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	:	15E 6 GHz Low Power Dual Client (6CD)
TEST DATE(S)	:	Oct. 26, 2022 ~ Dec. 12, 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)

1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055

People's Republic of China

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History of this test report

Report No.	Version	Description	Issued Date
FR2O2001F	01	Initial issue of report	Dec. 21, 2022

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.403(i) 15.407(a)(10)	26dB Emission Bandwidth	Pass	-
3.1	2.1049	99% Occupied Bandwidth	Reporting only	-
3.2	15.407(a)(8)(7)	Maximum Conducted Output Power	Reporting only	-
3.2	15.407(a)(8)(7)	Fundamental Maximum EIRP	Pass	-
3.3	15.407(a)(8)(7)	Fundamental Power Spectral Density	Pass	-
3.4	15.407(b)(6)	In-Band Emissions (Channel Mask)	Pass	-
3.5	15.407(d)(6)	Contention Based Protocol	Pass	
3.6	15.407(b)	Unwanted Emissions	Pass	Under limit 5.09 dB at 7125.000 MHz
3.7	15.207	AC Conducted Emission	Pass	Under limit 13.72 dB at 0.470 MHz
3.8	15.203 15.407(a)	Antenna Requirement	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 CBP: 864921060049972/864921060049964
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

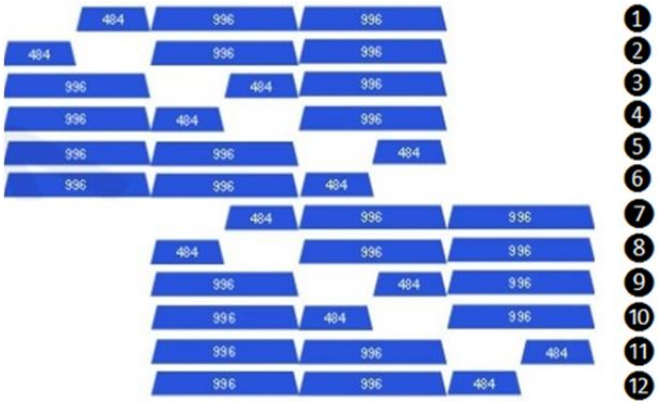
Standards-related Product Specification	
Tx/Rx Frequency Range	U-NII-5: 5925 MHz ~ 6425 MHz U-NII-6: 6425 MHz ~ 6525 MHz U-NII-7: 6525 MHz ~ 6875 MHz U-NII-8: 6875 MHz ~ 7125 MHz
Maximum EIRP	**<MIMO Ant.10+13>** **<5925 MHz ~ 7125 MHz >** 802.11a : 8.67 dBm / 0.0074 W 802.11ax HE20 : 10.33 dBm / 0.0108 W 802.11ax HE40 : 11.12 dBm / 0.0129 W 802.11ax HE80 : 11.24 dBm / 0.0133 W 802.11ax HE160 : 11.55 dBm / 0.0143 W 802.11be EHT20 : 9.83 dBm / 0.0096 W 802.11be EHT40 : 11.25 dBm / 0.0133 W 802.11be EHT80 : 11.45 dBm / 0.0140 W 802.11be EHT160 : 11.89 dBm / 0.0155 W 802.11be EHT320 : 11.38 dBm / 0.0137 W
99% Occupied Bandwidth	**<MIMO Ant.10+13>** 802.11a : 18.142 MHz 802.11be EHT20 : 19.540 MHz 802.11be EHT40 : 39.001 MHz 802.11be EHT80 : 79.441 MHz 802.11be EHT160 : 161.439 MHz 802.11be EHT320 : 319.680 MHz
Antenna Type / Gain	**<5925 MHz ~ 6425 MHz >** <Ant. 10> : IFA Antenna with gain 1.3 dBi <Ant. 13> : IFA Antenna with gain -2.2 dBi **<6425 MHz ~ 6525 MHz >** <Ant. 10> : IFA Antenna with gain -0.2 dBi <Ant. 13> : IFA Antenna with gain -1.4 dBi **<6525 MHz ~ 6875 MHz >** <Ant. 10> : IFA Antenna with gain -1.3 dBi <Ant. 13> : IFA Antenna with gain 0.4 dBi **<6875 MHz ~ 7125 MHz >** <Ant. 10> : IFA Antenna with gain -2.4 dBi <Ant. 13> : IFA Antenna with gain 1.9 dBi
Type of Modulation	802.11a: OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ax: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM) 802.11be: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM / 4096QAM)

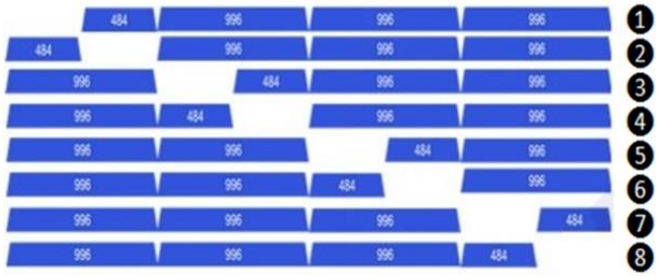
Remark:

1. For 802.11ax/be 20/40/80/160MHz mode, the whole testing has assessed only 802.11be EHT20/ EHT40/ EHT80/ EHT160MHz by referring to the higher output power.
2. For WLAN SISO & MIMO mode, the whole testing has assessed only MIMO mode by referring to the higher normal conducted power.
3. U-NII-5/-6/-7/-8 can't transmit simultaneously.

4. 802.11ax/be support full RU tone and partial RU tone, both full RU and partial RU-left (for low CH) and partial RU-right (for high CH), small size RU, Large size RU and Puncturing modes are tested for conducted power/PSD/Channel Mask/RSE, the Bandwidth Emission test for full RU only.
5. CBP test with minimum antenna gain (Antenna 10 path, minimum gain = -2.4dBi).
6. The standard client and indoor client are the same power level, thus test items according to indoor client standard to test, which is stringent limit.
7. 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/ch07			1/2/3/4
80MHz/ch215			
160MHz/ch15			1/2/3/4
160MHz/ch207			
320MHz/ch31			1~12
320MHz/ch191			

320MHz/ch31		1/2/3/4
320MHz/ch191		
320MHz/ch31		1~8
320MHz/ch191		

Puncturing 20MHz modes

BWs/channels	Tones	Index	For test modes configure
80MHz/ch7			1/2/3/4
80MHz/ch215			
160MHz/ch15			1~8
160MHz/ch207			

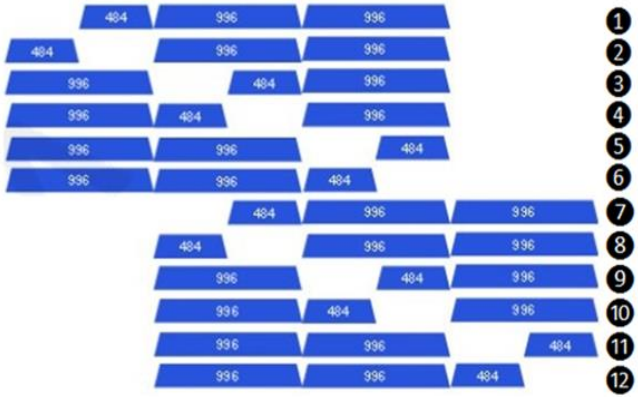
Puncturing 40MHz modes

BWs/channels	Tones	Index	For test modes configure
160MHz/ch15			1/2/3/4
160MHz/ch207			
320MHz/ch31			1~8
320MHz/ch191			

Puncturing 80MHz modes

BWs/channels	Tones	Index	For test modes configure
320MHz/ch31			1/2/3/4
320MHz/ch191			

Puncturing 80+40MHz modes

BWs/channels	Tones	Index	For test modes configure
320MHz/ch31			1~12
320MHz/ch191			

Only the worse cases are shown in this report.

8. 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

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.**
	DFS01-KS	CN1257	314309

Test data subcontracted: CBP test case in section 3.5 of this report

1.7 Test Software

Item	Site	Manufacture	Name	Version
1.	03CH04-SZ	AUDIX	E3	6.2009-8-24
2.	CO01-SZ	AUDIX	E3	6.120613b
3.	DFS01-KS	Sporton	DFS & Adaptivity Test Tools	1.0

1.8 Applicable Standards

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

- FCC Part 15 Subpart E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
- FCC KDB 987594 D02 U-NII 6 GHz EMC Measurement v01r01
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- 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

<U-NII-5, 6, 7, 8>

BW 20M	**Channel**	1	5	9	13	17	21	25	29
	Freq. (MHz)	5955	5975	5995	6015	6035	6055	6075	6095
BW 40M	**Channel**	3		11		19		27	
	Freq. (MHz)	5965		6005		6045		6085	
BW 80M	**Channel**	7				23			
	Freq. (MHz)	5985				6065			
BW 160M	**Channel**	15							
	Freq. (MHz)	6025							

BW 20M	**Channel**	33	37	41	45	49	53	57	61
	Freq. (MHz)	6115	6135	6155	6175	6195	6215	6235	6255
BW 40M	**Channel**	35		43		51		59	
	Freq. (MHz)	6125		6165		6205		6245	
BW 80M	**Channel**	39				55			
	Freq. (MHz)	6145				6225			
BW 160M	**Channel**	47							
	Freq. (MHz)	6185							
BW 320M	**Channel**	31				63			
	Freq. (MHz)	6105				6265			

BW 20M	Channel	65	69	73	77	81	85	89	93
	Freq. (MHz)	6275	6295	6315	6335	6355	6375	6395	6415
BW 40M	Channel	67		75		83		91	
	Freq. (MHz)	6285		6325		6365		6405	
BW 80M	Channel	71				87			
	Freq. (MHz)	6305				6385			
BW 160M	Channel	79							
	Freq. (MHz)	6345							
BW 320M	Channel	95							
	Freq. (MHz)	6425							

BW 20M	Channel	97	101	105	109	113	117	121	125
	Freq. (MHz)	6435	6455	6475	6495	6515	6535	6555	6575
BW 40M	Channel	99		107		115		123	
	Freq. (MHz)	6445		6485		6525		6565	
BW 80M	Channel	103				119			
	Freq. (MHz)	6465				6545			
BW 160M	Channel	111							
	Freq. (MHz)	6505							

BW 20M	Channel	129	133	137	141	145	149	153	157
	Freq. (MHz)	6595	6615	6635	6655	6675	6695	6715	6735
BW 40M	Channel	131		139		147		155	
	Freq. (MHz)	6605		6645		6685		6725	
BW 80M	Channel	135				151			
	Freq. (MHz)	6625				6705			
BW 160M	Channel	143							
	Freq. (MHz)	6665							
BW 320M	Channel	127							
	Freq. (MHz)	6585							

BW 20M	Channel	161	165	169	173	177	181	185	189
	Freq. (MHz)	6755	6775	6795	6815	6835	6855	6875	6895
BW 40M	Channel	163		171		179		187	
	Freq. (MHz)	6765		6805		6845		6885	
BW 80M	Channel	167				183			
	Freq. (MHz)	6785				6865			
BW 160M	Channel	175							
	Freq. (MHz)	6825							
BW 320M	Channel	159							
	Freq. (MHz)	6745							

BW 20M	Channel	193	197	201	205	209	213	217	221
	Freq. (MHz)	6915	6935	6955	6975	6995	7015	7035	7055
BW 40M	Channel	195		203		211		219	
	Freq. (MHz)	6925		6965		7005		7045	
BW 80M	Channel	199				215			
	Freq. (MHz)	6945				7025			
BW 160M	Channel	207							
	Freq. (MHz)	6985							
BW 320M	Channel	191							
	Freq. (MHz)	6905							

BW 20M	Channel	225	229	233
	Freq. (MHz)	7075	7095	7115
BW 40M	Channel	227		
	Freq. (MHz)	7085		

2.2 Test Mode

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

Modulation	Data Rate
802.11a	6 Mbps
802.11be EHT20	MCS0
802.11be EHT40	MCS0
802.11be EHT80	MCS0
802.11be EHT160	MCS0
802.11be EHT320	MCS0

Test Cases	
AC Conducted Emission	Mode 1 : GSM 850 Idle + BT Link + WLAN Link(6G) + USB Cable (Charging From Adapter)
Remark: For Radiated Test Cases, the tests were performed with Adapter and USB Cable.	

Co-location
LTE B48 TX + WLAN 6G 802.11be EHT20 CH233 TX + WLAN 2.4G 802.11be EHT20 CH01 TX
LTE B48 TX + WLAN 6G 802.11be EHT20 CH233 TX + Bluetooth LE (2Mbps) CH39 TX

Ch. #		UNII-5	UNII-6	UNII-7	UNII-8
		802.11a/be EHT20	802.11a/be EHT20	802.11a/be EHT20	802.11a/be EHT20
L	Low	001	097	117	189
M	Middle	045	105	149	209
H	High	093	113	181	229/233
Straddle		-	-	-	185

Ch. #		UNII-5	UNII-6	UNII-7	UNII-8
		802.11be EHT40	802.11be EHT40	802.11be EHT40	802.11be EHT40
L	Low	003	099	123	195
M	Middle	043	-	147	203
H	High	091	107	179	227
Straddle		-	115	-	187

Ch. #		UNII-5	UNII-6	UNII-7	UNII-8
		802.11be EHT80	802.11be EHT80	802.11be EHT80	802.11be EHT80
L	Low	007	103	135	199
M	Middle	039		151	-
H	High	087		167	215
Straddle		-	119	183	-

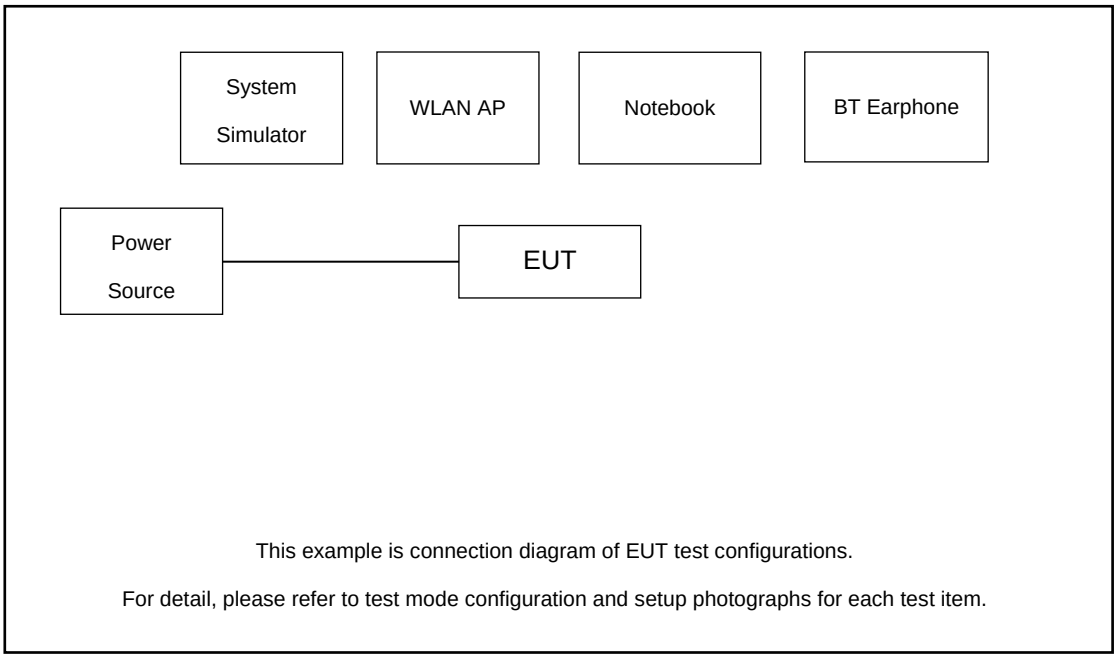
Ch. #		UNII-5	UNII-6	UNII-7	UNII-8
		802.11be EHT160	802.11be EHT160	802.11be EHT160	802.11be EHT160
L	Low	015	-	143	207
M	Middle	047			
H	High	079			
Straddle		-	111	175	-

Ch. #		UNII-5	UNII-6	UNII-7	UNII-8
		802.11be EHT320	802.11be EHT320	802.11be EHT320	802.11be EHT320
L	Low	-	-	-	-
M	Middle	031			
H	High	063			
Straddle		95	127	159	191

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

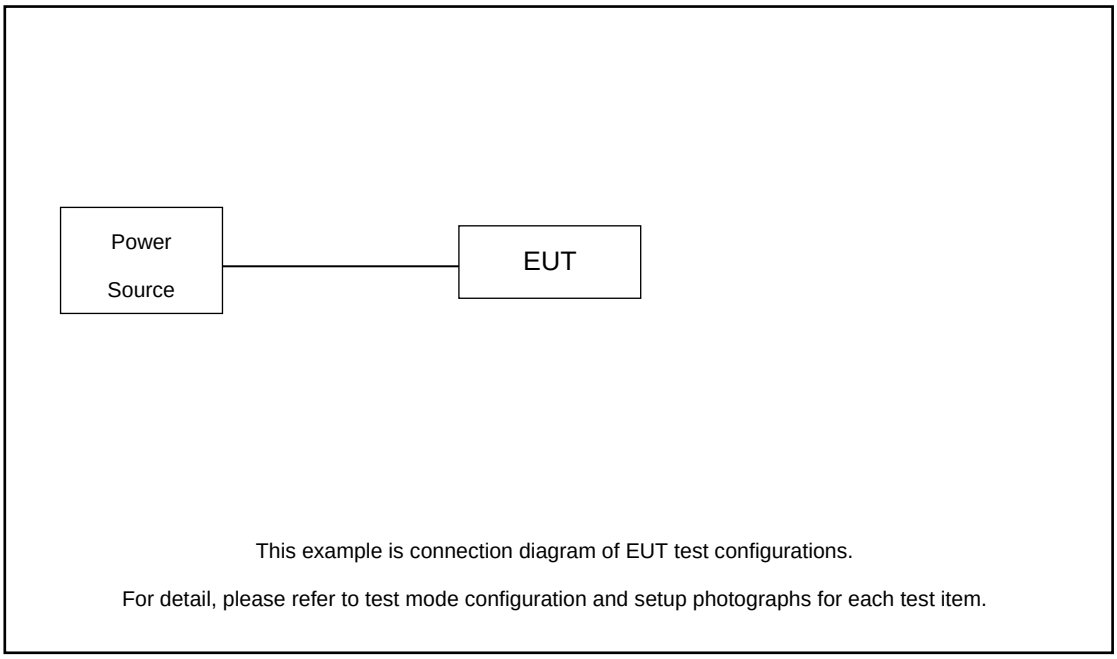
For AC Conducted Emission



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	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Bluetooth Earphone	Samsung	EO-MG900	N/A	N/A	N/A
2.	WLAN AP	Qualcomm	N/A	N/A	N/A	Shielded, 1.8 m
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.

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

2.6 Measurement Results Explanation Example

For all conducted test items:

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

Example :

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

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 6.24 dB and 20dB attenuator.

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

= 6.24 + 20 = 26.24 (dB)

3 Test Result

3.1 26dB & 99% Occupied Bandwidth Measurement

3.1.1 Limit of 26dB & 99% Occupied Bandwidth

<FCC 14-30 CFR 15.407>

(a)(10) The maximum transmitter channel bandwidth for U-NII devices in the 5.925-7.125 GHz band is 320 megahertz.

3.1.2 Measuring Instruments

See list of measuring equipment 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
2. Set RBW = approximately 1% of the emission bandwidth.
3. Set the VBW > RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. 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%.
7. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the emission bandwidth and set the Video bandwidth (VBW) ≥ 3 * RBW.
8. Measure and record the results in the test report.

3.1.4 Test Setup

3.1.5 Test Result of 26dB & 99% Occupied Bandwidth

Please refer to Appendix A.

3.2 Maximum conducted Output Power and Fundamental Maximum EIRP Measurement

3.2.1 Limit of Fundamental Maximum EIRP

<FCC 14-30 CFR 15.407>

(a)(7) For client devices, except for fixed client devices as defined in this subpart, operating under the control of a standard power access point in 5.925-6.425 GHz and 6.525-6.875 GHz bands, the maximum e.i.r.p. over the frequency band of operation must not exceed 30 dBm and the device must limit its power to no more than 6 dB below its associated standard power access point's authorized transmit power.

(a)(8) For client devices operating under the control of an indoor access point in the 5.925-7.125 GHz bands, the maximum e.i.r.p. over the frequency band of operation must not exceed 24 dBm.

3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

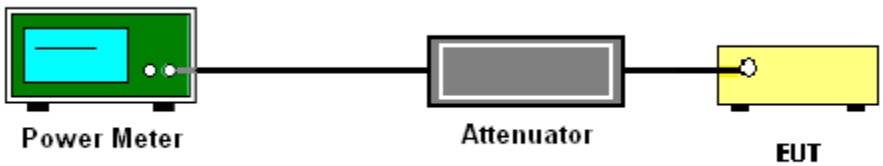
3.2.3 Test Procedures

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 Fundamental Maximum EIRP

Please refer to Appendix A.

3.3 Fundamental Power Spectral Density Measurement

3.3.1 Limit of Fundamental Power Spectral Density

<FCC 14-30 CFR 15.407>

(a)(7) For client devices, except for fixed client devices as defined in this subpart, operating under the control of a standard power access point in 5.925-6.425 GHz and 6.525-6.875 GHz bands, the maximum power spectral density must not exceed 17 dBm e.i.r.p. in any 1-megahertz band.

(a)(8) For client devices operating under the control of an indoor access point in the 5.925-7.125 GHz bands, the maximum power spectral density must not exceed −1 dBm e.i.r.p. in any 1-megahertz band.

3.3.2 Measuring Instruments

See list of measuring equipment 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 = 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.

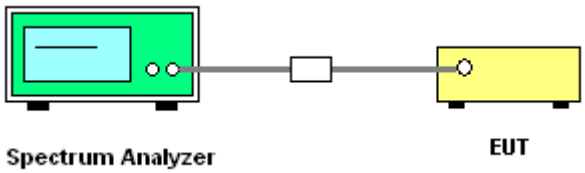
1. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
2. Each plot has already offset with cable loss, attenuator loss and duty factor. Measure the PPSD and record it.
3. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

Method (a): Measure and sum the spectra across the outputs.
The total final Power Spectral Density is from a 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 In-Band Emissions (Channel Mask)

3.4.1 Limit of Unwanted Emissions

<FCC 14-30 CFR 15.407>

(b)(6) For transmitters operating within the 5.925-7.125 GHz bands: Power spectral density must be suppressed by 20 dB at 1 MHz outside of channel edge, by 28 dB at one channel bandwidth from the channel center, and by 40 dB at one- and one-half times the channel bandwidth away from channel center. At frequencies between one megahertz outside an unlicensed device's channel edge and one channel bandwidth from the center of the channel, the limits must be linearly interpolated between 20 dB and 28 dB suppression, and at frequencies between one and one- and one-half times an unlicensed device's channel bandwidth, the limits must be linearly interpolated between 28 dB and 40 dB suppression. Emissions removed from the channel center by more than one- and one-half times the channel bandwidth must be suppressed by at least 40 dB.

3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

3.4.3 Test Procedures

The testing follows FCC KDB 987594 D02 U-NII 6GHz EMC Measurement v01r01.

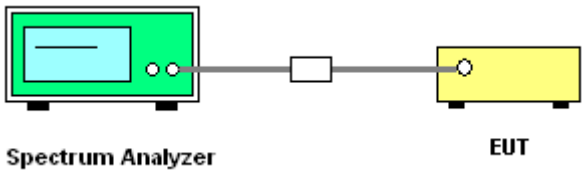
Section J) In-Band Emissions.

1. Take nominal bandwidth as reference channel bandwidth provided that 26 dB emission bandwidth is always larger than nominal bandwidth
2. Measure the power spectral density (which will be used for emissions mask reference) using the following procedure:
   a) Set the span to encompass the entire 26 dB EBW of the signal.
   b) Set RBW = same RBW used for 26 dB EBW measurement.
   c) Set VBW ≥ 3 X RBW
   d) Number of points in sweep ≥ [2 X span / RBW].
   e) Sweep time = auto.
   f) Detector = RMS (i.e., power averaging)
   g) Trace average at least 100 traces in power averaging (rms) mode.
   h) Use the peak search function on the instrument to find the peak of the spectrum.
3. Using the measuring equipment limit line function, develop the emissions mask based on the following requirements. The emissions power spectral density must be reduced below the peak power spectral density (in dB) as follows:
   a. Suppressed by 20 dB at 1 MHz outside of the channel edge.
   b. Suppressed by 28 dB at one channel bandwidth from the channel center.

c. Suppressed by 40 dB at one- and one-half times the channel bandwidth from the channel center.

4. Adjust the span to encompass the entire mask as necessary.
5. Clear trace.
6. Trace average at least 100 traces in power averaging (rms) mode.
7. Adjust the reference level as necessary so that the crest of the channel touches the top of the emission mask.

3.4.4 Test Setup



3.4.5 Test Result

Please refer to Appendix A.

3.5 Contention Based Protocol

3.5.1 Limit of Contention Based Protocol

<FCC 14-30 CFR 15.407>

(d)(6) Indoor access points, subordinate devices and client devices operating in the 5.925-7.125 GHz band must employ a contention-based protocol.

FCC KDB 987594 D02 U-NII 6GHz EMC Measurement v01r01

Unlicensed low-power indoor devices must detect co-channel radio frequency power that is at least -62 dBm or lower. Upon detection of energy in the band, unlicensed low power indoor devices must vacate the channel and stay off the channel as long as detected radio frequency power is equal to or greater than the threshold (-62 dBm). The -62 dBm (or lower) threshold is referenced to a 0 dBi antenna gain. To ensure incumbent operations are reliably detected in the band, low power indoor devices must detect RF energy throughout their intended operating channel. For example, an 802.11 device that plans to transmit a 40 MHz- wide signal (on a primary 20 MHz channel and a secondary 20 MHz channel) must detect energy throughout the entire 40 MHz channel. Additionally, low-power indoor devices must detect co-channel energy with 90% or greater certainty.

Table 1. Criteria to determine number of times detection threshold test may be performed

If	Number of Tests	Placement of Incumbent Transmission
$BW_{EUT} \leq BW_{Inc}$	Once	Tune incumbent and EUT transmissions ($f_{c1} = f_{c2}$)
$BW_{Inc} < BW_{EUT} \leq 2BW_{Inc}$	Once	Incumbent transmission is contained within BW_{EUT}
$2BW_{Inc} < BW_{EUT} \leq 4BW_{Inc}$	Twice. Incumbent transmission is contained within BW_{EUT}	Incumbent transmission is located as closely as possible to the lower edge and upper edge, respectively, of the EUT channel
$BW_{EUT} > 4BW_{Inc}$	Three times	Incumbent transmission is located as closely as possible to the lower edge of the EUT channel, in the middle of EUT channel, and as closely as possible to the upper edge of the EUT channel

where:
$BWEUT$: Transmission bandwidth of EUT signal
$BWInc$: Transmission bandwidth of the simulated incumbent signal (10 MHz wide AWGN signal)
$fc1$: Center frequency of EUT transmission
$fc2$: Center frequency of simulated incumbent signal

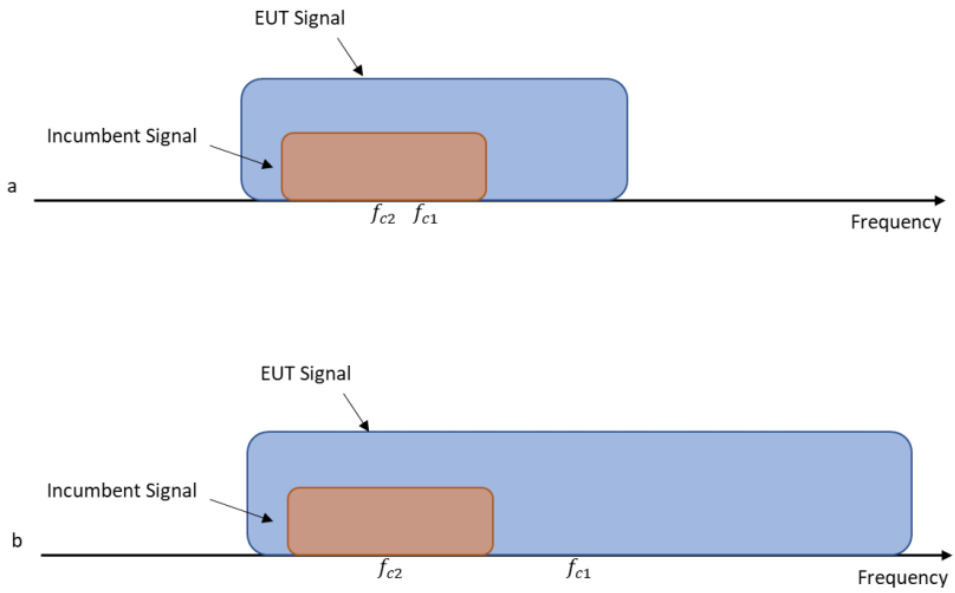


Figure 1. Two possible scenarios where a) center frequency of EUT transmission falls within incumbent's bandwidth, or b) outside of it

3.5.2 Measuring Instruments

See list of measuring equipment of this test report.

3.5.3 Test Procedures

Refer to KDB 987594 D02 v01r01.

1. To ensure EUT reliably detects an incumbent signal in both scenarios shown in Figure 1, the detection threshold test may be repeated more than once with the incumbent signal (having center frequency $fc2$) tuned to different center frequencies within the UT transmission bandwidth. The criteria specified in Table 1 determines how many times the detection threshold test must be performed
2. Using an AWGN signal source, generate (but do not transmit, i.e., RF OFF) a 10 MHz-wide AWGN signal. Use Table 1 to determine the center frequency of the 10 MHz AWGN signal relative to the EUT's channel bandwidth and center frequency.
3. Monitor the signal analyzer to verify if the AWGN signal has been detected and the EUT has ceased transmission. If the EUT continues to transmit, then incrementally increase the AWGN signal power level until the EUT stops transmitting.
4. (Including all losses in the RF paths) Determine and record the AWGN signal power level (at the EUT's antenna port) at which the EUT ceased transmission. Repeat the procedure at least 10 times to verify the EUT can detect an AWGN signal with 90% (or better) level of certainty.
5. Refer to Table 1 to determine number of times the detection threshold testing needs to be repeated. If testing is required more than once, then go back to step 2, choose a different center frequency for the AWGN signal and repeat the process.

3.5.4 Test Setup

Conducted Setup

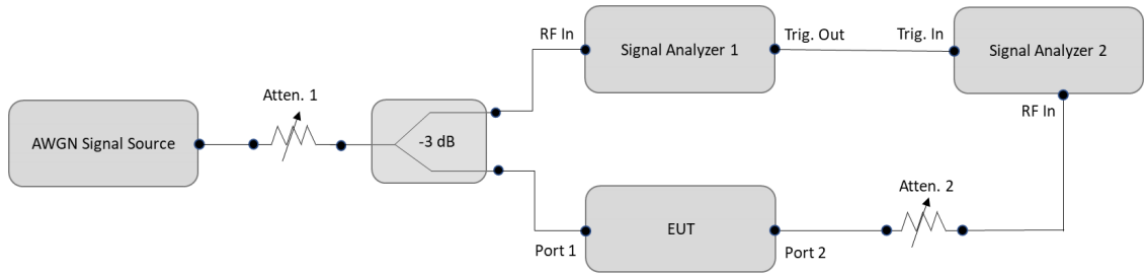


Figure 2. Contention-based protocol test setup, conducted method Step-by-Step Procedure, Conducted Setup

3.5.5 Support Unit used in test configuration and system

Instrument	Brand Name	Model No.	Characteristics
WLAN AP	Qualcomm	N/A	Dual Band AP
Notebook	DELL	P78G	LAN

3.5.6 Test Summary of Contention Based Protocol Test

Band	Channel Freq. (MHz)	Channel BW (MHz)	Incumbent freq. (MHz)	Injected AWGN Level (dBm)	Detection Rate (%)	Regulated Threshold level (dBm)	Adjusted Power (dBm)	Margin (dB)
UNII Band 5	6135	20	6135	-70.19	100	-62	-67.79	5.79
					Result: Stop Transmission			
				-71.19	< 90	-62	-68.79	6.79
					Result: Minimal Operation			
				-72.45	0	-62	-70.05	8.05
					Result: Normal Operation			
	6105	320	5950	-73.28	100	-62	-70.88	8.88
					Result: Stop Transmission			
				-74.28	< 90	-62	-71.88	9.88
					Result: Minimal Operation			
				-75.83	0	-62	-73.43	11.43
					Result: Normal Operation			
			6105	-68.32	100	-62	-65.92	3.92
					Result: Stop Transmission			
				-69.32	< 90	-62	-66.92	4.92
					Result: Minimal Operation			
				-71.93	0	-62	-69.53	7.53
					Result: Normal Operation			
			6260	-68.81	100	-62	-66.41	4.41
					Result: Stop Transmission			
				-69.81	< 90	-62	-67.41	5.41
					Result: Minimal Operation			
				-72.99	0	-62	-70.59	8.59
					Result: Normal Operation			

Note 1: Adjusted Power = Injected AWGN Level - minimum antenna gain (Antenna 10, gain = -2.4dBi)

Note 2: Pass Loss is negligible. (0 dB)

Note 3: Margin = Regulated Threshold level - Adjusted Power

Band	Channel Freq. (MHz)	Channel BW (MHz)	Incumbent freq. (MHz)	Injected AWGN Level (dBm)	Detection Rate (%)	Regulated Threshold level (dBm)	Adjusted Power (dBm)	Margin (dB)
UNII Band 6	6455	20	6455	-68.24	100	-62	-65.84	3.84
					Result: Stop Transmission			
				-69.24	< 90	-62	-66.84	4.84
					Result: Minimal Operation			
				-72.55	0	-62	-70.15	8.15
					Result: Normal Operation			
UNII Band 5/6/7	6425	320	6270	-71.00	100	-62	-68.6	6.6
					Result: Stop Transmission			
				-72.00	< 90	-62	-69.6	7.6
					Result: Minimal Operation			
				-72.57	0	-62	-70.17	8.17
					Result: Normal Operation			
			6425	-67.49	100	-62	-65.09	3.09
					Result: Stop Transmission			
				-68.49	< 90	-62	-66.09	4.09
					Result: Minimal Operation			
				-71.93	0	-62	-69.53	7.53
					Result: Normal Operation			
			6580	-70.44	100	-62	-68.04	6.04
					Result: Stop Transmission			
				-71.44	< 90	-62	-69.04	7.04
					Result: Minimal Operation			
				-74.15	0	-62	-71.75	9.75
					Result: Normal Operation			

Note 1: Adjusted Power = Injected AWGN Level - minimum antenna gain (Antenna 10, gain = -2.4dBi)

Note 2: Pass Loss is negligible. (0 dB)

Note 3: Margin = Regulated Threshold level - Adjusted Power

Band	Channel Freq. (MHz)	Channel BW (MHz)	Incumbent freq. (MHz)	Injected AWGN Level (dBm)	Detection Rate (%)	Regulated Threshold level (dBm)	Adjusted Power (dBm)	Margin (dB)
UNII Band 7	6695	20	6695	-66.94	100	-62	-64.54	2.54
					Result: Stop Transmission			
				-67.94	< 90	-62	-65.54	3.54
					Result: Minimal Operation			
				-69.68	0	-62	-67.28	5.28
					Result: Normal Operation			
UNII Band 7(8)	6745	320	6590	-72.83	100	-62	-70.43	8.43
					Result: Stop Transmission			
				-73.83	< 90	-62	-71.43	9.43
					Result: Minimal Operation			
				-76.43	0	-62	-74.03	12.03
					Result: Normal Operation			
			6745	-74.46	100	-62	-72.06	10.06
					Result: Stop Transmission			
				-75.46	< 90	-62	-73.06	11.06
					Result: Minimal Operation			
				-77.30	0	-62	-74.9	12.9
					Result: Normal Operation			
			6900	-69.51	100	-62	-67.11	5.11
					Result: Stop Transmission			
				-70.51	< 90	-62	-68.11	6.11
					Result: Minimal Operation			
				-71.61	0	-62	-69.21	7.21
					Result: Normal Operation			

Note 1: Adjusted Power = Injected AWGN Level - minimum antenna gain (Antenna 10, gain = -2.4dBi)

Note 2: Pass Loss is negligible. (0 dB)

Note 3: Margin = Regulated Threshold level - Adjusted Power

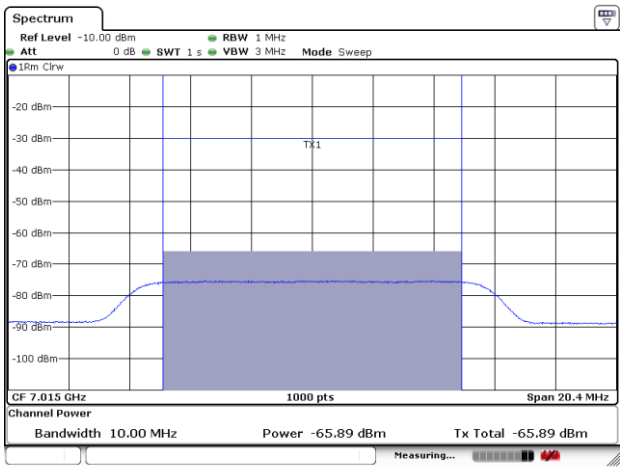
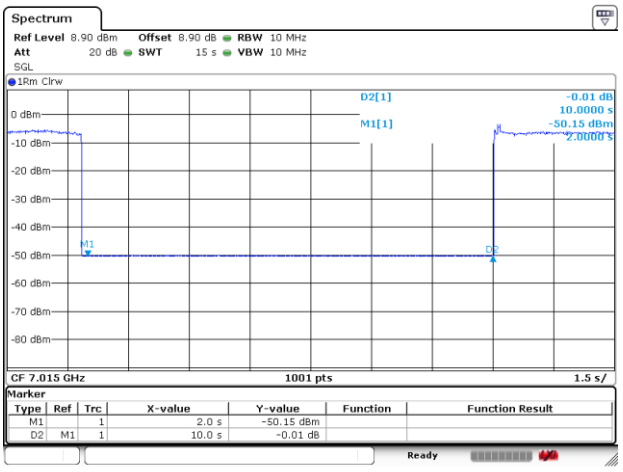
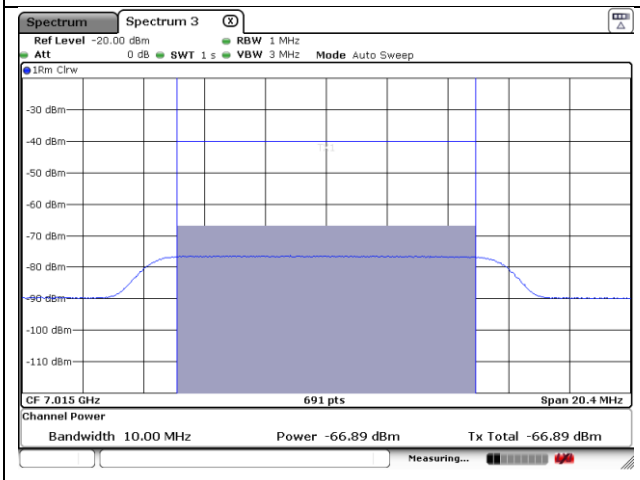
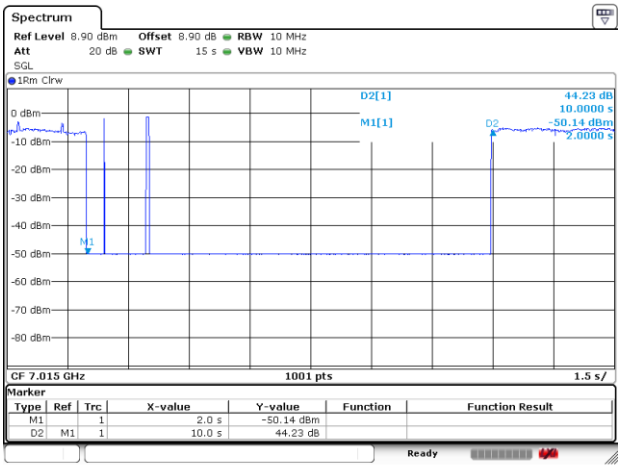
Band	Channel Freq. (MHz)	Channel BW (MHz)	Incumbent freq. (MHz)	Injected AWGN Level (dBm)	Detection Rate (%)	Regulated Threshold level (dBm)	Adjusted Power (dBm)	Margin (dB)
UNII Band 8	7015	20	7015	**-65.89 (worst)**	100	-62	-63.49	**1.49**
					Result: Stop Transmission			
				-66.89	< 90	-62	-64.49	2.49
					Result: Minimal Operation			
				-69.07	0	-62	-66.67	4.67
					Result: Normal Operation			
UNII Band 8(7)	6745	320	6590	-72.83	100	-62	-70.43	8.43
					Result: Stop Transmission			
				-73.83	< 90	-62	-71.43	9.43
					Result: Minimal Operation			
				-76.43	0	-62	-74.03	12.03
					Result: Normal Operation			
			6745	-74.46	100	-62	-72.06	10.06
					Result: Stop Transmission			
				-75.46	< 90	-62	-73.06	11.06
					Result: Minimal Operation			
				-77.30	0	-62	-74.9	12.9
					Result: Normal Operation			
			6900	-69.51	100	-62	-67.11	5.11
					Result: Stop Transmission			
				-70.51	< 90	-62	-68.11	6.11
					Result: Minimal Operation			
				-71.61	0	-62	-69.21	7.21
					Result: Normal Operation			

Note 1: Adjusted Power = Injected AWGN Level - minimum antenna gain (Antenna 10, gain = -2.4dBi)

Note 2: Pass Loss is negligible. (0 dB)

Note 3: Margin = Regulated Threshold level - Adjusted Power

3.5.7 Worst Case Plots of Contention Based Protocol

Contention Based Protocol Result Plots on U-NII 8 (AWGN Interference)	
802.11be (EHT20) / 7015MHz Threshold Level (TL) = -65.89dBm	802.11be (EHT20) / 7015MHz Test result is pass due to no transmission occur.
	
802.11be (EHT20) / 7015MHz Threshold Level (TL) = -66.89dBm	802.11be (EHT20) / 7015MHz Transmit when the interferer is 1dB lower.
	

Remark: M1: Injection of AWGN signal, D1: Removal of AWGN signal

3.6 Unwanted Emissions Measurement

This section is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement.

3.6.1 Limit of Unwanted Emissions

(1) For transmitters operating within the 5.925-7.125 GHz band: Any emissions outside of the 5.925-7.125 GHz band must not exceed an e.i.r.p. of −27 dBm/MHz.

EIRP (dBm)	Field Strength at 3m (dBμV/m)
- 27 (RMS)	68.2
- 7 (Peak)	88.2

According 987594 D02 U-NII 6GHz EMC Measurement v01r01 section G:
Unwanted emissions outside of restricted bands are measured with a RMS detector.
In addition, 15.35(b) applies where the peak emissions must be limited to no more than 20 dB above the average limit

(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

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

$$E=\frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

3.6.2 Measuring Instruments

See list of measuring equipment of this test report.

3.6.3 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

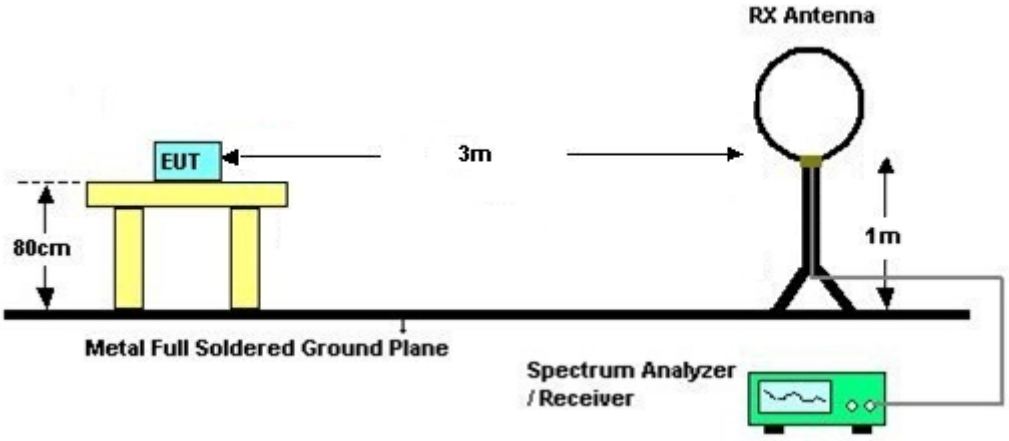
   (3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

   - 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.

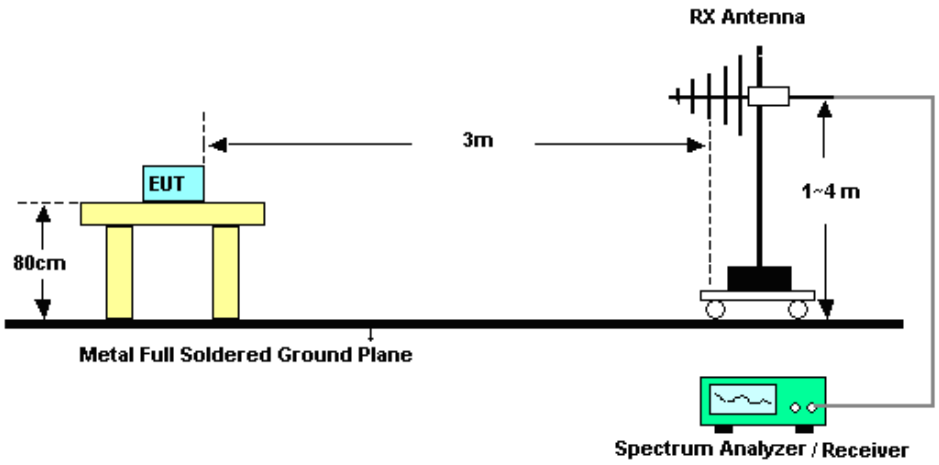
2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband 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 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.

3.6.4 Test Setup

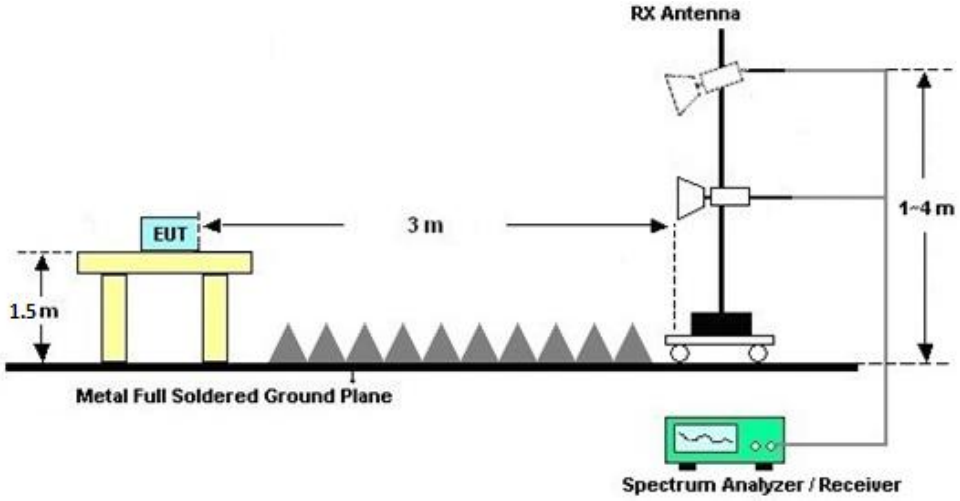
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.6.5 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 adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.6.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C&D

3.6.7 Duty Cycle

Please refer to Appendix E.

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

Please refer to Appendix C&D.

3.7 AC Conducted Emission Measurement

3.7.1 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.

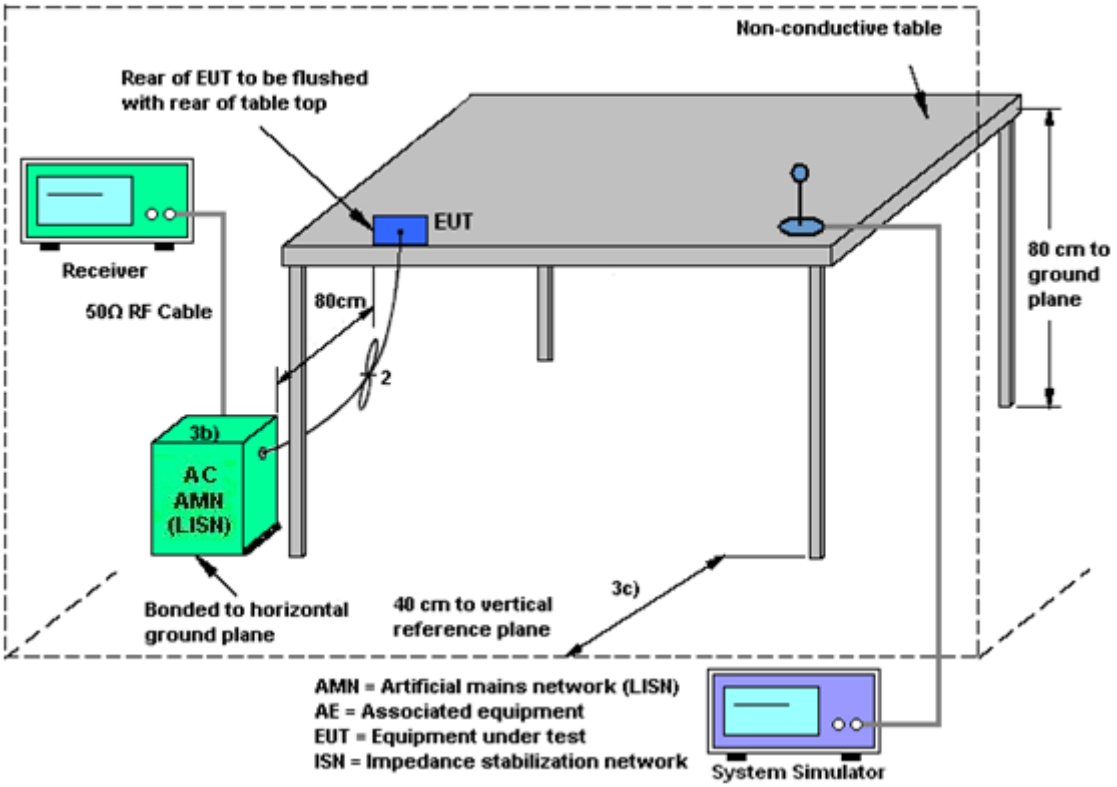
3.7.2 Measuring Instruments

See list of measuring equipment of this test report.

3.7.3 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.

3.7.4 Test Setup



3.7.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.8 Antenna Requirements

3.8.1 Standard Applicable

§15.203: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.8.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used. The EUT complies with the requirement of 15.203.

3.8.3 Antenna Gain

<CDD Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

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

Directional gain = $G_{ANT\ MAX}$(Ant.1 Gain, Ant.2 Gain,…) + Array Gain, as following table for Power,

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

For PSD, the directional gain calculation is following,

Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{Gn/20})^2 / N_{ANT}$] dBi, as following table for PSD.

N_{ANT} = number of transmit antennas

N_{SS} = number of spatial streams. (The worst case directional gain will occur when NSS = 1)

For completely uncorrelated transmissions, directional gain is calculated as,

Directional gain = $G_{ANT\ MAX}$(Ant.1 Gain, Ant.2 Gain,…), as following table

<CDD Modes>

	Ant. 10 (dBi)	Ant. 13 (dBi)	DG for Power (dBi)	DG for PSD (dBi)
U-NII-5	1.30	-2.20	1.30	2.74
U-NII-6	-0.20	-1.40	-0.20	2.23
U-NII-7	-1.30	0.40	0.40	2.60
U-NII-8	-2.40	1.90	1.90	3.02

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 07, 2022	Oct. 26, 2022~ Dec. 09, 2022	Apr. 06, 2023	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 28, 2021	Oct. 26, 2022~ Dec. 09, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 28, 2021	Oct. 26, 2022~ Dec. 09, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
EMI Test Receiver	R&S	ESR7	101404	9kHz~7GHz	Oct. 19, 2022	Nov. 04, 2022~ Dec. 09, 2022	Oct. 18, 2023	Radiation (03CH04-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Jul. 07, 2022	Nov. 04, 2022~ Dec. 09, 2022	Jul. 06, 2023	Radiation (03CH04-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jun. 28, 2022	Nov. 04, 2022~ Dec. 09, 2022	Jun. 27, 2023	Radiation (03CH04-SZ)
Bilog Antenna	TeseQ	CBL6111D	41909	30MHz~1GHz	Apr. 27, 2022	Nov. 04, 2022~ Dec. 09, 2022	Apr. 26, 2023	Radiation (03CH04-SZ)
Double Ridge Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1474	1GHz~18GHz	Jul. 07, 2022	Nov. 04, 2022~ Dec. 09, 2022	Jul. 06, 2023	Radiation (03CH04-SZ)
Horn Antenna	SCHWARZBECK	BBHA9170	9170#679	15GHz~40GHz	Jul. 07, 2022	Nov. 04, 2022~ Dec. 09, 2022	Jul. 06, 2023	Radiation (03CH04-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz ~3000MHz	Oct. 19, 2022	Nov. 04, 2022~ Dec. 09, 2022	Oct. 18, 2023	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	AMF-7D-00101800-30-10P-R	1943528	1GHz~18GHz	Oct. 19, 2022	Nov. 04, 2022~ Dec. 09, 2022	Oct. 18, 2023	Radiation (03CH04-SZ)
HF Amplifier	MITEQ	TTA1840-35-HG	1871923	18GHz~40GHz	Jul. 06, 2022	Nov. 04, 2022~ Dec. 09, 2022	Jul. 05, 2023	Radiation (03CH04-SZ)
Amplifier	Agilent Technologies	83017A	MY57280136	500MHz~26.5GHz	Sep. 30, 2022	Nov. 04, 2022~ Dec. 09, 2022	Sep. 29, 2023	Radiation (03CH04-SZ)
AC Power Source	APC	AFV-S-600B	F119050019	N/A	Nov. 10, 2022	Nov. 04, 2022~ Dec. 09, 2022	Nov. 09, 2023	Radiation (03CH04-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Nov. 04, 2022~ Dec. 09, 2022	NCR	Radiation (03CH04-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Nov. 04, 2022~ Dec. 09, 2022	NCR	Radiation (03CH04-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jul. 07, 2022	Dec. 12, 2022	Jul. 06, 2023	Conduction (CO01-SZ)
AC LISN	R&S	ENV216	100063	9kHz~30MHz	Sep. 15, 2022	Dec. 12, 2022	Sep. 14, 2023	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 17, 2022	Dec. 12, 2022	Oct. 16, 2023	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	616020000891	100Vac~250Vac	Jul. 07, 2022	Dec. 12, 2022	Jul. 06, 2023	Conduction (CO01-SZ)
Spectrum Analyzer	R&S	FSV30	101338	10Hz~30GHz	Apr. 12, 2022	Nov. 29, 2022	Apr. 11, 2023	CBP (DFS01-KS)
MXG-B RF Vector Signal Genertor	Keysight	5182B /5182BX07	MY56200417 /MY59360210	9kHz~7.2GHz	May 24, 2022	Nov. 29, 2022	May 23, 2023	CBP (DFS01-KS)
Vector Signal Generator	R&S	SMBV100A	258305	9kHz~6GHz	Jan. 06, 2022	Nov. 29, 2022	Jan. 05, 2023	CBP (DFS01-KS)
Combiner	MTJ Cooperation	MTJ7112	N/A	0.4-6GHz	NCR	Nov. 29, 2022	NCR	CBP (DFS01-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	0.012MHz
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))	5.1 dB

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

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

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

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

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

Appendix A. Conducted Test Results

FCase No. : 2O2001	
Ambient Condition: 24~26 ℃, 45~55 %RH	
According Standard: ■Part15E	
Test Date: 2022/10/26~2022/12/9	**Test Engineer:** Tang ZhaoYang

Emission Bandwidth

Test Result

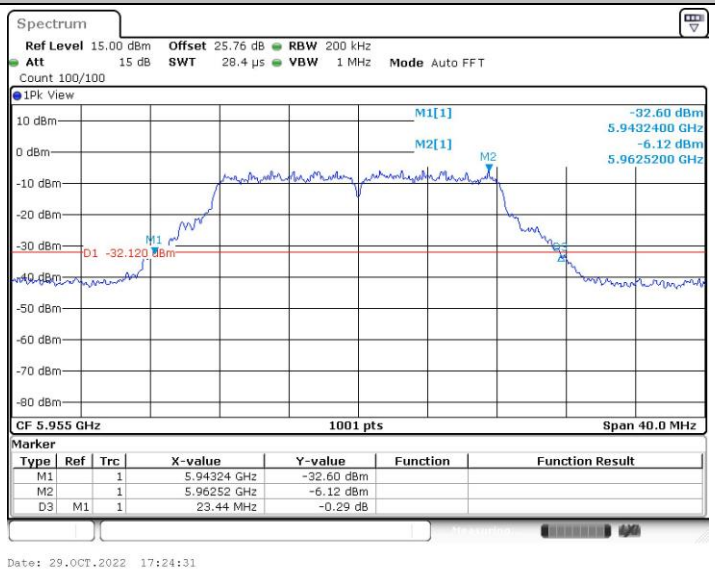
TestMode	Antenna	Freq(MHz)	26dB EBW [MHz]	FL[MHz]	FH[MHz]
11A-CDD	Ant10	5955	23.44	5943.24	5966.68
	Ant13	5955	23.12	5943.64	5966.76
	Ant10	6175	22.88	6163.68	6186.56
	Ant13	6175	23.24	6163.48	6186.72
	Ant10	6415	23.32	6403.04	6426.36
	Ant13	6415	23.08	6403.64	6426.72
	Ant10	6435	23.68	6423.60	6447.28
	Ant13	6435	22.84	6423.64	6446.48
	Ant10	6475	23.16	6463.32	6486.48
	Ant13	6475	23.28	6463.28	6486.56
	Ant10	6515	23.44	6502.96	6526.40
	Ant13	6515	23.00	6503.64	6526.64
	Ant10	6535	23.84	6523.28	6547.12
	Ant13	6535	22.76	6523.56	6546.32
	Ant10	6695	22.20	6683.92	6706.12
	Ant13	6695	22.92	6683.32	6706.24
	Ant10	6855	23.24	6843.48	6866.72
	Ant13	6855	23.16	6843.56	6866.72
	Ant10	6875	23.32	6863.64	6886.96
	Ant13	6875	23.08	6863.64	6886.72
	Ant10	6895	23.40	6883.24	6906.64
	Ant13	6895	23.60	6883.40	6907.00
	Ant10	6995	23.24	6983.20	7006.44
	Ant13	6995	23.24	6983.16	7006.40
	Ant10	7095	23.08	7083.52	7106.60
	Ant13	7095	23.20	7083.40	7106.60
	Ant10	7115	22.64	7103.72	7126.36
	Ant13	7115	23.04	7103.68	7126.72
11BE20MIMO	Ant10	5955	22.72	5943.64	5966.36
	Ant13	5955	23.60	5943.36	5966.96
	Ant10	6175	23.36	6163.32	6186.68
	Ant13	6175	23.72	6163.24	6186.96
	Ant10	6415	23.20	6403.36	6426.56
	Ant13	6415	23.12	6403.28	6426.40
	Ant10	6435	23.48	6423.16	6446.64
	Ant13	6435	23.40	6423.40	6446.80
	Ant10	6475	23.56	6463.12	6486.68
	Ant13	6475	23.04	6463.68	6486.72
	Ant10	6515	23.28	6503.36	6526.64

	Ant13	6515	23.48	6503.24	6526.72
	Ant10	6535	23.16	6523.28	6546.44
	Ant13	6535	23.16	6523.32	6546.48
	Ant10	6695	22.76	6683.64	6706.40
	Ant13	6695	23.56	6683.28	6706.84
	Ant10	6855	22.84	6843.44	6866.28
	Ant13	6855	23.16	6843.52	6866.68
	Ant10	6875	23.36	6863.32	6886.68
	Ant13	6875	23.08	6863.44	6886.52
	Ant10	6895	23.44	6883.36	6906.80
	Ant13	6895	23.60	6883.24	6906.84
	Ant10	6995	23.60	6983.04	7006.64
	Ant13	6995	23.84	6982.96	7006.80
	Ant10	7095	23.40	7083.32	7106.72
	Ant13	7095	23.52	7083.24	7106.76
	Ant10	7115	23.08	7103.64	7126.72
	Ant13	7115	23.48	7103.28	7126.76
11BE40MIMO	Ant10	5965	44.16	5942.52	5986.68
	Ant13	5965	43.04	5943.40	5986.44
	Ant10	6165	42.64	6143.16	6185.80
	Ant13	6165	43.68	6143.72	6187.40
	Ant10	6405	44.32	6383.16	6427.48
	Ant13	6405	44.40	6382.52	6426.92
	Ant10	6445	44.16	6422.68	6466.84
	Ant13	6445	43.20	6423.40	6466.60
	Ant10	6485	43.12	6463.72	6506.84
	Ant13	6485	43.60	6463.56	6507.16
	Ant10	6525	42.24	6503.80	6546.04
	Ant13	6525	43.60	6503.00	6546.60
	Ant10	6565	43.84	6543.00	6586.84
	Ant13	6565	43.36	6543.32	6586.68
	Ant10	6685	43.76	6662.84	6706.60
	Ant13	6685	43.60	6663.40	6707.00
	Ant10	6845	45.12	6823.00	6868.12
	Ant13	6845	42.32	6823.80	6866.12
	Ant10	6885	43.92	6862.92	6906.84
	Ant13	6885	42.48	6863.56	6906.04
	Ant10	6925	43.92	6903.00	6946.92
	Ant13	6925	43.68	6903.00	6946.68
	Ant10	6965	43.84	6943.16	6987.00
	Ant13	6965	44.16	6942.92	6987.08
	Ant10	7085	44.72	7062.36	7107.08
	Ant13	7085	44.08	7062.84	7106.92
11BE80MIMO	Ant10	5985	85.92	5943.24	6029.16
	Ant13	5985	83.52	5943.56	6027.08
	Ant10	6145	87.20	6100.04	6187.24
	Ant13	6145	86.88	6100.84	6187.72
	Ant10	6385	85.28	6341.48	6426.76
	Ant13	6385	84.48	6343.08	6427.56
	Ant10	6465	87.20	6421.64	6508.84
	Ant13	6465	82.88	6424.52	6507.40

	Ant10	6545	86.40	6501.16	6587.56
	Ant13	6545	85.12	6501.32	6586.44
	Ant10	6625	87.36	6581.96	6669.32
	Ant13	6625	87.36	6581.48	6668.84
	Ant10	6705	86.72	6661.32	6748.04
	Ant13	6705	87.20	6661.00	6748.20
	Ant10	6785	87.04	6742.44	6829.48
	Ant13	6785	84.48	6742.76	6827.24
	Ant10	6865	88.32	6821.80	6910.12
	Ant13	6865	85.60	6821.32	6906.92
	Ant10	6945	82.40	6903.40	6985.80
	Ant13	6945	85.76	6901.16	6986.92
	Ant10	7025	83.68	6982.12	7065.80
	Ant13	7025	85.92	6979.40	7065.32
11BE160MIMO	Ant10	6025	172.48	5938.92	6111.40
	Ant13	6025	169.60	5939.88	6109.48
	Ant10	6185	171.20	6097.96	6269.16
	Ant13	6185	167.68	6101.80	6269.48
	Ant10	6345	171.84	6260.20	6432.04
	Ant13	6345	166.08	6260.84	6426.92
	Ant10	6505	170.88	6417.96	6588.84
	Ant13	6505	168.32	6423.40	6591.72
	Ant10	6665	168.96	6578.60	6747.56
	Ant13	6665	165.44	6581.16	6746.60
	Ant10	6825	174.40	6736.68	6911.08
	Ant13	6825	168.00	6743.40	6911.40
	Ant10	6985	168.32	6900.52	7068.84
	Ant13	6985	169.92	6896.68	7066.60
11BE320MIMO	Ant10	6105	337.92	5937.32	6275.24
	Ant13	6105	339.20	5935.40	6274.60
	Ant10	6265	343.04	6092.84	6435.88
	Ant13	6265	340.48	6094.12	6434.60
	Ant10	6425	341.76	6255.40	6597.16
	Ant13	6425	340.48	6254.76	6595.24
	Ant10	6585	339.20	6414.76	6753.96
	Ant13	6585	338.56	6415.40	6753.96
	Ant10	6745	337.92	6576.04	6913.96
	Ant13	6745	337.28	6576.04	6913.32
	Ant10	6905	337.92	6735.40	7073.32
	Ant13	6905	336.64	6736.04	7072.68

Test Graphs

11A-CDD_Ant10_5955



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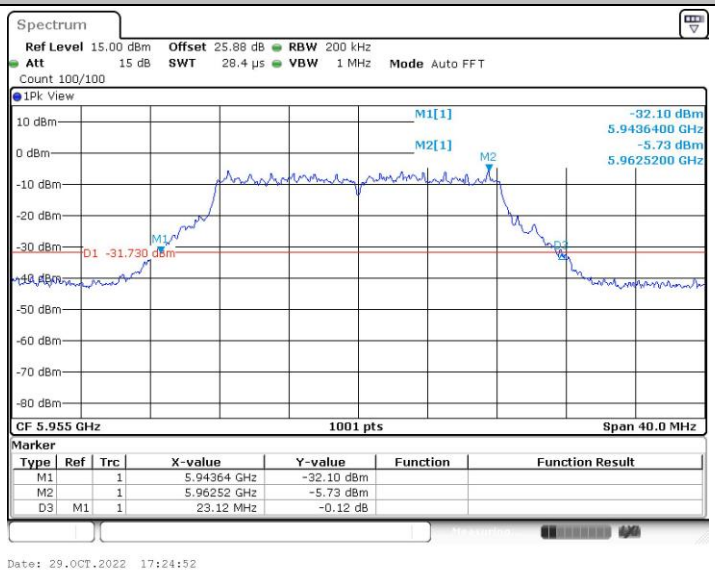

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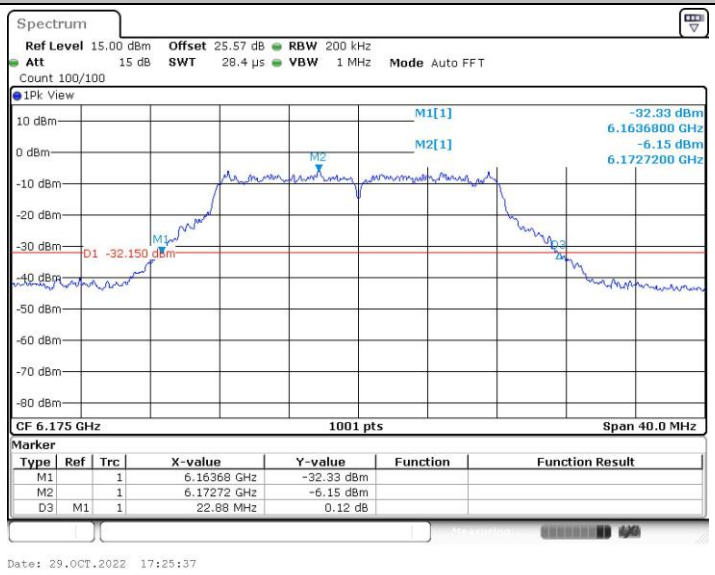

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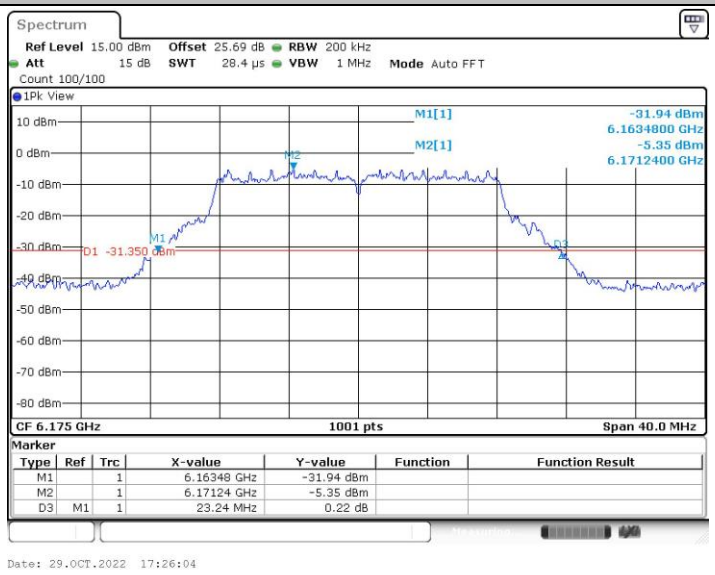

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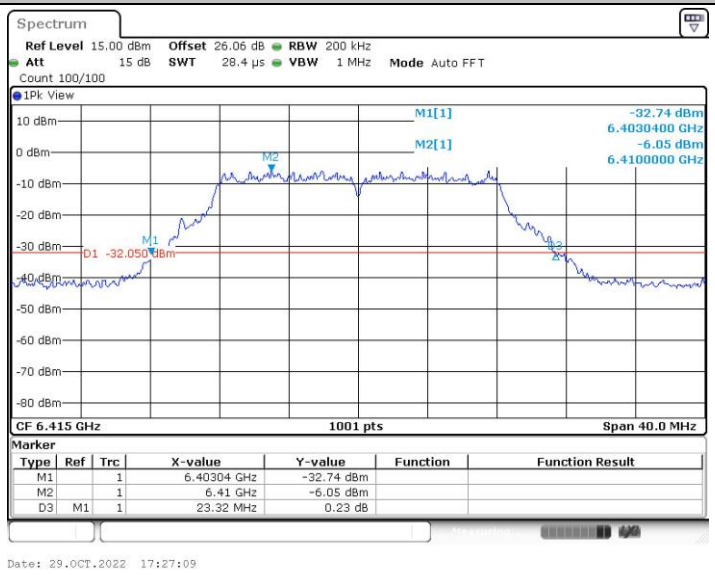

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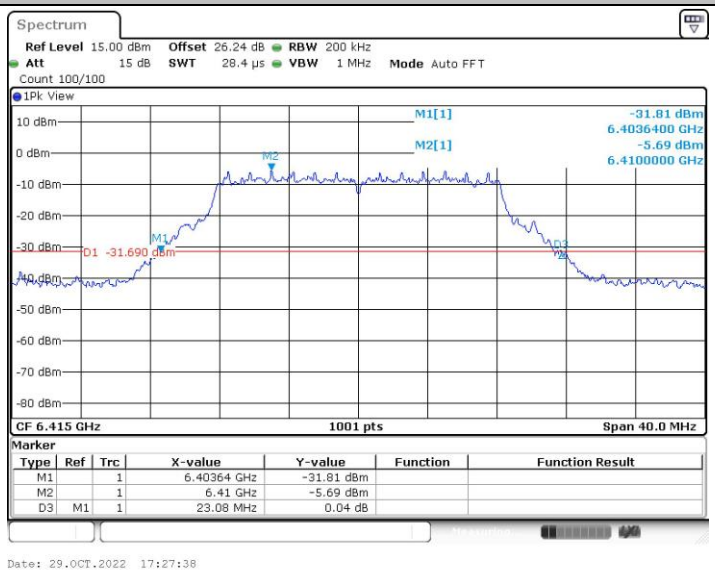

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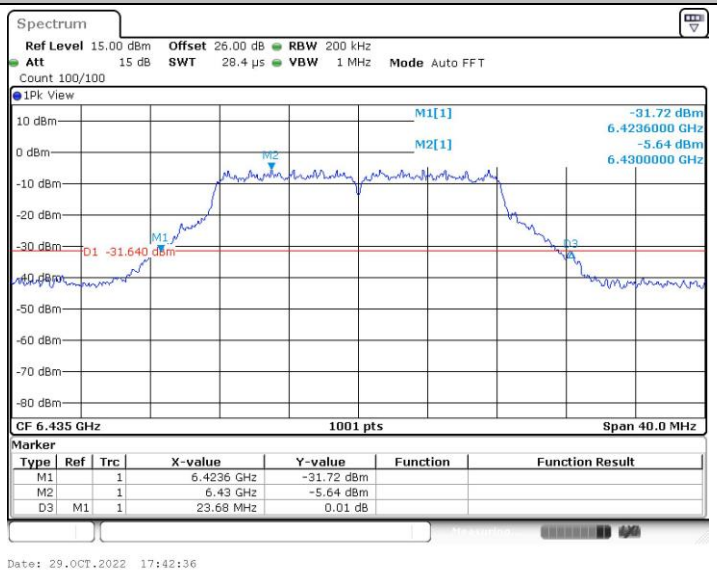

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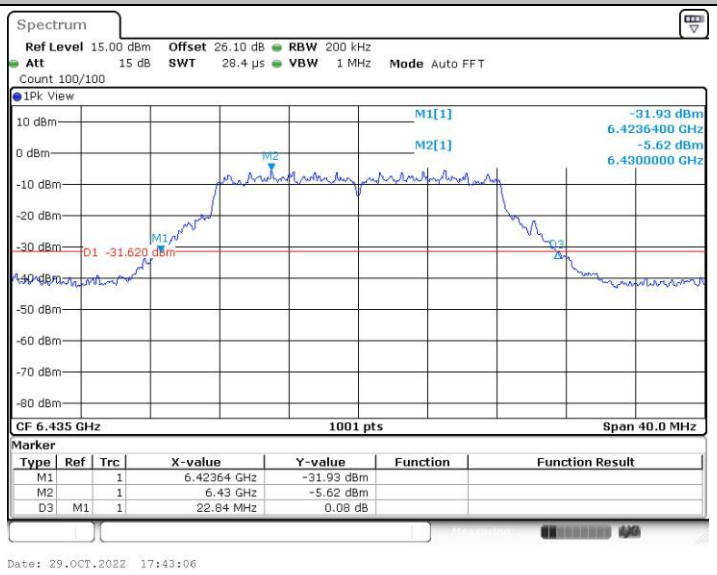

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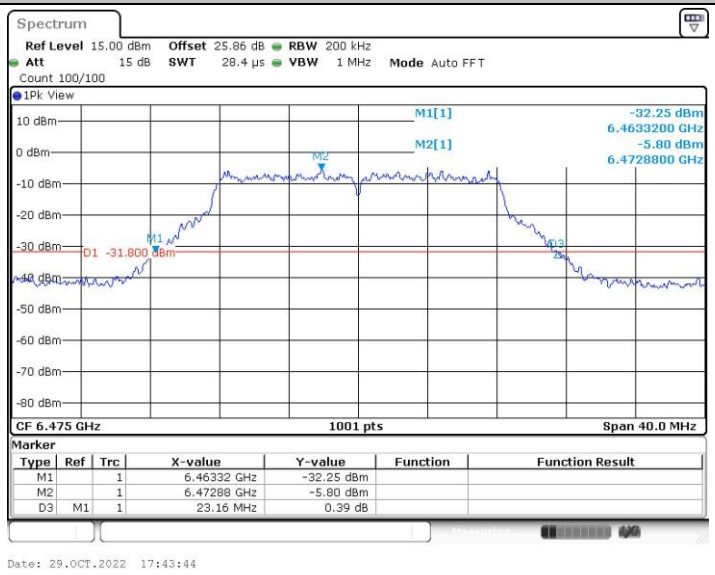

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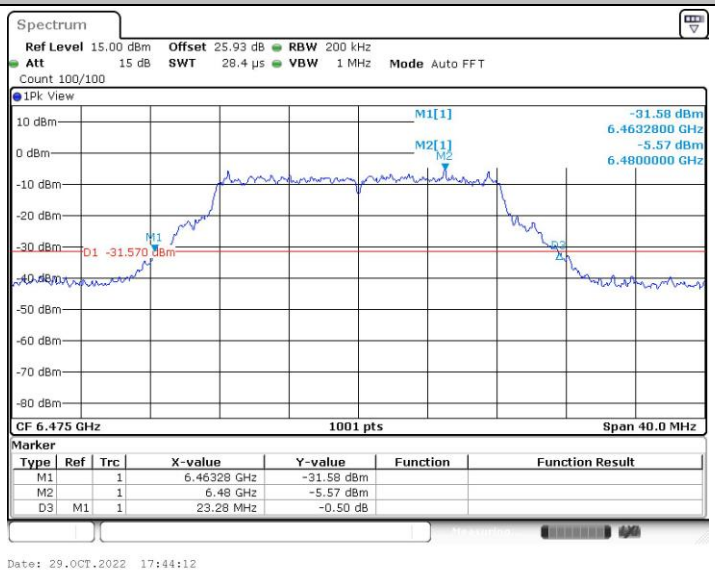

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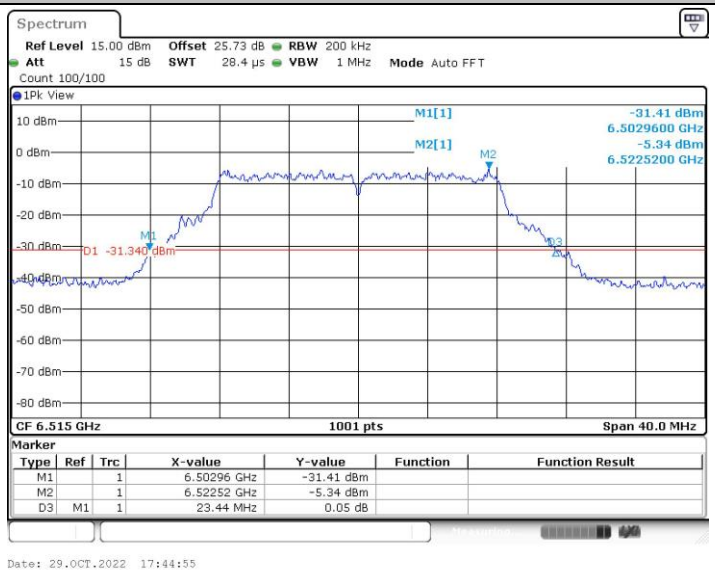

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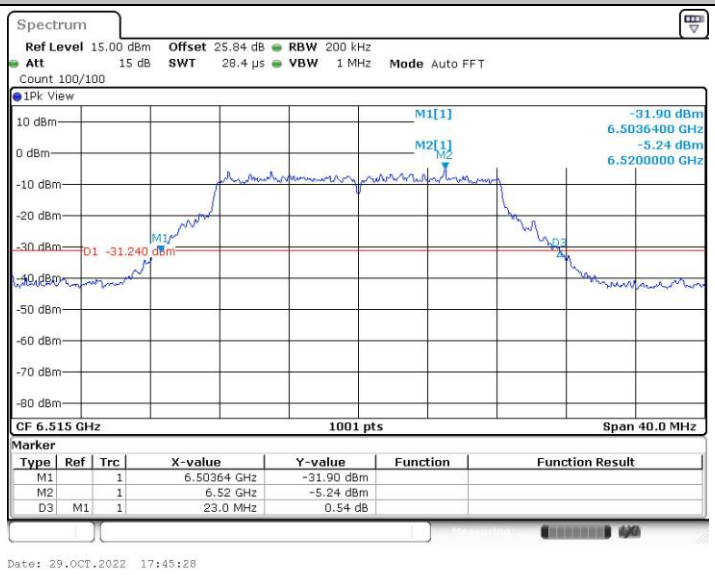

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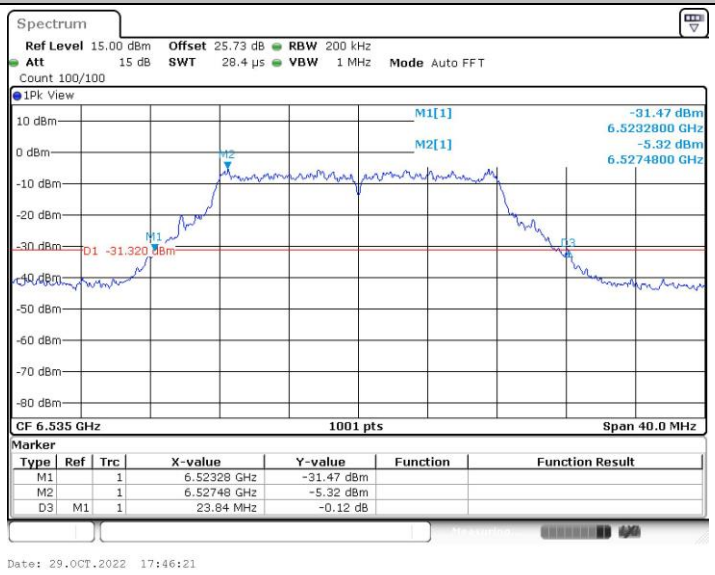

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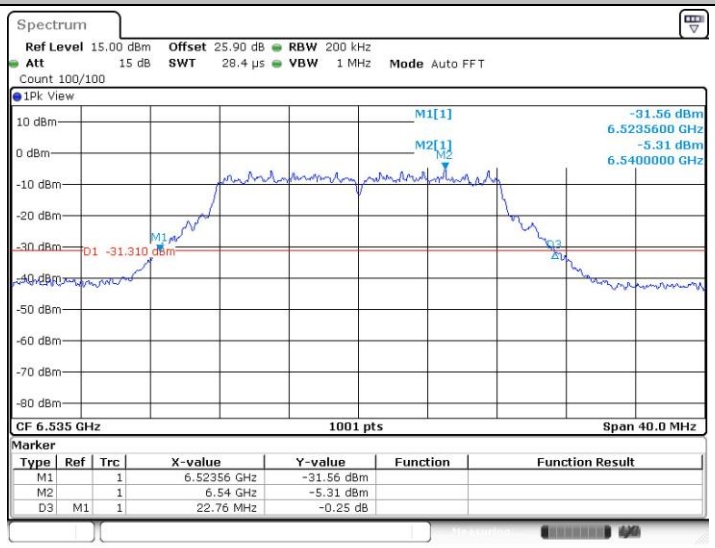

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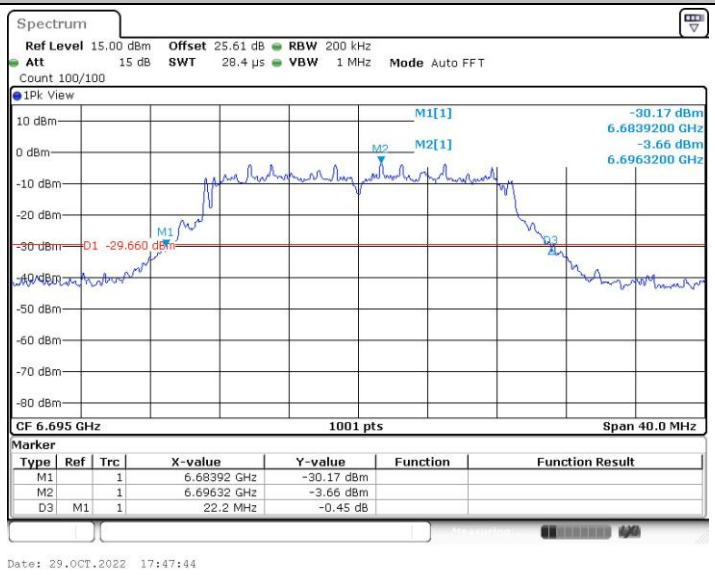

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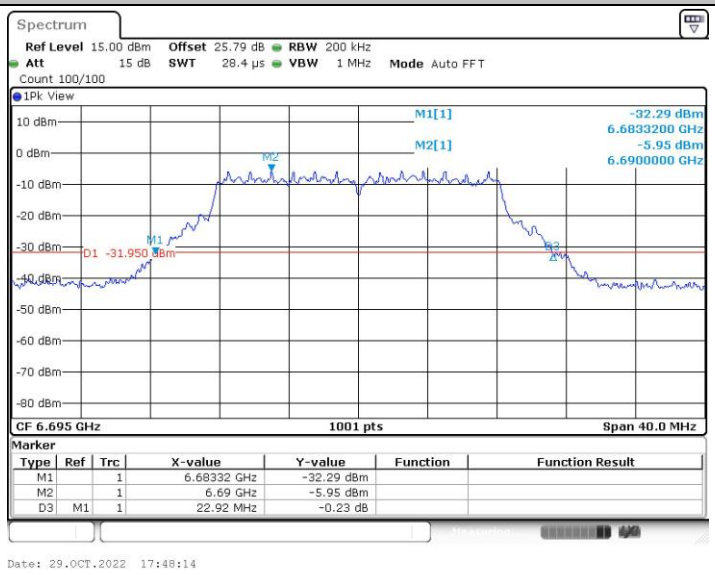

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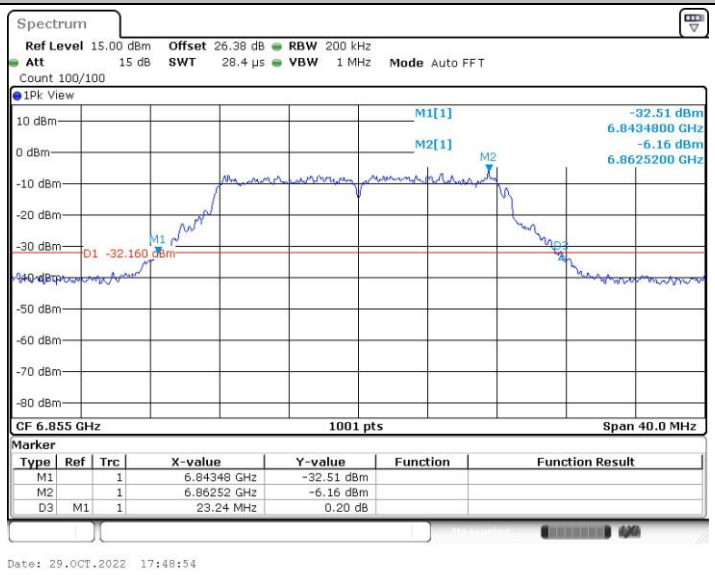

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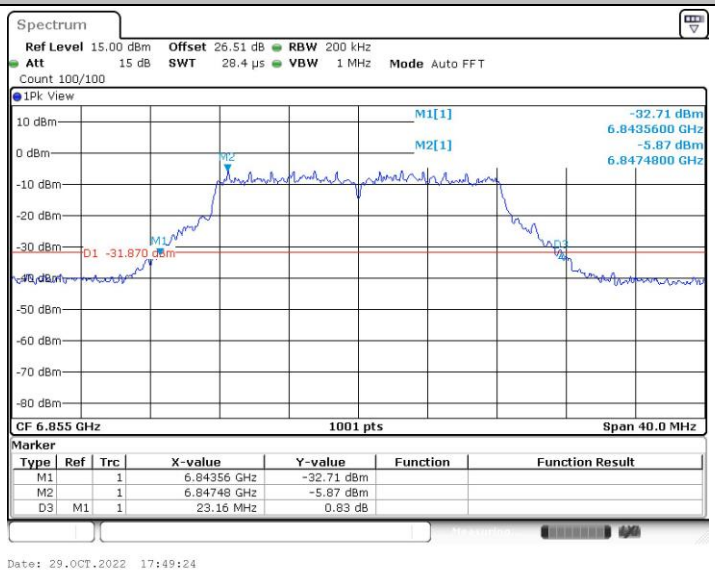

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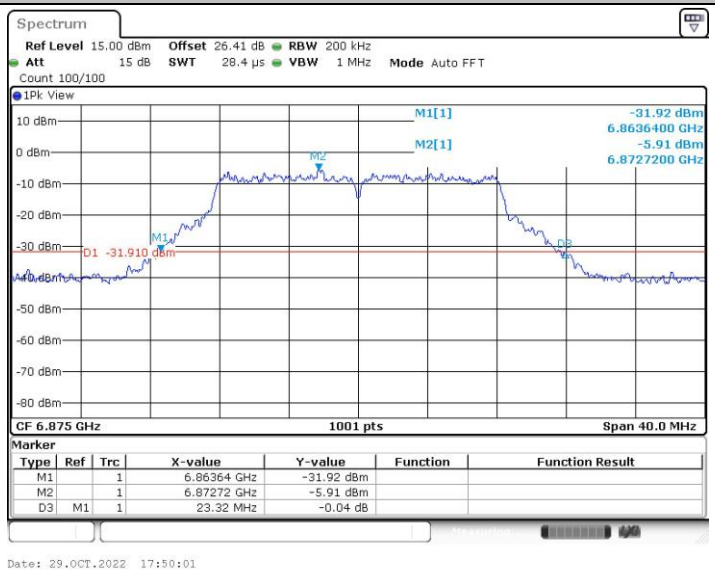

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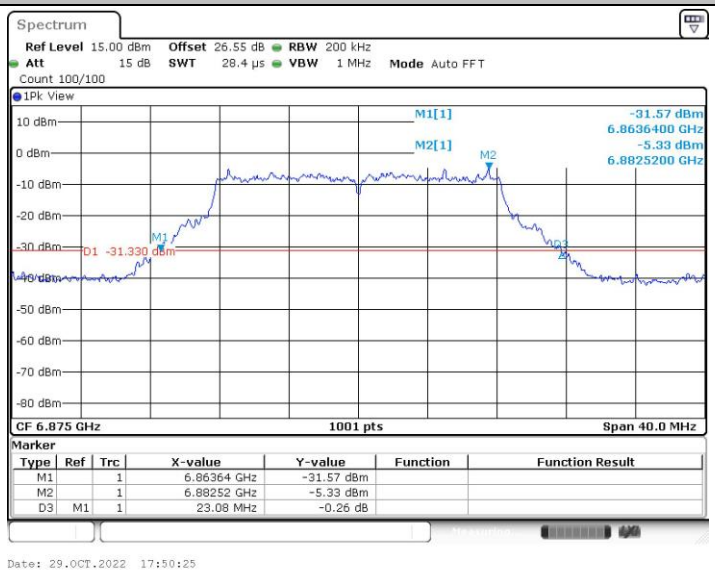

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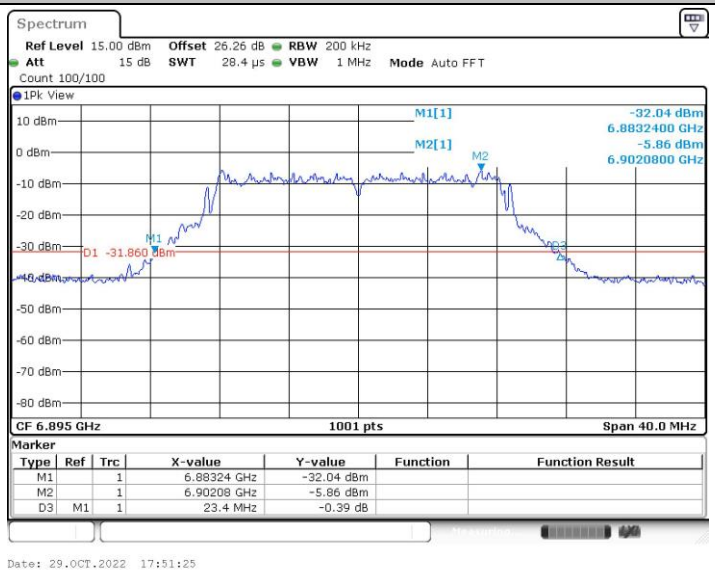

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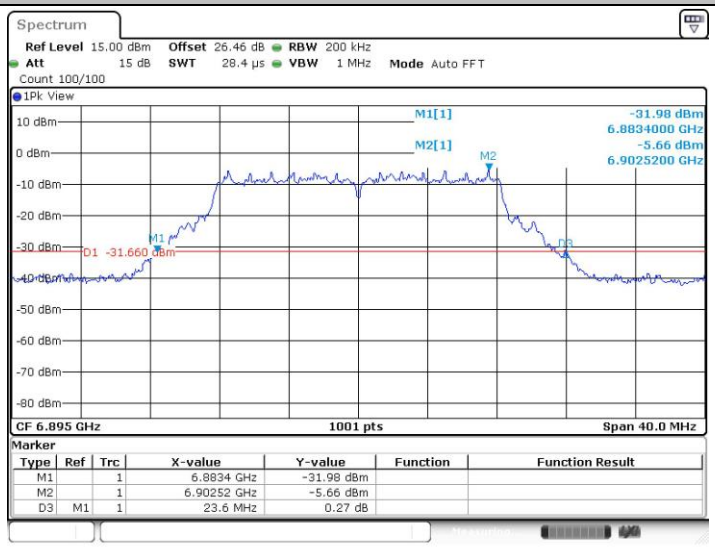

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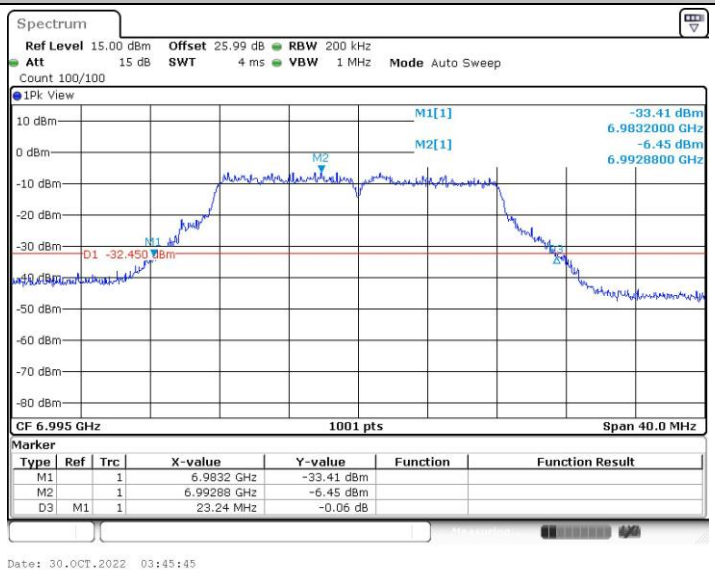

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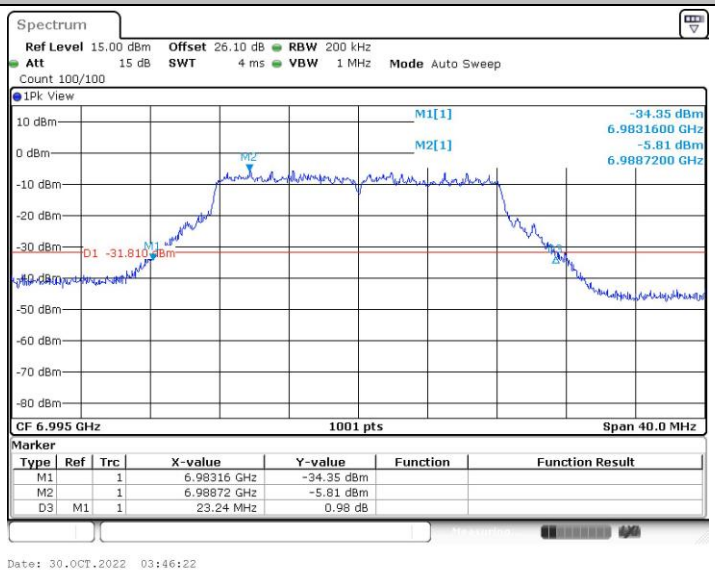

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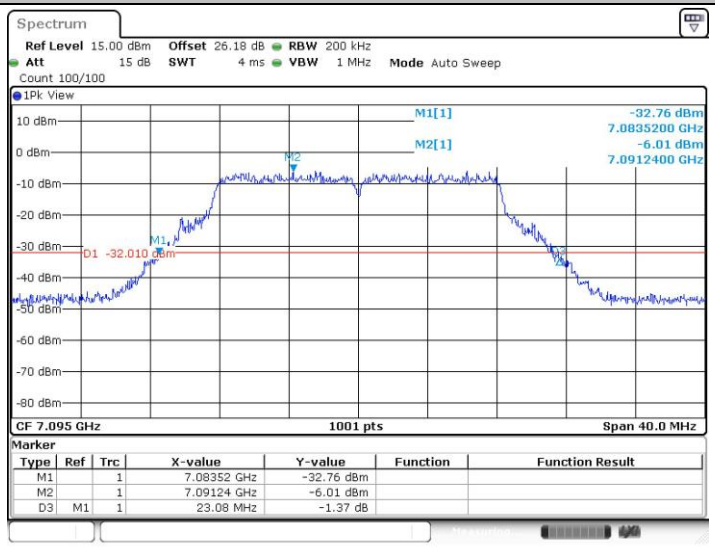

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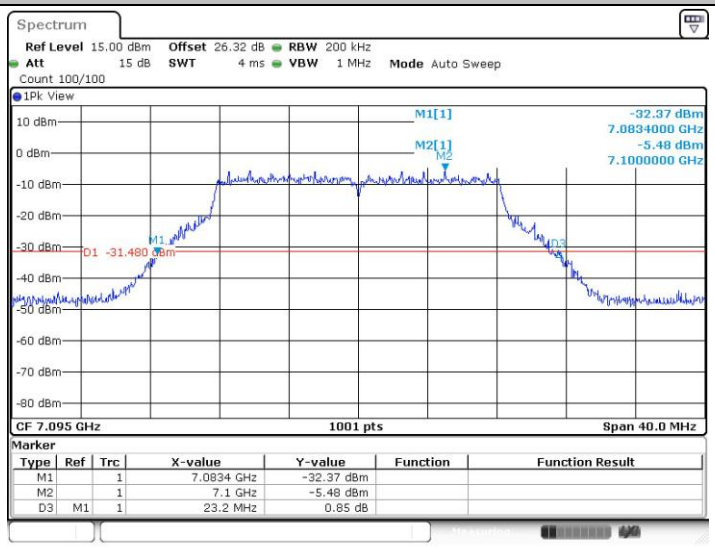

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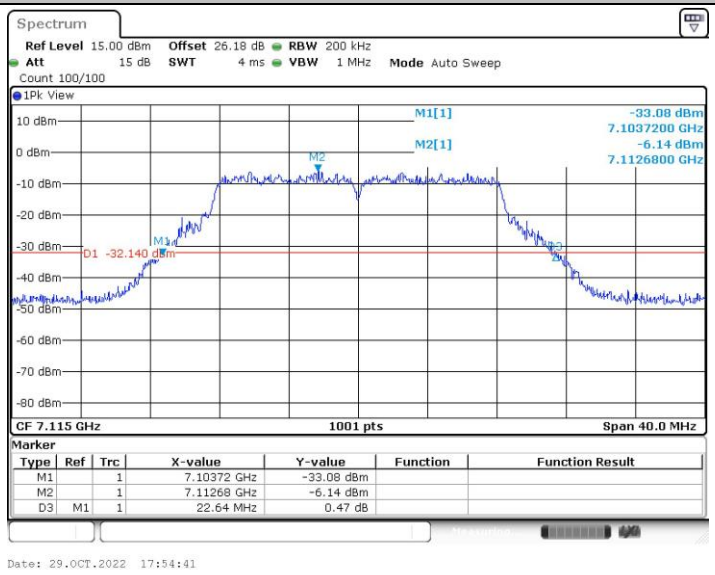

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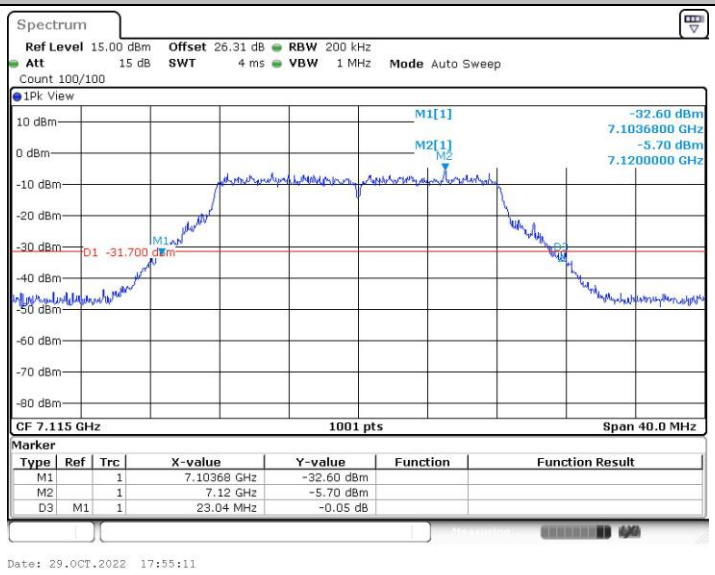

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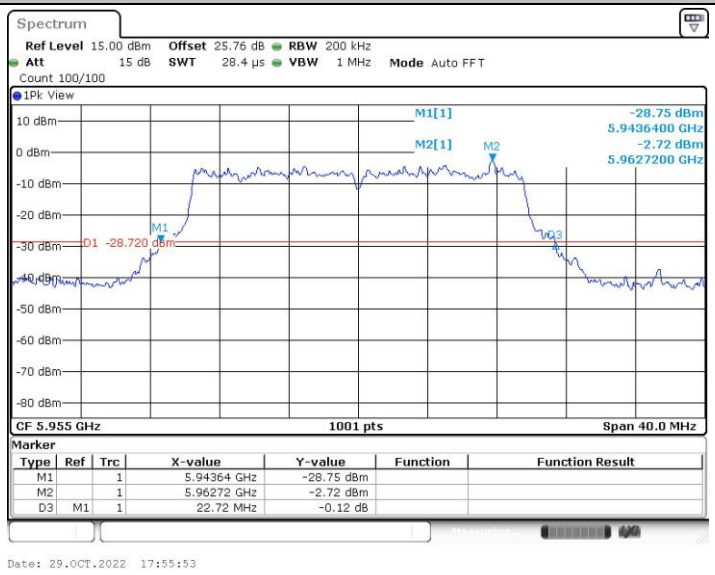

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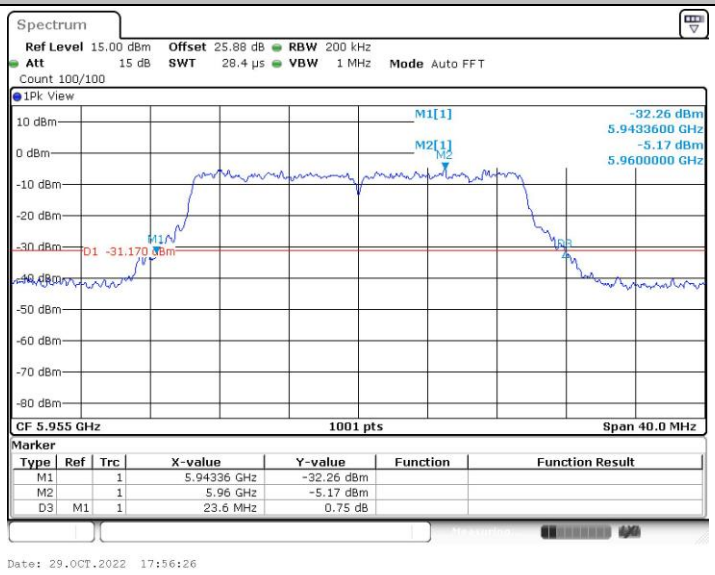

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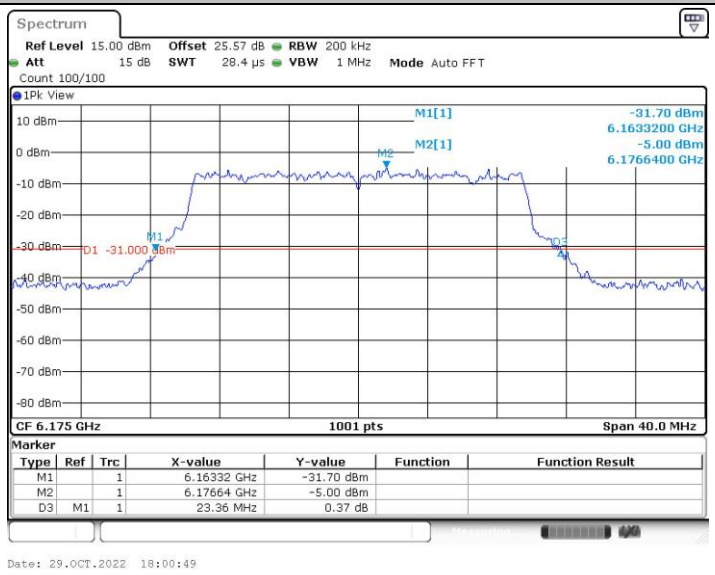

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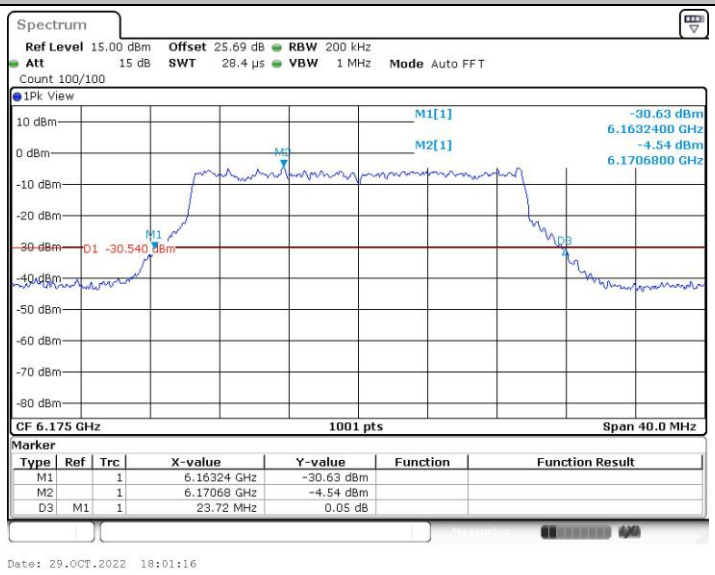

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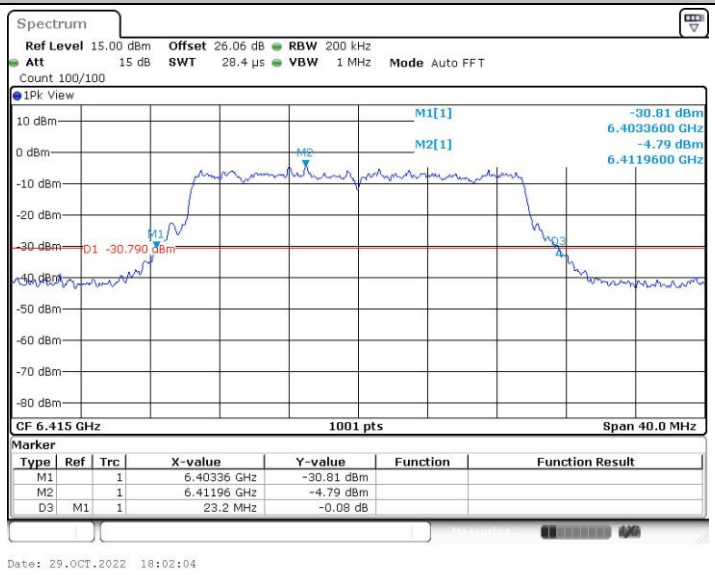

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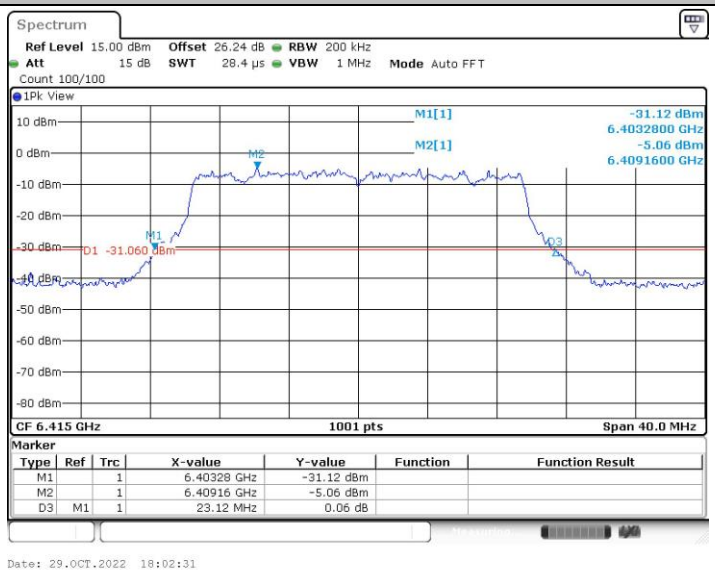

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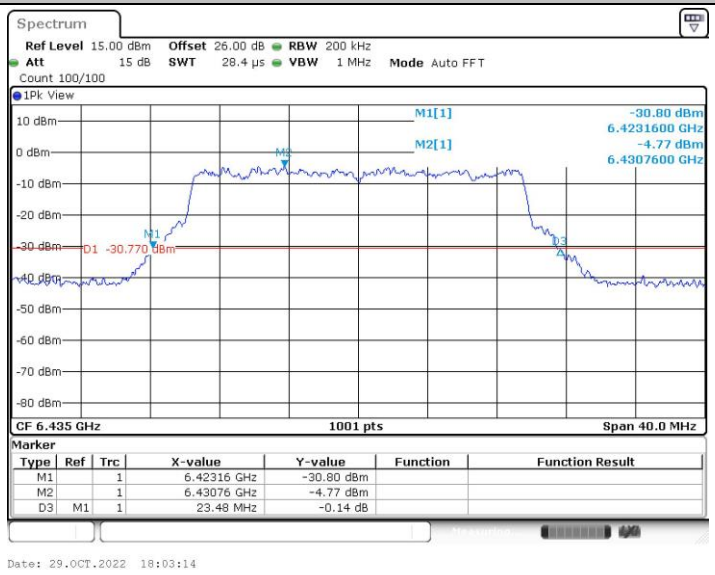

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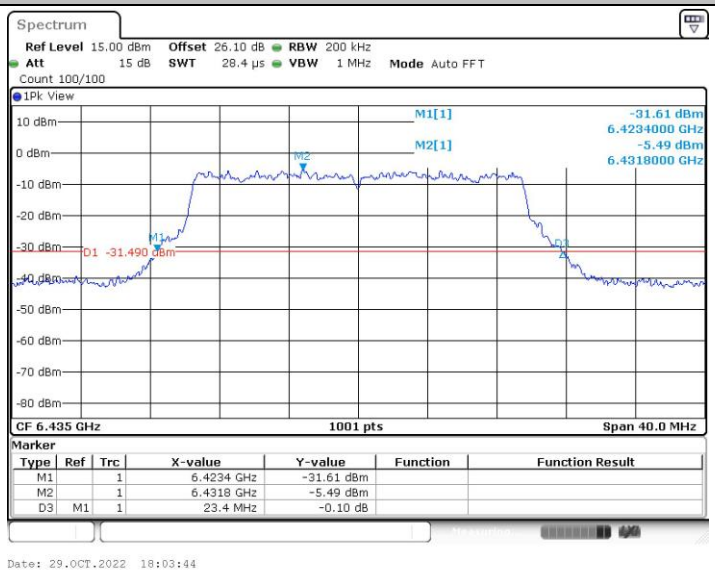

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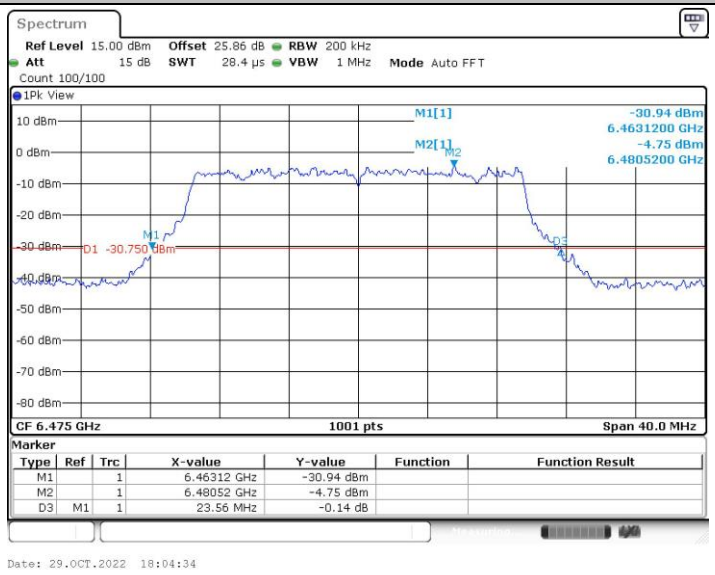

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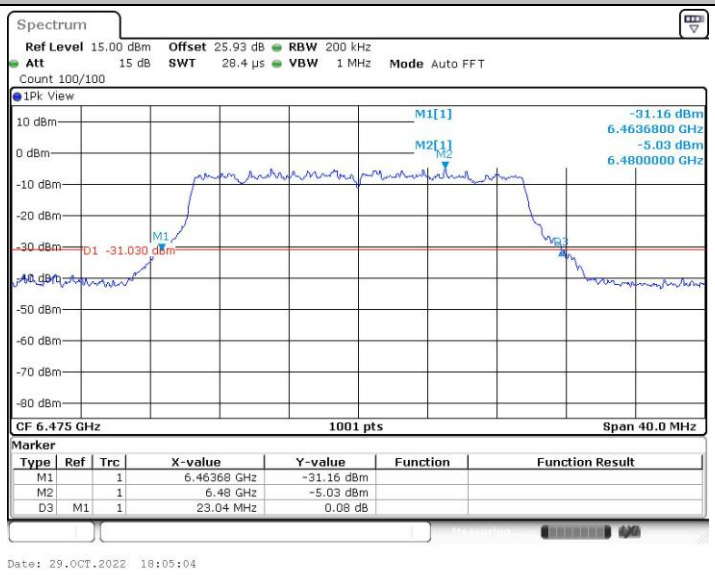

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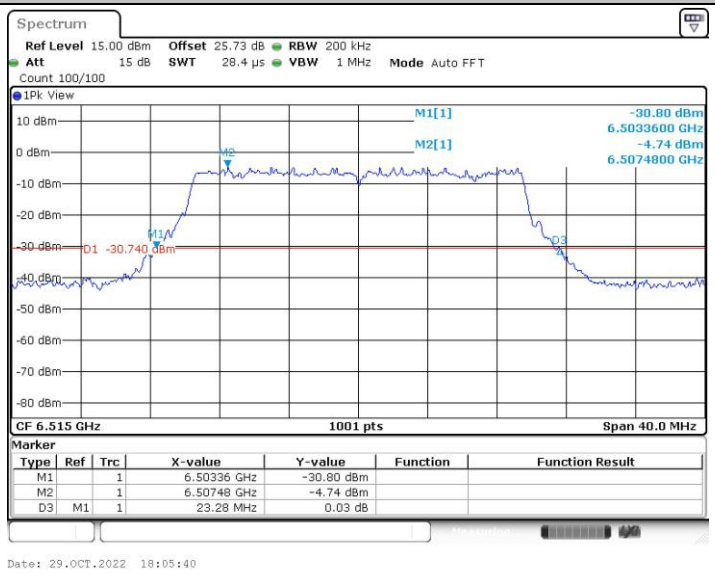

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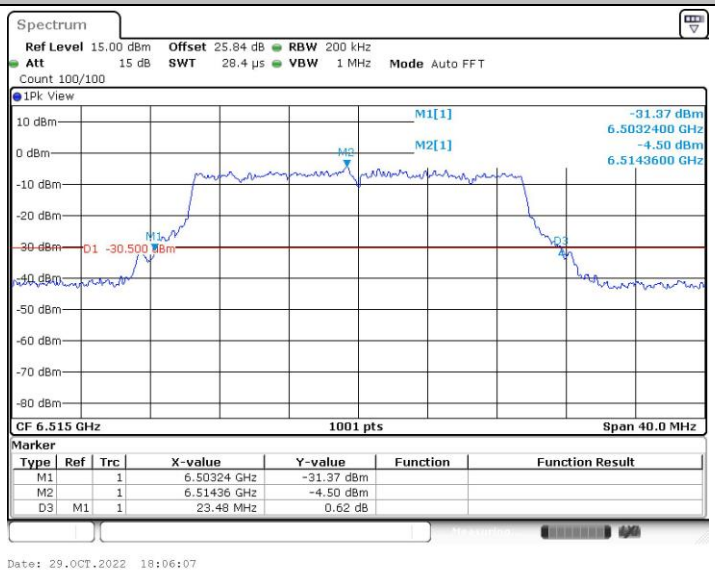

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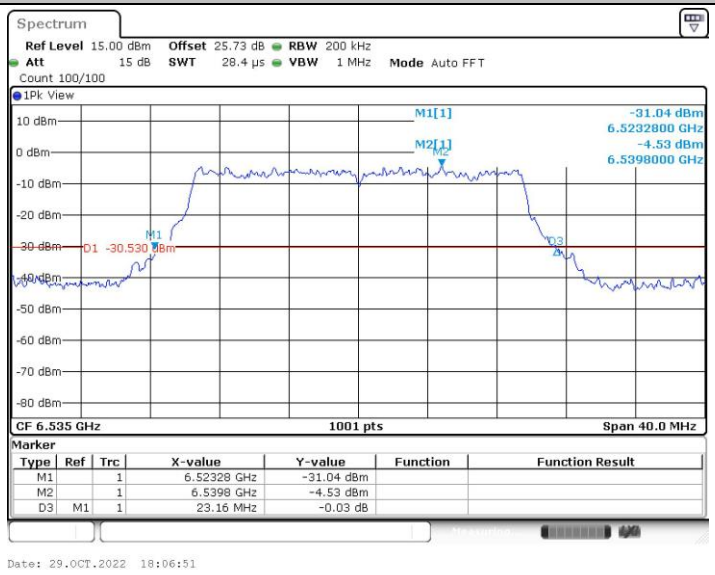

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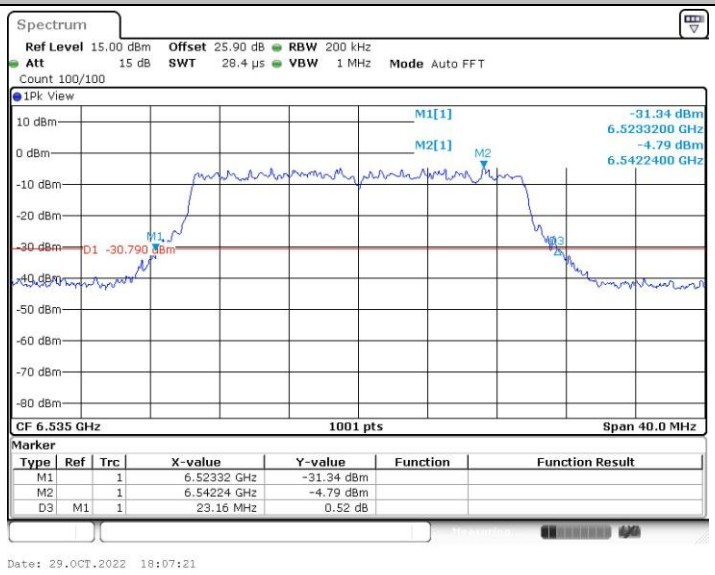

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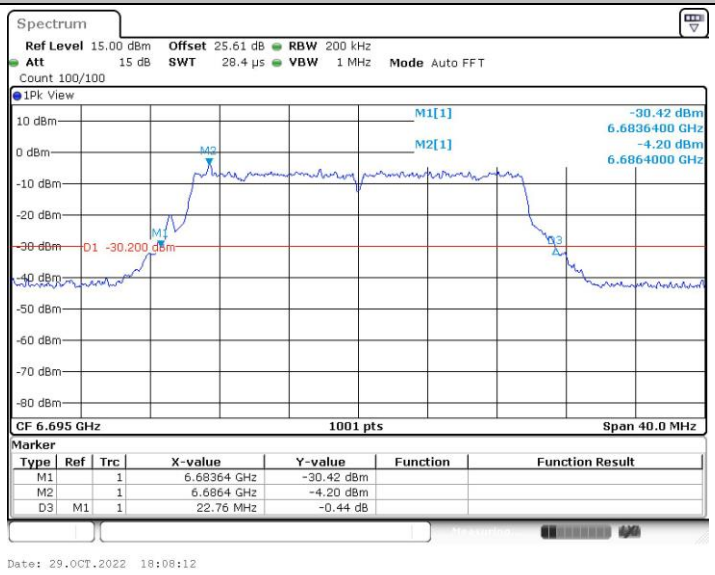

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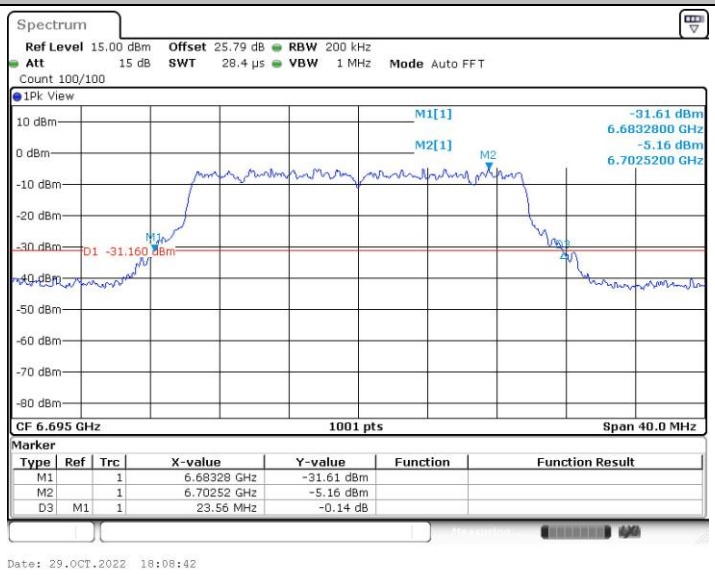

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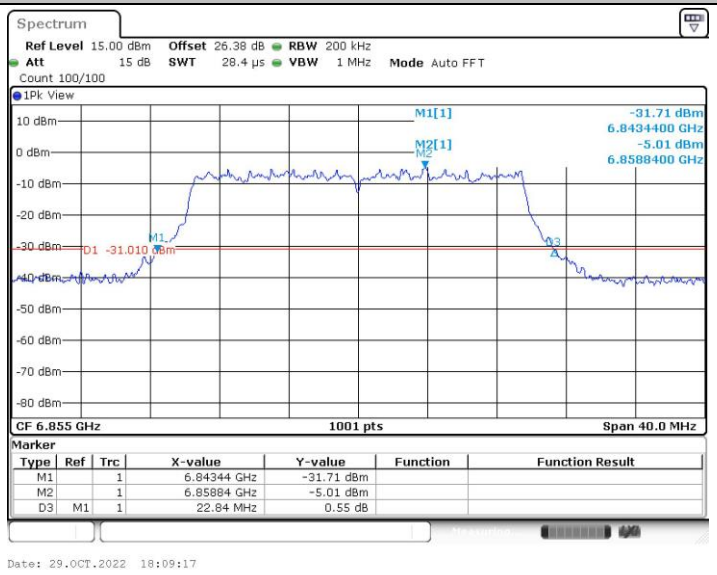

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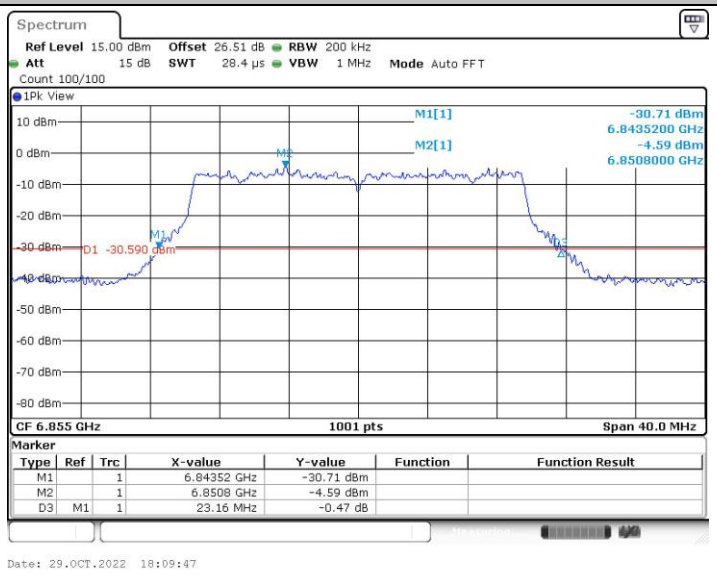

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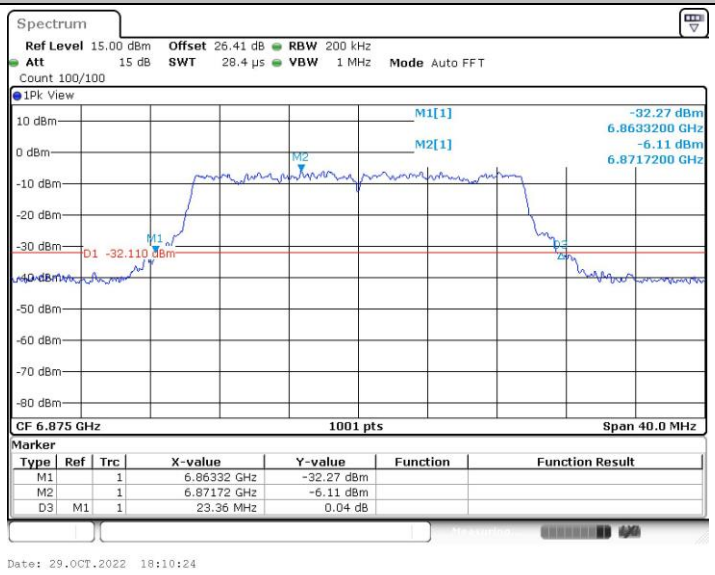

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