FCC RF Test Report

APPLICANT	:	OnePlus Technology (Shenzhen) Co., Ltd.
EQUIPMENT	:	Mobile Phone
BRAND NAME	:	1+, ONEPLUS
MODEL NAME	:	CPH2451
FCC ID	:	2ABZ2-AA516
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure
TEST DATE(S)	:	Oct. 28, 2022 ~ Dec. 04, 2022

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

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

Jason Jia

Approved by: Jason Jia

ACCREDITED Cert #5145.01

Sporton International Inc. (ShenZhen)

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People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR2O2001E	Rev. 01	Initial issue of report	Dec. 21, 2022

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit for U-NII-1 ~ U-NII-2C	Limit for U-NII-3	Result	Remark
3.1	2.1049 & 15.403(i)	6dB, 26dB & 99% 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	≤ 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 5.09 dB at 5436.40 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	15.207(a)	Pass	Under limit 12.73 dB at 1.500 MHz
3.6	15.203 & 15.407(a)	Antenna Requirement	N/A	N/A	Pass	-

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

1 General Description

1.1 Applicant

OnePlus Technology (Shenzhen) Co., Ltd.
18C02, 18C03, 18C04, and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen, Guangdong, P.R. China.

1.2 Manufacturer

OnePlus Technology (Shenzhen) Co., Ltd.
18C02, 18C03, 18C04, and 18C05, Shum Yip Terra Building, Binhe Avenue North, Futian District, Shenzhen, Guangdong, P.R. China.

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Phone
Brand Name	1+, ONEPLUS
Model Name	CPH2451
FCC ID	2ABZ2-AA516
IMEI Code	Conducted: 864921060035658/864921060035641 Conduction: 864921060029230/864921060029222 Radiation: 864921060029156/864921060029149
HW Version	11
SW Version	OxygenOS 13.0
EUT Stage	Production Unit

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 ~ 5700 MHz 5745 MHz ~ 5825 MHz
Maximum Output Power to Antenna	**MIMO <Ant. 10+13>** **<5180 MHz ~ 5250 MHz>** 802.11a : 19.44 dBm / 0.0879 W 802.11n HT20 : 19.55 dBm / 0.0902 W 802.11n HT40 : 20.21 dBm / 0.1050 W 802.11ac VHT20: 19.53 dBm / 0.0897 W 802.11ac VHT40: 20.15 dBm / 0.1035 W 802.11ac VHT80: 20.15 dBm / 0.1035 W 802.11ax HE20: 19.56 dBm / 0.0904 W 802.11ax HE40: 20.18 dBm / 0.1042 W 802.11ax HE80: 20.20 dBm / 0.1047 W 802.11be EHT20: 19.60 dBm / 0.0912 W 802.11be EHT40: 20.25 dBm / 0.1059 W 802.11be EHT80: 20.31 dBm / 0.1074 W **<5260 MHz ~ 5320 MHz>** 802.11a : 20.37 dBm / 0.1089 W 802.11n HT20 : 20.40 dBm / 0.1096 W 802.11n HT40 : 20.09 dBm / 0.1021 W 802.11ac VHT20: 20.35 dBm / 0.1084 W 802.11ac VHT40: 20.06 dBm / 0.1014 W 802.11ac VHT80: 20.13 dBm / 0.1030 W 802.11ac VHT160: 19.03 dBm / 0.0800 W 802.11ax HE20: 20.43 dBm / 0.1104 W 802.11ax HE40: 20.09 dBm / 0.1021 W 802.11ax HE80: 20.19 dBm / 0.1045 W 802.11ax HE160: 19.13 dBm / 0.0818 W 802.11be EHT20: 20.46 dBm / 0.1112 W 802.11be EHT40: 20.11 dBm / 0.1026 W 802.11be EHT80: 20.24 dBm / 0.1057 W 802.11be EHT160: 19.18 dBm / 0.0828 W **<5500 MHz ~ 5700 MHz >** 802.11a : 16.99 dBm / 0.0500 W 802.11n HT20 : 16.91 dBm / 0.0491 W 802.11n HT40 : 17.67 dBm / 0.0585W 802.11ac VHT20: 16.96 dBm / 0.0497 W 802.11ac VHT40: 17.54 dBm / 0.0568W 802.11ac VHT80: 17.63 dBm / 0.0579 W 802.11ac VHT160: 17.79 dBm / 0.0601 W 802.11ax HE20: 17.05 dBm / 0.0507 W 802.11ax HE40: 17.62 dBm / 0.0578W 802.11ax HE80: 17.67 dBm / 0.0585 W 802.11ax HE160: 17.63 dBm / 0.0579 W 802.11be EHT20: 17.19 dBm / 0.0524 W 802.11be EHT40: 17.72 dBm / 0.0592W 802.11be EHT80: 19.26 dBm / 0.0843 W 802.11be EHT160: 17.84 dBm / 0.0608 W **<5745 MHz ~ 5825 MHz>** 802.11a : 16.39 dBm / 0.0436 W 802.11n HT20 : 16.41 dBm / 0.0438 W

	802.11n HT40 : 17.11 dBm / 0.0514 W 802.11ac VHT20: 16.40 dBm / 0.0437 W 802.11ac VHT40: 17.11 dBm / 0.0514 W 802.11ac VHT80: 17.08 dBm / 0.0511 W 802.11ax HE20: 16.50 dBm / 0.0447 W 802.11ax HE40: 17.13 dBm / 0.0516 W 802.11ax HE80: 17.16 dBm / 0.0520 W 802.11be EHT20: 16.55 dBm / 0.0452 W 802.11be EHT40: 17.21 dBm / 0.0526 W 802.11be EHT80: 18.82 dBm / 0.0762 W
99% Occupied Bandwidth	**<5180 MHz ~ 5250 MHz>** 802.11a : 18.102 MHz 802.11be EHT20 : 19.461 MHz 802.11be EHT40 : 38.921 MHz 802.11be EHT80 : 78.961 MHz **<5260 MHz ~ 5320 MHz>** 802.11a : 18.142 MHz 802.11be EHT20 : 19.700 MHz 802.11be EHT40 : 38.921 MHz 802.11be EHT80 : 78.641 MHz 802.11be EHT160 : 161.119 MHz **<5500 MHz ~ 5700 MHz>** 802.11a : 18.142 MHz 802.11be EHT20 : 19.421 MHz 802.11be EHT40 : 39.161 MHz 802.11be EHT80 : 79.600 MHz 802.11be EHT160 : 161.758 MHz **<5745 MHz ~ 5825 MHz>** 802.11a : 18.342 MHz 802.11be EHT20 : 19.461 MHz 802.11be EHT40 : 38.601 MHz 802.11be EHT80 : 78.641 MHz
Antenna Type	IFA Antenna
Antenna Gain	**<Ant. 10> :** 5180 MHz ~ 5250 MHz: -1.3 dBi 5260 MHz ~ 5320 MHz: 1.0 dBi 5500 MHz ~ 5700 MHz: 2.6 dBi 5745 MHz ~ 5825 MHz: 2.6 dBi **<Ant. 13> :** 5180 MHz ~ 5250 MHz: -0.3 dBi 5260 MHz ~ 5320 MHz: 0.6 dBi 5500 MHz ~ 5700 MHz: 0.9 dBi 5745 MHz ~ 5825 MHz: -1.1 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) 802.11be: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM / 4096QAM)

Note:

1. For WLAN SISO & MIMO mode, the whole testing has assessed only MIMO mode by referring to the higher normal conducted power.
2. For 802.11n HT20/ac VHT20/ax HE20/be EHT20, 802.11n HT40/ac VHT40/ax HE40/be EHT40, 802.11ac VHT80/ax HE80/be EHT80 and 802.11ac VHT160/ax HE160/be EHT160 modes, the

whole testing have assessed only 802.11be EHT20/ EHT 40/ EHT 80/ EHT 160 by referring to the higher output power.

3. 802.11ax/be support OFDMA full RU tone and partial RU tone, both full RU and partial RU-left (for low CH) and partial RU-right (for high CH), small size RU, Large size RU and Puncturing modes are tested for conducted power/PSD/RSE, the Bandwidth Emission test for full RU only.
4. 802.11be support small size RU, Large size RU and Puncturing modes as below,
   Small size RU:
   a. For Low channel, 52Tone, Index38 + 26Tone, Index1 and 106Tone, Index53 + 26Tone, Index4
   b. For High channel, 52Tone, Index39 + 26Tone, Index7 and 106Tone, Index54 + 26Tone, Index4

   Large size RU:

BWs/channels	Tones		Index		For test modes configure
80MHz/ch42/58/106/122/155	484	242	66	62	1
80MHz/ch42/58/106/122/155	484	242	66	61	2
80MHz/ch42/58/106/122/155	484	242	65	64	3
80MHz/ch42/58/106/122/155	484	242	65	63	4
160MHz/ch50/114	996-Right	484-Left	67-Right	66-Left	1
160MHz/ch50/114	996-Right	484-Left	67-Right	65-Left	2
160MHz/ch50/114	996-Left	484-Right	67-Left	66-Right	3
160MHz/ch50/114	996-Left	484-Right	67-Left	65-Right	4

Puncturing 20MHz modes

BWs/channels	Tones		Index		For test modes configure
80MHz ch42/58/106/122/155	484	242	66	62	1
80MHz ch42/58/106/122/155	484	242	66	61	2
80MHz ch42/58/106/122/155	484	242	65	64	3
80MHz ch42/58/106/122/155	484	242	65	63	4

BWs/ channels	Tones			Index			For test modes configure
160MHz ch50/114	242-Left	484-Left	996-Right	62-Left	66-Left	67-Right	1
160MHz ch50/114	242-Left	484-Left	996-Right	61-Left	66-Left	67-Right	2
160MHz ch50/114	484-Left	242-Left	996-Right	65-Left	64-Left	67-Right	3
160MHz ch50/114	484-Left	242-Left	996-Right	65-Left	63-Left	67-Right	4
160MHz ch50/114	996-Left	242-Right	484-Right	67-Left	62-Right	66-Right	5
160MHz ch50/114	996-Left	242-Right	484-Right	67-Left	61-Right	66-Right	6
160MHz ch50/114	996-Left	484-Right	242-Right	67-Left	65-Right	64-Right	7
160MHz ch50/114	996-Left	484-Right	242-Right	67-Left	65-Right	63-Right	8

Puncturing 40MHz modes

BWs/channels	Tones		Index		For test modes configure
160MHz/ch50/114	484-Left	996-Right	66-Left	67-Right	1
160MHz/ch50/114	484-Left	996-Right	65-Left	67-Right	2
160MHz/ch50/114	996-Left	484-Right	67-Left	66-Right	3
160MHz/ch50/114	996-Left	484-Right	67-Left	65-Right	4

Only the worse cases are shown in this report.

5. The worse cases of RSE for partial RU, Large size RU, small size RU and puncturing mode are shown in this report.

1.5 Modification of EUT

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

1.6 Testing Location

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

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 China 518103 TEL: +86-755-33202398		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH04-SZ	CN1256	421272

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH04-SZ	AUDIX	E3	6.2009-8-24
2.	CO01-SZ	AUDIX	E3	6.120613b

1.8 Applicable Standards

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

- 47 CFR Part 15 Subpart 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. The worst cases (Y plane) were recorded in this report.

b. AC power line Conducted Emission was tested under maximum output power.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
5180-5250 MHz U-NII-1	36	5180	44	5220
	38*	5190	46*	5230
	40	5200	48	5240
	42#	5210	50[2]	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	114[2]	5570
	102*	5510	116	5580
	104	5520	132	5660
	106#	5530	134*	5670
	108	5540	136	5680
	110*	5550	140	5700
	112	5560		

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

Note:

1. The above Frequency and Channel in "*" were 802.11n HT40 and 802.11ac VHT40, 802.11ax HE40 and 802.11be EHT40.
2. The above Frequency and Channel in "#" were 802.11ac VHT80, 802.11ax HE80 and 802.11be EHT80.
3. The above Frequency and Channel in "2" were 802.11ac VHT160, 802.11ax HE160 and 802.11be EHT160.

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**
802.11be EHT20	**MCS0**
802.11be EHT40	**MCS0**
802.11be EHT80	**MCS0**
802.11be EHT160	**MCS0**

Co-location mode
WLAN 5G 802.11 be EHT80 CH106 Tx + WLAN 2.4G 802.11 be EHT20 CH01 Tx + LTE B48 Link
WLAN 5G 802.11 be EHT80 CH106 Tx + BLE(2M) Ch39 Tx + LTE B48 Link

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

Ch. #		U-NII-1 5180-5250 MHz	U-NII-2A 5260-5320 MHz	U-NII-2C 5500-5720MHz	U-NII-3 5745-5825 MHz
		802.11a	802.11a	802.11a	802.11a
L	Low	36	52	100	149
M	Middle	44	60	116	157
H	High	48	64	140	165

Ch. #		U-NII-1 5180-5250 MHz	U-NII-2A 5260-5320 MHz	U-NII-2C 5500-5720MHz	U-NII-3 5745-5825 MHz
		802.11be EHT20	802.11be EHT20	802.11be EHT20	802.11be EHT20
L	Low	36	52	100	149
M	Middle	44	60	116	157
H	High	48	64	140	165

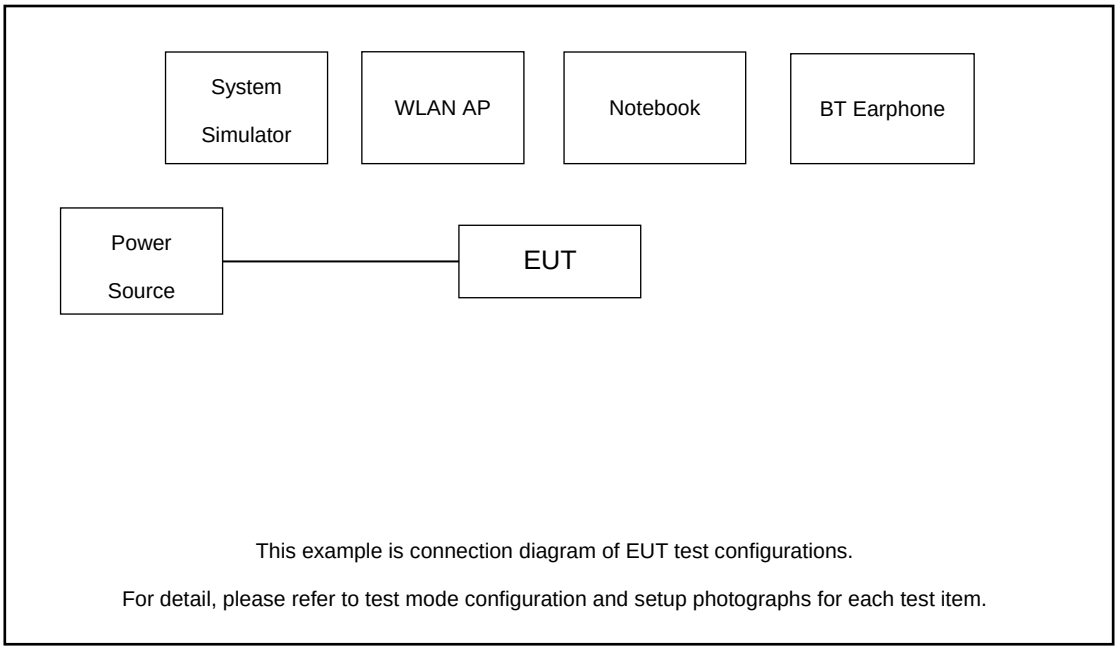
Ch. #		U-NII-1 5180-5250 MHz	U-NII-2A 5260-5320 MHz	U-NII-2C 5500-5720MHz	U-NII-3 5745-5825 MHz
		802.11be EHT40	802.11be EHT40	802.11be EHT40	802.11be EHT40
L	Low	38	54	102	151
M	Middle	-	-	110	-
H	High	46	62	134	159

Ch. #		U-NII-1 5180-5250 MHz	U-NII-2A 5260-5320 MHz	U-NII-2C 5500-5720MHz	U-NII-3 5745-5825 MHz
		802.11be EHT80	802.11be EHT80	802.11be EHT80	802.11be EHT80
L	Low	-	-	106	-
M	Middle	42	58	-	155
H	High	-	-	122	-

Ch. #		U-NII-1 5180-5250 MHz	U-NII-2A 5260-5320 MHz	U-NII-2C 5500-5720MHz	U-NII-3 5745-5825 MHz
		802.11be EHT160	802.11be EHT160	802.11be EHT160	802.11be EHT160
L	Low	-	-	-	-
M	Middle	50	-	114	-
H	High	-	-	-	-

2.3 Connection Diagram of Test System

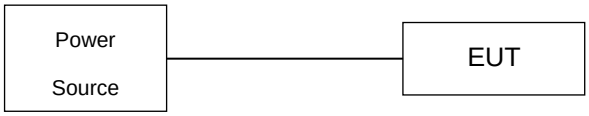
For Conducted Emission:



This example is connection diagram of EUT test configurations.

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

For Radiated Emission:



This example is connection diagram of EUT test configurations.

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

2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Earphone	Samsung	EO-MG900	N/A	N/A	N/A
2.	WLAN AP	D-Link	DIR-820L	KA2IR820LA1	N/A	Unshielded,1.8m
3.	Notebook	Lenovo	E540	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Base Station	Anritsu	MT8821C	N/A	N/A	Unshielded,1.8m

2.5 EUT Operation Test Setup

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

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

2.6 Measurement Results Explanation Example

For all conducted test items:

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

Example :
The spectrum analyzer offset is derived from RF cable loss and attenuator factor.
Offset = RF cable loss + attenuator factor.
Following shows an offset computation example with cable loss 4.53 dB and 20dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
= 4.53 + 20 = 24.53 (dB)

3 Test Result

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

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

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

26dB and 99% Occupied bandwidth are reporting only.

3.1.2 Measuring Instruments

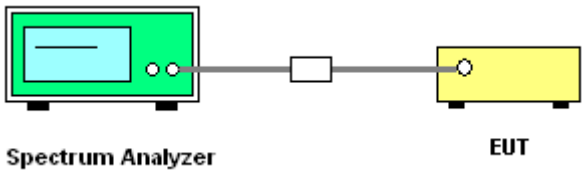
The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

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

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

3.1.4 Test Setup



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

Please refer to Appendix A.

3.2 Maximum Conducted Output Power Measurement

3.2.1 Limit of Maximum Conducted Output Power

<FCC 14-30 CFR 15.407>

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

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

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

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

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

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3.2.2 Measuring Instruments

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

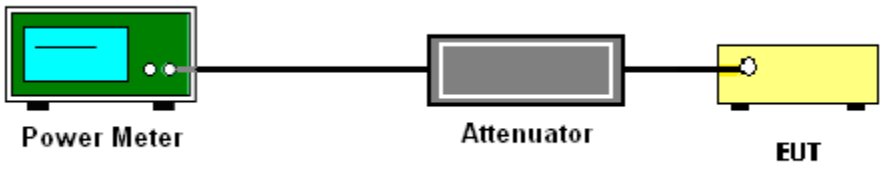
3.2.3 Test Procedures

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

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

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor, 10 log(1/x), where x is the duty cycle.
4. For MIMO mode, the measure-and-sum technique should be used for measuring the in-band transmit power of a device.

3.2.4 Test Setup



3.2.5 Test Result of Maximum Conducted Output Power

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

<FCC 14-30 CFR 15.407>

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

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

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

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

3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

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

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

 # Method SA-2 #

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

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

For devices operating in the band 5.725 - 5.85 GHz

 # Method SA-2 #

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

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

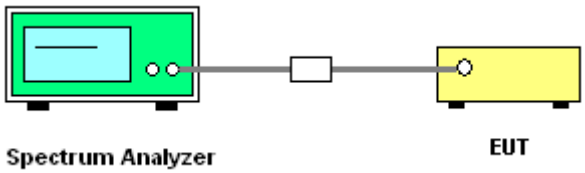
1. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
2. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.
3. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

Method (a): Measure and sum the spectra across the outputs.
The total final Power Spectral Density is the bin-by-bin summation to obtain the combined spectrum. For the device with 2 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points, the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 to obtain the value for the first frequency bin of the summed spectrum.

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.

Method (c): Measure and add 10 log(N_{ANT}) dB, where N_{ANT} is the number of outputs.
The measurement on each individual output were performed with the same span and number on each individual output. The quantity 10 log(N_{ANT}) dB is added to each spectrum value before comparing to the emission limit.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

3.4 Unwanted Emissions Measurement

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

3.4.1 Limit of Unwanted Emissions

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

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

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

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

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

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

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

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

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

where

EIRP is the equivalent isotropically radiated power, in dBm

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

d_{Meas} is the measurement distance, in m

3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

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

   (1) Procedure for Unwanted Emissions Measurements Below 1000MHz

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

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

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

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

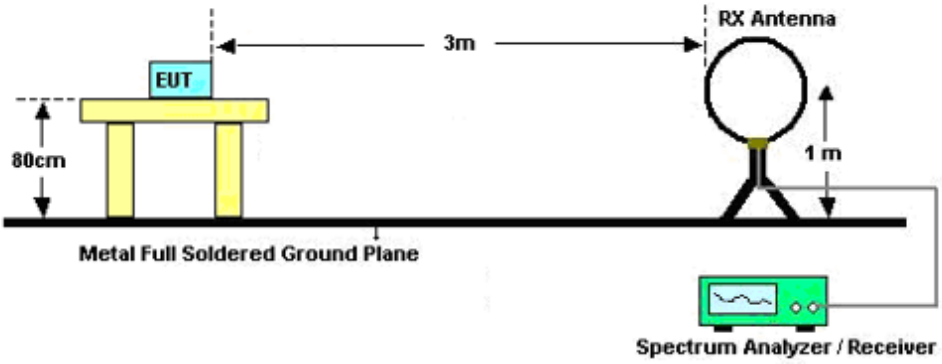
   - RBW = 1 MHz
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

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.

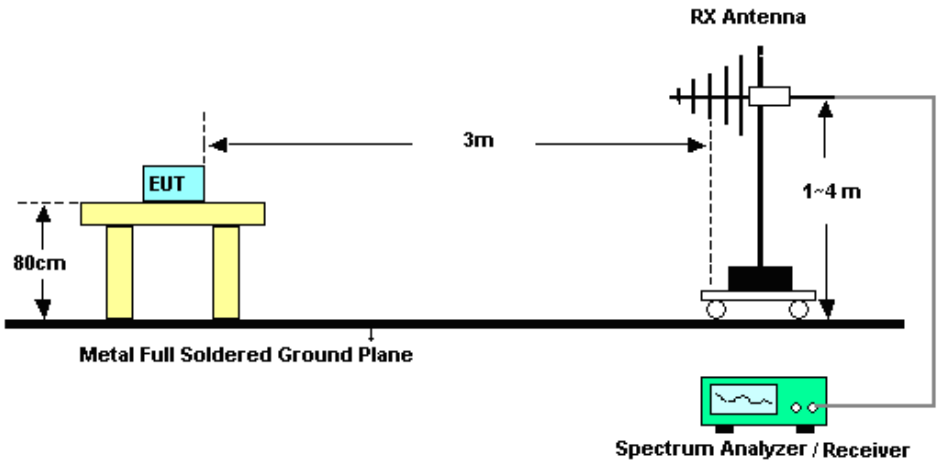
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again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

3.4.4 Test Setup

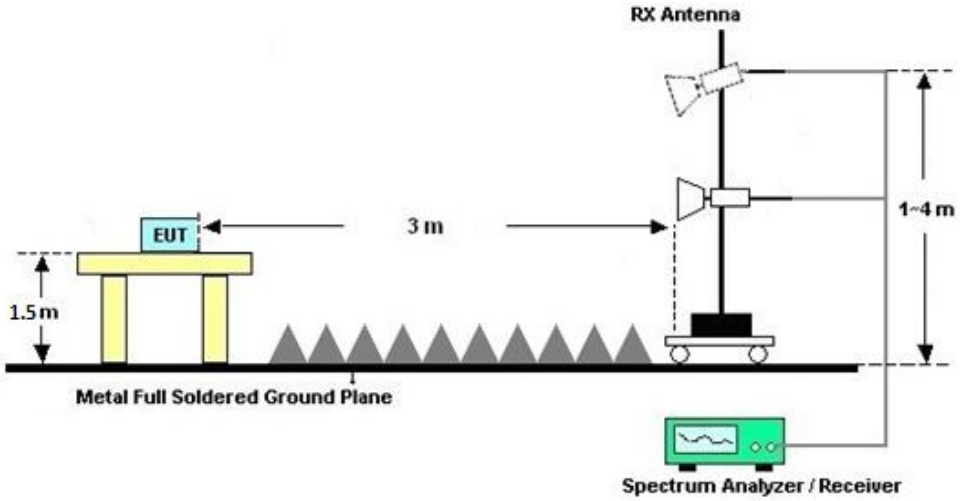
For radiated emissions below 30MHz



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.

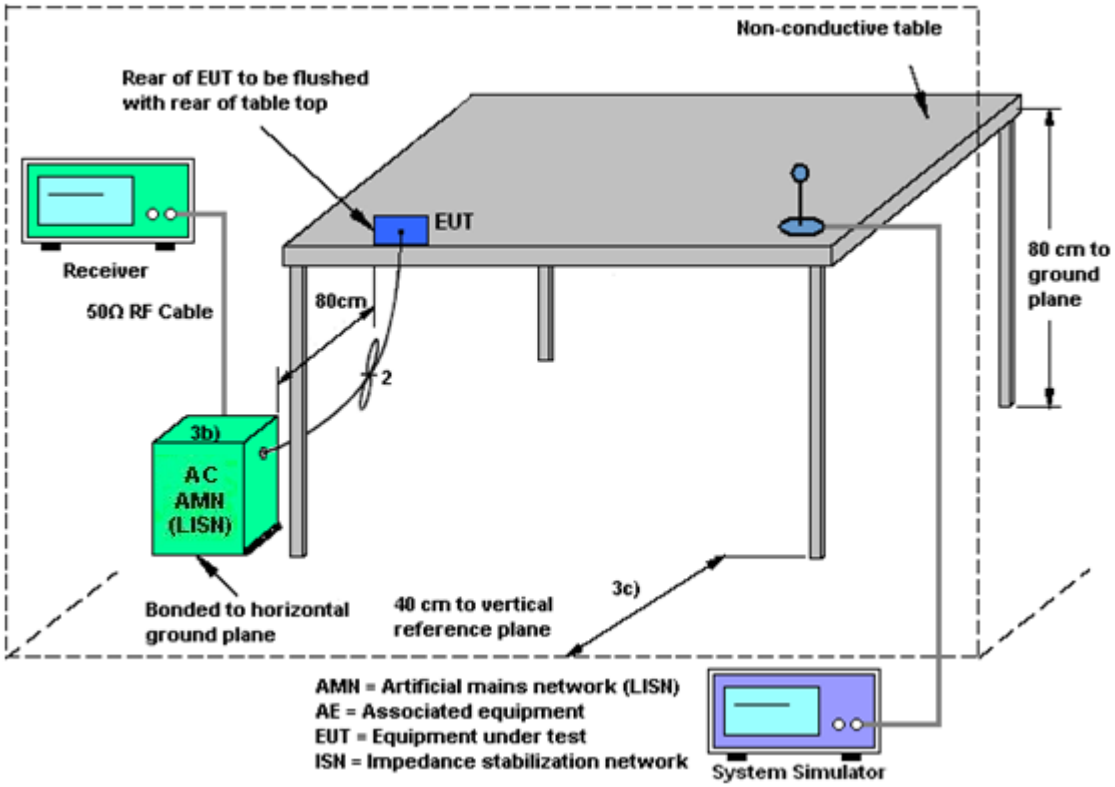
3.5.2 Measuring Instruments

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. 10 (dBi)	Ant. 13 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
Band I	-1.30	-0.30	-0.30	2.22	0.00	0.00
Band II	1.00	0.60	1.00	3.81	0.00	0.00
Band III	2.60	0.90	2.60	4.80	0.00	0.00
Band IV	2.60	-1.10	2.60	3.96	0.00	0.00

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 07, 2022	Oct. 28, 2022~ Nov. 25, 2022	Apr. 06, 2023	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 28, 2021	Oct. 28, 2022~ Nov. 25, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 28, 2021	Oct. 28, 2022~ Nov. 25, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz	Oct. 19, 2022	Dec. 04, 2022	Oct. 18, 2023	Radiation (03CH04-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Jul. 07, 2022	Dec. 04, 2022	Jul. 06, 2023	Radiation (03CH04-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jun. 28, 2022	Dec. 04, 2022	Jun. 27, 2023	Radiation (03CH04-SZ)
Bilog Antenna	TeseQ	CBL6111D	41909	30MHz~1GHz	Apr. 27, 2022	Dec. 04, 2022	Apr. 26, 2023	Radiation (03CH04-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1474	1GHz~18GHz	Jul. 07, 2022	Dec. 04, 2022	Jul. 06, 2023	Radiation (03CH04-SZ)
Horn Antenna	SCHWARZBECK	BBHA9170	9170#679	15GHz~40GHz	Jul. 07, 2022	Dec. 04, 2022	Jul. 06, 2023	Radiation (03CH04-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz ~3000MHz	Oct. 19, 2022	Dec. 04, 2022	Oct. 18, 2023	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 19, 2022	Dec. 04, 2022	Oct. 18, 2023	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 06, 2022	Dec. 04, 2022	Jul. 05, 2023	Radiation (03CH04-SZ)
Amplifier	Agilent Technologies	83017A	MY57280136	500MHz~26.5GHz	Sep. 30, 2022	Dec. 04, 2022	Sep. 29, 2023	Radiation (03CH04-SZ)
AC Power Source	APC	AFV-S-600B	F119050019	N/A	Nov. 10, 2022	Dec. 04, 2022	Nov. 09, 2023	Radiation (03CH04-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Dec. 04, 2022	NCR	Radiation (03CH04-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Dec. 04, 2022	NCR	Radiation (03CH04-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jul. 07, 2022	Nov. 10, 2022	Jul. 06, 2023	Conduction (CO01-SZ)
AC LISN	R&S	ENV216	100063	9kHz~30MHz	Sep. 15, 2022	Nov. 10, 2022	Sep. 14, 2023	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 17, 2022	Nov. 10, 2022	Oct. 16, 2023	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 07, 2022	Nov. 10, 2022	Jul. 06, 2023	Conduction (CO01-SZ)

NCR: No Calibration Required

5 Uncertainty of Evaluation

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

Uncertainty of Conducted Measurement

Test Item	Uncertainty
Conducted Power	±1.34 dB
Conducted Emissions	±1.34 dB
Occupied Channel Bandwidth	0.012MHz
Conducted Power Spectral Density	±1.32 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.94 dB

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

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

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

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

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

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

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

Appendix A. Conducted Test Results

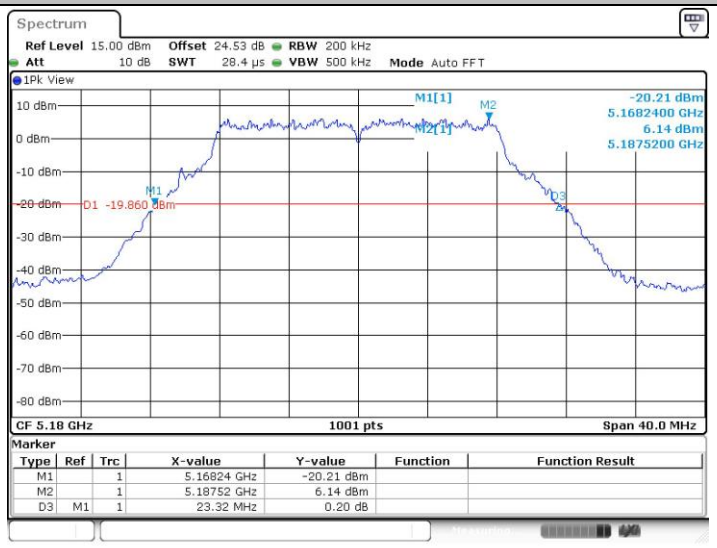
Emission Bandwidth

Test Result

TestMode	Antenna	Freq(MHz)	26dB EBW [MHz]	FL[MHz]	FH[MHz]
11A-CDD	Ant10	5180	23.32	5168.24	5191.56
	Ant13	5180	23.32	5168.64	5191.96
	Ant10	5220	23.04	5208.32	5231.36
	Ant13	5220	22.72	5208.64	5231.36
	Ant10	5240	23.12	5228.24	5251.36
	Ant13	5240	22.76	5228.64	5251.40
	Ant10	5260	23.32	5248.28	5271.60
	Ant13	5260	23.00	5248.68	5271.68
	Ant10	5300	23.04	5288.32	5311.36
	Ant13	5300	22.96	5288.48	5311.44
	Ant10	5320	23.12	5308.24	5331.36
	Ant13	5320	22.88	5308.56	5331.44
	Ant10	5500	22.92	5488.64	5511.56
	Ant13	5500	23.08	5488.28	5511.36
	Ant10	5580	23.40	5568.24	5591.64
	Ant13	5580	22.76	5568.64	5591.40
	Ant10	5700	23.16	5688.20	5711.36
	Ant13	5700	22.88	5688.44	5711.32
	Ant10	5745	23.36	5733.20	5756.56
	Ant13	5745	22.76	5733.64	5756.40
	Ant10	5785	23.12	5773.24	5796.36
	Ant13	5785	22.76	5773.64	5796.40
	Ant10	5825	23.32	5813.24	5836.56
	Ant13	5825	22.68	5813.64	5836.32
11BE20MIMO	Ant10	5180	23.32	5168.28	5191.60
	Ant13	5180	23.40	5168.52	5191.92
	Ant10	5220	23.36	5208.44	5231.80
	Ant13	5220	23.28	5208.28	5231.56
	Ant10	5240	22.96	5228.48	5251.44
	Ant13	5240	23.72	5228.24	5251.96
	Ant10	5260	23.32	5248.20	5271.52
	Ant13	5260	23.80	5247.88	5271.68
	Ant10	5300	23.72	5288.08	5311.80
	Ant13	5300	23.72	5288.24	5311.96
	Ant10	5320	23.40	5308.44	5331.84
	Ant13	5320	23.56	5308.12	5331.68
	Ant10	5500	23.08	5488.36	5511.44
	Ant13	5500	23.68	5488.28	5511.96
	Ant10	5580	23.44	5568.04	5591.48
	Ant13	5580	23.68	5568.28	5591.96
	Ant10	5700	23.40	5688.32	5711.72
	Ant13	5700	23.76	5687.96	5711.72
	Ant10	5745	23.28	5733.40	5756.68
	Ant13	5745	23.40	5733.24	5756.64

	Ant10	5785	23.56	5773.24	5796.80
	Ant13	5785	23.44	5773.48	5796.92
	Ant10	5825	23.48	5813.36	5836.84
	Ant13	5825	23.64	5813.32	5836.96
11BE40MIMO	Ant10	5190	43.60	5167.92	5211.52
	Ant13	5190	44.00	5168.16	5212.16
	Ant10	5230	43.20	5208.24	5251.44
	Ant13	5230	43.92	5207.68	5251.60
	Ant10	5270	44.96	5247.36	5292.32
	Ant13	5270	43.52	5248.16	5291.68
	Ant10	5310	43.68	5287.84	5331.52
	Ant13	5310	43.68	5288.00	5331.68
	Ant10	5510	43.68	5487.76	5531.44
	Ant13	5510	43.44	5488.16	5531.60
	Ant10	5550	43.44	5528.40	5571.84
	Ant13	5550	43.92	5528.24	5572.16
	Ant10	5670	44.24	5648.00	5692.24
	Ant13	5670	44.00	5648.16	5692.16
	Ant10	5755	44.96	5731.88	5776.84
	Ant13	5755	43.92	5733.40	5777.32
	Ant10	5795	43.36	5773.16	5816.52
	Ant13	5795	43.76	5773.24	5817.00
11BE80MIMO	Ant10	5210	87.04	5165.52	5252.56
	Ant13	5210	86.08	5167.60	5253.68
	Ant10	5290	86.24	5247.12	5333.36
	Ant13	5290	87.04	5246.32	5333.36
	Ant10	5530	88.00	5485.68	5573.68
	Ant13	5530	88.00	5485.84	5573.84
	Ant10	5610	87.68	5565.20	5652.88
	Ant13	5610	85.92	5566.16	5652.08
	Ant10	5775	87.20	5732.12	5819.32
	Ant13	5775	87.04	5732.12	5819.16
11BE160MIMO	Ant10	5250	168.96	5164.88	5333.84
	Ant13	5250	170.56	5164.24	5334.80
	Ant10	5570	168.64	5484.24	5652.88
	Ant13	5570	170.24	5485.52	5655.76

Test Graphs

11A-CDD_Ant10_5180


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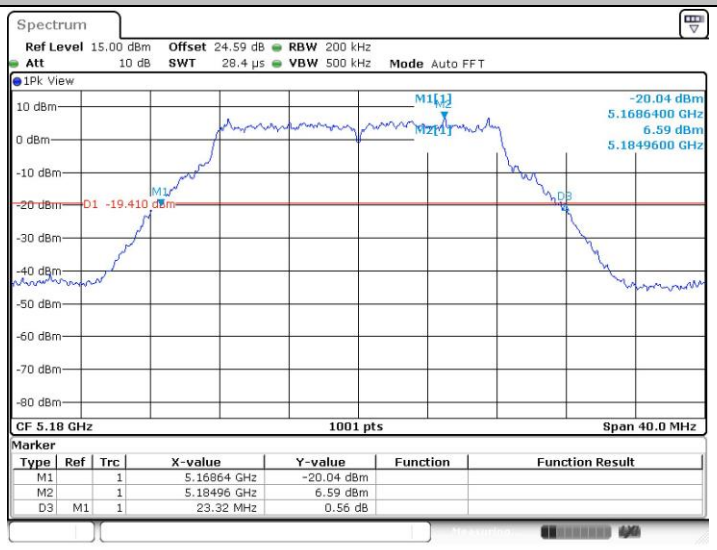

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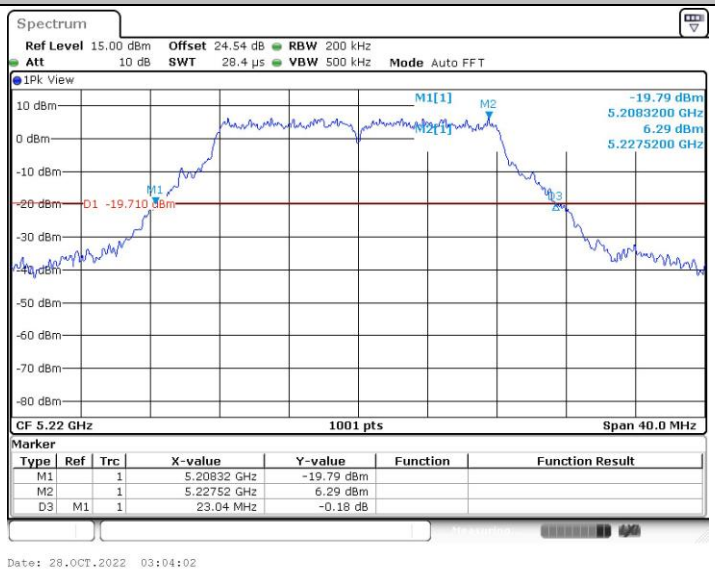

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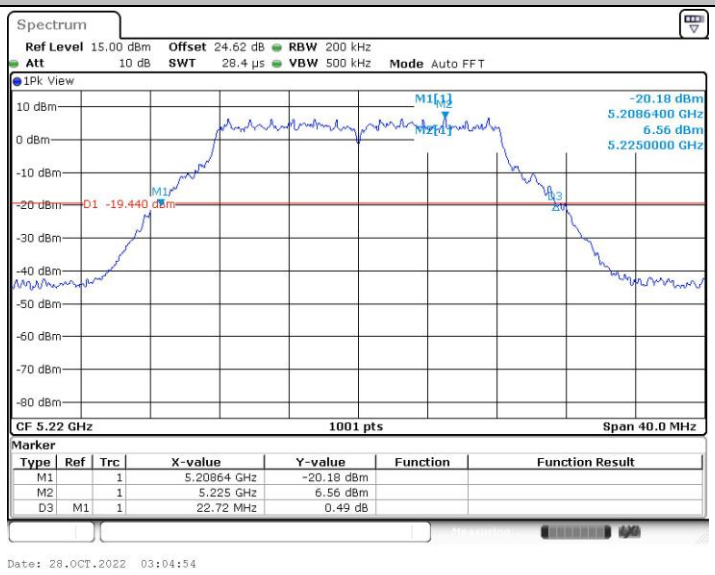
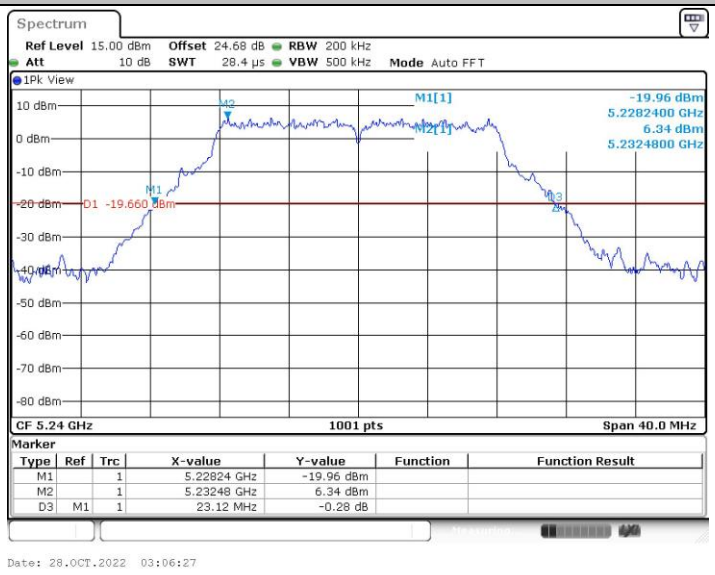
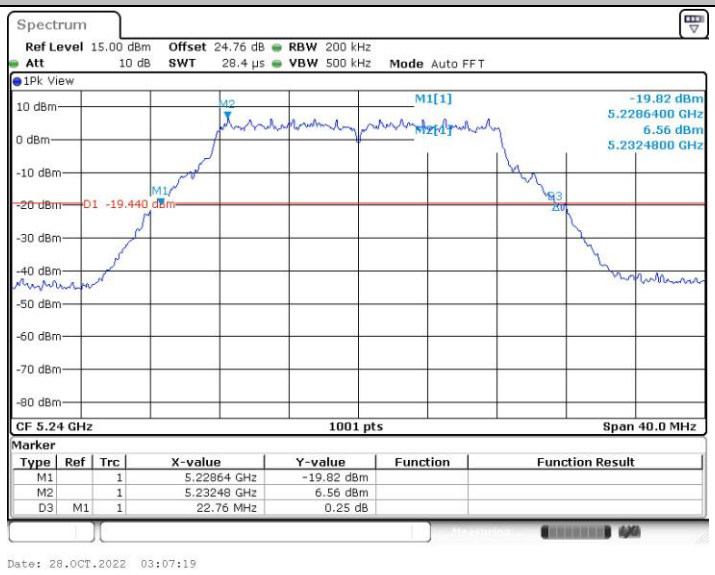


11A-CDD_Ant10_5240


11A-CDD_Ant13_5240


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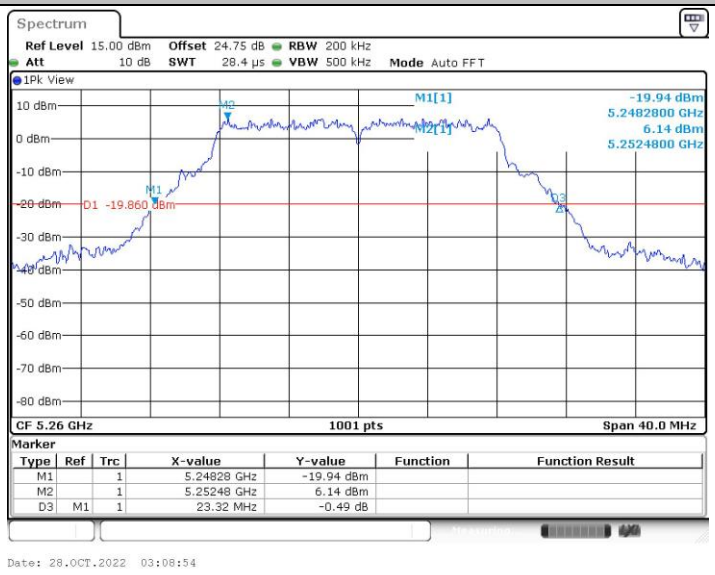

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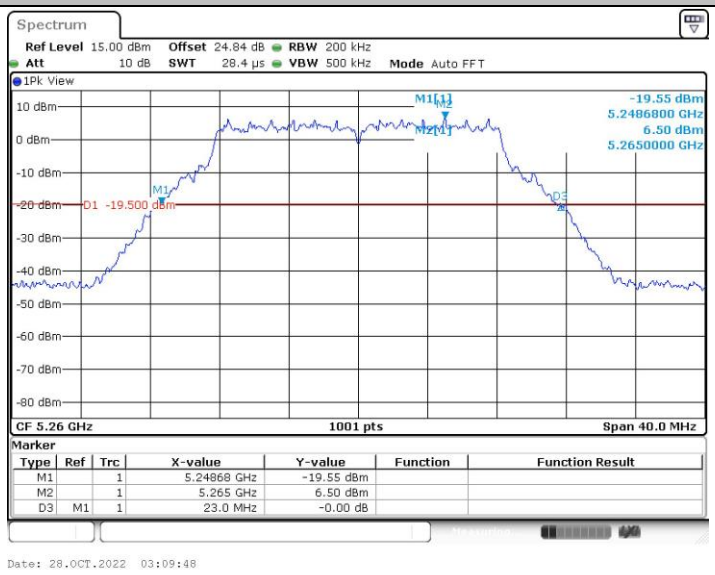

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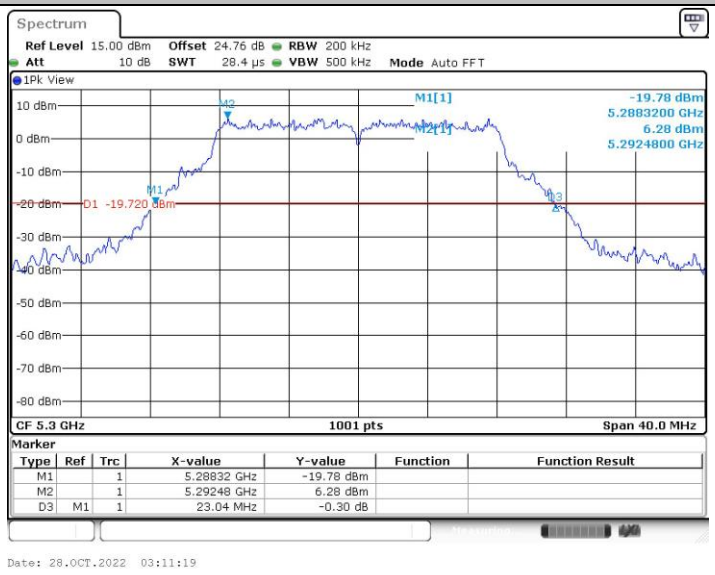

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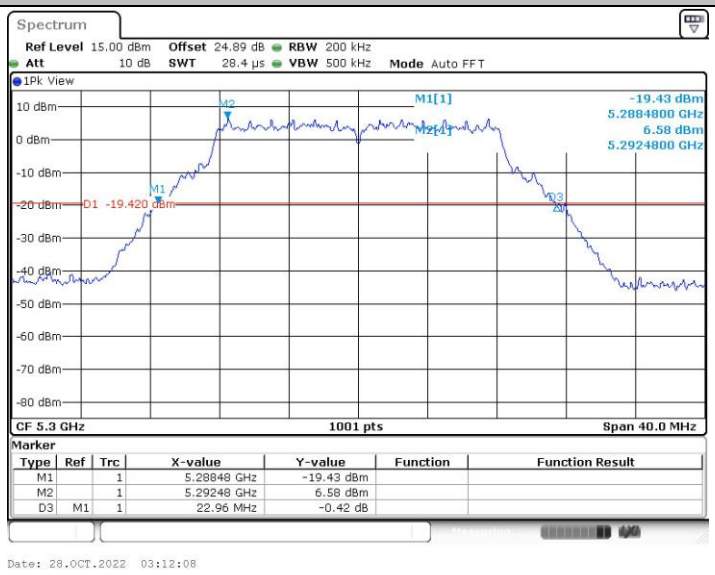

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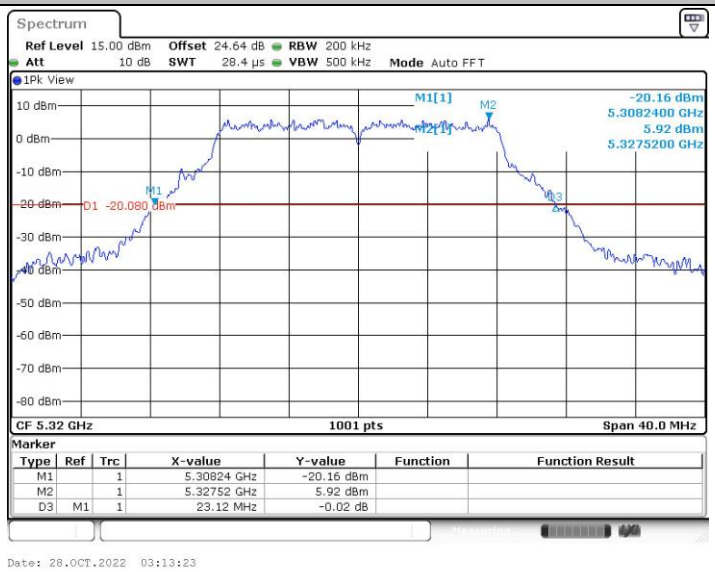

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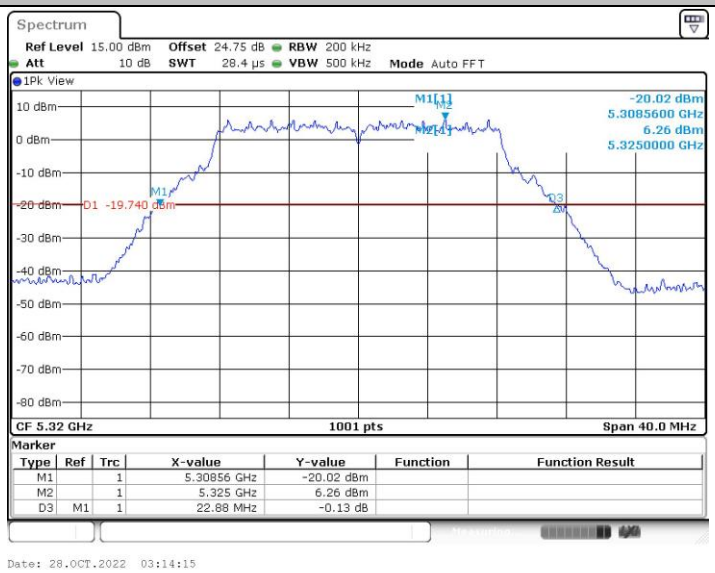

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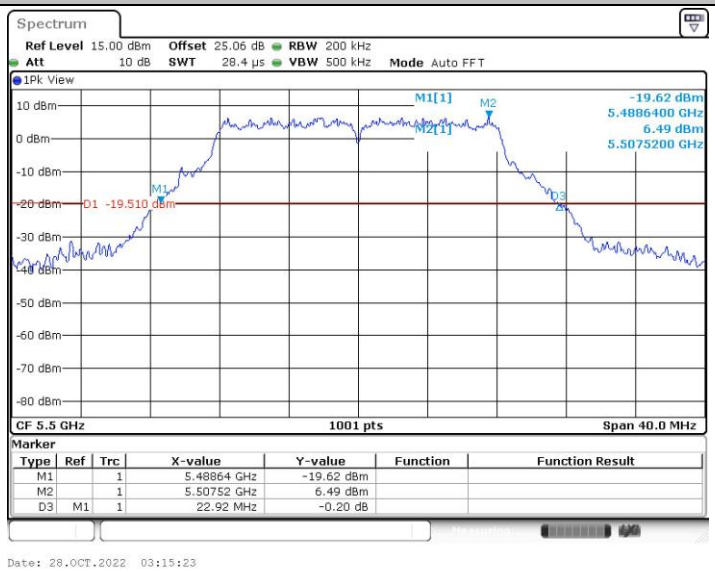

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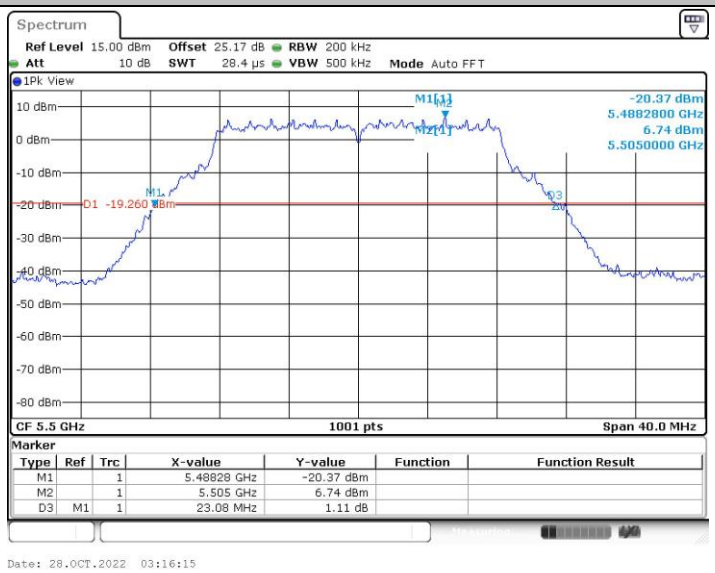

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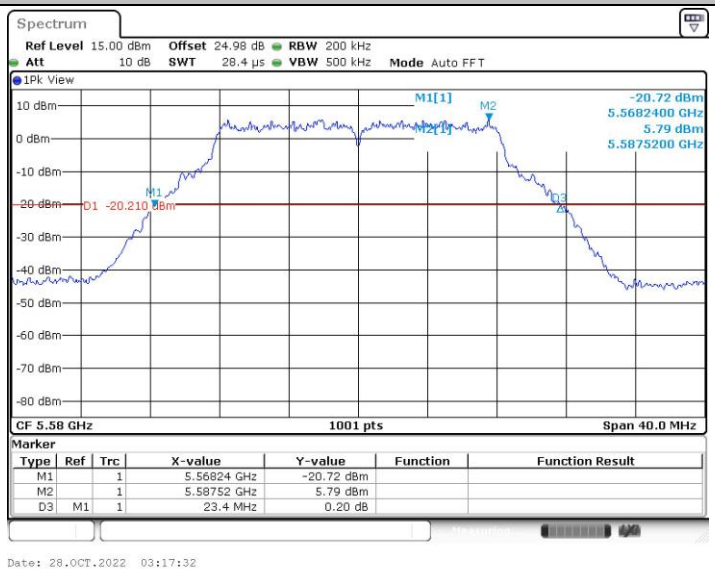

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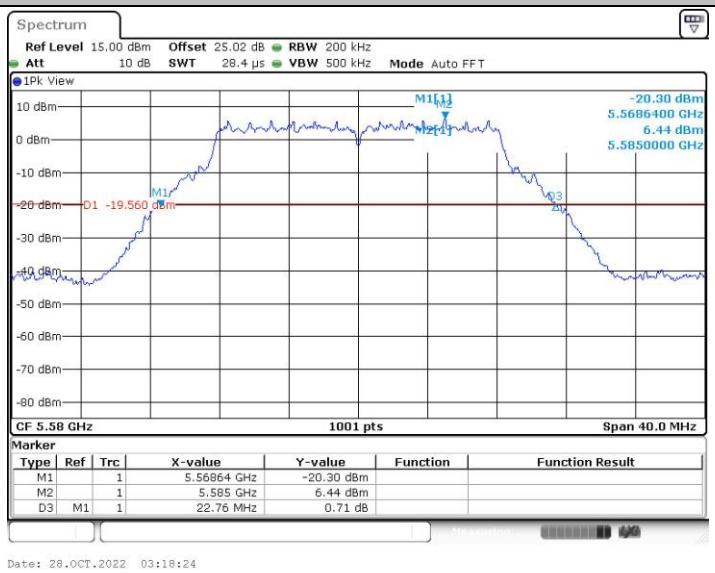

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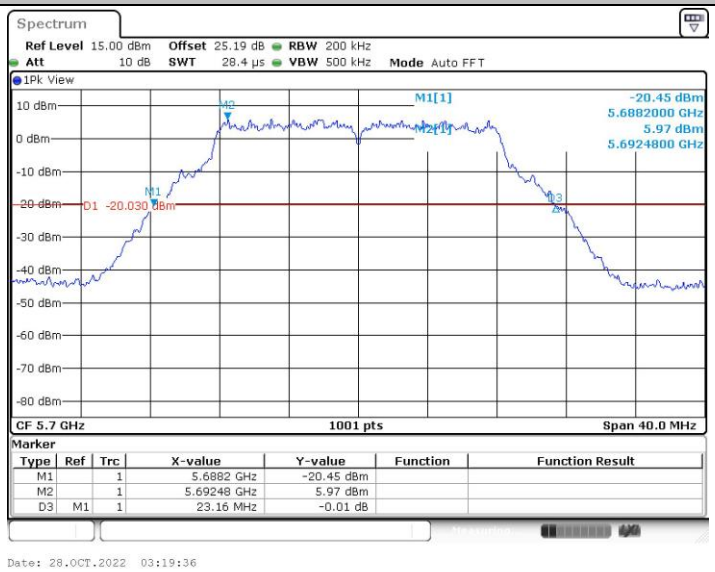

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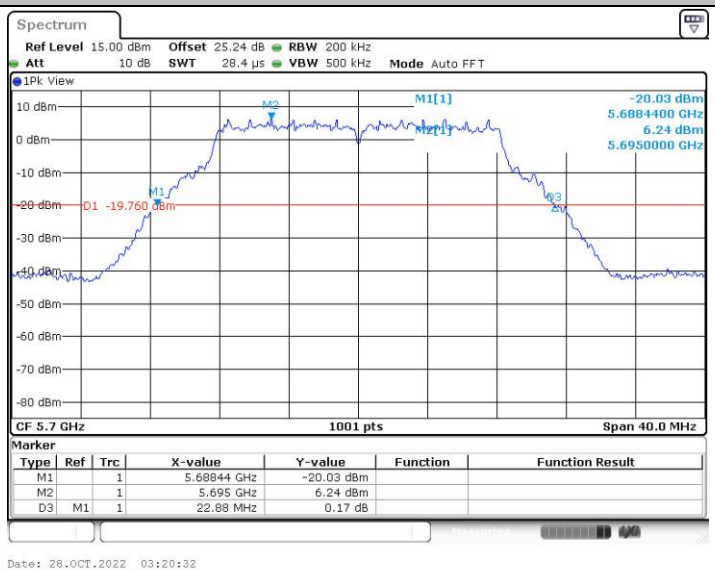

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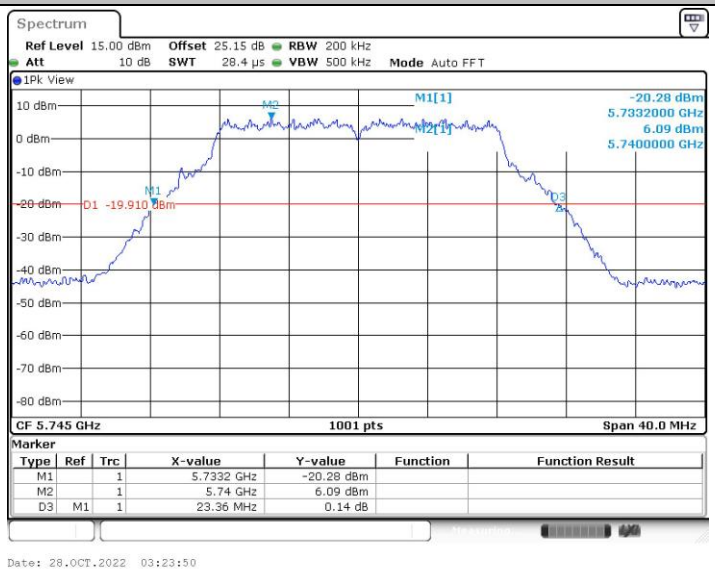

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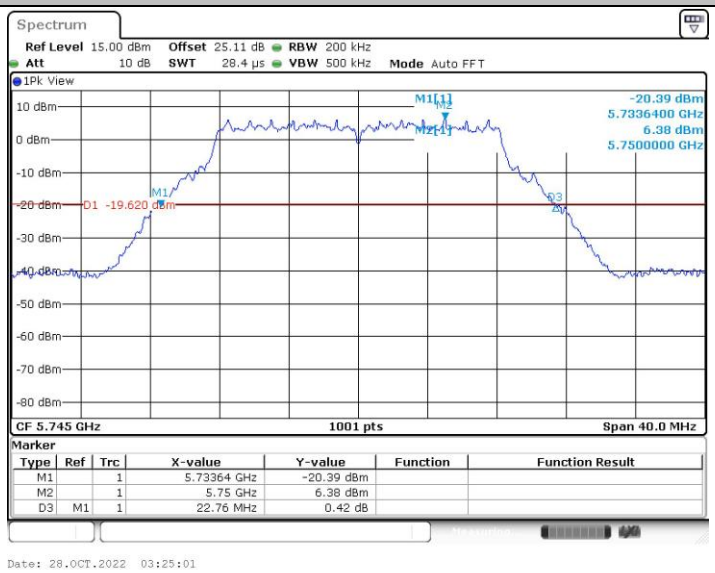

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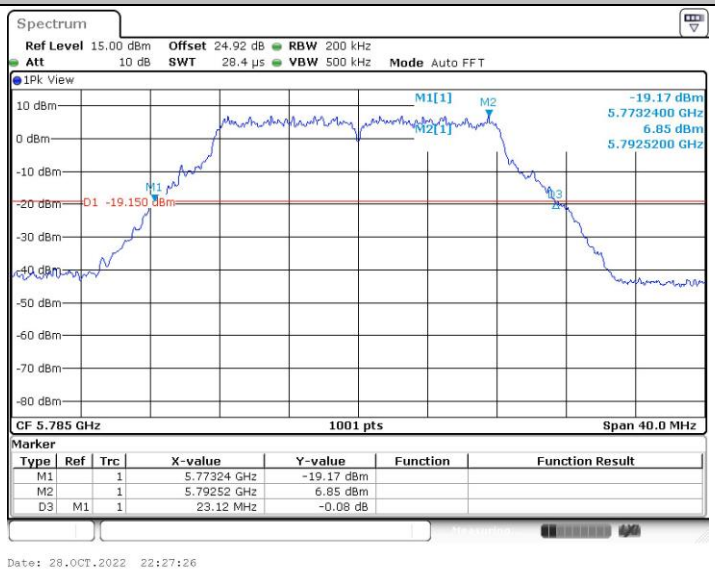

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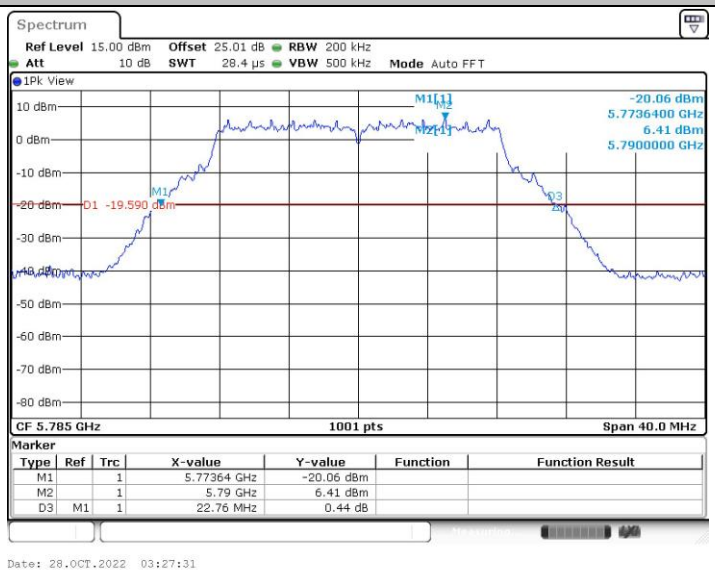

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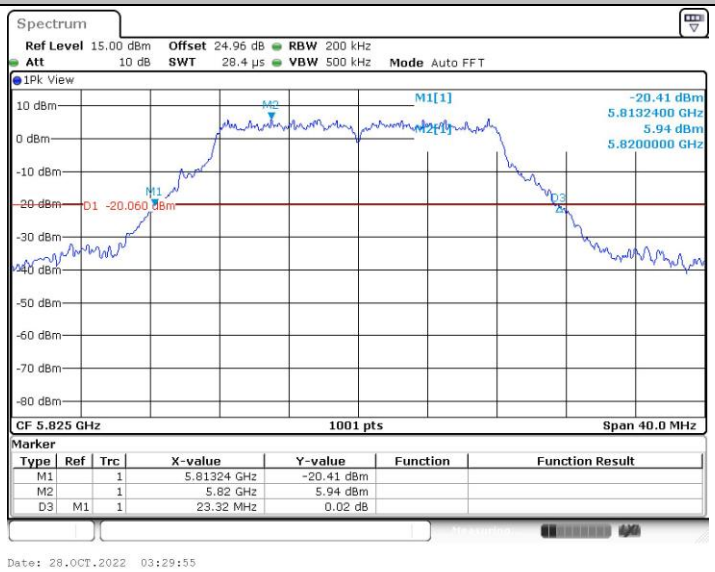

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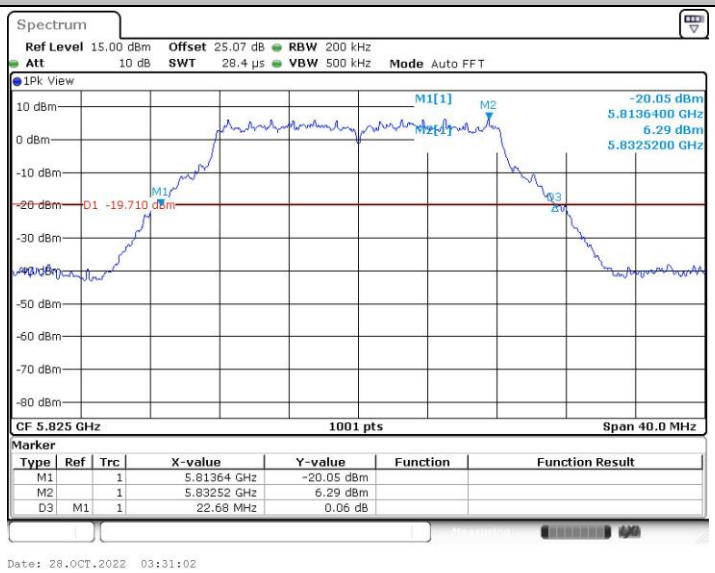

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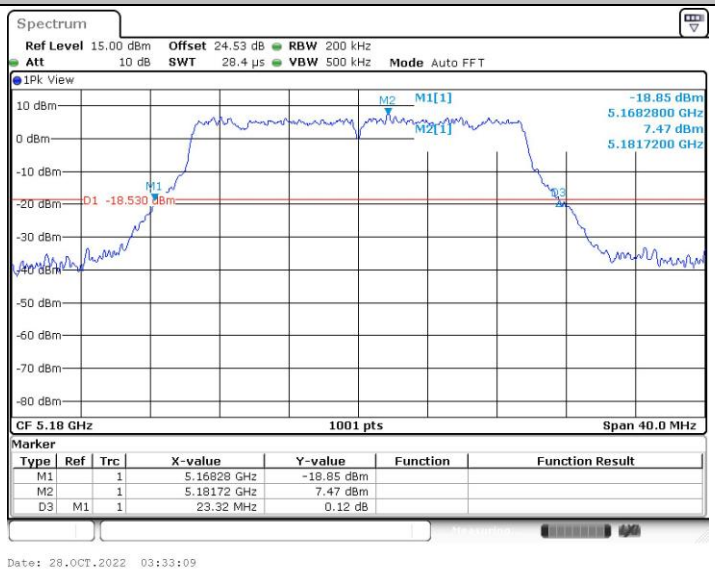

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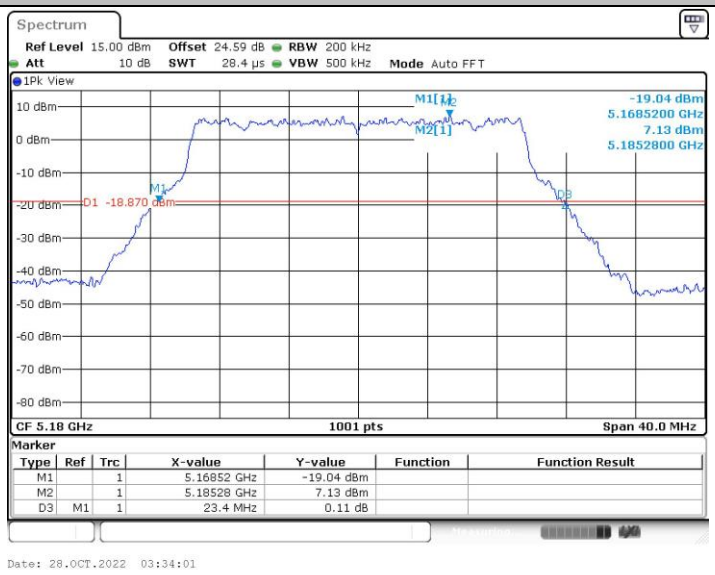

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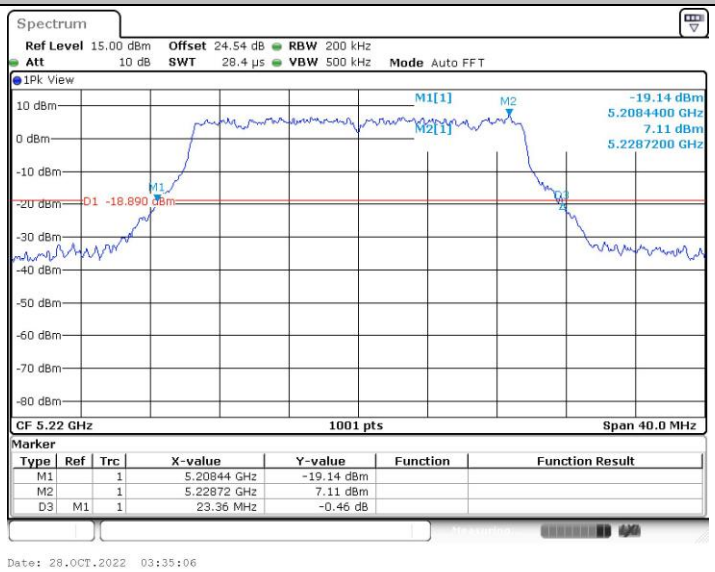

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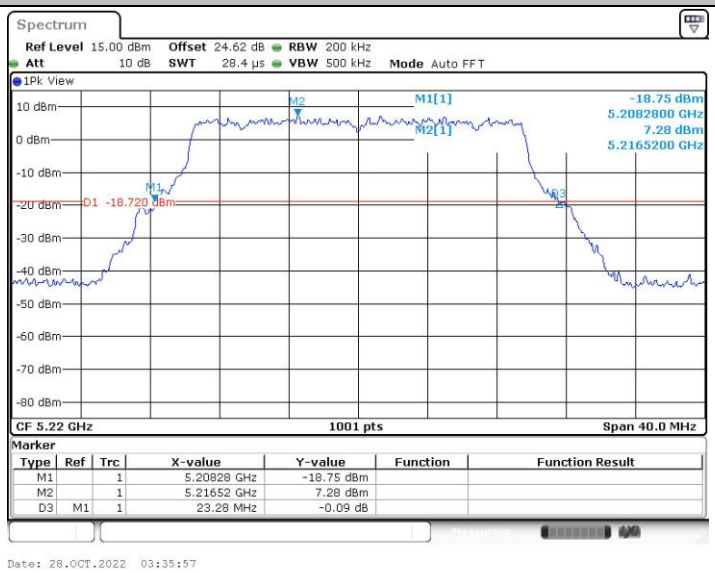

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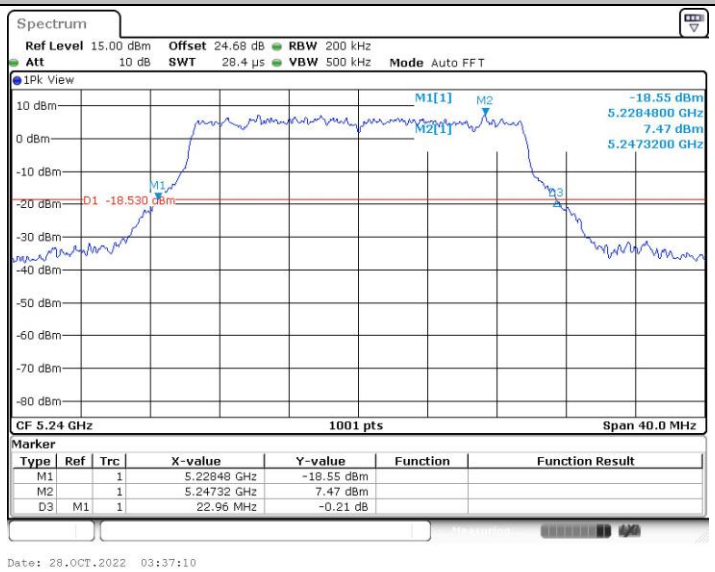

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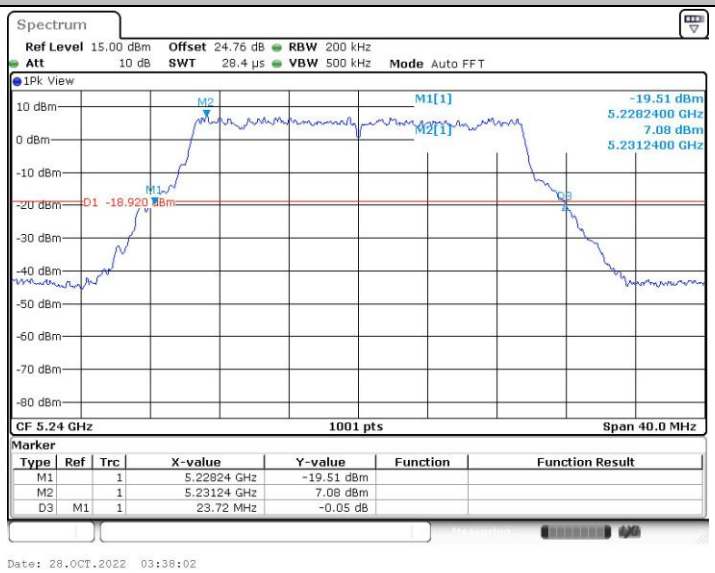

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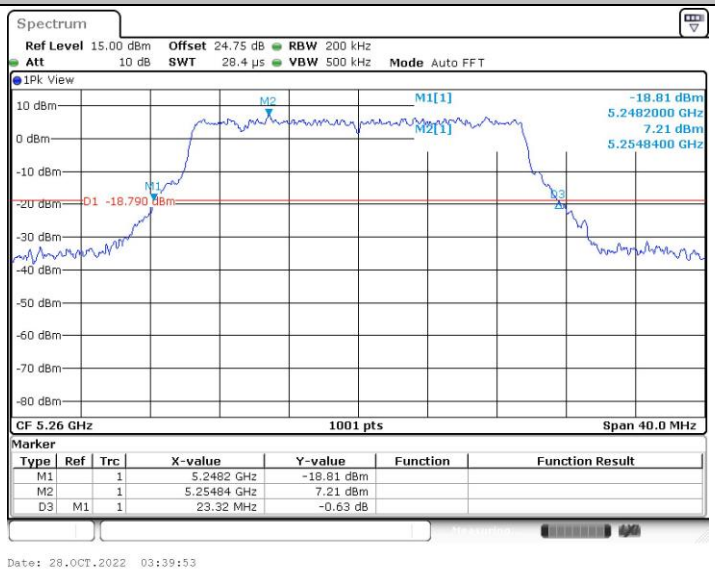

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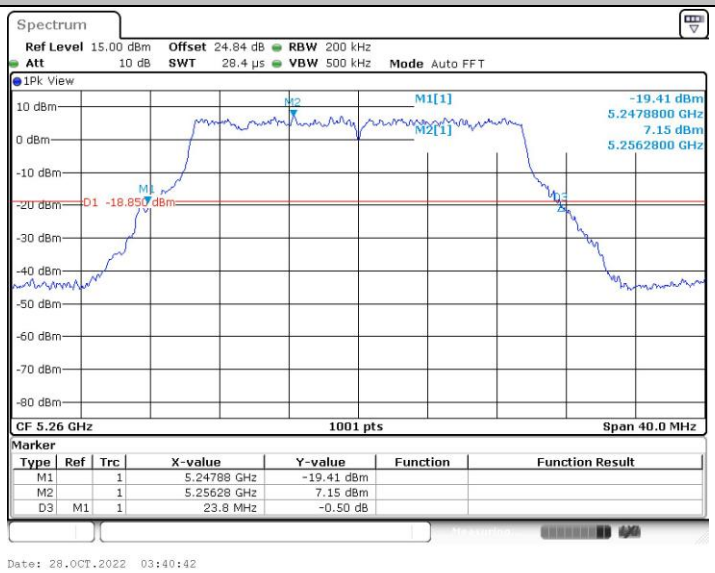

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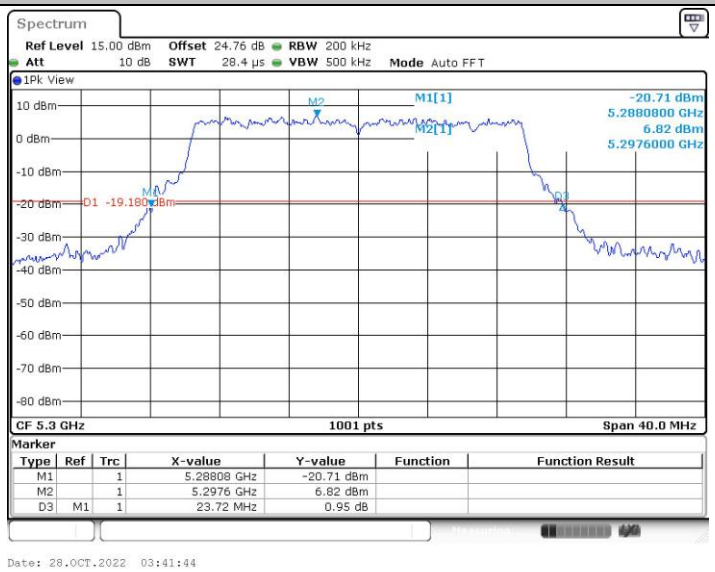

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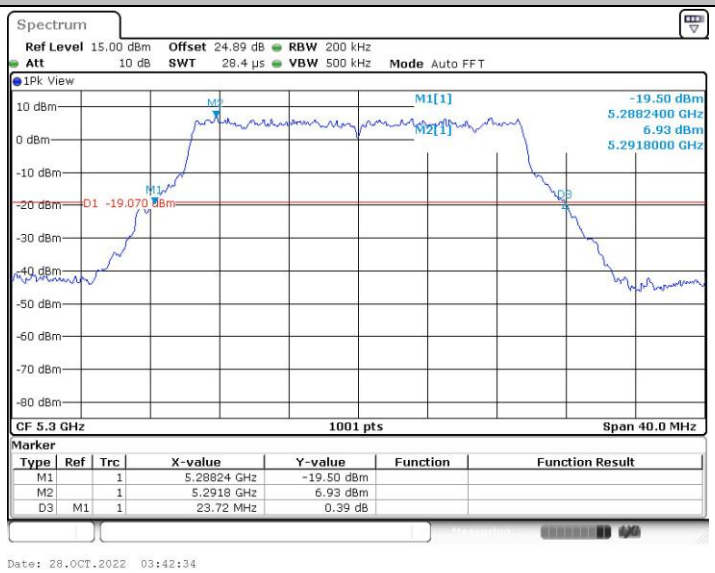

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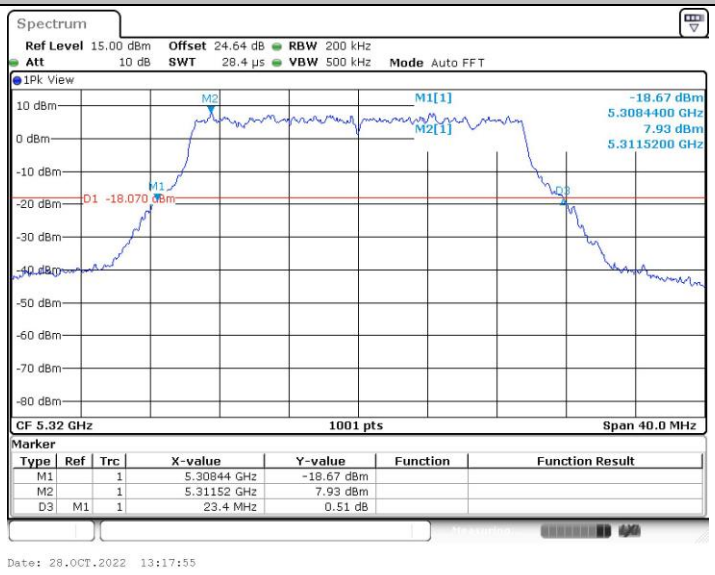

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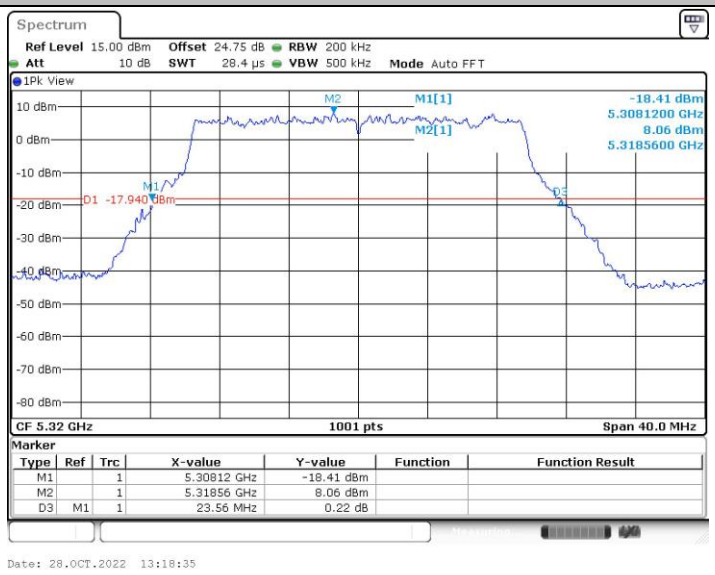

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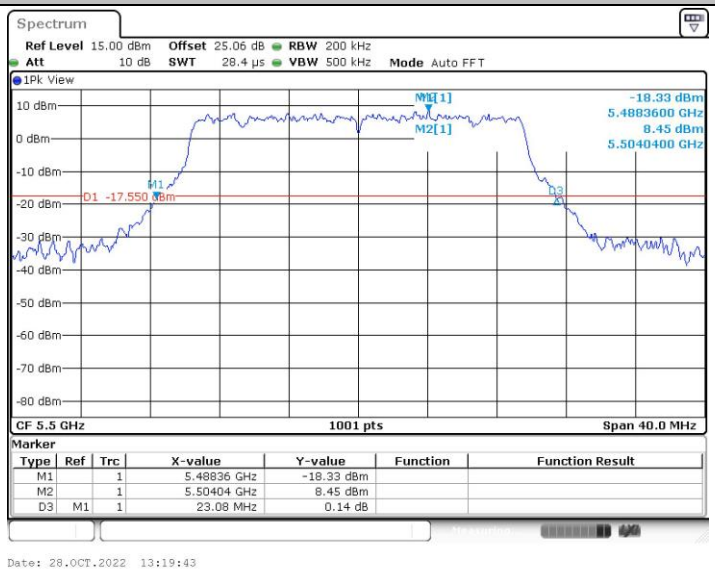

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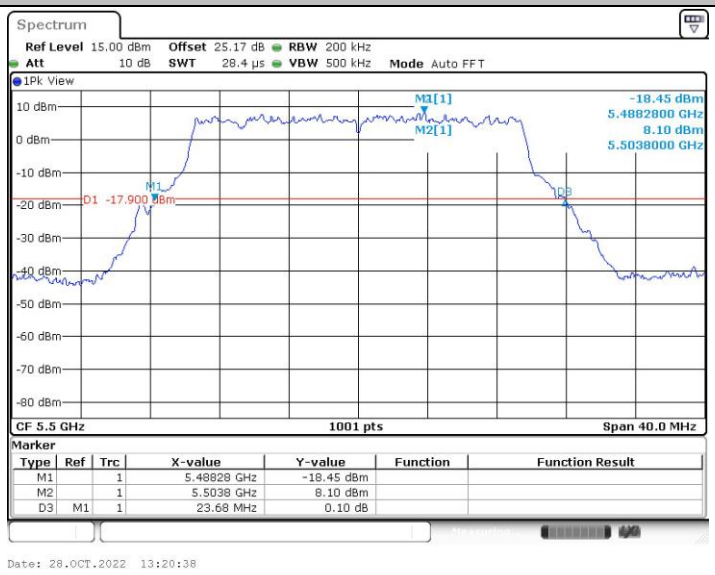

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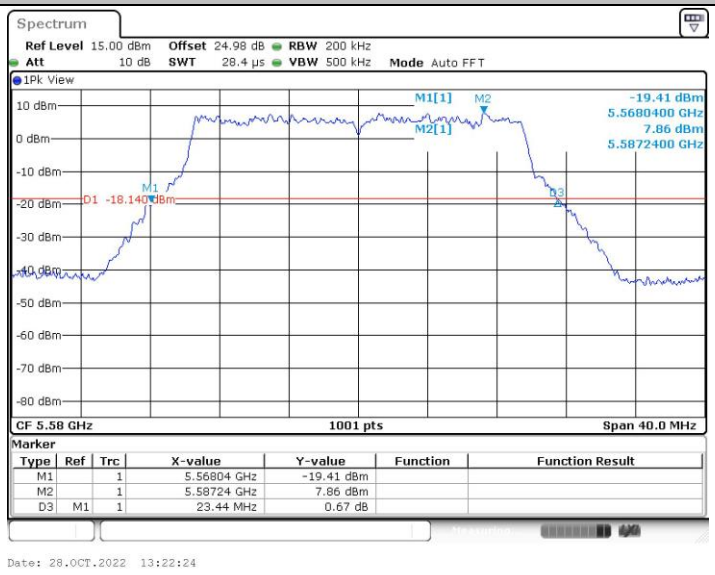

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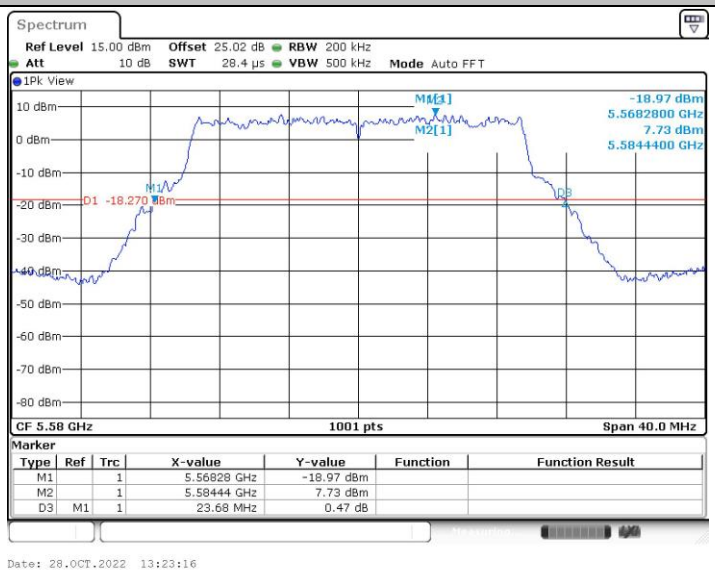

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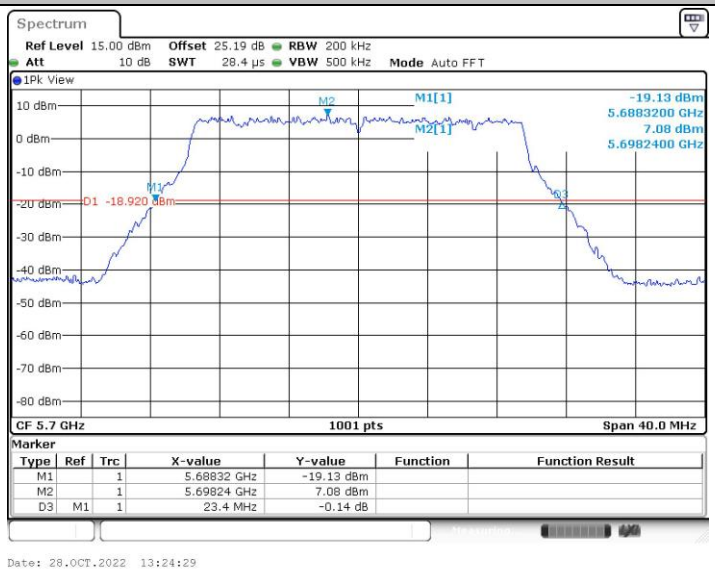

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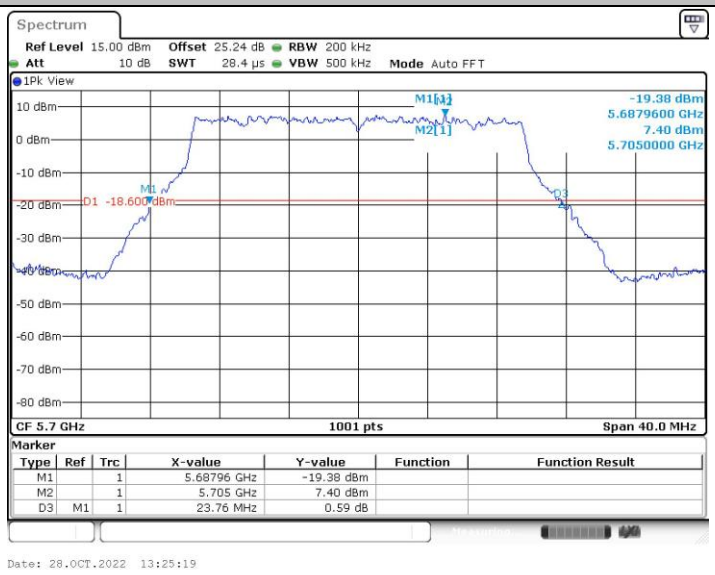

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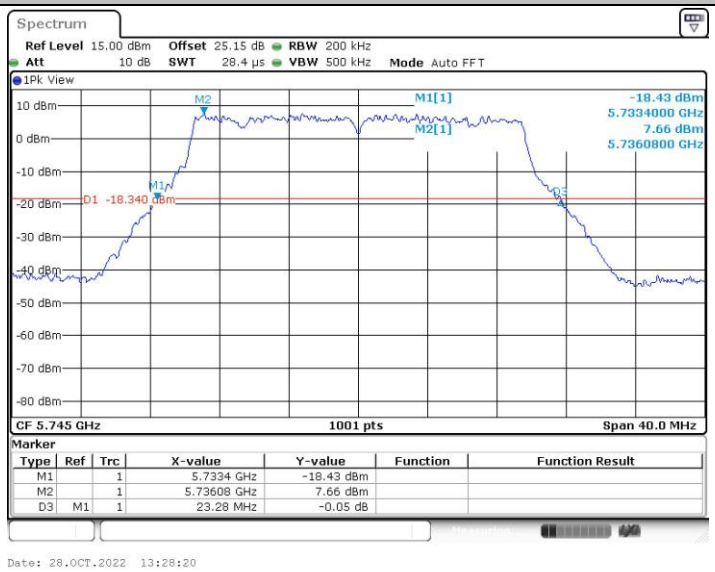

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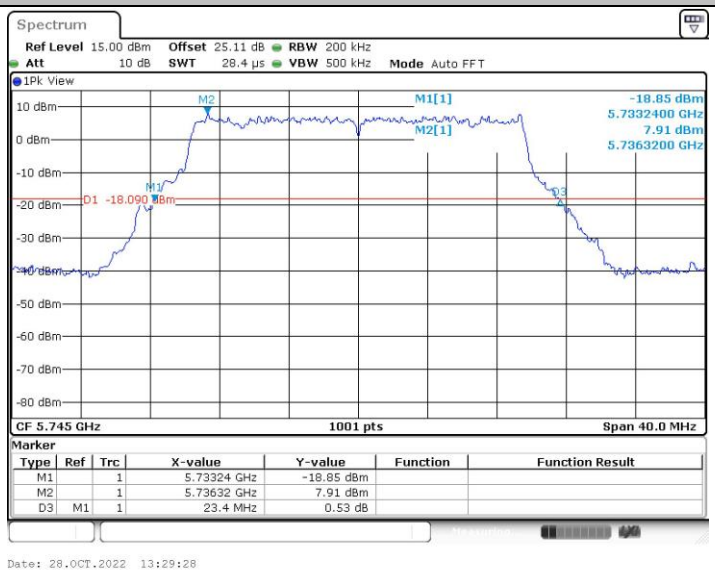

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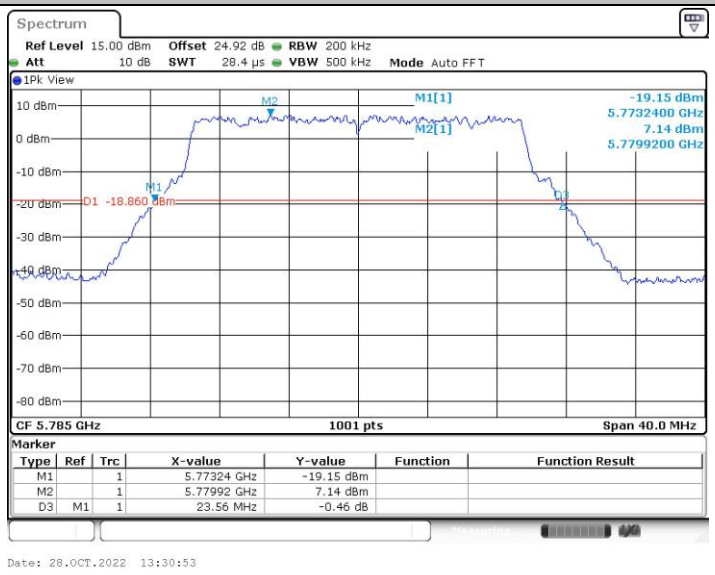

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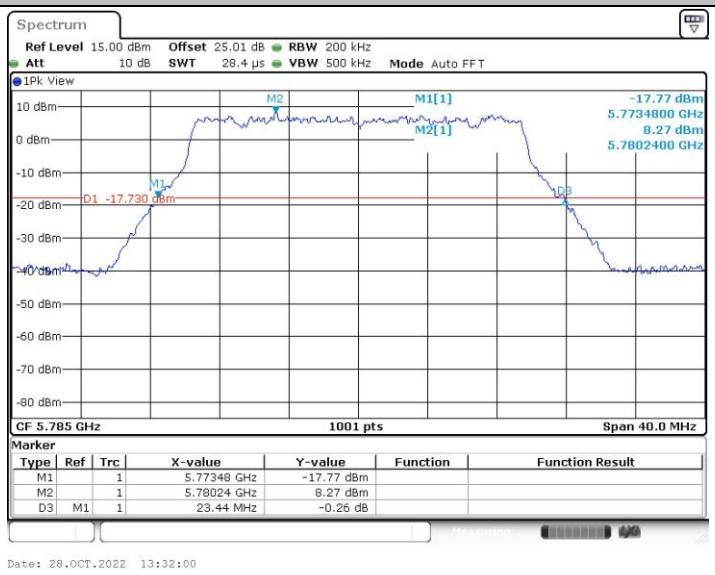

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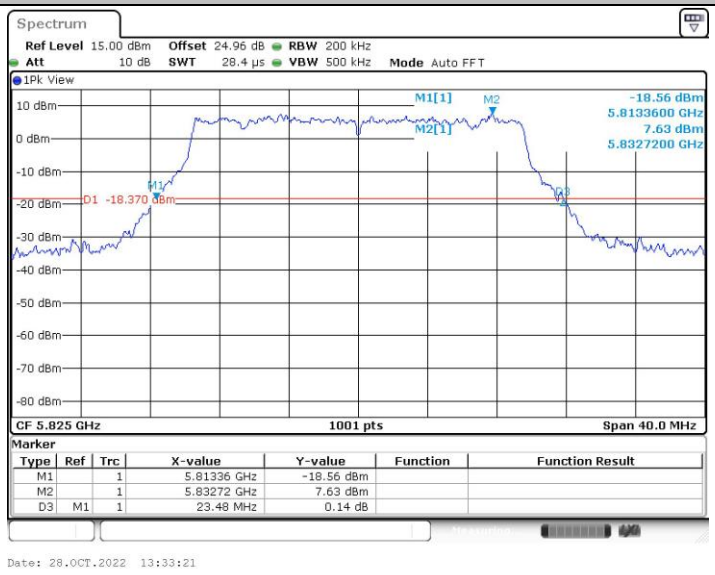

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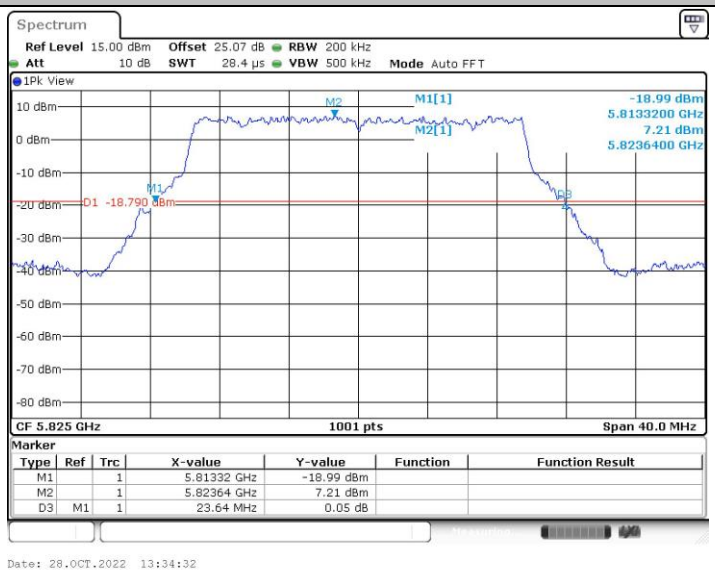

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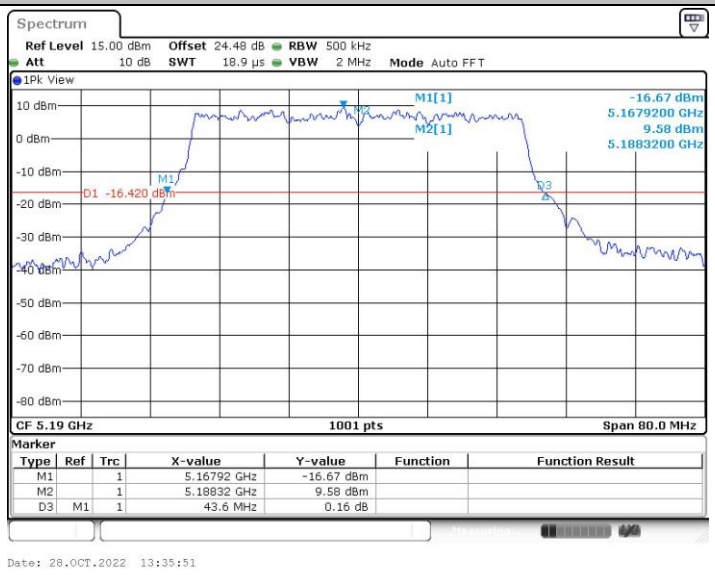

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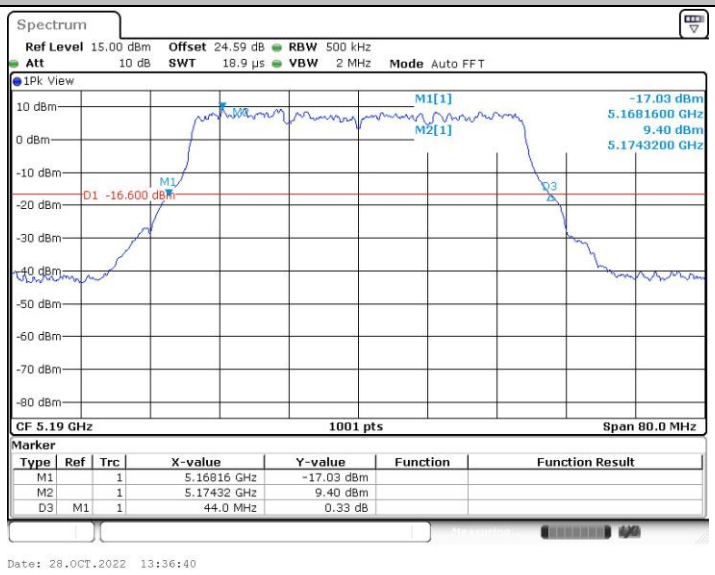

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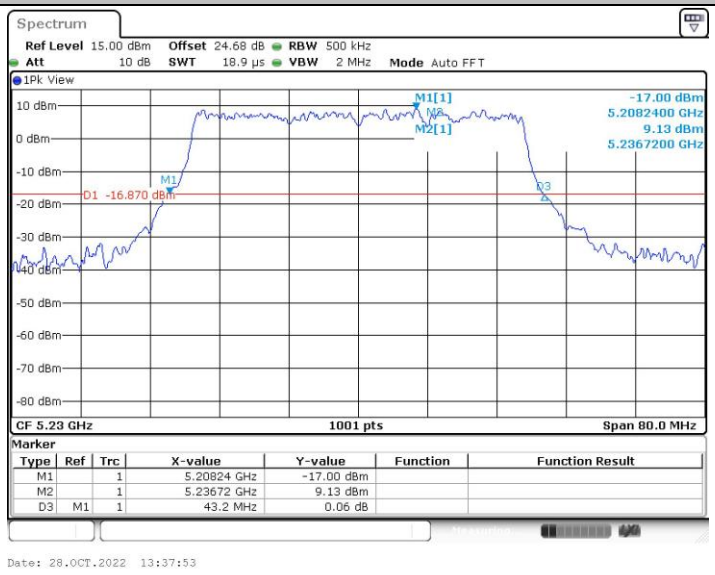

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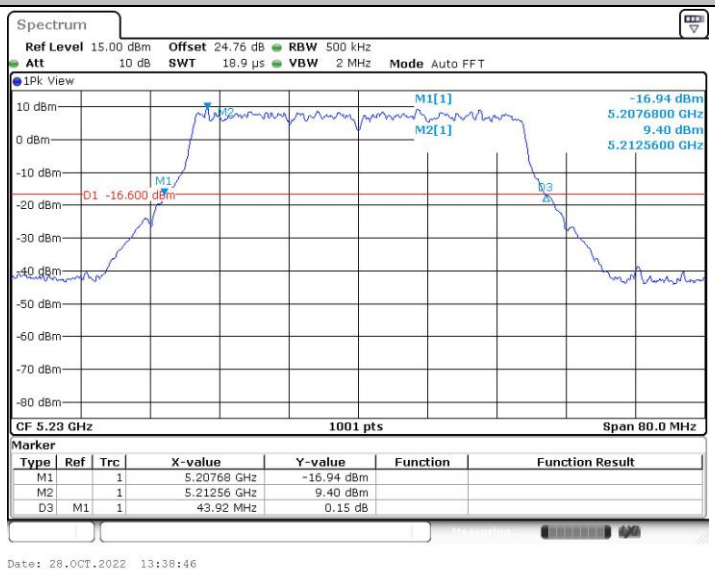

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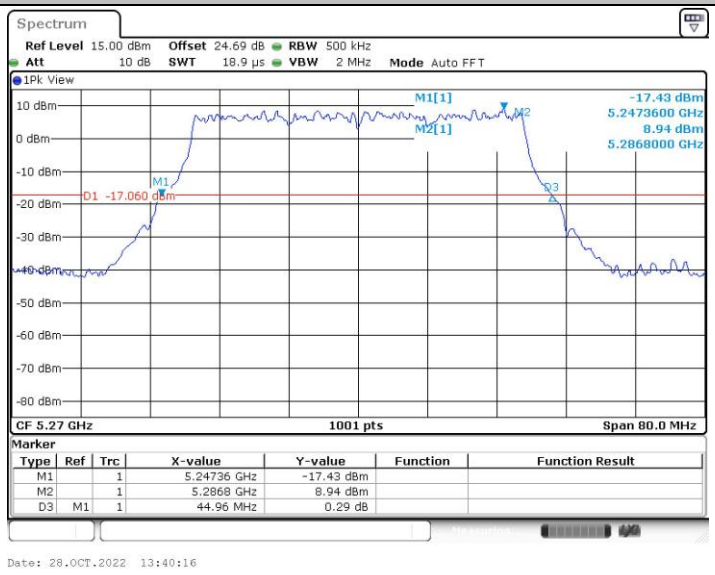

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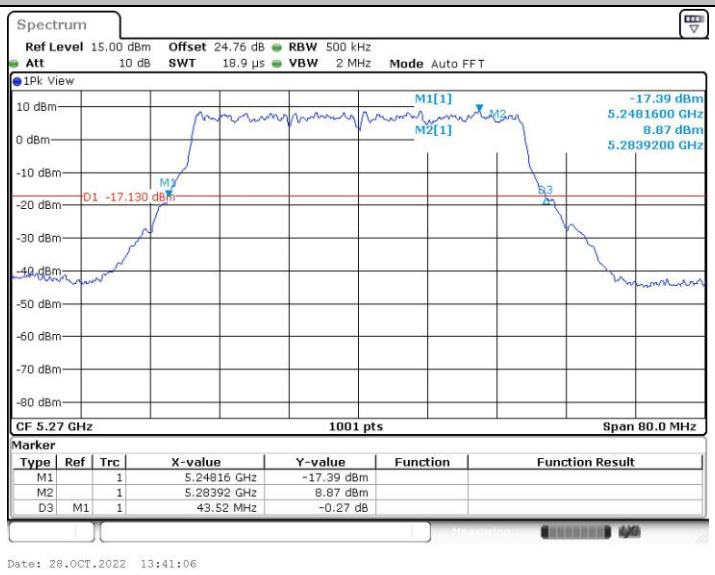

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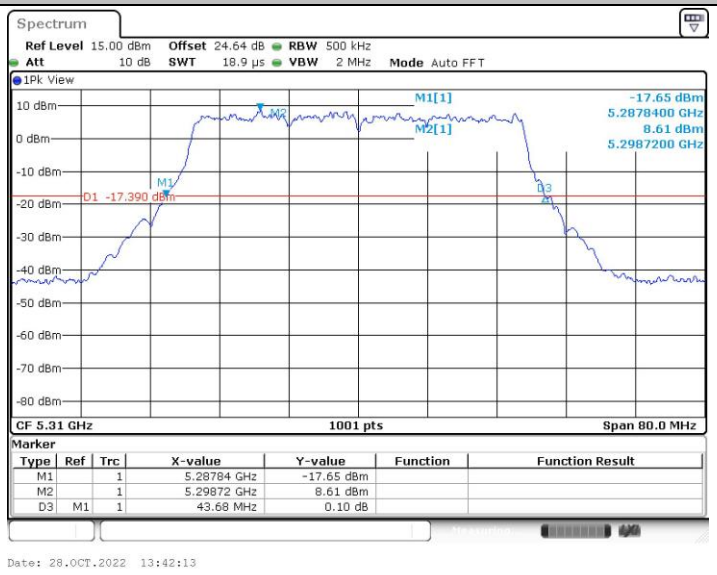

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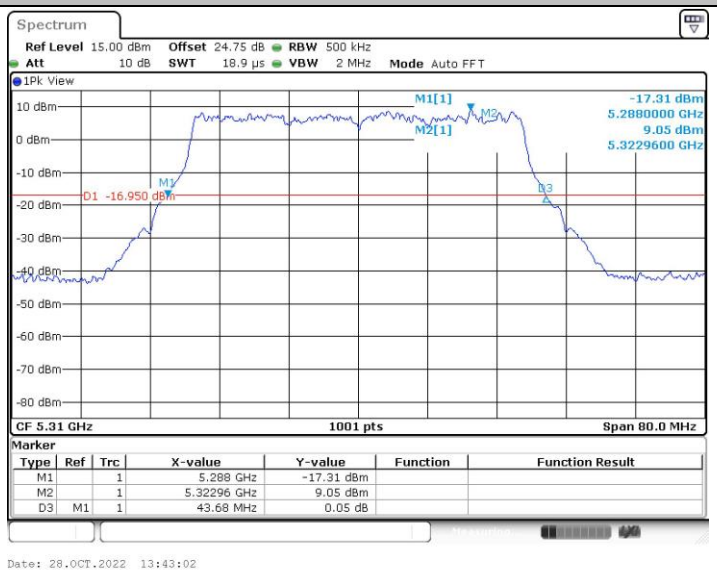

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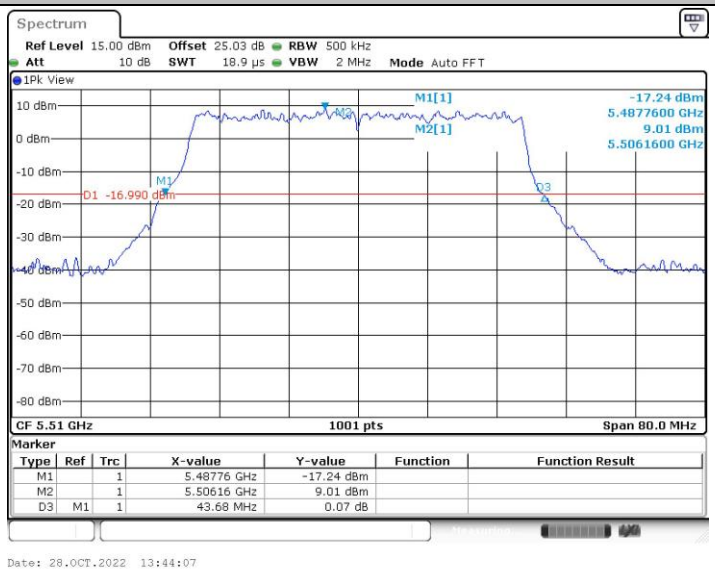

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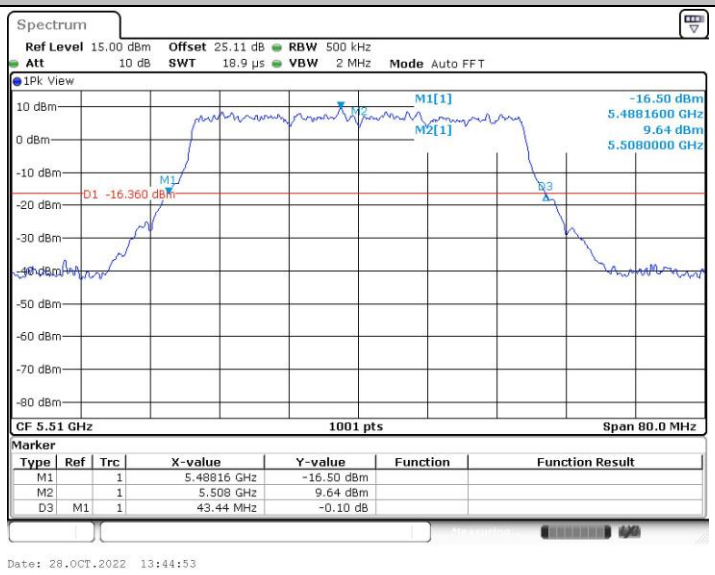

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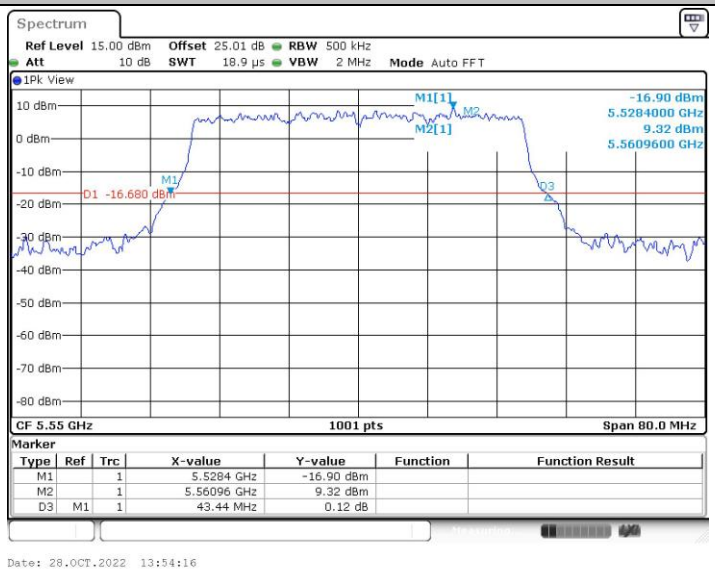

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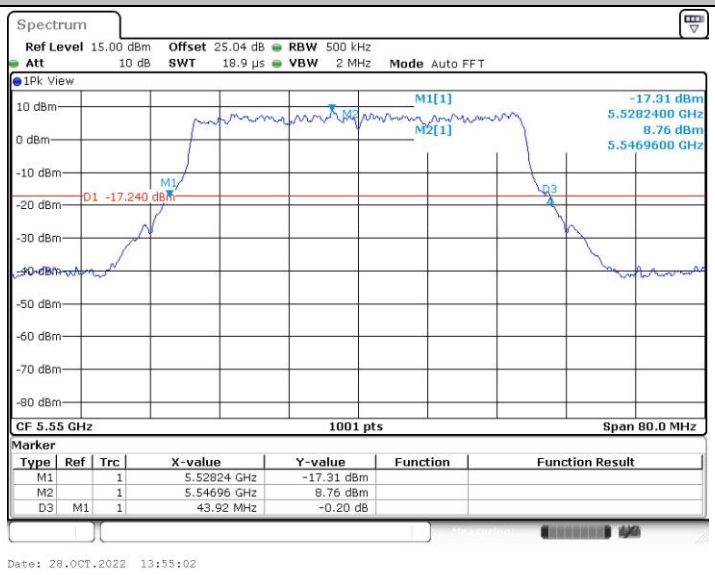

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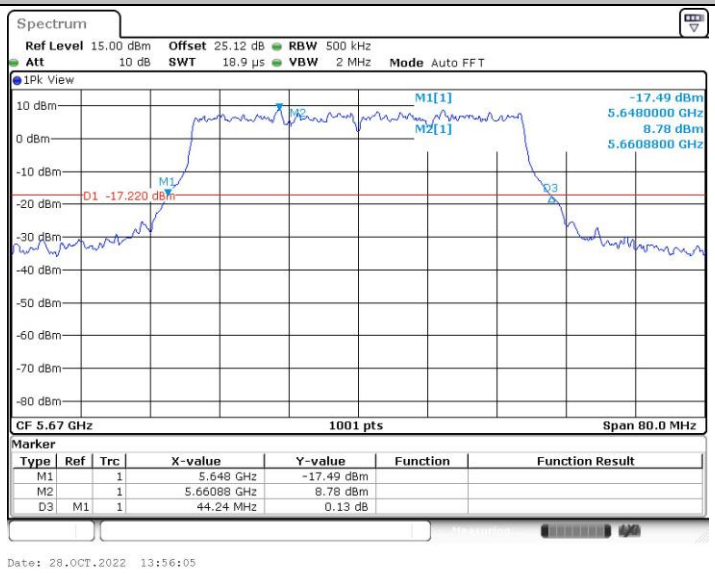

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