

Armatura LLC

RF TEST REPORT

Report Type:

FCC Part 15.225 RF report

Model:

OmniAC30

REPORT NUMBER:

230200227SHA-003

ISSUE DATE:

April 12, 2023

DOCUMENT CONTROL NUMBER:

TTRF15.225_V1 © 2018 Intertek



TEST REPORT

Report no.: 230200227SHA-003

Applicant: Armatura LLC
190 Bluegrass Valley Parkway Alpharetta, GA 30005
Manufacturer: Armatura LLC
190 Bluegrass Valley Parkway Alpharetta, GA 30005
FCC ID: 2A5UQ-OMNIAC30

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2020): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

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TEST REPORT

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Revision History

Report No.	Version	Description	Issued Date
230200227SHA-003	Rev. 01	Initial issue of report	April 12, 2023

Measurement result summary

TEST ITEM	FCC REFERENCE	RESULT
Fundamental emission	15.225(a) (b) (c)	Pass
Spurious emission	15.225(d)	Pass
Frequency stability	15.225(e)	Pass
Conducted emissions	15.207	Pass
20dB Bandwidth	15.215(c)	Pass
Antenna requirement	15.203	Pass

Notes: 1: NA =Not Applicable

2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Smart Access Control Terminal
Type/Model:	OmniAC30
Description of EUT:	Smart Access Control Terminal
Rating:	DC input: 9-24Vdc or supply by POE
EUT type:	☒ Table top ☐ Floor standing
Software Version:	NA
Hardware Version:	NA
Sample received date:	January 31, 2023
Date of test:	February 03, 2023 to February 14, 2023

Note: The product is powered by an adapter (120V ~60Hz, 1.0A)

1.2 Technical Specification

Frequency Range:	13.56 MHz ~ 13.56 MHz
Modulation:	ASK
Antenna:	Loop Antenna

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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 Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

All tests were sub-contracted.

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 518109

Telephone: +86 (0) 755 2823 0888

Fax: +86 (0) 755 2823 0886

All tests were sub-contracted at Shenzhen UnionTrust Quality and Technology Co., Ltd, and conducted by Kieron Luo

Reviewed and approved by Wakeyou Wang from Intertek Testing Services Shanghai.

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

IC-Registration No.: 21600-1

The 3m Semi-anechoic chamber of Shenzhen UnionTrust Quality and Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with

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Registration No.: 21600-1.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

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2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2020)

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 Mode 1: Card with 13.56MHz recognition mode (powered with 12V adapter)

Test Mode 2: Card with 13.56MHz recognition mode (powered with POE)

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	e3	Audix	9.160333
Radiated emission	e3	Audix	9.160333

2.4 Test peripherals list

Item No	Description	Band and Model	S/No	rating
1	IC card	NA	NA	NA
2	Adapter	SHENZHEN HONOR, ADS-40SI-12-3 12036E	N/A	AC100-240V 50/60Hz 1.0A
3	Ethernet switch	GRANDSTREAM, GWN7700P	N/A	N/A
4	Laptop	Lenovo,E450	SL10G10780	N/A
5	mouse	DELL, MS111	CN-011D3V-73826-62N-OLK	N/A

2.5 Support Cable list

Item No	Description	Length (m)	Cable Type
1	AC Cable	1.5	NA

2.6 Test environment condition:

Test items	Temperature	Humidity
Radiated emission	22.1C	58.0% RH
Power line conducted emission	23.5°C	55.2% RH

2.7 Instrument list

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	3 m SAC	ETS-LINDGREN	3m	N/A	Jan. 22, 2021	Jan. 21, 2024
☒	Receiver	R&S	ESIB26	100114	Nov. 03, 2022	Nov. 02, 2023
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	Nov. 21, 2022	Nov. 20, 2023
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Nov. 11, 2021	Nov. 10, 2023
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	Nov. 03, 2022	Nov. 02, 2023
☒	Preamplifier	HP	8447F	2805A02960	Nov. 1, 2022	Oct. 31, 2023
☒	Spectrum analyzer	R&S	FSV40-N	101653	Apr. 15, 2022	Apr. 14, 2023

Conducted Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	Receiver	R&S	ESR7	1316.3003K07-101181-K3	Nov. 01, 2022	Oct. 31, 2023
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Nov. 01, 2022	Oct. 31, 2023
☒	LISN	R&S	ESH2-Z5	860014/024	Nov. 01, 2022	Oct. 31, 2023
☒	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 Fundamental Emission

Test result: Pass

3.1 Limit

Frequencies (MHz)	Limit at 30m (dBuV/m)	Limit at 3m (dBuV/m)
13.110 – 13.410	40.50	80.50
13.410 – 13.553	50.50	90.50
13.553 – 13.567	84.00	124.00
13.567 – 13.710	50.50	90.50
13.710 – 14.010	40.50	80.50

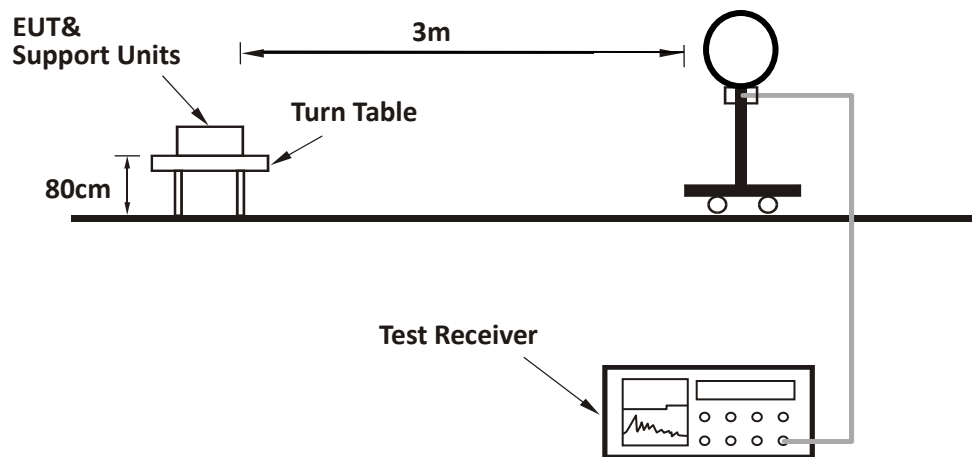
3.2 Measurement Procedure

- The EUT was placed on a 0.8m plank above the ground at a 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Both X and Y axes of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to PK Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

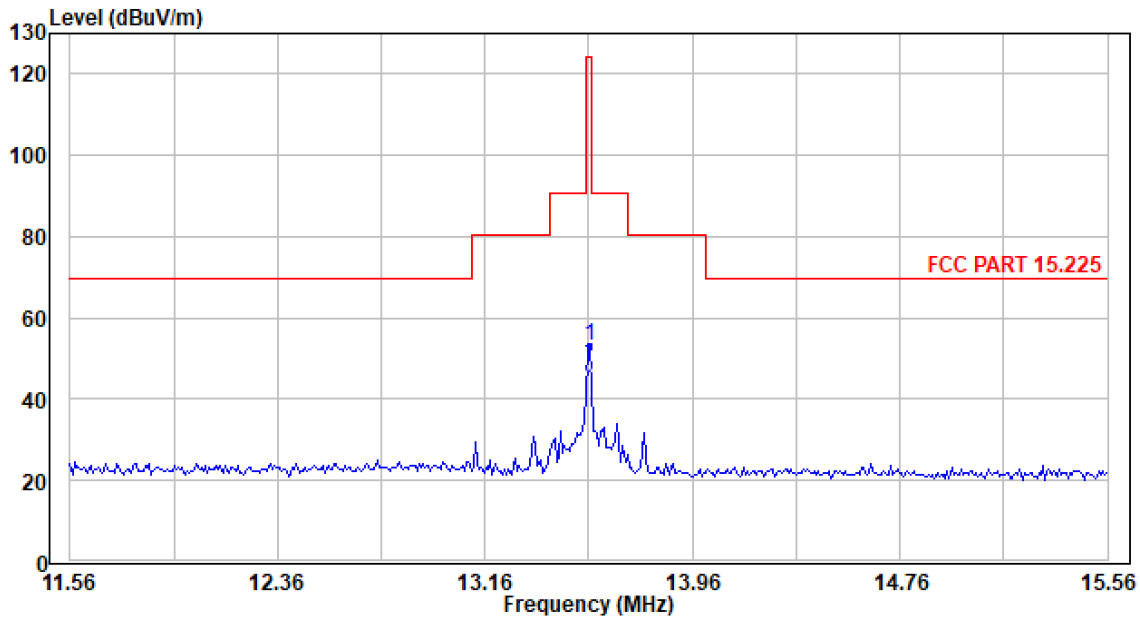
3.3 Test Configuration



TEST REPORT

3.4 Test Results of Fundamental Emissions

Test Curve:



Antenna Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin	Detector
X	13.56	56.87	-17.38	124.00	-67.13	PK
Y	13.56	53.24	-17.56	124.00	-70.76	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), 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

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
 Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
 Limit = 40.00dBuV/m.
 Then Correct Factor = 30.20 + 2.00 - 32.00 = 0.20dB/m;
 Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
 Margin = 10.20dBuV/m - 40.00dBuV/m = -29.80dB.

4 Spurious Emission

Test result: Pass

4.1 Limit

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

4.2 Measurement Procedure

For Radiated emission below 30MHz:

- The EUT was placed on a 0.8m plank above the ground at a 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Both X and Y axes of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz:

- The EUT was placed on a 0.8m plank above the ground at a 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.

TEST REPORT

- d) 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.
- e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
- 3. All modes of operation were evaluated and the worst-case emissions were reported

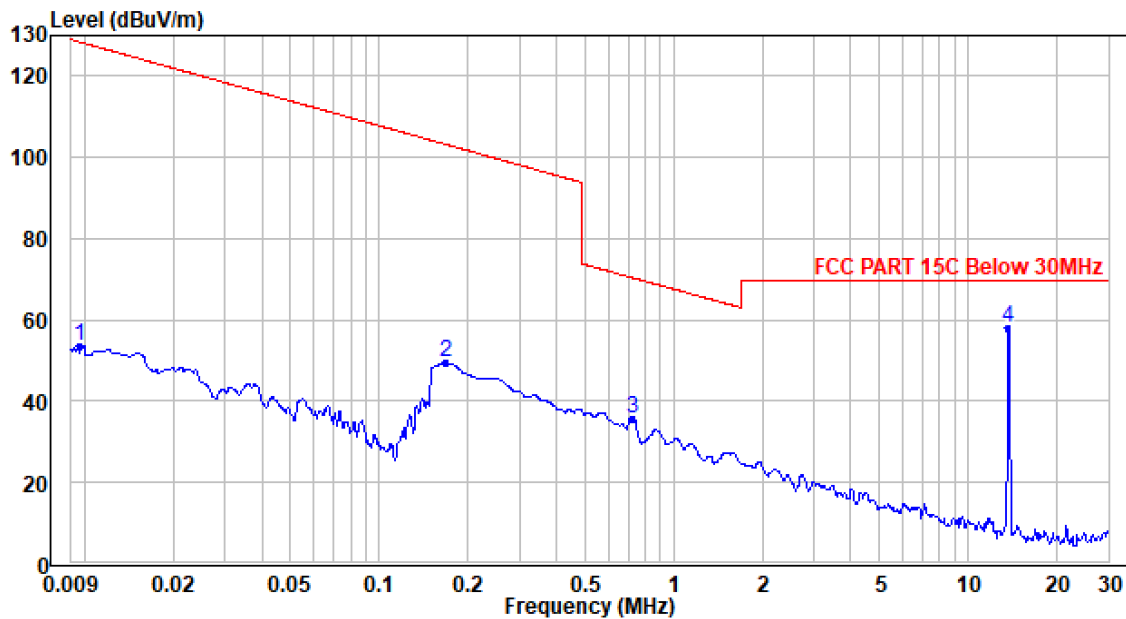
TEST REPORT

4.3 Test Results of Radiated Emissions

The EUT has been tested in all two orthogonal planes, it has the worst case when it is in horizontal position for both below 30MHz & above 30MHz.

Test Curve

Worst case Test Mode 1: X axes



Test data below 30MHz:

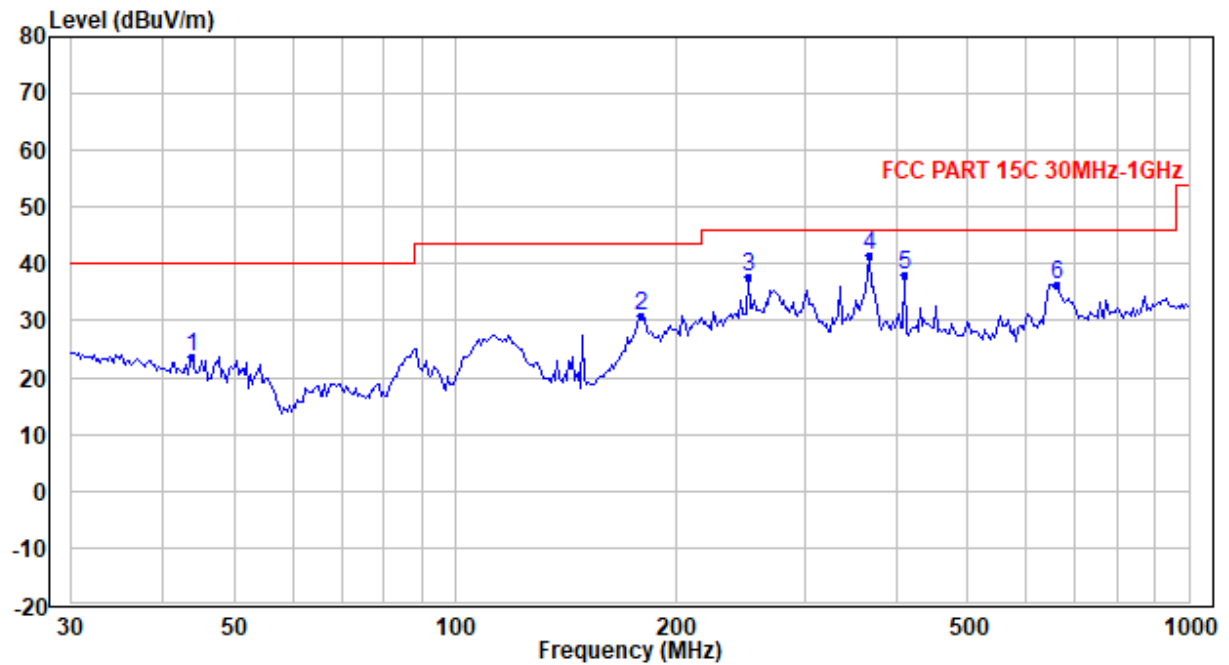
Frequency (MHz)	Measured level (dBμV/m)	Factor (dB)	Limits (dBμV/m)	Margin (dB)	Detector
0.010	53.78	-8.32	128.43	-74.65	Peak
0.169	49.39	-16.98	103.18	-53.79	Peak
0.729	35.84	-18.01	70.36	-34.52	Peak
13.529	59.24	-17.38	69.50	-10.26	Peak

TEST REPORT

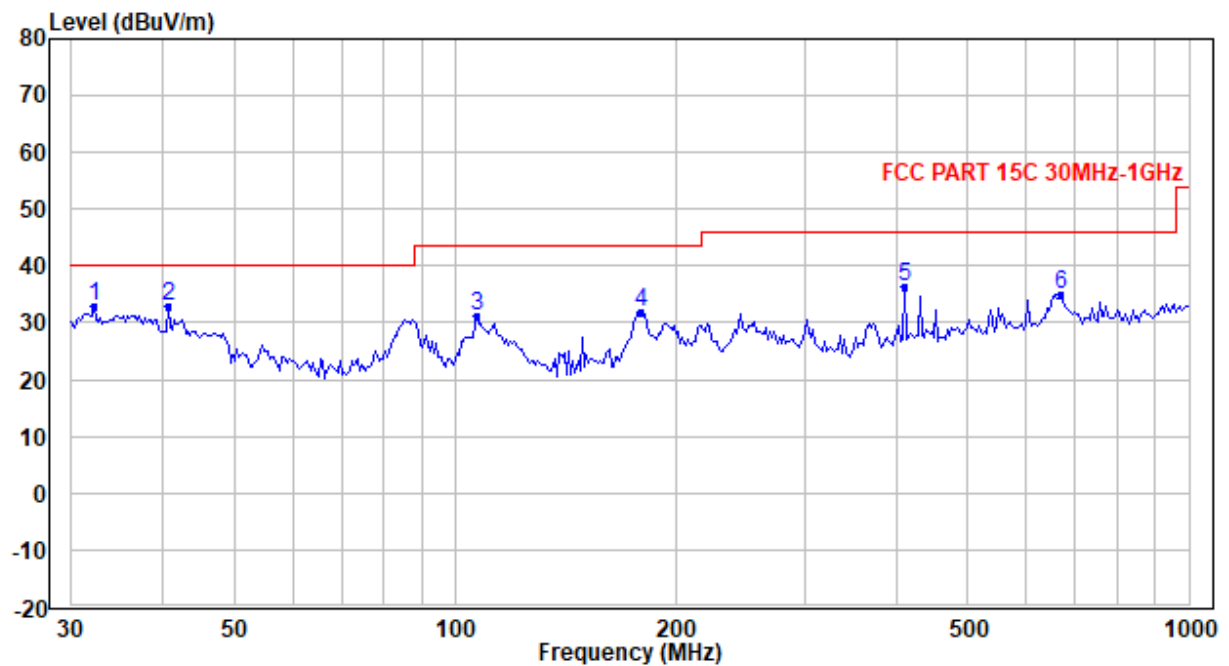
Test Curve

Worst case Test Mode 1

Horizontal



Vertical



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Test data from 30MHz to 1000MHz:

Polarization	Frequency (MHz)	Measured level (dBμV/m)	Factor (dB)	Limits (dBμV/m)	Margin (dB)	Detector
H	43.845	23.58	-10.49	40.00	-16.42	Peak
	178.770	30.74	-9.70	43.50	-12.76	Peak
	250.486	37.60	-8.65	46.00	-8.40	Peak
	366.087	41.35	-4.70	46.00	-4.65	Peak
	409.651	37.95	-3.55	46.00	-8.05	Peak
	660.602	36.35	1.18	46.00	-9.65	Peak
V	32.184	32.92	-5.11	40.00	-7.08	Peak
	40.584	33.09	-8.29	40.00	-6.91	Peak
	107.031	31.32	-15.56	43.50	-12.18	Peak
	178.770	32.05	-9.70	43.50	-11.45	Peak
	409.651	36.41	-3.55	46.00	-9.59	Peak
	669.952	35.03	1.42	46.00	-10.97	Peak

- Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), 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. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.
5. All possible modes of operation were investigated, only the worst-case emissions reported.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 10.20dBuV/m -40.00dBuV/m = -29.80dB.

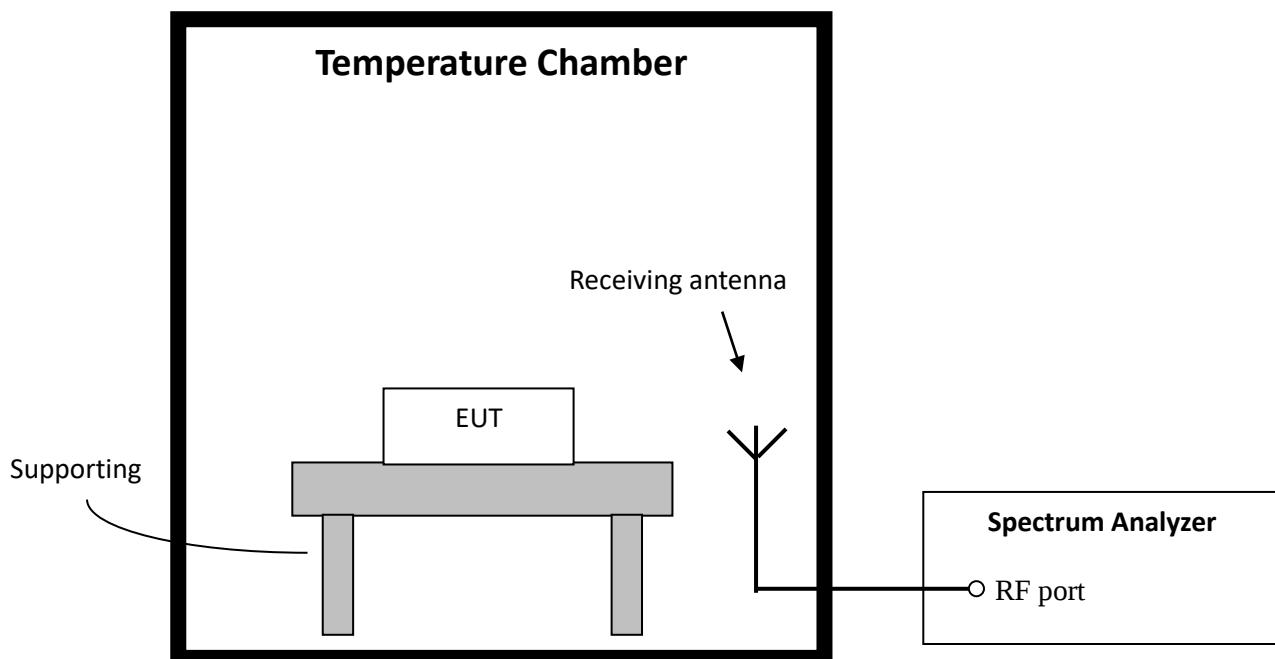
5 Frequency Stability (Temperature Variation)

Test result: PASS

5.1 Test limit

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to $+50$ degrees C at normal supply voltage.

5.2 Test Configuration



TEST REPORT

5.3 Test procedure and test setup

Test Procedure as per ANSI 63.10 clause 6.8.1.

5.4 Test protocol

Voltage (V)	Temp (°C)	Freq measured (MHz)	Freq nominal (MHz)	Tolerance (%)	Limit (%)
	-20	13.56055	13.56	0.0041	±0.01
	-10	13.56032		0.0024	
	0	13.5605		0.0037	
	10	13.56065		0.0048	
	20	13.56048		0.0036	
	30	13.56057		0.0039	
	40	13.56063		0.0046	
	50	13.56069		0.0046	

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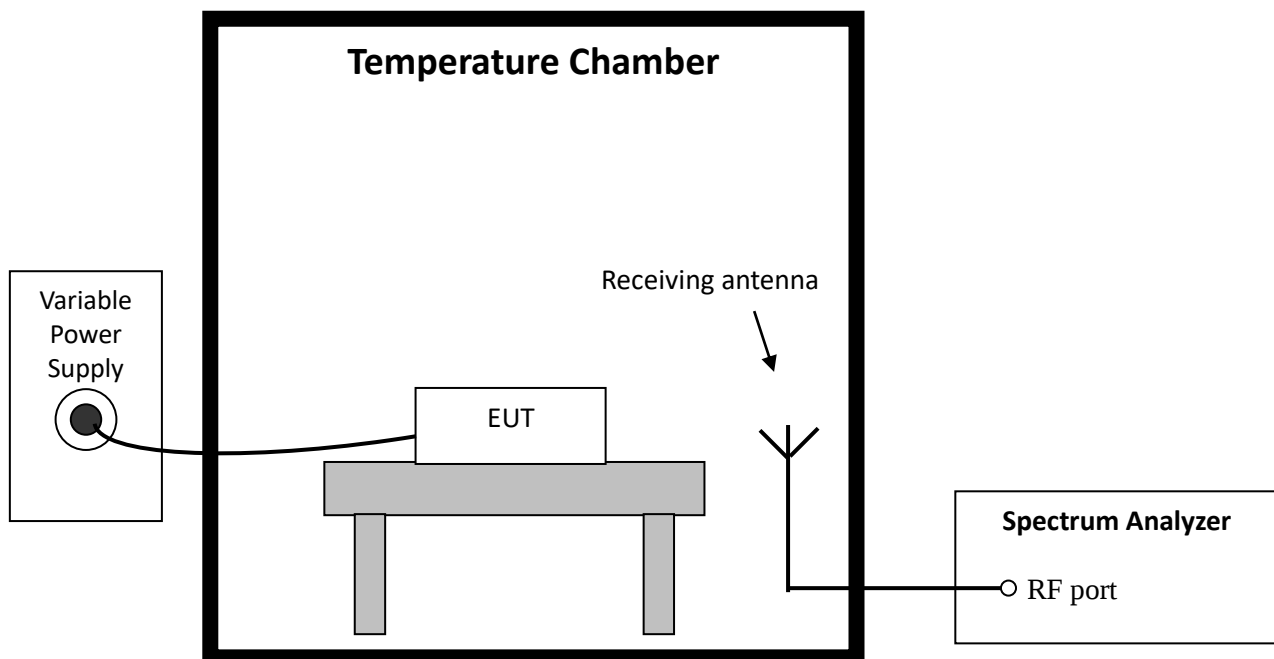
6 Frequency Stability (Voltage Variation)

Test result: PASS

6.1 Test limit

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

6.2 Test Configuration



6.3 Test procedure and test setup

Test Procedure as per ANSI 63.10 clause 6.8.2.

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6.4 Test protocol

Temp (°C)	Voltage (V)	Freq Measured (MHz)	Freq nominal (MHz)	Tolerance (%)	Limit (%)
20	10.2	13.56055	13.56	0.0041	±0.01
	12.0	13.56072		0.0053	
	13.8	13.56054		0.0040	

TEST REPORT

7 Conducted emissions

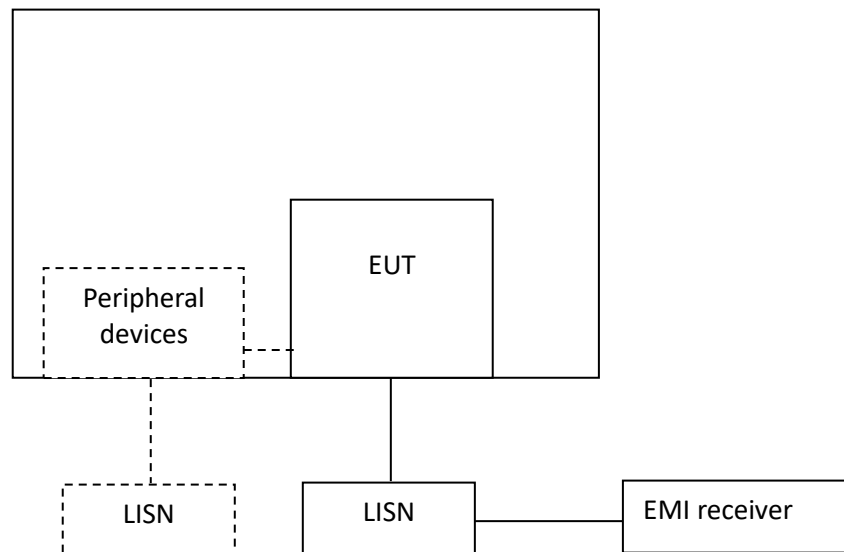
Test result: Pass

7.1 Limit

Frequency of Emission (MHz)	Conducted Emissions Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

7.2 Test Configuration



TEST REPORT**7.3 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 C63.4. 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.

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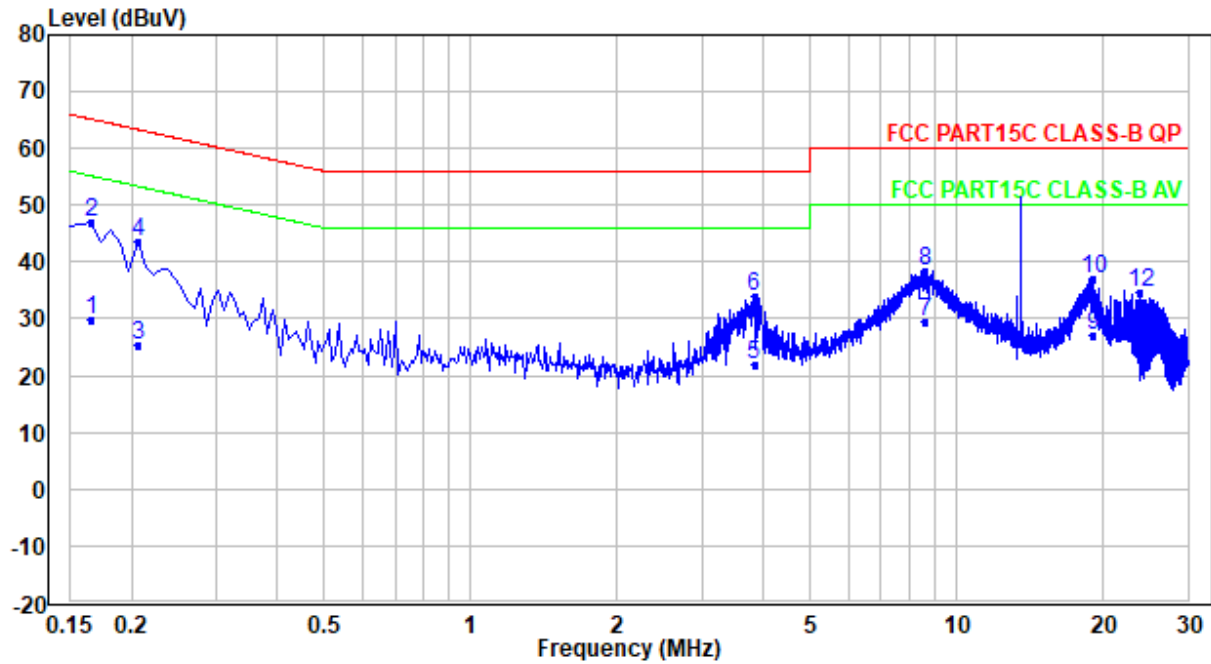
7.4 Test Results of Conducted Emissions

Test Voltage: 120V ~60Hz

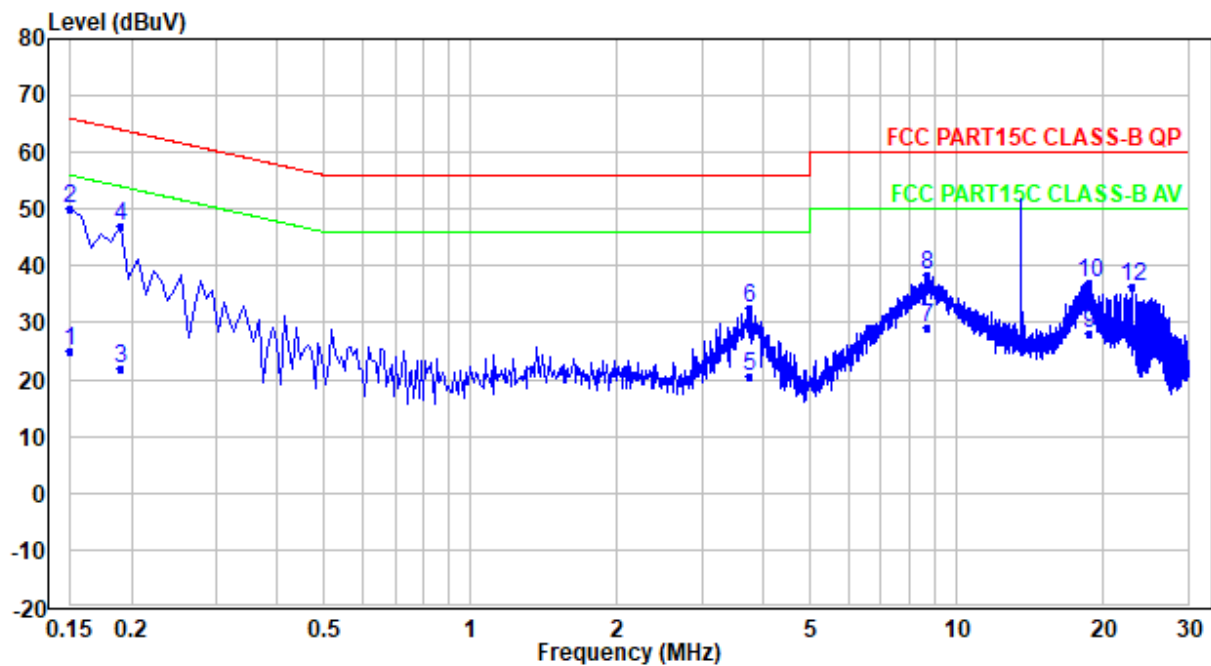
Worse Case Test Mode 1

Test Curve:

L Line



N Line



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Frequency [MHz]	QP Level [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Level [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Phase
0.166	46.89	65.16	-18.27	29.89	55.16	-25.27	L
0.206	43.43	63.37	-19.94	25.43	53.37	-27.94	L
3.837	33.86	56.00	-22.14	21.86	46.00	-24.14	L
8.620	38.43	60.00	-21.57	29.43	50.00	-20.57	L
19.122	37.19	60.00	-22.81	27.19	50.00	-22.81	L
23.857	34.70	60.00	-25.30	27.70	50.00	-22.30	L
0.150	50.17	66.00	-15.83	25.17	56.00	-30.83	N
0.190	46.99	64.04	-17.05	21.99	54.04	-32.05	N
3.741	32.64	56.00	-23.36	20.64	46.00	-25.36	N
8.700	38.26	60.00	-21.74	29.26	50.00	-20.74	N
18.858	37.07	60.00	-22.93	28.07	50.00	-21.93	N
23.113	36.44	60.00	-23.56	28.44	50.00	-21.56	N

Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.

2. Level = Original Receiver Reading + Correct Factor

3. Margin = Level - Limit

4. If the PK Level is lower than AV limit, the AV test can be elided.

5. the emissions of 13.56MHz are the product's RF signal.

6. All possible modes of operation were investigated, only the worst-case emissions reported.

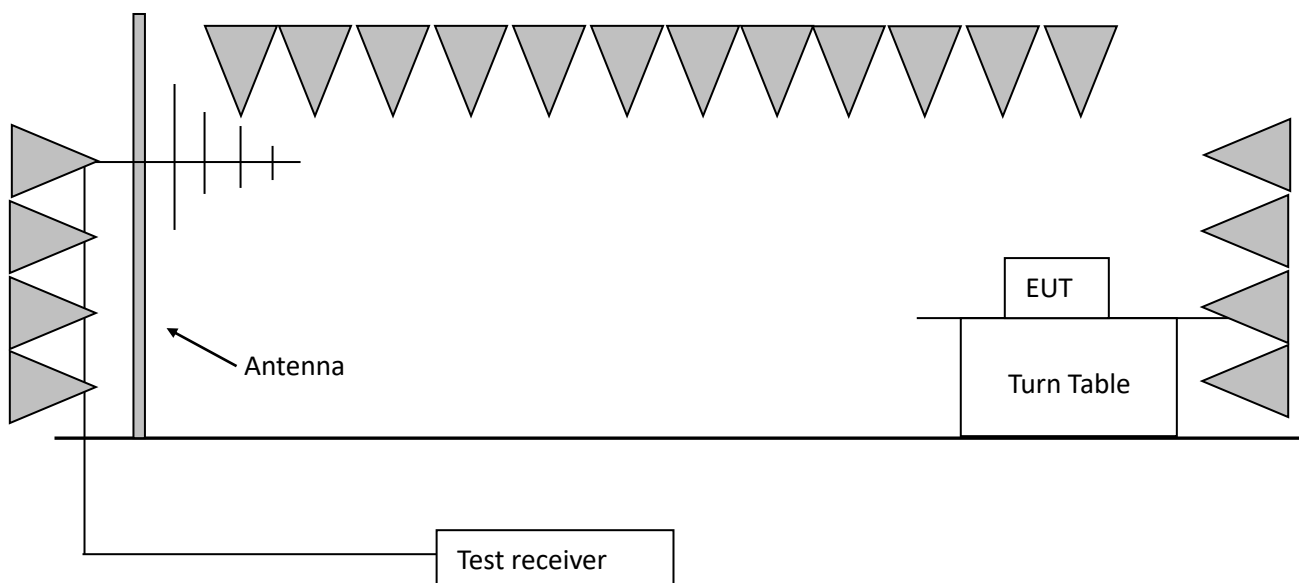
8 20dB Bandwidth

Test result: Pass

8.1 Limit

The 20dB bandwidth should be fallen in the allocated operating frequency range.
No limit for 99% bandwidth.

8.2 Test configuration



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8.3 Test procedure and test set up

The measurement was applied in a 3m semi-anechoic chamber.

The center of the loop antenna shall be 1 m above the horizontal metal ground plane.

The following procedure shall be used for measuring (99 %) power bandwidth:

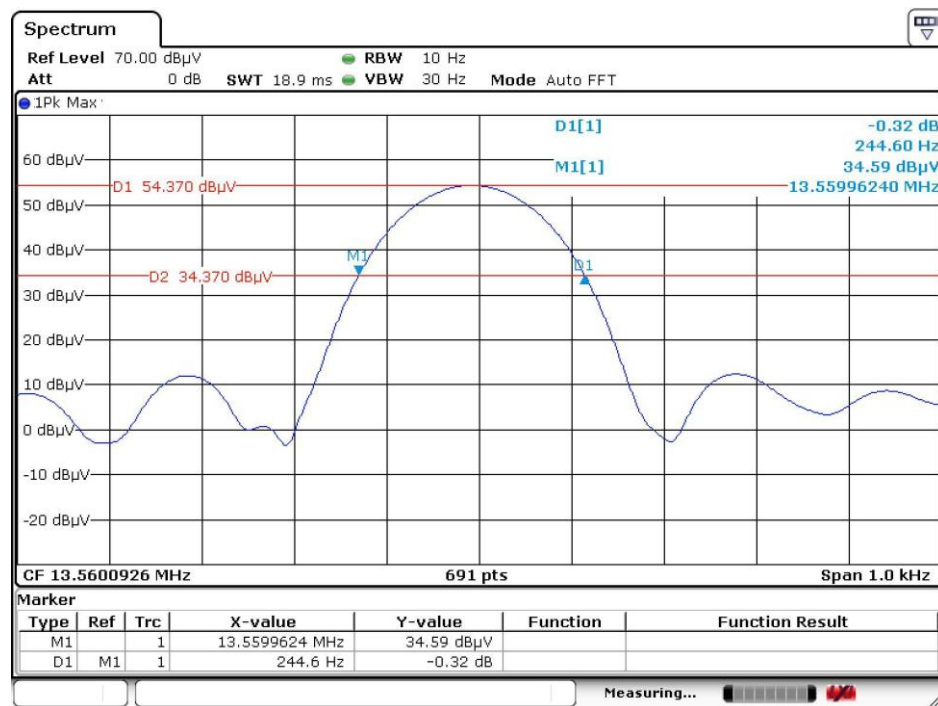
1. Set center frequency to the nominal EUT channel center frequency.
2. Set RBW = 1 % to 5 % of the OBW
3. Set VBW $\geq 3 \cdot$ RBW
4. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
5. Use the 99 % power bandwidth function of the instrument (if available).
6. the 20dB bandwidth is also measured with the same setting.

TEST REPORT

8.4 Test protocol

	Lower point (MHz)	Higher point (MHz)	Bandwidth (kHz)	Allocated bandwidth (MHz)
20dB Bandwidth	13.55996	13.5602046	0.2446	13.553 ~ 13.567

Test Curve:



Date: 14.FEB.2023 14:49:39

9 Antenna requirement

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 shall be considered sufficient to comply with the provisions of this section.

Result:

EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

***** END *****