FCC RF Test Report

APPLICANT	:	Xiaomi Communications Co., Ltd.
EQUIPMENT	:	Mobile Phone
BRAND NAME	:	Xiaomi
MODEL NAME	:	2406APNFAG
FCC ID	:	2AFZZPNFAG
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure
TEST DATE(S)	:	May 06, 2024 ~ May 30, 2024

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.

This report contains data that were produced under subcontract by Sporton International Inc. (ShenZhen)

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

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR442515E	Rev. 01	Initial issue of report	Jun. 11, 2024

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 3.03 dB at 5728.08 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	15.207(a)	Pass	Under limit 23.33 dB at 21.600 MHz
3.6	15.203 & 15.407(a)	Antenna Requirement	15.203 & 15.407(a)	15.203 & 15.407(a)	Pass	-

Conformity Assessment Condition:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
2. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

1 General Description

1.1 Applicant

Xiaomi Communications Co., Ltd.
#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

1.2 Manufacturer

Xiaomi Communications Co., Ltd.
#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Phone
Brand Name	Xiaomi
Model Name	2406APNFAG
FCC ID	2AFZZPNFAG
IMEI Code	Conducted: 868329070074764/868329070074772 Conduction: 868329070075761/868329070075779 Radiation: 868329070077080/868329070077098(SZ) 868329070078740/868329070078757(KS)
HW Version	1351N12A
SW Version	Xiaomi HyperOS 1.0
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 Frequency Range	5180 MHz ~ 5250 MHz 5260 MHz ~ 5320 MHz 5500 MHz ~ 5720 MHz 5745 MHz ~ 5825 MHz
Maximum Output Power to Antenna	**MIMO <Ant. 6 + 17>** **<5180 MHz ~ 5250 MHz>** 802.11a : 20.68 dBm / 0.1169 W 802.11n HT20 : 20.27 dBm / 0.1064 W 802.11n HT40 : 19.79 dBm / 0.0953 W 802.11ac VHT20: 20.37 dBm / 0.1089 W 802.11ac VHT40: 19.84 dBm / 0.0964 W 802.11ac VHT80: 16.80 dBm / 0.0479 W 802.11ac VHT160: 15.44 dBm / 0.0350 W 802.11ax HE20: 20.45 dBm / 0.1109 W 802.11ax HE40: 20.12 dBm / 0.1028 W 802.11ax HE80: 16.91 dBm / 0.0491 W 802.11ax HE160: 15.51 dBm / 0.0356 W **<5260 MHz ~ 5320 MHz>** 802.11a : 20.39 dBm / 0.1094 W 802.11n HT20 : 20.28 dBm / 0.1067 W 802.11n HT40 : 19.46 dBm / 0.0883 W 802.11ac VHT20: 20.40 dBm / 0.1096 W 802.11ac VHT40: 19.51 dBm / 0.0893 W 802.11ac VHT80: 18.31 dBm / 0.0678 W 802.11ax HE20: 20.49 dBm / 0.1119 W 802.11ax HE40: 20.23 dBm / 0.1054 W 802.11ax HE80: 18.92 dBm / 0.0780 W **<5500 MHz ~ 5720 MHz >** 802.11a : 21.14 dBm / 0.1300 W 802.11n HT20 : 21.13 dBm / 0.1297 W 802.11n HT40 : 20.84 dBm / 0.1213 W 802.11ac VHT20: 21.24 dBm / 0.1330 W 802.11ac VHT40: 20.90 dBm / 0.1230 W 802.11ac VHT80: 19.75 dBm / 0.0944 W 802.11ac VHT160: 15.40 dBm / 0.0347 W 802.11ax HE20: 21.31 dBm / 0.1352 W 802.11ax HE40: 21.19 dBm / 0.1315 W 802.11ax HE80: 21.11 dBm / 0.1291 W 802.11ax HE160: 15.47 dBm / 0.0352 W **<5745 MHz ~ 5825 MHz>** 802.11a : 22.19 dBm / 0.1656 W 802.11n HT20 : 20.94 dBm / 0.1242 W 802.11n HT40 : 20.19 dBm / 0.1045 W 802.11ac VHT20: 21.06 dBm / 0.1276 W 802.11ac VHT40: 20.26 dBm / 0.1062 W 802.11ac VHT80: 19.11 dBm / 0.0815 W 802.11ax HE20: 21.14 dBm / 0.1300 W 802.11ax HE40: 20.79 dBm / 0.1199 W 802.11ax HE80: 20.61 dBm / 0.1151 W

99% Occupied Bandwidth	**<5180 MHz ~ 5250 MHz>** 802.11a : 17.423 MHz 802.11ax HE20: 19.181 MHz 802.11ax HE40: 38.202 MHz 802.11ax HE80: 78.162 MHz 802.11ax HE160: 157.922 MHz **<5260 MHz ~ 5320 MHz>** 802.11a : 17.423 MHz 802.11ax HE20: 19.221 MHz 802.11ax HE40: 38.122 MHz 802.11ax HE80: 78.002 MHz **<5500 MHz ~ 5720 MHz>** 802.11a : 19.421 MHz 802.11ax HE20: 19.181 MHz 802.11ax HE40: 38.282 MHz 802.11ax HE80: 78.322 MHz 802.11ax HE160: 157.922 MHz **<5745 MHz ~ 5825 MHz>** 802.11a : 18.701 MHz 802.11ax HE20: 19.261 MHz 802.11ax HE40: 38.282 MHz 802.11ax HE80: 78.002 MHz
Antenna Type / Gain	**<5180 MHz ~ 5240 MHz>** <Ant. 6> : Fixed Internal Antenna with gain -2.30 dBi <Ant. 17> : Fixed Internal Antenna with gain -2.80 dBi **<5260 MHz ~ 5320 MHz>** <Ant. 6> : Fixed Internal Antenna with gain -2.50 dBi <Ant. 17> : Fixed Internal Antenna with gain -1.60 dBi **<5500 MHz ~ 5720 MHz>** <Ant. 6> : Fixed Internal Antenna with gain -2.20 dBi <Ant. 17> : Fixed Internal Antenna with gain -1.70 dBi **<5745 MHz ~ 5825 MHz>** <Ant. 6> : Fixed Internal Antenna with gain -2.20 dBi <Ant. 17> : Fixed Internal Antenna with gain -1.70 dBi
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM) 802.11ax : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM / 4096QAM)

Note:

1. For 802.11n/ac & 802.11ax mode, the whole testing have assessed only 802.11ax HE20/40/80/160 by referring to the higher output power.
2. For WLAN SISO & CDD MIMO mode, the whole testing has assessed only MIMO mode by referring to the higher normal conducted power.
3. 802.11ax support full RU tone and partial RU tone, both full RU and partial RU-left (for low CH) and partial RU-right (for high CH) are tested for conducted power/PSD/RSE, the full RU power > partial RU, therefore the full RU perform full test and Partial RU verified power/PSD/RSE

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.

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		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-KS TH01-KS 03CH03-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.

Test Firm	Sporton International Inc. (ShenZhen)		
Test Site Location	101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City, Guangdong Province 518103 People's Republic of China TEL: +86-755-86066985		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH04-SZ	CN1256	421272

Note: Test data subcontracted: radiated Spurious Emission test case for 802.11ax in section 3.4 of this report.

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	TH01-KS	Tonscend	JS1120-3 test system China_210602	3.3.10
2.	CO01-KS	AUDIX	E3	6.2009-8-24
3.	03CH04-SZ	AUDIX	E3	6.2009-8-24
4.	03CH03-KS	AUDIX	E3	210616

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 E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- FCC KDB 662911 D01 Multiple Transmitter Output 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 for Adapter and Earphone mode. The worst cases (X plane-Adapter mode) 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	50##	5250

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)
TDWR Channel	118*	5590	124	5620
	120	5600	126*	5630
	122#	5610	128	5640
	-	-	114##	5570

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

Note:

1. The above Frequency and Channel in "*" are 40MHz bandwidth.
2. The above Frequency and Channel in "#" are 80MHz bandwidth.
3. The above Frequency and Channel in "##" are 160MHz bandwidth.

2.2 Test Mode

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

MIMO Mode

Modulation	Data Rate
802.11a	6 Mbps
802.11ax HE20	MCS0
802.11ax HE40	MCS0
802.11ax HE80	MCS0
802.11ax HE160	MCS0

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

Ch. #		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
		20M BW	20M BW	20M BW	20M BW
L	Low	36	52	100	149
M	Middle	44	60	116	157
H	High	48	64	140	165
Straddle		-	-	144	-

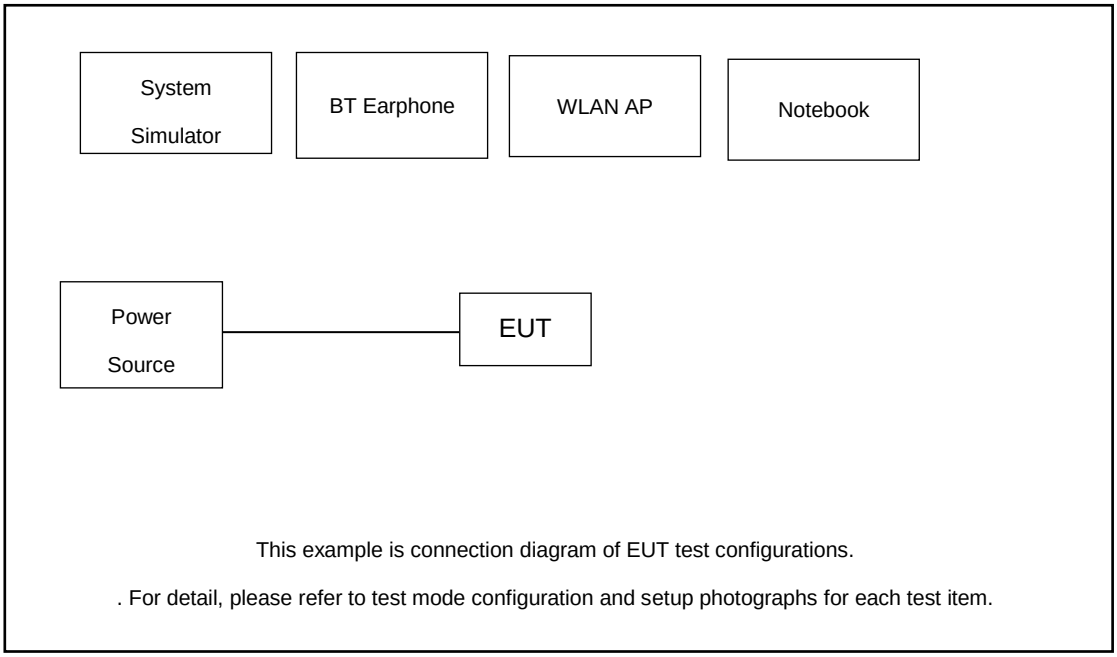
Ch. #		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
		40M BW	40M BW	40M BW	40M BW
L	Low	38	54	102	151
M	Middle	-	-	110	-
H	High	46	62	134	159
Straddle		-	-	142	-

Ch. #		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
		80M BW	80M BW	80M BW	80M BW
L	Low	-	-	106	-
M	Middle	42	58	-	155
H	High	-	-	122	-
Straddle		-	-	138	-

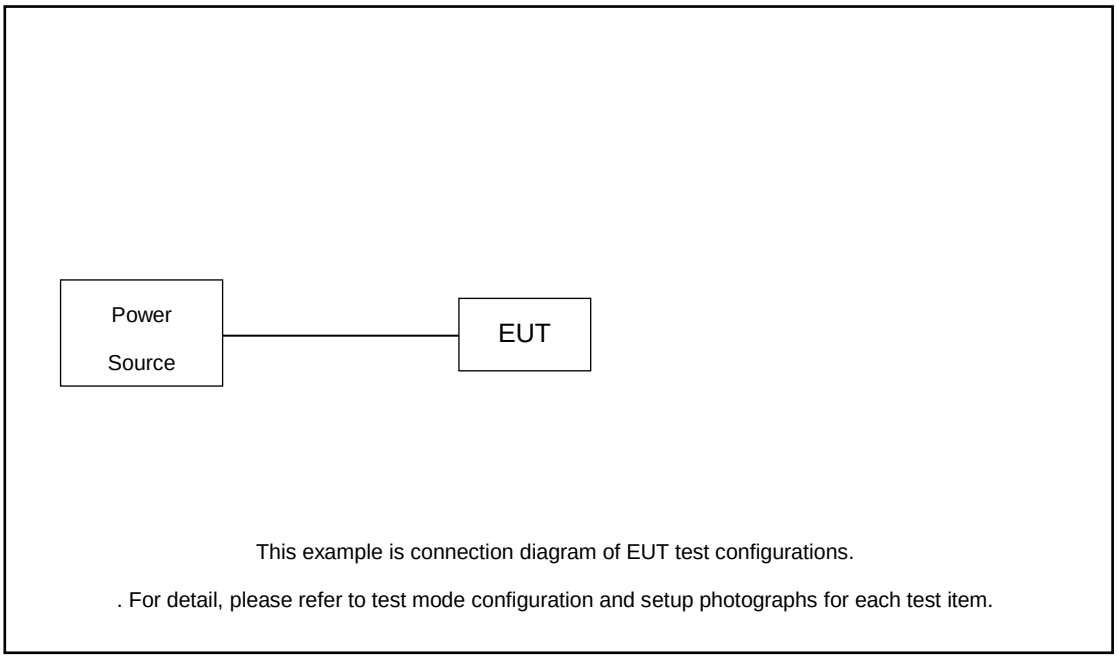
Ch. #		U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
		160M BW		160M BW	160M BW
M	Middle	50		114	-

2.3 Connection Diagram of Test System

AC Conducted Emission:



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	G480	QDS-BRCM1050I	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m
4.	Bluetooth Earphone	Xiaomi	LYEJ02LM	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.

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 4.58 dB and 10dB attenuator.

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

= 4.58 + 10 = 14.58 (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

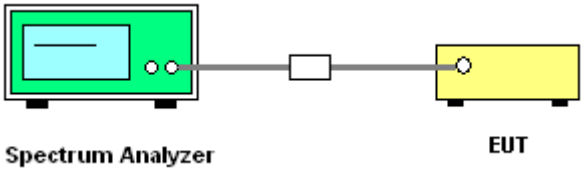
The measuring equipment is listed in the section 4 of this test report.

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 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 $\log_{10}$ 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.

.

3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

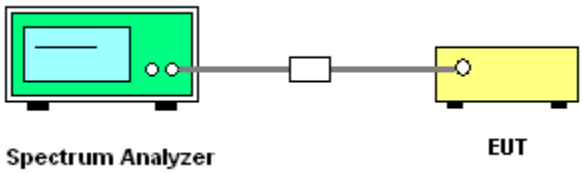
The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.

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.
4. For MIMO mode, the measure-and-sum technique should be used for measuring the in-band transmit power of a device.

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

FCC U-NII-1 MIMO																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power with duty factor (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail	Power Setting	
					Ant 6	Ant 17	Ant 6	Ant 17	SUM	Ant 6	Ant 17	Ant 6	Ant 17		Ant 6	Ant 17
11a	6Mbps	2	36	5180	0.10	0.10	17.35	17.52	20.45	24.00		-2.30		Pass	18	
11a	6Mbps	2	44	5220	0.10	0.10	17.24	17.05	20.16	24.00		-2.30		Pass	18	
11a	6Mbps	2	48	5240	0.10	0.10	17.71	17.63	20.68	24.00		-2.30		Pass	18.5	
HT20	MCS0	2	36	5180	0.10	0.10	17.19	17.34	20.27	24.00		-2.30		Pass	18	
HT20	MCS0	2	44	5220	0.10	0.10	17.17	17.03	20.11	24.00		-2.30		Pass	18	
HT20	MCS0	2	48	5240	0.10	0.10	17.01	17.01	20.02	24.00		-2.30		Pass	18	
HT40	MCS0	2	38	5190	0.27	0.27	16.68	16.89	19.79	24.00		-2.30		Pass	17	
HT40	MCS0	2	46	5230	0.27	0.27	16.73	16.64	19.69	24.00		-2.30		Pass	17	
VHT20	MCS0	2	36	5180	0.16	0.16	17.28	17.44	20.37	24.00		-2.30		Pass	18	
VHT20	MCS0	2	44	5220	0.16	0.16	17.28	17.17	20.23	24.00		-2.30		Pass	18	
VHT20	MCS0	2	48	5240	0.16	0.16	17.14	17.14	20.15	24.00		-2.30		Pass	18	
VHT40	MCS0	2	38	5190	0.28	0.28	16.72	16.93	19.84	24.00		-2.30		Pass	17	
VHT40	MCS0	2	46	5230	0.28	0.28	16.78	16.69	19.75	24.00		-2.30		Pass	17	
VHT80	MCS0	2	42	5210	0.55	0.55	13.92	13.66	16.80	24.00		-2.30		Pass	14.5	
VHT160	MCS0	2	50	5250	0.25	0.25	12.46	12.40	15.44	24.00		-2.30		Pass	13	

FCC U-NII-2A MIMO																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power with duty factor (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail	Power Setting	
					Ant 6	Ant 17	Ant 6	Ant 17	SUM	Ant 6	Ant 17	Ant 6	Ant 17			Ant 6	Ant 17
11a	6Mbps	2	52	5260	0.10	0.10	17.42	17.34	20.39	23.98		-1.60		30.00	Pass	18	
11a	6Mbps	2	60	5300	0.10	0.10	17.08	17.45	20.28	23.98		-1.60		30.00	Pass	18	
11a	6Mbps	2	64	5320	0.10	0.10	17.03	17.22	20.14	23.98		-1.60		30.00	Pass	18	
HT20	MCS0	2	52	5260	0.10	0.10	17.30	17.25	20.28	23.98		-1.60		30.00	Pass	18	
HT20	MCS0	2	60	5300	0.10	0.10	16.72	17.27	20.01	23.98		-1.60		30.00	Pass	18	
HT20	MCS0	2	64	5320	0.10	0.10	16.47	17.32	19.92	23.98		-1.60		30.00	Pass	18	
HT40	MCS0	2	54	5270	0.27	0.27	16.49	16.41	19.46	23.98		-1.60		30.00	Pass	17	
HT40	MCS0	2	62	5310	0.27	0.27	15.53	16.50	19.05	23.98		-1.60		30.00	Pass	17	
VHT20	MCS0	2	52	5260	0.16	0.16	17.42	17.37	20.40	23.98		-1.60		30.00	Pass	18	
VHT20	MCS0	2	60	5300	0.16	0.16	16.81	17.36	20.10	23.98		-1.60		30.00	Pass	18	
VHT20	MCS0	2	64	5320	0.16	0.16	16.58	17.43	20.03	23.98		-1.60		30.00	Pass	18	
VHT40	MCS0	2	54	5270	0.28	0.28	16.54	16.45	19.51	23.98		-1.60		30.00	Pass	17	
VHT40	MCS0	2	62	5310	0.28	0.28	15.84	16.56	19.23	23.98		-1.60		30.00	Pass	17	

VHT80	MCS0	2	58	5290	0.55	0.55	15.13	15.47	18.31	23.98	-1.60	30.00	Pass	16

FCC U-NII-2C MIMO																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power with duty factor (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail	Power Setting	
					Ant 6	Ant 17	Ant 6	Ant 17	SUM	Ant 6	Ant 17	Ant 6	Ant 17			Ant 6	Ant 17
11a	6Mbps	2	100	5500	0.10	0.10	16.85	17.91	20.43	23.98		-1.70		30.00	Pass	17	
11a	6Mbps	2	116	5580	0.10	0.10	17.11	17.93	20.55	23.98		-1.70		30.00	Pass	17	
11a	6Mbps	2	140	5700	0.10	0.10	17.51	17.48	20.51	23.98		-1.70		30.00	Pass	17.5	
HT20	MCS0	2	100	5500	0.10	0.10	16.99	18.24	20.67	23.98		-1.70		30.00	Pass	17.5	
HT20	MCS0	2	116	5580	0.10	0.10	17.68	18.53	21.13	23.98		-1.70		30.00	Pass	17.5	
HT20	MCS0	2	140	5700	0.10	0.10	18.35	17.80	21.09	23.98		-1.70		30.00	Pass	18	
HT40	MCS0	2	102	5510	0.27	0.27	16.98	18.28	20.68	23.98		-1.70		30.00	Pass	17	
HT40	MCS0	2	110	5550	0.27	0.27	17.12	18.11	20.65	23.98		-1.70		30.00	Pass	17	
HT40	MCS0	2	134	5670	0.27	0.27	17.24	18.35	20.84	23.98		-1.70		30.00	Pass	17	
VHT20	MCS0	2	100	5500	0.16	0.16	17.18	18.34	20.80	23.98		-1.70		30.00	Pass	17.5	
VHT20	MCS0	2	116	5580	0.16	0.16	17.77	18.65	21.24	23.98		-1.70		30.00	Pass	17.5	
VHT20	MCS0	2	140	5700	0.16	0.16	18.47	17.94	21.22	23.98		-1.70		30.00	Pass	18	
VHT40	MCS0	2	102	5510	0.28	0.28	17.01	18.31	20.72	23.98		-1.70		30.00	Pass	17	
VHT40	MCS0	2	110	5550	0.28	0.28	17.17	18.16	20.70	23.98		-1.70		30.00	Pass	17	
VHT40	MCS0	2	134	5670	0.28	0.28	17.30	18.41	20.90	23.98		-1.70		30.00	Pass	17	
VHT80	MCS0	2	106	5530	0.55	0.55	12.66	13.46	16.09	23.98		-1.70		30.00	Pass	13	
VHT80	MCS0	2	122	5610	0.55	0.55	16.33	17.11	19.75	23.98		-1.70		30.00	Pass	16	
VHT160	MCS0	2	114	5570	0.25	0.25	12.04	12.71	15.40	23.98		-1.70		30.00	Pass	12	

FCC U-NII-2C straddle channel MIMO																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power with duty factor (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail	Power Setting	
					Ant 6	Ant 17	Ant 6	Ant 17	SUM	Ant 6	Ant 17	Ant 6	Ant 17			Ant 6	Ant 17
11a	6Mbps	2	144	5720	0.10	0.10	18.21	18.05	21.14	23.98		-1.70		30.00	Pass	18	
HT20	MCS0	2	144	5720	0.10	0.10	18.15	17.90	21.04	23.98		-1.70		30.00	Pass	18	
HT40	MCS0	2	142	5710	0.27	0.27	17.42	17.34	20.39	23.98		-1.70		30.00	Pass	17	
VHT20	MCS0	2	144	5720	0.16	0.16	18.26	18.01	21.14	23.98		-1.70		30.00	Pass	18	
VHT40	MCS0	2	142	5710	0.28	0.28	17.46	17.38	20.43	23.98		-1.70		30.00	Pass	17	
VHT80	MCS0	2	138	5690	0.55	0.55	16.41	16.55	19.49	23.98		-1.70		30.00	Pass	16	

FCC U-NII-1 MIMO															
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Duty Factor (dB)		Average Conducted Power with duty factor (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail	Power Setting
						Ant 6	Ant 17	Ant 6	Ant 17	SUM	Ant 6	Ant 17	Ant 6	Ant 17		2Tx
HE20	MCS0	2	36	5180	Full	0.18	0.18	17.37	17.50	20.45	24.00		-2.30		Pass	18
HE20	MCS0	2	36	5180	26/0	0.05	0.05	9.63	9.41	12.53	24.00		-2.30		Pass	9.5
HE20	MCS0	2	36	5180	52/37	0.08	0.08	12.55	12.45	15.51	24.00		-2.30		Pass	12.5
HE20	MCS0	2	36	5180	106/53	0.08	0.08	15.49	15.44	18.47	24.00		-2.30		Pass	15.5
HE20	MCS0	2	44	5220	Full	0.18	0.18	17.37	17.22	20.31	24.00		-2.30		Pass	18
HE20	MCS0	2	44	5220	26/0	0.05	0.05	9.19	9.04	12.13	24.00		-2.30		Pass	9.5
HE20	MCS0	2	44	5220	52/37	0.08	0.08	12.34	12.13	15.25	24.00		-2.30		Pass	12.5
HE20	MCS0	2	44	5220	106/53	0.08	0.08	15.11	14.81	17.97	24.00		-2.30		Pass	15.5
HE20	MCS0	2	48	5240	Full	0.18	0.18	17.20	17.19	20.21	24.00		-2.30		Pass	18
HE20	MCS0	2	48	5240	26/8	0.05	0.05	9.11	9.23	12.18	24.00		-2.30		Pass	9.5
HE20	MCS0	2	48	5240	52/40	0.08	0.08	12.33	12.20	15.27	24.00		-2.30		Pass	12.5
HE20	MCS0	2	48	5240	106/54	0.08	0.08	15.05	14.99	18.03	24.00		-2.30		Pass	15.5
HE40	MCS0	2	38	5190	Full	0.34	0.34	16.99	16.83	19.92	24.00		-2.30		Pass	17
HE40	MCS0	2	46	5230	Full	0.34	0.34	17.13	17.08	20.12	24.00		-2.30		Pass	17.5
HE80	MCS0	2	42	5210	Full	0.62	0.62	14.01	13.80	16.91	24.00		-2.30		Pass	14.5
HE160	MCS0	2	50	5250	Full	0.30	0.30	12.53	12.47	15.51	24.00		-2.30		Pass	13

FCC U-NII-2A MIMO																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Duty Factor (dB)		Average Conducted Power with duty factor (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail	Power Setting	
						Ant 6	Ant 17	Ant 6	Ant 17	SUM	Ant 6	Ant 17	Ant 6	Ant 17			Ant 6	Ant 17
HE20	MCS0	2	52	5260	Full	0.18	0.18	17.50	17.45	20.49	23.98		-1.60		30.00	Pass	18	
HE20	MCS0	2	52	5260	26/0	0.05	0.05	9.78	9.29	12.55	23.98		-1.60		30.00	Pass	9.5	
HE20	MCS0	2	52	5260	52/37	0.08	0.08	12.75	12.29	15.53	23.98		-1.60		30.00	Pass	12.5	
HE20	MCS0	2	52	5260	106/53	0.08	0.08	15.51	15.29	18.41	23.98		-1.60		30.00	Pass	15.5	
HE20	MCS0	2	60	5300	Full	0.18	0.18	16.86	17.41	20.16	23.98		-1.60		30.00	Pass	18	
HE20	MCS0	2	60	5300	26/0	0.05	0.05	9.31	9.57	12.45	23.98		-1.60		30.00	Pass	9.5	
HE20	MCS0	2	60	5300	52/37	0.08	0.08	12.37	12.53	15.46	23.98		-1.60		30.00	Pass	12.5	
HE20	MCS0	2	60	5300	106/53	0.08	0.08	15.30	15.55	18.43	23.98		-1.60		30.00	Pass	15.5	
HE20	MCS0	2	64	5320	Full	0.18	0.18	16.65	17.50	20.11	23.98		-1.60		30.00	Pass	18	
HE20	MCS0	2	64	5320	26/8	0.05	0.05	9.17	9.56	12.38	23.98		-1.60		30.00	Pass	9.5	
HE20	MCS0	2	64	5320	52/40	0.08	0.08	12.11	12.52	15.33	23.98		-1.60		30.00	Pass	12.5	
HE20	MCS0	2	64	5320	106/54	0.08	0.08	15.21	18.36	20.07	23.98		-1.60		30.00	Pass	15.5	
HE40	MCS0	2	54	5270	Full	0.34	0.34	17.26	17.17	20.23	23.98		-1.60		30.00	Pass	17.5	
HE40	MCS0	2	62	5310	Full	0.34	0.34	16.61	17.33	20.00	23.98		-1.60		30.00	Pass	17.5	

HE80	MCS0	2	58	5290	Full	0.62	0.62	15.75	16.07	18.92	23.98	-1.60	30.00	Pass	16.5

FCC U-NII-2C MIMO																		
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Duty Factor (dB)		Average Conducted Power with duty factor (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail	Power Setting	
						Ant 6	Ant 17	Ant 6	Ant 17	SUM	Ant 6	Ant 17	Ant 6	Ant 17			Ant 6	Ant 17
HE20	MCS0	2	100	5500	Full	0.18	0.18	17.24	18.43	20.89	23.98		-1.70		30.00	Pass	17.5	
HE20	MCS0	2	100	5500	26/0	0.05	0.05	9.38	10.49	12.98	23.98		-1.70		30.00	Pass	9	
HE20	MCS0	2	100	5500	52/37	0.08	0.08	12.42	13.53	16.02	23.98		-1.70		30.00	Pass	12	
HE20	MCS0	2	100	5500	106/53	0.08	0.08	15.35	16.46	18.95	23.98		-1.70		30.00	Pass	15	
HE20	MCS0	2	116	5580	Full	0.18	0.18	17.86	18.70	21.31	23.98		-1.70		30.00	Pass	17.5	
HE20	MCS0	2	116	5580	26/0	0.05	0.05	10.32	11.12	13.75	23.98		-1.70		30.00	Pass	9.5	
HE20	MCS0	2	116	5580	52/37	0.08	0.08	13.45	14.33	16.92	23.98		-1.70		30.00	Pass	12.5	
HE20	MCS0	2	116	5580	106/53	0.08	0.08	16.20	17.12	19.69	23.98		-1.70		30.00	Pass	15.5	
HE20	MCS0	2	140	5700	Full	0.18	0.18	18.53	18.02	21.30	23.98		-1.70		30.00	Pass	18	
HE20	MCS0	2	140	5700	26/8	0.05	0.05	10.53	10.19	13.37	23.98		-1.70		30.00	Pass	9.5	
HE20	MCS0	2	140	5700	52/40	0.08	0.08	13.50	13.22	16.37	23.98		-1.70		30.00	Pass	12.5	
HE20	MCS0	2	140	5700	106/54	0.08	0.08	15.89	15.64	18.77	23.98		-1.70		30.00	Pass	15	
HE40	MCS0	2	102	5510	Full	0.34	0.34	17.12	18.35	20.79	23.98		-1.70		30.00	Pass	17	
HE40	MCS0	2	110	5550	Full	0.34	0.34	17.77	18.56	21.19	23.98		-1.70		30.00	Pass	17.5	
HE40	MCS0	2	134	5670	Full	0.34	0.34	18.02	18.15	21.10	23.98		-1.70		30.00	Pass	17.5	
HE80	MCS0	2	106	5530	Full	0.62	0.62	12.87	13.59	16.25	23.98		-1.70		30.00	Pass	13	
HE80	MCS0	2	122	5610	Full	0.62	0.62	17.75	18.44	21.11	23.98		-1.70		30.00	Pass	17.5	
HE160	MCS0	2	114	5570	Full	0.30	0.30	12.12	12.78	15.47	23.98		-1.70		30.00	Pass	12	

FCC U-NII-2C straddle channel MIMO																		
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Duty Factor (dB)		Average Conducted Power with duty factor (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		EIRP Power Limit (dBm)	Pass/Fail	Power Setting	
						Ant 6	Ant 17	Ant 6	Ant 17	SUM	Ant 6	Ant 17	Ant 6	Ant 17			Ant 6	Ant 17
HE20	MCS0	2	144	5720	Full	0.18	0.18	18.32	18.07	21.21	23.98		-1.70		30.00	Pass	18	
HE20	MCS0	2	144	5720	26/8	0.05	0.05	10.39	10.12	13.27	23.98		-1.70		30.00	Pass	9.5	
HE20	MCS0	2	144	5720	52/40	0.08	0.08	13.40	13.11	16.27	23.98		-1.70		30.00	Pass	12.5	
HE20	MCS0	2	144	5720	106/54	0.08	0.08	16.31	15.96	19.15	23.98		-1.70		30.00	Pass	15.5	
HE40	MCS0	2	142	5710	Full	0.34	0.34	18.19	17.91	21.06	23.98		-1.70		30.00	Pass	17.5	
HE80	MCS0	2	138	5690	Full	0.62	0.62	17.95	17.83	20.90	23.98		-1.70		30.00	Pass	17.5	

U-NII-3 MIMO																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power with duty factor (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail	Power Setting	
					Ant 6	Ant 17	Ant 6	Ant 17	SUM	Ant 6	Ant 17	Ant 6	Ant 17		Ant 6	Ant 17
11a	6Mbps	2	149	5745	0.10	0.10	18.84	19.49	22.19	30.00		-1.70		Pass	19	
11a	6Mbps	2	157	5785	0.10	0.10	18.45	19.01	21.75	30.00		-1.70		Pass	19	
11a	6Mbps	2	165	5825	0.10	0.10	18.72	18.66	21.70	30.00		-1.70		Pass	19	
HT20	MCS0	2	149	5745	0.10	0.10	17.62	18.22	20.94	30.00		-1.70		Pass	18	
HT20	MCS0	2	157	5785	0.10	0.10	17.52	18.02	20.79	30.00		-1.70		Pass	18	
HT20	MCS0	2	165	5825	0.10	0.10	17.74	17.62	20.69	30.00		-1.70		Pass	18	
HT40	MCS0	2	151	5755	0.27	0.27	16.99	17.38	20.19	30.00		-1.70		Pass	17	
HT40	MCS0	2	159	5795	0.27	0.27	16.78	17.27	20.04	30.00		-1.70		Pass	17	
VHT20	MCS0	2	149	5745	0.16	0.16	17.77	18.33	21.06	30.00		-1.70		Pass	18	
VHT20	MCS0	2	157	5785	0.16	0.16	17.61	18.16	20.90	30.00		-1.70		Pass	18	
VHT20	MCS0	2	165	5825	0.16	0.16	17.87	17.70	20.79	30.00		-1.70		Pass	18	
VHT40	MCS0	2	151	5755	0.28	0.28	17.04	17.45	20.26	30.00		-1.70		Pass	17	
VHT40	MCS0	2	159	5795	0.28	0.28	16.83	17.35	20.11	30.00		-1.70		Pass	17	
VHT80	MCS0	2	155	5775	0.55	0.55	15.77	16.40	19.11	30.00		-1.70		Pass	16	

U-NII-3 MIMO																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Duty Factor (dB)		Average Conducted Power with duty factor (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail	Power Setting	
						Ant 6	Ant 17	Ant 6	Ant 17	SUM	Ant 6	Ant 17	Ant 6	Ant 17		Ant 6	Ant 17
HE20	MCS0	2	149	5745	Full	0.18	0.18	17.84	18.39	21.14	30.00		-1.70		Pass	18	
HE20	MCS0	2	149	5745	26/0	0.05	0.05	10.03	10.52	13.29	30.00		-1.70		Pass	9.5	
HE20	MCS0	2	149	5745	52/37	0.08	0.08	13.11	13.70	16.42	30.00		-1.70		Pass	12.5	
HE20	MCS0	2	149	5745	106/53	0.08	0.08	16.11	16.49	19.31	30.00		-1.70		Pass	15.5	
HE20	MCS0	2	157	5785	Full	0.18	0.18	17.64	18.22	20.95	30.00		-1.70		Pass	18	
HE20	MCS0	2	157	5785	26/0	0.05	0.05	9.73	10.40	13.09	30.00		-1.70		Pass	9.5	
HE20	MCS0	2	157	5785	52/37	0.08	0.08	12.77	13.49	16.15	30.00		-1.70		Pass	12.5	
HE20	MCS0	2	157	5785	106/53	0.08	0.08	15.59	16.36	19.00	30.00		-1.70		Pass	15.5	
HE20	MCS0	2	165	5825	Full	0.18	0.18	17.93	17.79	20.87	30.00		-1.70		Pass	18	
HE20	MCS0	2	165	5825	26/8	0.05	0.05	10.23	10.10	13.18	30.00		-1.70		Pass	10	
HE20	MCS0	2	165	5825	52/40	0.08	0.08	13.46	13.22	16.35	30.00		-1.70		Pass	13	
HE20	MCS0	2	165	5825	106/54	0.08	0.08	16.09	16.23	19.17	30.00		-1.70		Pass	16	
HE40	MCS0	2	151	5755	Full	0.34	0.34	17.47	18.06	20.79	30.00		-1.70		Pass	17.5	
HE40	MCS0	2	159	5795	Full	0.34	0.34	17.25	18.03	20.67	30.00		-1.70		Pass	17.5	
HE80	MCS0	2	155	5775	Full	0.62	0.62	17.24	17.94	20.61	30.00		-1.70		Pass	17.5	

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 UNII-1/2A/2C

 # 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 UNII-3

 # Method SA-2 #

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

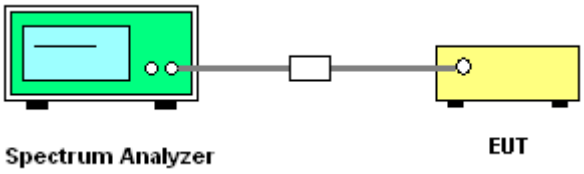
- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 500KHz (or 300 kHz if the SA can’t set RBW=500KHz).
- Set VBW ≥ 1 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces 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. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

Method (b): Measure and sum spectral maxima across the outputs.

The measurement on each individual output were performed with the same span and number on each individual output. The maximum value (peak) of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs.

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	68.2

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.

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

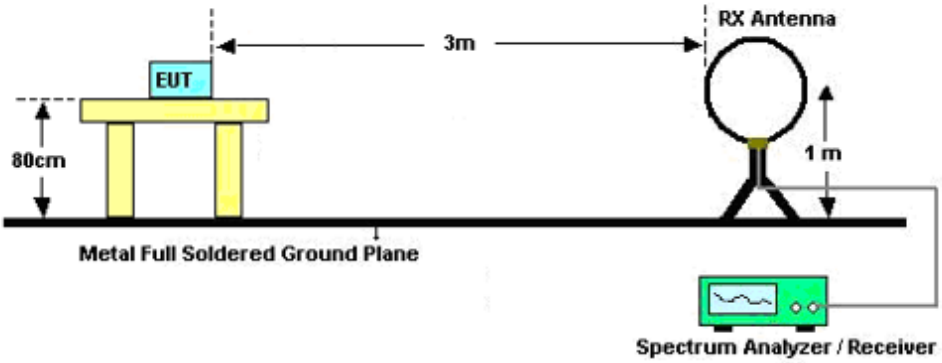
   - RBW = 1 MHz
   - VBW = 3 MHz
   - Detector = power averaging (rms), set span/(# of points in sweep) ≥ RBW/2.
   - Averaging type = power averaging(RMS)
   - The correction factor shall be offset is 10 log (1/x), where x is the duty cycle.
2. The EUT was placed on a turntable with 0.8 meter for frequency 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.

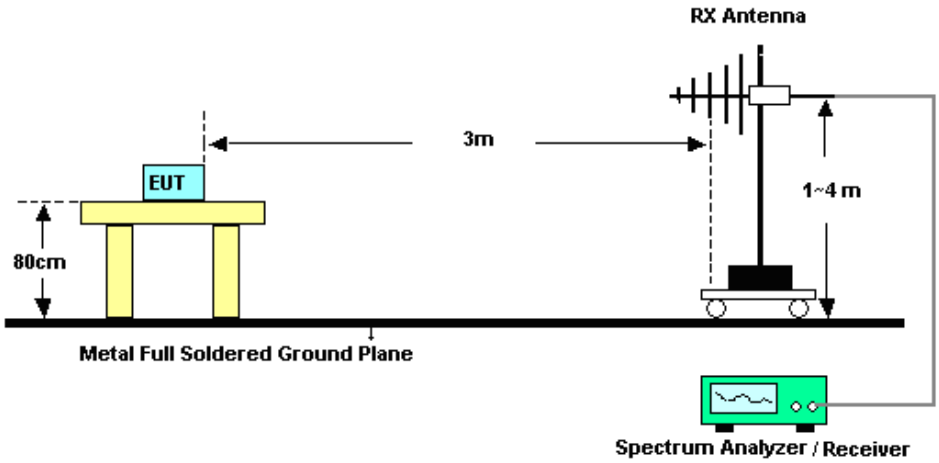
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.4.4 Test Setup

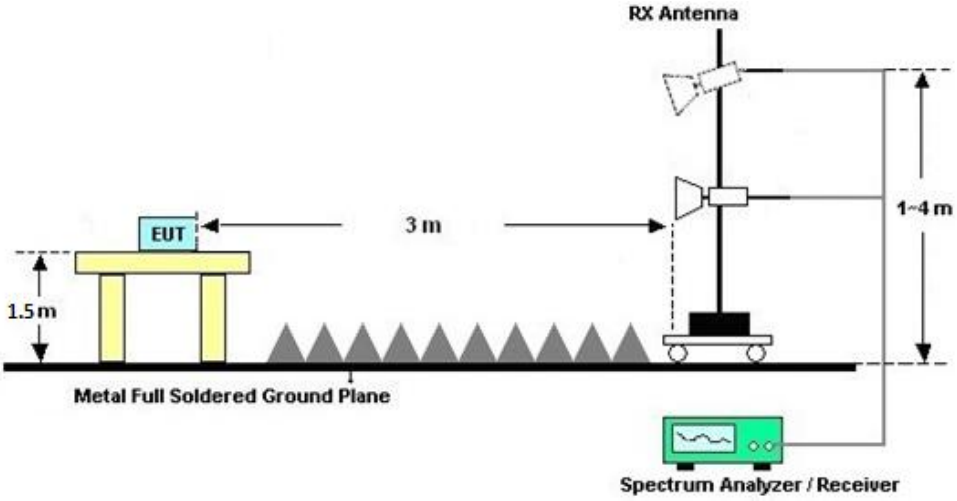
For radiated emissions below 30MHz



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.

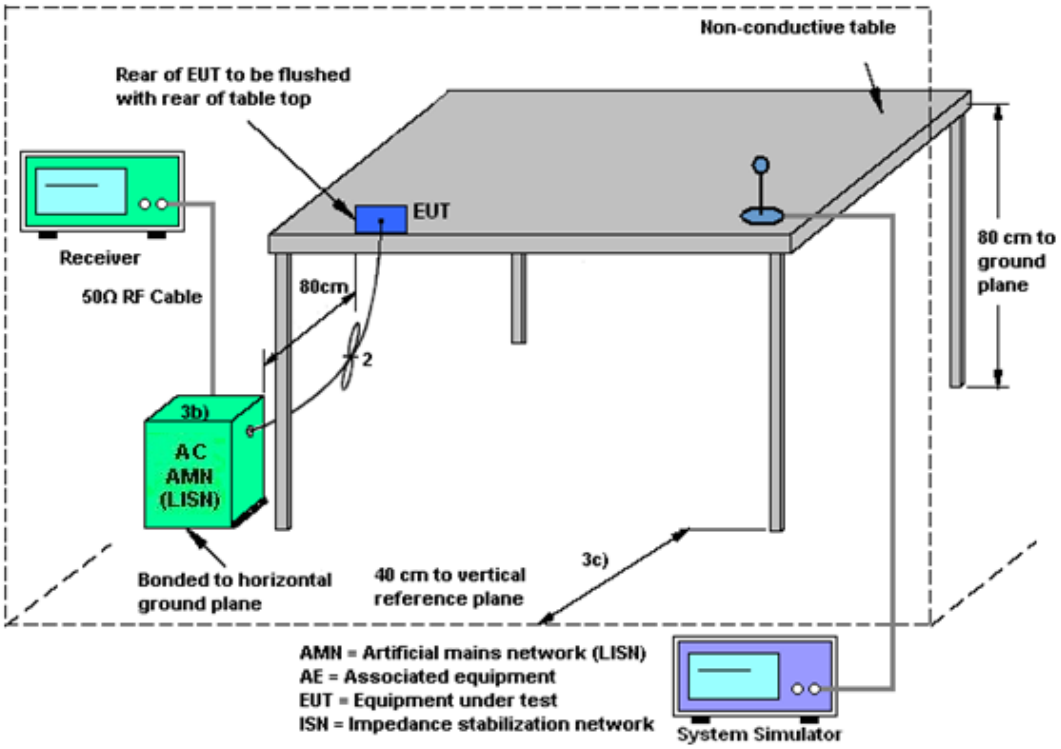
3.5.2 Measuring Instruments

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

<CDD Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain = GANT + Array Gain, where Array Gain is as follows.

For power spectral density (PSD) measurements on all devices,

Array Gain = 10 log(NANT/NSS=1) dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4.

Directional gain may be calculated by using the formulas applicable to equal gain antennas with GANT set equal to the gain of the antenna having the highest gain;

The EUT supports CDD mode.

For power, the directional gain GANT is set equal to the antenna having the highest gain, i.e., F)2)f)i).

For PSD, the directional gain calculation is following F)2)f)ii) of KDB 662911 D01 v02r01.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain “DG” is calculated as following table.

<CDD Modes>

	Ant. 6 (dBi)	Ant. 17 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
UNII-1	-2.30	-2.80	-2.30	0.46	0.00	0.00
UNII-2A	-2.50	-1.60	-1.60	0.97	0.00	0.00
UNII-2C	-2.20	-1.70	-1.70	1.06	0.00	0.00
UNII-3	-2.20	-1.70	-1.70	1.06	0.00	0.00

Power limit reduction = Composite gain – 6dBi, (min = 0)

PSD limit reduction = Composite gain + PSD Array gain – 6dBi, (min = 0)

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. 11, 2023	May 06, 2024~ May 22, 2024	Oct. 10, 2024	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 02, 2024	May 06, 2024~ May 22, 2024	Jan. 01, 2025	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 02, 2024	May 06, 2024~ May 22, 2024	Jan. 01, 2025	Conducted (TH01-KS)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz	Oct. 18, 2023	May 28, 2024~ May 29, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Jul. 07, 2023	May 28, 2024~ May 29, 2024	Jul. 06, 2024	Radiation (03CH04-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jun. 28, 2022	May 28, 2024~ May 29, 2024	Jun. 27, 2024	Radiation (03CH04-SZ)
Bilog Antenna	TeseQ	CBL6111D	41909	30MHz~1GHz	May 09, 2024	May 28, 2024~ May 29, 2024	May 08, 2025	Radiation (03CH04-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1474	1GHz~18GHz	Jul. 07, 2023	May 28, 2024~ May 29, 2024	Jul. 06, 2024	Radiation (03CH04-SZ)
Horn Antenna	SCHWARZBECK	BBHA9170	9170#679	15GHz~40GHz	Jul. 08, 2023	May 28, 2024~ May 29, 2024	Jul. 07, 2024	Radiation (03CH04-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz ~3000MHz	Oct. 18, 2023	May 28, 2024~ May 29, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 18, 2023	May 28, 2024~ May 29, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 07, 2023	May 28, 2024~ May 29, 2024	Jul. 06, 2024	Radiation (03CH04-SZ)
Amplifier	Agilent Technologies	83017A	MY57280136	500MHz~26.5GHz	Aug. 21, 2023	May 28, 2024~ May 29, 2024	Aug. 20, 2024	Radiation (03CH04-SZ)
AC Power Source	APC	AFV-S-600B	F119050019	N/A	Oct. 18, 2023	May 28, 2024~ May 29, 2024	Oct. 17, 2024	Radiation (03CH04-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	May 28, 2024~ May 29, 2024	NCR	Radiation (03CH04-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	May 28, 2024~ May 29, 2024	NCR	Radiation (03CH04-SZ)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 10, 2023	May 28, 2024~ May 29, 2024	Oct. 09, 2024	Radiation (03CH03-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY55370528	10Hz-44GHz	Oct. 11, 2023	May 28, 2024~ May 29, 2024	Oct. 10, 2024	Radiation (03CH03-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 10, 2023	May 28, 2024~ May 29, 2024	Oct. 09, 2024	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	23182	30MHz-1GHz	Dec. 20, 2023	May 28, 2024~ May 29, 2024	Dec. 19, 2024	Radiation (03CH03-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Dec. 21, 2023	May 28, 2024~ May 29, 2024	Dec. 20, 2024	Radiation (03CH03-KS)
SHF-EHF Horn	com-power	AH-840	101116	18GHz~40GHz	Oct. 10, 2023	May 28, 2024~ May 29, 2024	Oct. 09, 2024	Radiation (03CH03-KS)
Amplifier	SONOMA	310N	413740	30MHz ~1000MHz	Jan. 05, 2024	May 28, 2024~ May 29, 2024	Jan. 04, 2025	Radiation (03CH03-KS)
Amplifier	EM	EM18G40GA	060851	18~40GHz	Jan. 05, 2024	May 28, 2024~ May 29, 2024	Jan. 04, 2025	Radiation (03CH03-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2082394	1Ghz-18Ghz	Jan. 05, 2024	May 28, 2024~ May 29, 2024	Jan. 04, 2025	Radiation (03CH03-KS)
Amplifier	Keysight	83017A	MY53270319	1GHz~26.5GHz	Oct. 10, 2023	May 28, 2024~ May 29, 2024	Oct. 09, 2024	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	May 28, 2024~ May 29, 2024	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	May 28, 2024~ May 29, 2024	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	May 28, 2024~ May 29, 2024	NCR	Radiation (03CH03-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 18, 2024	May 30, 2024	Apr. 17, 2025	Conduction (CO01-KS)

AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 11, 2023	May 30, 2024	Oct. 10, 2024	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	Apr. 18, 2024	May 30, 2024	Apr. 17, 2025	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 11, 2023	May 30, 2024	Oct. 10, 2024	Conduction (CO01-KS)

NCR: No Calibration Required

5 Measurement Uncertainty

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

Conducted Spurious Emission & Bandedge	**±2.26 dB**
Occupied Channel Bandwidth	**±0.1%**
Conducted Power	**±0.46 dB**
Conducted Power Spectral Density	**±0.88 dB**
Frequency	**±0.4 Hz**

Uncertainty of AC Conducted Emission Measurement (0.15 MHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.84 dB**

Uncertainty of Radiated Emission Measurement (9 KHz ~ 30 MHz) for 03CH03-KS

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.30 dB**

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz) for 03CH03-KS

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.08 dB**

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz) for 03CH03-KS

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.18 dB**

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz) for 03CH03-KS

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.22 dB**

Uncertainty of Radiated Emission Measurement (9 KHz ~ 30 MHz) for 03CH04-SZ

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.1 dB

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz) for 03CH04-SZ

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.1 dB

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz) for 03CH04-SZ

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.8 dB

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz) for 03CH04-SZ

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.1 dB

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

Appendix A. Conducted Test Results

Case No. : 442515	
Ambient Condition: 25 ℃, 45 %RH	
According Standard: ■Part15E	
Test Date: 2024.5.6~2024.5.22	**Test Engineer:** Jiang Jun

Emission Bandwidth

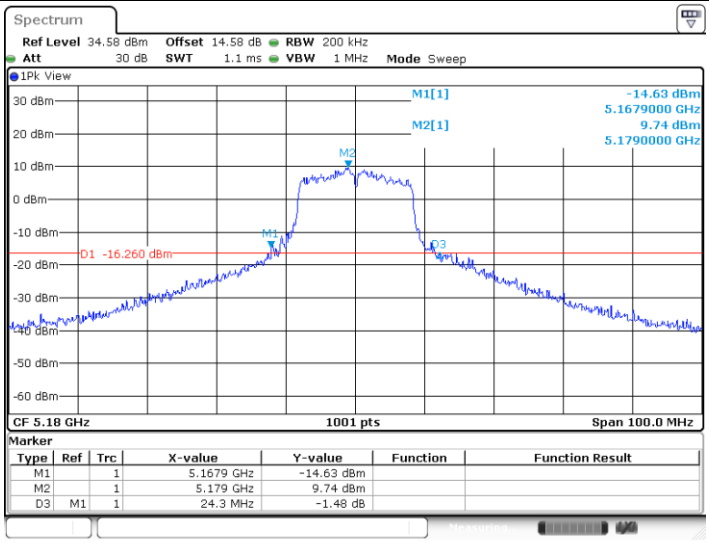
Test Result

TestMode	Antenna	Freq(MHz)	26dB EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A-CDD	Ant6	5180	24.30	5167.90	5192.20	---	---
	Ant17	5180	24.00	5168.00	5192.00	---	---
	Ant6	5220	23.00	5209.00	5232.00	---	---
	Ant17	5220	24.90	5207.70	5232.60	---	---
	Ant6	5240	21.60	5229.10	5250.70	---	---
	Ant17	5240	21.60	5229.10	5250.70	---	---
	Ant6	5260	21.30	5249.60	5270.90	---	---
	Ant17	5260	24.80	5247.80	5272.60	---	---
	Ant6	5300	25.10	5287.50	5312.60	---	---
	Ant17	5300	23.70	5288.30	5312.00	---	---
	Ant6	5320	22.50	5308.10	5330.60	---	---
	Ant17	5320	25.90	5307.90	5333.80	---	---
	Ant6	5500	29.00	5486.30	5515.30	---	---
	Ant17	5500	29.70	5486.30	5516.00	---	---
	Ant6	5580	28.60	5565.90	5594.50	---	---
	Ant17	5580	33.00	5564.80	5597.80	---	---
	Ant6	5700	26.70	5685.60	5712.30	---	---
	Ant17	5700	25.90	5686.00	5711.90	---	---
	Ant6	5720	29.00	5705.50	5734.50	---	---
	Ant17	5720	28.60	5705.60	5734.20	---	---
	Ant6	5745	23.70	5734.90	5758.60	---	---
	Ant17	5745	26.00	5733.80	5759.80	---	---
	Ant6	5785	26.20	5772.50	5798.70	---	---
	Ant17	5785	31.60	5768.90	5800.50	---	---
	Ant6	5825	27.00	5808.50	5835.50	---	---
	Ant17	5825	31.80	5807.70	5839.50	---	---
11AX20MIMO	Ant6	5180	26.90	5166.40	5193.30	---	---
	Ant17	5180	27.10	5168.10	5195.20	---	---
	Ant6	5220	21.50	5209.10	5230.60	---	---
	Ant17	5220	21.30	5209.30	5230.60	---	---
	Ant6	5240	21.50	5229.40	5250.90	---	---
	Ant17	5240	21.50	5229.40	5250.90	---	---
	Ant6	5260	21.60	5249.10	5270.70	---	---
	Ant17	5260	21.50	5249.30	5270.80	---	---
	Ant6	5300	26.50	5286.60	5313.10	---	---
	Ant17	5300	23.90	5287.60	5311.50	---	---
	Ant6	5320	25.00	5306.70	5331.70	---	---
	Ant17	5320	24.00	5307.40	5331.40	---	---

	Ant6	5500	26.50	5487.30	5513.80	---	---
	Ant17	5500	26.50	5487.30	5513.80	---	---
	Ant6	5580	27.00	5566.20	5593.20	---	---
	Ant17	5580	27.00	5566.20	5593.20	---	---
	Ant6	5700	23.30	5687.60	5710.90	---	---
	Ant17	5700	23.30	5687.60	5710.90	---	---
	Ant6	5720	23.30	5708.40	5731.70	---	---
	Ant17	5720	24.70	5709.00	5733.70	---	---
	Ant6	5745	24.70	5734.30	5759.00	---	---
	Ant17	5745	28.20	5734.00	5762.20	---	---
	Ant6	5785	21.70	5774.10	5795.80	---	---
	Ant17	5785	25.30	5771.20	5796.50	---	---
	Ant6	5825	23.70	5812.00	5835.70	---	---
	Ant17	5825	21.90	5813.50	5835.40	---	---
11AX40MIMO	Ant6	5190	54.00	5165.00	5219.00	---	---
	Ant17	5190	62.80	5165.00	5227.80	---	---
	Ant6	5230	39.60	5210.20	5249.80	---	---
	Ant17	5230	39.80	5210.20	5250.00	---	---
	Ant6	5270	39.80	5250.20	5290.00	---	---
	Ant17	5270	48.60	5245.40	5294.00	---	---
	Ant6	5310	51.00	5283.60	5334.60	---	---
	Ant17	5310	55.40	5278.80	5334.20	---	---
	Ant6	5510	62.60	5485.00	5547.60	---	---
	Ant17	5510	54.20	5484.80	5539.00	---	---
	Ant6	5550	39.60	5530.40	5570.00	---	---
	Ant17	5550	69.20	5518.60	5587.80	---	---
	Ant6	5670	52.20	5643.20	5695.40	---	---
	Ant17	5670	74.20	5633.60	5707.80	---	---
	Ant6	5710	49.40	5685.20	5734.60	---	---
	Ant17	5710	48.20	5686.00	5734.20	---	---
	Ant6	5755	48.60	5735.40	5784.00	---	---
	Ant17	5755	48.60	5735.40	5784.00	---	---
	Ant6	5795	39.60	5775.40	5815.00	---	---
	Ant17	5795	74.40	5758.60	5833.00	---	---
11AX80MIMO	Ant6	5210	80.80	5170.00	5250.80	---	---
	Ant17	5210	84.40	5166.00	5250.40	---	---
	Ant6	5290	94.00	5236.40	5330.40	---	---
	Ant17	5290	82.00	5250.00	5332.00	---	---
	Ant6	5530	91.60	5488.00	5579.60	---	---
	Ant17	5530	106.40	5485.60	5592.00	---	---
	Ant6	5610	90.80	5559.60	5650.40	---	---
	Ant17	5610	94.40	5564.00	5658.40	---	---
	Ant6	5690	100.80	5645.20	5746.00	---	---
	Ant17	5690	80.80	5650.00	5730.80	---	---
	Ant6	5775	80.40	5735.00	5815.40	---	---
	Ant17	5775	81.60	5733.80	5815.40	---	---
11AX160MIMO	Ant6	5250	162.40	5169.20	5331.60	---	---
	Ant17	5250	162.40	5169.20	5331.60	---	---
	Ant6	5570	166.40	5489.20	5655.60	---	---
	Ant17	5570	162.40	5489.20	5651.60	---	---

Test Graphs

11A-CDD_Ant6_5180



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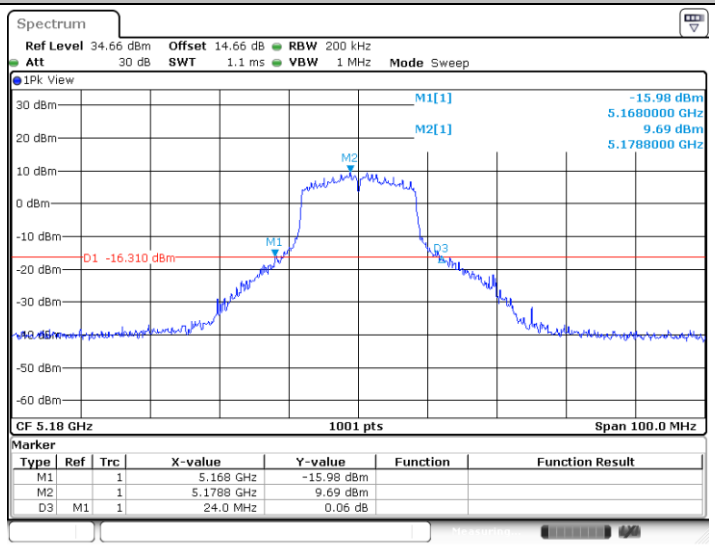

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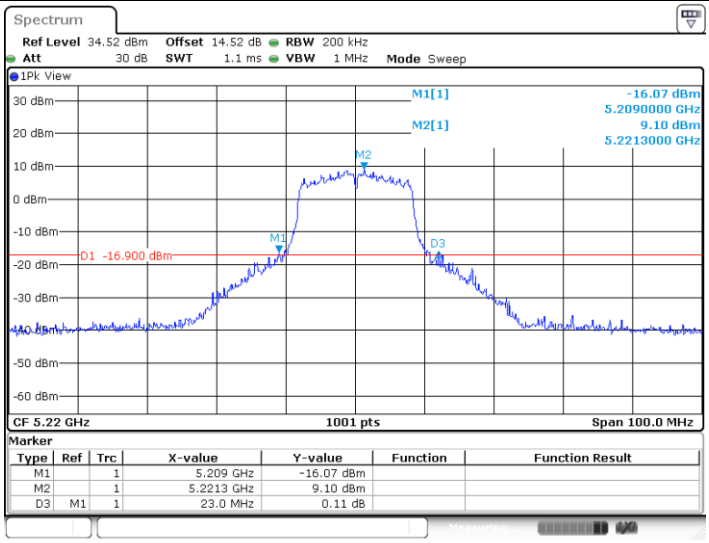

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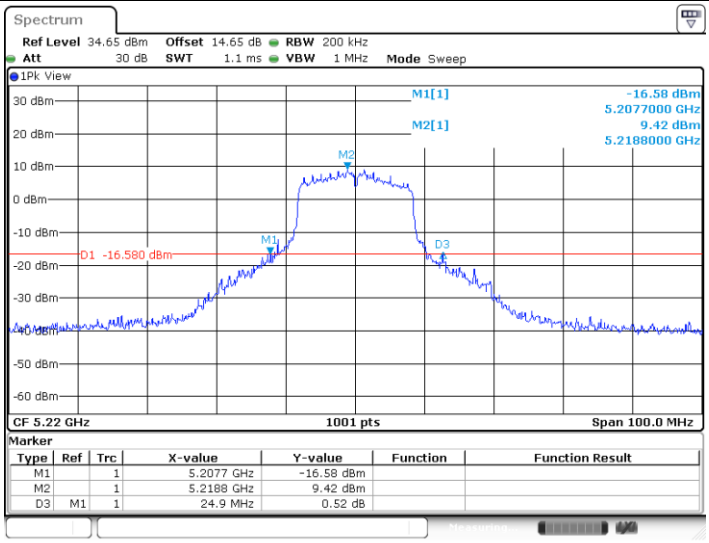

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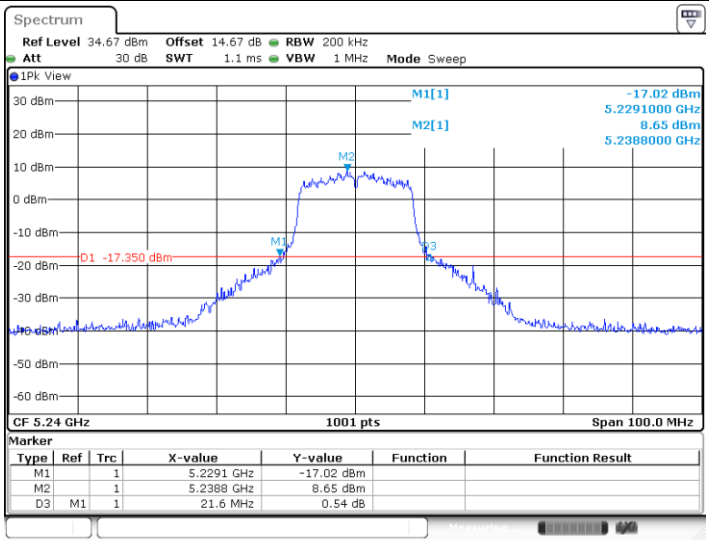

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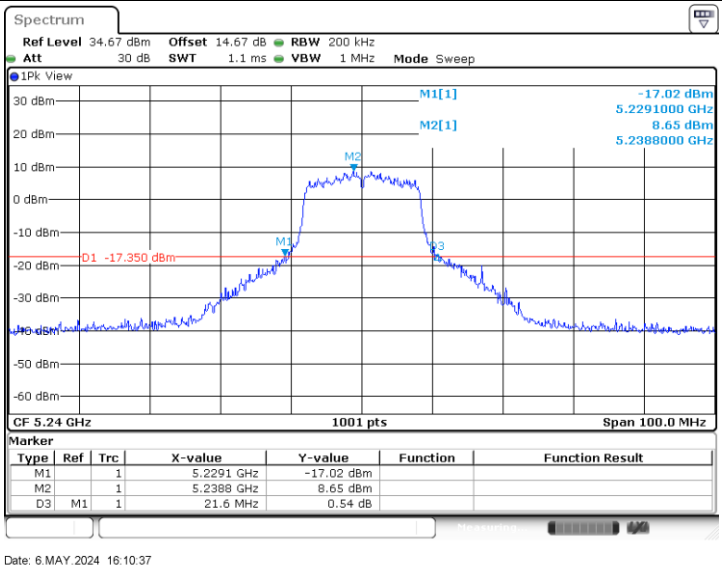

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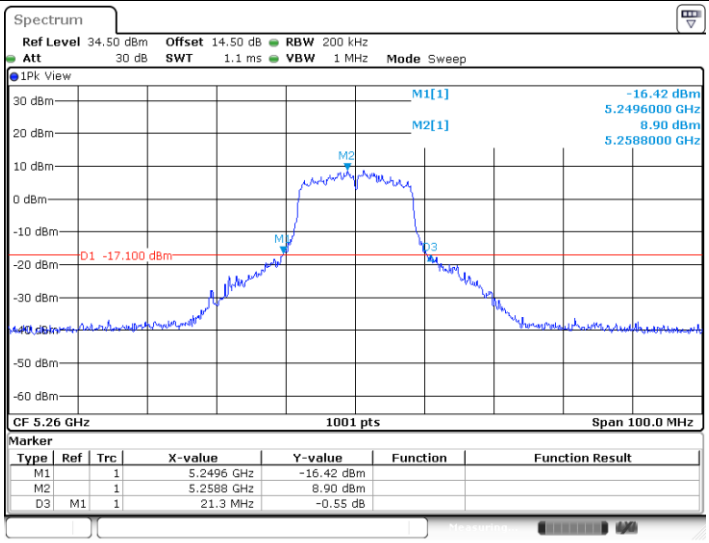

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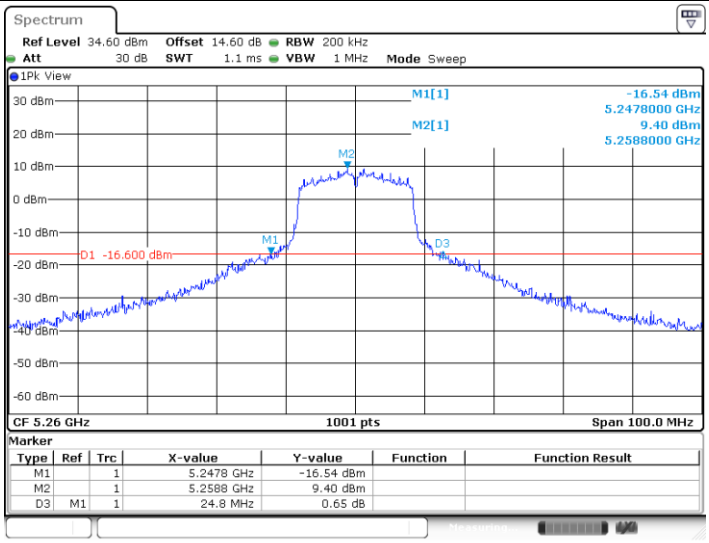

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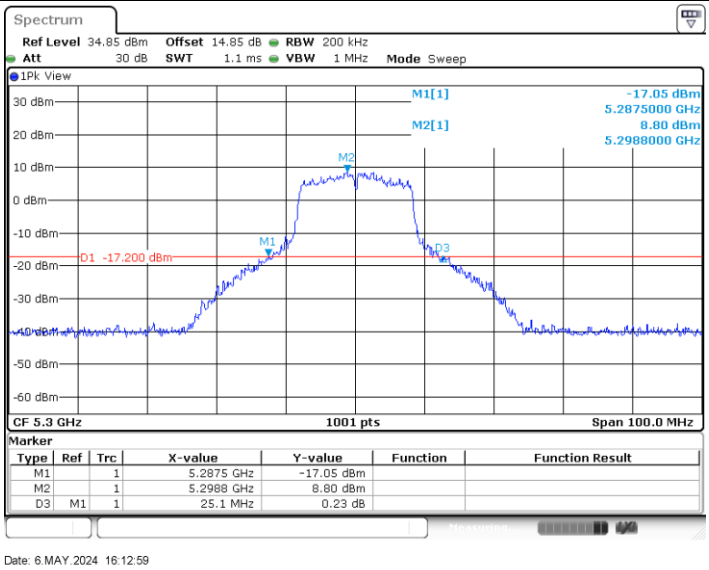

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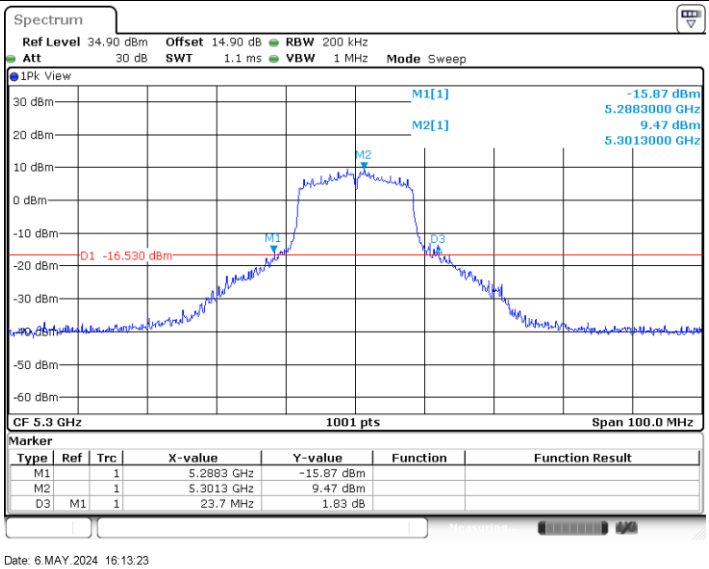

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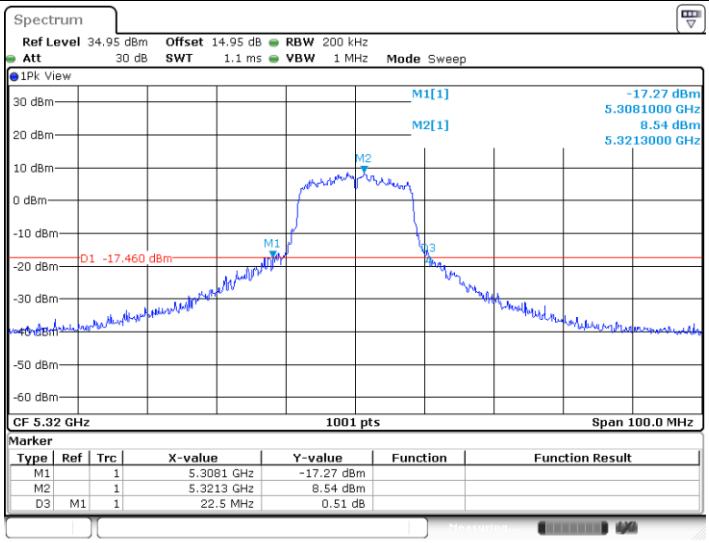

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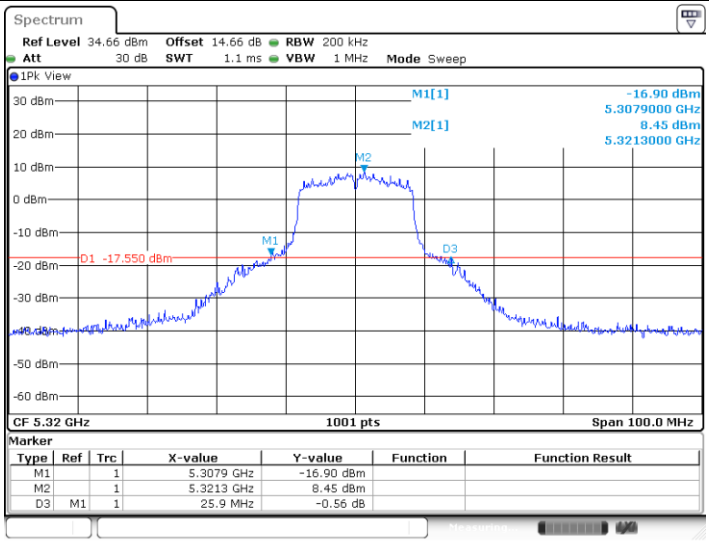

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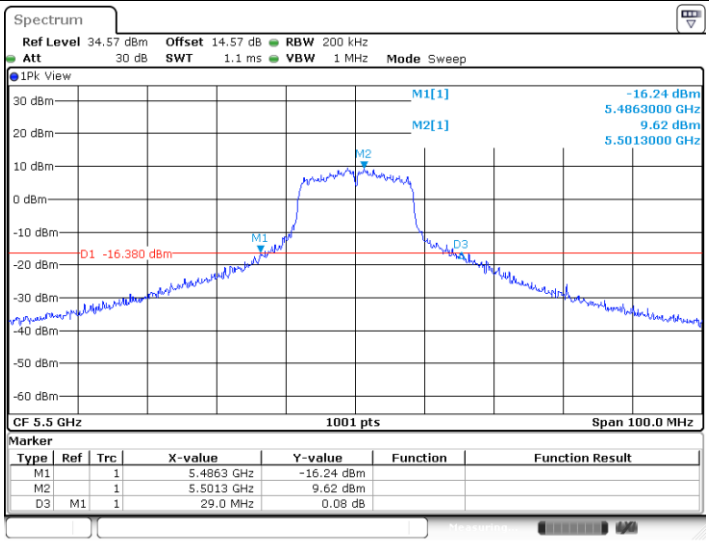

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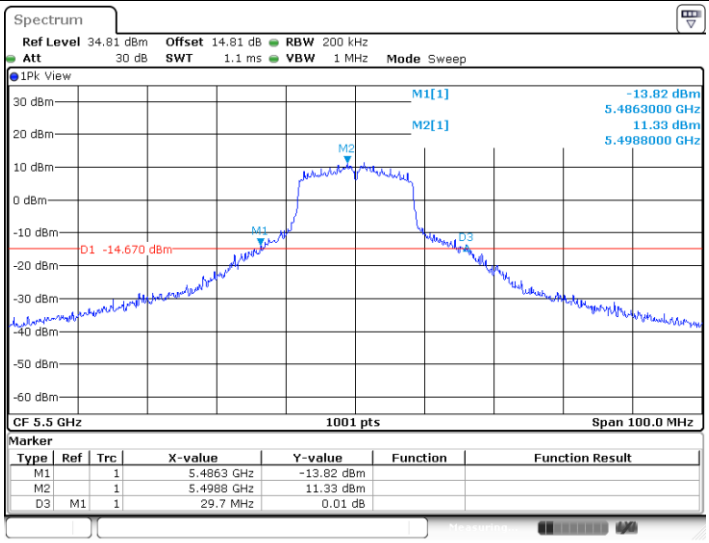

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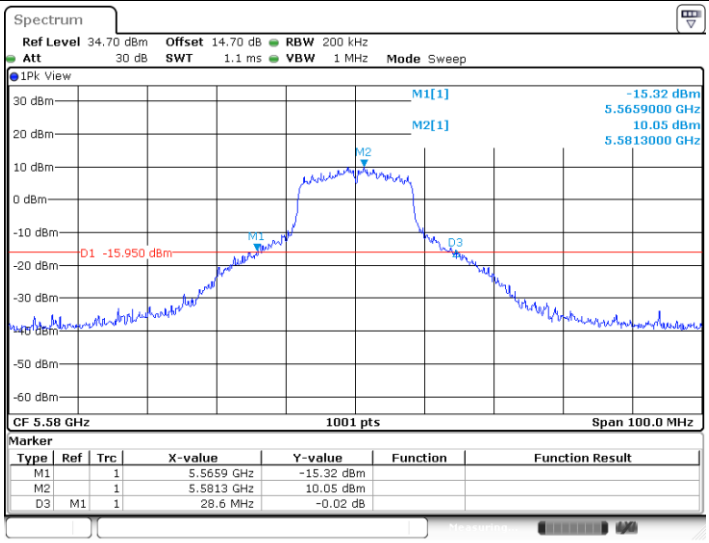

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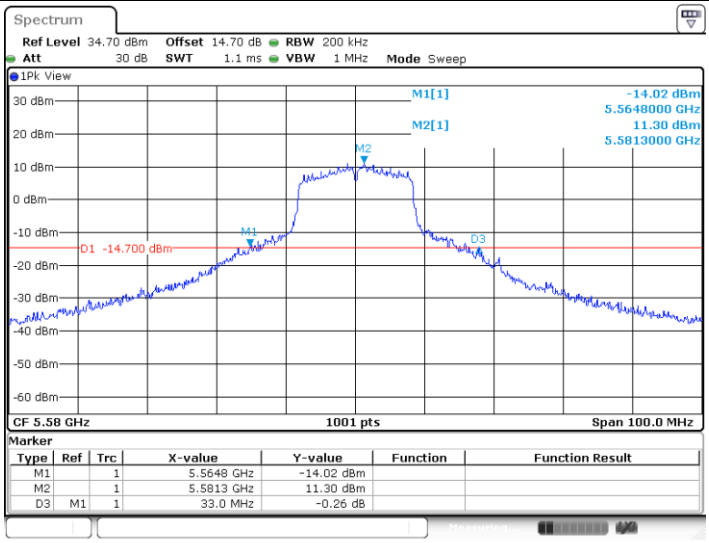

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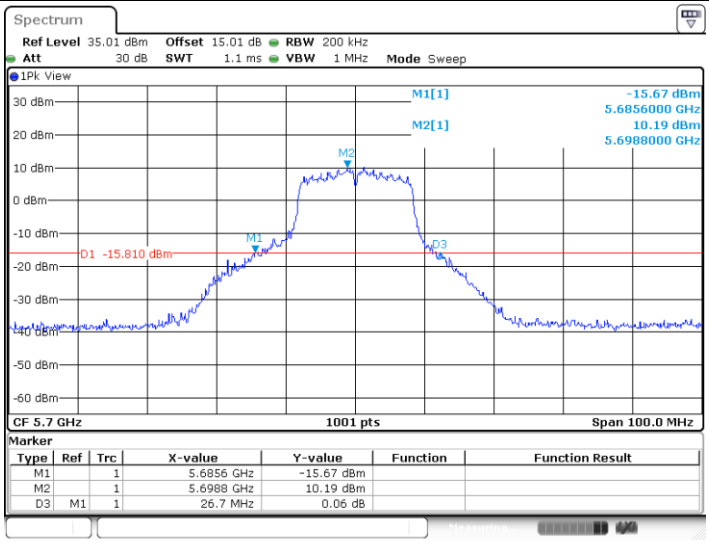

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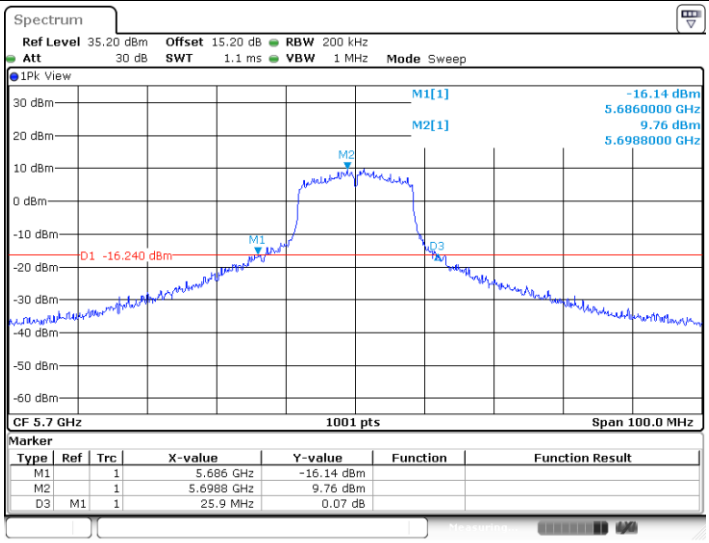

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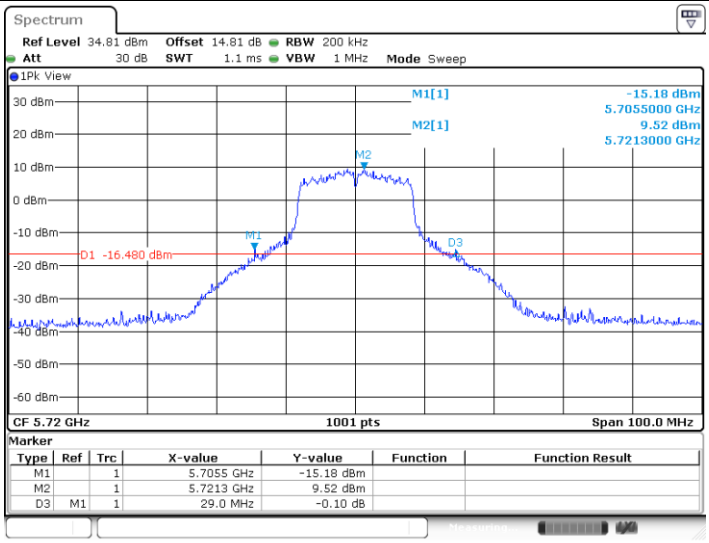

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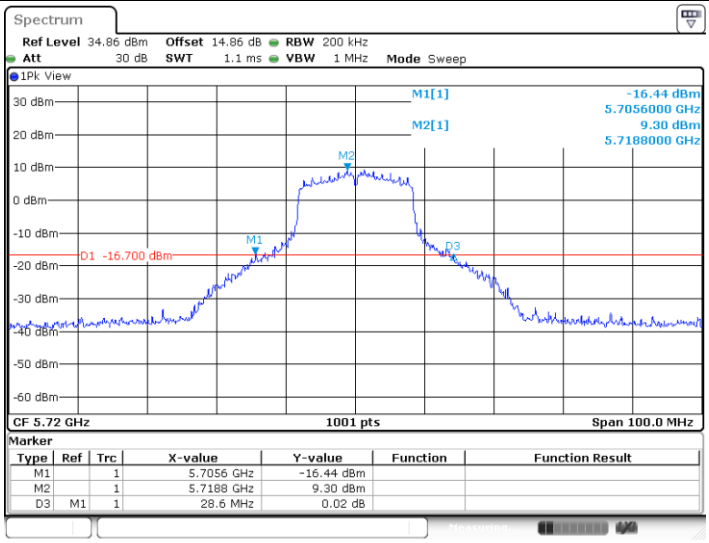

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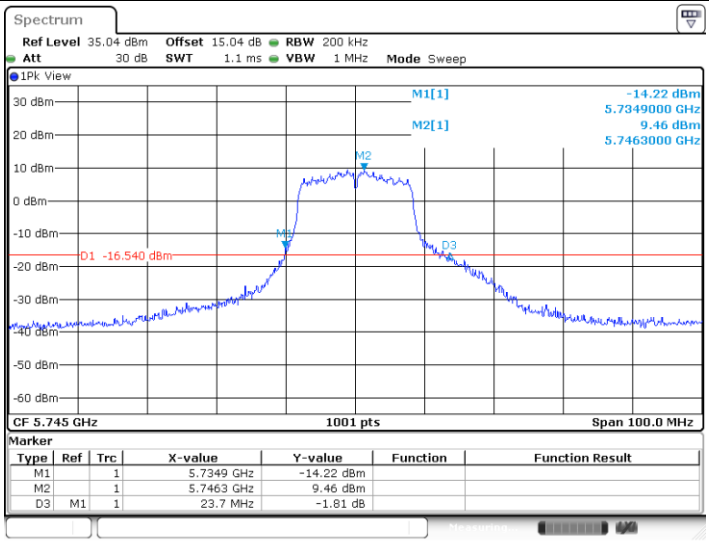

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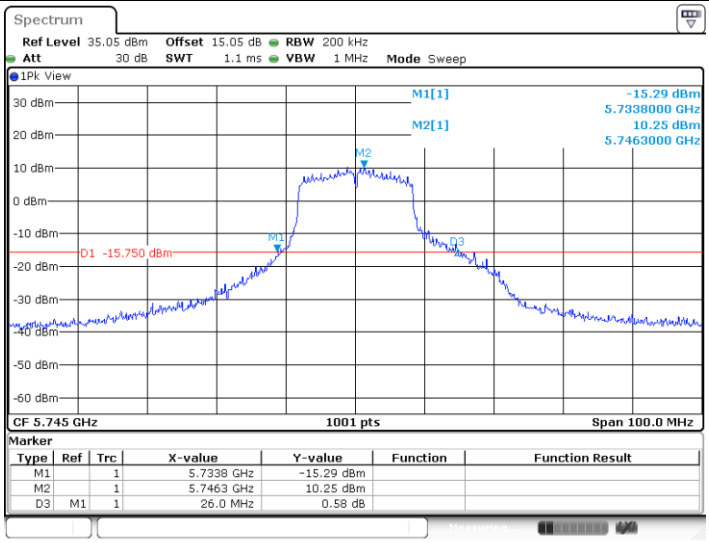

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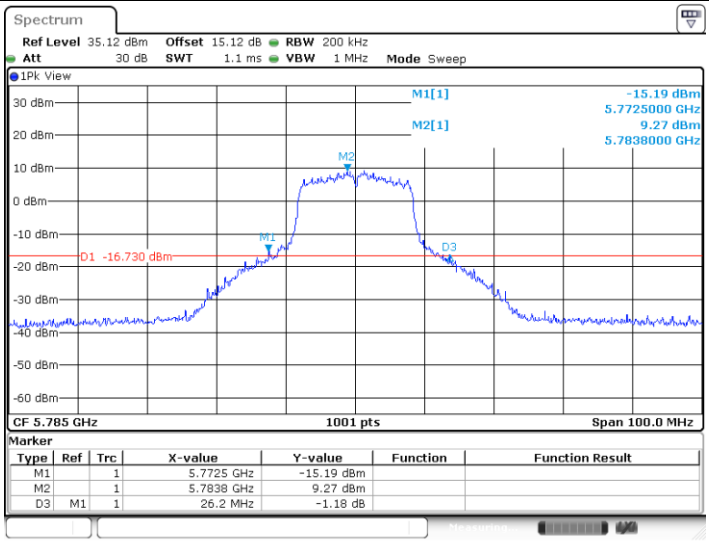

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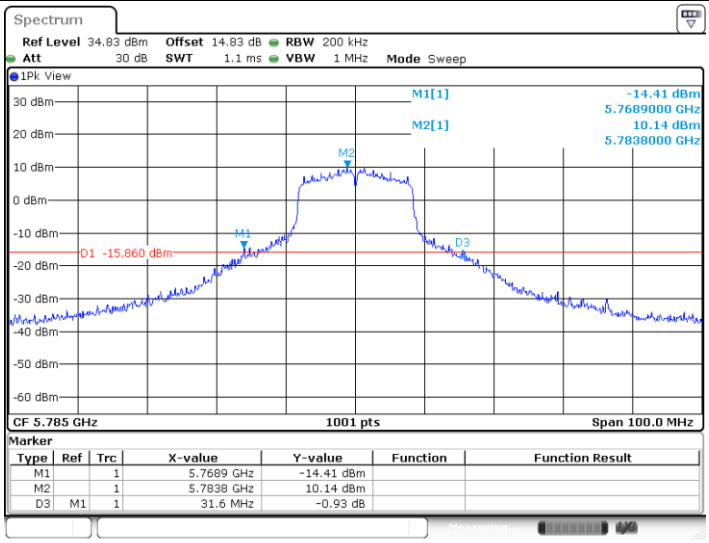

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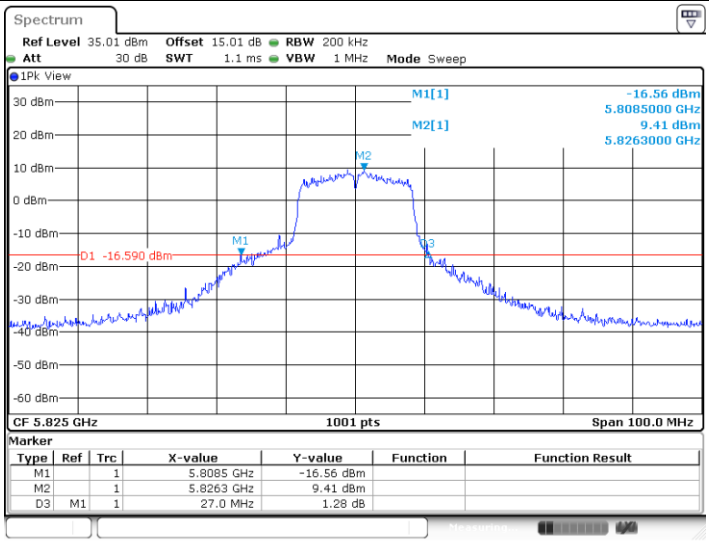

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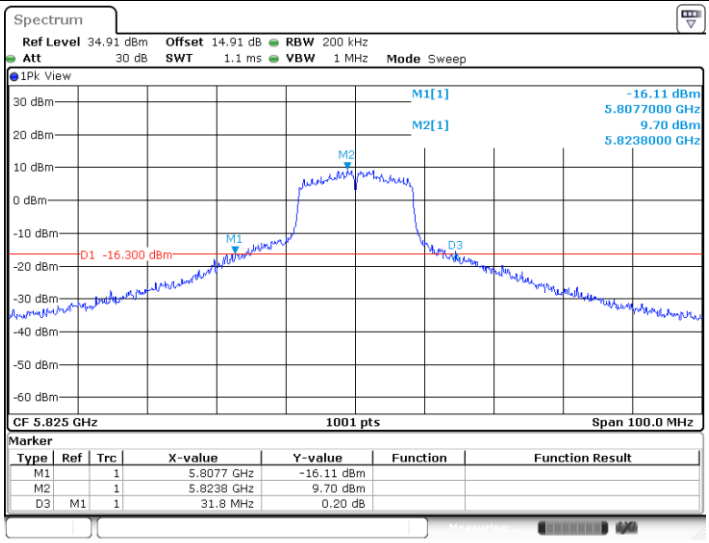

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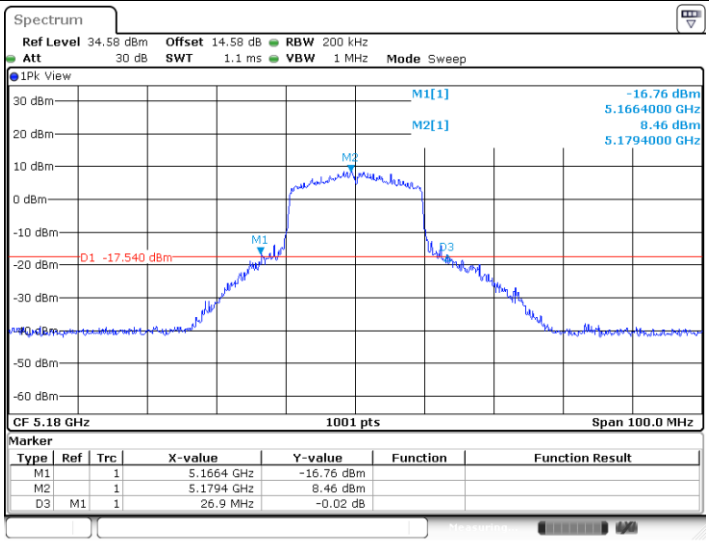

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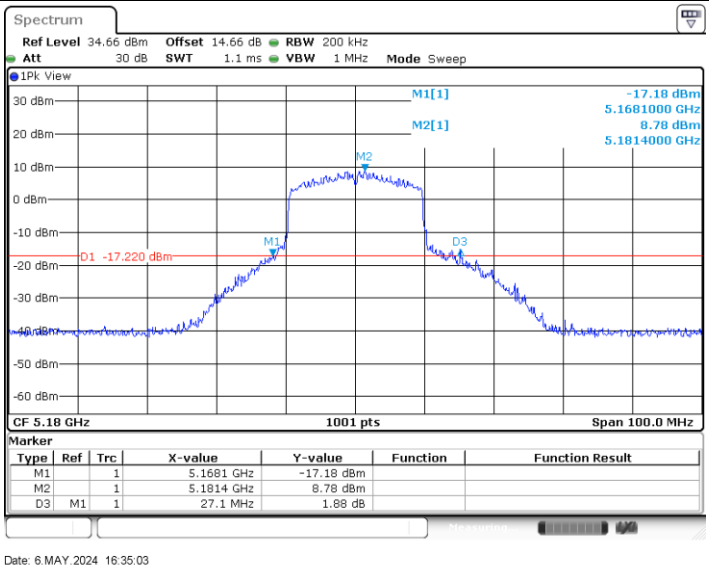

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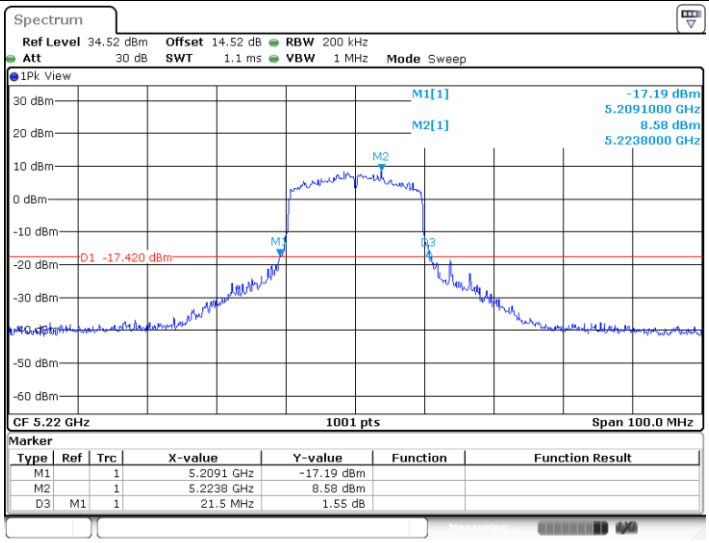

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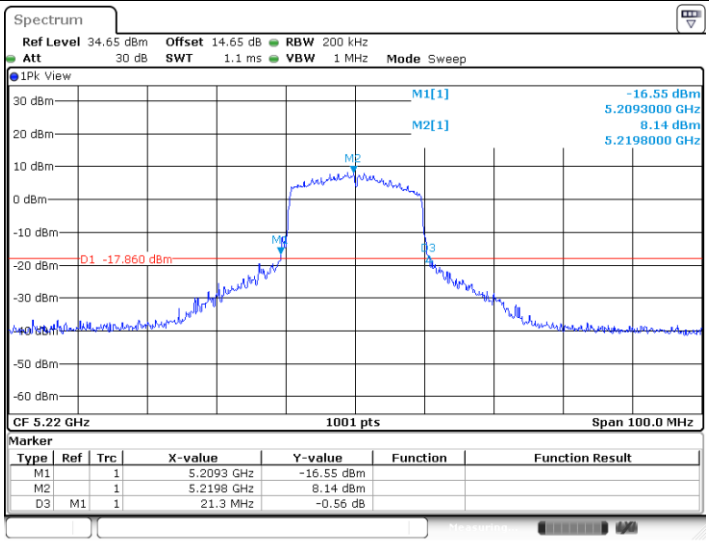

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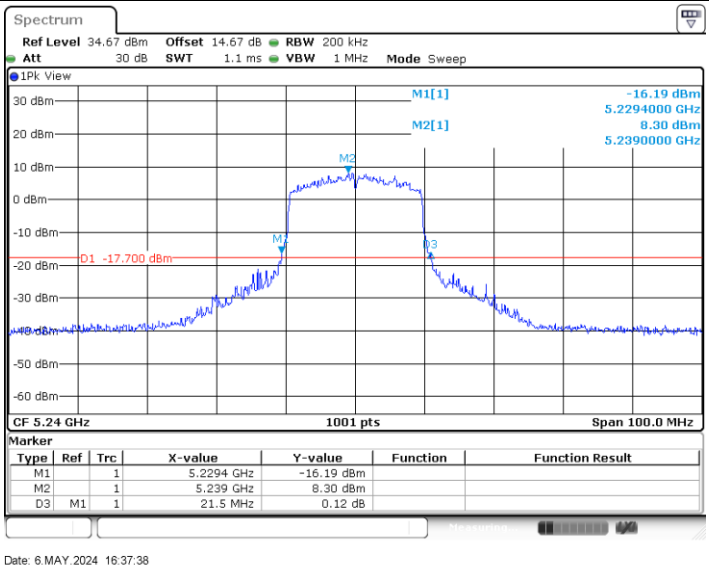

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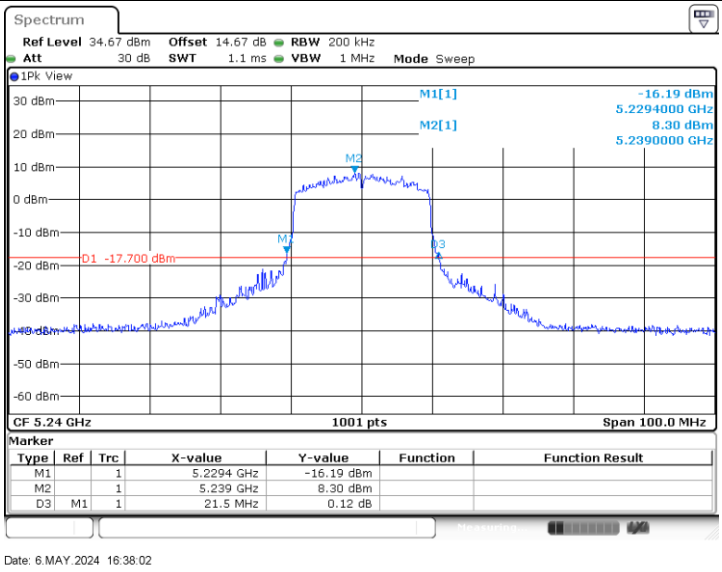

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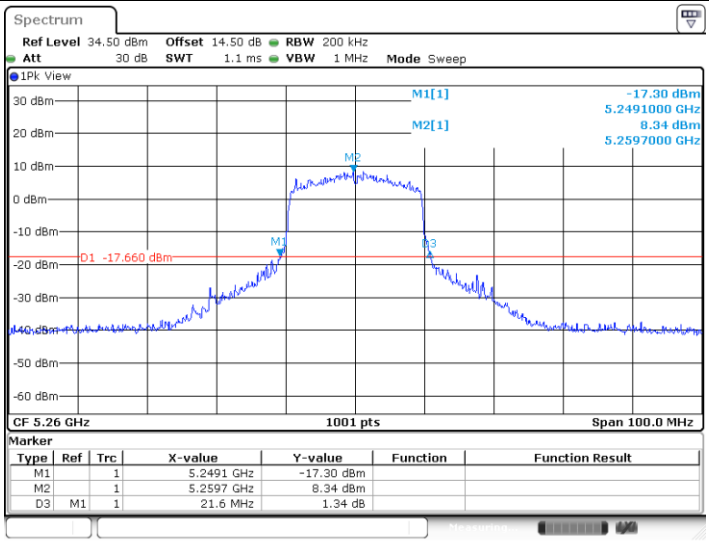

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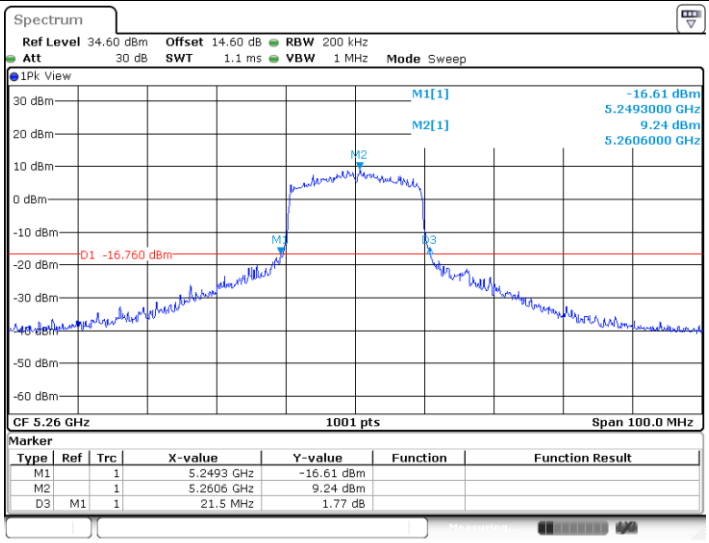

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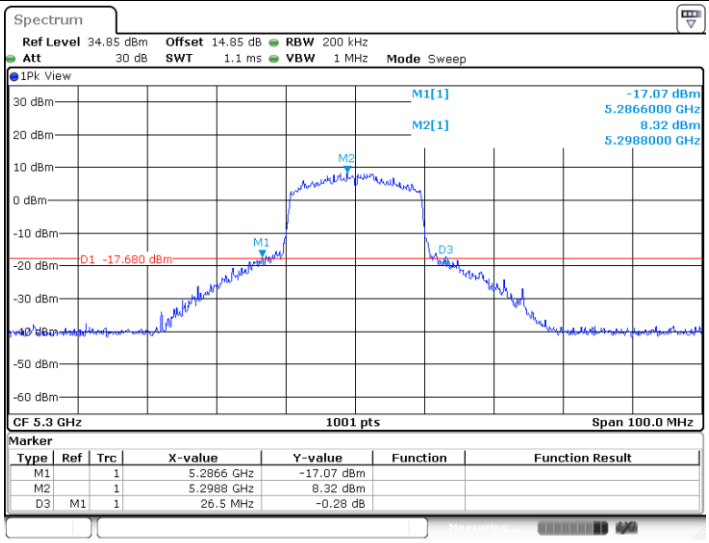

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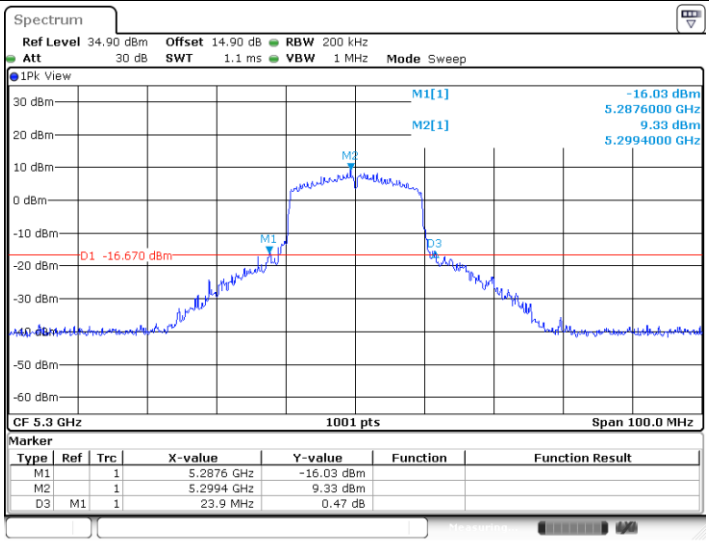

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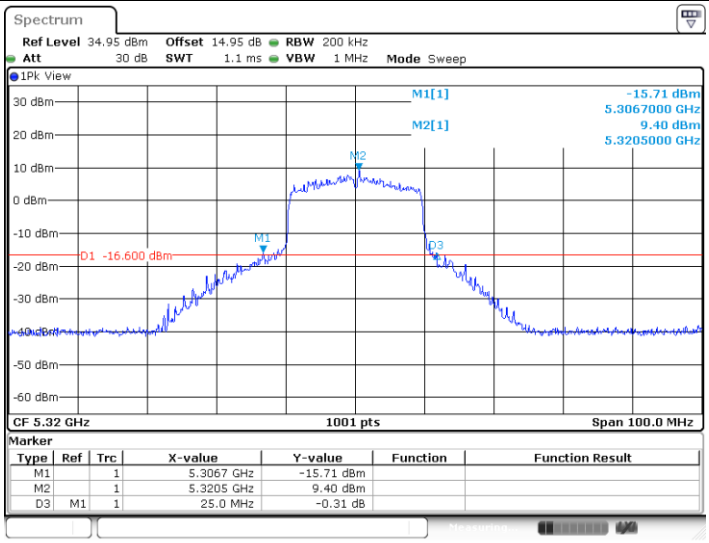

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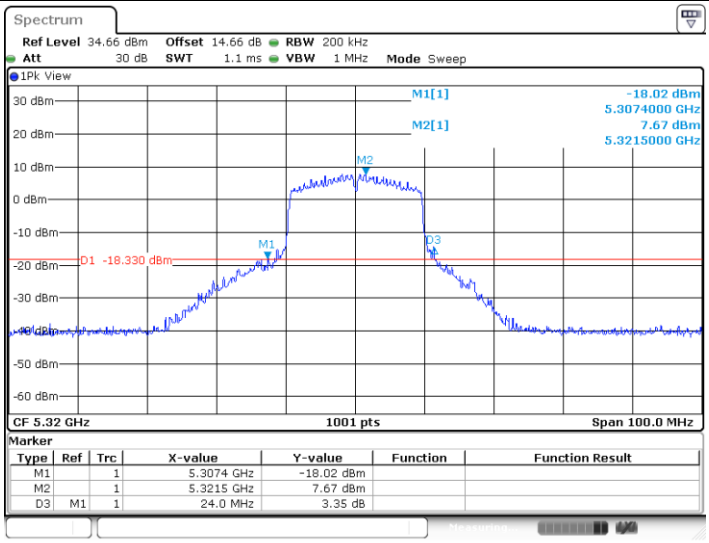

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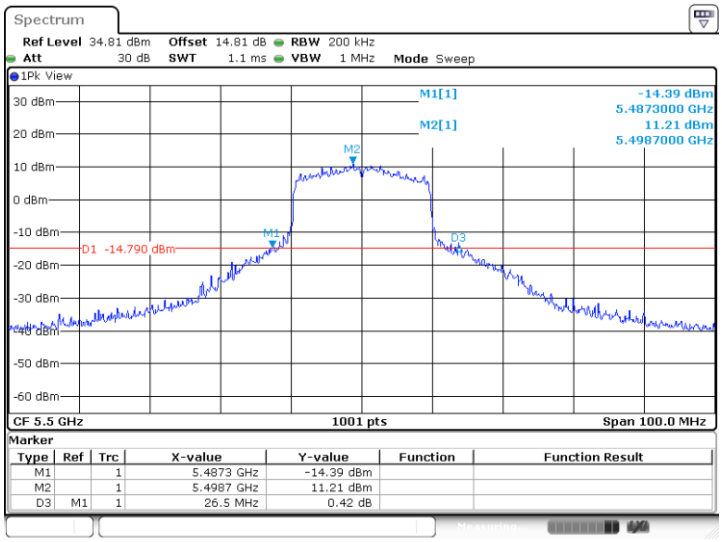

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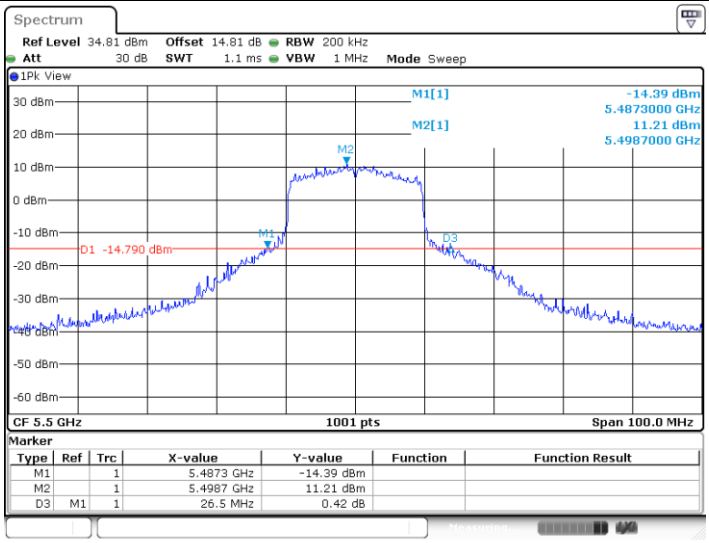

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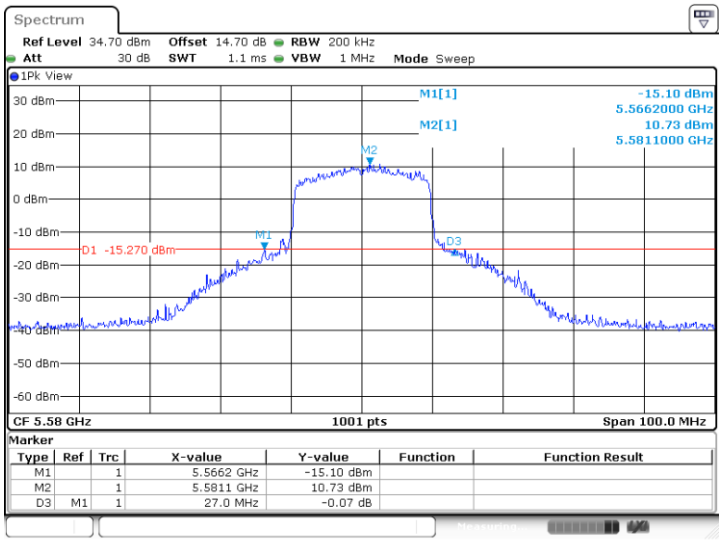

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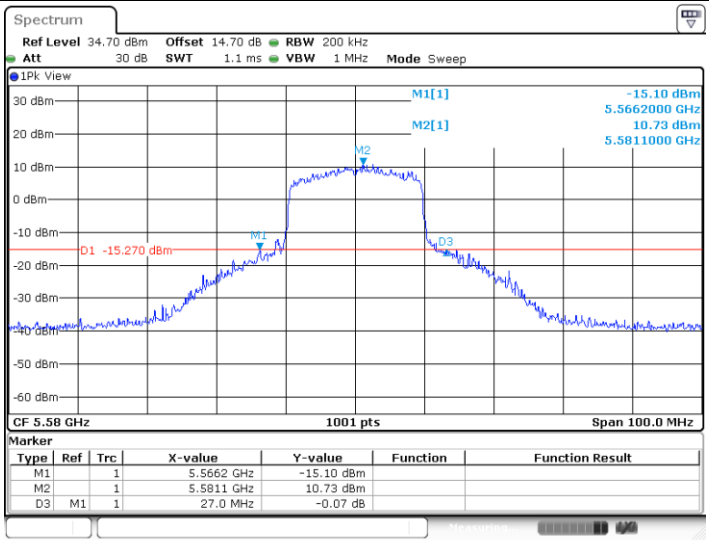

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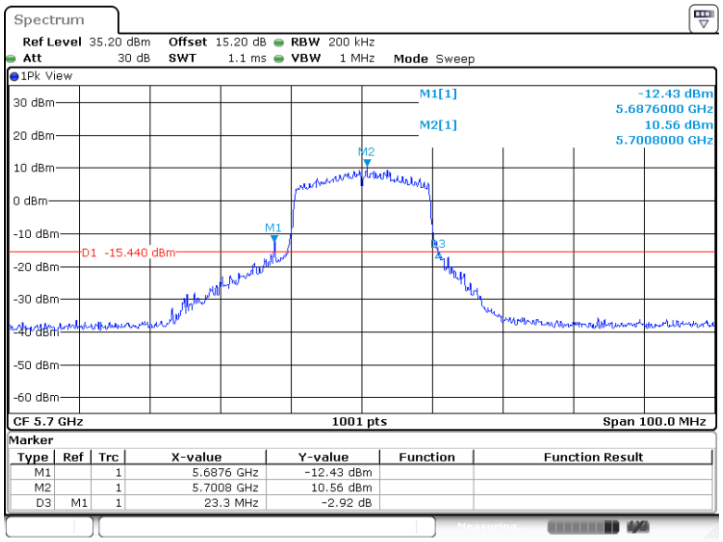
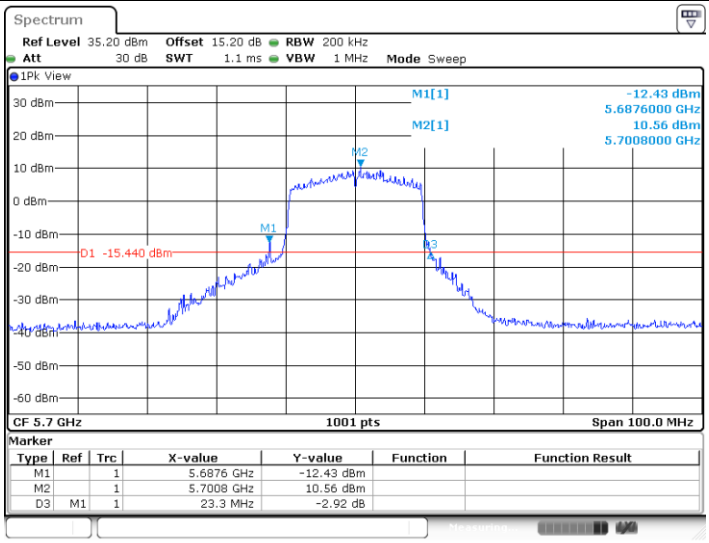


Date: 6.MAY.2024 16:44:17

11AX20MIMO_Ant17_5700



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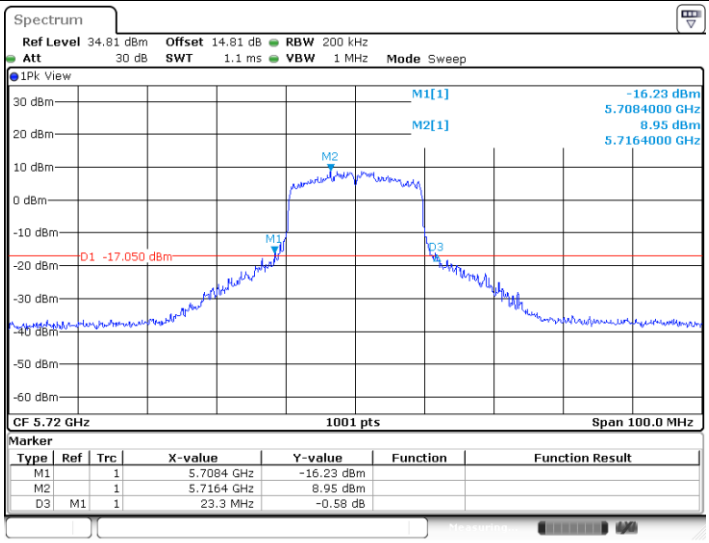

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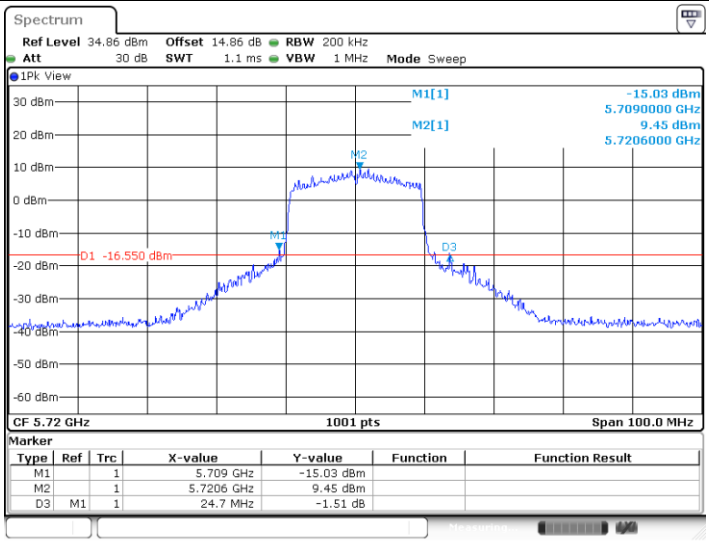

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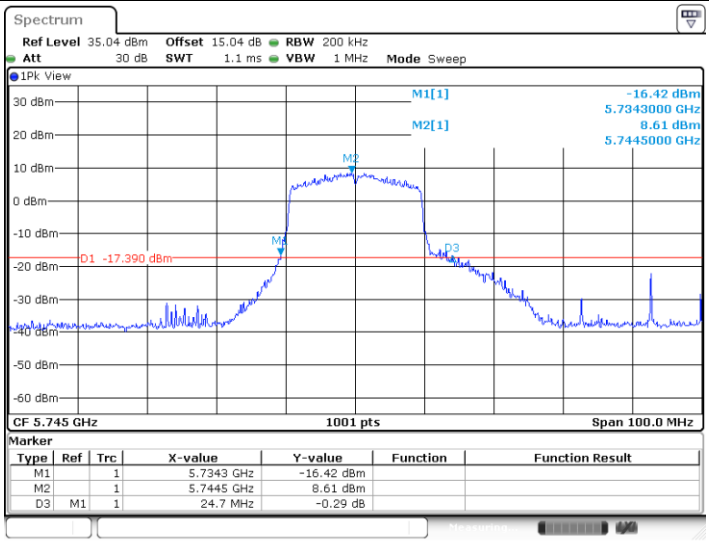

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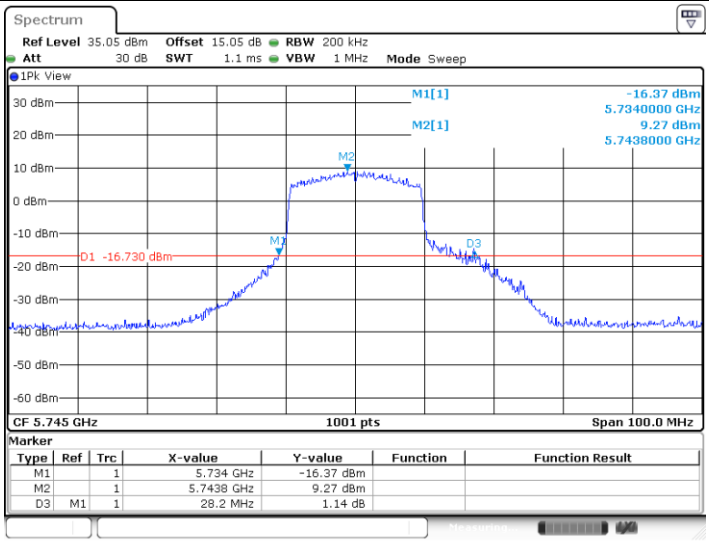

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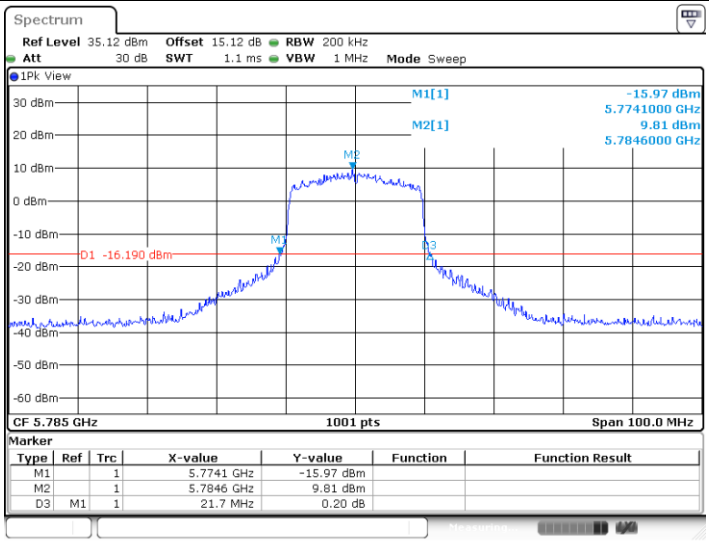

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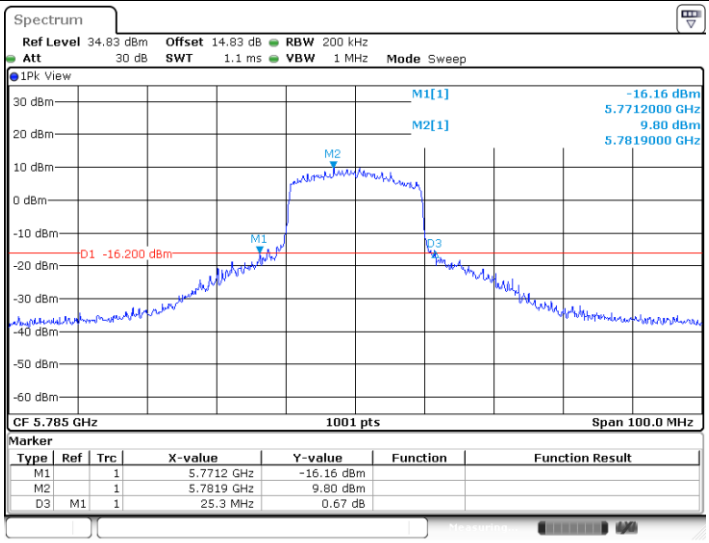

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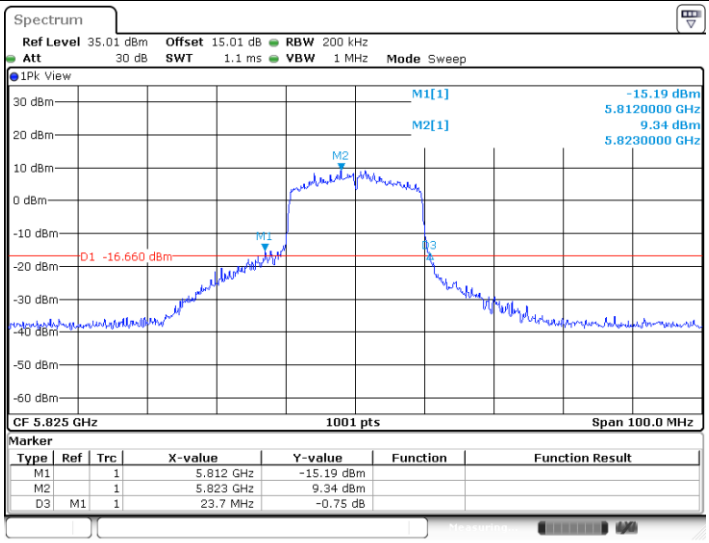

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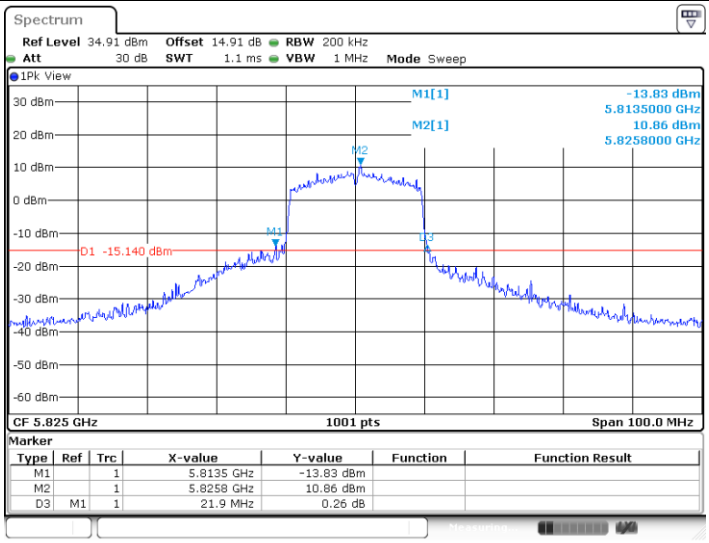

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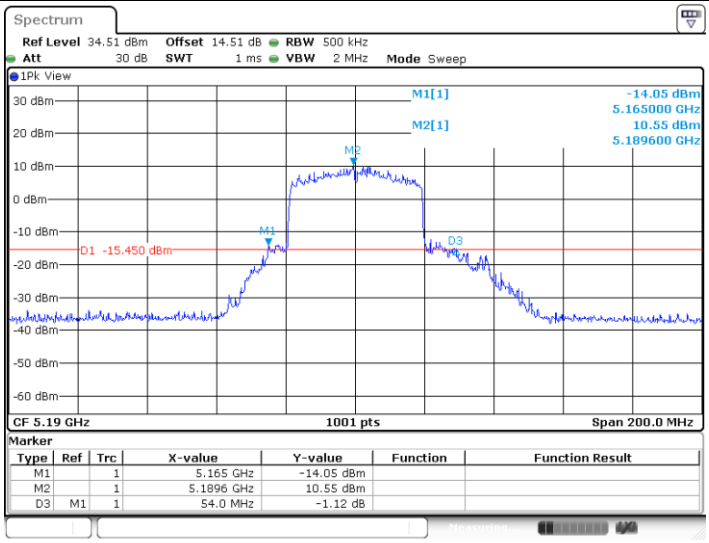

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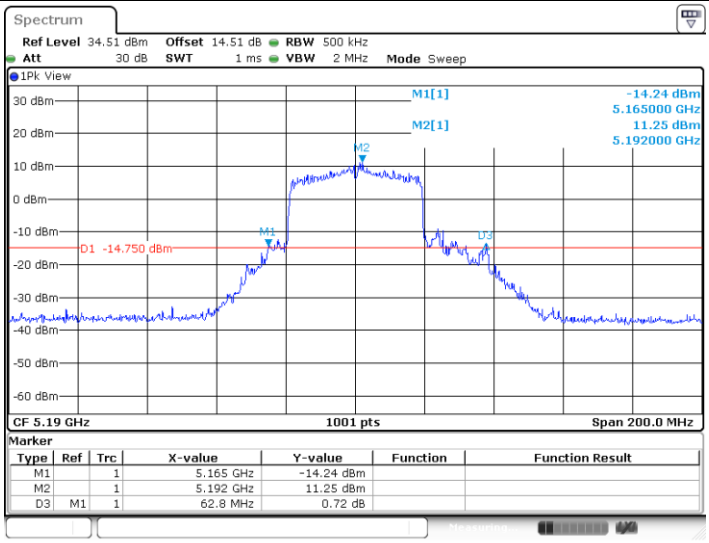

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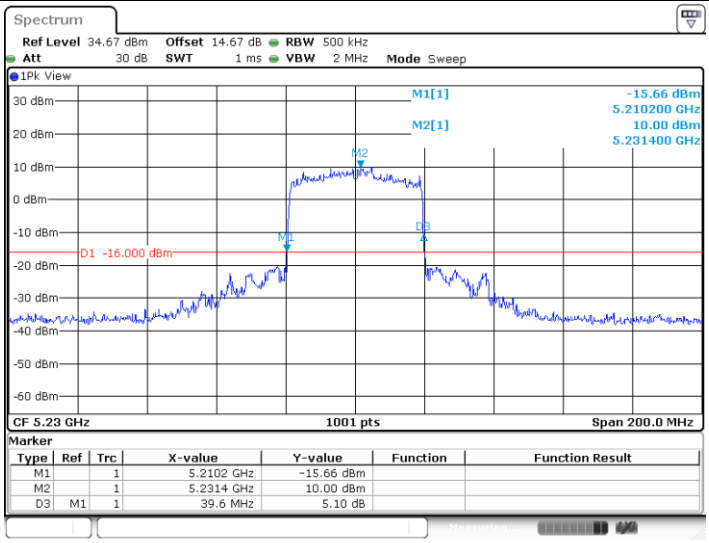

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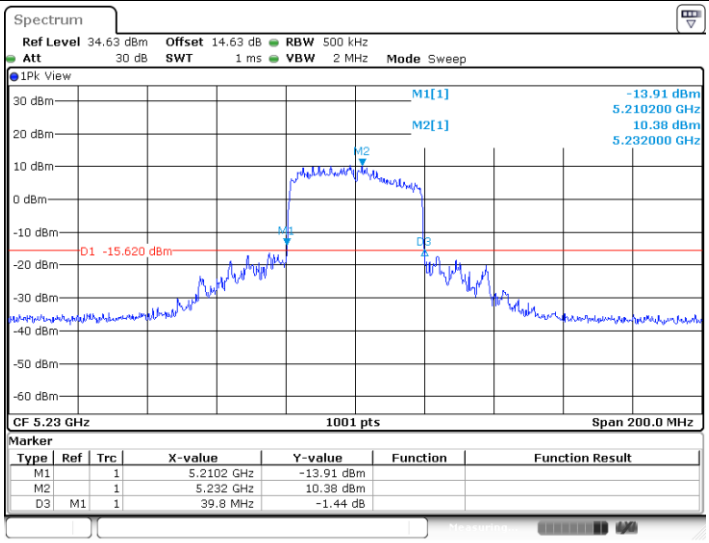

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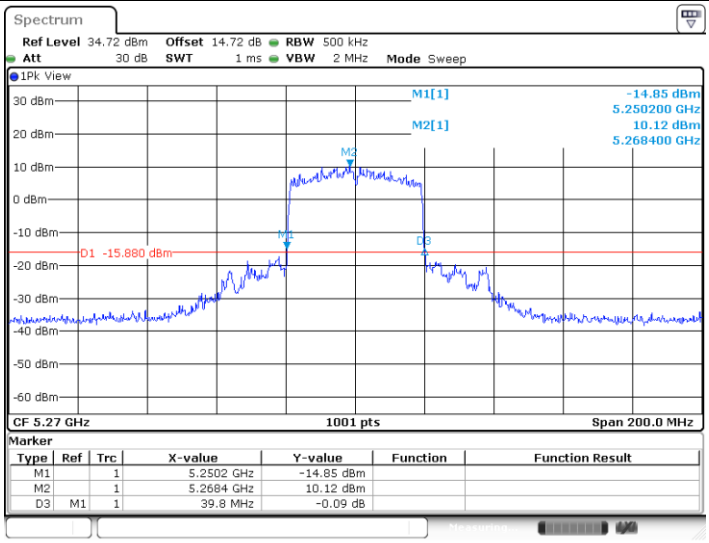

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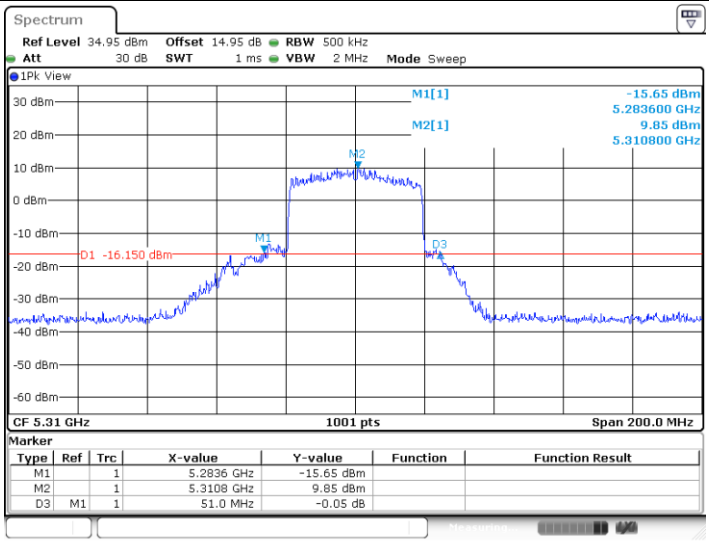
11AX40MIMO_Ant6_5310



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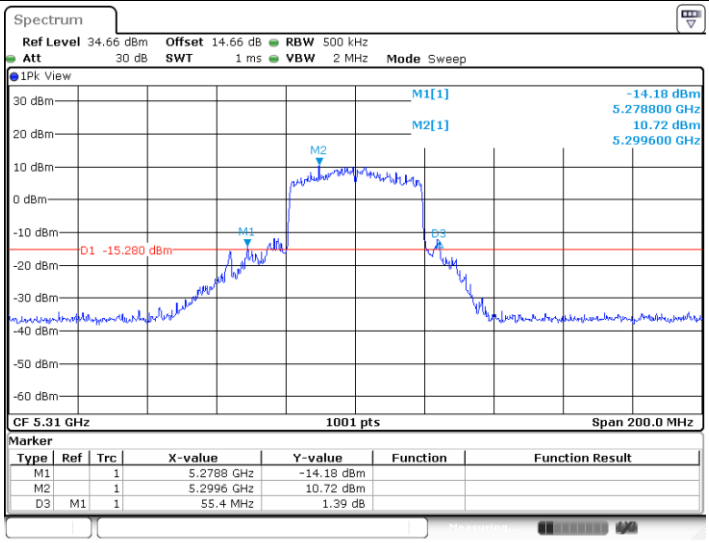

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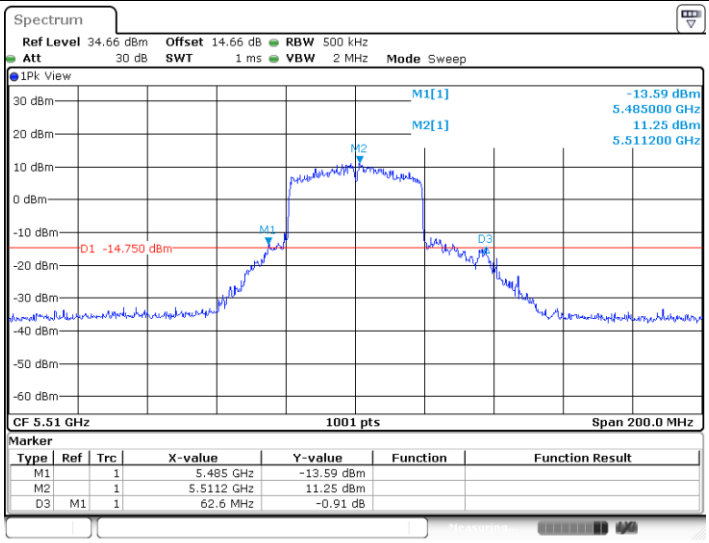

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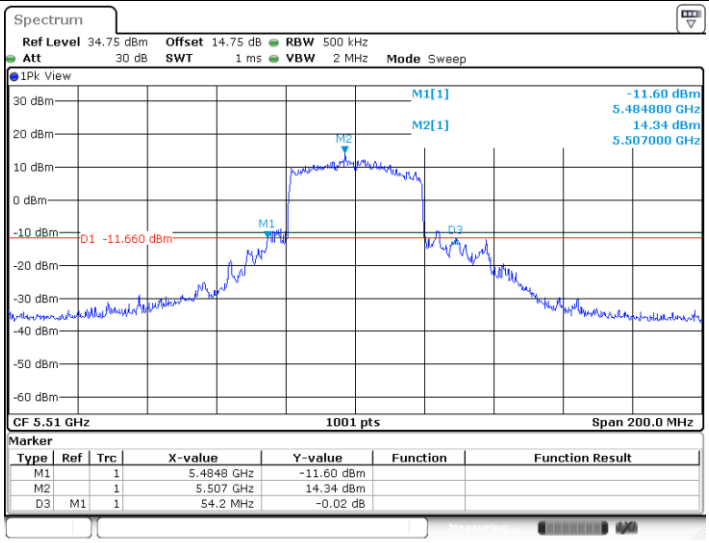

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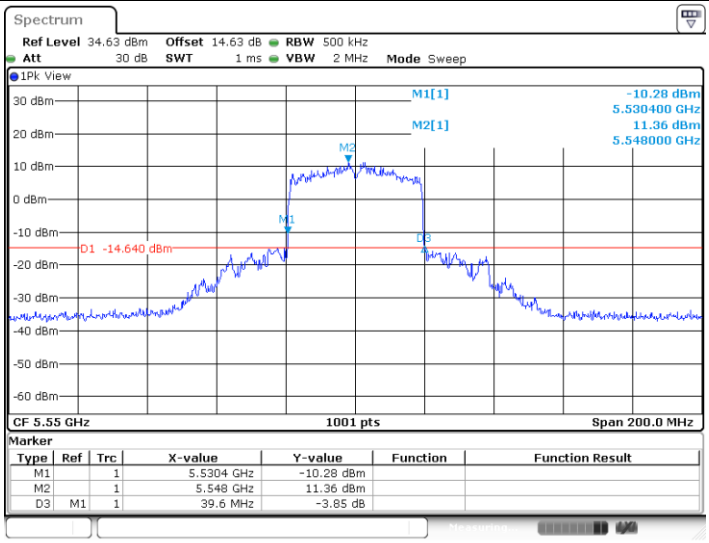

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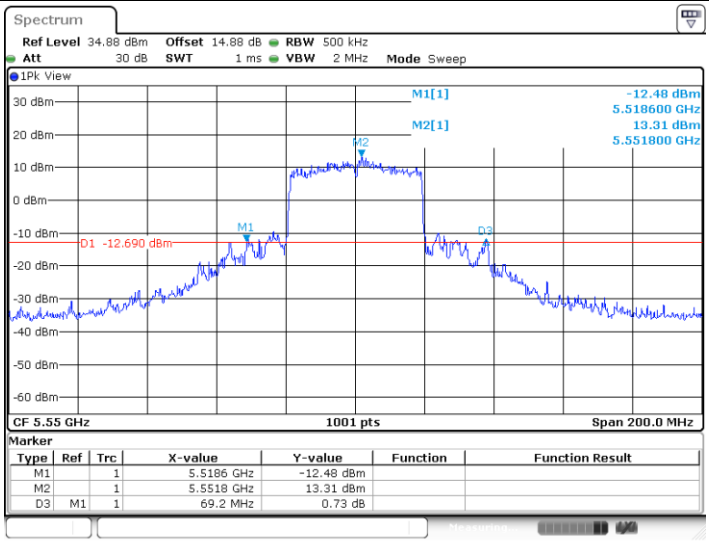

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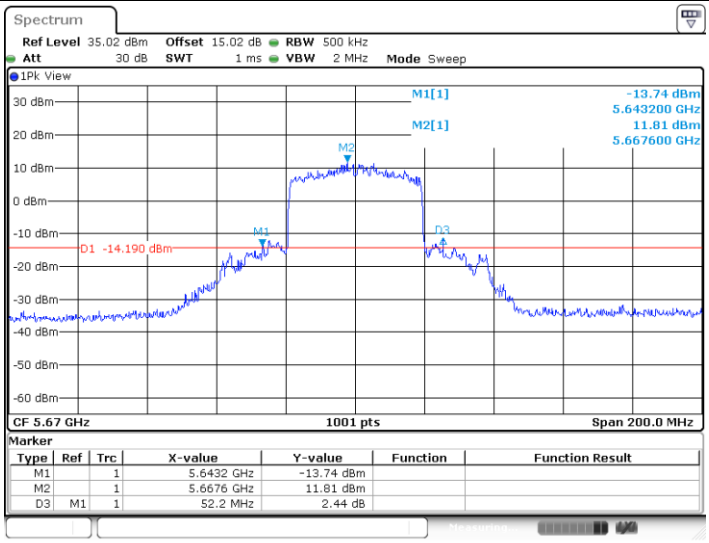

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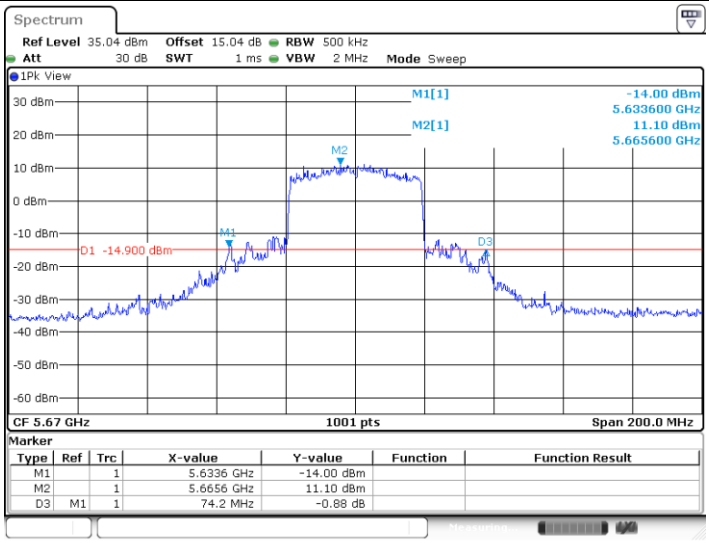

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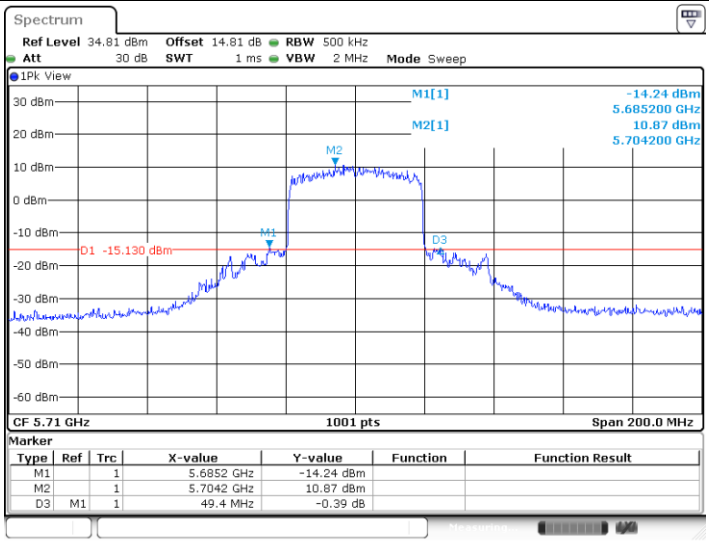

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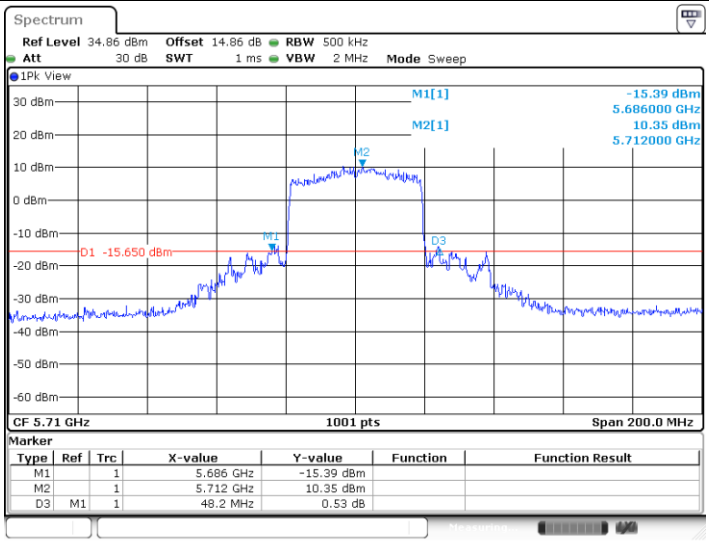

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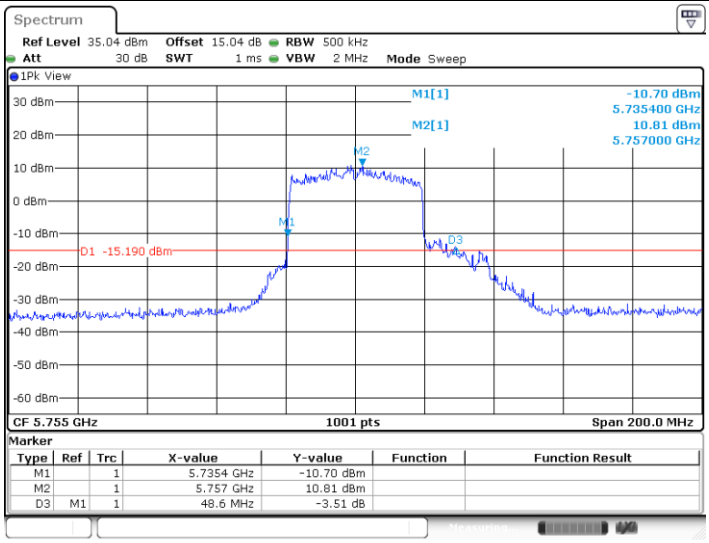

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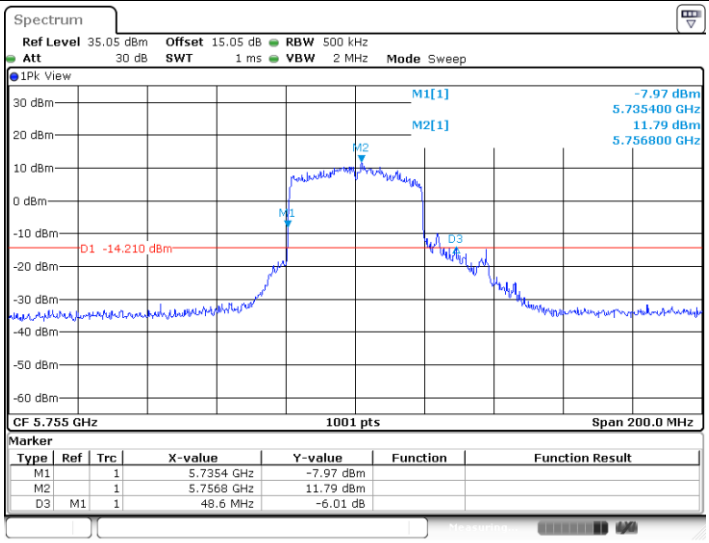

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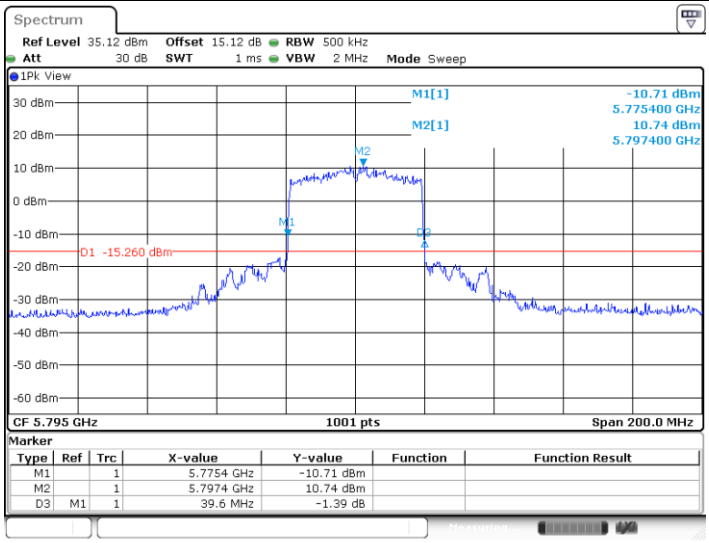

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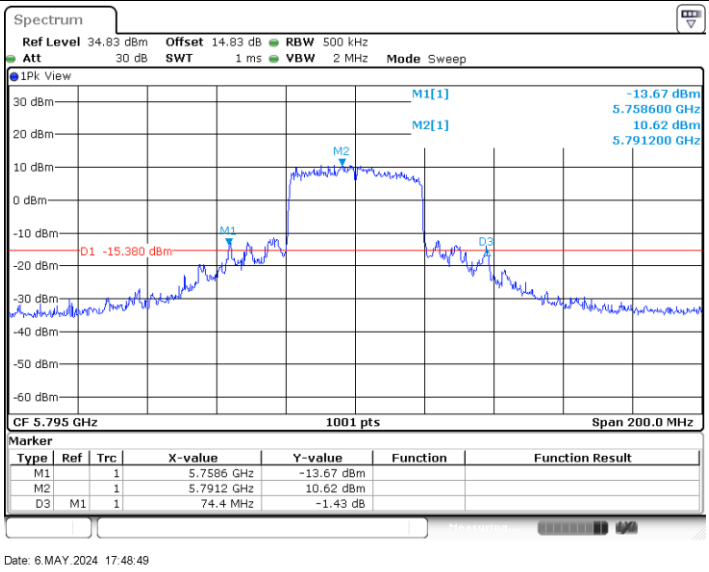

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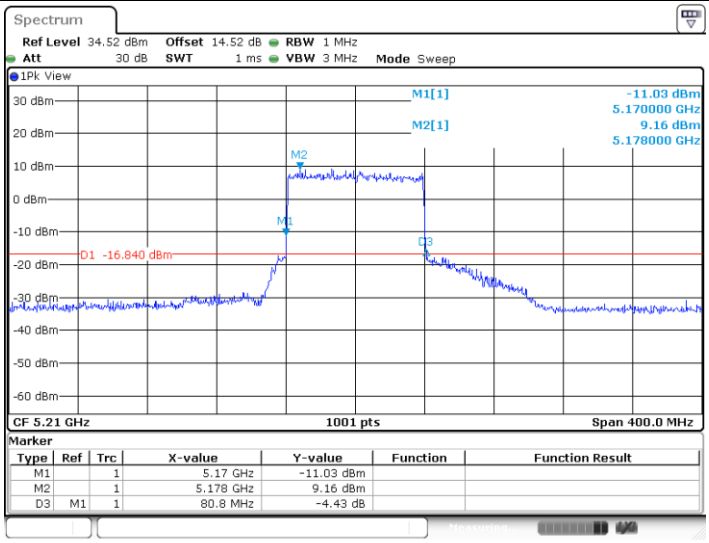

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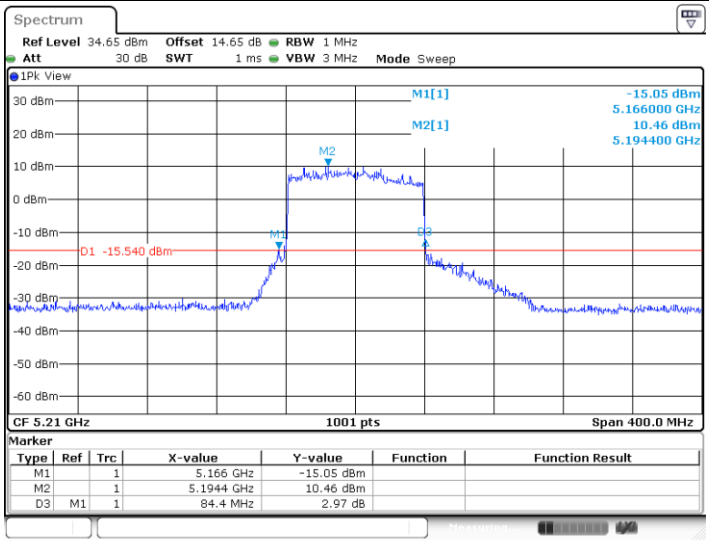

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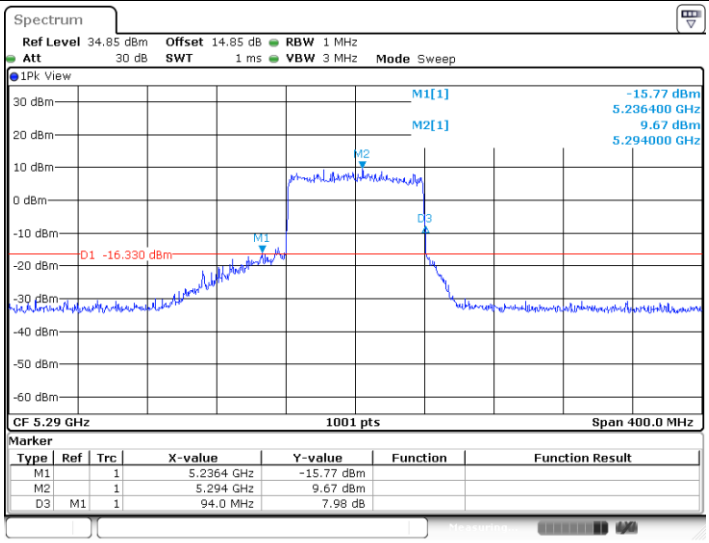
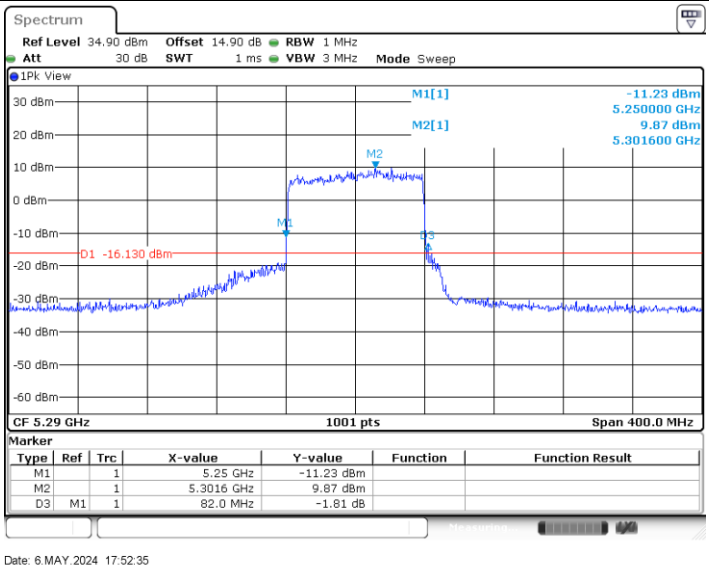
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