FCC RF Test Report

APPLICANT	:	Motorola Mobility LLC
EQUIPMENT	:	Mobile Cellular Phone
BRAND NAME	:	Motorola
MODEL NAME	:	XT2205-1, XT2205-2
FCC ID	:	IHDT56AE7
STANDARD	:	FCC Part 15 Subpart E §15.407
CLASSIFICATION	:	(NII) Unlicensed National Information Infrastructure
TEST DATE(S)	:	Apr. 25, 2022 ~ May 20, 2022

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

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
FR240834G	Rev. 01	Initial issue of report	Jun. 06, 2022

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.403(i)	6dB, 26dB and 99% Occupied Bandwidth	> 500kHz	Pass	-
3.2	15.407(a)	Maximum Conducted Output Power	≤ 30 dBm	Pass	-
3.3	15.407(a)	Power Spectral Density	≤ 30 dBm/500kHz	Pass	-
3.4	15.407(b)	Unwanted Emissions	15.407(b)(4)(i) &15.209(a)	Pass	Under limit 3.70 dB at 5628.80 MHz
3.5	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 10.42 dB at 0.168 MHz
3.6	15.203 & 15.407(a)	Antenna Requirement	15.203 & 15.407(a)	Pass	-

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

1 General Description

1.1 Applicant

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

1.2 Manufacturer

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

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Cellular Phone
Brand Name	Motorola
Model Name	XT2205-1, XT2205-2
FCC ID	IHDT56AE7
IMEI Code	Conducted: 357910940014128 Conduction: 357910940014755 Radiation: 357910940013435
HW Version	DVT2
SW Version	S2ST32.48
EUT Stage	Identical Prototype

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

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Channel Frequency Range	5745 MHz ~ 5825 MHz
Maximum Output Power	**<MIMO Ant. 1+2>** **<5745 MHz ~ 5825 MHz>** 802.11a : 20.83 dBm / 0.1211 W 802.11n HT20 : 20.84 dBm / 0.1213 W 802.11n HT40 : 20.73 dBm / 0.1183 W 802.11ac VHT20: 20.79 dBm / 0.1199 W 802.11ac VHT40: 20.66 dBm / 0.1164 W 802.11ac VHT80: 20.61 dBm / 0.1151 W 802.11ax HE20 : 18.70 dBm / 0.0741 W 802.11ax HE40 : 18.86 dBm / 0.0769 W 802.11ax HE80 : 18.59 dBm / 0.0723 W
99% Occupied Bandwidth	**<MIMO Ant. 1+2>** **<5745 MHz ~ 5825 MHz>** 802.11a : 19.74 MHz 802.11n HT20 : 21.02 MHz 802.11n HT40 : 38.28 MHz 802.11ac VHT80 : 78.80 MHz 802.11ax HE20 : 19.14 MHz 802.11ax HE40 : 38.04 MHz 802.11ax HE80 : 79.12 MHz
Type of Modulation	802.11a/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac/ax : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)
Antenna Type / Gain	<Ant. 1> : Loop Antenna with gain -7.5 dBi <Ant. 2> : ILA Antenna with gain -7.3 dBi
Antenna Function Description	<table><tr><td></td><td>Ant. 1</td><td>Ant. 2</td></tr><tr><td>802.11 a/n/ac/ax MIMO</td><td>V</td><td>V</td></tr></table>

Note:

1. For 802.11n HT20/HT40 & 802.11ac VHT20/VHT40 mode, the whole testing have assessed only 802.11n HT20/HT40 by referring to the higher output power.
2. 802.11ax 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) test Power/PSD/RSE, the full RU power > partial RU, therefor the full RU perform full test and Partial RU verified power/PSD/RSE.
3. WIFI MIMO only support STBC by manufacturer declared.
4. WLAN 5G Ant. 1 / Ant. 2 corresponding to EUT Photo Ant. 2 / Ant. 9.

1.5 Modification of EUT

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

1.6 Specification of Accessory

Specification of Accessory				
AC Adapter 1	**Brand Name**	Motorola(Salom)	**Model Name**	MC-301
AC Adapter 2	**Brand Name**	Motorola(Acbel)	**Model Name**	MC-301
Battery	**Brand Name**	Motorola(ATL)	**Model Name**	NF50
USB Cable 1	**Brand Name**	Motorola(Saibao)	**Model Name**	SC18D13215
USB Cable 2	**Brand Name**	Motorola(Cabletech)	**Model Name**	SC18D13216
USB Cable 3	**Brand Name**	Motorola(Luxshare)	**Model Name**	SC18D13217

1.7 Testing Location

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

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158 FAX : +86-512-57900958		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-KS 03CH04-KS 03CH06-KS	CN1257	314309

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

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.**
	TH01-SZ	CN1256	421272

Test data subcontracted: conducted test items in section 3.1 ~ 3.3 of this report.

1.8 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH04-KS	AUDIX	E3	6.2009-8-24a
2.	03CH06-KS	AUDIX	E3	6.2009-8-24al
3.	CO01-KS	AUDIX	E3	6.2009-8-24

1.9 Applicable Standards

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

- 47 CFR Part 15 Subpart E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- 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 (X plane) were recorded in this report.

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

2.1 Carrier Frequency and Channel

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

Note:

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

2.2 Test Mode

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

MIMO Mode

Modulation	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT80	MCS0
802.11ax HE20	MCS0
802.11ax HE40	MCS0
802.11ax HE80	MCS0

AC Conducted Emission	Mode 1 : GSM850 Idle + Bluetooth Link + WLAN Link(5G) + USB Cable 1(Charging from Adapter 1) + Battery 1
Remark: The AC Conduction and RSE are tested with accessories from the worst case of Part 15B report.	

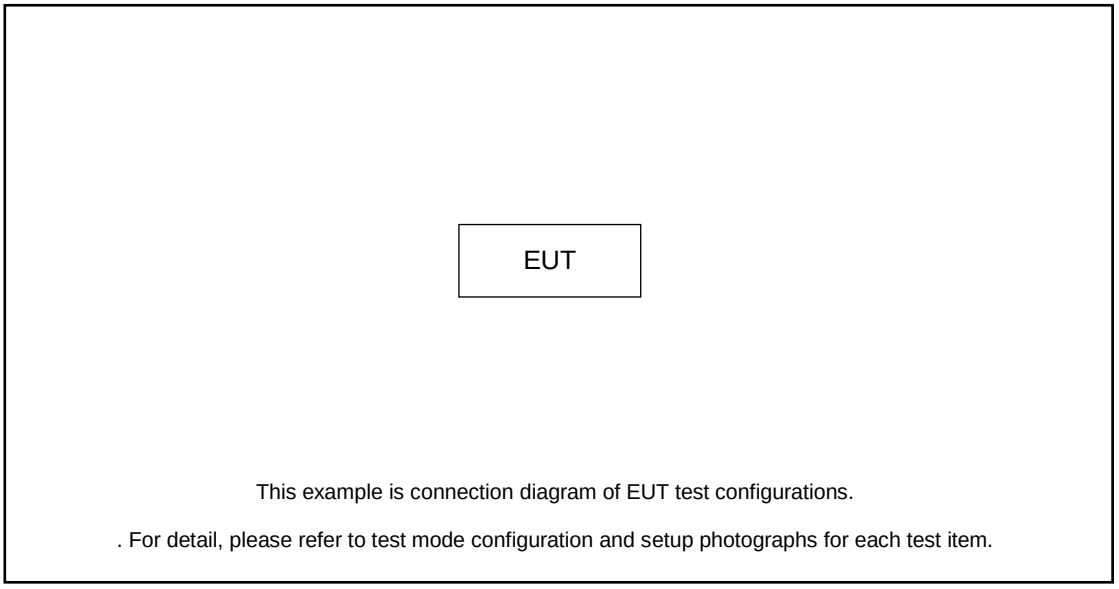
Ch. #		U-NII-3：5745-5825 MHz			
		802.11a	802.11n HT20	802.11n HT40	802.11ac VHT80
L	Low	149	149	151	-
M	Middle	157	157	-	155
H	High	165	165	159	-

Ch. #		U-NII-3：5745-5825 MHz		
		802.11ax HE20	802.11ax HE40	802.11ax HE80
L	Low	149	151	-
M	Middle	157	-	155
H	High	165	159	-

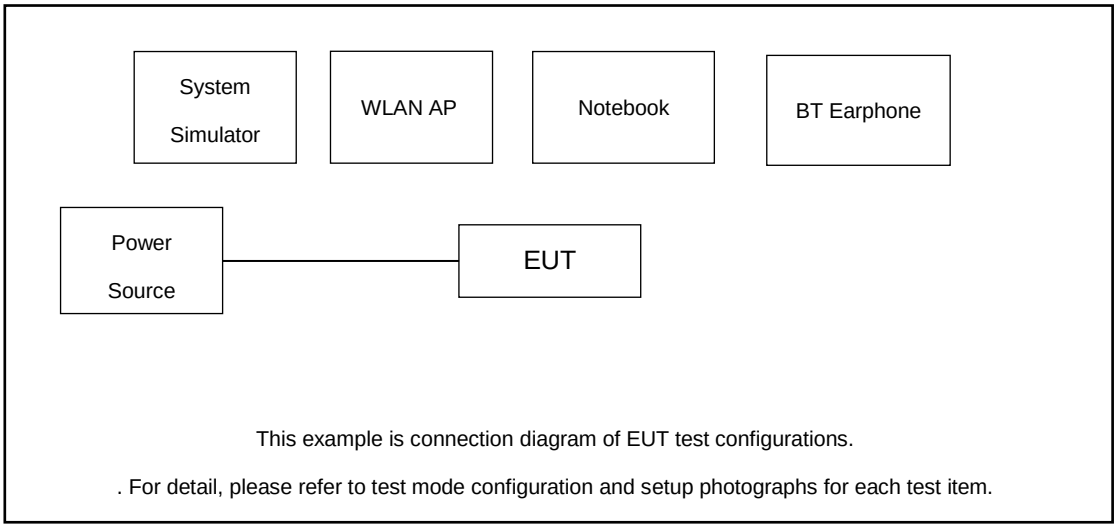
Remark: For radiation spurious emission, the final modulation and the worst data rate was reference the max RF conducted power.

2.3 Connection Diagram of Test System

For Radiated Emission



For AC Conducted Emission



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	LTE Base Station	Anritus	MT8821C	N/A	N/A	Unshielded,1.8m
2.	WLAN AP	D-link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
3.	Bluetooth Earphone	Lenovo	LBH308	N/A	N/A	N/A
4.	Notebook	Lenovo	G480	QDS-BRCM1050I	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m

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 5.81 dB and 20dB attenuator.

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

= 5.81 + 20 = 25.81(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.

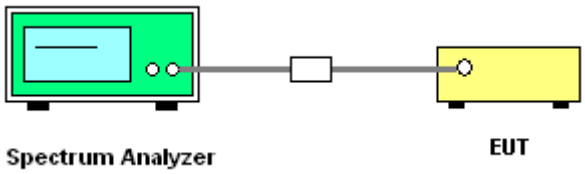
3.1.2 Measuring Instruments

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) Emission bandwidth for the band 5.725-5.85GHz
2. For 6dB BW, Set RBW = 100kHz.
   For 26dB BW, Set RBW = approximately 1% of the emission bandwidth.
   For 99% OBW, Set RBW = 1% to 5% of the OBW.
3. For 26dB BW, Set the VBW > RBW.
   For 6dB BW & 99% OBW, Set the VBW ≥ 3 x RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 6 dB down from the peak of the emission.
7. 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

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.

3.2.2 Measuring Instruments

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

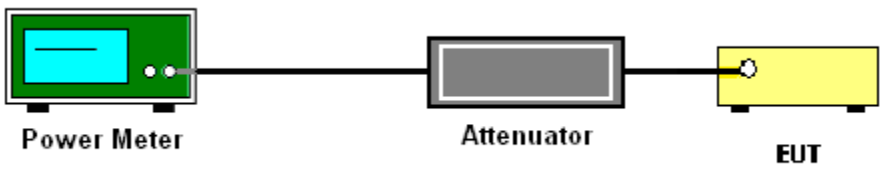
3.2.3 Test Procedures

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

U-NII-3															
Mod.	Data Rate	NTX	CH.	RU Config	Freq. (MHz)	Duty Factor (dB)		Average Conducted Power (dBm)			FCC Conducted Power Limit (dBm)		DG (dBi)		Pass/Fail
						Ant 1	Ant 2	Ant 1	Ant 2	SUM	Ant 1	Ant 2	Ant 1	Ant 2	
11a	6Mbps	2	149	Full	5745	0.12	0.15	18.61	16.28	20.61	30.00		-7.30		Pass
11a	6Mbps	2	157	Full	5785	0.12	0.15	18.74	16.63	20.83	30.00		-7.30		Pass
11a	6Mbps	2	165	Full	5825	0.12	0.15	18.49	16.50	20.62	30.00		-7.30		Pass
HT20	MCS0	2	149	Full	5745	0.13	0.16	18.38	16.20	20.44	30.00		-7.30		Pass
HT20	MCS0	2	157	Full	5785	0.13	0.16	18.81	16.55	20.84	30.00		-7.30		Pass
HT20	MCS0	2	165	Full	5825	0.13	0.16	18.34	16.37	20.48	30.00		-7.30		Pass
HT40	MCS0	2	151	Full	5755	0.26	0.33	18.73	16.41	20.73	30.00		-7.30		Pass
HT40	MCS0	2	159	Full	5795	0.26	0.33	18.59	16.25	20.59	30.00		-7.30		Pass
VHT20	MCS0	2	149	Full	5745	0.13	0.13	18.35	16.08	20.37	30.00		-7.30		Pass
VHT20	MCS0	2	157	Full	5785	0.13	0.13	18.78	16.48	20.79	30.00		-7.30		Pass
VHT20	MCS0	2	165	Full	5825	0.13	0.13	18.32	16.30	20.44	30.00		-7.30		Pass
VHT40	MCS0	2	151	Full	5755	0.26	0.26	18.68	16.32	20.66	30.00		-7.30		Pass
VHT40	MCS0	2	159	Full	5795	0.26	0.26	18.52	16.17	20.51	30.00		-7.30		Pass
VHT80	MCS0	2	155	Full	5775	0.50	0.50	18.64	16.25	20.61	30.00		-7.30		Pass
HE20	MCS0	2	149	Full	5745	0.17	0.21	16.59	14.21	18.57	30.00		-7.30		Pass
HE20	MCS0	2	149	26/0	5745	0.17	0.21	8.45	6.01	10.41	30.00		-7.30		Pass
HE20	MCS0	2	149	52/37	5745	0.17	0.21	11.10	8.72	13.08	30.00		-7.30		Pass
HE20	MCS0	2	149	106/53	5745	0.17	0.21	13.98	11.88	16.07	30.00		-7.30		Pass
HE20	MCS0	2	157	Full	5785	0.17	0.21	16.61	14.53	18.70	30.00		-7.30		Pass
HE20	MCS0	2	165	Full	5825	0.17	0.21	16.32	14.27	18.42	30.00		-7.30		Pass
HE20	MCS0	2	165	26/8	5825	0.17	0.21	7.63	5.79	9.82	30.00		-7.30		Pass
HE20	MCS0	2	165	52/40	5825	0.17	0.21	10.52	8.39	12.59	30.00		-7.30		Pass
HE20	MCS0	2	165	106/54	5825	0.17	0.21	14.05	12.01	16.16	30.00		-7.30		Pass
HE40	MCS0	2	151	Full	5755	0.39	0.39	16.86	14.35	18.80	30.00		-7.30		Pass
HE40	MCS0	2	151	242/61	5755	0.39	0.39	15.40	12.79	17.30	30.00		-7.30		Pass
HE40	MCS0	2	159	Full	5795	0.39	0.39	16.85	14.54	18.86	30.00		-7.30		Pass
HE40	MCS0	2	159	242/62	5795	0.39	0.39	15.69	13.24	17.65	30.00		-7.30		Pass
HE80	MCS0	2	155	Full	5775	0.69	0.71	15.70	15.45	18.59	30.00		-7.30		Pass
HE80	MCS0	2	155	484/65	5775	0.69	0.71	14.57	13.00	16.87	30.00		-7.30		Pass
HE80	MCS0	2	155	484/66	5775	0.69	0.71	14.69	13.10	16.98	30.00		-7.30		Pass

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

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 v02r01.

Section F) Maximum power spectral density.

 # Method SA-2 #

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

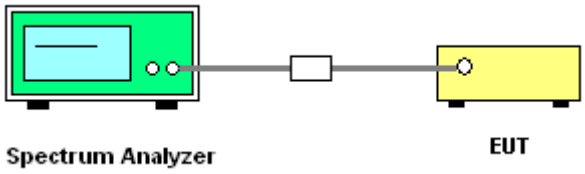
- Measure the duty cycle.
- Set span to encompass the entire emission bandwidth (EBW) of the signal.
- Set RBW = 500 kHz.
- Set VBW ≥ 1 MHz.
- Number of points in sweep ≥ 2 Span / RBW.
- Sweep time = auto.
- Detector = RMS
- Trace average at least 100 traces in power averaging mode.

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 (c): Measure and add 10 log(N_{ANT}) dB.

   With this technique, spectrum measurements are performed at each output of the device, but rather than summing the spectra or the spectral peaks across the outputs, the quantity 10 log(N_{ANT}) dB is added to each spectrum value before comparing to the emission limit. The addition of 10 log(N_{ANT}) dB serves to apportion the emission limit among the N_{ANT} outputs so that each output is permitted to contribute no more than $1/N_{ANT}$ th of the PSD 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 is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

3.4.1 Limit of Unwanted Emissions

(1) 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.

(2) 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

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 v02r01. 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

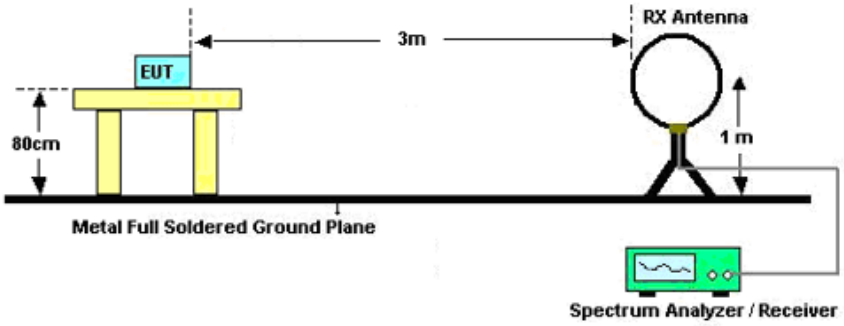
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

   - 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.

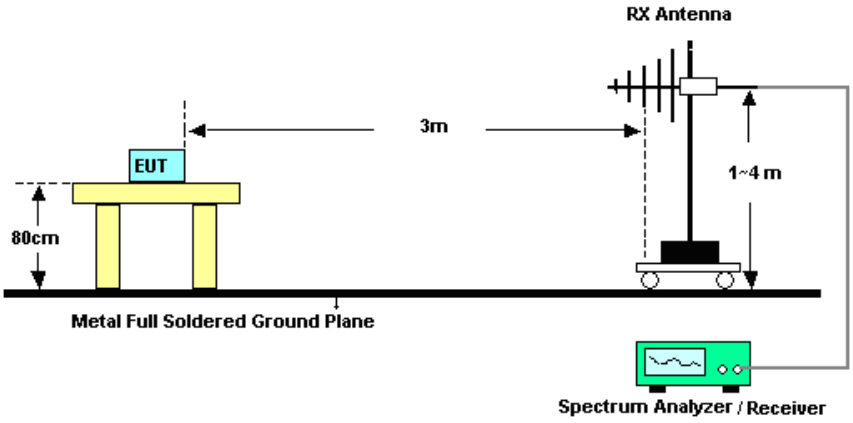
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband 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 peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

3.4.4 Test Setup

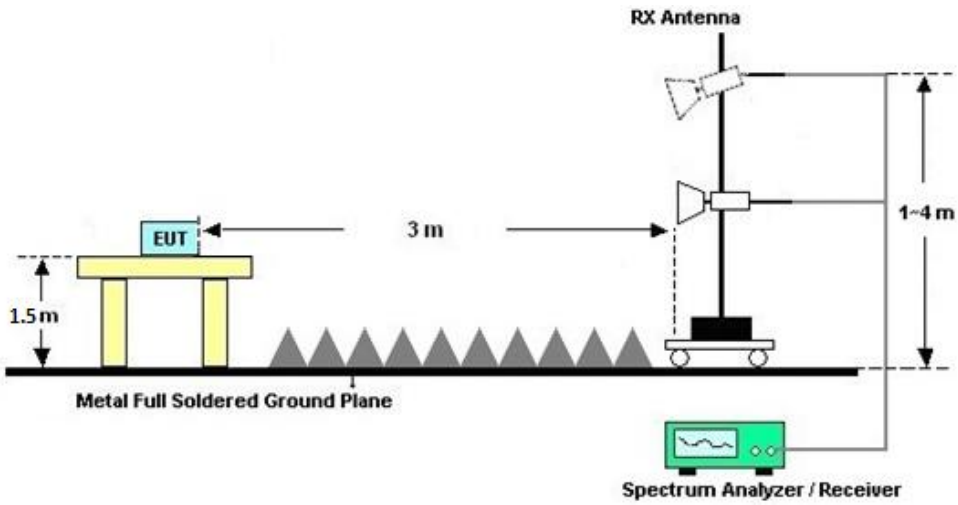
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.4.5 Test Results of Radiated 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 Band Edges

Please refer to Appendix C.

3.4.7 Duty Cycle

Please refer to Appendix D.

3.4.8 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

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.

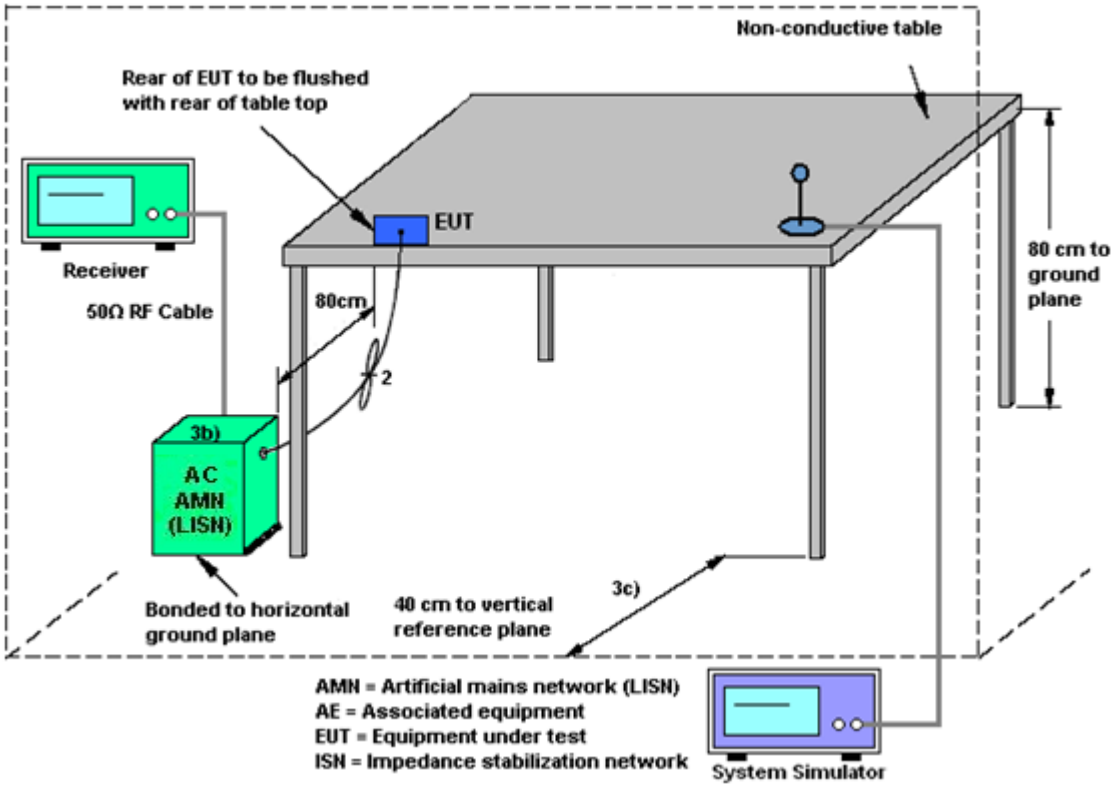
3.5.2 Measuring Instruments

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

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

<STBC Modes>

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

Basic methodology with N_{ANT} transmit antennas, each with the same directional gain G_{ANT} dBi, being driven by N_{ANT} transmitter outputs of equal power, and If antenna gains are not equal and each transmit antenna can be driven by more than one spatial stream, directional gain may be calculated by either of the following two formulas:

Directional gain = G_{ANT} MAX + 10 log(N_{ANT}/N_{SS}) dBi, where N_{ANT}=2, N_{SS} =2.

<STBC Modes>

	Ant. 1 (dBi)	Ant. 2 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
Band IV	-7.50	-7.30	-7.30	-7.30	0.00	0.00

Power Limit Reduction = DG(Power) – 6dBi, (min = 0)

PSD Limit Reduction = DG(PSD) – 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. 14, 2021	Apr. 25, 2022~ May 09, 2022	Oct. 13, 2022	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 05, 2022	Apr. 25, 2022~ May 09, 2022	Jan. 04, 2023	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 05, 2022	Apr. 25, 2022~ May 09, 2022	Jan. 04, 2023	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY57290151	3Hz~8.5GHz;Max 30dBm	Jul. 12, 2021	May 19, 2022	Jul. 11, 2022	Radiation (03CH04-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY57541079	10Hz-44G,MAX 30dB	Oct. 14, 2021	May 19, 2022	Oct. 13, 2022	Radiation (03CH04-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	May 19, 2022	Oct. 29, 2022	Radiation (03CH04-KS)
Bilog Antenna	TeseQ	CBL6111D	49922	30MHz-1GHz	May 30, 2021	May 19, 2022	May 29, 2022	Radiation (03CH05-KS)
Horn Antenna	Schwarzbeck	BBHA9120D	1284	1GHz~18GHz	Oct. 18, 2021	May 19, 2022	Oct. 18, 2022	Radiation (03CH04-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 05, 2022	May 19, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
Amplifier	Burgeon	BPA-530	102219	0.01MHz ~3000MHz	Nov. 01, 2021	May 19, 2022	Oct. 31, 2022	Radiation (03CH04-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2022	May 19, 2022	Jan. 04, 2023	Radiation (03CH04-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	1Ghz-18Ghz	Jul. 30, 2021	May 19, 2022	Jul. 29, 2022	Radiation (03CH04-KS)
Amplifier	Keysight	83017A	MY57280106	500MHz~26.5GHz	Oct. 12, 2021	May 19, 2022	Oct. 11, 2022	Radiation (03CH04-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	May 19, 2022	NCR	Radiation (03CH04-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	May 19, 2022	NCR	Radiation (03CH04-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	May 19, 2022	NCR	Radiation (03CH04-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 16, 2021	May 20, 2022	Oct. 15, 2022	Radiation (03CH06-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY60242126	10Hz-44GHz	Oct. 26, 2021	May 20, 2022	Oct. 25, 2022	Radiation (03CH06-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 30, 2021	May 20, 2022	Oct. 29, 2022	Radiation (03CH06-KS)
Bilog Antenna	TeseQ	CBL6111D	49921	30MHz-1GHz	May 27, 2021	May 20, 2022	May 26, 2022	Radiation (03CH06-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00240138	1GHz~18GHz	Jul. 19, 2021	May 20, 2022	Jul. 18, 2022	Radiation (03CH06-KS)
SHF-EHF Horn	Com-power	AH-840	101093	18GHz~40GHz	Jan. 05, 2022	May 20, 2022	Jan. 04, 2023	Radiation (03CH06-KS)
Amplifier	SONOMA	310N	380827	9KHz ~1GHZ	Jul. 30, 2021	May 20, 2022	Jul. 29, 2022	Radiation (03CH06-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2022	May 20, 2022	Jan. 04, 2023	Radiation (03CH06-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2025788	1Ghz-18Ghz	Jul. 30, 2021	May 20, 2022	Jul. 29, 2022	Radiation (03CH06-KS)
Amplifier	Keysight	83017A	MY53270319	500MHz~26.5GHz	Oct. 14, 2021	May 20, 2022	Oct. 13, 2022	Radiation (03CH06-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	May 20, 2022	NCR	Radiation (03CH06-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	May 20, 2022	NCR	Radiation (03CH06-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	May 20, 2022	NCR	Radiation (03CH06-KS)

EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	Apr. 20, 2022	May 05, 2022	Apr. 19, 2023	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 14, 2021	May 05, 2022	Oct. 13, 2022	Conduction (CO01-KS)
AC LISN	R&S	ENV216	100334	9kHz~30MHz	Oct. 14, 2021	May 05, 2022	Oct. 13, 2022	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP00000 0811	AC 0V~300V, 45Hz~1000Hz	Oct. 14, 2021	May 05, 2022	Oct. 13, 2022	Conduction (CO01-KS)

NCR: No Calibration Required

5 Uncertainty of Evaluation

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

Uncertainty of Conducted Measurement

Test Item	Uncertainty
Conducted Power	1.34 dB
Conducted Emissions	1.34 dB
Occupied Channel Bandwidth	0.012 MHz
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))	2.94dB

For 03CH04-KS

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

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

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

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

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

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

For 03CH06-KS

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

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

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

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

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

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

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

Appendix A. Conducted Test Results

Appendix A. Conducted Test Results

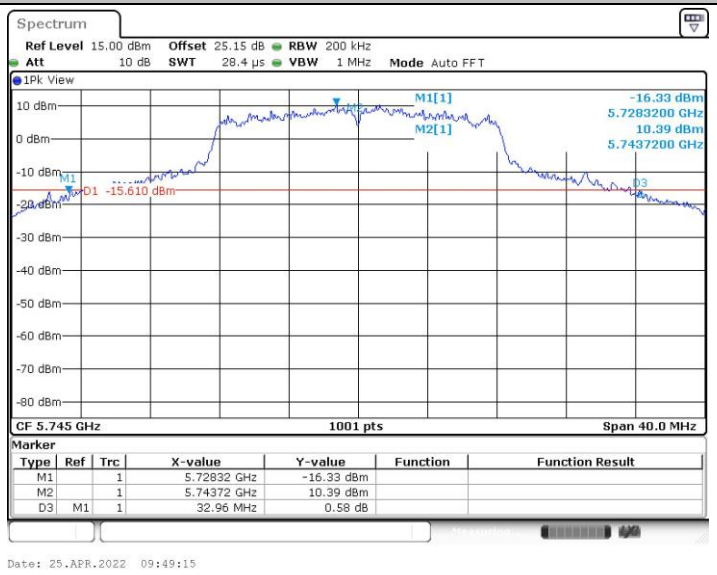
Test Engineer :	Xueyi Zhang	Temperature :	20~25°C
		Relative Humidity :	45~51%

26DB Emission Bandwidth

Test Result

TestMode	Antenna	Freq(MHz)	26dB EBW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A	Ant1	5745	32.96	5728.32	5761.28	---	---
	Ant2	5745	30.52	5729.84	5760.36	---	---
	Ant1	5785	31.44	5770.20	5801.64	---	---
	Ant2	5785	32.28	5767.40	5799.68	---	---
	Ant1	5825	28.64	5810.20	5838.84	---	---
	Ant2	5825	29.92	5810.80	5840.72	---	---
11N20MIMO	Ant1	5745	31.52	5729.44	5760.96	---	---
	Ant2	5745	33.44	5729.88	5763.32	---	---
	Ant1	5785	30.40	5770.28	5800.68	---	---
	Ant2	5785	33.28	5768.96	5802.24	---	---
	Ant1	5825	27.00	5811.80	5838.80	---	---
	Ant2	5825	30.88	5809.80	5840.68	---	---
11N40MIMO	Ant1	5755	75.04	5717.24	5792.28	---	---
	Ant2	5755	62.40	5723.56	5785.96	---	---
	Ant1	5795	63.84	5762.52	5826.36	---	---
	Ant2	5795	65.92	5762.36	5828.28	---	---
11AC80MIMO	Ant1	5775	141.44	5699.96	5841.40	---	---
	Ant2	5775	127.52	5711.00	5838.52	---	---
11AX20MIMO	Ant1	5745	22.28	5734.36	5756.64	---	---
	Ant2	5745	21.36	5734.20	5755.56	---	---
	Ant1	5785	21.84	5774.00	5795.84	---	---
	Ant2	5785	21.76	5774.20	5795.96	---	---
	Ant1	5825	21.28	5814.32	5835.60	---	---
	Ant2	5825	21.16	5814.36	5835.52	---	---
11AX40MIMO	Ant1	5755	39.76	5735.08	5774.84	---	---
	Ant2	5755	43.04	5731.88	5774.92	---	---
	Ant1	5795	39.92	5775.08	5815.00	---	---
	Ant2	5795	39.84	5775.00	5814.84	---	---
11AX80MIMO	Ant1	5775	122.88	5717.08	5839.96	---	---
	Ant2	5775	146.24	5705.08	5851.32	---	---

Test Graphs

11A__Ant1_5745


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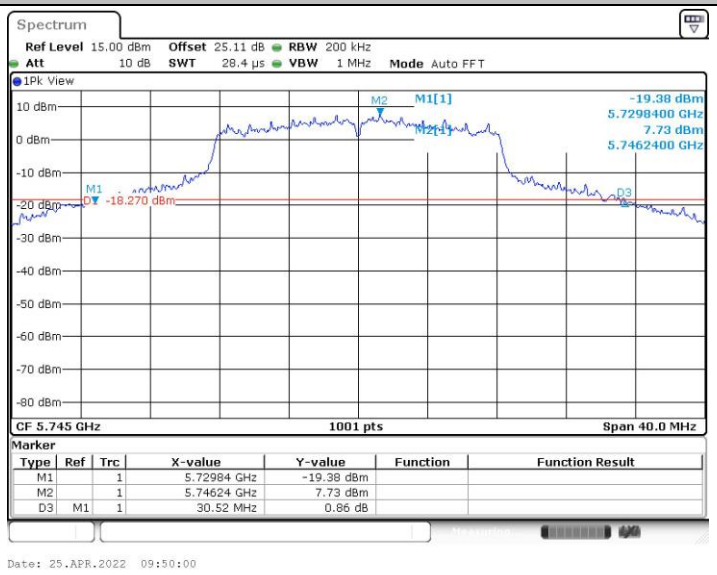

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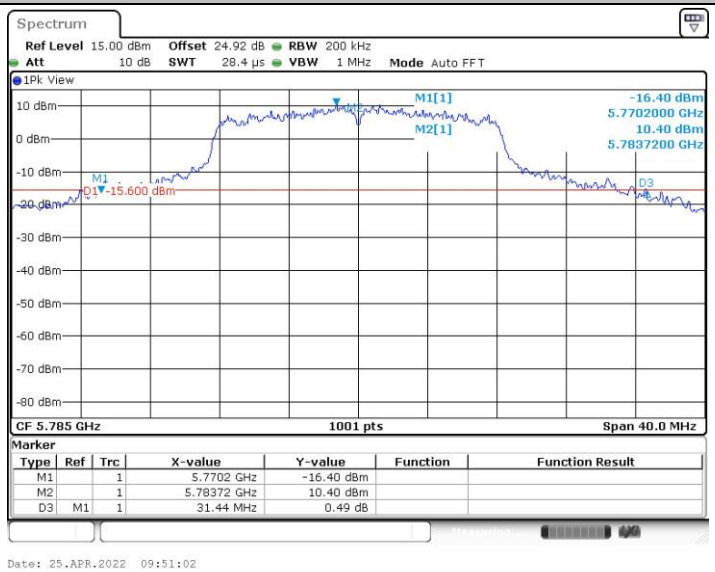

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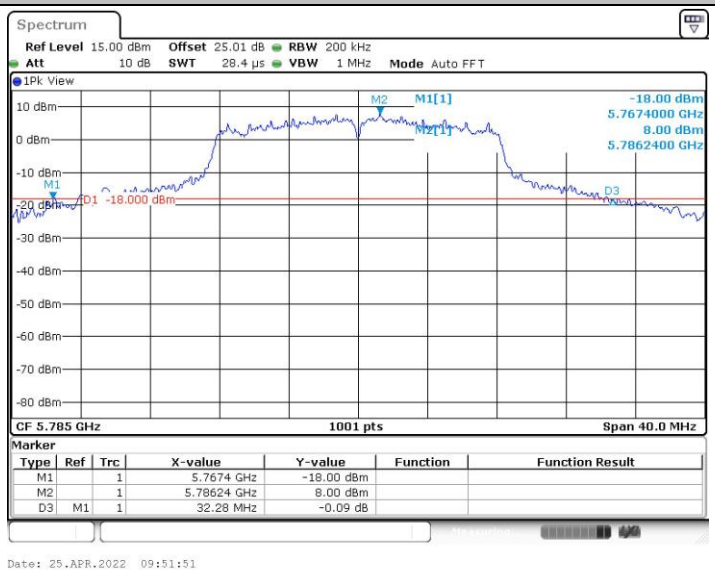

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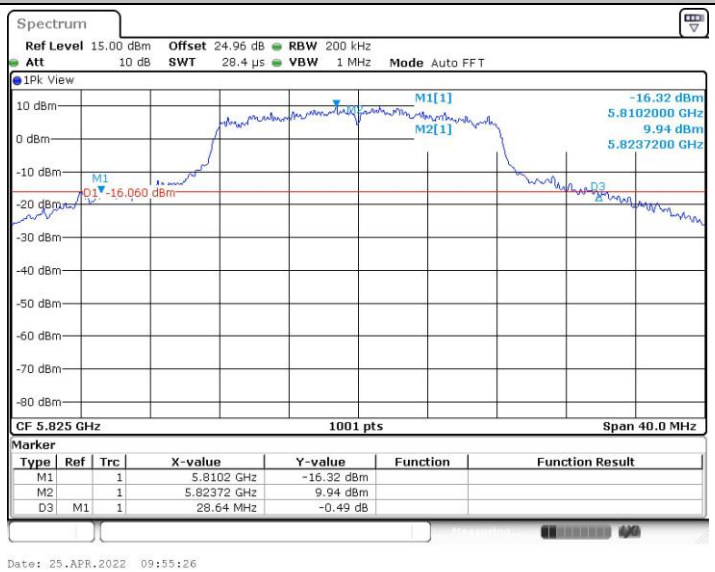

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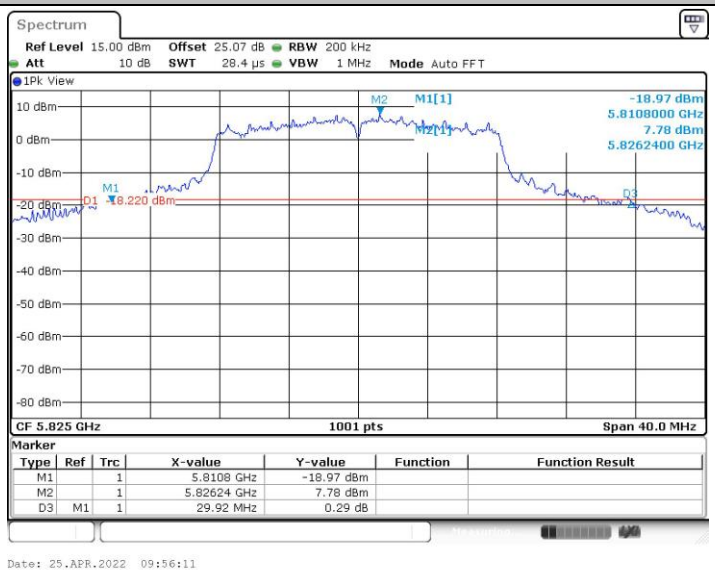

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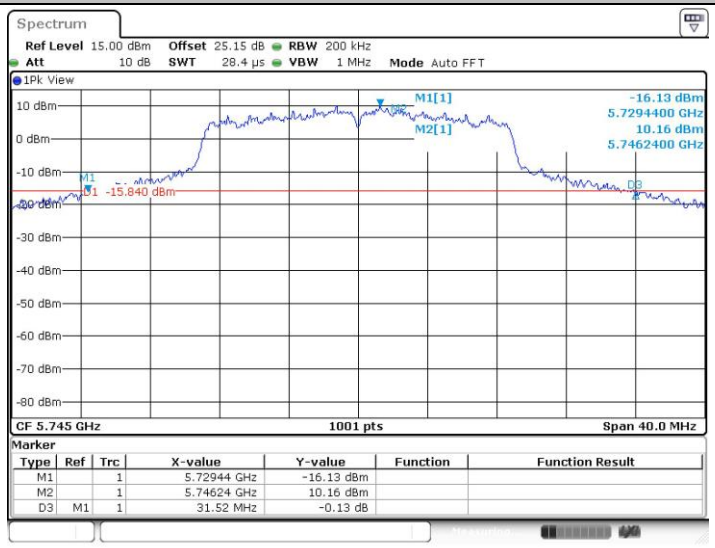

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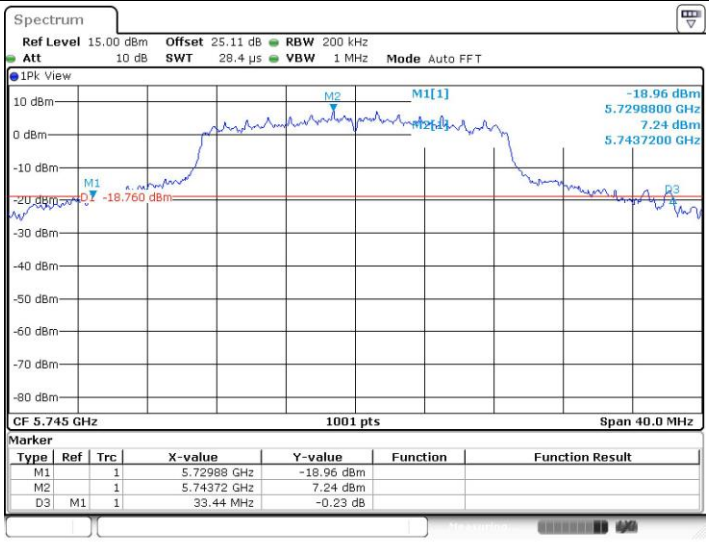

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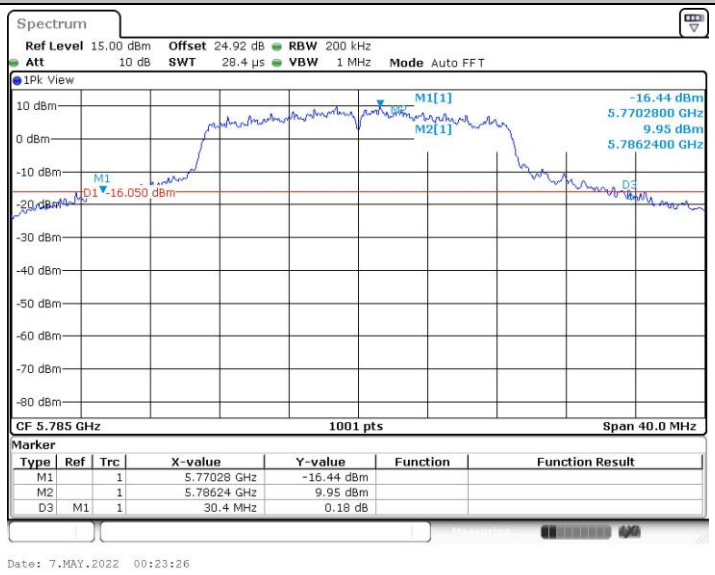

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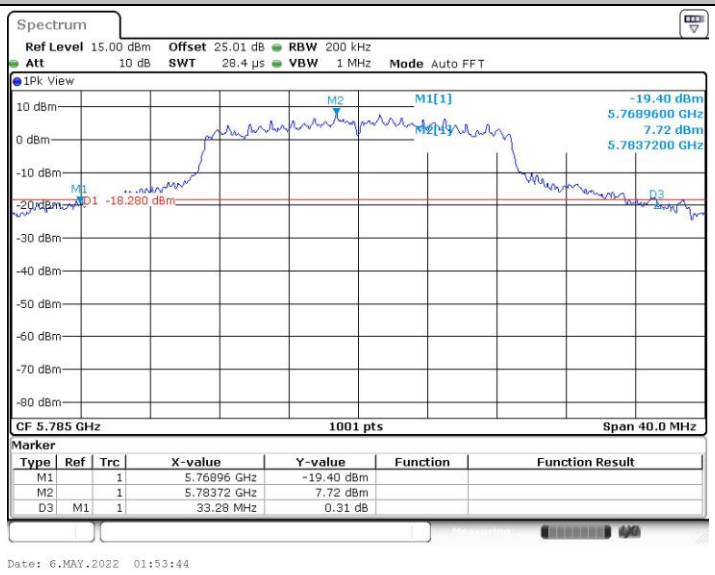

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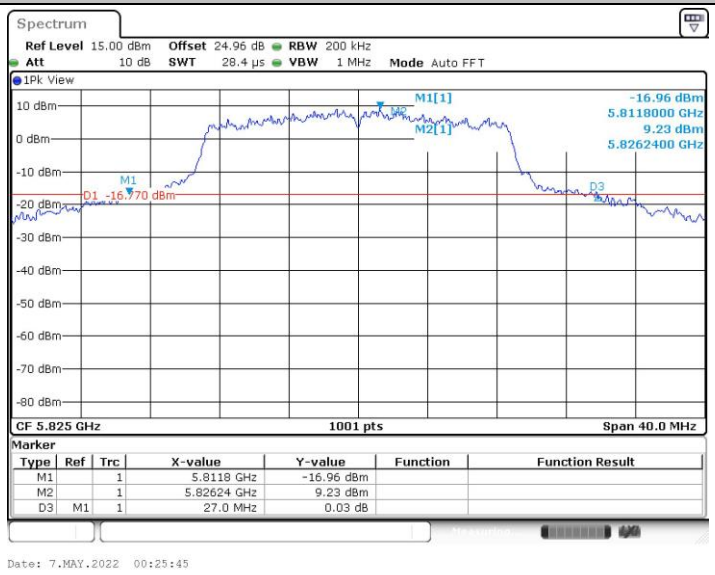

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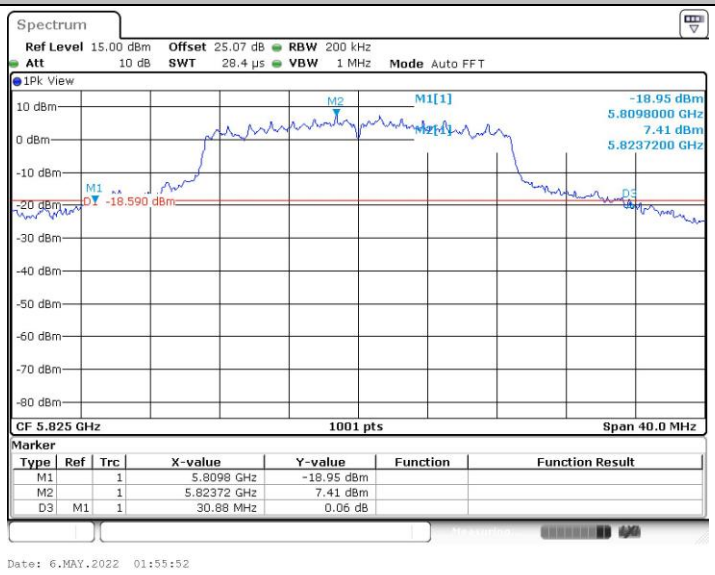

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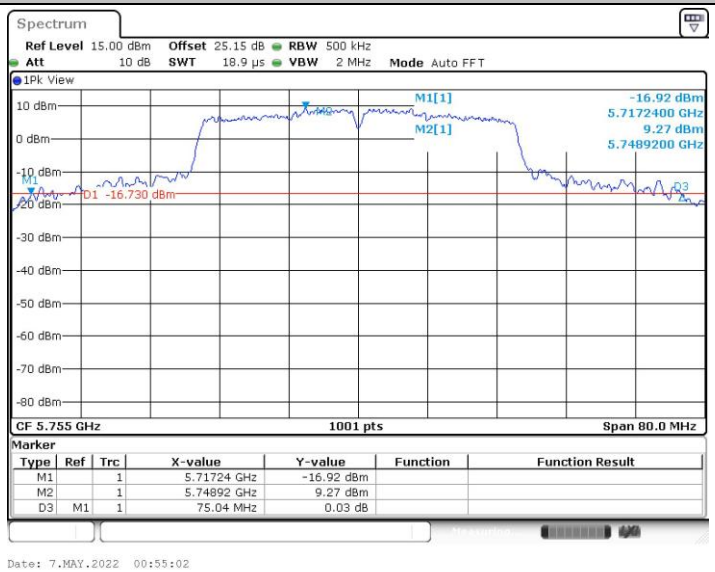

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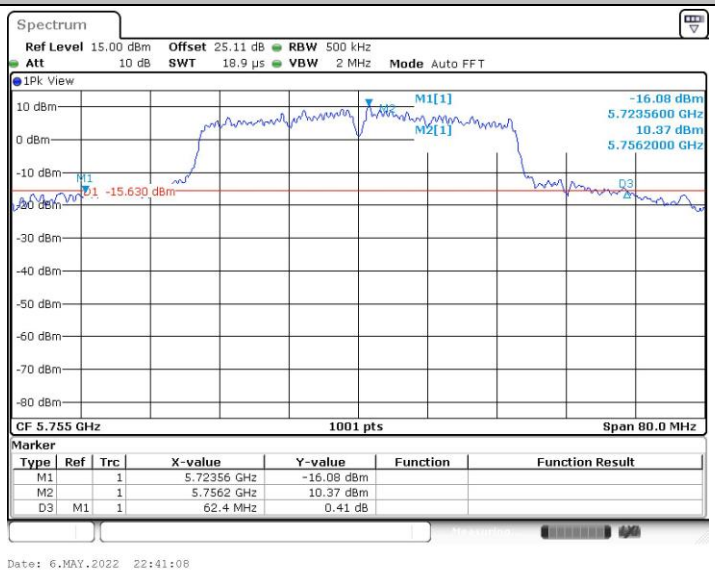

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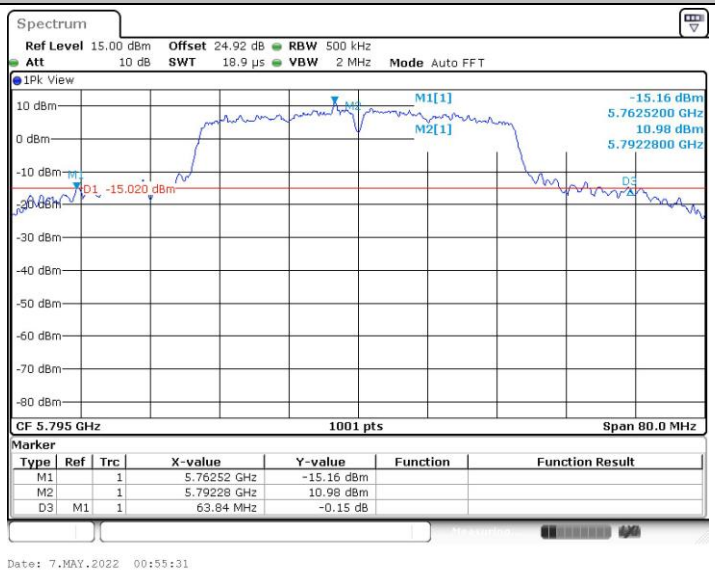

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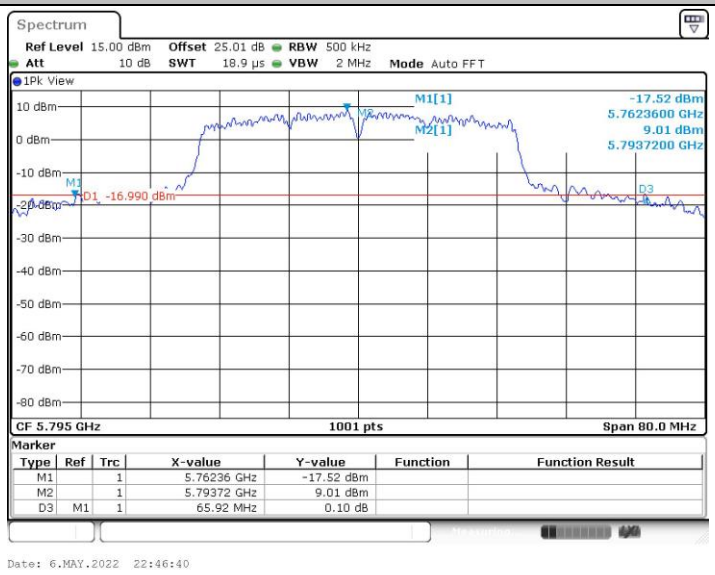

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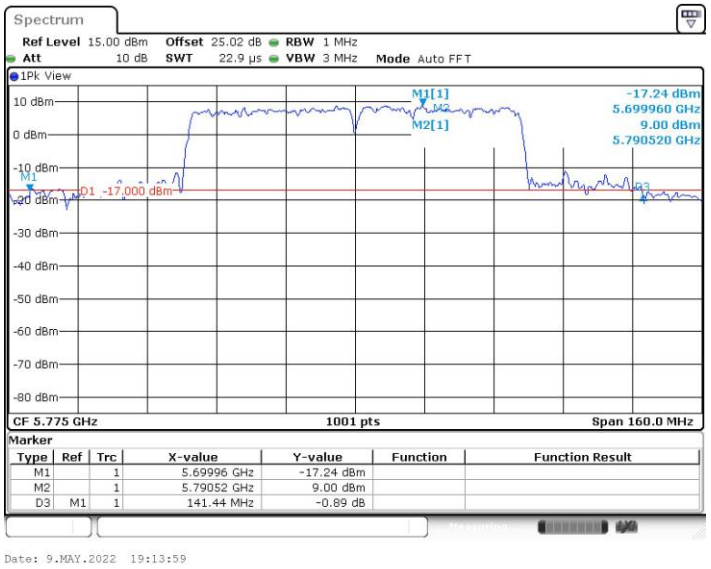

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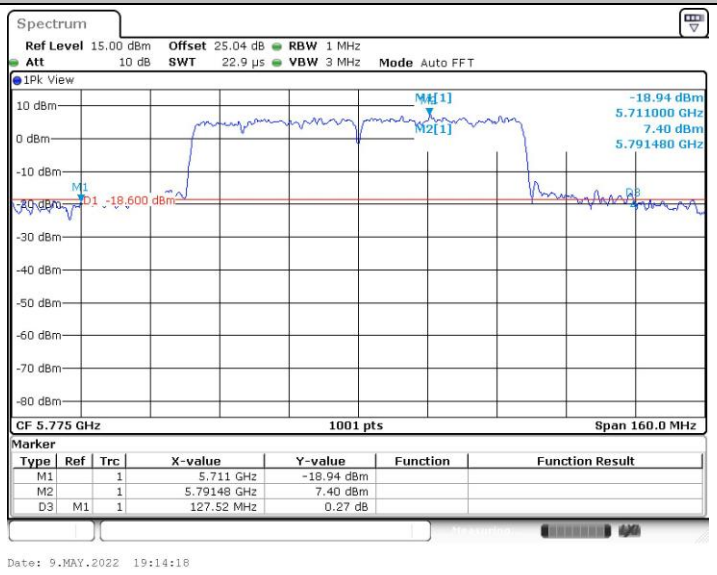

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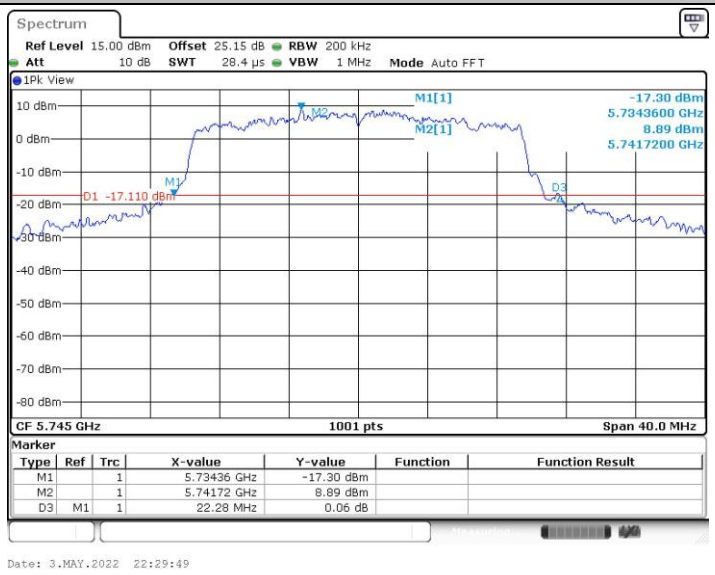

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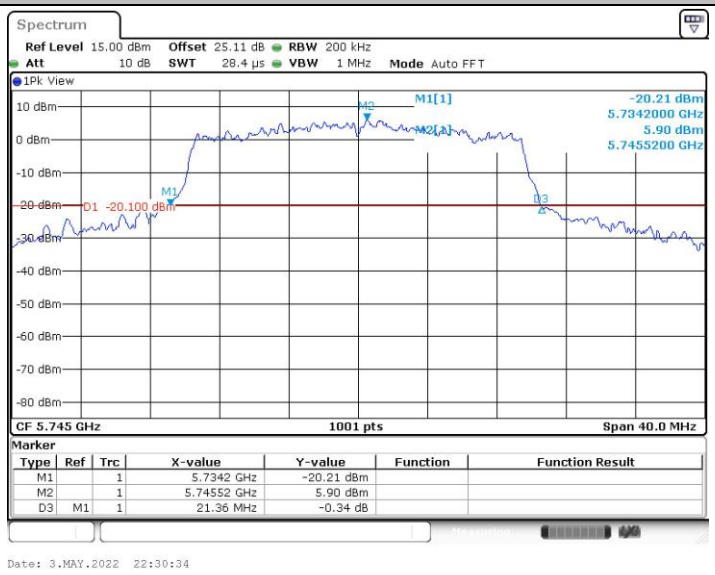

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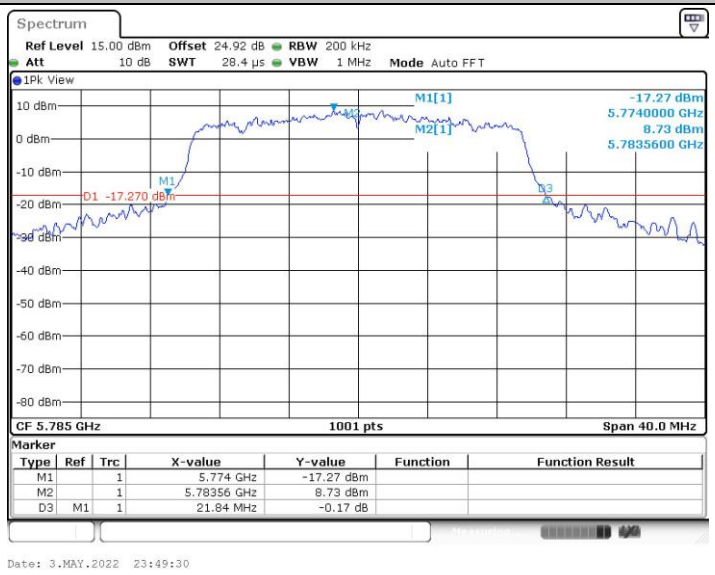

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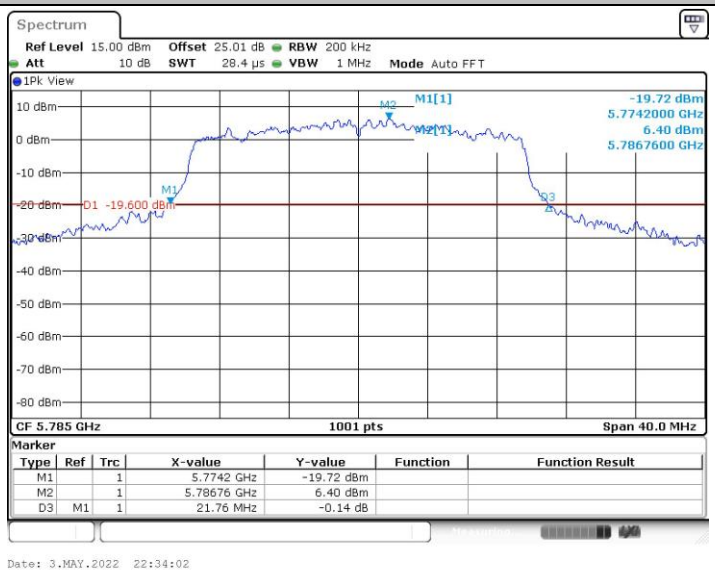

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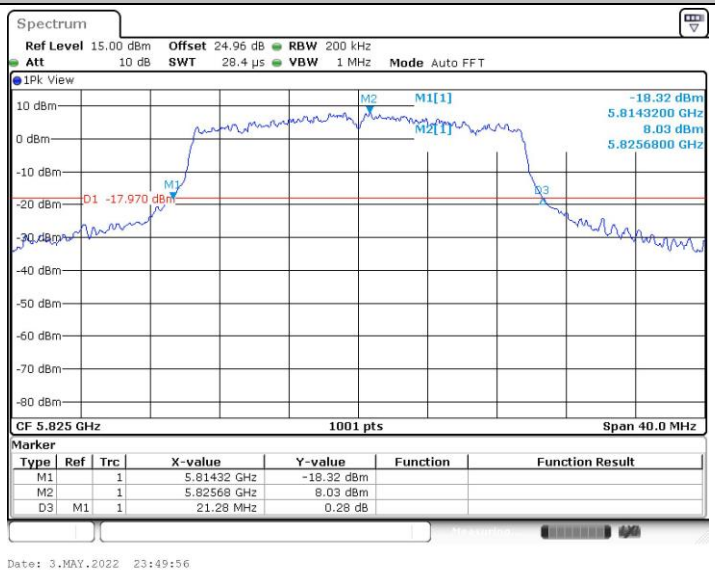

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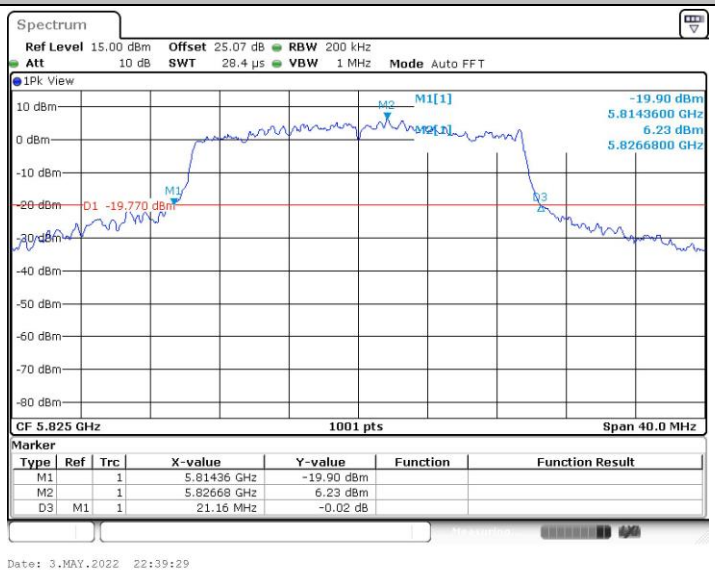
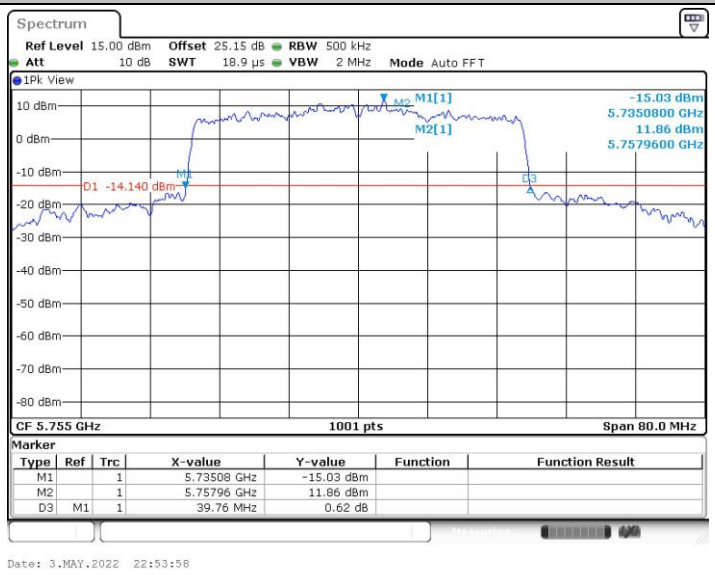
11AX20MIMO_Ant2_5825


Date: 3.MAY.2022 22:39:29

11AX40MIMO_Ant1_5755


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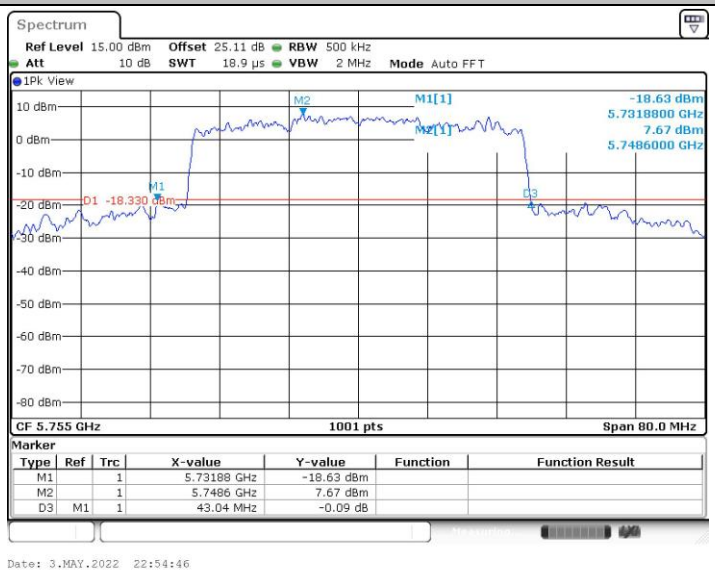

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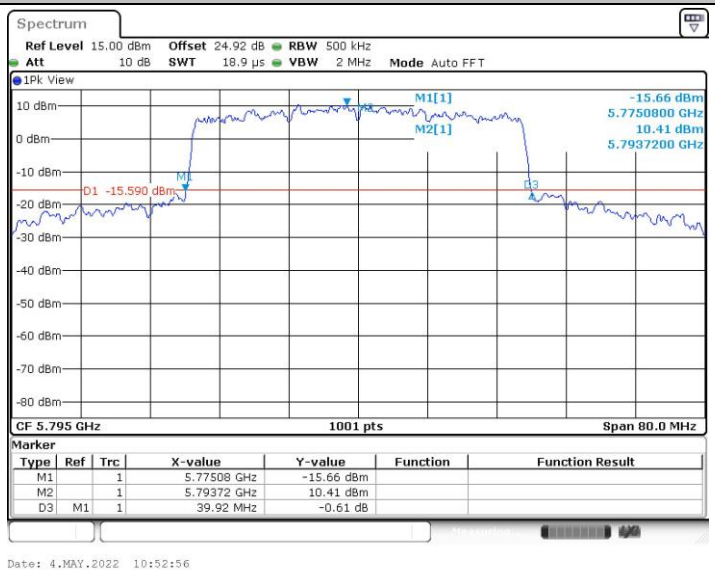

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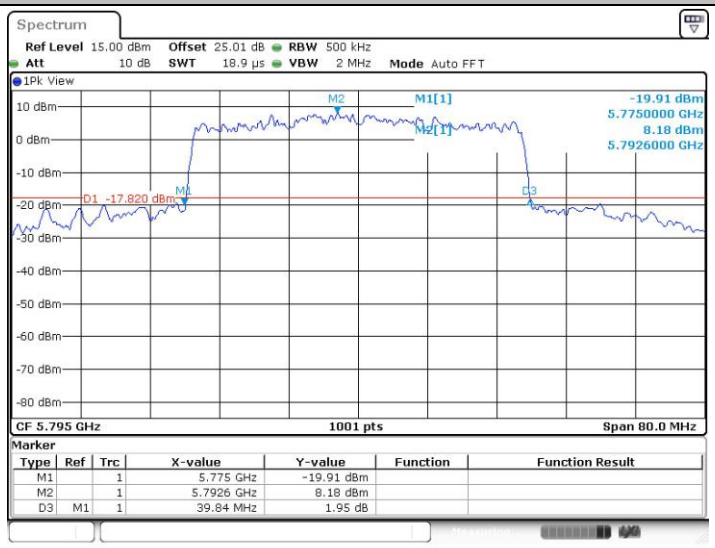
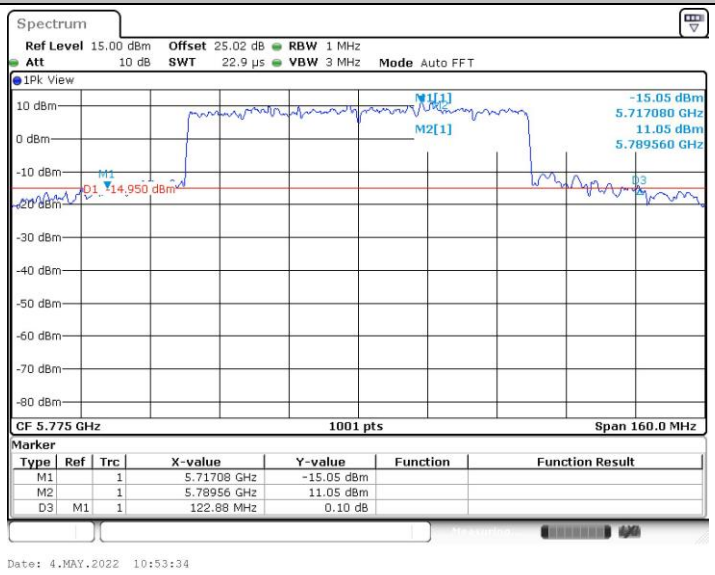


Date: 3.MAY.2022 22:56:42

11AX80MIMO_Ant1_5775



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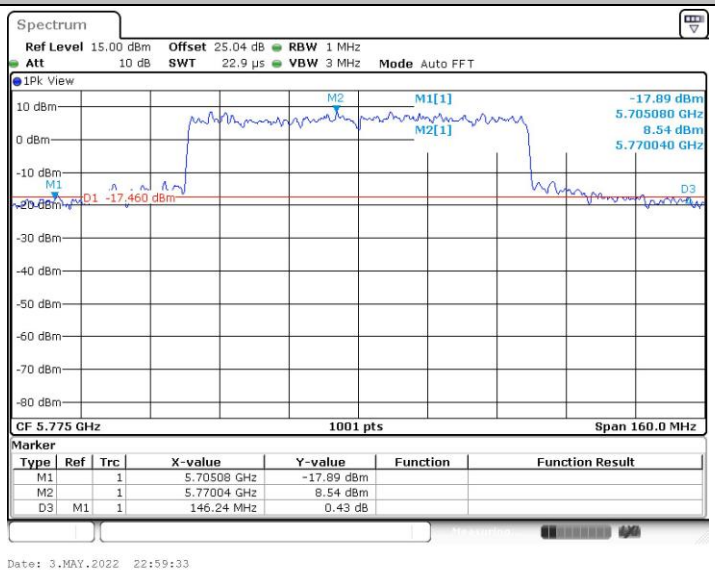


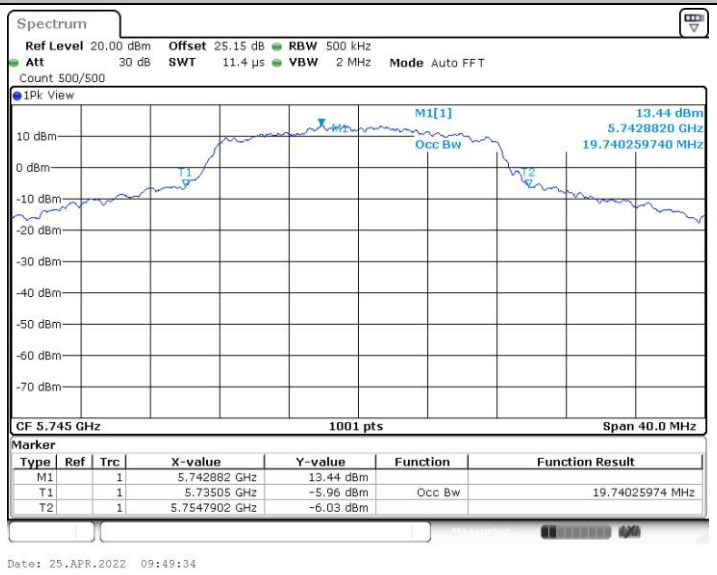
Occupied channel bandwidth

Test Result

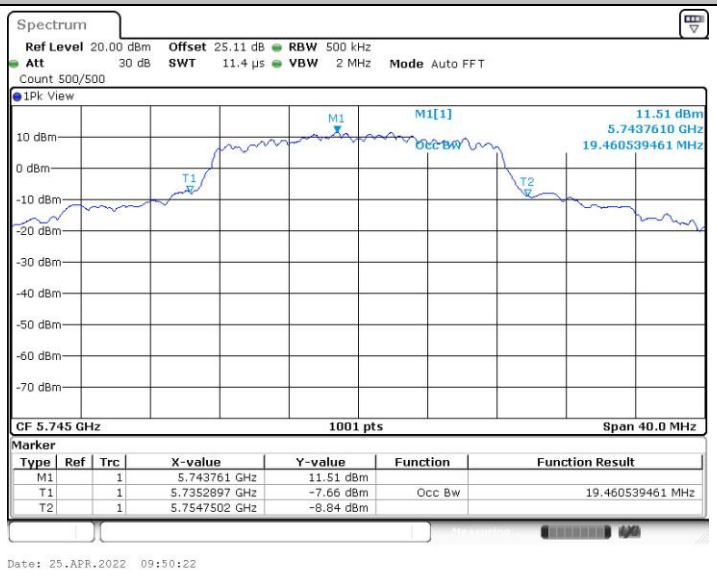
TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11A_	Ant1	5745	19.74	5735.050	5754.790	---	---
	Ant2	5745	19.461	5735.290	5754.750	---	---
	Ant1	5785	19.181	5775.330	5794.510	---	---
	Ant2	5785	19.54	5775.490	5795.030	---	---
	Ant1	5825	18.022	5815.809	5833.831	---	---
	Ant2	5825	18.541	5815.410	5833.951	---	---
11N20MIMO	Ant1	5745	21.019	5734.291	5755.310	---	---
	Ant2	5745	19.381	5735.290	5754.670	---	---
	Ant1	5785	20.5	5774.850	5795.350	---	---
	Ant2	5785	20.739	5774.491	5795.230	---	---
	Ant1	5825	19.141	5815.649	5834.790	---	---
	Ant2	5825	18.901	5815.490	5834.391	---	---
11N40MIMO	Ant1	5755	38.122	5735.739	5773.861	---	---
	Ant2	5755	38.282	5736.059	5774.341	---	---
	Ant1	5795	37.802	5775.979	5813.781	---	---
	Ant2	5795	37.483	5776.299	5813.781	---	---
11AC80MIMO	Ant1	5775	78.801	5735.999	5814.800	---	---
	Ant2	5775	77.682	5736.319	5814.001	---	---
11AX20MIMO	Ant1	5745	19.061	5735.450	5754.510	---	---
	Ant2	5745	19.101	5735.450	5754.550	---	---
	Ant1	5785	19.061	5775.490	5794.550	---	---
	Ant2	5785	19.141	5775.450	5794.590	---	---
	Ant1	5825	19.061	5815.450	5834.510	---	---
	Ant2	5825	19.141	5815.450	5834.590	---	---
11AX40MIMO	Ant1	5755	37.882	5736.139	5774.021	---	---
	Ant2	5755	38.042	5735.979	5774.021	---	---
	Ant1	5795	37.882	5775.979	5813.861	---	---
	Ant2	5795	37.882	5776.059	5813.941	---	---
11AX80MIMO	Ant1	5775	79.121	5735.519	5814.640	---	---
	Ant2	5775	79.121	5735.519	5814.640	---	---

Test Graphs

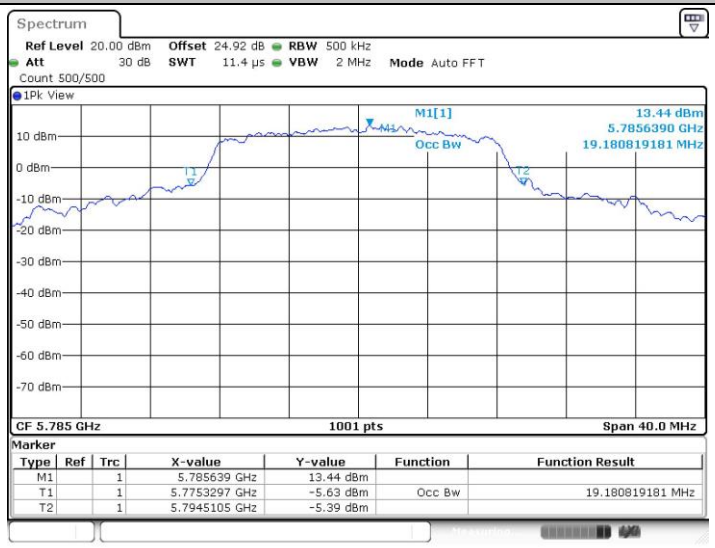
11A__Ant1_5745



11A__Ant2_5745



11A__Ant1_5785



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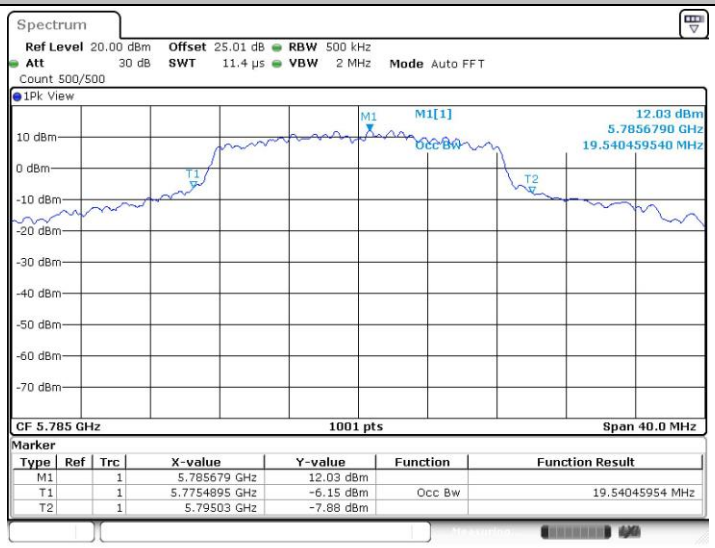

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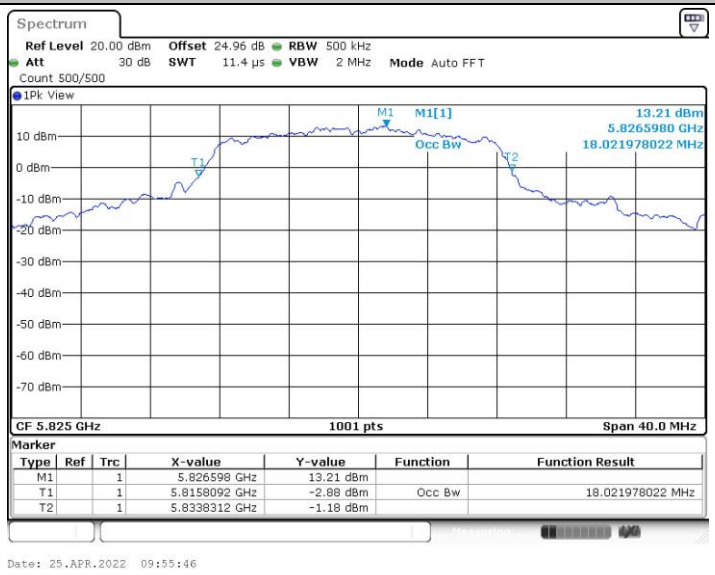

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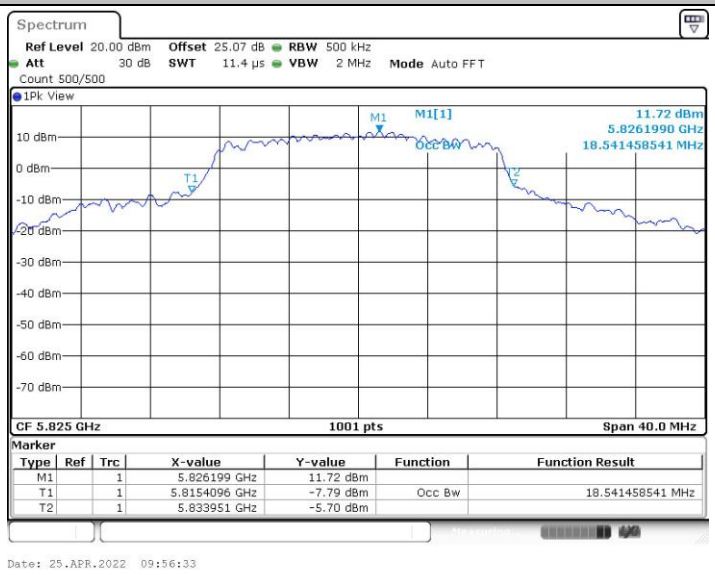
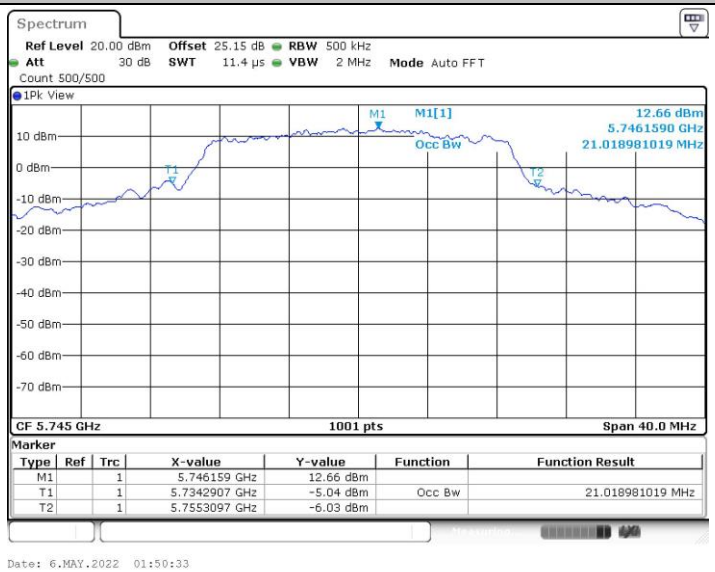


11N20MIMO_Ant1_5745



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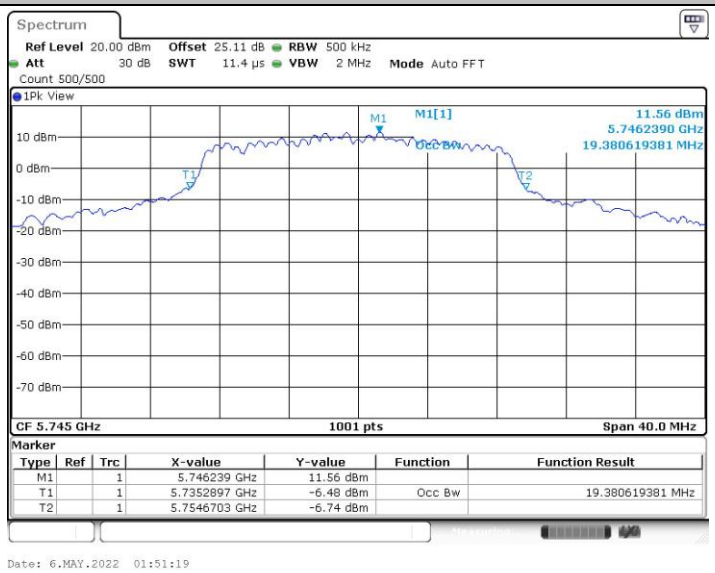

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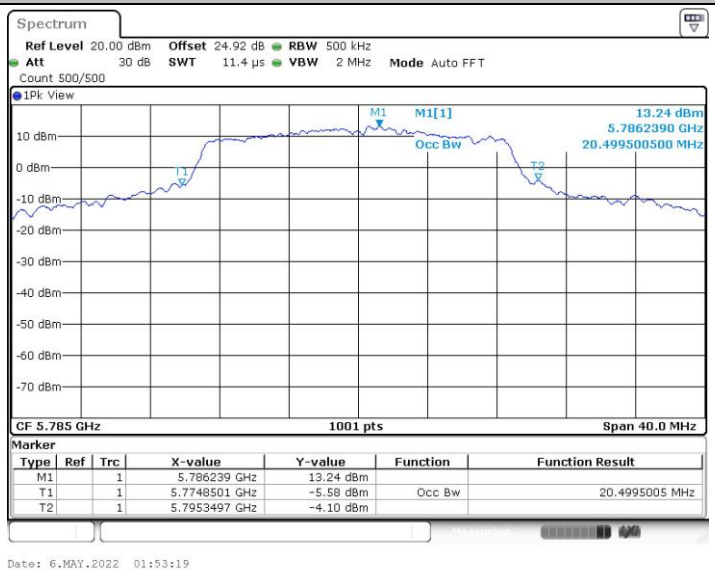

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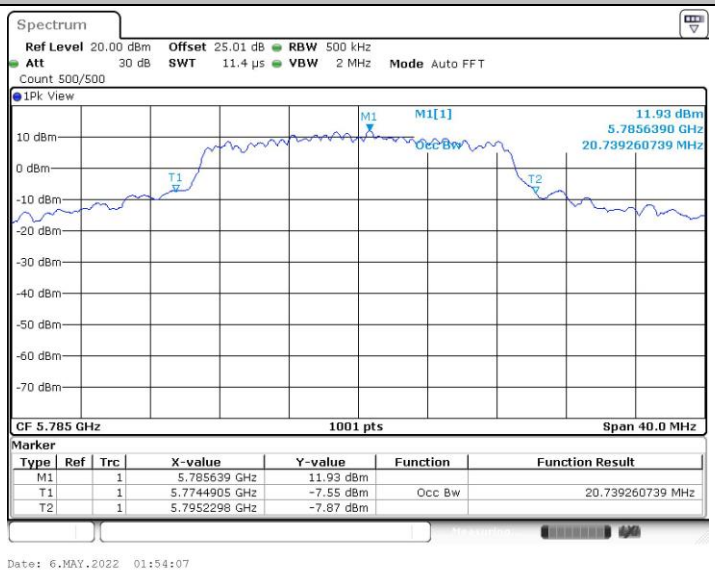

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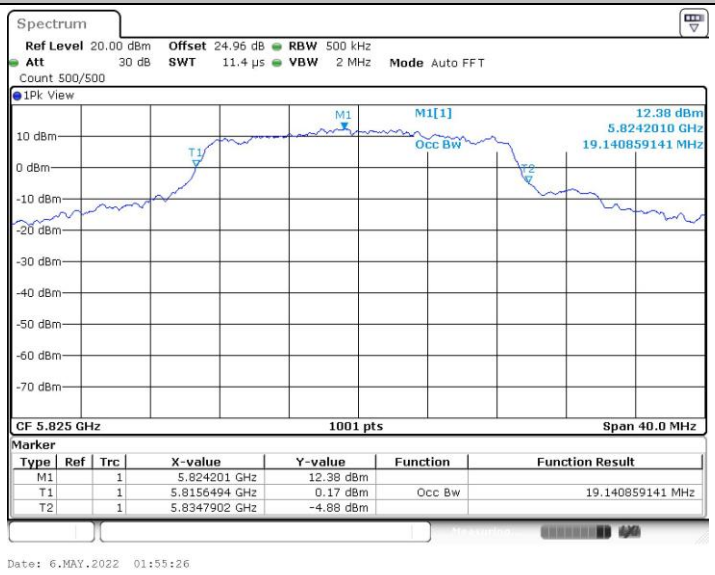

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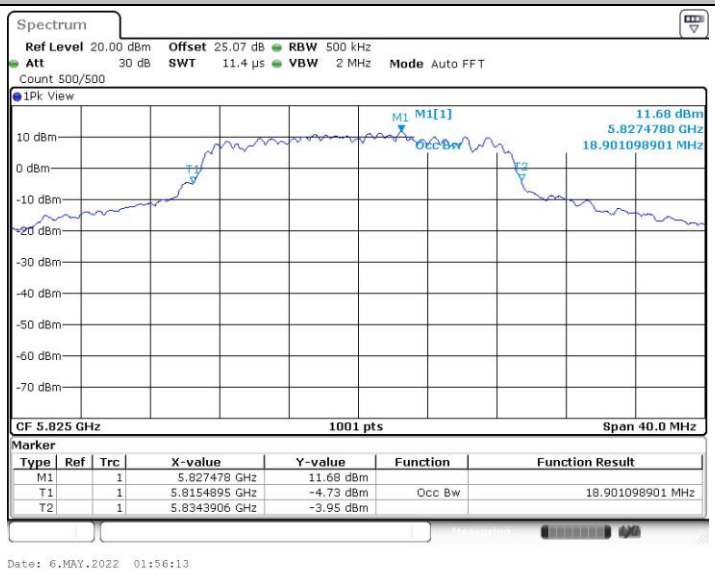

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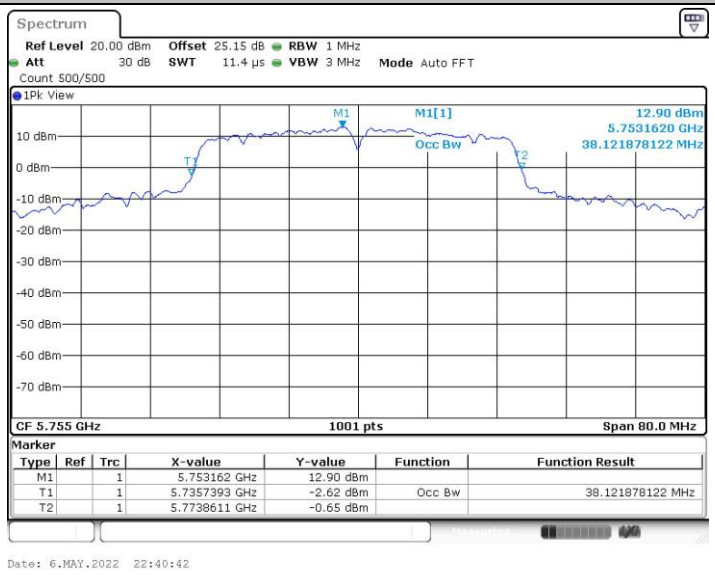

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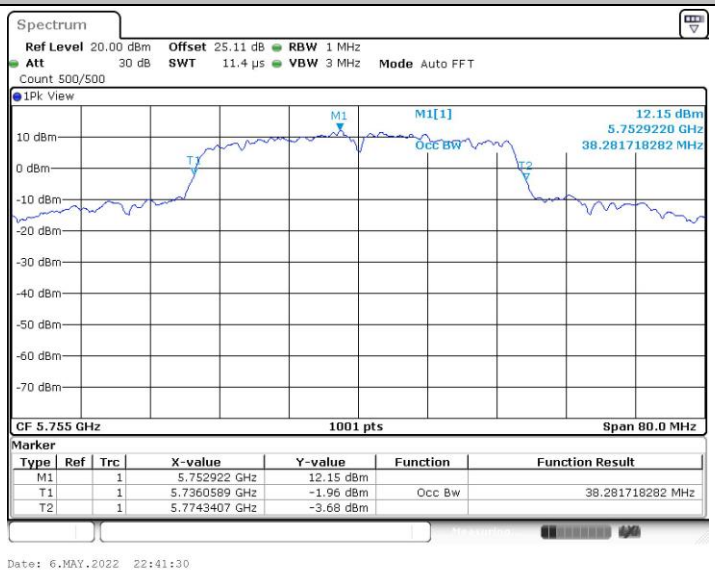

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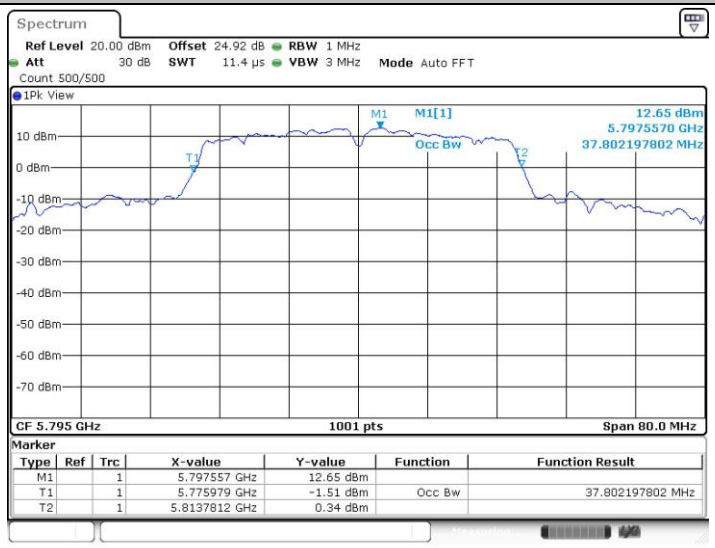

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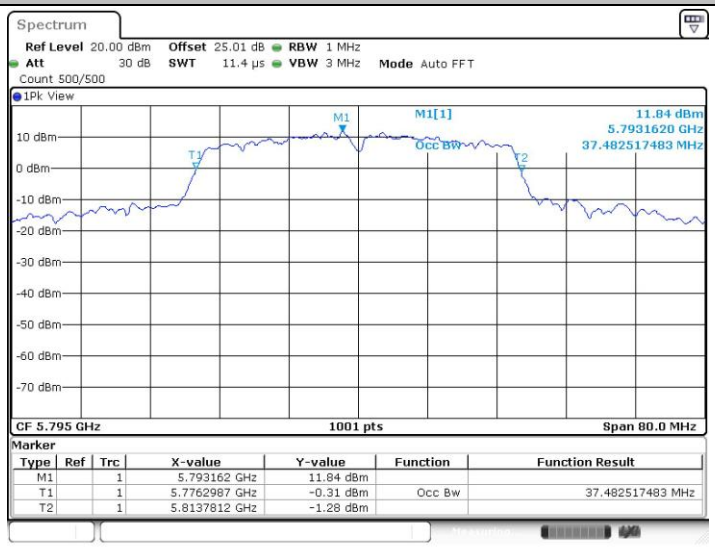

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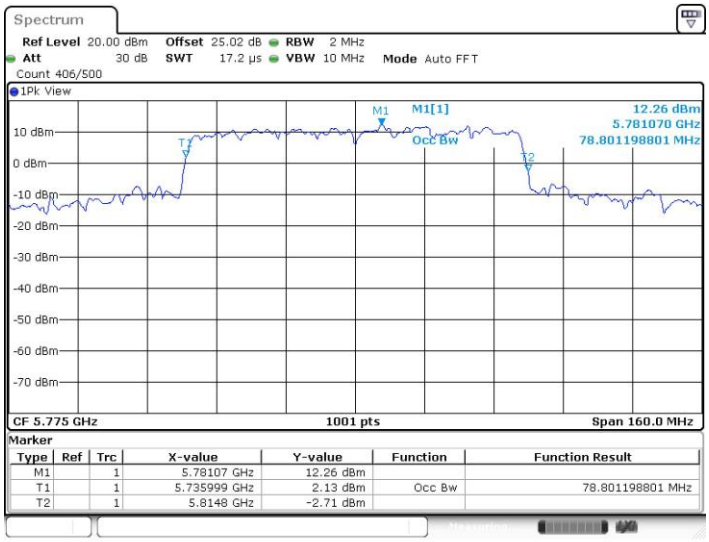

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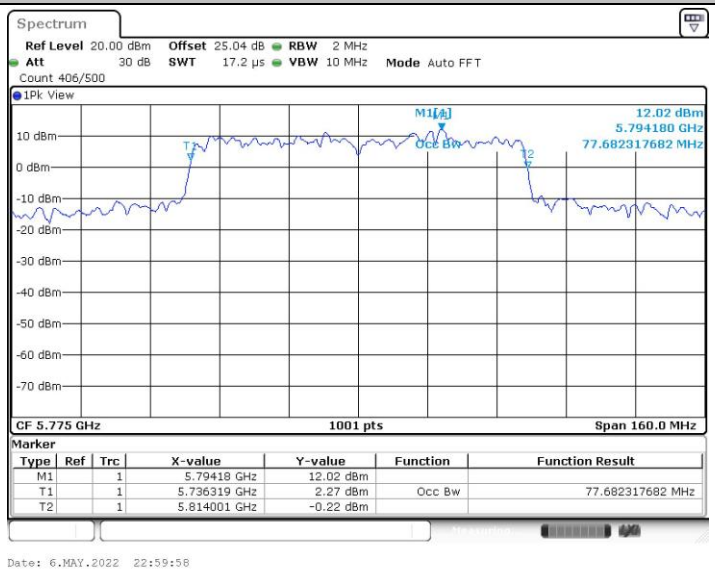

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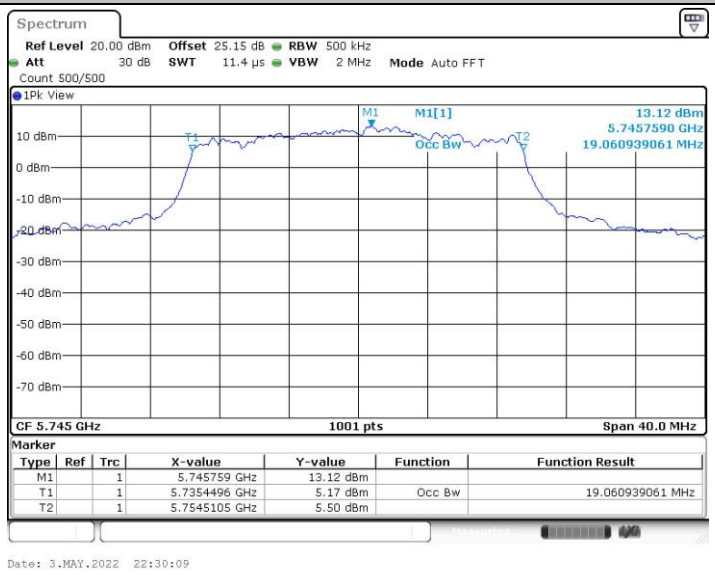

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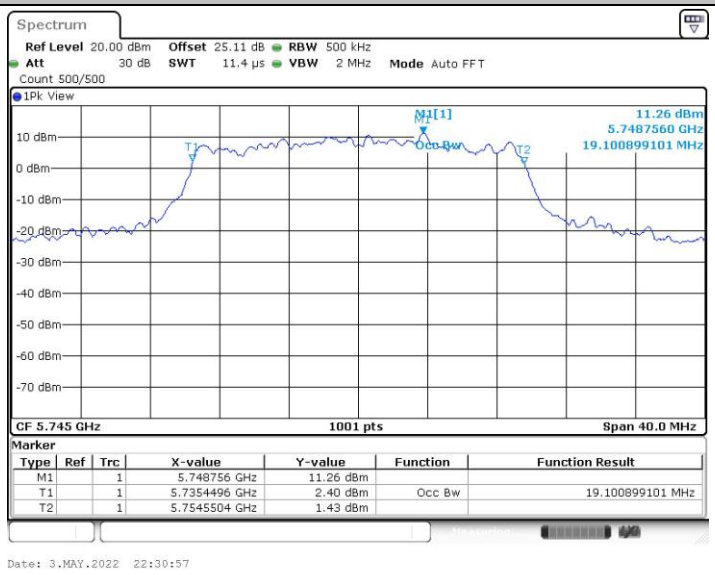

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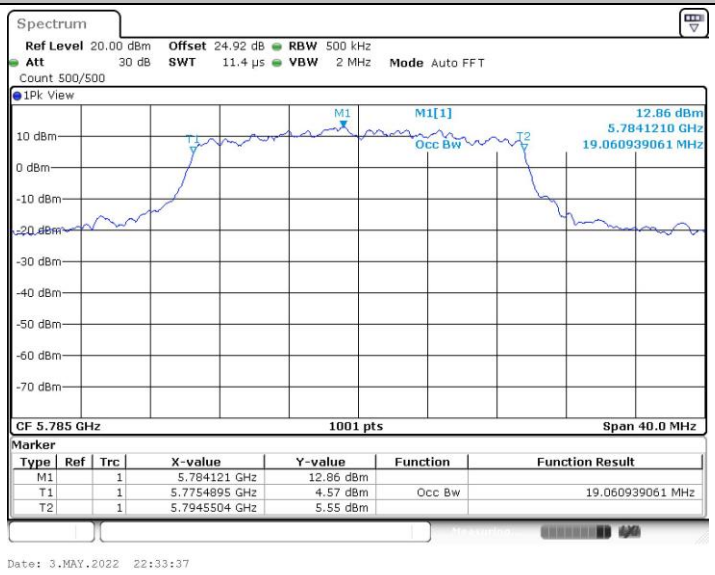

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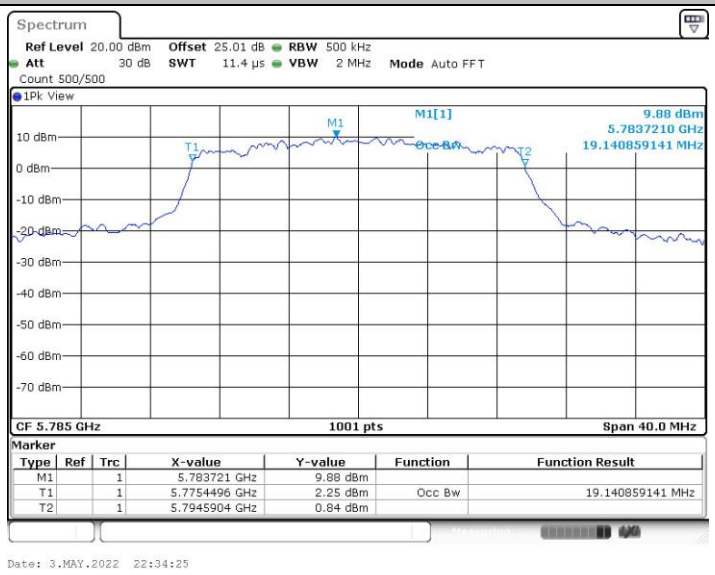

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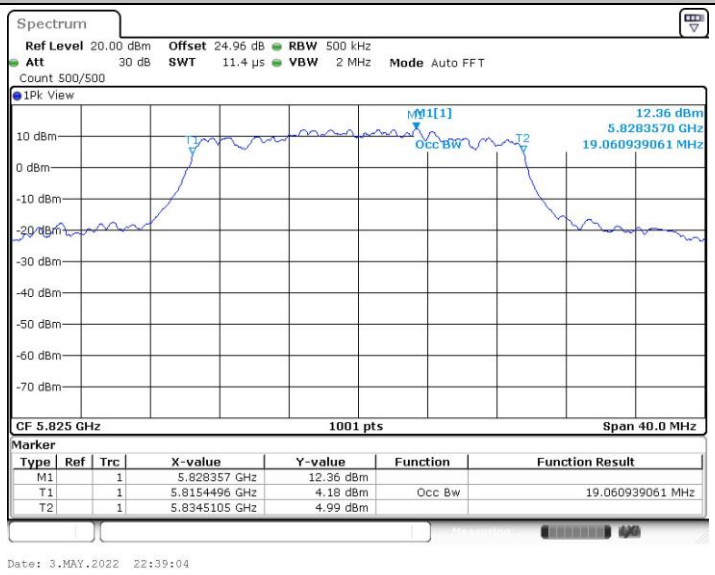

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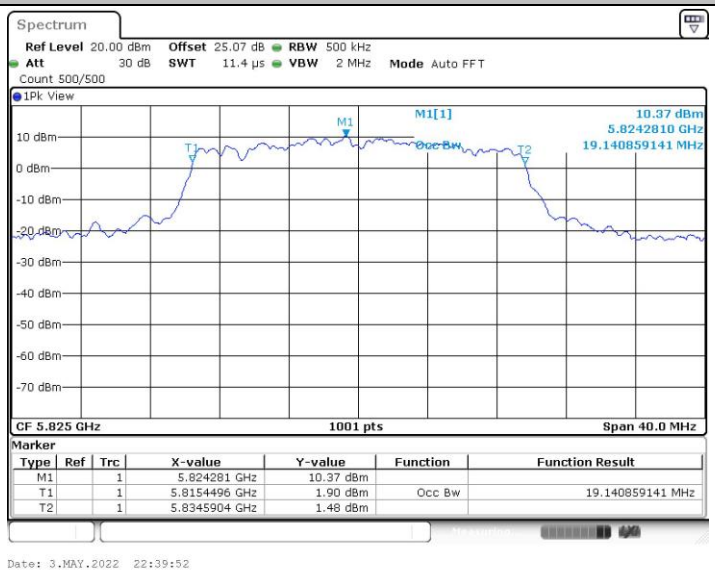

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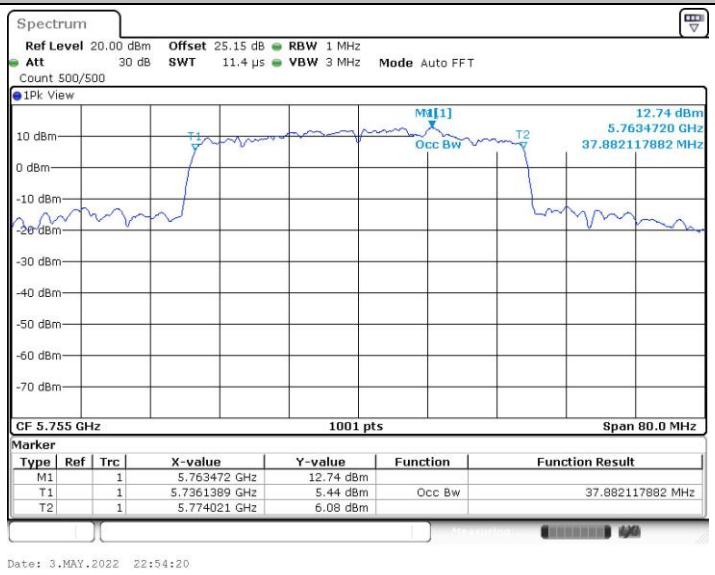

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