Teison Energy Technology Co., Ltd.

RF TEST REPORT

REPORT TYPE:
FCC Part 15.225 & ISED RSS-210 RF Report

MODEL:
TS-EVC50-001, TS-EVC48-001
TS-EVC40-001, TS-EVC32-001

REPORT NUMBER:
2406B0408SHA-001

ISSUE DATE:
August 13, 2024

DOCUMENT CONTROL NUMBER:
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Total Quality. Assured.

TEST REPORT

Report no.: 2406B0408SHA-001

Applicant:	Teison Energy Technology Co., Ltd. Meihu Road, Xihu Town, Hanjiang District, Yangzhou City, Jiangsu Province, China, 225000
Manufacturer:	Teison Energy Technology Co., Ltd. Meihu Road, Xihu Town, Hanjiang District, Yangzhou City, Jiangsu Province, China, 225000
Factory:	Teison Energy Technology Co., Ltd. Meihu Road, Xihu Town, Hanjiang District, Yangzhou City, Jiangsu Province, China, 225000
FCC ID:	2BHT2-TSEVC50
IC:	32801-TSEVC50

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:
47CFR Part 15 (2023): 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 Scout Gong	Reviewer Eric Li

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TEST REPORT

Content

TEST REPORT

Revision History

Report No.	Version	Description	Issued Date
2406B0408SHA-001	Rev. 01	Initial issue of report	August 13, 2024

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. *The determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.*
3. *Additions, Deviations and Exclusions from Standards: None.*

TEST REPORT

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	EV Charger
Type/Model:	TS-EVC50-001, TS-EVC48-001 TS-EVC40-001, TS-EVC32-001
Description of EUT:	The EUT covered in the report is an EV charger. RFID card reader is incorporated in model for process control. There are 4 models, the electrical circuit design of them is identical, only the output rating is different. Model TS-EVC50-001 was tested as a representative. Here is the certificate information of the wireless modules which EUT equipped. For the WIFI/BT/BLE module: FCC ID: 2AC7Z-ESP32WROVERE and IC: 21098-ESPWROVERE
Rating:	TS-EVC50-001: 240V 50A 60Hz TS-EVC48-001: 240V 48A 60Hz TS-EVC40-001: 240V 40A 60Hz TS-EVC32-001: 240V 32A 60Hz
EUT type:	☒ Tabletop ☐ Floor standing
Software Version:	/
Hardware Version:	/
Serial numbers:	A240606-57-003
Sample received date:	June 06, 2024
Date of test:	June 06, 2024, to August 5, 2024

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 FTZ) Co., Ltd.
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 L21189
	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 (2023)
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 continuous 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
1	Resistor Load	-	-

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	2025-02-27
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2024-11-19
☒	Attenuator	Hua Xiang	Ts5-10db-6g	EC 6194-1	2024-12-07
☒	Shielded room	Zhongyu	-	EC 2838	2025-01-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2024-11-22
☒	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2024-09-12
☒	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2024-10-16
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2024-10-08
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Spectrum Analyzer	Keysight	N9030B	EC 6078	2025-06-14
☒	Climate chamber	GWS	MT3065	EC 6021	2025-03-06
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Thermo-Hygrograph	Testo	175h1	EC 6640	2024-10-28
☒	Thermo-Hygrograph	Testo	175h1	EC 6643	2024-10-28

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

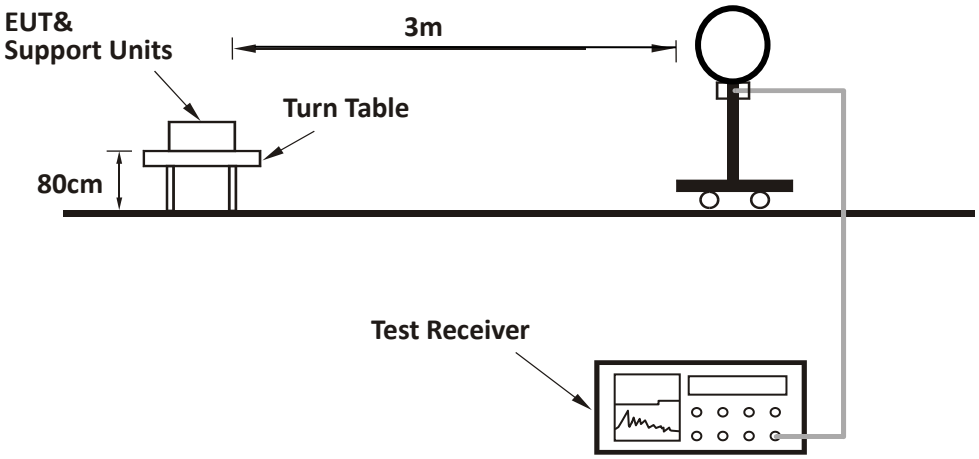
3.2 Measurement Procedure

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:

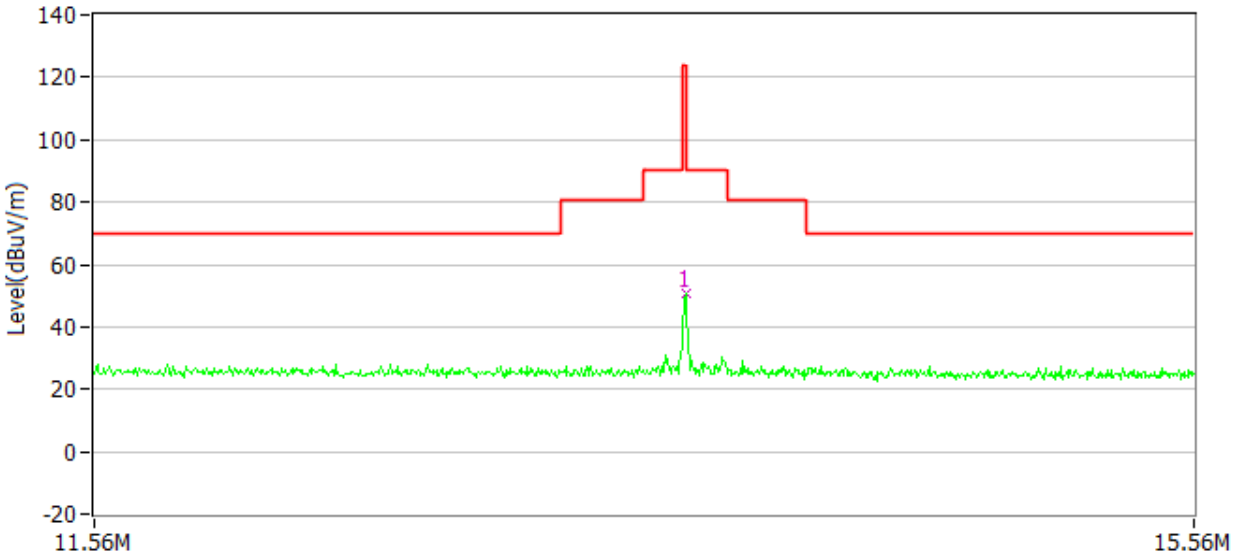
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

3.3 Test Configuration

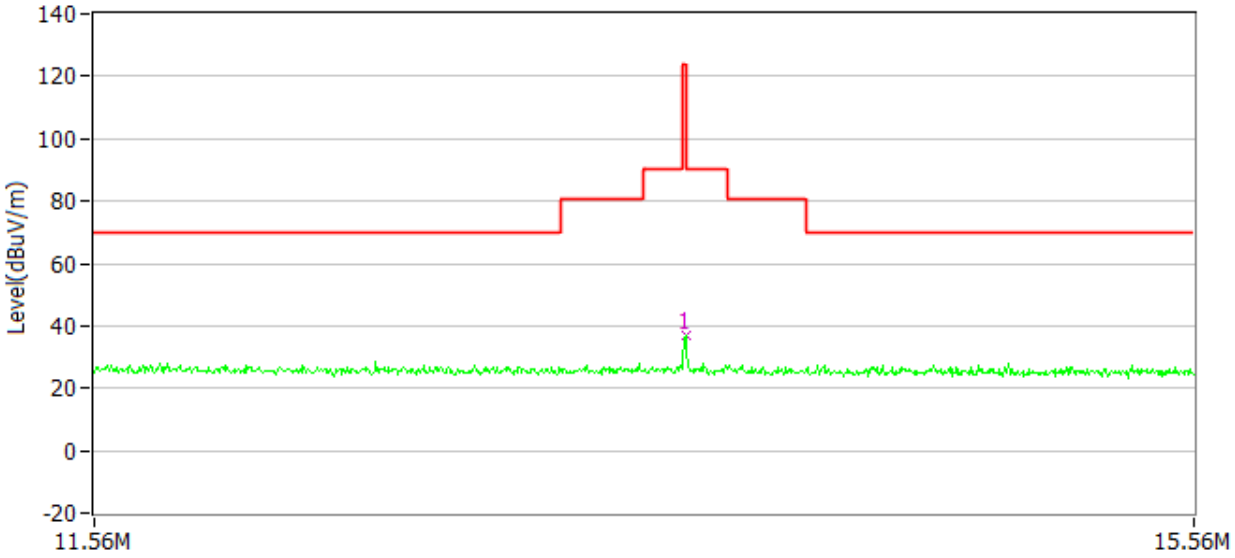


3.4 Test Results of Fundamental Emissions

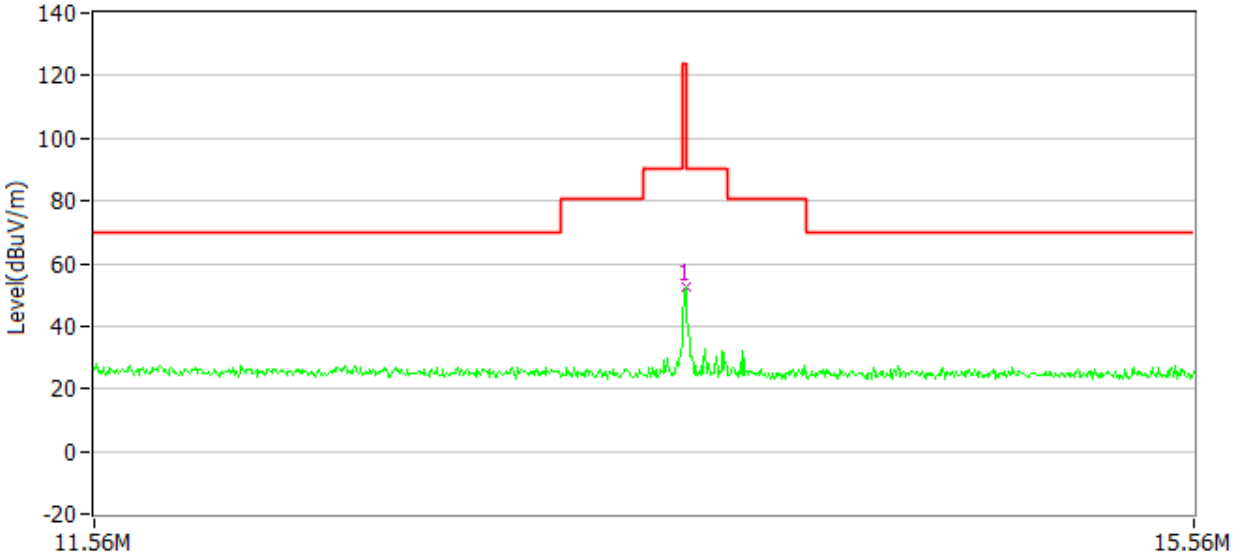
Antenna Polarization: X axis



Antenna Polarization: Y axis



Antenna Polarization: Z axis



Antenna Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
X	13.56	50.50	20.50	124.00	73.50	PK
Y	13.56	37.10	20.50	124.00	86.90	PK
Z	13.56	52.40	20.50	124.00	71.60	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.

TEST REPORT

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.

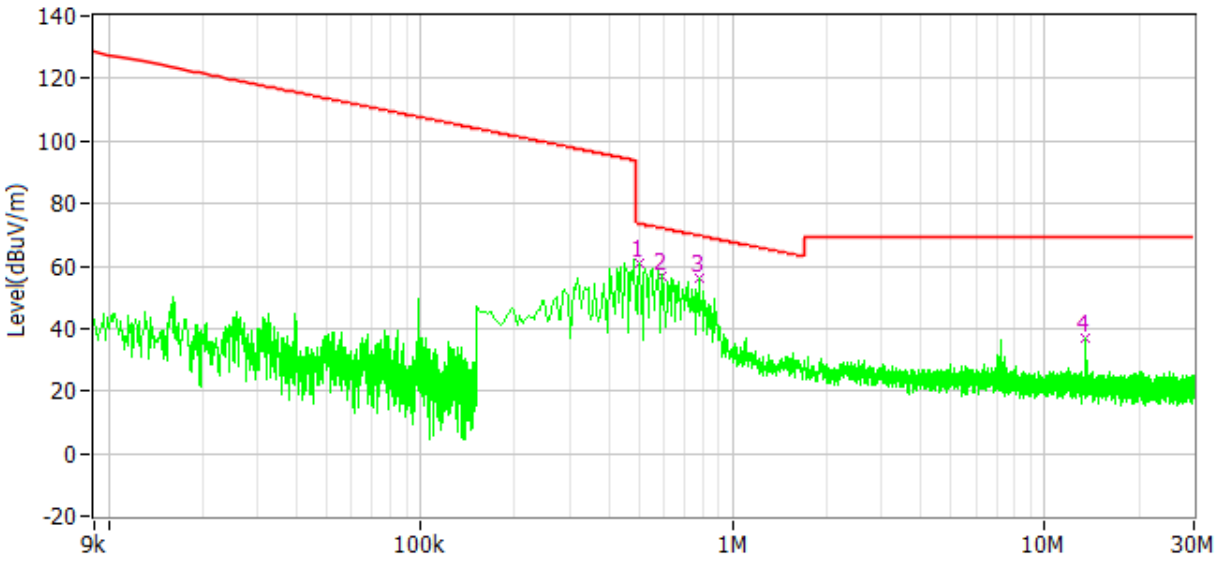
d) For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e) The test-receiver system was set to quasi-peak detect function and 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

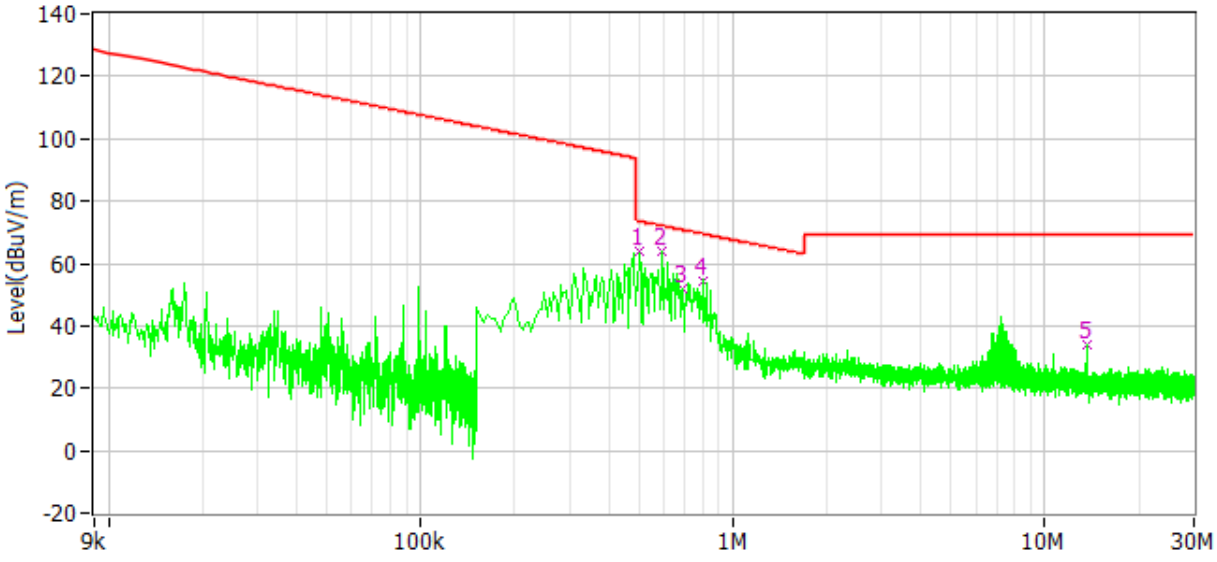
4.3 Test Results of Radiated Emissions

Test Curve (below 30MHz):

Antenna Polarization: X axis

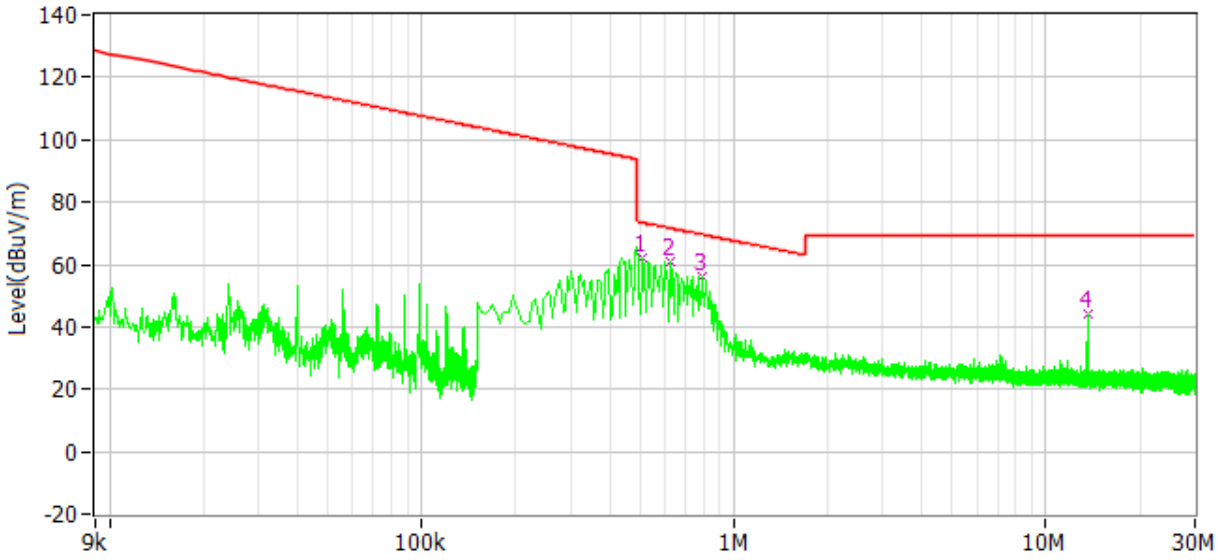


Antenna Polarization: Y axis



TEST REPORT

Antenna Polarization: Z axis



Test data below 30MHz:

Frequency	Limit (dBuV/m)	Corrected Reading (dBuV/m)	Margin (dB)	Reading (dBuV)	Factor (dB/m)	Detector	Polarity
501.000kHz	73.60	60.60	13.00	40.40	20.20	PK	X
595.500kHz	72.10	57.00	15.10	36.80	20.20	PK	X
780.000kHz	69.80	55.90	13.90	35.80	20.10	PK	X
501.000kHz	73.60	63.60	10.00	43.40	20.20	PK	Y
595.500kHz	72.10	63.70	8.40	43.50	20.20	PK	Y
694.500kHz	70.80	51.80	19.00	31.60	20.20	PK	Y
802.500kHz	69.50	54.60	14.90	34.50	20.10	PK	Y
510.000kHz	73.50	62.00	11.40	41.80	20.20	PK	Z
627.000kHz	71.70	61.10	10.60	40.90	20.20	PK	Z
789.000kHz	69.70	55.90	13.70	35.80	20.10	PK	Z

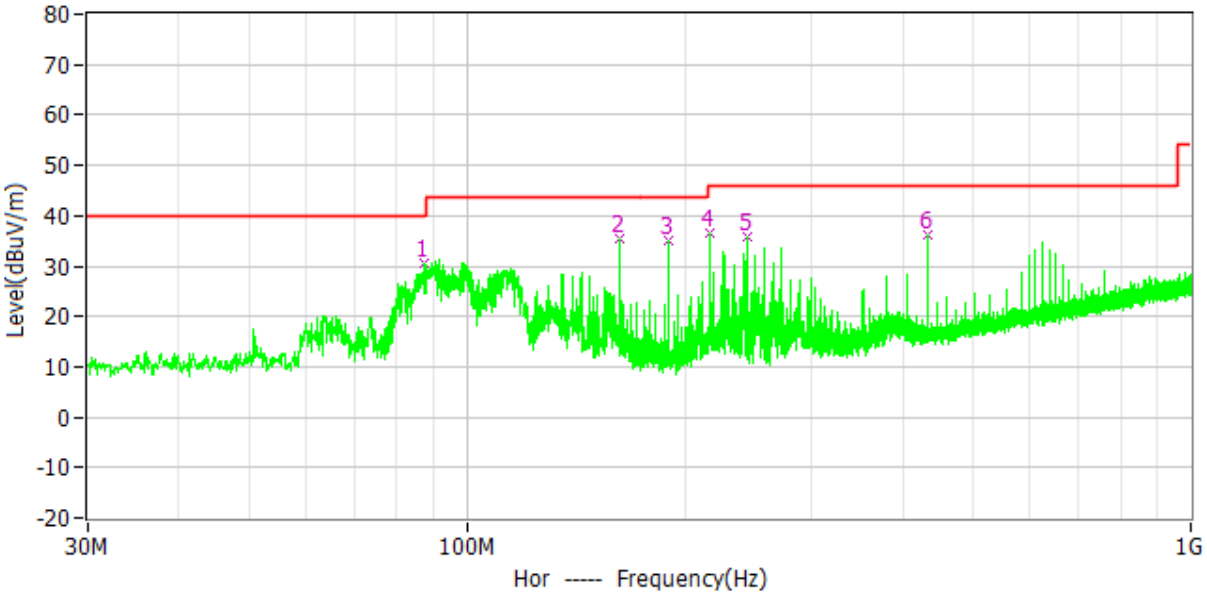
Remark:

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.

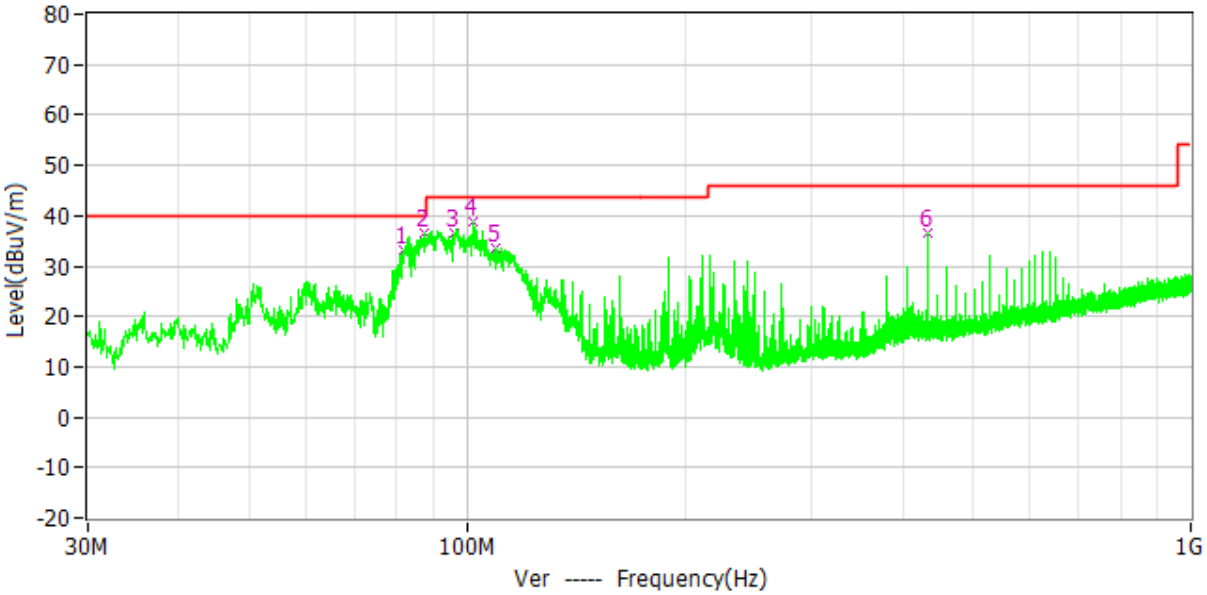
TEST REPORT

Test Curve (30MHz to 1000MHz):

Horizontal



Vertical



TEST REPORT

Test data (30MHz to 1000MHz)

Frequency (MHz)	Limit (dBuV/m)	Corrected Reading (dBuV/m)	Margin (dB)	Original Reading (dBuV)	Correct Factor (dB/m)	Detector	Polar
87.618	40.00	30.50	9.50	21.30	9.20	PK	Hor
162.696	43.50	35.40	8.10	20.80	14.60	PK	Hor
189.856	43.50	34.90	8.60	22.50	12.40	PK	Hor
216.919	46.00	36.60	9.40	24.40	12.20	PK	Hor
244.079	46.00	35.90	10.10	22.50	13.40	PK	Hor
434.005	46.00	36.30	9.70	17.50	18.80	PK	Hor
81.701	40.00	33.10	6.90	23.10	10.00	PK	Ver
87.424	40.00	36.70	3.30	27.50	9.20	PK	Ver
96.154	43.50	36.50	7.00	26.90	9.60	PK	Ver
102.168	43.50	38.80	4.70	28.60	10.20	PK	Ver
109.540	43.50	33.70	9.80	22.60	11.10	PK	Ver
433.908	46.00	36.50	9.50	17.70	18.80	PK	Ver

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.

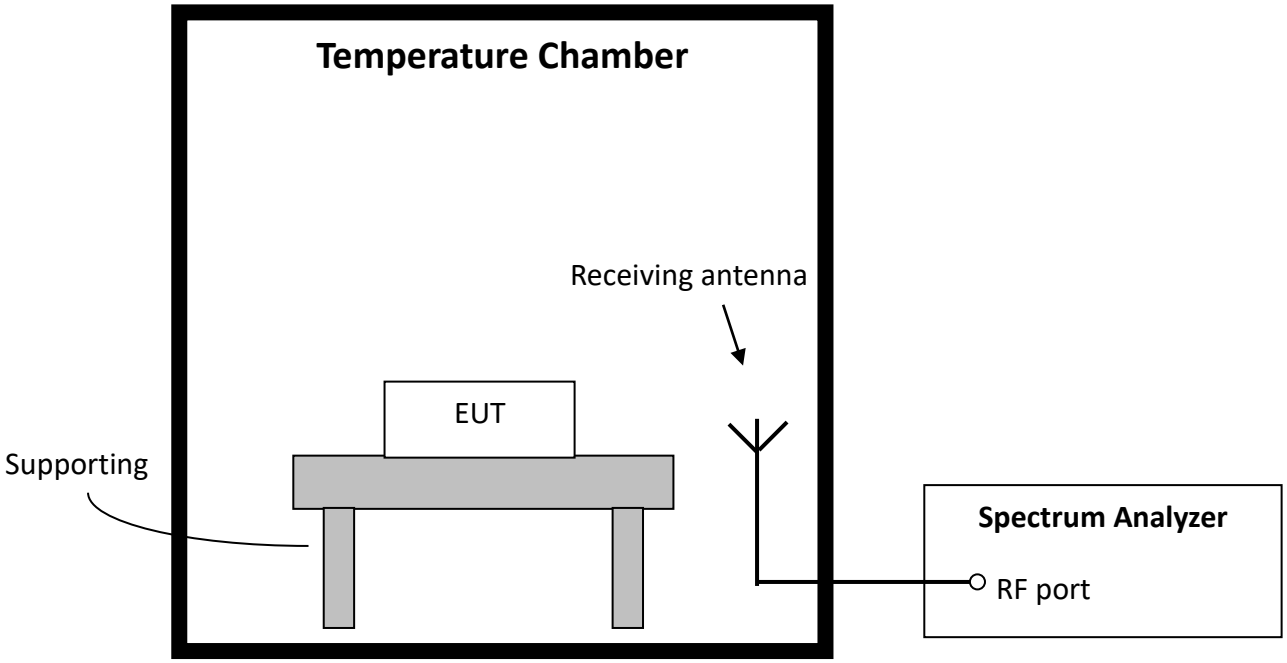
5 Frequency Stability (Temperature Variation)

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	13.5606	13.5600	0.0044	± 0.0100
	-10	13.5607		0.0051	
	0	13.5607		0.0051	
	10	13.5611		0.0081	
	20	13.5612		0.0088	
	30	13.5612		0.0088	
	40	13.5610		0.0073	
	50	13.5611		0.0081	

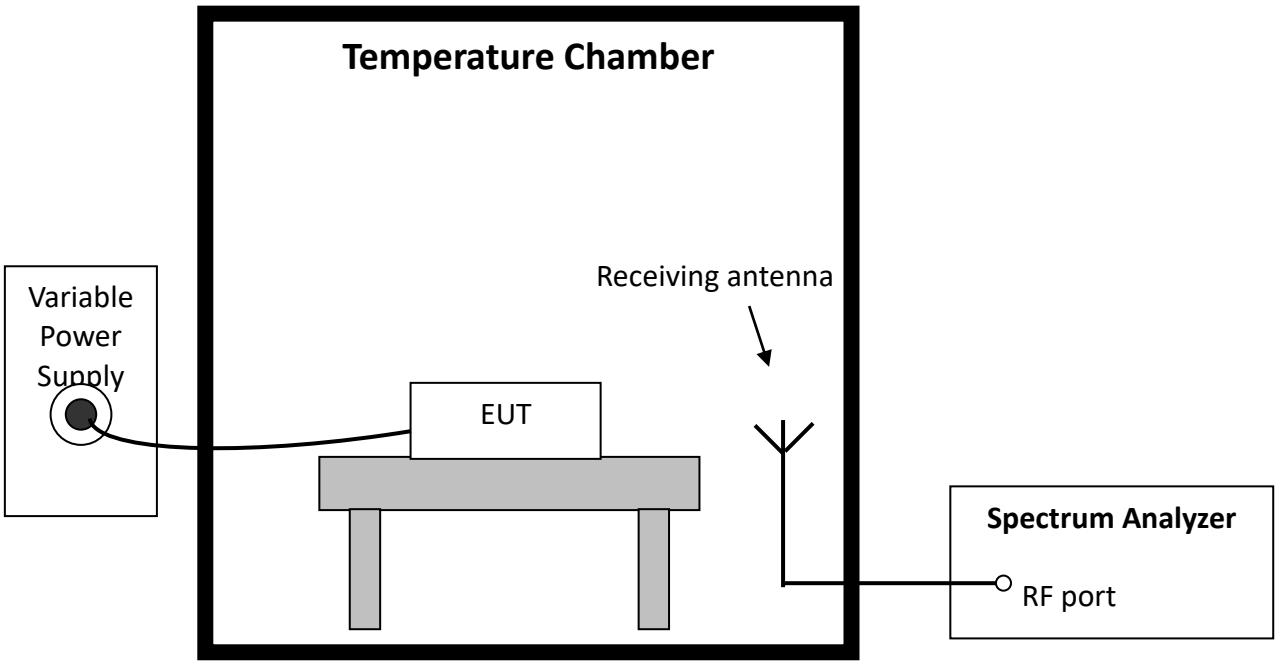
6 Frequency Stability (Voltage Variation)

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.

TEST REPORT

6.4 Test protocol

Temp (ºC)	Voltage (V)	Freq Measured (MHz)	Freq nominal (MHz)	Tolerance (%)	Limit (%)
20	204	13.5611	13.5600	0.0081	± 0.0100
	240	13.5613		0.0095	
	276	13.5613		0.0095	

7 Conducted emissions

Test result: **PASS**

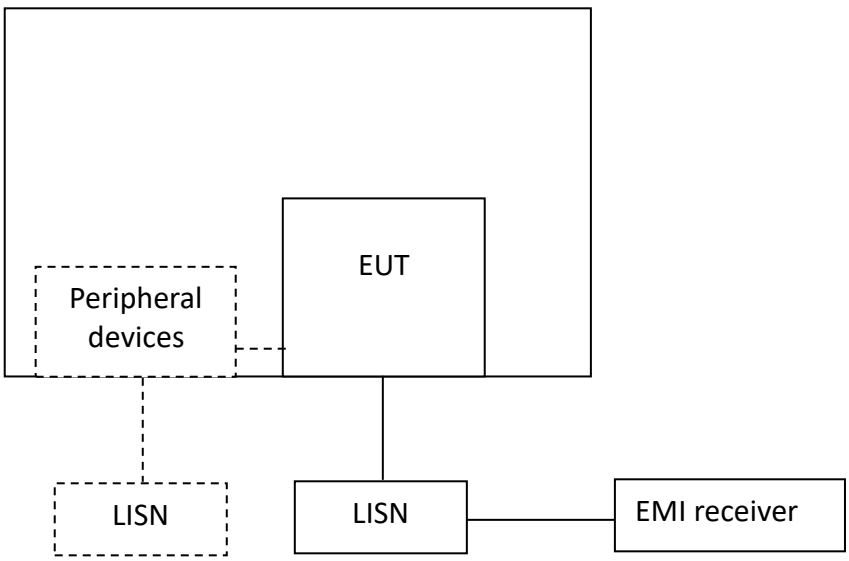
7.1 Limit

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

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.

7.2 Test Configuration



TEST REPORT

7.3 Measurement Procedure

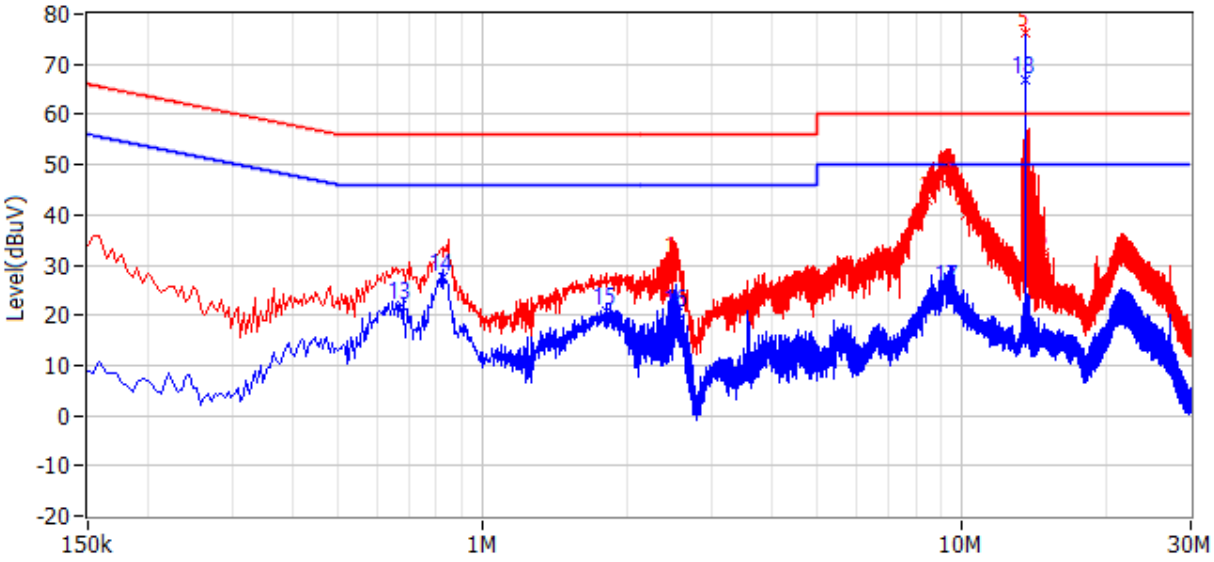
Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be 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.

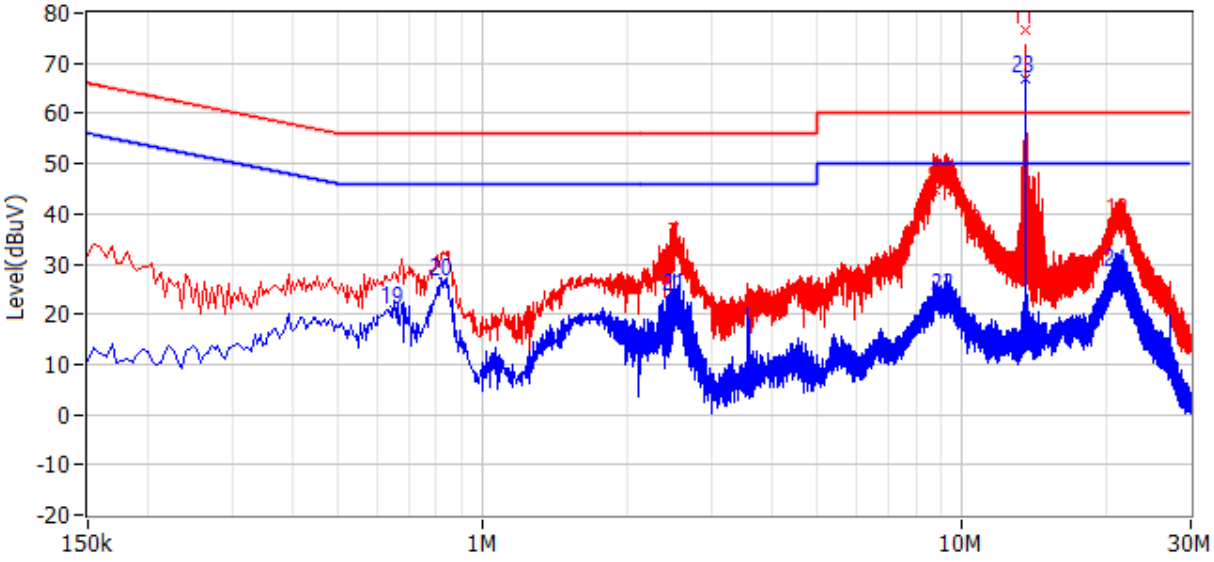
The bandwidth of the test receiver is set at 9 kHz.

7.4 Test Results of Conducted Emissions

Test Voltage: 240VAC/60Hz
Test Curve:



Line L1



Line L2

TEST REPORT

Frequency	Limit (dBuV)	Level (dBuV)	Delta (dB)	Original Receiver Reading (dBuV)	Correct Factor (dB)	Detector	Phase
2.481MHz	56.0	30.8	-25.2	24.6	6.2	QP	L1
8.516MHz	60.0	43.0	-17.0	36.4	6.6	QP	L1
9.357MHz	60.0	47.3	-12.7	40.7	6.6	QP	L1
10.181MHz	60.0	40.0	-20.0	33.4	6.6	QP	L1
13.560MHz	-	-	-	-	-	-	L1
14.834MHz	60.0	32.5	-27.5	25.6	6.9	QP	L1
2.531MHz	56.0	33.6	-22.4	27.4	6.2	QP	L2
8.817MHz	60.0	44.8	-15.2	38.2	6.6	QP	L2
9.492MHz	60.0	44.9	-15.1	38.3	6.6	QP	L2
10.509MHz	60.0	36.1	-23.9	29.4	6.7	QP	L2
13.560MHz	-	-	-	-	-	-	L2
21.327MHz	60.0	38.4	-21.6	31.1	7.3	QP	L2
676.500kHz	46.0	21.9	-24.1	15.7	6.2	CAV	L1
825.000kHz	46.0	27.4	-18.6	21.2	6.2	CAV	L1
1.811MHz	46.0	20.7	-25.3	14.5	6.2	CAV	L1
2.553MHz	46.0	20.4	-25.6	14.2	6.2	CAV	L1
9.357MHz	50.0	25.4	-24.6	18.8	6.6	CAV	L1
13.560MHz	-	-	-	-	-	-	L1
654.000kHz	46.0	21.0	-25.0	14.8	6.2	CAV	L2
825.000kHz	46.0	26.6	-19.4	20.4	6.2	CAV	L2
2.531MHz	46.0	23.3	-22.7	17.1	6.2	CAV	L2
9.236MHz	50.0	23.3	-26.7	16.7	6.6	CAV	L2
13.560MHz	-	-	-	-	-	-	L2
21.066MHz	50.0	28.4	-21.6	21.1	7.3	CAV	L2

Note: The signal of 13.56MHz was caused by the RFID module. It is a wanted signal.

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.*

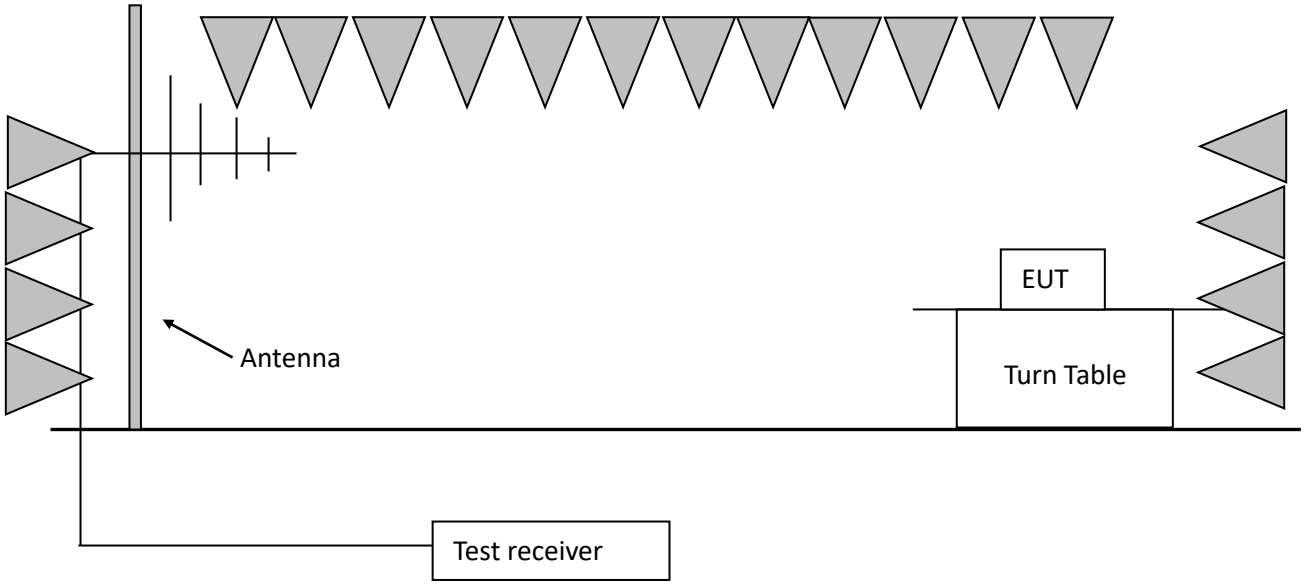
8 20dB Bandwidth

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	13.560844	13.561362	0.518	13.553 ~ 13.567
Occupied bandwidth	13.560009	13.562180	2.172	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 **********