FCC RF Test Report

APPLICANT	:	unitech electronics co., ltd.
EQUIPMENT	:	Rugged Handheld Computer
BRAND NAME	:	unitech
MODEL NAME	:	EA660
FCC ID	:	HLEEA660BWNW
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System
TEST DATE(S)	:	Jul. 28, 2023 ~ Sep. 18, 2023

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.

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)
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People's Republic of China

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APPENDIX A. CONDUCTED TEST RESULTS

APPENDIX B. AC CONDUCTED EMISSION TEST RESULT

APPENDIX C. RADIATED SPURIOUS EMISSION AND PLOTS

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR372407C	Rev. 01	Initial issue of report	Oct. 13, 2023

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.1	-	99% Bandwidth	-	Report Only	-
3.2	15.247(b)	Power Output Measurement	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
		Conducted Spurious Emission		Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 3.18 dB at 7386.000 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 13.62 dB at 0.184 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

Conformity Assessment Condition:

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

Disclaimer:

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

1 General Description

1.1 Applicant

unitech electronics co., ltd.
5F., No. 136, Ln. 235, Baoqiao Rd., Xindian Dist., New Taipei City, Taiwan

1.2 Manufacturer

unitech electronics co., ltd.
5F., No. 136, Ln. 235, Baoqiao Rd., Xindian Dist., New Taipei City, Taiwan

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Rugged Handheld Computer
Brand Name	unitech
Model Name	EA660
FCC ID	HLEEA660BWNW
IMEI Code	Conducted: 004400152020000 Conduction: 004400152020000 Radiation: 357458980006356
HW Version	V4
SW Version	ST6729A_1280_Unitech_patchbuild_20230815181058934
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	2412 MHz ~ 2462 MHz
Maximum (Peak) Output Power to antenna	<MIMO Ant 2+4> 802.11b : 22.79 dBm (0.1901 W) 802.11g : 27.12 dBm (0.5152 W) 802.11n HT20 : 26.41 dBm (0.4375 W) 802.11n HT40 : 26.23 dBm (0.4198 W) 802.11ax HE20 : 26.47 dBm (0.4436 W) 802.11ax HE40 : 26.29 dBm (0.4256 W)
99% Occupied Bandwidth	<Ant.2> 802.11b : 13.107 MHz 802.11g : 16.743 MHz 802.11ax HE20 : 19.021 MHz 802.11ax HE40 : 37.962 MHz <Ant.4> 802.11b : 13.147 MHz 802.11g : 16.623 MHz 802.11ax HE20 : 19.021 MHz 802.11ax HE40 : 37.962 MHz
Antenna Type / Gain	<Ant. 2> PIFA Antenne Type with gain -1.00 dBi <Ant. 4> PIFA Antenne Type with gain -1.00 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ax : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)

Note:

1. For WLAN SISO & CDD MIMO mode, the whole testing has assessed only MIMO mode by referring to the higher normal conducted power.
2. For 802.11n & 11ax mode, the whole testing have assessed only 802.11ax mode by referring to the higher output power.
3. 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 output power/PSD/RSE, the full RU Power > partial RU, therefore the full RU perform full test and Partial RU verified power/PSD/RSE.

1.5 Modification of EUT

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

1.6 Testing Location

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

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-KS 03CH06-KS TH01-KS	CN1257	314309

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	TH01-KS	Tonscend	JS1120-3 test system China_210602	3.3.10
2.	03CH06-KS	AUDIX	E3	210616
3.	CO01-KS	AUDIX	E3	6.2009-8-24

1.8 Applicable Standards

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

- 47 CFR Part 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- 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)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

2.2 Test Mode

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

MIMO Antenna

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11ax HE20	MCS0
802.11ax HE40	MCS0

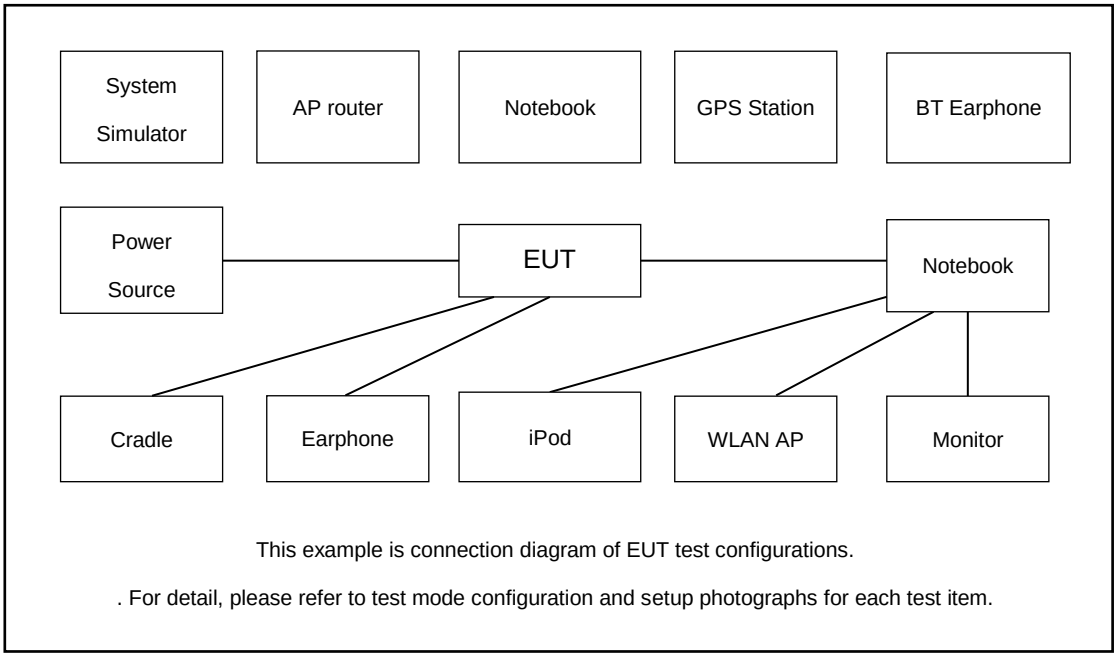
Test Cases	
AC Conducted Emission	Mode 1 :GSM 850 Idle + Bluetooth Link + WLAN Link (2.4G) + USB Cable (Charging from Adapter)

Co-location
802.11b CH11_TX + LTE Band48_20M_Link

Remark:

1. For Radiated Test Cases, The tests were performance with Adapter and USB Cable.
2. The RSE Co-location mode is assessed from the worst WLAN TX + WWAN Link mode.

2.3 Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

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

2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	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.	Notebook	Lenovo	G480	QDS-BRCM1050I	N/A	shielded cable DC O/P 1.8m , Unshielded AC I/P cable 1.8m
4.	Bluetooth Earphone	Lenovo	thinkplus-BH3	N/A	N/A	N/A
5.	SD Card	Kingston	8GB	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For WLAN RF test items, an engineering test program was provided and enabled to make EUT continuous 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 loss7.80 dB

Offset(dB) = RF cable loss(dB)

= 7.80(dB)

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

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 ANSI C63.10-2013 clause 11.8
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 1%~5% of OBW and set the Video bandwidth (VBW) = 3MHz.
6. Measure and record the results in the test report.

3.1.4 Test Setup

3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A.

3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna with directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

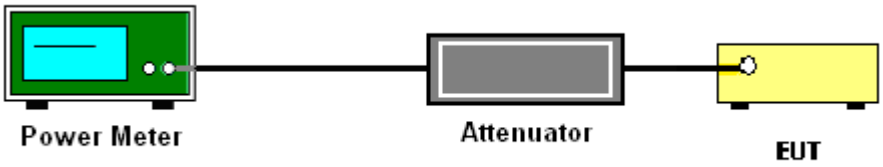
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1 Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.1 Method AVGPM method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.
5. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

1. The testing follows Measurement Procedure of ANSI C63.10-2013 clause 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

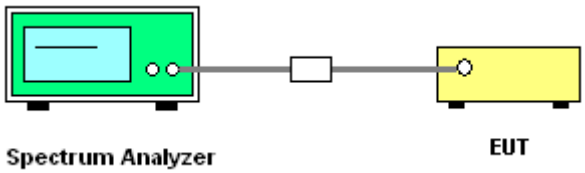
   If measurements performed using method (2) plus 10 log (N) exceeds the emission limit, the test should choose method (1) before declaring that the device fails the emission limit.

   Method (1): 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 (2): Measure and add 10 log (N) dB, where N is the number of outputs. (N=2)

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement.

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 ANSI C63.10-2013 clause 11.11
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup

3.4.5 Test Result of Conducted Band Edges and Spurious Emission

Please refer to Appendix A.

3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

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

3.5.2 Measuring Instruments

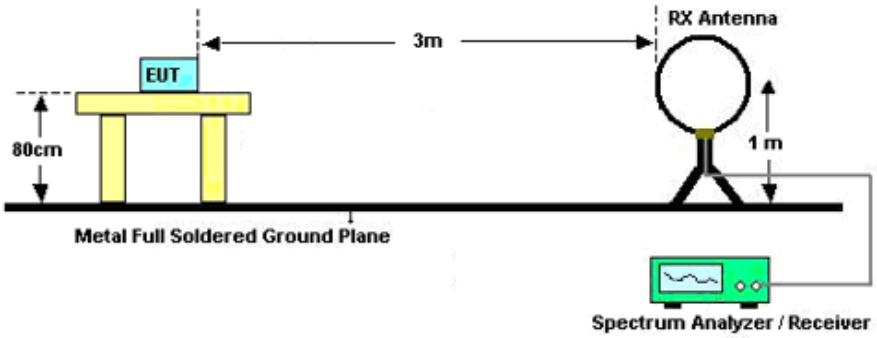
The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

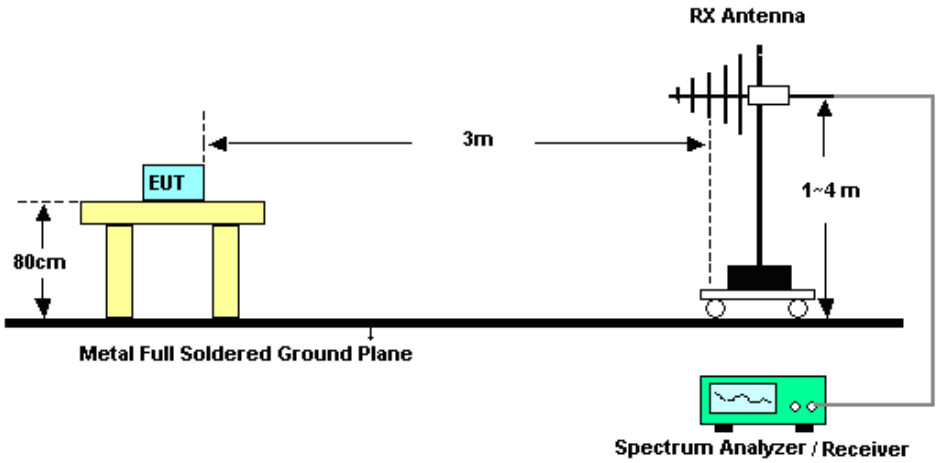
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. 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.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
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.
8. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - 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.

3.5.4 Test Setup

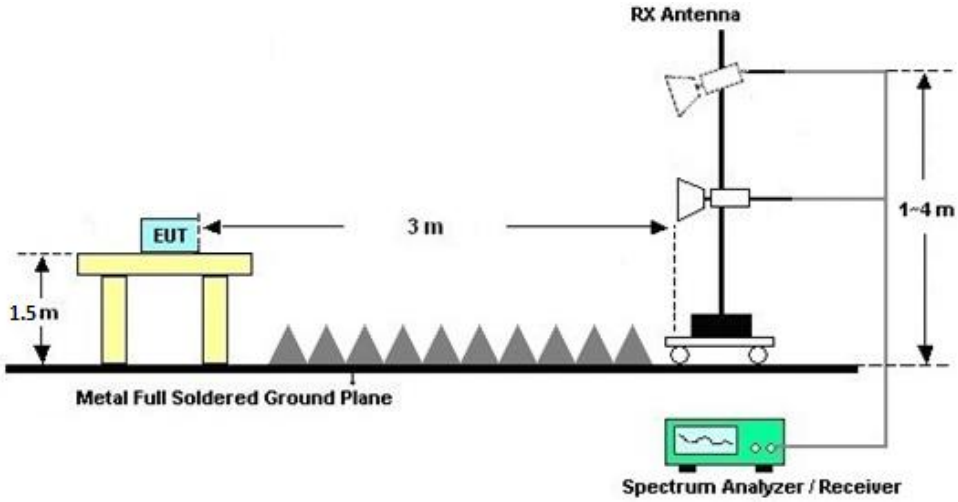
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.5.5 Test Results of Radiated Spurious Emissions (9kHz ~ 30MHz)

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.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C

3.5.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix C

3.6 AC Conducted Emission Measurement

3.6.1 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.

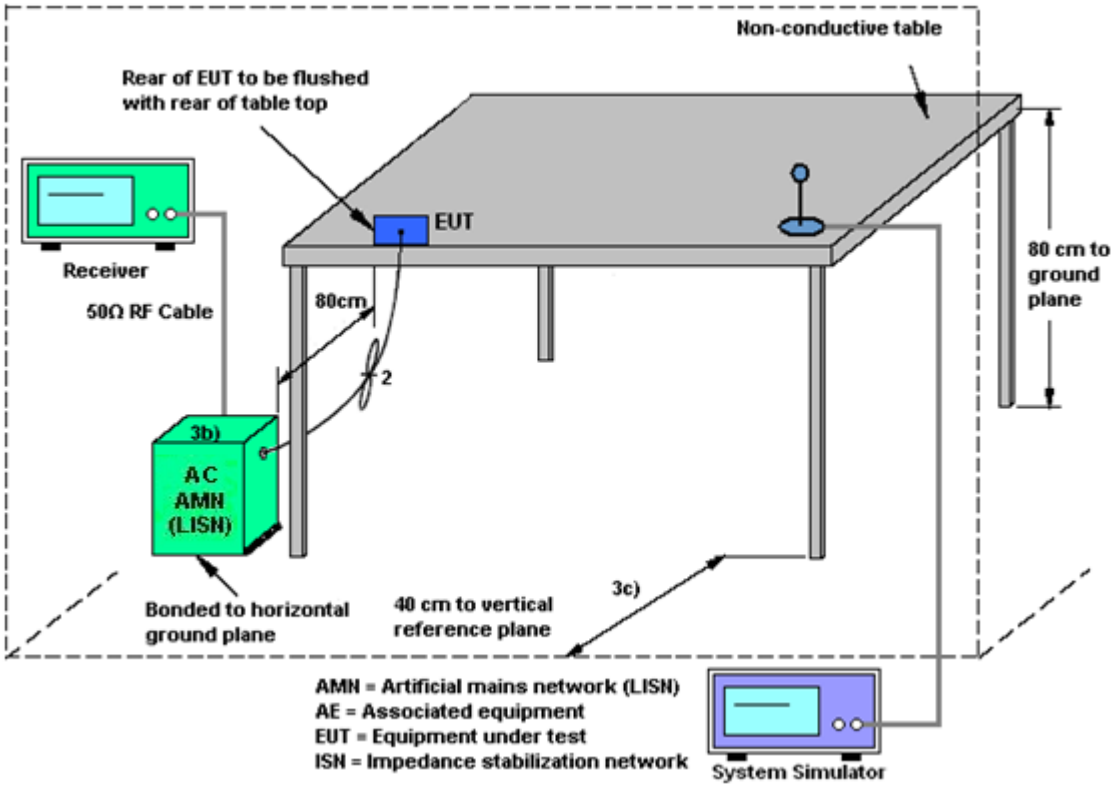
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it 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 (IF bandwidth = 9kHz) with Maximum Hold Mode.

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.7 Antenna Requirements

3.7.1 Standard Applicable

If directional gain of transmitting Antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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 rule.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV30	101338	10Hz~30GHz	May 16, 2023	Aug. 09, 2023 ~Sep. 12, 2023	May 15, 2024	Conducted (TH01-KS)
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 12, 2022	Aug. 09, 2023 ~Sep. 12, 2023	Oct. 11, 2023	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 05, 2023	Aug. 09, 2023 ~Sep. 12, 2023	Jan. 04, 2024	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 13, 2022	Jul. 28, 2023 ~Sep. 18, 2023	Oct. 12, 2023	Radiation (03CH06-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY60242126	10Hz-44GHz	Oct. 13, 2022	Jul. 28, 2023 ~Sep. 18, 2023	Oct. 12, 2023	Radiation (03CH06-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 16, 2022	Jul. 28, 2023 ~Sep. 18, 2023	Oct. 15, 2023	Radiation (03CH06-KS)
Bilog Antenna	TeseQ	CBL6111D	49921	30MHz-1GHz	Apr. 09, 2023	Jul. 28, 2023 ~Sep. 18, 2023	Apr. 08, 2024	Radiation (03CH06-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218652	1GHz~18GHz	Apr. 06, 2023	Jul. 28, 2023 ~Sep. 18, 2023	Apr. 05, 2024	Radiation (03CH06-KS)
SHF-EHF Horn	Com-power	AH-840	101093	18GHz~40GHz	Jan. 08, 2023	Jul. 28, 2023 ~Sep. 18, 2023	Jan. 07, 2024	Radiation (03CH06-KS)
Amplifier	SONOMA	310N	380827	9KHz ~1GHZ	Jul. 06, 2023	Jul. 28, 2023 ~Sep. 18, 2023	Jul. 05, 2024	Radiation (03CH06-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2023	Jul. 28, 2023 ~Sep. 18, 2023	Jan. 04, 2024	Radiation (03CH06-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2082395	1Ghz-18Ghz	Jan. 05, 2023	Jul. 28, 2023 ~Sep. 18, 2023	Jan. 04, 2024	Radiation (03CH06-KS)
Amplifier	Keysight	83017A	MY53270319	500MHz~26.5GHz	Oct. 12, 2022	Jul. 28, 2023 ~Sep. 18, 2023	Oct. 12, 2023	Radiation (03CH06-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jul. 28, 2023 ~Sep. 18, 2023	NCR	Radiation (03CH06-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jul. 28, 2023 ~Sep. 18, 2023	NCR	Radiation (03CH06-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jul. 28, 2023 ~Sep. 18, 2023	NCR	Radiation (03CH06-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	May 16, 2023	Aug. 31, 2023 ~Sep. 01, 2023	May 15, 2024	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2022	Aug. 31, 2023 ~Sep. 01, 2023	Oct. 12, 2023	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	May 16, 2023	Aug. 31, 2023 ~Sep. 01, 2023	May 15, 2024	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2022	Aug. 31, 2023 ~Sep. 01, 2023	Oct. 11, 2023	Conduction (CO01-KS)

NCR: No Calibration Required

5 Measurement Uncertainty

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

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

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

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.26dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.02dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.26dB**

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

Appendix A. Conducted Test Results

Case No. : FR372407C	
Ambient Condition: 25 ℃, 45 %RH	
According Standard: ■Part15C	
Test Date: 2023.8.09~2023.9.12	**Test Engineer:** Jiang Jun

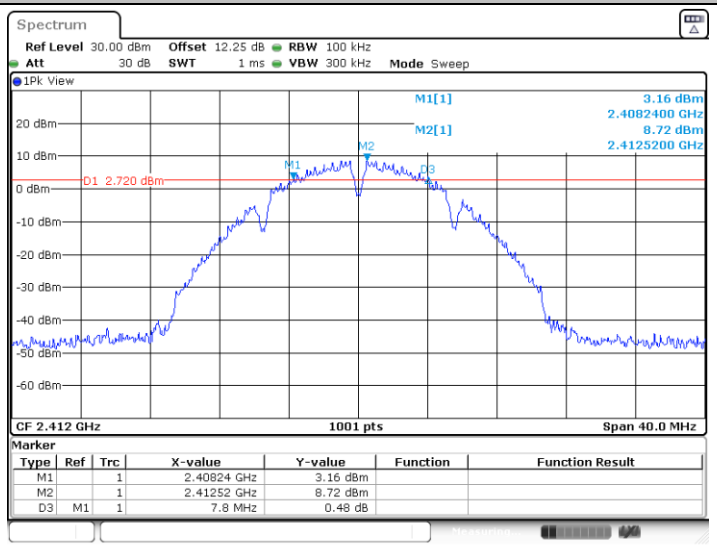
DTS Bandwidth

Test Result

TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B-CDD	Ant2	2412	7.80	2408.24	2416.04	0.5	PASS
	Ant4	2412	8.00	2408.04	2416.04	0.5	PASS
	Ant2	2437	8.04	2433.00	2441.04	0.5	PASS
	Ant4	2437	8.04	2433.00	2441.04	0.5	PASS
	Ant2	2462	8.08	2457.96	2466.04	0.5	PASS
	Ant4	2462	8.08	2457.96	2466.04	0.5	PASS
11G-CDD	Ant2	2412	16.28	2403.88	2420.16	0.5	PASS
	Ant4	2412	16.00	2404.20	2420.20	0.5	PASS
	Ant2	2437	16.36	2428.84	2445.20	0.5	PASS
	Ant4	2437	16.32	2428.84	2445.16	0.5	PASS
	Ant2	2462	16.32	2453.84	2470.16	0.5	PASS
	Ant4	2462	16.36	2453.84	2470.20	0.5	PASS
11AX20MIMO	Ant2	2412	17.80	2403.48	2421.28	0.5	PASS
	Ant4	2412	18.28	2403.12	2421.40	0.5	PASS
	Ant2	2437	18.84	2427.56	2446.40	0.5	PASS
	Ant4	2437	18.92	2427.52	2446.44	0.5	PASS
	Ant2	2462	18.24	2453.12	2471.36	0.5	PASS
	Ant4	2462	18.64	2452.60	2471.24	0.5	PASS
11AX40MIMO	Ant2	2422	37.44	2403.36	2440.80	0.5	PASS
	Ant4	2422	37.44	2403.28	2440.72	0.5	PASS
	Ant2	2437	38.00	2417.96	2455.96	0.5	PASS
	Ant4	2437	37.84	2417.96	2455.80	0.5	PASS
	Ant2	2452	37.92	2433.04	2470.96	0.5	PASS
	Ant4	2452	36.80	2433.20	2470.00	0.5	PASS

Test Graphs

11B-CDD_Ant2_2412



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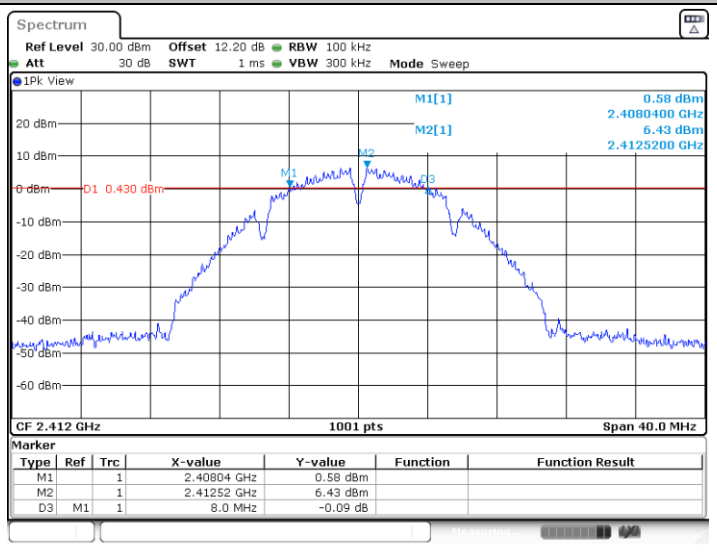

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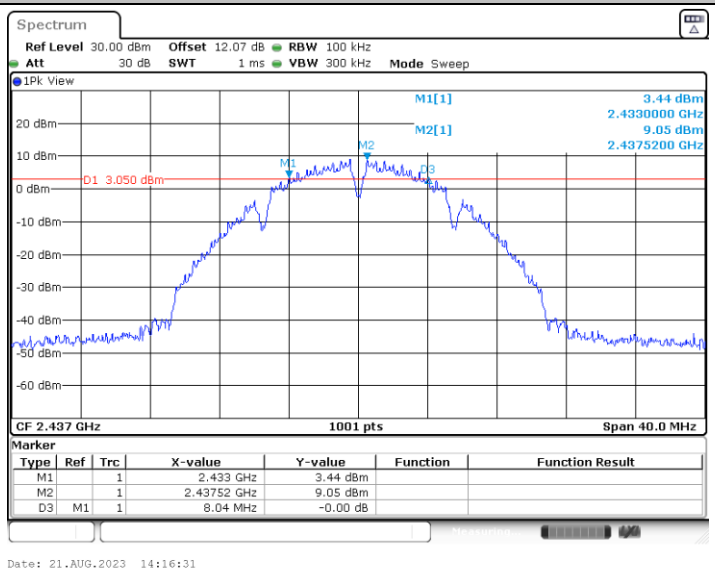

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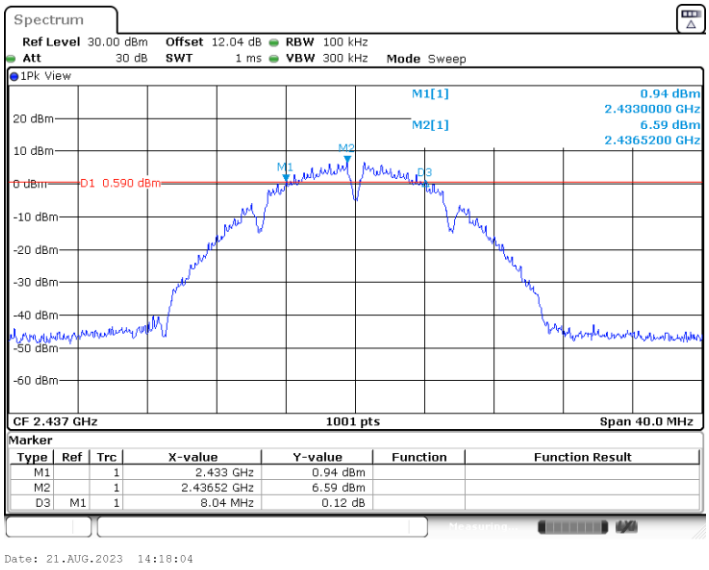

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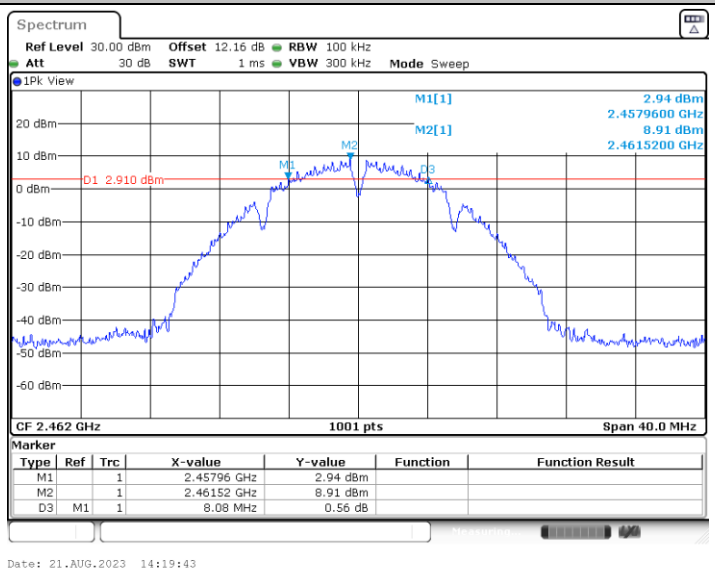

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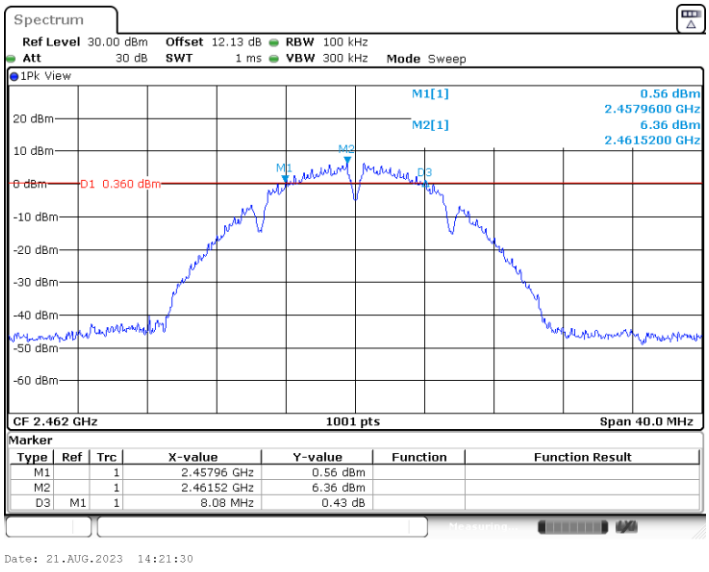

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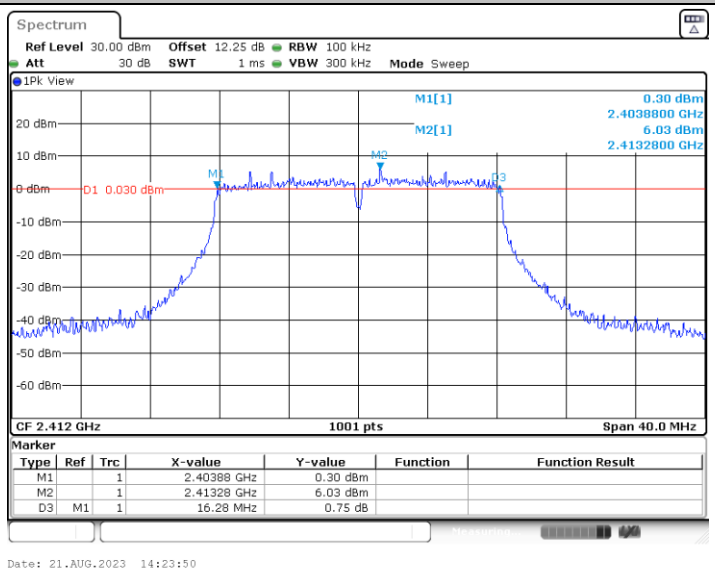

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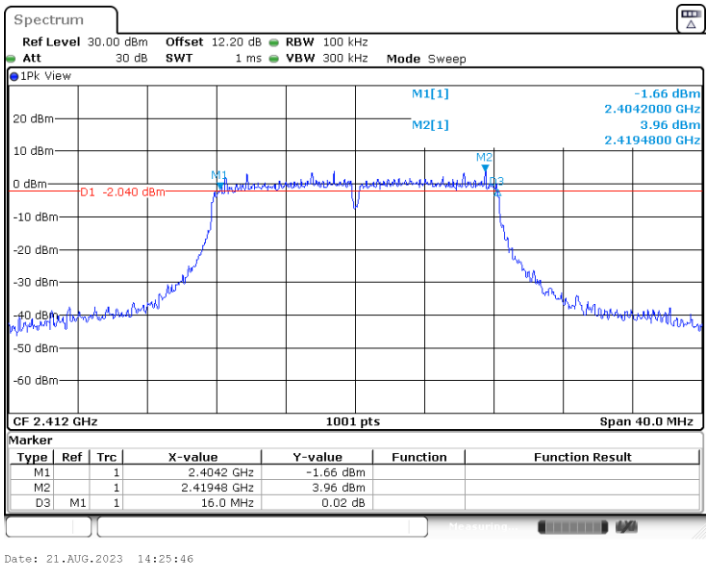

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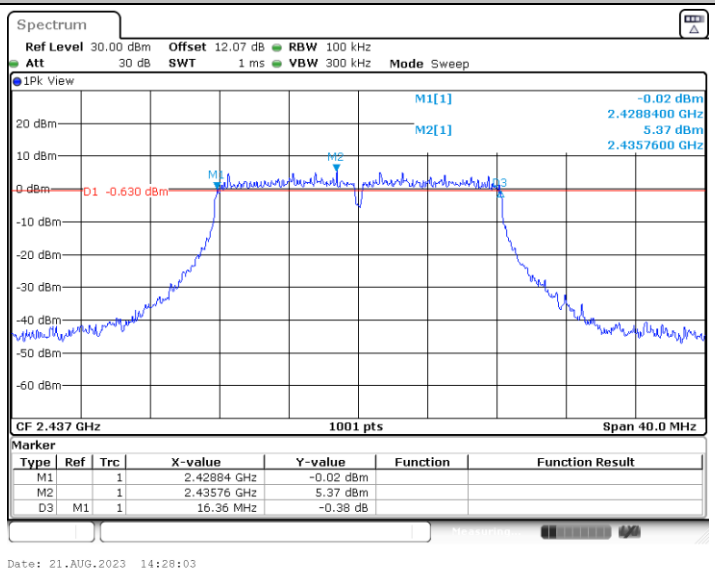

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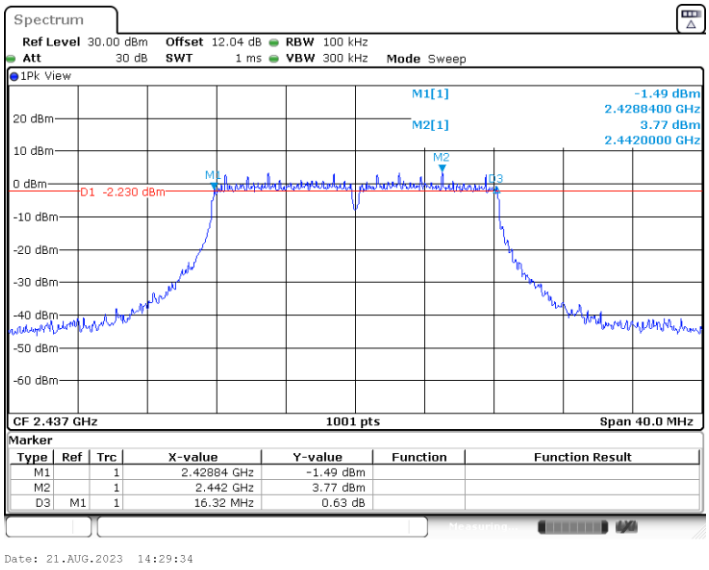

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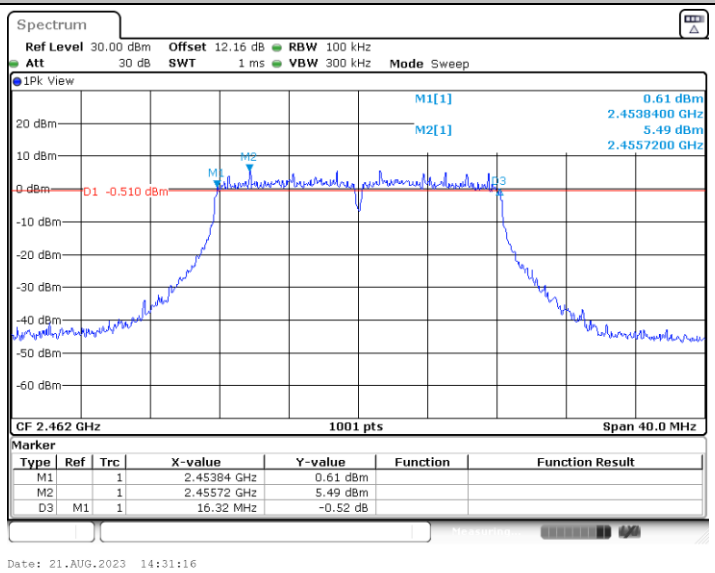

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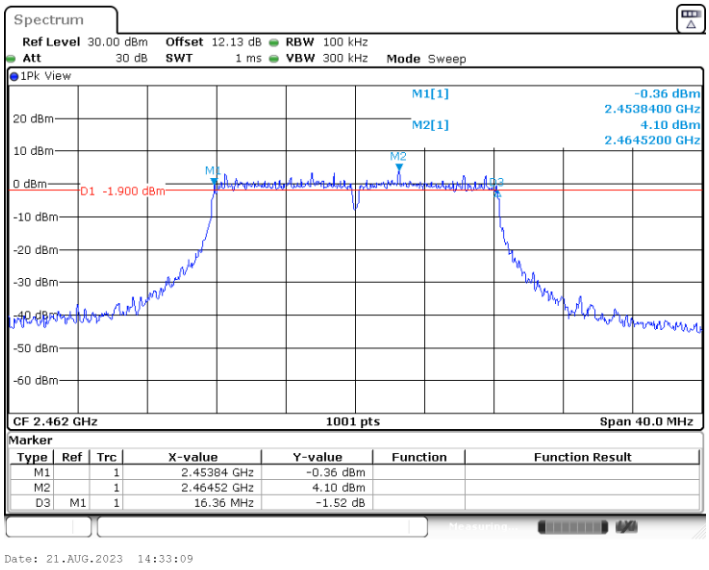

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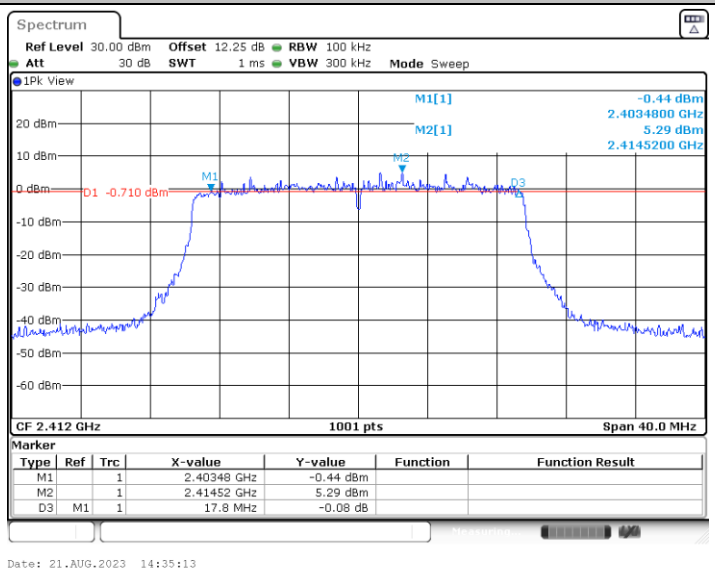

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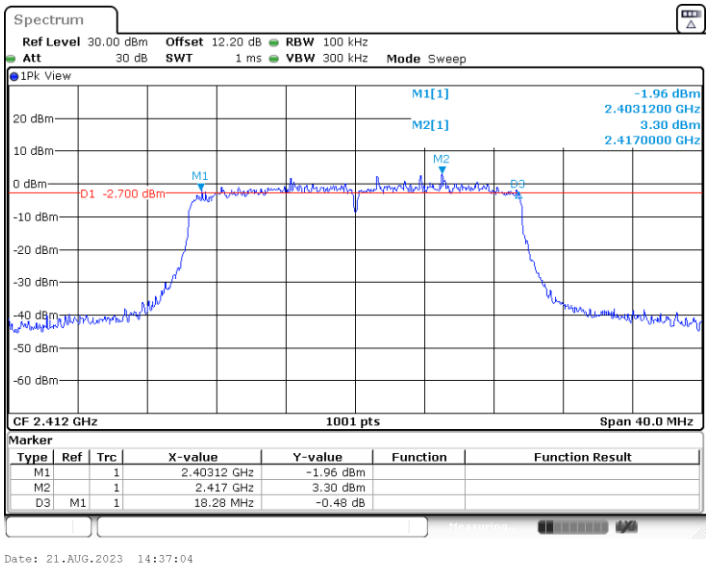

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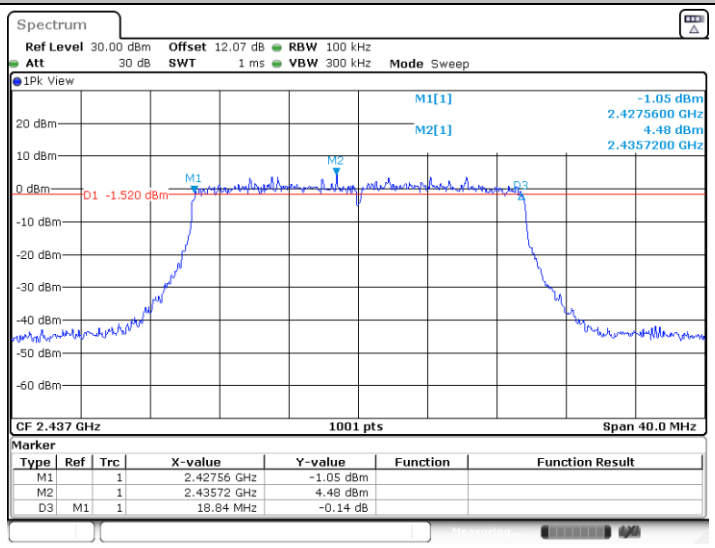

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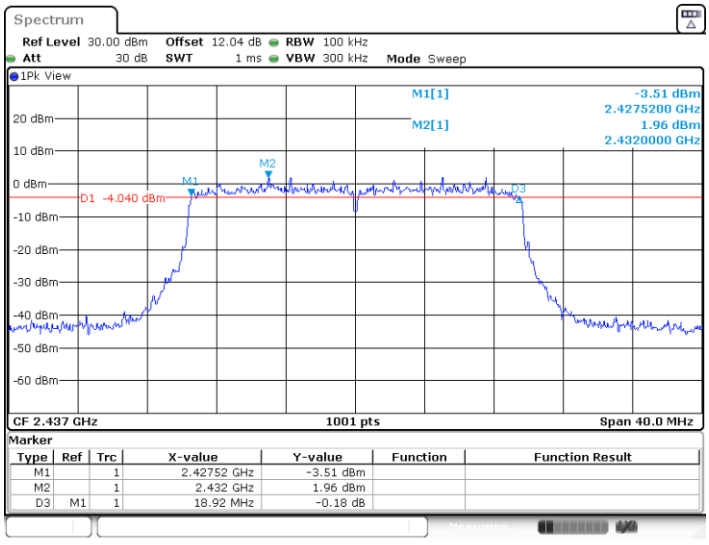

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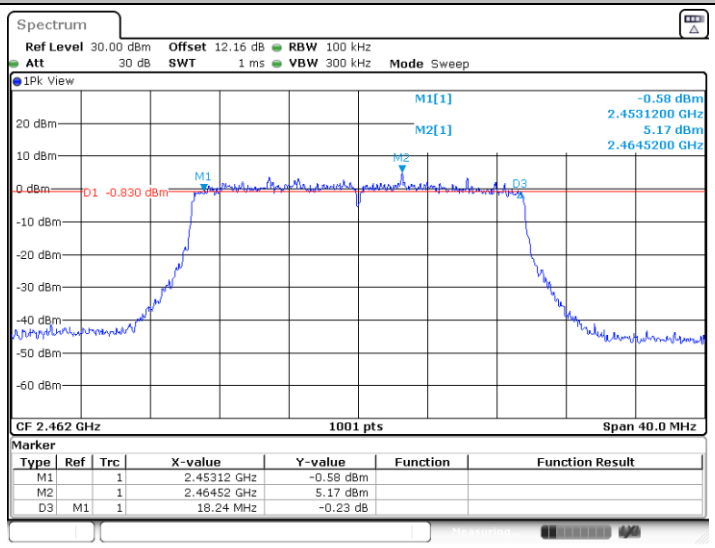

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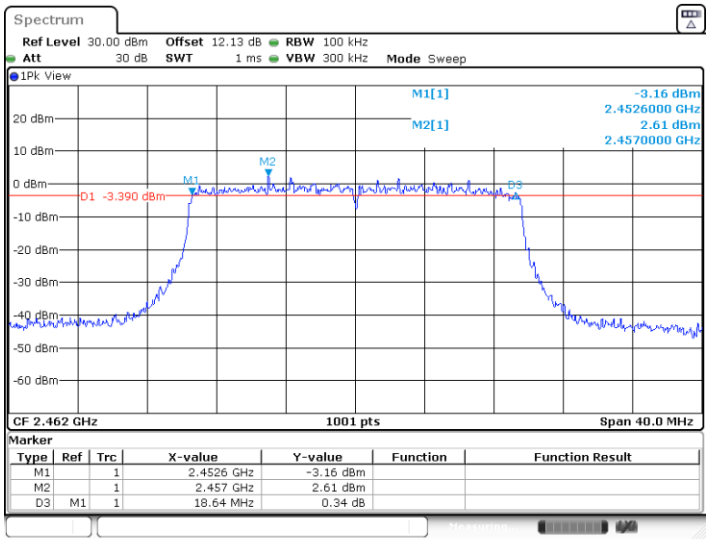

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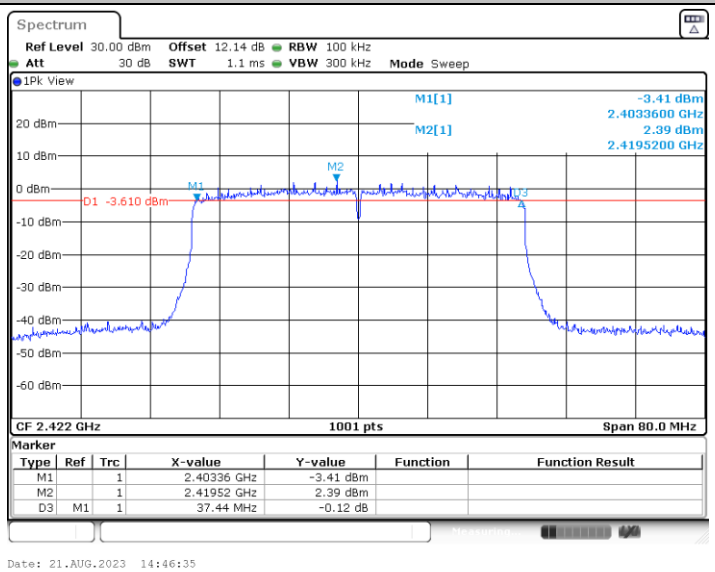

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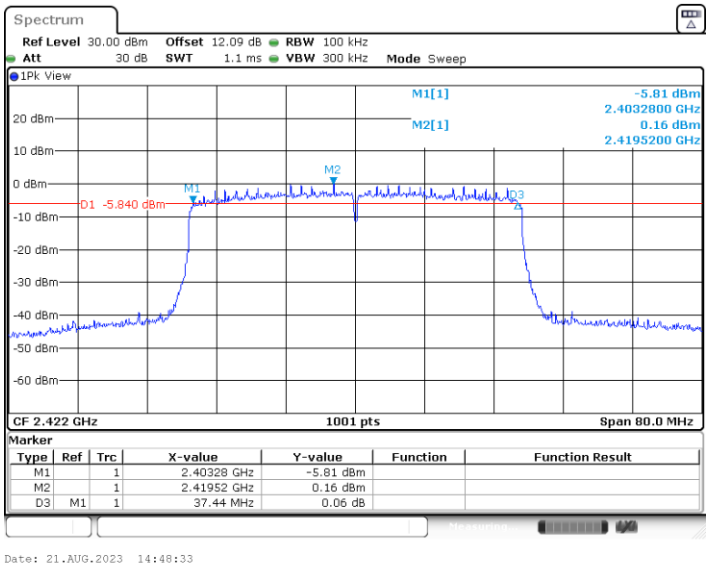

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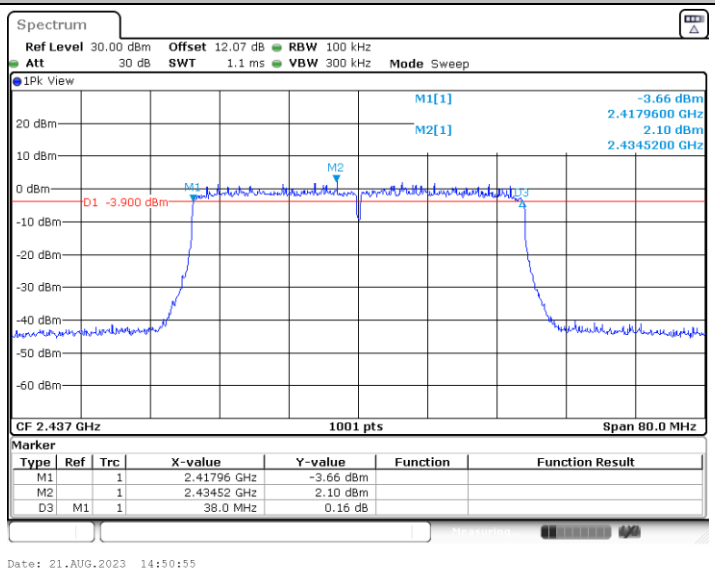

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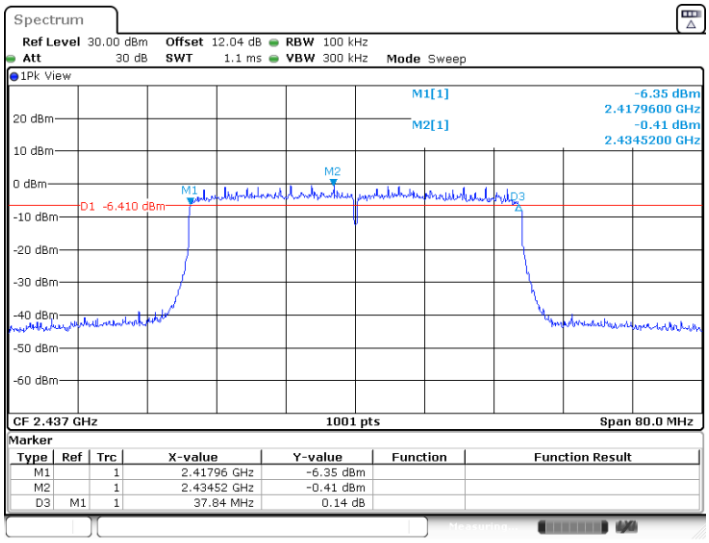

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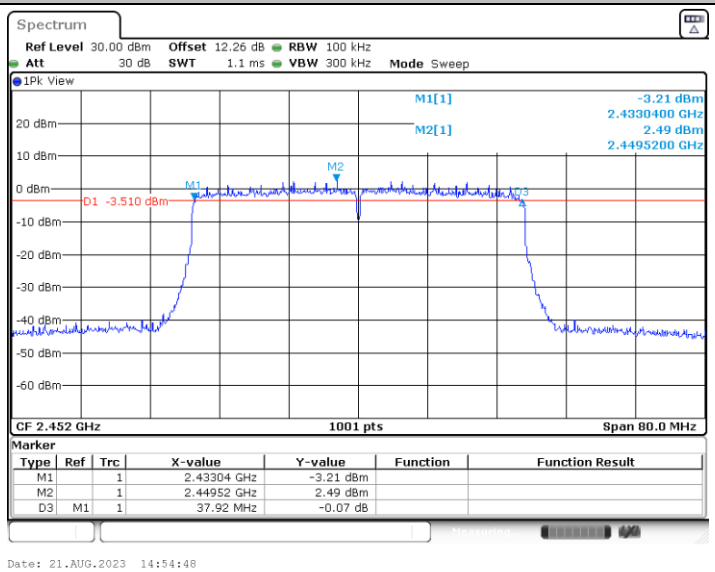

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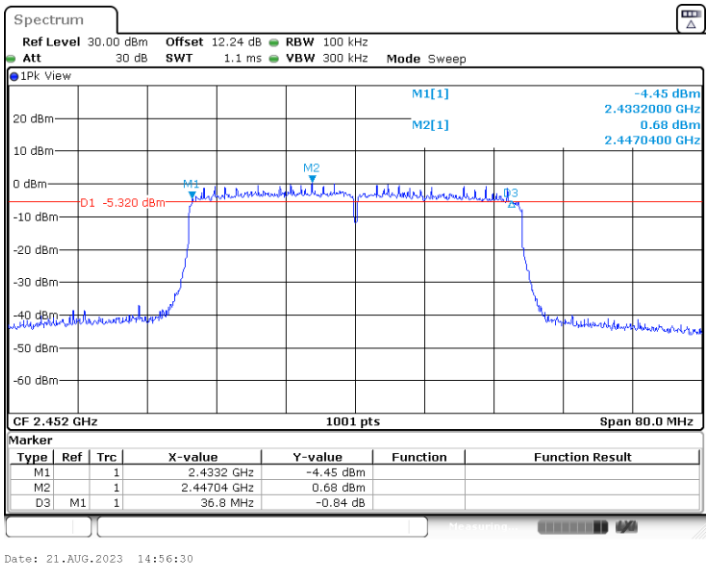


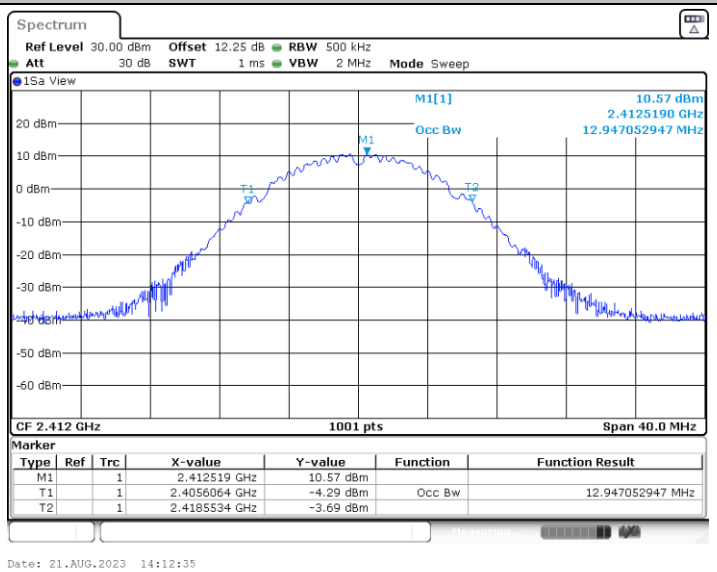
Occupied Channel Bandwidth

Test Result

TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B-CDD	Ant2	2412	12.947	2405.6064	2418.5534	---	---
	Ant4	2412	12.867	2405.6464	2418.5135	---	---
	Ant2	2437	13.107	2430.4466	2443.5534	---	---
	Ant4	2437	13.147	2430.4066	2443.5534	---	---
	Ant2	2462	13.107	2455.4066	2468.5135	---	---
	Ant4	2462	13.067	2455.4066	2468.4735	---	---
11G-CDD	Ant2	2412	16.663	2403.6484	2420.3117	---	---
	Ant4	2412	16.543	2403.7682	2420.3117	---	---
	Ant2	2437	16.743	2428.5684	2445.3117	---	---
	Ant4	2437	16.623	2428.6883	2445.3117	---	---
	Ant2	2462	16.703	2453.5684	2470.2717	---	---
	Ant4	2462	16.583	2453.6883	2470.2717	---	---
11AX20MIMO	Ant2	2412	19.021	2402.5295	2421.5504	---	---
	Ant4	2412	18.981	2402.5694	2421.5504	---	---
	Ant2	2437	19.021	2427.4895	2446.5105	---	---
	Ant4	2437	19.021	2427.4895	2446.5105	---	---
	Ant2	2462	18.981	2452.4895	2471.4705	---	---
	Ant4	2462	18.981	2452.4895	2471.4705	---	---
11AX40MIMO	Ant2	2422	37.802	2403.1389	2440.9411	---	---
	Ant4	2422	37.802	2403.2188	2441.0210	---	---
	Ant2	2437	37.962	2417.9790	2455.9411	---	---
	Ant4	2437	37.962	2417.9790	2455.9411	---	---
	Ant2	2452	37.882	2433.0589	2470.9411	---	---
	Ant4	2452	37.962	2432.9790	2470.9411	---	---

Test Graphs

11B-CDD_Ant2_2412



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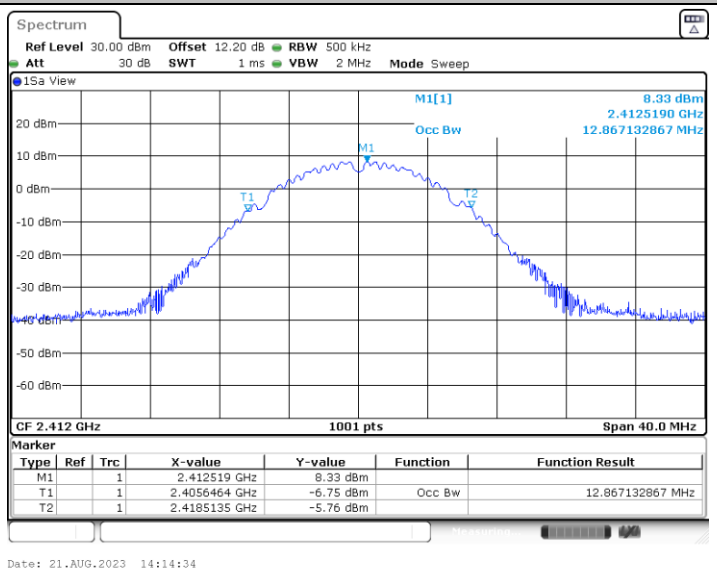

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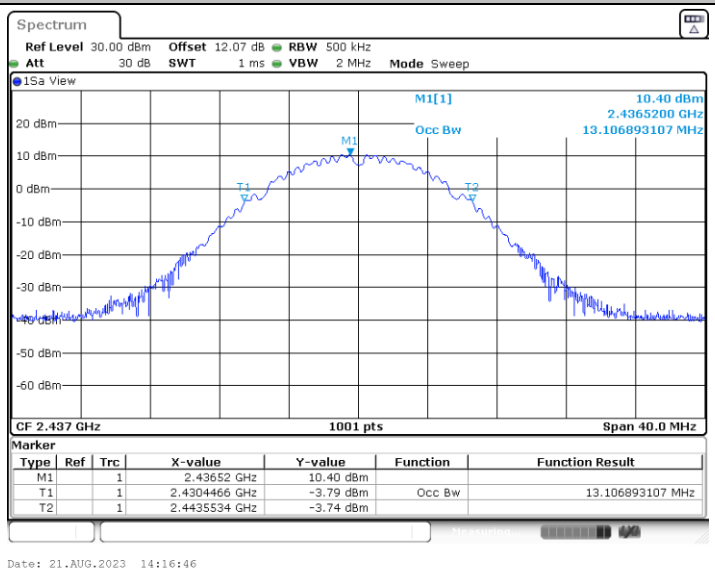

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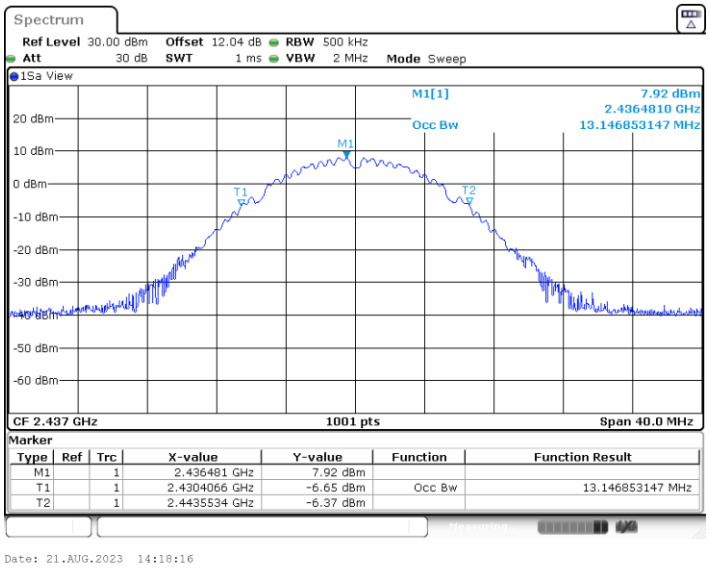

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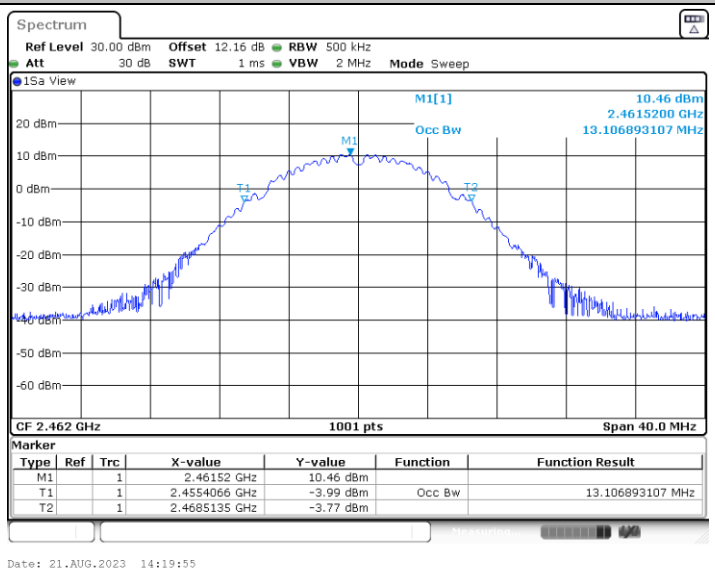

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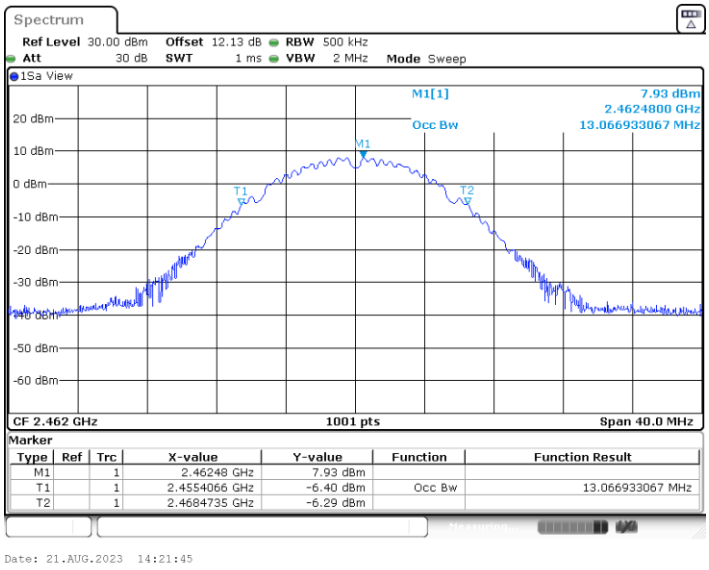

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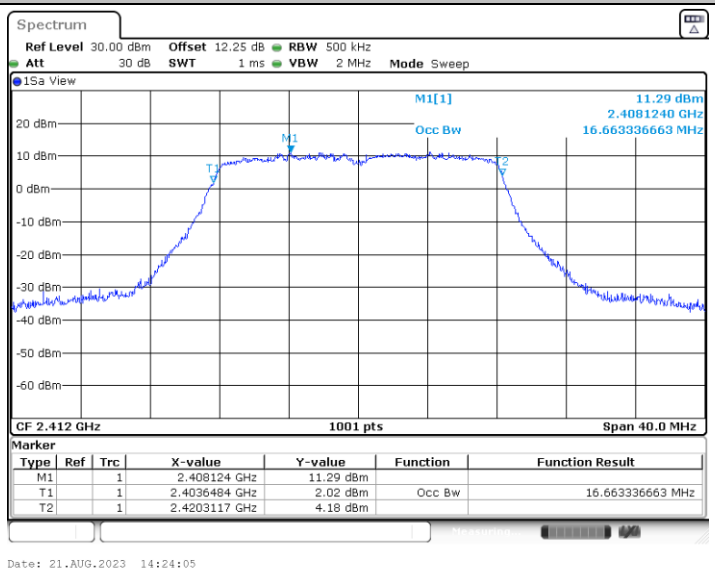

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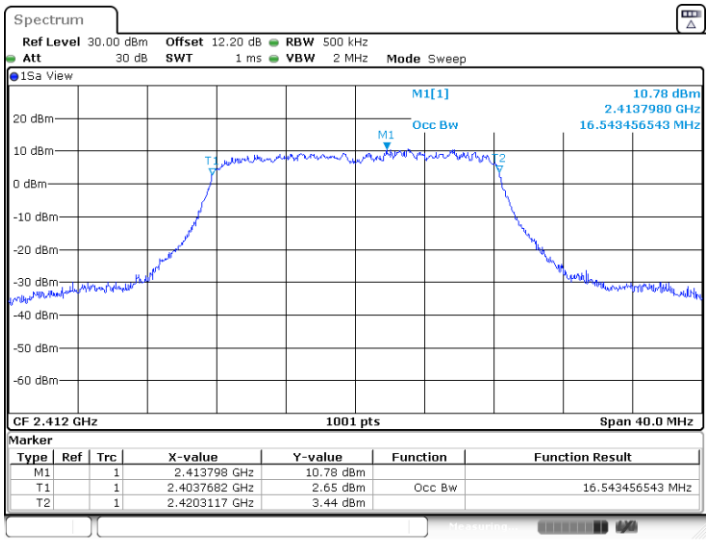

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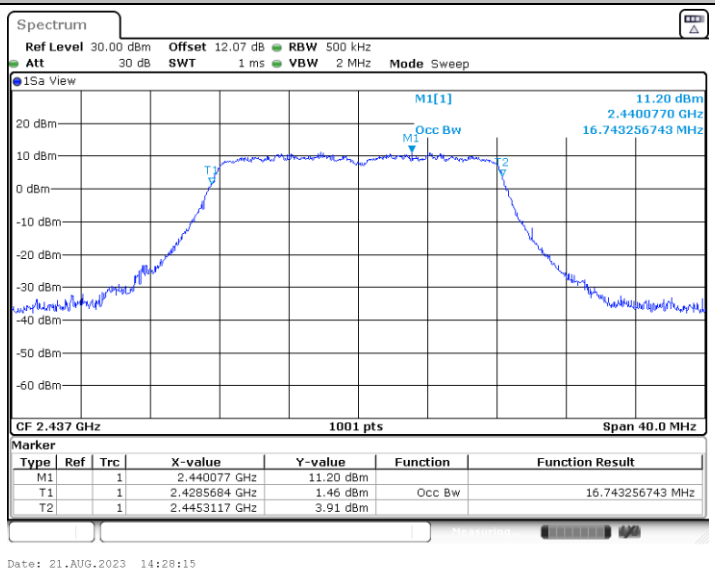

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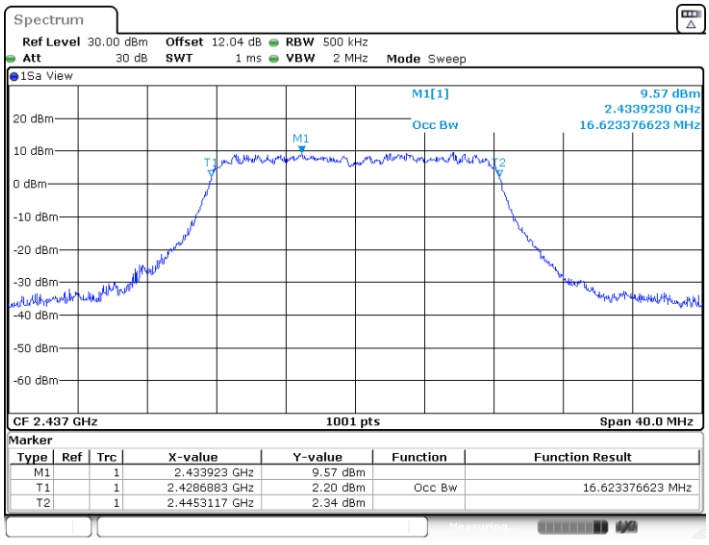

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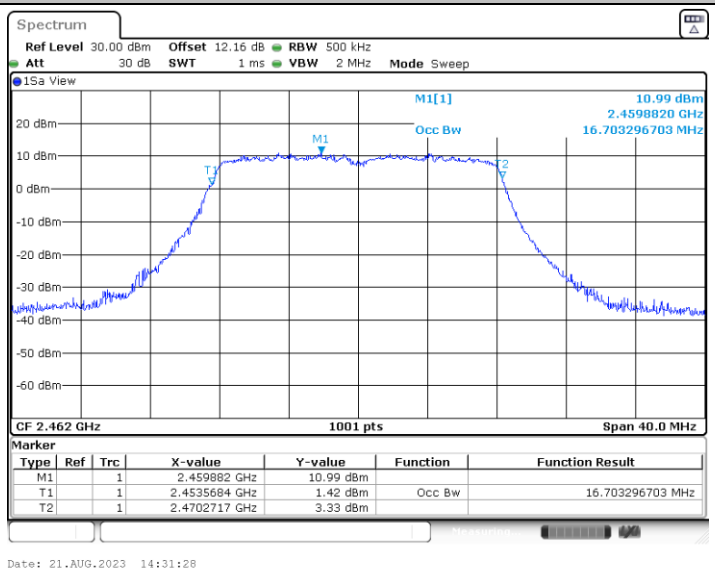

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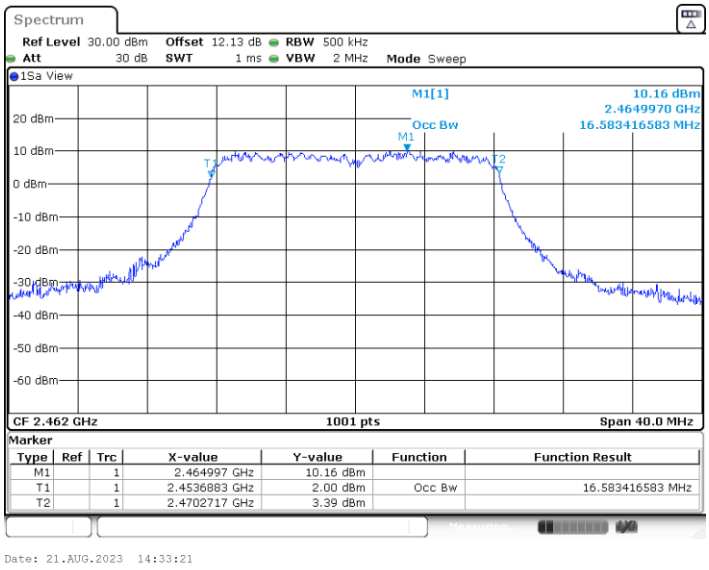
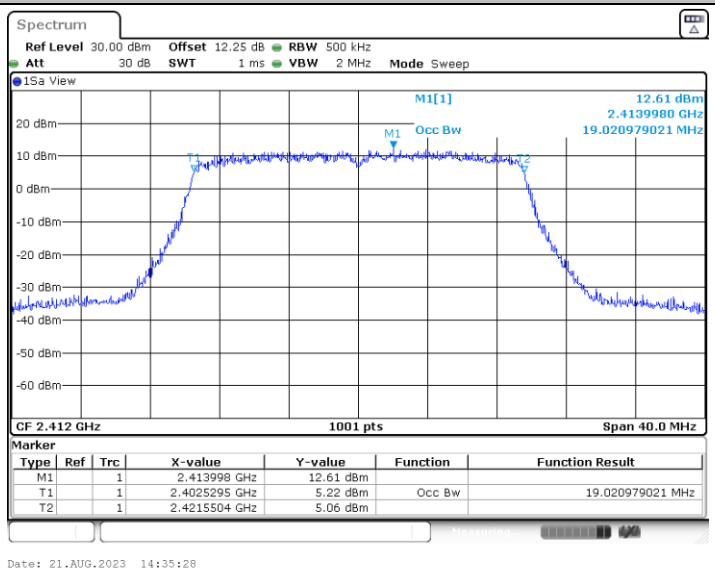


11AX20MIMO_Ant2_2412


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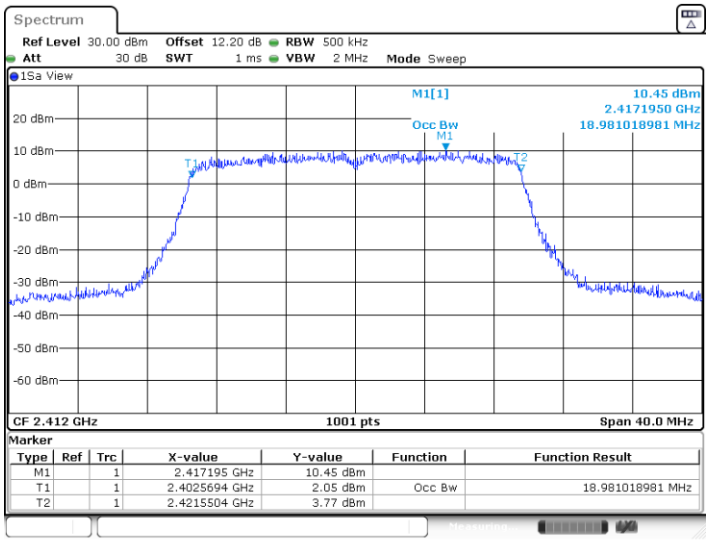

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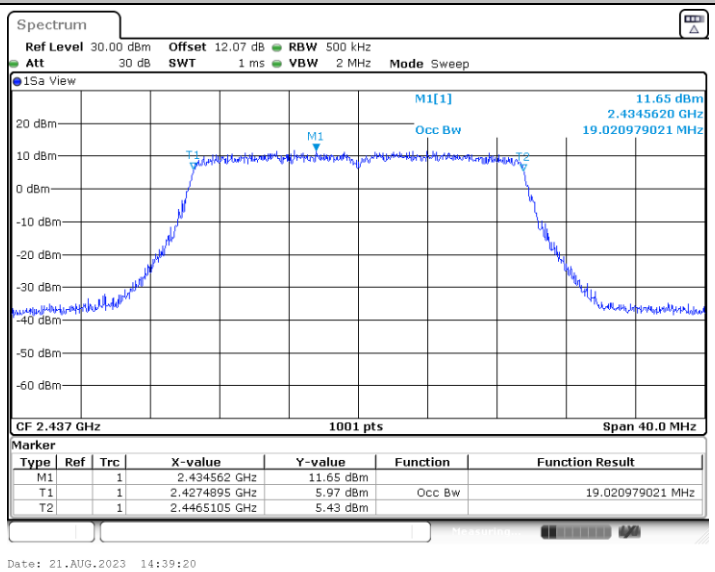

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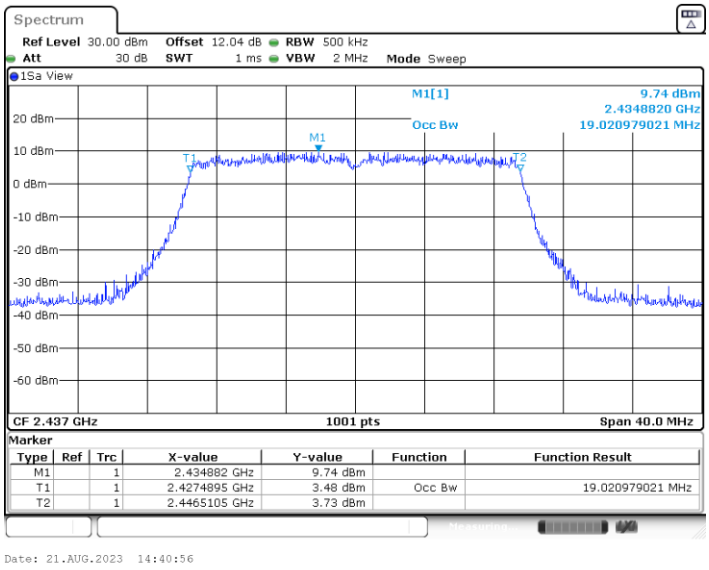

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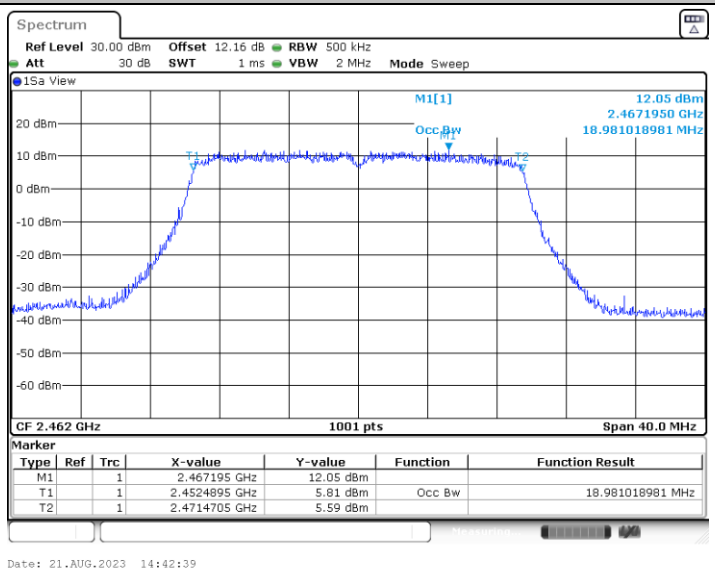

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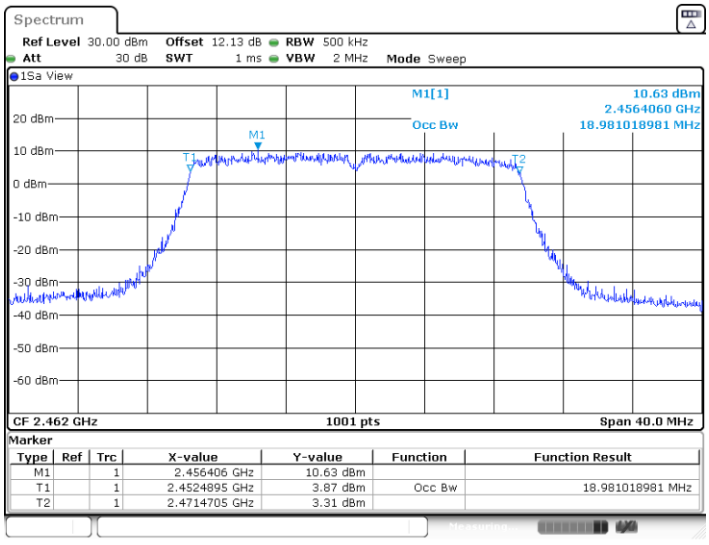

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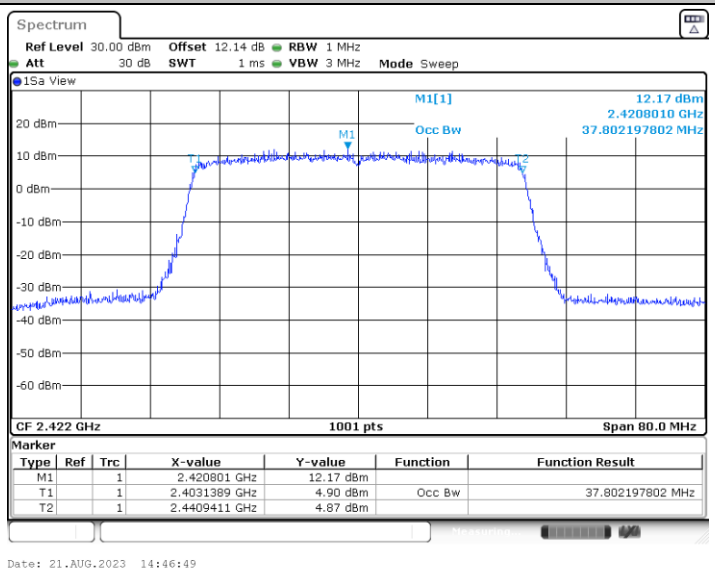

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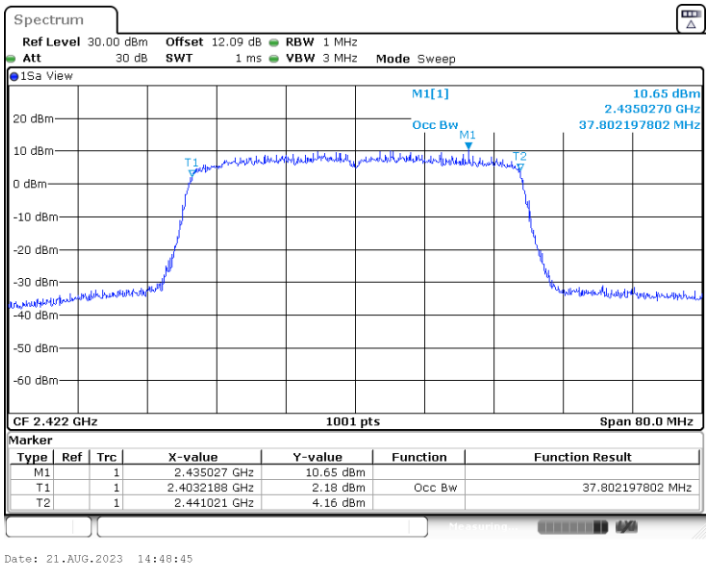

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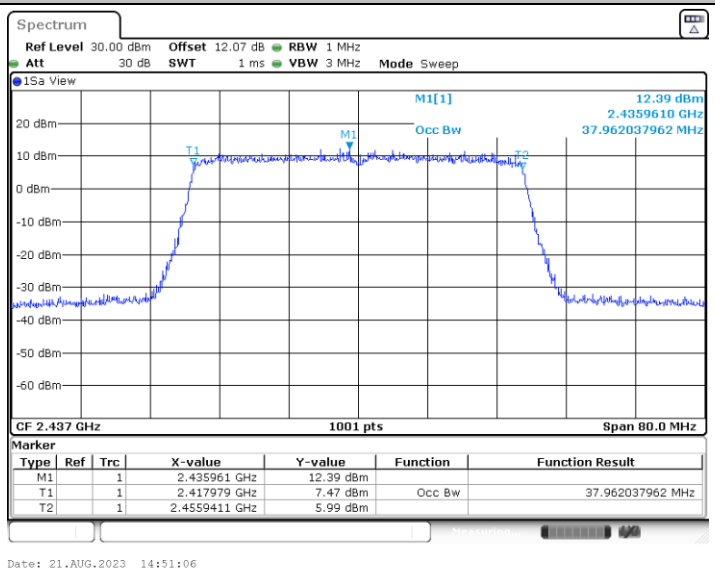

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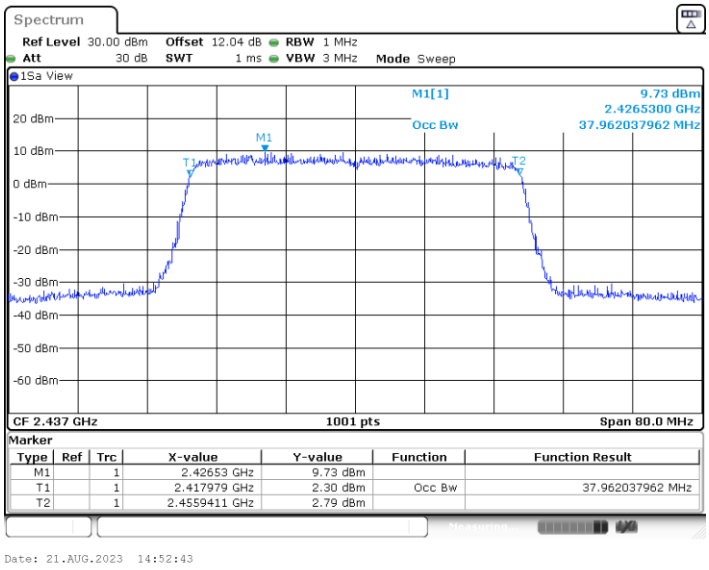

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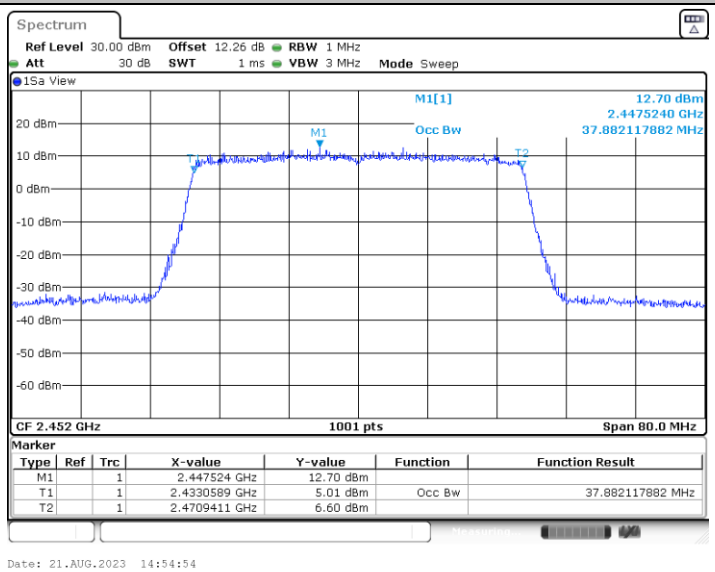

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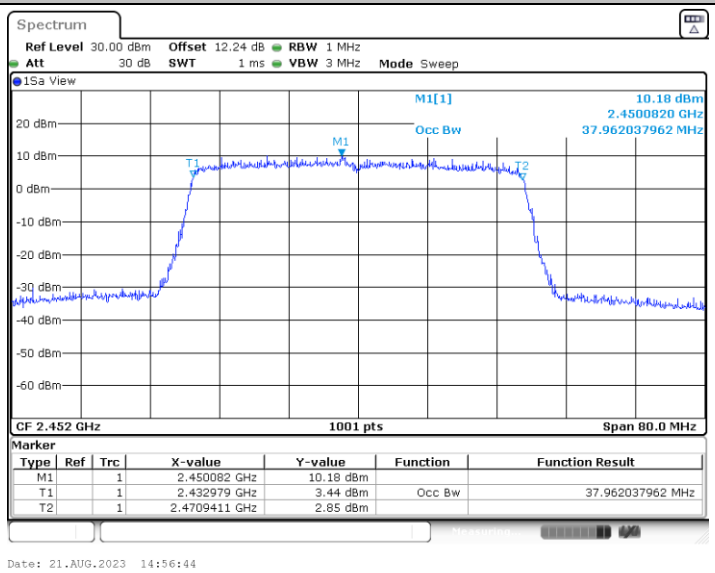


Maximum conducted output power

Test Result Peak

2.4GHz Band MIMO																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant2	Ant4	SUM	Ant2	Ant4	Ant2	Ant4	Ant2	Ant4	Ant2	Ant4	
11b	1Mbps	2	1	2412	20.97	18.13	22.79	30.00		-1.00		21.79		36.00		Pass
11b	1Mbps	2	6	2437	19.66	16.93	21.52	30.00		-1.00		20.52		36.00		Pass
11b	1Mbps	2	11	2462	18.55	16.01	20.47	30.00		-1.00		19.47		36.00		Pass
11g	6Mbps	2	1	2412	25.23	22.59	27.12	30.00		-1.00		26.12		36.00		Pass
11g	6Mbps	2	6	2437	24.82	21.86	26.60	30.00		-1.00		25.60		36.00		Pass
11g	6Mbps	2	11	2462	24.65	22.03	26.54	30.00		-1.00		25.54		36.00		Pass
HT20	MCS0	2	1	2412	23.58	21.75	25.77	30.00		-1.00		24.77		36.00		Pass
HT20	MCS0	2	6	2437	24.70	21.53	26.41	30.00		-1.00		25.41		36.00		Pass
HT20	MCS0	2	11	2462	24.09	21.56	26.02	30.00		-1.00		25.02		36.00		Pass
HT40	MCS0	2	3	2422	24.30	21.79	26.23	30.00		-1.00		25.23		36.00		Pass
HT40	MCS0	2	6	2437	24.17	21.66	26.10	30.00		-1.00		25.10		36.00		Pass
HT40	MCS0	2	9	2452	24.09	21.56	26.02	30.00		-1.00		25.02		36.00		Pass

2.4GHz Band MIMO																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Peak Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
						Ant2	Ant4	SUM	Ant2	Ant4	Ant2	Ant4	Ant2	Ant4	Ant2	Ant4	
HE20	MCS0	2	1	2412	Full	23.70	21.81	25.87	30.00		-1.00		24.87		36.00		Pass
HE20	MCS0	2	1	2412	26/0	15.82	13.93	17.99	30.00		-1.00		16.99		36.00		Pass
HE20	MCS0	2	1	2412	52/37	18.69	16.74	20.83	30.00		-1.00		19.83		36.00		Pass
HE20	MCS0	2	1	2412	106/53	21.51	19.58	23.66	30.00		-1.00		22.66		36.00		Pass
HE20	MCS0	2	6	2437	Full	24.75	21.61	26.47	30.00		-1.00		25.47		36.00		Pass
HE20	MCS0	2	6	2437	26/0	17.33	14.85	19.27	30.00		-1.00		18.27		36.00		Pass
HE20	MCS0	2	6	2437	52/37	19.35	17.62	21.58	30.00		-1.00		20.58		36.00		Pass
HE20	MCS0	2	6	2437	106/53	22.34	19.92	24.31	30.00		-1.00		23.31		36.00		Pass
HE20	MCS0	2	11	2462	Full	24.68	21.63	26.43	30.00		-1.00		25.43		36.00		Pass
HE20	MCS0	2	11	2462	26/8	17.14	15.91	19.58	30.00		-1.00		18.58		36.00		Pass
HE20	MCS0	2	11	2462	52/40	20.43	18.42	22.55	30.00		-1.00		21.55		36.00		Pass
HE20	MCS0	2	11	2462	106/54	22.93	20.32	24.83	30.00		-1.00		23.83		36.00		Pass
HE40	MCS0	2	3	2422	Full	24.37	21.82	26.29	30.00		-1.00		25.29		36.00		Pass
HE40	MCS0	2	6	2437	Full	24.22	21.68	26.14	30.00		-1.00		25.14		36.00		Pass
HE40	MCS0	2	9	2452	Full	24.13	21.61	26.06	30.00		-1.00		25.06		36.00		Pass

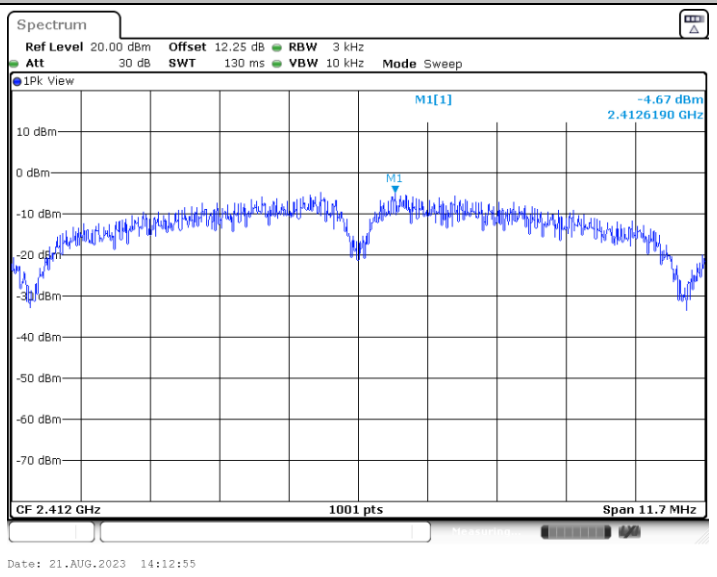
Maximum power spectral density

Test Result

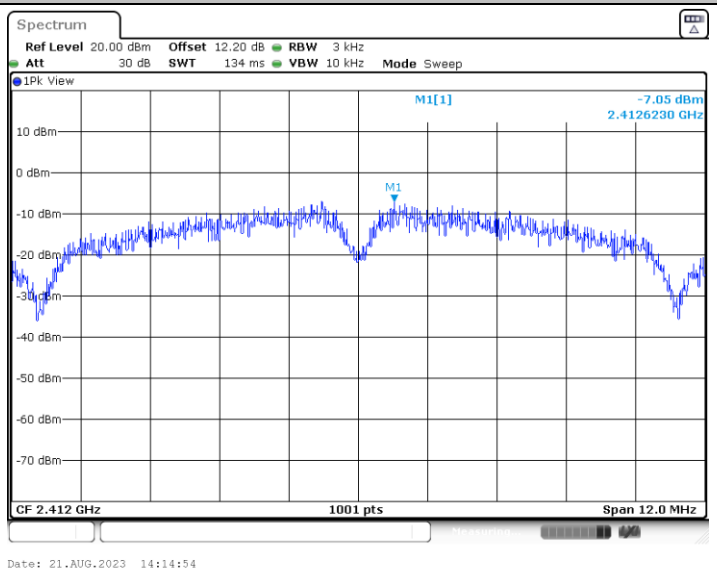
TestMode	Antenna	Freq(MHz)	Result	Limit	Verdict
11B-CDD	Ant2	2412	-4.67	≤8.00	PASS
	Ant4	2412	-7.05	≤8.00	PASS
	total	2412	-2.69	≤8.00	PASS
	Ant2	2437	-6.63	≤8.00	PASS
	Ant4	2437	-9.47	≤8.00	PASS
	total	2437	-4.81	≤8.00	PASS
	Ant2	2462	-7.96	≤8.00	PASS
	Ant4	2462	-10.76	≤8.00	PASS
	total	2462	-6.13	≤8.00	PASS
11G-CDD	Ant2	2412	-7.72	≤8.00	PASS
	Ant4	2412	-10.5	≤8.00	PASS
	total	2412	-5.88	≤8.00	PASS
	Ant2	2437	-9.06	≤8.00	PASS
	Ant4	2437	-12.07	≤8.00	PASS
	total	2437	-7.30	≤8.00	PASS
	Ant2	2462	-8.71	≤8.00	PASS
	Ant4	2462	-9.48	≤8.00	PASS
	total	2462	-6.07	≤8.00	PASS
11AX20MIMO	Ant2	2412	-11.74	≤8.00	PASS
	Ant4	2412	-14.18	≤8.00	PASS
	total	2412	-9.78	≤8.00	PASS
	Ant2	2437	-10.1	≤8.00	PASS
	Ant4	2437	-12.28	≤8.00	PASS
	total	2437	-8.04	≤8.00	PASS
	Ant2	2462	-9.73	≤8.00	PASS
	Ant4	2462	-12.78	≤8.00	PASS
	total	2462	-7.98	≤8.00	PASS
11AX40MIMO	Ant2	2422	-13.1	≤8.00	PASS
	Ant4	2422	-15.01	≤8.00	PASS
	total	2422	-10.94	≤8.00	PASS
	Ant2	2437	-12.37	≤8.00	PASS
	Ant4	2437	-16.19	≤8.00	PASS
	total	2437	-10.86	≤8.00	PASS
	Ant2	2452	-12.3	≤8.00	PASS
	Ant4	2452	-14.57	≤8.00	PASS
	total	2452	-10.28	≤8.00	PASS

Test Graphs

11B-CDD_Ant2_2412



11B-CDD_Ant4_2412



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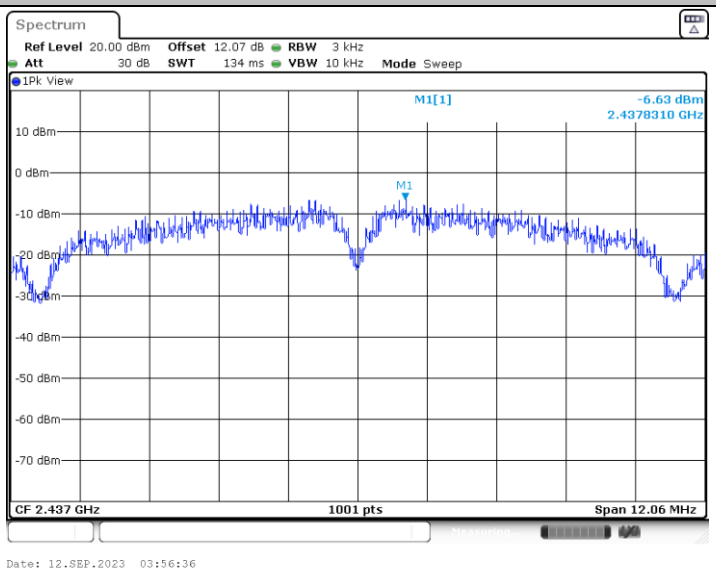

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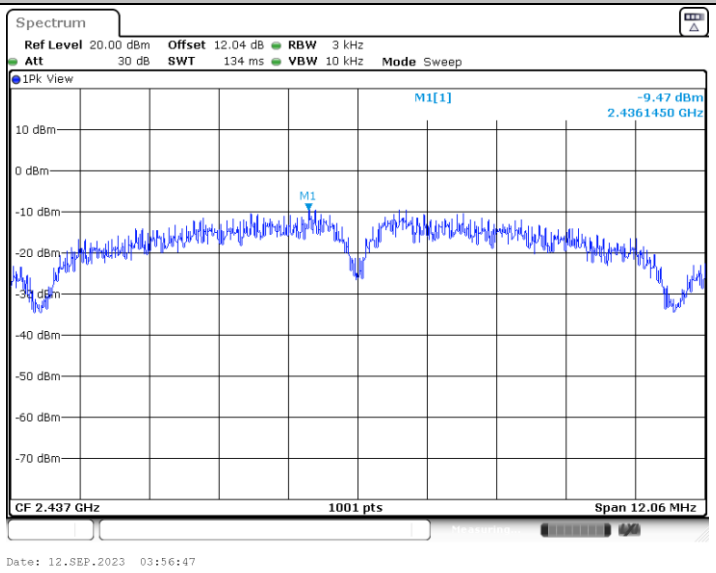

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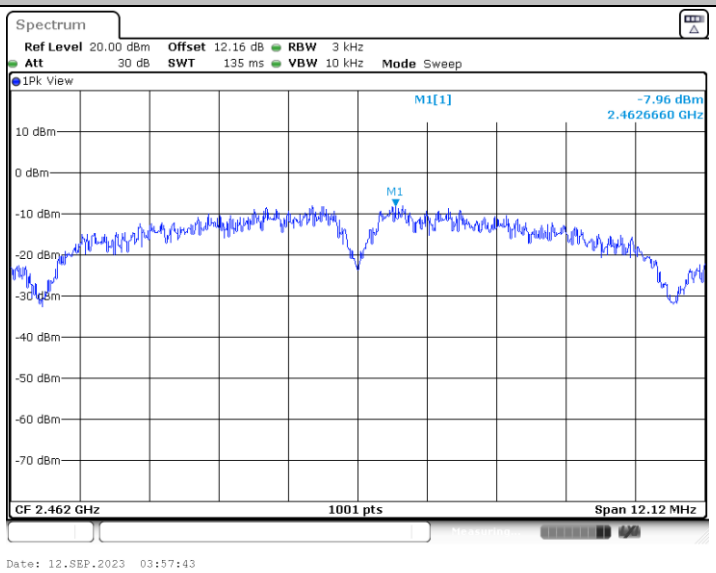

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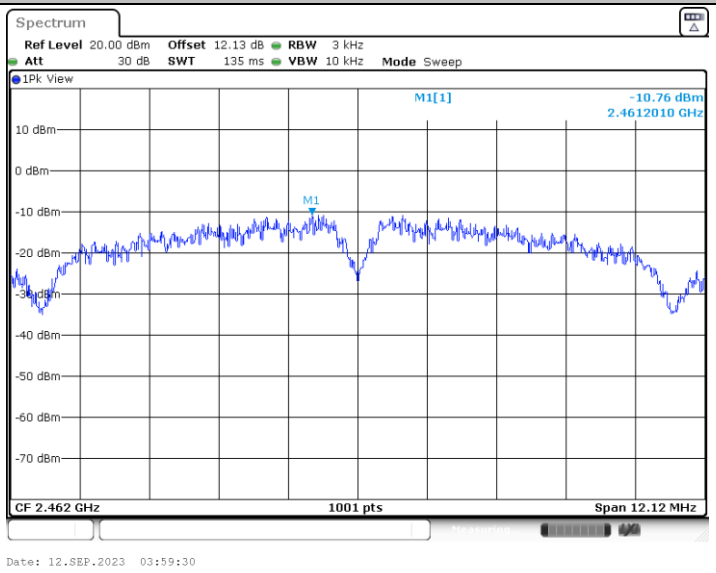

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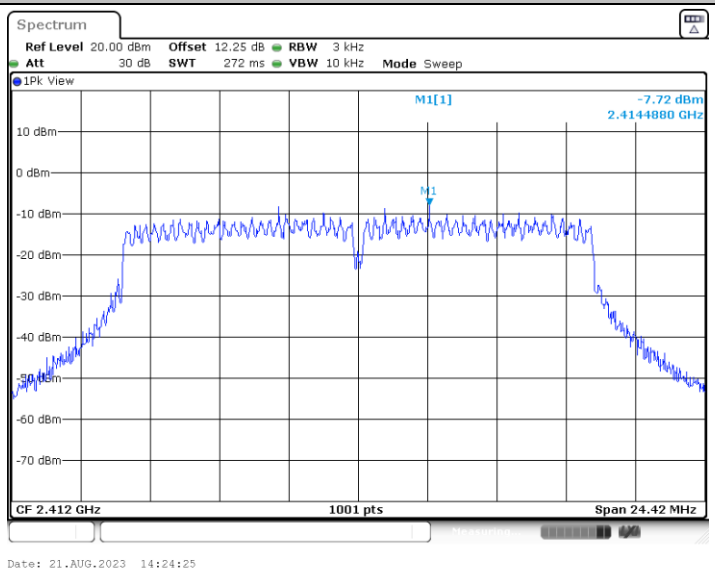

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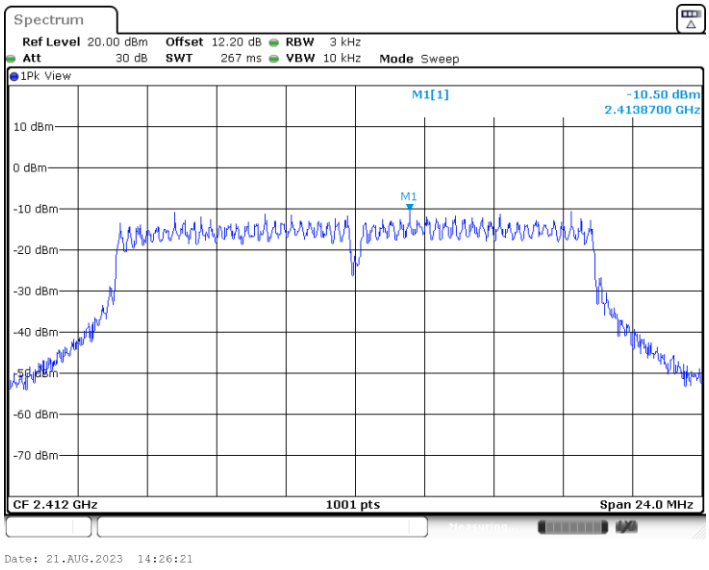

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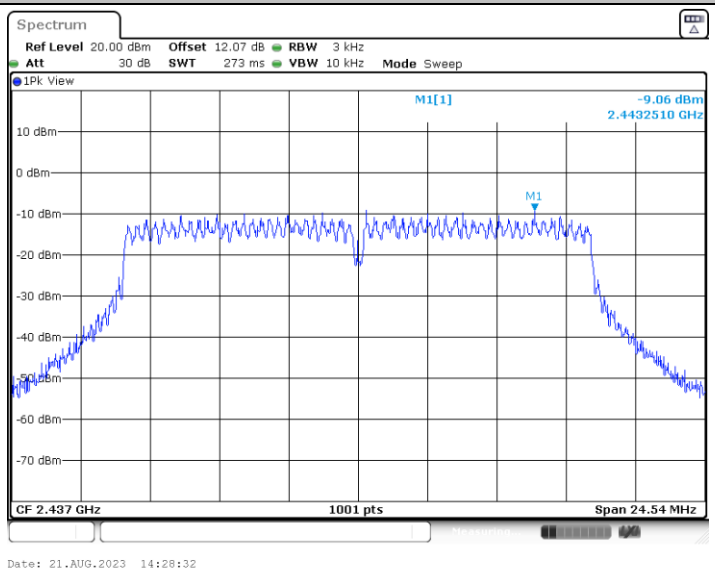

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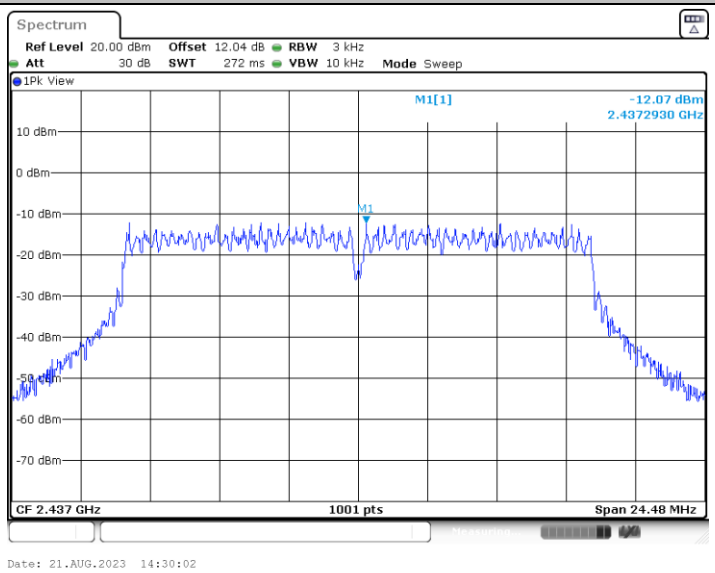

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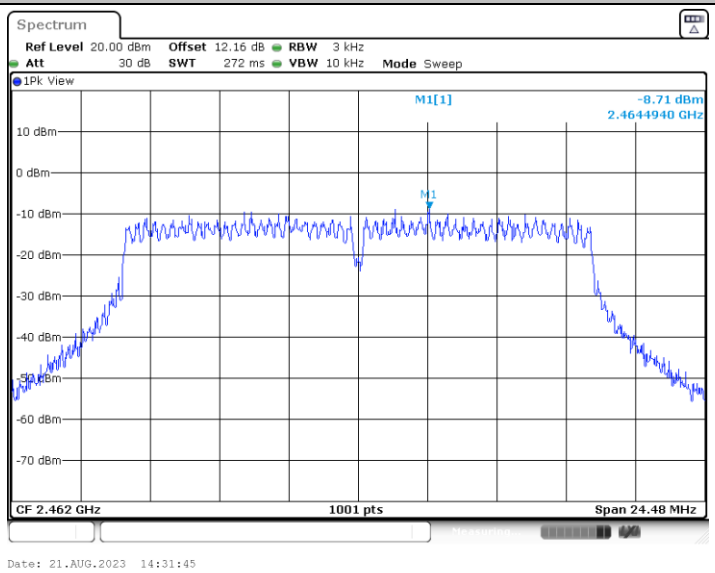

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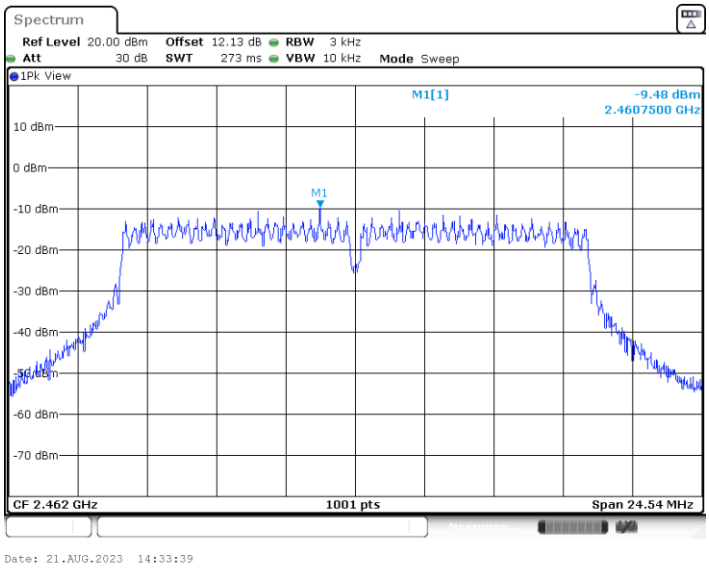

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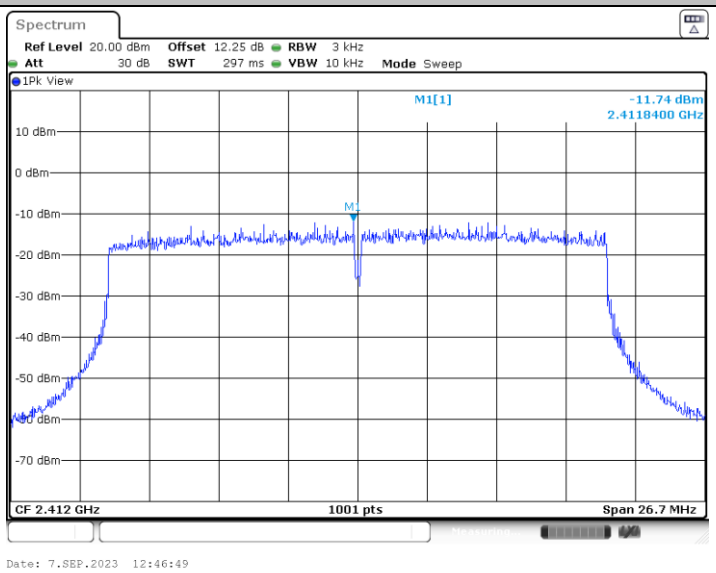

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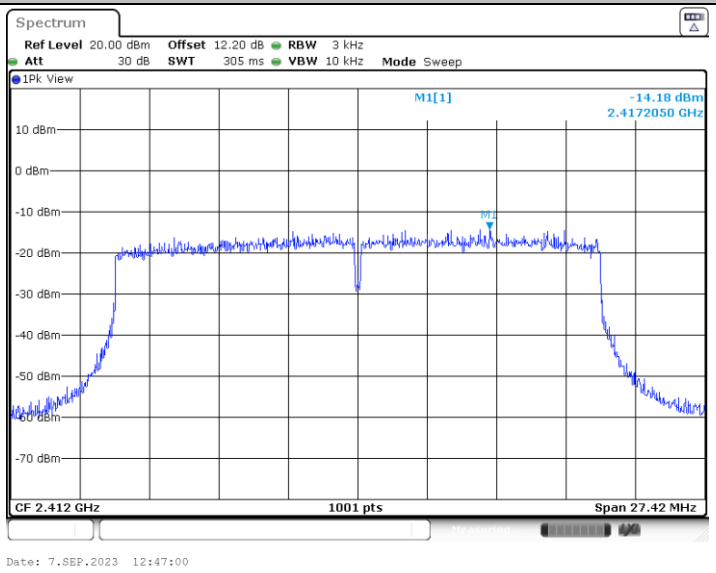

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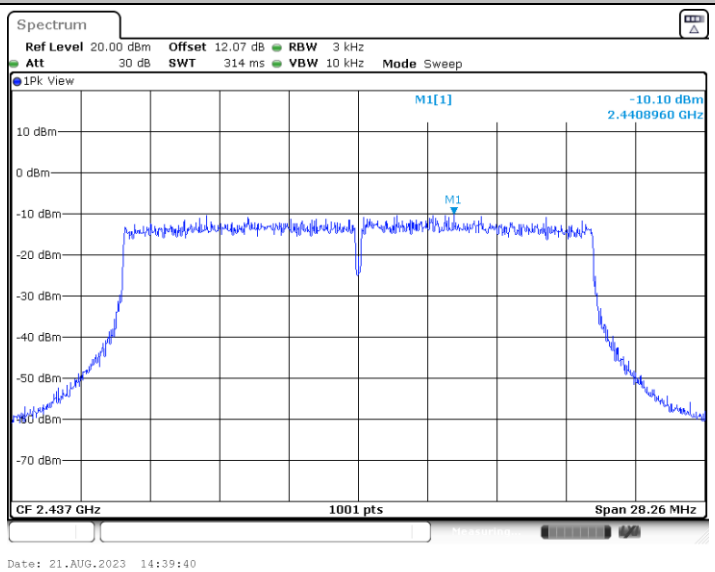

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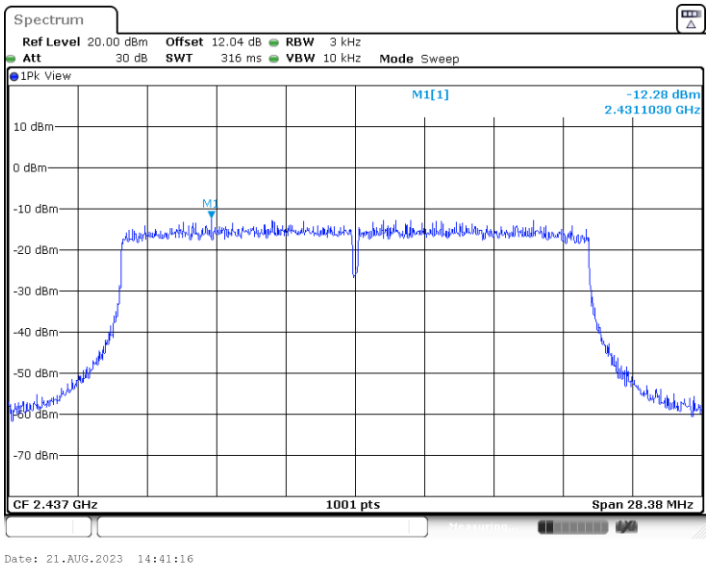

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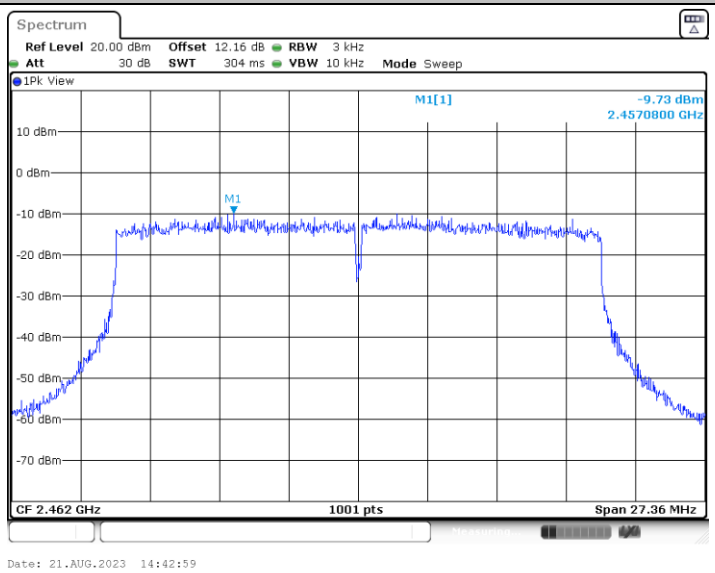

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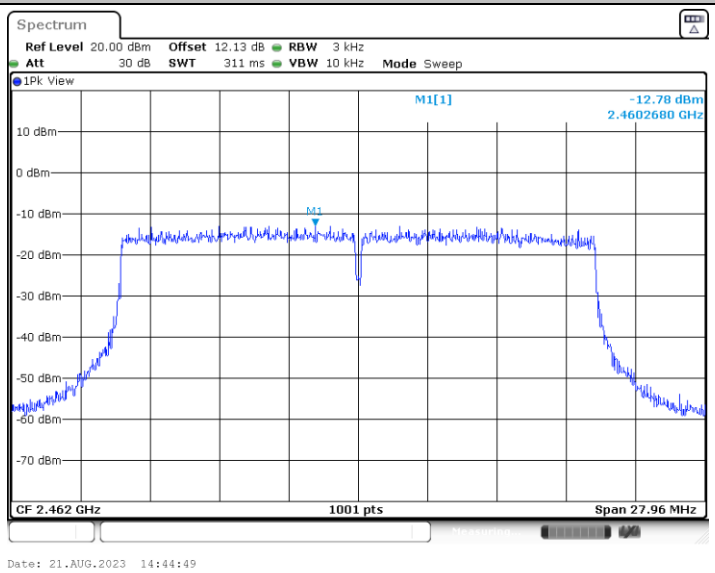

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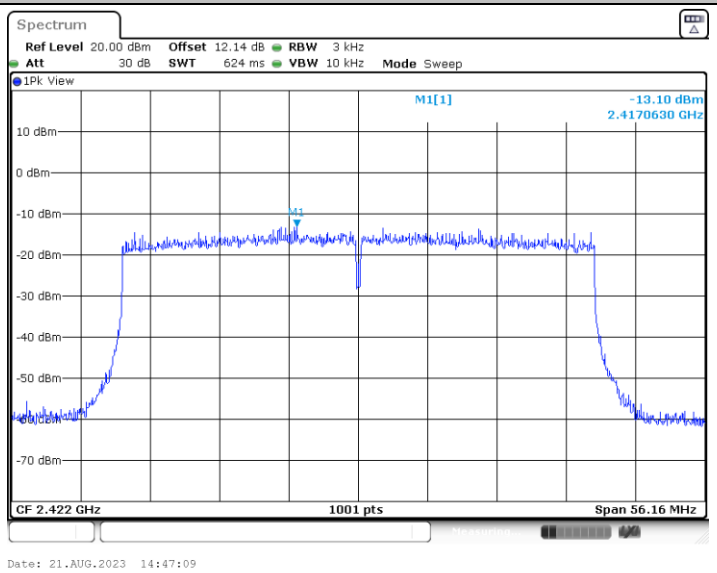

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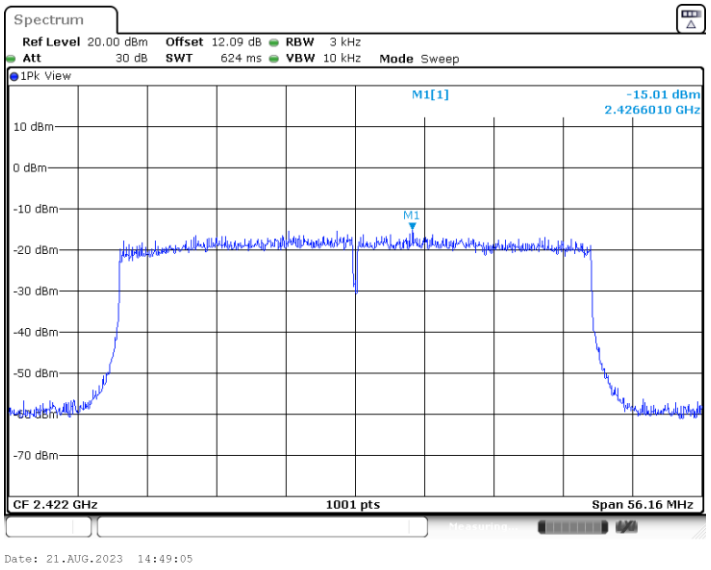

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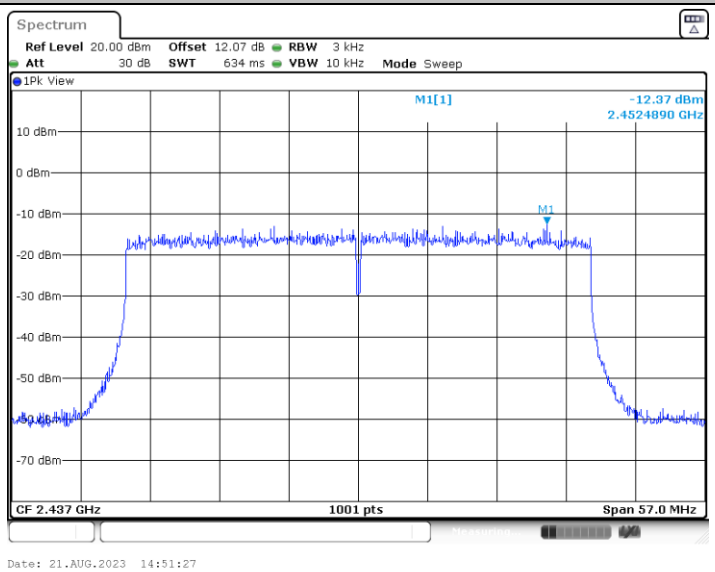

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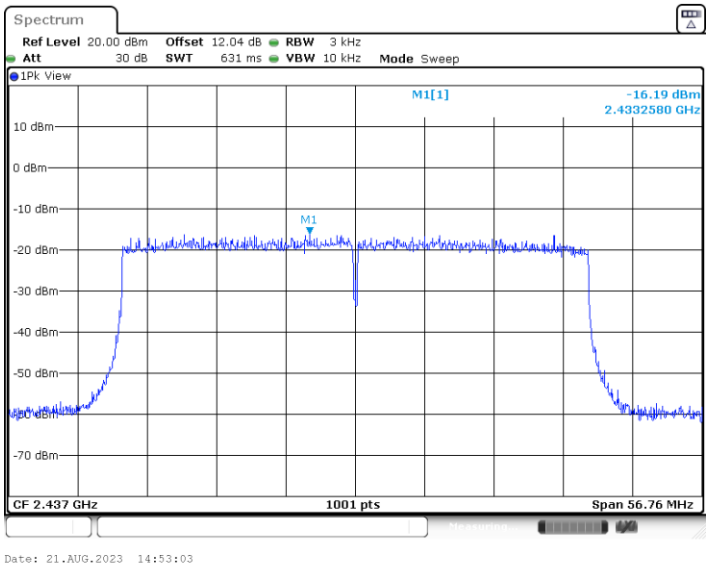

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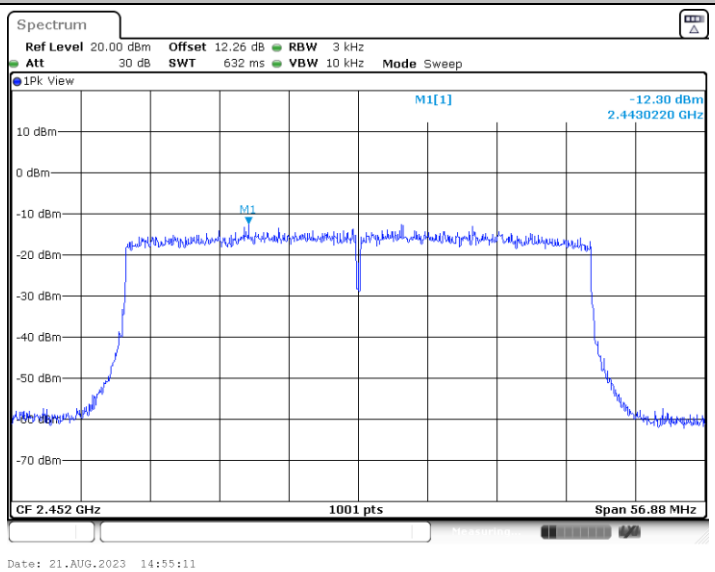

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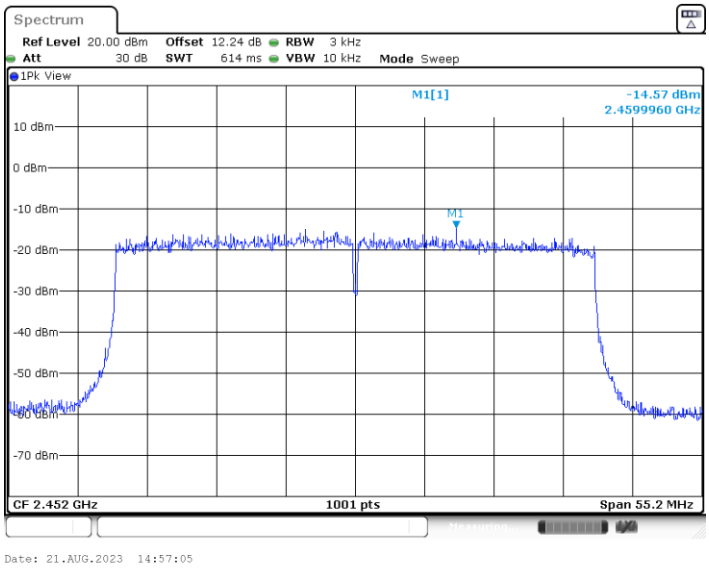


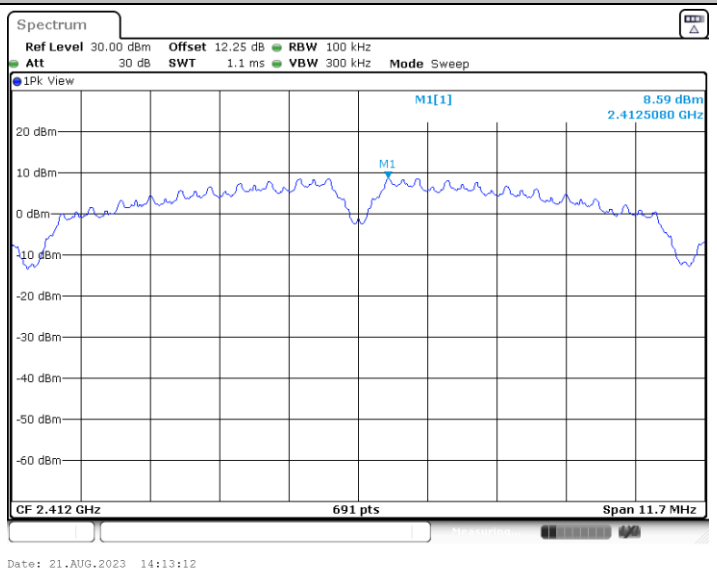
Reference level measurement

Test Result

TestMode	Antenna	Freq(MHz)	Max.Point[MHz]	Result[dBm/100KHz]
11B-CDD	Ant2	2412	2412.51	8.59
	Ant4	2412	2413.01	6.26
	Ant2	2437	2436.49	8.89
	Ant4	2437	2436.49	6.39
	Ant2	2462	2462.51	8.85
	Ant4	2462	2462.49	6.26
11G-CDD	Ant2	2412	2414.51	6.28
	Ant4	2412	2417.00	4.63
	Ant2	2437	2439.49	6.26
	Ant4	2437	2442.00	3.70
	Ant2	2462	2464.52	6.16
	Ant4	2462	2464.49	4.16
11AX20MIMO	Ant2	2412	2414.47	4.88
	Ant4	2412	2414.50	3.25
	Ant2	2437	2435.73	4.55
	Ant4	2437	2435.77	2.15
	Ant2	2462	2455.74	4.59
	Ant4	2462	2464.51	2.77
11AX40MIMO	Ant2	2422	2419.48	2.26
	Ant4	2422	2419.48	0.39
	Ant2	2437	2434.53	2.22
	Ant4	2437	2434.54	-0.20
	Ant2	2452	2449.53	2.67
	Ant4	2452	2446.97	0.68

Test Graphs

11B-CDD_Ant2_2412



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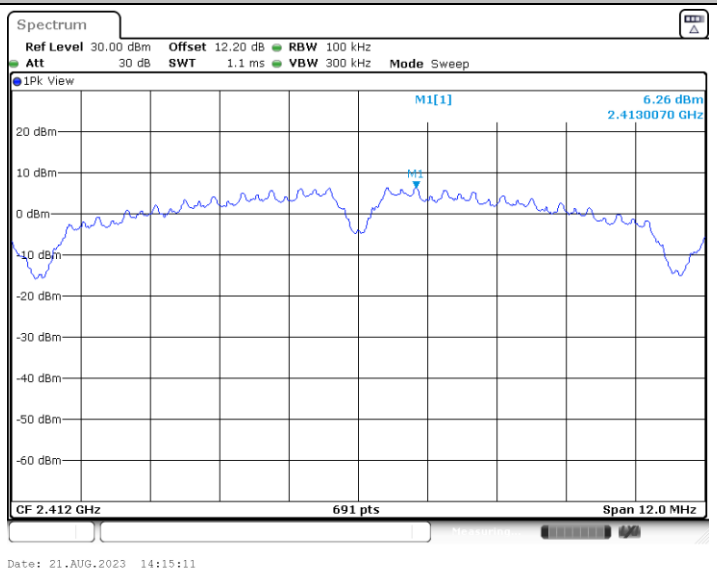

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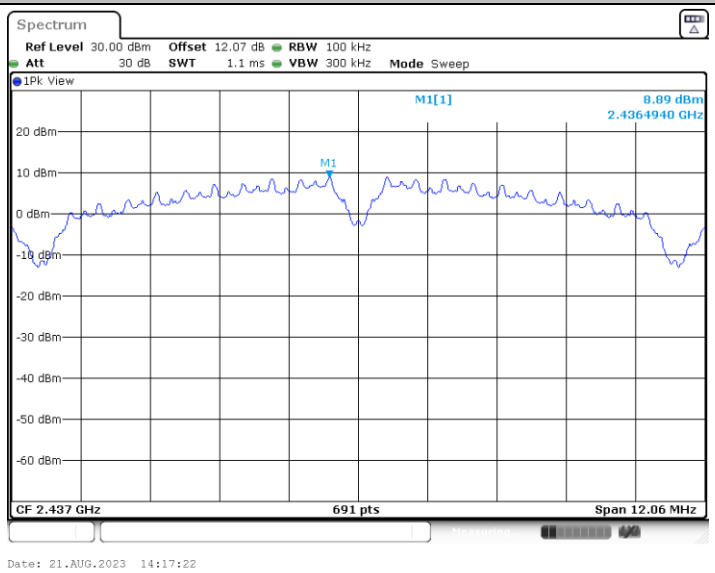

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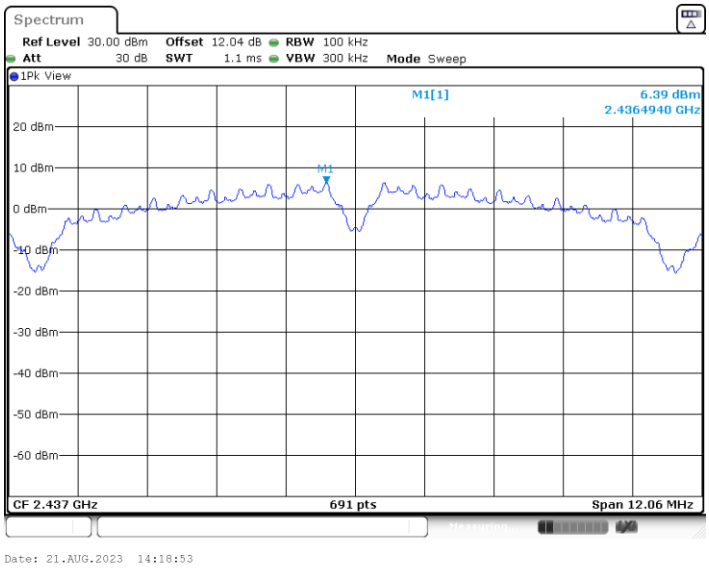

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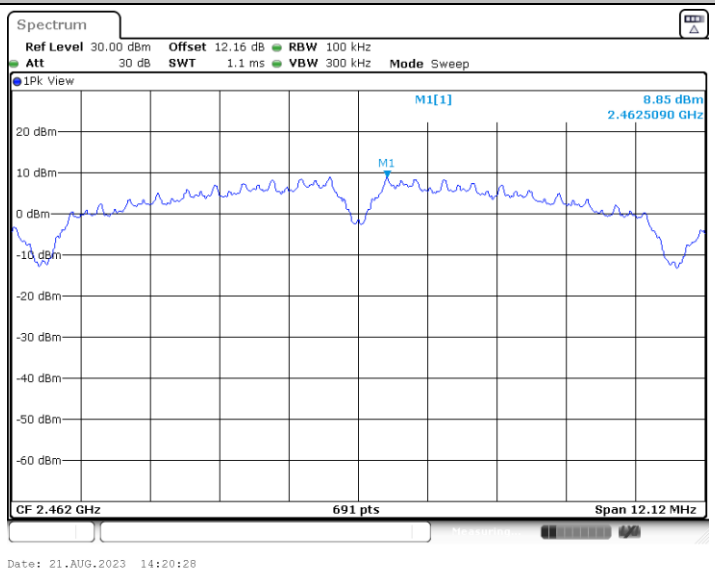

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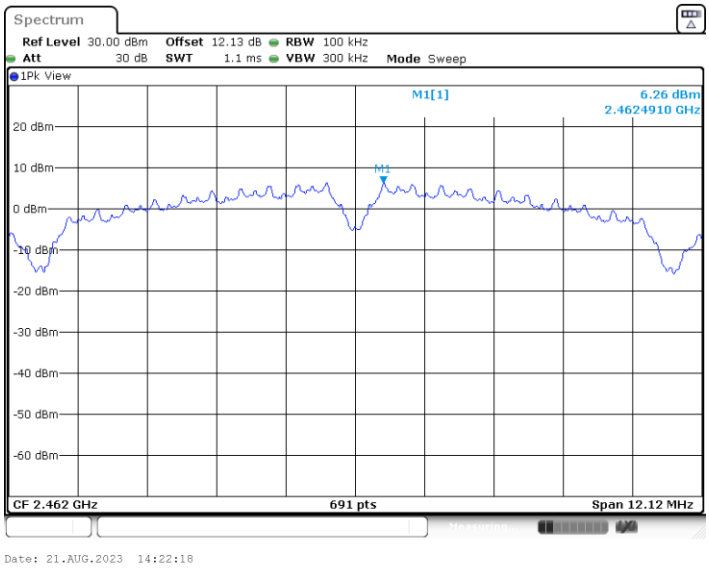

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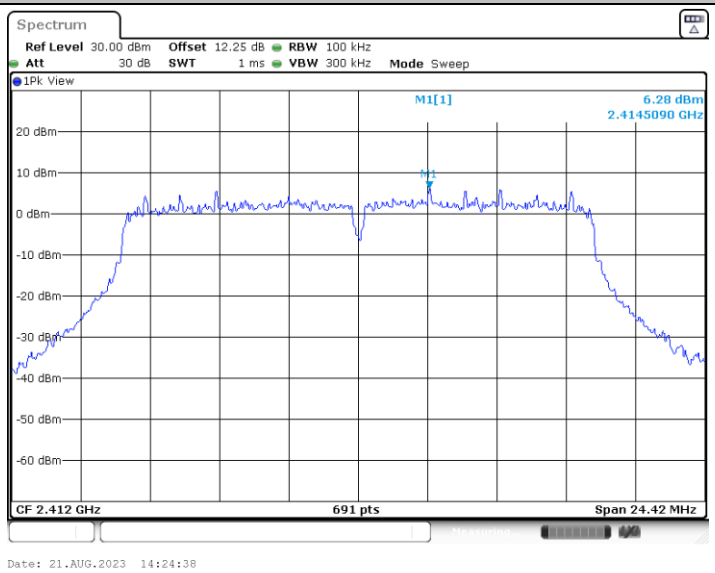

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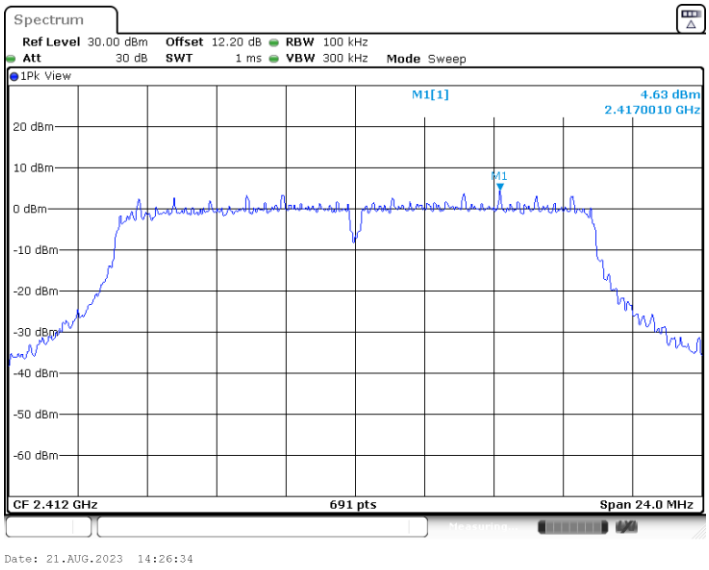

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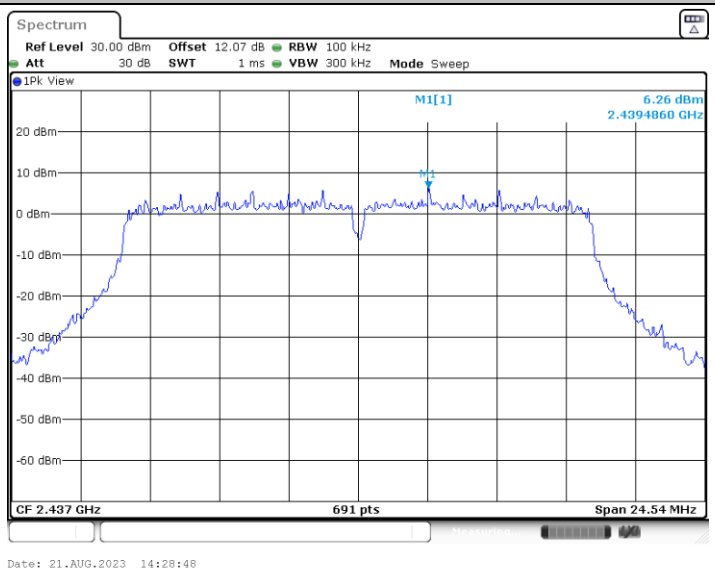
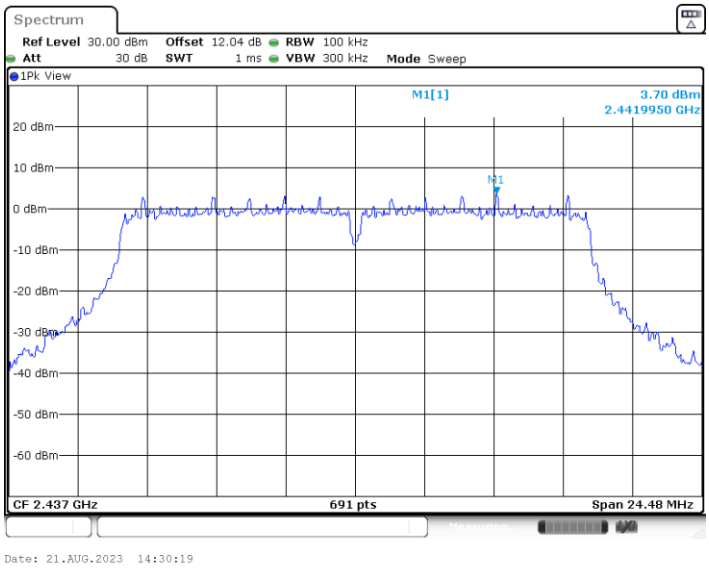
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