FCC RF Test Report

APPLICANT	:	Motorola Mobility LLC
EQUIPMENT	:	Mobile Cellular Phone
BRAND NAME	:	Motorola
MODEL NAME	:	XT2317-1, XT2317-2, XT2317-3, XT2317DL
FCC ID	:	IHDT56AL4
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure
TEST DATE(S)	:	Jan. 02, 2023 ~ Jan. 10, 2023

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

ACCREDITED
Cert #5145.02

Sporton International Inc. (Kunshan)
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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR2N1003D	Rev. 01	Initial issue of report	Jan. 18, 2023

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit for U-NII-1/2A/2C	Limit for U-NII-3	Result	Remark
3.1	2.1049 & 15.403(i)	6dB, 26dB & 99% Bandwidth	-	6dB Bandwidth > 500kHz	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	≤ 24 dBm	≤ 30 dBm	Pass	-
3.3	15.407(a)	Power Spectral Density	≤ 11 dBm/MHz	≤ 30 dBm/500kHz	Pass	-
3.4	15.407(b)	Unwanted Emissions	15.407(b) & 15.209(a)	15.407(b)(4)(i) &15.209(a)	Pass	Under limit 3.16 dB at 5466.480 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	15.207(a)	Pass	Under limit 12.01 dB at 0.627 MHz
3.6	15.203 & 15.407(a)	Antenna Requirement	N/A	N/A	Pass	-

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

1 General Description

1.1 Applicant

Motorola Mobility LLC
222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

1.2 Manufacturer

Motorola Mobility LLC
222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT2317-1, XT2317-2, XT2317-3, XT2317DL
FCC ID	IHDT56AL4
IMEI Code	Conducted: 359026430016032 Conduction: 359026430016594 Radiation: 359026430016917
HW Version	DVT2
SW Version	T1TH33.27
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. The four model name XT2317-1, XT2317-2, XT2317-3, XT2317DL are the same product except model name different for market segment.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	5180 MHz ~ 5240 MHz 5260 MHz ~ 5320 MHz 5500 MHz ~ 5720 MHz 5745 MHz ~ 5825 MHz
Maximum Output Power to Antenna	**<5180 MHz ~ 5240 MHz>** 802.11a : 18.61 dBm / 0.0726 W 802.11n HT20 : 18.53 dBm / 0.0713 W 802.11n HT40 : 18.02 dBm / 0.0634 W 802.11ac VHT20: 18.55 dBm / 0.0716 W 802.11ac VHT40: 18.09 dBm / 0.0644 W 802.11ac VHT80: 17.29 dBm / 0.0536 W **<5260 MHz ~ 5320 MHz>** 802.11a : 17.84 dBm / 0.0608 W 802.11n HT20 : 17.74 dBm / 0.0594 W 802.11n HT40 : 17.48 dBm / 0.0560 W 802.11ac VHT20: 17.82 dBm / 0.0605 W 802.11ac VHT40: 17.57 dBm / 0.0571 W 802.11ac VHT80: 16.74 dBm / 0.0472 W **<5500 MHz ~ 5720 MHz >** 802.11a : 17.22 dBm / 0.0527 W 802.11n HT20 : 17.12 dBm / 0.0515 W 802.11n HT40 : 17.06 dBm / 0.0508 W 802.11ac VHT20: 17.19 dBm / 0.0524 W 802.11ac VHT40: 17.14 dBm / 0.0518 W 802.11ac VHT80: 17.07 dBm / 0.0509 W **<5745 MHz ~ 5825 MHz>** 802.11a : 16.17 dBm / 0.0414 W 802.11n HT20 : 15.93 dBm / 0.0392 W 802.11n HT40 : 15.81 dBm / 0.0381 W 802.11ac VHT20: 15.98 dBm / 0.0396 W 802.11ac VHT40: 15.87 dBm / 0.0386 W 802.11ac VHT80: 15.95 dBm / 0.0394 W

99% Occupied Bandwidth	**<5180 MHz ~ 5240 MHz>** 802.11a : 17.78 MHz 802.11 ac VHT20 : 18.46 MHz 802.11 ac VHT40 : 36.52 MHz 802.11ac VHT80 : 75.45 MHz **<5260 MHz ~ 5320 MHz>** 802.11a : 17.50 MHz 802.11 ac VHT20 : 18.34 MHz 802.11 ac VHT40 : 36.28 MHz 802.11ac VHT80 : 75.45 MHz **<5500 MHz ~ 5720 MHz>** 802.11a : 18.34 MHz 802.11 ac VHT20 : 18.90 MHz 802.11 ac VHT40 : 36.44 MHz 802.11ac VHT80 : 75.60 MHz **<5745 MHz ~ 5825 MHz>** 802.11a : 18.30 MHz 802.11 ac VHT20 : 18.98 MHz 802.11 ac VHT40 : 36.52 MHz 802.11ac VHT80 : 75.45 MHz
Antenna Type / Gain	**<5180 MHz ~ 5240 MHz>** IFA Antenna with gain -3.00 dBi **<5260 MHz ~ 5320 MHz>** IFA Antenna with gain -2.80 dBi **<5500 MHz ~ 5720 MHz>** IFA Antenna with gain -2.20 dBi **<5745 MHz ~ 5825 MHz>** IFA Antenna with gain -2.90 dBi
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)

Note:

1. WLAN operation in 5600 MHz ~ 5650 MHz is notched.
2. For 802.11n HT20 / ac VHT20 and 802.11n HT40 / ac VHT40 mode, the whole testing has assessed only 802.11 ac VHT20/VHT40 by referring to their higher conducted power.

1.5 Specification of Accessory

Specification of Accessory				
AC Adapter 1	**Brand Name**	Motorola(Aohai)	**Model Name**	MC-101
AC Adapter 2	**Brand Name**	Motorola(Salcomp)	**Model Name**	MC-101
AC Adapter 3	**Brand Name**	Motorola(Chenyang)	**Model Name**	MC-101
Battery 1	**Brand Name**	Motorola(ATL)	**Model Name**	PG50
Battery 2	**Brand Name**	Motorola(SCUD)	**Model Name**	PG50
Earphone	**Brand Name**	Motorola(New Leader)	**Model Name**	MH191
USB Cable 1	**Brand Name**	Motorola (SAIBAO)	**Model Name**	SWT-A120A
USB Cable 2	**Brand Name**	Motorola (NAEE)	**Model Name**	1.1.0157
USB Cable 3	**Brand Name**	Motorola (WASHIN)	**Model Name**	HX-WT-40

1.6 Modification of EUT

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

1.7 Testing Location

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

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	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		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-KS 03CH08-KS TH01-KS	CN1257	314309

1.8 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH08-KS	AUDIX	E3	6.2009-8-24
2.	CO01-KS	AUDIX	E3	6.2009-8-24

1.9 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 E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- 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)
5180-5240 MHz U-NII-1	36	5180	44	5220
	38*	5190	46*	5230
	40	5200	48	5240
	42#	5210		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5260-5320 MHz U-NII-2A	52	5260	60	5300
	54*	5270	62*	5310
	56	5280	64	5320
	58#	5290		

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5500-5720MHz U-NII-2C	100	5500	112	5560
	102*	5510	116	5580
	104	5520	132	5660
	106#	5530	134*	5670
	108	5540	136	5680
	110*	5550	140	5700

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5745-5825 MHz U-NII-3	149	5745	157	5785
	151*	5755	159*	5795
	153	5765	161	5805
	155#	5775	165	5825

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
Straddle Channel	138#	5690	144	5720
	142*	5710		

Note:

1. The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40.
2. The above Frequency and Channel in "#" were 802.11ac VHT80.

2.2 Test Mode

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

Modulation	Data Rate
802.11a	**6 Mbps**
802.11ac VHT20	**MCS0**
802.11ac VHT40	**MCS0**
802.11ac VHT80	**MCS0**

AC Conducted Emission	Mode 1 : GSM 850 Idle + BT Link + WLAN Link(5G) + USB Cable 3(Charging From Adapter 3)
Remark: For Radiated Test Cases, The tests were performed with Adapter 1, Battery 1, Earphone and USB Cable 1.	

Ch. #		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
		802.11a	802.11a	802.11a	802.11a
L	Low	36	52	100	149
M	Middle	44	60	116	157
H	High	48	64	140	165
Straddle		-	-	144	-

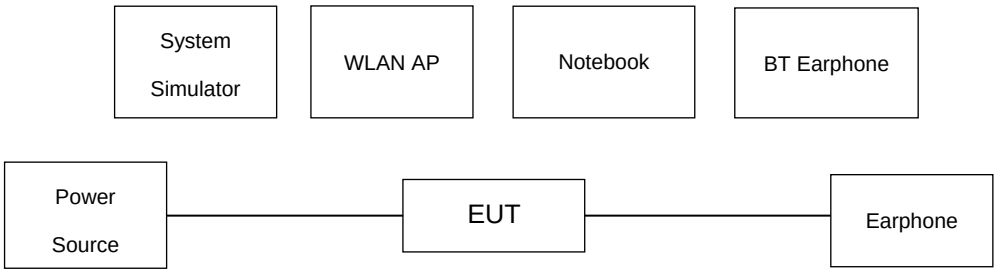
Ch. #		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
		802.11ac VHT20	802.11ac VHT20	802.11ac VHT20	802.11ac VHT20
L	Low	36	52	100	149
M	Middle	44	60	116	157
H	High	48	64	140	165
Straddle		-	-	144	-

Ch. #		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
		802.11ac VHT40	802.11ac VHT40	802.11ac VHT40	802.11ac VHT40
L	Low	38	54	102	151
M	Middle	-	-	110	-
H	High	46	62	134	159
Straddle		-	-	142	-

Ch. #		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
		802.11ac VHT80	802.11ac VHT80	802.11ac VHT80	802.11ac VHT80
L	Low	-	-	106	-
M	Middle	42	58	-	155
H	High	-	-	-	-
Straddle		-	-	138	-

2.3 Connection Diagram of Test System

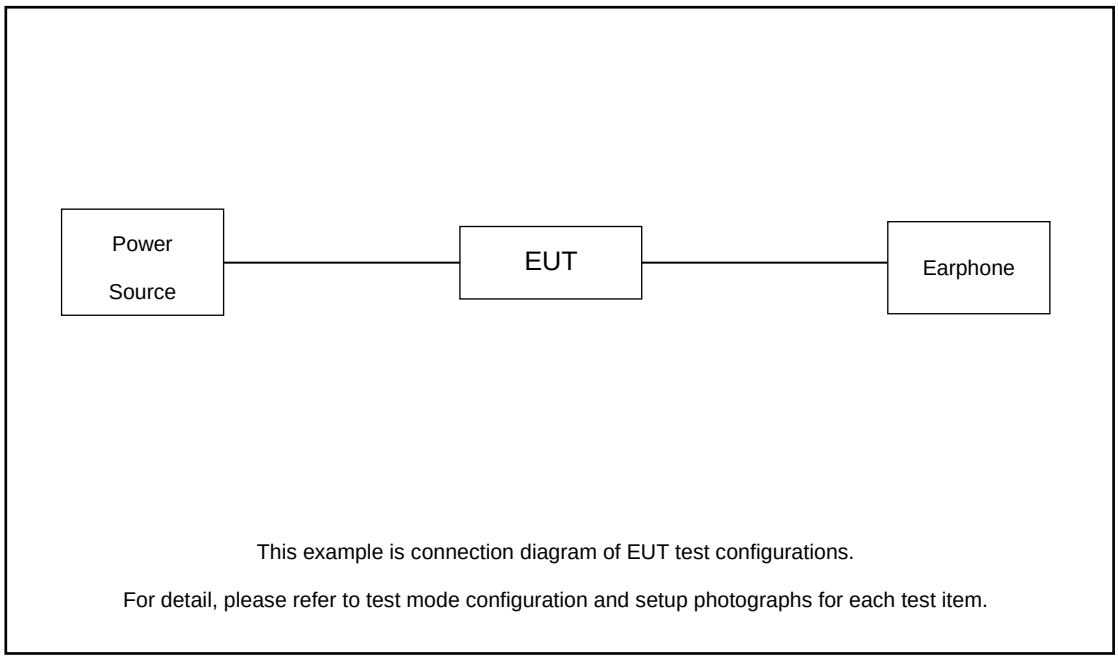
For Conducted Emission:



This example is connection diagram of EUT test configurations.

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

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.	Base Station	Anritsu	MT8821C	N/A	N/A	Unshielded,1.8m
2.	WLAN AP	D-Link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
3.	Notebook	Lenovo	V130-15IKB005	N/A	N/A	shielded cable DC O/P 1.8m , Unshielded AC I/P cable 1.8m
4.	Bluetooth Earphone	Lenovo	LBH308	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 continuously transmit/receive.

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

2.6 Measurement Results Explanation Example

For all conducted test items:

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

Example :

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

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 6.75 dB and 10dB attenuator.

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

= 6.75 + 10 = 16.75 (dB)

3 Test Result

3.1 6dB and 26dB and 99% Occupied Bandwidth Measurement

3.1.1 Description of 6dB and 26dB and 99% Occupied Bandwidth

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

26dB and 99% Occupied bandwidth are reporting only.

3.1.2 Measuring Instruments

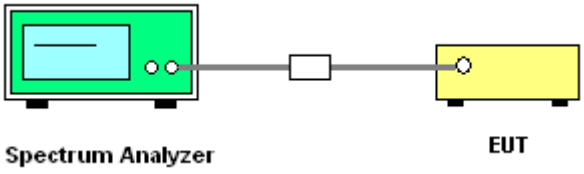
The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

☒	Section C) Bandwidth Measurement 1. Emission Bandwidth (EBW) and 99% OBW
	1. Set RBW = approximately 1% of the emission bandwidth. **2.** Set the VBW > RBW. **3.** Detector = Peak. **4.** Trace mode = max hold **5.** Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%. **6.** For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set to 1%~5% of the OBW and set the Video bandwidth (VBW) ≥ 3 * RBW. **7.** Measure and record the results in the test report.
☒	Section C) Bandwidth Measurement 2. Minimum Emission Bandwidth for the band 5.725 - 5.85 GHz
	1. Set RBW = 100kHz. **2.** Set the VBW ≥ 3 x RBW. **3.** Detector = Peak. **4.** Trace mode = max hold **5.** Measure the maximum width of the emission that is 6 dB down from the peak of the emission. **6.** Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of 6dB and 26dB and 99% Occupied Bandwidth

Please refer to Appendix A.

3.2 Maximum Conducted Output Power Measurement

3.2.1 Limit of Maximum Conducted Output Power

<FCC 14-30 CFR 15.407>

For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW.

For the 5.25–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm 10 log B, where B is the 26 dB emission bandwidth in megahertz.

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

For Straddle Channel, According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, If the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note that U-NII-2 band, devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

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3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

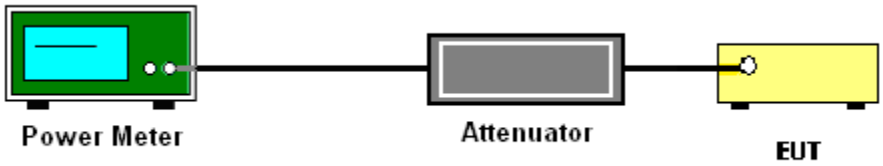
The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, 10 log(1/x), where x is the duty cycle.

For Straddle Channel, According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, If the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

3.2.4 Test Setup



3.2.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

<FCC 14-30 CFR 15.407>

For mobile and portable client devices in the 5.15–5.25 GHz band, the maximum power spectral density shall not exceed 11dBm in any 1 megahertz band.

For the 5.25–5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

For the band 5.725–5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

For Straddle Channel, According to KDB 789033 D02 General UNII Test Procedures New Rules v02r01, If the power and PSD of the devices are uniform and comply with the lower limits specified for the U-NII-2 bands, a single measurement over the entire emission bandwidth can be performed to show compliance.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04. Section F) Maximum power spectral density.

For devices operating in the bands 5.15 - 5.25 GHz, 5.25 - 5.35 GHz, and 5.47 - 5.725 GHz

 # Method SA-2 #

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 1 MHz.
- Set VBW ≥ 3 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- Add 10 log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add 10 log(1/0.25) = 6 dB if the duty cycle is 25 percent.

For devices operating in the band 5.725 - 5.85 GHz

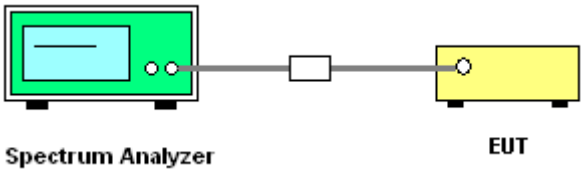
 # Method SA-2 #

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 500KHz (or 300 kHz if the SA can’t set RBW=500KHz).
- Set VBW ≥ 1 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.
- If the SA can’t set RBW=500KHz, then add 10 log(500kHz/RBW) to the test result.
- Add 10 log(1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add 10 log(1/0.25) = 6 dB if the duty cycle is 25 percent.

1. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
2. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

3.4 Unwanted Emissions Measurement

This section as specified in FCC Part 15.407(b) is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement. The unwanted emissions shall comply with 15.407(b)(1) to (6), and restricted bands per FCC Part15.205.

3.4.1 Limit of Unwanted Emissions

(1) For transmitters operating in the 5150-5250 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of –27dBm/MHz.

For transmitters operating in the 5250-5350 MHz band: all emissions outside of the 5150-5350 MHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band must meet all applicable technical requirements for operation in the 5150-5250 MHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5150-5250 MHz band.

For transmitters operating in the 5470-5600 MHz and 5650-5725MHz band: all emissions outside of the 5470-5600 MHz and 5650-5725MHz band shall not exceed an EIRP of -27 dBm/MHz.

(2) For transmitters operating in the 5.725-5.85 GHz band:
15.407(b)(4)(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(3) Unwanted spurious emissions fallen in restricted bands shall comply with the general field strength limits as below table,

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

(4) EIRP (dBm)	Field Strength at 3m (dBµV/m)
- 27	68.3

Note: The following formula is used to convert the EIRP to field strength.

$$EIRP = E_{Meas} + 20\log(d_{Meas}) - 104.7$$

where

EIRP is the equivalent isotropically radiated power, in dBm

E_{Meas} is the field strength of the emission at the measurement distance, in dBµV/m

d_{Meas} is the measurement distance, in m

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 FCC KDB 789033 D02 General UNII Test Procedures New Rules v01r04. Section G) Unwanted emissions measurement.

   (1) Procedure for Unwanted Emissions Measurements Below 1000MHz

   - RBW = 120 kHz
   - VBW = 300 kHz
   - Detector = Peak
   - Trace mode = max hold

   (2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz

   - RBW = 1 MHz
   - VBW ≥ 3 MHz
   - Detector = Peak
   - Sweep time = auto
   - Trace mode = max hold

   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

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

   (4) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

   - RBW = 1 MHz
   - VBW = 3 MHz
   - Detector = power averaging (rms), set span/(# of points in sweep) ≥ RBW/2.
   - Averaging type = power averaging(RMS)
   - The correction factor shall be offset is 10 log (1/x), where x is the duty cycle.

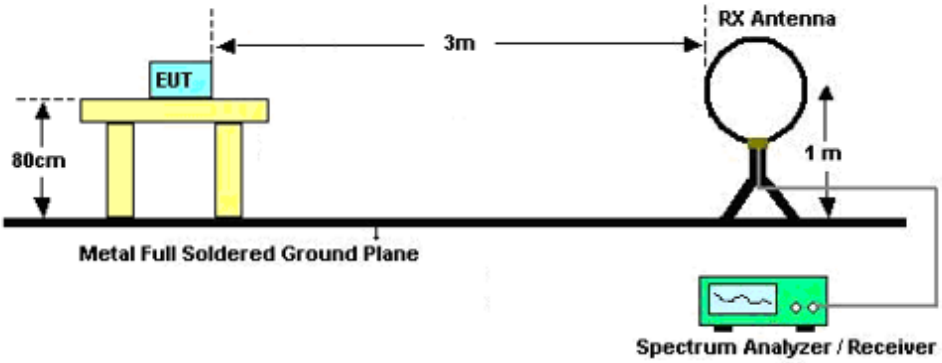
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal

polarization and vertical polarization of the antenna.

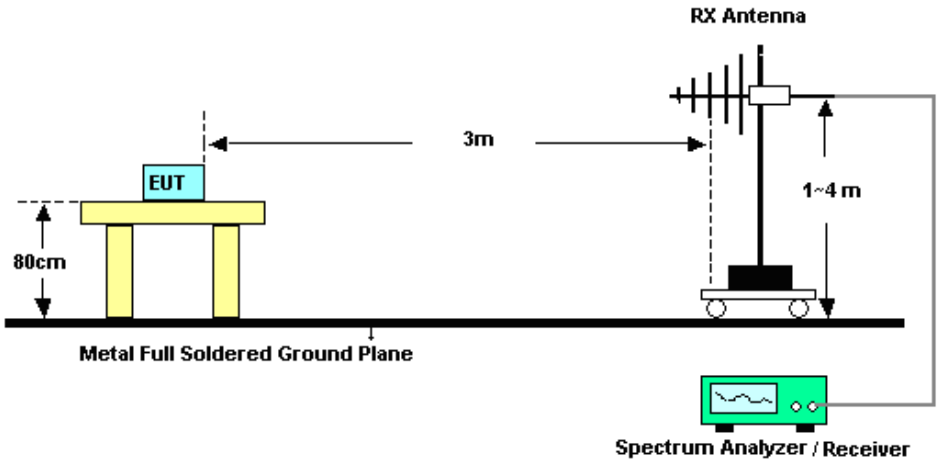
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.4.4 Test Setup

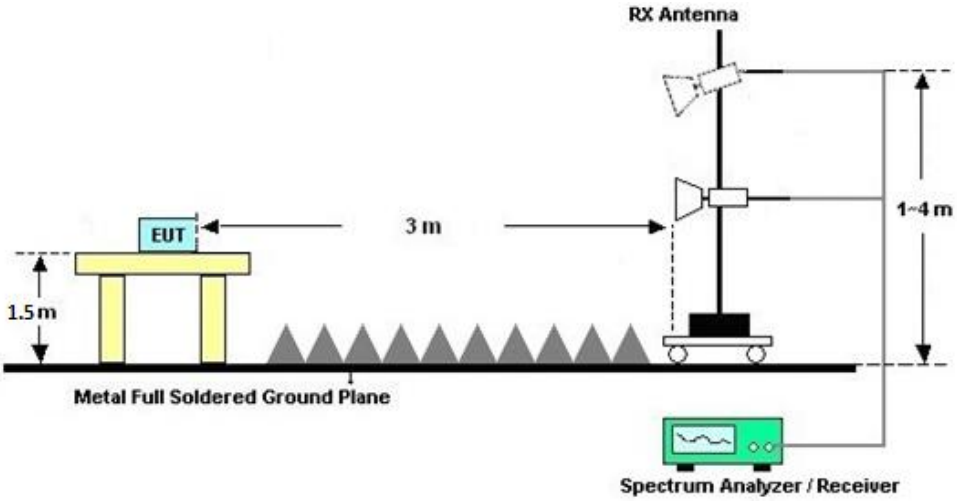
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.4.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

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.

3.4.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C.

3.4.7 Duty Cycle

Please refer to Appendix D.

3.4.8 Test Result of Radiated Spurious Emissions (30MHz ~ 10th Harmonic)

Please refer to Appendix C.

3.5 AC Conducted Emission Measurement

3.5.1 Limit of AC Conducted Emission

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

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

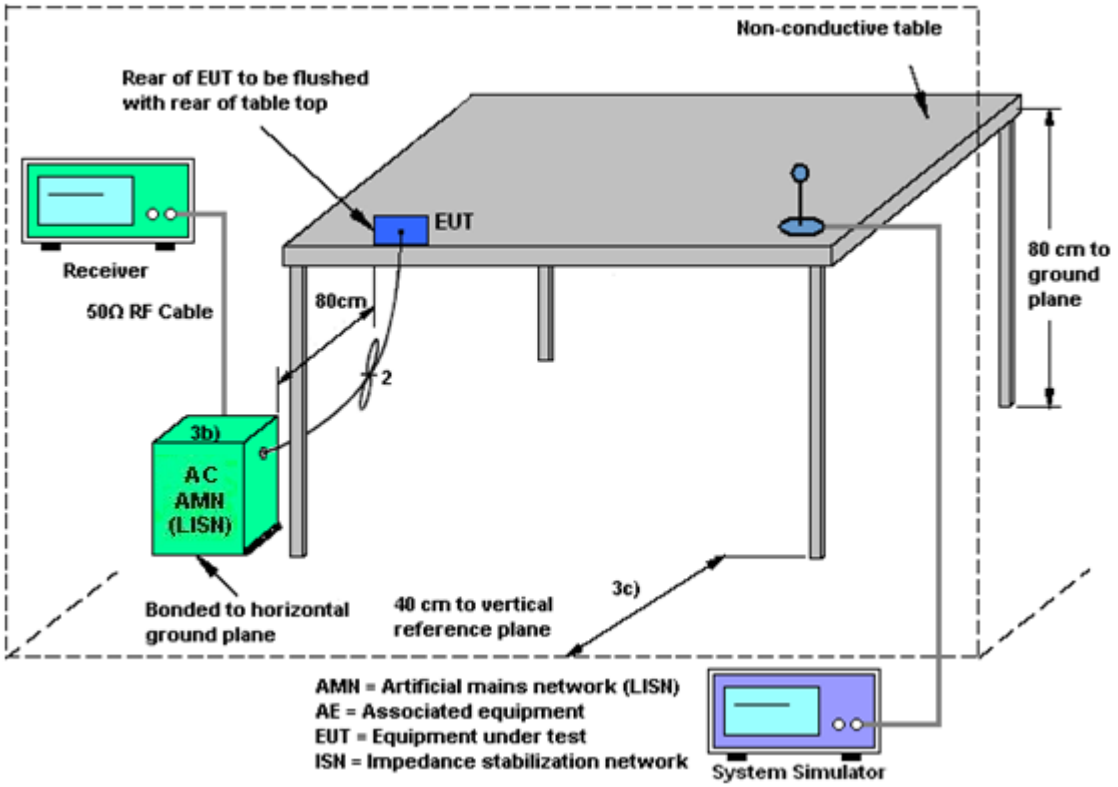
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room 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 with Maximum Hold Mode.

3.5.4 Test Setup



3.5.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.6 Antenna Requirements

3.6.1 Standard Applicable

According to FCC 47 CFR Section 15.407(a)(1)(2) ,if transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.6.3 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	101040	10Hz~40GHz	Oct. 12, 2022	Jan. 02, 2023~ Jan. 10, 2023	Oct. 11, 2023	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 05, 2022	Jan. 02, 2023~ Jan. 10, 2023	Jan. 04, 2023	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 04, 2023		Jan. 03, 2024	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 05, 2022	Jan. 02, 2023~ Jan. 10, 2023	Jan. 04, 2023	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 04, 2023		Jan. 03, 2024	Conducted (TH01-KS)
Temperature & humidity chamber	Hongzhan	LP-150U	H2014011440	-40~+150°C 20%~95%RH	Jul. 15, 2022	Jan. 02, 2023~ Jan. 10, 2023	Jul. 14, 2023	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY57290151	3Hz~8.5GHz;Max 30dBm	Jul. 11, 2022	Jan. 10, 2023	Jul. 10, 2023	Radiation (03CH08-KS)
Spectrum Analyzer	R&S	FSV40	101932	10kHz~40GHz; Max 30dBm	Oct. 12, 2022	Jan. 10, 2023	Oct. 11, 2023	Radiation (03CH08-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 16, 2022	Jan. 10, 2023	Oct. 15, 2023	Radiation (03CH08-KS)
Bilog Antenna	TESEQ& VGT	CBL 61110	59915	30MHz-1GHz	Aug. 26, 2022	Jan. 10, 2023	Aug. 25, 2023	Radiation (03CH08-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00240138	1GHz~18GHz	Jul. 08, 2022	Jan. 10, 2023	Jul. 07, 2023	Radiation (03CH08-KS)
high gain Amplifier	EM	EM01G18GA	060845	1Ghz-18Ghz	Jan. 04, 2023	Jan. 10, 2023	Jan. 03, 2024	Radiation (03CH08-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 04, 2023	Jan. 10, 2023	Jan. 03, 2024	Radiation (03CH08-KS)
Amplifier	SONOMA	310N	413741	9KHz-1GHz	Jan. 04, 2023	Jan. 10, 2023	Jan. 03, 2024	Radiation (03CH08-KS)
Amplifier	EM	EM01G18GA	060834	1Ghz-18Ghz	Jan. 04, 2023	Jan. 10, 2023	Jan. 03, 2024	Radiation (03CH08-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 04, 2023	Jan. 10, 2023	Jan. 03, 2024	Radiation (03CH08-KS)
AC Power Source	Chroma	61601	616010002473	N/A	NCR	Jan. 10, 2023	NCR	Radiation (03CH08-KS)
Turn Table	EM	EM 1000-T	N/A	0~360 degree	NCR	Jan. 10, 2023	NCR	Radiation (03CH08-KS)
Antenna Mast	EM	EM 1000-A	N/A	1 m~4 m	NCR	Jan. 10, 2023	NCR	Radiation (03CH08-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	May 24, 2022	Jan. 07, 2023	May 23, 2023	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2022	Jan. 07, 2023	Oct. 12, 2023	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	May 24, 2022	Jan. 07, 2023	May 23, 2023	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2022	Jan. 07, 2023	Oct. 11, 2023	Conduction (CO01-KS)

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	±0.46 dB
Conducted Emissions	±0.48 dB
Occupied Channel Bandwidth	±0.1 %
Conducted Power Spectral Density	±0.40 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.78dB

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

Appendix A. Conducted Test Results

Test Engineer:	Jiang Jun	Temperature:	21~25	°C
Test Date:	2023.1.2~2023.1.10	Relative Humidity:	51~54	%

Report Number : FR2N1003D

TEST RESULTS DATA
Average Power Table

FCC U-NII-1 single antenna								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power with duty factor (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)	Pass/Fail
					Ant 4	Ant 4	Ant 4	
11a	6Mbps	1	36	5180	18.31	24.00	-3.0	Pass
11a	6Mbps	1	44	5220	18.61	24.00	-3.0	Pass
11a	6Mbps	1	48	5240	18.60	24.00	-3.0	Pass
HT20	MCS0	1	36	5180	18.49	24.00	-3.0	Pass
HT20	MCS0	1	44	5220	18.53	24.00	-3.0	Pass
HT20	MCS0	1	48	5240	18.51	24.00	-3.0	Pass
HT40	MCS0	1	38	5190	17.85	24.00	-3.0	Pass
HT40	MCS0	1	46	5230	18.02	24.00	-3.0	Pass
VHT20	MCS0	1	36	5180	18.53	24.00	-3.0	Pass
VHT20	MCS0	1	44	5220	18.55	24.00	-3.0	Pass
VHT20	MCS0	1	48	5240	18.53	24.00	-3.0	Pass
VHT40	MCS0	1	38	5190	17.98	24.00	-3.0	Pass
VHT40	MCS0	1	46	5230	18.09	24.00	-3.0	Pass
VHT80	MCS0	1	42	5210	17.29	24.00	-3.0	Pass

TEST RESULTS DATA
Average Power Table

FCC U-NII-2A single antenna									
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power with duty factor (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)	EIRP Power Limit (dBm)	Pass/Fail
					Ant 4	Ant 4	Ant 4		
11a	6Mbps	1	52	5260	17.77	23.98	-2.8	26.99	Pass
11a	6Mbps	1	60	5300	17.84	23.98	-2.8	26.99	Pass
11a	6Mbps	1	64	5320	17.62	23.98	-2.8	26.99	Pass
HT20	MCS0	1	52	5260	17.67	23.98	-2.8	26.99	Pass
HT20	MCS0	1	60	5300	17.74	23.98	-2.8	26.99	Pass
HT20	MCS0	1	64	5320	17.50	23.98	-2.8	26.99	Pass
HT40	MCS0	1	54	5270	17.44	23.98	-2.8	26.99	Pass
HT40	MCS0	1	62	5310	17.48	23.98	-2.8	26.99	Pass
VHT20	MCS0	1	52	5260	17.71	23.98	-2.8	26.99	Pass
VHT20	MCS0	1	60	5300	17.82	23.98	-2.8	26.99	Pass
VHT20	MCS0	1	64	5320	17.53	23.98	-2.8	26.99	Pass
VHT40	MCS0	1	54	5270	17.53	23.98	-2.8	26.99	Pass
VHT40	MCS0	1	62	5310	17.57	23.98	-2.8	26.99	Pass
VHT80	MCS0	1	58	5290	16.74	23.98	-2.8	26.99	Pass

TEST RESULTS DATA
Average Power Table

FCC U-NII-2C single antenna									
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power with duty factor	FCC Conducted Power Limit (dBm)	DG (dBi)	EIRP Power Limit (dBm)	Pass/Fail
					Ant 4	Ant 4	Ant 4		
11a	6Mbps	1	100	5500	16.90	23.98	-2.2	26.99	Pass
11a	6Mbps	1	116	5580	16.94	23.98	-2.2	26.99	Pass
11a	6Mbps	1	140	5700	16.34	23.98	-2.2	26.99	Pass
HT20	MCS0	1	100	5500	16.78	23.98	-2.2	26.99	Pass
HT20	MCS0	1	116	5580	16.77	23.98	-2.2	26.99	Pass
HT20	MCS0	1	140	5700	16.29	23.98	-2.2	26.99	Pass
HT40	MCS0	1	102	5510	16.46	23.98	-2.2	26.99	Pass
HT40	MCS0	1	110	5550	16.51	23.98	-2.2	26.99	Pass
HT40	MCS0	1	134	5670	16.92	23.98	-2.2	26.99	Pass
VHT20	MCS0	1	100	5500	16.84	23.98	-2.2	26.99	Pass
VHT20	MCS0	1	116	5580	16.83	23.98	-2.2	26.99	Pass
VHT20	MCS0	1	140	5700	16.33	23.98	-2.2	26.99	Pass
VHT40	MCS0	1	102	5510	16.51	23.98	-2.2	26.99	Pass
VHT40	MCS0	1	110	5550	16.57	23.98	-2.2	26.99	Pass
VHT40	MCS0	1	134	5670	16.97	23.98	-2.2	26.99	Pass
VHT80	MCS0	1	106	5530	16.24	23.98	-2.2	26.99	Pass

FCC U-NII-2C straddle channel single antenna									
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power with duty factor	FCC Conducted Power Limit (dBm)	DG (dBi)	EIRP Power Limit (dBm)	Pass/Fail
					Ant 4	Ant 4	Ant 4		
11a	6Mbps	1	144	5720	17.22	23.98	-2.2	26.99	Pass
HT20	MCS0	1	144	5720	17.12	23.98	-2.2	26.99	Pass
HT40	MCS0	1	142	5710	17.06	23.98	-2.2	26.99	Pass
VHT20	MCS0	1	144	5720	17.19	23.98	-2.2	26.99	Pass
VHT40	MCS0	1	142	5710	17.14	23.98	-2.2	26.99	Pass
VHT80	MCS0	1	138	5690	17.07	23.98	-2.2	26.99	Pass

TEST RESULTS DATA
Average Power Table

U-NII-3 single antenna								
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power with duty factor (dBm)	FCC Conducted Power Limit (dBm)	DG (dBi)	Pass/Fail
					Ant 4	Ant 4	Ant 4	
11a	6Mbps	1	149	5745	16.17	30.00	-2.9	Pass
11a	6Mbps	1	157	5785	16.12	30.00	-2.9	Pass
11a	6Mbps	1	165	5825	16.08	30.00	-2.9	Pass
HT20	MCS0	1	149	5745	15.92	30.00	-2.9	Pass
HT20	MCS0	1	157	5785	15.93	30.00	-2.9	Pass
HT20	MCS0	1	165	5825	15.91	30.00	-2.9	Pass
HT40	MCS0	1	151	5755	15.75	30.00	-2.9	Pass
HT40	MCS0	1	159	5795	15.81	30.00	-2.9	Pass
VHT20	MCS0	1	149	5745	15.95	30.00	-2.9	Pass
VHT20	MCS0	1	157	5785	15.98	30.00	-2.9	Pass
VHT20	MCS0	1	165	5825	15.97	30.00	-2.9	Pass
VHT40	MCS0	1	151	5755	15.79	30.00	-2.9	Pass
VHT40	MCS0	1	159	5795	15.87	30.00	-2.9	Pass
VHT80	MCS0	1	155	5775	15.95	30.00	-2.9	Pass

Ambient Condition: 25 ℃, 45 %RH	
Test Date: 2023/1/2~2023/1/10	**Test Engineer:** Long Wu

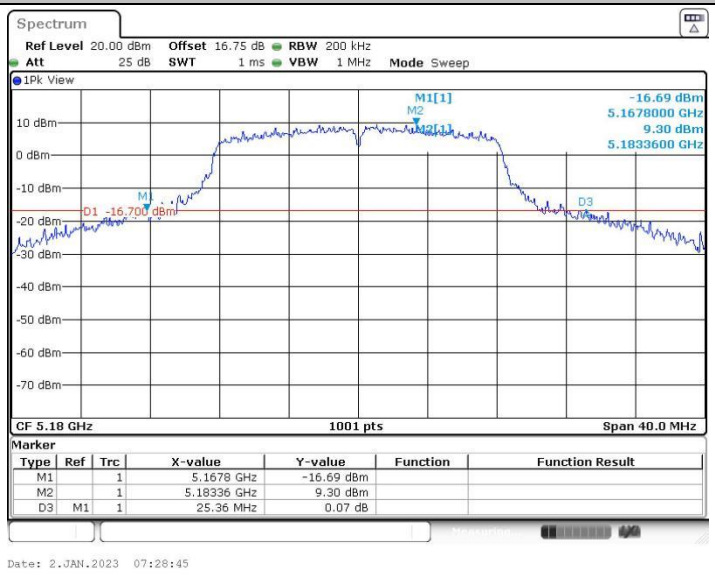
Emission Bandwidth

Test Result

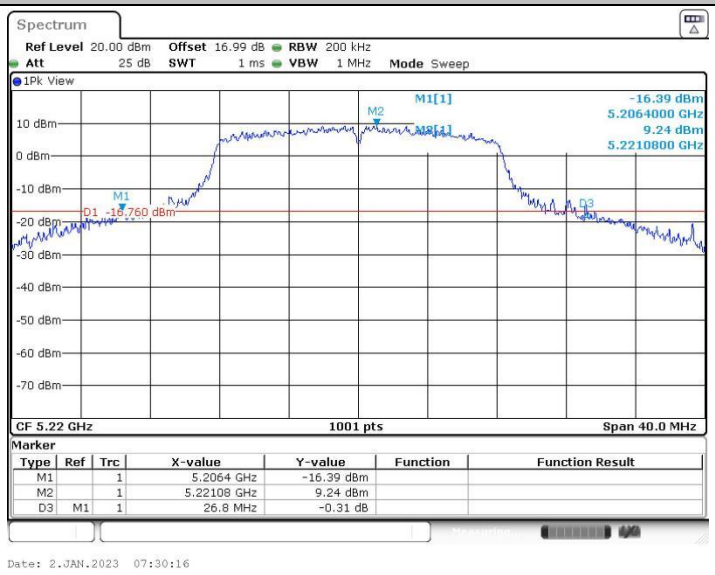
TestMode	Antenna	Freq(MHz)	26dB EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant4	5180	25.36	5167.80	5193.16	---	---
		5220	26.80	5206.40	5233.20	---	---
		5240	24.64	5227.64	5252.28	---	---
		5260	23.48	5246.60	5270.08	---	---
		5300	22.76	5288.08	5310.84	---	---
		5320	26.08	5305.84	5331.92	---	---
		5500	28.68	5485.16	5513.84	---	---
		5580	27.80	5566.44	5594.24	---	---
		5700	30.92	5684.36	5715.28	---	---
		5720	27.56	5706.68	5734.24	---	---
		5745	29.16	5729.56	5758.72	---	---
		5785	30.88	5768.00	5798.88	---	---
		5825	31.32	5808.68	5840.00	---	---
11AC20	Ant4	5180	27.40	5166.16	5193.56	---	---
		5220	26.88	5206.80	5233.68	---	---
		5240	25.64	5228.12	5253.76	---	---
		5260	23.52	5247.60	5271.12	---	---
		5300	24.80	5287.88	5312.68	---	---
		5320	25.84	5307.68	5333.52	---	---
		5500	28.40	5485.64	5514.04	---	---
		5580	27.16	5566.88	5594.04	---	---
		5700	29.60	5685.56	5715.16	---	---
		5720	30.68	5704.04	5734.72	---	---
		5745	31.08	5728.68	5759.76	---	---
		5785	29.36	5770.32	5799.68	---	---
		5825	34.52	5807.12	5841.64	---	---
11AC40	Ant4	5190	40.80	5169.76	5210.56	---	---
		5230	47.52	5203.12	5250.64	---	---
		5270	41.12	5249.36	5290.48	---	---
		5310	40.80	5289.76	5330.56	---	---
		5510	40.72	5489.60	5530.32	---	---
		5550	49.68	5524.32	5574.00	---	---
		5670	50.80	5644.40	5695.20	---	---
		5710	46.96	5687.76	5734.72	---	---
		5755	46.72	5732.84	5779.56	---	---
		5795	50.08	5770.52	5820.60	---	---
11AC80	Ant4	5210	80.96	5169.68	5250.64	---	---
		5290	81.12	5249.52	5330.64	---	---
		5530	81.44	5489.68	5571.12	---	---
		5690	81.12	5649.52	5730.64	---	---
		5775	91.04	5724.60	5815.64	---	---

Test Graphs

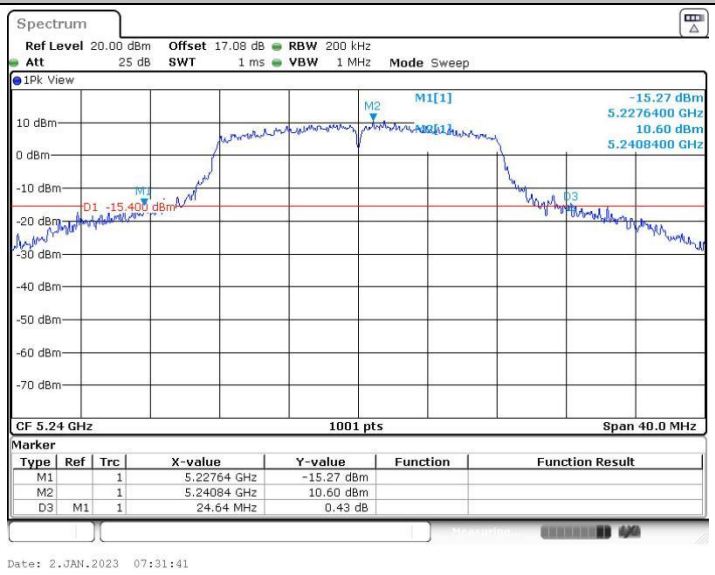
11A_Ant4_5180



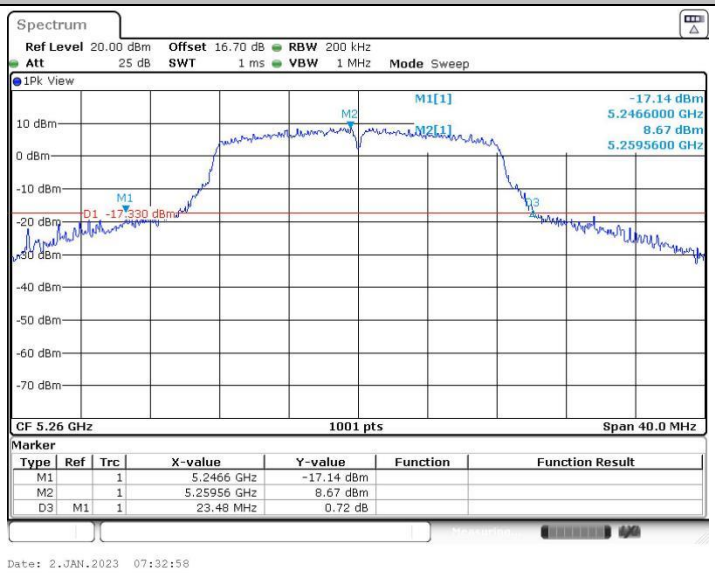
11A_Ant4_5220



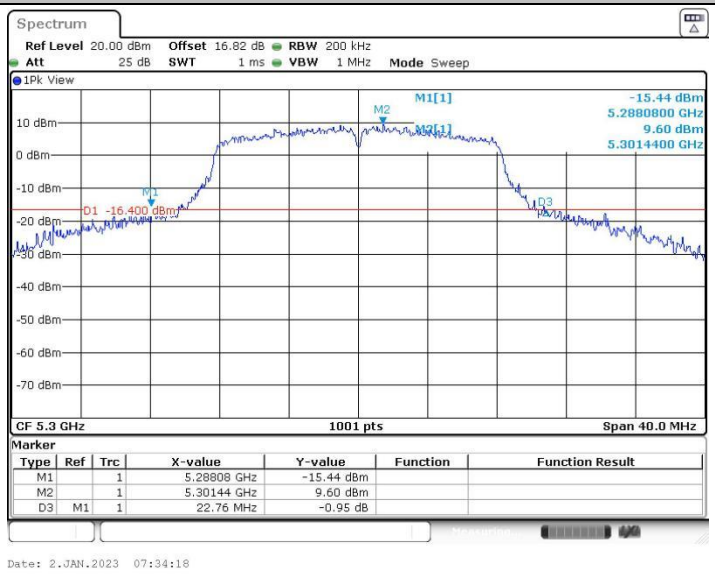
11A_Ant4_5240



11A_Ant4_5260



11A_Ant4_5300



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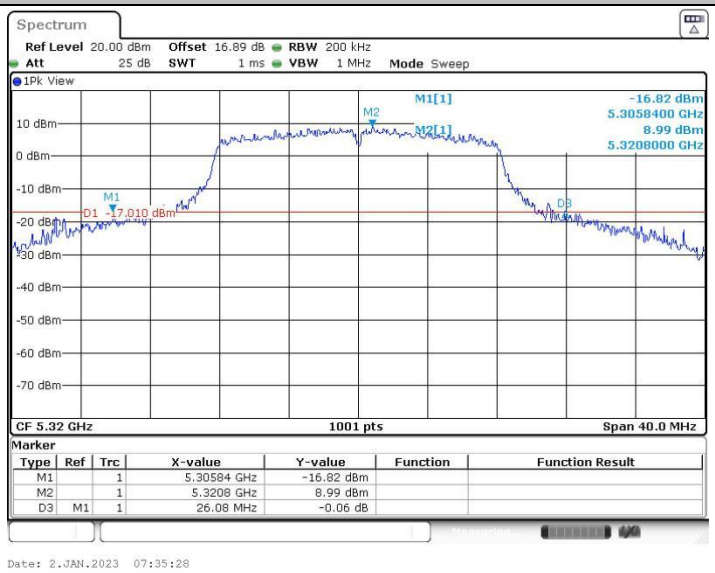

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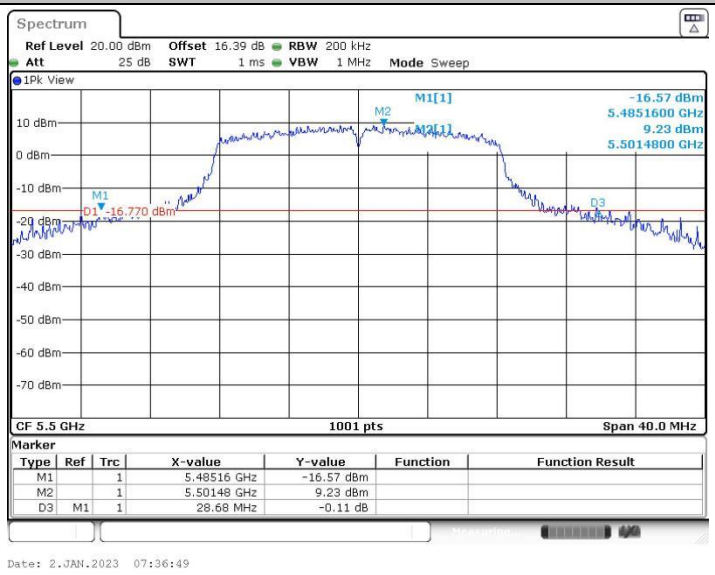

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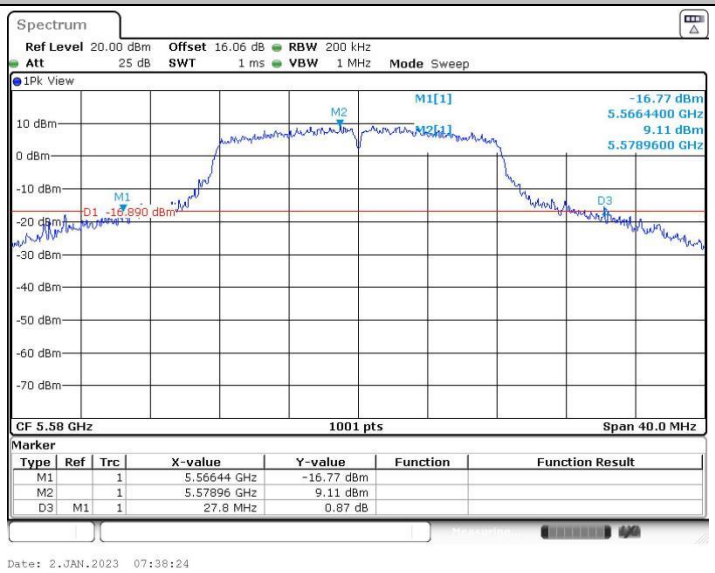

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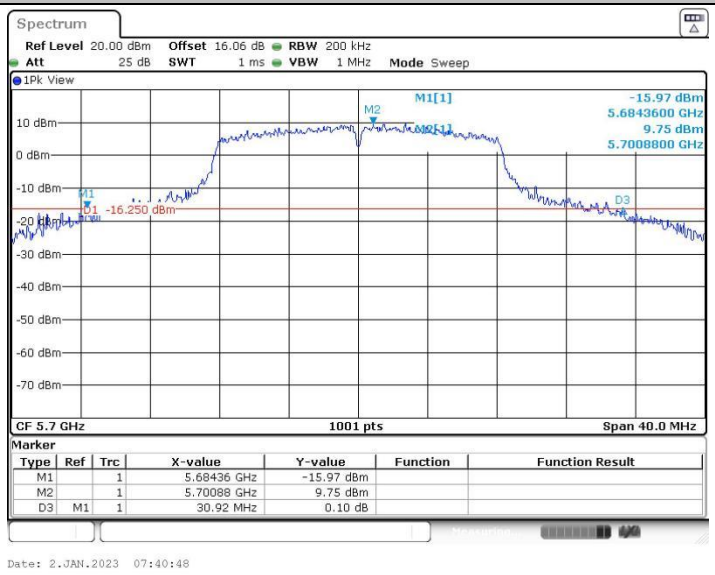

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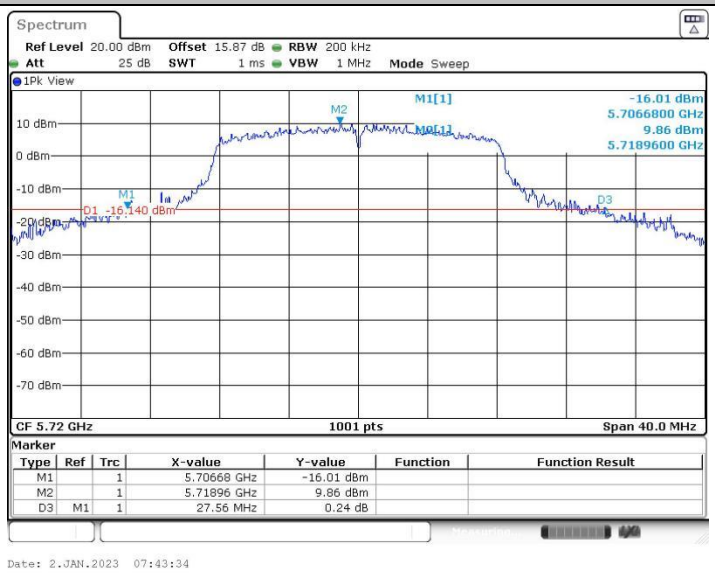

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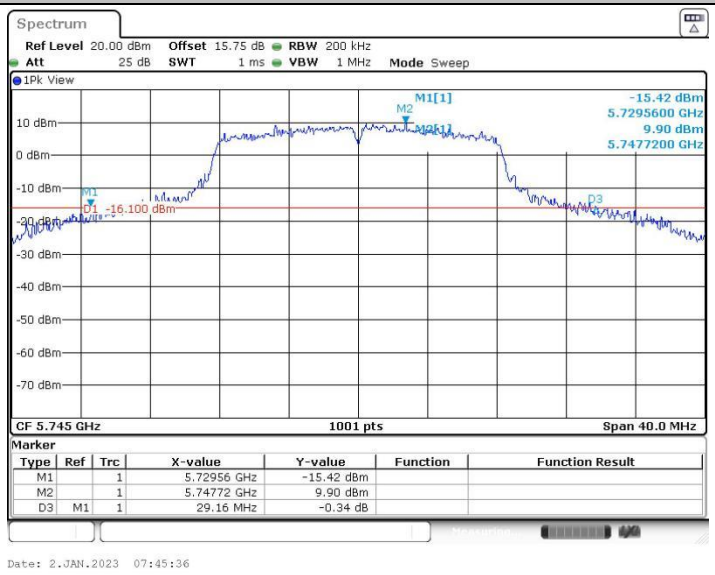
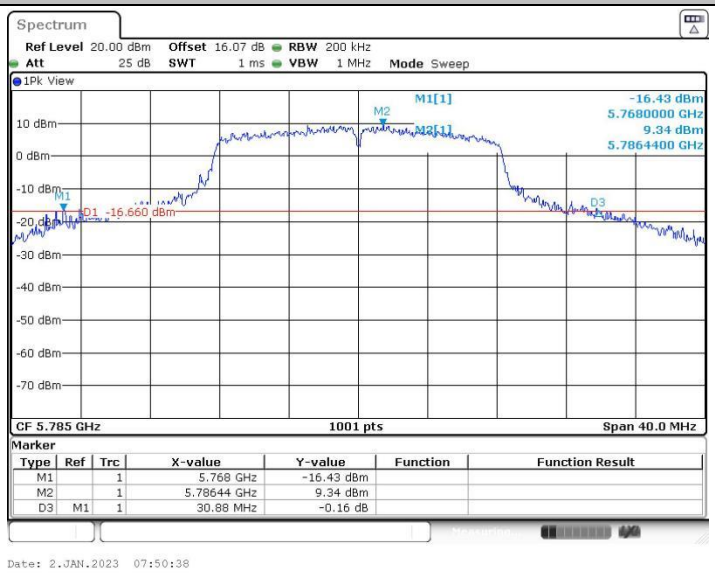


11A_Ant4_5785



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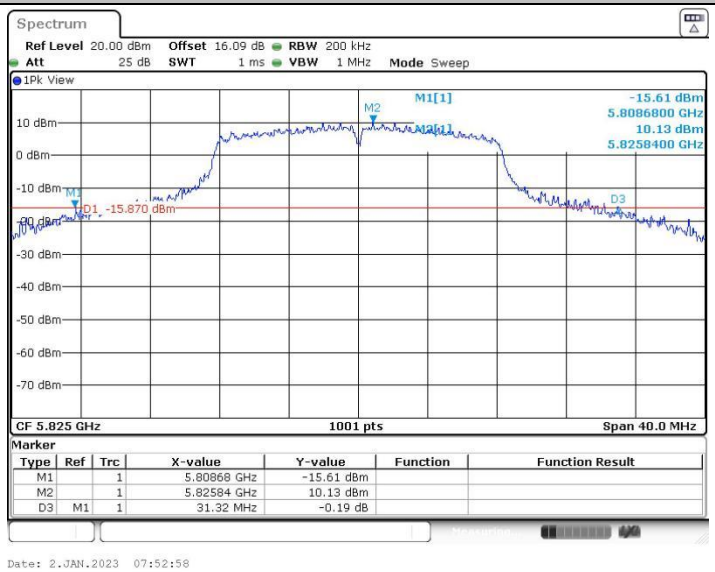

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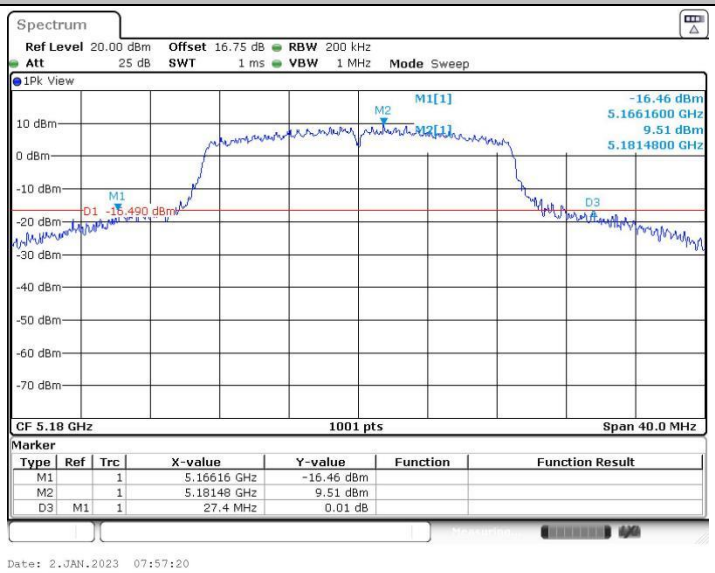

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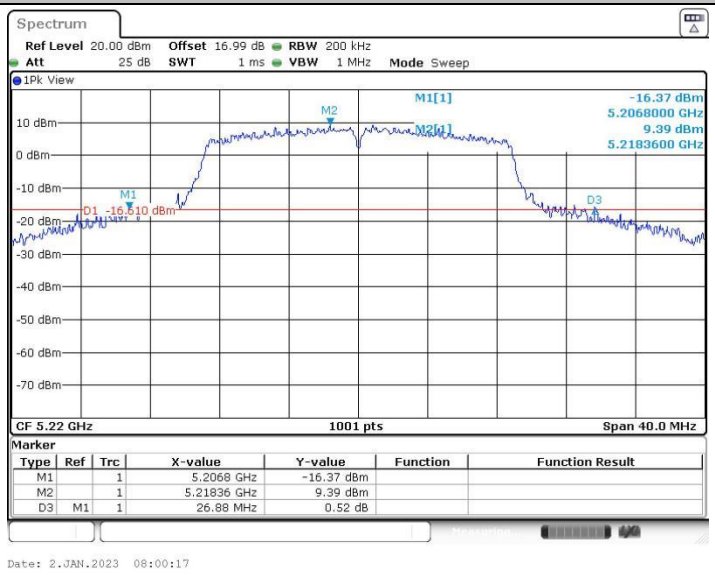

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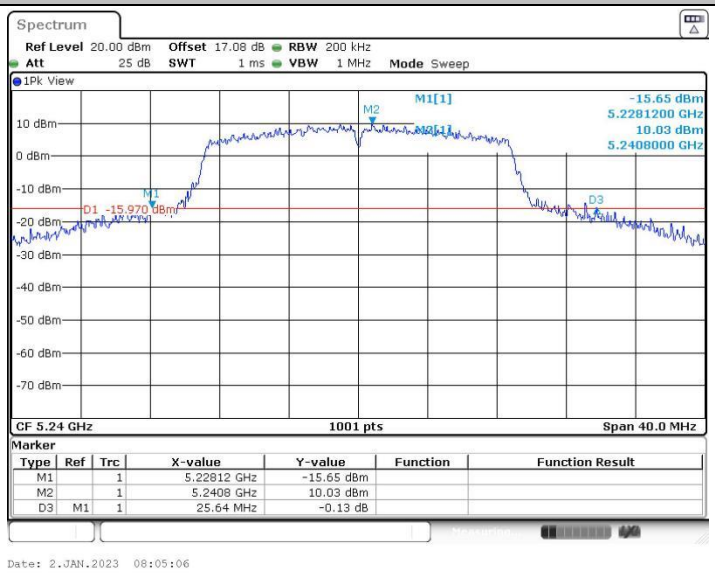

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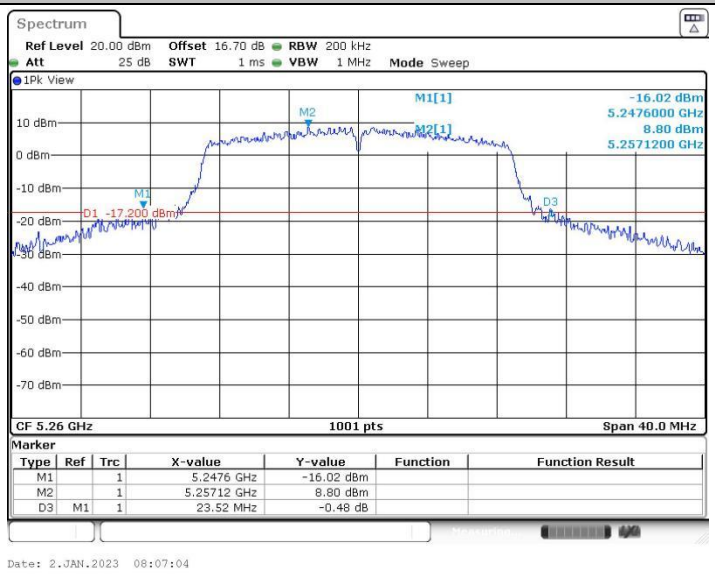

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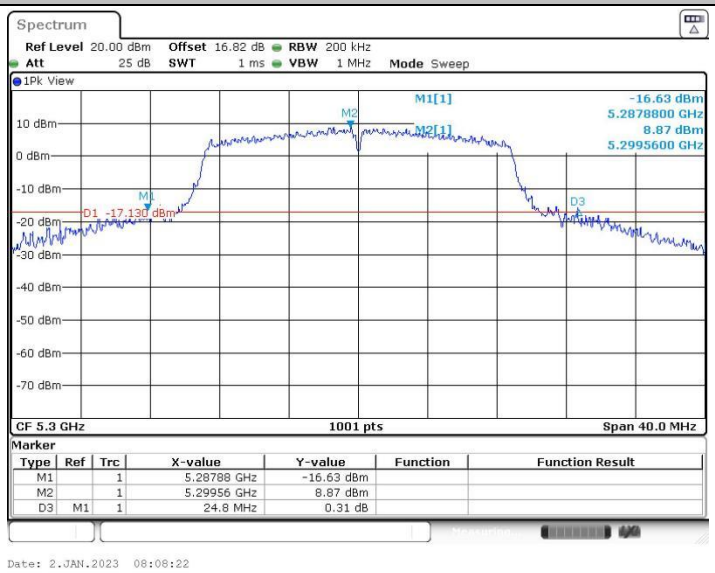

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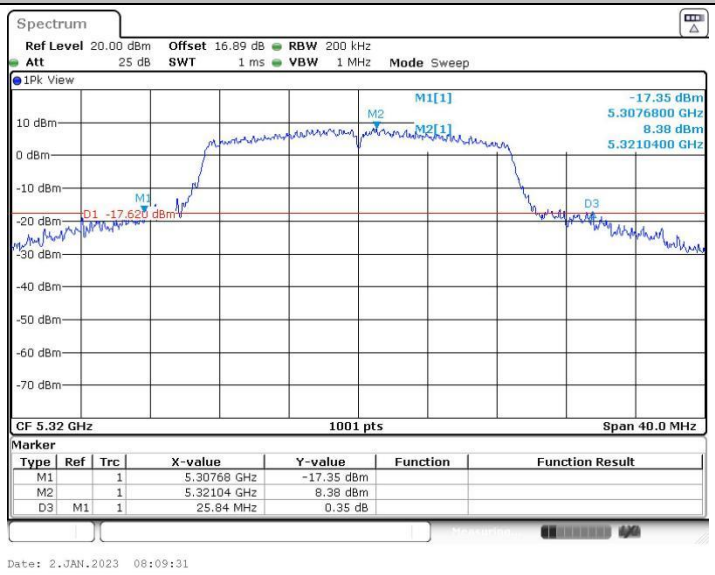

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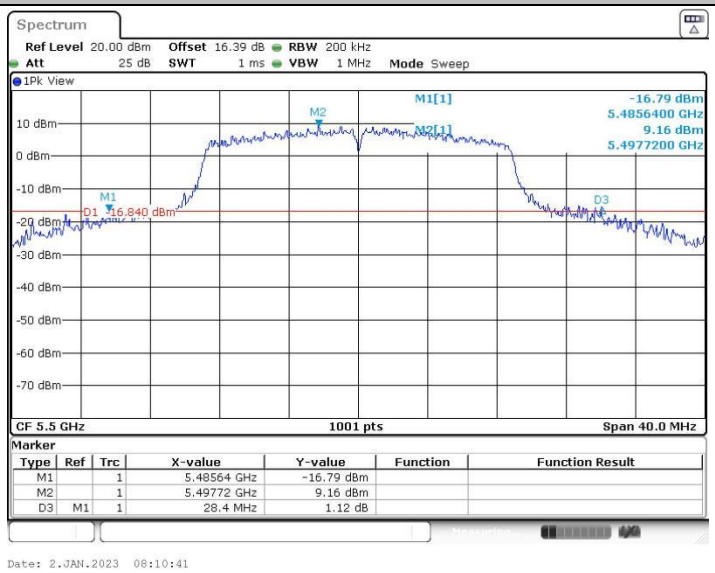

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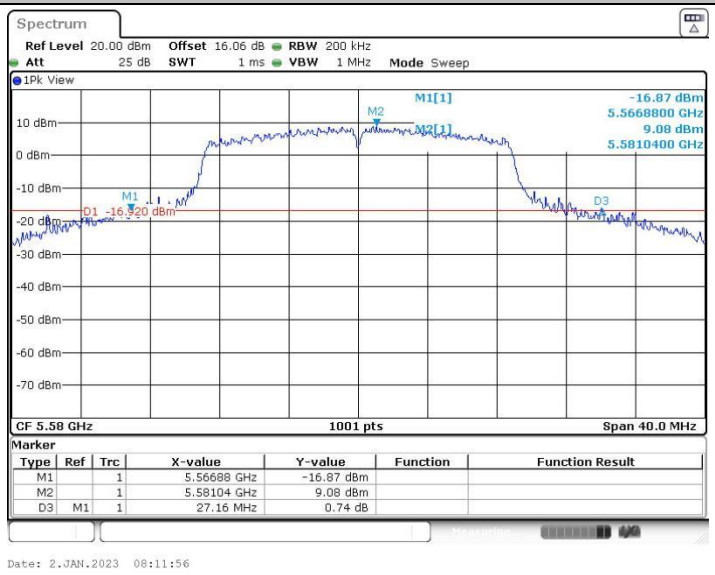

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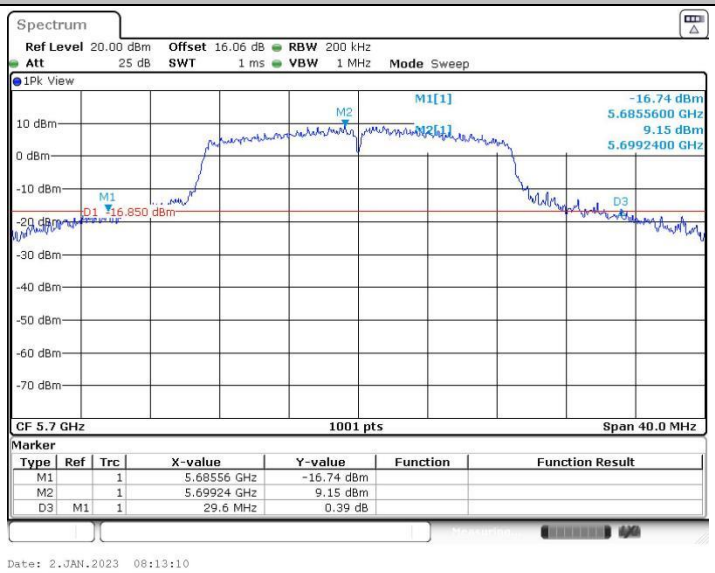

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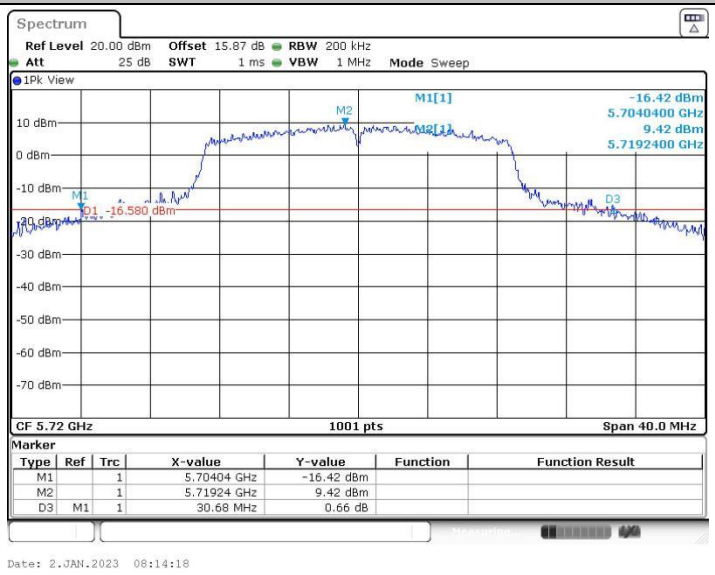

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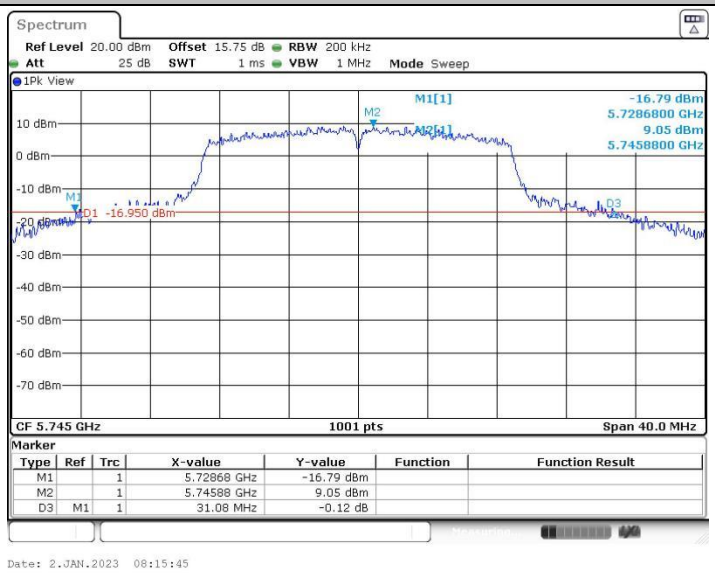

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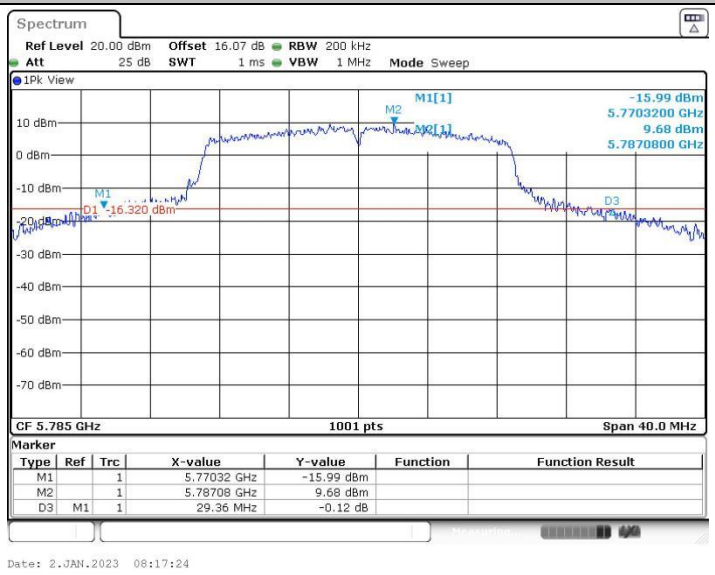

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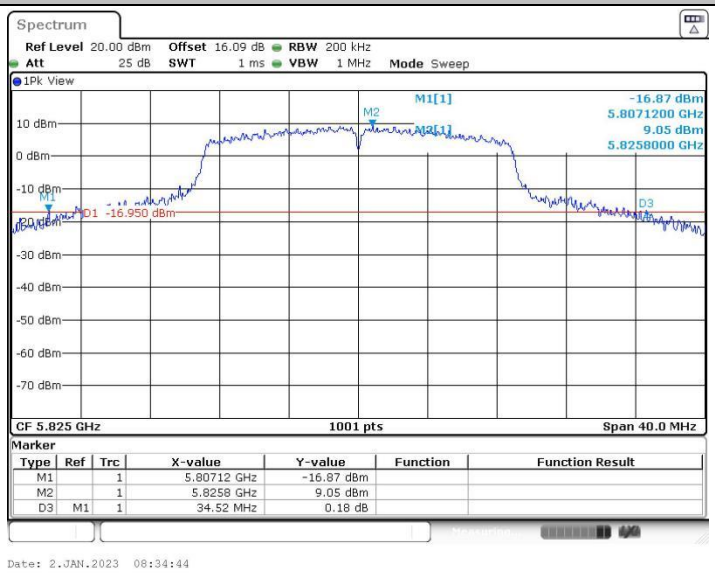

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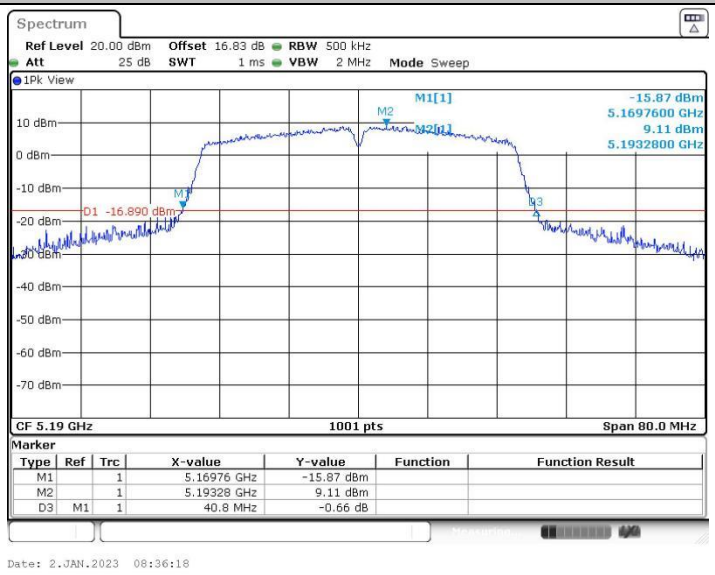

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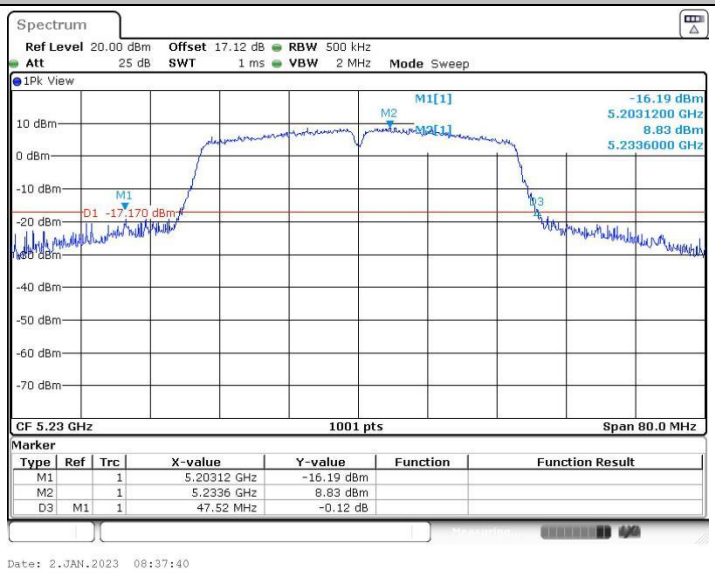

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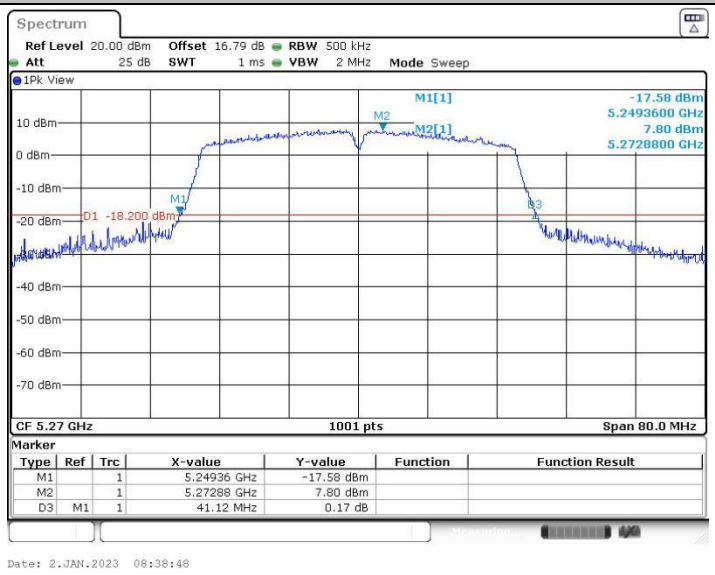

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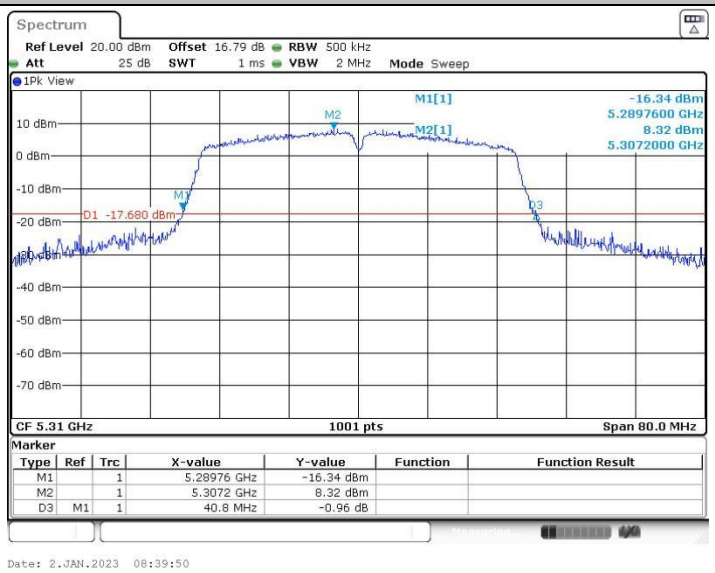

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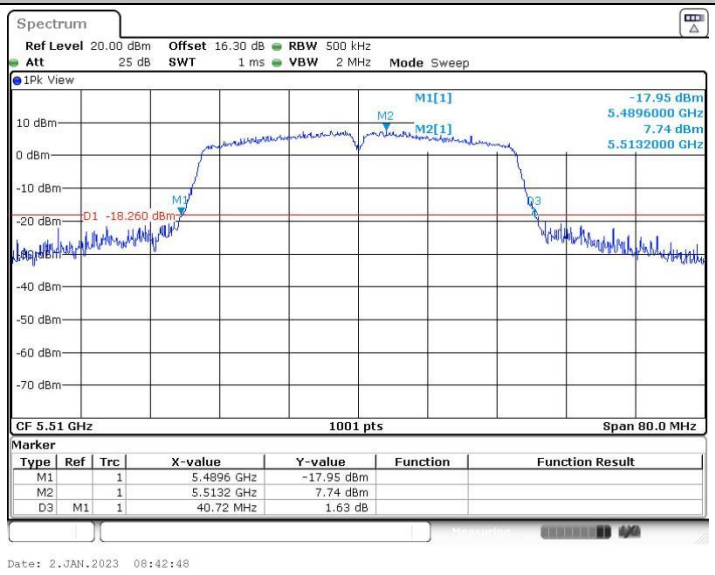

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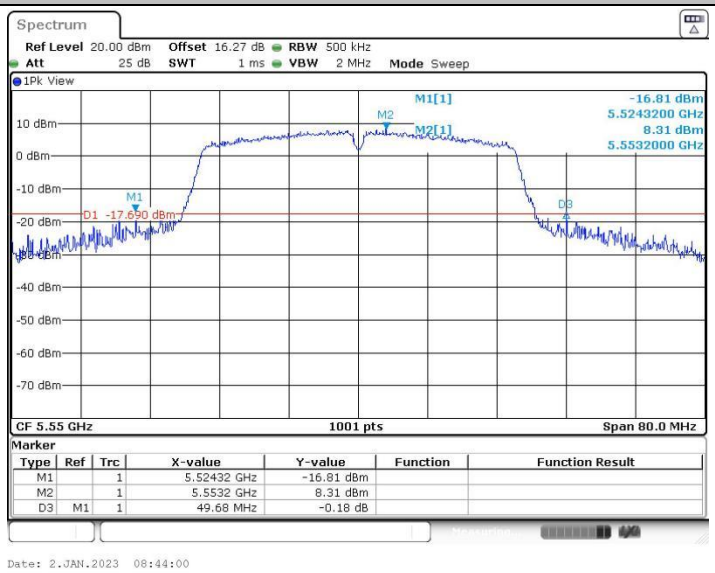

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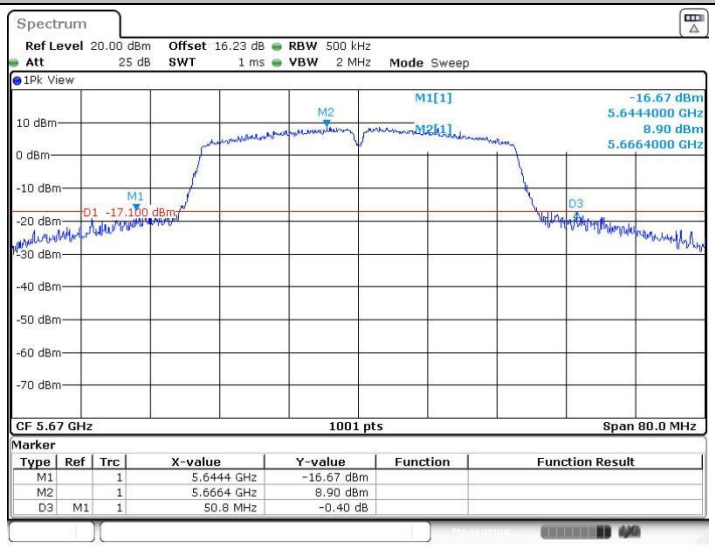

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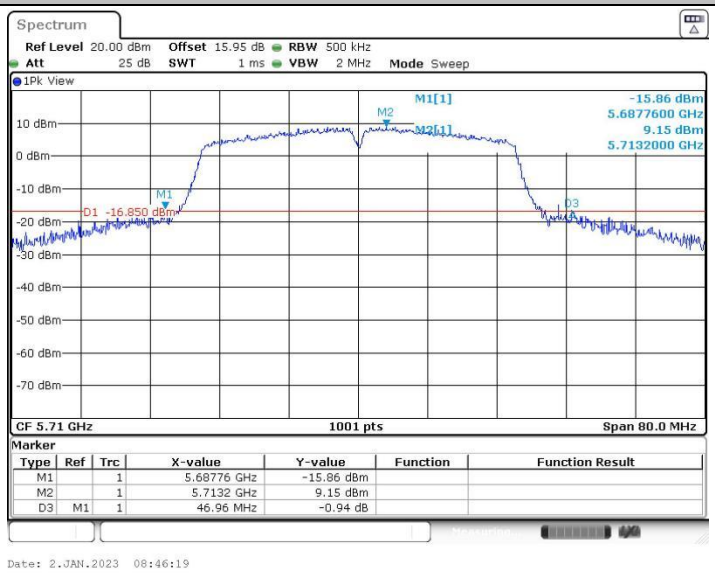

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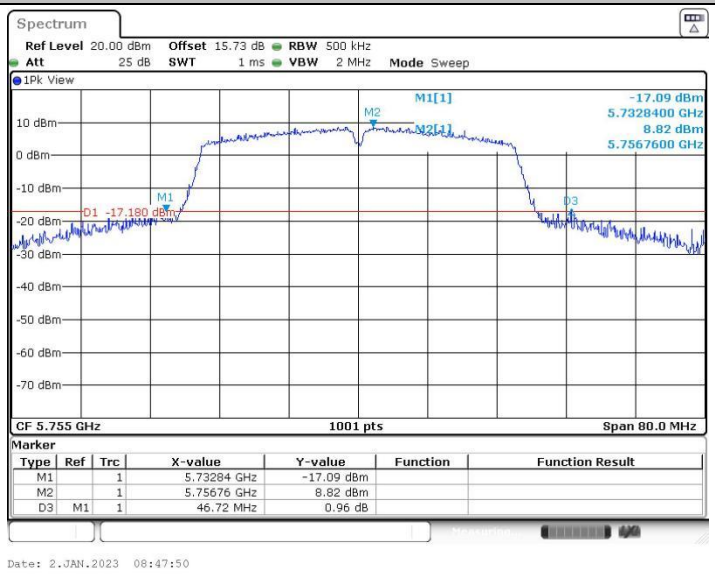

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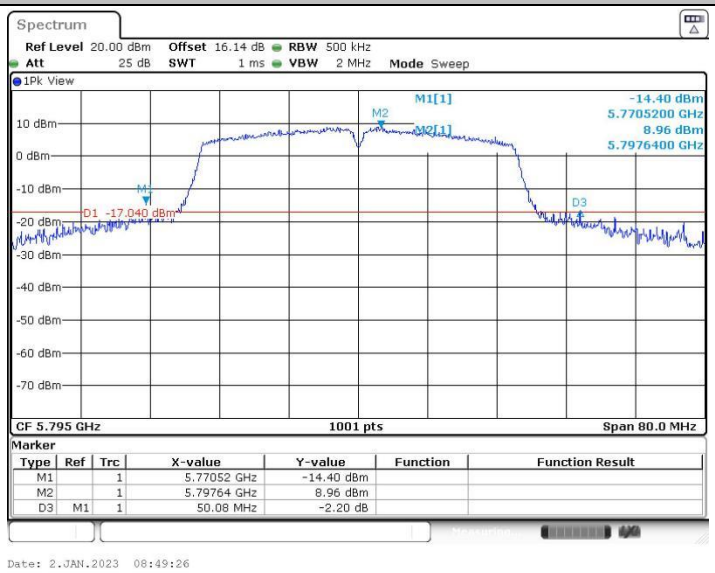

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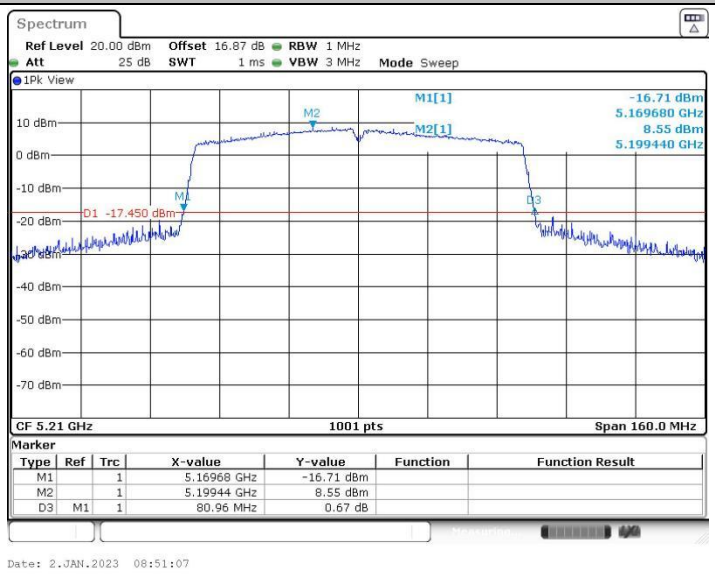

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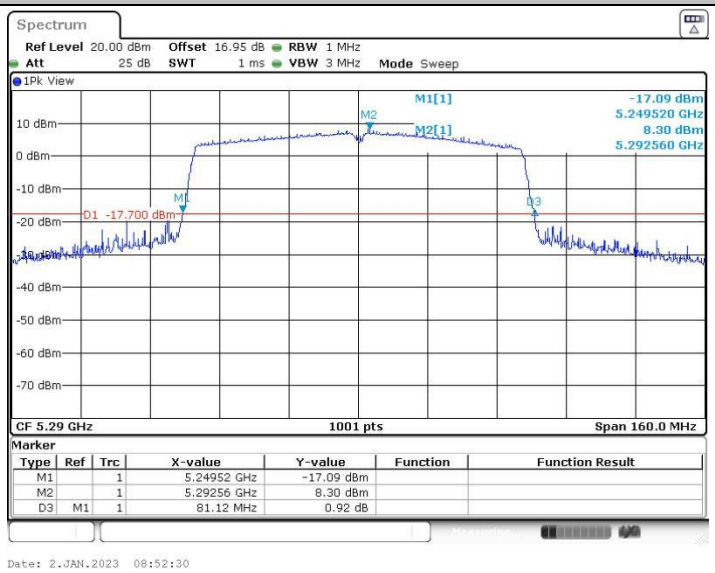

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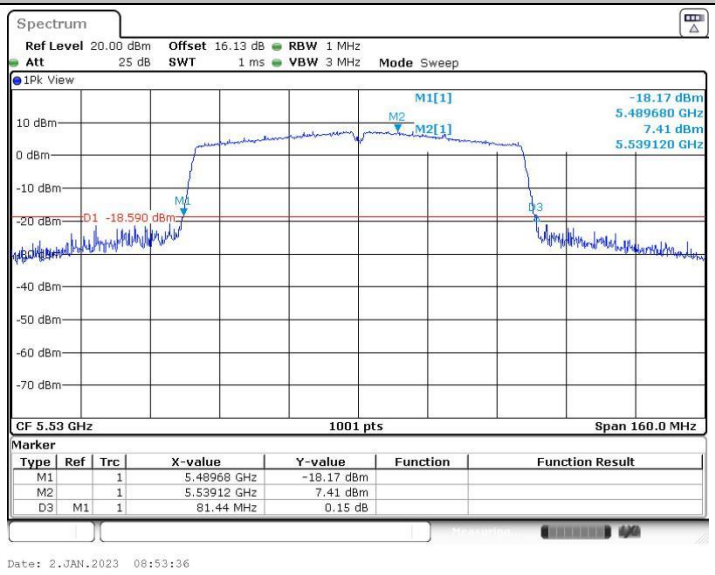
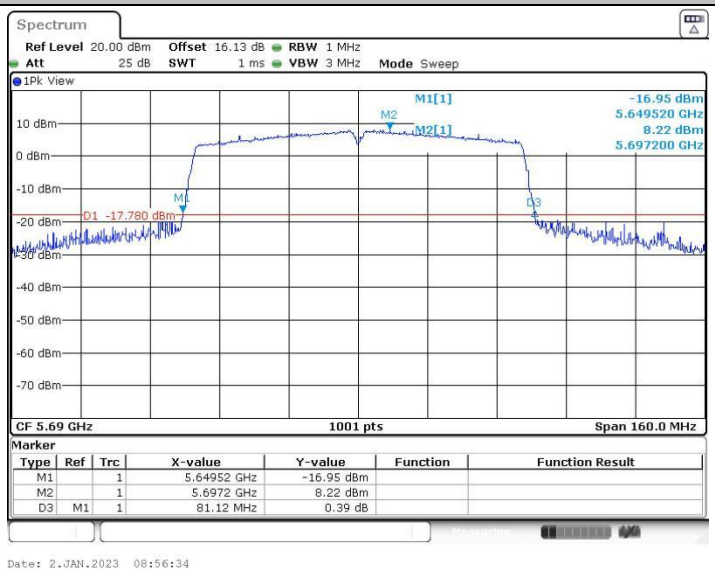
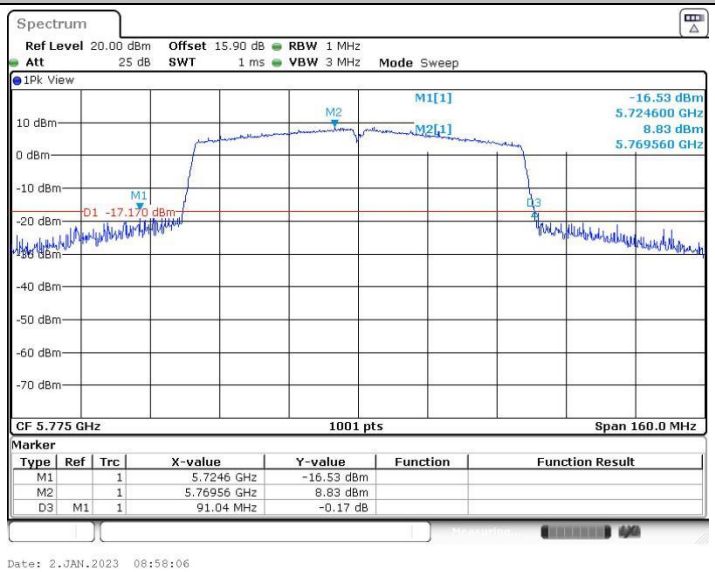


11AC80_Ant4_5690



11AC80_Ant4_5775



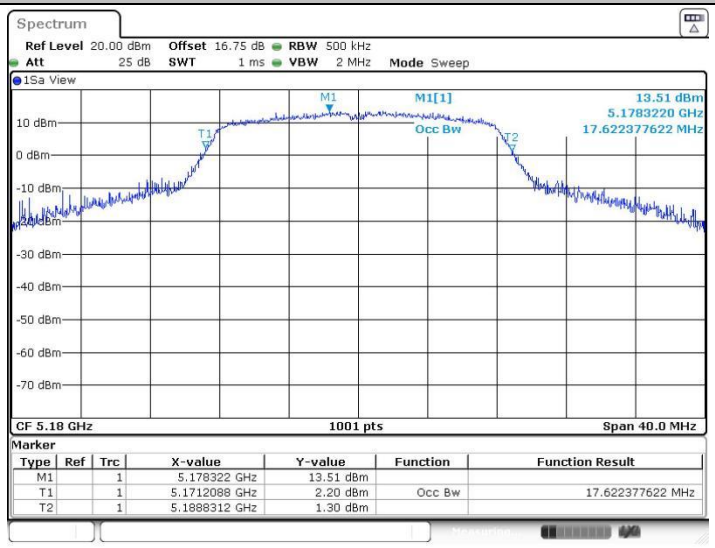
Occupied channel bandwidth

Test Result

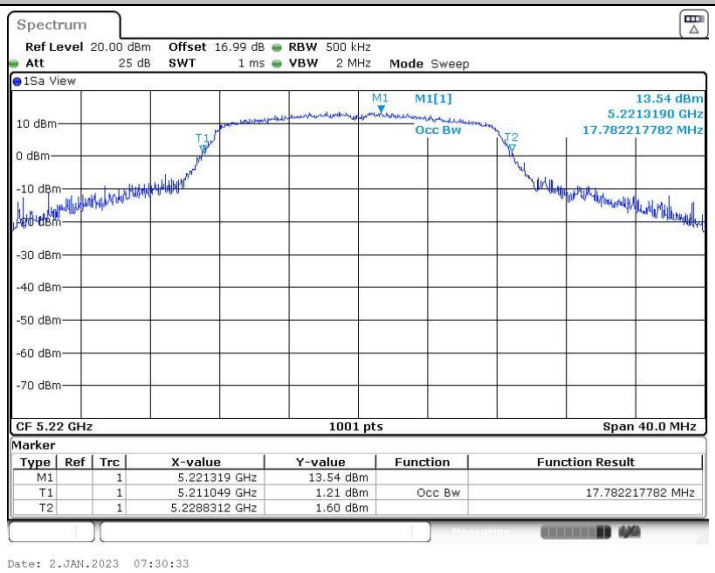
TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant4	5180	17.622	5171.2088	5188.8312	---	---
		5220	17.782	5211.0490	5228.8312	---	---
		5240	17.662	5231.1688	5248.8312	---	---
		5260	17.423	5251.2488	5268.6713	---	---
		5300	17.463	5291.2488	5308.7113	---	---
		5320	17.502	5311.1688	5328.6713	---	---
		5500	17.822	5491.0889	5508.9111	---	---
		5580	17.782	5571.1688	5588.9510	---	---
		5700	18.342	5690.8492	5709.1908	---	---
		5720	17.902	5711.0889	5728.9910	---	---
		5745	18.142	5735.9291	5754.0709	---	---
		5785	18.062	5775.8492	5793.9111	---	---
		5825	18.302	5815.7293	5834.0310	---	---
11AC20	Ant4	5180	18.382	5170.8492	5189.2308	---	---
		5220	18.462	5210.7293	5229.1908	---	---
		5240	18.382	5230.8092	5249.1908	---	---
		5260	18.222	5250.8492	5269.0709	---	---
		5300	18.302	5290.8092	5309.1109	---	---
		5320	18.342	5310.7692	5329.1109	---	---
		5500	18.501	5490.6893	5509.1908	---	---
		5580	18.541	5570.7692	5589.3107	---	---
		5700	18.901	5690.5694	5709.4705	---	---
		5720	18.861	5710.6094	5729.4705	---	---
		5745	18.821	5735.5694	5754.3906	---	---
		5785	18.741	5775.5295	5794.2707	---	---
		5825	18.981	5815.4895	5834.4705	---	---
11AC40	Ant4	5190	36.284	5171.8581	5208.1419	---	---
		5230	36.523	5211.6983	5248.2218	---	---
		5270	36.284	5251.7782	5288.0619	---	---
		5310	36.284	5291.7782	5328.0619	---	---
		5510	36.284	5491.8581	5528.1419	---	---
		5550	36.364	5531.8581	5568.2218	---	---
		5670	36.444	5651.7782	5688.2218	---	---
		5710	36.444	5691.8581	5728.3017	---	---
		5755	36.523	5736.6983	5773.2218	---	---
		5795	36.523	5776.6184	5813.1419	---	---
11AC80	Ant4	5210	75.445	5172.2777	5247.7223	---	---
		5290	75.445	5252.1179	5327.5624	---	---
		5530	75.445	5492.2777	5567.7223	---	---
		5690	75.604	5652.2777	5727.8821	---	---
		5775	75.445	5737.1179	5812.5624	---	---

Test Graphs

11A_Ant4_5180



11A_Ant4_5220



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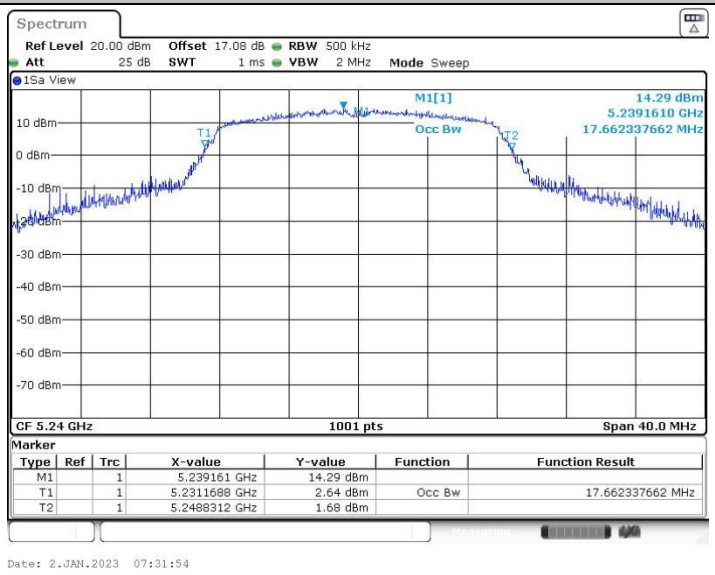

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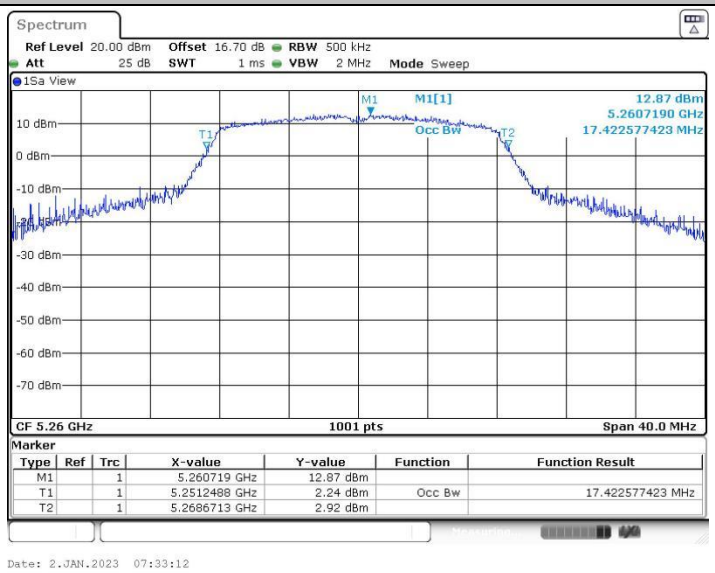

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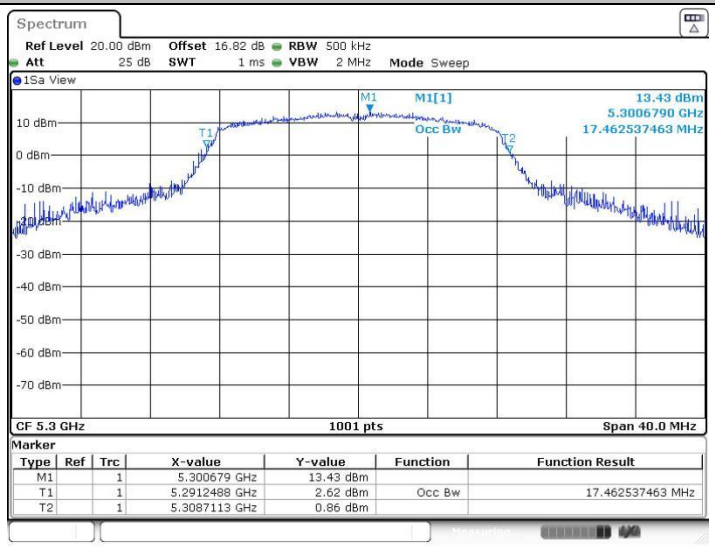

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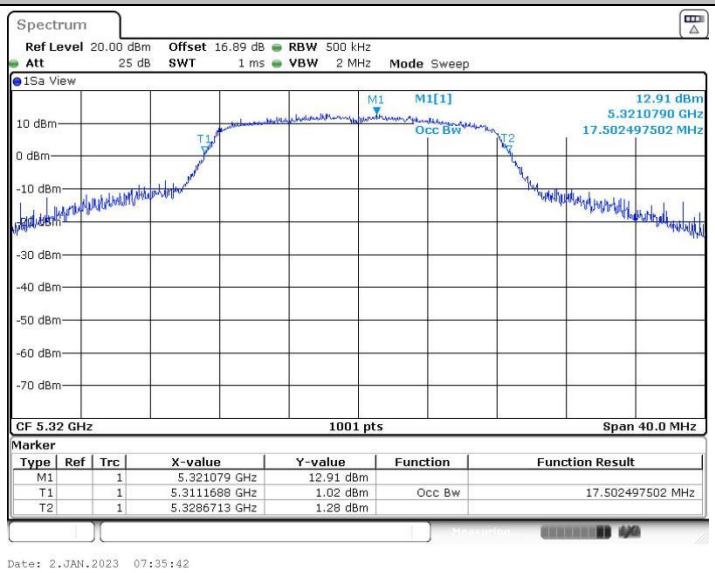

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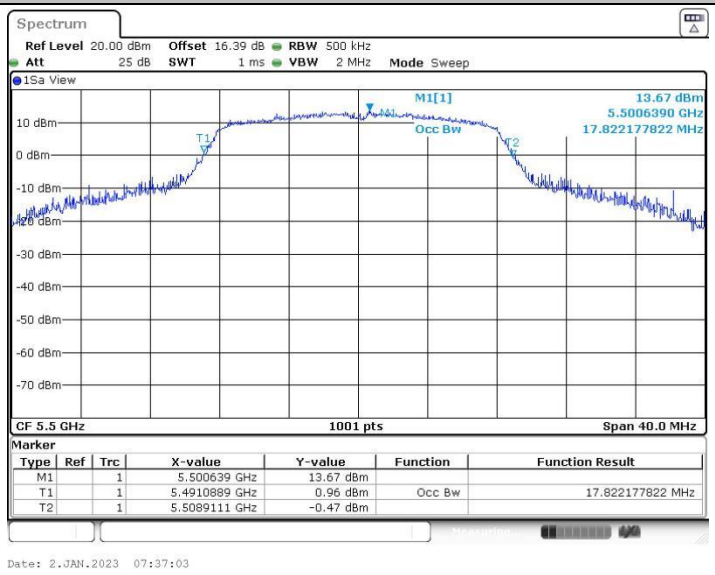
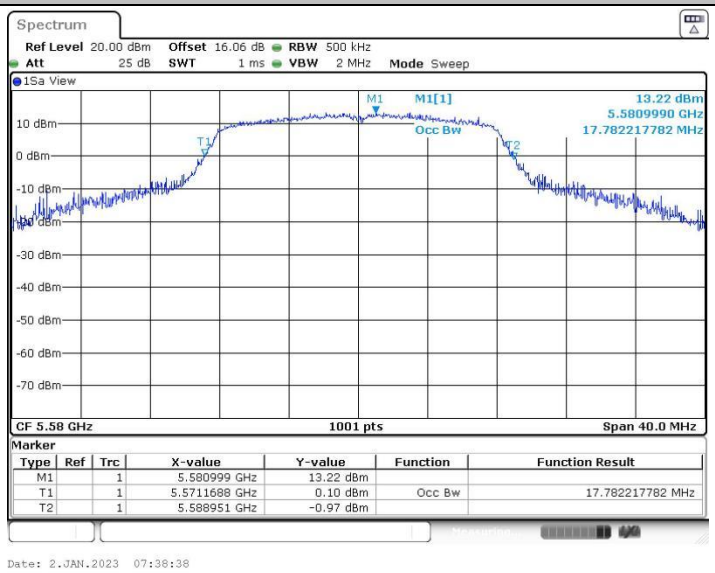
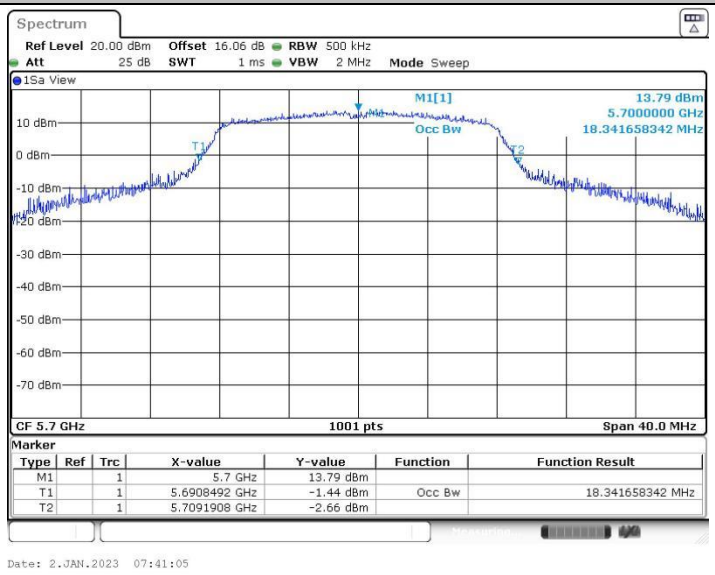
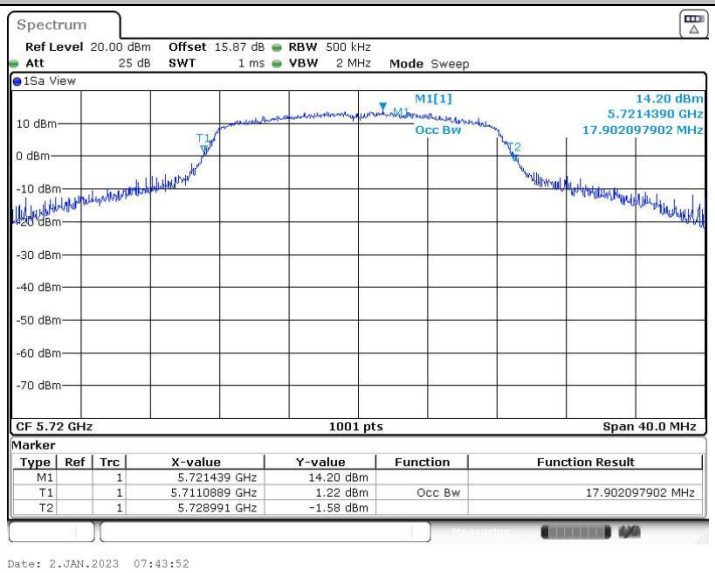


11A_Ant4_5580



11A_Ant4_5700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