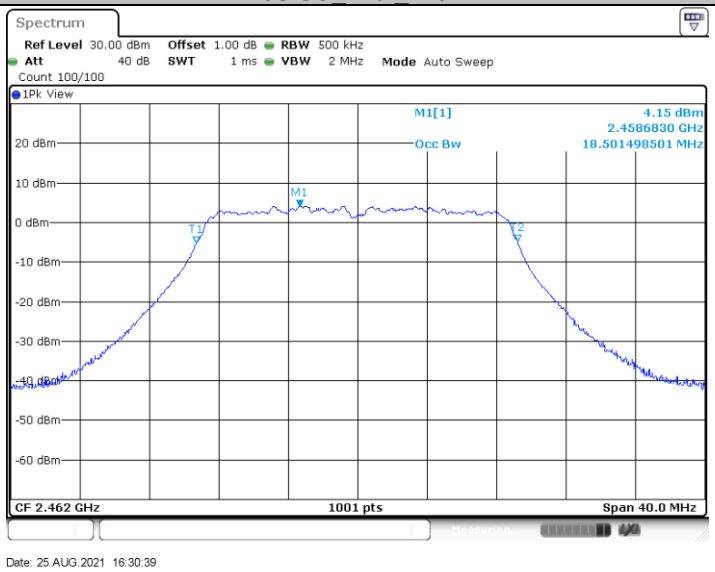


Date: 25.AUG.2021 16:15:07

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11G_Ant1_2462MHz
 Date: 25.AUG.2021 16:18:27
11N20SISO_Ant1_2412MHz
 Date: 25.AUG.2021 16:22:04
11N20SISO_Ant1_2437MHz
 Date: 25.AUG.2021 16:25:52

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11N20SISO_Ant1_2462MHz


TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

9.4 Power spectral density

Test Method

1. Connect EUT test port to spectrum analyzer.
2. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW≥3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
3. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
4. Repeat above procedures until other frequencies measured were completed.

Limit

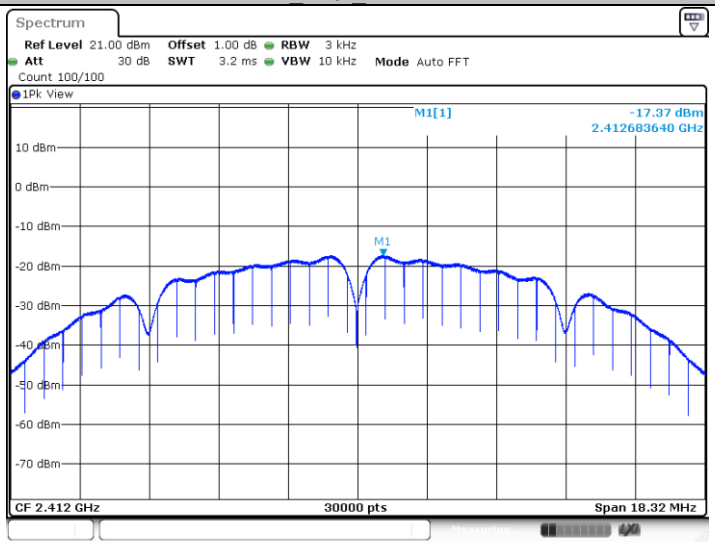
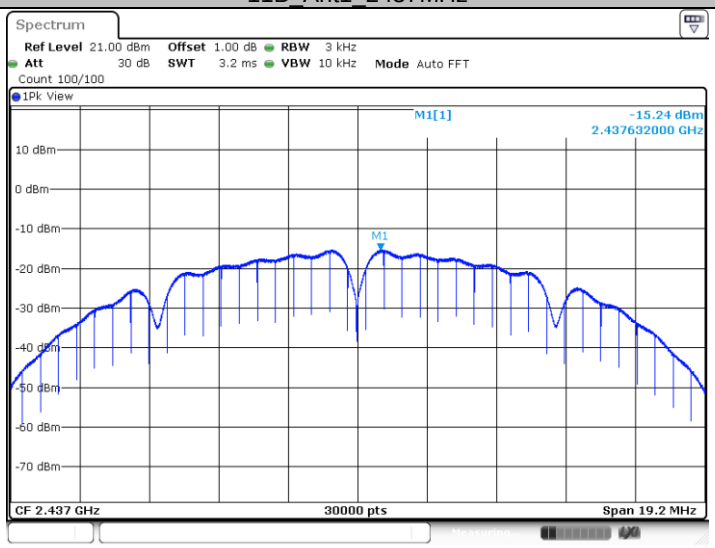
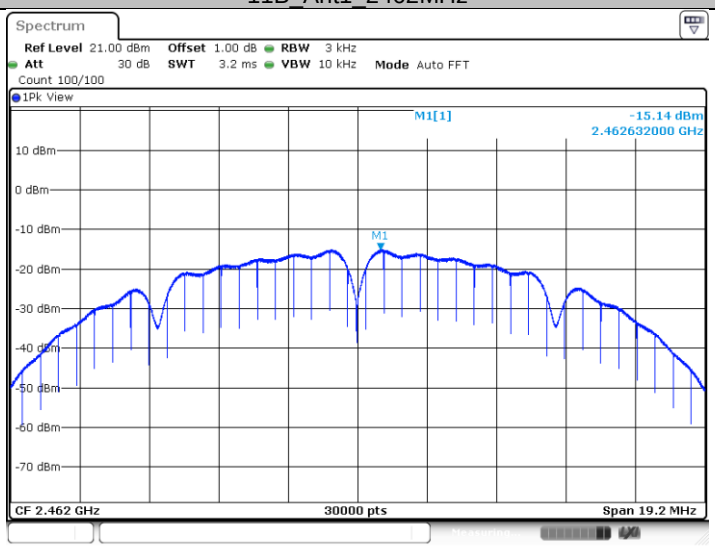
Limit [dBm/3KHz]
≤8

Test result

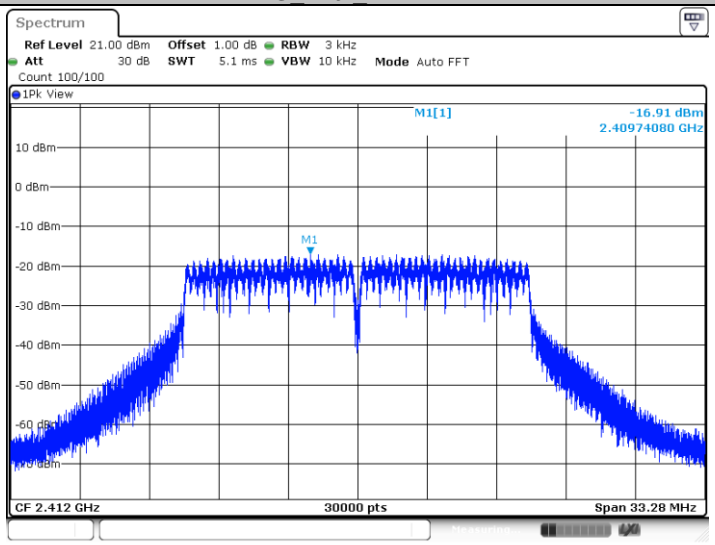
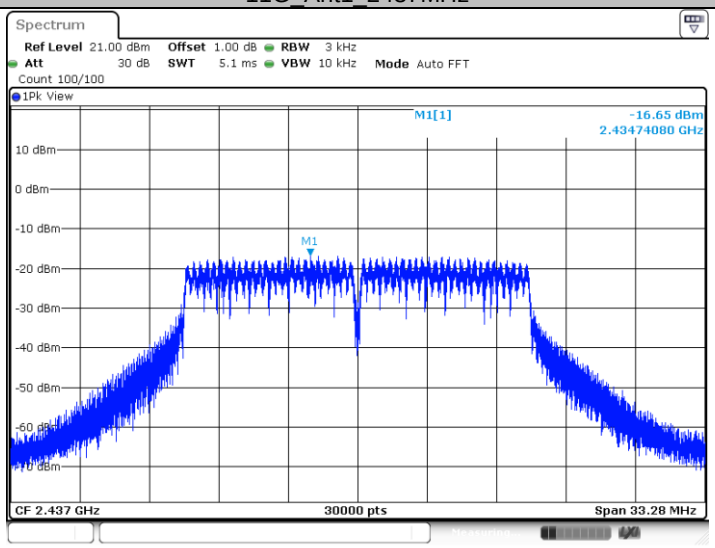
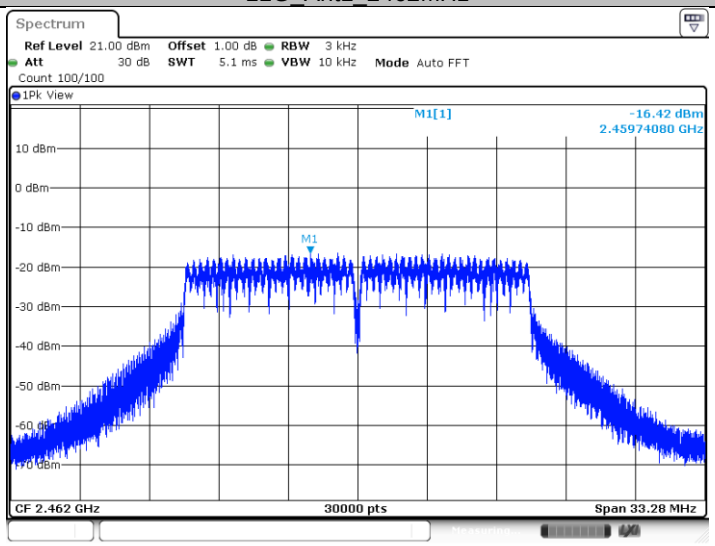
TestMode	Channel[MHz]	Result[dBm/3KHz]	Limit[dBm/3KHz]	Verdict
11B	2412	-17.37	≤8	PASS
	2437	-15.24	≤8	PASS
	2462	-15.14	≤8	PASS
11G	2412	-16.91	≤8	PASS
	2437	-16.65	≤8	PASS
	2462	-16.42	≤8	PASS
11N20SISO	2412	-15.79	≤8	PASS
	2437	-17.43	≤8	PASS
	2462	-17.17	≤8	PASS

Test Graphs

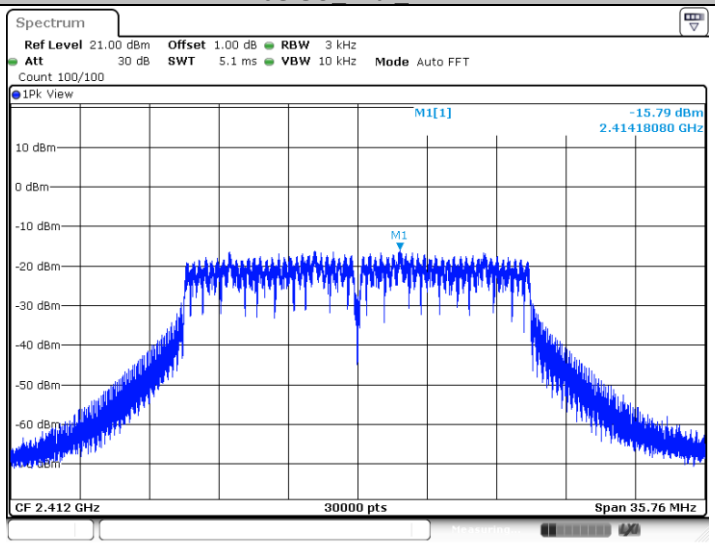
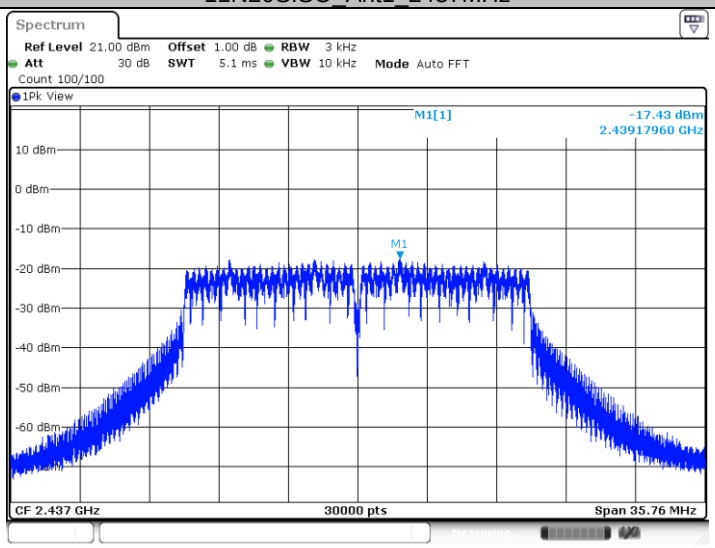
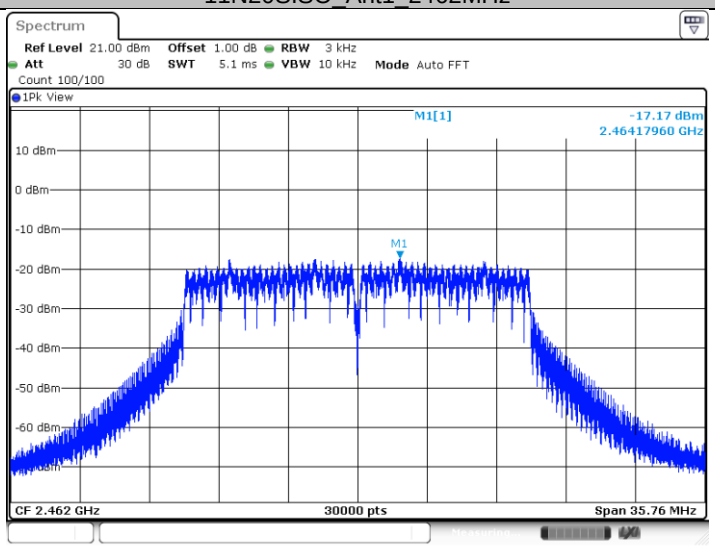
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11B_Ant1_2412MHz
 Date: 25.AUG.2021 16:04:05
11B_Ant1_2437MHz
 Date: 25.AUG.2021 16:06:56
11B_Ant1_2462MHz
 Date: 25.AUG.2021 16:09:25

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11G_Ant1_2412MHz
 Date: 25.AUG.2021 16:12:02
11G_Ant1_2437MHz
 Date: 25.AUG.2021 16:15:18
11G_Ant1_2462MHz
 Date: 25.AUG.2021 16:18:39

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11N20SISO_Ant1_2412MHz
 Date: 25.AUG.2021 16:22:16
11N20SISO_Ant1_2437MHz
 Date: 25.AUG.2021 16:26:03
11N20SISO_Ant1_2462MHz
 Date: 25.AUG.2021 16:30:50

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

9.5 Spurious RF conducted emissions

Test Method

1. Connect EUT test port to spectrum analyzer.
2. Establish a reference level by using the following procedure:
   a. Set RBW=100 kHz. VBW≥3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
   b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
3. Use the maximum PSD level to establish the reference level.
   a. Set the center frequency and span to encompass frequency range to be measured.
   b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
4. Repeat above procedures until other frequencies measured were completed.

Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

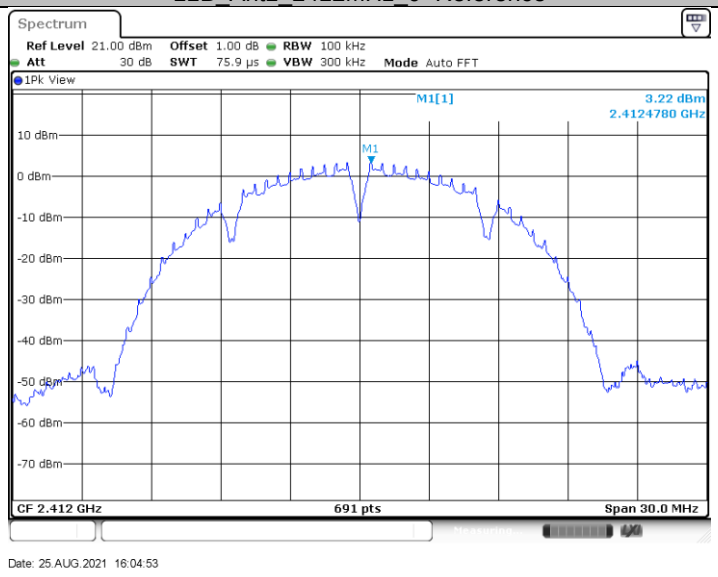
Spurious RF conducted emissions

Test Result

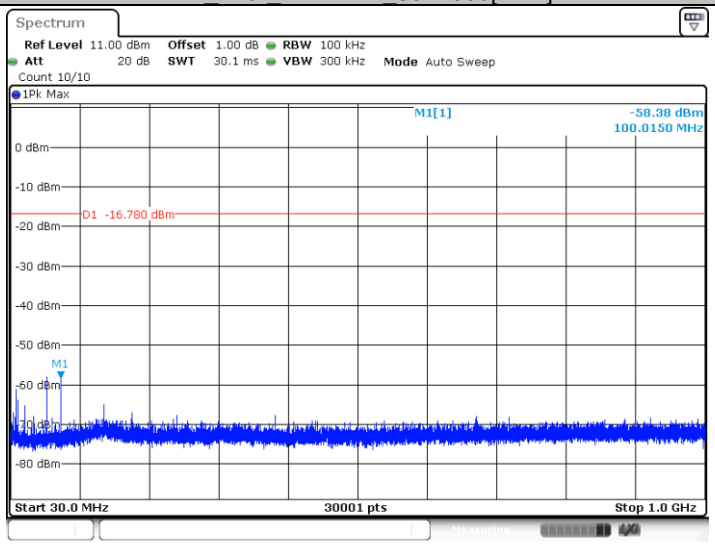
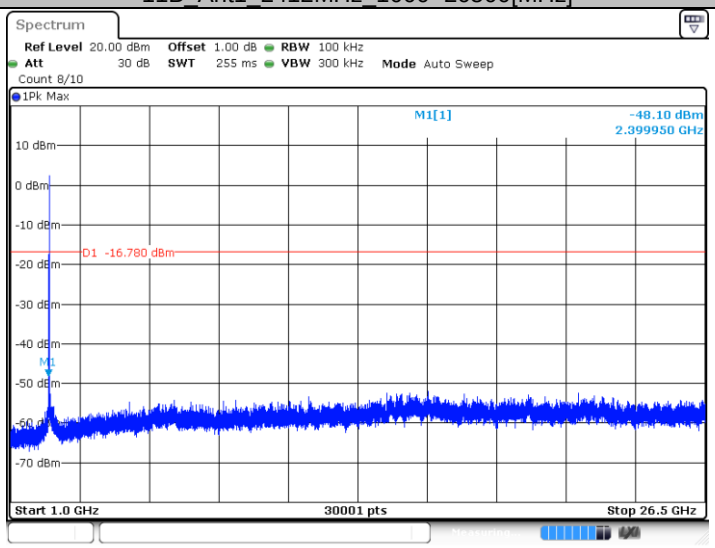
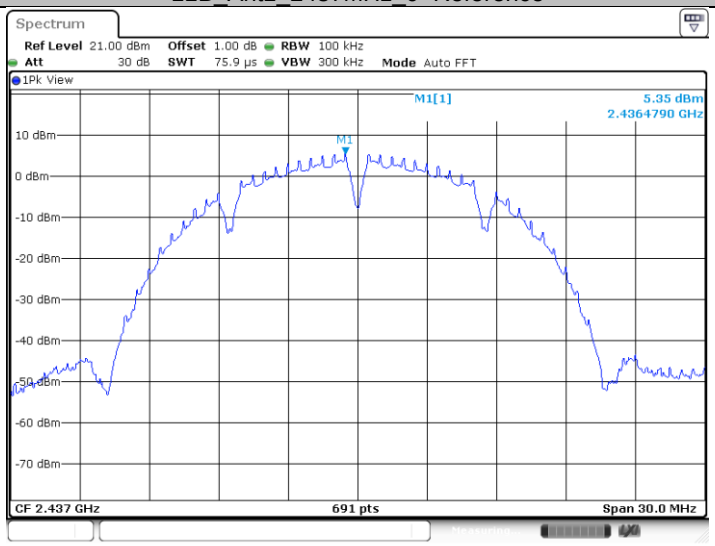
TestMode	Channel[MHz]	FreqRange[MHz]	RefLevel(dBm)	Result(dBm)	Limit(dBm)	Verdict
11B	2412	Reference	3.22	3.22	---	PASS
		30~1000	30~1000	-58.38	≤-16.78	PASS
		1000~26500	1000~26500	-48.32	≤-16.78	PASS
	2437	Reference	5.35	5.35	---	PASS
		30~1000	30~1000	-58.27	≤-14.65	PASS
		1000~26500	1000~26500	-52.23	≤-14.65	PASS
	2462	Reference	5.45	5.45	---	PASS
		30~1000	30~1000	-58.07	≤-14.55	PASS
		1000~26500	1000~26500	-51.94	≤-14.55	PASS
11G	2412	Reference	-2.33	-2.33	---	PASS
		30~1000	30~1000	-55.21	≤-22.33	PASS
		1000~26500	1000~26500	-32.18	≤-22.33	PASS
	2437	Reference	-2.14	-2.14	---	PASS
		30~1000	30~1000	-55.16	≤-22.14	PASS
		1000~26500	1000~26500	-52.45	≤-22.14	PASS
	2462	Reference	-1.91	-1.91	---	PASS
		30~1000	30~1000	-55.27	≤-21.91	PASS
		1000~26500	1000~26500	-51.85	≤-21.91	PASS
11N20SISO	2412	Reference	-1.59	-1.59	---	PASS
		30~1000	30~1000	-55.18	≤-21.59	PASS
		1000~26500	1000~26500	-34.81	≤-21.59	PASS
	2437	Reference	-3.59	-3.59	---	PASS
		30~1000	30~1000	-55.37	≤-23.59	PASS
		1000~26500	1000~26500	-52.08	≤-23.59	PASS
	2462	Reference	-3.02	-3.02	---	PASS
		30~1000	30~1000	-55.21	≤-23.02	PASS
		1000~26500	1000~26500	-51.63	≤-23.02	PASS

Test Graphs

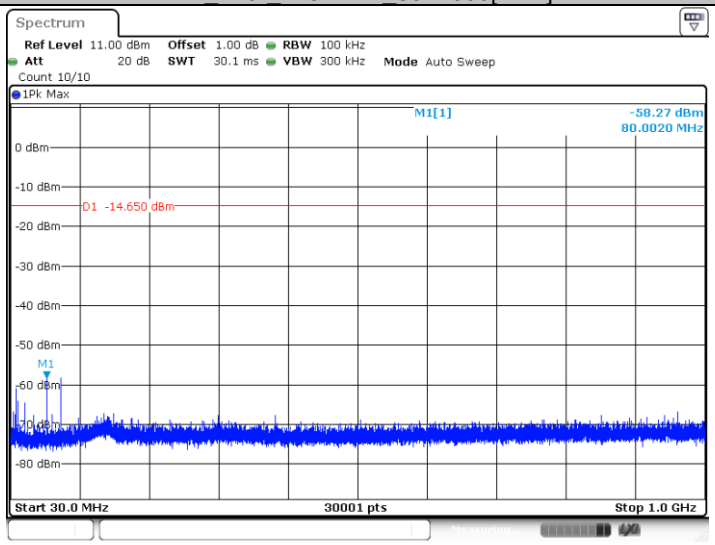
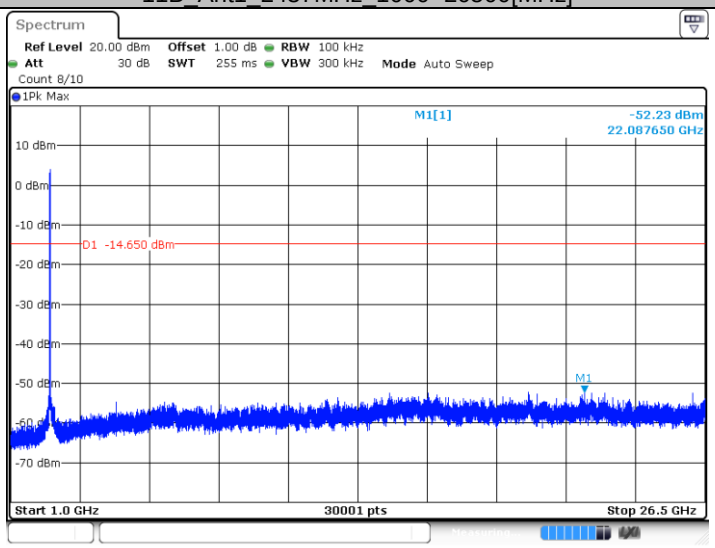
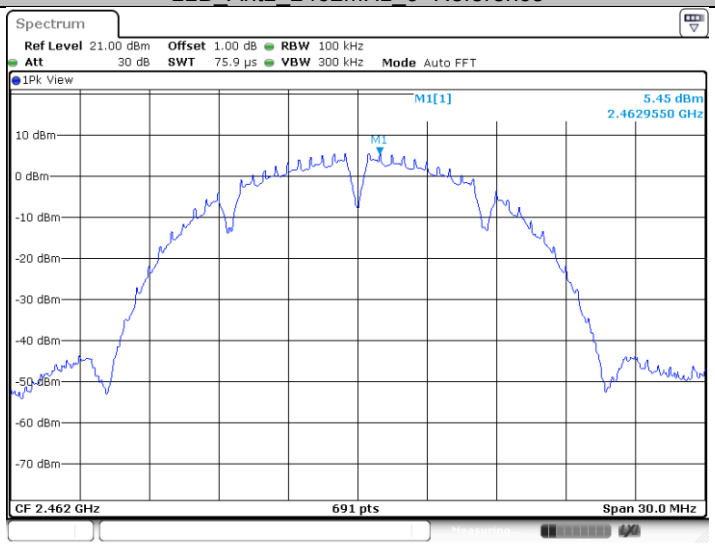
11B_Ant1_2412MHz_0~Reference



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

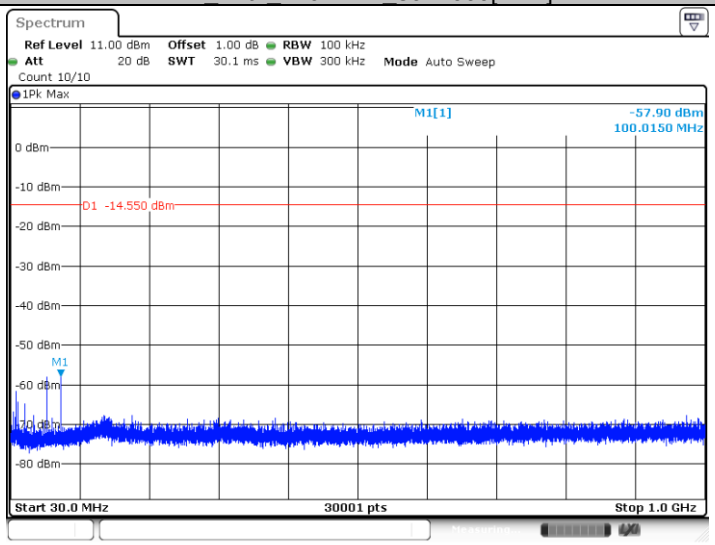
11B_Ant1_2412MHz_30~1000[MHz]
 Date: 25.AUG.2021 16:05:00
11B_Ant1_2412MHz_1000~26500[MHz]
 Date: 25.AUG.2021 16:05:07
11B_Ant1_2437MHz_0~Reference
 Date: 25.AUG.2021 16:07:02

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11B_Ant1_2437MHz_30~1000[MHz]
 Date: 25.AUG.2021 16:07:08
11B_Ant1_2437MHz_1000~26500[MHz]
 Date: 25.AUG.2021 16:07:15
11B_Ant1_2462MHz_0~Reference
 Date: 25.AUG.2021 16:09:39

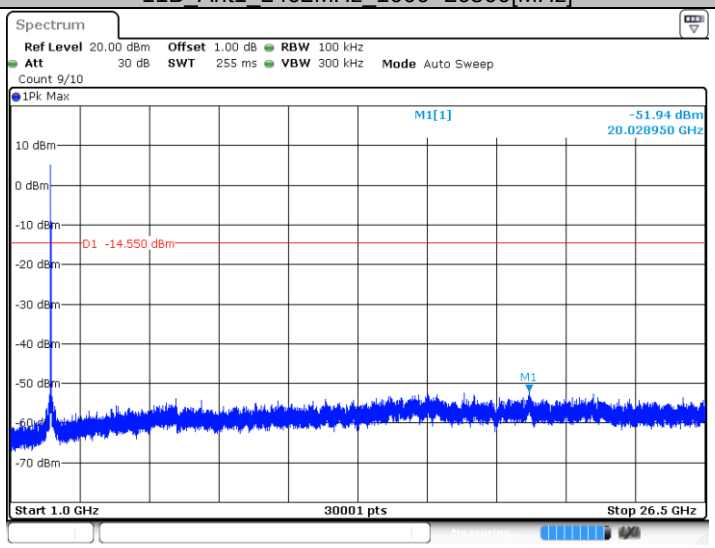
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11B_Ant1_2462MHz_30~1000[MHz]



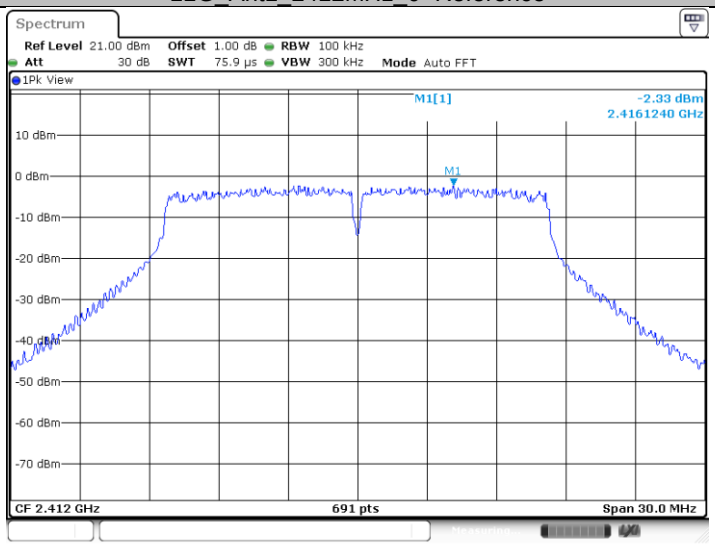
Date: 25.AUG.2021 16:09:46

11B_Ant1_2462MHz_1000~26500[MHz]



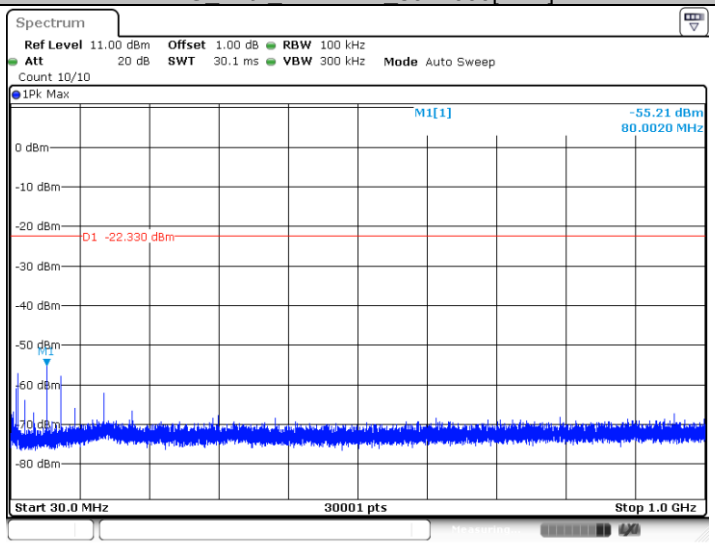
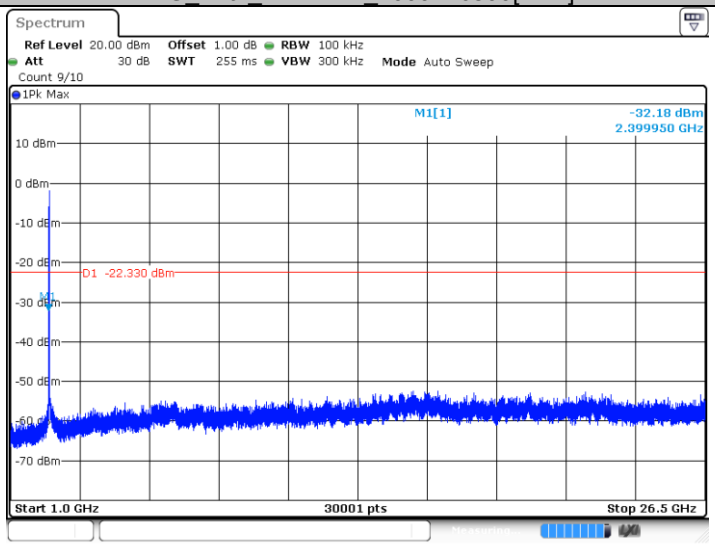
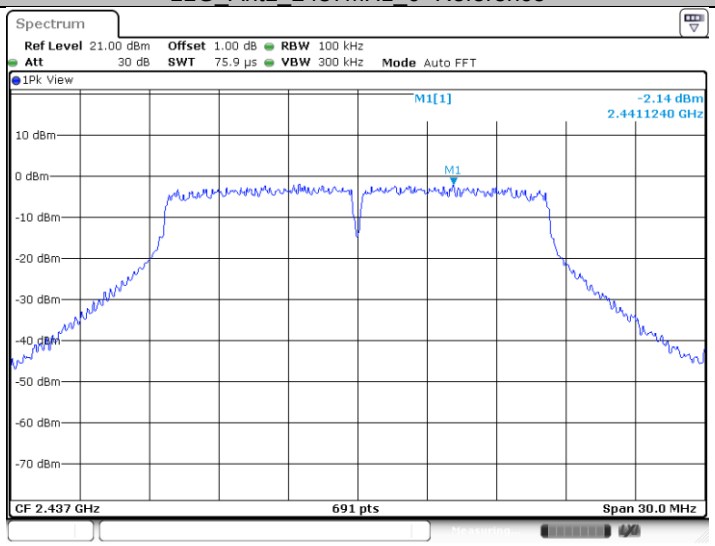
Date: 25.AUG.2021 16:09:53

11G_Ant1_2412MHz_0~Reference



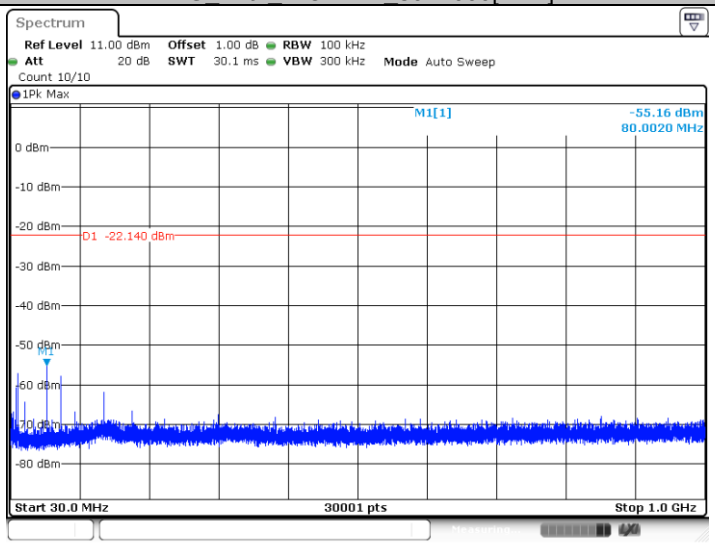
Date: 25.AUG.2021 16:12:17

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11G_Ant1_2412MHz_30~1000[MHz]
 Date: 25.AUG.2021 16:12:23
11G_Ant1_2412MHz_1000~26500[MHz]
 Date: 25.AUG.2021 16:12:31
11G_Ant1_2437MHz_0~Reference
 Date: 25.AUG.2021 16:15:24

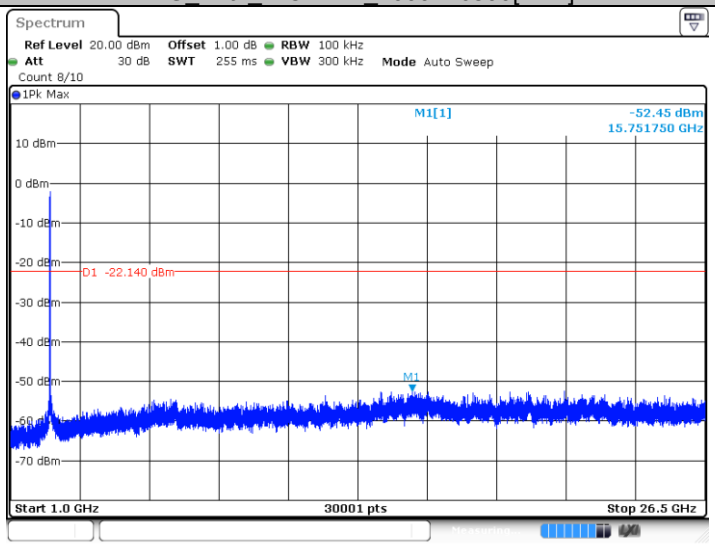
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11G_Ant1_2437MHz_30~1000[MHz]



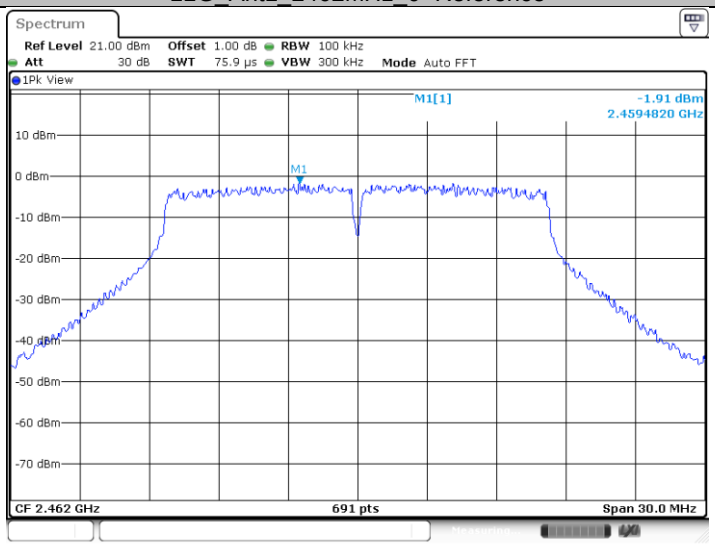
Date: 25.AUG.2021 16:15:30

11G_Ant1_2437MHz_1000~26500[MHz]



Date: 25.AUG.2021 16:15:38

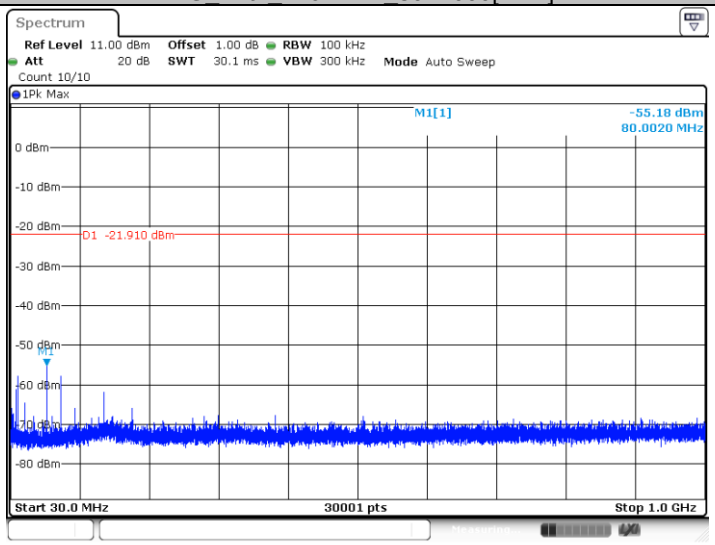
11G_Ant1_2462MHz_0~Reference



Date: 25.AUG.2021 16:18:53

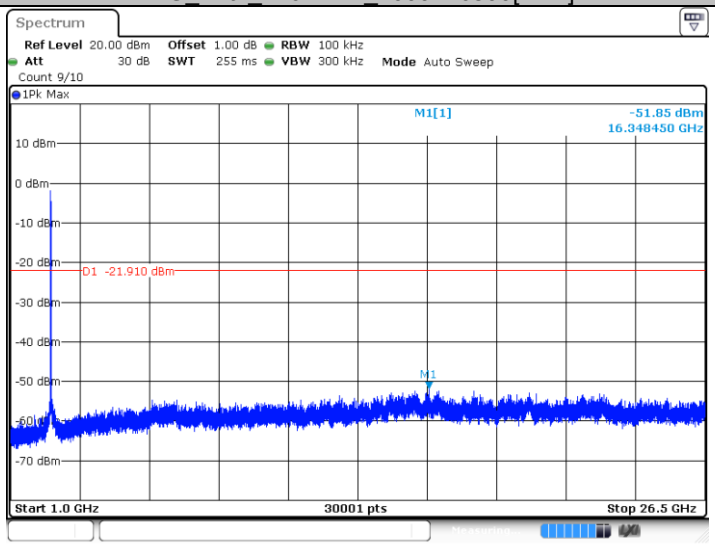
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11G_Ant1_2462MHz_30~1000[MHz]



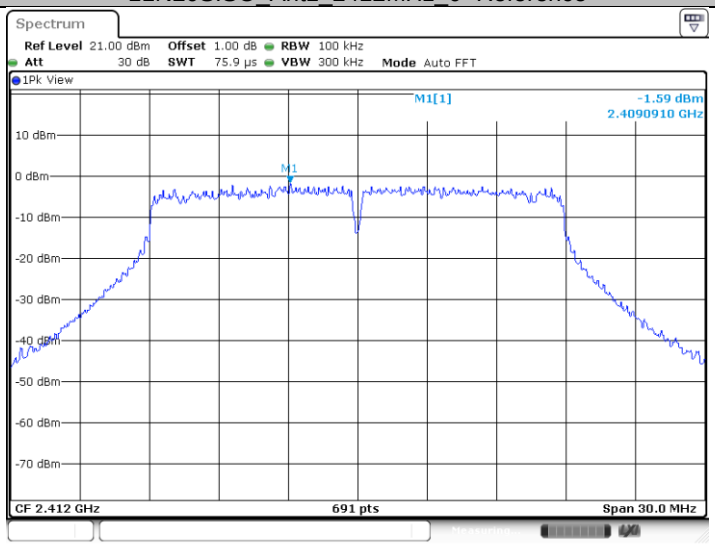
Date: 25.AUG.2021 16:18:59

11G_Ant1_2462MHz_1000~26500[MHz]



Date: 25.AUG.2021 16:19:07

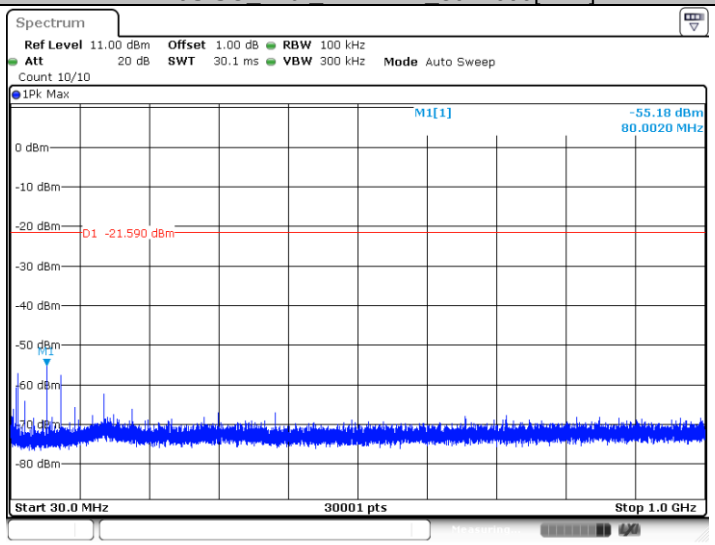
11N20SISO_Ant1_2412MHz_0~Reference



Date: 25.AUG.2021 16:22:30

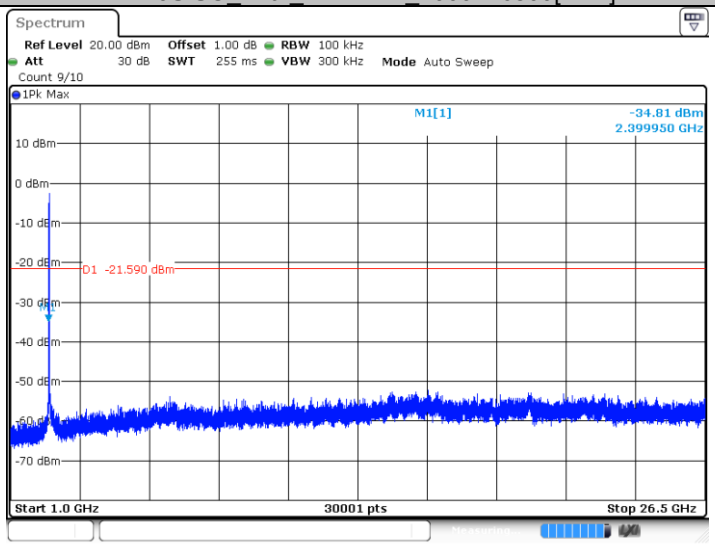
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11N20SISO_Ant1_2412MHz_30~1000[MHz]



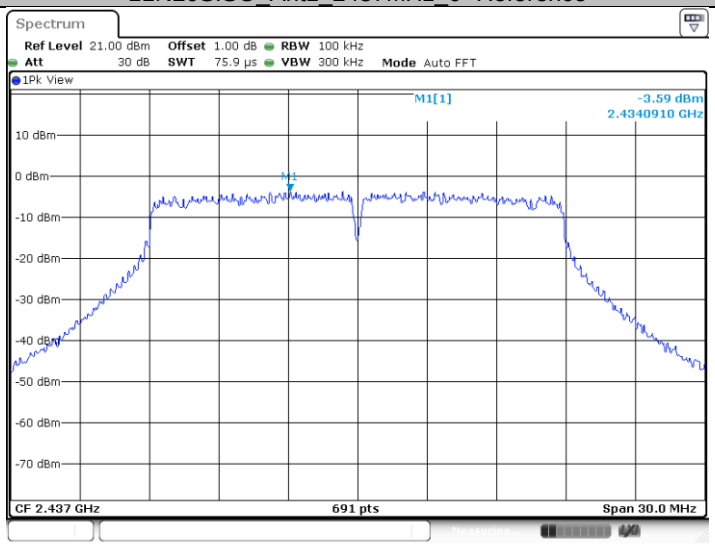
Date: 25.AUG.2021 16:22:37

11N20SISO_Ant1_2412MHz_1000~26500[MHz]



Date: 25.AUG.2021 16:22:44

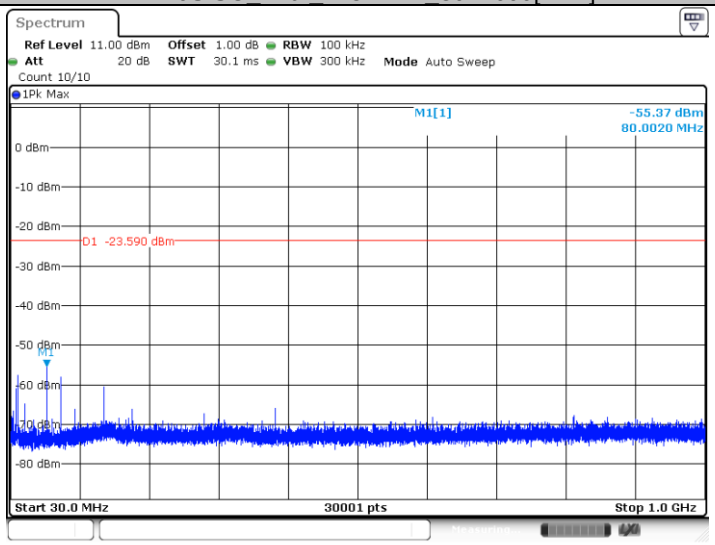
11N20SISO_Ant1_2437MHz_0~Reference



Date: 25.AUG.2021 16:26:09

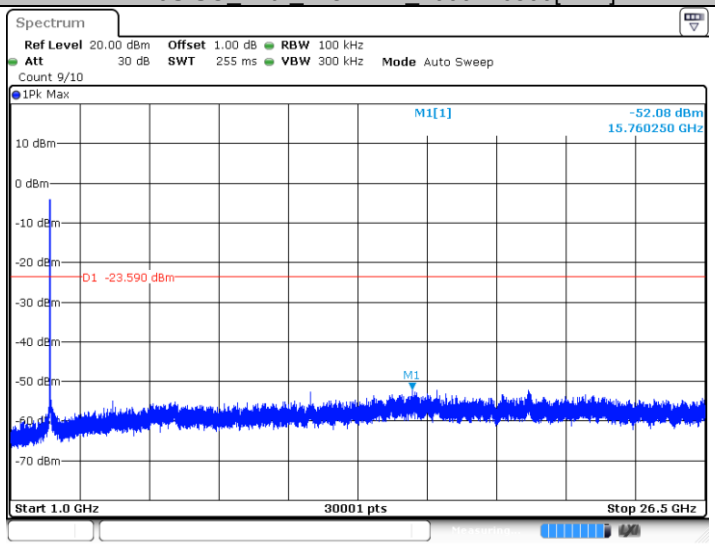
TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11N20SISO_Ant1_2437MHz_30~1000[MHz]



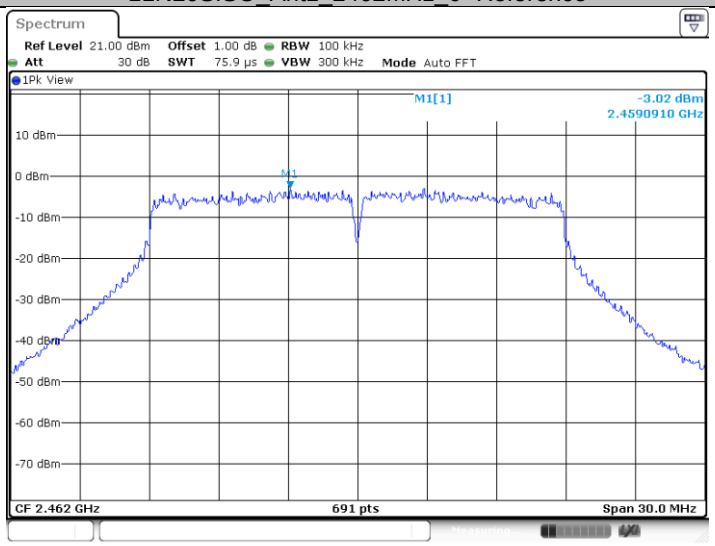
Date: 25.AUG.2021 16:26:15

11N20SISO_Ant1_2437MHz_1000~26500[MHz]



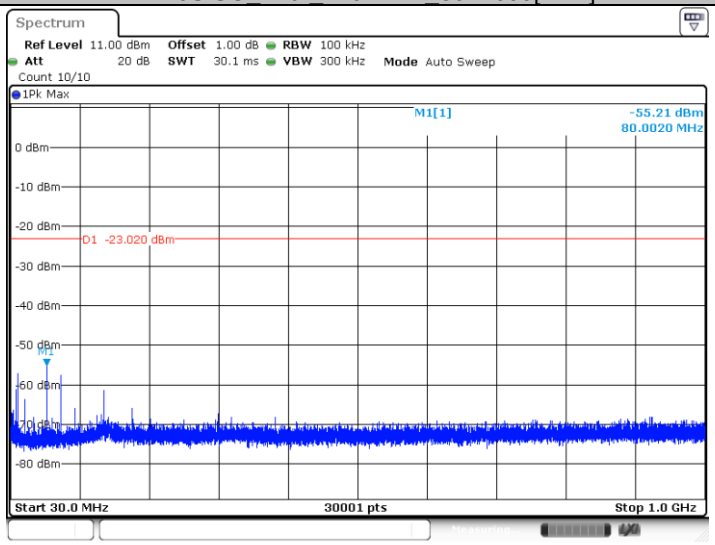
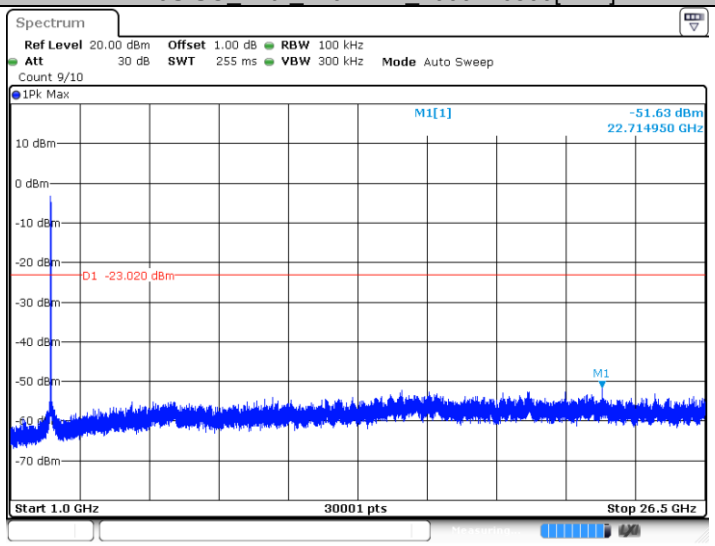
Date: 25.AUG.2021 16:26:23

11N20SISO_Ant1_2462MHz_0~Reference



Date: 25.AUG.2021 16:31:05

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11N20SISO_Ant1_2462MHz_30~1000[MHz]
 Date: 25.AUG.2021 16:31:11
11N20SISO_Ant1_2462MHz_1000~26500[MHz]
 Date: 25.AUG.2021 16:31:19

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

9.6 Band edge

Test Method

1. Connect EUT test port to spectrum analyzer.
2. Set spectrum analyzer setting as below:
   Set RBW ≥ 1% of the span, VBW ≥ RBW.
   Set Sweep = auto. Set Detector function = peak. Allow the trace to stabilize.
   Set Span = wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.
3. Repeat above procedures until all frequencies measured were complete.

Limit

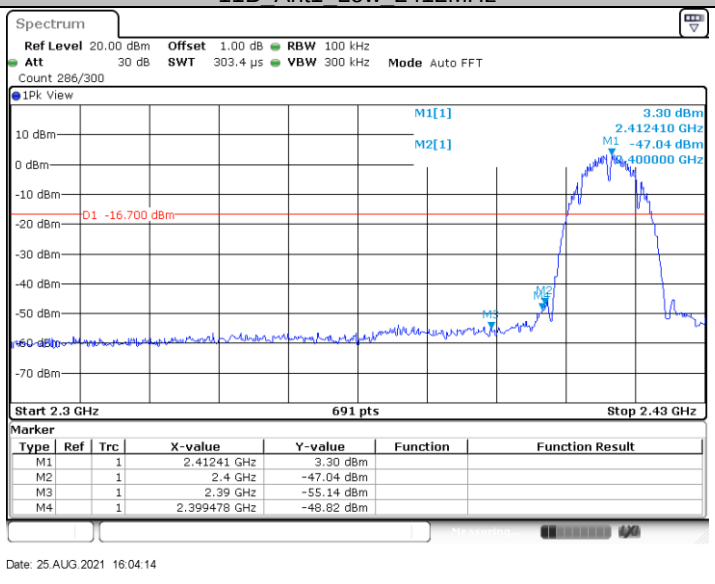
Frequency Range MHz	Limit (dBc)
30-25000	-20

Test result

TestMode	ChName	Channel[MHz]	RefLevel(dBm)	Result(dBm)	Limit(dBm)	Verdict
11B	Low	2412	3.30	-48.82	≤-16.7	PASS
	High	2462	5.44	-50.13	≤-14.56	PASS
11G	Low	2412	-2.42	-33.92	≤-22.42	PASS
	High	2462	-2.08	-52.04	≤-22.08	PASS
11N20SISO	Low	2412	-2.10	-35	≤-22.1	PASS
	High	2462	-2.95	-53.31	≤-22.95	PASS

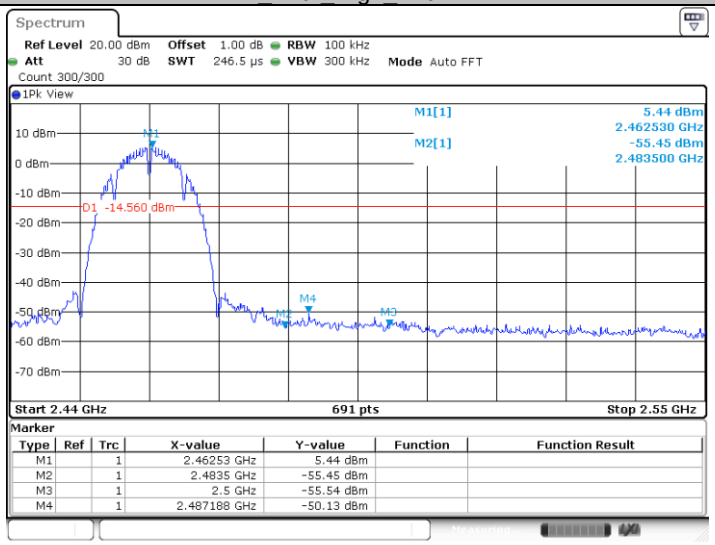
Test Graphs

11B_Ant1_Low_2412MHz



TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11B_Ant1_High_2462MHz

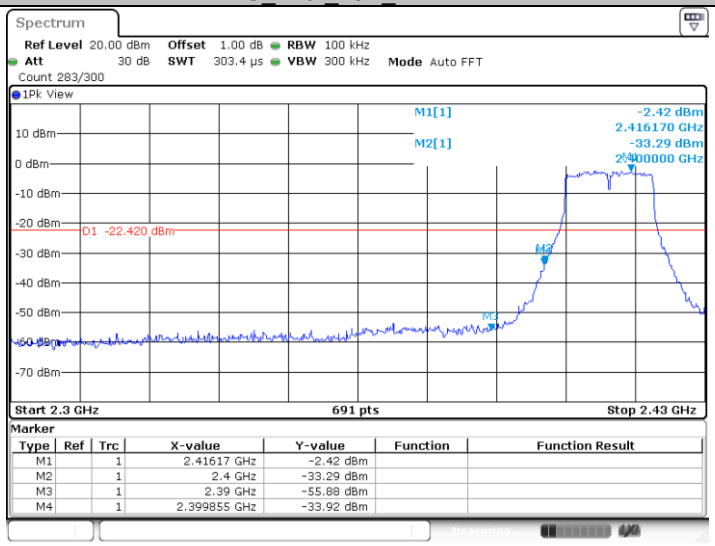


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.46253 GHz	5.44 dBm		
M2		1	2.4835 GHz	-55.45 dBm		
M3		1	2.5 GHz	-55.54 dBm		
M4		1	2.487188 GHz	-50.13 dBm		

Date: 25.AUG.2021 16:09:34

11G_Ant1_Low_2412MHz

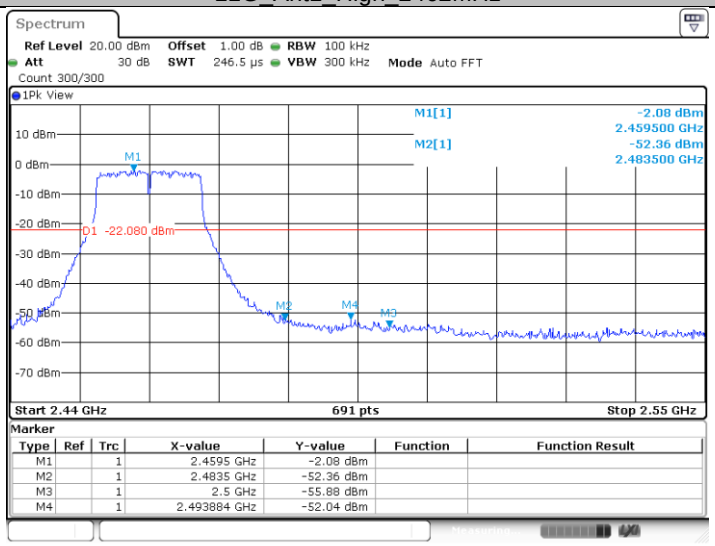


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.41617 GHz	-2.42 dBm		
M2		1	2.4 GHz	-33.29 dBm		
M3		1	2.39 GHz	-55.88 dBm		
M4		1	2.399855 GHz	-33.92 dBm		

Date: 25.AUG.2021 16:12:11

11G_Ant1_High_2462MHz

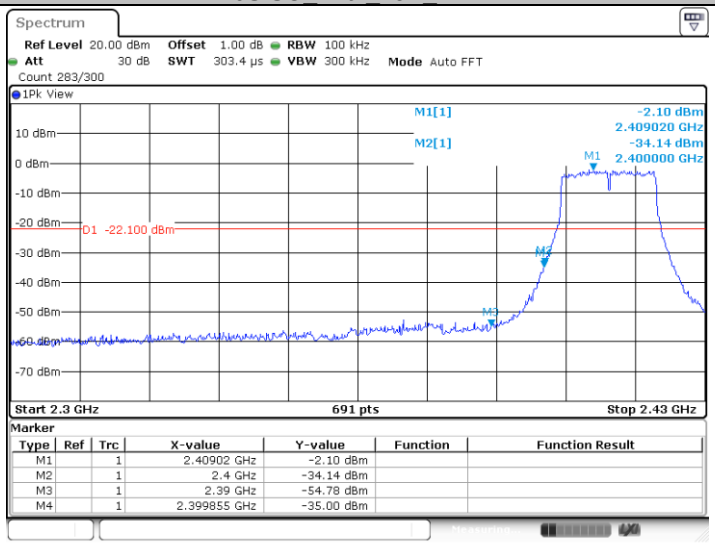
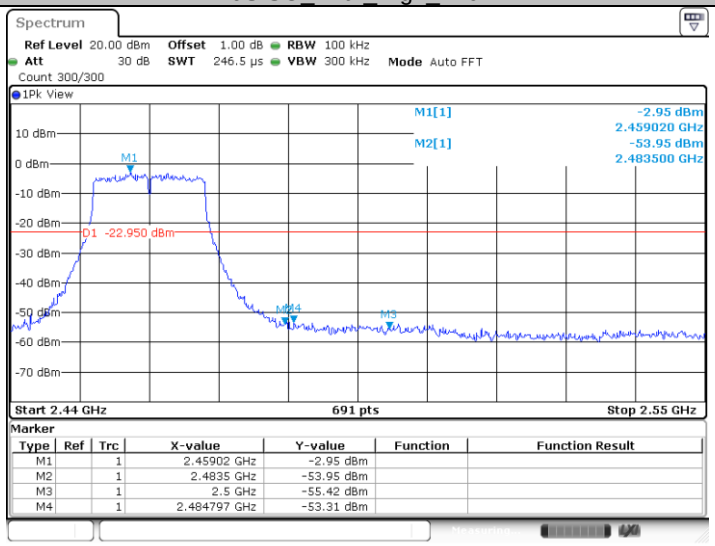


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4595 GHz	-2.08 dBm		
M2		1	2.4835 GHz	-52.36 dBm		
M3		1	2.5 GHz	-55.88 dBm		
M4		1	2.493884 GHz	-52.04 dBm		

Date: 25.AUG.2021 16:18:48

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11N20SISO_Ant1_Low_2412MHz
 Date: 25.AUG.2021 16:22:25
11N20SISO_Ant1_High_2462MHz
 Date: 25.AUG.2021 16:30:59

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

9.7 Spurious radiated emissions for transmitter

Test Method

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5: Use the following spectrum analyzer settings According to C63.10:
For Below 1GHz
Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 100 KHz to 120KHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious RBW = 1MHz, VBW≥RBW for peak measurement ,Sweep = auto, Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz

a) RBW = 1 MHz.
b) VBW \ [3 × RBW].
c) Detector = RMS (power averaging), if [span / (# of points in sweep)] \ RBW / 2. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
e) Sweep time = auto.
f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D,where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.
2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.
3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Limit

The radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

Only show data of the WORST case for all Test Modes and Channels.

Emission (30MHz – 1GHz)

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
33.017778	17.66	40.00	22.34	H	11.36
99.678333	19.38	43.50	24.12	H	12.88
366.320556	24.05	46.00	21.95	H	16.90
30.970000	23.20	40.00	16.80	V	11.23
90.517222	23.55	43.50	19.95	V	11.11
389.816111	25.45	46.00	20.55	V	17.26

Emission (Above 1GHz)

802.11b
2412MHz

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
2394.000000	46.83	74.00	27.17	H	-2.05
2575.500000	46.18	74.00	27.82	H	-1.48
4657.500000	47.87	74.00	26.13	H	3.66
5708.000000	50.79	74.00	23.21	H	6.17
7431.000000	42.33	74.00	31.67	H	7.21
9648.000000	43.79	74.00	30.21	H	9.27
2248.500000	45.22	74.00	28.78	V	-2.50
2581.000000	44.61	74.00	29.39	V	-1.46
4286.000000	48.48	74.00	25.52	V	3.21
5916.000000	50.40	74.00	23.60	V	6.73
7235.500000	42.87	74.00	31.13	V	6.91
9870.000000	43.92	74.00	30.08	V	11.29

2437MHz

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
2268.000000	44.57	74.00	29.43	H	-2.50
3732.000000	46.48	74.00	27.52	H	1.13
4752.000000	47.42	74.00	26.58	H	3.78
5976.500000	50.78	74.00	23.22	H	6.77
7138.500000	41.63	74.00	32.37	H	6.70
9491.500000	43.26	74.00	30.74	H	9.66
2249.500000	45.93	74.00	28.07	V	-2.51
2592.500000	43.97	74.00	30.03	V	-1.42
4314.000000	47.72	74.00	26.28	V	3.13
5859.000000	50.12	74.00	23.88	V	6.76
7939.500000	42.47	74.00	31.53	V	7.85
9863.500000	44.12	74.00	29.88	V	11.41

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

2462MHz

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Pol	Corr. (dB/m)
1595.500000	43.68	74.00	30.32	H	-6.69
2340.500000	45.43	74.00	28.57	H	-2.14
2930.000000	45.66	74.00	28.34	H	-0.29
4123.500000	48.53	74.00	25.47	H	2.64
5371.000000	48.64	74.00	25.36	H	5.40
5720.000000	49.59	74.00	24.41	H	6.25
2335.500000	44.38	74.00	29.62	V	-2.11
2611.000000	44.18	74.00	29.82	V	-1.36
4291.500000	48.46	74.00	25.54	V	3.19
5843.000000	50.71	74.00	23.29	V	6.69
7277.000000	41.57	74.00	32.43	V	6.98
9892.000000	45.87	74.00	28.13	V	10.88

Remark:

(1) Data of Data of measurement within frequency range18-26GHz are the noise floor or attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so test data does not present in this report.

(2) Level=Reading Level + Correction Factor
Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Amplifier Gain
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
(The Reading Level is recorded by software which is not shown in the sheet)

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

10 Test Equipment List

List of Test Instruments

Conducted Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2022-6-4
LISN	Rohde & Schwarz	ENV4200	100249	2022-6-5
LISN	Rohde & Schwarz	ENV432	101318	2022-6-5
LISN	Rohde & Schwarz	ENV216	100326	2022-6-5

Radiated Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2022-6-4
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9162	284	2022-2-2
Wave Guide Antenna	ETS	3117	00218954	2022-5-24
Pre-amplifier	Rohde & Schwarz	SCU 18F	100745	2021-10-25
Pre-amplifier	Rohde & Schwarz	SCU 08F2	08400018	2021-10-25
Sideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	12827	2022-7-21
Pre-amplifier	Rohde & Schwarz	SCU 40A	100432	2022-7-27
3m Semi-anechoic chamber	TDK	SAC-3 #2	----	2023-5-28
Test software	Rohde & Schwarz	EMC32	Version10.35.02	N/A

RF conducted test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Generator	Rohde & Schwarz	SMB100A	108272	2022-6-3
Vector Signal Generator	Rohde & Schwarz	SMBV100A	262825	2022-6-3
Communication Synthetical Test Instrument	Rohde & Schwarz	CMW 270	101251	2022-6-3
Signal Analyzer	Rohde & Schwarz	FSV40	101030	2022-6-3
Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2022-6-3
RF Switch Module	Rohde & Schwarz	OSP120/OSP-B157	101226/100851	2022-6-3
Power Splitter	Weinschel	1580	SC319	2022-6-3
10dB Attenuator	Weinschel	4M-10	43152	2022-6-3
10dB Attenuator	R&S	DNF	DNF-001	2022-6-3
10dB Attenuator	R&S	DNF	DNF-002	2022-6-3
10dB Attenuator	R&S	DNF	DNF-003	2022-6-3
10dB Attenuator	R&S	DNF	DNF-004	2022-6-3
Test software	Rohde & Schwarz	EMC32	Version 10.60.10	N/A
Test software	Tonscend	System for BT/WIFI	Version 2.6.77.0518	N/A
Shielding Room	TDK	TS8997	----	2022-11-07

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Conducted Emission 150kHz-30MHz	3.21dB
Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.80dB; Vertical: 4.87dB;
Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz	Horizontal: 4.59dB; Vertical: 4.58dB;
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 5.05dB; Vertical: 5.04dB;
Uncertainty for Conducted RF test with TS 8997	Power level test involved: 1.16dB Frequency test involved: 0.6×10^{-7} or 1%

Remark:
Measurement Uncertainty Decision Rule
Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2007, clause 4.4.3 and 4.5.1.

TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch
5F,Communication Building,163 Pingyun Rd, Huangpu Ave. West Guangzhou, P.R.China TEL: +86 20 3832 0668 FAX: +86 20 3832 0478