CFR 47 FCC PART 15 SUBPART C

TEST REPORT

For

Wall Box EV Charger

MODEL NUMBER: SK-EV40, SK-EV40-16AS, SK-EV40-16AT, SK-EV40-32AS, SK-EV40-32AT

REPORT NUMBER: E04A23080897F00204

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FCC ID: 2BK65-SKEV40

Prepared for

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Prepared by

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This report is based on a single evaluation of the submitted sample(s) of the above mentioned Product, it does not imply an assessment of the production of the products.
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Revision History

Rev.	Issue Date	Revisions	Revised By
V0	September 21, 2024	Initial Issue	

Summary of Test Results

Test Item	Clause	Result
Antenna Requirement	CFR 47 FCC §15.203	Pass
AC Power Line Conducted Emission	CFR 47 FCC §15.207	Pass
Radiated Spurious Emissions	CFR 47 FCC §5.225(a)(b)(c)(d) CFR 47 FCC§15.209(a)	Pass
20dB Bandwidth	CFR 47 FCC §15.215	Pass
Frequency Stability Tolerance	CFR 47 FCC §15.225(e)	Pass

*This test report is only published to and used by the applicant, and it is not for evidence purpose in China.
*The measurement result for the sample received is <Pass> according to <CFR 47 FCC PART 15 SUBPART C> when <Accuracy Method> decision rule is applied.

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1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name:	Shenzhen Southking Technology Co.,Ltd
Address:	2nd / 4th Floor, Building 1 and 2nd Floor,Building 2，No. 596 Zhoushi Road, Jiuwei Community, Hangcheng Street, Baoan District, Shenzhen, Guangdong, China

Manufacturer Information

Company Name:	Shenzhen Southking Technology Co.,Ltd
Address:	2nd / 4th Floor, Building 1 and 2nd Floor,Building 2，No. 596 Zhoushi Road, Jiuwei Community, Hangcheng Street, Baoan District, Shenzhen, Guangdong, China

EUT Information

Product Description:	Wall Box EV Charger
Model:	SK-EV40, SK-EV40-16AS, SK-EV40-16AT, SK-EV40-32AS, SK-EV40-32AT
Brand:	Half Minute Power
Sample Received Date:	December 12, 2023
Sample Status:	Normal
Sample ID:	A23080897 003
Date of Tested:	December 12, 2023 to September 21, 2024

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 FCC PART 15 SUBPART C	**Pass**

Prepared By:

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Checked By:

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Laboratory Manager

2. TEST METHODOLOGY

All tests were performed in accordance with the standard CFR 47 FCC PART 15 SUBPART C

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	**A2LA (Certificate No.: 6947.01)** Guangdong Global Testing Technology Co., Ltd. has been assessed and proved to be in compliance with A2LA. **FCC (FCC Designation No.: CN1343)** Guangdong Global Testing Technology Co., Ltd. has been recognized to perform compliance testing on equipment subject to Supplier's Declaration of Conformity (SDoC) and Certification rules **ISED (Company No.: 30714)** Guangdong Global Testing Technology Co., Ltd. has been registered and fully described in a report filed with ISED. The Company Number is 30714 and the test lab Conformity Assessment Body Identifier (CABID) is CN0148.

Note: All tests measurement facilities use to collect the measurement data are located at Room 101-105, 203-210, Building 1, No.2, Keji 8 Road, Songshan Lake Park, Dongguan city, Guangdong, People’s Republic of China, 523808

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Items	k	Uncertainty
20dB Emission Bandwidth	1.96	±9.2 PPM
Conducted Output Power	1.96	±1.5 dB
Power Spectral Density Level	1.96	±1.9 dB
Conducted Spurious Emission	1.96	9 kHz-30 MHz: ± 0.95 dB 30 MHz-1 GHz: ± 1.5 dB 1GHz-12.75GHz: ± 1.8 dB 12.75 GHz-26.5 GHz: ± 2.1dB
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.		

Test Item	Measurement Frequency Range	K	U(dB)
Conducted emissions from the AC mains power ports (AMN)	150 kHz ~ 30 MHz	2	3.37
Radiated emissions	9 kHz ~ 30 MHz	2	4.16
Radiated emissions	30 MHz ~ 1 GHz	2	3.79
Radiated emissions	1 GHz ~ 18 GHz	2	5.62
Radiated emissions	18 GHz ~ 40 GHz	2	5.54
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.			

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name		Wall Box EV Charger
Model		SK-EV40
Series Model		SK-EV40-16AS, SK-EV40-16AT, SK-EV40-32AS, SK-EV40-32AT
Hardware Version		V1.0
Software Version		V1.0
Ratings		Input voltage: 85~415V Output voltage: 85~415V Output Current: 16A/40A Max.Output Power: 22KW Max
Power Supply	AC	240V/60Hz

Operation Frequency:	13.56 MHz
Type of Modulation:	ASK

5.2. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	13.56	/	/	/	/	/	/

5.3. MAXIMUM FIELD STRENGTH

Frequency (MHz)	Max field strength (dBμV/m)
13.56	66.18

5.4. TEST CHANNEL CONFIGURATION

Test Channel	Frequency
CH 1(Low Channel)	13.56 MHz

5.5. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 13.56MHz Band		
Test Software Version		/
Modulation Type	Transmit Antenna Number	Test Software setting value
		CH 1
ASK	1	default

5.6. DESCRIPTION OF AVAILABLE ANTENNAS

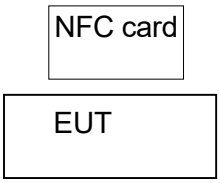
Antenna	Frequency (MHz)	Antenna Type	MAX Antenna Gain (dBi)
1	13.56	Internal antenna	0

5.7. SUPPORT UNITS FOR SYSTEM TEST

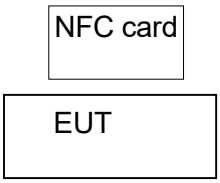
No.	Equipment	Manufacturer	Model No.	Serial No.	Remark
1	NFC card	Shenzhen Southking Technology Co.,Ltd	/	/	/

5.8. SETUP DIAGRAM

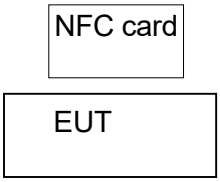
AC conducted emission :



Radiated Emission:



RF conducted:



6. MEASURING EQUIPMENT AND SOFTWARE USED

Test Equipment of Conducted RF					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
Spectrum Analyzer	Rohde & Schwarz	FSV40	102257	2024/09/14	2025/09/13
Spectrum Analyzer	KEYSIGHT	N9020A	MY51285127	2024/09/14	2025/09/13
EXG Analog Signal Generator	KEYSIGHT	N5173B	MY61253075	2024/09/14	2025/09/13
Vector Signal Generator	Rohde & Schwarz	SMM100A	101899	2024/09/14	2025/09/13
RF Control box	MWRF-test	MW100-RFCB	MW220926GTG	2024/09/14	2025/09/13
Wideband Radio Communication Tester	Rohde & Schwarz	CMW270	102792	2024/09/14	2025/09/13
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	103235	2024/09/14	2025/09/13
temperature humidity chamber	Espec	SH-241	SH-241-2014	2024/09/14	2025/09/13
RF Test Software	MWRF-test	MTS8310E (Ver. V2/0)	N/A	N/A	N/A

Test Equipment of Radiated emissions below 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
3m Semi-anechoic Chamber	ETS	9m*6m*6m	Q2146	2022/08/30	2025/08/29
EMI Test Receiver	Rohde & Schwarz	ESCI3	101409	2024/09/14	2025/09/13
Spectrum Analyzer	KEYSIGHT	N9020A	MY51283932	2024/09/14	2025/09/13
Pre-Amplifier	HzEMC	HPA-9K0130	HYPA21001	2024/09/14	2025/09/13
Biconilog Antenna	Schwarzbeck	VULB 9168	01315	2022/10/10	2025/10/09
Biconilog Antenna	ETS	3142E	00243646	2022/03/23	2025/03/22
Loop Antenna	ETS	6502	243668	2022/03/30	2025/03/29
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE)	N/A	N/A	N/A

Test Equipment of Radiated emissions above 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
3m Semi-anechoic Chamber	ETS	9m*6m*6m	Q2149	2022/08/30	2025/08/29
Spectrum Analyzer	Rohde & Schwarz	FSV40	101413	2024/09/14	2025/09/13
Spectrum Analyzer	KEYSIGHT	N9020A	MY51283932	2024/09/14	2025/09/13
Pre-Amplifier	A-INFO	HPA-1G1850	HYPA21003	2024/09/14	2025/09/13
Horn antenna	A-INFO	3117	246069	2022/03/11	2025/03/10
Pre-Amplifier	ZKJC	HPA-184057	HYPA21004	2024/09/14	2025/09/13

Horn antenna	ZKJC	3116C	246265	2022/03/29	2025/03/28
Test Software	Farad	EZ-EMC (Ver.FA-03A2 RE+)	N/A	N/A	N/A

Test Equipment of Conducted emissions					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal.**	**Due Date**
Shielded Room	CHENG YU	8m*5m*4m	N/A	2022/10/29	2025/10/28
EMI Test Receiver	Rohde & Schwarz	ESR3	102647	2024/09/14	2025/09/13
LISN/AMN	Rohde & Schwarz	ENV216	102843	2024/09/14	2025/09/13
NNLK 8129 RC	Schwarzbeck	NNLK 8129 RC	5046	2024/09/14	2025/09/13
8-Wire ISN CAT6	Schwarzbeck	NTFM8158	#237	2024/09/14	2025/09/13
CURRENT PROBE	Rohde & Schwarz	EZ-17	101602	2024/09/14	2025/09/13
Test Software	Farad	EZ-EMC (Ver. EMC-con-3A1 1+)	N/A	N/A	N/A

7. ANTENNA PORT TEST RESULTS

7.1. 20DB BANDWIDTH

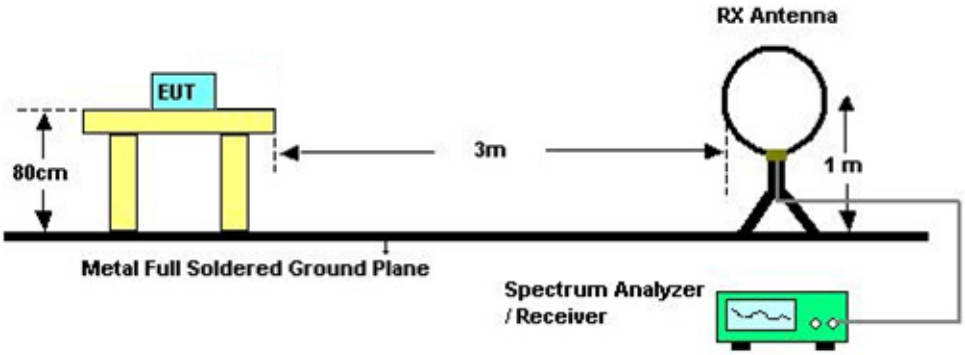
LIMITS

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

TEST PROCEDURE

1) The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
2) If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
3) If the EUT is a floor standing device, it is placed on the ground.
4) Auxiliary equipment and cables were positioned to simulate normal operation conditions.
5) The EUT is connected to DC Power Source.
6) The measurement distance is 3 meter.
7) The EUT was set into operation.
8) Adjust the test instrument for the following setting
   RBW: 1% to 5% of the Necessary bandwidth
   VBW: at least 3 times of the RBW
   Detector: Peak
   Sweep time: Auto
   Trace Mode: Max hold
9) Allow trace to fully stabilize

TEST SETUP

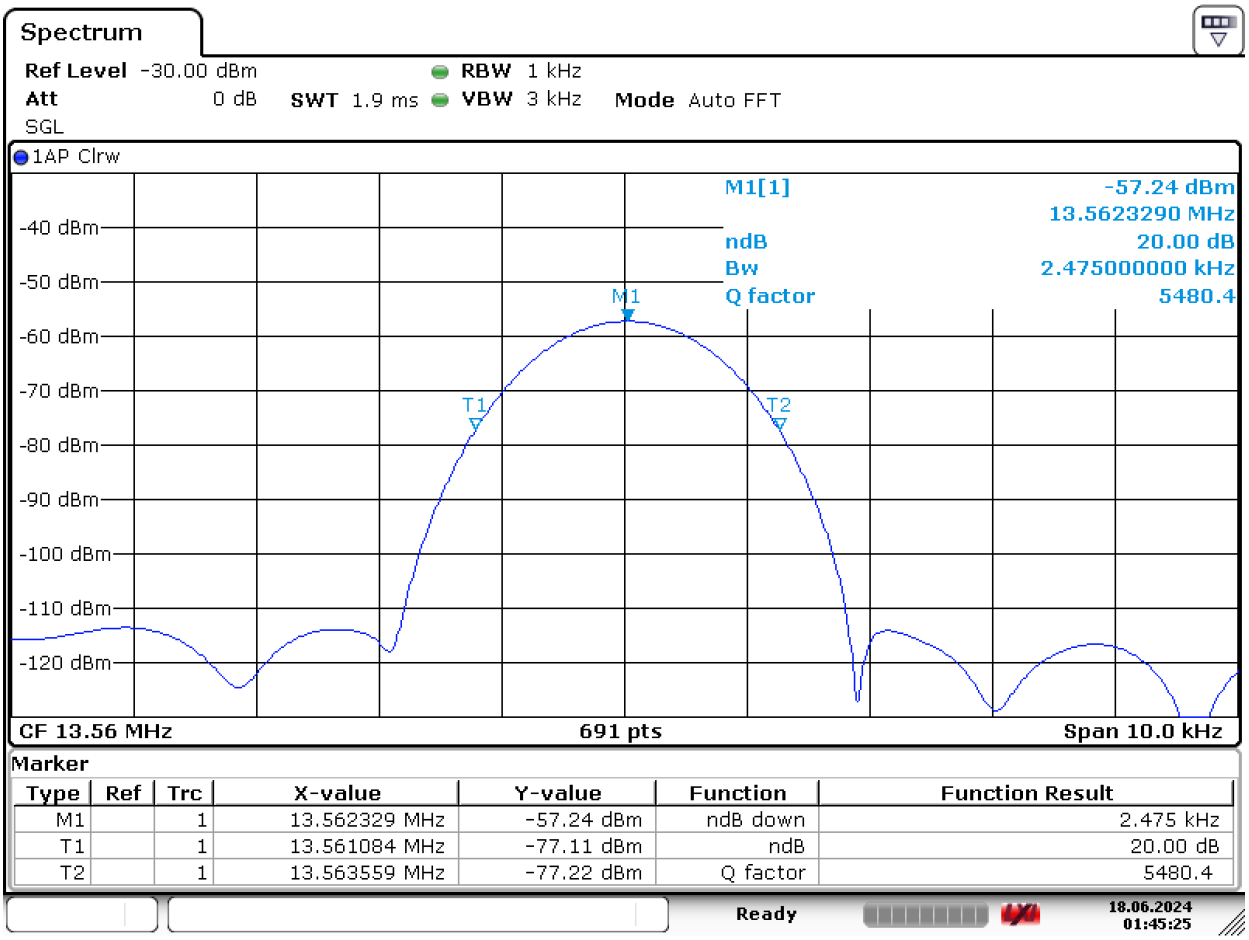


TEST ENVIRONMENT

Temperature	24.6℃	Relative Humidity	55%
Atmosphere Pressure	101kPa		

TEST RESULTS

Frequency (MHz)	20dB Bandwidth (kHz)	limit	Test Result
13.56	2.475	N/A	PASS



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7.2. FREQUENCY TOLERANCE (TEMPERATURE VARIATION AND VOLTAGE VARIATION)

LIMITS

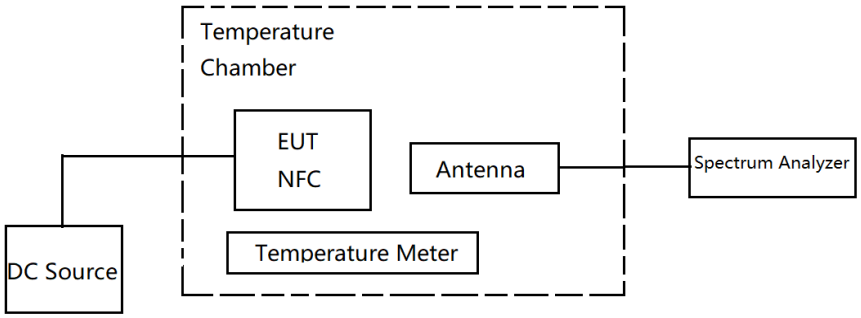
The frequency tolerance of the carrier signal shall be maintained within ±0.01% of operating frequency over a temperature variation of -20degrees to +50 degrees C at normal supply voltage , and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

TEST PROCEDURE

Frequency tolerance (Temperature variation)
1) The EUT and test equipment were setup as shown on the following page.
2) Set the temperature -20 degrees C.
3) Leave the EUT for 1 hour after it become the temperature that was setup.
4) Setup the EUT to transmitting.
5) Measure the transmitting frequency (startup, 2min, 5min and 10min).
6) Set the temperature -20 degrees C to +50 degrees C.
7) Repeat test procedure the step 4 to 6, and record the test data after the testing finished.

Frequency tolerance (Voltage variation)
1) The EUT and test equipment (set the supply voltage 100%) were setup as shown on the following page.
2) Set the temperature 20 degrees C.
3) Leave the EUT for 1 hour after it become the temperature that was setup.
4) Setup the EUT to transmitting.
5) Measure the transmitting frequency.
6) Set the supply voltage 85% and 115%
7) Repeat test procedure the step 4 to 6, and record the test data after the testing finished.

TEST SETUP



TEST ENVIRONMENT

Temperature	24.5℃	Relative Humidity	52%
Atmosphere Pressure	101kPa		

TEST RESULTS

startup

Transmitting Frequency (MHz)	Temperature (Degree C)	Voltage (V)	Frequency (MHz)	Deviation(%)	Limit(±) (%)
13.56	-20	240	13.560295	0.002176	0.01
	-10	240	13.560300	0.002212	0.01
	0	240	13.560305	0.002249	0.01
	10	240	13.560310	0.002286	0.01
	20	240	13.560310	0.002286	0.01
	30	240	13.560335	0.002471	0.01
	40	240	13.560320	0.002360	0.01
	50	240	13.560331	0.002441	0.01

2min

Transmitting Frequency (MHz)	Temperature (Degree C)	Voltage (V)	Frequency (MHz)	Deviation(%)	Limit(±) (%)
13.56	-20	240	13.560320	0.002360	0.01
	-10	240	13.560270	0.001991	0.01
	0	240	13.560320	0.002360	0.01
	10	240	13.560305	0.002249	0.01
	20	240	13.560325	0.002397	0.01
	30	240	13.560320	0.002360	0.01
	40	240	13.560305	0.002249	0.01
	50	240	13.560330	0.002434	0.01

5min

Transmitting Frequency (MHz)	Temperature (Degree C)	Voltage (V)	Frequency (MHz)	Deviation(%)	Limit(±) (%)
13.56	-20	240	13.560290	0.002139	0.01
	-10	240	13.560350	0.002581	0.01
	0	240	13.560325	0.002397	0.01
	10	240	13.560325	0.002397	0.01
	20	240	13.560325	0.002397	0.01
	30	240	13.560330	0.002434	0.01
	40	240	13.560332	0.002448	0.01
	50	240	13.560330	0.002434	0.01

10min

Transmitting Frequency (MHz)	Temperature (Degree C)	Voltage (V)	Frequency (MHz)	Deviation(%)	Limit(±) (%)
13.56	-20	240	13.560328	0.002419	0.01
	-10	240	13.560334	0.002463	0.01
	0	240	13.560330	0.002434	0.01
	10	240	13.560335	0.002471	0.01
	20	240	13.560335	0.002471	0.01
	30	240	13.560305	0.002249	0.01
	40	240	13.560350	0.002581	0.01
	50	240	13.560335	0.002471	0.01

Frequency tolerance (Voltage variation)

Transmitting Frequency (MHz)	Temperature (Degree C)	Voltage (V)	Frequency (MHz)	Deviation(%)	Limit(±) (%)
13.56	20	204	13.560340	0.002507	0.01
	20	240	13.560342	0.002522	0.01
	20	276	13.560335	0.002471	0.01

8. RADIATED TEST RESULTS

LIMITS

Fundamental field strength

FCC Reference:	Part 15.225(a)(b)(c)(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.3, 6.4 and 6.5

Frequency (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measured Distance (Meters)
13.553-13.567	15848	84	30
13.410-13.553/13.567-13.710	334	50.47	30
13.110-13.410/13.710-14.010	106	40.51	30

Note(s):
1. The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

2. The limit is specified at a test distance of 30 meters. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40dB/decade).

Radiation Disturbance Test Limit for FCC (Class B) (9 kHz ~ 1 GHz)

Emissions radiated outside of the specified frequency bands above 30 MHz			
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

FCC Emissions radiated outside of the specified frequency bands below 30 MHz

Frequency (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

ISED General field strength limits at frequencies below 30 MHz

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Magnetic field strength (H-Field) (µA/m)	Measurement distance (m)
9 - 490 kHz[Note 1]	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

ISED Restricted bands please refer to ISED RSS-GEN Clause 8.10

Table 7 – Restricted frequency bands[Note 1]		
MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 – 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 – 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 – 8500	
108 – 138		

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

FCC Restricted bands of operation refer to FCC §15.205 (a):

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

Note: [1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2]Above 38.6c

TEST PROCEDURE

Below 30 MHz

The setting of the spectrum analyser

RBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
VBW	200 Hz (From 9 kHz to 0.15 MHz)/ 9 kHz (From 0.15 MHz to 30 MHz)
Sweep	Auto

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.4.

2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80 cm above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1 m height antenna tower.

5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

6. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak and average detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak and average detector and reported.

7. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field site based on KDB 414788.

8. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω. For example, the measurement frequency X KHz resulted in a level of Y dBuV/m, which is equivalent to Y-51.5 = Z dBuA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

Below 1 GHz and above 30 MHz

The setting of the spectrum analyser

RBW	120 kHz
VBW	300 kHz
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.5.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80 cm above ground.

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

5. For measurement below 1 GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

Above 1G

The setting of the spectrum analyser

RBW	1 MHz
VBW	PEAK: 3 MHz AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013 clause 6.6.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

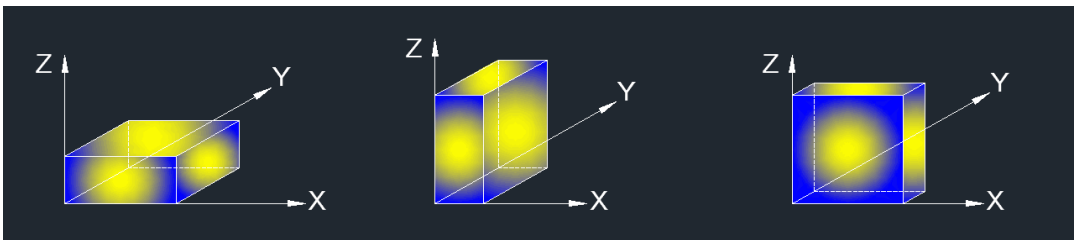
3. The EUT was placed on a turntable with 1.5 m above ground.

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

5. For measurement above 1 GHz, the emission measurement will be measured by the peak detector. This peak level, once corrected, must comply with the limit specified in Section 15.209.

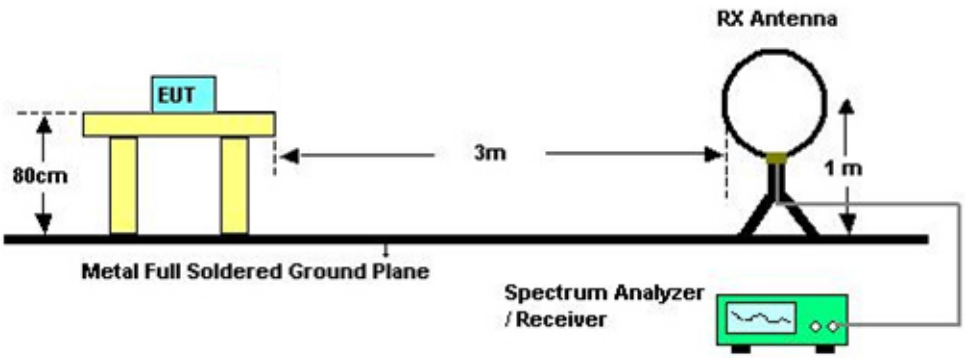
6. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1 MHz resolution bandwidth with 1/T video bandwidth with peak detector for average measurements. For the Duty Cycle please refer to clause 7.1.ON TIME AND DUTY CYCLE.

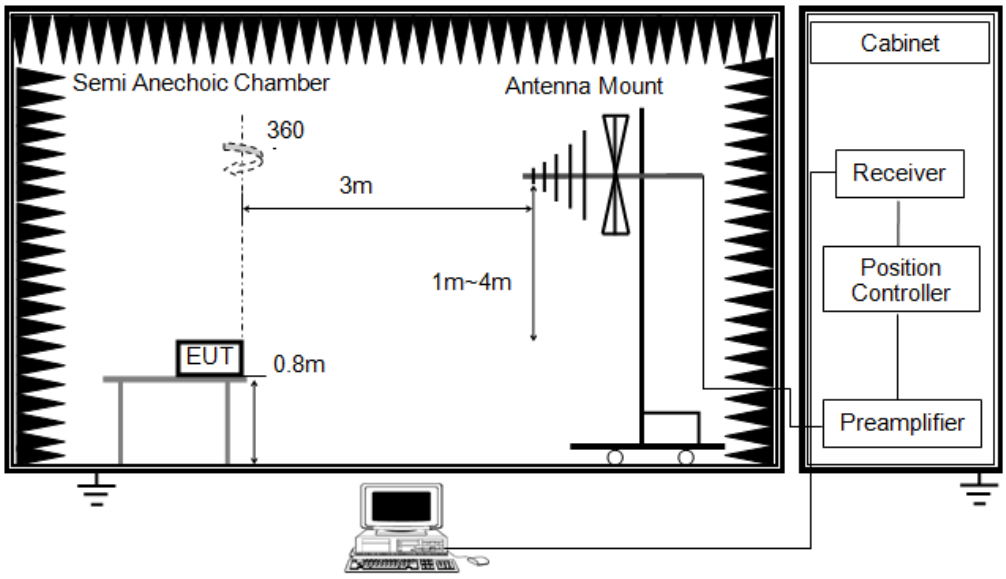
X axis, Y axis, Z axis positions:

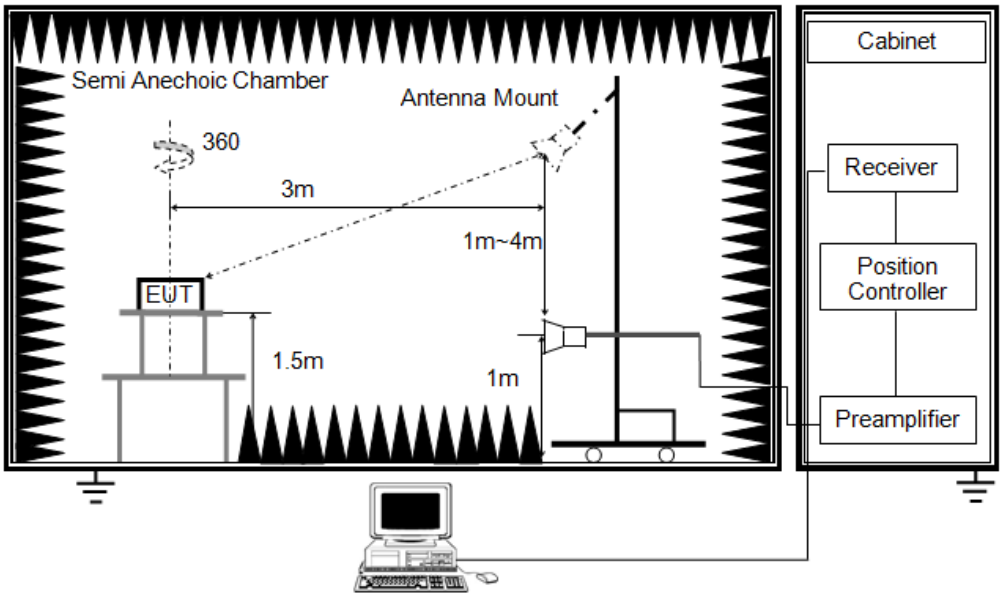


Note 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

TEST SETUP







TEST ENVIRONMENT

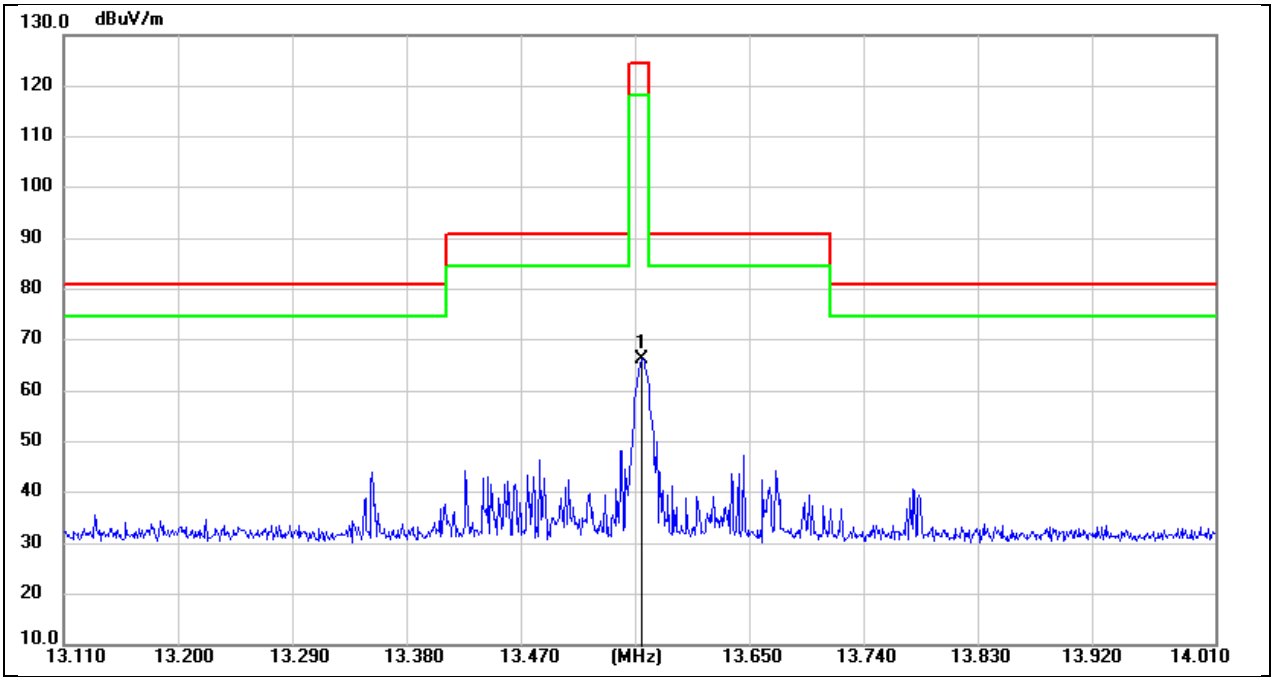
Temperature	26℃	Relative Humidity	54%
Atmosphere Pressure	101kPa		

TEST RESULTS

Please refer to section 8.1.

8.1. RADIATED SPURIOUS EMISSION

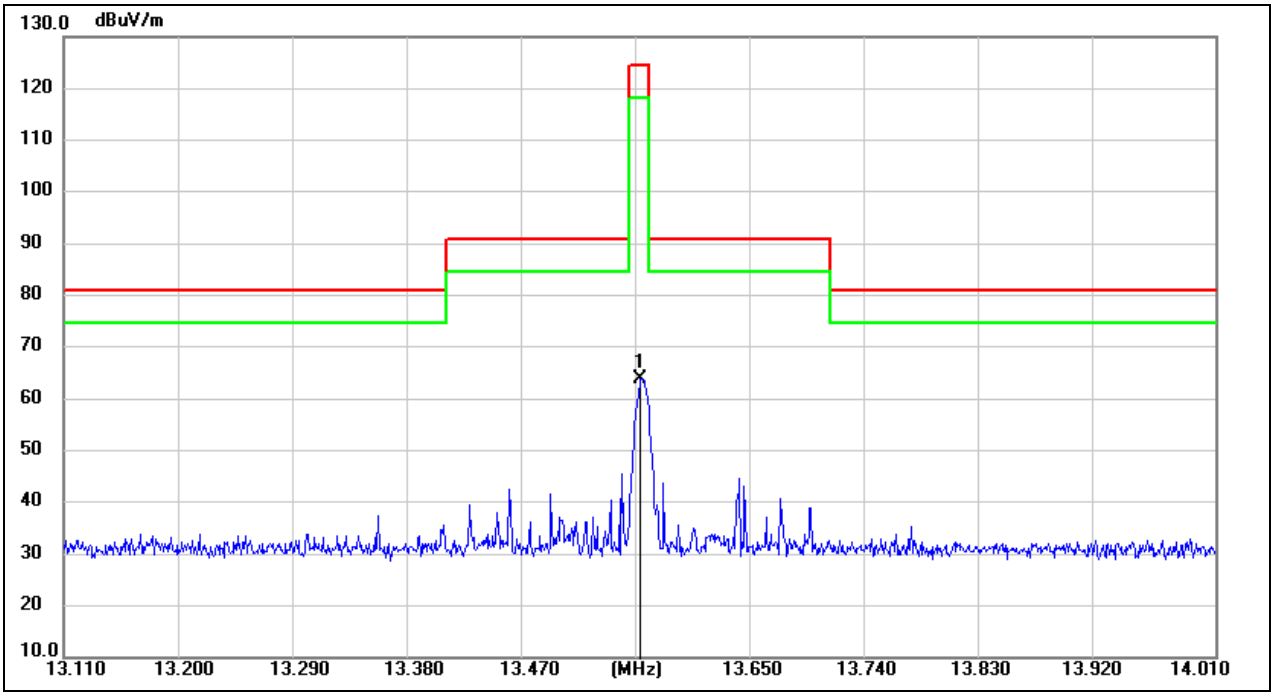
Mode:	13.56MHz
Power:	AC 240V/60Hz
TE:	Berny
Date	2024/08/28
T/A/P	26℃/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	13.5618	45.88	20.30	66.18	124.00	-57.82	PK+	coaxial

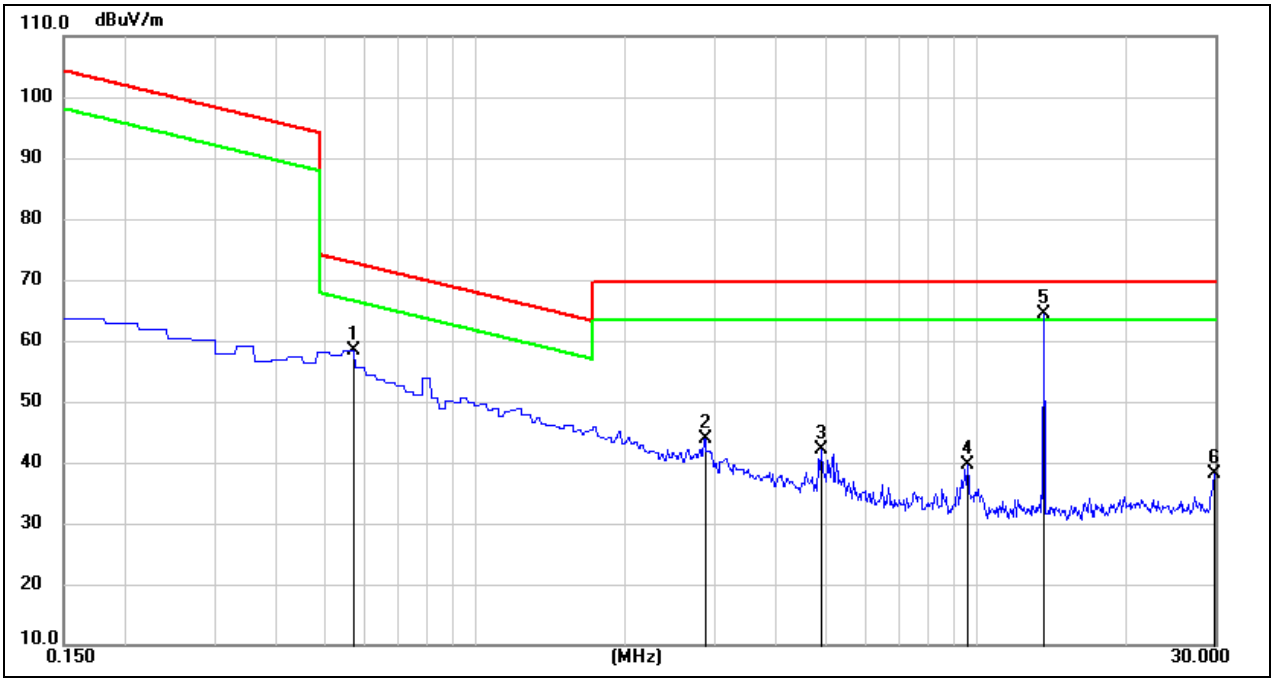
Mode:	13.56 MHz
Power:	AC 240V/60Hz
TE:	Berny
Date	2024/08/28
T/A/P	26℃/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	13.5610	43.67	20.30	63.97	124.00	-60.03	PK+	coplanar

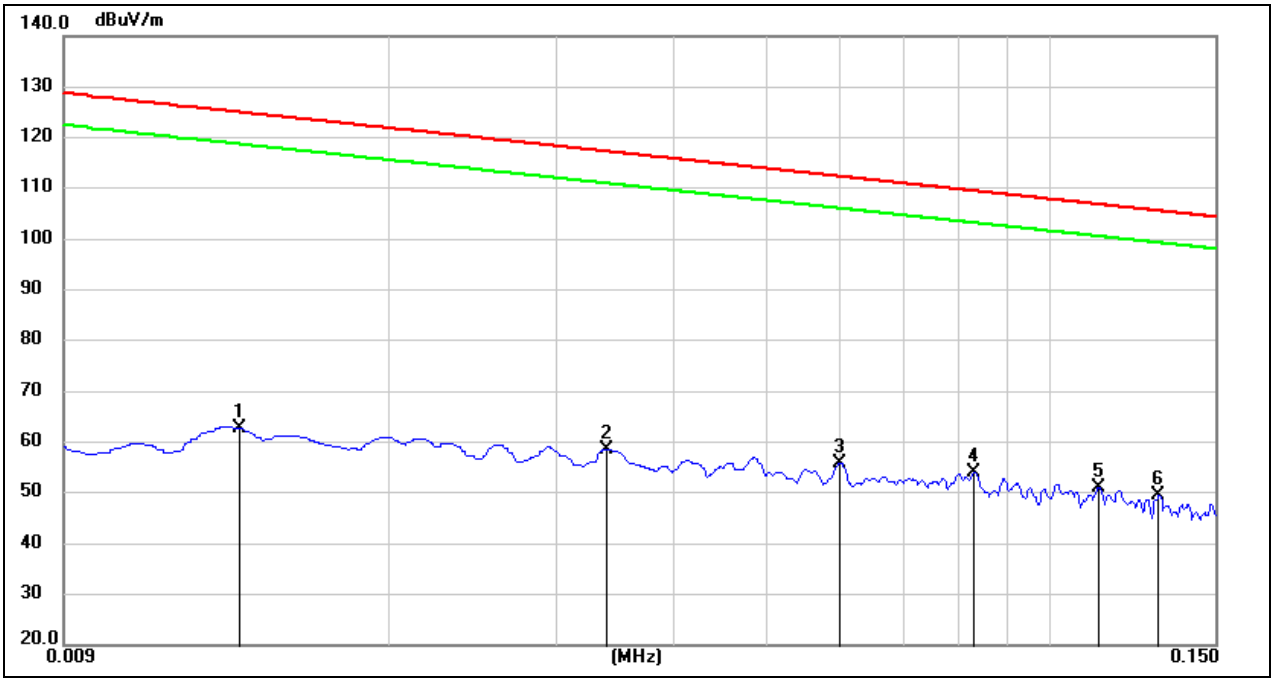
Mode:	13.56 MHz
Power:	AC 240V/60Hz
TE:	Berny
Date	2024/08/28
T/A/P	26℃/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	0.5680	38.81	19.57	58.38	72.52	-14.14	PK+	coaxial
2	2.8664	24.32	19.61	43.93	69.50	-25.57	PK+	coaxial
3	4.8961	22.37	19.81	42.18	69.50	-27.32	PK+	coaxial
4	9.5527	19.68	19.85	39.53	69.50	-29.97	PK+	coaxial
5	13.5526	44.11	20.30	64.41	69.50	-5.09	PK+	coaxial
6	29.7910	17.83	20.24	38.07	69.50	-31.43	PK+	coaxial

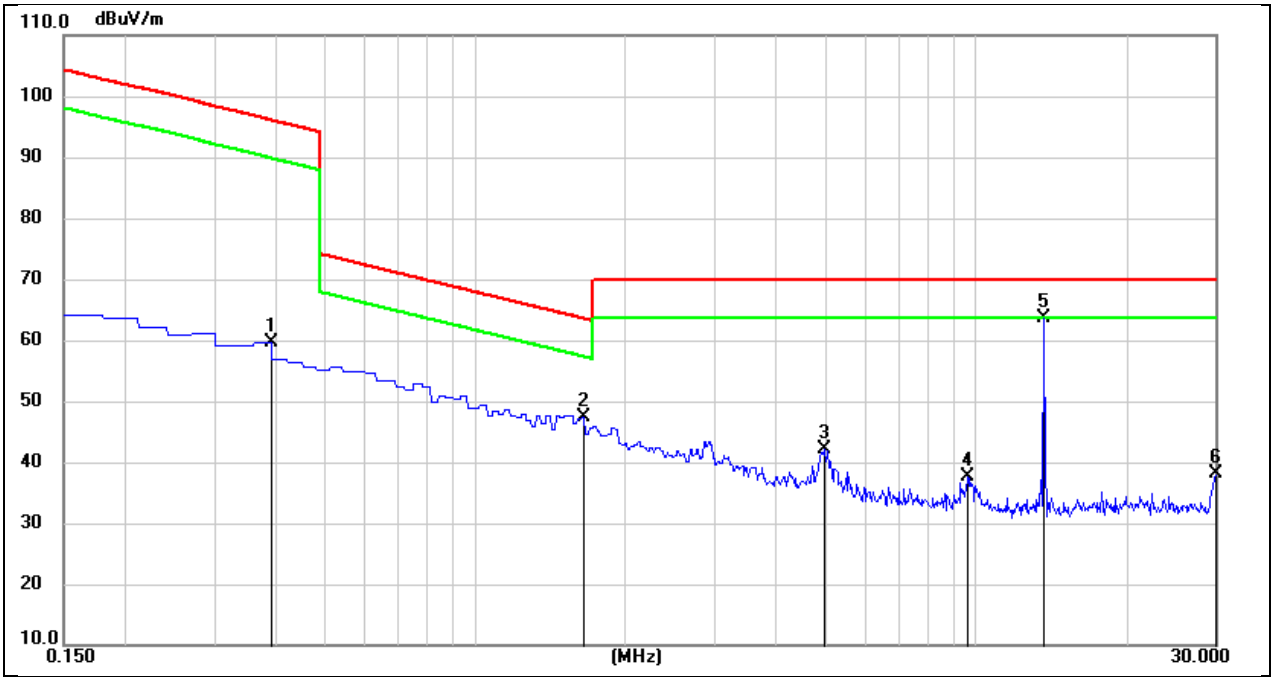
Mode:	13.56 MHz
Power:	AC 240V/60Hz
TE:	Berny
Date	2024/08/28
T/A/P	26℃/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	0.0138	42.48	20.39	62.87	124.79	-61.92	PK+	coaxial
2	0.0340	38.57	20.10	58.67	116.96	-58.29	PK+	coaxial
3	0.0600	36.01	19.79	55.80	112.03	-56.23	PK+	coaxial
4	0.0833	34.48	19.71	54.19	109.18	-54.99	PK+	coaxial
5	0.1128	31.46	19.55	51.01	106.55	-55.54	PK+	coaxial
6	0.1307	29.86	19.64	49.50	105.27	-55.77	PK+	coaxial

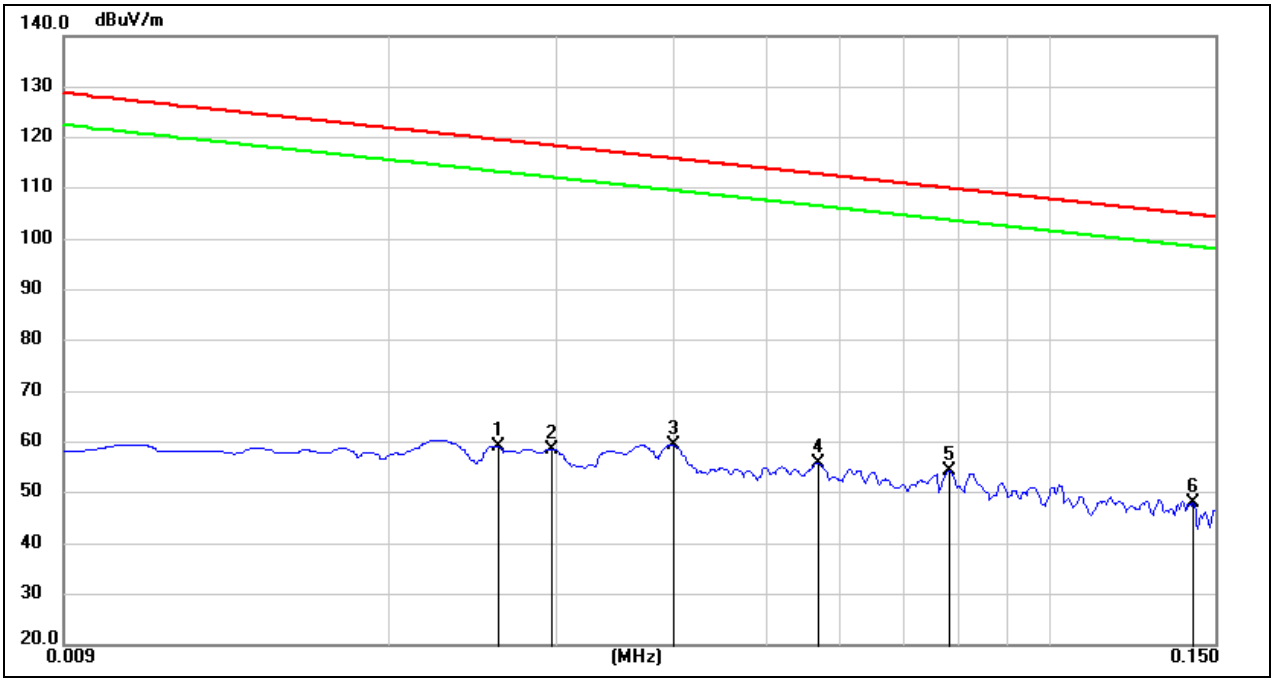
Mode:	13.56 MHz
Power:	AC 240V/60Hz
TE:	Berny
Date	2024/08/28
T/A/P	26℃/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	0.3888	39.92	19.61	59.53	95.84	-36.31	PK+	coplanar
2	1.6425	27.85	19.50	47.35	63.30	-15.95	PK+	coplanar
3	4.9558	22.28	19.82	42.10	69.54	-27.44	PK+	coplanar
4	9.5826	17.72	19.85	37.57	69.54	-31.97	PK+	coplanar
5	13.5526	43.32	20.30	63.62	69.54	-5.92	PK+	coplanar
6	30.0000	11.96	26.22	38.18	69.54	-31.36	PK+	coplanar

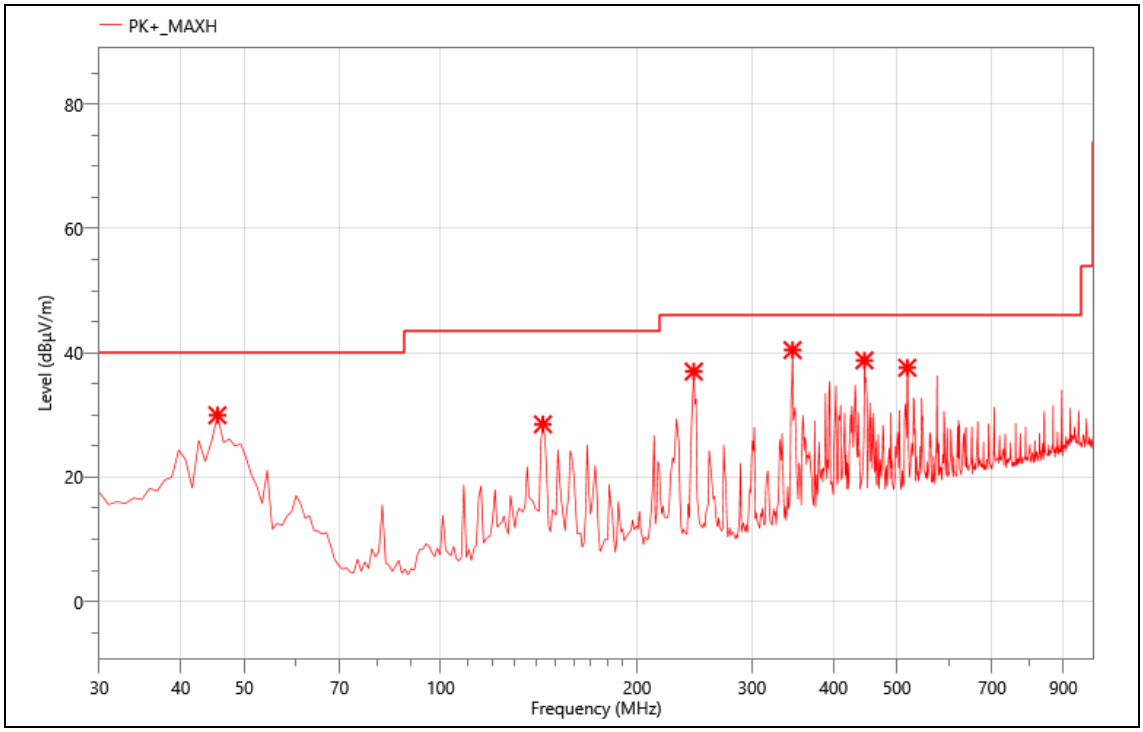
Mode:	13.56 MHz
Power:	AC 240V/60Hz
TE:	Berny
Date	2024/08/28
T/A/P	26℃/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	0.0260	39.06	20.21	59.27	119.29	-60.02	PK+	coplanar
2	0.0297	38.50	20.15	58.65	118.14	-59.49	PK+	coplanar
3	0.0400	39.45	20.04	59.49	115.55	-56.06	PK+	coplanar
4	0.0568	35.93	19.84	55.77	112.51	-56.74	PK+	coplanar
5	0.0782	34.76	19.68	54.44	109.73	-55.29	PK+	coplanar
6	0.1420	28.54	19.64	48.18	104.55	-56.37	PK+	coplanar

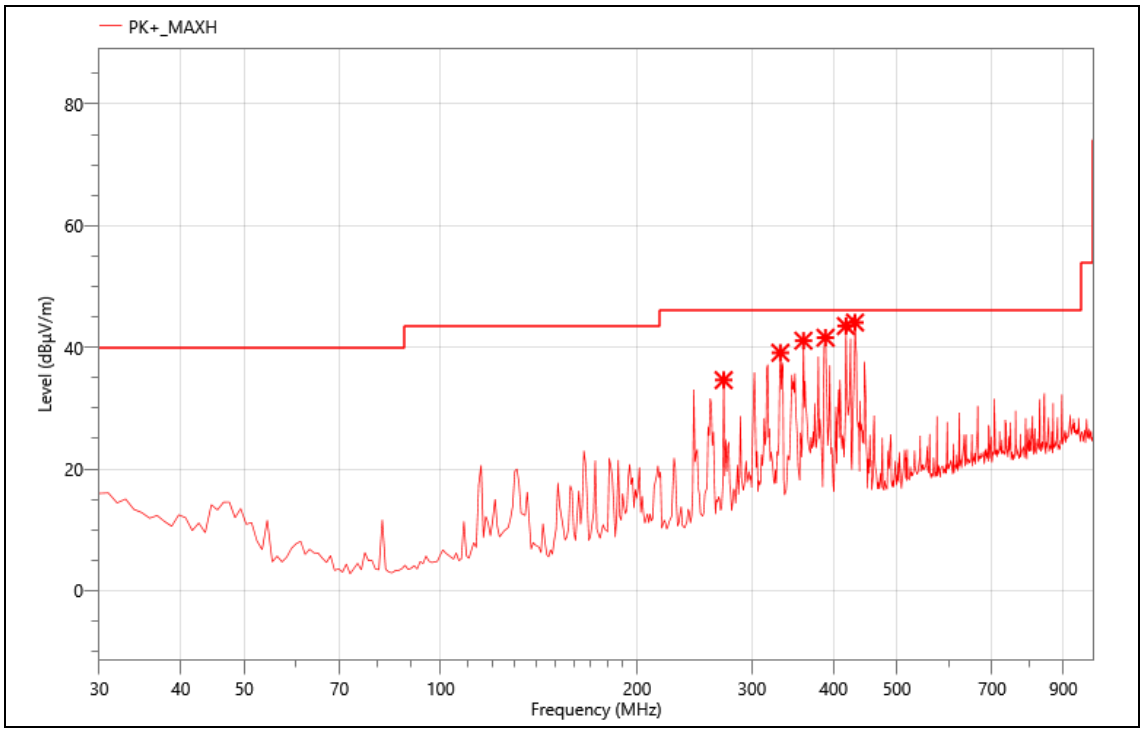
Mode:	13.56 MHz
Power:	AC 240V/60Hz
TE:	Berny
Date	2024/08/28
T/A/P	26℃/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	45.520	52.52	-22.56	29.96	40.00	10.04	PK+	V
2	143.490	52.03	-23.52	28.51	43.50	14.99	PK+	V
3	244.370	56.34	-19.35	36.99	46.00	9.01	PK+	V
4	346.220	57.10	-16.66	40.44	46.00	5.56	PK+	V
5	446.130	52.84	-14.06	38.78	46.00	7.22	PK+	V
6	518.880	48.91	-11.31	37.60	46.00	8.40	PK+	V

Mode:	13.56 MHz
Power:	AC 240V/60Hz
TE:	Berny
Date	2024/08/28
T/A/P	26℃/54%/101Kpa



Critical_Freqs

No.	Freq. (MHz)	Reading (dBµV)	Corr. (dB)	Meas. (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Det.	Pol.
1	271.530	53.25	-18.64	34.61	46.00	11.39	PK+	H
2	331.670	56.35	-17.24	39.11	46.00	6.89	PK+	H
3	359.800	56.97	-15.88	41.09	46.00	4.91	PK+	H
4	388.900	56.02	-14.44	41.58	46.00	4.42	PK+	H
5	418.000	57.32	-13.82	43.50	46.00	2.50	PK+	H
6	431.580	58.23	-14.16	44.07	46.00	1.93	PK+	H

Note:

1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Peak: Peak detector.
4. Only the worst data was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

9. ANTENNA REQUIREMENT

REQUIREMENT

Please refer to FCC §15.203
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. 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.

DESCRIPTION

Pass

10. AC POWER LINE CONDUCTED EMISSION

LIMITS

Please refer to CFR 47 FCC §15.207 (a) and ISED RSS-Gen Clause 8.8

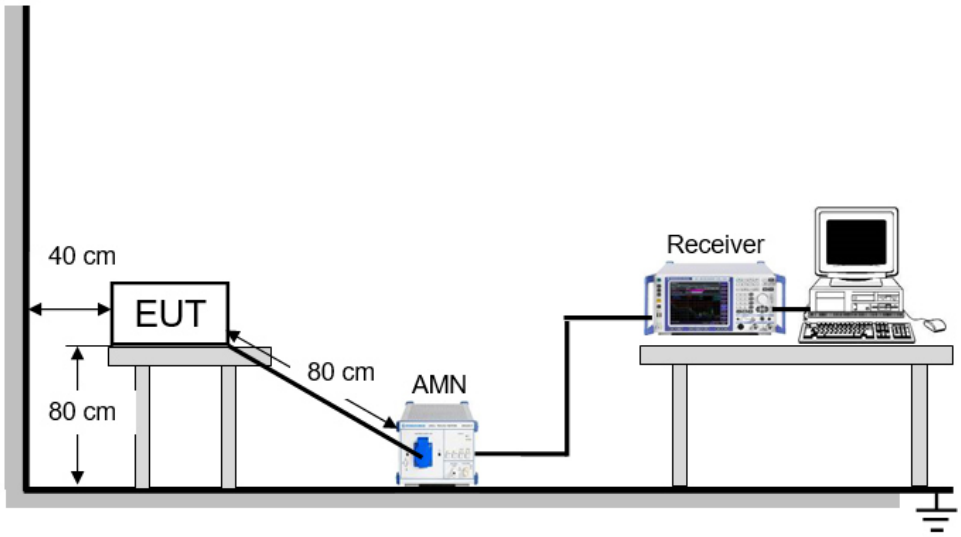
FREQUENCY (MHz)	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

TEST PROCEDURE

The EUT is put on a table of non-conducting material that is 80 cm high. The vertical conducting wall of shielding is located 40 cm to the rear of the EUT. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.). A EMI Measurement Receiver (R&S Test Receiver ESR3) is used to test the emissions from both sides of AC line. According to the requirements in Section 6.2 of ANSI C63.10-2013.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode. The bandwidth of EMI test receiver is set at 9 kHz.

The arrangement of the equipment is installed to meet the standards and operating in a manner, which tends to maximize its emission characteristics in a normal application.

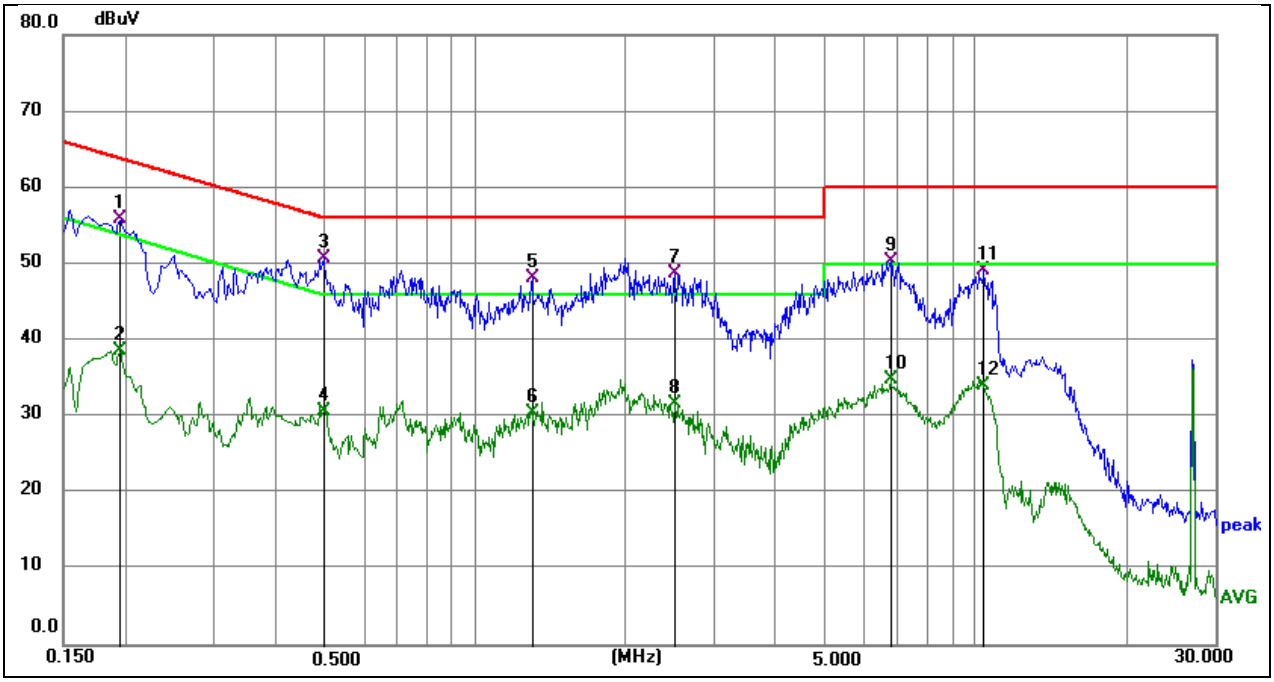
TEST SETUP



TEST ENVIRONMENT

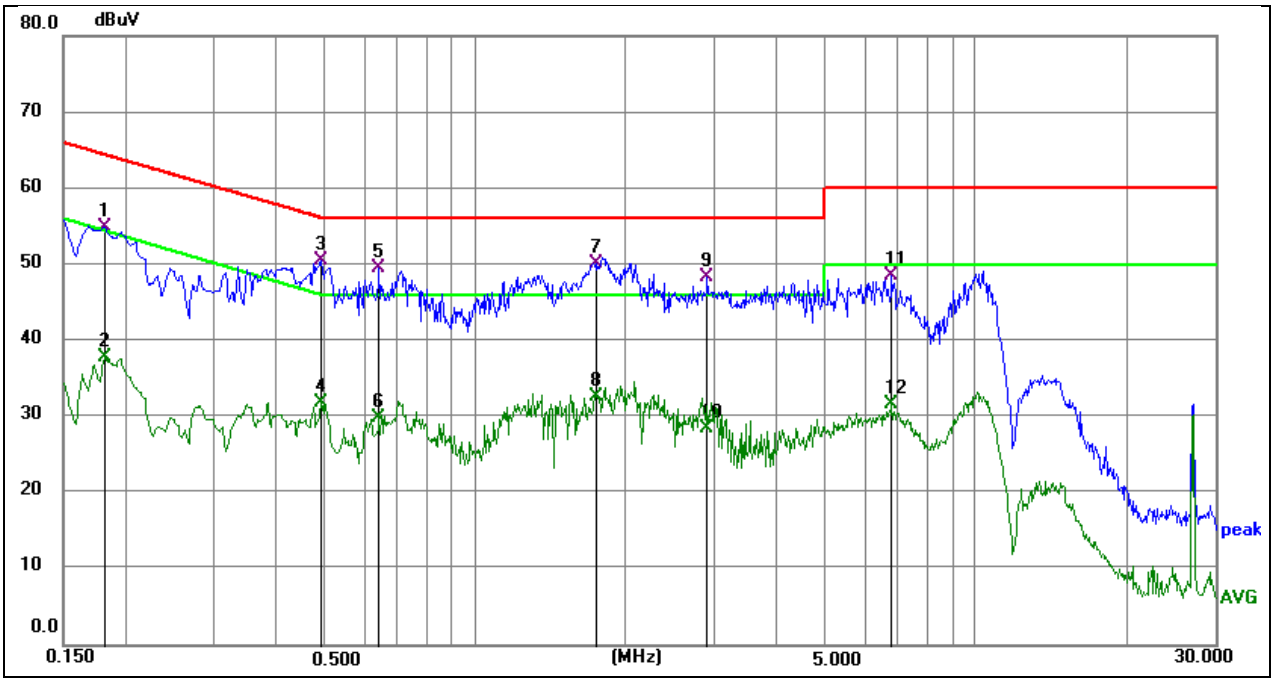
Temperature	26℃	Relative Humidity	54%
Atmosphere Pressure	100kPa		

TEST RESULTS



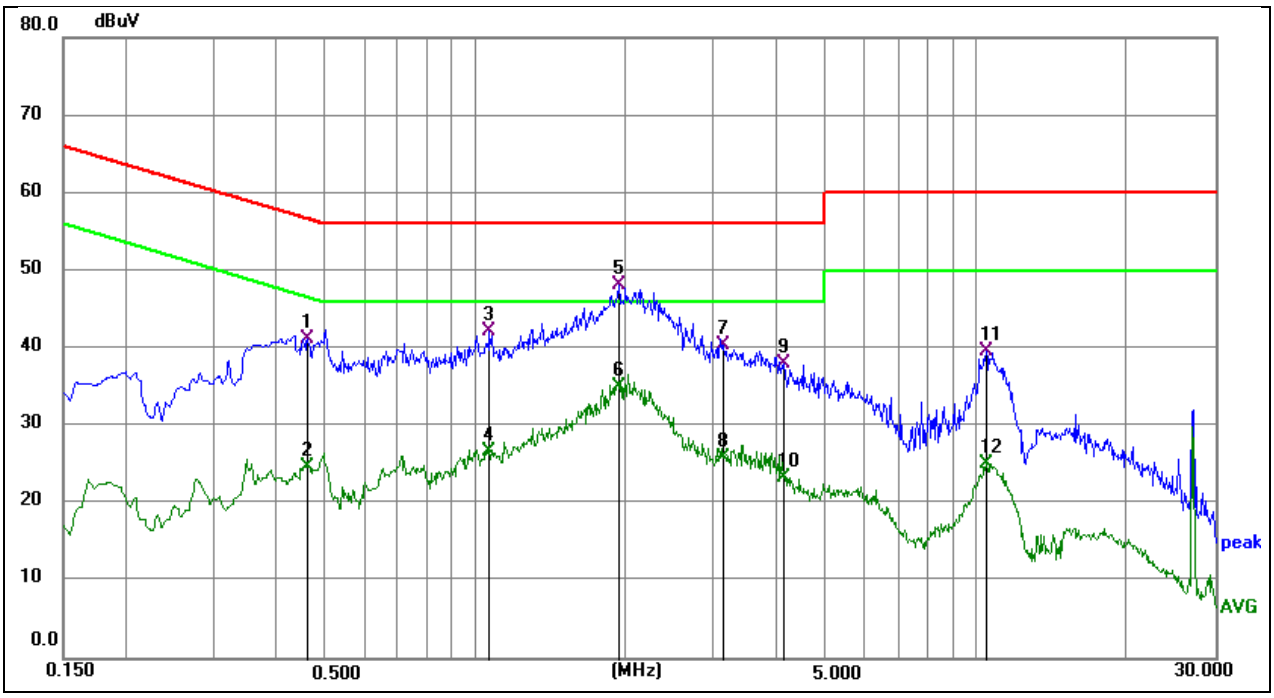
Phase: N	Mode: 13.56MHz

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1949	45.69	10.10	55.79	63.83	-8.04	QP
2	0.1949	28.55	10.10	38.65	53.83	-15.18	AVG
3	0.4964	40.55	10.21	50.76	56.06	-5.30	QP
4	0.4964	20.53	10.21	30.74	46.06	-15.32	AVG
5	1.3020	37.85	10.25	48.10	56.00	-7.90	QP
6	1.3020	20.31	10.25	30.56	46.00	-15.44	AVG
7	2.5034	38.54	10.28	48.82	56.00	-7.18	QP
8	2.5034	21.43	10.28	31.71	46.00	-14.29	AVG
9	6.7560	39.82	10.42	50.24	60.00	-9.76	QP
10	6.7560	24.42	10.42	34.84	50.00	-15.16	AVG
11	10.3559	38.72	10.43	49.15	60.00	-10.85	QP
12	10.3559	23.63	10.43	34.06	50.00	-15.94	AVG



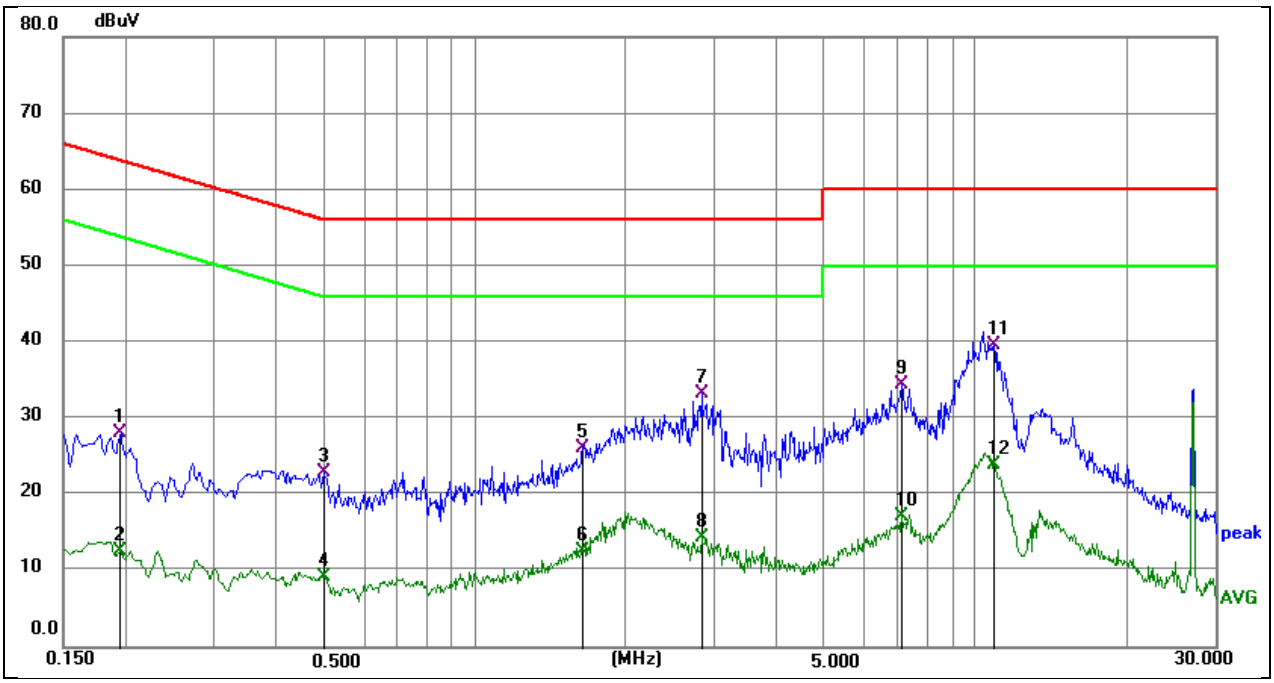
Phase: L1	Mode: 13.56MHz

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1814	44.78	10.18	54.96	64.42	-9.46	QP
2	0.1814	27.60	10.18	37.78	54.42	-16.64	AVG
3	0.4920	40.30	10.15	50.45	56.13	-5.68	QP
4	0.4920	21.81	10.15	31.96	46.13	-14.17	AVG
5	0.6404	39.34	10.19	49.53	56.00	-6.47	QP
6	0.6404	19.77	10.19	29.96	46.00	-16.04	AVG
7	1.7475	39.93	10.26	50.19	56.00	-5.81	QP
8	1.7475	22.48	10.26	32.74	46.00	-13.26	AVG
9	2.9085	37.99	10.34	48.33	56.00	-7.67	QP
10	2.9085	18.16	10.34	28.50	46.00	-17.50	AVG
11	6.7964	37.98	10.46	48.44	60.00	-11.56	QP
12	6.7964	21.20	10.46	31.66	50.00	-18.34	AVG



Phase: L2	Mode: 13.56MHz

No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.4605	31.04	10.20	41.24	56.68	-15.44	QP
2	0.4605	14.54	10.20	24.74	46.68	-21.94	AVG
3	1.0680	31.98	10.25	42.23	56.00	-13.77	QP
4	1.0680	16.52	10.25	26.77	46.00	-19.23	AVG
5	1.9320	37.97	10.26	48.23	56.00	-7.77	QP
6	1.9320	24.70	10.26	34.96	46.00	-11.04	AVG
7	3.1335	30.26	10.21	40.47	56.00	-15.53	QP
8	3.1335	15.76	10.21	25.97	46.00	-20.03	AVG
9	4.1190	27.91	10.20	38.11	56.00	-17.89	QP
10	4.1190	13.05	10.20	23.25	46.00	-22.75	AVG
11	10.4954	29.29	10.37	39.66	60.00	-20.34	QP
12	10.4954	14.77	10.37	25.14	50.00	-24.86	AVG



Phase: L3	Mode: 13.56MHz

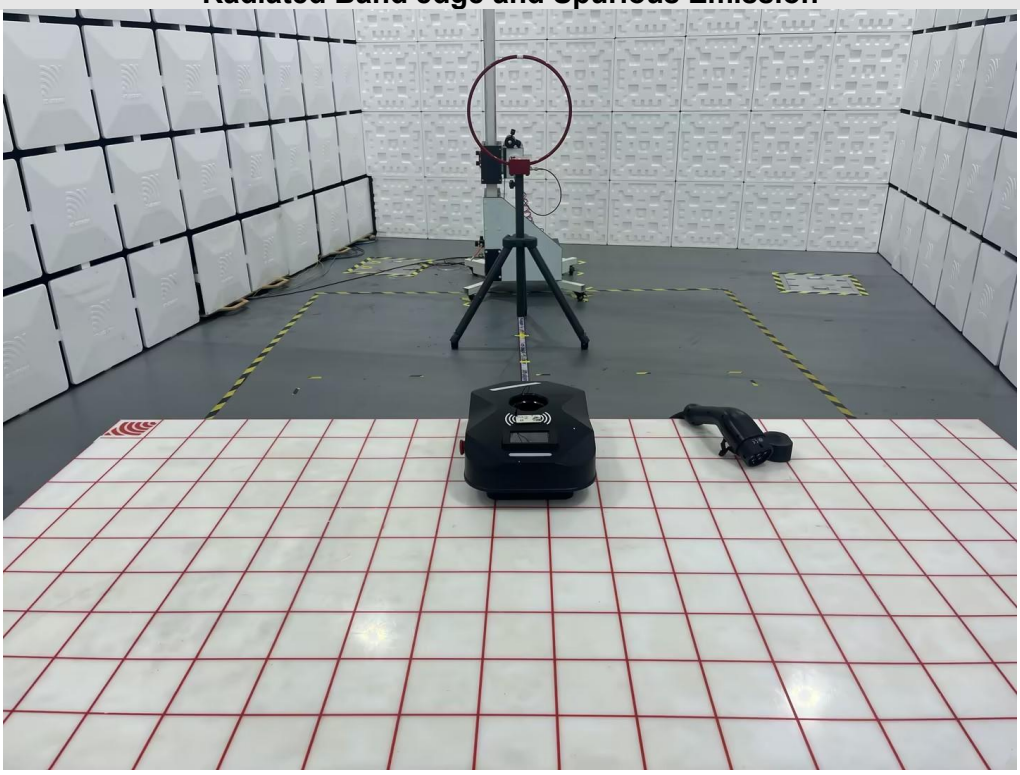
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1949	17.88	10.23	28.11	63.83	-35.72	QP
2	0.1949	2.40	10.23	12.63	53.83	-41.20	AVG
3	0.4964	12.80	10.15	22.95	56.06	-33.11	QP
4	0.4964	-0.96	10.15	9.19	46.06	-36.87	AVG
5	1.6440	15.85	10.24	26.09	56.00	-29.91	QP
6	1.6440	2.35	10.24	12.59	46.00	-33.41	AVG
7	2.8365	22.97	10.36	33.33	56.00	-22.67	QP
8	2.8365	3.98	10.36	14.34	46.00	-31.66	AVG
9	7.1115	23.82	10.56	34.38	60.00	-25.62	QP
10	7.1115	6.52	10.56	17.08	50.00	-32.92	AVG
11	10.8780	28.98	10.57	39.55	60.00	-20.45	QP
12	10.8780	13.34	10.57	23.91	50.00	-26.09	AVG

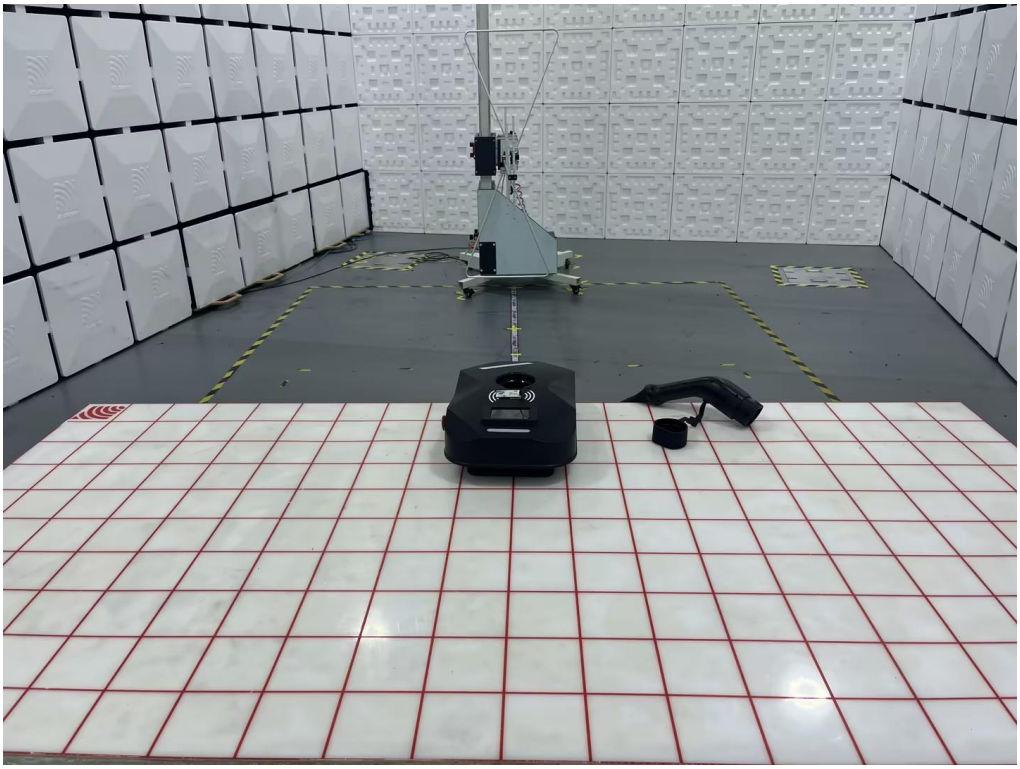
Note: 1. Result = Reading + Correct Factor.
2. If QP Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 200 Hz (9 kHz ~ 150 kHz), 9 kHz (150 kHz ~ 30 MHz).
4. Step size: 80 Hz (0.009 MHz ~ 0.15 MHz), 4 kHz (0.15 MHz ~ 30 MHz), Scan time: auto.

APPENDIX: PHOTOGRAPHS OF TEST CONFIGURATION

AC Power Line Conducted Emission

Radiated Band edge and Spurious Emission





END OF REPORT