

Armatura LLC

TEST REPORT

Report Type:
FCC Part 15C

Model:
OmniAC20

REPORT NUMBER:
230402194SHA-005

ISSUE DATE:
July 5, 2023

DOCUMENT CONTROL NUMBER:
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Applicant: Armatura LLC
Address of Applicant: 190 Bluegrass Valley Parkway Alpharetta, GA 30005

Manufacturer: Armatura LLC
Address of Manufacturer: 190 Bluegrass Valley Parkway Alpharetta, GA 30005

FCC ID: 2A5UQ-OMNIAC20W

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:
47CFR Part 15 (2021): Radio Frequency Devices (Subpart C)
ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

PREPARED BY:**REVIEWED BY:**

Project Engineer
Damon Ding

Reviewer
Erick Liu

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TEST REPORT

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Revision History

Report No.	Version	Description	Issued Date
230402194SHA-005	Rev. 01	Initial issue of report	July 5, 2023

Measurement result summary

TEST ITEM	FCC REFERENCE	RESULT
Antenna Requirement	15.203	Pass
Power line conducted emission	15.207	Pass
Radiated emission	15.209	Pass
20dB bandwidth	15.215	Pass

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Smart Access Control Terminal
Type/Model:	OmniAC20
Description of EUT:	Smart Access Control Terminal
Rating:	Powered from adapter: Input: 100V-240~50/60Hz, 1.0A Max Output: DC12V, 3.0A
EUT type:	<input checked="" type="checkbox"/> Table top <input type="checkbox"/> Floor standing
Operating Frequency:	125kHz
Antenna Type:	induction coil antenna
Software Version:	Not provided
Hardware Version:	Not provided
Normal Test Voltage:	120V ~60Hz
Sample received date:	March 8, 2023
Date of test:	April 13, 2023 to June 01, 2023

1.2 Technical Specification

Frequency Range:	119 kHz ~ 140 kHz
Nominal Operating Frequency:	125kHz
Number of Channels:	1
Modulation:	ASK
Antenna:	induction coil antenna

1.3 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab CAB identifier.: CN0014
	VCCI Registration Lab Member No: 3598 (Registration No.: R-14243, G-10845, C-14723, T-12252)
	A2LA Accreditation Lab Certificate Number: 3309.02

All tests were sub-contracted.

Name:	Shenzhen UnionTrust Quality and Technology Co., Ltd.
Address:	Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng Science and Technology Park, Longhua District, Shenzhen, China
Telephone:	+86 (0) 755 2823 0888
Telefax:	+86 (0) 755 2823 0886

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L9069
	FCC Accredited Lab Designation Number: CN1194
	A2LA Accreditation Lab Certificate Number: 4312.01

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2021)
ANSI C63.10 (2013)

2.2 Mode of operation during the test

Within this test report, EUT was tested under all available operation modes and tested under its rating voltage and frequency. The below test modes in boldface were the worst cases, only the test data of these modes were reported.

Test Item	EMI Test Modes
Radiated emission	Test Mode 1: AC120~60Hz+ 13.56MHz Tx mode
Conducted emission	Test Mode 1: AC120~60Hz+ 13.56MHz Tx mode

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	e3	Audix	9.20151119i
Radiated emission	e3	Audix	9.160323

2.4 Test peripherals list

Item No	Description	Band and Model	S/No	rating
1	Advanced Look	N/A, AL-280 (LED)	N/A	NA
2	Card Reader	ZKTeco, KR503E	N/A	AC100-240V 50/60Hz 1.0A
3	Advanced ID Card	ZKTeco, 125 kHz	NA	NA
4	Laptop	Lenovo,E450	SL10G10780	N/A
5	mouse	DELL, MS111	CN-011D3V- 73826-62N- OLK	N/A

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2.5 Support Cable list

Item No	Description	Length (m)	Cable Type
1	Ethernet Cable	1.5	RJ45_Cat 5

2.6 Test environment condition:

Test items	Temperature	Humidity
Power line conducted emission	24.4°C	58.2% RH
Radiated Emissions	22.7°C	59.6% RH
RF Test	24.8°C	52.4% RH

2.7 Instrument list

Radiated Emission & RF Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
<input checked="" type="checkbox"/>	3m Chamber SAC	ETS-LINDGREN	3m	NA	22-Jan-2021	21-Jan-2024
<input checked="" type="checkbox"/>	Receiver	R&S	ESIB26	100114	3-Nov-2022	2-Nov-2023
<input checked="" type="checkbox"/>	Loop Antenna	ETS-LINDGREN	6502	00202525	Nov. 21, 2022	Nov. 20, 2023
<input checked="" type="checkbox"/>	Broadband Antenna	ETS-LINDGREN	3142E	00201566	13-Dec-2022	12-Dec-2023
<input checked="" type="checkbox"/>	6dB Attenuator	Talent	RA6A5-N-18	18103001	13-Dec-2022	12-Dec-2023
<input checked="" type="checkbox"/>	Preamplifier	HP	8447F	2805A02960	1-Nov-2022	31-Oct-2023
<input checked="" type="checkbox"/>	Spectrum analyzer	R&S	FSV40-N	101653	Apr. 14, 2023	Apr. 13, 2024
<input checked="" type="checkbox"/>	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
<input checked="" type="checkbox"/>	Receiver	R&S	ESR7	1316.3003K07-101181-K3	Nov. 01, 2022	Oct. 31, 2023
<input checked="" type="checkbox"/>	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Nov. 01, 2022	Oct. 31, 2023
<input checked="" type="checkbox"/>	LISN	R&S	ESH2-Z5	860014/024	Nov. 01, 2022	Oct. 31, 2023
<input checked="" type="checkbox"/>	LISN	ETS-Lindgren	3816/2SH	00201088	Nov. 01, 2022	Oct. 31, 2023
<input checked="" type="checkbox"/>	Test Software	Audix	e3	Software Version: 9 20151119i		

2.8 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Frequency	Expanded Uncertainty (k=2)
Conducted emission at mains ports	9kHz ~ 150kHz	±3.2 dB
	150kHz ~ 30MHz	±2.7 dB
Radiated Emissions	9kHz ~ 30MHz	± 4.7 dB
	30MHz ~ 1GHz	± 4.6 dB
	1GHz ~ 18GHz	± 4.4 dB
	18GHz~26 GHz	± 4.4 dB
	26 GHz~40 GHz	± 4.6 dB

3 Radiated Emissions

Test result: Pass

3.1 Limit

3.1.1 the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission level (μV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.
4. For Below 30MHz, the measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

Field strength limit for 13.56MHz = 15848 μV/m at 30m
= 84 dBμV/m at 30m
= 84 dBμV/m + 40log (30/3) dB at 3m
= 124 dBμV/m at 3m

3.2 Block diagram and test set up

For table top equipment

Figure 1. Below 30MHz

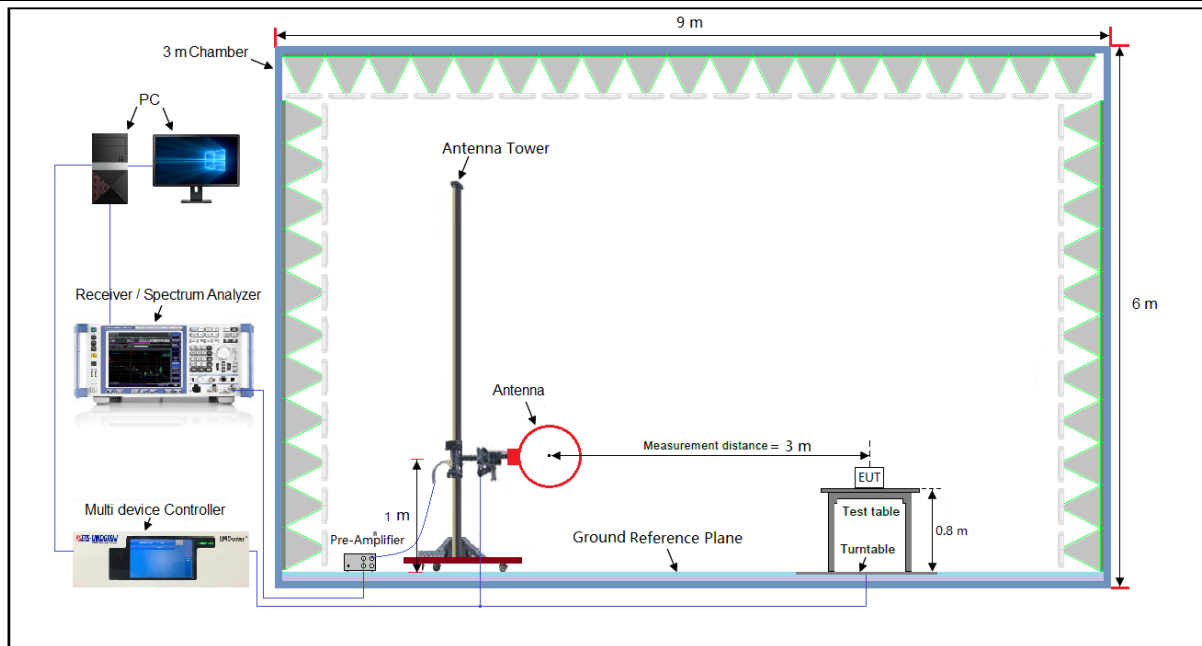
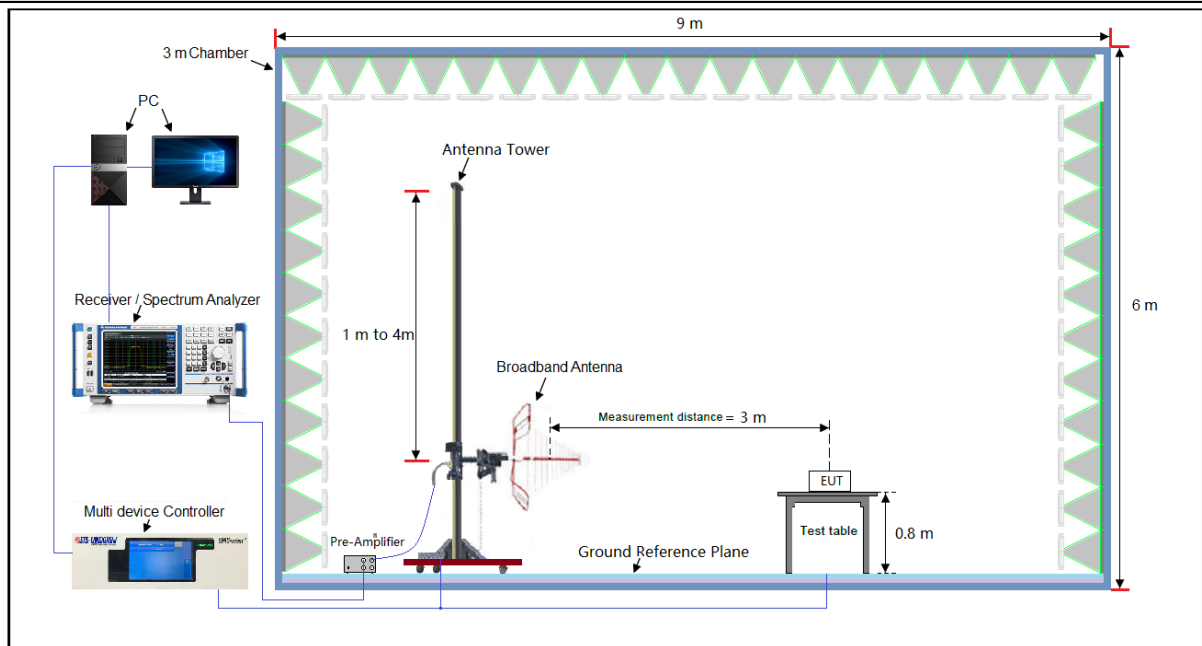


Figure 2. 30MHz to 1GHz



3.3 Measurement Procedure

- 1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3-meter semi-anechoic chamber. 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 antenna height 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 6) If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- 7) The system was investigated from 9 kHz to 1 GHz. During the radiated emission test, the EMI test Receiver was set with the following configurations:

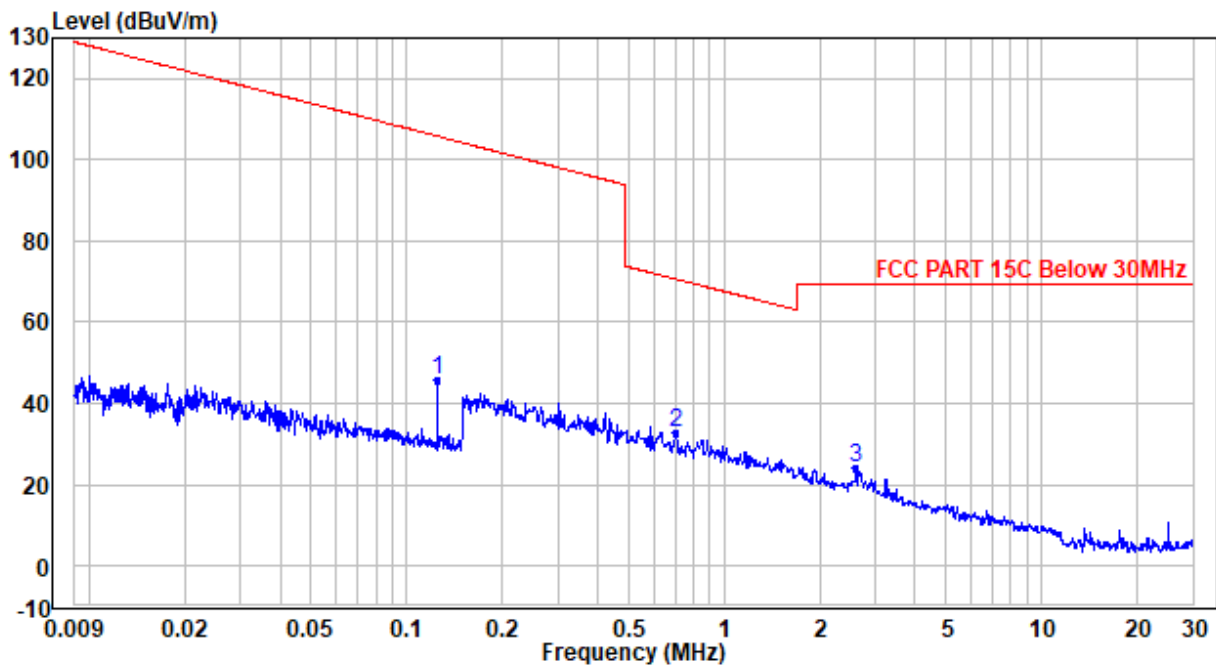
Frequency Range	RBW	VBW	Measurement
9 kHz – 150 kHz	1kHz	3 kHz	Peak
150 kHz – 30 MHz	9kHz	30 kHz	Peak
30 MHz – 1000 MHz	120 kHz	300 kHz	Peak

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3.4 Test Results of Radiated Emissions

Radiated Emission Test Data (9 KHz ~ 30 MHz):

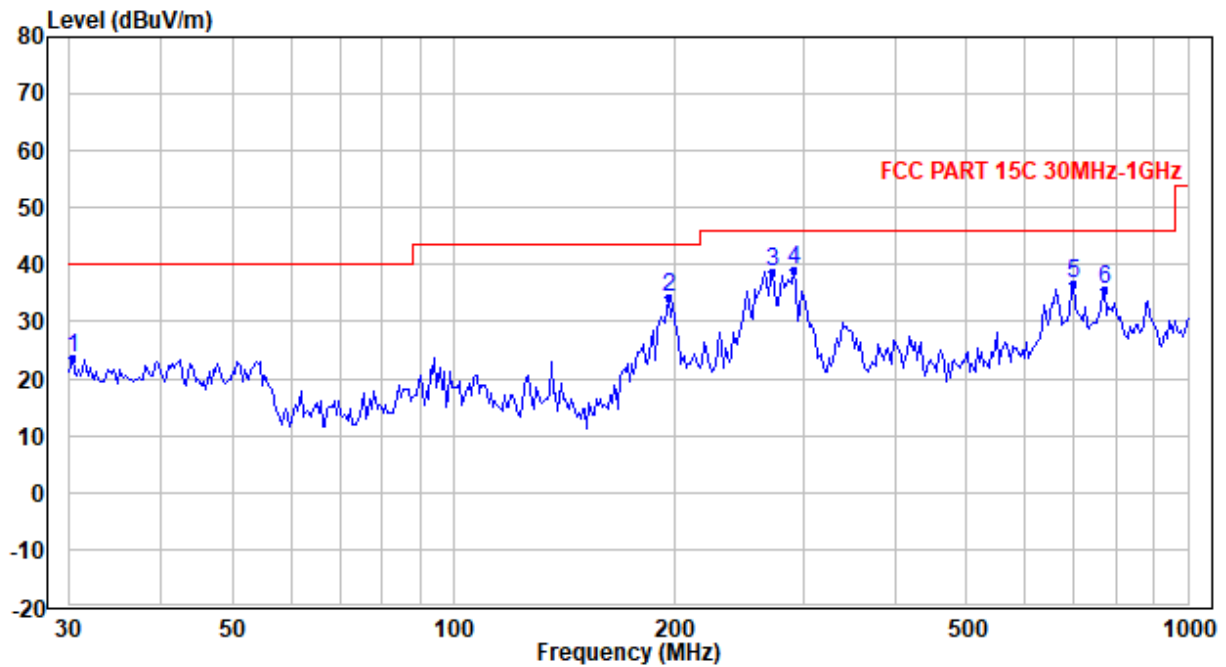
Worst case Test Mode 1: X axes



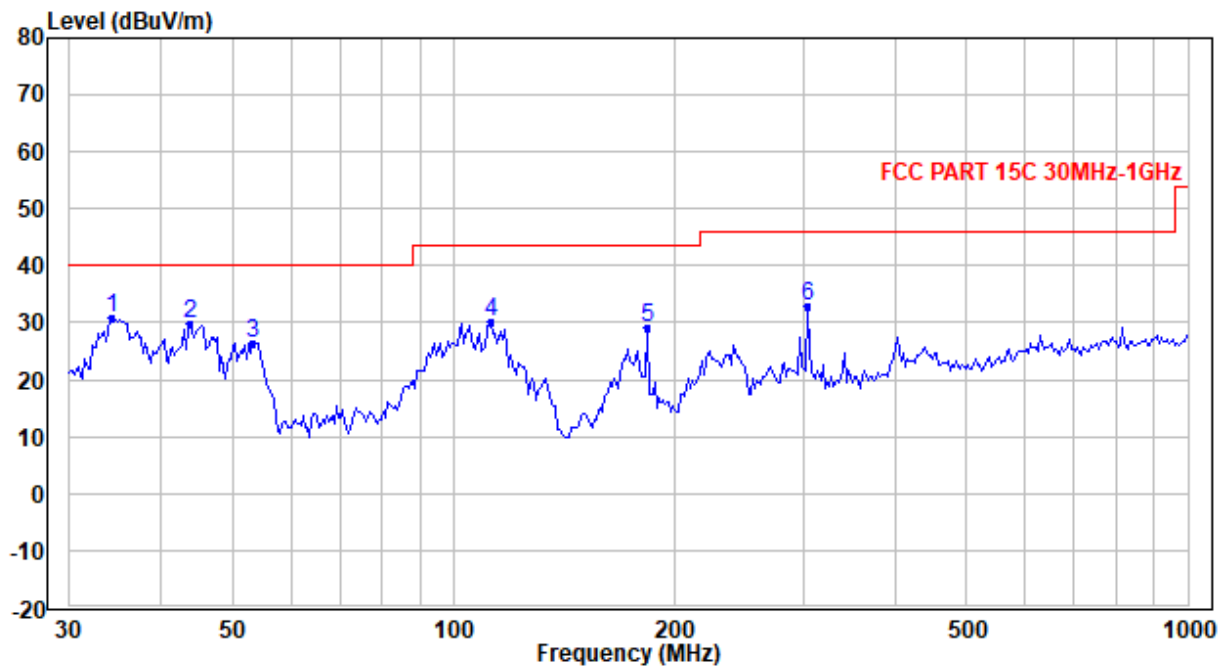
Radiated Emission Test Data (30 MHz ~ 1 GHz):

Worst case Test Mode 1

Horizontal



Vertical



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Test data 9 KHz ~ 30 MHz:

Frequency (MHz)	Measured level (dBμV/m)	Factor (dB)	Limits (dBμV/m)	Margin (dB)	Detector
0.125	45.62	-20.25	105.81	-60.19	AVG
0.706	33.05	-20.57	70.64	-37.59	Peak
2.605	24.39	-20.48	69.50	-45.11	Peak

Test data 30MHz~1GHz:

Polarization	Frequency (MHz)	Measured level (dBμV/m)	Factor (dB)	Limits (dBμV/m)	Margin (dB)	Detector
H	30.212	23.67	-4.78	40.00	-16.33	Peak
	195.870	34.14	-10.37	43.50	-9.36	Peak
	272.525	38.90	-7.58	46.00	-7.10	Peak
	290.317	39.27	-7.01	46.00	-6.73	Peak
	698.804	36.82	2.43	46.00	-9.18	Peak
	771.047	35.51	2.95	46.00	-10.49	Peak
V	34.285	30.70	-5.38	40.00	-9.30	Peak
	43.845	29.91	-10.49	40.00	-10.09	Peak
	53.379	26.47	-16.14	40.00	-13.53	Peak
	112.427	30.19	-15.39	43.50	-13.31	Peak
	183.866	29.20	-10.09	43.50	-14.30	Peak
	302.819	32.83	-6.25	46.00	-13.17	Peak

Remark:

- Factor= Antenna Factor + Cable Loss (-Amplifier, is employed)
- Measured level= Original Receiver Reading + Factor
- Margin =Measured level -Limit
- All possible modes of operation were investigated, only the worst-case emissions reported.

4 Power line conducted emission

Test result: PASS

4.1 Limit

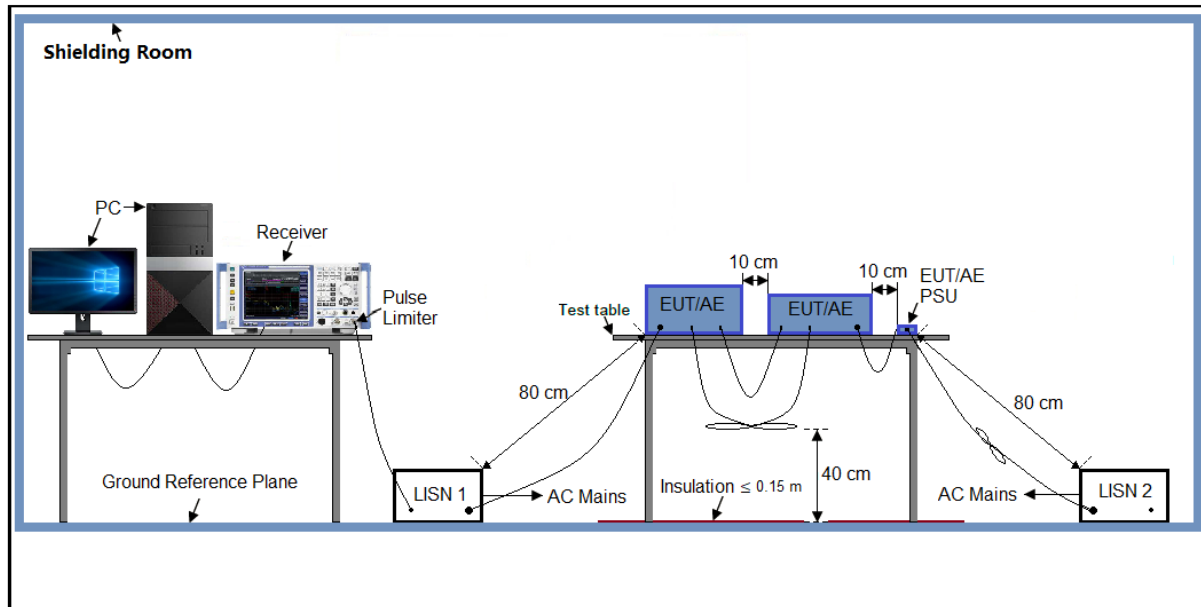
4.1.1 Limits for conducted disturbance voltage at the mains ports of class B device

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 ~ 56 *	56 ~ 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

Note: 1. * Means the limit decreasing linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz
2. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

4.2 Block diagram and test set up

For table top equipment



4.3 Measurement Procedure

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

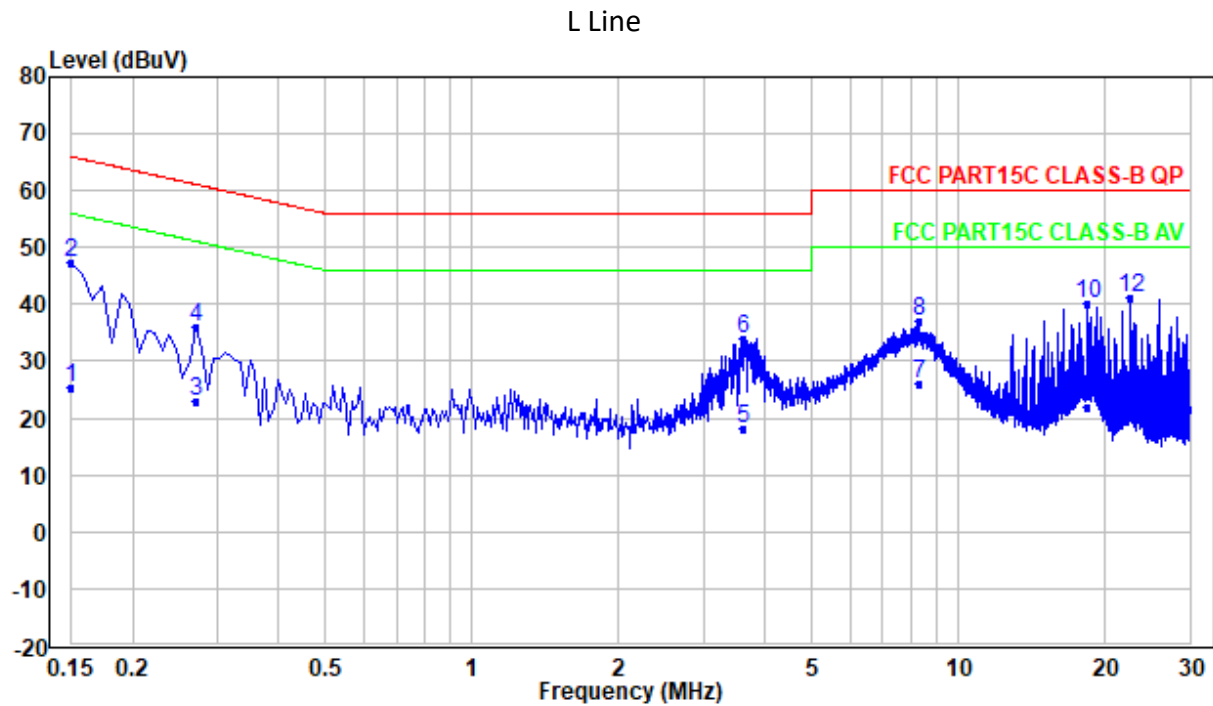
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.10. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

4.4 Test Results of Power line conducted emission

Worst case Test Mode 1

Test Curve:

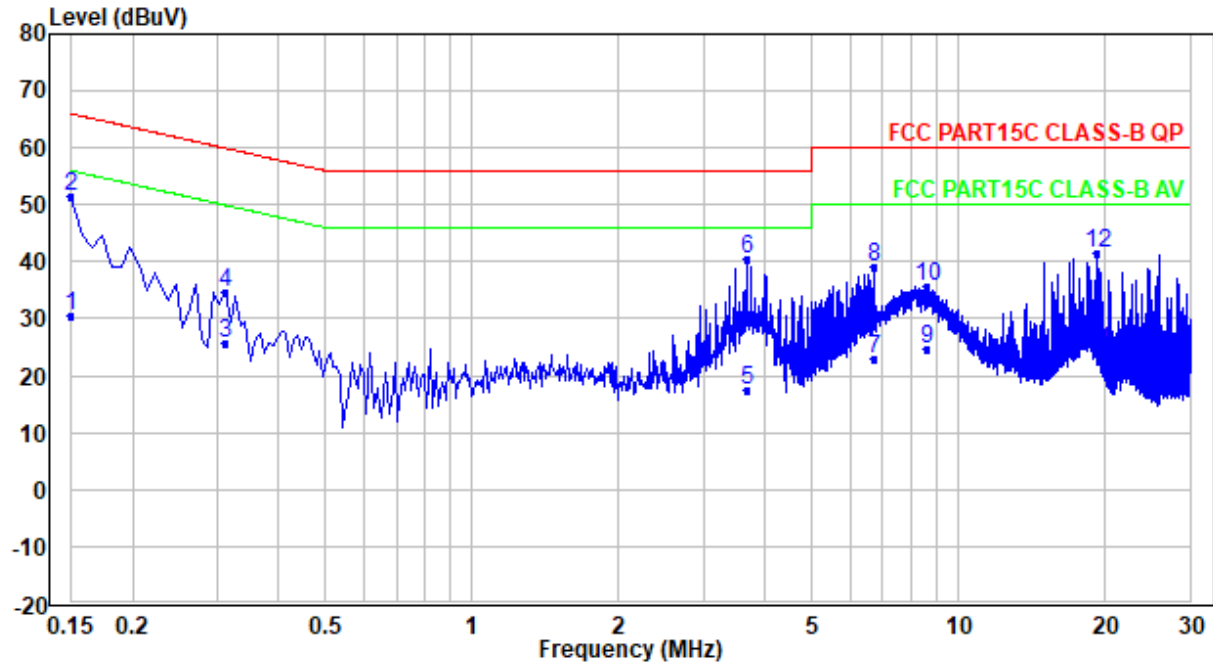


Test Data:

Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.150	47.41	66.00	-18.59	25.41	56.00	-30.59
0.270	35.95	61.12	-25.17	22.95	51.12	-28.17
3.613	34.08	56.00	-21.92	18.08	46.00	-27.92
8.332	36.88	60.00	-23.12	25.88	50.00	-24.12
18.498	40.04	60.00	-19.96	22.04	50.00	-27.96
22.530	41.23	60.00	-18.77	22.23	50.00	-27.77

Test Curve:

N Line



Test Data:

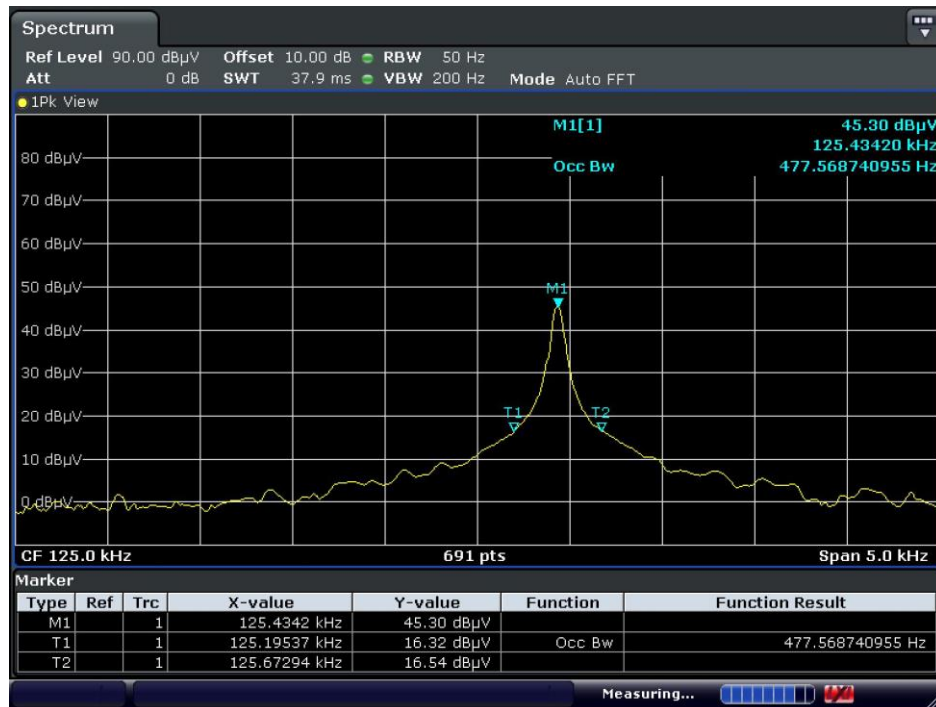
Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.150	51.34	66.00	-14.66	30.34	56.00	-25.66
0.310	34.74	59.97	-25.23	25.74	49.97	-24.23
3.669	40.55	56.00	-15.45	17.55	46.00	-28.45
6.693	39.07	60.00	-20.93	23.07	50.00	-26.93
8.596	35.83	60.00	-24.17	24.83	50.00	-25.17
19.354	41.36	60.00	-18.64	24.36	50.00	-25.64

Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.
 2. Corrected Reading = Original Receiver Reading + Correct Factor
 3. Margin = Corrected Reading - Limit
 4. All possible modes of operation were investigated, only the worst-case emissions reported.

5 Measured Bandwidth

Pursuant to FCC Part 15 Section 15.215(c), the 20dB bandwidth of the emission was contained within the frequency band designed (mentioned as above) which the EUT operated. The effects, if any, from frequency sweeping, frequency hopping, other modulation techniques and frequency stability over expected variations in temperature and supply voltage were considered.

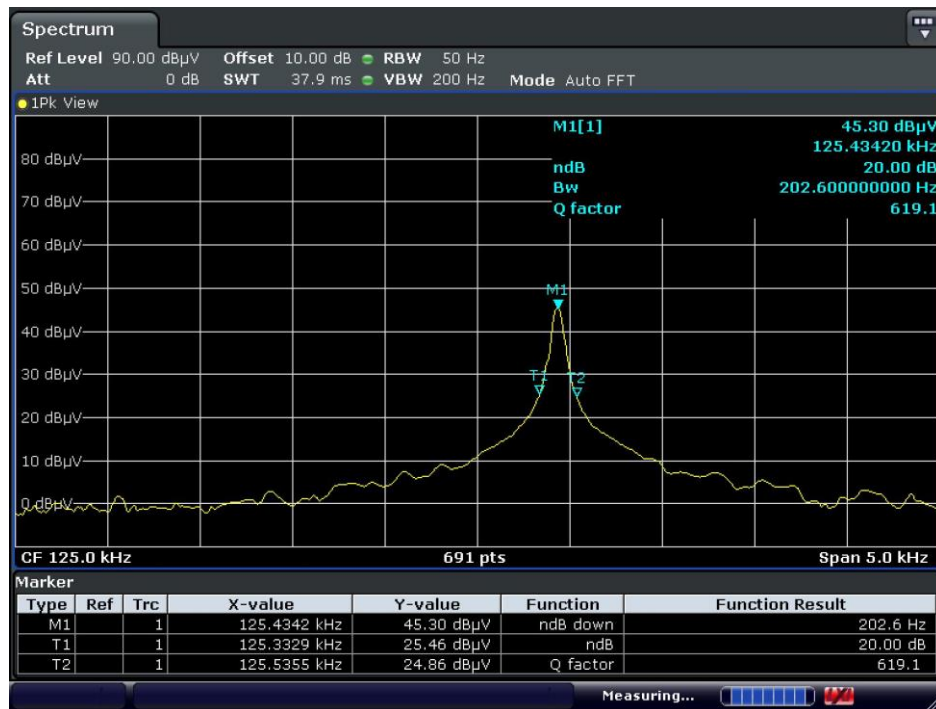
125kHz_OBW



Date: 31.MAY.2023 09:23:48

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125kHz_20dB BW



Date: 31.MAY.2023 09:24:29

Frequency	OBW	20dB BW
125kHz	477.57 Hz	202.60 Hz

6 ANTENNA REQUIREMENT

Standard Requirement
<p>15.203 requirement:</p> <p>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.</p>
<p>EUT Antenna:</p> <p>This product has a permanent antenna, fulfill the requirement of this section.</p>

Appendix I: Photograph of test setup

See test photos attached in Appendix I for the actual connections between Product and support equipment.

Appendix II: Photograph of equipment under test

Refer to Appendix II for EUT external and internal photos.

***** END *****