

TEST REPORT

ETSI EN 303 345-1 V1.1.1 (2019-06)

ETSI EN 303 345-3 V1.1.1 (2021-06)

Product: Multi-functional solar crank charging emergency radio

Trademark: GREATONE

Model Name: HY-068

Report No.: BKC22051390ER

Prepared for

GREAT-ONE ELECTRONIC TECHNOLOGY CO., LTD

5/F,NO11,PINGDONG FOURTH RD, Building A.,NANPING HI-TECH INDUSTRIAL
ZONE,ZHUHAI, GUANGDONG

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name.....: GREAT-ONE ELECTRONIC TECHNOLOGY CO., LTD
Address.....: 5/F,NO11,PINGDONG FOURTH RD, Building A.,NANPING
HI-TECH INDUSTRIAL ZONE,ZHUHAI,GUANGDONG
Manufacture's Name.....: GREAT-ONE ELECTRONIC TECHNOLOGY CO., LTD
Address.....: 5/F,NO11,PINGDONG FOURTH RD, Building A.,NANPING
HI-TECH INDUSTRIAL ZONE,ZHUHAI,GUANGDONG

Product description

Product name.....: Multi-functional solar crank charging emergency radio
Trademark: GREATONE
Model and/or type reference: HY-068

Standards.....: ETSI EN 303 345-1 V1.1.1 (2019-06)
ETSI EN 303 345-3 V1.1.1 (2021-06)

This device described above has been tested by BKC, and the test results show that the equipment under test (EUT) is in compliance with 2014/53/EU RED Directive Art.3.2 requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test.....:

Date (s) of performance of tests.....: Aug. 31, 2022 - Sep. 08, 2022

Date of Issue.....: Sep. 08, 2022

Test Result.....: **Pass**

Prepared by(Test Engineer):
Zach Liu

Zach Liu

Reviewer(Supervisor):
Corbin Wang

Corbin Wang

Approved(Manager):
Levi Xiao





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1 General Information

1.1 General Description of EUT

EUT Name:	Multi-functional solar crank charging emergency radio
Model No:	HY-068
Model differences:	All the same except the appearance and model number
Trademark:	GREATONE
Operation frequency:	87MHz -108MHz
Power supply:	DC5V from USB port or DC3.7V from battery or DC4.5V from battery (3*1.5V AAA)
Modulation type:	FM
Note:For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.	

1.2 Accessories of device (EUT)

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	Notebook	Lenovo	E430	MP-0DN27	N/A
2	USB Driver	Kingston	DTSE9H/8GB	U8JFL-L82K7A-LXVQE	N/A

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	USB Line: Unshielded, Detachable 1.5m.
2	N/A

2 Summary of test

2.1 Summary of test result

ETSI EN 303 345-1 V1.1.1 (2019-06)		
Clause	Test Parameter	Result
4.2.4	Sensitivity	Pass
4.2.5	Receiver adjacent channel selectivity and blocking	Pass
4.2.6	Unwanted emissions in the spurious domain	Pass, (Note)

This EUT Use Integral Antenna, and do not have external RF port. Therefore, conducted (conducted differential voltage) emissions from an external RF port is excluded

2.2 Test mode

Sensitivity

☒ Following frequency was selected for test as listed below.

De-modulation	Tuned frequency band	Wanted Frequency (MHz)	Required sensitivity limit	
			Conducted (dBm)	Radiated (dBμV/m)
FM	VHF band II	98	-90	50 (note 1)

Note 1: For products with an integral antenna, the requirement is relaxed to 67 dBμV/m

Receiver Adjacent Channel Selectivity and Blocking

☒ Following frequency was selected for test as listed below.

De-modulation	Tuned frequency band	C Wanted signal centre frequency (MHz)	C Wanted signal level		Required I/C ratio (see notes 1)			
			Conducted (dBm)	Radiated (dBμV/m)	N = 1 (dB)	N = 2 (dB)	N = 3 (dB)	Blocking (dB)
FM (built-in or integral antenna)	VHF band II	98	n/a	56(see note 2)	-15	-3	8	20
FM (Internal antenna)	VHF band II	98	-84	n/a	3	17	30	30

NOTE1: The frequency of the interfere shall be calculated using the channel spacing data in table 7 for each of the 6 defined adjacent channels $N = \{-3, -2, -1, +1, +2, +3\}$ and the two blocking offsets. Each row of table 8 thus defines 8 individual tests.

NOTE 2: The wanted signal level for receivers with integral antenna is 73 dBμV/m.

Unwanted emissions in the spurious domain

☒ Following frequencies were selected for test as listed below.

De-modulation	Tuned frequency band	Wanted Frequency (MHz)	Radiated Emission limit @ 3m/10m (dB μ V/m)
FM	VHF band II	98	Refer to 3.3.1

2.3 Measurement Uncertainty (95% confidence levels, k=2)

Maximum measurement uncertainty

Parameter	Uncertainty
Uncertainty in conducted measurements	± 1 dB
Uncertainty in radiated measurements	± 6 dB
Spurious emissions	See CENELEC EN 55032 [3], clause 11

2.4 Test Equipment

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Signal Analyzer	Rohde&Schwarz	FSL3	101507	Nov. 08, 21	Nov. 07, 22
Signal Generator	Rohde&Schwarz	SMB100A	102382	Nov. 08, 21	Nov. 07, 22
Signal Generator	Rohde&Schwarz	SMB100A	102383	Nov. 08, 21	Nov. 07, 22
Audio Analyzer	Rohde&Schwarz	UPV	101346	Nov. 08, 21	Nov. 07, 22
Audio Analyzer	AP	ATS-1	N/A	Nov. 08, 21	Nov. 07, 22
Signal Generator	Rohde&Schwarz	SMBV100A	N/A	Nov. 08, 21	Nov. 07, 22

3 Test Summary

3.1 Limit

Sensitivity requirements

Test	De-modulation	Tuned frequency band	Wanted signal centre frequency (MHz)	Required sensitivity limit	
				Conducted (dBm)	Radiated (dBμV/m)
1	FM	VHF band II	98	-90	50 (note 1)

NOTE 1: For products with an integral antenna, the requirement is relaxed to 67 dBμV/m.

NOTE 2: For products with an integral antenna, the requirement is relaxed to 50 dBμV/m.

Impairment criteria for sensitivity tests

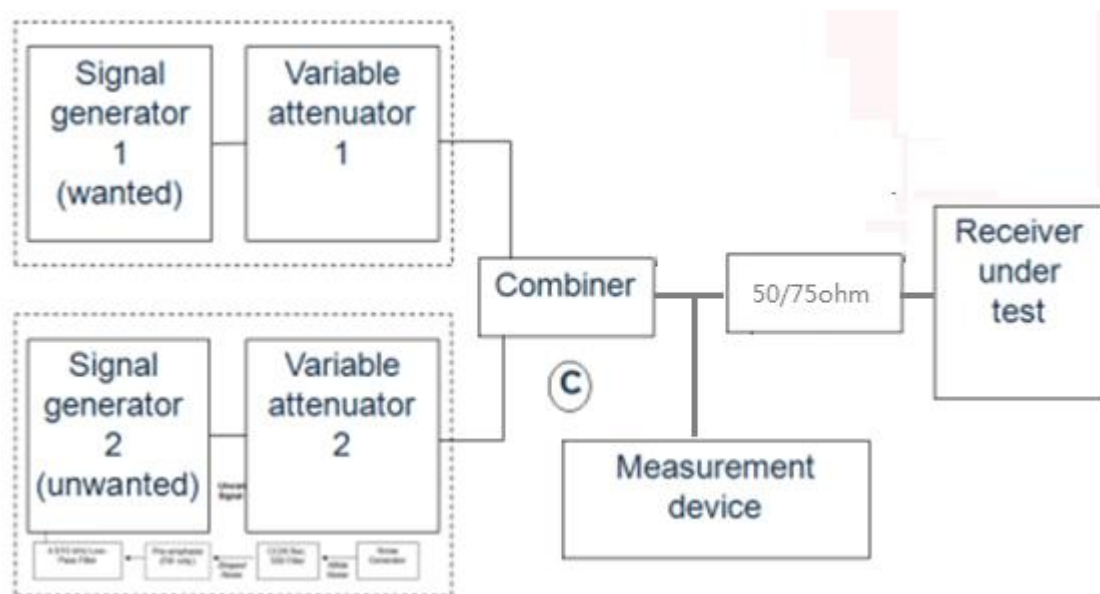
Demodulation	Impairment criteria
FM	SNR ≥ 40 dBQ ref ±60,8 kHz deviation; clean audio (see note 1)
NOTE 1: Clean audio is defined as 10 seconds of audio with no subjective impairments	
NOTE 2: Clean audio is defined as 10 seconds of audio with no subjective impairments	

3.2 Test Signal Configurations

FM configuration

Parameter	FM signals	
	Wanted	Unwanted
Audio modulation	1 kHz tone	Weighted noise Recommendation ITU-R BS.559-2
	Band-limited to 15 kHz	
Other modulation parameters	±60,8 kHz peak deviation	34.9 kHz quasi-peak deviation (see note)
Pilot tone	None	None
NOTE: This is equivalent to $19 / \sqrt{2} = 13.4$ kHz RMS deviation in the absence of pre-emphasis.		

3.3 Test Setup



3.4 Test Procedure

Refer to chapter 5.3.4 of ETSI EN 303 345-1 V1.1.1 (2019-06), ETSI EN 303 345-3 V1.1.1 (2021-06).

- 1) The EUT is placed in semi anechoic chamber (SAC). The field strength generated by the signal generator applying to the EUT at 3 meters distance from the antenna is pre-calibrated before testing.
- 2) The 'unwanted' signal generator remains switched off for the duration of the test.
- 3) The 'wanted' signal generator is set to the required modulation method and test configuration and to the frequency specified. The signal level is adjusted to provide the level, as measured at ©
- 4) The receiver (EUT) is tuned to the frequency of the 'wanted' signal generator. The audio level shall be set so as to provide clean 1 kHz audio tone at the audio output (that is less than 10 % total harmonic distortion) but of sufficient level to drive the measurement device.
- 5) The level of the 'wanted' signal generator is adjusted to provide the level, as measured at ©
- 6) The audio output, measured using the measurement device, is recorded as the signal level, S.
- 7) The modulating audio signal for the 'wanted' signal generator is removed. The audio output, measured using the measurement device, is recorded as the noise level, N.
- 8) If the impairment criteria given are met then the receiver has passed the test.

3.5 Test Result

FM (integral antenna) VHF band II 98MHz						
Wanted Signal Level at ©(dBm)	Total Harmonic Distortion (%)	S (mV)	N (mV)	SNR (dBQ)	SNR Limit (dBQ)	Result
-90	1.39	633	1.2	54	≥ 40	Pass

NOTE:

1. $SNR (dBQ) = 20\log(S/N)$ 

4 Receiver Adjacent Channel Selectivity And Blocking

4.1 Limit

Channel spacing for adjacent channel selectivity and blocking

Demodulation	Tuned frequency band	Unwanted frequency (N = 1, 2, 3)	Unwanted frequency (blocking)
FM	VHF band II	$\pm(N+1) \times 100$ kHz	± 800 kHz

Adjacent channel selectivity and blocking requirements

Test	De-modulation	Tuned frequency band	C Wanted signal centre frequency (MHz)	C Wanted signal level		Required I/C ratio (see notes 1 and 2)			
				Conducted (dBm)	Radiated (dB μ V/m)	N = 1 (dB)	N = 2 (dB)	N = 3 (dB)	Blocking (dB)
1	FM (built-in or integral antenna)	VHF band II	98	n/a	56(see note 3)	-15	-3	8	20
2	FM (Internal antenna)	VHF band II	98	-84	n/a	3	17	30	30

NOTE 1: The frequency of the interfere shall be calculated using the channel spacing data in table 7 for each of the 6 defined adjacent channels $N = \{-3, -2, -1, +1, +2, +3\}$ and the two blocking offsets. Each row of table 8 thus defines 8 individual tests.

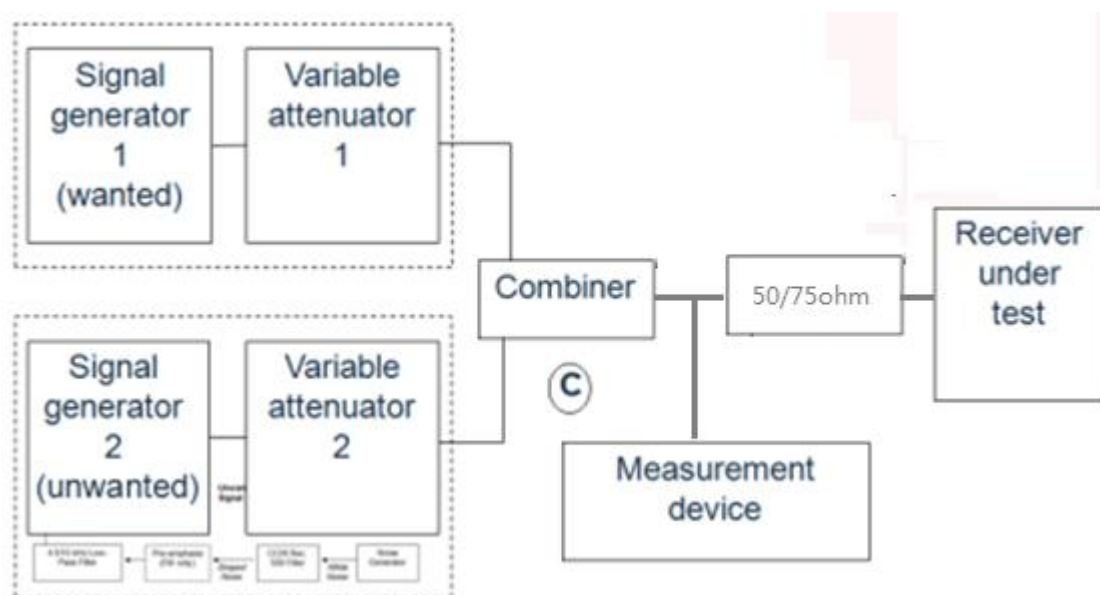
NOTE 2: The minimum level of I for the relevant level of impairment is calculated by adding the I/C ratio to the wanted C level.

NOTE 3: The wanted signal level for receivers with integral antenna is 73 dB μ V/m.

Impairment criteria for adjacent channel selectivity and blocking tests

Demodulation	Impairment criteria
FM	SNR ≥ 40 dBQ ref $\pm 60,8$ kHz deviation; clean audio (see note 1)
NOTE 1: Clean audio is defined as 10 seconds of audio with no subjective impairments	
NOTE 2: Clean audio is defined as 10 seconds of audio with no subjective impairments	

4.2 Test Setup



4.3 Test Procedure

Refer to chapter 5.3.5 of ETSI EN 303 345-1 V1.1.1 (2019-06), ETSI EN 303 345-3 V1.1.1 (2021-06).

- 1) The EUT is placed in semi anechoic chamber (SAC). The field strength generated by the signal generator applying to the EUT at 3 meters distance from the antenna is pre-calibrated before testing.
- 2) The 'wanted' signal generator is set to the required modulation method and test configuration as specified in Table 2, and to the frequency specified in Table 8. The signal level is adjusted to provide the level, as measured at ©, specified in Table 8, with the 'unwanted' generator switched off.
- 3) The receiver (EUT) is tuned to the frequency of the 'wanted' signal generator. The audio level shall be set so as to provide clean 1 kHz audio tone at the audio output (that is less than 10 % total harmonic distortion) but of sufficient level to drive the measurement device.
- 4) The 'unwanted' signal generator is set to the required modulation method and test configuration as specified in Table 2. and to the frequency calculated from the wanted signal centre frequency and the required offset specified in Table 8. The signal level is adjusted to provide the level, as measured at ©, specified in Table 8, with the 'wanted' generator switched off. For the blocking test only, the audio modulation of the 'unwanted' signal shall be removed whilst measuring the level at ©.
- 5) The 'wanted' signal generator is switched back on.
- 6) The audio output, measured using the measurement device, is recorded as the signal level, S.
- 7) The modulating audio signal for the 'wanted' signal generator is removed. The audio output, measured using the measurement device, is recorded as the noise level, N.
- 8) If the impairment criteria given in Table 9 are met then the receiver has passed the test.

4.4 Test Result

FM (integral antenna) VHF band II98MHz								
Adjacency	C Wanted signal level at © (dBm)	I Unwanted Signal Level at © (dBm)	Required I/C ratio (dB)	S (mV)	N (mV)	SNR (dBQ)	SNR Limit (dBQ)	Result
N = -1 97.8MHz	-84	-81	3	523	1.32	51.96	≥ 40	Pass
N = +1 98.2 MHz	-84	-81	3	523	1.46	51.08	≥ 40	Pass
N = -2 97.7 MHz	-84	-67	17	523	1.75	49.51	≥ 40	Pass
N = +2 98.3 MHz	-84	-67	17	523	1.83	49.12	≥ 40	Pass
N = -3 97.6 MHz	-84	-54	30	523	2.32	47.06	≥ 40	Pass
N = +3 98.4 MHz	-84	-54	30	523	2.52	46.34	≥ 40	Pass
Blocking 97.2 MHz	-84	-54	30	523	2.4	46.77	≥ 40	Pass
Blocking 98.8 MHz	-84	-54	30	523	2.33	47.02	≥ 40	Pass

S = Measured audio level when wanted signal on and modulation on; unwanted signal on and modulation on

Note: For blocking signal,the unwanted signal modulation is off.

N = Measured audio level when wanted signal on but modulation off; unwanted signal on and modulation on

Note: For blocking signal,the unwanted signal modulation is off.

Remarks:

1. Measured I/C ratio (dB) = Unwanted Field Level (dBμV/m) – Wanted Field Level (dBμV/m).

2. SNR (dBQ) = 20log(S/N)

5 Unwanted emissions in the spurious domain

5.1 Limit

FOR FREQUENCY BELOW 1000 MHz

Equipment Type	Distance (m)	Signal Source	Frequency Range (MHz)	Limits(dB μ V/m)
FM Receivers	10	LO. Fundamental	≤ 1000	50
		LO. Harmonics	30 to 300	42
			300 to 1000	46
		Others	30 to 230	30
			230 to 1000	37
	3	LO. Fundamental	≤ 1000	60
		LO. Harmonics	30 to 300	52
			300 to 1000	56
		Others	30 to 230	40
			230 to 1000	47
Equipment Type	Distance (m)	Signal Source	Frequency Range (MHz)	Limits(dB μ V/m)
Others Receivers	10	All	30 to 230	30
			230 to 1000	37
	3	All	30 to 230	40
			230 to 1000	47

5.2 Test Instruments

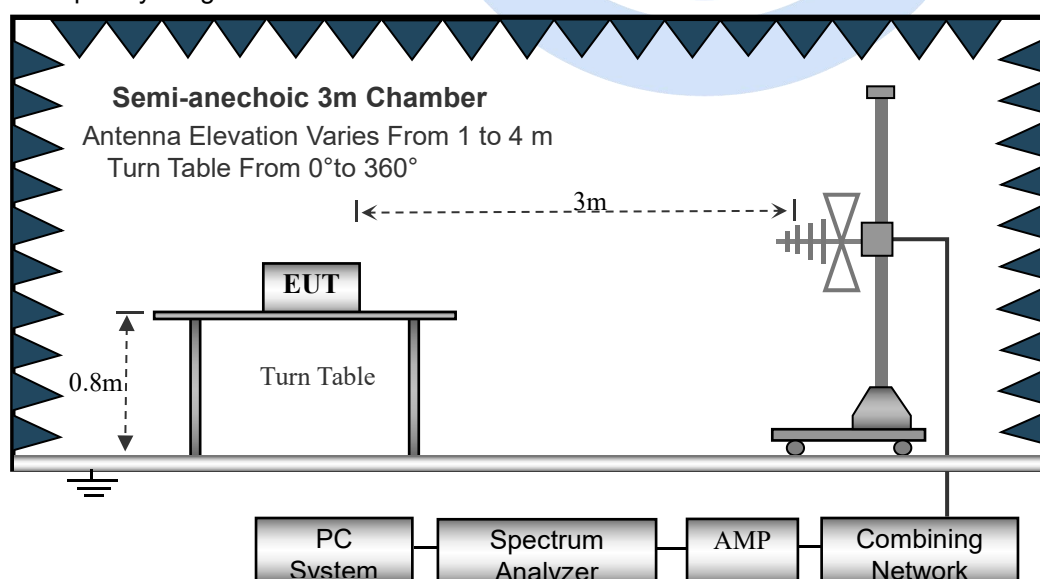
FREQUENCY RANGE BELOW 1GHz

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Test Receiver (9kHz-7GHz)	R&S	ESPI	101318	2021.11.08	2022.11.07
Bilog Antenna (30MHz-1GHz)	R&S	VULB 9168	VULB91 68-438	2021.11.08	2022.11.07
Amplifier (9KHz-6GHz)	SCHWARZBECK	BBV9744	9744-0037	2021.11.08	2022.11.07
Spectrum Analyzer (9kHz-26.5GHz)	Agilent	E4407B	MY45108040	2021.11.08	2022.11.07
Horn Antenna (1GHz-18GHz)	SCHWARZBECK	BBHA9120D	1201	2021.11.08	2022.11.07
Amplifier (1GHz-18GHz)	SCHWARZBECK	BBV9718	9718-309	2021.11.08	2022.11.07
RF cables1 (9kHz-1GHz)	R&S	R203	R20X	2021.11.08	2022.11.07
RF cables2 (1GHz-40GHz)	R&S	R204	R21X	2021.11.08	2022.11.07

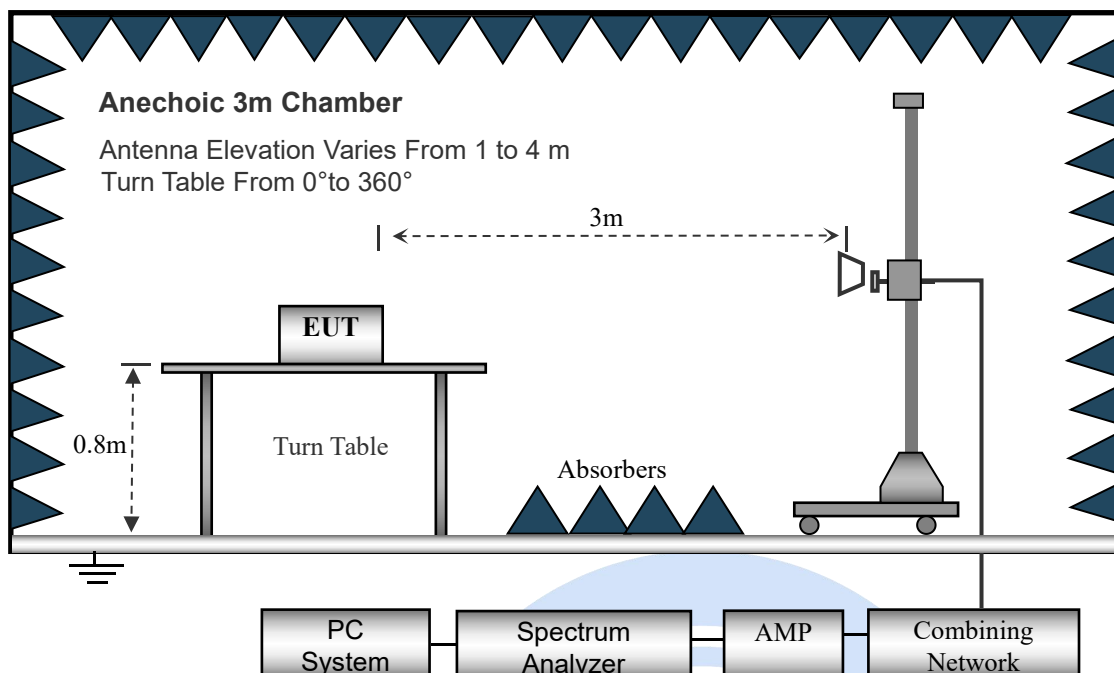
NOTES:1. The test was performed in 966Chamber(a 3m Semi-anechoic chamber).

5.3 Test Setup

<FrequencyRange below 1GHz>



<Frequency Range above 1GHz>



*: depends on the EUT height and the antenna 3dB bandwidth both, refer to section 7.3 of CISPR 16-2-3.

5.4 Test Procedure

<Frequency Range below 1GHz>

- The EUT was placed on the top of a rotating table 0.8 meters above the ground in a 3 meter semi-anechoic chamber room. 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.
- 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 turn 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 when the test frequency is below 1 GHz.

NOTE:

- The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
- Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)

3. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) (if the raw value not contains the amplifier);
4. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB) (if the raw value contains the amplifier).
5. Margin value = Emission level – Limit value.

<Frequency Range above 1GHz>

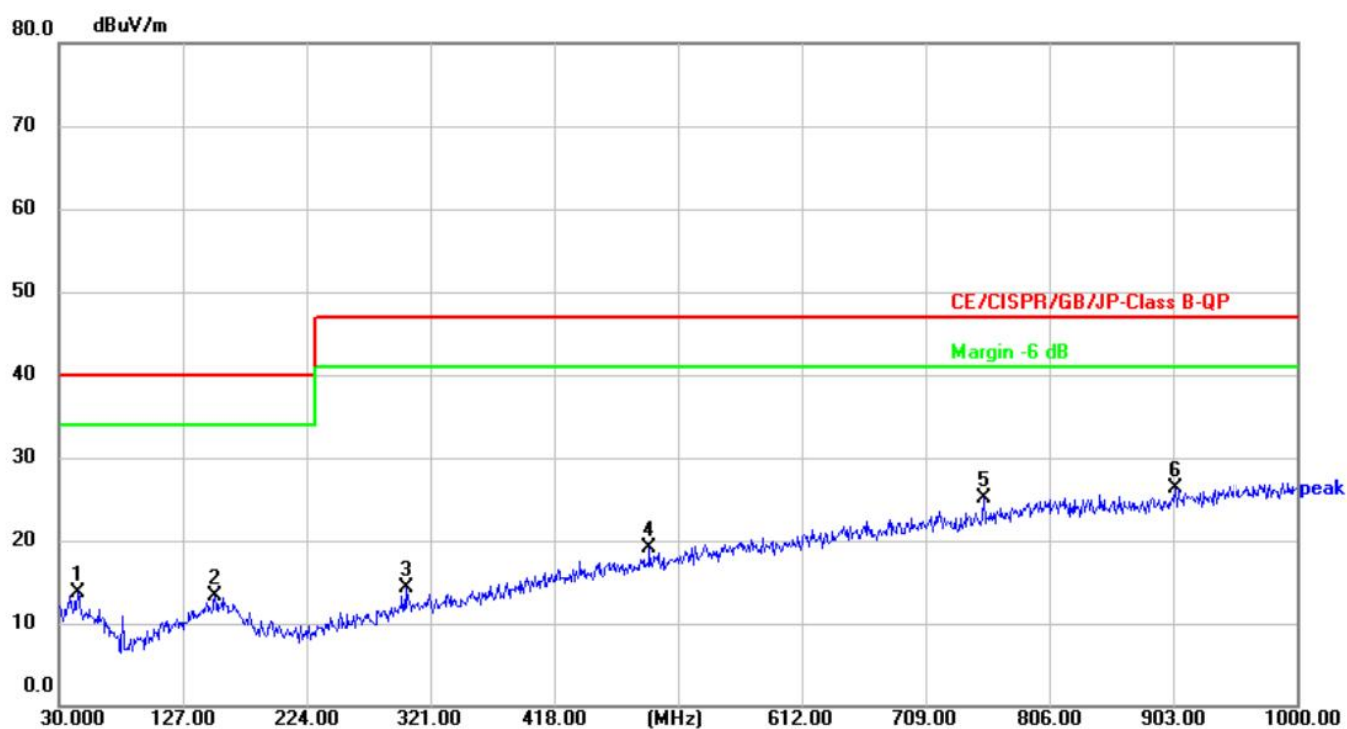
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter Semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB bandwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. The bore sight should be used during the test above 1GHz.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights 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 peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

NOTE:

1. The resolution bandwidth is 1MHz and video bandwidth of test receiver/spectrum analyzer is 3MHz for Peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Average detection (AV) at frequency above 1GHz.
2. For measurement of frequency above 1000 MHz, the EUT was set 3 meters away from the receiver antenna.
3. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
4. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) (if the raw value not contains the amplifier);
5. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB) (if the raw value contains the amplifier).
6. Margin value = Emission level – Limit value.

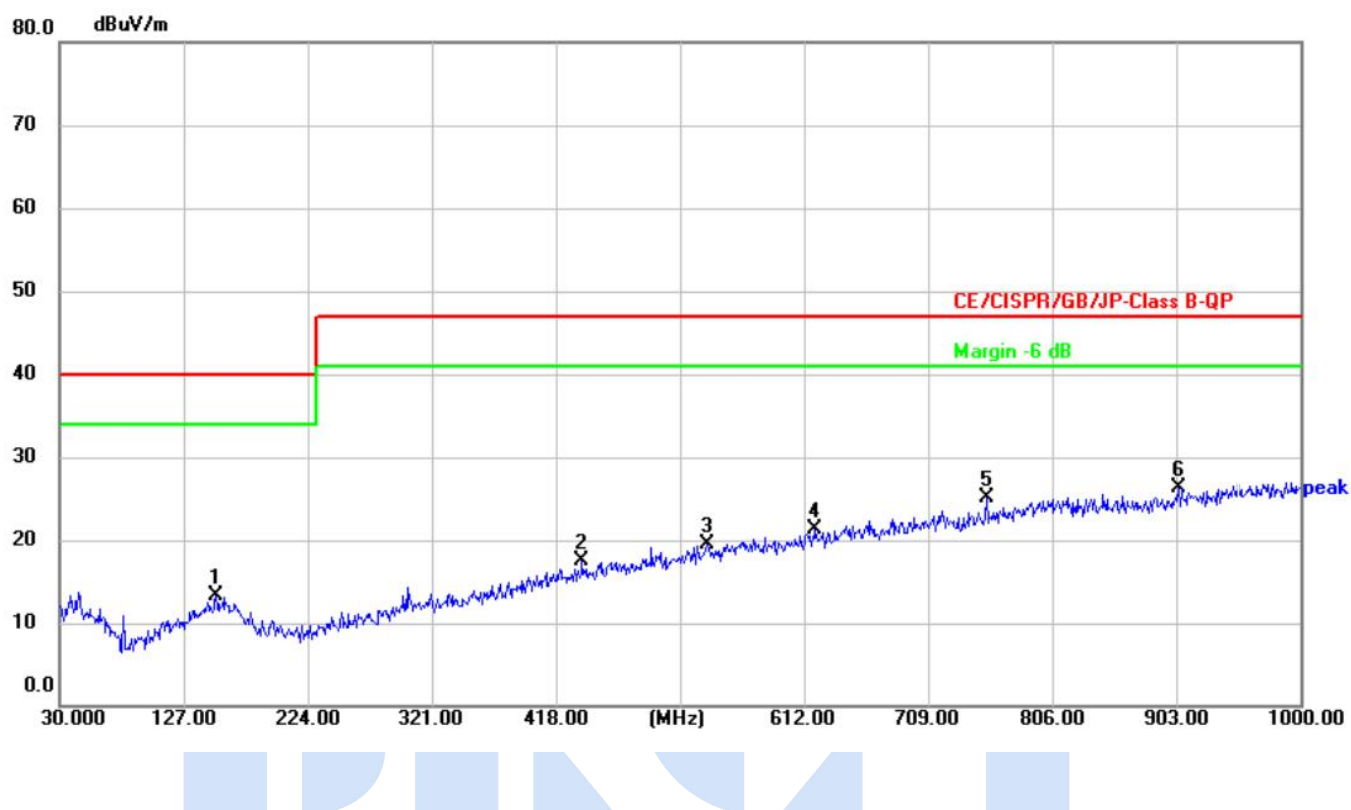
5.5 Test Result

Temperature:	24℃	Relative Humidity:	54%
Pressure:	1010 hPa	Polarization:	Horizontal
Test Voltage:	DC 3.7V	Test Mode:	FM 98MHz



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	44.5500	29.71	-15.93	13.78	40.00	-26.22	peak			P	
2	152.2200	29.19	-15.81	13.38	40.00	-26.62	peak			P	
3	301.6000	29.82	-15.61	14.21	47.00	-32.79	peak			P	
4	492.6900	30.12	-11.02	19.10	47.00	-27.90	peak			P	
5	754.5900	30.84	-5.72	25.12	47.00	-21.88	peak			P	
6 *	904.9400	29.86	-3.51	26.35	47.00	-20.65	peak			P	

Temperature:	24°C	Relative Humidity:	54%
Pressure:	1010 hPa	Polarization:	Vertical
Test Voltage:	DC 3.7V	Test Mode:	FM 98MHz



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	152.2200	29.19	-15.81	13.38	40.00	-26.62	peak			P	
2	438.3700	29.66	-12.16	17.50	47.00	-29.50	peak			P	
3	536.3400	29.59	-10.04	19.55	47.00	-27.45	peak			P	
4	620.7300	29.76	-8.42	21.34	47.00	-25.66	peak			P	
5	754.5900	30.84	-5.72	25.12	47.00	-21.88	peak			P	
6 *	904.9400	29.86	-3.51	26.35	47.00	-20.65	peak			P	

6 Photos of the EUT

Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

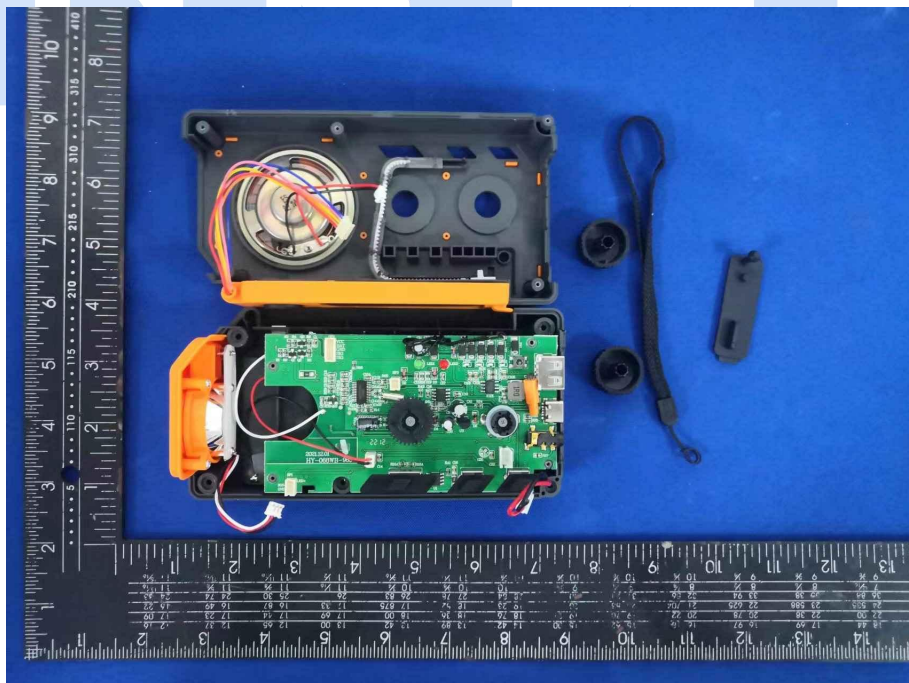


Photo 7

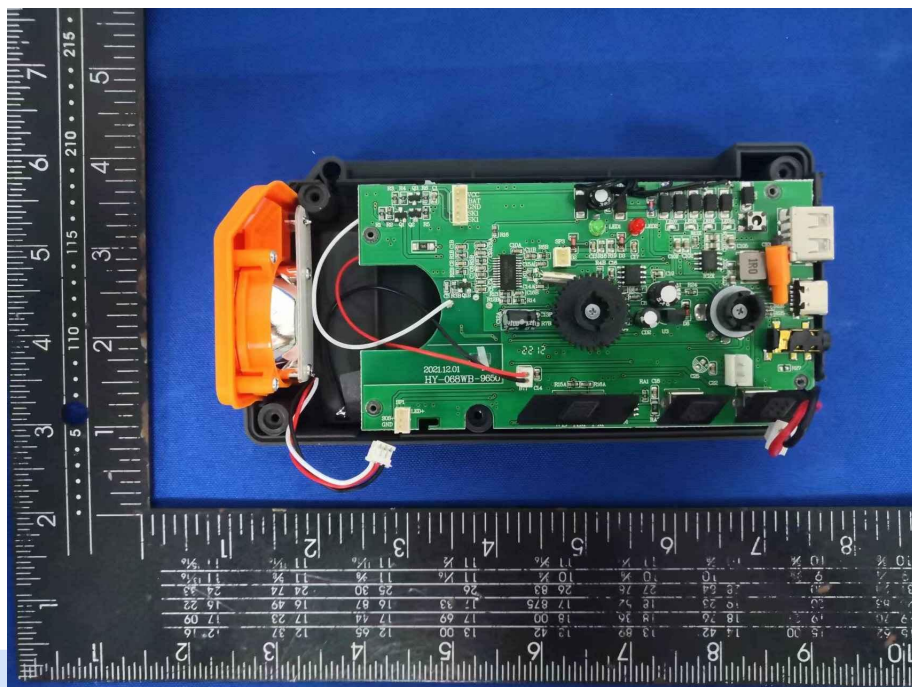
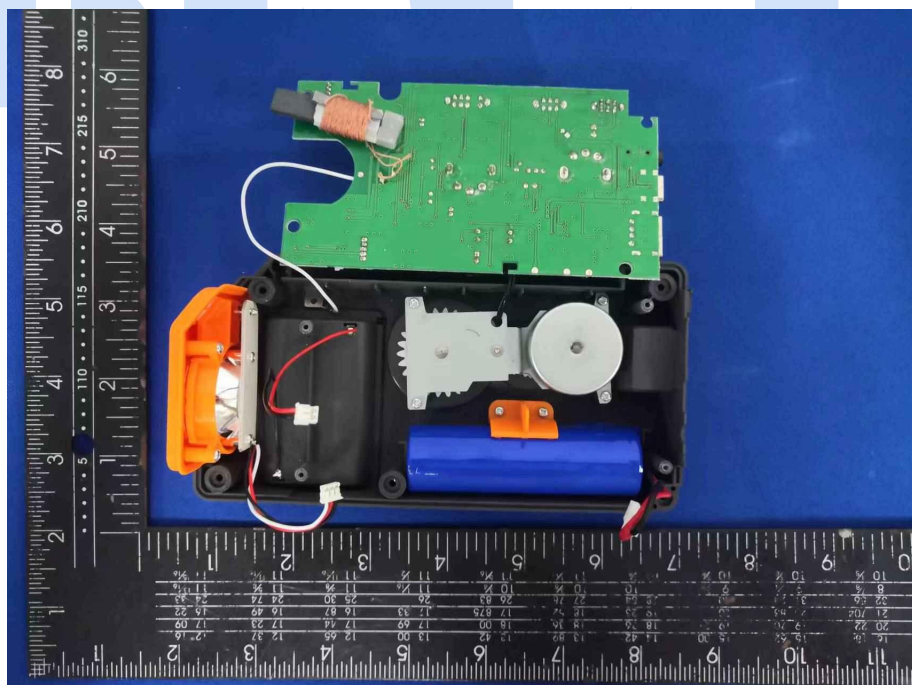


Photo 8



***** END OF REPORT *****