China

FCC - TEST REPORT

Report Number	:	**708882100633-00**	Date of Issue:	December 15, 2021

Model	:	**FOTRIC 326M etc. (Details refer to page 4)**
Product Type	:	Infrared Thermal Camera
FCC ID	:	2AZTCMOTH
Applicant	:	FOTRIC INC.
Address	:	No. 14, Lane 2500, Xiupu Road, Pudong, 201201 Shanghai, PEOPLE'S REPUBLIC OF CHINA
Manufacturer	:	FOTRIC INC.
Address	:	No. 14, Lane 2500, Xiupu Road, Pudong, 201201 Shanghai, PEOPLE'S REPUBLIC OF CHINA

Test Result	:	■ **Positive** ☐ **Negative**
Total pages including Appendices	:	60

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1	TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch No.16 Lane, 1951 Du Hui Road, Shanghai 201108, P.R. China
Telephone:	+86 21 6141 0123
Fax:	+86 21 6140 8600
FCC Registration No.:	820234
FCC Designation Number:	CN1183
ISED#:	25988
CAB identifier:	CN0101

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3 Description of the Equipment under Test

Product:	Infrared Thermal Camera
Model no.:	FOTRIC 326Q, FOTRIC 325Q, FOTRIC 325Q, FOTRIC 323Q, FOTRIC 323Q, FOTRIC 321Q, FOTRIC 316, FOTRIC 315, FOTRIC 314, FOTRIC 313, FOTRIC 312, FOTRIC 311, FOTRIC 336Q, FOTRIC 335Q, FOTRIC 334Q, FOTRIC 333Q, FOTRIC 332QA, FOTRIC 331QA, FOTRIC 336QA, FOTRIC 335QA, FOTRIC 334QA, FOTRIC 333QA, FOTRIC 332QA, FOTRIC 331QA, FOTRIC 326X, FOTRIC 325X, FOTRIC 324X, FOTRIC 323X, FOTRIC 322X, FOTRIC 321X, FOTRIC 316B, FOTRIC 315B, FOTRIC 314B, FOTRIC 313B, FOTRIC 312B, FOTRIC 311B, FOTRIC 326M, FOTRIC 325M, FOTRIC 325M, FOTRIC 323M, FOTRIC 322M, FOTRIC 321M, FOTRIC 326F, FOTRIC 325F, FOTRIC 323F, FOTRIC 322F, FOTRIC 321F, FOTRIC 326G, FOTRIC 325G, FOTRIC 324G, FOTRIC 323G, FOTRIC 322G, FOTRIC 321G, FOTRIC 329G, FOTRIC 328G, FOTRIC 327G, FOTRIC 329P, FOTRIC 328P, FOTRIC 327P, FOTRIC 326P, FOTRIC 325P, FOTRIC 324P, FOTRIC 323P, FOTRIC 322P, FOTRIC 321P, FOTRIC 326E, FOTRIC 325E, FOTRIC 324E, FOTRIC 323E, FOTRIC 322E, FOTRIC 321E, FOTRIC 329E, FOTRIC 328E, FOTRIC 327E, FOTRIC 311CE, FOTRIC 691B
Sample(s) Tested:	FOTRIC 326M
FCC ID:	2AZTCMOTH
Options and accessories:	Test harness
Rating:	DC 3.6V Li-ion Battery
RF Transmission Frequency:	2402~2480MHz for Bluetooth For 2.4G & 5G Wi-Fi For 802.11b/g/n-HT20: 2412~2462 MHz For 802.11n-HT40: 2422~2452 MHz 5180~5240 MHz (U-NII-1) 5260~5320 MHz (U-NII-2A) 5500~5720 MHz (U-NII-2C) 5745~5825 MHz (U-NII-3)
No. of Operated Channel:	79 channels for Bluetooth 4.2+EDR 40 channels for Bluetooth 4.2 BLE For 2.4GHz Wi-Fi

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Operation Frequency each of channel For 802.11b/g/n(H20)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		

Operation Frequency each of channel For 802.11n(H40)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
		4	2427MHz	7	2442MHz		
		5	2432MHz	8	2447MHz		
3	2422MHz	6	2437MHz	9	2452MHz		

5180~5240 MHz (U-NII-1)
5260~5320 MHz (U-NII-2A)
5500~5720 MHz (U-NII-2C)
5745~5825 MHz (U-NII-3)

Modulation: Bluetooth 5.0+EDR FHSS: GFSK, π/4 DQPSK, 8DPSK
Bluetooth 5.0+BLE digital modulation: GFSK
For Wi-Fi: Direct Sequence Spread Spectrum (DSSS) for 802.11b
Orthogonal Frequency Division Multiplexing (OFDM) for 802.11a/b/g/n/ac

Hardware Version: V02

Software Version: 1.0.13

Data speed: 1. Bluetooth 5.0+EDR FHSS: 1Mbps, 2Mbps, 3Mbps
2. Bluetooth 5.0+BLE digital modulation: 1Mbps
3. Wi-Fi: 11b 1 ~ 11Mbps,
11g/a 6 ~ 54Mbps, 11n HT20 6.5 ~ 72.2Mbps,
11n HT 40 13.5 ~ 150Mbps,
11ac VHT40 13.5 ~ 200Mbps,
11ac VHT80 29.3 ~ 433.3Mbps

Duty Cycle:

TestMode	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11B	2412	8.20	8.22	99.76
11G	2412	1.35	1.37	98.54
11N20SISO	2412	1.27	1.29	98.45
11N40SISO	2422	0.63	0.65	96.92
	2437	0.63	0.65	96.92

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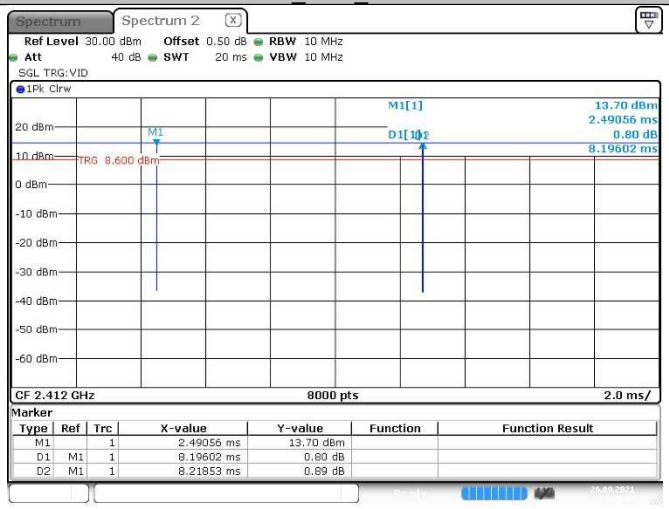
11B_Ant1_2412



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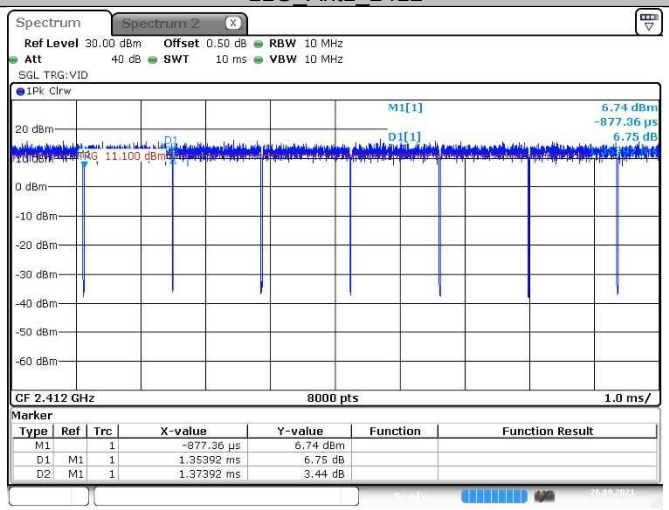

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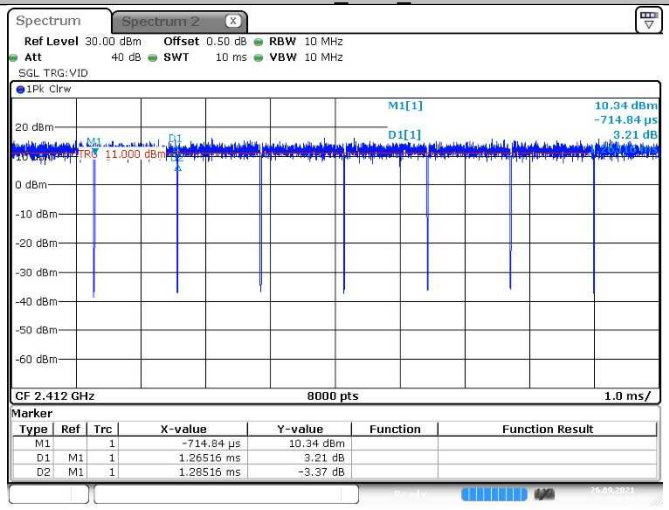

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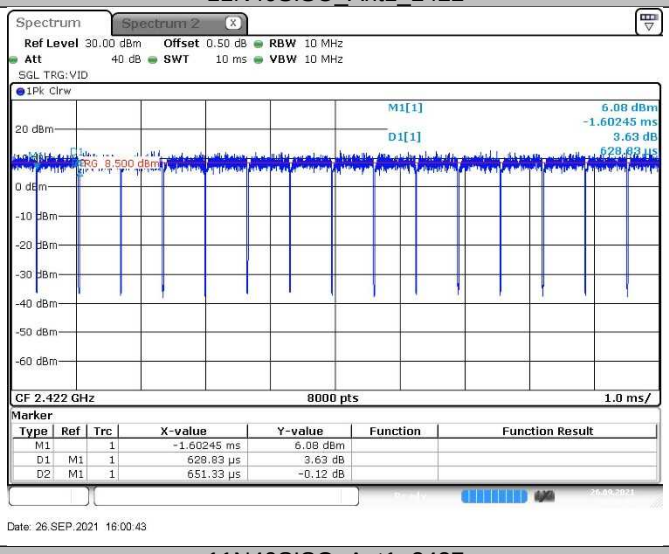
11N40SISO_Ant1_2422	China



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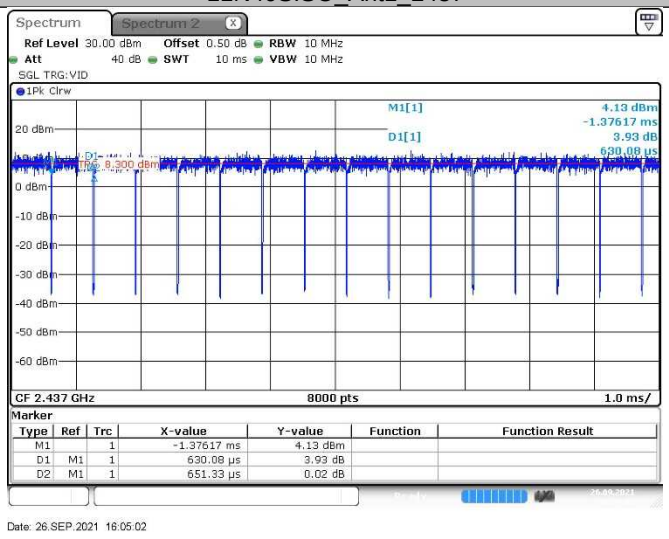

Antenna Type: PIFA Antenna

Antenna Gain: 2.5dBi

Description of the EUT: The Equipment Under Test (EUT) is an Infrared Thermal Camera with Bluetooth and Wi-Fi Module. The EUT support Bluetooth 5.0+EDR and support BLE function and Wi-Fi operated at 5GHz and 2.4GHz.
Only 2.4G Wi-Fi included in this report.

Test sample no.: SHA-566436-1

The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment, antenna gain or any information supplied.

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 2021 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10 (2013).

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5 Summary of Test Results

Technical Requirements						
FCC Part 15 Subpart C						
Test Condition		Pages	Test Site	Test Result		
				Pass	Fail	N/A
§15.207	Conducted emission AC power port	15-17	Site 1	☒	☐	☐
§15.247 (b) (1)	Conducted peak output power	18	Site 1	☒	☐	☐
§15.247(a)(1)	20dB bandwidth	---	---	☐	☐	☒
§15.247(a)(1)	Carrier frequency separation	---	---	☐	☐	☒
§15.247(a)(1)(iii)	Number of hopping frequencies	---	---	☐	☐	☒
§15.247(a)(1)(iii)	Dwell Time	---	---	☐	☐	☒
§15.247(a)(2)	6dB Occupied Bandwidth	19-23	Site 1	☒	☐	☐
§15.247(e)	Power spectral density	24-28	Site 1	☒	☐	☐
§15.247(d)	Conducted Band Edge and Out-of-Band Emissions	29-50	Site 1	☒	☐	☐
§15.247(d) & §15.209	Spurious radiated emissions for transmitter	51-56	Site 1	☒	☐	☐
§15.203	Antenna requirement	See note 1		☒	☐	☐

Note 1: The EUT uses a patch antenna, which gain is 2.5dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

15.203 requirement: 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 15.247(c) (1)(i) requirement: (i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

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6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: 2AZTCMOTH, complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C rules.

This report in only for 2.4GHz Wi-Fi. The TX and RX range is 2412MHz-2462MHz.

According to the client's declaration, all the models have the same electrical circuit board and mechanical structure, except pixel, or shell color differences, so we chose the FOTRIC 326M to perform all the tests.

SUMMARY:

All tests according to the regulations cited on page 6 were

■ - Performed

☐ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date:	July 9, 2021
Testing Start Date:	July 13, 2021
Testing End Date:	September 26, 2021

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Reviewed by:	Prepared by:	Tested by:
Hui TONG	Zhining ZHANG	Wenqiang LU
Review Engineer	Project Engineer	Test Engineer

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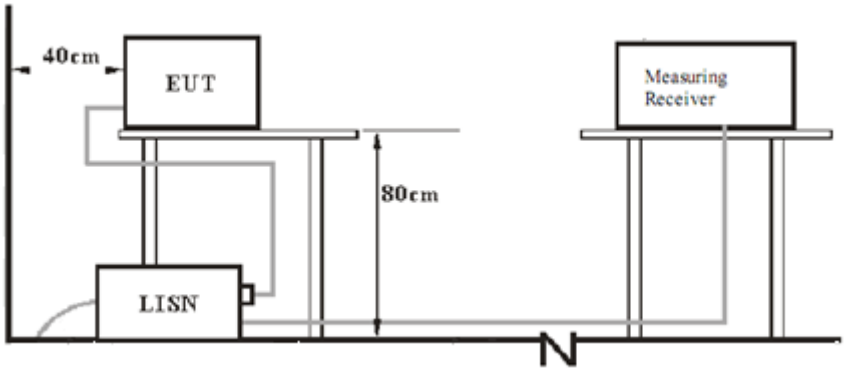
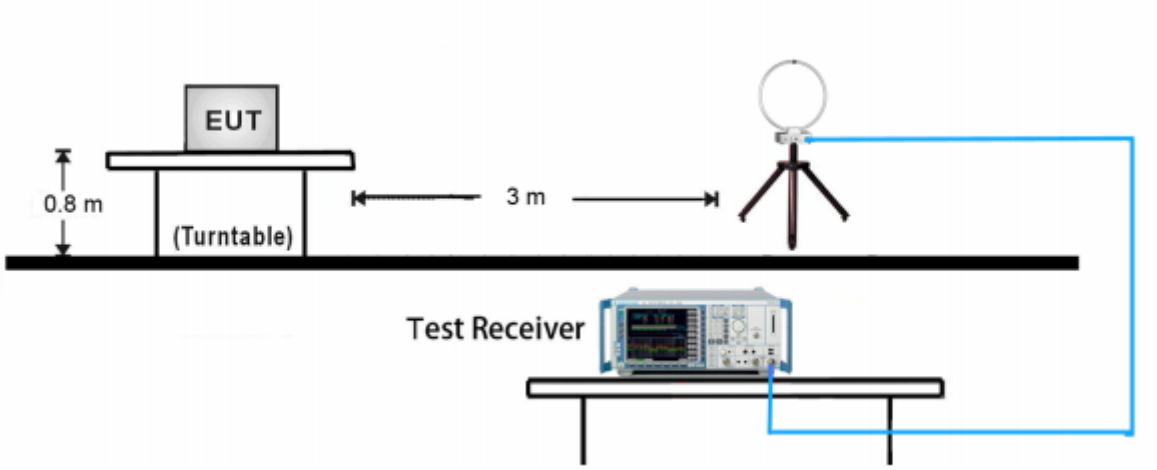
7 Test Setups

7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups

9kHz ~ 30MHz Test Setup:



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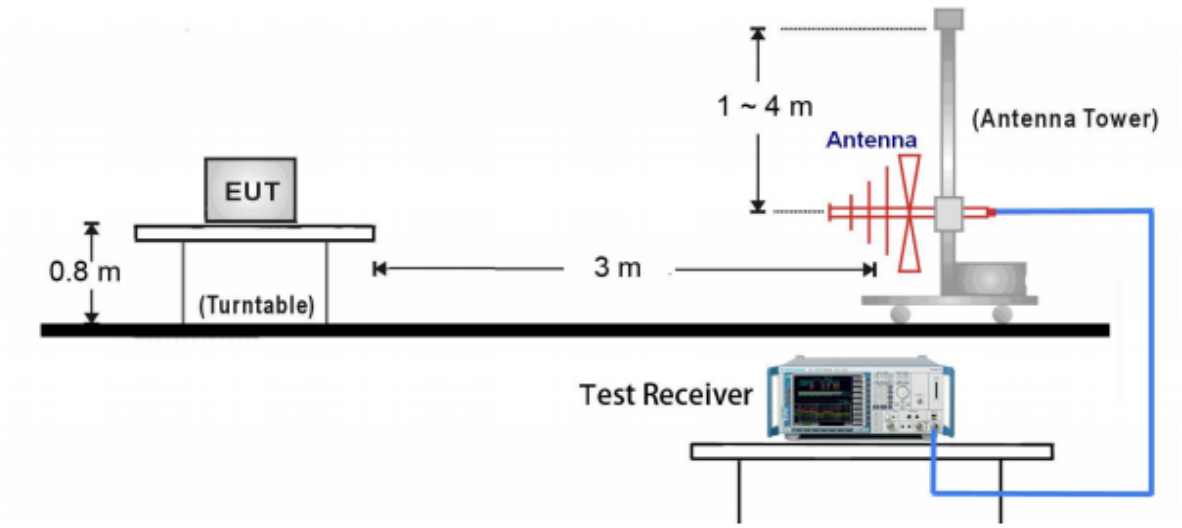
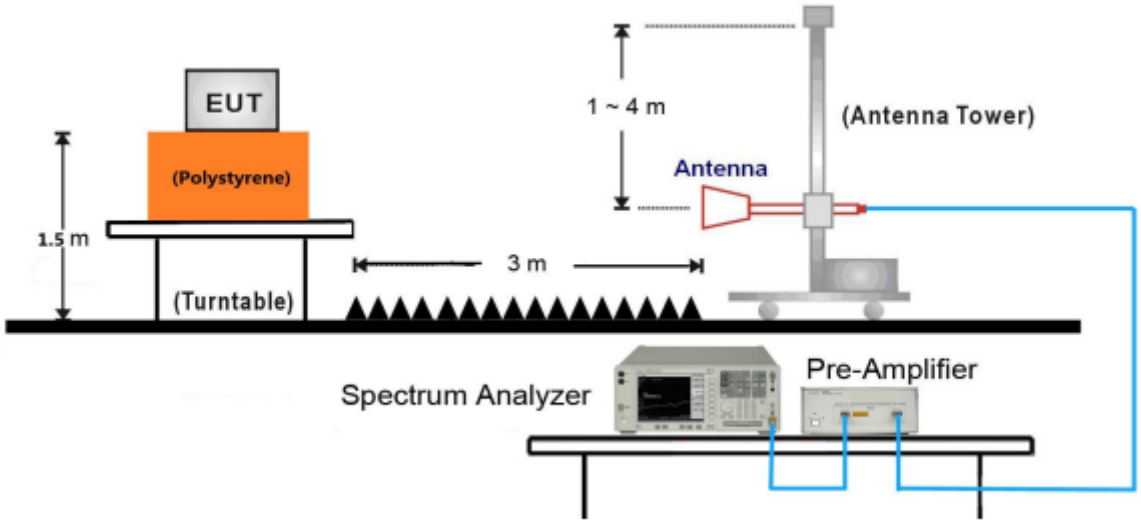
30MHz ~ 1GHz Test Setup:



1GHz ~ 18GHz Test Setup:



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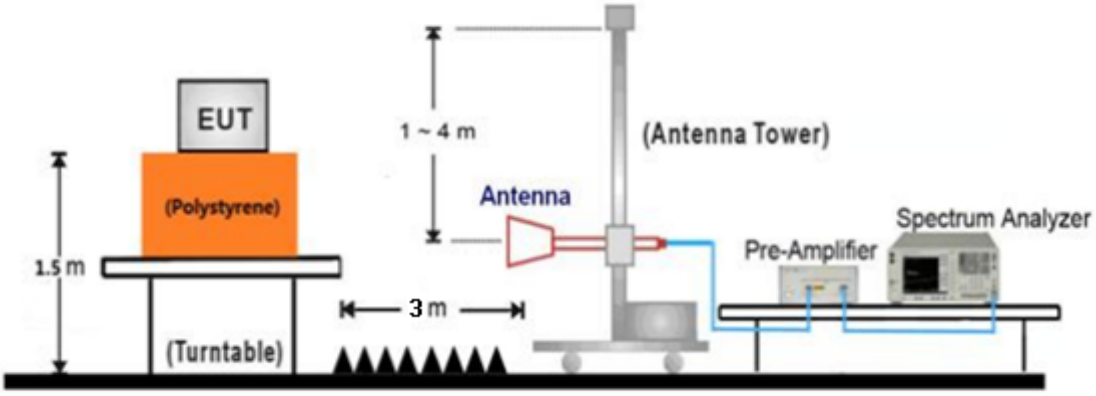
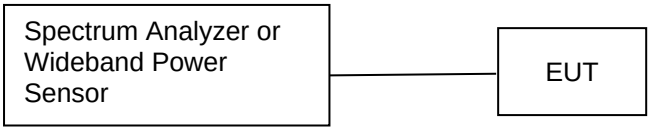
18GHz ~ 25GHz Test Setup:



7.3 Conducted RF test setups



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8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	Lenovo	X240	--

Test software: QRCT.exe, which used to control the EUT in continues transmitting mode.

802.11b/802.11g/802.11n-HT20

Test mode	Channel	Frequency (MHz)
Tx	1	2412
Tx	6	2437
Tx	11	2462

802.11n-HT40

Test mode	Channel	Frequency (MHz)
Tx	3	2422
Tx	6	2437
Tx	9	2452

The pre-test has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.

Tested Channel	Modulation Type	Data Rate
Low, Middle, High	802.11b: DSSS	1Mbps
Low, Middle, High	802.11g: OFDM	6Mbps
Low, Middle, High	802.11n (HT20): OFDM	MCS0 (6.5Mbps)
Low, Middle, High	802.11n (HT40): OFDM	MCS0 (13.5Mbps)

Device Capabilities

This device contains the following capabilities:
802.11b/g/n-HT20/n-HT40 Wi-Fi Device.
Duty Cycle:

TestMode	Channel	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]
11B	2412	8.20	8.22	99.76
11G	2412	1.35	1.37	98.54
11N20SISO	2412	1.27	1.29	98.45
11N40SISO	2422	0.63	0.65	96.92
	2437	0.63	0.65	96.92

Note: 2.4GHz WLAN (DTS) operation is possible in 20MHz, and 40MHz channel bandwidths.

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9 Technical Requirement

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency

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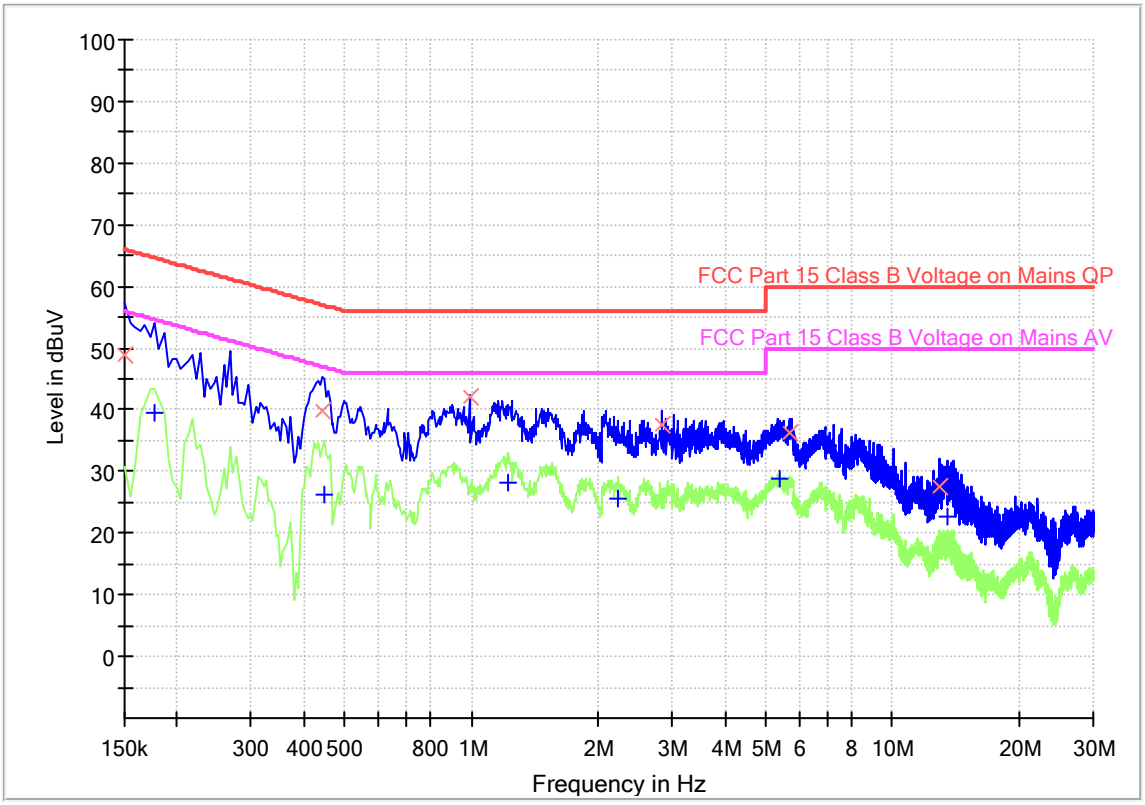
Conducted Emission

Product Type	:	Infrared Thermal Camera
M/N	:	FOTRIC 326M
Operating Condition	:	Mode 1: Tx_802.11N-HT40, 2422MHz
Test Specification	:	L-Line
Comment	:	AC 120V/60Hz for computer (charging mode)



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	48.98	---	66.00	17.02	1000.0	9.000	L1	19.5
0.177000	---	39.49	54.63	15.14	1000.0	9.000	L1	19.5
0.442500	39.89	---	57.01	17.12	1000.0	9.000	L1	19.5
0.447000	---	26.14	46.93	20.79	1000.0	9.000	L1	19.5
0.991500	42.03	---	56.00	13.97	1000.0	9.000	L1	19.5
1.216500	---	28.22	46.00	17.78	1000.0	9.000	L1	19.5
2.238000	---	25.53	46.00	20.47	1000.0	9.000	L1	19.5
2.832000	37.42	---	56.00	18.58	1000.0	9.000	L1	19.5
5.383500	---	28.86	50.00	21.14	1000.0	9.000	L1	19.5
5.721000	36.40	---	60.00	23.60	1000.0	9.000	L1	19.6
12.957000	27.39	---	60.00	32.61	1000.0	9.000	L1	19.7
13.564500	---	22.69	50.00	27.31	1000.0	9.000	L1	19.7

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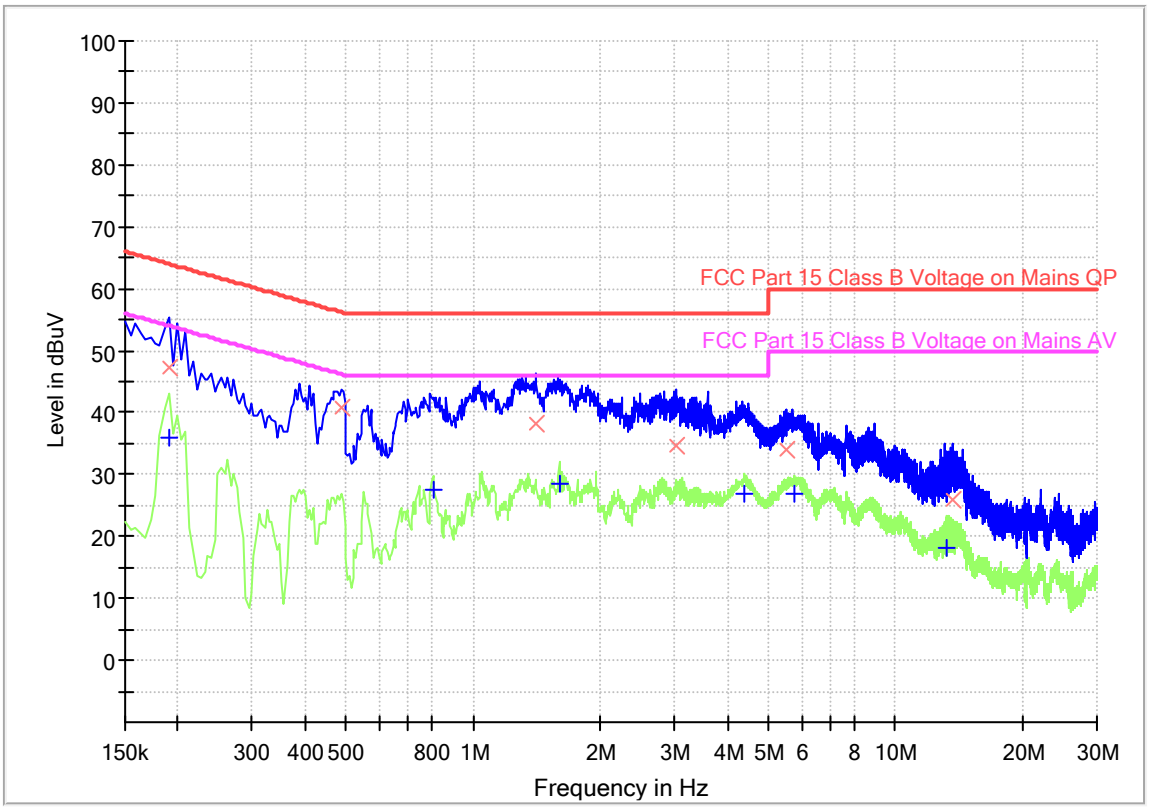
Product Type	:	Infrared Thermal Camera
M/N	:	FOTRIC 326M
Operating Condition	:	Mode 1: Tx_802.11N-HT40, 2422MHz
Test Specification	:	N-Line
Comment	:	AC 120V/60Hz for computer (charging mode)



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.190500	---	35.98	54.01	18.03	1000.0	9.000	N	19.5
0.190500	47.20	---	64.01	16.81	1000.0	9.000	N	19.5
0.487500	40.84	---	56.21	15.37	1000.0	9.000	N	19.5
0.802500	---	27.51	46.00	18.49	1000.0	9.000	N	19.5
1.405500	38.35	---	56.00	17.65	1000.0	9.000	N	19.5
1.599000	---	28.50	46.00	17.50	1000.0	9.000	N	19.5
3.021000	34.58	---	56.00	21.42	1000.0	9.000	N	19.6
4.384500	---	26.83	46.00	19.17	1000.0	9.000	N	19.6
5.509500	34.05	---	60.00	25.95	1000.0	9.000	N	19.6
5.766000	---	26.93	50.00	23.07	1000.0	9.000	N	19.6
13.281000	---	18.25	50.00	31.75	1000.0	9.000	N	19.8
13.731000	25.88	---	60.00	34.12	1000.0	9.000	N	19.8

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

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9.2 Conducted peak output power

Test Method

1. Use the following spectrum analyzer settings:
   RBW > the 6dB bandwidth of the emission being measured, VBW≥3RBW, Span≥3RBW
   Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Use a power meter to measure the conducted peak output power.

Limits

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤1	≤30

Test result as below table

Mode	Antenna Gain (dBi)	Channel	Frequency (MHz)	Average Power (dBm) Report purpose only	Peak Power (dBm)	Limit (dBm)
b	2.5	CH01	2412	12.05	14.87	30.00
		CH06	2437	10.78	13.56	30.00
		CH11	2462	9.88	12.7	30.00
g		CH01	2412	9.03	18.58	30.00
		CH06	2437	8.34	18.06	30.00
		CH11	2462	7.68	17.57	30.00
n-HT20		CH01	2412	9.04	18.85	30.00
		CH06	2437	8.4	18.12	30.00
		CH11	2462	7.8	17.81	30.00
n-HT40		CH03	2422	8.18	**18.87**	30.00
		CH06	2437	8.52	18.8	30.00
		CH09	2452	8.26	18.58	30.00

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9.3 6dB Occupied Bandwidth

Test Method

1. Use the following spectrum analyzer settings:
   RBW=100K, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

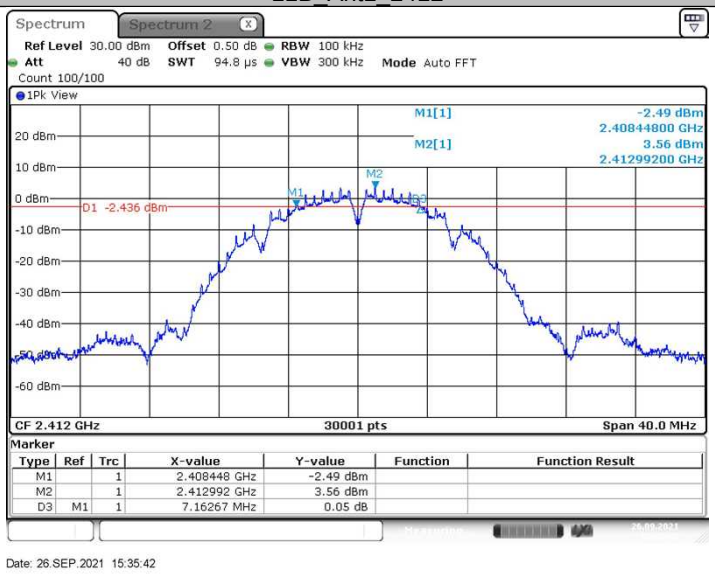
Limit

Limit [kHz]
≥500

Test result

TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	7.163	2408.448	2415.611	0.5	PASS
		2437	8.083	2433.435	2441.517	0.5	PASS
		2462	9.544	2456.971	2466.515	0.5	PASS
11G	Ant1	2412	16.292	2403.857	2420.149	0.5	PASS
		2437	16.329	2428.856	2445.185	0.5	PASS
		2462	16.348	2453.817	2470.165	0.5	PASS
11N20SISO	Ant1	2412	17.159	2403.607	2420.765	0.5	PASS
		2437	17.179	2428.609	2445.788	0.5	PASS
		2462	17.588	2453.195	2470.783	0.5	PASS
11N40SISO	Ant1	2422	33.870	2405.681	2439.551	0.5	PASS
		2437	35.111	2419.446	2454.557	0.5	PASS
		2452	35.100	2434.446	2469.546	0.5	PASS

11B_Ant1_2412



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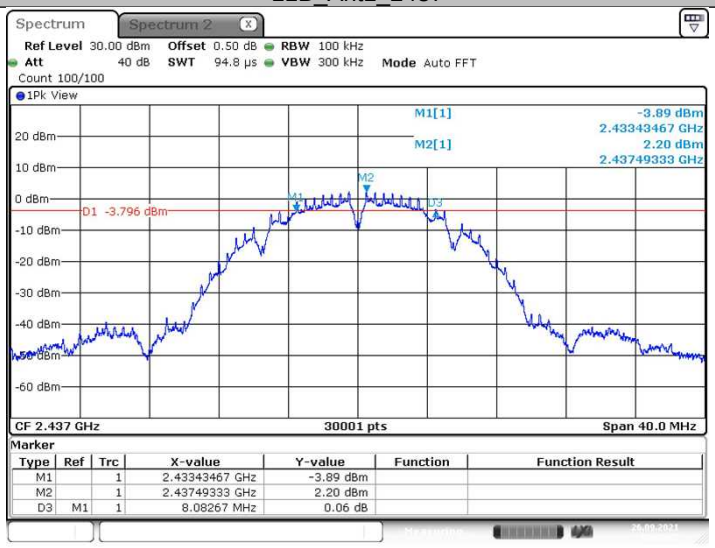
11B_Ant1_2437



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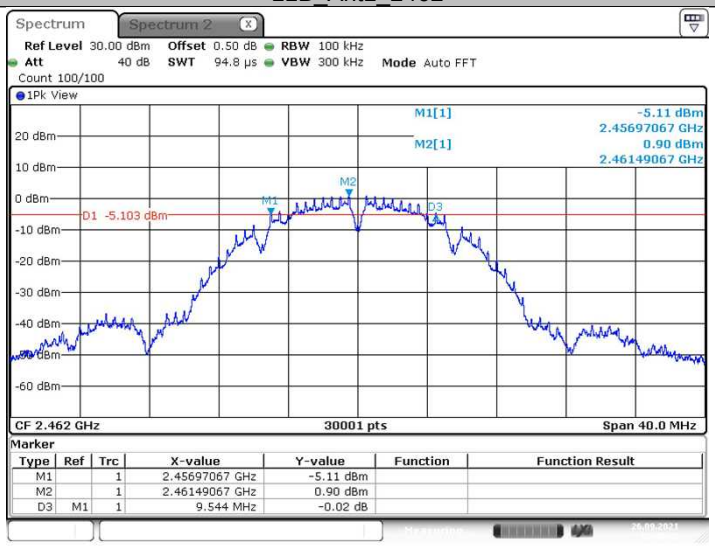
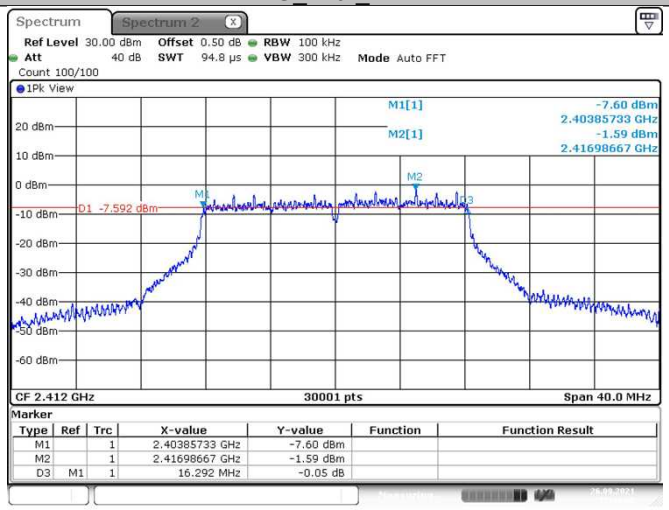
11B_Ant1_2462



Date: 26.SEP.2021 15:40:49

China

11G_Ant1_2412



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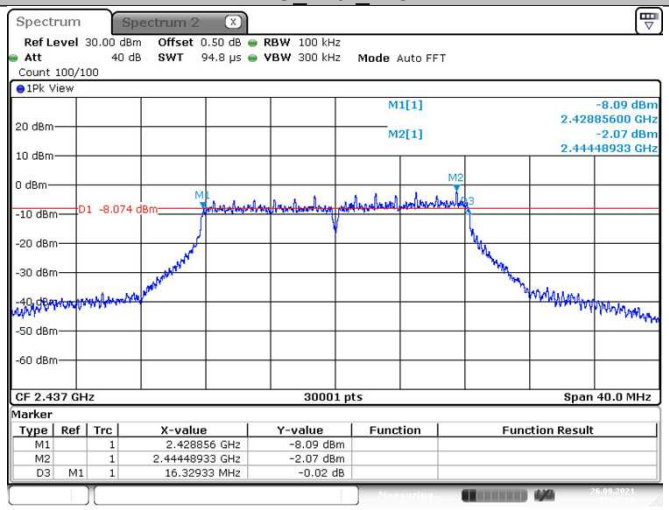

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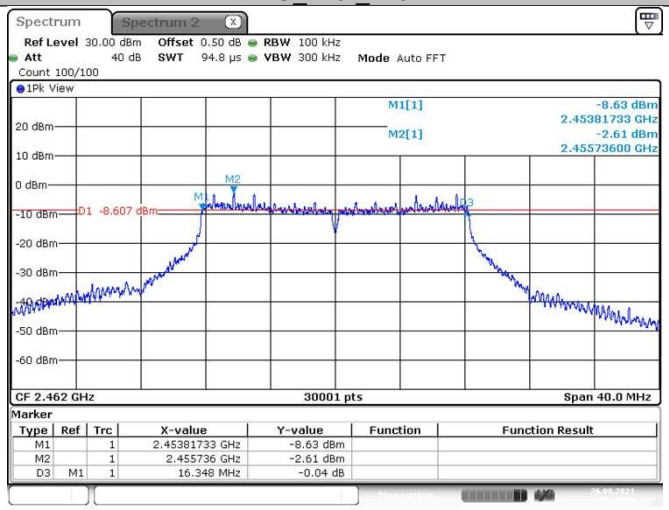

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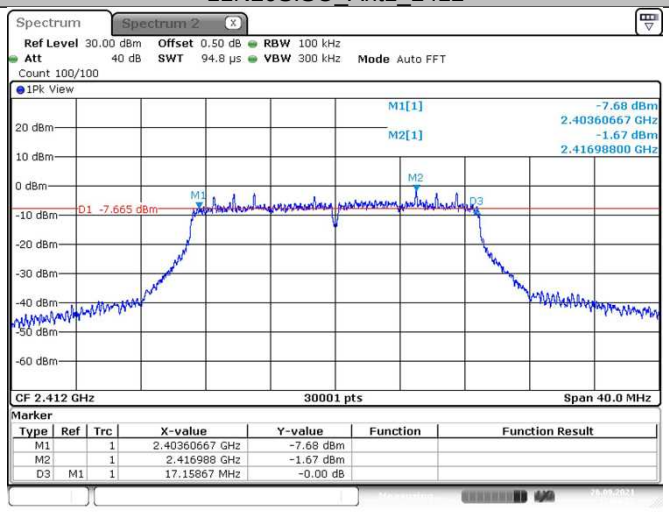
China

11N20SISO_Ant1_2412



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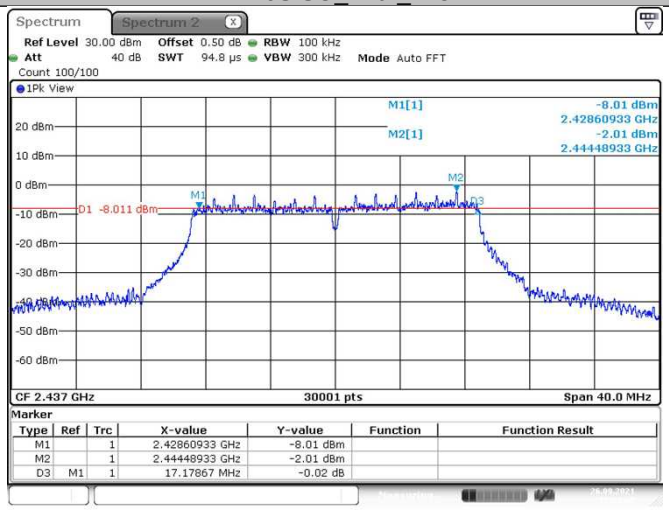

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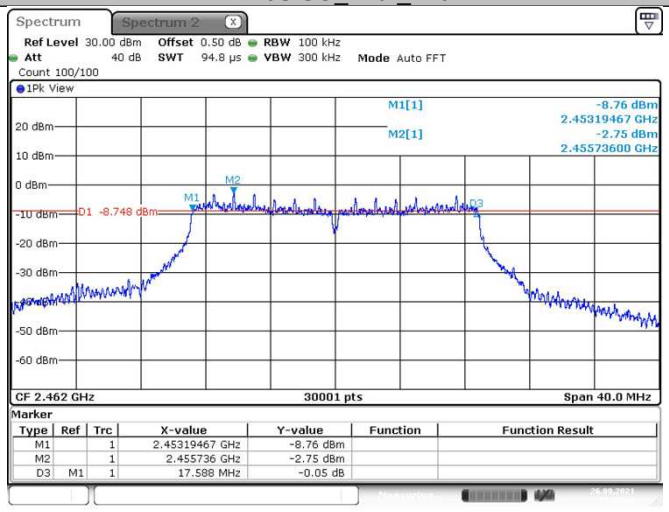
11N20SISO_Ant1_2462



Date: 26.SEP.2021 15:55:43

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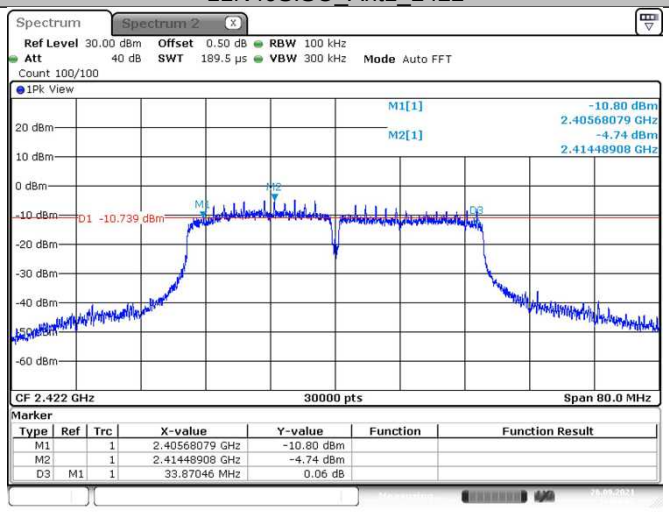
11N40SISO_Ant1_2422



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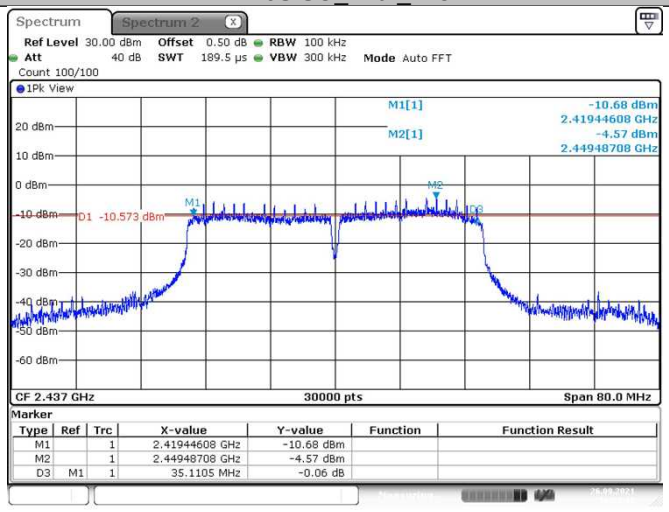

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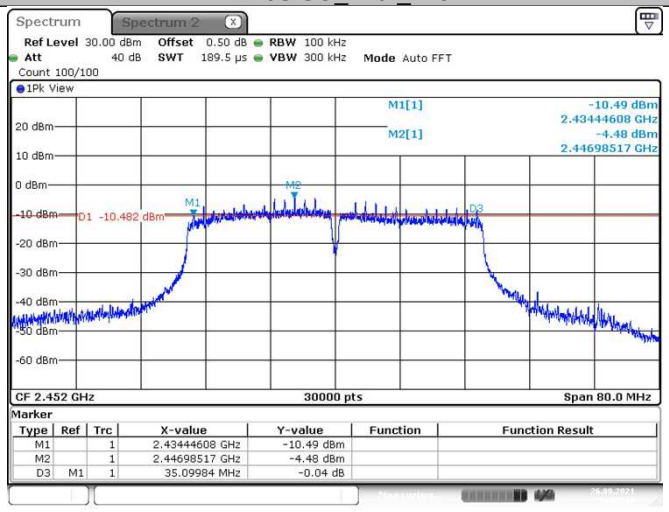
11N40SISO_Ant1_2452



Date: 26.SEP.2021 16:07:13

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9.4 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

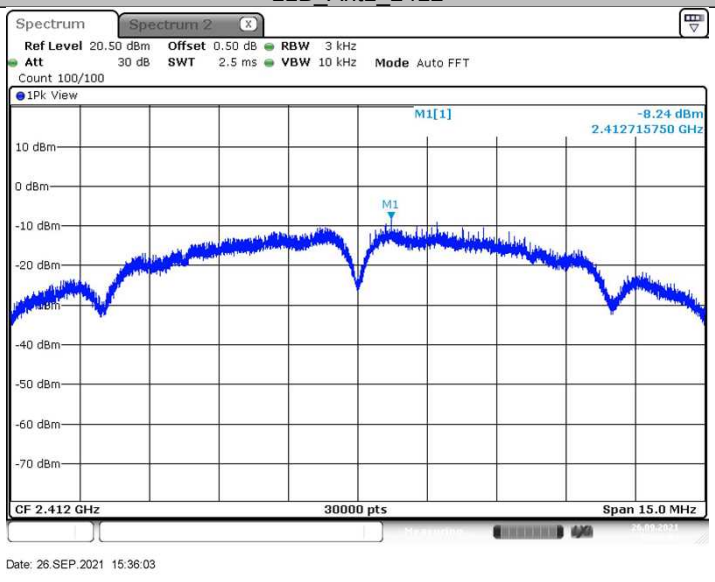
Limit

Limit [dBm]
≤8

Test result

TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-8.24	<=8	PASS
		2437	-11.16	<=8	PASS
		2462	-11.61	<=8	PASS
11G	Ant1	2412	-14.57	<=8	PASS
		2437	-16.49	<=8	PASS
		2462	-16.15	<=8	PASS
11N20SISO	Ant1	2412	-15.54	<=8	PASS
		2437	-15.67	<=8	PASS
		2462	-16.97	<=8	PASS
11N40SISO	Ant1	2422	-18.48	<=8	PASS
		2437	-18.04	<=8	PASS
		2452	-18.77	<=8	PASS

11B_Ant1_2412



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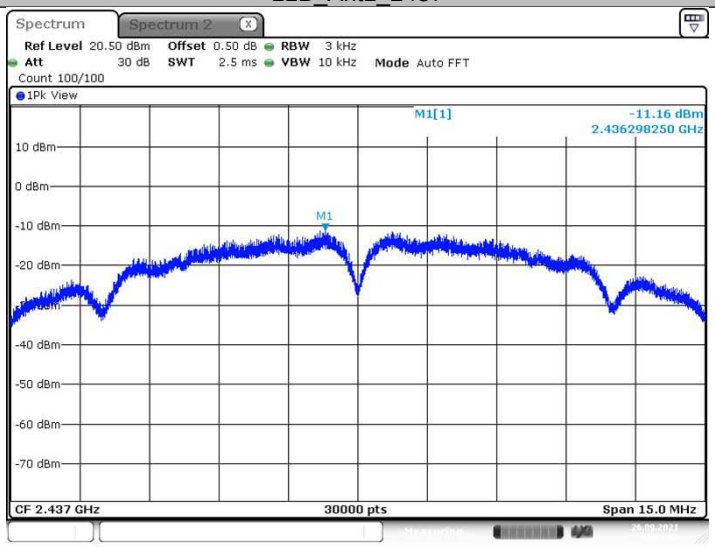
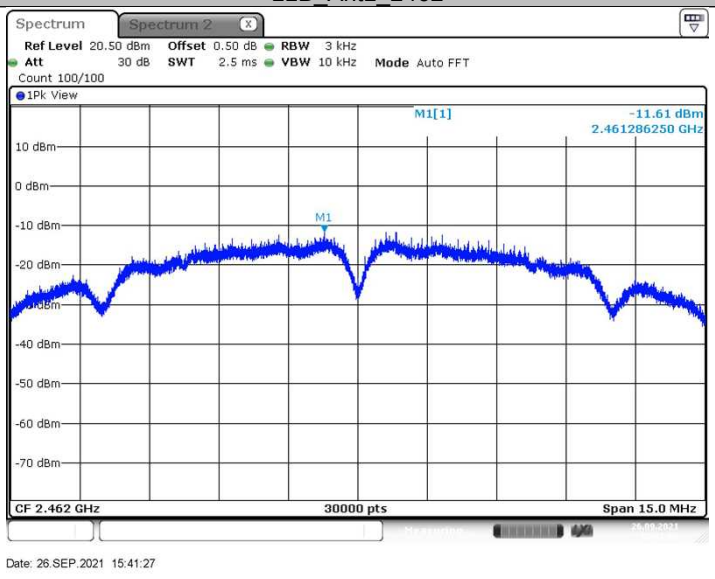
11B_Ant1_2437

11B_Ant1_2462


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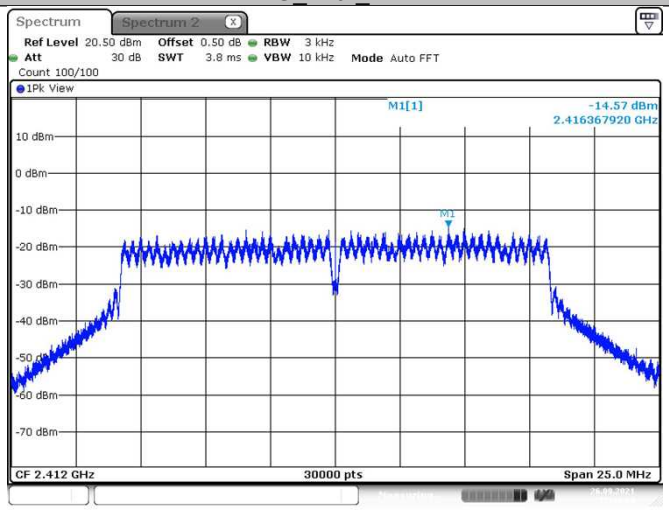
11G_Ant1_2412



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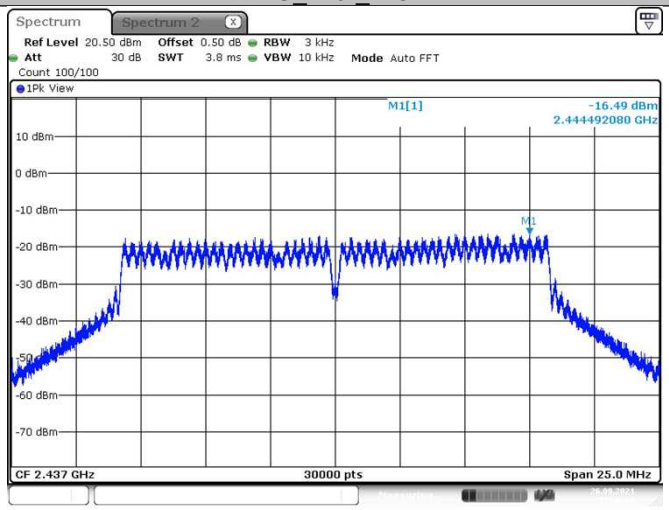
11G_Ant1_2437



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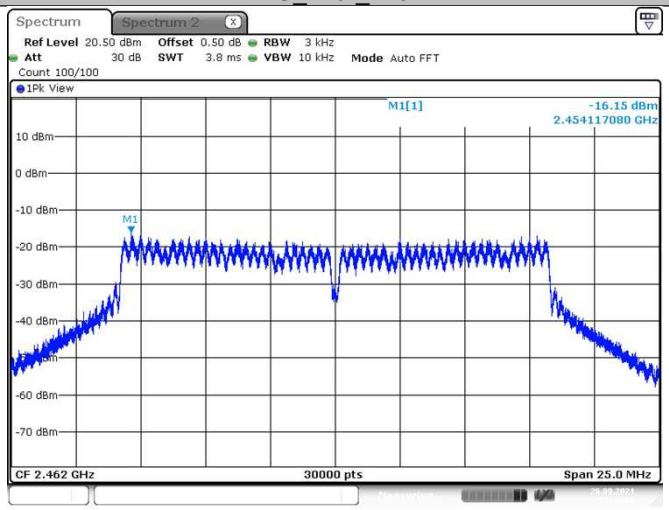

Date: 26.SEP.2021 15:48:27

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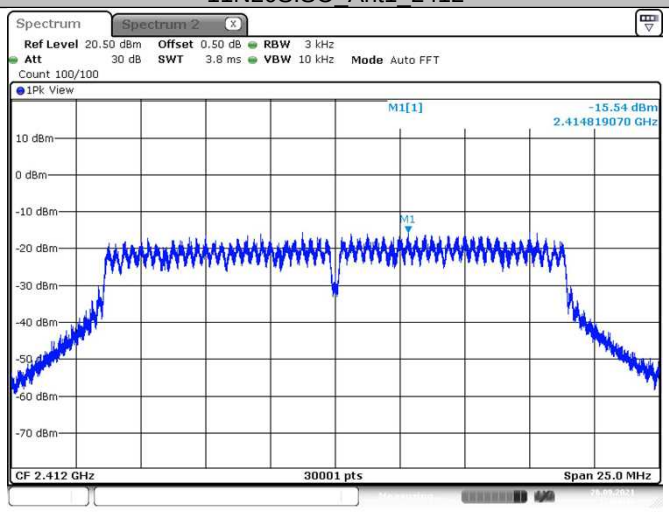
11N20SISO_Ant1_2412



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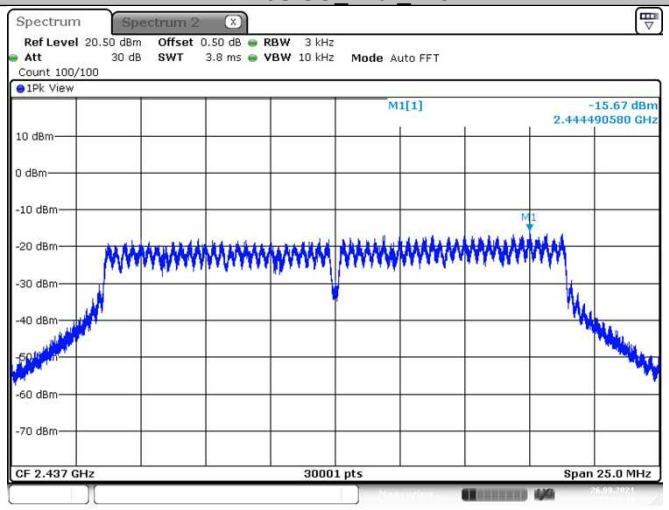
11N20SISO_Ant1_2437



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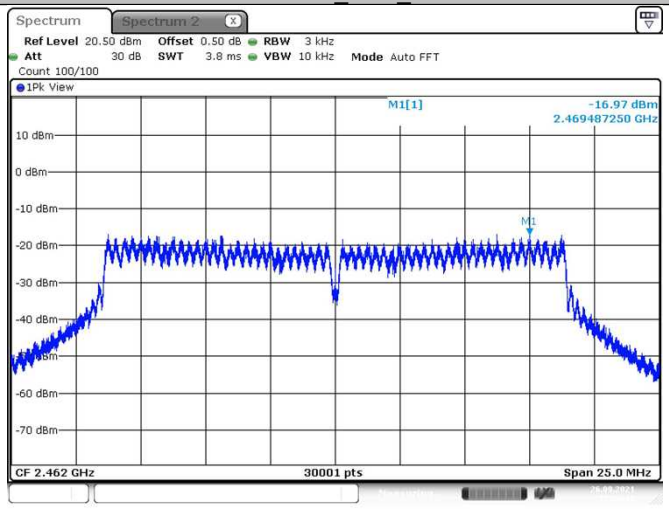

Date: 26.SEP.2021 15:56:11

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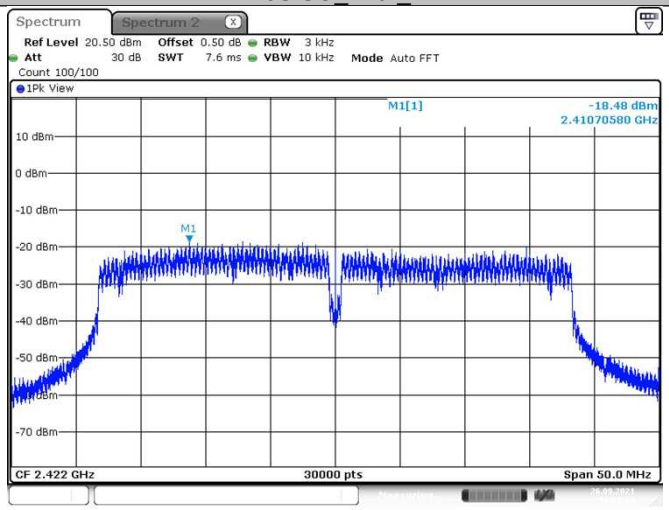
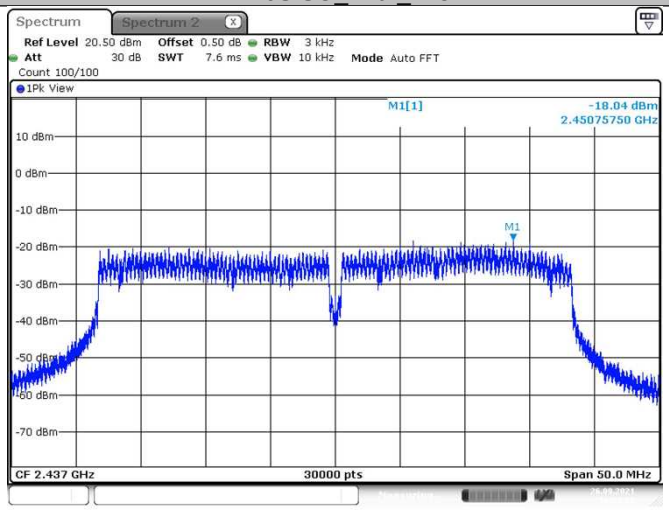
11N40SISO_Ant1_2422



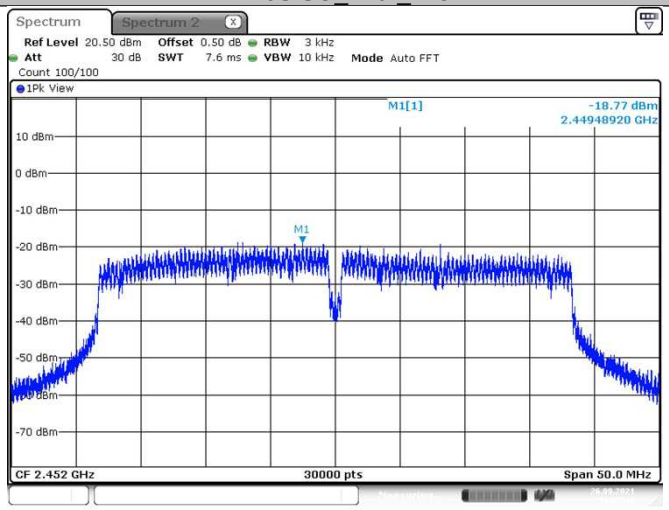
Date: 26.SEP.2021 16:01:14

11N40SISO_Ant1_2437



Date: 26.SEP.2021 16:05:33

11N40SISO_Ant1_2452



Date: 26.SEP.2021 16:07:41

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9.5 Conducted Band Edge and Out-of-Band Emissions

Test Method

1. Establish a reference level by using the following procedure:
   a. Set RBW=100 kHz. VBW≥3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
   b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
   a. Set the center frequency and span to encompass frequency range to be measured.
   b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

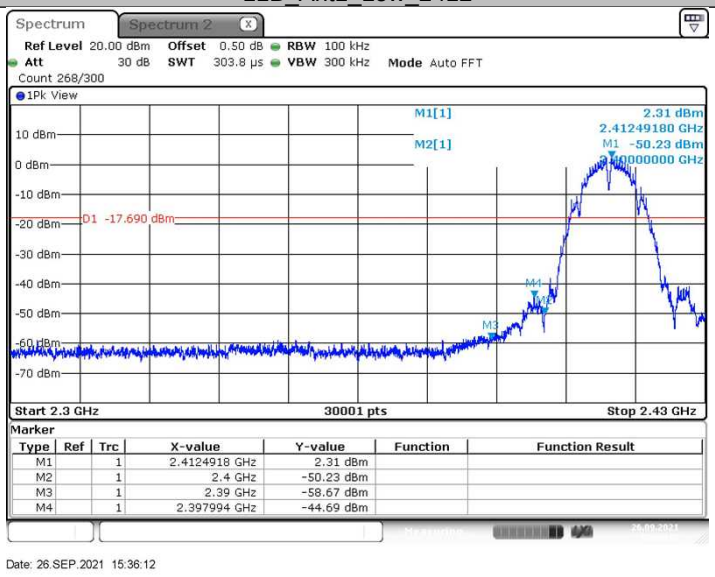
Limit

Frequency Range MHz	Limit (dBc)
30-25000	-20

Test result

TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	Low	2412	2.31	-44.69	<=-17.69	PASS
		High	2462	0.31	-56.85	<=-19.69	PASS
11G	Ant1	Low	2412	-2.08	-39.2	<=-22.08	PASS
		High	2462	-2.88	-52.49	<=-22.88	PASS
11N20SISO	Ant1	Low	2412	-1.70	-38.39	<=-21.7	PASS
		High	2462	-3.03	-49.61	<=-23.03	PASS
11N40SISO	Ant1	Low	2422	-5.20	-39.15	<=-25.2	PASS
		High	2452	-4.72	-40.49	<=-24.72	PASS

11B_Ant1_Low_2412



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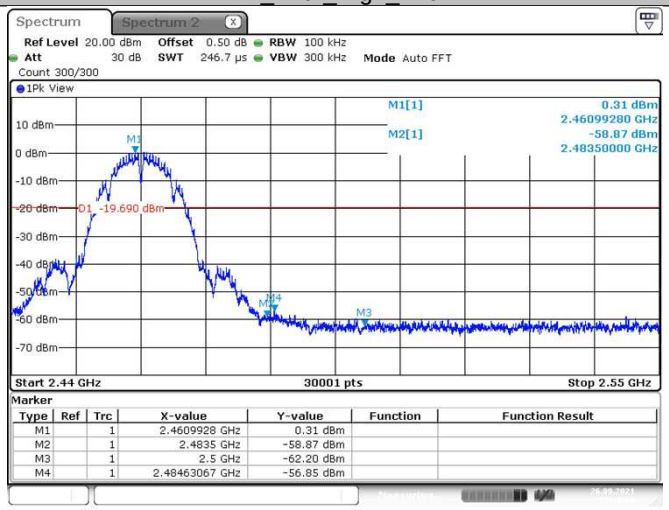
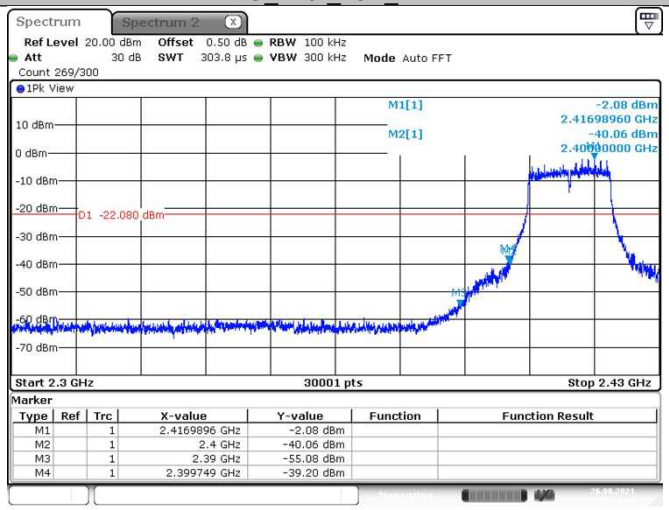
11B_Ant1_High_2462



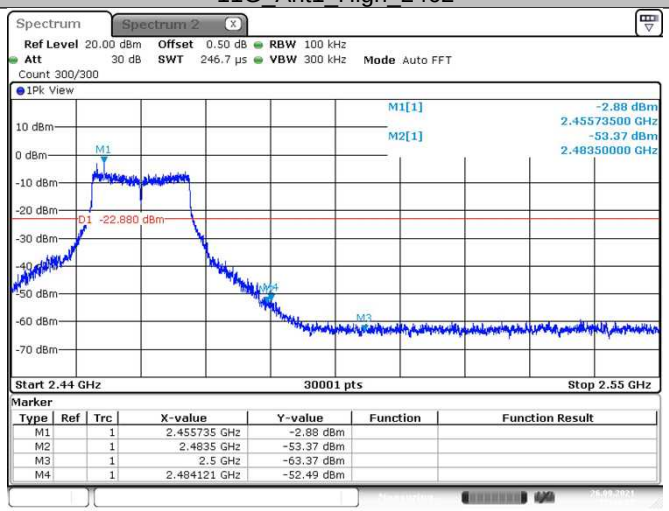
Date: 26.SEP.2021 15:41:36

11G_Ant1_Low_2412



Date: 26.SEP.2021 15:44:13

11G_Ant1_High_2462



Date: 26.SEP.2021 15:48:36

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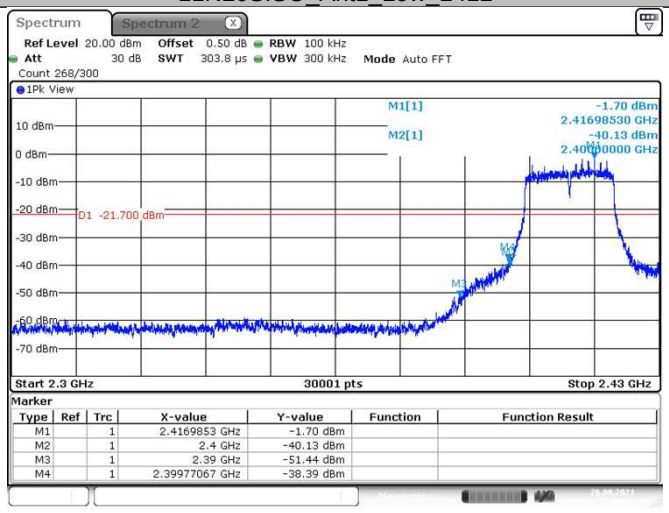
11N20SISO_Ant1_Low_2412

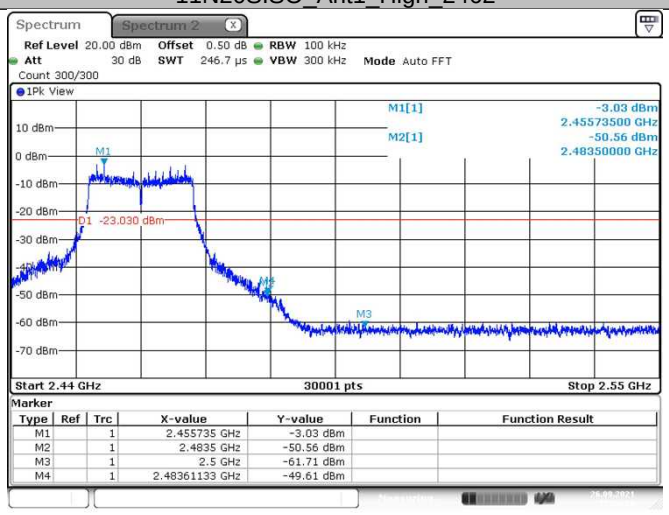


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4169853 GHz	-1.70 dBm		
M2		1	2.4 GHz	-40.13 dBm		
M3		1	2.39 GHz	-51.44 dBm		
M4		1	2.39977067 GHz	-38.39 dBm		

Date: 26.SEP.2021 15:50:56

11N20SISO_Ant1_High_2462

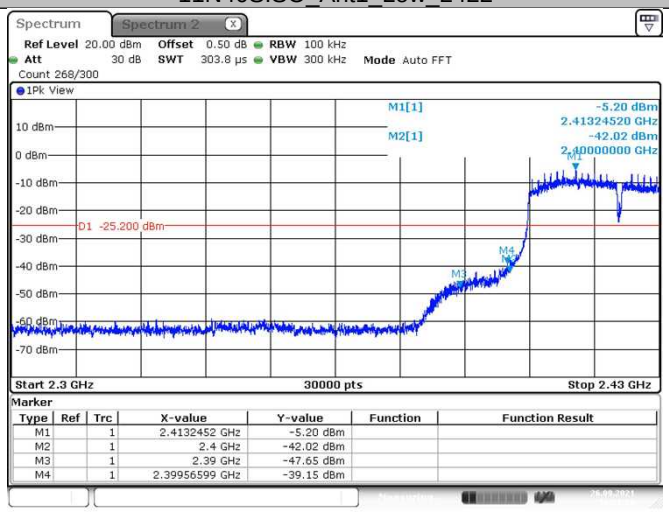


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.455735 GHz	-3.03 dBm		
M2		1	2.4835 GHz	-50.56 dBm		
M3		1	2.5 GHz	-61.71 dBm		
M4		1	2.48361133 GHz	-49.61 dBm		

Date: 26.SEP.2021 15:56:20

11N40SISO_Ant1_Low_2422



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4132452 GHz	-5.20 dBm		
M2		1	2.4 GHz	-42.02 dBm		
M3		1	2.39 GHz	-47.65 dBm		
M4		1	2.39956599 GHz	-39.15 dBm		

Date: 26.SEP.2021 16:01:23

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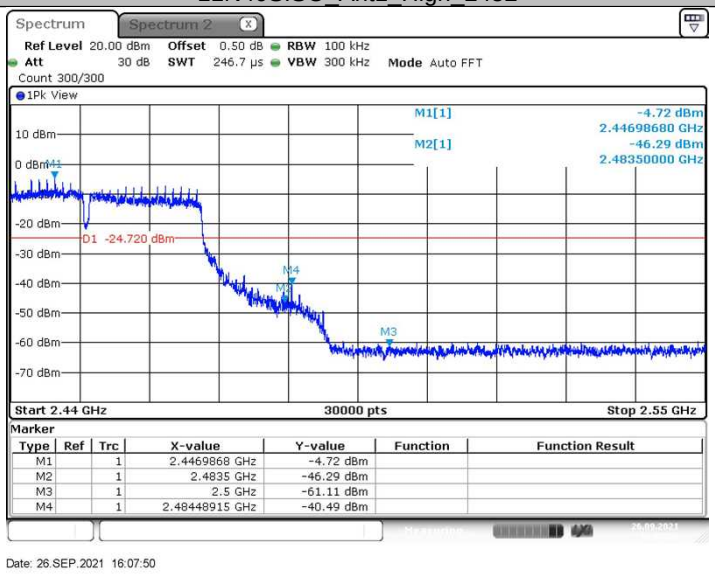
11N40SISO_Ant1_High_2452



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Spurious RF conducted emissions

TestMode	Antenna	Channel	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
11B	Ant1	2412	Reference	3.22	3.22	---	PASS
			30~1000	3.22	-57.91	<=-16.78	PASS
			1000~5000	3.22	-55.33	<=-16.78	PASS
			5000~26500	3.22	-52.23	<=-16.78	PASS
		2437	Reference	1.91	1.91	---	PASS
			30~1000	1.91	-58	<=-18.09	PASS
			1000~5000	1.91	-54.25	<=-18.09	PASS
			5000~26500	1.91	-52.39	<=-18.09	PASS
		2462	Reference	0.98	0.98	---	PASS
			30~1000	0.98	-58.33	<=-19.02	PASS
			1000~5000	0.98	-55.49	<=-19.02	PASS
			5000~26500	0.98	-51.81	<=-19.02	PASS
11G	Ant1	2412	Reference	-2.48	-2.48	---	PASS
			30~1000	-2.48	-58.75	<=-22.48	PASS
			1000~5000	-2.48	-55.44	<=-22.48	PASS
			5000~26500	-2.48	-52.35	<=-22.48	PASS
		2437	Reference	-2.36	-2.36	---	PASS
			30~1000	-2.36	-57.4	<=-22.36	PASS
			1000~5000	-2.36	-55.34	<=-22.36	PASS
			5000~26500	-2.36	-52.12	<=-22.36	PASS
		2462	Reference	-3.68	-3.68	---	PASS
			30~1000	-3.68	-58.24	<=-23.68	PASS
			1000~5000	-3.68	-55.51	<=-23.68	PASS
			5000~26500	-3.68	-51.91	<=-23.68	PASS
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			30~1000	-2.37	-57.96	<=-22.37	PASS
			1000~5000	-2.37	-55.53	<=-22.37	PASS
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			30~1000	-2.51	-58.29	<=-22.51	PASS
			1000~5000	-2.51	-55.36	<=-22.51	PASS
			5000~26500	-2.51	-51.73	<=-22.51	PASS
		2462	Reference	-2.93	-2.93	---	PASS
			30~1000	-2.93	-58.38	<=-22.93	PASS
			1000~5000	-2.93	-55.86	<=-22.93	PASS
			5000~26500	-2.93	-52.5	<=-22.93	PASS
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			5000~26500	-4.60	-51.72	<=-24.6	PASS
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			1000~5000	-4.55	-55.67	<=-24.55	PASS
			5000~26500	-4.55	-52.4	<=-24.55	PASS
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			30~1000	-4.82	-58.01	<=-24.82	PASS
			1000~5000	-4.82	-54.84	<=-24.82	PASS
			5000~26500	-4.82	-52.45	<=-24.82	PASS

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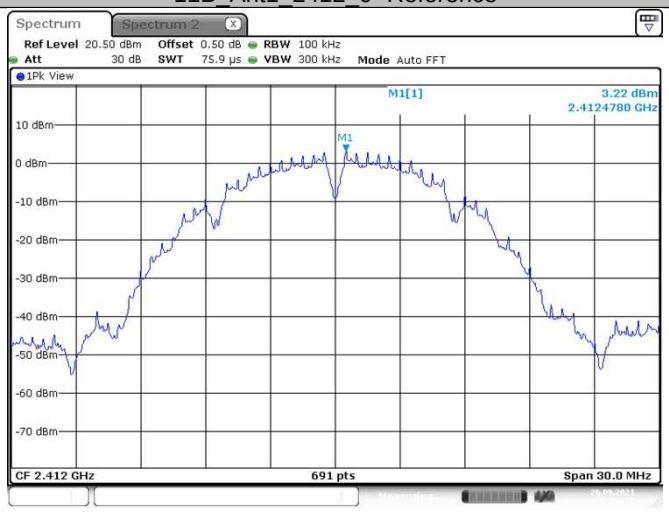 Date: 26.SEP.2021 15:36:18
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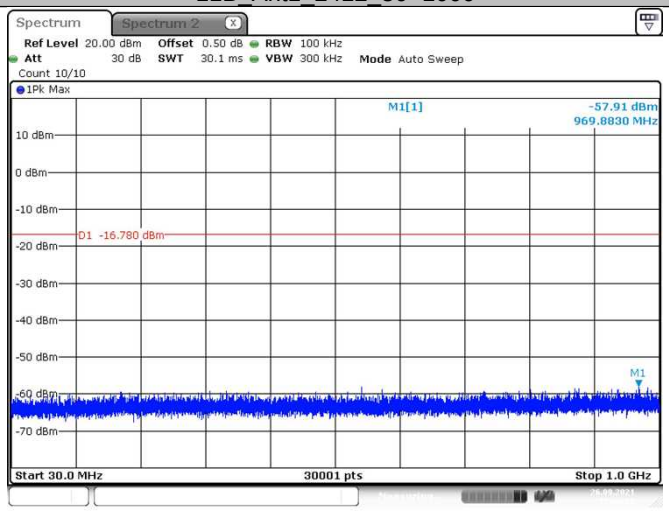 Date: 26.SEP.2021 15:36:22
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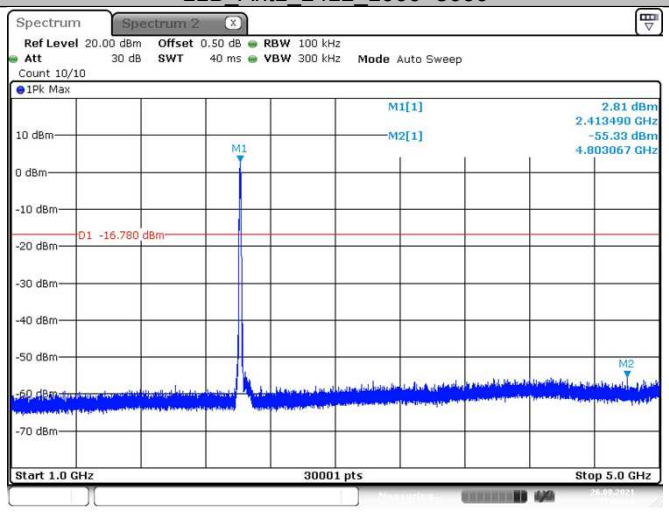 Date: 26.SEP.2021 15:36:34

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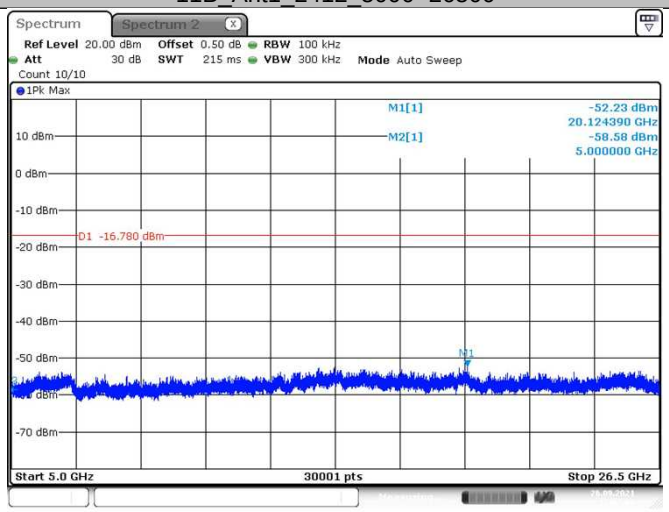
11B_Ant1_2412_5000~26500



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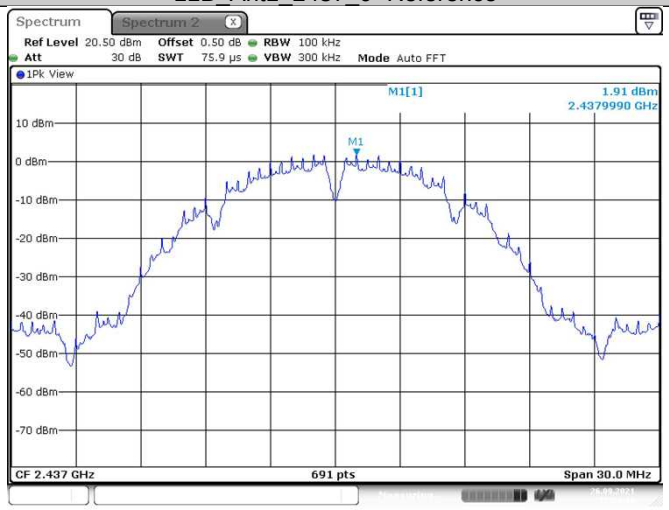

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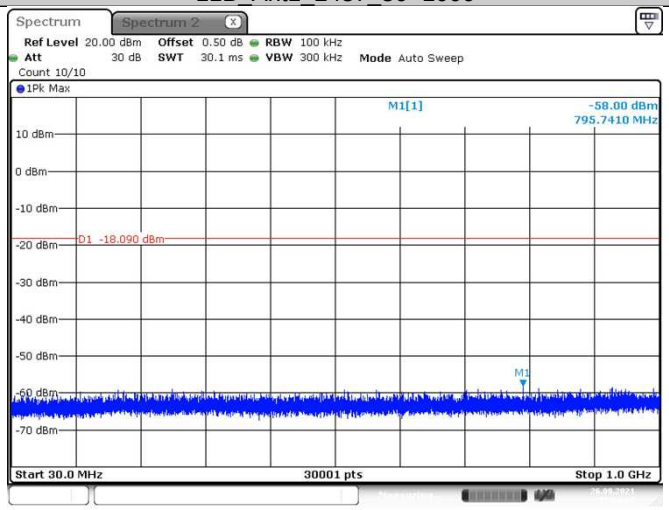

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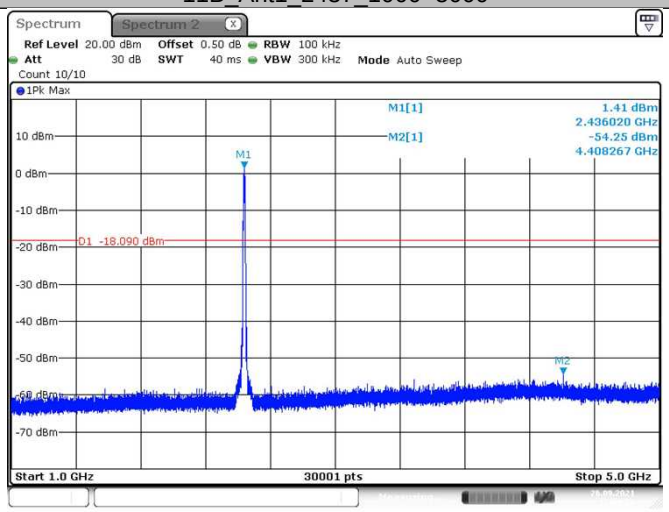

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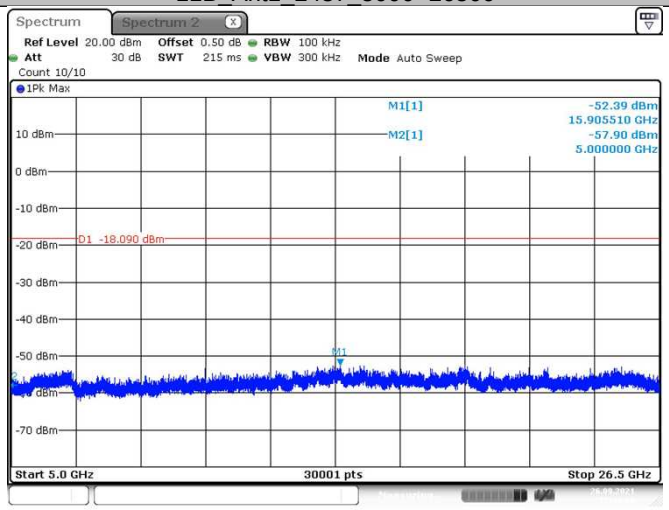

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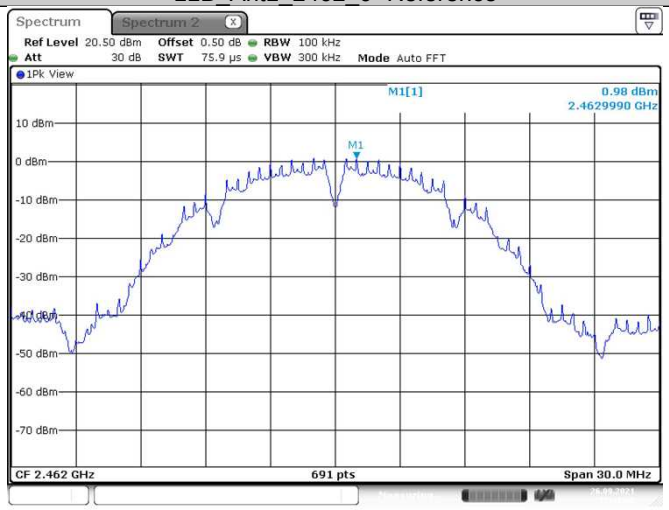

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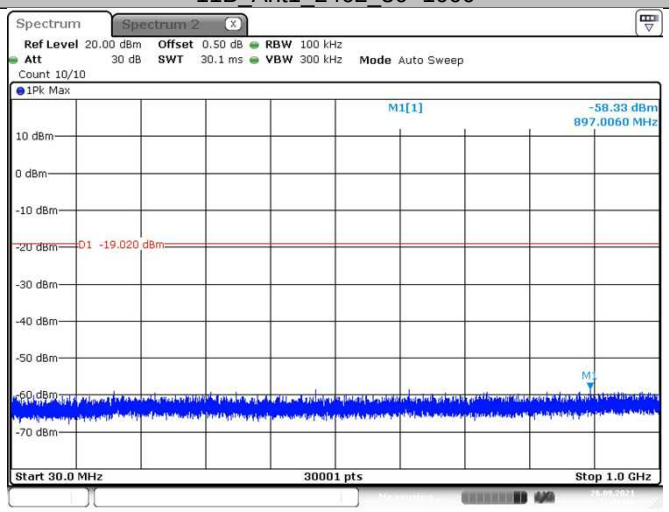
11B_Ant1_2462_30~1000



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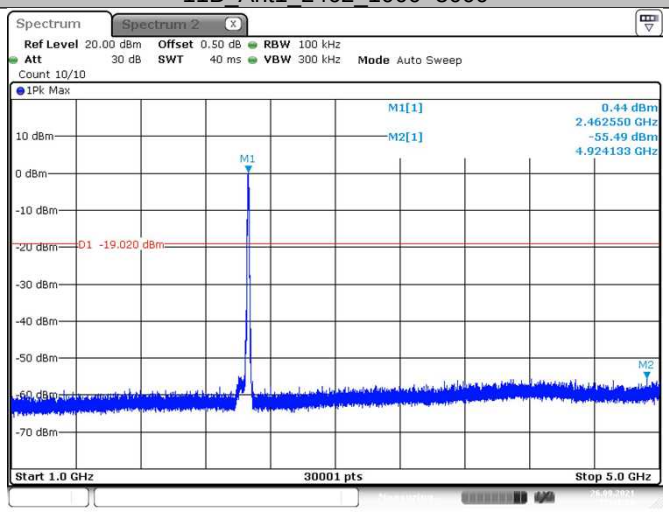

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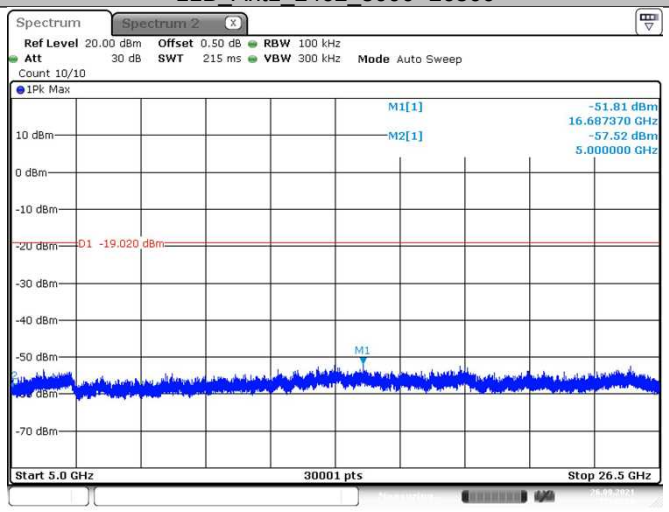

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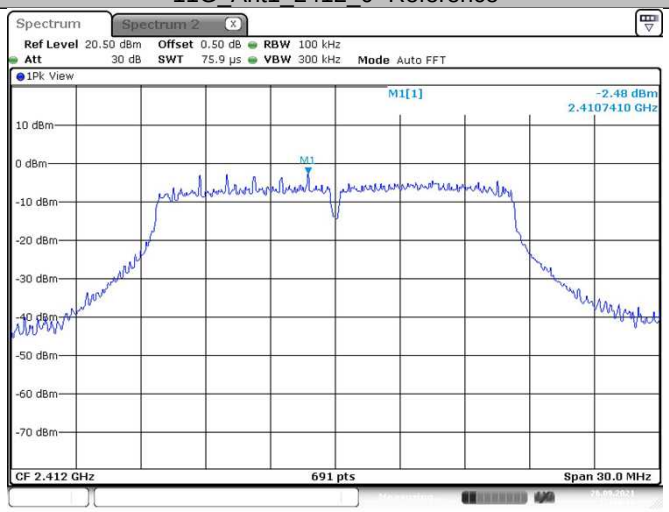
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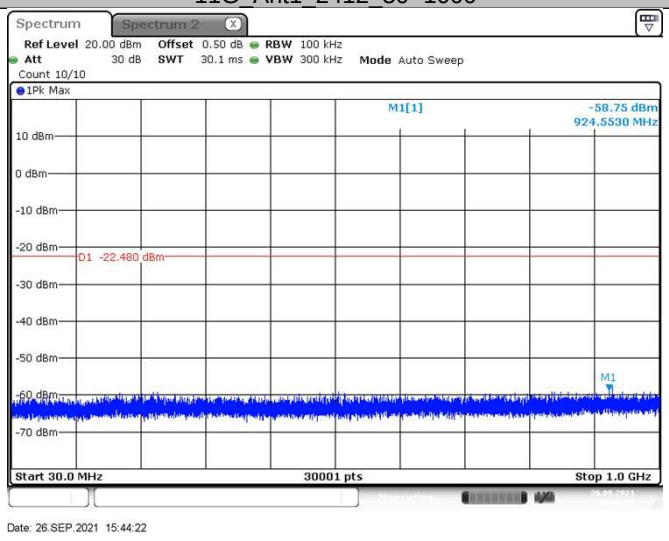

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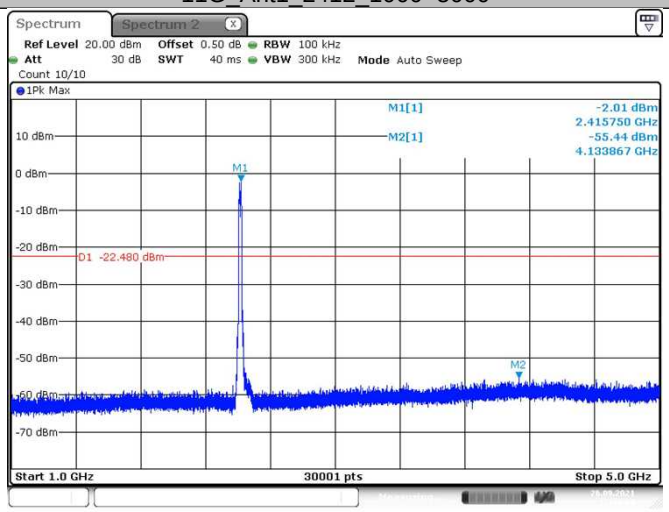
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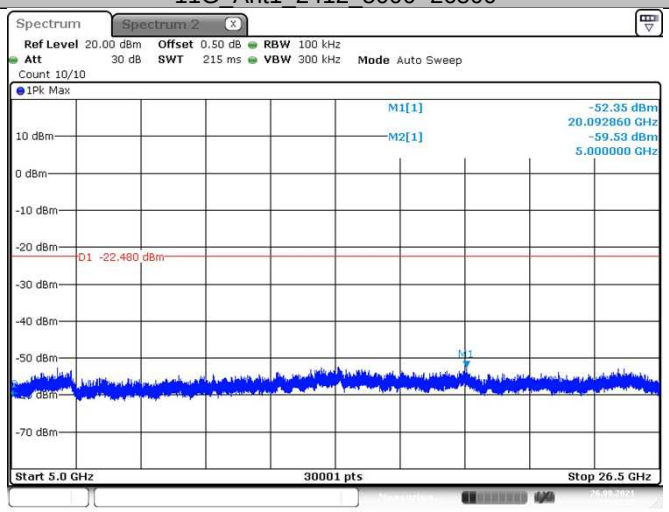
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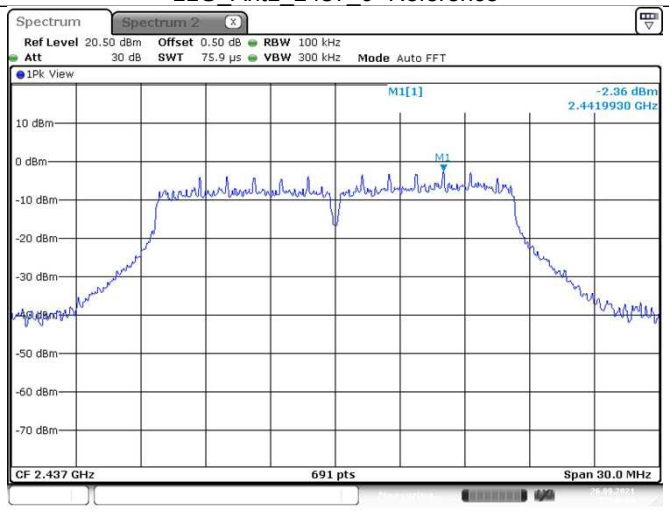

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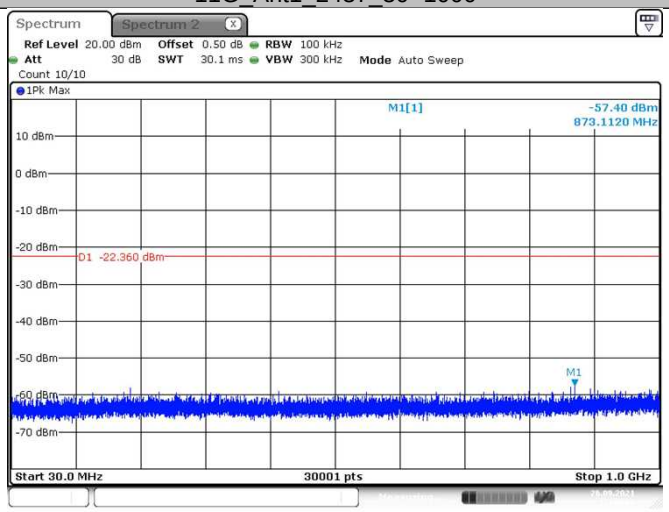
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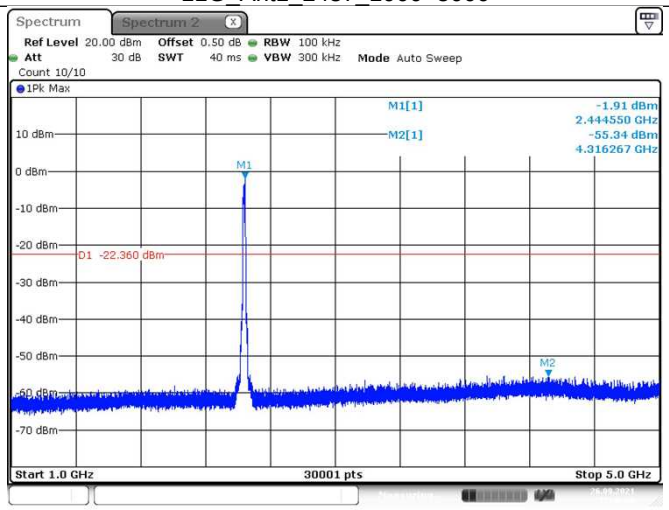
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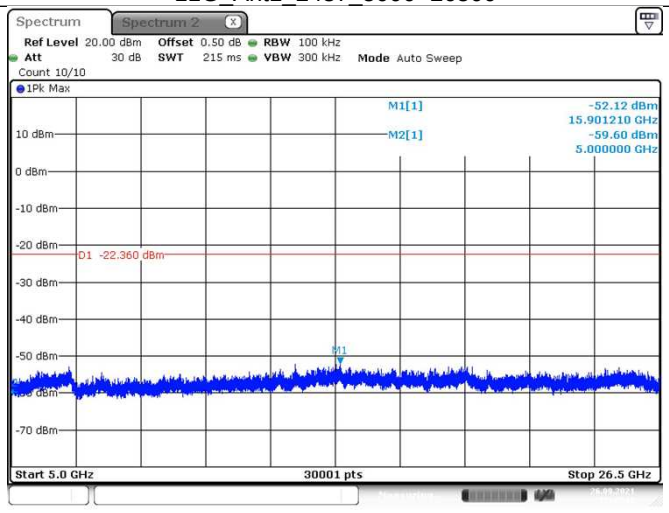

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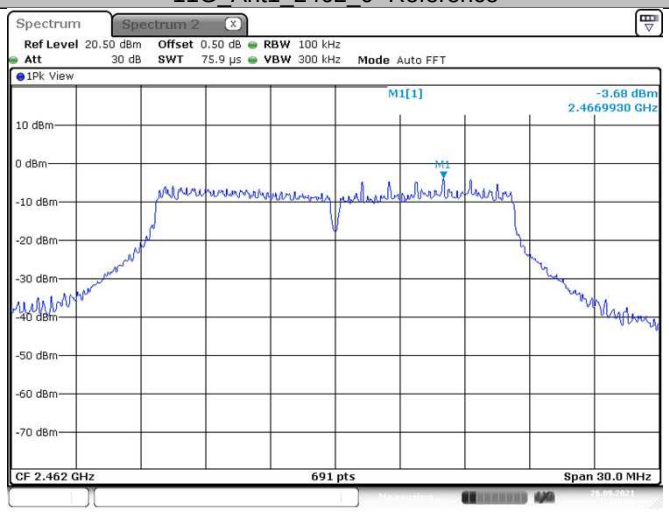

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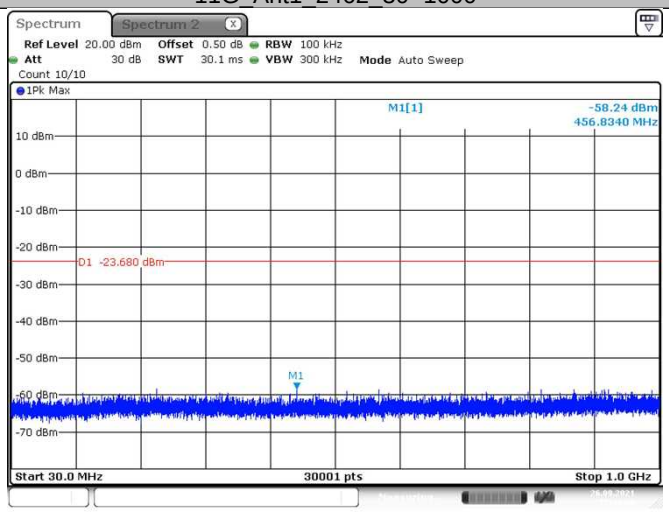

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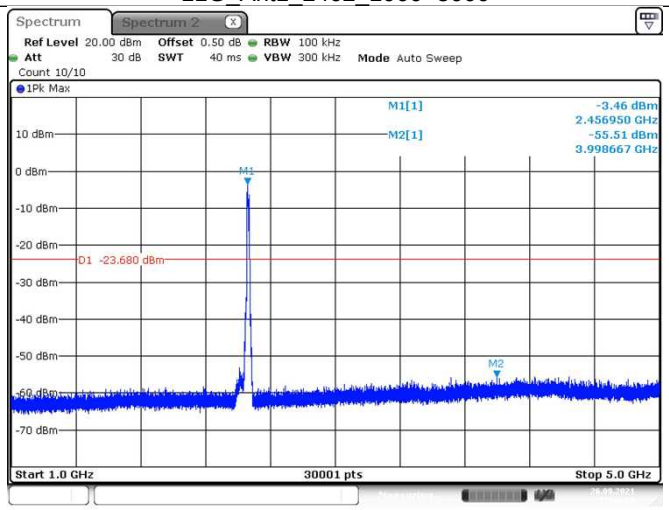

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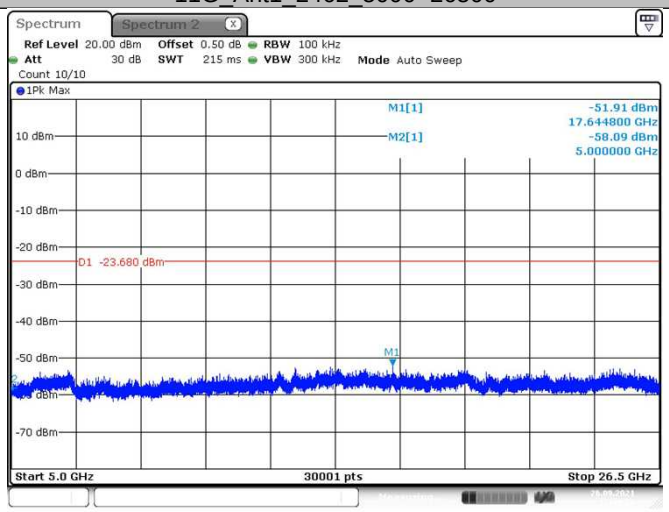
11G_Ant1_2462_5000~26500

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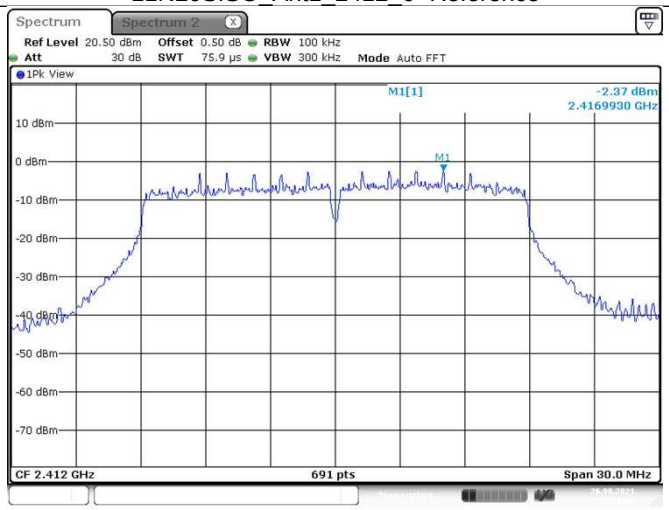
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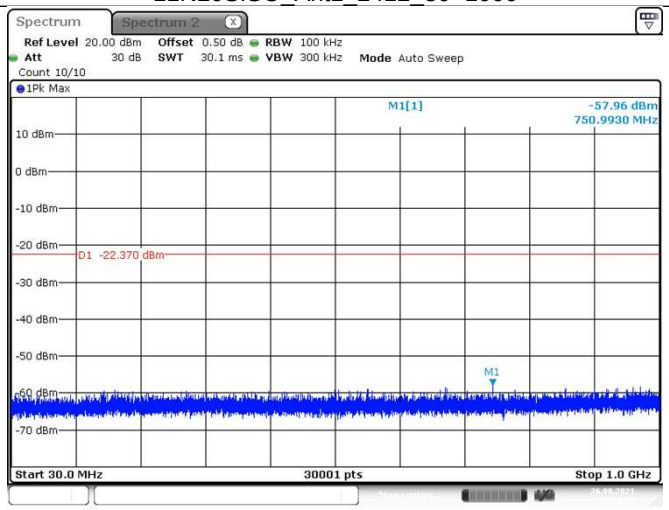

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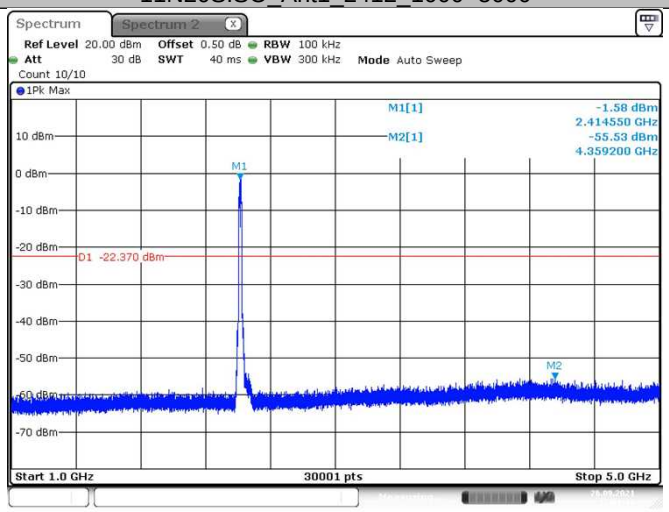 Date: 26.SEP.2021 15:51:17
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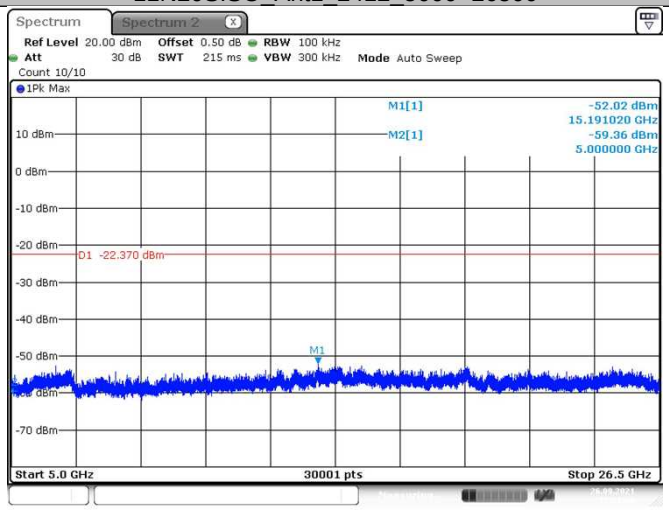 Date: 26.SEP.2021 15:51:49
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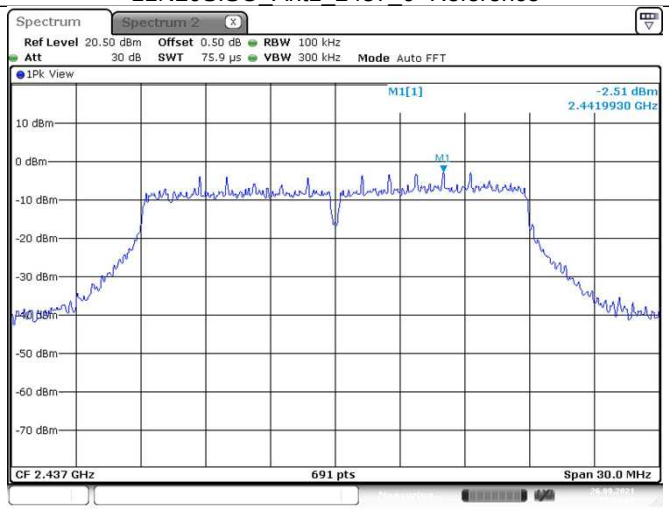 Date: 26.SEP.2021 15:53:18

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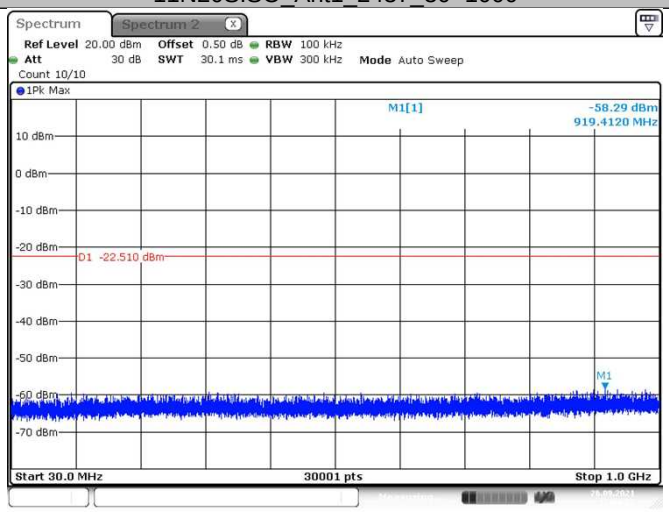
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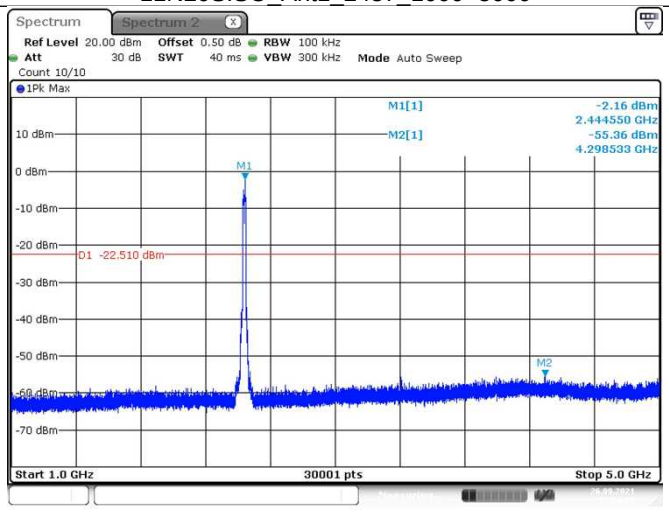
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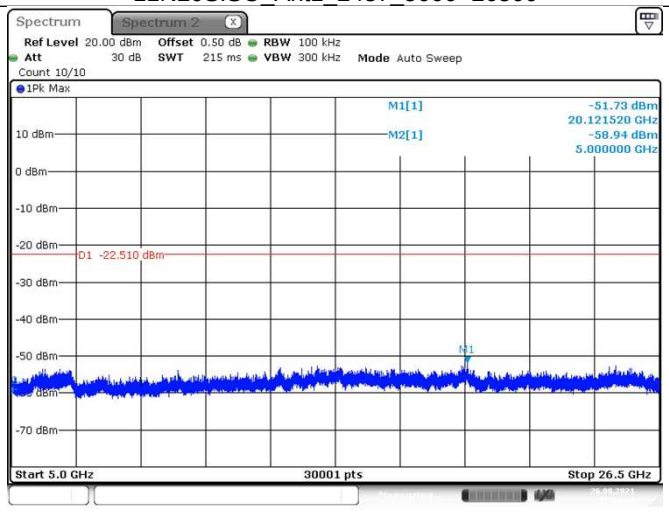

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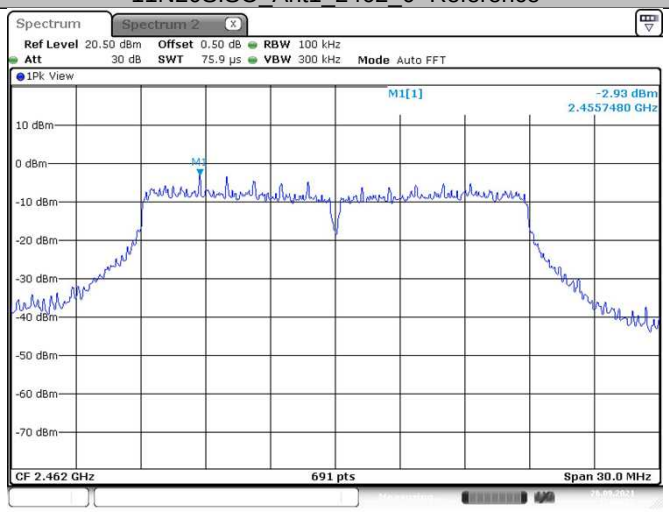
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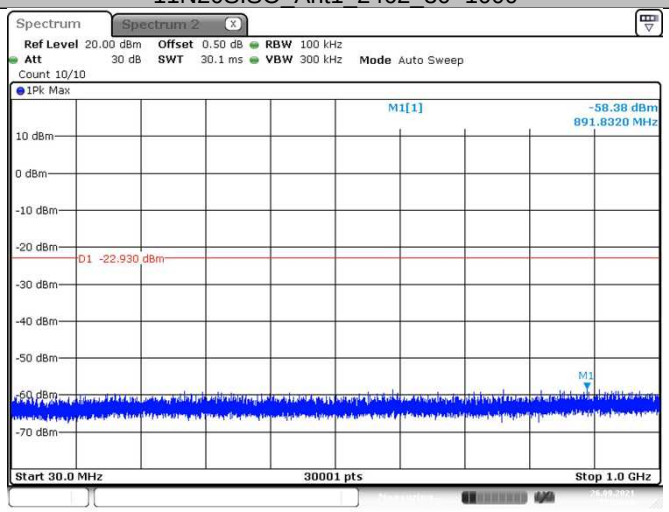
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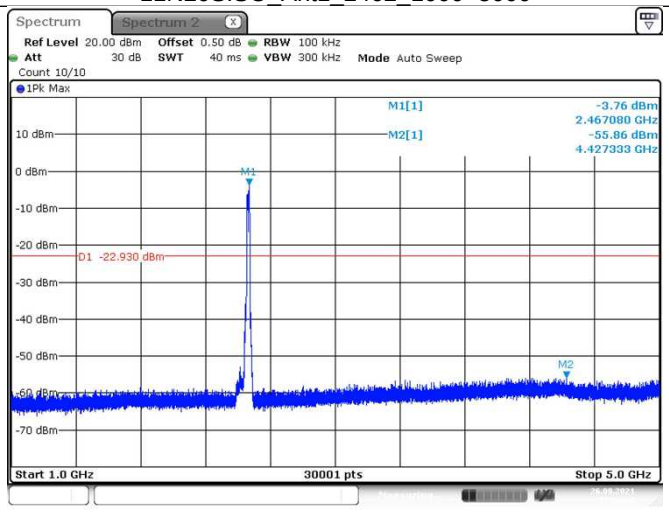

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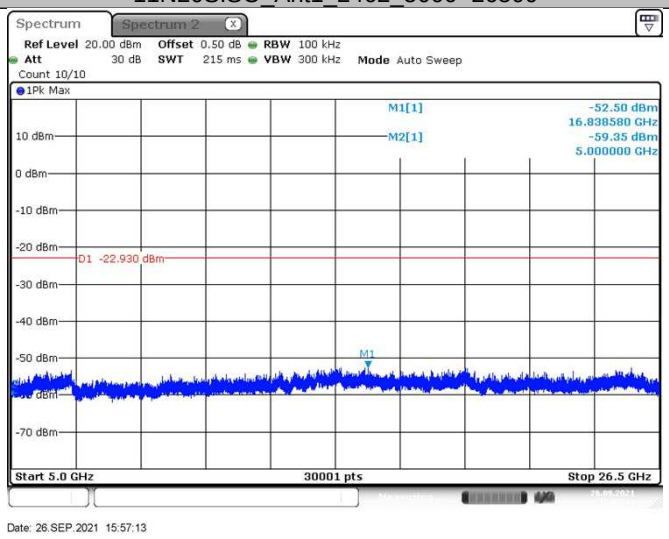
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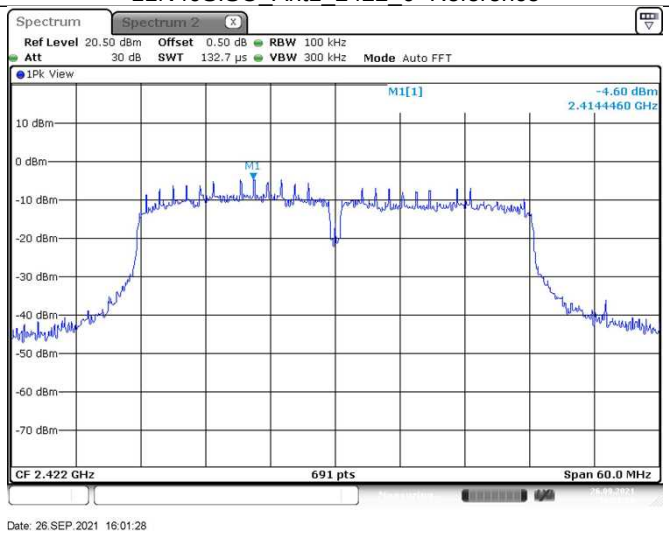
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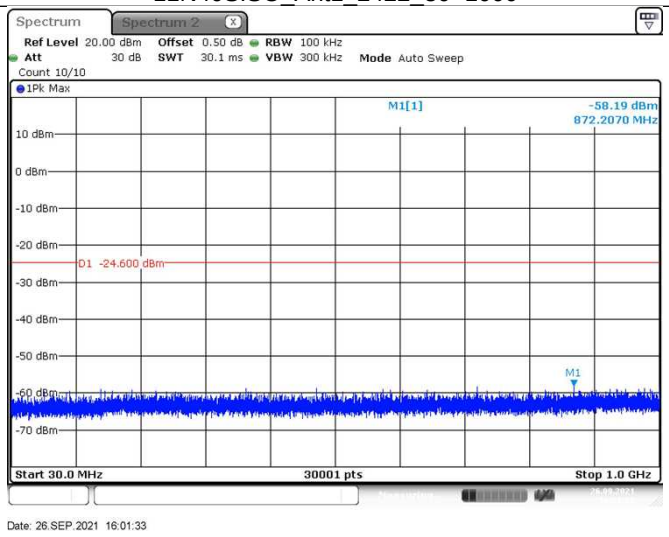

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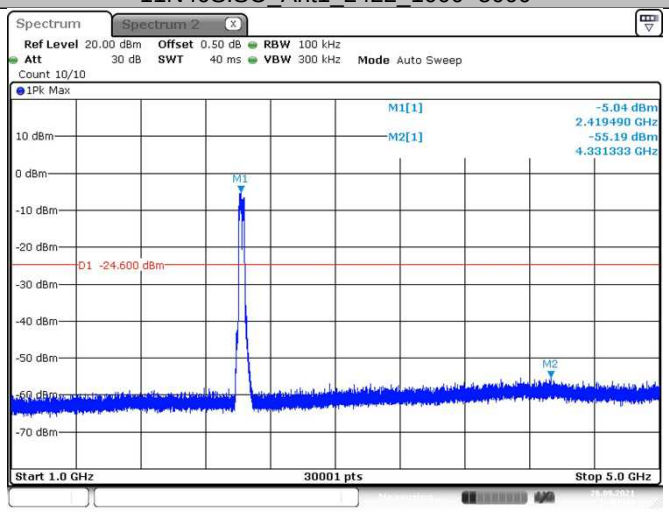 Date: 26.SEP.2021 16:01:45
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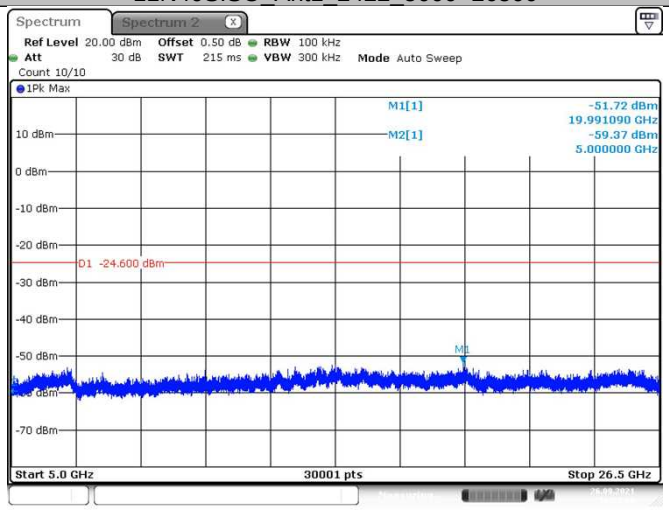 Date: 26.SEP.2021 16:02:16
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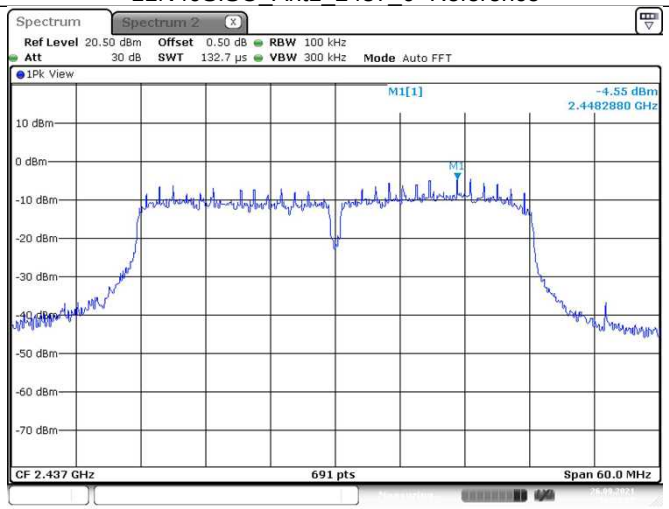 Date: 26.SEP.2021 16:05:38

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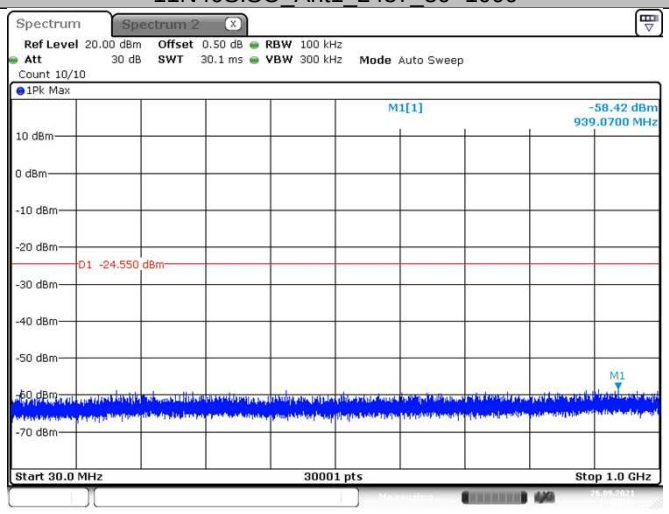
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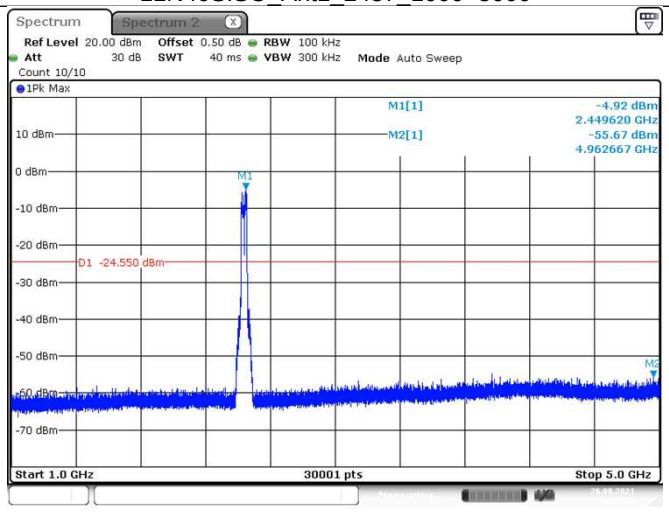
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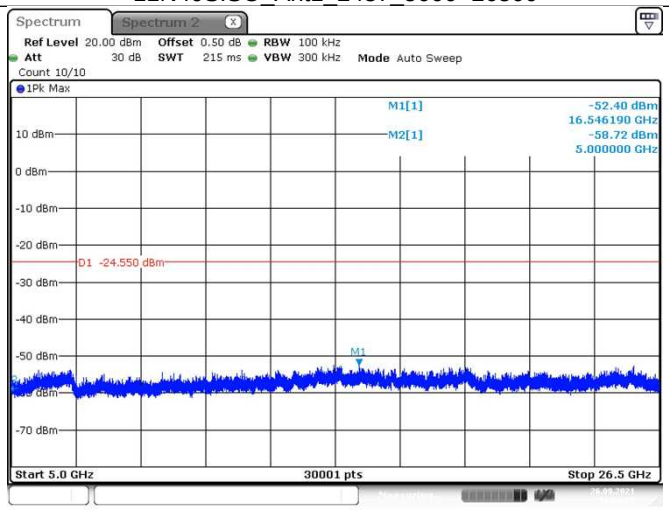

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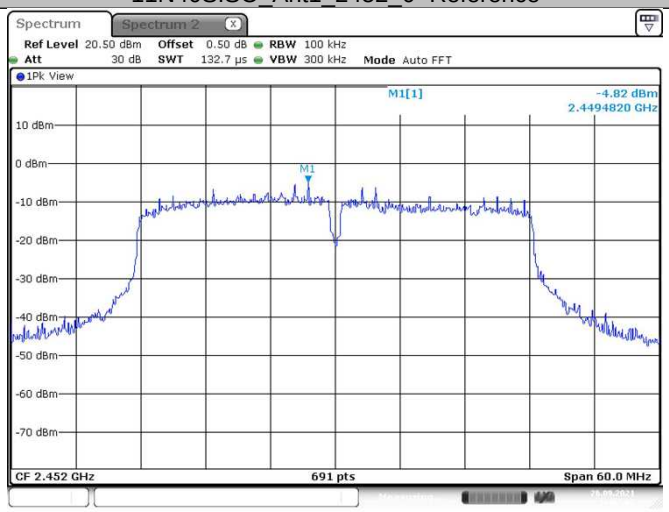 Date: 26.SEP.2021 16:07:56
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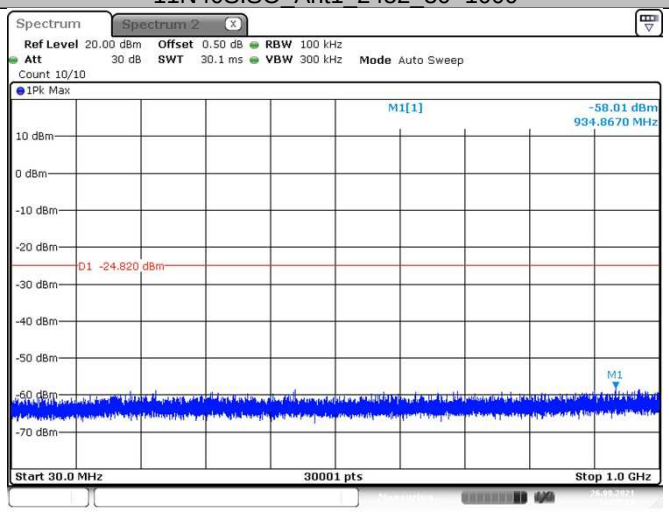
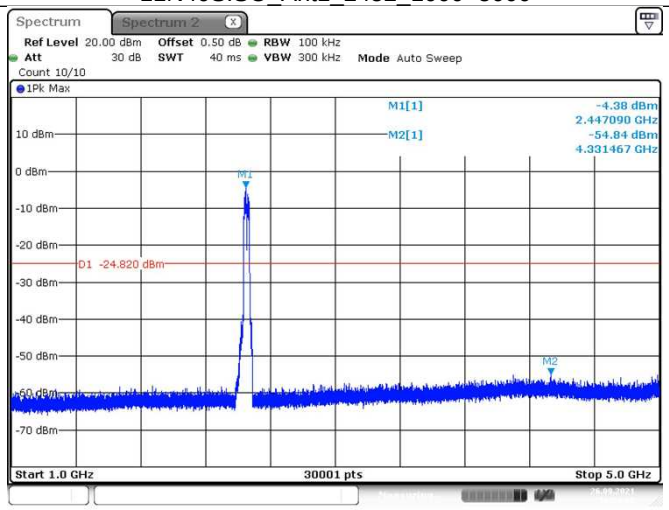
 Date: 26.SEP.2021 16:08:00
11N40SISO_Ant1_2452_1000~5000
 Date: 26.SEP.2021 16:08:12

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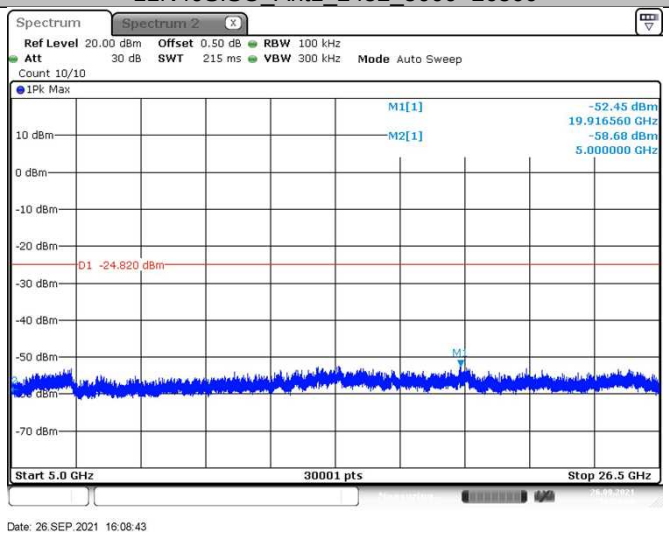
11N40SISO_Ant1_2452_5000~26500



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9.6 Spurious radiated emissions for transmitter

Test Method

1. The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3-meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. Use the following spectrum analyzer settings According to C63.10:

For Below 1GHz

Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz to 120 kHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

For Peak unwanted emissions Above 1GHz:

Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW≥RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Procedures for average unwanted emissions measurements above 1000 MHz

a) RBW = 1MHz.
b) VBW ≥ [3 × RBW].
c) Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ RBW / 2. Satisfying this condition can require increasing the number of points in the sweep or reducing the span. If the condition is not satisfied, then the detector mode shall be set to peak.
d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
e) Sweep time = auto.
f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)
g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:

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1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.
2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.
3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Limit

The radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Measured Distance Meters
0.009~0.490	2400/F (kHz)	300
0.490~1.705	24000/F (kHz)	30
1.705~30	30	30

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

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Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Pre-scan with three orthogonal axis and the worst case as X axis.

The only worse case (which is subject to the maximum EIRP, 802.11 n-HT20 mode & 802.11 n-HT40 mode) are listed in the report.

Transmitting spurious emission test result as below:

802.11 n-HT20

2412MHz

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBµV/m	
2390	62.01	H	74	PK	11.99	Pass
2390	47.8	H	54	AV	6.20	Pass
4824	44.15	H	74	PK	29.85	Pass
2390	61.62	V	74	PK	12.38	Pass
2390	52.9	V	54	AV	1.10	Pass
4824	45.16	V	74	PK	28.84	Pass

2437MHz

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBµV/m	
4874	43.27	H	74	PK	30.73	Pass
4874	44.78	V	74	PK	29.22	Pass

2462MHz

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBµV/m	
2483.5	61.12	H	74	PK	12.88	Pass
2483.5	50.9	H	54	AV	3.10	Pass
4924	43.26	H	74	PK	30.74	Pass
2483.5	65.07	V	74	PK	8.93	Pass
2483.5	52.3	V	54	AV	1.70	Pass
4924	45.97	V	74	PK	28.03	Pass

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802.11 n-HT40

2422MHz

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBµV/m	
2390	57.93	H	74	PK	16.07	Pass
2390	49.3	H	54	AV	4.70	Pass
4844	44.82	H	74	PK	29.18	Pass
2390	60.79	V	74	PK	13.21	Pass
2390	52.1	V	54	AV	1.90	Pass
4844	46.18	V	74	PK	27.82	Pass

2437MHz

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBµV/m	
4874	43.15	H	74	PK	30.85	Pass
4874	44.67	V	74	PK	29.33	Pass

2452MHz

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBµV/m		dBµV/m	
2483.5	57.13	H	74	PK	16.87	Pass
2483.5	49.8	H	54	AV	4.20	Pass
4904	44.82	H	74	PK	29.18	Pass
2483.5	60.86	V	74	PK	13.14	Pass
2483.5	52.7	V	54	AV	1.30	Pass
4904	46.57	V	74	PK	27.43	Pass

Remark:

(1) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Pre-amplifier
Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
Emission Level =Reading level +Correction Factor
(The Reading Level is recorded by software which is not shown in the sheet)

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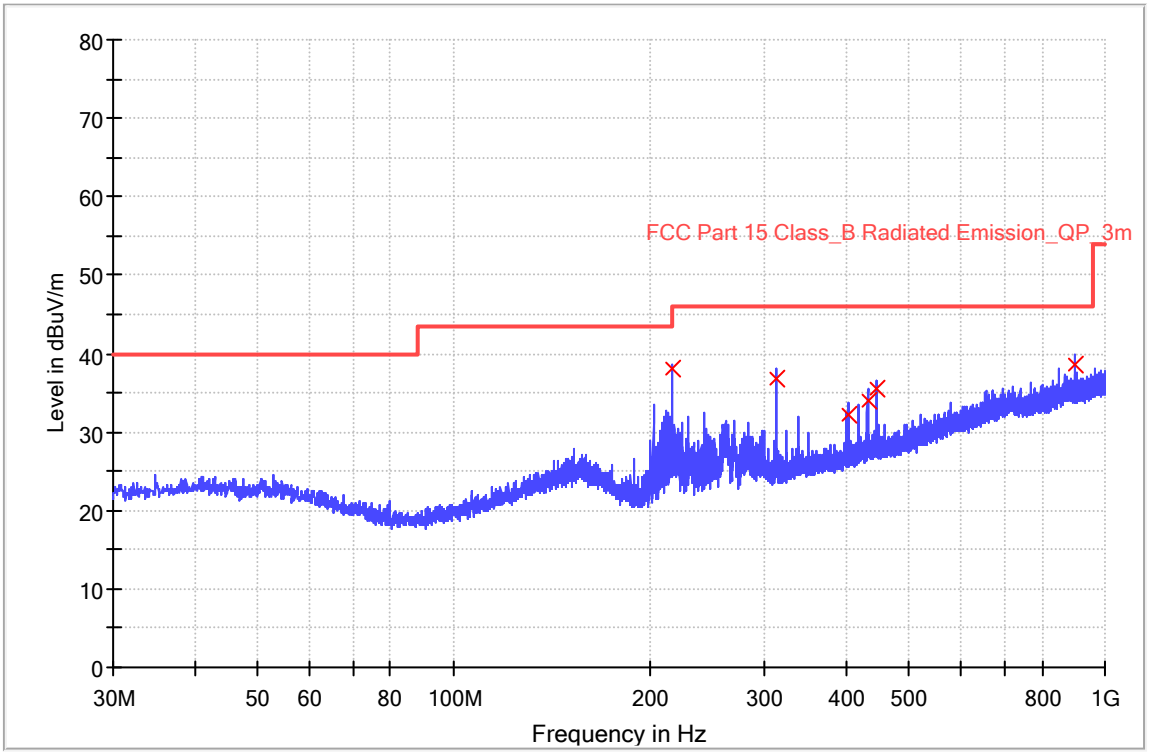
The worst case of Radiated Emission below 1GHz:

Site: 3 meter chamber	Time: 2021/07/13 - 16:30
Limit: FCC_Part15.109_RE(3m)_ClassB	Engineer: Wenqiang LU
Probe: VULB9168	Polarity: Horizontal
EUT: Infrared Thermal Camera, Model no: FOTRIC 326M	Power: 120VAC, 60Hz for computer
Note: Transmit by at 802.11 n-HT40 channel 2422MHz. Note: Pre-scan with three orthogonal axis and the worst case as X axis.	

RE_VULB9168_pre_Cont_30-1000



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
216.000000	38.1	1000.0	120.000	100.0	H	0.0	12.3	7.9	43.5
311.960000	36.8	1000.0	120.000	100.0	H	0.0	15.3	9.2	46.0
405.000000	32.2	1000.0	120.000	100.0	H	0.0	17.5	13.8	46.0
431.960000	34.0	1000.0	120.000	100.0	H	0.0	18.1	12.1	46.0
445.480000	35.6	1000.0	120.000	100.0	H	0.0	18.3	10.4	46.0
900.000000	38.7	1000.0	120.000	100.0	H	0.0	25.9	7.3	46.0

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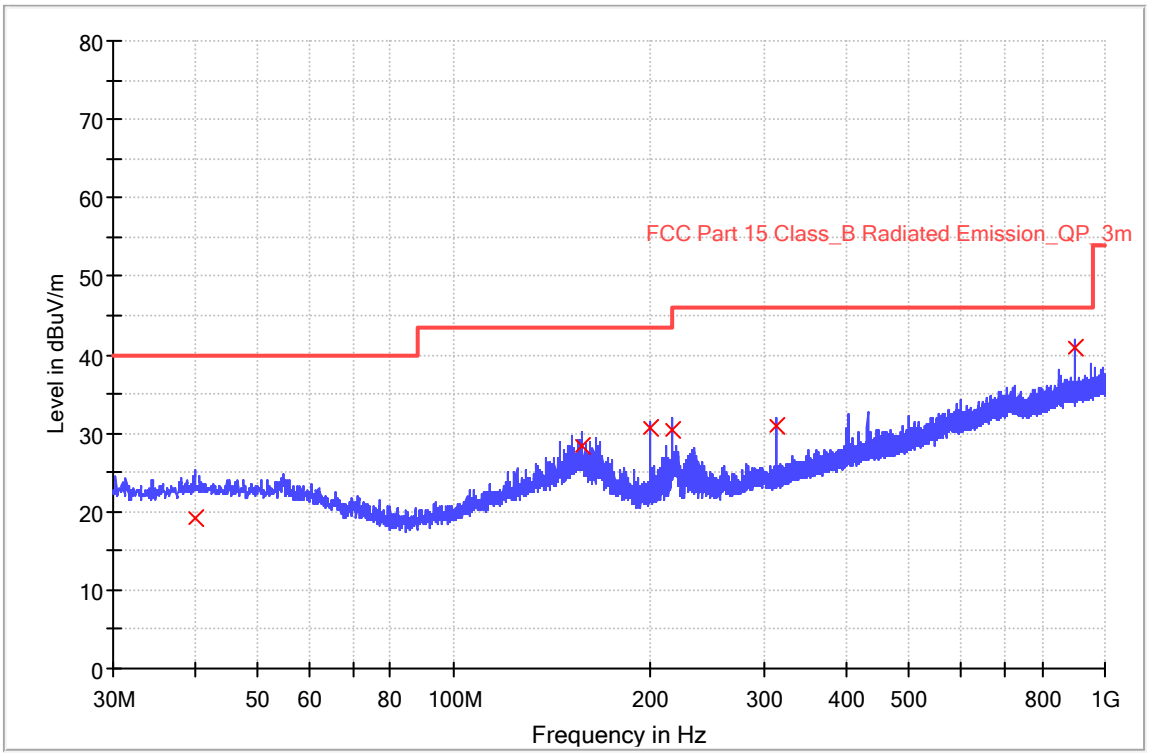
The worst case of Radiated Emission below 1GHz:

Site: 3 meter chamber	Time: 2021/07/13 - 16:38
Limit: FCC_Part15.109_RE(3m)_ClassB	Engineer: Wenqiang LU
Probe: VULB9168	Polarity: Vertical
EUT: Infrared Thermal Camera, Model no: FOTRIC 326M	Power: 120VAC, 60Hz for computer
Note: Transmit by at 802.11 n-HT40 channel 2422MHz. Note: Pre-scan with three orthogonal axis and the worst case as X axis.	

RE_VULB9168_pre_Cont_30-1000



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
40.040000	19.3	1000.0	120.000	100.0	V	250.0	14.8	20.7	40.0
157.720000	28.4	1000.0	120.000	100.0	V	75.0	15.7	15.1	43.5
200.000000	30.6	1000.0	120.000	100.0	V	77.0	11.6	12.9	43.5
216.000000	30.5	1000.0	120.000	100.0	V	165.0	12.3	15.5	46.0
311.960000	31.0	1000.0	120.000	100.0	V	57.0	15.3	15.0	46.0
900.000000	40.9	1000.0	120.000	100.0	V	17.0	25.9	5.1	46.0

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)
Factor (dB) = Cable Loss (dB) + Antenna Factor (dB/m)
Note 2: The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.

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10 Test Equipment List

List of Test Instruments

Test Site1

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE	CAL. DUE DATE
C	Wideband power sensor	Rohde & Schwarz	NRP-Z81	104782	2020-12-23	2021-12-22
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2020-8-4	2021-8-3
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2021-8-2	2022-8-1
RE	EMI Test Receiver	Rohde & Schwarz	ESR3	101906	2020-8-4	2021-8-3
	EMI Test Receiver	Rohde & Schwarz	ESR3	101906	2021-8-2	2022-8-1
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2020-8-4	2021-8-3
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2021-8-2	2022-8-1
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	961	2019-3-16	2022-3-15
	Horn Antenna	Rohde & Schwarz	HF907	102393	2021-3-15	2022-3-14
	Pre-amplifier	Rohde & Schwarz	SCU-18D	19006451	2020-8-4	2021-8-3
	Pre-amplifier	Rohde & Schwarz	SCU-18D	19006451	2021-8-2	2022-8-1
	Loop antenna	Rohde & Schwarz	HFH2-Z2	100443	2020-5-23	2021-5-22
	Loop antenna	Rohde & Schwarz	HFH2-Z2	100443	2021-5-21	2022-5-20
	DOUBLE-RIDGED WAVEGUIDE HORN WITH PRE-AMPLIFIER (18 GHZ - 40 GHZ)	ETS-Lindgren	3116C-PA	002222727	2020-9-23	2023-9-22
	3m Semi-anechoic chamber	TDK	9X6X6	----	2018-5-11	2021-5-10
	3m Semi-anechoic chamber	TDK	9X6X6	----	2021-5-8	2024-5-7
CE	EMI Test Receiver	Rohde & Schwarz	ESR3	101907	2020-8-4	2021-8-3
	EMI Test Receiver	Rohde & Schwarz	ESR3	101907	2021-8-2	2022-8-1
	LISN	Rohde & Schwarz	ENV216	101924	2020-8-4	2021-8-3
	LISN	Rohde & Schwarz	ENV216	101924	2021-8-2	2022-8-1

Measurement Software Information			
Test Item	Software	Manufacturer	Version
C	Bluetooth and WiFi Test System	Shenzhen JS tonscend co.,ltd	2.6.77.0518
RE	EMC 32	Rohde & Schwarz	V9.15.00
CE	EMC 32	Rohde & Schwarz	V9.15.03

C - Conducted RF tests

- Conducted peak output power
- 6dB Occupied Bandwidth
- Power spectral density*
- Conducted Band Edge and Out-of-Band Emissions

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11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

Items	Extended Uncertainty
Conducted Disturbance at Mains Terminals	150kHz to 30MHz, LISN, ±3.16dB
Radiated Disturbance	30MHz to 1GHz, ±5.03dB (Horizontal) ±5.12dB (Vertical) 1GHz to 18GHz, ±5.49dB 18GHz to 25GHz, ±5.63dB
Carrier power conducted measurement	50MHz~18GHz, ±1.238dB
Spurious Emission Conducted Measurement	9kHz ~40GHz, ± 1.224dB

Measurement Uncertainty Decision Rule:

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2007, clause 4.4.3 and 4.5.1.

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12 Photographs of Test Set-ups

Refer to the < Test Setup photos >.

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13 Photographs of EUT

Refer to the < External Photos > & < Internal Photos >.

THE END

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