Powercore Technology Co., Ltd.

RF TEST REPORT

Report Type:
FCC Part 15.225 & ISED RSS-210 RF report

Model:
AC003PT17, AC003PT19, AC003PT111

REPORT NUMBER:
230501971SHA-001

ISSUE DATE:
November 24, 2023

DOCUMENT CONTROL NUMBER:
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TEST REPORT

Report no.: 230501971SHA-001

Applicant:	Powercore Technology Co., Ltd. 4th Floor, Jiangsu Science and Technology Finance Building, No.21 Andemen Street, Yuhuatai District, Nanjing City, Jiangsu Province, P.R. China
Manufacturer:	Powercore Technology Co., Ltd. 4th Floor, Jiangsu Science and Technology Finance Building, No.21 Andemen Street, Yuhuatai District, Nanjing City, Jiangsu Province, P.R. China
Factory:	Powercore Technology Co., Ltd. Zone A, No.1 Yuansi Road, Jiangbei New District, Nanjing City, Jiangsu Province, P.R. China
FCC ID:	2A98K-AC003P
IC:	30675-AC003P

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 (2020): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

RSS-210 Issue 10 (December 2019): Licence-Exempt Radio Apparatus: Category I Equipment

RSS-Gen Issue 5, Amendment 1 (March 2019): General Requirements for Compliance of Radio Apparatus

PREPARED BY:	**REVIEWED BY:**
	
Project Engineer Sky Yang	Reviewer Eric Li

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Content

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Revision History

Report No.	Version	Description	Issued Date
230501971SHA-001	Rev. 01	Initial issue of report	November 24, 2023

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Measurement result summary

TEST ITEM	FCC REFERENCE	IC REFERENCE	RESULT
Fundamental emission	15.225(a) (b) (c)	RSS 210 B.6	Pass
Spurious emission	15.225(d)	RSS 210 B.6	Pass
Frequency stability	15.225(e)	RSS 210 B.6	Pass
Conducted emissions	15.207	RSS-Gen Issue 5 Clause 8.8	Pass
99% and 20dB Bandwidth	15.215(c)	RSS-Gen Issue 5 Clause 6.6	Pass
Antenna requirement	15.203	RSS-GEN 6.8	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:	AC Electric Vehicle Charging Station
Type/Model:	AC003PT17, AC003PT19, AC003PT111
Description of EUT:	The EUT is an electric vehicle AC charger. It contains two certified modules. The LTE module FCC ID is XMR201903EG25G, the LTE module IC is 10224A-201903EG25G. The WIFI/Bluetooth module FCC ID is 2AC7Z-ESPWROOM32UE, the WIFI/Bluetooth module IC is 21098-ESPWROOMUE. All models are electric identical except the rated power. We test AC003PT111 as representative and list the result in this report.
Rating:	AC003PT17: 208/240VAC, 50/60Hz, 32A Max AC003PT19: 208/240VAC, 50/60Hz, 40A Max AC003PT111: 208/240VAC, 50/60Hz, 48A Max
EUT type:	☒ Table top ☐ Floor standing
Software Version:	-
Hardware Version:	-
Serial numbers:	A231029-07
Sample received date:	November 1, 2023
Date of test:	November 1, 2023 ~ November 10, 2023

1.2 Technical Specification

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

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2021)
ANSI C63.10 (2020)
RSS-210 Issue 10 (December 2019)
RSS-Gen Issue 5, Amendment 1 (March 2019)

2.2 Mode of operation during the test

While testing, the internal modulation and continuously transmission was applied.

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	SKET Auto EMC Test Software	Keleto	V3.0
Radiated emission	SKET Auto EMC Test Software	Keleto	V3.0

2.4 Test peripherals list

Item No	Description	Band and Model	S/No

2.5 Test environment condition:

Test items	Temperature	Humidity
Radiated emission	26°C	53% RH
Power line conducted emission	27°C	53% RH

2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESR7	EC 6194	2024-02-08
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2024-11-08
☒	Shielded room	Zhongyu	-	EC 2838	2024-01-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2024-08-24
☒	TRILOG broadband Antenna	Schwarzbeck	VULB9168	EC 6402	2024-02-14
☒	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2024-07-16
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2024-07-08
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Spectrum Analyzer	Keysight	N9030B	EC 6078	2024-06-15
☐	Vector Signal Generator	Agilent	N5182B	EC 5175	2024-03-05
☐	Universal Radio Communication Tester	R&S	CMW500	EC5944	2024-03-05
☐	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2024-03-05
☐	Mobile Test System	Litepoint	Iqxel	EC 5176	2024-01-11
☒	Climate chamber	GWS	MT3065	EC 6021	2024-03-06
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2024-03-24
☒	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5199	2024-03-13

2.7 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	3.52 dB
	150kHz ~ 30MHz	3.19 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	3.06 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.02 dB
	6GHz ~ 18GHz	5.28 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

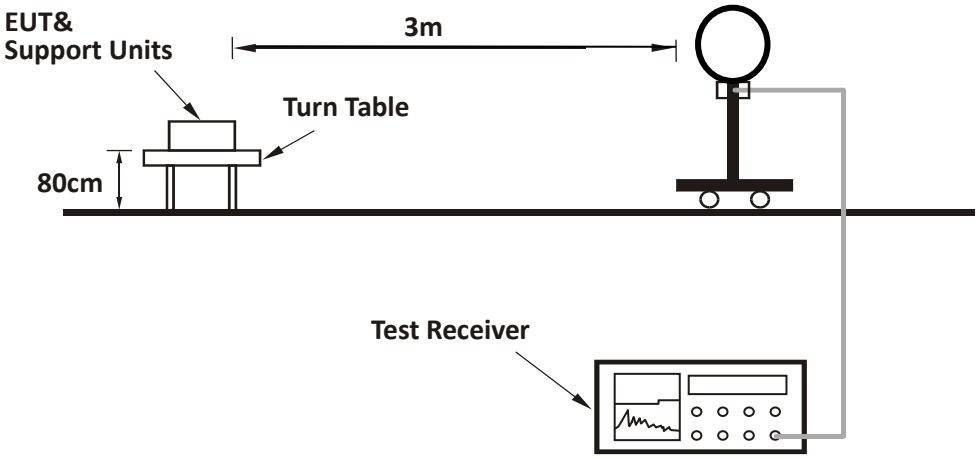
3.2 Measurement Procedure

a) 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.
b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c) Both X and Y axes of the antenna are set to make the measurement.
d) 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.
e) The test-receiver system was set to PK Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

3.3 Test Configuration



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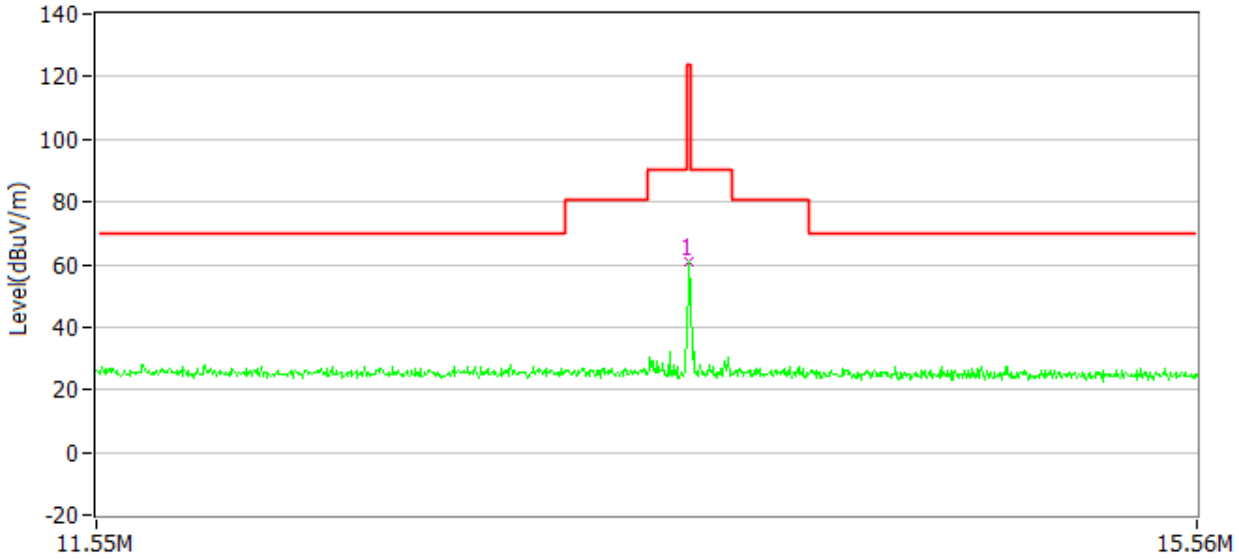
3.4 Test Results of Fundamental Emissions



Antenna Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin	Detector
X	13.56	60.9	20.4	124.00	63.1	PK
Y	13.56	59.4	20.4	124.00	64.6	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 = Limit - Corrected Reading

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 = 40.00dBuV/m - 10.20dBuV/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:

f) 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.
g) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
h) Both X and Y axes of the antenna are set to make the measurement.
i) 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.
j) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

For Radiated emission above 30MHz:

a) 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.

b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c) 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

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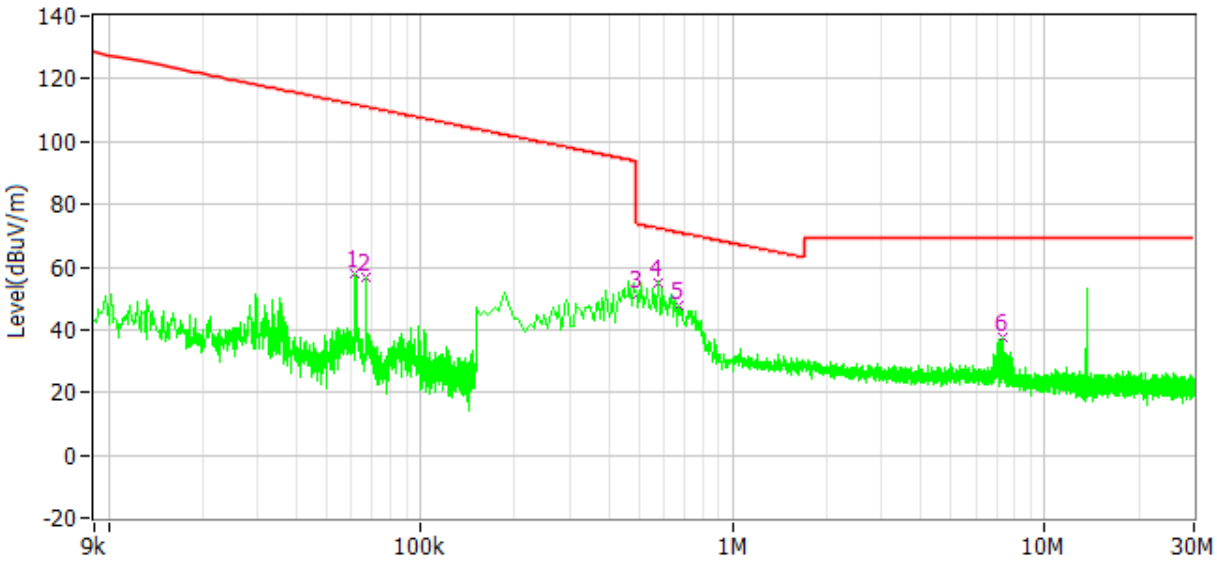
4.3 Test Results of Radiated Emissions

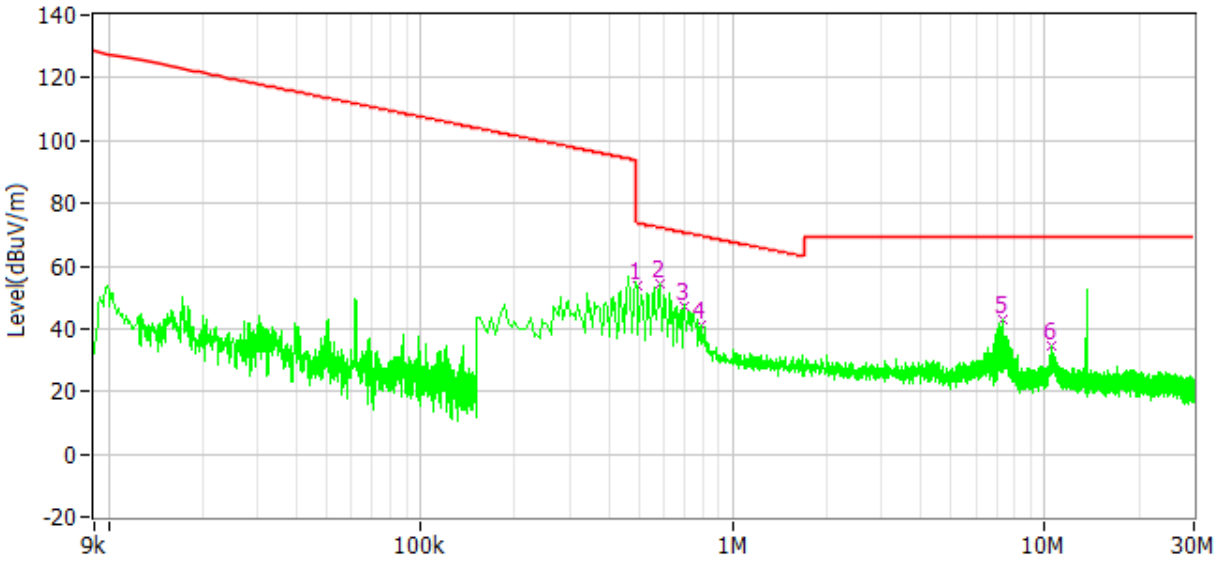
The EUT has been tested in all two orthogonal planes.

Below 30MHz:

X



Y



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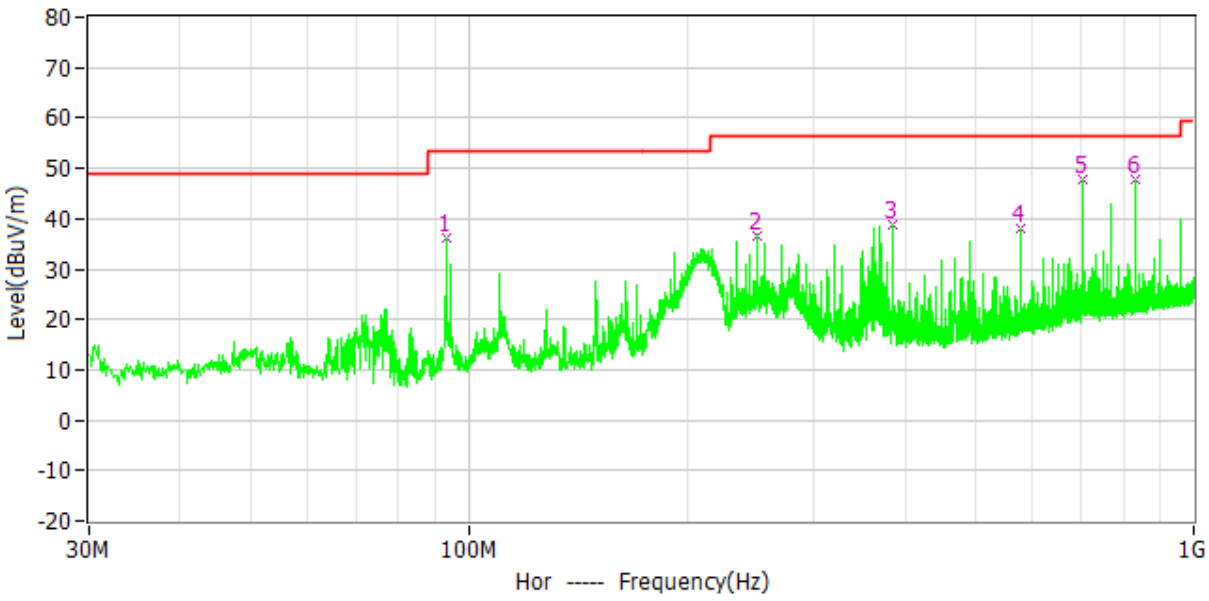
Test data below 30MHz:

Frequency	Limit (dBuV/m)	Corrected Reading (dBuV/m)	Margin	Detector	Polarity
61.800kHz	111.8	57.7	54.0	PK	X
66.800kHz	111.1	56.5	54.6	PK	X
492.000kHz	73.8	51.4	22.4	PK	X
573.000kHz	72.4	55.2	17.2	PK	X
672.000kHz	71.1	47.7	23.4	PK	X
7.346MHz	69.5	37.7	31.8	PK	Y
492.000kHz	73.8	53.7	20.1	PK	Y
582.000kHz	72.3	54.4	17.9	PK	Y
699.000kHz	70.7	47.4	23.3	PK	Y
789.000kHz	69.7	41.3	28.4	PK	Y
7.346MHz	69.5	42.7	26.8	PK	Y
10.541MHz	69.5	34.4	35.1	PK	Y

Above 30MHz:

H



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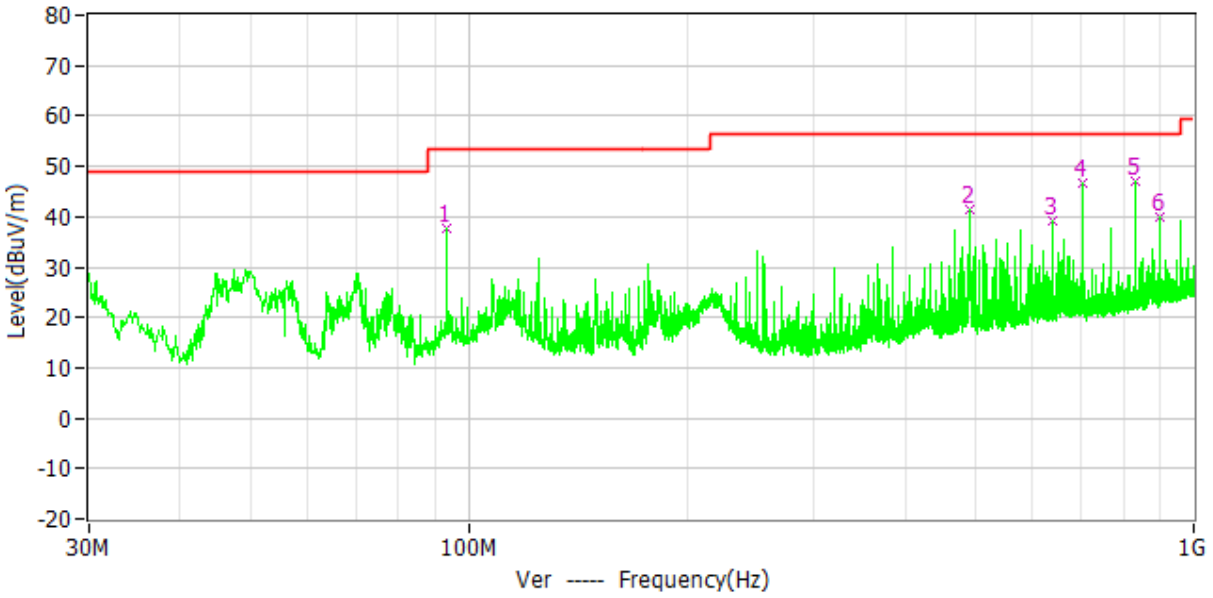
V



Test data from 30MHz to 1000MHz:

Antenna Polarization	Frequency	Limit (dBuV/m)	Corrected Reading (dBuV/m)	Margin	Detector
H	93.341MHz	53.5	36.3	17.2	PK
H	249.996MHz	56.5	36.7	19.8	PK
H	383.953MHz	56.5	38.8	17.7	PK
H	576.013MHz	56.5	38.2	18.3	PK
H	704.053MHz	56.5	47.9	8.6	PK
H	832.093MHz	56.5	47.7	8.8	PK
V	93.341MHz	53.5	37.8	15.7	PK
V	490.653MHz	56.5	41.5	15.0	PK
V	640.033MHz	56.5	39.3	17.2	PK
V	704.053MHz	56.5	46.6	9.9	PK
V	832.093MHz	56.5	46.9	9.6	PK
V	896.016MHz	56.5	39.9	16.6	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 = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

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 = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

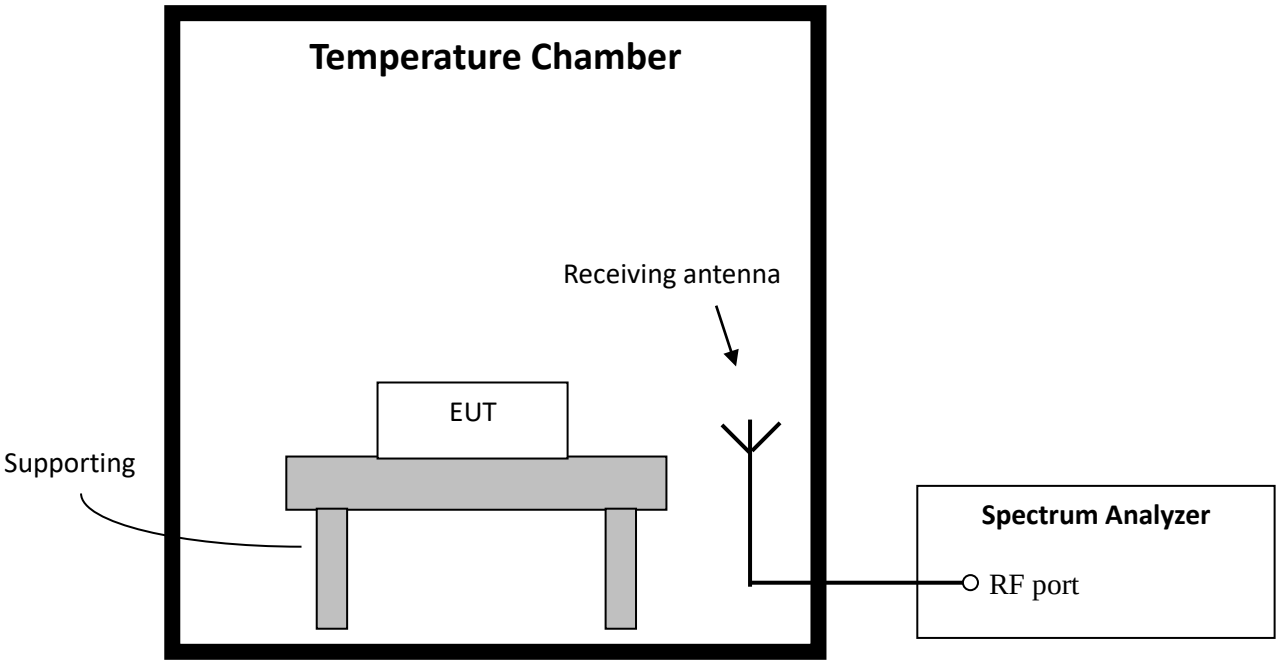
5 Frequency Stability (Temperature Variation)

Test result: PASS

5.1 Test limit

The frequency tolerance of the carrier signal shall be maintained within ±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



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 (ºC)	Freq measured (MHz)	Freq nominal (MHz)	Tolerance (%)	Limit (%)
240	-20	13.5595	13.56	-0.004	±0.01
	-10	13.5598		-0.001	
	0	13.5603		0.002	
	10	13.5600		0	
	20	13.5600		0	
	30	13.5602		0.001	
	40	13.5596		-0.003	
	50	13.5597		-0.002	

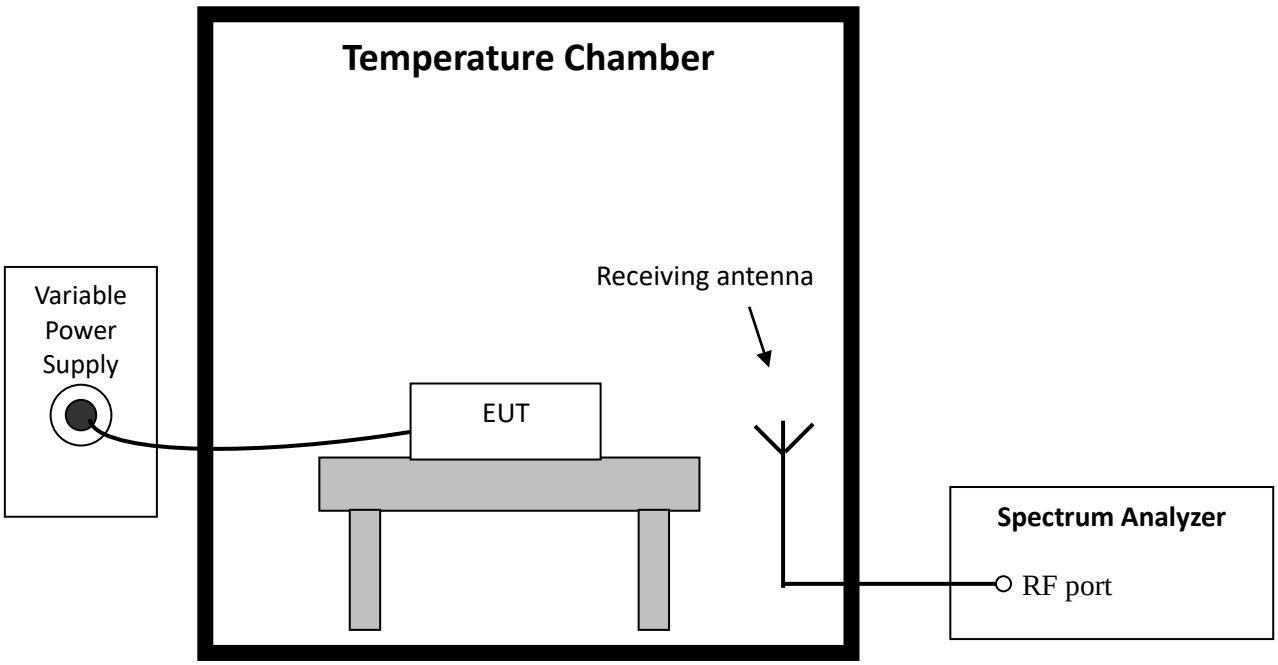
6 Frequency Stability (Voltage Variation)

Test result: PASS

6.1 Test limit

The frequency tolerance of the carrier signal shall be maintained within ±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.

6.4 Test protocol

Temp (ºC)	Voltage (V)	Freq Measured (MHz)	Freq nominal (MHz)	Tolerance (%)	Limit (%)
20	216	13.5601	13.56	0.0007	±0.01
	240	13.5600		0	
	264	13.5602		0.001	

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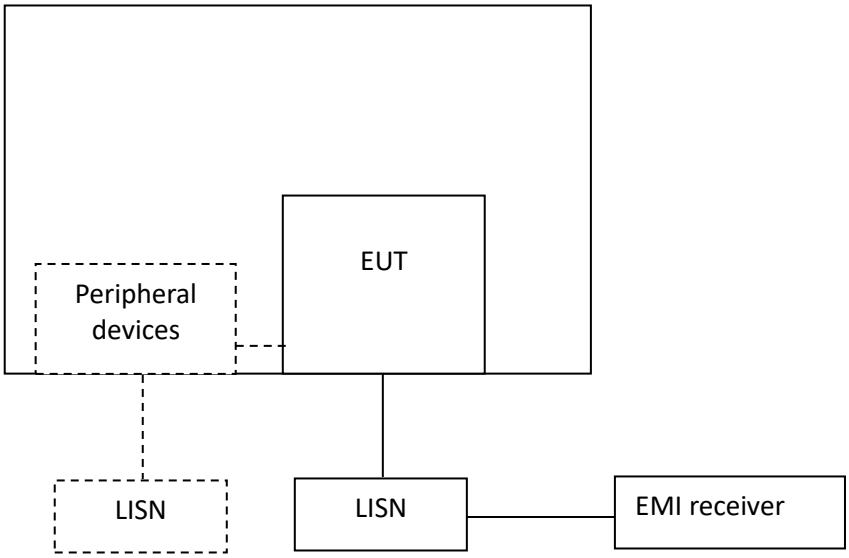
7 Conducted emissions

Test result: **Pass**

7.1 Limit

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.5	79	66
0.5 ~ 30	73	60
Note: 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.		

7.2 Test Configuration



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.

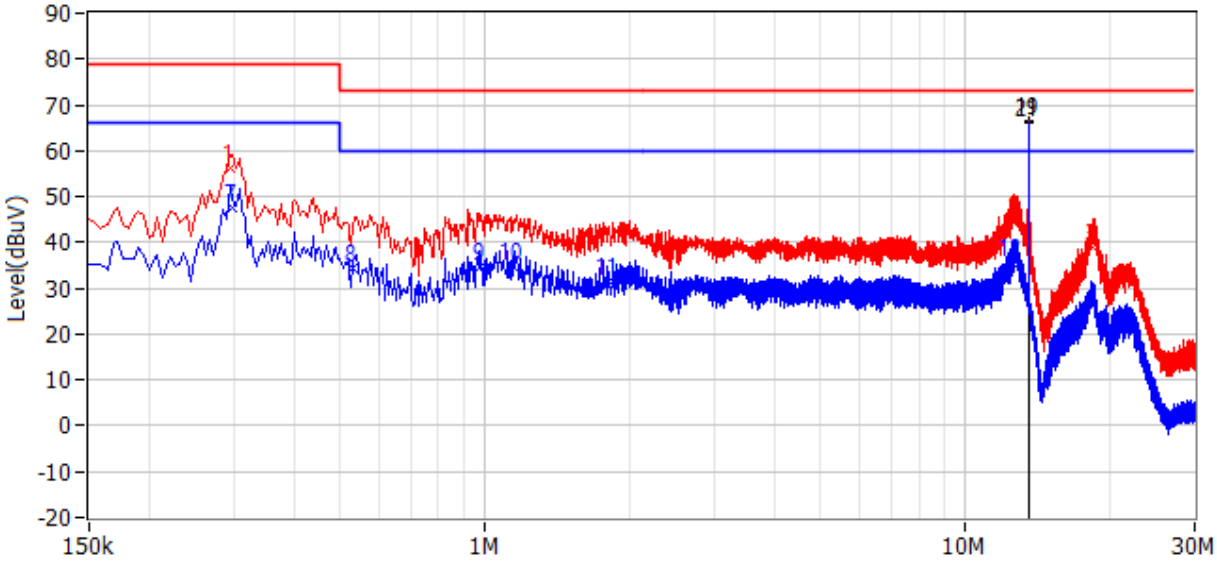
Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on 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.

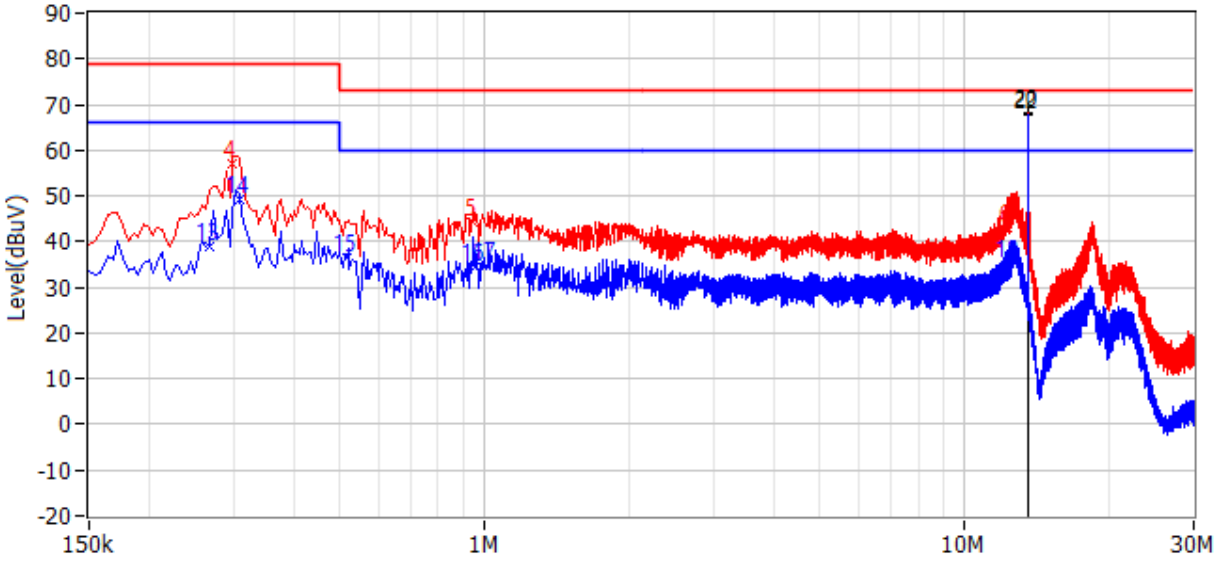
7.4 Test Results of Conducted Emissions

Test Voltage: 240VAC/60Hz

L1 Line



L2 Line



No.	Frequency	Limit dBuV	Level dBuV	Delta dB	Detector	Phase
1	294.000kHz	79.0	56.3	-22.7	QP	L1
2	12.674MHz	73.0	44.5	-28.5	QP	L1
3	18.425MHz	73.0	39.0	-34.0	QP	L1
4	298.500kHz	79.0	57.0	-22.0	QP	L2
5	946.500kHz	73.0	44.3	-28.7	QP	L2
6	12.327MHz	73.0	43.0	-30.0	QP	L2
7	298.500kHz	66.0	47.7	-18.3	CAV	L1
8	532.500kHz	60.0	34.5	-25.5	CAV	L1
9	978.000kHz	60.0	34.6	-25.4	CAV	L1
10	1.140MHz	60.0	34.9	-25.1	CAV	L1
11	1.820MHz	60.0	31.4	-28.6	CAV	L1
12	12.525MHz	60.0	35.7	-24.3	CAV	L1
13	267.000kHz	66.0	38.9	-27.1	CAV	L2
14	307.500kHz	66.0	49.2	-16.8	CAV	L2
15	514.500kHz	60.0	36.3	-23.7	CAV	L2
16	955.500kHz	60.0	34.4	-25.6	CAV	L2
17	1.005MHz	60.0	34.9	-25.1	CAV	L2
18	12.354MHz	60.0	35.4	-24.6	CAV	L2
19	13.560MHz	-	-	-	-	L1
20	13.560MHz	-	-	-	-	L2

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. Delta = 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.

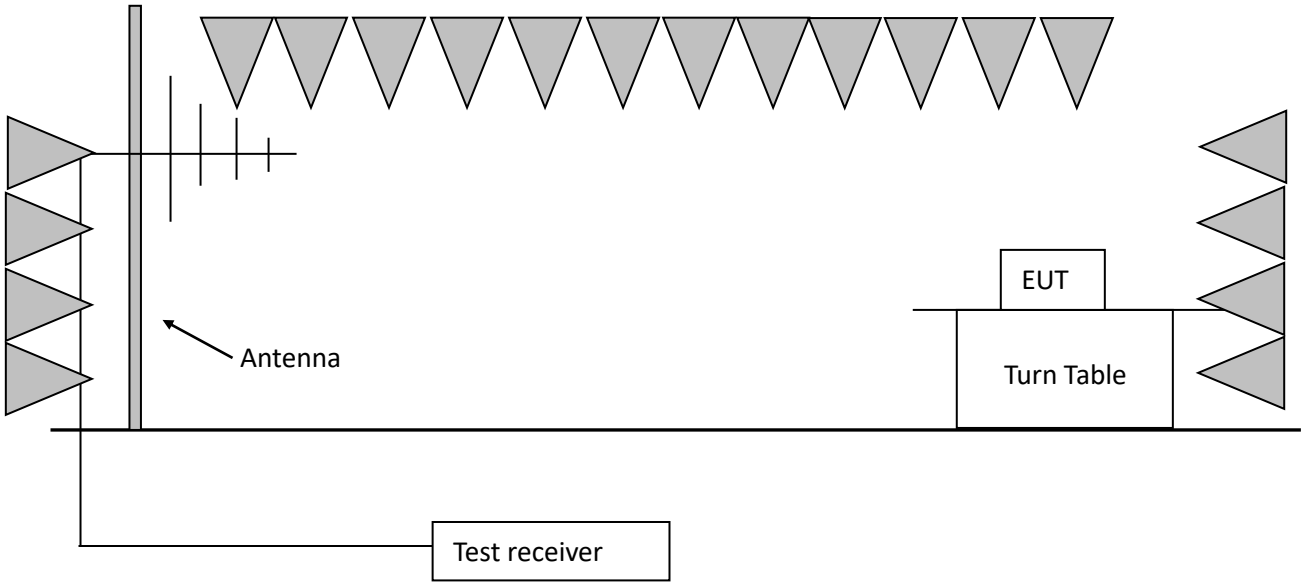
8 20dB Bandwidth

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



8.3 Test procedure and test set up

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

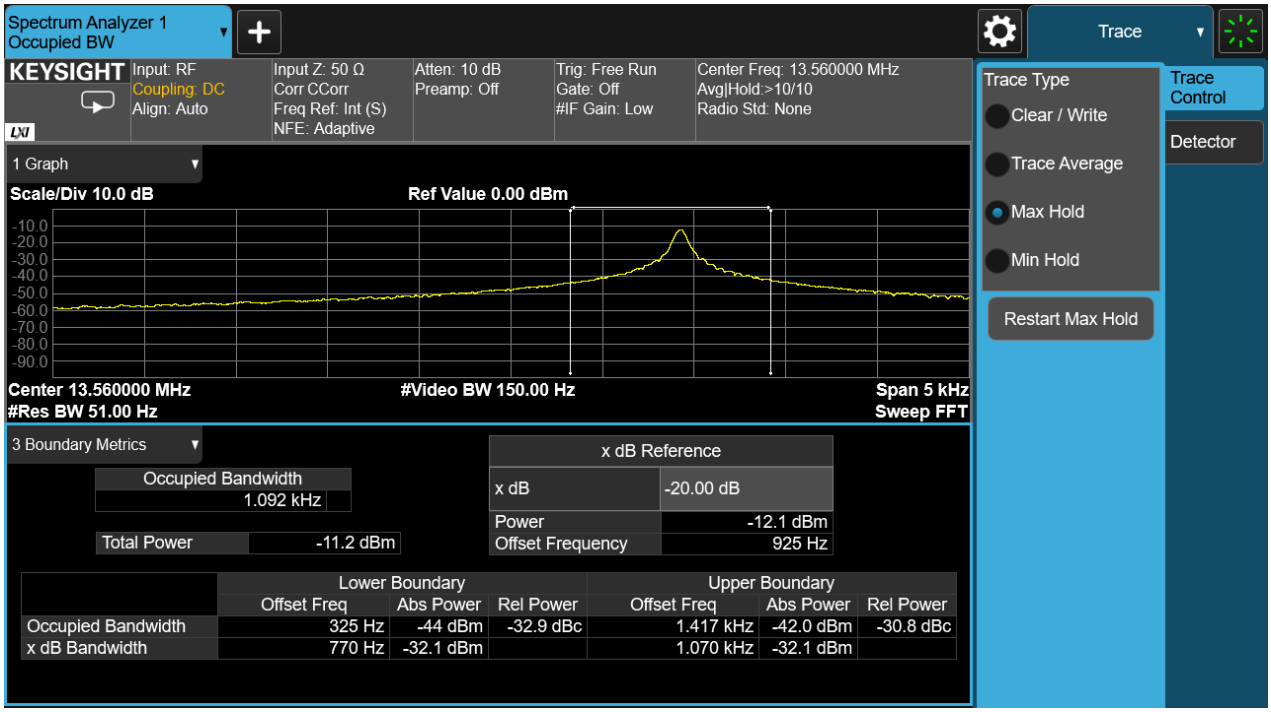
The center of the loop antenna shall be 1 m above the horizontal metal ground plane.

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 ≥ 3 · 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.

8.4 Test protocol

	Lower point (MHz)	Higher point (MHz)	Bandwidth (kHz)	Allocated bandwidth (MHz)
20dB Bandwidth	13.56077	13.56107	0.745	13.553 ~ 13.567
Occupied bandwidth	13.560325	13.561417	1.092	13.553 ~ 13.567



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 **********