

FCC CERTIFICATION TEST REPORT

FOR

Applicant	:	arpara Technology Co.,Ltd.
Address	:	Room 109 1/F Building 36, Nantaihu Dongyuan Business Building High-tech Zone, Wuxing District, Huzhou City, Zhejiang Province China
Equipment under Test	:	arpara AIO 5K
Model No.	:	VRM1020WNA
Trade Mark	:	
FCC ID	:	2A77G-VRM1020
Manufacturer	:	arpara Technology Co.,Ltd.
Address	:	Room 109 1/F Building 36, Nantaihu Dongyuan Business Building High-tech Zone, Wuxing District, Huzhou City, Zhejiang Province China

Issued By: Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park,
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REPORT

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Test Report Declare

Applicant	:	arpara Technology Co.,Ltd.
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Equipment under Test	:	arpara AIO 5K
Model No	:	VRM1020WNA
Trade Mark	:	
Manufacturer	:	arpara Technology Co.,Ltd.
Address	:	Room 109 1/F Building 36, Nantaihu Dongyuan Business Building High-tech Zone, Wuxing District, Huzhou City, Zhejiang Province China

Test Standard Used: FCC Rules and Regulations Part 15 Subpart C.

Test procedure used: ANSI C63.10:2013, 558074 D01 15.247 Meas Guidance v05r02,
662911 D01 Multiple Transmitter Output v02r01

We Declare:

The equipment described above is tested by Dongguan Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.

Report No:	DDT-R22041329-2E03		
Date of Receipt:	Jun. 13, 2022	Date of Test:	Jun. 13, 2022 ~ Aug. 31, 2022

Prepared By:

Johnny Wang

Johnny Wang/Engineer

Approved By:



Damon Hu/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Aug. 31, 2022	

1. Summary of Test Results

The EUT have been tested according to the applicable standards as referenced below.		
Description of Test Item	Standard	Verdict
6 dB Bandwidth and 99% Bandwidth	FCC Part 15: 15.247 ANSI C63.10:2013	Pass
Maximum Peak Output Power	FCC Part 15: 15.247 ANSI C63.10:2013	Pass
Power Spectral Density	FCC Part 15:15.247 ANSI C63.10:2013	Pass
Band Edge Compliance (conducted method)	FCC Part 15: 15.209 FCC Part 15: 15.247 ANSI C63.10: 2013	Pass
Radiation Emission	FCC Part 15: 15.247 ANSI C63.10:2013	Pass
RF Conducted Spurious Emissions	FCC Part 15: 15.209 FCC Part 15: 15.247 ANSI C63.10: 2013	Pass
Emission in Restricted Frequency Bands	FCC Part 15: 15.209 FCC Part 15: 15.247 ANSI C63.10: 2013	Pass
Power Line Conducted Emission	FCC Part 15: 15.207 ANSI C63.10: 2013	Pass
Antenna Requirement	FCC Part 15: 15.203	Pass

2. General Test Information

2.1. Description of EUT

EUT* Name	: arpara AIO 5K
Model Number	: VRM1020WNA
EUT function description	: Please reference user manual of this device
Power supply	: Battery 3.85V or DC 5V by external adapter power supply
Radio Technology	: IEEE 802.11b/g/n/ax
Operation frequency	: IEEE 802.11b: 2412MHz-2462MHz IEEE 802.11g: 2412MHz-2462MHz IEEE 802.11n HT20: 2412MHz-2462MHz IEEE 802.11n HT40: 2422MHz-2452MHz IEEE 802.11ax HE20: 2412MHz-2462MHz IEEE 802.11ax HE40: 2422MHz-2452MHz
Modulation	: IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n HT20, HT40: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ax HE20, HE40: OFDM (1024QAM, 64QAM, 16QAM, QPSK, BPSK)
Transmitter rate	: IEEE 802.11b: up to 11 Mbps IEEE 802.11g: up to 54 Mbps IEEE 802.11n HT20, HT40: up to 130 Mbps IEEE 802.11ax HE20, HE40: up to 573.5 Mbps
Antenna Type	: Antenna 1: FPC antenna, Maximum PK gain: 2.15 dBi Antenna 2: FPC antenna, Maximum PK gain: 2.97 dBi
Sample Type	: Series production
Sample Number	: S22041329-01 for conductive S22041329-02 for radiation

Note: EUT is the ab. of equipment under test. It does not support RU mode.

Antenna information			
	Ant1 gain	Ant2 gain	MIMO
IEEE 802.11b	2.97	2.15	/
IEEE 802.11g	2.97	2.15	/
IEEE 802.11n HT20	2.97	2.15	5.59
IEEE 802.11n HT40	2.97	2.15	5.59
IEEE 802.11ax HE20	2.97	2.15	5.59
IEEE 802.11ax HE40	2.97	2.15	5.59

Channel information					
CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)
1	2412	5	2432	9	2452
2	2417	6	2437	10	2457
3	2422	7	2442	11	2462
4	2427	8	2447	/	/

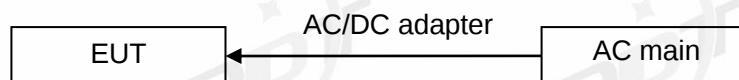
2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number	Description	Other
N/A	N/A	N/A	N/A	N/A

2.3. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	EMC Compliance	SN
Adapter	SAMSUNG	N/A	Input: 100-240~, 50/60Hz, 0.5A; Output: 9V/2A or 5V/2A	N/A

2.4. Block diagram of EUT configuration for test



The test software was used to control EUT work in Continuous Tx mode and select test channel, wireless mode as below table.

Test software: QRCT.exe

The pathloss of external cable: 0.5dB (According to the manufacturer's claims)

Tested mode, channel, and data rate information				
Mode	Setting Tx Power	data rate (Mbps) (see Note)	Channel	Frequency (MHz)
IEEE 802.11b	15	1	LCH: CH1	2412
	15	1	MCH: CH6	2437
	15	1	HCH: CH11	2462
IEEE 802.11g	15	6	LCH: CH1	2412
	15	6	MCH: CH6	2437
	15	6	HCH: CH11	2462
IEEE 802.11n HT20	15	MCS 0	LCH: CH1	2412
	15	MCS 0	MCH: CH6	2437
	15	MCS 0	HCH: CH11	2462
IEEE 802.11n HT40	15	MCS 0	LCH: CH3	2422
	15	MCS 0	MCH: CH6	2437
	15	MCS 0	HCH: CH9	2452
IEEE 802.11ax HE20	15	MCS 0	LCH: CH1	2412
	15	MCS 0	MCH: CH6	2437
	15	MCS 0	HCH: CH11	2462
IEEE 802.11ax HE40	15	MCS 0	LCH: CH3	2422
	15	MCS 0	MCH: CH6	2437
	15	MCS 0	HCH: CH9	2452
Note: According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.				

2.5. Deviations of test standard

No Deviation

2.6. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature range:	21-25°C
Humidity range:	40-75%
Pressure range:	86-106kPa

2.7. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd.

Add.: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808.

Tel.: +86-0769-38826678, <http://www.dgddt.com>, Email: ddt@dgddt.com.

CNAS Accreditation No. L6451; A2LA Accreditation Number: 3870.01

FCC Designation Number: CN1182, Test Firm Registration Number: 540522

Innovation, Science and Economic Development Canada Site Registration Number: 10288A

Conformity Assessment Body identifier: CN0048

VCCI facility registration number: C-20087, T-20088, R-20123, R-20155, G-20118

2.8. Measurement uncertainty

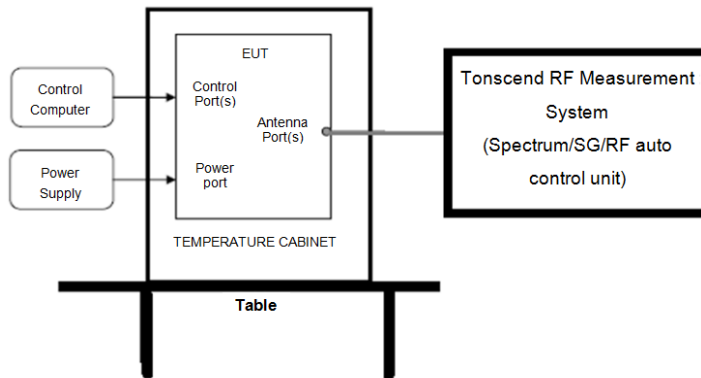
Test Item	Uncertainty
Bandwidth	1.1%
Peak Output Power (Conducted) (Spectrum analyzer)	0.86 dB ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$); 1.38 dB ($3.6 \text{ GHz} \leq f < 8 \text{ GHz}$)
Peak Output Power (Conducted) (Power Sensor)	0.74 dB
Power Spectral Density	0.74 dB ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$); 1.38 dB ($3.6 \text{ GHz} \leq f < 8 \text{ GHz}$)
Frequencies Stability	6.7×10^{-8} (Antenna couple method) 5.5×10^{-8} (Conducted method)
Conducted spurious emissions	0.86 dB ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$); 1.40 dB ($3.6 \text{ GHz} \leq f < 8 \text{ GHz}$) 1.66 dB ($8 \text{ GHz} \leq f < 22 \text{ GHz}$)
Uncertainty for radio frequency (RBW<20 kHz)	3×10^{-8}
Temperature	0.4°C
Humidity	2%
Uncertainty for Radiation Emission test (30 MHz-1 GHz)	4.70 dB (Antenna Polarize: V) 4.84 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission test (1 GHz-40 GHz)	4.10 dB (1-6 GHz) 4.40 dB (6 GHz-18 GHz) 3.54 dB (18 GHz-26 GHz) 4.30 dB (26 GHz-40 GHz)
Uncertainty for Power line conduction emission test	3.32 dB (150 kHz-30 MHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3. Equipment Used During Test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
☑RF Connected Test (Tonscend RF Measurement System 3#)					
SPECTRUM ANALYZER	R&S	FSU26	200071	Sep. 02, 2021	1 Year
Wideband Radio Communication tester	R&S	CMW500	117491	May 18, 2022	1 Year
Vector Signal Generator	Agilent	N5182A	MY19060405	May 18, 2022	1 Year
Vector Signal Generator	Agilent	N5182A	MY48180912	May 18, 2022	1 Year
RF Control Unit	Tonsend	JS0806-2	DDT-ZC01449	May 18, 2022	1 Year
Temp&Humi Programmable	ZHIXIANG	ZXGDJS-150L	ZX170110-A	May 26, 2022	1 Year
Test Software	JS Tonscend	JS1120-3	Ver.2.6.77.0518	N/A	N/A
☑Radiation 3#chamber					
EMI Test Receiver	R&S	ESU	100472	May 18, 2022	1 Year
Spectrum analyzer	Agilent	E4447A	MY50180031	May 18, 2022	1 Year
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	Sep. 19, 2021	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB 9163	01429	Aug. 07, 2021	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB 9163	01429	Jul. 22, 2022	1 Year
Double Ridged Horn Antenna	Schwarzbeck	BBHA9120	02468	Nov. 17, 2021	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	May 06, 2022	1 Year
Pre-amplifier	COM-POWER	PAM-118A	18040084	Sep. 02, 2021	1 Year
Pre-amplifier	COM-POWER	PAM-840A	461369	Apr. 11, 2022	1 Year
Test software	Audix	E3	V 6.1.1.1	N/A	N/A
☑Power Line Conducted Emissions Test 1#					
Test Receiver	R&S	ESCI	100551	Sep. 02, 2021	1 Year
LISN 1	R&S	ENV216	101109	Sep. 02, 2021	1 Year
LISN 2	R&S	ESH2-Z5	100309	Sep. 02, 2021	1 Year
Pulse Limiter	R&S	ESH3-Z2	101242	Sep. 02, 2021	1 Year
CE Cable 1	HUBSER	N/A	W10.01	Sep. 02, 2021	1 Year
LISN 3	SCHWARZBECK	NSLK 8163	00017	Sep. 02, 2021	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A

4. 6dB Bandwidth and 99% Bandwidth

4.1. Block diagram of test setup



4.2. Limits

For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz

4.3. Test procedure

(1) Connect EUT's antenna output to spectrum analyzer by RF cable.

(2) 99% Bandwidth set the spectrum analyzer as follows:

RBW: 1%-5%OBW

VBW: $\geq 3\text{RBW}$

Detector Mode: Peak

Sweep time: auto

Trace mode Max hold

(3) 6dB Bandwidth set the spectrum analyzer as follows:

RBW: 100 kHz

VBW: 300 kHz

Detector Mode: Peak

Sweep time: auto

Trace mode Max hold

(4) Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.4. Test result

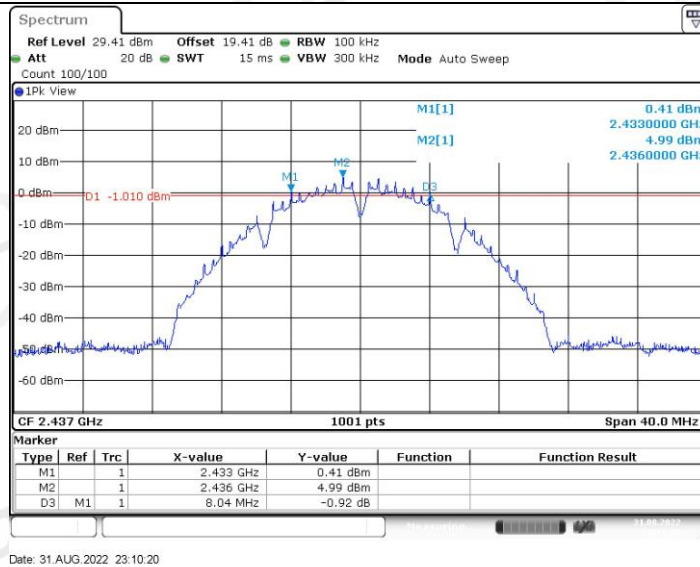
Test Mode	Test	Ant	6dB Bandwidth [MHz]	Limit [MHz]	Verdict
11B	2412	Ant1	7.60	0.5	Pass
11B	2412	Ant2	8.04	0.5	Pass
11B	2437	Ant1	8.04	0.5	Pass
11B	2437	Ant2	8.04	0.5	Pass
11B	2462	Ant1	8.04	0.5	Pass
11B	2462	Ant2	7.16	0.5	Pass
11G	2412	Ant1	15.76	0.5	Pass
11G	2412	Ant2	15.72	0.5	Pass
11G	2437	Ant1	16.00	0.5	Pass
11G	2437	Ant2	16.00	0.5	Pass
11G	2462	Ant1	16.12	0.5	Pass
11G	2462	Ant2	16.32	0.5	Pass
11N20MIMO	2412	Ant1	17.36	0.5	Pass
11N20MIMO	2412	Ant2	17.68	0.5	Pass
11N20MIMO	2437	Ant1	17.64	0.5	Pass
11N20MIMO	2437	Ant2	17.68	0.5	Pass
11N20MIMO	2462	Ant1	17.68	0.5	Pass
11N20MIMO	2462	Ant2	17.72	0.5	Pass
11N40MIMO	2422	Ant1	36.00	0.5	Pass
11N40MIMO	2422	Ant2	36.32	0.5	Pass
11N40MIMO	2437	Ant1	36.40	0.5	Pass
11N40MIMO	2437	Ant2	36.40	0.5	Pass
11N40MIMO	2452	Ant1	36.48	0.5	Pass
11N40MIMO	2452	Ant2	36.48	0.5	Pass
11AX20MIMO	2412	Ant1	17.04	0.5	Pass
11AX20MIMO	2412	Ant2	17.72	0.5	Pass
11AX20MIMO	2437	Ant1	18.60	0.5	Pass
11AX20MIMO	2437	Ant2	18.36	0.5	Pass
11AX20MIMO	2462	Ant1	18.72	0.5	Pass
11AX20MIMO	2462	Ant2	18.60	0.5	Pass
11AX40MIMO	2422	Ant1	37.92	0.5	Pass
11AX40MIMO	2422	Ant2	38.08	0.5	Pass
11AX40MIMO	2437	Ant1	38.08	0.5	Pass
11AX40MIMO	2437	Ant2	38.08	0.5	Pass
11AX40MIMO	2452	Ant1	38.24	0.5	Pass
11AX40MIMO	2452	Ant2	38.00	0.5	Pass

Test Mode	Test	Ant	99% OBW [MHz]	Limit [MHz]	Verdict
11B	2412	Ant1	12.83	---	Pass
11B	2412	Ant2	12.71	---	Pass
11B	2437	Ant1	12.95	---	Pass
11B	2437	Ant2	12.87	---	Pass
11B	2462	Ant1	13.03	---	Pass
11B	2462	Ant2	12.99	---	Pass
11G	2412	Ant1	16.54	---	Pass
11G	2412	Ant2	16.50	---	Pass
11G	2437	Ant1	16.58	---	Pass
11G	2437	Ant2	16.58	---	Pass
11G	2462	Ant1	16.62	---	Pass
11G	2462	Ant2	16.58	---	Pass
11N20MIMO	2412	Ant1	18.18	---	Pass
11N20MIMO	2412	Ant2	18.10	---	Pass
11N20MIMO	2437	Ant1	18.26	---	Pass
11N20MIMO	2437	Ant2	18.30	---	Pass
11N20MIMO	2462	Ant1	18.26	---	Pass
11N20MIMO	2462	Ant2	18.26	---	Pass
11N40MIMO	2422	Ant1	36.20	---	Pass
11N40MIMO	2422	Ant2	36.28	---	Pass
11N40MIMO	2437	Ant1	36.44	---	Pass
11N40MIMO	2437	Ant2	36.44	---	Pass
11N40MIMO	2452	Ant1	36.52	---	Pass
11N40MIMO	2452	Ant2	36.44	---	Pass
11AX20MIMO	2412	Ant1	18.82	---	Pass
11AX20MIMO	2412	Ant2	18.82	---	Pass
11AX20MIMO	2437	Ant1	18.86	---	Pass
11AX20MIMO	2437	Ant2	18.90	---	Pass
11AX20MIMO	2462	Ant1	18.90	---	Pass
11AX20MIMO	2462	Ant2	18.86	---	Pass
11AX40MIMO	2422	Ant1	37.80	---	Pass
11AX40MIMO	2422	Ant2	37.80	---	Pass
11AX40MIMO	2437	Ant1	37.88	---	Pass
11AX40MIMO	2437	Ant2	37.96	---	Pass
11AX40MIMO	2452	Ant1	38.04	---	Pass
11AX40MIMO	2452	Ant2	37.96	---	Pass

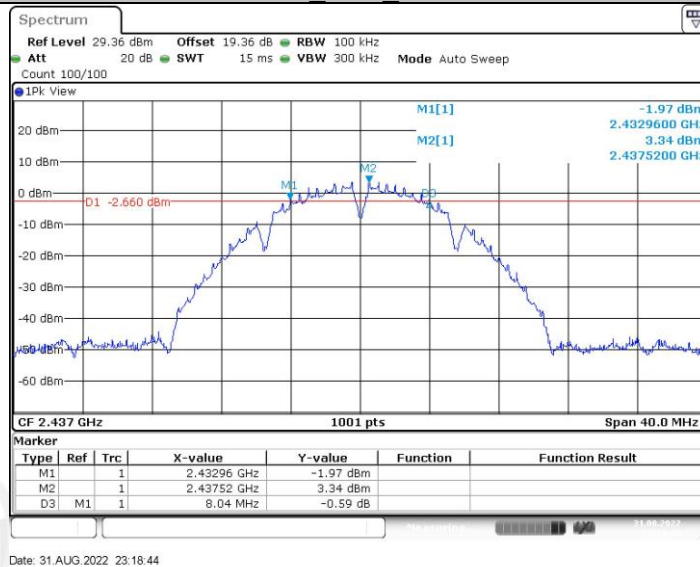
4.5. Original test data

6 dB bandwidth:

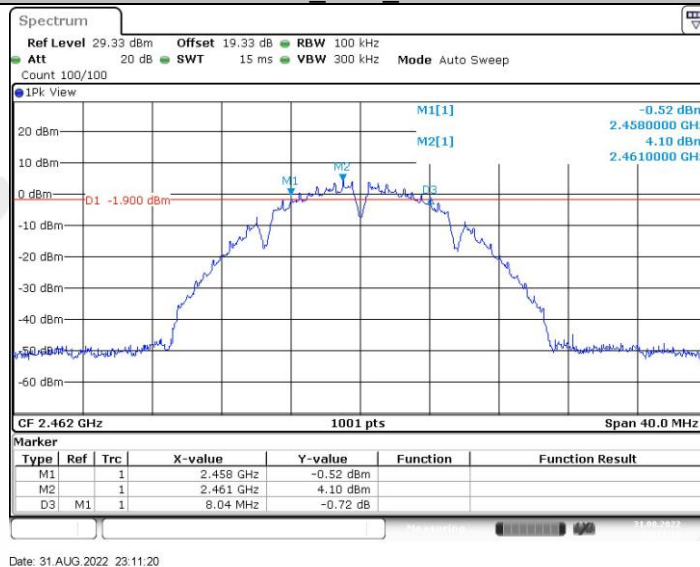




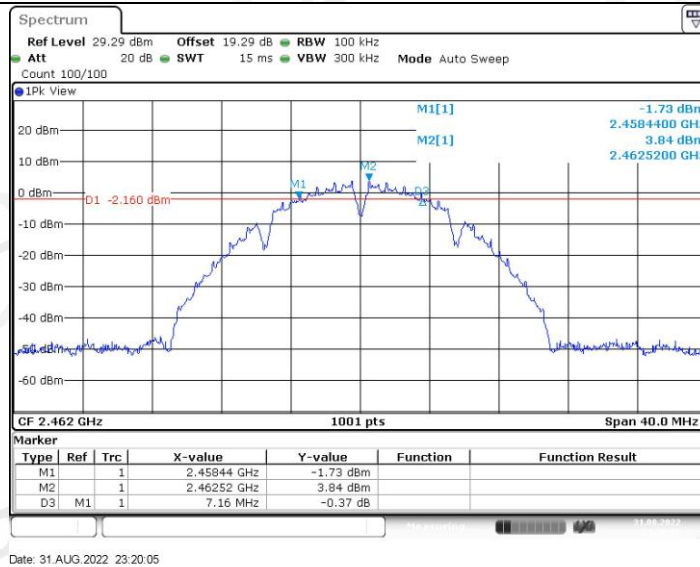
11B_Ant2_2437



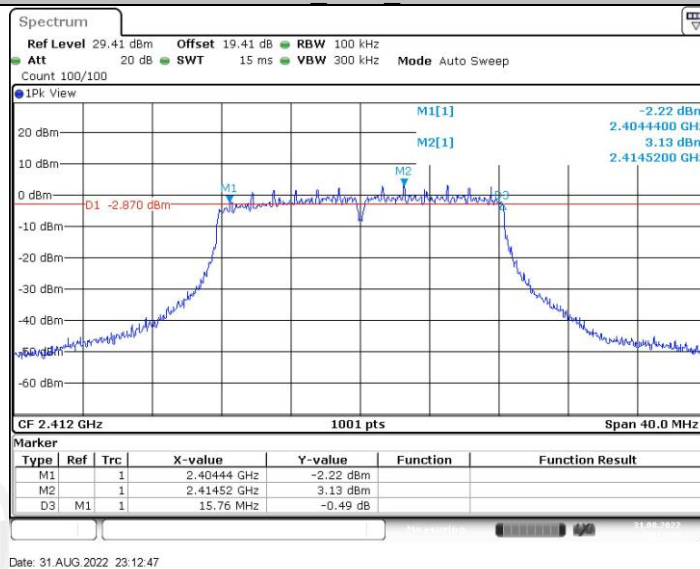
11B_Ant1_2462



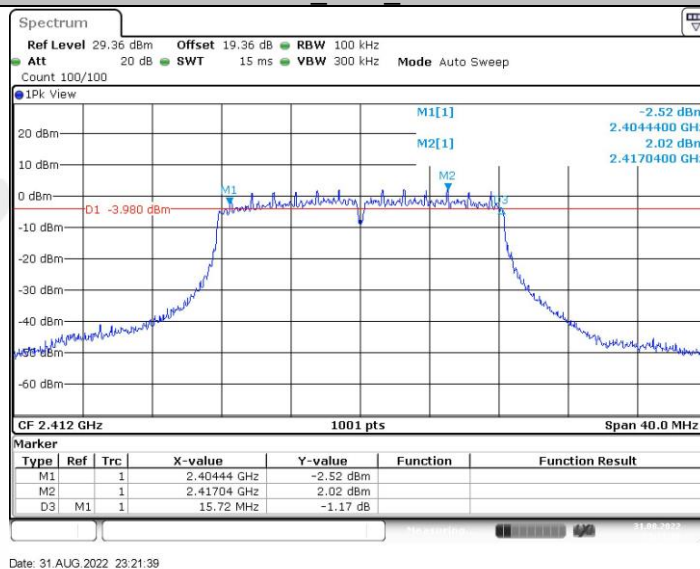
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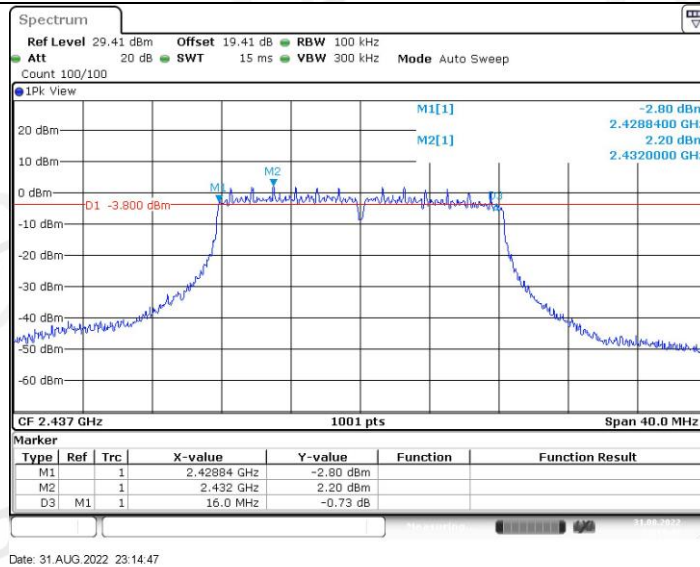
11G Ant1 2412



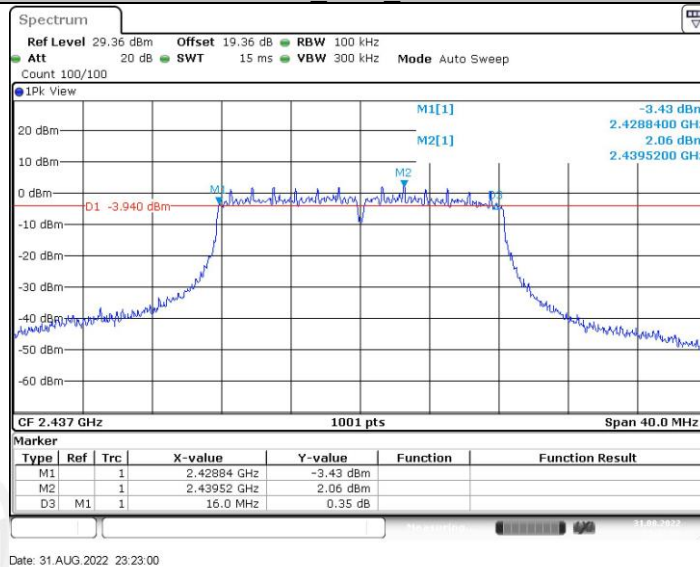
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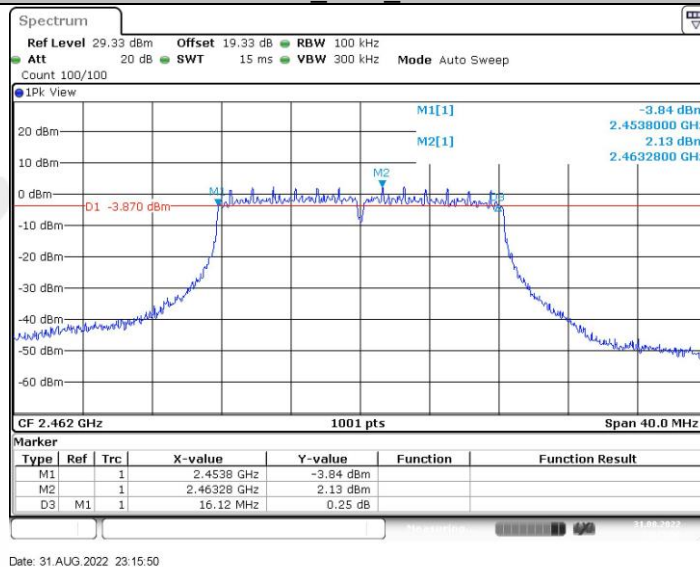
11G Ant1 2437



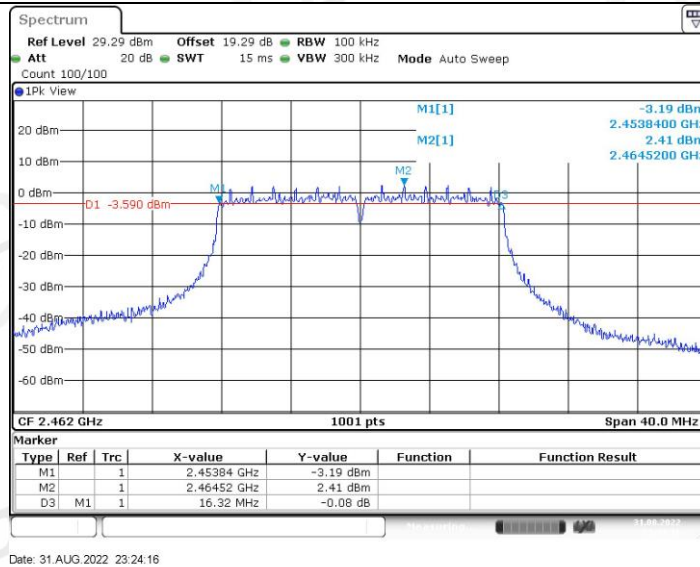
11G_Ant2_2437



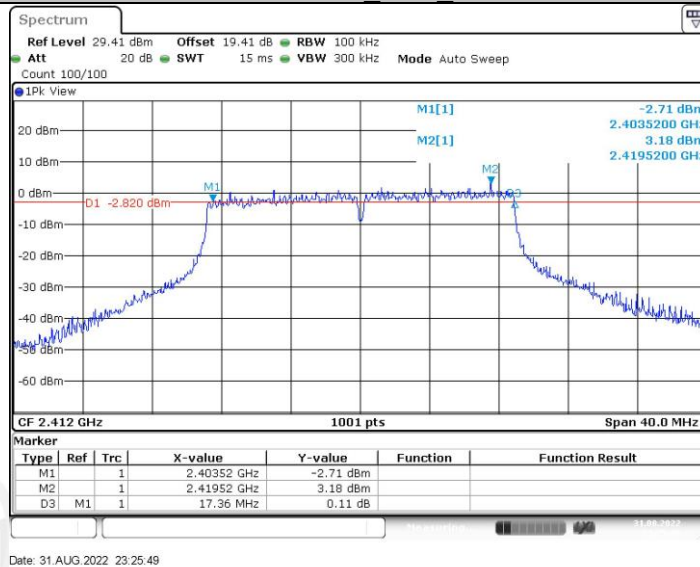
11G_Ant1_2462



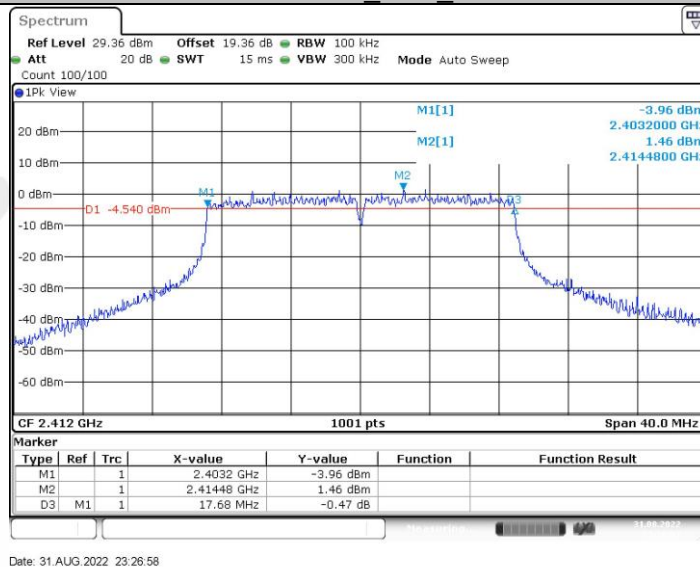
11G_Ant2_2462



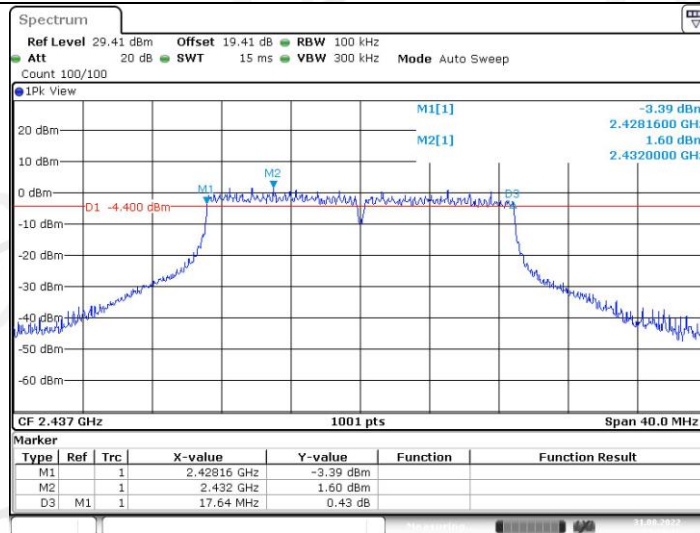
11N20MIMO_Ant1_2412



11N20MIMO_Ant2_2412

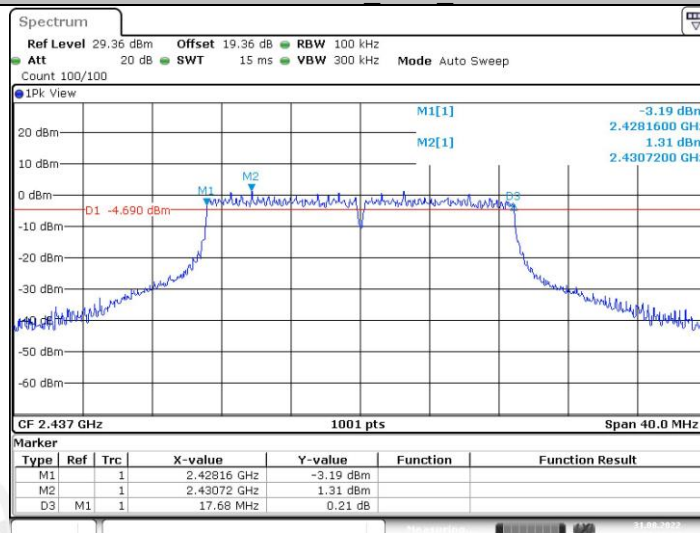


11N20MIMO_Ant1_2437



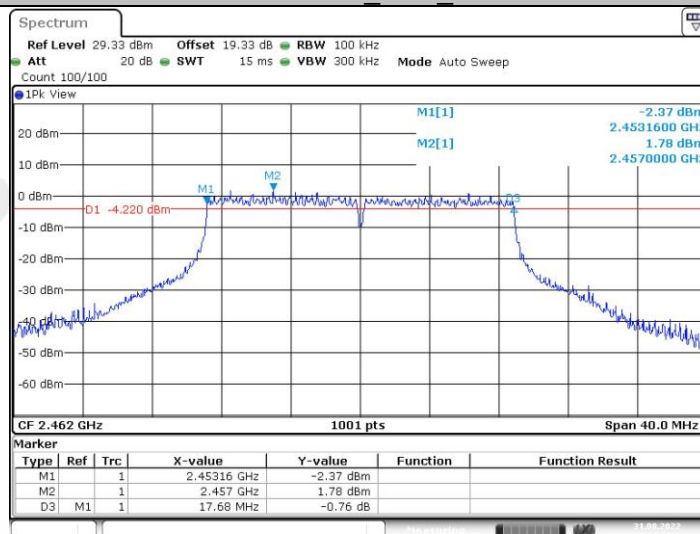
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11N20MIMO_Ant2_2437



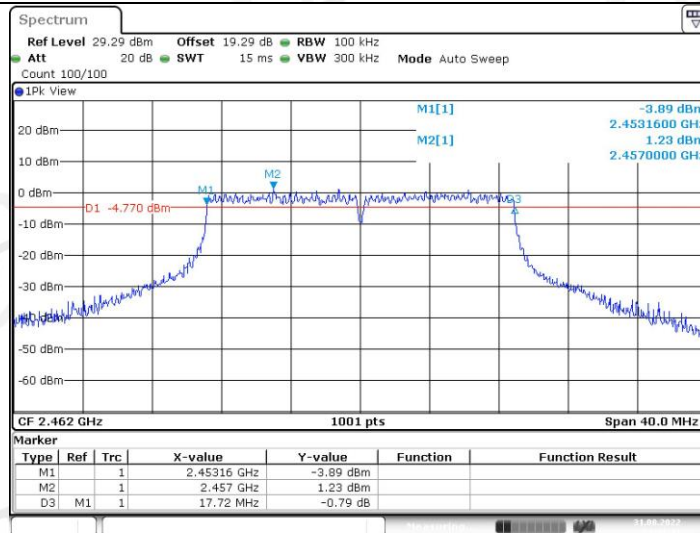
Date: 31 AUG 2022 23:29:15

11N20MIMO_Ant1_2462



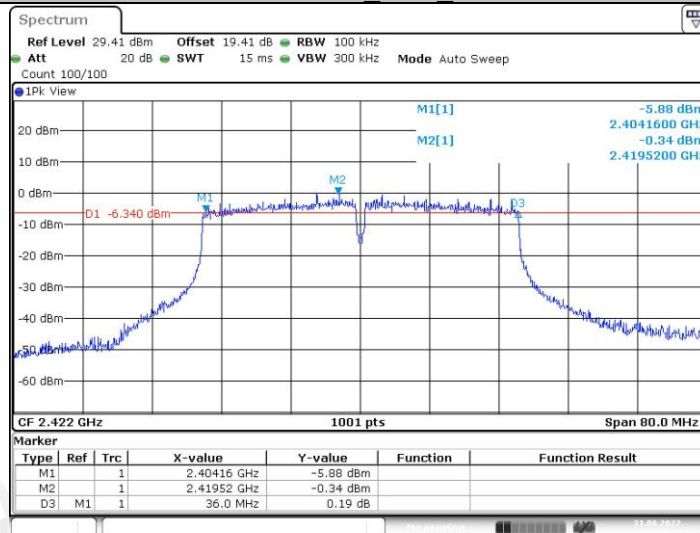
Date: 31 AUG 2022 23:30:23

11N20MIMO_Ant2_2462



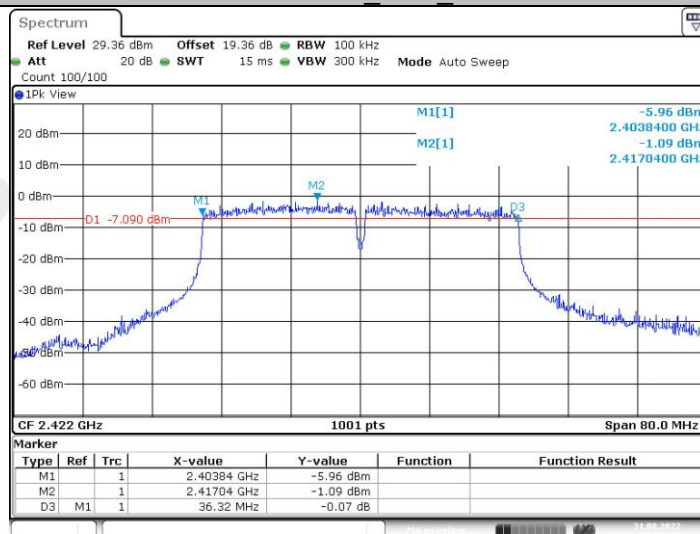
Date: 31 AUG 2022 23:31:32

11N40MIMO_Ant1_2422



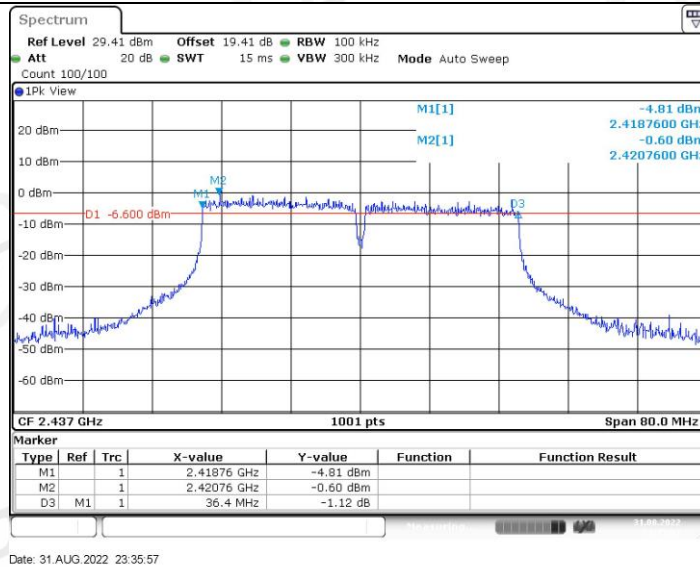
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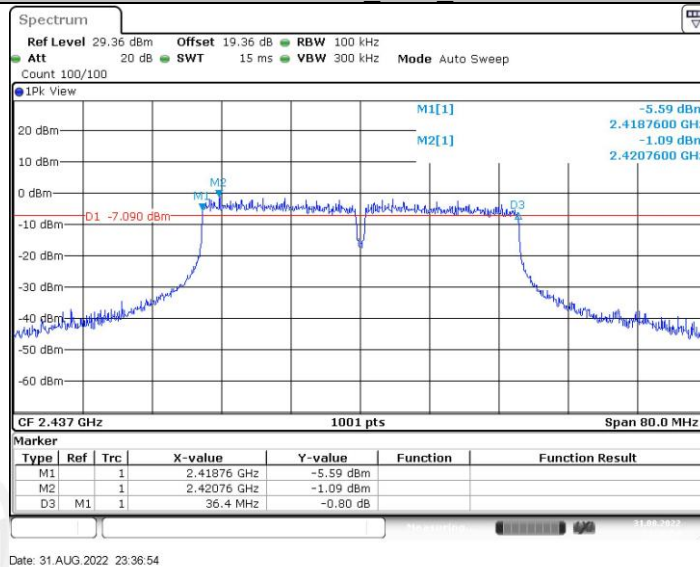


Date: 31 AUG 2022 23:34:27

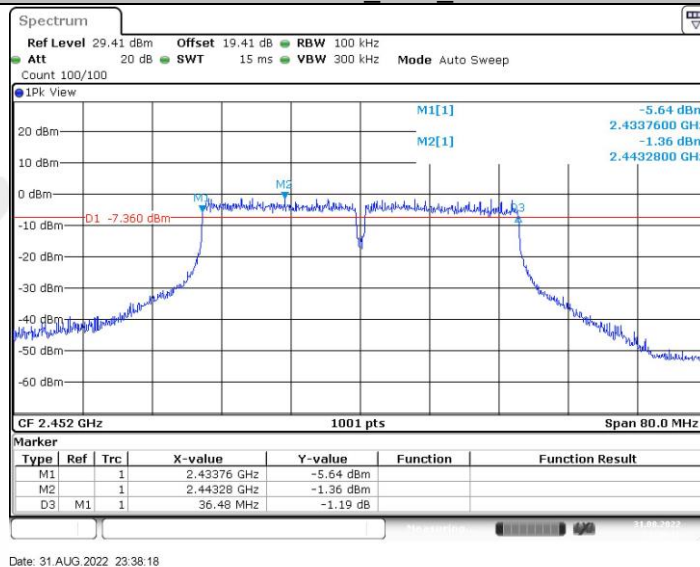
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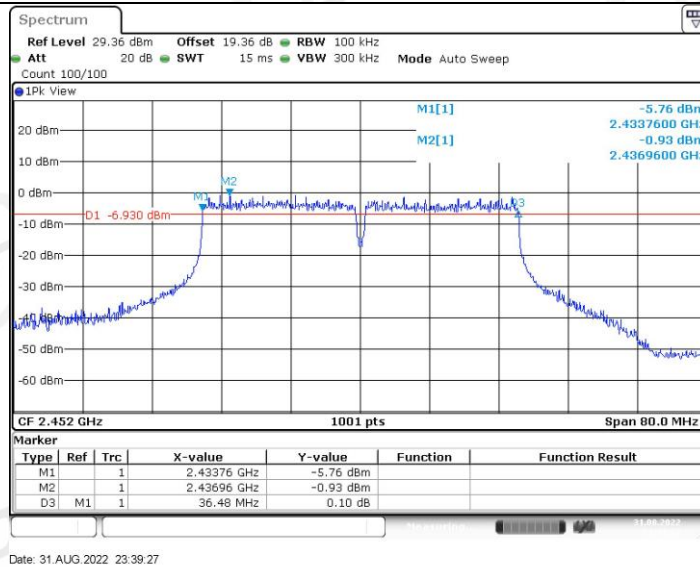
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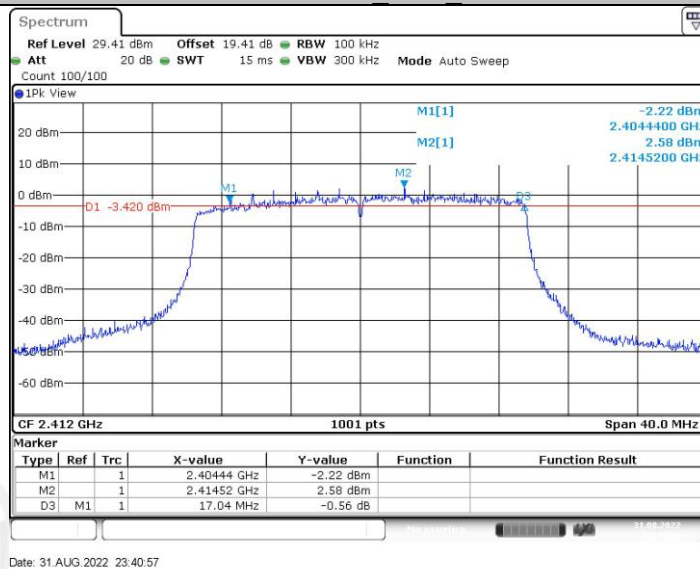
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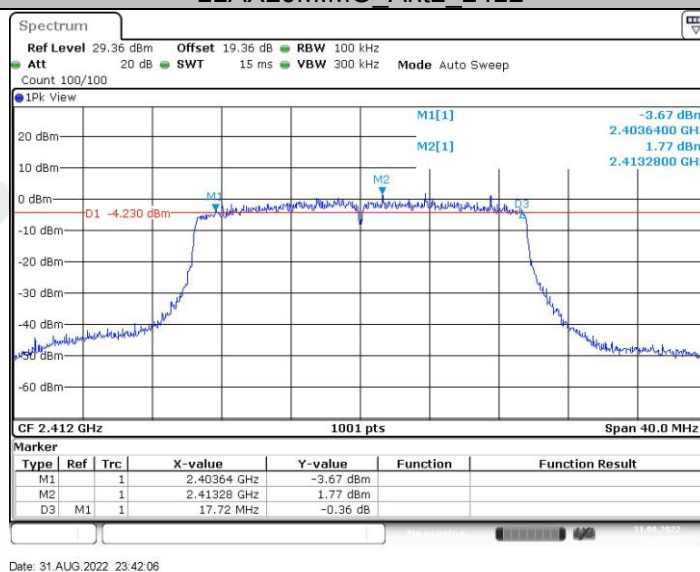
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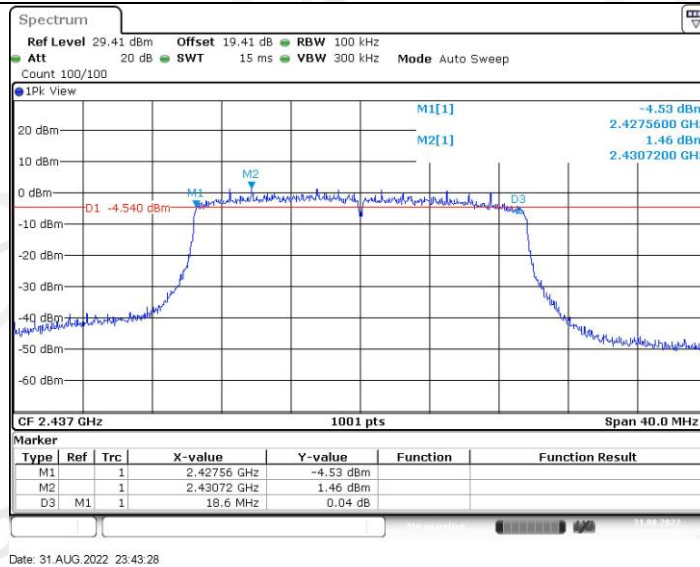
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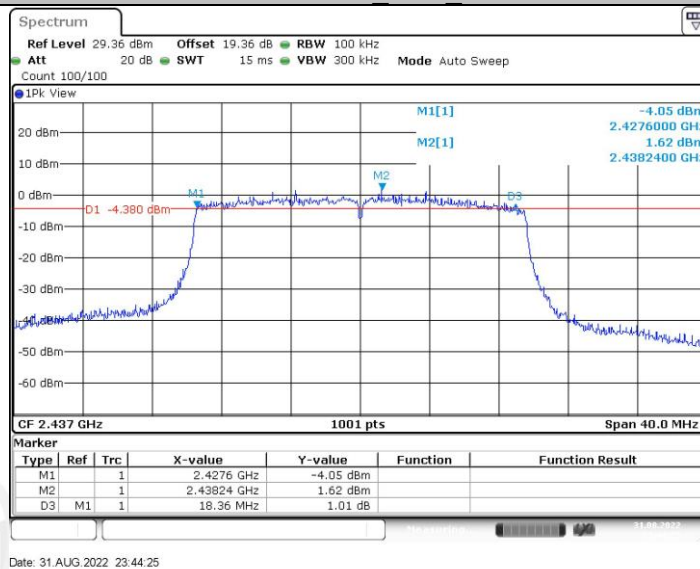
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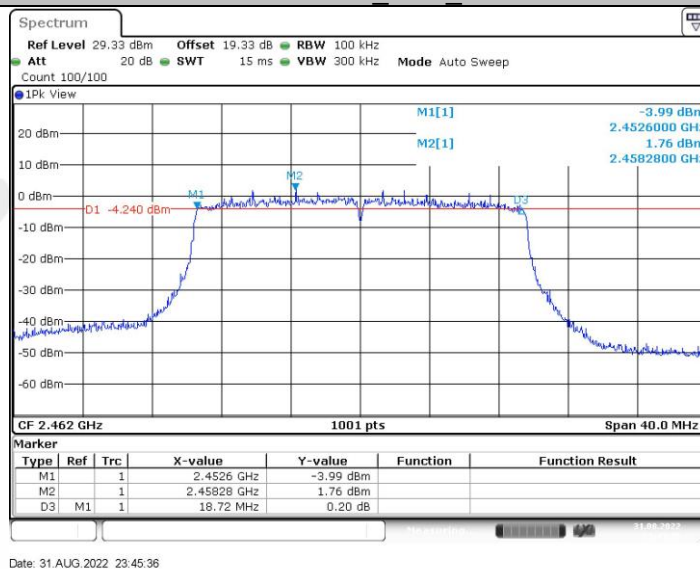
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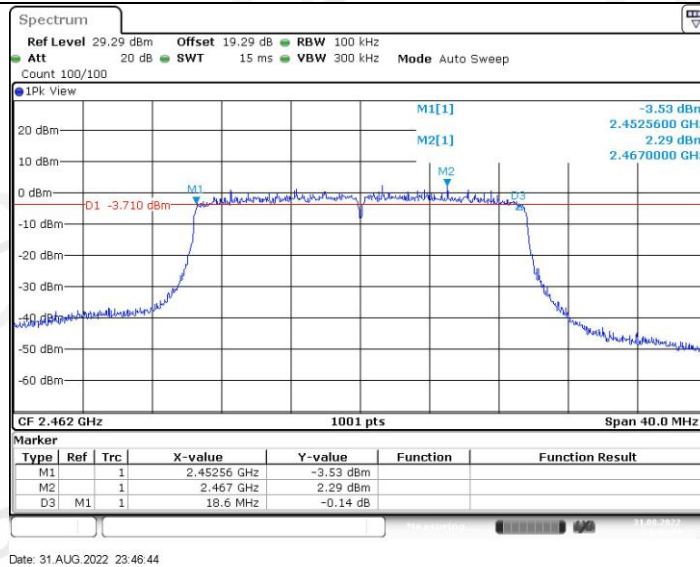
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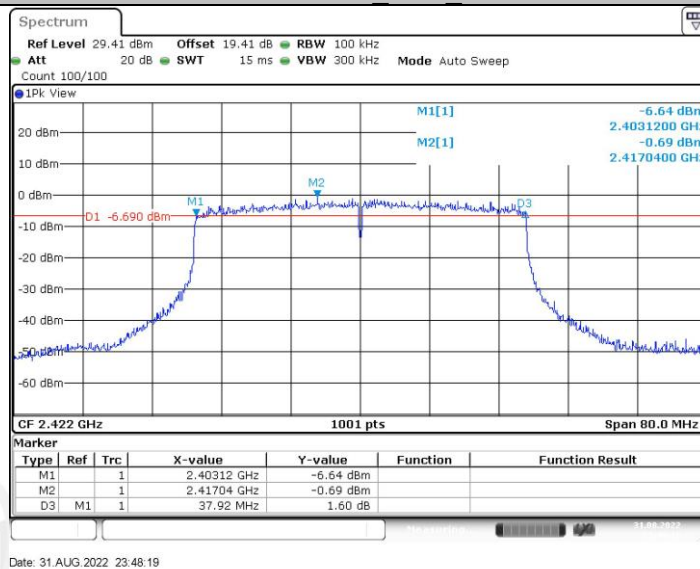
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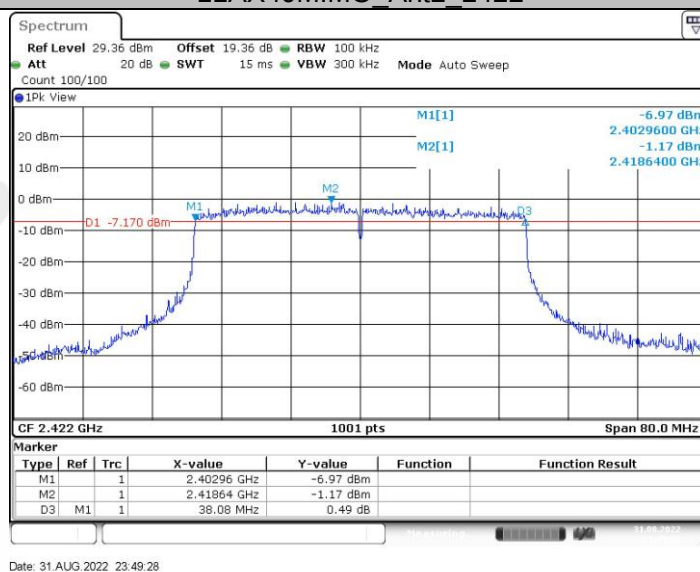
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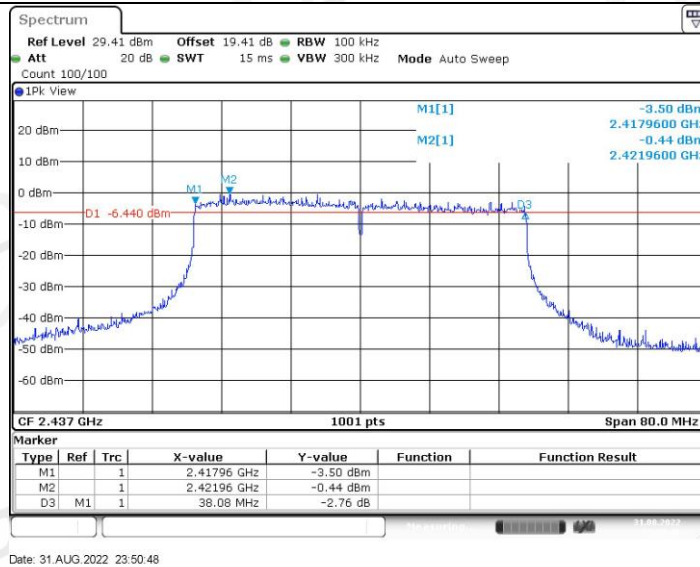
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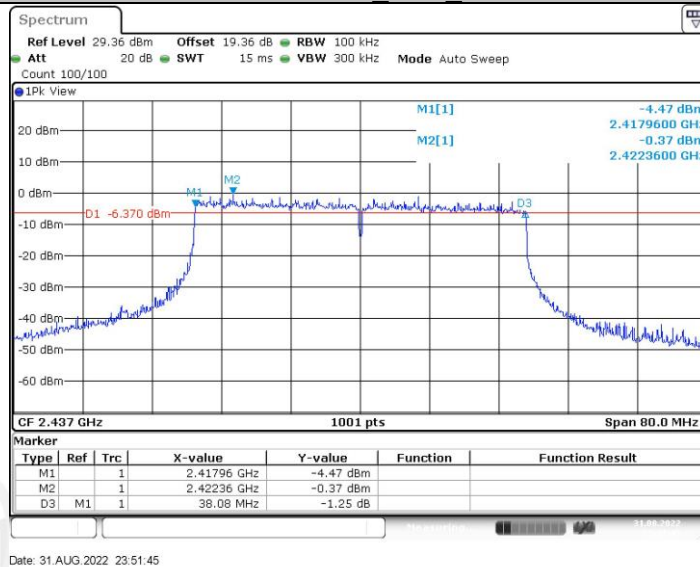
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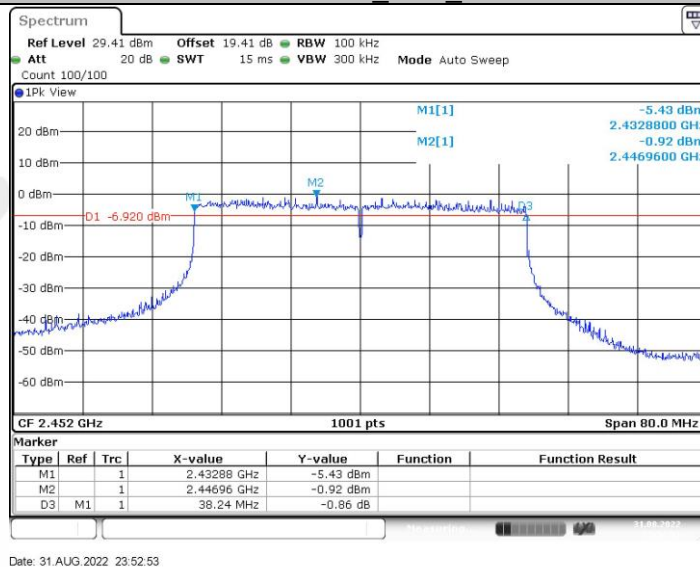
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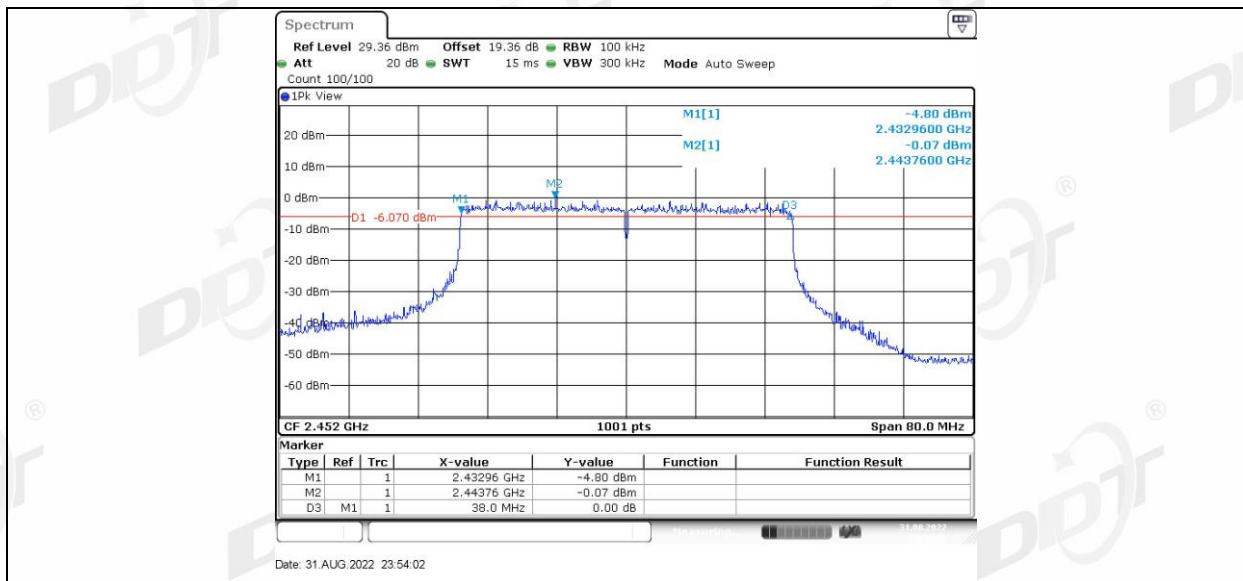
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11AX40MIMO_Ant1_2452

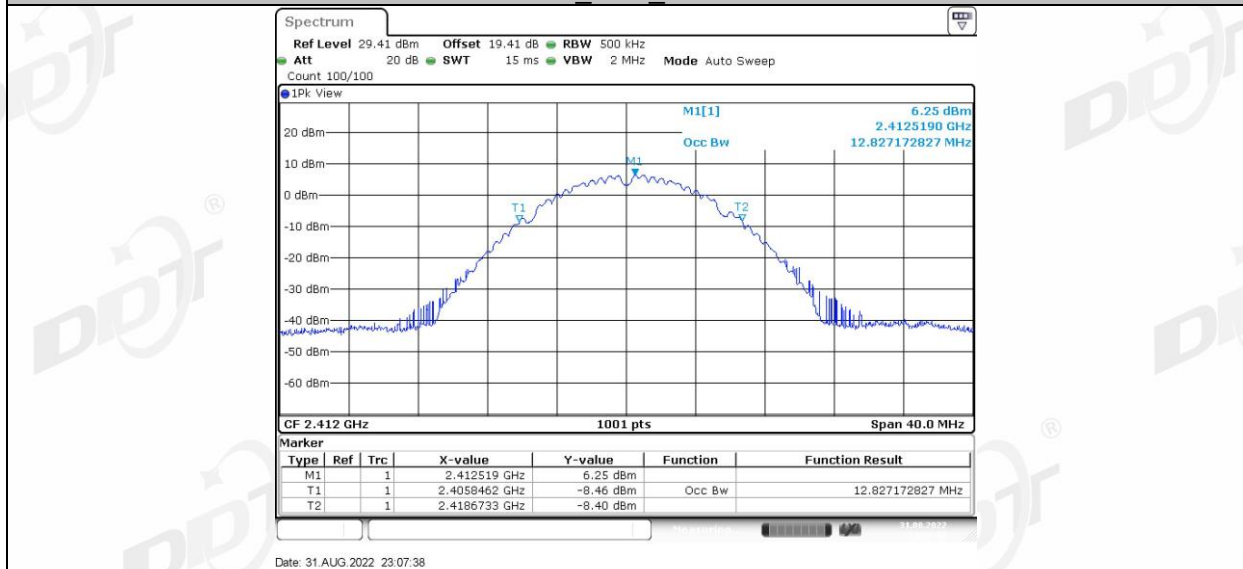


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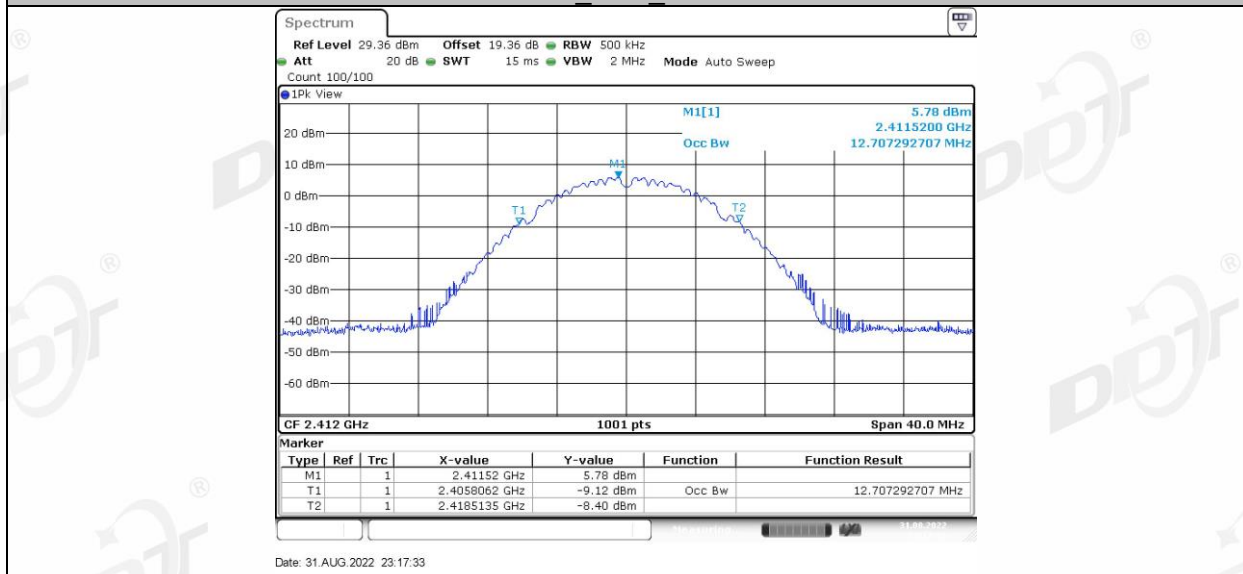


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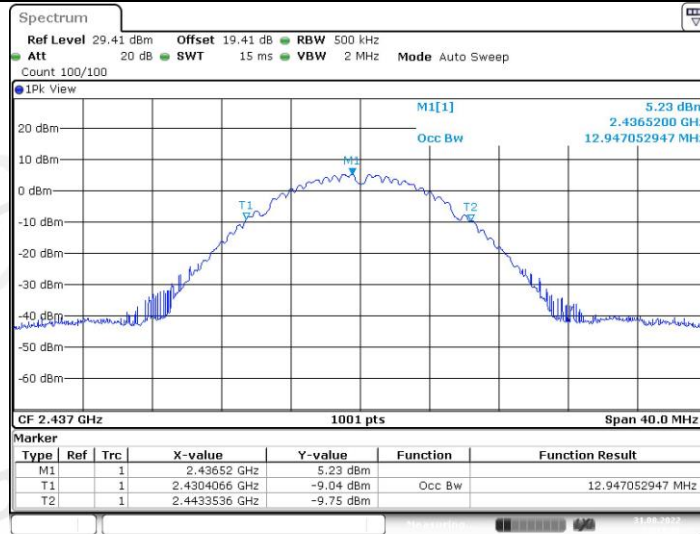
11B_Ant1_2412



11B_Ant2_2412

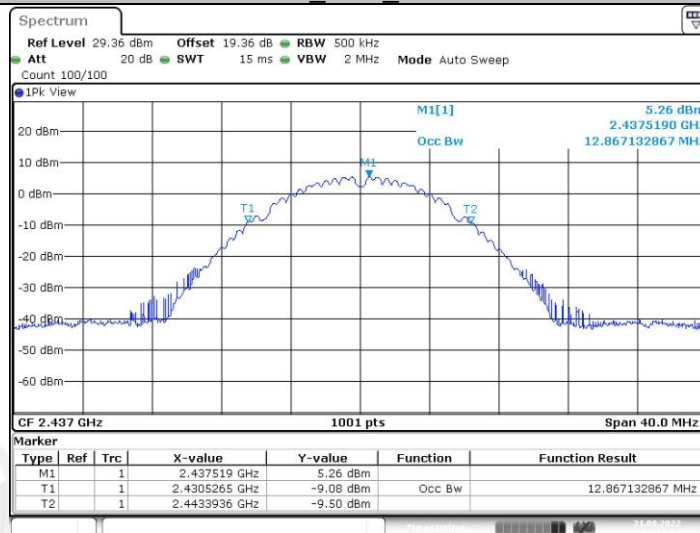


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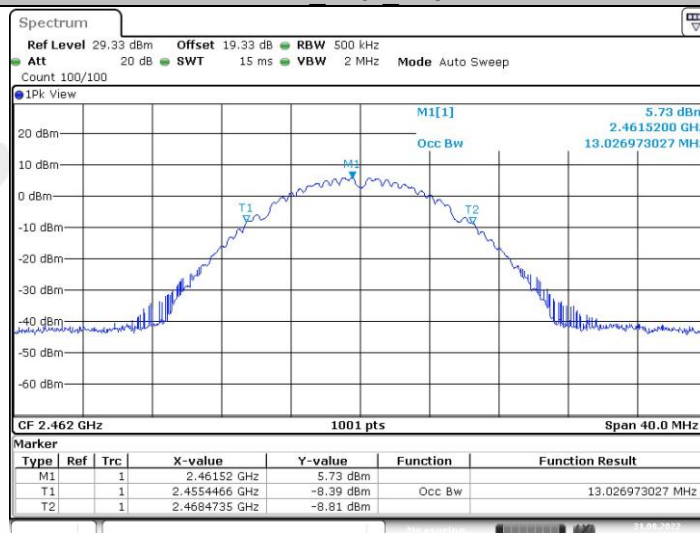
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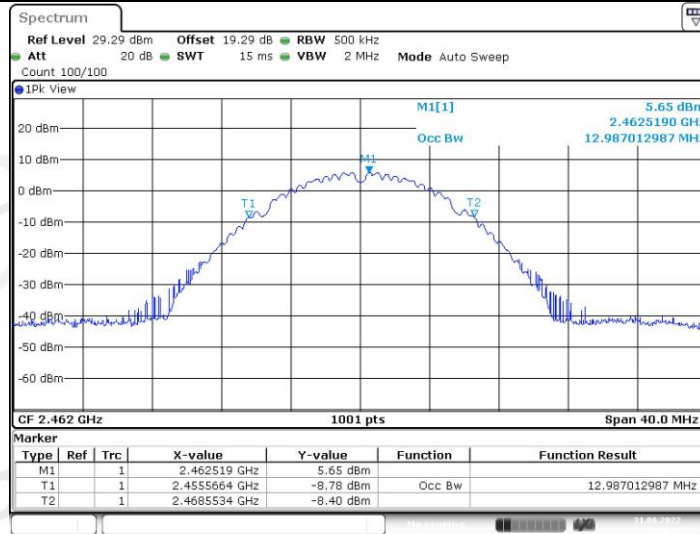
Date: 31.AUG.2022 23:18:54

11B_Ant1_2462



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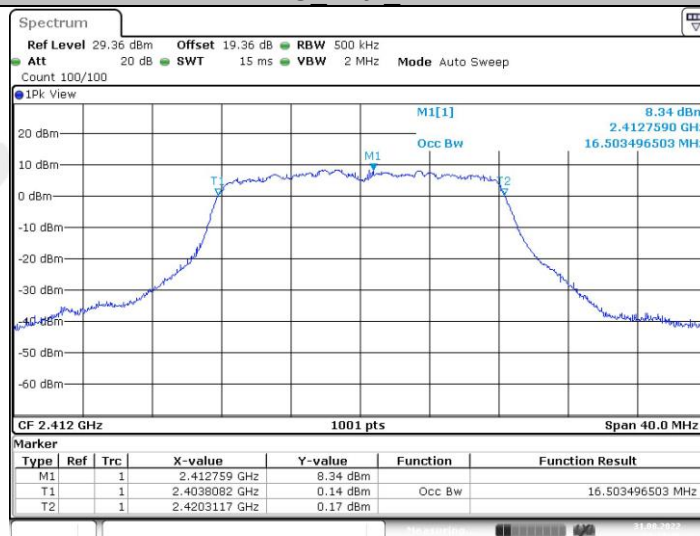
11B_Ant2_2462



11G_Ant1_2412



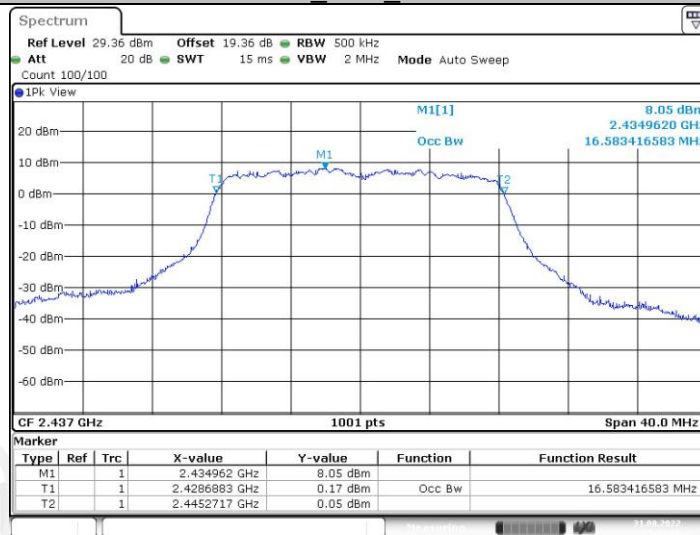
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11G_Ant1_2437



11G_Ant2_2437



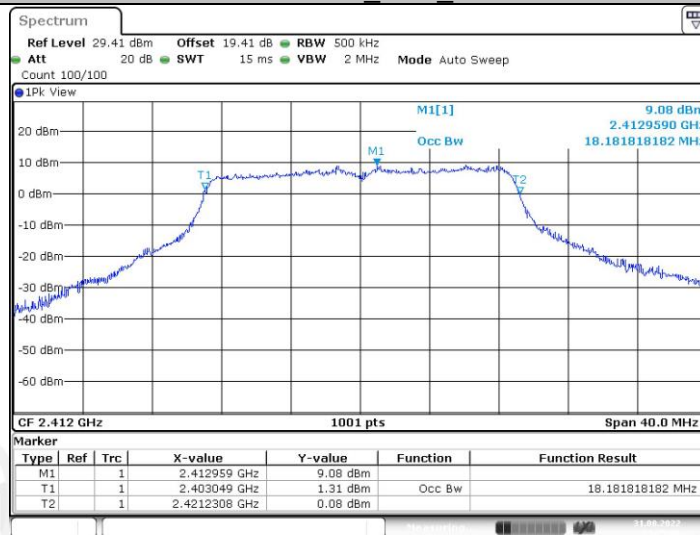
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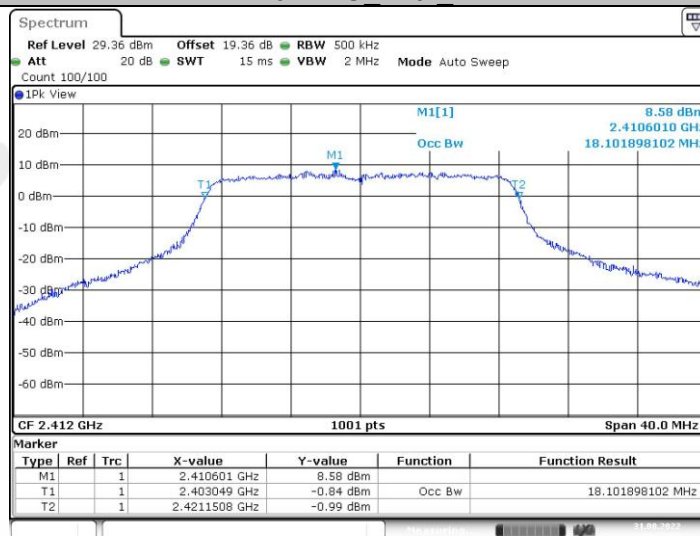
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11N20MIMO_Ant1_2412



11N20MIMO_Ant2_2412

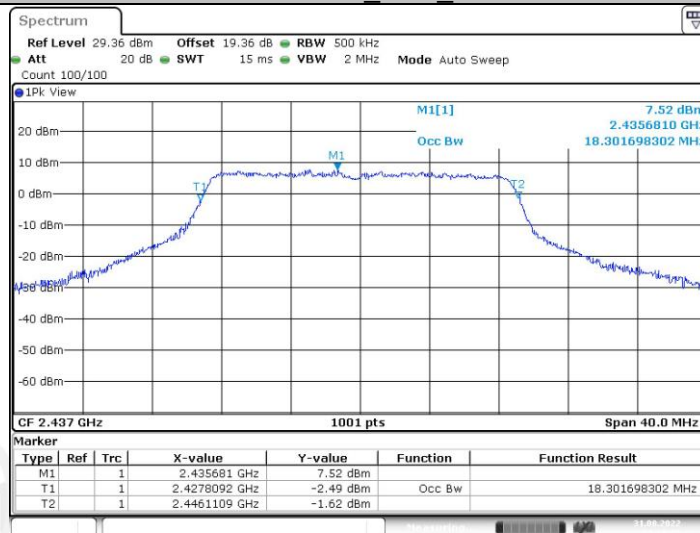


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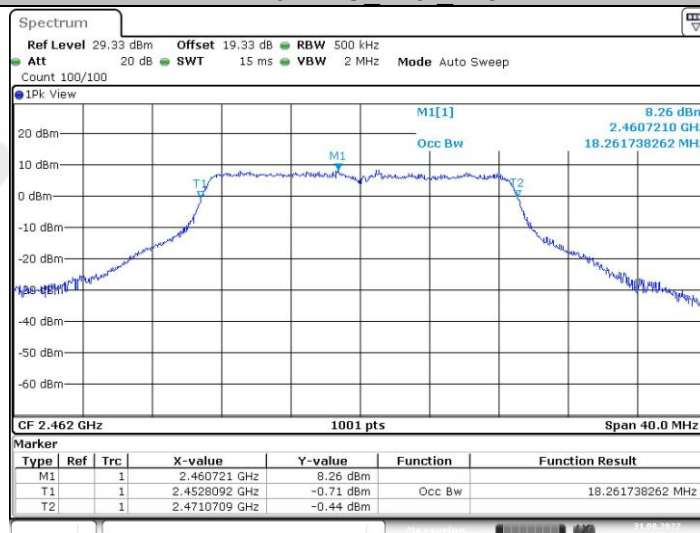
Date: 31 AUG 2022 23:28:27

11N20MIMO_Ant2_2437



Date: 31 AUG 2022 23:29:24

11N20MIMO_Ant1_2462



Date: 31 AUG 2022 23:30:33

11N20MIMO_Ant2_2462



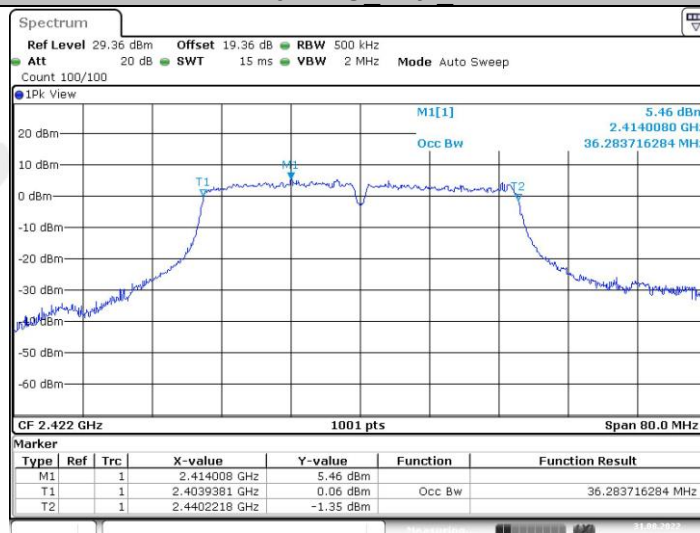
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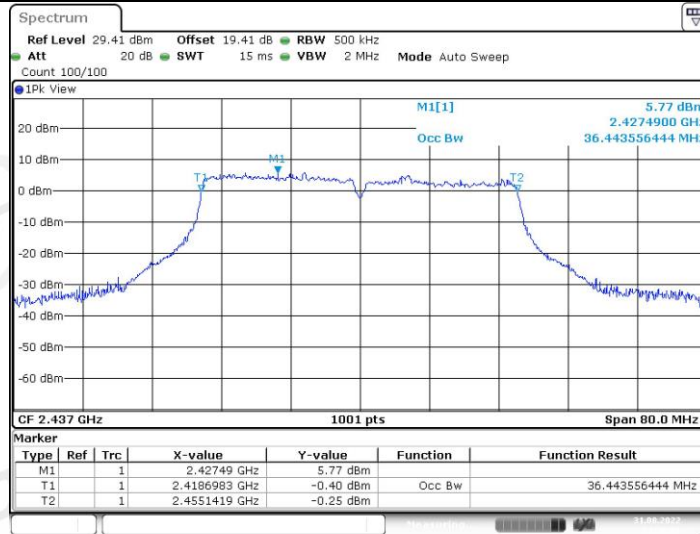
Date: 31 AUG 2022 23:33:27

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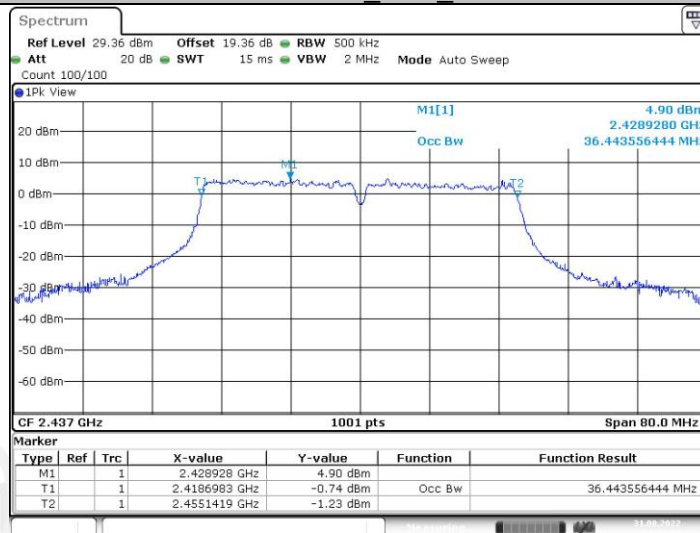
Date: 31 AUG 2022 23:34:36

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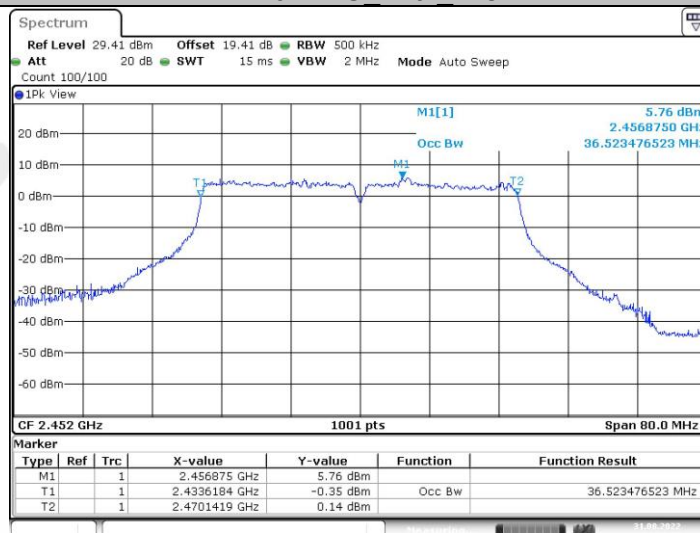
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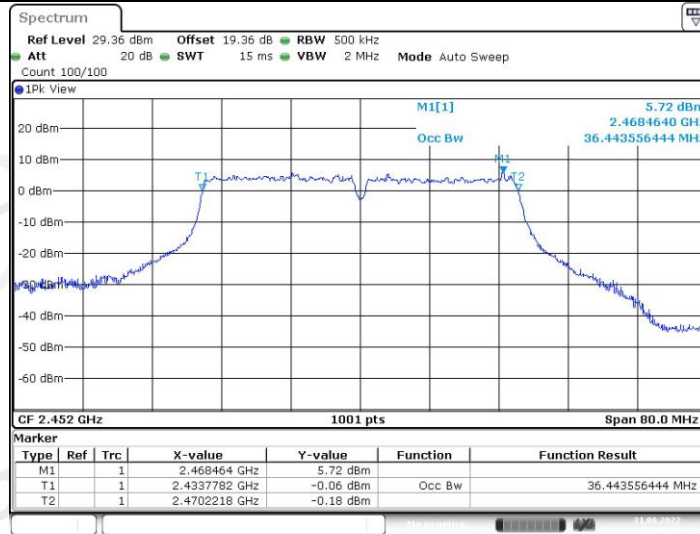
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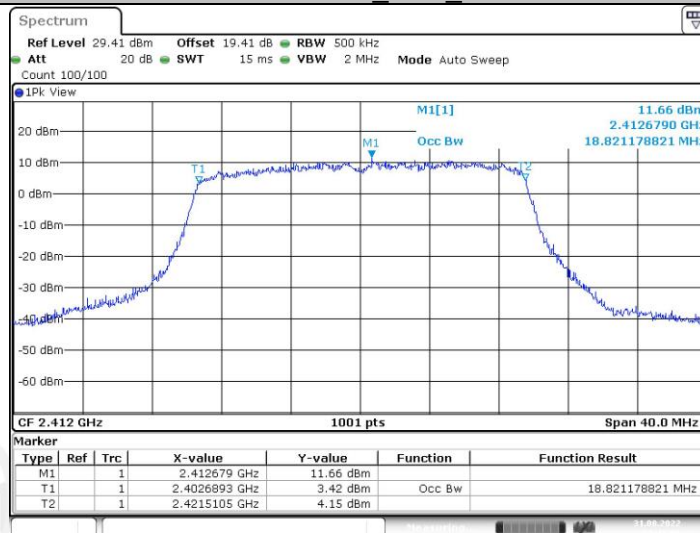
Date: 31 AUG 2022 23:38:28

11N40MIMO_Ant2_2452



Date: 31 AUG 2022 23:39:37

11AX20MIMO_Ant1_2412



Date: 31 AUG 2022 23:41:06

11AX20MIMO_Ant2_2412

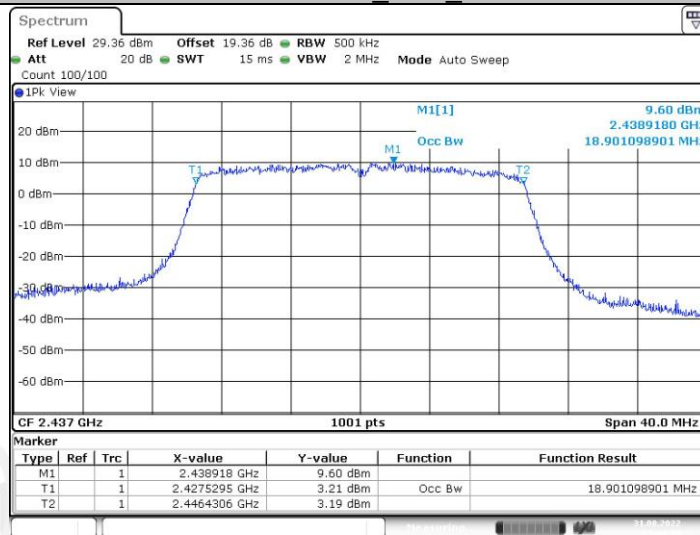


Date: 31 AUG 2022 23:42:15

11AX20MIMO_Ant1_2437



11AX20MIMO_Ant2_2437



11AX20MIMO_Ant1_2462

