



TEST REPORT

REPORT NUMBER: I23W00008-WIFI 5.1G RF

ON

Type of Equipment: Multimedia Control System

Type of Designation: IN9.0-OS

Brand Name:     HAVALNOBO®

Manufacturer: NOBO AUTOMOTIVE TECHNOLOGIES CO., LTD.

FCC ID: 2A7V5-IN90-OS-1

ACCORDING TO

FCC Part15

Chongqing Academy of Information and Communications Technology

Month date, year

Mar 23, 2023

Signature

Xiang Luoyong

Director

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of Chongqing Academy of Information and Communications Technology.



Report No.: I23W00008-WIFI 5.1G RF

Revision Version

Report Number	Revision	Date	Memo
I23W00008-WIFI 5.1G RF	00	2023-03-23	Initial creation of test report

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1. Test Laboratory

1.1. Testing Location

Name:	Chongqing Academy of Information and Communications Technology
FCC/IC Registration Number:	CN1239
Address:	Building C, Technology Innovation Center, No.8, Yuma Road, Chayuan New Area, Nan'an District, Chongqing, People's Republic of China
Postal Code:	401336
Telephone:	0086-23-88069965
Fax:	0086-23-88608777

1.2. Testing Environment

Normal Temperature:	15-35°C
Relative Humidity:	25-75%

1.3. Project data

Testing Start Date:	2023-01-05
Testing End Date:	2023-03-01

1.4. Signature




2023-03-23

Dong Junxin
(Prepared this test report)

Date

2023-03-23

Li Xu
(Reviewed this test report)

Date

2023-03-23

Xiang Luoyong
Director of the laboratory
(Approved this test report)

Date

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2. Client Information

2.1. Applicant Information

Company Name:	NOBO AUTOMOTIVE TECHNOLOGIES CO., LTD.
Address /Post:	No. 668, Caihong Road, Zhangjiagang Economic and Technological Development Zone, Suzhou , Jiangsu, P.R. China
City:	Jiangsu
Country:	China
Telephone:	0512-80616208
Fax:	N/A
Email:	douwenjuan@noboauto.com
Contact Person:	Wenjuan Dou

2.2. Manufacturer Information


Company Name:	NOBO AUTOMOTIVE TECHNOLOGIES CO., LTD.
Address /Post:	No. 668, Caihong Road, Zhangjiagang Economic and Technological Development Zone, Suzhou , Jiangsu, P.R. China
City:	Jiangsu
Country:	China
Telephone:	0512-80616208
Fax:	N/A
Email:	douwenjuan@noboauto.com
Contact Person:	Wenjuan Dou

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3. Equipment under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

EUT Description	The IN9.0-OS, manufactured by NOBO AUTOMOTIVE TECHNOLOGIES CO., LTD. is a new product for testing.
Model name	IN9.0-OS
Brand name	
GSM Frequency Band	NA
WCDMA Frequency Band	NA
LTE Frequency Band	NA
BLUETOOTH Frequency	2402MHz-2480MHz
WLAN Frequency	Wi-Fi 2.4G:802.11b/g/n, Wi-Fi 5G U-NII-1/Wi-Fi 5G U-NII-3:802.11a/n/ac
Type of modulation	OFDM
Extreme Temperature	-40-85°C
Nominal Voltage	12V
Extreme High Voltage	18V
Extreme Low Voltage	7V

Note: Photographs of EUT are shown in ANNEX A of this test report.

Note: High and low voltage values in extreme condition test are given by manufacturer.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version	Date of receipt
S1	NA	AA	AA	2023-03-14
S2	NA	AA	AA	2023-03-14

*EUT ID: is used to identify the test sample in the lab internally.

Technology	Band	UL Freq.(MHz)	DL Freq.(MHz)	Note
WLAN	5G	UNII 1: 5150MHz-5240MHz		--

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3.3. Outline of Equipment under Test

3.4. Internal Identification of AE used during the test

AE ID*	Description	dB*
AE1	RF cable	0.5dB

*AE ID: is used to identify the test sample in the lab internally.

dB*: is provided customer.

3.5. EUT Test RF Confagle Configuration

EUT uses adb tool to control emission measurement, Change power level, channel, rate and HT.

```

C:\Users\Administrator\Desktop\ADB\adb\cmd.exe - adb shell
Response status 0
qca6174TxCommand() Success = 0
WlanATSetWifiTX done with sucess
sa8155_v35:/ # myftm -J -M 7 -r 15 -f 5775 -p 10 -a 1 -t 3
myftm -J -M 7 -r 15 -f 5775 -p 10 -a 1 -t 3
Version Flags: 1.0
using TLV2.0
WlanATSetWlanMode using athtestcmdlib
WlanATSetRate using athtestcmdlib
WlanATSetWifiFreq using athtestcmdlib
WlanATSetWifiTxPower using athtestcmdlib
WlanATSetWifiAntenna using athtestcmdlib

-----qca6174SetAntenna() gCmd.chain = 1
WlanATSetWifiTX using athtestcmdlib
-----qca6174TxCommand():3001 gCmd.chain = 1
rateIndexToArrayMapping() 90 VHT40 MCS0 S1 13.5 Mb Is11AcRate 1
dataRate 90 rateIndex 76
qca6174TxCommand - input pwr 10.00 output pwr 20
qca6174TxCommand() TLV2 CMD_TX 3
qca6174TxCommand() TLV2 CMD_TX DPD flag is not Enabled PARM_FLAGS 24
qca6174TxCommand() TLV2 CMD_TX/CMD_TXSTATUS 3
05 00 00 00 02 00 00 00 00 00 00 00 84 01 00 00
ee 6e 00 00 00 00 00 00 00 00 00 00 0e 00 00 00
2f 5b 05 2f 15 00 00 00 a6 00 00 00 14 52 e6 44
00 00 00 00 35 00 00 00 ef 46 5a 14 03 00 00 00
36 00 00 00 50 3e bd 54 8f 16 00 00 38 00 00 00
52 1c e2 02 07 00 00 00 37 00 00 00 bc 33 5c 52
01 00 00 00 2d 00 00 00 28 b7 b7 05 00 00 00 00
42 00 00 00 f8 7b b5 29 18 00 00 00 3e 00 00 00
  
```


4. Reference Documents

4.1. Documents supplied by applicant

PICS/PIXIT, referring to Annex B for detailed information, is supplied by the client or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part15	FCC CFR 47, Part 15, Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz	2020
ANSI C63.10	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices	2013
KDB 558074	Guidance for Performing Compliance Measurements on Frequency Hopping Spread Spectrum systems (DSS) Operating Under §15.247	2019

5. Test Equipments Utilized

5.1. RF Test System

No.	Equipment	Model	SN	HW Version	SW Version	Manufacture	Cal.Due Date
1	Spectrum analyzer	FSQ 26	201137/026	--	--	R&S	2023-06-29
2	Spectrum analyzer	FSW26	104280	--	--	R&S	2023-06-29
3	DC Power Supply	3303D	801128	--	--	Topward	2023-06-29
4	Universal Radio Communication Tester	CMW500	152395	--	--	R&S	2023-06-29

5.2. RSE Test System

No.	Equipment	Model	SN	HW Version	SW Version	Manufacture	Cal.Due Date
1	EMI Test Receiver	ESU40	100307	--	--	R&S	2023-06-29
2	TRILOG Broadband Antenna	VULB9163	9163-586	--	--	Schwarzbeck	2024-10-28
3	Horn antenna	9120D	1083	--	--	Schwarzbeck	2024-12-14
4	Horn antenna	DATE 1152	LM7127	--	--	ETS	2024-09-06
5	Horn antenna	DATE 1012	LM5945	--	--	ETS	2024-09-06
6	Amplifier1	SCU-08F1	8320027	--	--	R&S	2023-06-29
7	Amplifier2	SCU-18F	180093	--	--	R&S	2023-06-29

5.3. Climate Chamber

No.	Name	Type	SN	Manufacture	Cal.Due Date
1	Climate chamber	SH-241	92010759	ESPEC	2023-06-29

5.4. Anechoic chamber Vibration table

No.	Name	Type	SN	Manufacture	Cal.Due Date
-----	------	------	----	-------------	--------------

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1	Fully-Anechoic Chamber	FAC5	--	TDK	2024-09-22
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5.5. Test software

No.	Name	version	SN	Manufacture
1	EMI Test Software	EMC32 V9.26.01	--	R&S

6. Measurement Results

6.1 Summary of Test Results

A brief summary of the tests carried out is shown as following.

FCC Rules	Name of Test	Result
15.407(a)	Maximum Output Power	Pass
15.407(a)	Power Spectral Density	Pass
15.407(a)	99% Occupied Bandwidth	Pass
15.407(a)	Occupied 26dB Bandwidth	Pass
15.407(b)	Band edge compliance	Pass
15.407(b)	Transmitter spurious emissions radiated	Pass
15.209 & 15.407(b)	Spurious emissions radiated < 30 MHz	Pass
15.407(b)	Spurious emissions conducted < 30 MHz	Pass
15.407(g)	Frequency Stability	N/A
15.407(h)	Transmit Power Control	N/A
15.207	AC Powerline Conducted Emission	N/A

Note:

The IN9.0-OS, manufactured by NOBO AUTOMOTIVE TECHNOLOGIES CO., LTD. is a new product for testing.

6.2 Occupied 26dB Bandwidth

Specifications:	FCC 47 CFR Part 15.407(a)
DUT Serial Number:	S1
Test conditions:	Ambient Temperature:20°C Relative Humidity:40% Air pressure: 90kPa
Test Results:	Pass

Measurement Limit and Method

Standard	Limit(dBm/MHz)
FCC 47 CFR Part 15.407(a)	N/A

Measurement Uncertainty:

Measurement Uncertainty	20kHz
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The measurement method is made according to KDB 789033 C

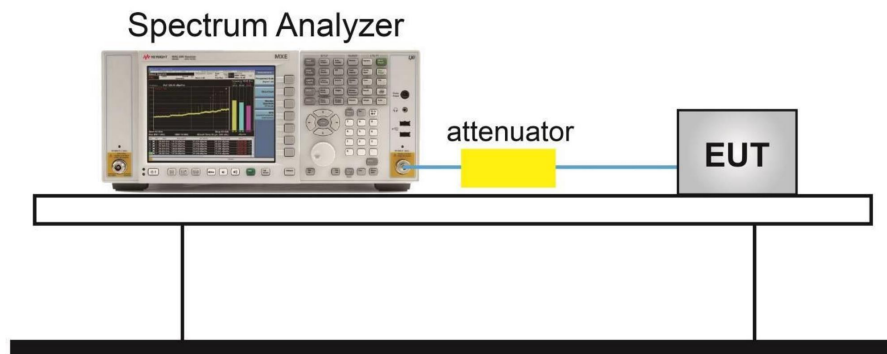
1. Set RBW = approximately 1% of the emission bandwidth
2. Set the VBW > RBW
3. Detector = Peak.
4. Trace mode = max hold.
5. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission.

Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

Test Setup

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Test Result

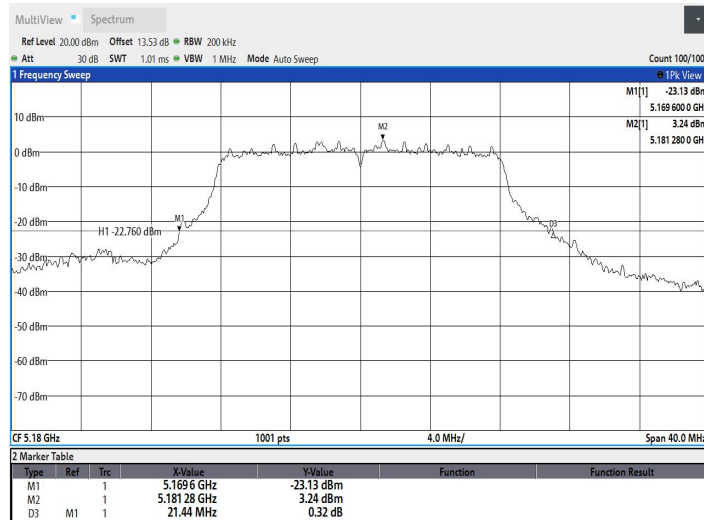
TestMode	Antenna	Frequency[MHz]	26db EBW [MHz]	FL[MHz]	FH[MHz]
11A	Ant1	5180	21.44	5169.60	5191.04
	Ant2	5180	21.92	5168.88	5190.80
	Ant1	5200	21.44	5189.60	5211.04
	Ant2	5200	22.12	5188.88	5211.00
	Ant1	5240	21.44	5229.56	5251.00
	Ant2	5240	21.80	5228.96	5250.76
11N20SISO	Ant1	5180	21.60	5169.48	5191.08
	Ant2	5180	21.96	5168.88	5190.84
	Ant1	5200	21.44	5189.56	5211.00
	Ant2	5200	22.28	5189.00	5211.28
	Ant1	5240	21.52	5229.48	5251.00
	Ant2	5240	21.64	5229.16	5250.80
11N40SISO	Ant1	5190	42.16	5169.20	5211.36
	Ant2	5190	42.32	5168.64	5210.96
	Ant1	5230	42.08	5209.12	5251.20
	Ant2	5230	42.40	5208.88	5251.28
11AC20SISO	Ant1	5180	21.52	5169.52	5191.04
	Ant2	5180	40.00	5160.00	5200.00
	Ant1	5200	21.48	5189.56	5211.04
	Ant2	5200	22.04	5189.00	5211.04
	Ant1	5240	21.56	5229.44	5251.00
	Ant2	5240	21.60	5229.24	5250.84
11AC40SISO	Ant1	5190	42.08	5169.20	5211.28
	Ant2	5190	42.40	5168.72	5211.12
	Ant1	5230	42.00	5209.12	5251.12
	Ant2	5230	42.32	5208.80	5251.12
11AC80SISO	Ant1	5210	42.56	5188.88	5231.44
	Ant2	5210	42.56	5188.88	5231.44

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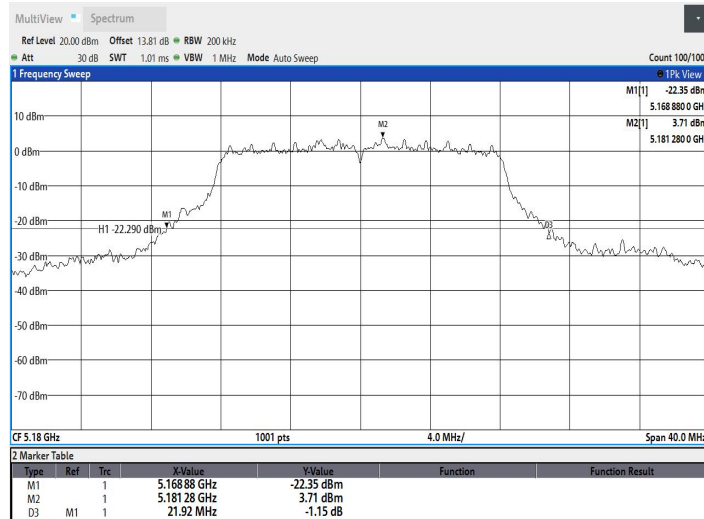
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Test Graphs

11A_Ant1_5180



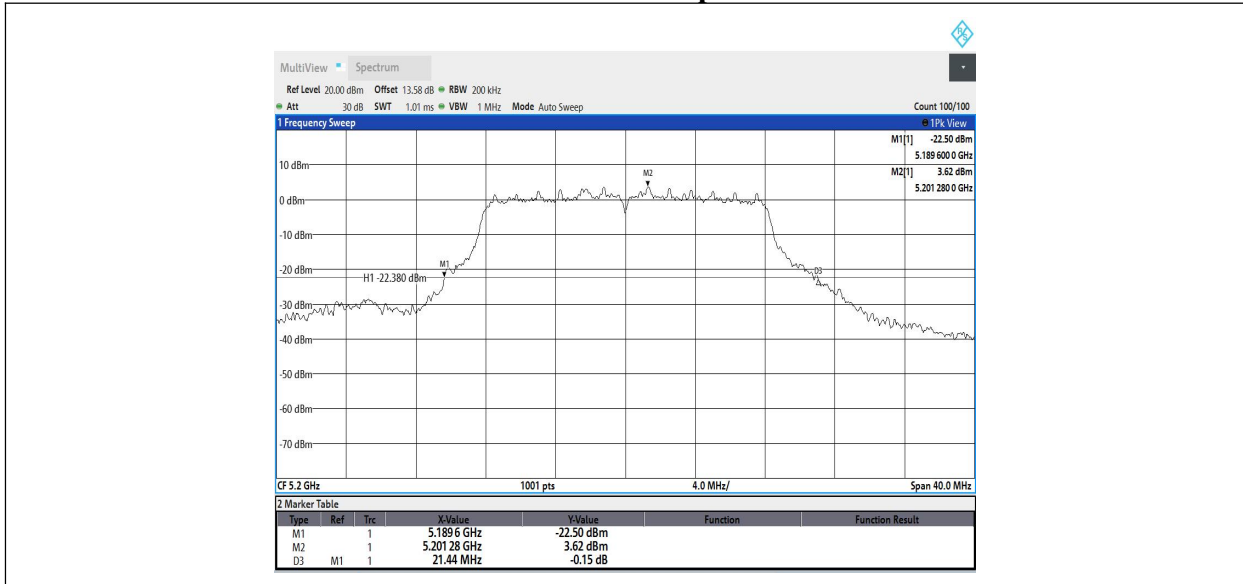
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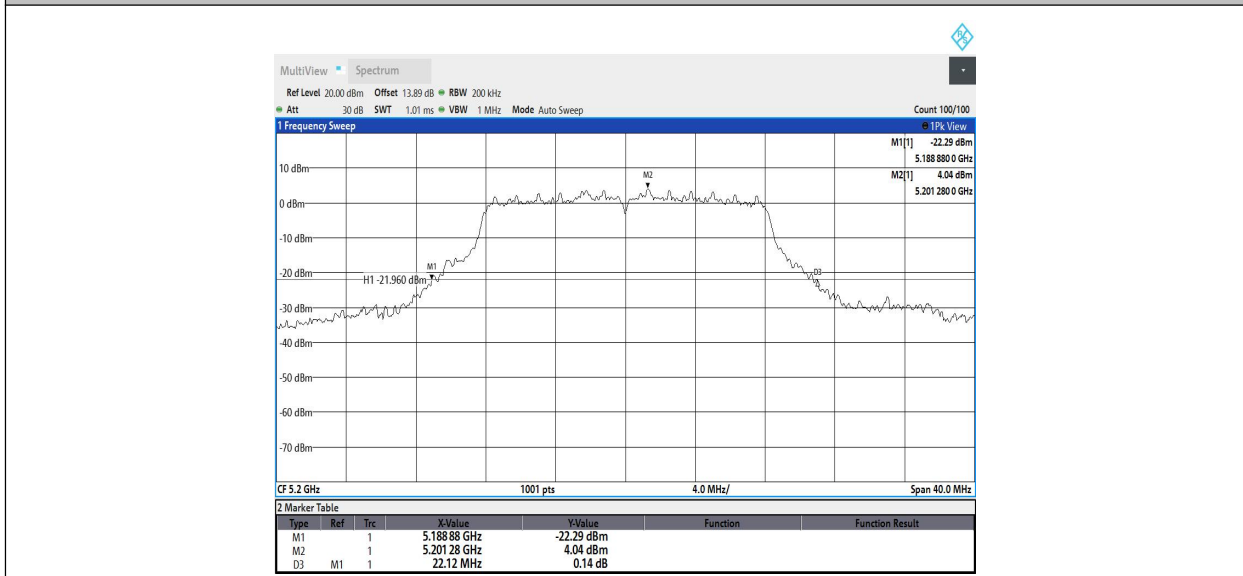
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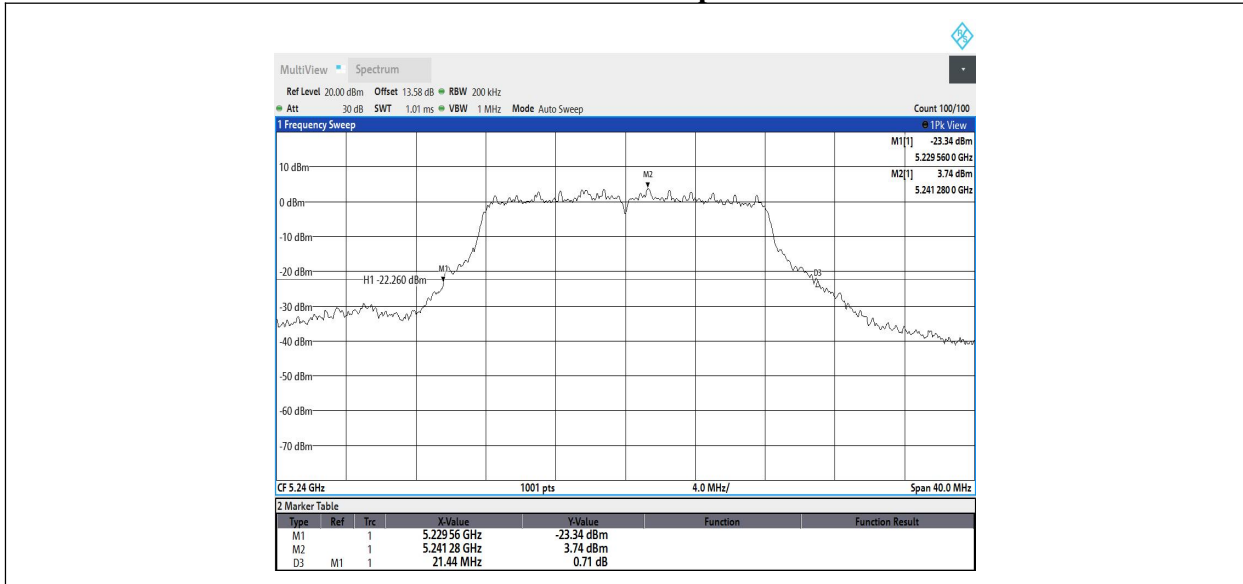
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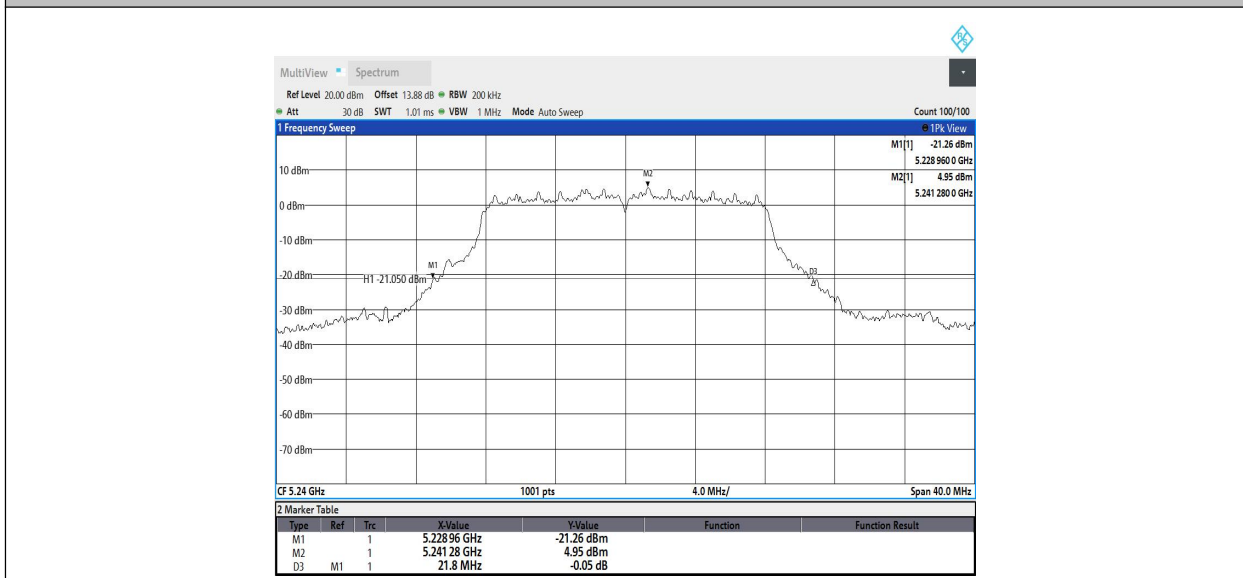
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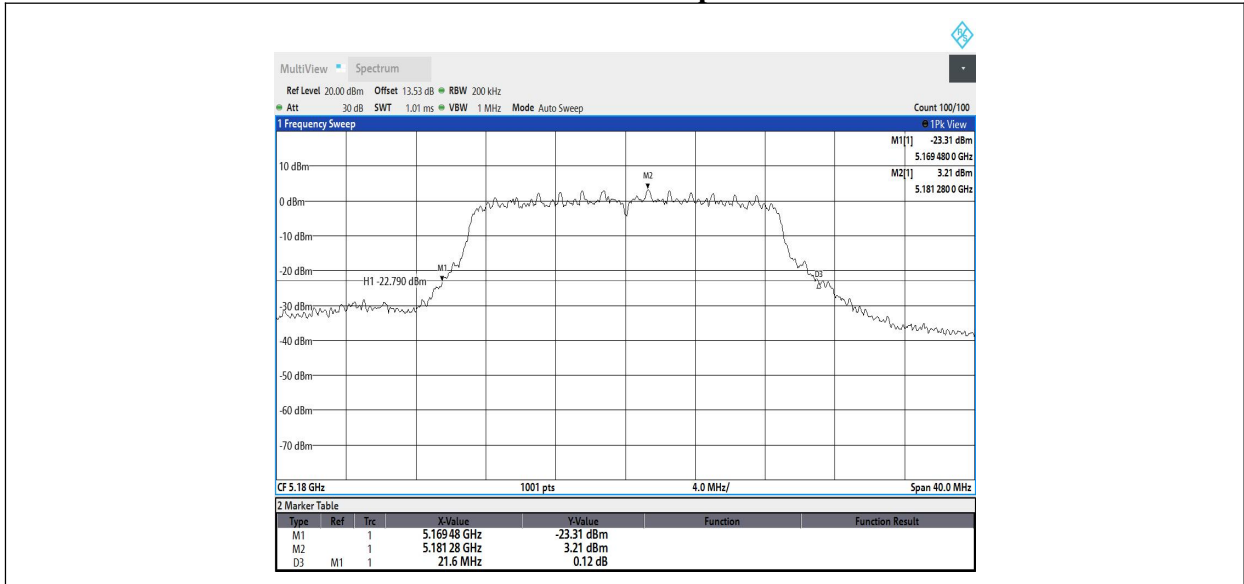
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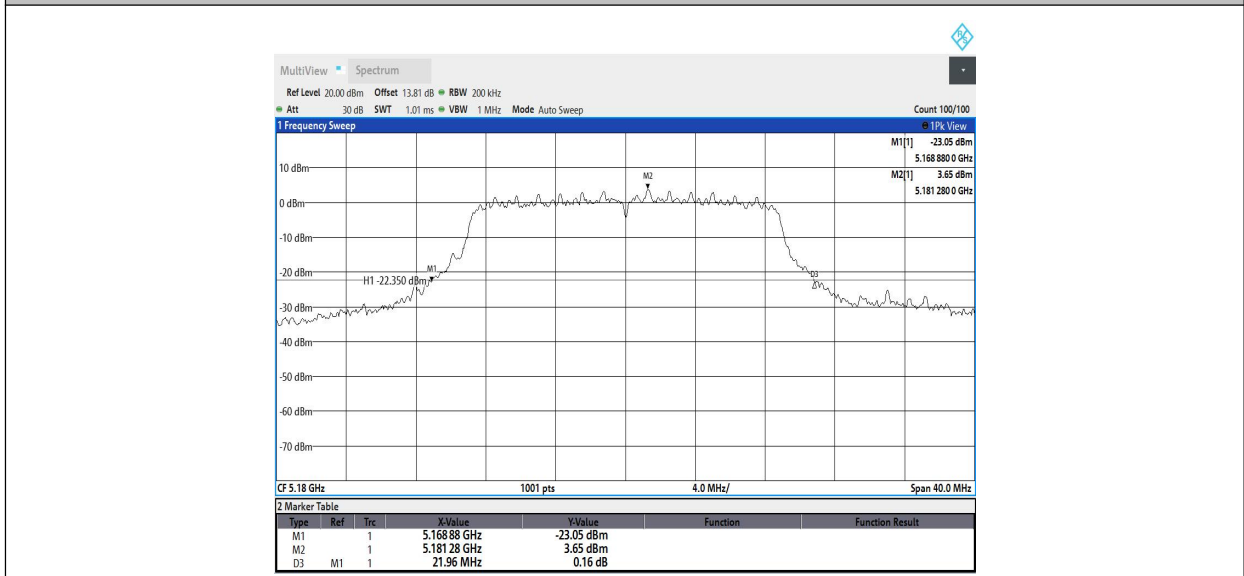
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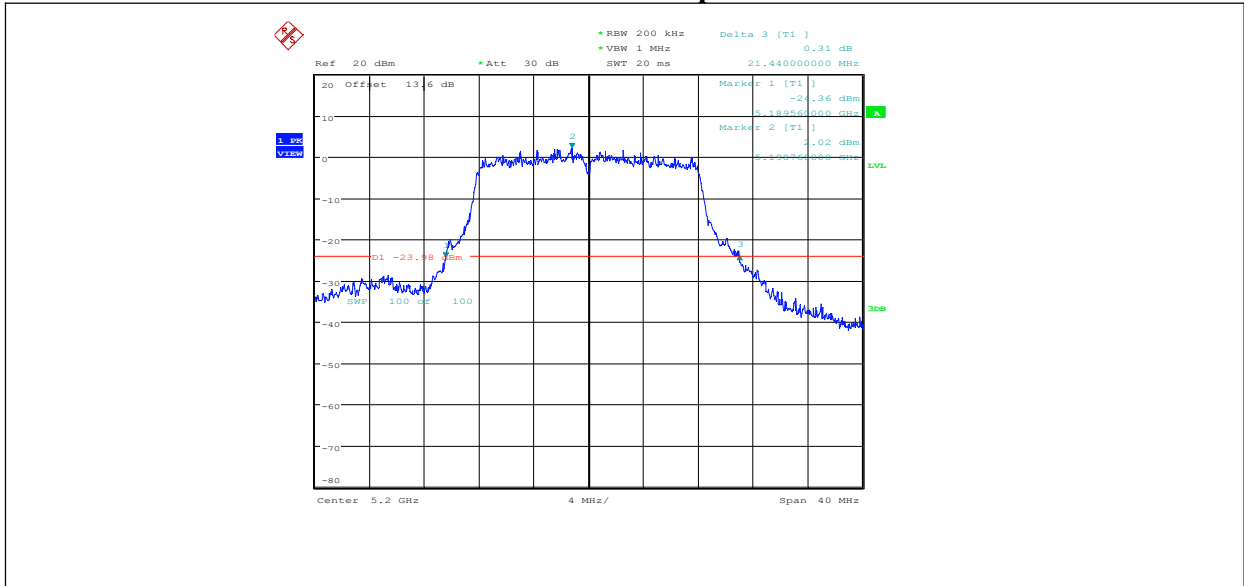
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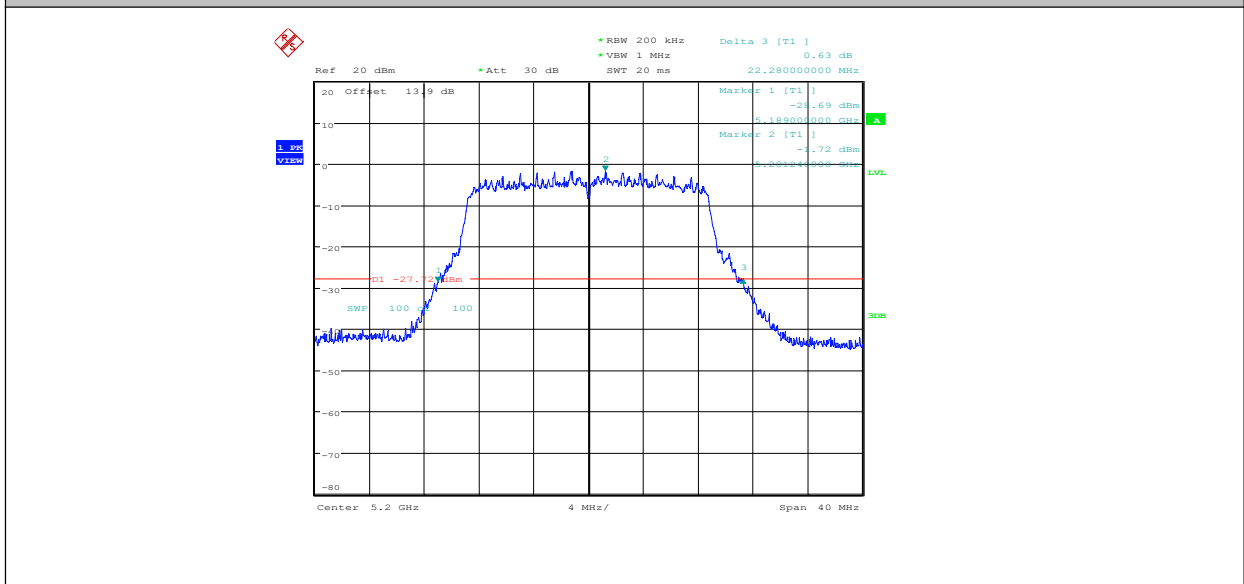
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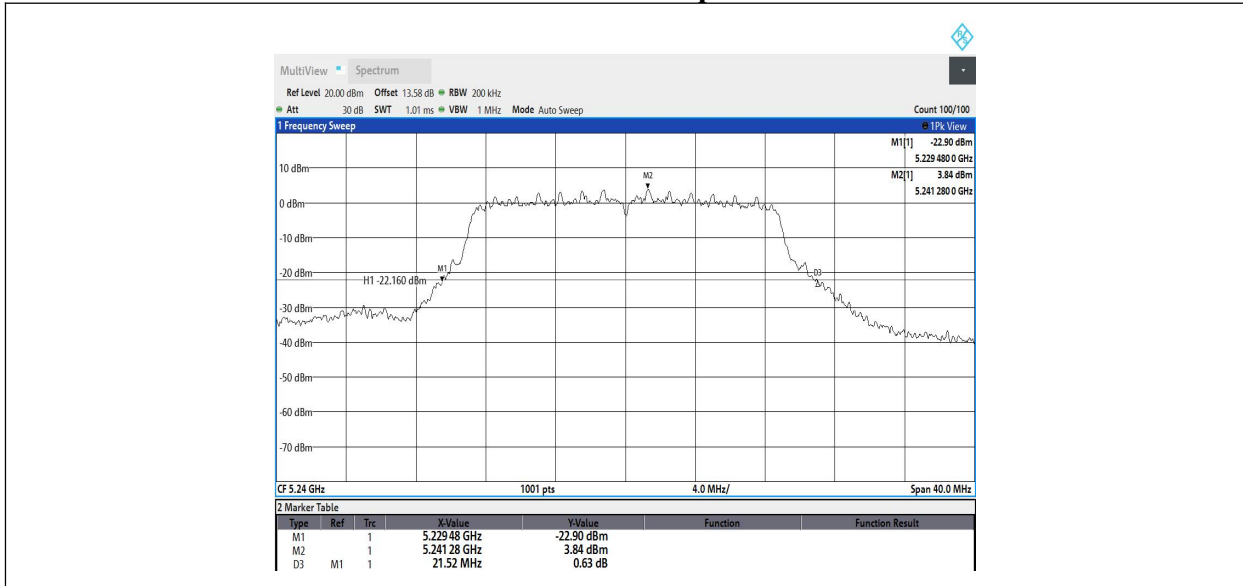
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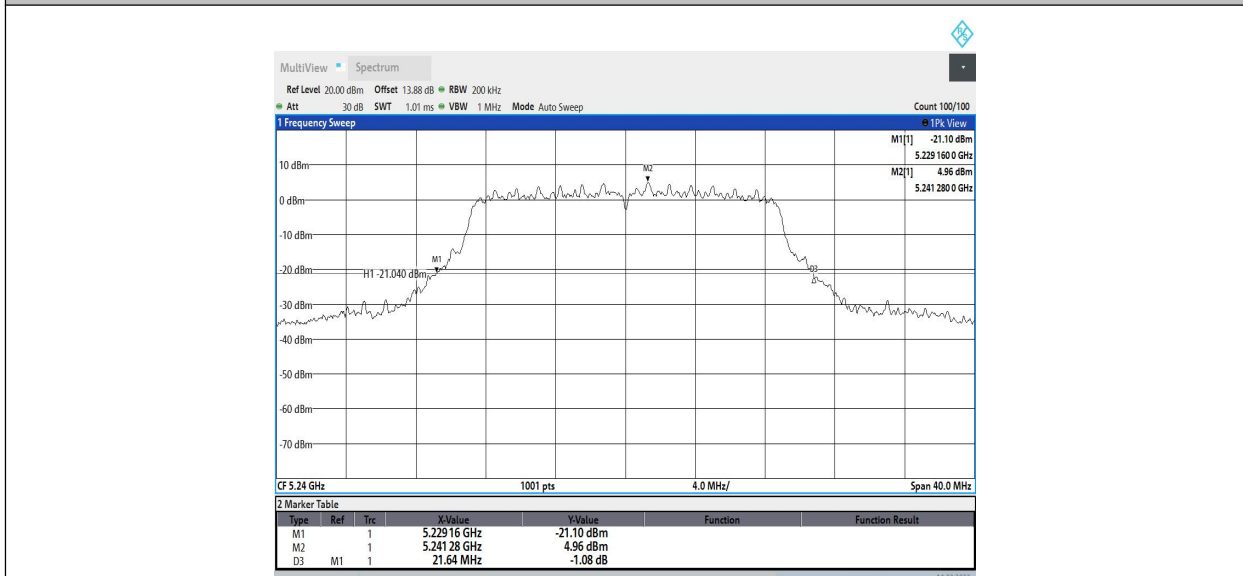
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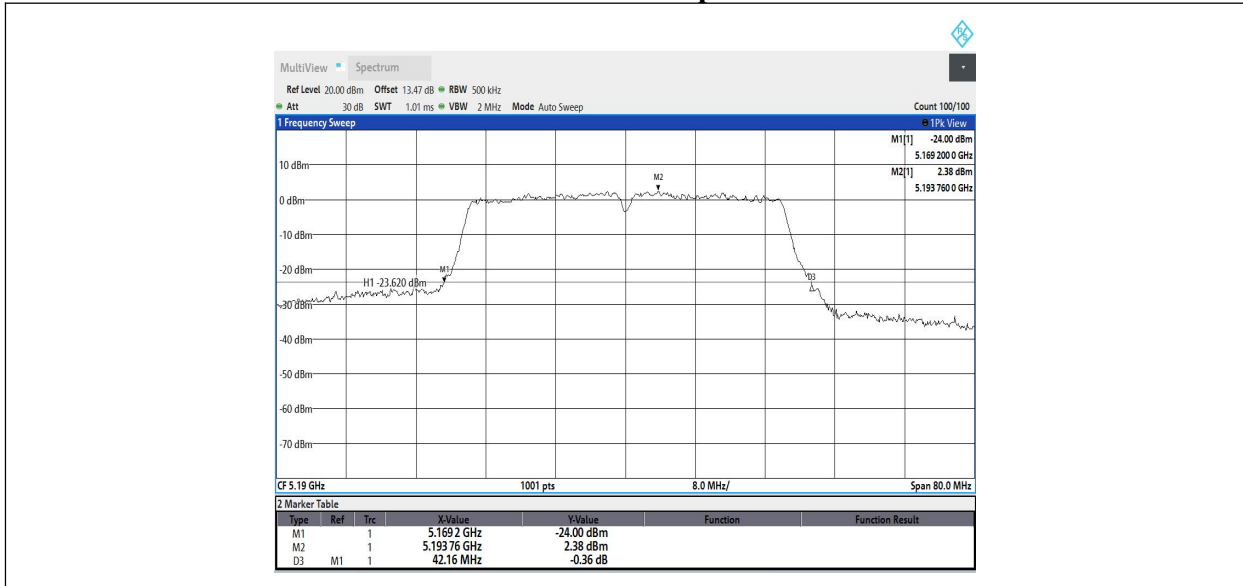
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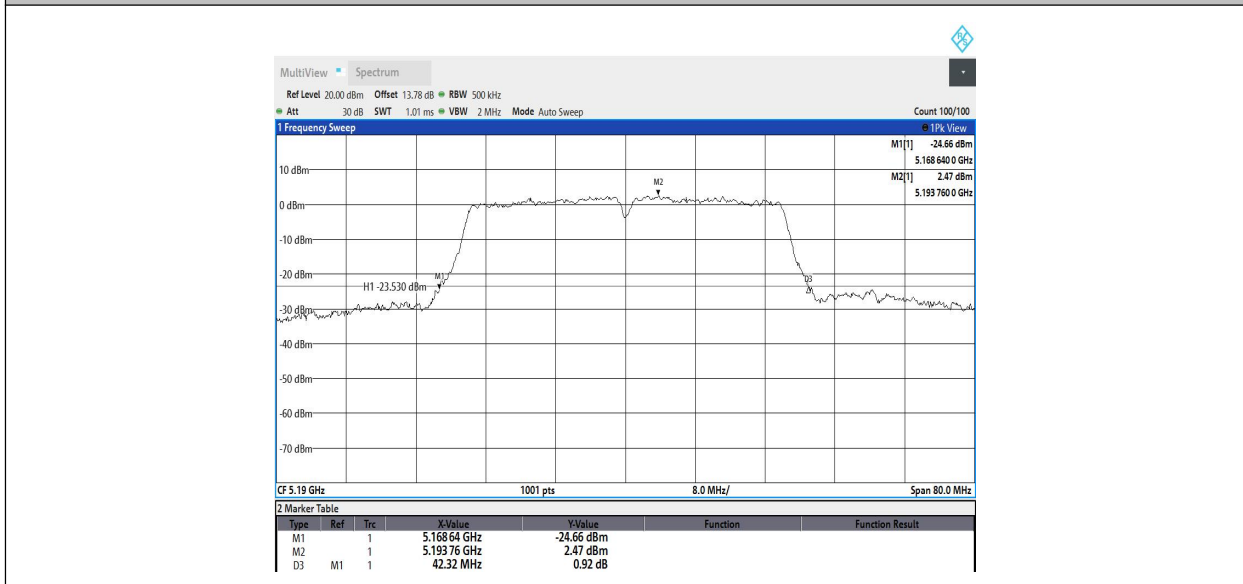
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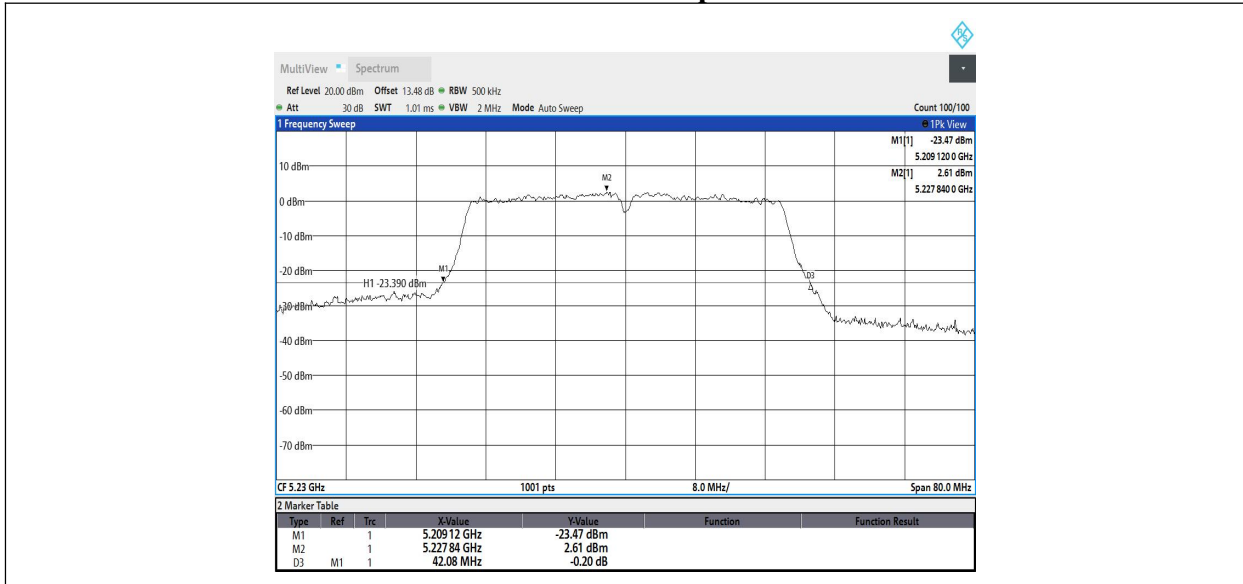
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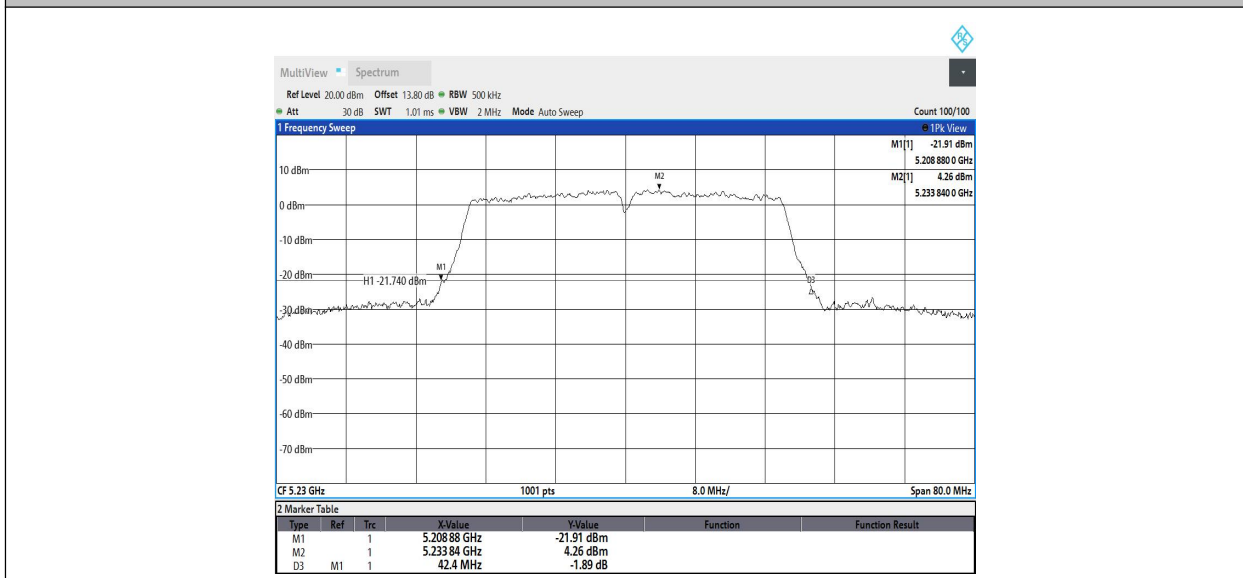
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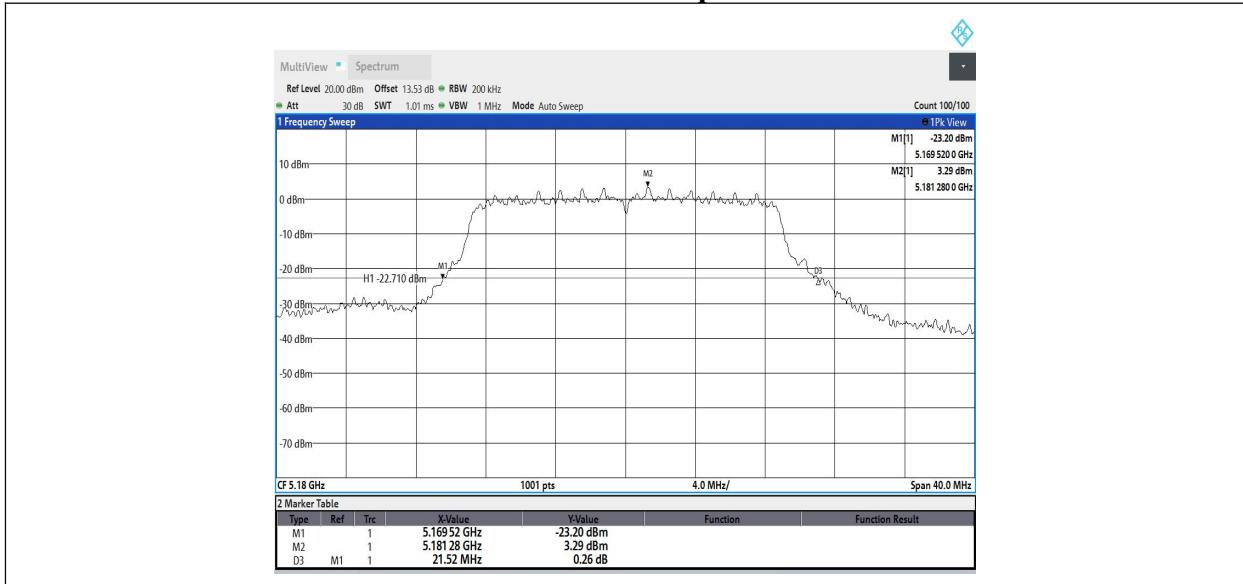
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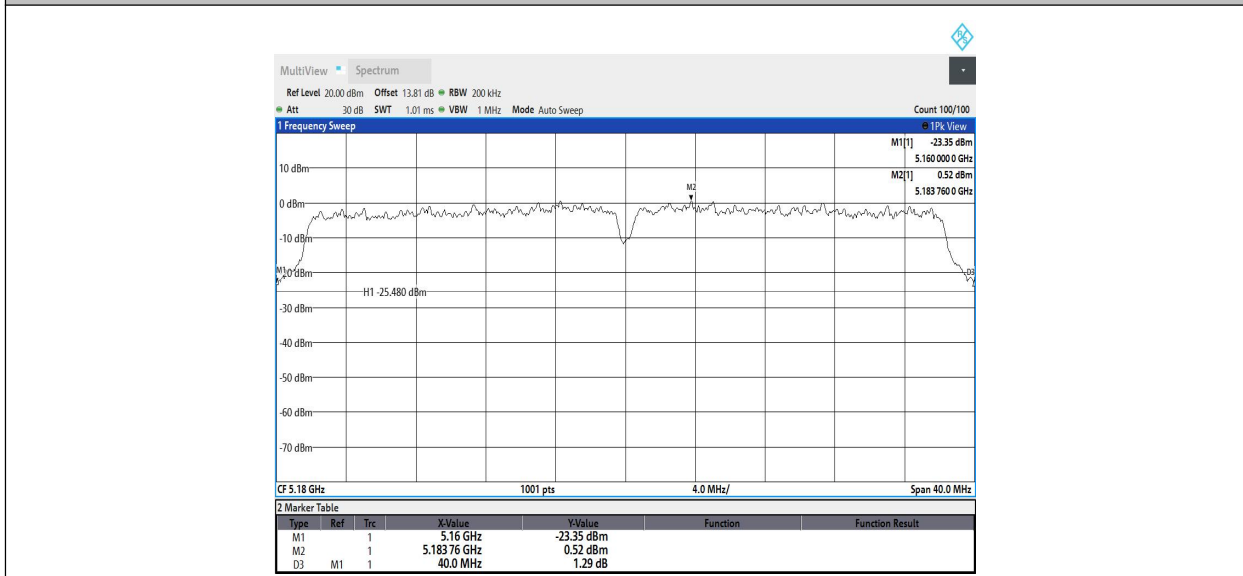
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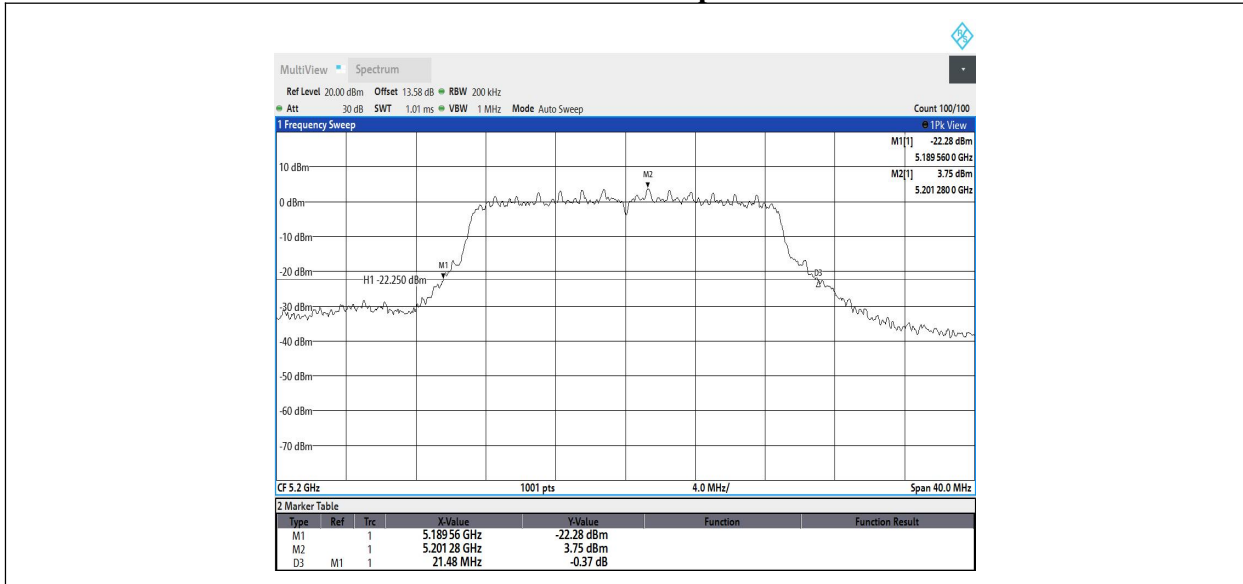
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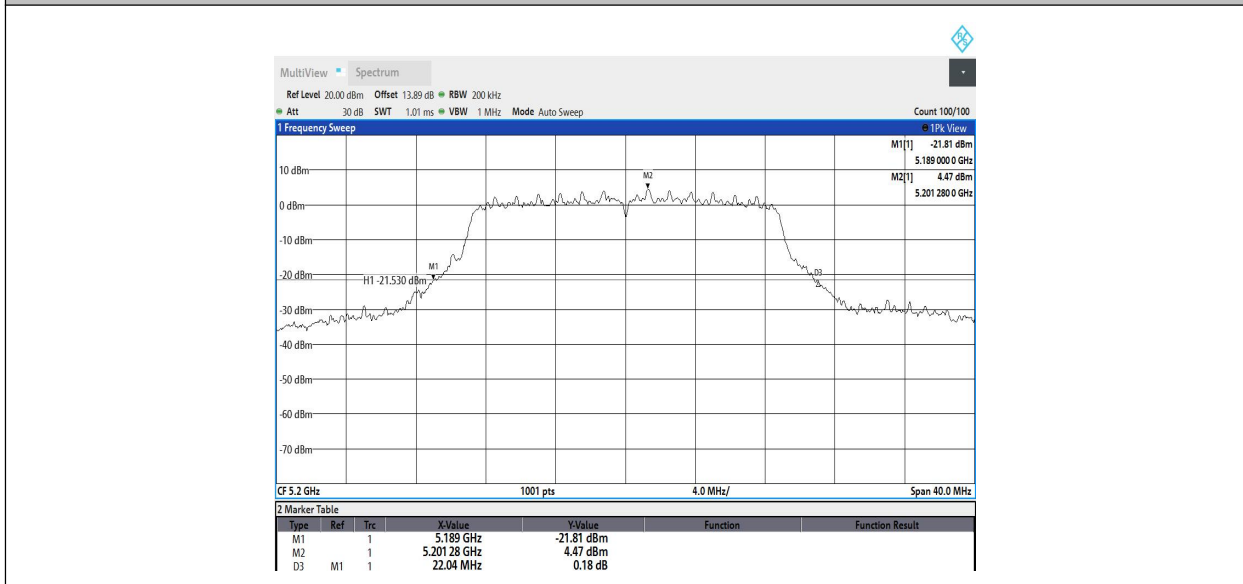
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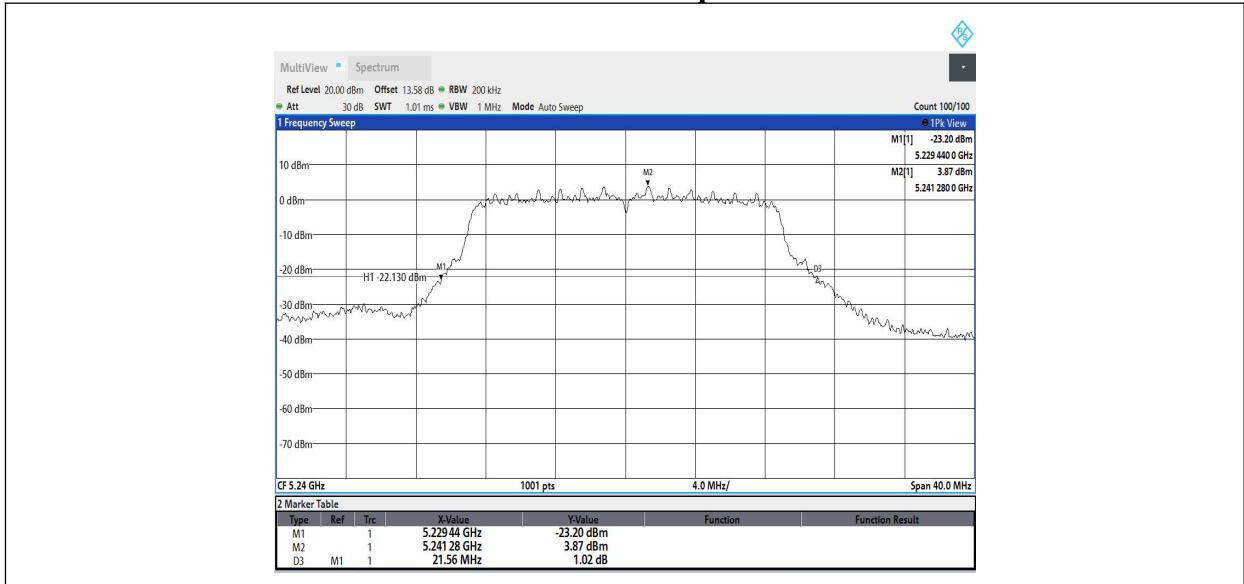
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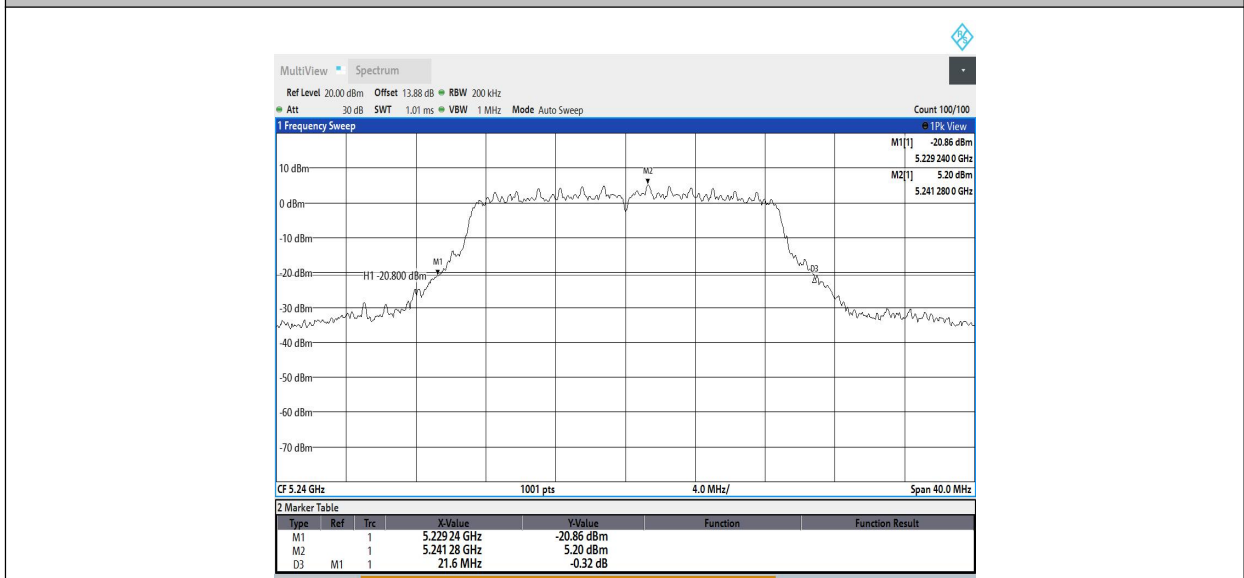
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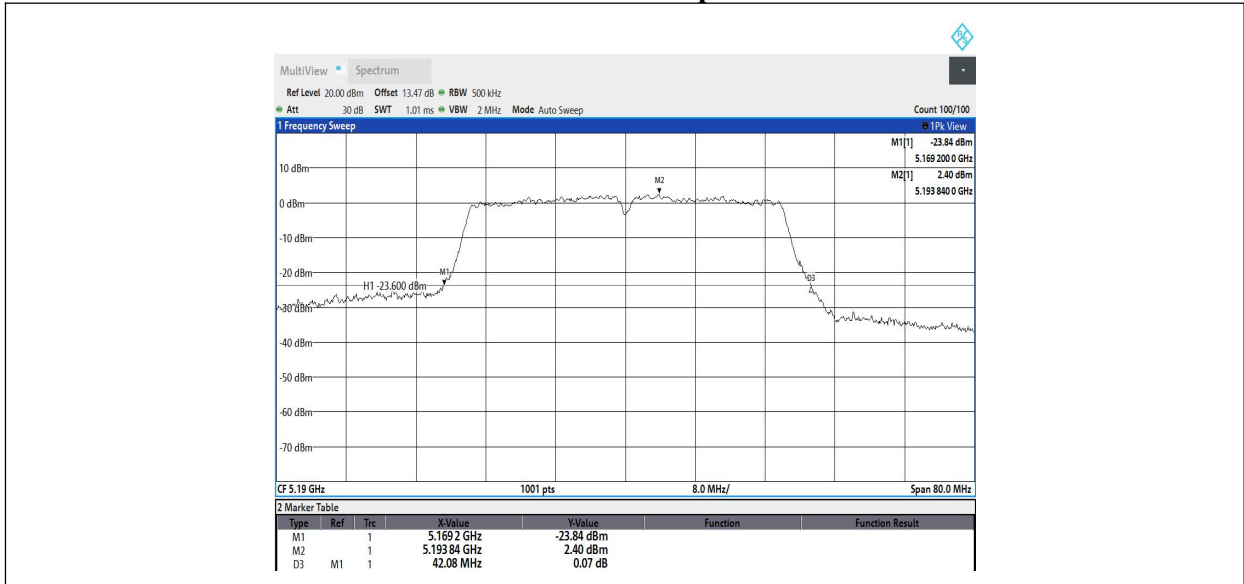


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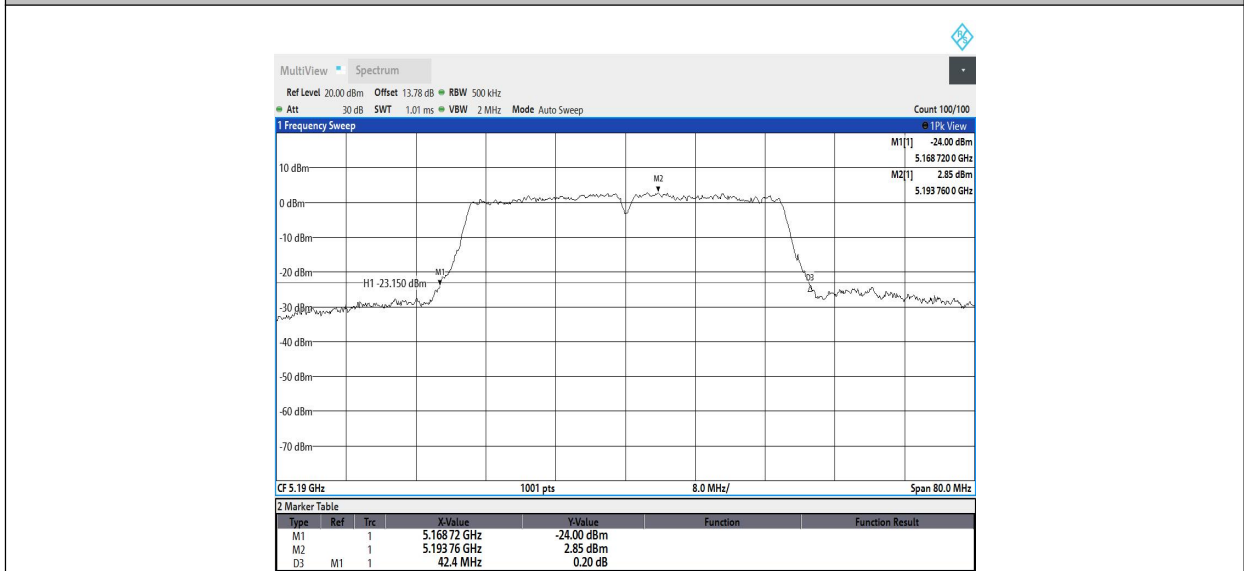
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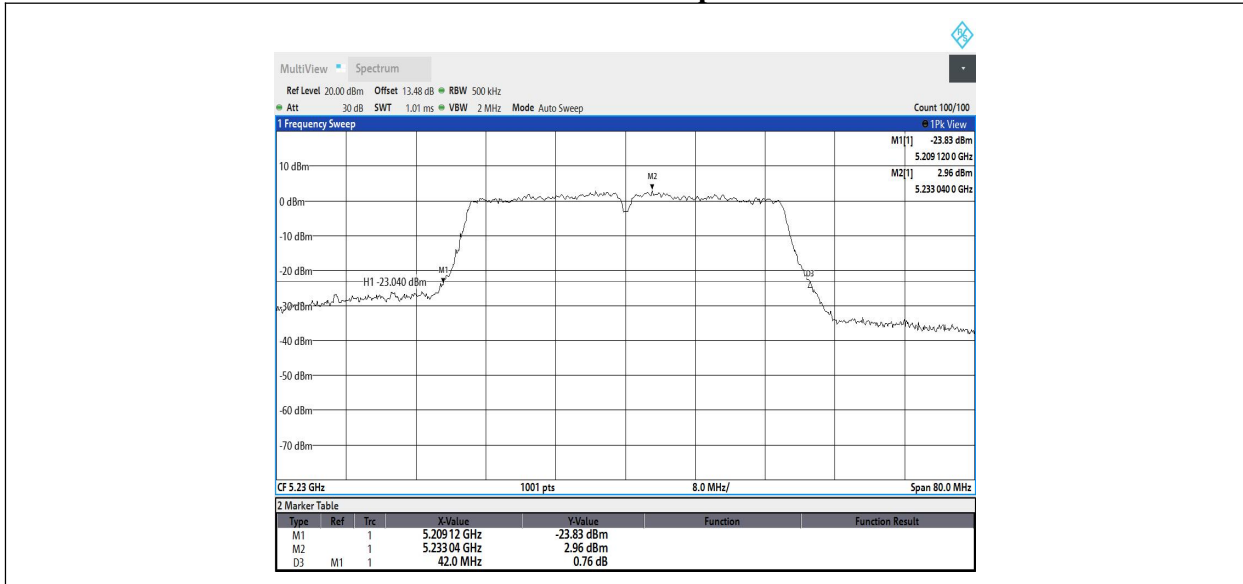
11AC40SISO_Ant2_5190



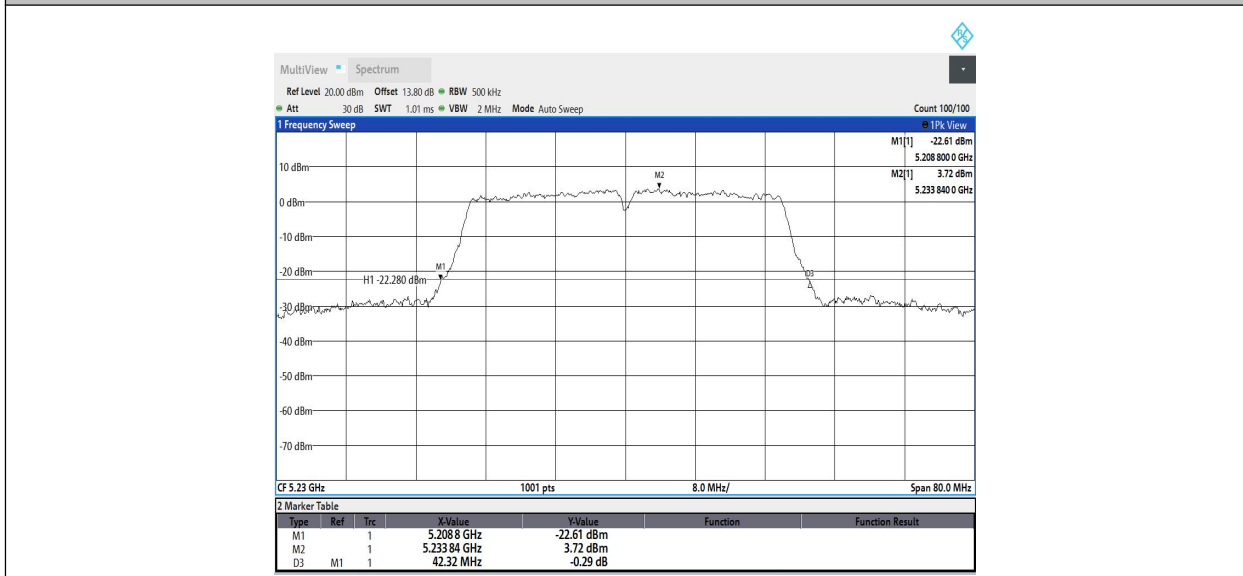
11AC40SISO_Ant1_5230

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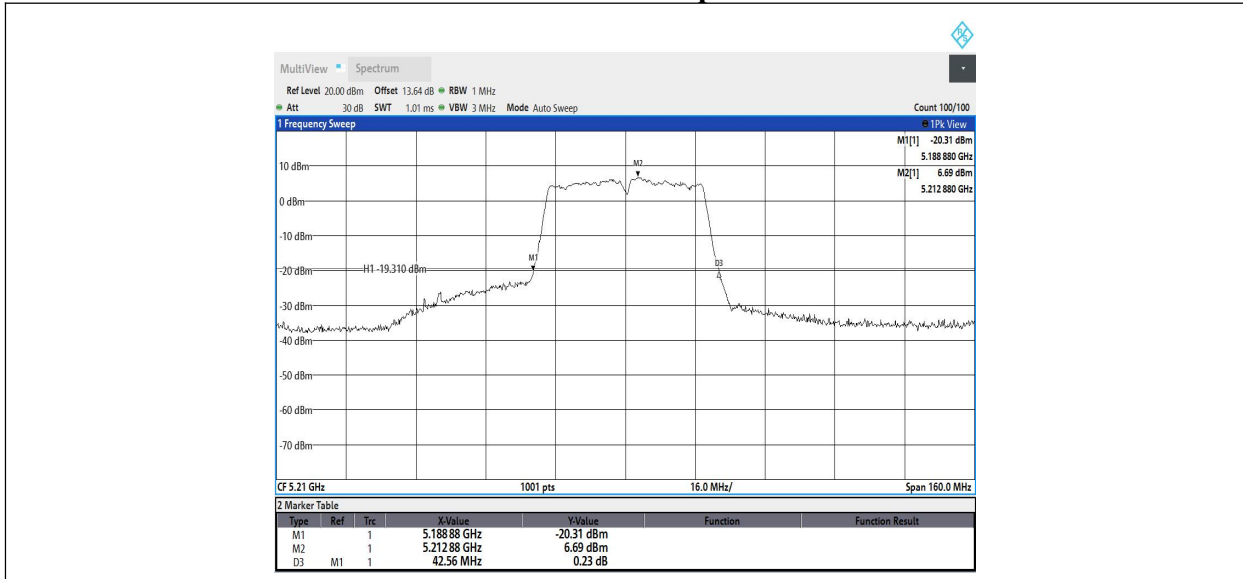
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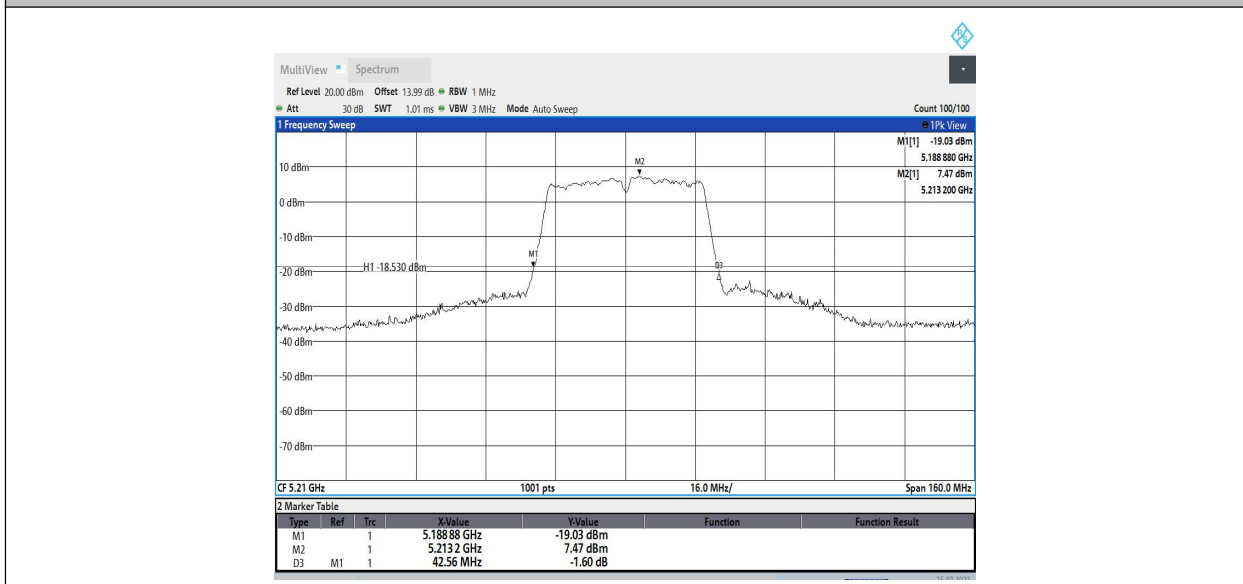
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11AC80SISO_Ant2_5210



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6.3 99% Occupied Bandwidth

Specifications:	FCC 47 CFR Part 15.407(a)
DUT Serial Number:	S1
Test conditions:	Ambient Temperature:20°C Relative Humidity:40% Air pressure: 90kPa
Test Results:	Pass

Measurement Limit and Method

Standard	Limit(MHz)
FCC 47 CFR Part 15.407(a)	N/A

Measurement Uncertainty:

Measurement Uncertainty	20kHz
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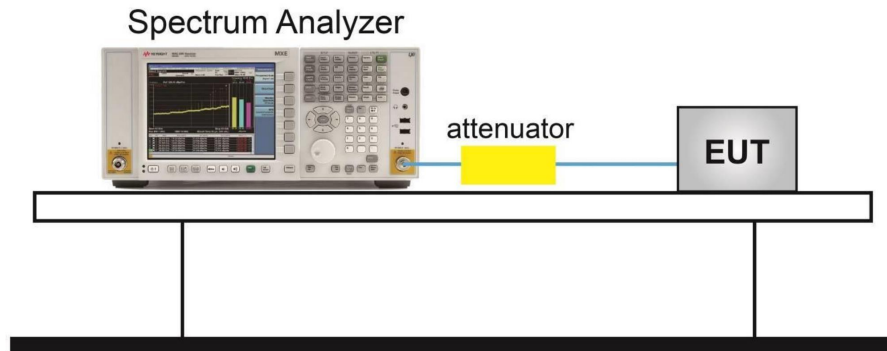
The measurement method is made according to KDB 789033 D

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1 % to 5 % of the OBW
4. Set VBW $\geq 3 \cdot$ RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99 % power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99 % power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 % of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5 % of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

Test Setup

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**Report No.: I23W00008-WIFI 5.1G RF**

Test Result

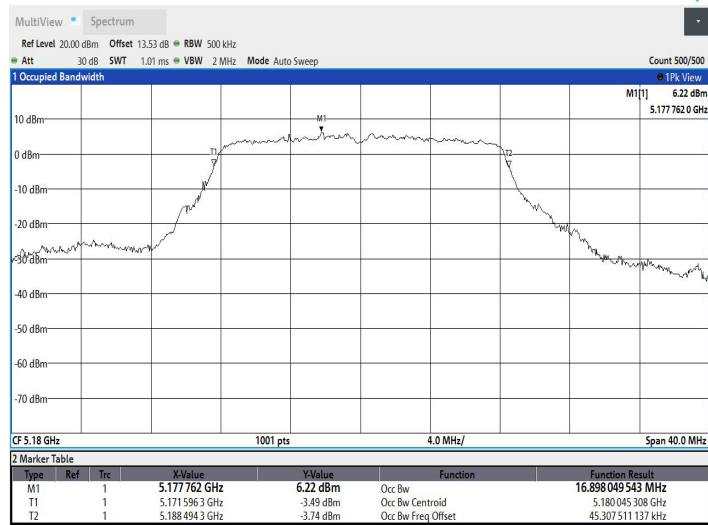
TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]
11A	Ant1	5180	16.898	5171.5963	5188.4943
	Ant2	5180	17.007	5171.5253	5188.5322
	Ant1	5200	16.882	5191.5999	5208.4818
	Ant2	5200	16.955	5191.5671	5208.5223
	Ant1	5240	16.856	5231.6066	5248.4622
	Ant2	5240	16.887	5231.5749	5248.4620
11N20SISO	Ant1	5180	17.981	5171.0623	5189.0429
	Ant2	5180	18.042	5171.0076	5189.0496
	Ant1	5200	17.948	5191.0546	5209.0027
	Ant2	5200	17.941	5191.0630	5209.0037
	Ant1	5240	17.943	5231.0532	5248.9965
	Ant2	5240	17.971	5231.0438	5249.0146
11N40SISO	Ant1	5190	36.606	5171.7886	5208.3949
	Ant2	5190	36.67	5171.8137	5208.4836
	Ant1	5230	36.59	5211.7607	5248.3512
	Ant2	5230	36.554	5211.8319	5248.3854
11AC20SISO	Ant1	5180	17.987	5171.0526	5189.0395
	Ant2	5180	36.275	5161.9329	5198.2078
	Ant1	5200	17.953	5191.0652	5209.0186
	Ant2	5200	18.016	5191.0287	5209.0448
	Ant1	5240	17.952	5231.0470	5248.9995
	Ant2	5240	17.96	5231.0447	5249.0043
11AC40SISO	Ant1	5190	36.54	5171.7782	5208.3182
	Ant2	5190	36.61	5171.7914	5208.4015
	Ant1	5230	36.533	5211.7474	5248.2809
	Ant2	5230	36.525	5211.8006	5248.3256
11AC80SISO	Ant1	5210	37.326	5191.3754	5228.7015
	Ant2	5210	37.332	5191.4312	5228.7637

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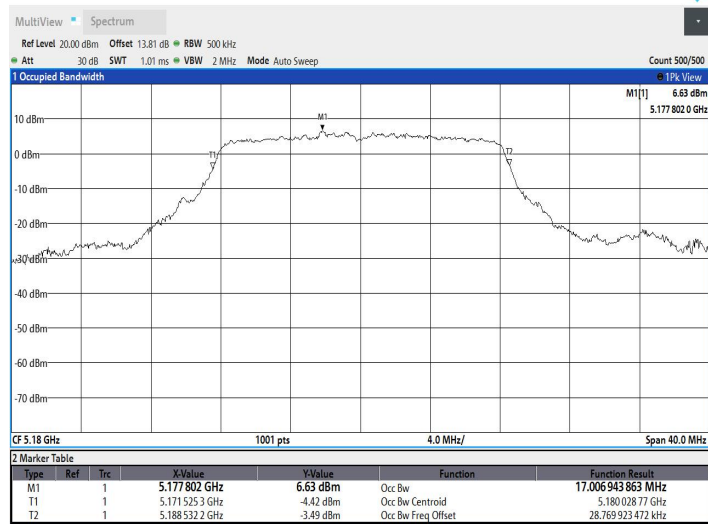
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Test Graphs

11A_Ant1_5180



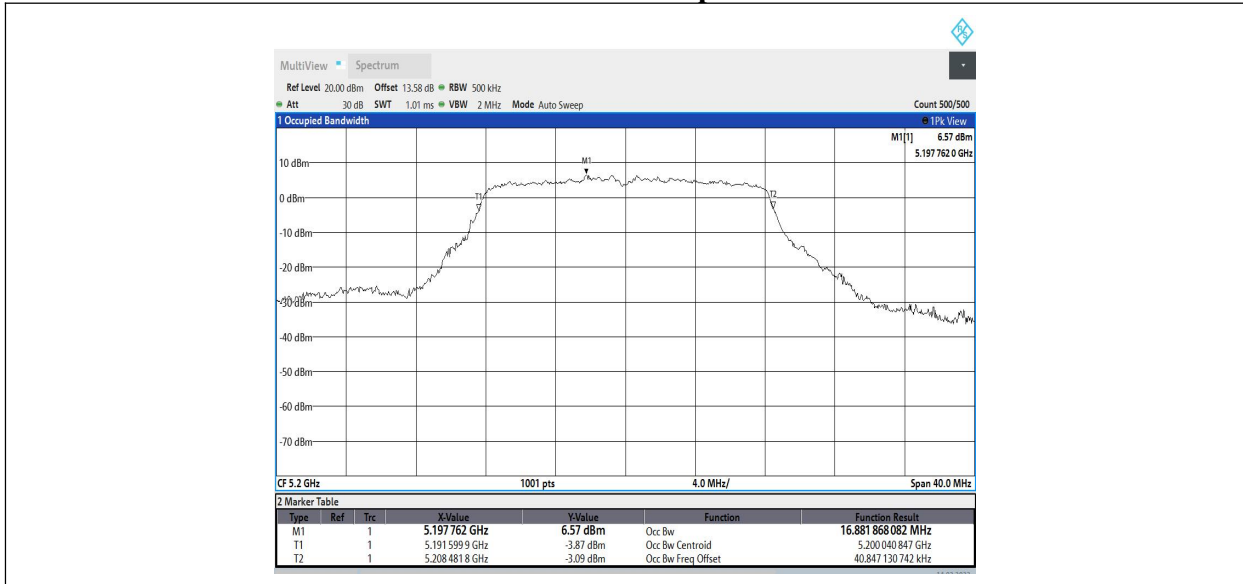
11A_Ant2_5180



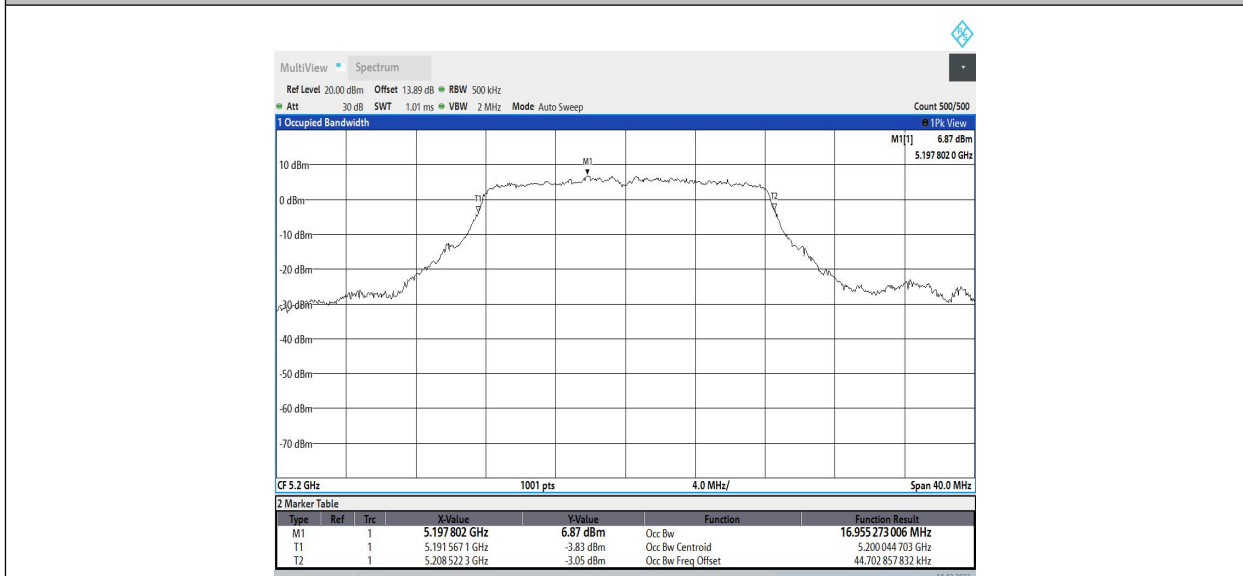
11A_Ant1_5200

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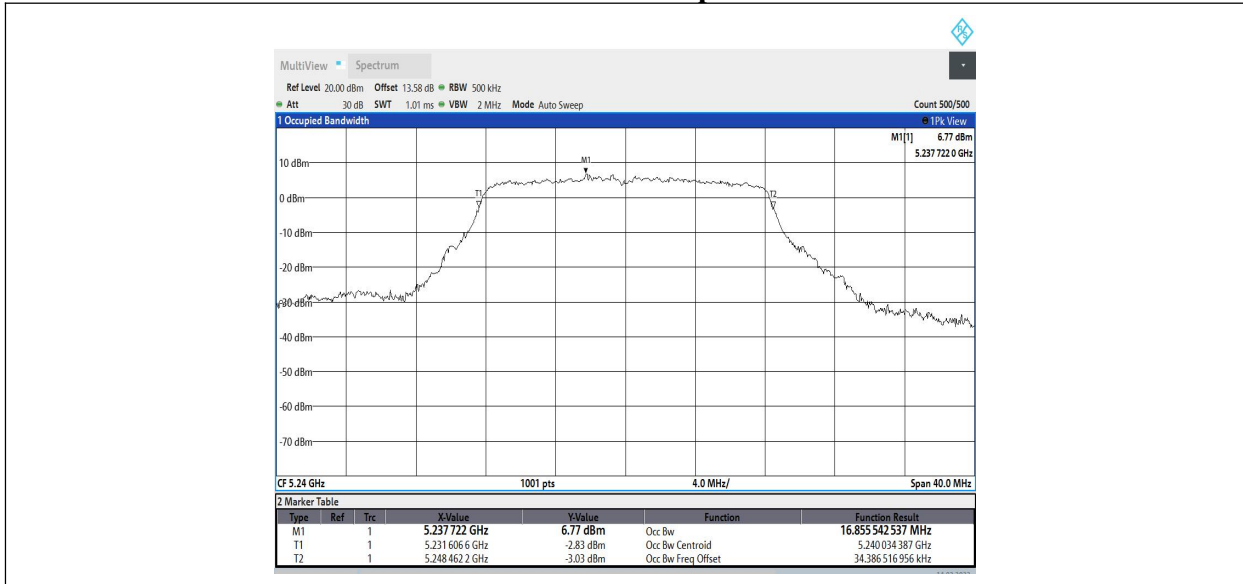
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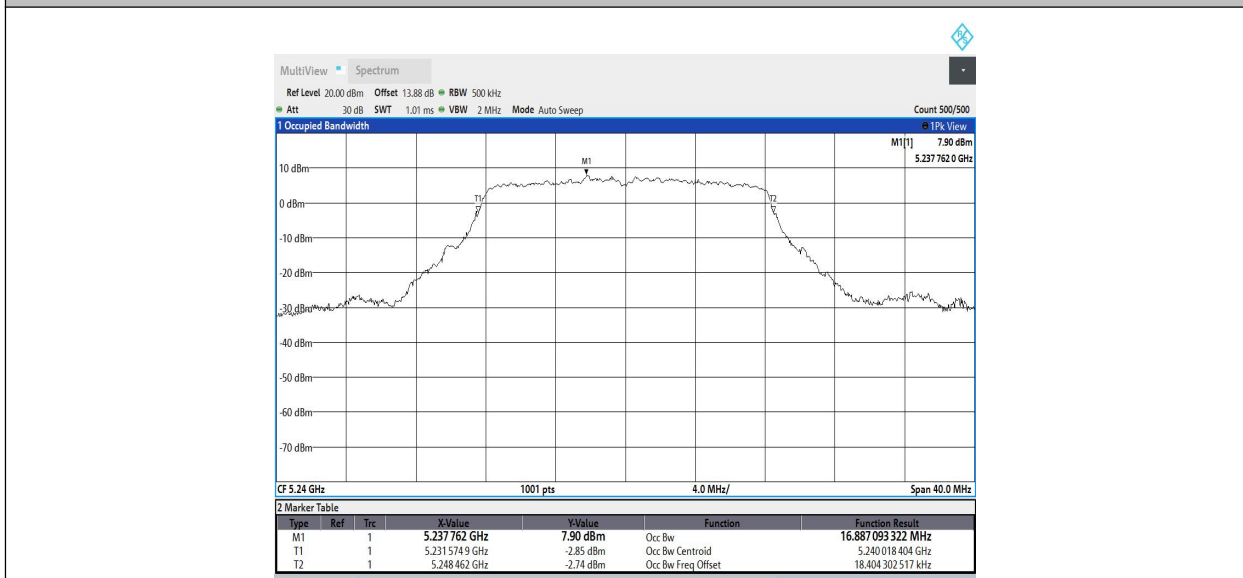
11A_Ant1_5240

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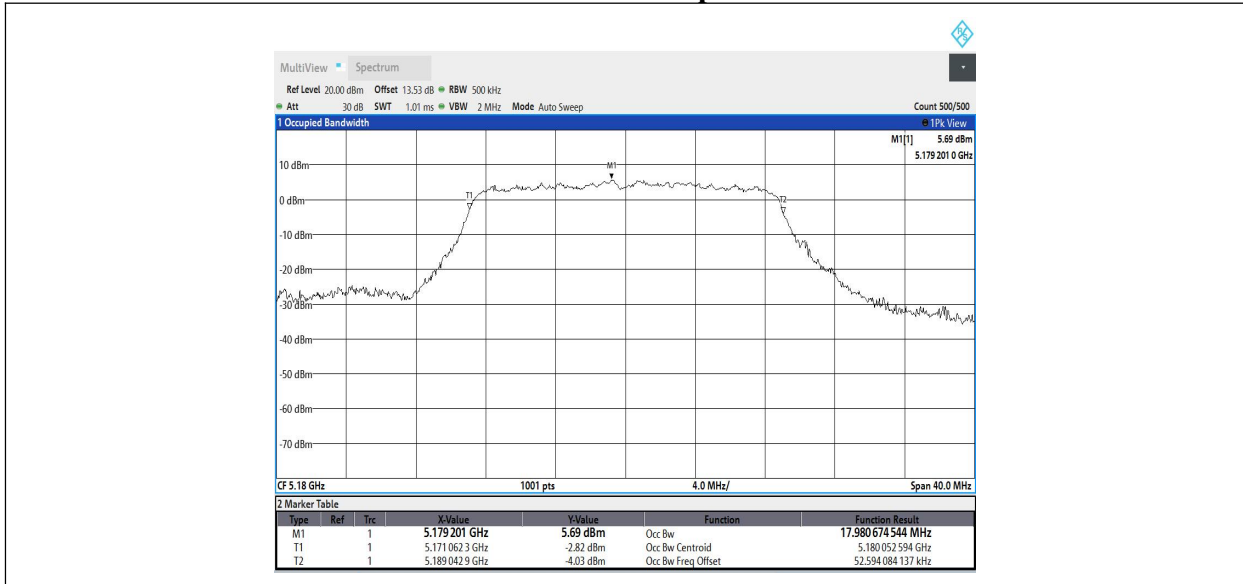
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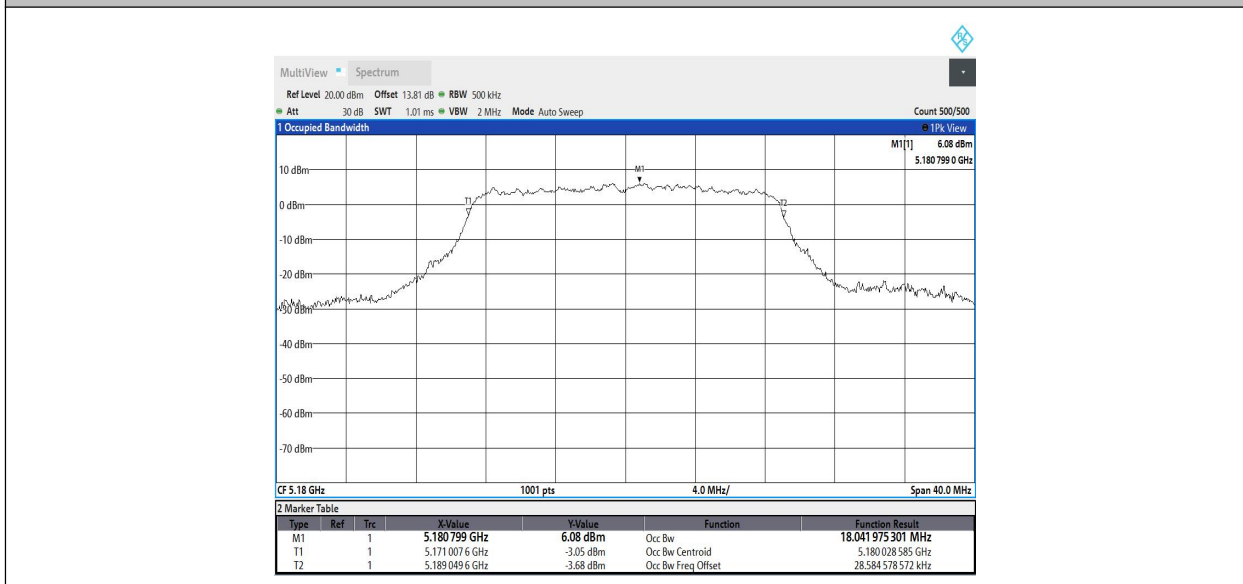
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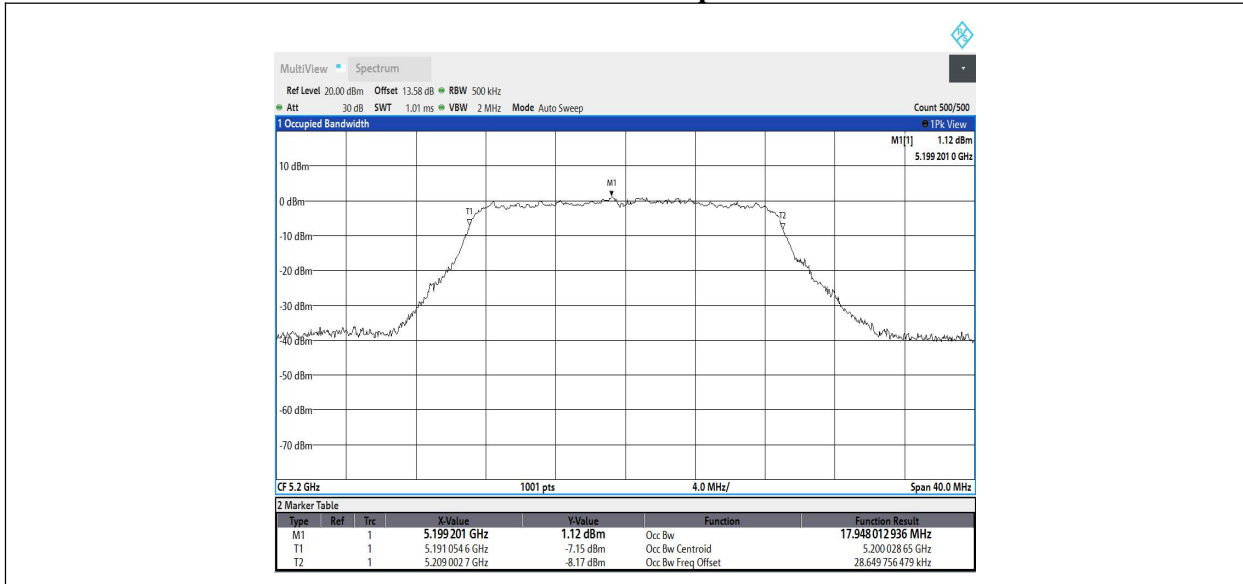
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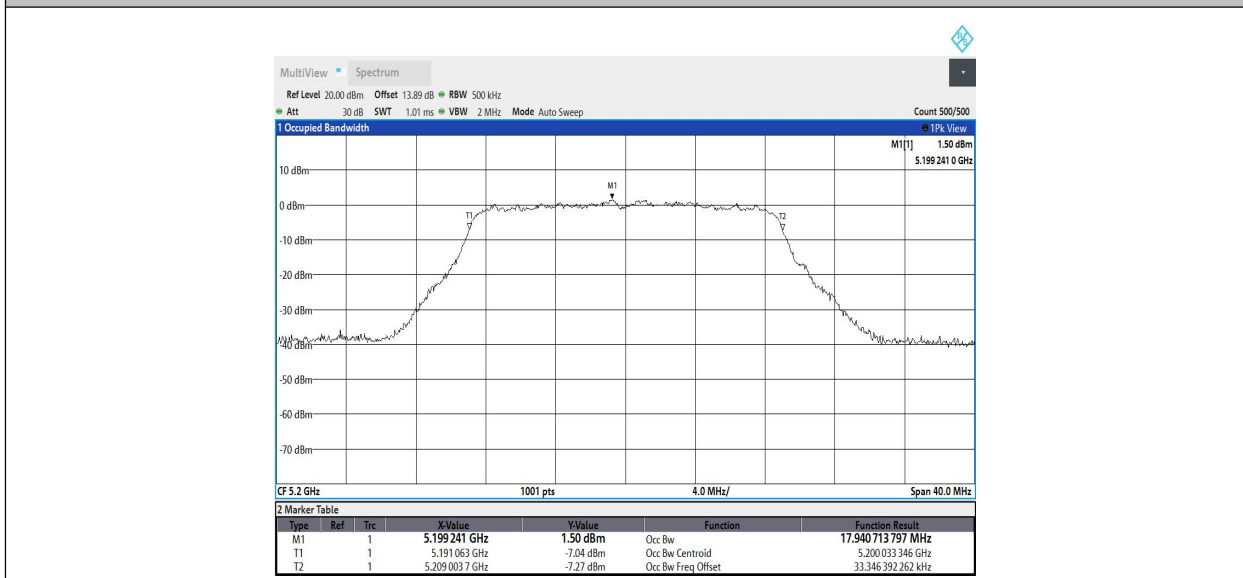
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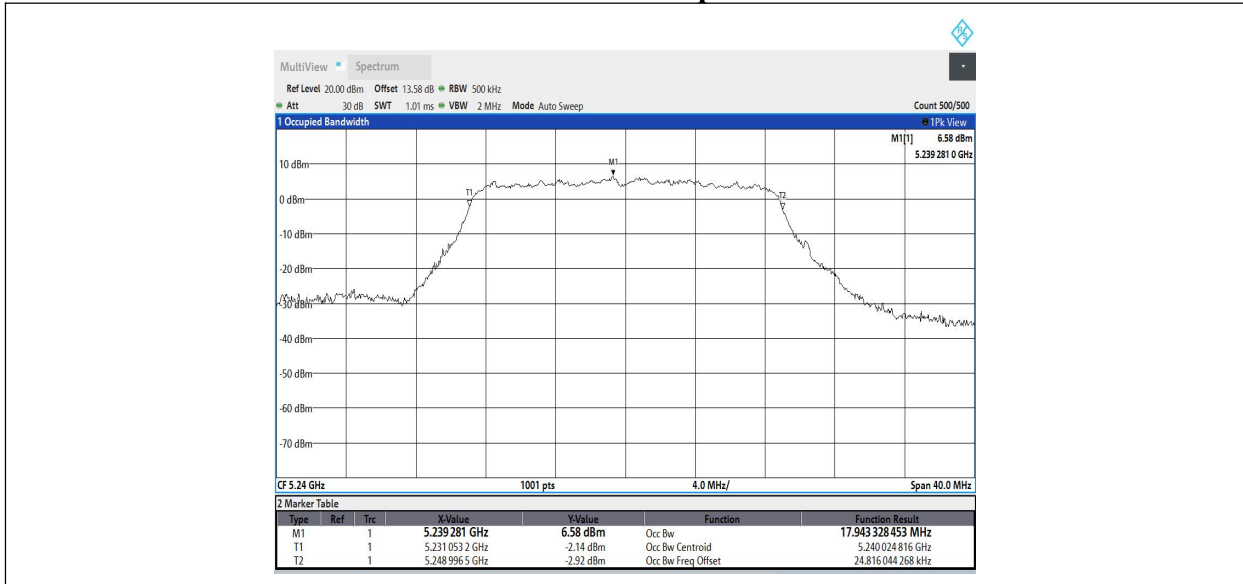
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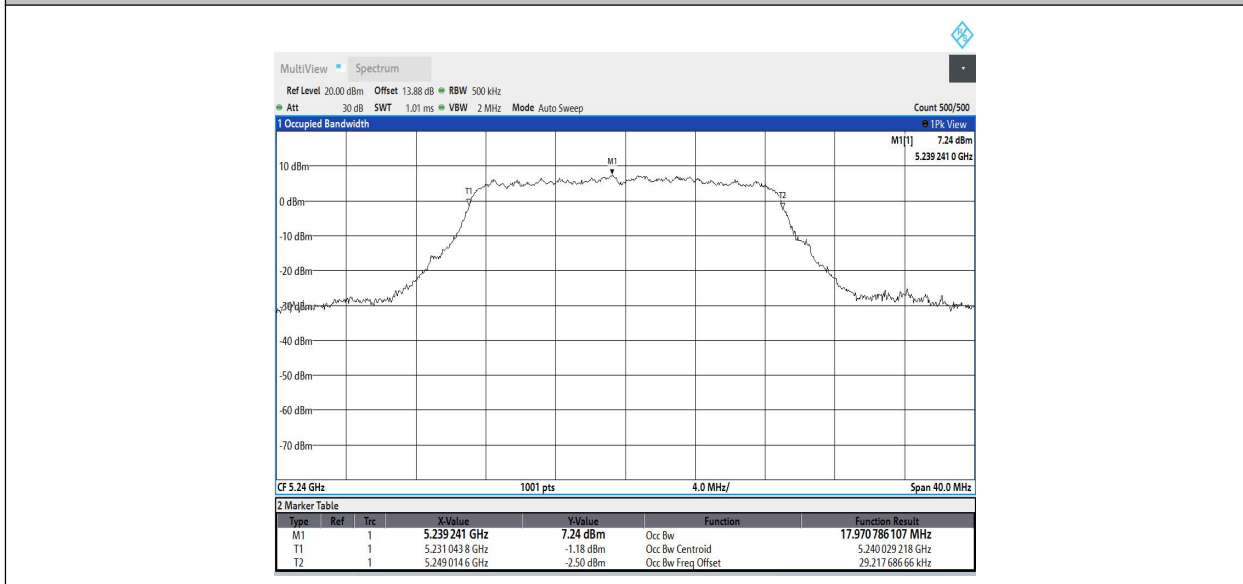
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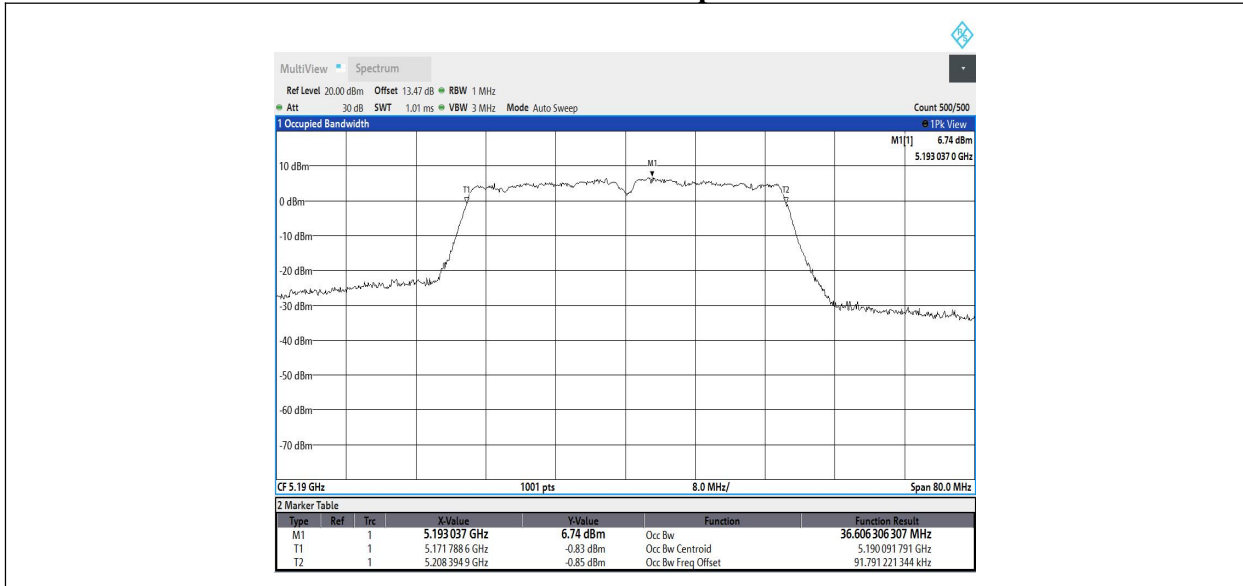
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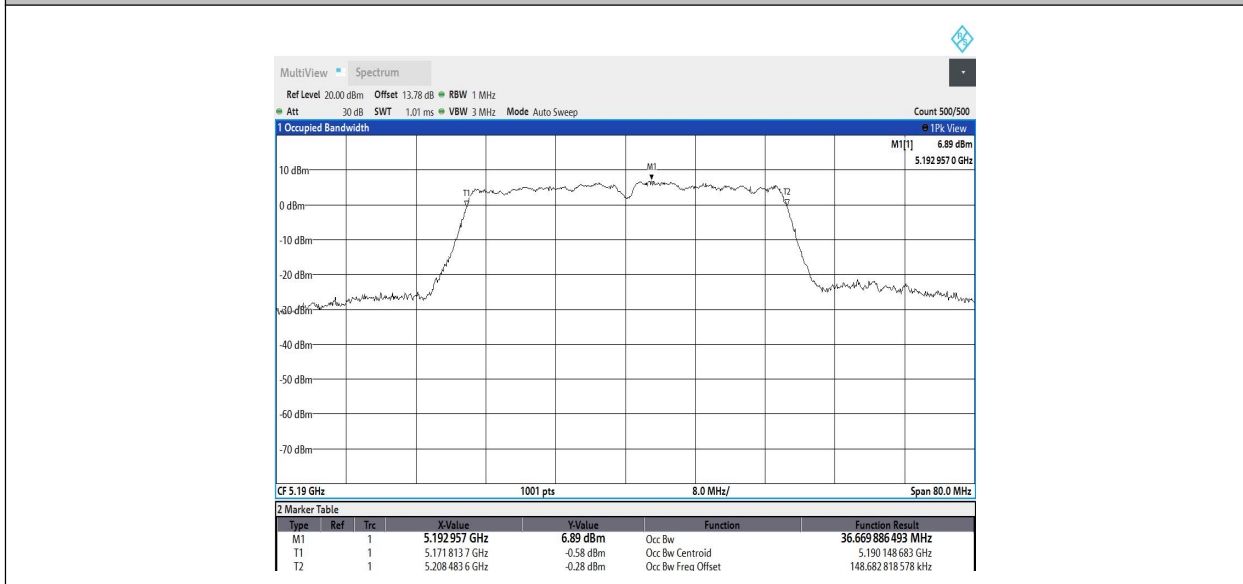
11N40SISO_Ant1_5190

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11N40SISO_Ant2_5190



11N40SISO_Ant1_5230

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