



# FCC RF Test Report

**APPLICANT** : Quectel Wireless Solutions Co., Ltd.  
**EQUIPMENT** : Smart Module  
**BRAND NAME** : Quectel  
**MODEL NAME** : SC668S-WF  
**FCC ID** : XMR2022SC668SWF  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DTS) Digital Transmission System  
**TEST DATE(S)** : Nov. 24, 2022 ~ Dec. 13, 2022

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia



Approved by: Jason Jia

**Sporton International Inc. (Kunshan)**

**No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300  
People's Republic of China**



# TABLE OF CONTENTS

**REVISION HISTORY..... 3**

**SUMMARY OF TEST RESULT ..... 4**

**1 GENERAL DESCRIPTION ..... 5**

    1.1 Applicant ..... 5

    1.2 Manufacturer ..... 5

    1.3 Product Feature of Equipment Under Test..... 5

    1.4 Product Specification of Equipment Under Test..... 5

    1.5 Modification of EUT ..... 6

    1.6 Testing Location ..... 6

    1.7 Test Software..... 6

    1.8 Applicable Standards..... 7

**2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST ..... 8**

    2.1 Carrier Frequency and Channel ..... 8

    2.2 Test Mode..... 9

    2.3 Connection Diagram of Test System ..... 10

    2.4 Support Unit used in test configuration and system ..... 11

    2.5 EUT Operation Test Setup ..... 11

    2.6 Measurement Results Explanation Example..... 11

**3 TEST RESULT ..... 12**

    3.1 6dB and 99% Bandwidth Measurement ..... 12

    3.2 Output Power Measurement..... 13

    3.3 Power Spectral Density Measurement ..... 14

    3.4 Conducted Band Edges and Spurious Emission Measurement ..... 15

    3.5 Radiated Band Edges and Spurious Emission Measurement ..... 16

    3.6 AC Conducted Emission Measurement..... 20

    3.7 Antenna Requirements ..... 22

**4 LIST OF MEASURING EQUIPMENT ..... 23**

**5 UNCERTAINTY OF EVALUATION ..... 24**

**APPENDIX A. CONDUCTED TEST RESULTS**

**APPENDIX B. AC CONDUCTED EMISSION TEST RESULT**

**APPENDIX C. RADIATED SPURIOUS EMISSION**

**APPENDIX D. DUTY CYCLE PLOTS**

**APPENDIX E. SETUP PHOTOGRAPHS**





### SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.1	-	99% Bandwidth	-	Report Only	-
3.2	15.247(b)	Power Output Measurement	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
		Conducted Spurious Emission		Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.70 dB at 827.340 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 3.82 dB at 0.590 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

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



# 1 General Description

## 1.1 Applicant

**Quectel Wireless Solutions Co., Ltd.**

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, 200233, China

## 1.2 Manufacturer

**Quectel Wireless Solutions Co., Ltd.**

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, 200233, China

## 1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Smart Module
Brand Name	Quectel
Model Name	SC668S-WF
FCC ID	XMR2022SC668SWF
SN	Conduction: E1C22HA09000049 Radiation: E1C22HA09000013 Conducted: E1C22HA09000011
HW Version	R1.0
SW Version	SC668SWFNAR01A02
EUT Stage	Identical Prototype

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to antenna	802.11b : 18.43 dBm (0.0697 W) 802.11g : 20.38 dBm (0.1091 W) 802.11n HT20 : 19.42 dBm (0.0875 W) 802.11n HT40 : 20.44 dBm (0.1107 W)
99% Occupied Bandwidth	802.11b : 14.066MHz 802.11g : 17.063MHz 802.11n HT20 : 18.302MHz 802.11n HT40 : 36.523MHz
Antenna Type / Gain	Folded Dipole Antenna with gain 0.47 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)



### 1.5 Modification of EUT

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

### 1.6 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

<b>Test Firm</b>	Sporton International Inc. (Kunshan)		
<b>Test Site Location</b>	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC Designation No.</b>	<b>FCC Test Firm Registration No.</b>
	03CH06-KS	CN1257	314309

Sporton International Inc. (ShenZhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

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

Test data subcontracted: Test case for Conducted in section 3.1~3.4and Conduction in section 3.6 of this report.

### 1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH06-KS	AUDIX	E3	6.2009-8-24al
2.	CO01-SZ	AUDIX	E3	6.120613b



## 1.8 Applicable Standards

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

- ♦ 47 CFR Part 15 Subpart C §15.247
- ♦ FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ♦ ANSI C63.10-2013

**Remark:**

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



## 2 Test Configuration of Equipment Under Test

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.
  
- b. AC power line Conducted Emission was tested under maximum output power.

### 2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		





## 2.2 Test Mode

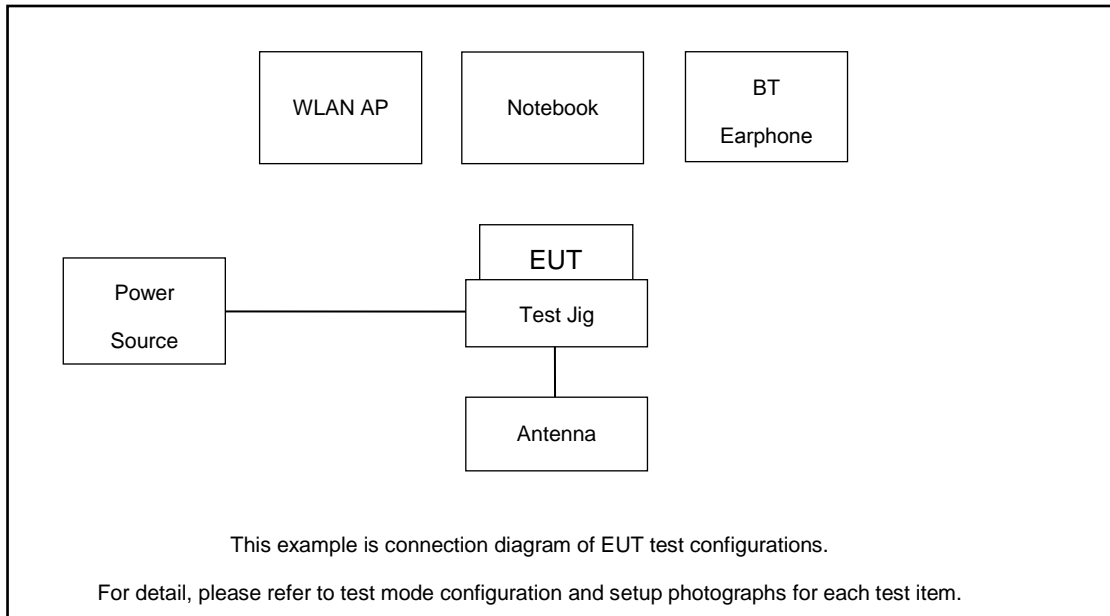
Final test modes are considering the modulation and worse data rates as below table.

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

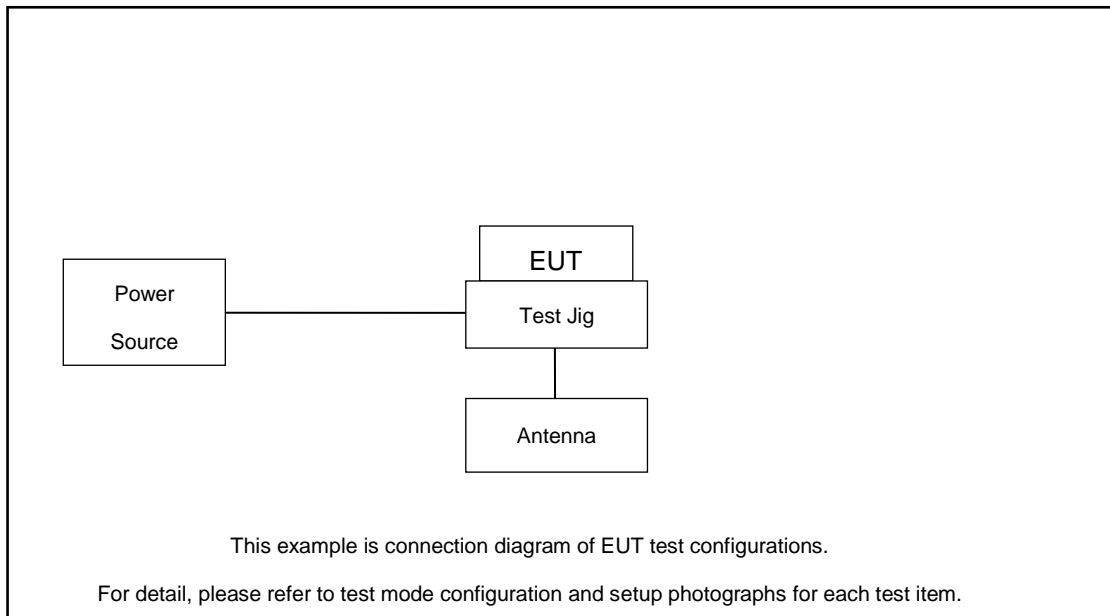
Test Cases	
AC Conducted Emission	Mode 1 :Bluetooth Link + WLAN Link (2.4G) + Charging from Test Jig

## 2.3 Connection Diagram of Test System

For Conducted Emission:



For Radiated Emission:



## 2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	D-link	DIR-820L	KA2IR820LA1	N/A	Unshielded, 1.8m
2.	Bluetooth Earphone	Samsung	EO-MG900	N/A	N/A	N/A
3.	Notebook	Lenovo	E540	N/A	N/A	AC I/P: Unshielded, 0.9 m DC O/P: Shielded, 1.8 m
4.	Test Jig	N/A	N/A	N/A	N/A	N/A
5.	Antenna	N/A	N/A	N/A	N/A	N/A
6.	Adapter	N/A	N/A	N/A	N/A	N/A

## 2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuous transmit.

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

## 2.6 Measurement Results Explanation Example

**For all conducted test items:**

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

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

*Offset = RF cable loss + attenuator factor.*

Following shows an offset computation example with cable loss 1.62 dB and 10dB attenuator.

$$\begin{aligned}
 \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\
 &= 1.62 + 10 = 11.62 \text{ (dB)}
 \end{aligned}$$

### 3 Test Result

#### 3.1 6dB and 99% Bandwidth Measurement

##### 3.1.1 Limit of 6dB and 99% Bandwidth

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

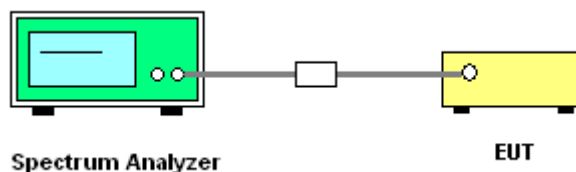
##### 3.1.2 Measuring Instruments

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

##### 3.1.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.8
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 1%~5% of OBW and set the Video bandwidth (VBW) = 3MHz.
6. Measure and record the results in the test report.

##### 3.1.4 Test Setup



##### 3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A.

## 3.2 Output Power Measurement

### 3.2.1 Limit of Output Power

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

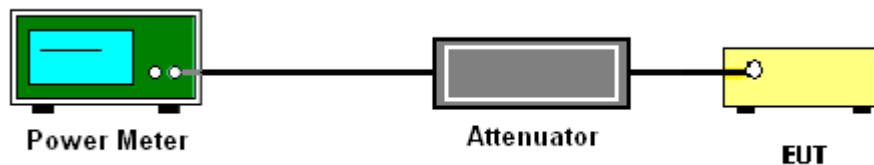
### 3.2.2 Measuring Instruments

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

### 3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1 Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.2 Method AVGPM-G method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

### 3.2.4 Test Setup



### 3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

### 3.2.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.

### 3.3 Power Spectral Density Measurement

#### 3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

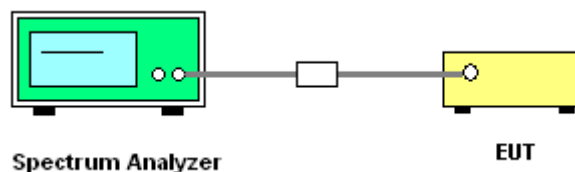
#### 3.3.2 Measuring Instruments

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

#### 3.3.3 Test Procedures

1. The testing follows Measurement Procedure of ANSI C63.10-2013 clause 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.

#### 3.3.4 Test Setup



#### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

## 3.4 Conducted Band Edges and Spurious Emission Measurement

### 3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement.

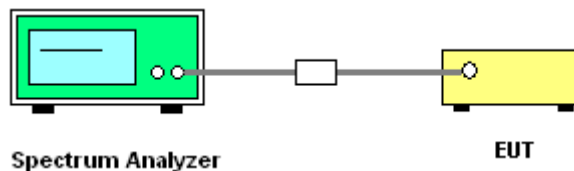
### 3.4.2 Measuring Instruments

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

### 3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.13
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

### 3.4.4 Test Setup



### 3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Please refer to Appendix A.



### 3.5 Radiated Band Edges and Spurious Emission Measurement

#### 3.5.1 Limit of Radiated band edge and Spurious Emission Measurement

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

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

#### 3.5.2 Measuring Instruments

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



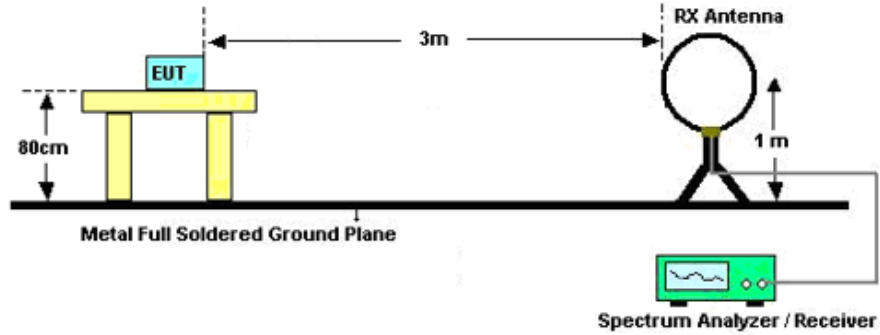


### 3.5.3 Test Procedures

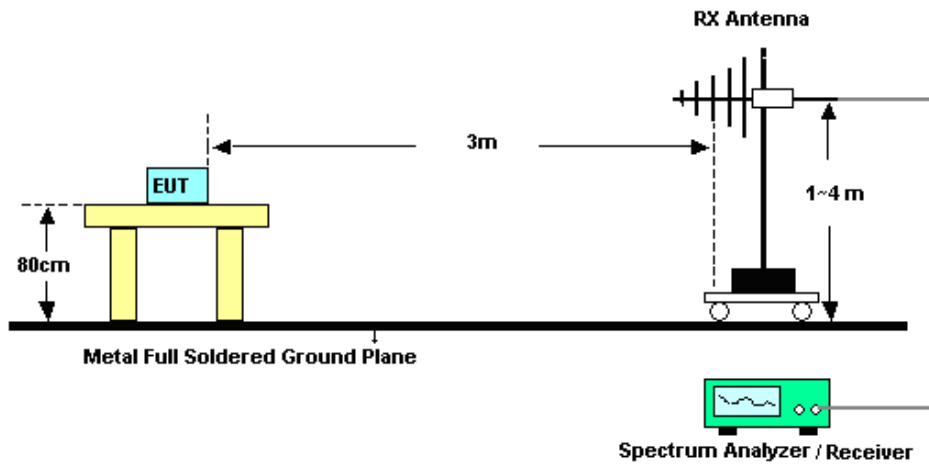
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for  $f < 1$  GHz; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW= 3MHz for  $f \geq 1$  GHz for peak measurement.  
For average measurement:
    - VBW = 10 Hz, when duty cycle is no less than 98 percent.
    - VBW  $\geq 1/T$ , when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

### 3.5.4 Test Setup

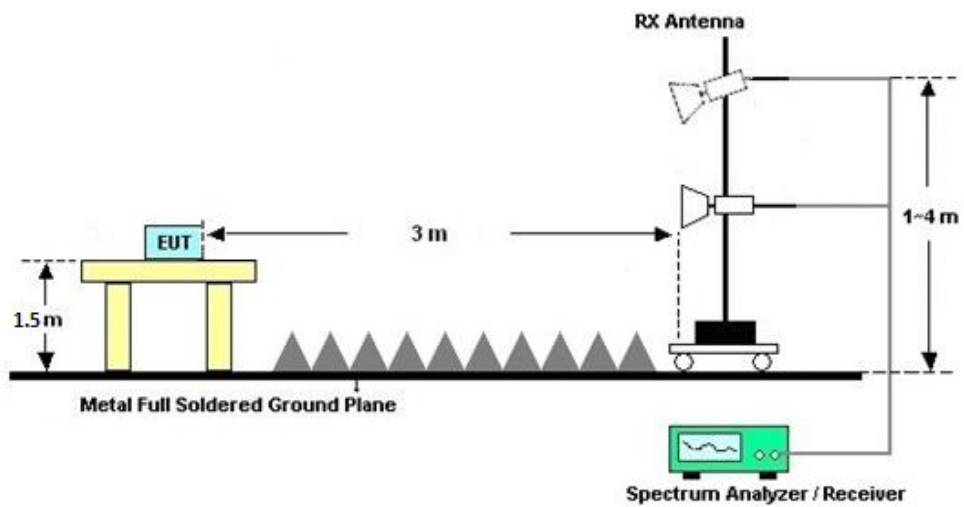
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz





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

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

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

### **3.5.6 Test Result of Radiated Spurious at Band Edges**

Please refer to Appendix C.

### **3.5.7 Duty Cycle**

Please refer to Appendix D.

### **3.5.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)**

Please refer to Appendix C.

## 3.6 AC Conducted Emission Measurement

### 3.6.1 Limit of AC Conducted Emission

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

Frequency of Emission (MHz)	Conducted Limit (dB $\mu$ V)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

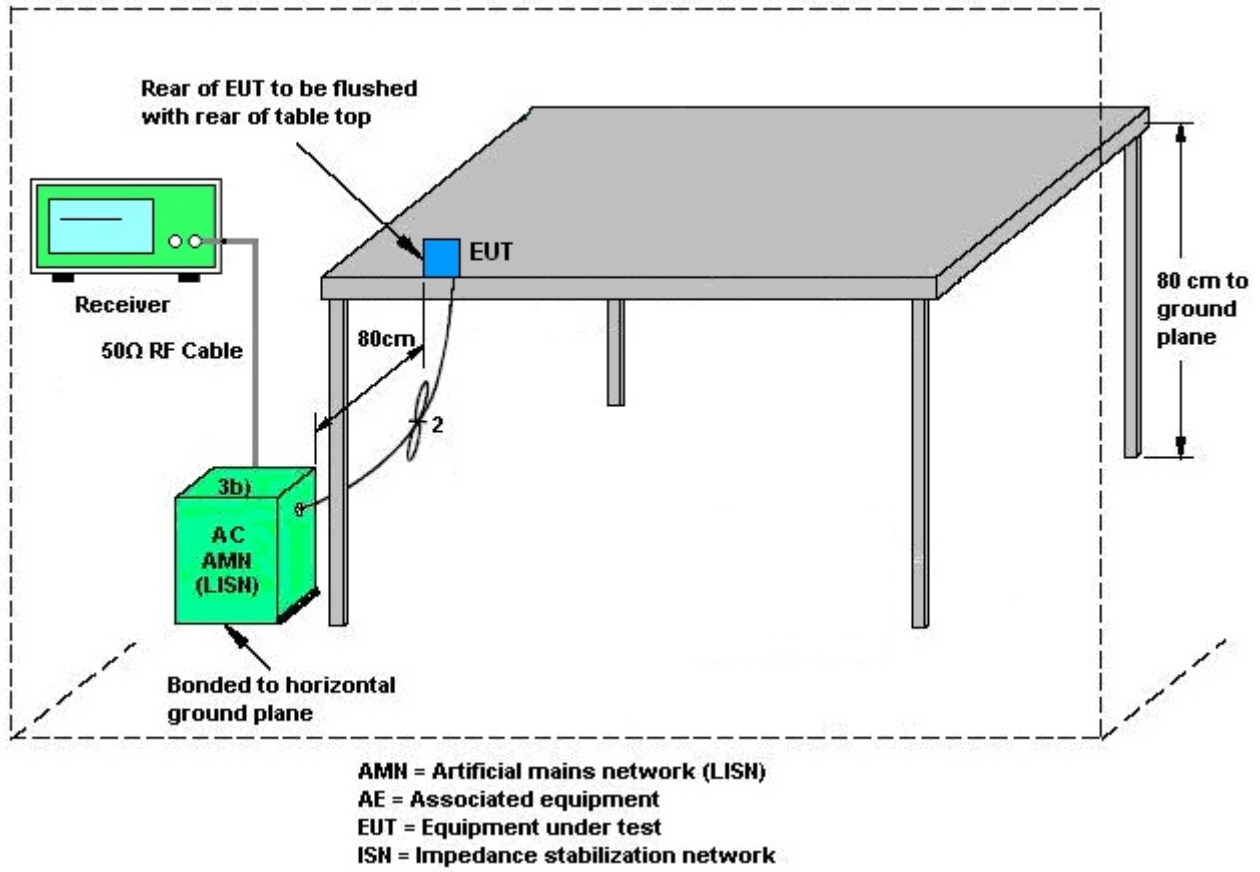
### 3.6.2 Measuring Instruments

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

### 3.6.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF bandwidth = 9kHz) with Maximum Hold Mode.

### 3.6.4 Test Setup



### 3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



## **3.7 Antenna Requirements**

### **3.7.1 Standard Applicable**

If directional gain of transmitting Antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached Antenna or of an Antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

### **3.7.2 Antenna Anti-Replacement Construction**

Non-standard antenna connector is used.

### **3.7.3 Antenna Gain**

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



## 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 07, 2022	Dec. 03, 2022~ Dec. 13, 2022	Apr. 06, 2023	Conducted (TH01-SZ)
Pulse Power Sensor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 28, 2021	Dec. 03, 2022~ Dec. 13, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 28, 2021	Dec. 03, 2022~ Dec. 13, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 13, 2022	Dec. 12, 2022	Oct. 12, 2023	Radiation (03CH06-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY60242126	10Hz~44GHz	Oct. 13, 2022	Dec. 12, 2022	Oct. 12, 2023	Radiation (03CH06-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 16, 2022	Dec. 12, 2022	Oct. 15, 2023	Radiation (03CH06-KS)
Bilog Antenna	TeseQ	CBL6111D	49921	30MHz~1GHz	May 24, 2022	Dec. 12, 2022	May 23, 2023	Radiation (03CH06-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218642	1GHz~18GHz	Apr. 18, 2022	Dec. 12, 2022	Apr. 17, 2023	Radiation (03CH06-KS)
SHF-EHF Horn	Com-power	AH-840	101093	18GHz~40GHz	Jan. 05, 2022	Dec. 12, 2022	Jan. 04, 2023	Radiation (03CH06-KS)
Amplifier	SONOMA	310N	380827	9KHz ~1GHZ	Jul. 11, 2022	Dec. 12, 2022	Jul. 10, 2023	Radiation (03CH06-KS)
Amplifier	MITEQ	EM18G40GG A	060728	18~40GHz	Jan. 05, 2022	Dec. 12, 2022	Jan. 04, 2023	Radiation (03CH06-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	2082395	1Ghz-18Ghz	Jan. 05, 2022	Dec. 12, 2022	Jan. 04, 2023	Radiation (03CH06-KS)
Amplifier	Keysight	83017A	MY53270319	500MHz~26.5GHz	Oct. 12, 2022	Dec. 12, 2022	Oct. 11, 2023	Radiation (03CH06-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Dec. 12, 2022	NCR	Radiation (03CH06-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Dec. 12, 2022	NCR	Radiation (03CH06-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Dec. 12, 2022	NCR	Radiation (03CH06-KS)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jul. 07, 2022	Nov. 24, 2022	Jul. 06, 2023	Conduction (CO01-SZ)
AC LISN	R&S	ENV216	100063	9kHz~30MHz	Sep. 15, 2022	Nov. 24, 2022	Sep. 14, 2023	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 17, 2022	Nov. 24, 2022	Oct. 16, 2023	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 07, 2022	Nov. 24, 2022	Jul. 06, 2023	Conduction (CO01-SZ)

NCR: No Calibration Required



## 5 Uncertainty of Evaluation

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

### Uncertainty of Conducted Measurement

Test Item	Uncertainty
Conducted Power	±1.34 dB
Conducted Emissions	±1.34 dB
Occupied Channel Bandwidth	±1.2 %
Conducted Power Spectral Density	±1.32 dB

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

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

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

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

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

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

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

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

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





## Appendix A. Conducted Test Results

## Appendix A. Test Result of Conducted Test Items

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

**TEST RESULTS DATA**  
**Peak Output Power**

2.4GHz Band										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
					Ant 1	Ant 1	Ant 1	Ant 1	Ant 1	
11b	1Mbps	1	1	2412	18.43	30.00	0.47	18.90	36.00	Pass
11b	1Mbps	1	6	2437	18.34	30.00	0.47	18.81	36.00	Pass
11b	1Mbps	1	11	2462	18.22	30.00	0.47	18.69	36.00	Pass
11g	6Mbps	1	1	2412	20.38	30.00	0.47	20.85	36.00	Pass
11g	6Mbps	1	6	2437	20.35	30.00	0.47	20.82	36.00	Pass
11g	6Mbps	1	11	2462	20.26	30.00	0.47	20.73	36.00	Pass
HT20	MCS0	1	1	2412	19.42	30.00	0.47	19.89	36.00	Pass
HT20	MCS0	1	6	2437	19.08	30.00	0.47	19.55	36.00	Pass
HT20	MCS0	1	11	2462	19.18	30.00	0.47	19.65	36.00	Pass
HT40	MCS0	1	3	2422	20.40	30.00	0.47	20.87	36.00	Pass
HT40	MCS0	1	6	2437	20.16	30.00	0.47	20.63	36.00	Pass
HT40	MCS0	1	9	2452	20.44	30.00	0.47	20.91	36.00	Pass

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

**TEST RESULTS DATA**  
**Average Output Power**

2.4GHz Band					
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)
					Ant 1
11b	1Mbps	1	1	2412	16.30
11b	1Mbps	1	6	2437	16.20
11b	1Mbps	1	11	2462	16.10
11g	6Mbps	1	1	2412	16.10
11g	6Mbps	1	6	2437	15.90
11g	6Mbps	1	11	2462	15.70
HT20	MCS0	1	1	2412	15.10
HT20	MCS0	1	6	2437	14.90
HT20	MCS0	1	11	2462	14.70
HT40	MCS0	1	3	2422	14.20
HT40	MCS0	1	6	2437	14.10
HT40	MCS0	1	9	2452	14.30

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



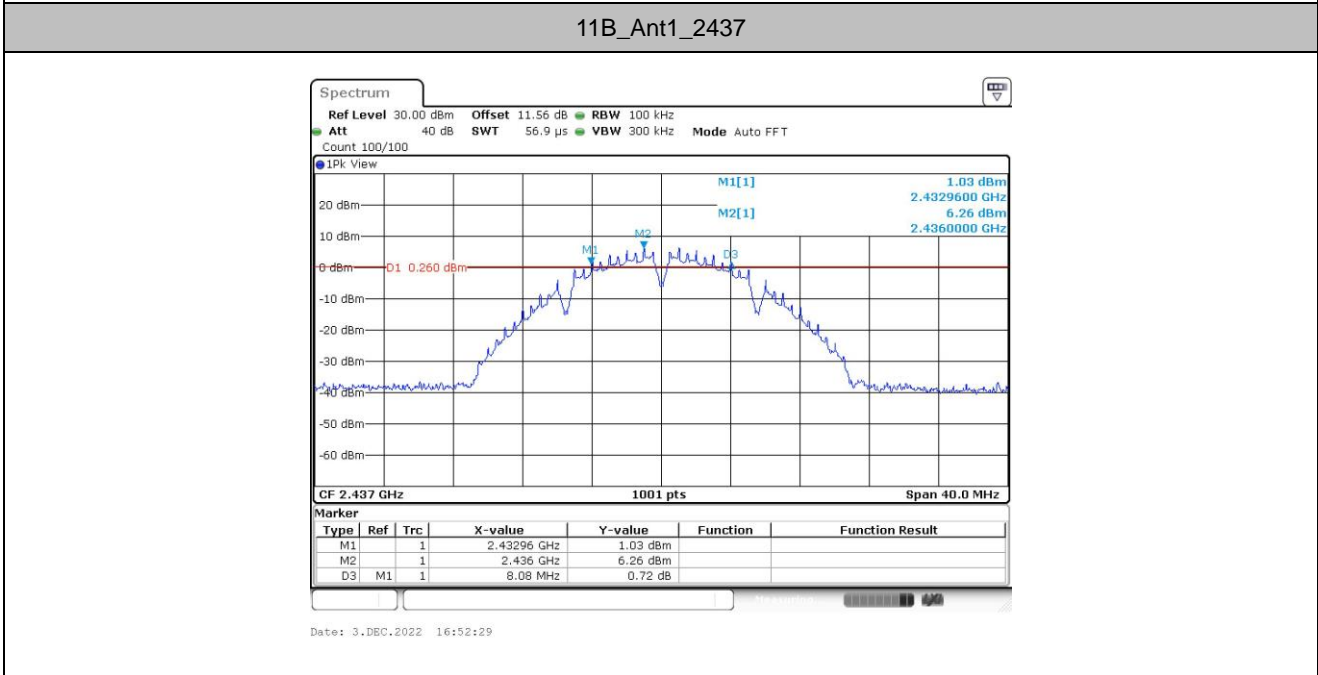
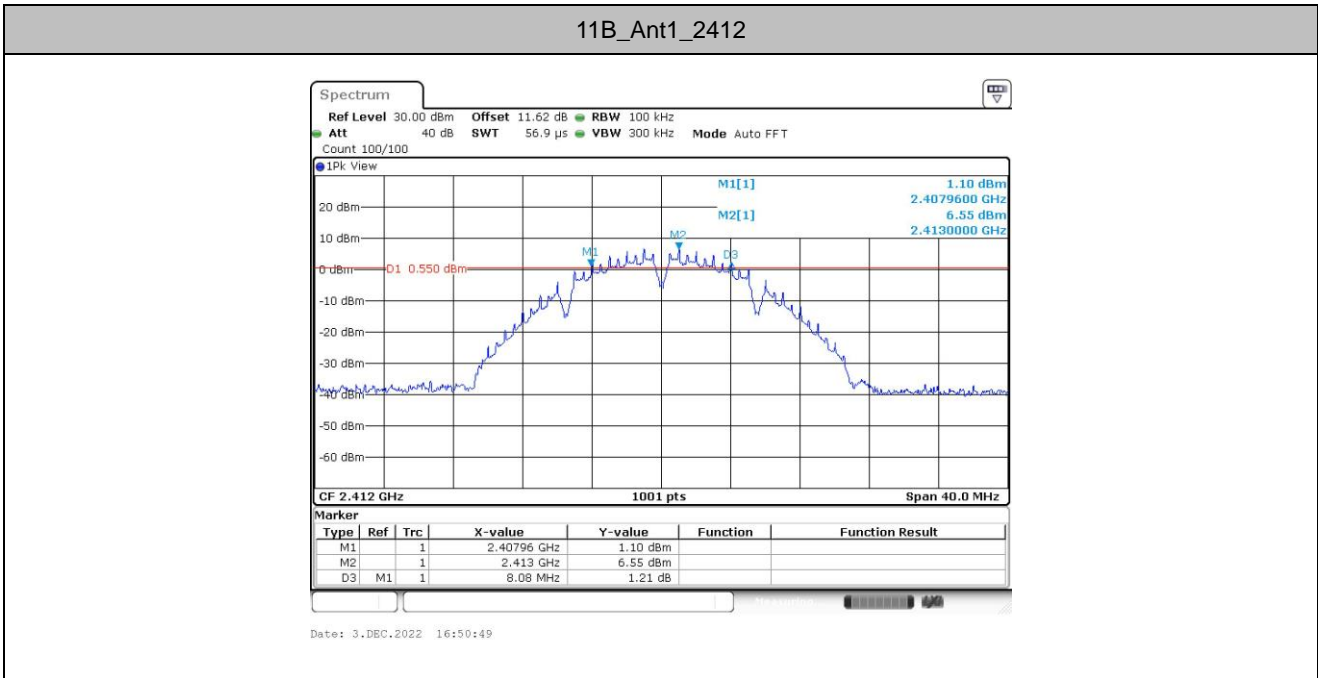
DTS Bandwidth

Test Result

TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	8.08	2407.96	2416.04	0.5	PASS
		2437	8.08	2432.96	2441.04	0.5	PASS
		2462	8.08	2457.96	2466.04	0.5	PASS
11G	Ant1	2412	16.04	2404.12	2420.16	0.5	PASS
		2437	15.68	2429.24	2444.92	0.5	PASS
		2462	15.32	2454.24	2469.56	0.5	PASS
11N20SISO	Ant1	2412	17.16	2403.60	2420.76	0.5	PASS
		2437	16.16	2428.60	2444.76	0.5	PASS
		2462	15.96	2453.60	2469.56	0.5	PASS
11N40SISO	Ant1	2422	35.28	2404.48	2439.76	0.5	PASS
		2437	35.76	2419.40	2455.16	0.5	PASS
		2452	35.20	2434.40	2469.60	0.5	PASS

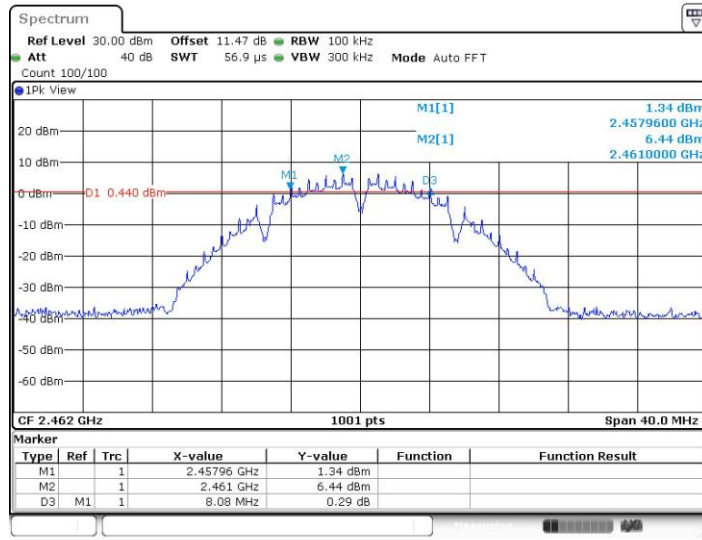


Test Graphs

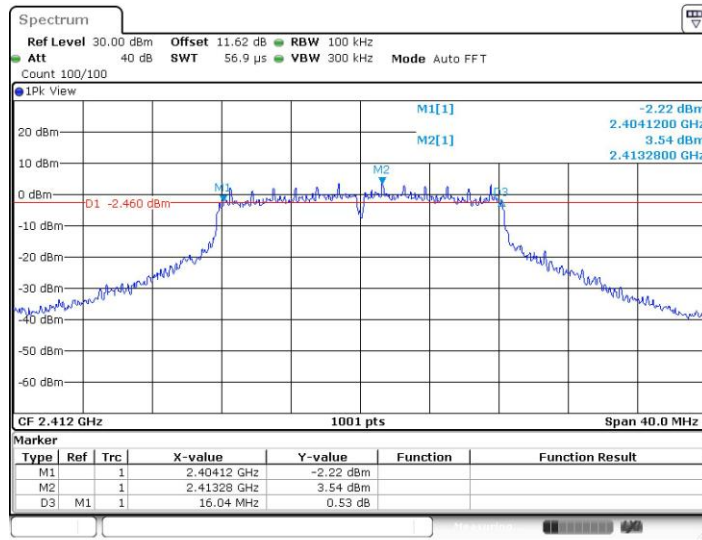




11B\_Ant1\_2462

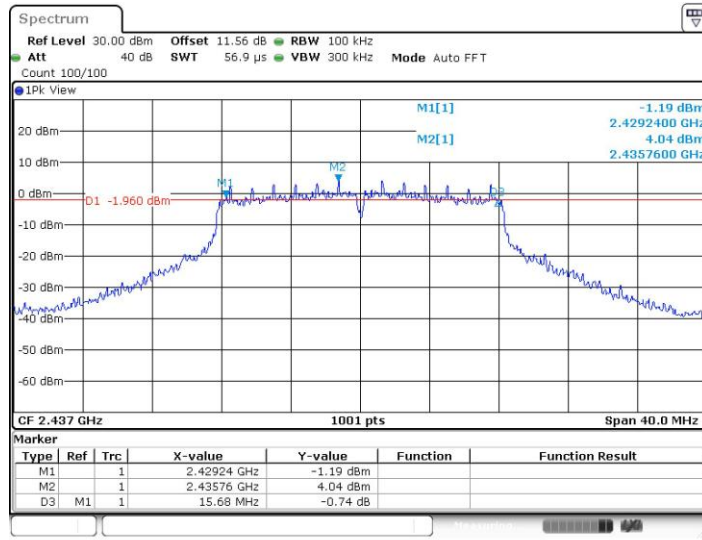


11G\_Ant1\_2412

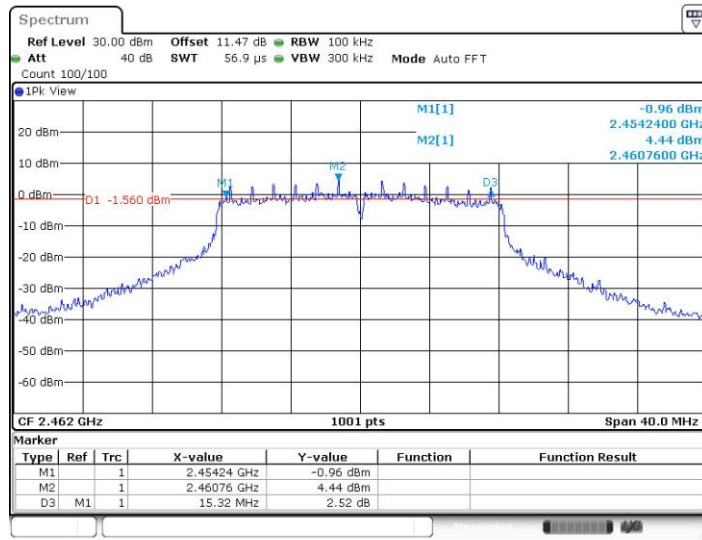




11G\_Ant1\_2437



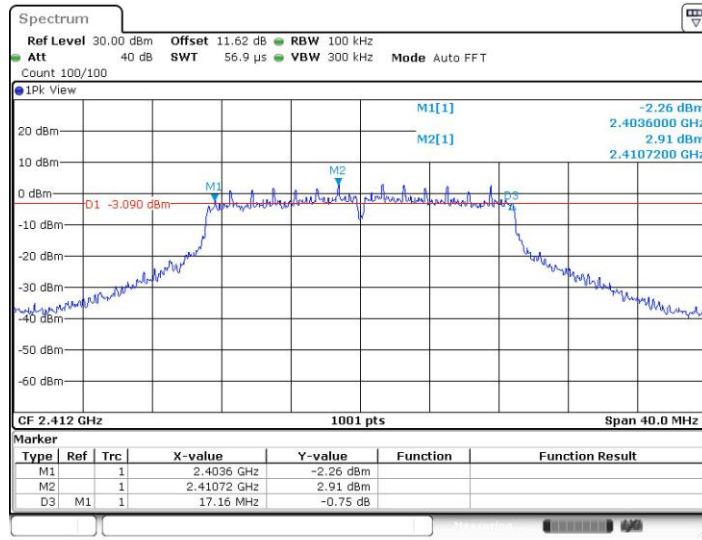
11G\_Ant1\_2462





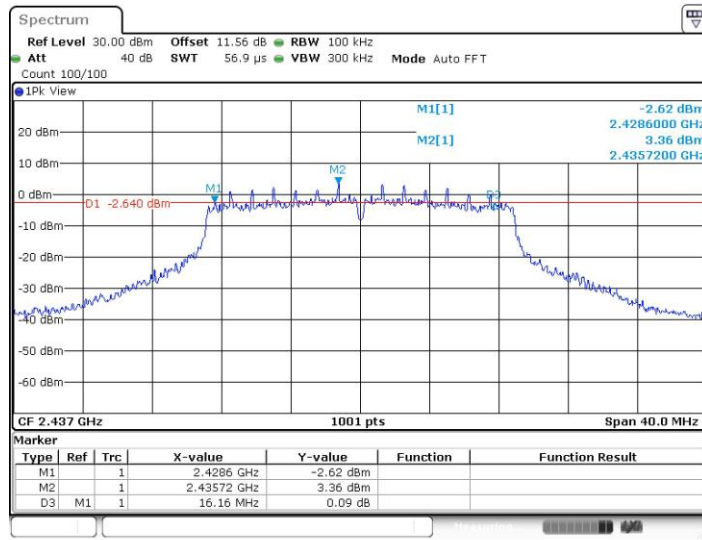


11N20SISO\_Ant1\_2412



Date: 3.DEC.2022 17:02:18

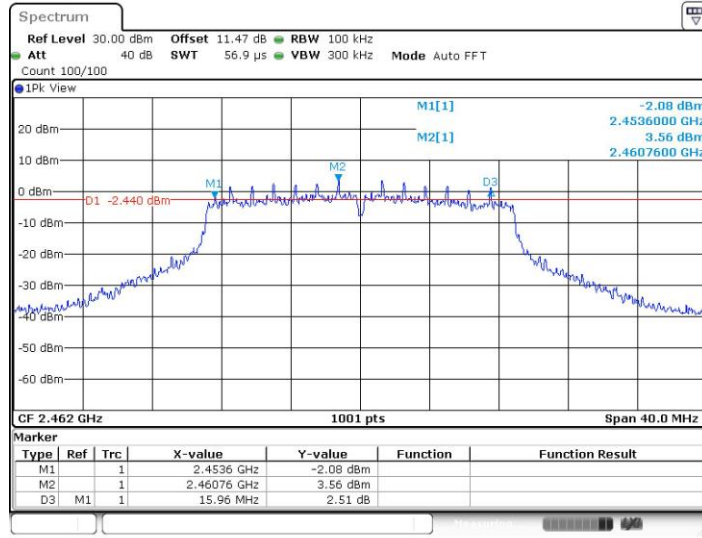
11N20SISO\_Ant1\_2437



Date: 3.DEC.2022 17:04:24

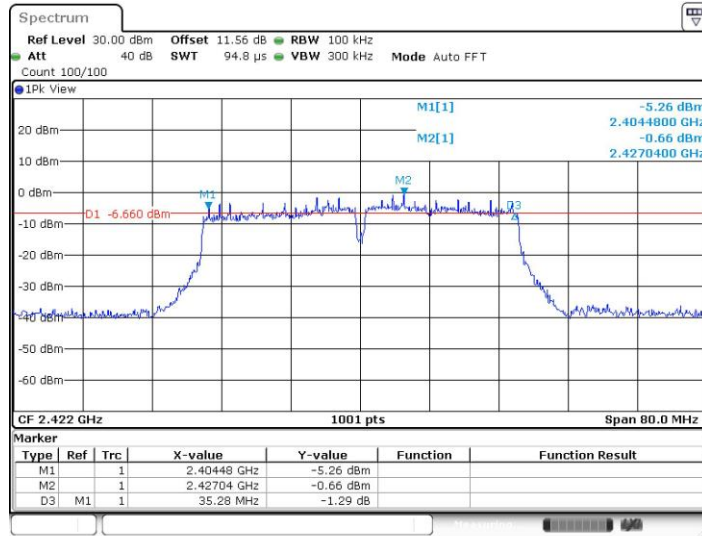


11N20SISO\_Ant1\_2462



Date: 3.DEC.2022 17:05:49

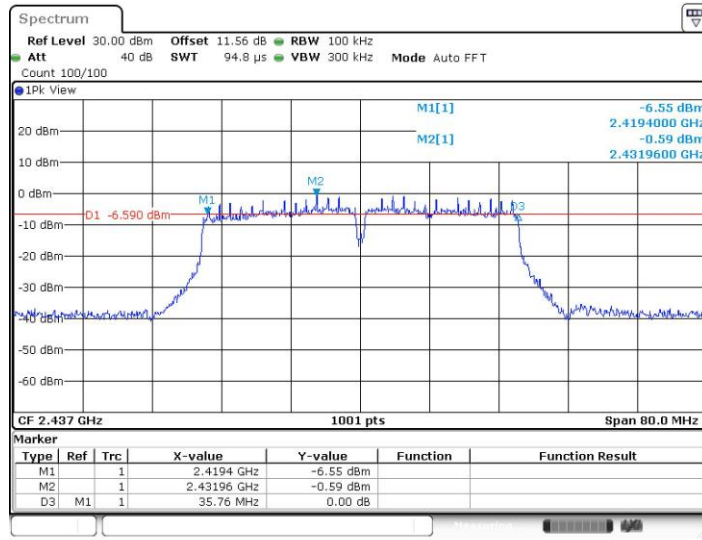
11N40SISO\_Ant1\_2422



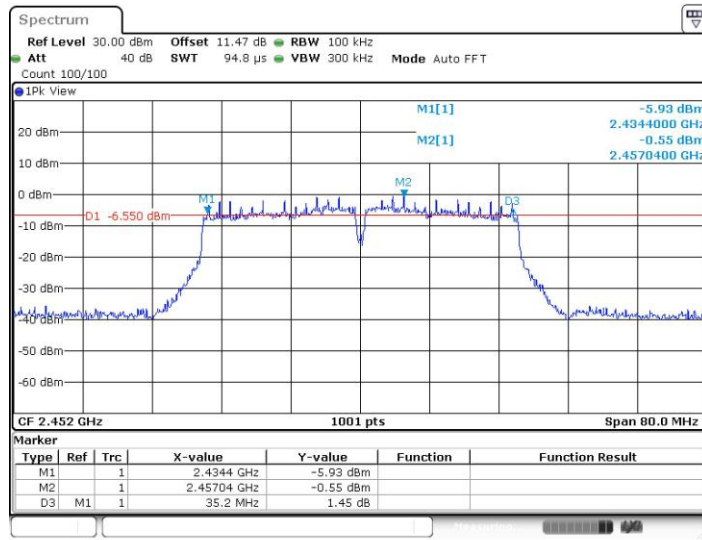
Date: 3.DEC.2022 17:07:32



11N40SISO\_Ant1\_2437



11N40SISO\_Ant1\_2452





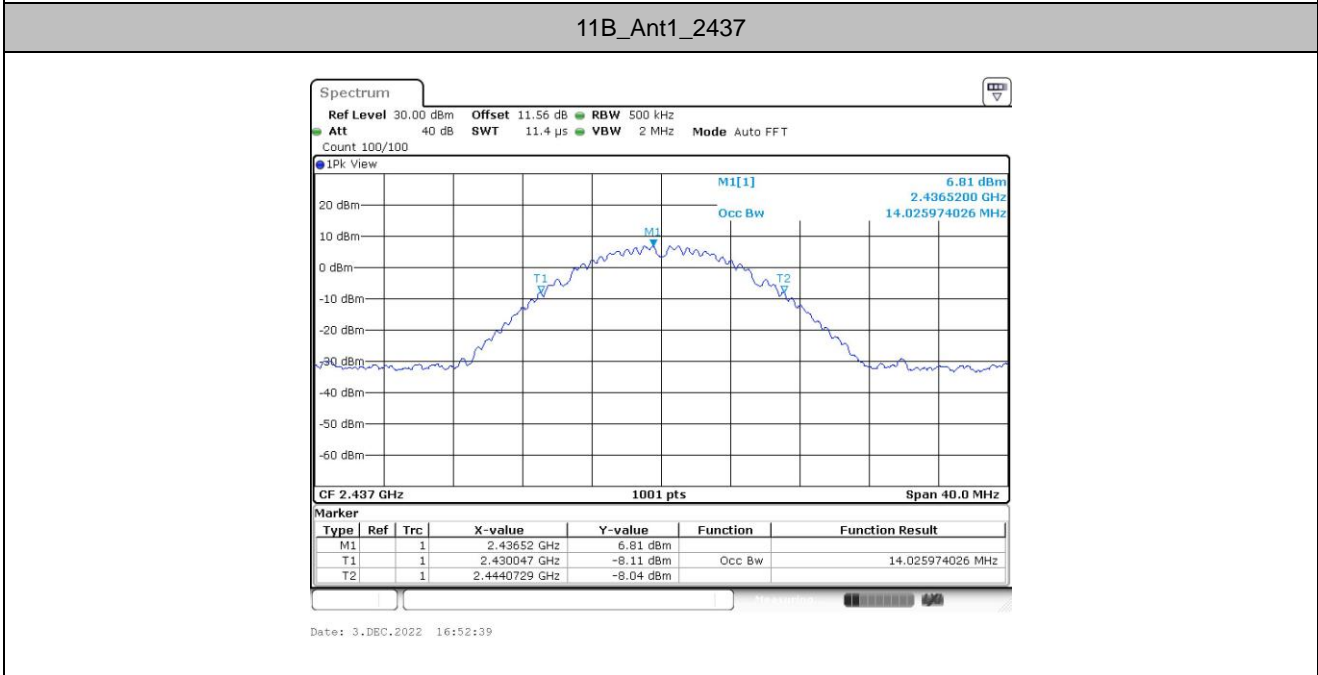
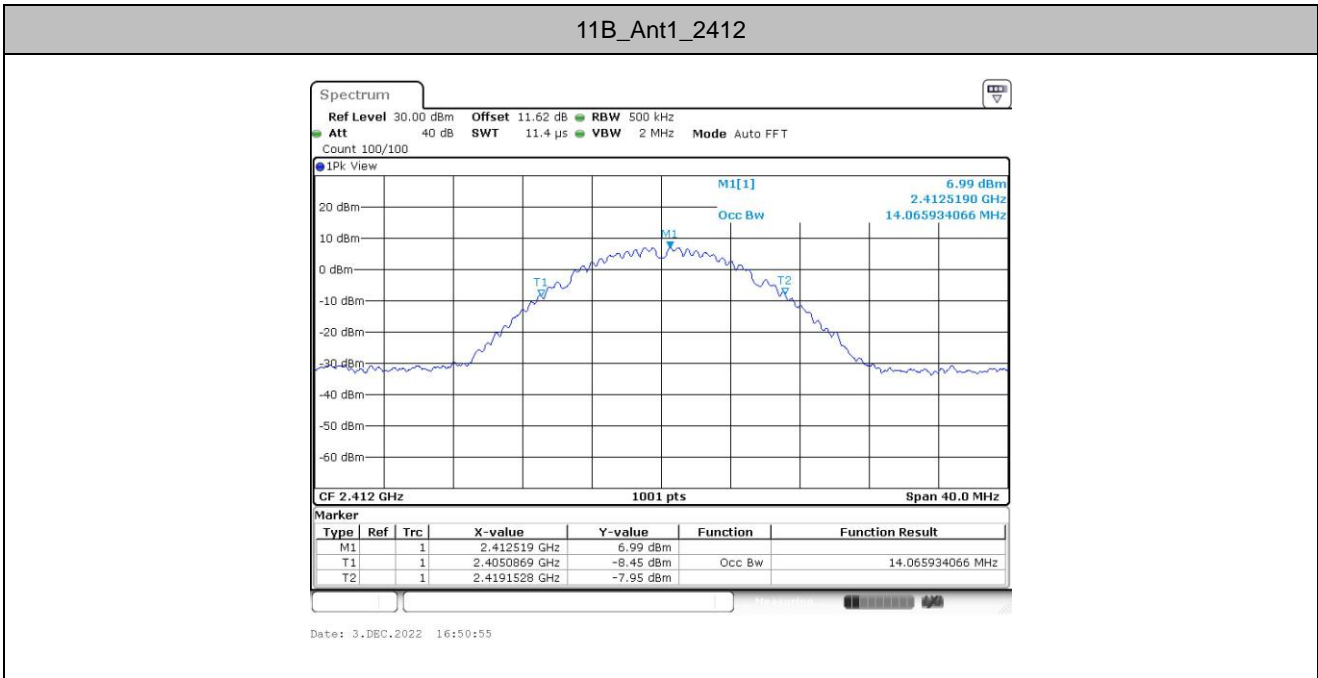
Occupied Channel Bandwidth

Test Result

TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	14.066	2405.0869	2419.1528	---	---
		2437	14.026	2430.0470	2444.0729	---	---
		2462	13.986	2455.0070	2468.9930	---	---
11G	Ant1	2412	17.063	2403.5684	2420.6314	---	---
		2437	17.023	2428.5285	2445.5514	---	---
		2462	17.023	2453.4486	2470.4715	---	---
11N20SISO	Ant1	2412	18.302	2402.9690	2421.2707	---	---
		2437	18.222	2427.9291	2446.1508	---	---
		2462	18.182	2452.9291	2471.1109	---	---
11N40SISO	Ant1	2422	36.364	2403.9381	2440.3017	---	---
		2437	36.523	2418.9381	2455.4615	---	---
		2452	36.523	2433.7782	2470.3017	---	---

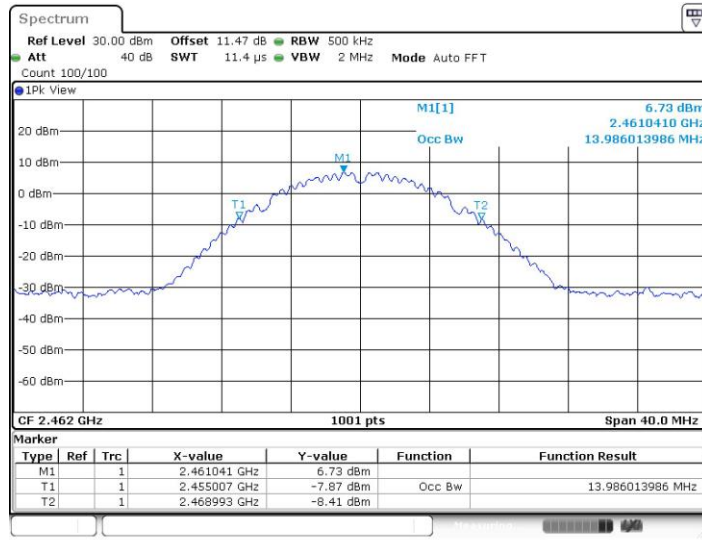


Test Graphs



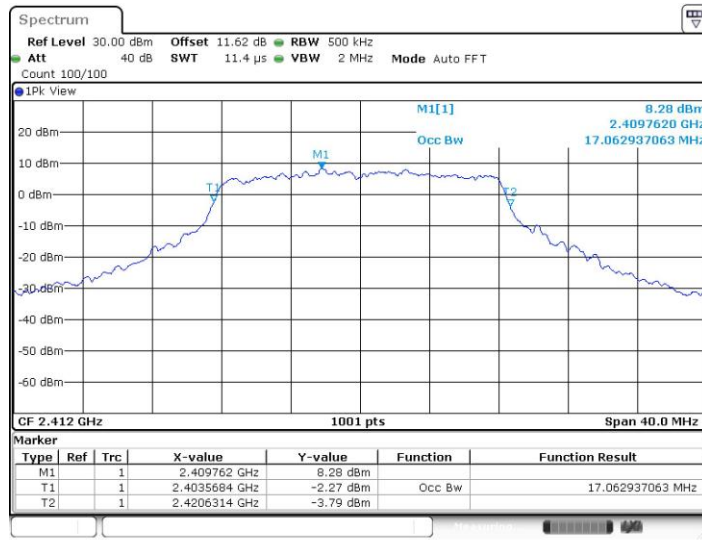


11B\_Ant1\_2462



Date: 3.DEC.2022 16:53:54

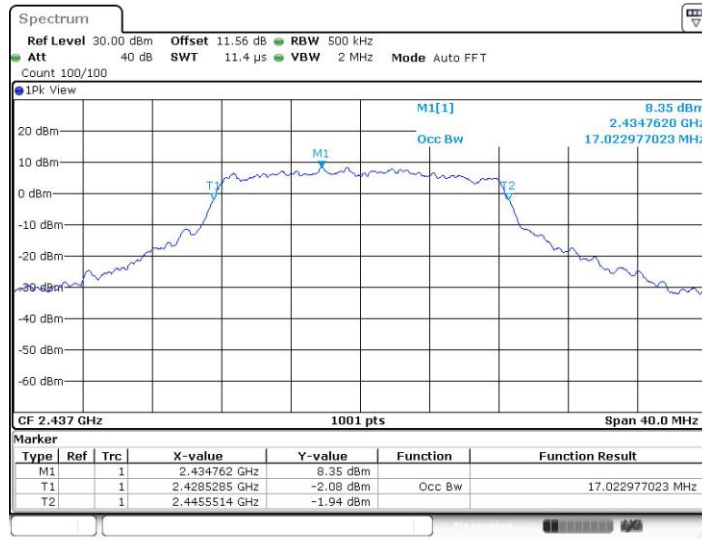
11G\_Ant1\_2412



Date: 3.DEC.2022 16:57:34

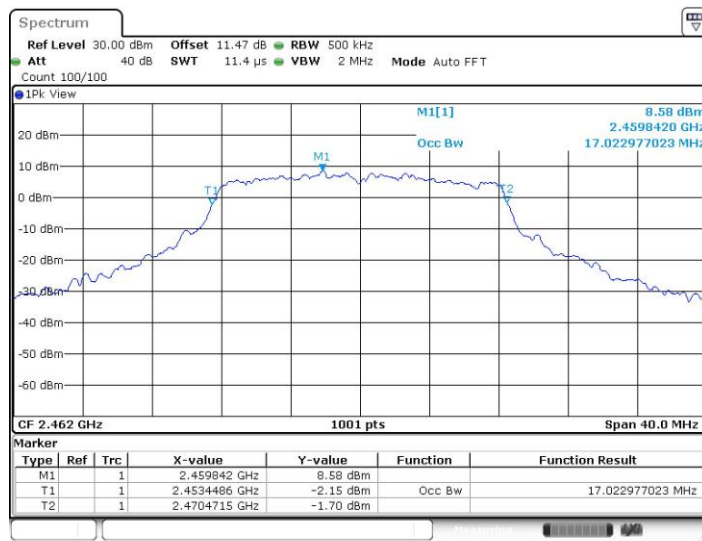


11G\_Ant1\_2437



Date: 3.DEC.2022 16:59:18

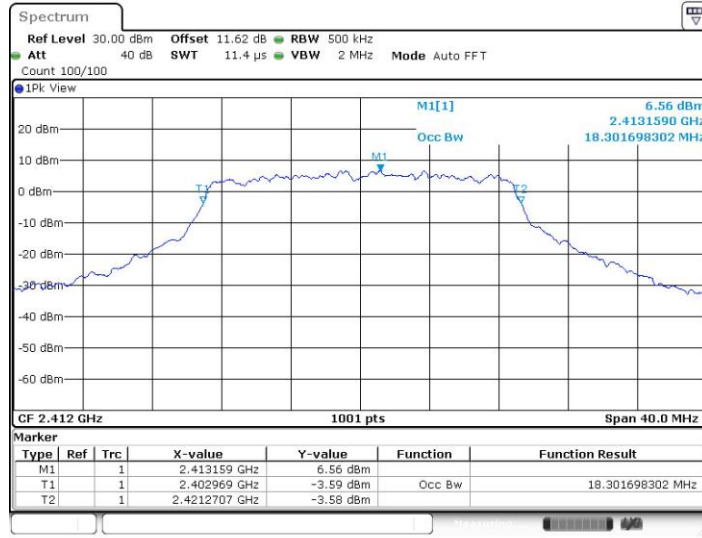
11G\_Ant1\_2462



Date: 3.DEC.2022 17:00:42

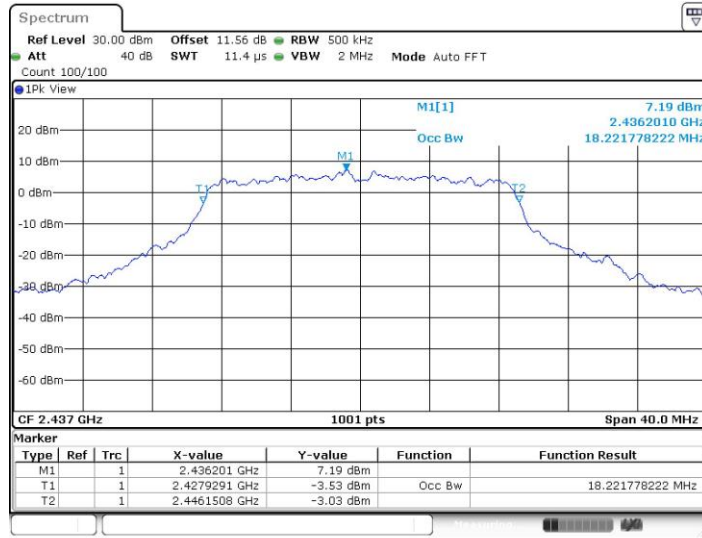


11N20SISO\_Ant1\_2412



Date: 3.DEC.2022 17:02:30

11N20SISO\_Ant1\_2437

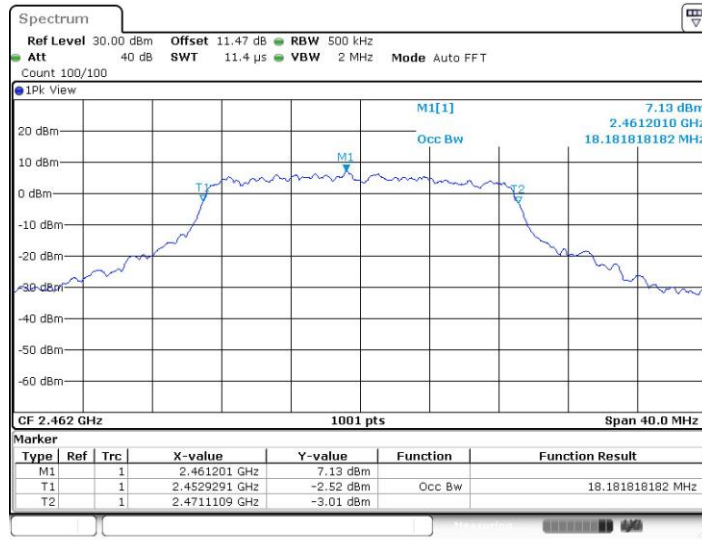


Date: 3.DEC.2022 17:04:34



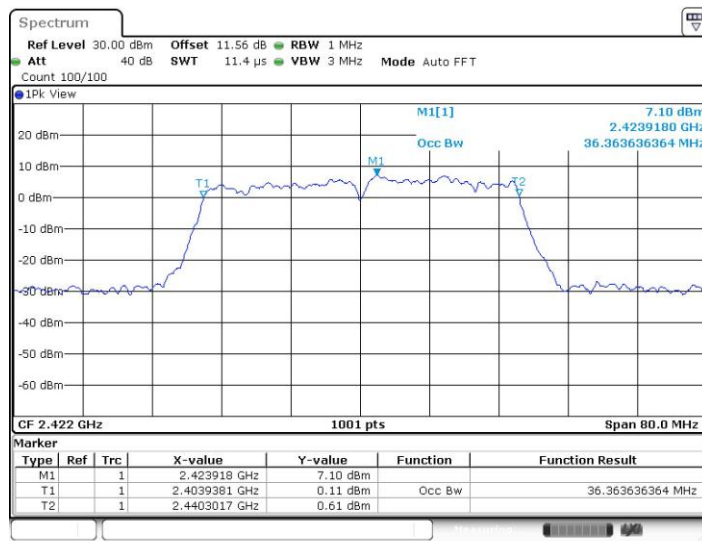


11N20SISO\_Ant1\_2462



Date: 3.DEC.2022 17:06:00

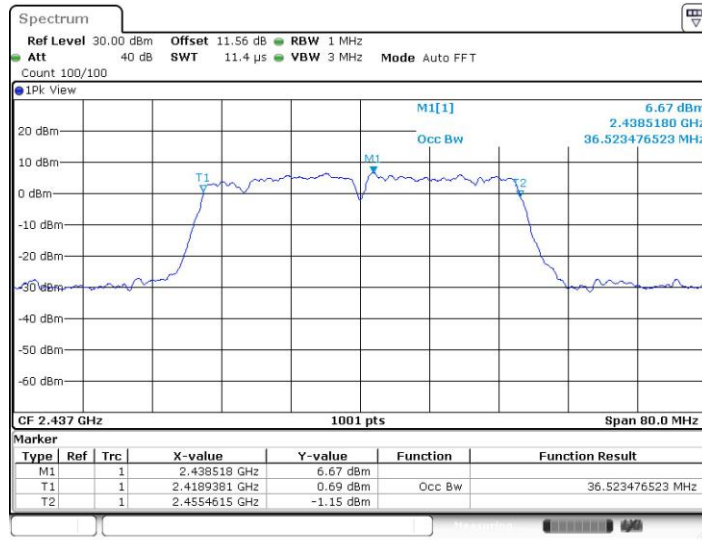
11N40SISO\_Ant1\_2422



Date: 3.DEC.2022 17:07:43

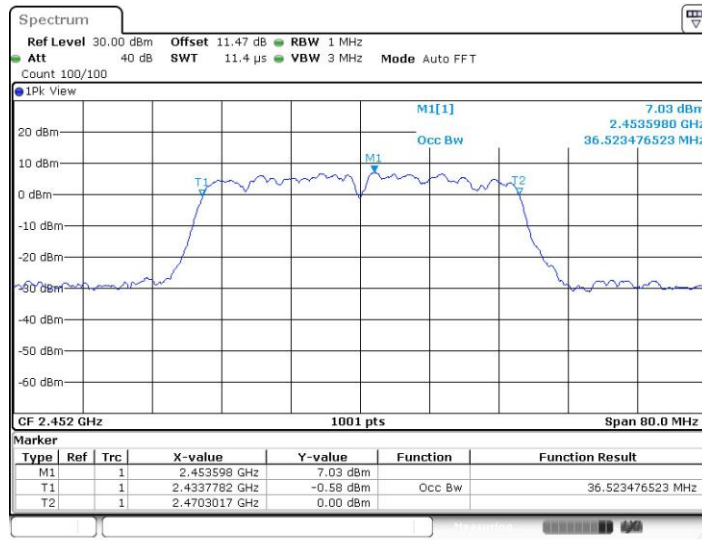


11N40SISO\_Ant1\_2437



Date: 3.DEC.2022 17:09:31

11N40SISO\_Ant1\_2452



Date: 3.DEC.2022 17:11:02



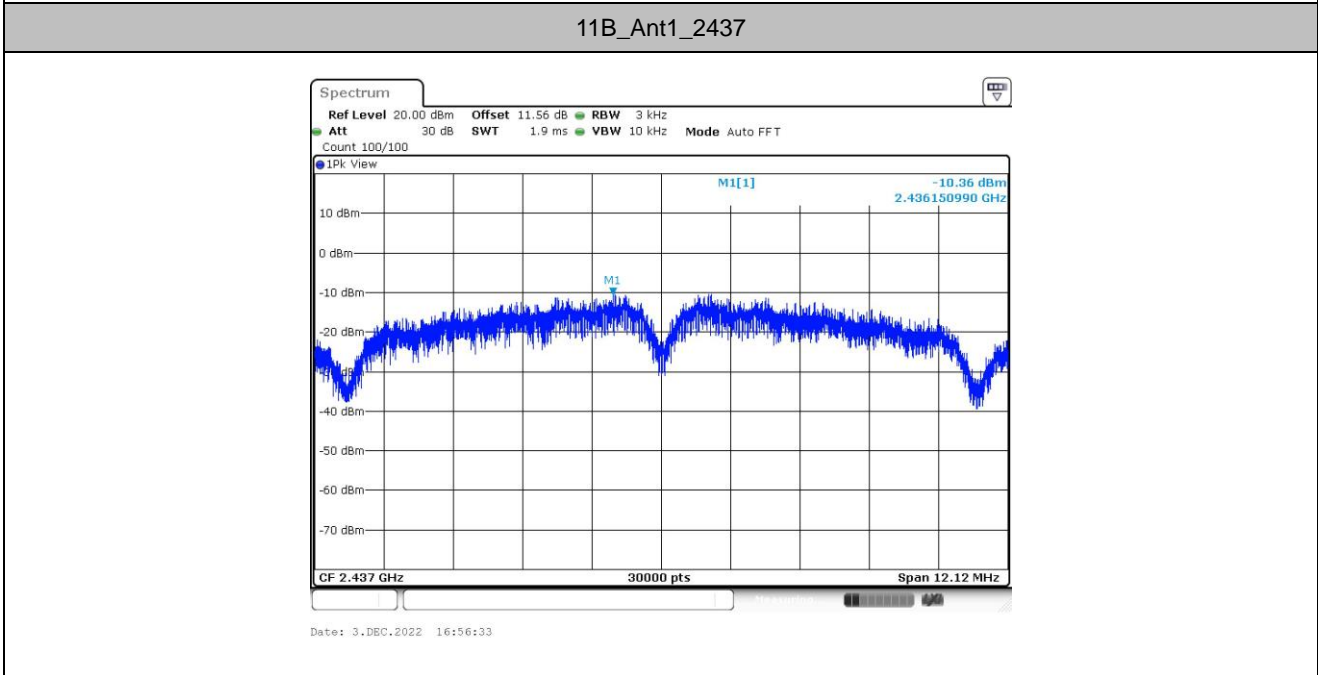
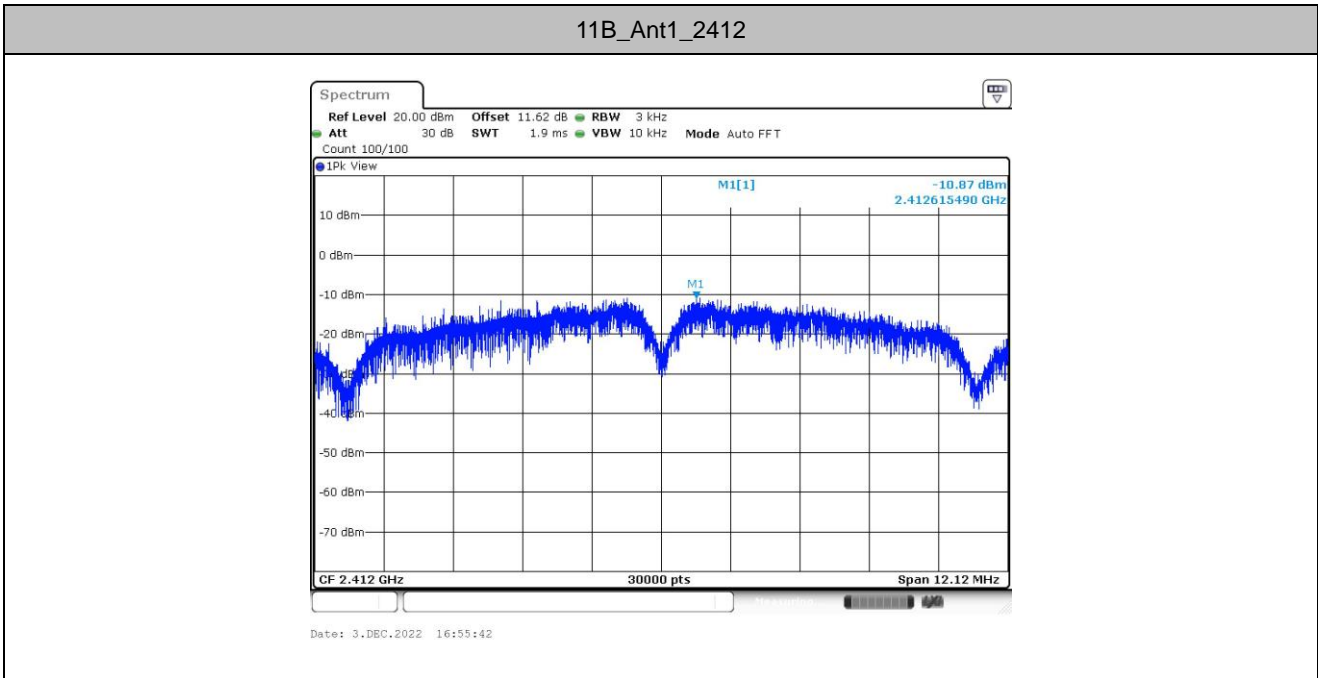
Power spectral density

Test Result

TestMode	Antenna	Freq(MHz)	Result [dBm/3kHz]	Limit [dBm/3kHz]	Verdict
11B	Ant1	2412	-10.87	≤8.00	PASS
		2437	-10.36	≤8.00	PASS
		2462	-10.38	≤8.00	PASS
11G	Ant1	2412	-10.51	≤8.00	PASS
		2437	-11.62	≤8.00	PASS
		2462	-12	≤8.00	PASS
11N20SISO	Ant1	2412	-12.23	≤8.00	PASS
		2437	-13.13	≤8.00	PASS
		2462	-11.75	≤8.00	PASS
11N40SISO	Ant1	2422	-15.47	≤8.00	PASS
		2437	-15.7	≤8.00	PASS
		2452	-15.28	≤8.00	PASS

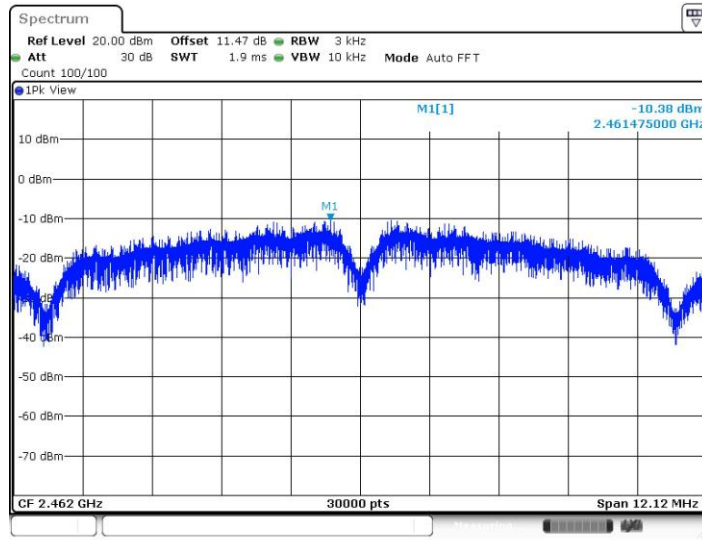


Test Graphs



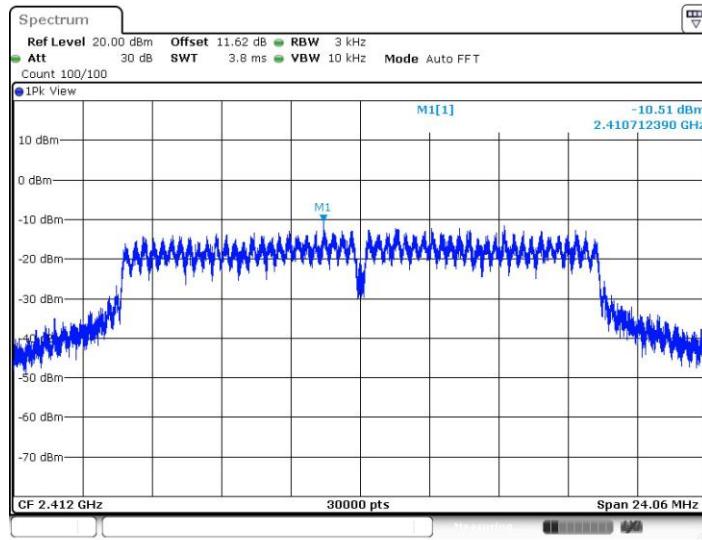


11B\_Ant1\_2462



Date: 3.DEC.2022 16:56:59

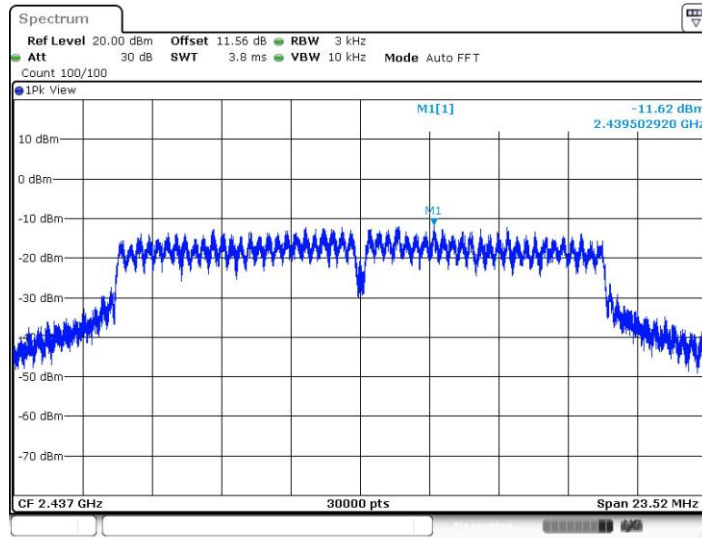
11G\_Ant1\_2412



Date: 3.DEC.2022 16:57:46

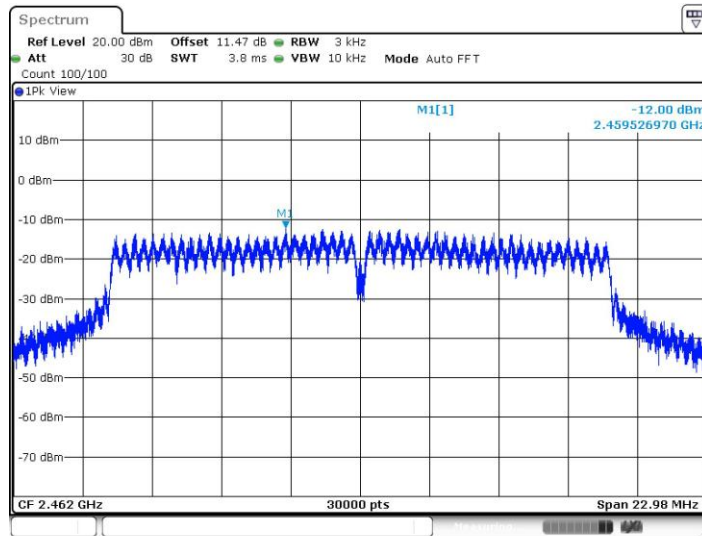


11G\_Ant1\_2437



Date: 3.DEC.2022 16:59:29

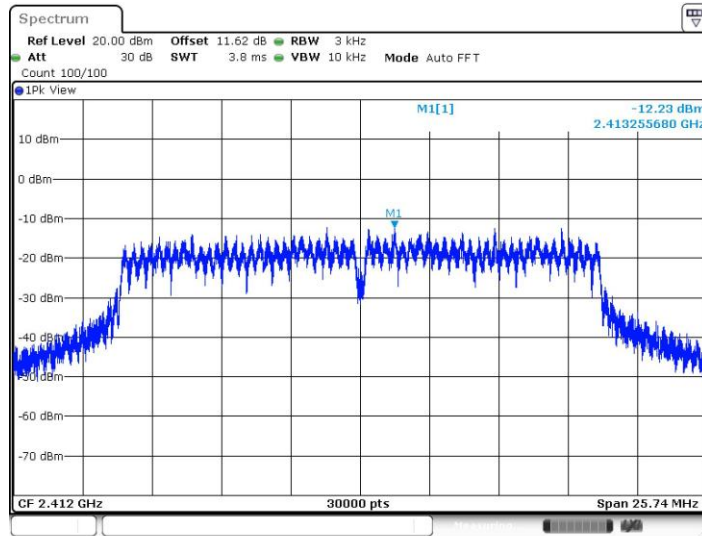
11G\_Ant1\_2462



Date: 3.DEC.2022 17:00:51

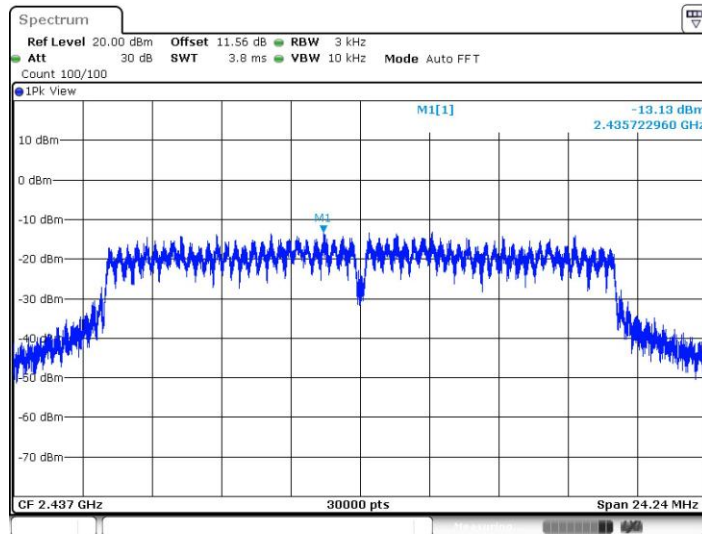


11N20SISO\_Ant1\_2412



Date: 3.DEC.2022 17:02:42

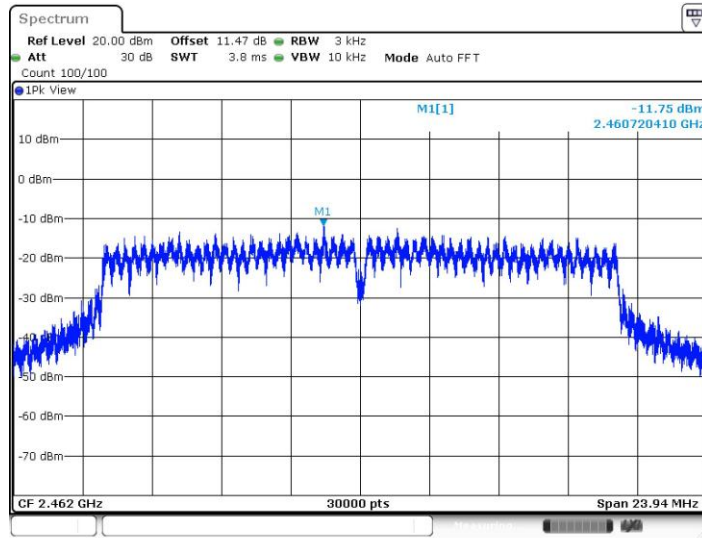
11N20SISO\_Ant1\_2437



Date: 3.DEC.2022 17:04:44

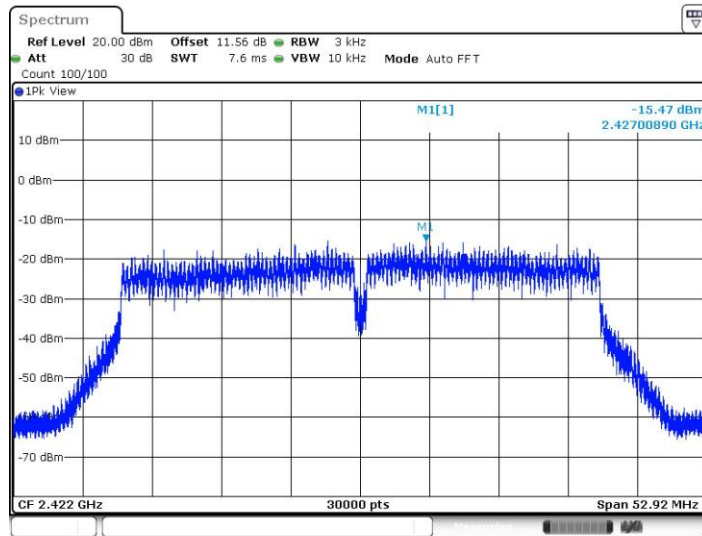


11N20SISO\_Ant1\_2462



Date: 3.DEC.2022 17:06:11

11N40SISO\_Ant1\_2422

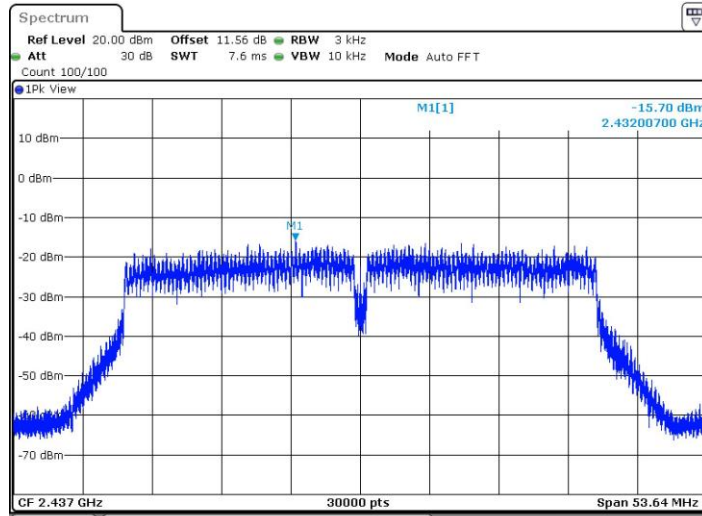


Date: 3.DEC.2022 17:07:56



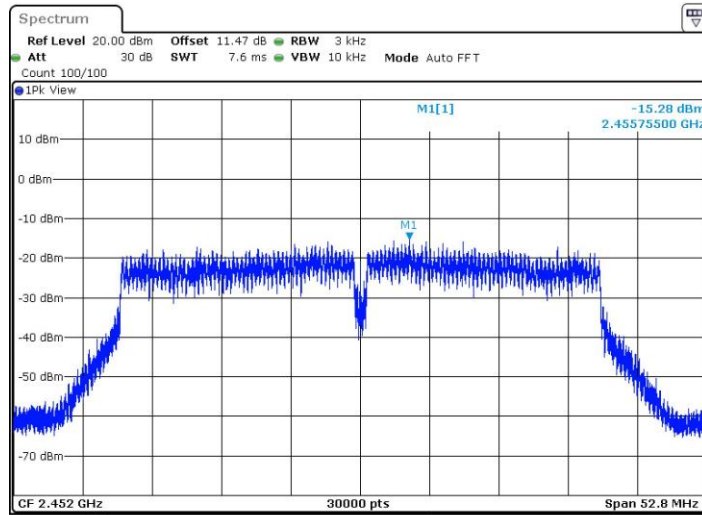


11N40SISO\_Ant1\_2437



Date: 3.DEC.2022 17:09:43

11N40SISO\_Ant1\_2452



Date: 3.DEC.2022 17:11:15



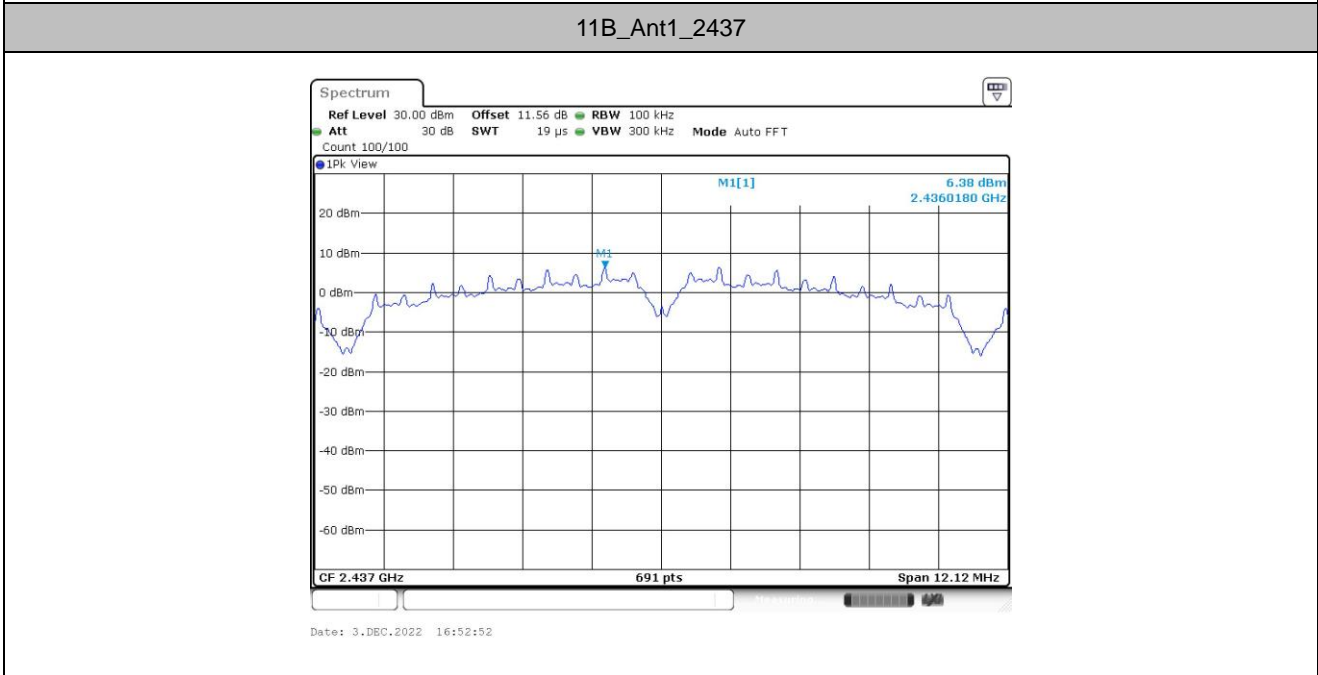
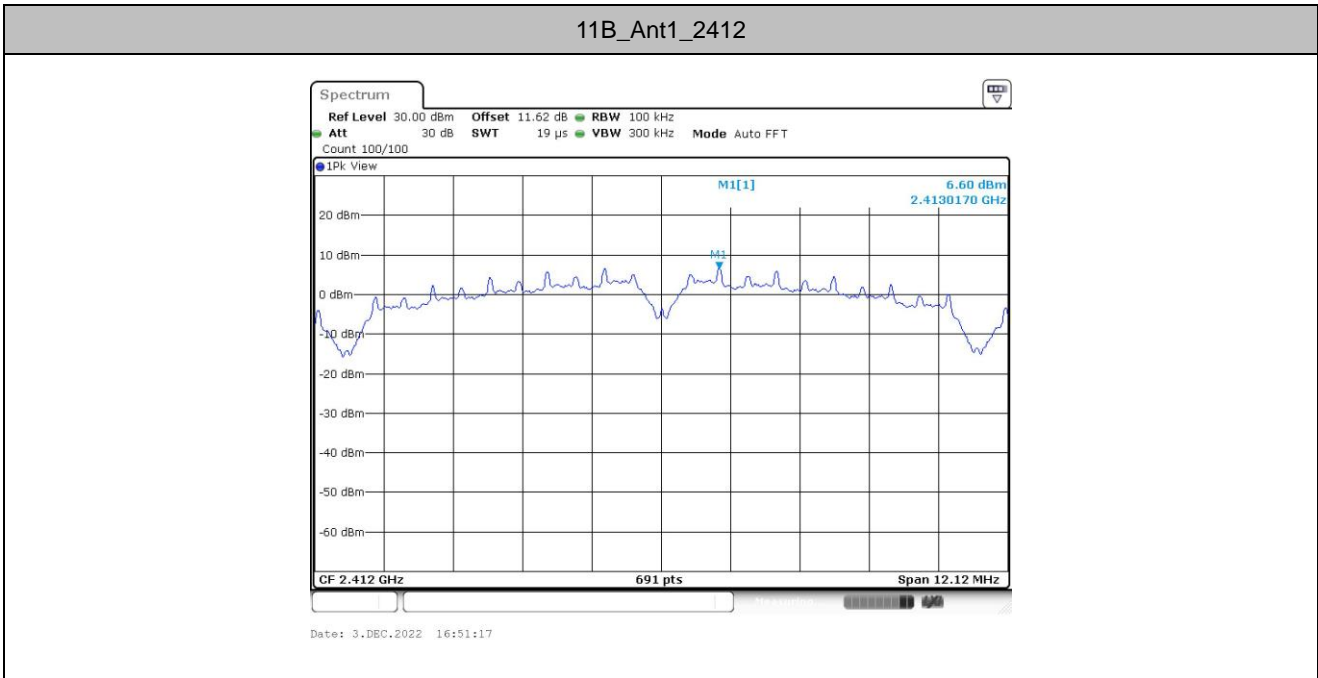
Reference level measurement

Test Result

TestMode	Antenna	Freq(MHz)	Max.Point[MHz]	Result[dBm/100KHz]
11B	Ant1	2412	2413.02	6.60
		2437	2436.02	6.38
		2462	2461.02	6.30
11G	Ant1	2412	2410.75	4.43
		2437	2435.74	4.65
		2462	2460.74	4.27
11N20SISO	Ant1	2412	2413.27	3.63
		2437	2435.74	3.23
		2462	2460.75	3.41
11N40SISO	Ant1	2422	2425.75	-0.19
		2437	2440.73	-0.78
		2452	2455.74	0.05

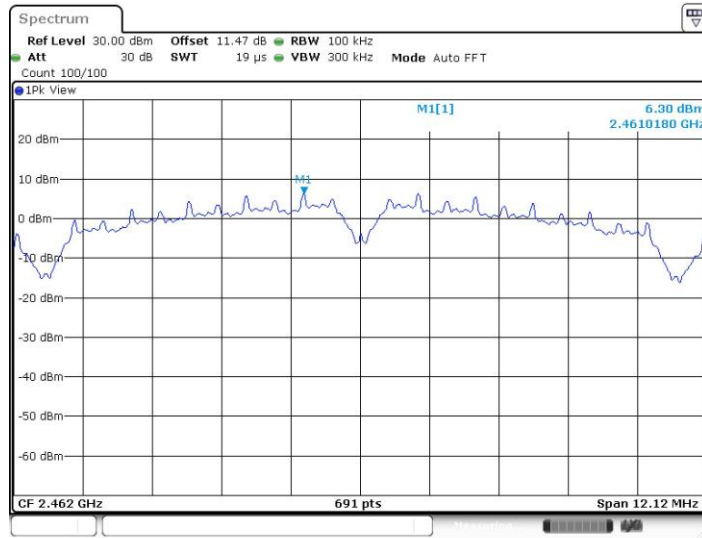


Test Graphs

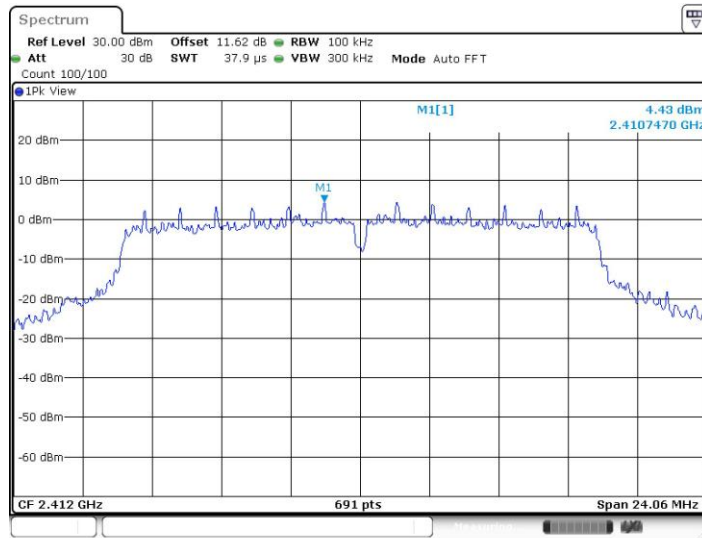




11B\_Ant1\_2462

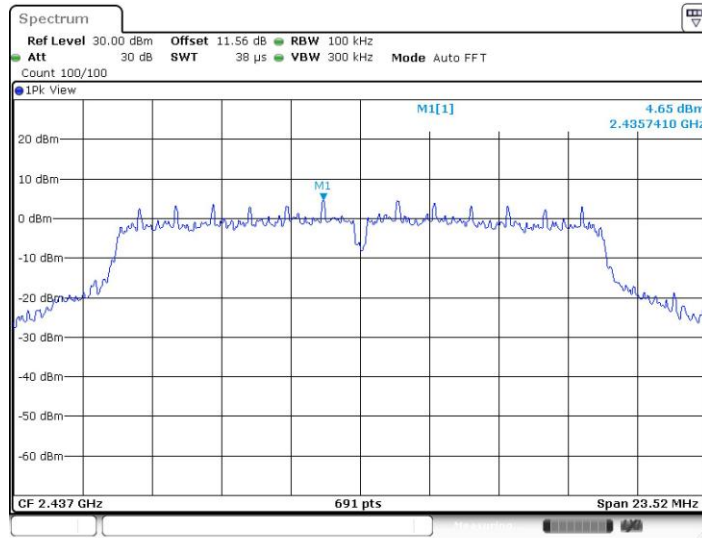


11G\_Ant1\_2412

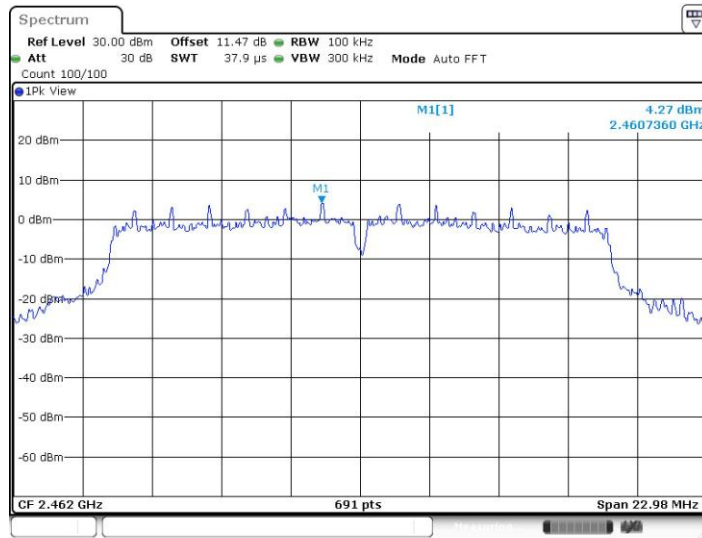




11G\_Ant1\_2437

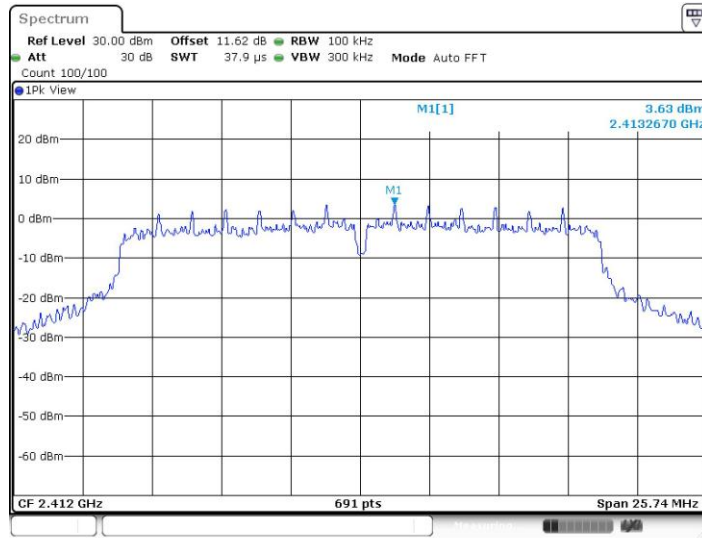


11G\_Ant1\_2462

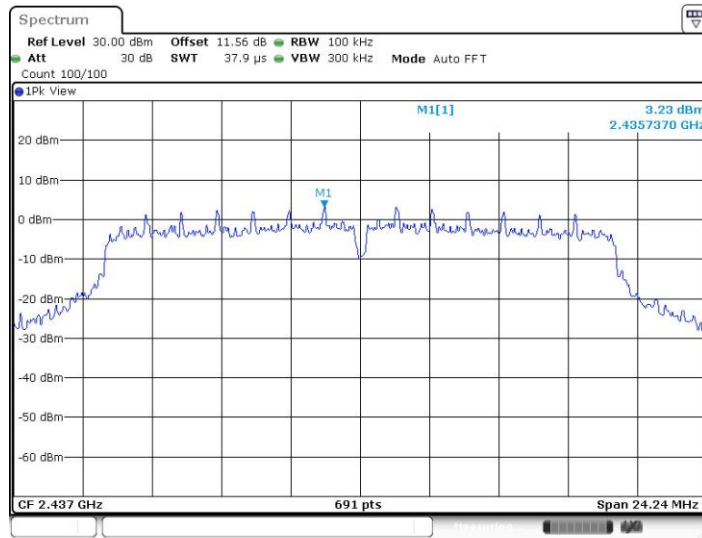




11N20SISO\_Ant1\_2412

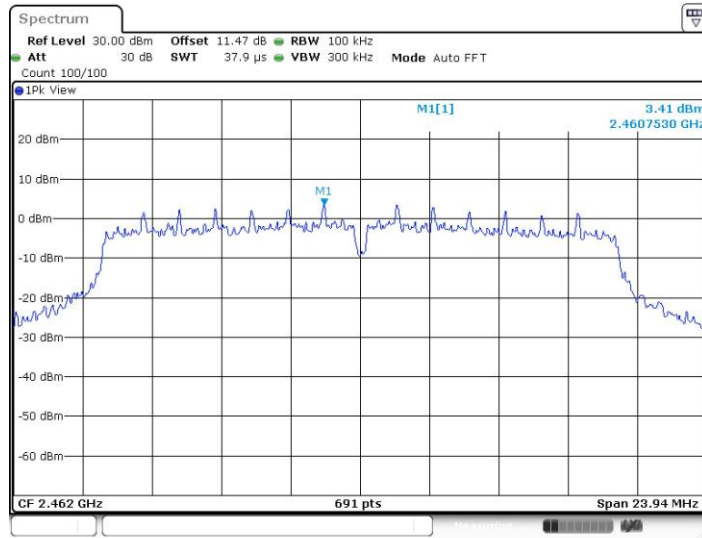


11N20SISO\_Ant1\_2437



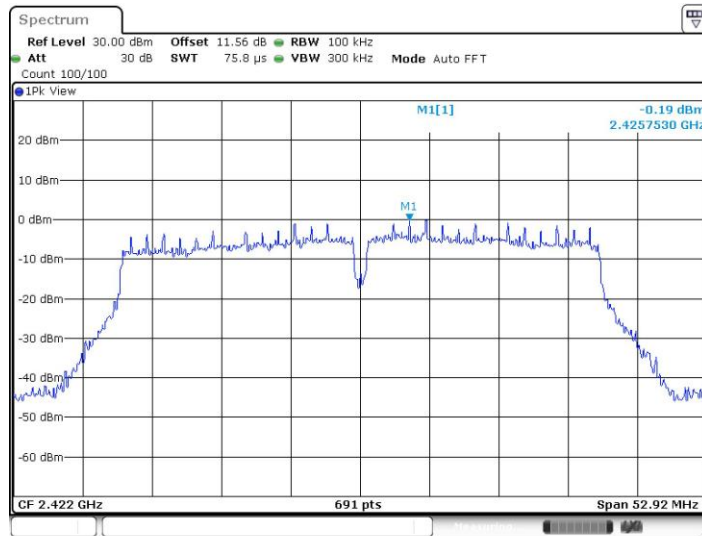


11N20SISO\_Ant1\_2462



Date: 3.DEC.2022 17:06:22

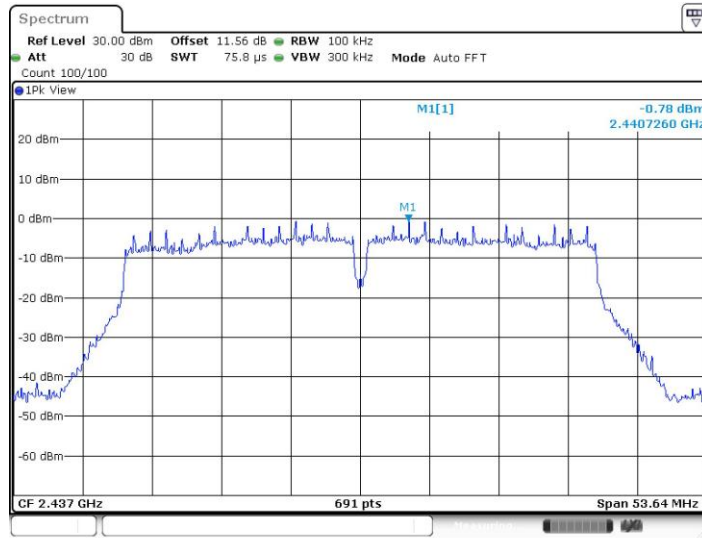
11N40SISO\_Ant1\_2422



Date: 3.DEC.2022 17:08:07

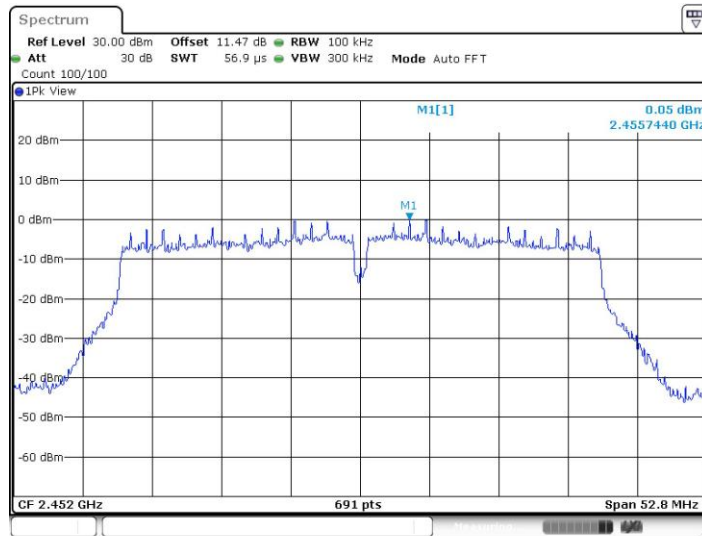


11N40SISO\_Ant1\_2437



Date: 3.DEC.2022 17:09:55

11N40SISO\_Ant1\_2452



Date: 3.DEC.2022 17:11:28





Band edge measurements

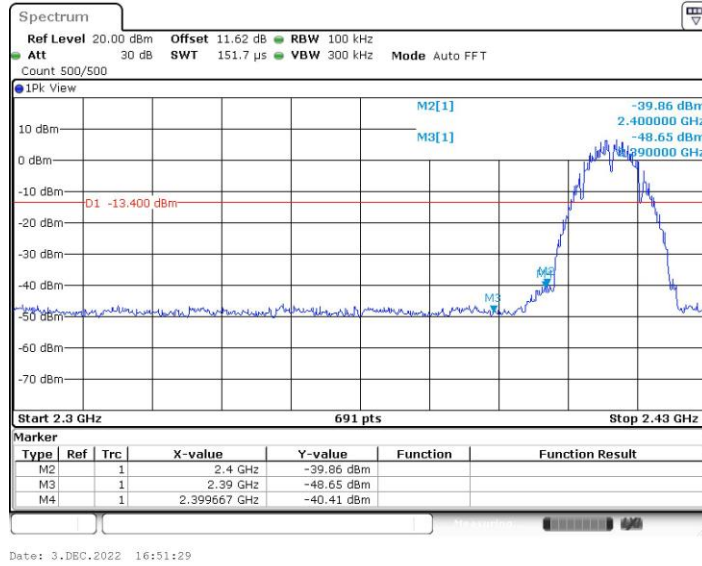
Test Result

TestMode	Antenna	Channel	Freq(MHz)	RefLevel[dBm/100KHz]	Result[dBm/100KH z]	Limit[dBm/100KH z]	Verdict
11B	Ant1	Low	2412	6.60	-40.41	≤-13.4	PASS
		High	2462	6.30	-45.53	≤-13.7	PASS
11G	Ant1	Low	2412	4.43	-26.34	≤-15.57	PASS
		High	2462	4.27	-44.87	≤-15.73	PASS
11N20SISO	Ant1	Low	2412	3.63	-27.08	≤-16.37	PASS
		High	2462	3.41	-45.09	≤-16.59	PASS
11N40SISO	Ant1	Low	2422	-0.19	-37.79	≤-20.19	PASS
		High	2452	0.05	-44.53	≤-19.95	PASS

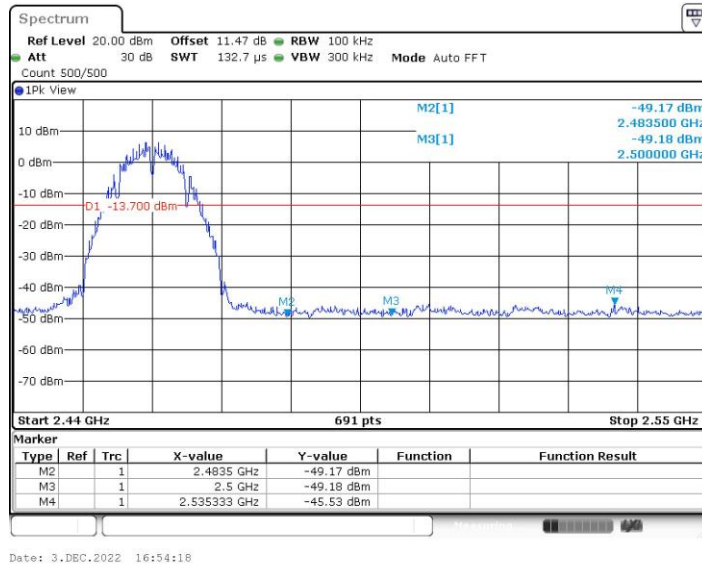


Test Graphs

11B\_Ant1\_Low\_2412

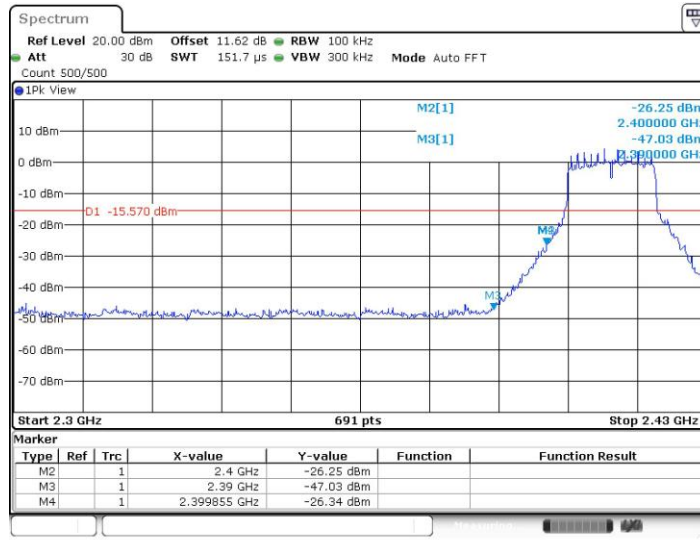


11B\_Ant1\_High\_2462

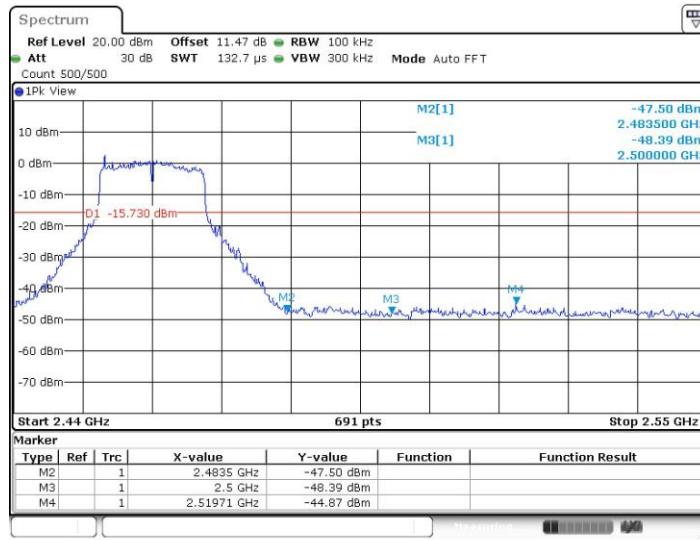




11G\_Ant1\_Low\_2412

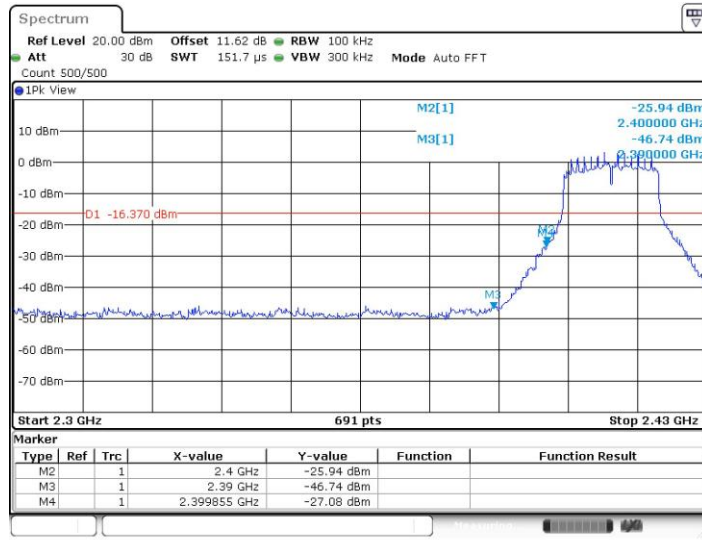


11G\_Ant1\_High\_2462

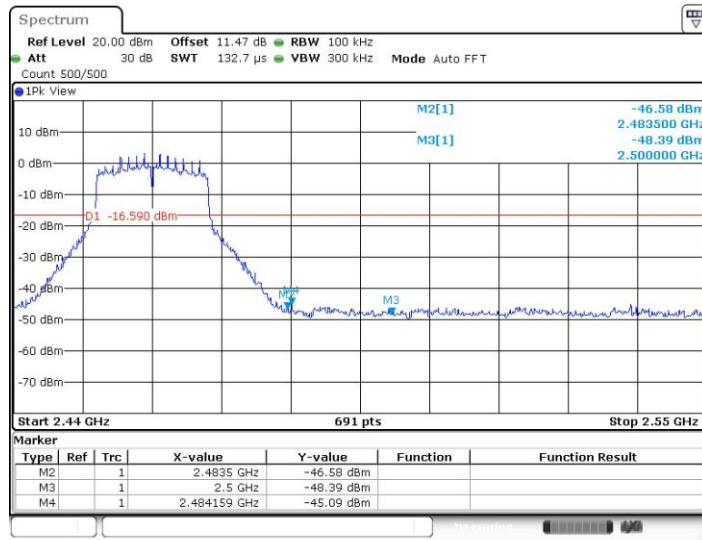




11N20SISO\_Ant1\_Low\_2412

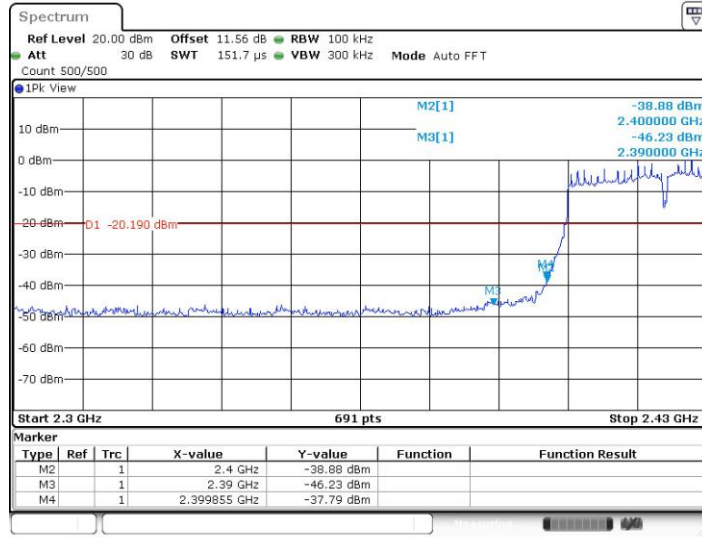


11N20SISO\_Ant1\_High\_2462



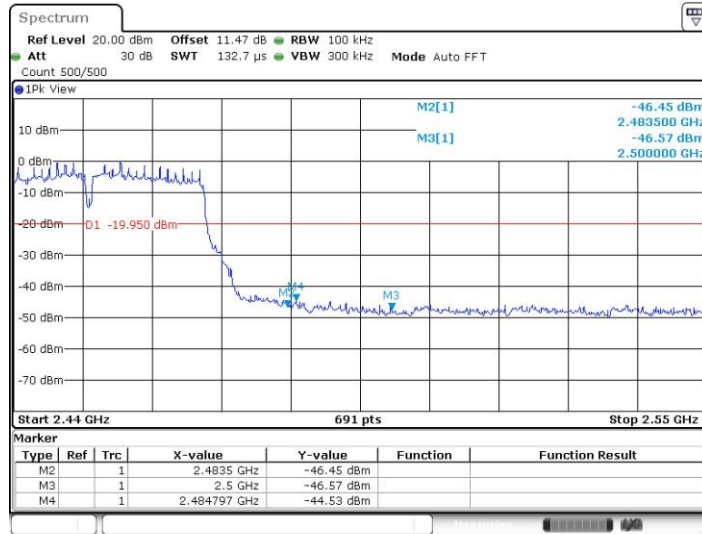


11N40SISO\_Ant1\_Low\_2422



Date: 3.DEC.2022 17:08:22

11N40SISO\_Ant1\_High\_2452



Date: 3.DEC.2022 17:11:41



Conducted Spurious Emission

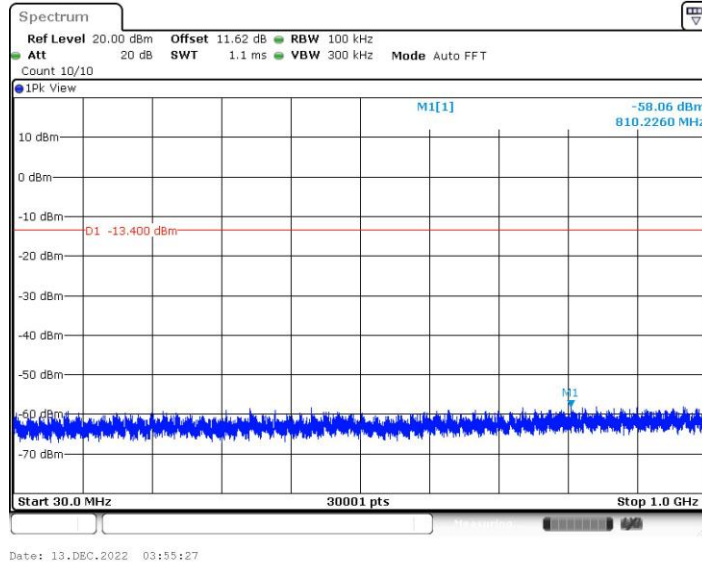
Test Result

TestMode	Antenna	Freq(MHz)	FreqRange [Mhz]	RefLevel [dBm/100KHz]	Result [dBm/100KHz]	Limit [dBm/100KHz]	Verdict
11B	Ant1	2412	30~1000	6.60	-58.06	≤-13.4	PASS
			1000~26500	6.60	-47.68	≤-13.4	PASS
		2437	30~1000	6.38	-56.71	≤-13.62	PASS
			1000~26500	6.38	-48.24	≤-13.62	PASS
		2462	30~1000	6.30	-57.67	≤-13.7	PASS
			1000~26500	6.30	-48.27	≤-13.7	PASS
11G	Ant1	2412	30~1000	4.43	-57.49	≤-15.57	PASS
			1000~26500	4.43	-47.6	≤-15.57	PASS
		2437	30~1000	4.65	-57.25	≤-15.35	PASS
			1000~26500	4.65	-47.88	≤-15.35	PASS
		2462	30~1000	4.27	-57.78	≤-15.73	PASS
			1000~26500	4.27	-48.17	≤-15.73	PASS
11N20SISO	Ant1	2412	30~1000	3.63	-57.11	≤-16.37	PASS
			1000~26500	3.63	-47.51	≤-16.37	PASS
		2437	30~1000	3.23	-57.31	≤-16.77	PASS
			1000~26500	3.23	-46.69	≤-16.77	PASS
		2462	30~1000	3.41	-57.14	≤-16.59	PASS
			1000~26500	3.41	-47.36	≤-16.59	PASS
11N40SISO	Ant1	2422	30~1000	-0.19	-57.41	≤-20.19	PASS
			1000~26500	-0.19	-47.83	≤-20.19	PASS
		2437	30~1000	-0.78	-57.5	≤-20.78	PASS
			1000~26500	-0.78	-48.12	≤-20.78	PASS
		2452	30~1000	0.05	-57.4	≤-19.95	PASS
			1000~26500	0.05	-47.57	≤-19.95	PASS

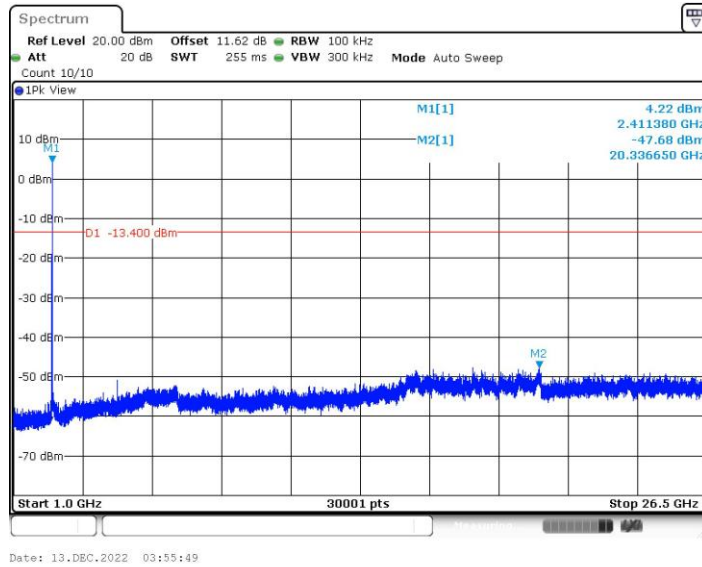


Test Graphs

11B\_Ant1\_2412\_30~1000

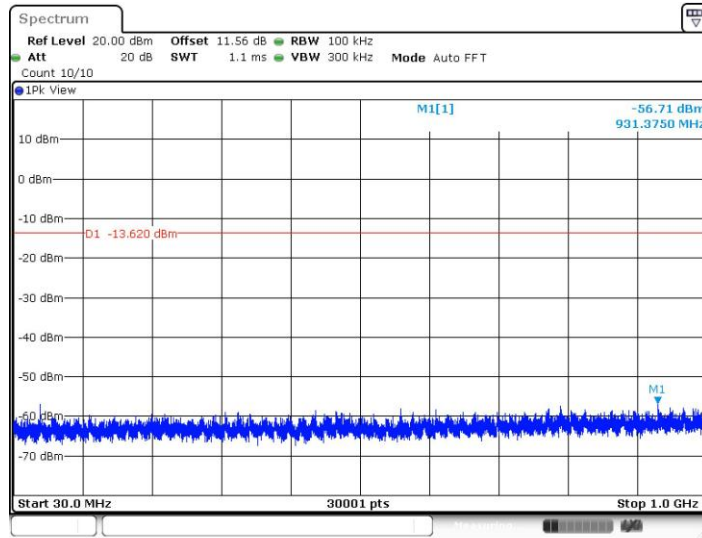


11B\_Ant1\_2412\_1000~26500



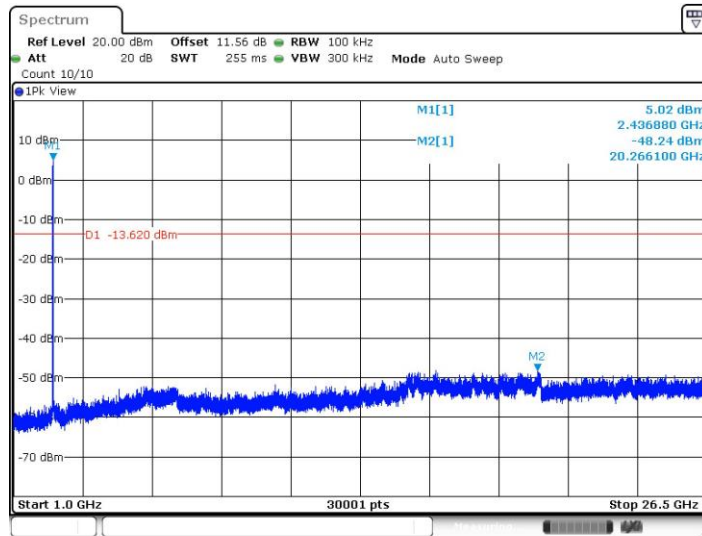


11B\_Ant1\_2437\_30~1000



Date: 13.DEC.2022 03:56:25

11B\_Ant1\_2437\_1000~26500

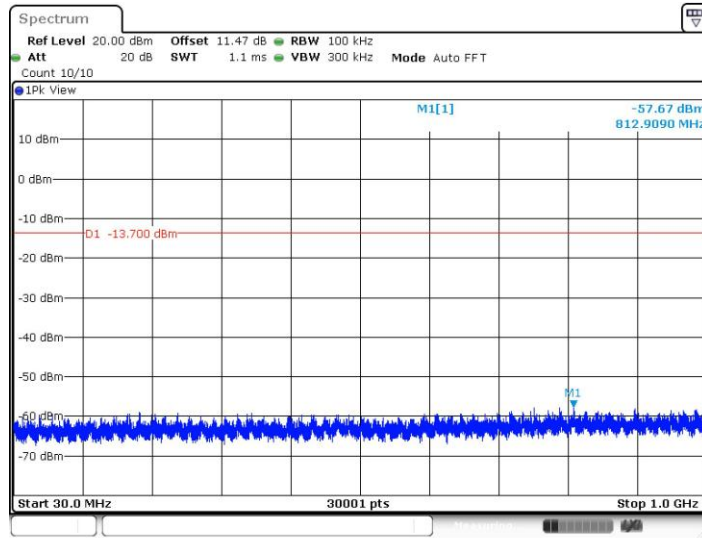


Date: 13.DEC.2022 03:56:47



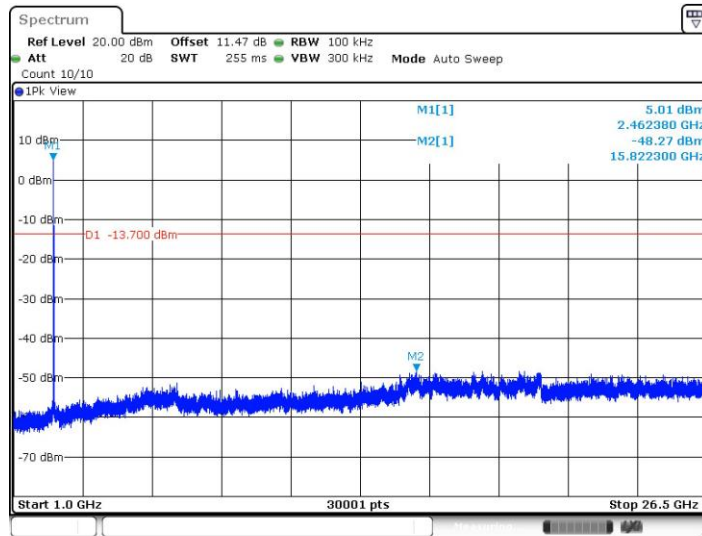


11B\_Ant1\_2462\_30~1000



Date: 13.DEC.2022 03:57:04

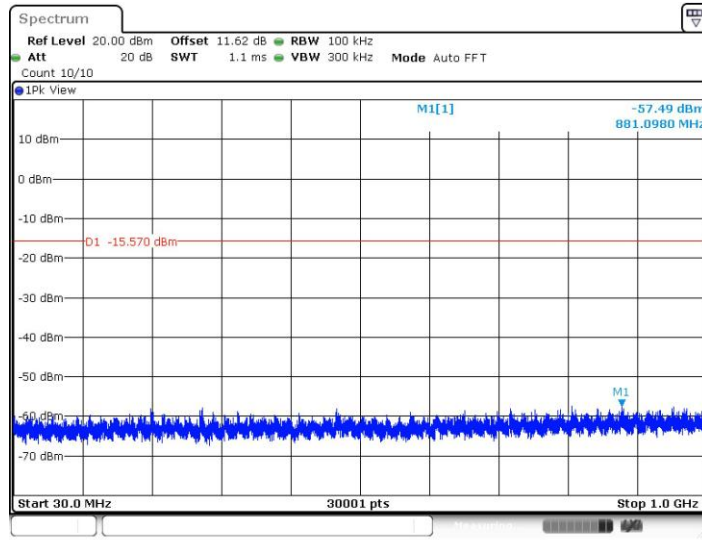
11B\_Ant1\_2462\_1000~26500



Date: 13.DEC.2022 03:57:27

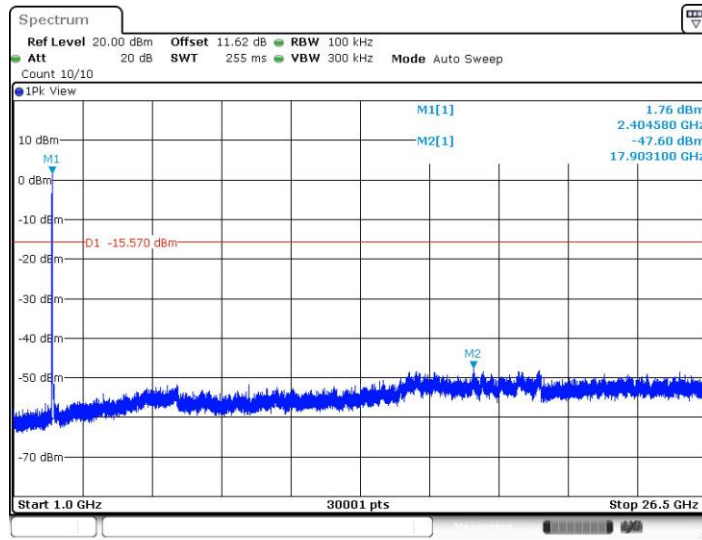


11G\_Ant1\_2412\_30~1000



Date: 13.DEC.2022 03:58:02

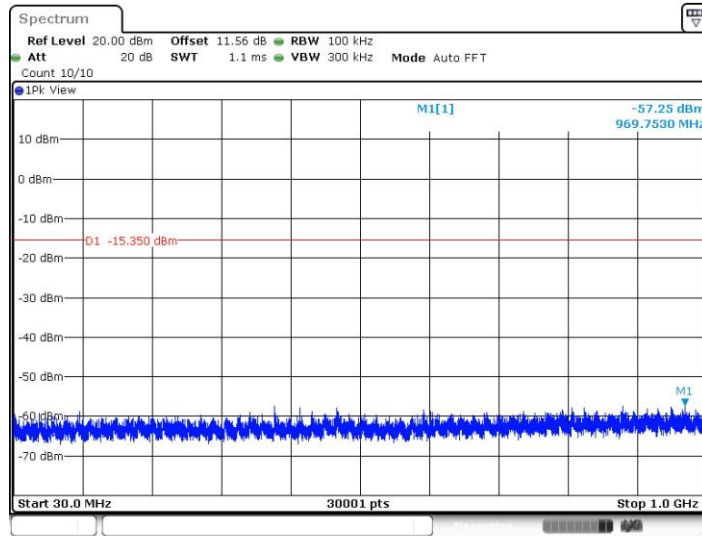
11G\_Ant1\_2412\_1000~26500



Date: 13.DEC.2022 03:58:24

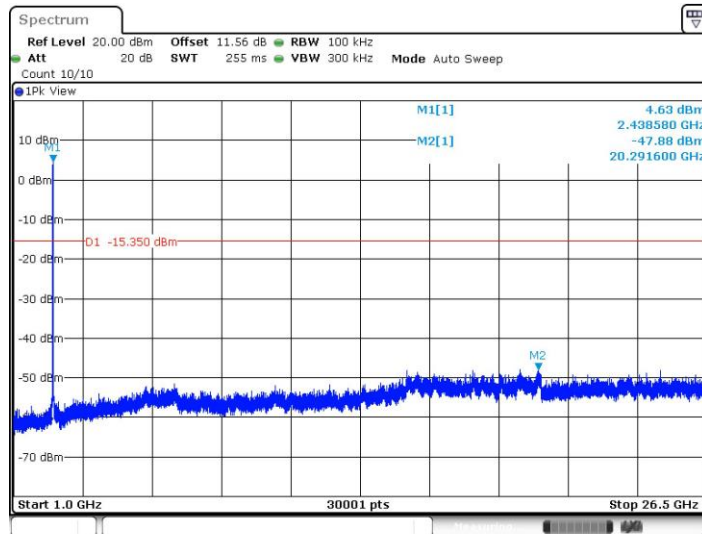


11G\_Ant1\_2437\_30~1000



Date: 13.DEC.2022 03:58:47

11G\_Ant1\_2437\_1000~26500



Date: 13.DEC.2022 03:59:09