

RED-Radio Test Report

Client Name : ZHUHAI MEDING TECHNOLOGY CO.,LTD
Address : Floor 2, Building 3, ZHIZAO DA JIE, JINHE ROAD,
HONGQI TOWN, JINWAN DISTRICT, ZHUHAI,
GUANGDONG
Product Name : Hand Crank Radio
Date : Apr. 07, 2022



Shenzhen Anbotech Compliance Laboratory Limited



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TEST REPORT

Applicant : ZHUHAI MEDING TECHNOLOGY CO.,LTD
Manufacturer : ZHUHAI MEDING TECHNOLOGY CO.,LTD
Product Name : Hand Crank Radio
Model No. : MD-090P
Trade Mark : N.A.
Rating(s) : Input: DC 5V, 1A
Output: DC 5V, 1A
Battery: DC 3.7V, 4000mAh

Test Standard(s) : **ETSI EN 303 345-1 V1.1.1 (2019-06)**
ETSI EN 303 345-2 V1.1.1 (2020-02)

The device described above is tested by Shenzhen Anbotech Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotech Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the ETSI EN 303 345 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotech Compliance Laboratory Limited.

Date of Receipt

Mar. 25, 2022

Date of Test

Mar. 25~Apr. 06, 2022

Prepared By

Nian xiu Chen

(Nianxiu Chen)

Approved & Authorized Signer

Kingkong Jin

(Kingkong Jin)

1. General Information

1.1. Client Information

Applicant	:	ZHUHAI MEDING TECHNOLOGY CO.,LTD
Address	:	Floor 2, Building 3, ZHIZAO DA JIE, JINHE ROAD, HONGQI TOWN, JINWAN DISTRICT, ZHUHAI, GUANGDONG
Manufacturer	:	ZHUHAI MEDING TECHNOLOGY CO.,LTD
Address	:	Floor 2, Building 3, ZHIZAO DA JIE, JINHE ROAD, HONGQI TOWN, JINWAN DISTRICT, ZHUHAI, GUANGDONG
Factory	:	ZHUHAI MEDING TECHNOLOGY CO.,LTD
Address	:	Floor 2, Building 3, ZHIZAO DA JIE, JINHE ROAD, HONGQI TOWN, JINWAN DISTRICT, ZHUHAI, GUANGDONG

1.2. Description of Device (EUT)

Product Name	:	Hand Crank Radio
Model No.	:	MD-090P
Trade Mark	:	N.A.
Test Power Supply	:	AC 230V, 50Hz for Adapter
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)
Product Description	Receiving Frequency:	FM: 87.5MHz-108MHz AM: 526.5KHz-1606.5KHz
	Antenna Type:	FM: External antenna AM: Inductive loop coil antenna
	Modulation:	FM: FM AM: AM
	Antenna Gain(Peak):	FM: 0dBi (Provided by customer) AM: 0dBi (Provided by customer)
	Adapter:	N.A.
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual. 2) This report is for AM module.		

1.3. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Oct. 22, 2021	2 Year
2.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Oct. 22, 2021	1 Year
3.	Signal Generator	Agilent	E4421B	MY41000743	Oct. 22, 2021	1 Year

1.4. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Uncertainty in conducted measurements	±0.8 dB
Uncertainty in radiated measurements	±5.4 dB
Radiated emissions (30 MHz-1 GHz)	4.30 dB
Radiated emissions (1 GHz-18 GHz)	4.81 dB

1.5. Description of Test Facility

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

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111.

ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Technical Test

2.1. Test Standards

Identity	Document Title
ETSI EN 303345-2 V1.1.1 (2020-02)	Broadcast Sound Receivers; Part 2: AM broadcast sound service; Harmonised Standard for access to radio spectrum
ETSI EN 303345-1 V1.1.1 (2019-06)	Broadcast Sound Receivers; Part 1: Generic requirements and measuring methods

2.2. Verdict

ETSI EN 303 345-3 V1.1.0 (2019-11)		
Description of Test	Rule	Result
Sensitivity	Section 4.2	Complies
Receiver adjacent channel selectivity and blocking	Section 4.3	Complies
Unwanted emissions in the spurious domain	Annex C3.5	Complies
Note 1: 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.		

2.3. Following frequencies were selected for test as listed below

Test Items	De-Modulation	Tuned frequency band	Wanted Frequency
Sensitivity	AM	Medium frequency	0.999 MHz
Receiver adjacent channel selectivity and blocking	AM	Medium frequency	0.999 MHz
Unwanted emissions in the spurious domain	AM	Medium frequency	0.999 MHz

2.4. Description of Test Modes

The EUT has been tested under its typical operating condition.

The generated AM signals (wanted, unwanted and blocking) shall be in accordance with table 1. The configuration is based on Recommendation ITU-R BS.1615-1 [i.5].

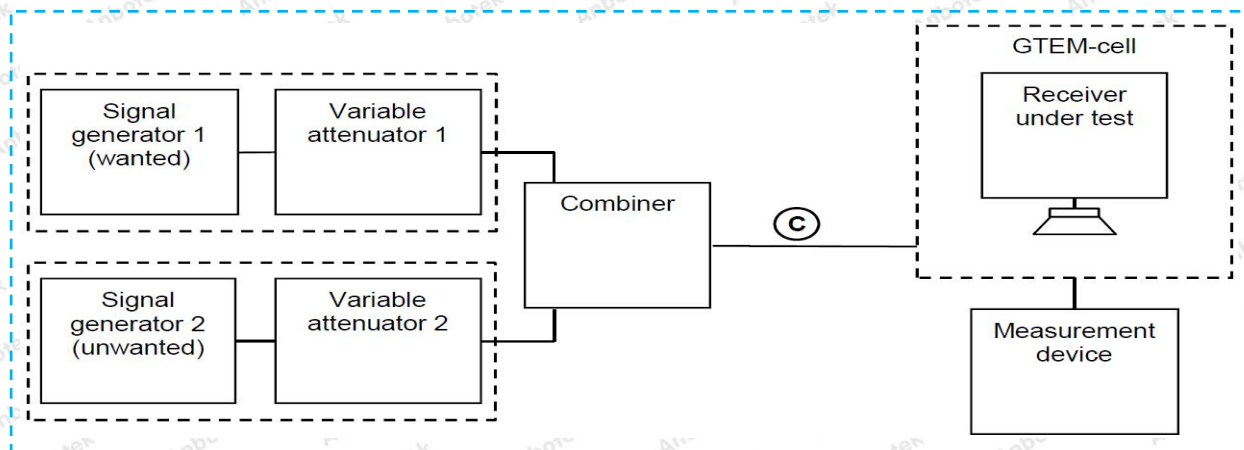
Table 1: AM configuration

Parameter	AM signals		
	Wanted	Unwanted	Blocking
Audio modulation	1 kHz tone	Weighted noise Recommendation ITU-R BS.559-2 [3], clause 1, band-limited to 4,5 kHz (see note 1)	1 kHz tone
Other modulation parameters	40 % depth	22,8 % RMS depth (see note 2)	80 % depth
NOTE 1: The filter shall have a cut-off frequency of 4,5 kHz and a minimum roll-off of 60 dB/octave.			
NOTE 2: This is equivalent to a quasi-peak modulation depth of 50 %. The demodulated audio level will have the same quasi-peak value as that of a carrier with 50 % AM modulation depth modulated with a 1 kHz sinusoid.			

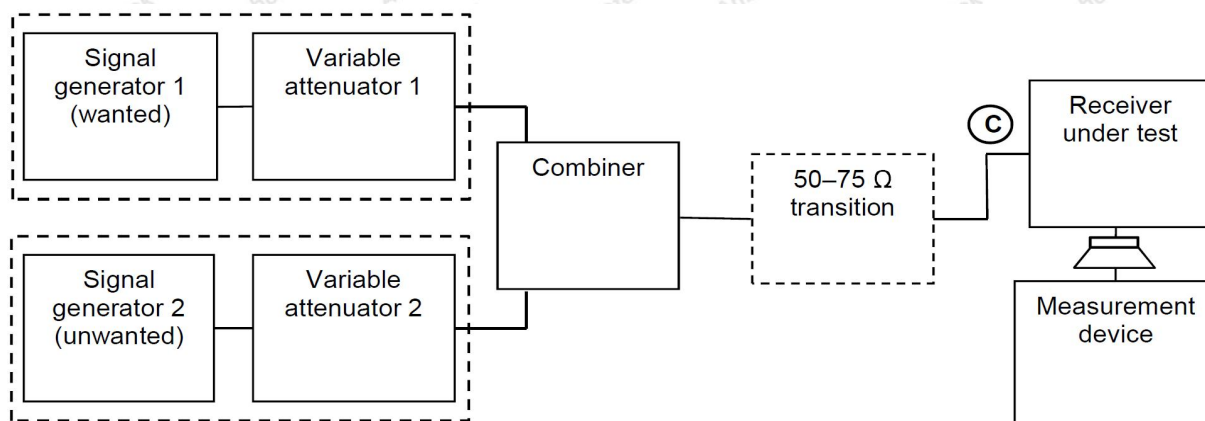
3. General Test Configurations

3.1. Setup Configuration of EUT

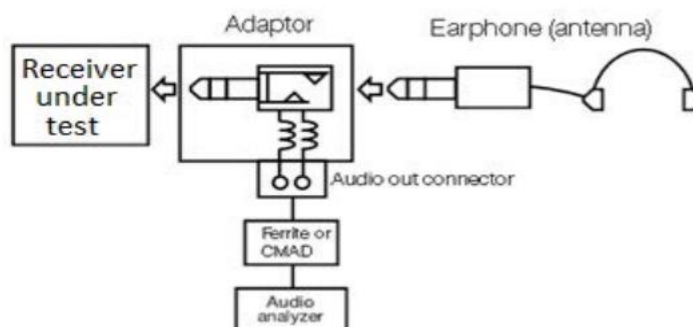
Set-up for radiated testing shall be as follows:



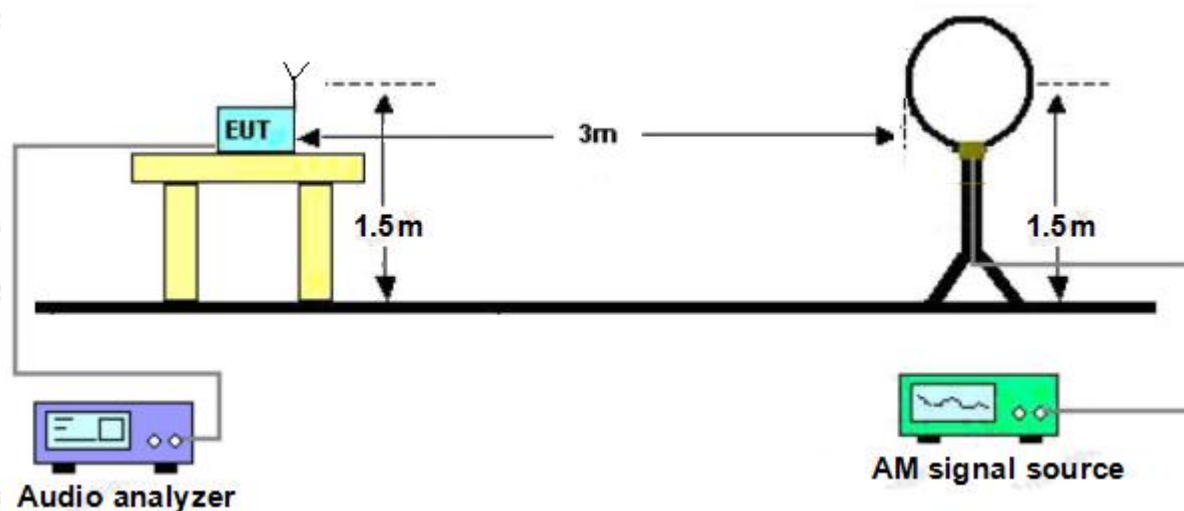
Set-up for Conducted testing shall be as follows:



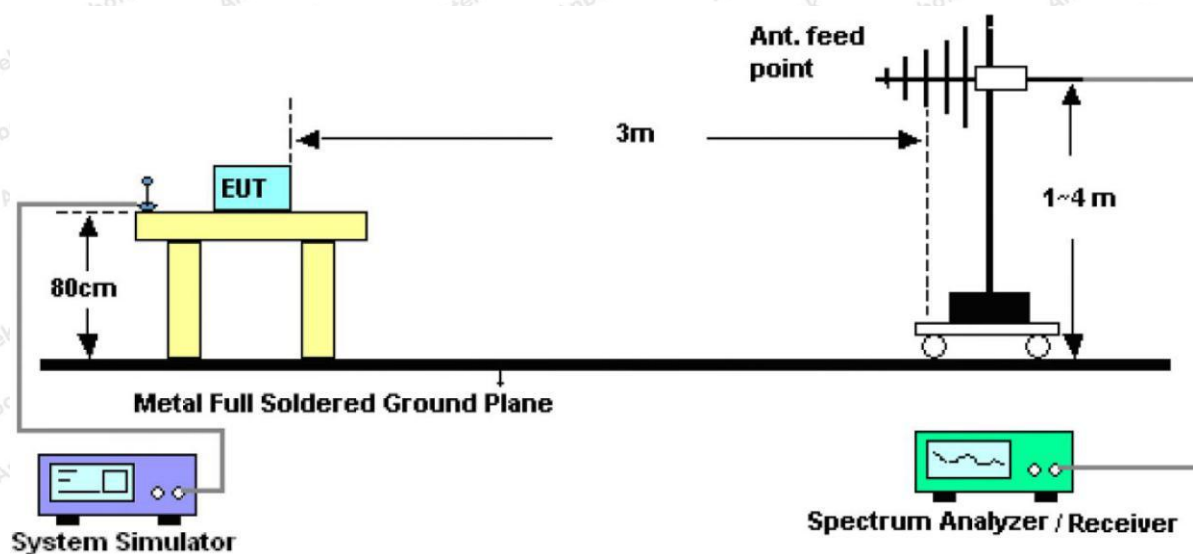
Set-up for products using earphone as antenna:



3.2. Test Setup



Below 30MHz



30MHz to 1GHz

4. Sensitivity

4.1. Standard Applicable

ETSI EN 303 345-2 (V1.1.1) Clause 4.2

ETSI EN 303 345-1 (V1.1.1) Clause 5.3.4

4.2. Test Procedure

Please refer to ETSI EN 303 345-1 (V1.1.1) clause 5.3.4 for the measurement method.

FM sensitivity measurements

- 1) The 'unwanted' signal generator remains switched off for the duration of the test.
- 2) The 'wanted' signal generator is set to the required modulation method, test configuration and centre frequency. The signal level is adjusted with the modulation disabled to the required sensitivity level plus 6 dB, as measured at ©. The modulation is enabled.
- 3) The receiver is tuned to the frequency of the 'wanted' signal generator. For a receiver without a digital frequency display, the receiver shall be tuned for optimum THD+N (i.e. as it would be tuned by a user for best quality). The receiver's 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 level of the 'wanted' signal generator is reduced by 6 dB.
- 5) The audio output, measured using the measurement device, is recorded as the signal level, S.
- 6) 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.
- 7) SNR was calculated by the formula $SNR (dBQ) = 20lg (S / N)$.

4.3. Test Limit

The limits for sensitivity specified in table 2 shall apply. Each figure quoted is the required level of wanted signal which provides a given level of audio quality. The audio impairment criterion relevant for these tests is that the audio $SNR \geq 22$ dBQ ref 40 % AM.

Table 2: AM sensitivity requirements

De-modulation	Tuned frequency band	Wanted signal centre frequency (MHz) (see note)	Required sensitivity limit	
			Conducted (dBm)	Radiated (dBµV/m)
AM	LF	0,216	-65	74
	MF	0,999	-65	66
	HF	9,650	-65	60
NOTE: If the receiver cannot be tuned to 9,650 MHz, the wanted signal centre frequency shall be set to the closest alternate from the following list: 3,980 MHz, 6,050 MHz, 7,330 MHz, 11,850 MHz, 13,720 MHz, 15,450 MHz, 17,690 MHz, 18,960 MHz, 21,650 MHz, 25,890 MHz.				

4.4. Test Result

AM							
Tuned frequency band	Frequency (MHz)	Wanted signal level at©(dBuV/m)	S (mV)	N (mV)	SNR (dBQ)	SNR limit (dBQ)	Result
Medium frequency	0.999	66	3676	6.41	55.16	≥ 40	PASS

Note1: $SNR(dBQ)=20lg(S/N)$

Note2: Clean audio is defined as 10 seconds of audio with no subjective impairments (e.g. muting, clicks, warbles or squeaks).

Note3: The total harmonic distortion is usually less than 3%,but not more than 10%.



5. Adjacent channel selectivity and blocking

5.1. Standard Applicable

ETSI EN 303 345-2 (V1.1.1) Clause 4.3

ETSI EN 303 345-1 (V1.1.1) Clause 5.3.5

5.2. Test Procedure

Please refer to ETSI EN 303 345-1 (V1.1.1) clause 5.3.5 for the measurement method.

FM adjacent channel selectivity and blocking measurements:

The means of generating the noise modulation for AM 'unwanted' signals is shown in figure 6. It is feasible to use a PC to generate these signals, but care is needed to ensure freedom from out-of-band artifacts.



Figure 6: Arrangement for generating AM interferer

Care needs to be exercised in setting up the modulation level. Normally a quasi-peak detector is appropriate. A useful technique for FM is to switch off the pre-emphasis and then apply a 1 kHz audio tone to the modulation input of the generator :

- 1) The 'wanted' signal generator is set to the required modulation method, test signal configuration, and centre frequency. The signal level is adjusted with the modulation disabled to the specified wanted signal level, as measured at ©, with the 'unwanted' generator switched off.
- 2) The 'unwanted' signal generator is set to the required modulation method, test signal configuration, and centre frequency calculated from the wanted signal centre frequency and the required frequency offset. The signal level is adjusted with the modulation disabled to provide the level calculated from the wanted signal level and the required level offset, as measured at ©, with the 'wanted' generator switched off.
- 3) The 'wanted' signal generator is switched back on. Modulation is enabled for both signal generators.
- 4) The receiver is tuned to the frequency of the 'wanted' signal generator. For a receiver without a digital frequency display, the receiver shall be tuned for optimum THD+N (i.e. as it would be tuned by a user for best quality). The receiver's audio level shall be set so as to provide clean 1 kHz audio tone at the audio output (minimum distortion, that is typically less than 3 % total harmonic distortion, but no more than 10 % total harmonic distortion) but of sufficient level to drive the measurement device.
- 5) The audio output, measured using the measurement device, is recorded as the signal level, S.

- 6) 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.
- 7) SNR was calculated by the formula $SNR (dBQ) = 20 \lg (S / N)$.

5.3. Test Limit

Table 3: Channel spacing for adjacent channel selectivity and blocking

Demodulation	Tuned frequency band	Unwanted frequency (N = 1, 2, 3)	Unwanted frequency (blocking)
AM	LF	$\pm N \times 9 \text{ kHz}$	$\pm 90 \text{ kHz}$
	MF	$\pm N \times 9 \text{ kHz}$	$\pm 90 \text{ kHz}$
	HF	$\pm N \times 10 \text{ kHz}$	$\pm 100 \text{ kHz}$

The limits for selectivity and blocking specified in table 4 shall apply with the channel spacings given in table 3. Each figure quoted is the minimum acceptable level of unwanted signal, relative to that of the wanted signal, which provides a given level of audio quality. The audio impairment criteria relevant for these tests is that the audio $SNR \geq 22 \text{ dBQ}$ ref 40 % AM.

Table 4: Adjacent channel selectivity and blocking requirements

De-modulation (see note 1)	Tuned frequency band	C Wanted signal centre frequency (MHz) (see note 4)	C Wanted signal level		Required I/C ratio (see notes 2 and 3)			
			Conducted (dBm)	Radiated (dBµV/m)	N = 1 (dB)	N = 2 (dB)	N = 3 (dB)	Blocking (dB)
AM (built-in or integral antenna)	LF	0,216	n/a	80	-20	10	20	20
	MF	0,999	n/a	72	-20	10	20	20
	HF	9,650	n/a	66	-20	10	20	20
AM (external antenna)	LF	0,216	-59	n/a	-5	25	35	40
	MF	0,999	-59	n/a	-5	25	35	40
	HF	9,650	-59	n/a	-5	25	35	40
NOTE 1: The ACS and blocking requirements are currently separated into different limits for radiated and conducted testing methods. These limits are likely to be unified in a future revision of the present document. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union. NOTE 2: The frequency of the interferer shall be calculated using the channel spacing data in table 3 for each of the 6 defined adjacent channels $N = \{-3, -2, -1, +1, +2, +3\}$ and the two blocking offsets. Each row of table 4 thus defines 8 individual tests. NOTE 3: 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 4: If the receiver cannot be tuned to 9,650 MHz, the wanted signal centre frequency shall be set to the closest alternate from the following list: 3,980 MHz, 6,050 MHz, 7,330 MHz, 11,850 MHz, 13,720 MHz, 15,450 MHz, 17,690 MHz, 18,960 MHz, 21,650 MHz, 25,890 MHz.								

5.4. Test Result

Tuned frequency band	Adjacent	C Wanted signal level (dBuv/m)	I Unwanted signal level (dBuv/m)	Required I/C ratio	S (mV)	N (mV)	SNR (dBQ)	SNR Limit (dBQ)	Result
Medium frequency	N=-1 0.99MHz	72	52	-20	3665	6.37	55.19	≥ 40	PASS
	N=+1 1.008MHz	72	52	-20	3667	6.49	55.04	≥ 40	PASS
	N=-2 0.981MHz	72	82	10	3664	6.38	55.19	≥ 40	PASS
	N=+2 1.017MHz	72	82	10	3668	6.16	55.50	≥ 40	PASS
	N=-3 0.972MHz	72	92	20	3664	6.25	55.37	≥ 40	PASS
	N=+3 1.026MHz	72	92	20	3664	6.41	55.14	≥ 40	PASS
	Block 0.909MHz	72	92	20	3569	6.38	54.95	≥ 40	PASS
	Block 1.089MHz	72	92	20	3447	6.62	54.34	≥ 40	PASS



6. Unwanted emissions in the spurious domain

6.1. Standard Applicable

ETSI EN 303 345-2 (V1.1.1) Annex C.3.5

6.2. Test Procedure

Please refer to en 55032:2015 for the measurement methods.

The EUT is placed on a turntable which is 0.8 meter high above the ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 and 10 meters away from the receiving antenna that is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Bilog antenna (calibrated by Dipole Antenna) and horn antenna are used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.

Result dB(μV/m):

Measurement Level dB(μV/m)= Antenna factor(dB) –Amp Factor +Cable Loss(dB) +Reading Level dB(μV).

Note: Antenna factor(dB) and Cable Loss(dB) are included Correct factor(dB) in test software.

Margin QP(db)=Reading Level dB(μV/m)- Limit dB(μV/m) for 30~1GHz.

Over(dB)= Emission Level dB(μV/m)- Limit dB(μV/m) for above 1GHz.

The bandwidth of the Receiver is set at 120 kHz (For 30MHz to 1000MHz).

The resolution bandwidth of the receiver RS EPI40 was set at 1MHz ((For above 1GHz.).

The frequency range for 1GHz to 6GHz was checked with peak and average detector, measurement distance is 3m in 3m Anechoic chamber.

The frequency range for 30MHz to 1GHz was checked with Quasi-peak detector, measurement distance is 3m in 3m semi-chamber.

6.3. Test Limit

Table A.4 – Requirements for radiated emissions at frequencies up to 1 GHz for class B equipment

Table clause	Frequency range MHz	Measurement			Class B limits dB(μV/m)
		Facility (see Table A.1)	Distance m	Detector type / bandwidth	
A4.1	30 to 230	OATS/SAC	10	Quasi Peak / 120 kHz	30
	230 to 1 000				37
A4.2	30 to 230	OATS/SAC	3		40
	230 to 1 000				47
A4.3	30 to 230	FAR	10	Quasi Peak / 120 kHz	32 to 25
	230 to 1 000				32
A4.4	30 to 230	FAR	3		42 to 35
	230 to 1 000				42

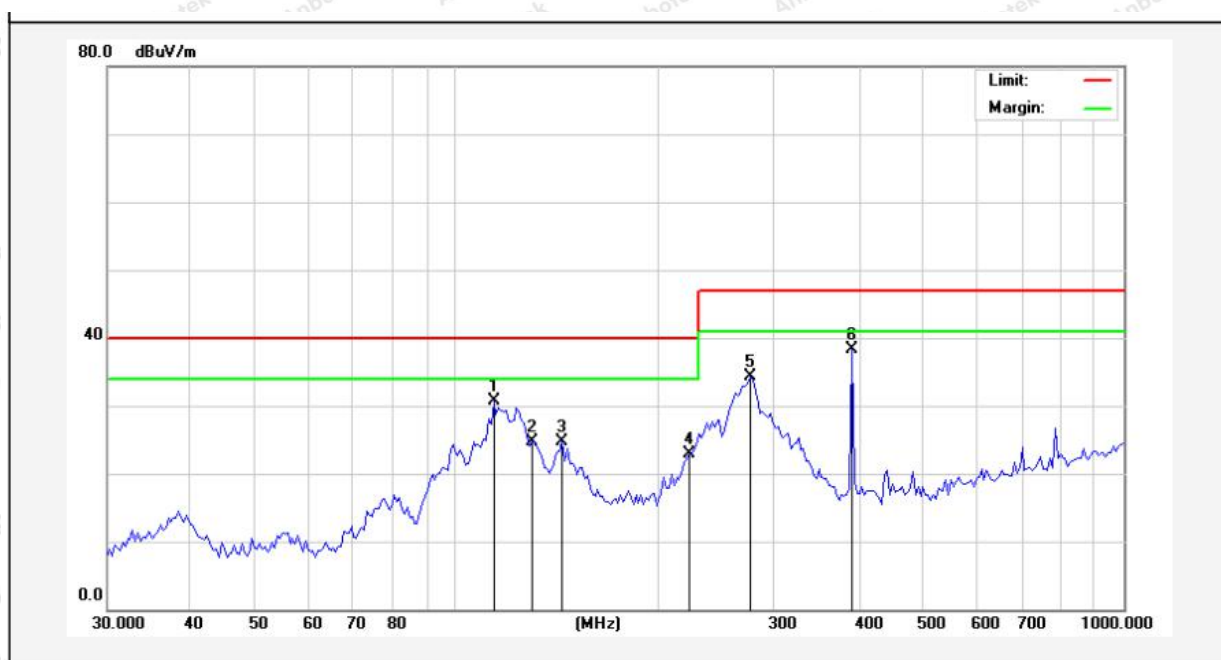
Apply only table clause A4.1 or A4.2 or A4.3 or A4.4 across the entire frequency range.

These requirements are not applicable to the local oscillator and harmonics frequencies of equipment covered by Table A.6.

6.4. Test Result

Test Results (30~1000MHz)

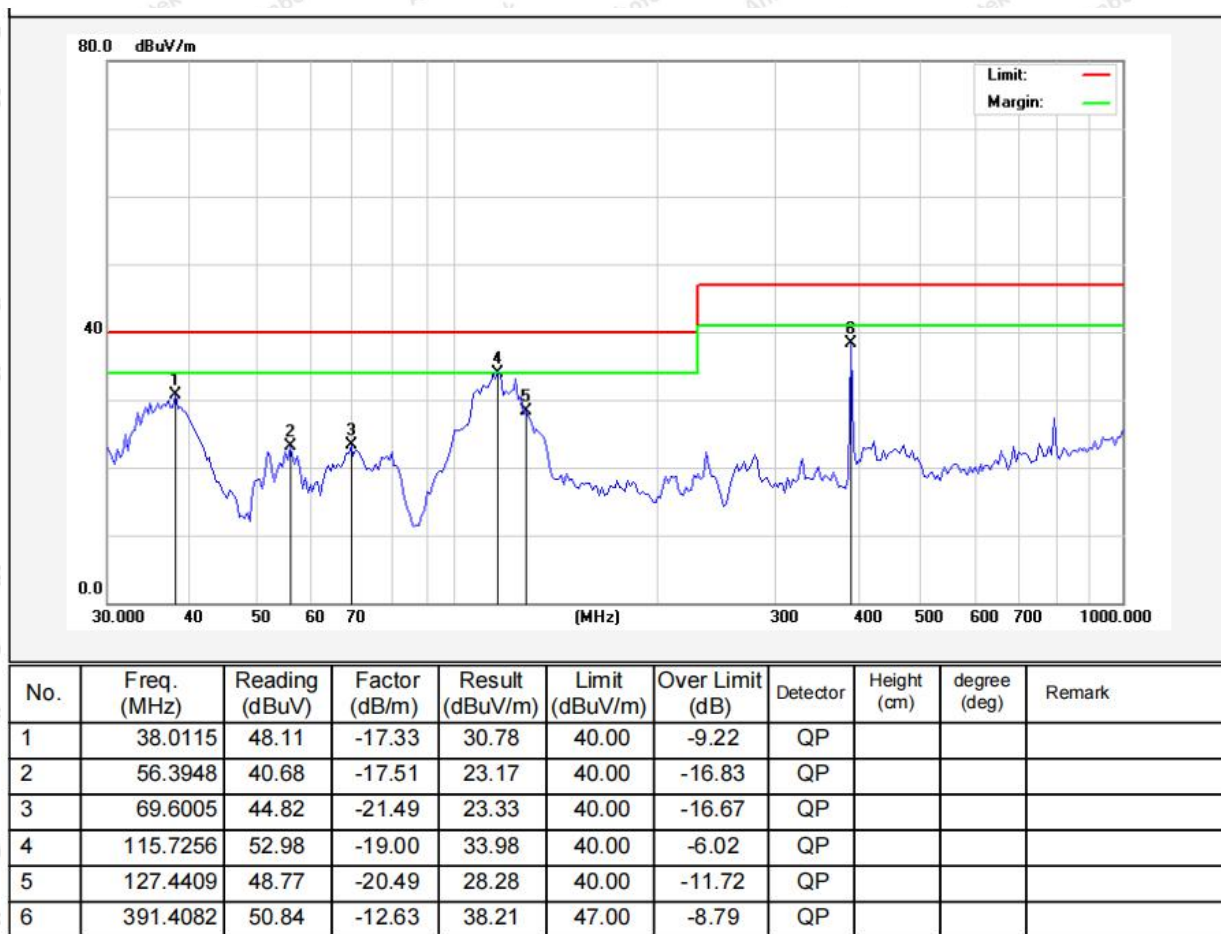
Test Mode: AM Mode
 Power Source: AC 230V, 50Hz for Adapter
 Polarization: Horizontal
 Temp.(°C)/Hum.(%RH): 22.7°C/49%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	113.7143	49.45	-18.74	30.71	40.00	-9.29	QP			
2	129.6950	45.51	-20.77	24.74	40.00	-15.26	QP			
3	144.0819	45.87	-21.26	24.61	40.00	-15.39	QP			
4	223.3415	40.08	-17.20	22.88	40.00	-17.12	QP			
5	275.6399	49.66	-15.45	34.21	47.00	-12.79	QP			
6	391.4082	51.01	-12.63	38.38	47.00	-8.62	QP			



Test Mode: AM Mode
Power Source: AC 230V, 50Hz for Adapter
Polarization: Vertical
Temp.(°C)/Hum.(%RH): 22.7°C/49%RH



APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Radiation Emission Test



----- End of Report -----