TEST REPORT

Reference No.	:	WTF25F06167111W002
Applicant	:	Mid Ocean Brands B.V.
Address	:	Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.
Manufacturer	:	114276
Address	:	---
Product Name	:	Solar hand crank radio torch
Model No	:	MO2746
Test specification	:	ETSI EN 303 345-1 V1.1.1 (2019-06) ETSI EN 303 345-2 V1.2.1 (2021-12)
Date of Receipt sample	:	2025-07-24
Date of Test	:	2025-08-04
Date of Issue	:	2025-08-15
Test Report Form No.	:	WEW-303345A-01A
Test Result	:	**Pass**

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

Prepared By:
Waltek Testing Group (Foshan) Co., Ltd.
Address: 1/F., Building 19, Sunlink Machinery City, Xingye 4 Road,
Guanglong Industrial Park, Chihua Neighborhood Committee, Chencun,
Shunde District, Foshan, Guangdong, China
Tel:+86-757-23811398 Fax:+86-757-23811381 E-mail:info@waltek.com.cn

Tested by:

Roy Hong

Approved by:

Danny Zhou

1 Test Summary

Radio Spectrum			
Test	**Test Requirement**	**Reference**	**Result**
Sensitivity	ETSI EN 303 345-2 V1.2.1	4.2	Pass
Adjacent channel Selectivity and blocking	ETSI EN 303 345-2 V1.2.1	4.3	Pass
Unwanted emissions in the spurious domain	ETSI EN 303 345-2 V1.2.1	4.4	Pass

Remark:

Pass The EUT complies with the essential requirements in the standard

Fail The EUT does not comply with the essential requirements in the standard

N/A Not Applicable

2 Contents

Page

1 TEST SUMMARY 2
2 CONTENTS 3
3 GENERAL INFORMATION 4
3.1 General Description of E.U.T. 4
3.2 Technical Specification 4
3.3 Standards Applicable for Testing 4
3.4 Test Facility 4
3.5 Subcontracted 5
3.6 Abnormalities from Standard Conditions 5
4 EQUIPMENT USED DURING TEST 6
4.1 Equipment List 6
4.2 Software List 7
4.3 Measurement Uncertainty 7
4.4 Decision Rule 7
5 TEST CONDITIONS AND TEST MODE 8
6 SENSITIVITY 9
6.1 Definition and Limit 9
6.2 Test Procedure 9
6.3 Test Result 9
7 ADJACENT CHANNEL SELECTIVITY AND BLOCKING 10
7.1 Definition and Limit 10
7.2 Test Procedure 11
7.3 Test Result 12
8 UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN 13
8.1 Definition and Limit 13
8.2 Test Procedure 14
8.3 Test Result 15
9 PHOTOGRAPHS – TEST SETUP 17
9.1 Photograph – Spurious Emissions Test Setup 17
10 PHOTOGRAPHS – EUT CONSTRUCTIONAL DETAILS 18

3 General Information

3.1 General Description of E.U.T.

Product Name ..... : Solar hand crank radio torch

Model No. ..... : MO2746

Remark ..... : ---

Rating ..... : USB-C Input: DC 5V, 1A
USB-A Input: DC 5V, 0.5A, 2.5W

Battery Capacity ..... : 3.7V, 1200mAh

Adapter Model..... : ---

3.2 Technical Specification

Frequency Bands ..... : 520-1620kHz

Antenna Type..... : External antenna

3.3 Standards Applicable for Testing

The tests were performed according to following standards:

ETSI EN 303 345-1 V1.1.1 (2019-06)	Broadcast Sound Receivers; Part 1: Generic requirements and measuring methods.
ETSI EN 303 345-2 V1.2.1 (2021-12)	Broadcast Sound Receivers; Part 2: AM broadcast sound service; Harmonised Standard for access to radio spectrum

3.4 Test Facility

The test facility has a test site registered with the following organizations:

- **ISED – Registration No.: 21895**

Waltek Testing Group (Foshan) Co., Ltd. has been registered and fully described in a report filed with the Innovation, Science an Economic Development Canada(ISED). The acceptance letter from the ISED is maintained in our files. Registration ISED number:21895.

- **FCC – Registration No.: 820106**

Waltek Testing Group (Foshan) Co., Ltd. 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 820106.

- **NVLAP – Lab Code: 600191-0**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 600191-0.
This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

3.5 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test items: ---

Lab information: ---

3.6 Abnormalities from Standard Conditions

None.

4 Equipment Used during Test

4.1 Equipment List

☒3m Semi-anechoic Chamber for Spurious Emission						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	3m Semi-anechoic Chamber	CHANGCHUANG	9m×6m×6m	-	2024-01-05	2027-01-04
2	EMI Test Receiver	R&S	ESR7	101566	2025-01-06	2026-01-05
3	Trilog Broadband Antenna	SCHWARZBECK	VULB 9162	9162-117	2025-01-12	2026-01-11
4	Coaxial Cable (below 1GHz)	Times Microwave Systems	RG223-NMNM-10M	-	2025-01-07	2026-01-06
5	Coaxial Cable (below 1GHz)	Times Microwave Systems	RG223-NMNM-3M	-	2025-01-07	2026-01-06
6	Spectrum Analyzer	Agilent	N9020A	MY48011796	2025-01-06	2026-01-05
☒RF Conducted test						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Environmental Chamber	GERUI	GR-HWS-1000L	GR24061818	2025-07-02	2026-07-01
2	Spectrum Analyzer	Agilent	N9020A	MY48011796	2025-01-06	2026-01-05
3	EXG Analog Signal Generator	Agilent	N5181A	MY48180720	2025-01-06	2026-01-05
4	RF Control Unit	TONSCEND	JS0806-2	-	2025-01-08	2026-01-07

☐: ***Not Used***

☒: ***Used***

4.2 Software List

Description	Manufacturer	Model	Version
EMI Test Software (Radiated Emission)	FARATRONIC	EZ-EMC	RA-03A1-2
RF Conducted Test	TONSCEND	JS1120-2	2.6

4.3 Measurement Uncertainty

Parameter	Uncertainty	Note
RF Output Power	±2.2dB	(1)
Occupied Bandwidth	±1.5%	(1)
Transmitter Spurious Emission	±3.8dB (for 25MHz-1GHz)	(1)
	±5.0dB (for 1GHz-18GHz)	(1)

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.4 Decision Rule

Compliance or non-compliance with a disturbance limit shall be determined in the following manner.

If U_{LAB} is less than or equal to U_{cispr}, then

-Compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;

-Non-compliance is deemed to occur is any measured disturbance level exceeds the disturbance limit.

If U_{LAB} is greater than U_{cispr}, then

-Compliance is deemed to occur if no measured disturbance level, increased by (U_{LAB}-U_{cispr}) , exceeds the disturbance limit;

-Non-compliance is deemed to occur if any measured disturbance level, increased by (U_{LAB}-U_{cispr}) , exceeds the disturbance limit.

5 Test Conditions and Test mode

The equipment under test (EUT) was configured to measure its highest possible emission/immunity level. The test modes were adapted according to the operation manual for use, the EUT was operated in the continuous transmitting mode that was for the purpose of the measurements, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	AM	Receive mode

Test Conditions	
Temperature (°C)	25 °C
Relative Humidity:	45 %
ATM Pressure:	101.2kPa

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

6 Sensitivity

6.1 Definition and Limit

The receiver sensitivity is the minimum wanted signal level required to provide a given level of audio quality.

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 ≥ 22 dBQ ref 40 % AM.

Table 2: AM sensitivity requirements

De-modulation	Tuned frequency band	Wanted signal centre frequency (MHz)	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.				

6.2 Test Procedure

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 signal 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.
NOTE: Modulation is disabled when setting the power level to prevent sideband power from influencing the measurement. Sideband power is not considered when measuring the power of analogue signals.

6.3 Test Result

De-modulation	Tuned frequency band	Wanted signal centre frequency	Wanted signal (dBµV/m)	S (dBmV)	N (dBmV)	SNR (dBQ)	Impairment criteria	Result
AM	MF	0.999MHz	66	87.77	62.79	24.98	SNR≥22 dBQ	Pass

7 Adjacent channel selectivity and blocking

7.1 Definition and Limit

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal which differs in frequency from the wanted signal by an amount equal to a small multiple of the adjacent channel spacing. The wanted and unwanted signals are of the same modulation type.

The blocking ratio is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted input signal at a given frequency separation. The wanted and unwanted signals are of the same modulation type.

In order to provide effective use of spectrum, devices shall be able to demodulate the tuned signal in the presence of similar signals in adjacent channels. In addition, testing shall also be performed to check the ability of the receiver to work effectively with interfering signals at a greater separation from the wanted signal (blocking).

The channel spacings specified in table 3 shall apply.

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	±N × 9kHz	±90kHz
	MF	±N × 9kHz	±90kHz
	HF	±N × 10kHz	±100kHz

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 ≥ 22 dBQ ref 40 % AM.

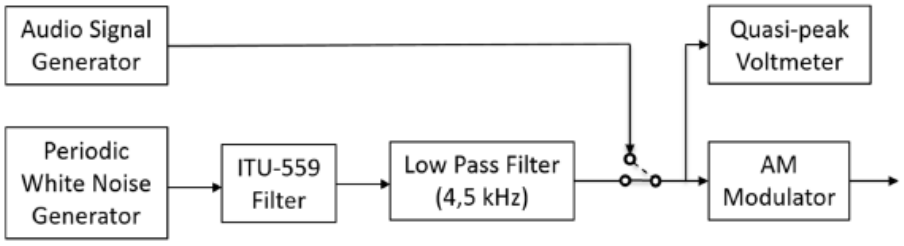
De-modulation (see note 1)	Tuned frequency band	C Wanted signal centre frequency (MHz) (see note 4)	C Wanted signal level		Required I/C ratio (see notes 2 and 3)			
			Conducted (dBm)	Radiated (dBμV/m)	N = 1 (dB)	N = 2 (dB)	N = 3 (dB)	Blocking (dB)
AM (built-in or Integral antenna)	LF	0.216	n/a	80	-20	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 an 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.

7.2 Test Procedure

The test signals required for the AM radio selectivity tests can be generated using analogue or digital techniques.

The analogue method is shown in figure B.1. An AM test signal generator is first modulated with a 500 Hz sinusoidal tone obtained from an audio signal generator. The level of the modulating signal at the input of the AM modulator is adjusted to obtain a modulation depth of 50 %. The audio level at the AM modulator input is measured by means of a noise voltmeter. The noise voltmeter consists of a quasi-peak voltmeter with defined dynamic characteristics (see Recommendation ITU-R BS.468-4 [2]). Any noise-weighting network is switched off. Next, the band-limited noise replaces the sinusoidal tone at the AM modulator input. The level of the noise signal at the AM modulator input is adjusted to give the same quasi-peak reading at the noise voltmeter as with the sinusoidal tone.



NOTE: The low pass filter has a cut-off frequency of 4,5 kHz and a minimum roll-off of 60 dB/octave.

Figure B.1: Block diagram for hardware generated test signal

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.

NOTE: Modulation is disabled when setting the power levels to prevent sideband power from influencing the measurement. Sideband power is not considered when measuring the power of analogue signals.

7.3 Test Result

De-modulation	Tuned frequency band	Wanted signal centre frequency	Wanted signal level(dBμV/m)	Unwanted signal Frequency (MHz)	S (dBmV)	N (dBmV)	SNR (dBQ)	Impairment criteria (dBQ)
AM (external antenna)	MF	0.999MHz	-59	1.008	87.11	62.76	24.35	SNR≥22
				1.017	87.09	61.11	25.98	SNR≥22
				1.026	88.29	62.71	25.58	SNR≥22
				1.089	84.65	60.27	24.38	SNR≥22
				0.990	85.44	61.19	24.25	SNR≥22
				0.981	86.88	61.55	25.33	SNR≥22
				0.972	87.06	61.1	25.96	SNR≥22
				0.909	88.4	62.72	25.68	SNR≥22

8 Unwanted emissions in the spurious domain

8.1 Definition and Limit

Spurious domain radiated and conducted (differential voltage) emissions from the equipment.

The limits for conducted (differential voltage) spurious domain emissions for an external RF port are specified in EN 55032 [4], table A.13, clause 13.3 for all receivers except car radios, or clause 13.4 for car radios.

Table A.13 – Requirements for conducted differential voltage emissions from Class B equipment

Applicable to
1. TV broadcast receiver tuner ports (3.1.8) with an accessible connector
2. RF modulator output ports (3.1.29)
3. FM broadcast receiver tuner ports (3.1.8) with an accessible connector

Table clause	Frequency range MHz	Detector type/ bandwidth	Class B limits dB(μV) 75 Ω			Applicability
			Other	Local Oscillator Fundamental	Local Oscillator Harmonics	
A13.1	30 to 950	For frequencies ≤1 GHz Quasi Peak/ 120 kHz	46	46	46	See [a]
	950 to 2 150		46	54	54	
A13.2	950 to 2 150		46	54	54	See [b]
A13.3	30 to 300		46	54	50	See [c]
	300 to 1 000				52	
A13.4	30 to 300	For frequencies ≥1 GHz Peak/ 1 MHz	46	66	59	See [d]
	300 to 1 000				52	
A13.5	30 to 950		46	76	46	See [e]
	950 to 2 150			n/a	54	

[a] Television receivers (analogue or digital), video recorders and PC TV broadcast receiver tuner cards working in channels between 30 MHz and 1 GHz, and digital audio receivers.

[b] Tuner units (not the LNB) for satellite signal reception.

[c] Frequency modulation audio receivers and PC tuner cards.

[d] Frequency modulation car radios.

[e] Applicable to EUTs with RF modulator output ports (for example DVD equipment, video recorders, camcorders and decoders etc.) designed to connect to TV broadcast receiver tuner ports. Limits specified for the LO are for the RF modulator carrier signal and harmonics.

The term 'other' refers to all emissions other than the fundamental and the harmonics of the LO.

The measurement shall cover the entire frequency range.

The EUT shall be tuned in accordance with Table B.3 and clause C.4.2.1.

The limits for radiated spurious domain emissions are specified in EN 55032 [4], tables A.4 and A6.

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.					

Table A.6 – Requirements for radiated emissions from FM receivers

Table Clause	Frequency Range MHz	Measurement			Class B Limit dB(µV/m)	
		Facility (see Table A.1)	Distance m	Detector type / Bandwidth	Fundamental	Harmonics
A6.1	30 to 230	OATS/SAC	10	Quasi Peak / 120 kHz	50	42
	230 to 300					42
	300 to 1 000					46
A6.2	30 to 230	OATS/SAC	3		60	52
	230 to 300					52
	300 to 1 000					56
A6.3	30 to 230	FAR	10	Quasi Peak / 120 kHz	52 to 45	44 to 37
	230 to 300				45	37
	300 to 1 000				45	41
A6.4	30 to 230	FAR	3		62 to 55	54 to 47
	230 to 300				55	47
	300 to 1 000				55	51
Apply only A6.1 or A6.2 or A6.3 or A6.4 across the entire frequency range. These relaxed limits apply only to emissions at the fundamental and harmonic frequencies of the LO. Signals at all other frequencies shall be compliant with the limits given in Table A.4.						

8.2 Test Procedure

For receivers with an external antenna connection, conformity shall be assessed by measuring the conducted (conducted differential voltage) emissions from the external RF port and radiated emissions from the cabinet and structure of the equipment (cabinet radiation).

For receivers without an external antenna connection, conformity shall be assessed by measuring the radiated emissions from the cabinet and the built-in or integral antenna (cabinet radiation).

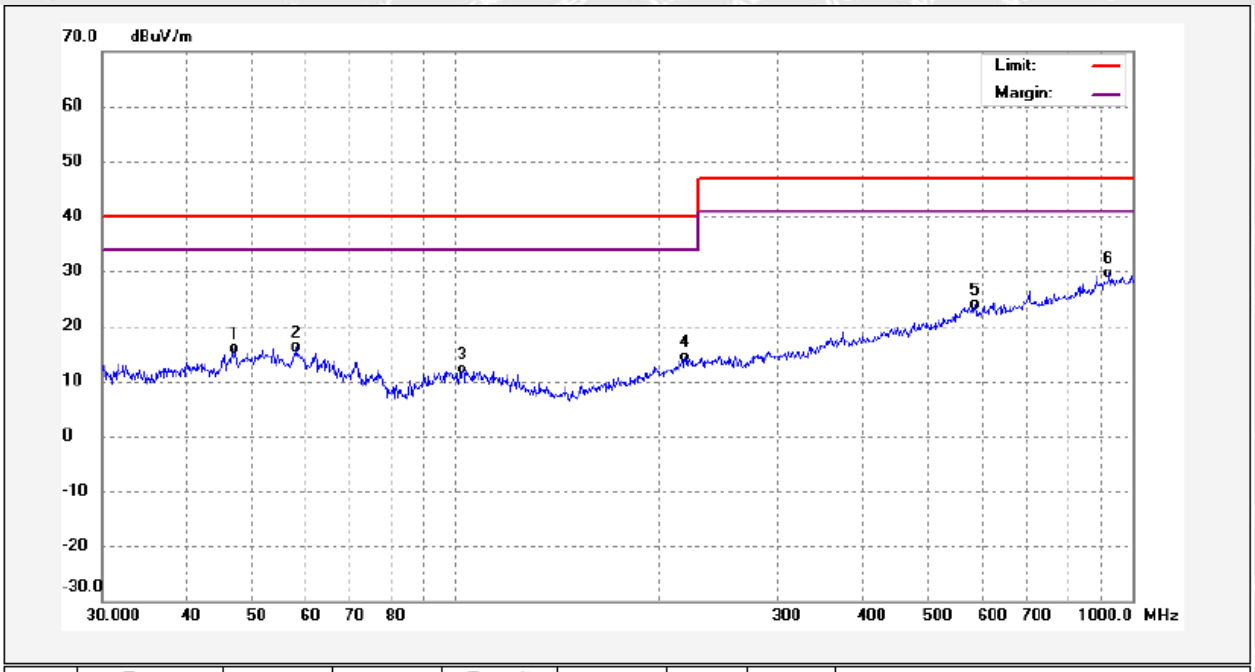
The level of spurious emissions shall be measured according to EN 55032 [4], clause 6.3, clause 8, table A.1, clause A.8.5 in table A.8, annex B, clause C.2.1, clause C.2.2, clause C.2.3, clause C.3.1, clause C.3.2,

clause C.3.3, clause C.3.4, clause C.3.7, clause C.4.2, clause C.4.4 and annex D and carried out by conducted (conducted differential voltage) emissions from an external RF port and/or radiated emissions from the cabinet and structure of the equipment (cabinet radiation).

If the limits given in clause 4.4.2 are met then the receiver has passed the unwanted emissions in the spurious domain requirement.

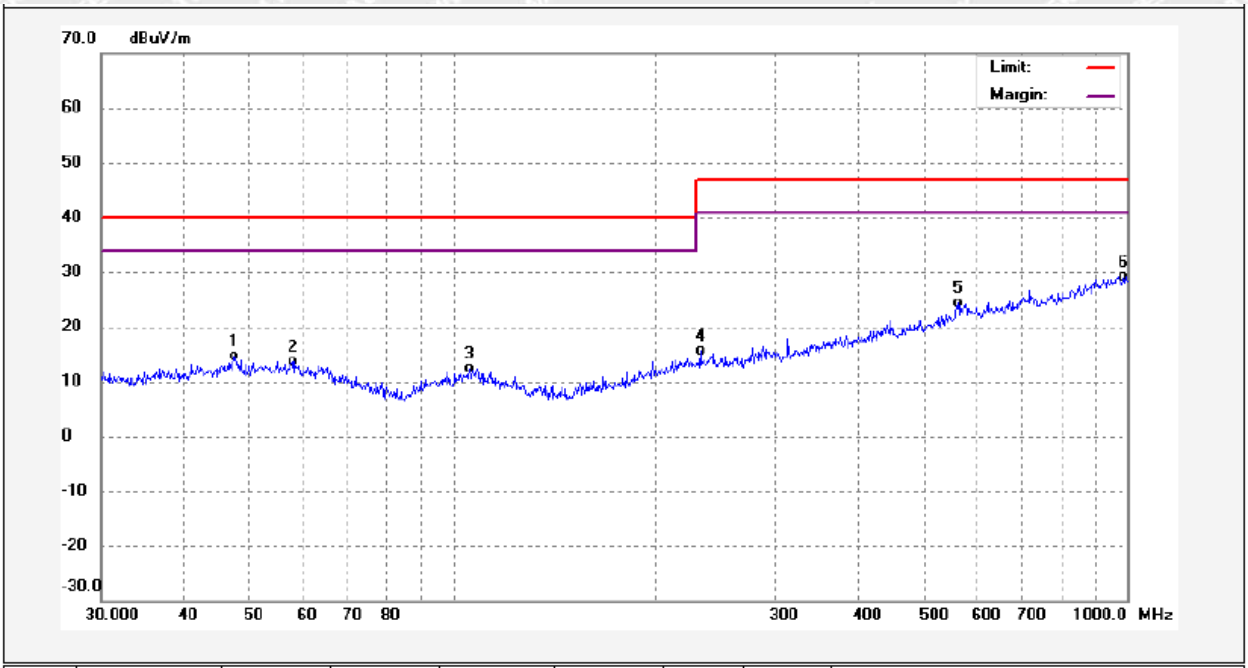
8.3 Test Result

Antenna Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	47.2095	1.54	14.26	15.80	40.00	-24.20	QP	
2	58.2643	1.90	14.26	16.16	40.00	-23.84	QP	
3	102.4315	-0.50	12.67	12.17	40.00	-27.83	QP	
4	218.3085	0.20	14.24	14.44	40.00	-25.56	QP	
5	585.4050	1.33	22.57	23.90	47.00	-23.10	QP	
6	923.1629	2.25	27.33	29.58	47.00	-17.42	QP	

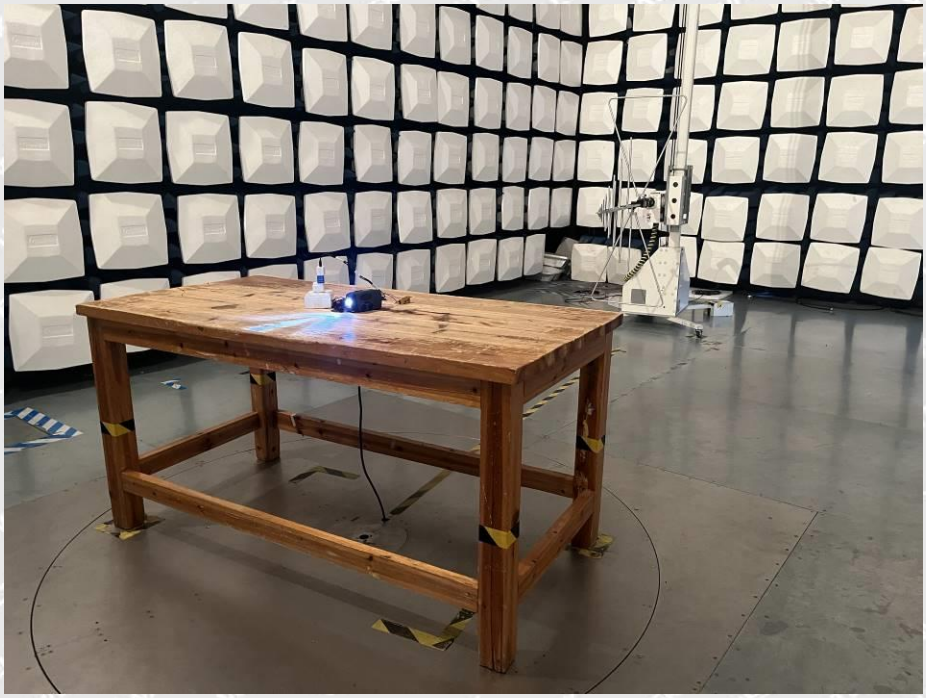
Antenna Polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	47.3753	0.28	14.31	14.59	40.00	-25.41	QP	
2	57.7962	-0.61	14.34	13.73	40.00	-26.27	QP	
3	105.7527	-0.69	13.04	12.35	40.00	-27.65	QP	
4	232.8582	1.37	14.29	15.66	47.00	-31.34	QP	
5	561.0862	2.04	22.41	24.45	47.00	-22.55	QP	
6	999.2989	1.11	27.94	29.05	47.00	-17.95	QP	

9 Photographs – Test Setup

9.1 Photograph – Spurious Emissions Test Setup



10 Photographs – EUT Constructional Details

Please refer to “ANNEX” (Reference No. WTF25F06167111W).

======End of Report======

中国认可
国际互认
检测
TESTING
CNAS L6478

TEST REPORT

Reference No.	:	WTF25F06167111W003
Applicant	:	Mid Ocean Brands B.V.
Address	:	Unit 711-716, 7/F., Tower A, 83 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.
Manufacturer	:	114276
Address	:	---
Product Name	:	Solar hand crank radio torch
Model No.	:	MO2746
Test specification	:	ETSI EN 303 345-1 V1.1.1 (2019-06) ETSI EN 303 345-3 V1.1.1 (2021-06)
Date of Receipt sample	:	2025-07-24
Date of Test	:	2025-08-04
Date of Issue	:	2025-08-15
Test Report Form No.	:	WEW-303345A-01A
Test Result	:	**Pass**

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

Prepared By:
Waltek Testing Group (Foshan) Co., Ltd.
Address: 1/F., Building 19, Sunlink Machinery City, Xingye 4 Road,
Guanglong Industrial Park, Chihua Neighborhood Committee, Chencun,
Shunde District, Foshan, Guangdong, China
Tel:+86-757-23811398 Fax:+86-757-23811381 E-mail:info@waltek.com.cn

Tested by:

Roy Hong

Approved by:

Danny Zhou

1 Test Summary

Radio Spectrum			
Test	**Test Requirement**	**Reference**	**Result**
Sensitivity	ETSI EN 303 345-3 V1.1.1	4.2	Pass
Receiver adjacent channel Selectivity and blocking	ETSI EN 303 345-3 V1.1.1	4.3	Pass
Unwanted emissions in the spurious domain	ETSI EN 303 345-3 V1.1.1	4.4	Pass

Remark:

Pass The EUT complies with the essential requirements in the standard

Fail The EUT does not comply with the essential requirements in the standard

N/A Not Applicable

2 Contents

Page

1 TEST SUMMARY 2
2 CONTENTS 3
3 GENERAL INFORMATION 4
3.1 General Description of E.U.T. 4
3.2 Technical Specification 4
3.3 Standards Applicable for Testing 4
3.4 Test Facility 4
3.5 Subcontracted 5
3.6 Abnormalities from Standard Conditions 5
4 EQUIPMENT USED DURING TEST 6
4.1 Equipment List 6
4.2 Software List 7
4.3 Measurement Uncertainty 7
4.4 Decision Rule 7
5 TEST CONDITIONS AND TEST MODE 8
6 SENSITIVITY 9
6.1 Definition and Limit 9
6.2 Test Procedure 9
6.3 Test Result 9
7 ADJACENT CHANNEL SELECTIVITY AND BLOCKING 10
7.1 Definition and Limit 10
7.2 Test Procedure 11
7.3 Test Result 12
8 UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN 13
8.1 Definition and Limit 13
8.2 Test Procedure 14
8.3 Test Result 15
9 PHOTOGRAPHS – TEST SETUP 17
9.1 Photograph – Spurious Emissions Test Setup 17
10 PHOTOGRAPHS – EUT CONSTRUCTIONAL DETAILS 18

3 General Information

3.1 General Description of E.U.T.

Product Name ..... : Solar hand crank radio torch

Model No. ..... : MO2746

Remark ..... : ---

Rating ..... : USB-C Input: DC 5V, 1A
USB-A Input: DC 5V, 0.5A, 2.5W

Battery Capacity ..... : 3.7V, 1200mAh

Adapter Model..... : ---

3.2 Technical Specification

Frequency Bands ..... : 87-108MHz

Antenna Type..... : External antenna

3.3 Standards Applicable for Testing

The tests were performed according to following standards:

ETSI EN 303 345-1 V1.1.1 (2019-06)	Broadcast Sound Receivers; Part 1: Generic requirements and measuring methods.
ETSI EN 303 345-3 V1.1.1 (2021-06)	Broadcast Sound Receivers; Part 3: FM broadcast sound service; Harmonised Standard for access to radio spectrum

3.4 Test Facility

The test facility has a test site registered with the following organizations:

- **ISED – Registration No.: 21895**

Waltek Testing Group (Foshan) Co., Ltd. has been registered and fully described in a report filed with the Innovation, Science an Economic Development Canada(ISED). The acceptance letter from the ISED is maintained in our files. Registration ISED number:21895.

- **FCC – Registration No.: 820106**

Waltek Testing Group (Foshan) Co., Ltd. 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 820106.

- **NVLAP – Lab Code: 600191-0**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 600191-0.
This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

3.5 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test items: ---

Lab information: ---

3.6 Abnormalities from Standard Conditions

None.

4 Equipment Used during Test

4.1 Equipment List

☒3m Semi-anechoic Chamber for Spurious Emission						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	3m Semi-anechoic Chamber	CHANGCHUANG	9m×6m×6m	-	2024-01-05	2027-01-04
2	EMI Test Receiver	R&S	ESR7	101566	2025-01-06	2026-01-05
3	Trilog Broadband Antenna	SCHWARZBECK	VULB 9162	9162-117	2025-01-12	2026-01-11
4	Coaxial Cable (below 1GHz)	Times Microwave Systems	RG223-NMNM-10M	-	2025-01-07	2026-01-06
5	Coaxial Cable (below 1GHz)	Times Microwave Systems	RG223-NMNM-3M	-	2025-01-07	2026-01-06
6	Spectrum Analyzer	Agilent	N9020A	MY48011796	2025-01-06	2026-01-05
☒RF Conducted test						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Environmental Chamber	GERUI	GR-HWS-1000L	GR24061818	2025-07-02	2026-07-01
2	Spectrum Analyzer	Agilent	N9020A	MY48011796	2025-01-06	2026-01-05
3	EXG Analog Signal Generator	Agilent	N5181A	MY48180720	2025-01-06	2026-01-05
4	RF Control Unit	TONSCEND	JS0806-2	-	2025-01-08	2026-01-07

☐: ***Not Used***

☒: ***Used***

4.2 Software List

Description	Manufacturer	Model	Version
EMI Test Software (Radiated Emission)	FARATRONIC	EZ-EMC	RA-03A1-2
RF Conducted Test	TONSCEND	JS1120-2	2.6

4.3 Measurement Uncertainty

Parameter	Uncertainty	Note
RF Output Power	±2.2dB	(1)
Occupied Bandwidth	±1.5%	(1)
Transmitter Spurious Emission	±3.8dB (for 25MHz-1GHz)	(1)
	±5.0dB (for 1GHz-18GHz)	(1)

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.4 Decision Rule

Compliance or non-compliance with a disturbance limit shall be determined in the following manner.

If U_{LAB} is less than or equal to U_{cispr}, then

-Compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;

-Non-compliance is deemed to occur is any measured disturbance level exceeds the disturbance limit.

If U_{LAB} is greater than U_{cispr}, then

-Compliance is deemed to occur if no measured disturbance level, increased by (U_{LAB}-U_{cispr}) , exceeds the disturbance limit;

-Non-compliance is deemed to occur if any measured disturbance level, increased by (U_{LAB}-U_{cispr}) , exceeds the disturbance limit.

5 Test Conditions and Test mode

The equipment under test (EUT) was configured to measure its highest possible emission/immunity level. The test modes were adapted according to the operation manual for use, the EUT was operated in the continuous transmitting mode that was for the purpose of the measurements, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	FM	Receive mode

Test Conditions	
Temperature (°C)	25 °C
Relative Humidity:	45 %
ATM Pressure:	101.2kPa

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

6 Sensitivity

6.1 Definition and Limit

The receiver sensitivity is the minimum wanted signal level required to provide a given level of audio quality.

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 criteria relevant for these tests is that the audio SNR ≥ 40 dBQ ref ±60,8 kHz deviation, and that there shall be 10 seconds of audio with no subjective impairments (e.g. clicks resulting from FM threshold effects).

Table 2: FM sensitivity requirements

De-modulation	Tuned frequency band	Wanted signal centre frequency (MHz)	Required sensitivity limit	
			Conducted (dBm)	Radiated (dBµV/m)
FM	VHF band II	98	-90	50 (see note)
NOTE: For products with an integral antenna, the requirement is relaxed to 67 dBµV/m.				

6.2 Test Procedure

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 signal 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.
NOTE: Modulation is disabled when setting the power level to prevent sideband power from influencing the measurement. Sideband power is not considered when measuring the power of analogue signals.

6.3 Test Result

De-modulation	Wanted signal centre frequency	Wanted signal (dBµV/m)	S (dBmV)	N (dBmV)	SNR (dBQ)	Impairment criteria	Result
FM	98MHz	50	104.98	61.87	43.11	SNR≥40 dBQ	Pass

7 Adjacent channel selectivity and blocking

7.1 Definition and Limit

The adjacent channel selectivity at a given frequency separation, is the ratio of the maximum unwanted signal level to the wanted signal level necessary to provide a given level of audio quality. The wanted and unwanted signals are of the same modulation type.

The blocking ratio is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted input signal at a given frequency separation. The wanted and unwanted signals are of different modulation types.

In order to provide effective use of spectrum, devices shall be able to demodulate the tuned signal in the presence of similar signals in adjacent channels. In addition, testing shall also be performed to check the ability of the receiver to work effectively with interfering signals at a greater separation from the wanted signal (blocking).
The channel spacings specified in table 3 shall apply.

Table 3: 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	±N × 100kHz	±800kHz

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 ≥ 40 dBQ ref ±60,8 kHz deviation, and that there shall be 10 seconds of audio with no subjective impairments (e.g. clicks resulting from FM threshold effects). Table 8: Adjacent channel selectivity and blocking requirements

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 (dBµV/m)	N = 2 (dB)	N = 3 (dB)	N = 4 (dB)	Blocking (dB)
FM (built-in or Integral antenna)	VHF band II	98	n/a	56 (see note 4)	-15	-3	8	20
FM (external antenna)	VHF band II	98	-84	n/a	3	17	30	30

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.

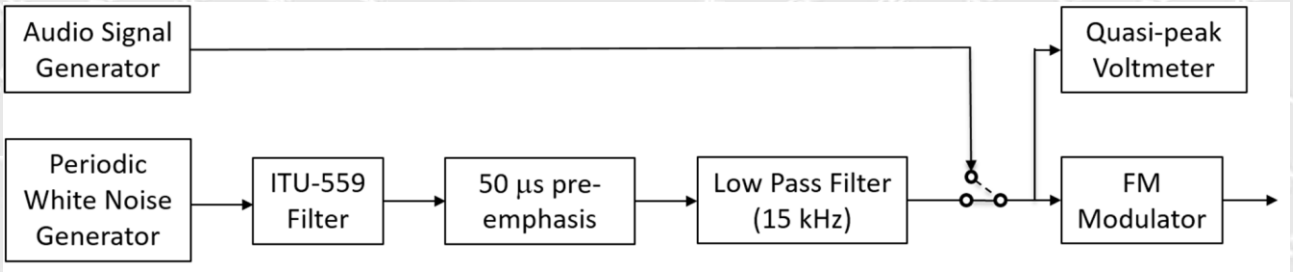
NOTE 2: The frequency of the interferer shall be calculated using the channel spacing data in table 3 for each of the 6 defined adjacent channels N = {-4, -3, -2, +2, +3, +4} and the two blocking offsets. Each row of table 4 thus defines 8 individual tests.

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

7.2 Test Procedure

The means of generating the noise modulation for FM '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.



NOTE: The low pass filter has a cut-off frequency of 15 kHz and a minimum roll-off of 60 dB/octave.

Figure B.1: Block diagram for hardware generated test signal

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. The tone is adjusted in level to achieve 19 kHz peak deviation. The tone is measured with an RMS voltmeter and replaced with noise of the same RMS voltage. With the pre-emphasis restored, the deviation should now be 34,9 kHz quasi-peak or 14,6 kHz RMS:

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.

NOTE: Modulation is disabled when setting the power levels to prevent sideband power from influencing the measurement. Sideband power is not considered when measuring the power of analogue signals.

7.3 Test Result

Wanted signal centre frequency	Wanted signal level(dBμV/m)	Unwanted signal Frequency (MHz)	S (dBmV)	N (dBmV)	SNR (dBQ)	Impairment criteria (dBQ)
98MHz	-84	98.2	103.39	61.26	42.13	SNR≥40
		98.3	106.12	62.19	43.93	SNR≥40
		98.4	103.38	60.79	42.59	SNR≥40
		98.8	105.18	62.16	43.02	SNR≥40
		97.8	104.21	60.96	43.25	SNR≥40
		97.7	106.05	63	43.05	SNR≥40
		97.6	103.84	61.76	42.08	SNR≥40
		97.2	103.61	61.4	42.21	SNR≥40

8 Unwanted emissions in the spurious domain

8.1 Definition and Limit

Spurious domain radiated and conducted (differential voltage) emissions from the equipment.

The limits for conducted (differential voltage) spurious domain emissions for an external RF port are specified in EN 55032 [4], table A.13, clause 13.3 for all receivers except car radios, or clause 13.4 for car radios.

Table A.13 – Requirements for conducted differential voltage emissions from Class B equipment

Applicable to
1. TV broadcast receiver tuner ports (3.1.8) with an accessible connector
2. RF modulator output ports (3.1.29)
3. FM broadcast receiver tuner ports (3.1.8) with an accessible connector

Table clause	Frequency range MHz	Detector type/ bandwidth	Class B limits dB(μV) 75 Ω			Applicability
			Other	Local Oscillator Fundamental	Local Oscillator Harmonics	
A13.1	30 to 950	For frequencies ≤1 GHz Quasi Peak/ 120 kHz	46	46	46	See [a]
	950 to 2 150		46	54	54	
A13.2	950 to 2 150		46	54	54	See [b]
A13.3	30 to 300		46	54	50	See [c]
	300 to 1 000				52	
A13.4	30 to 300	For frequencies ≥1 GHz Peak/ 1 MHz	46	66	59	See [d]
	300 to 1 000				52	
A13.5	30 to 950		46	76	46	See [e]
	950 to 2 150			n/a	54	

[a] Television receivers (analogue or digital), video recorders and PC TV broadcast receiver tuner cards working in channels between 30 MHz and 1 GHz, and digital audio receivers.

[b] Tuner units (not the LNB) for satellite signal reception.

[c] Frequency modulation audio receivers and PC tuner cards.

[d] Frequency modulation car radios.

[e] Applicable to EUTs with RF modulator output ports (for example DVD equipment, video recorders, camcorders and decoders etc.) designed to connect to TV broadcast receiver tuner ports. Limits specified for the LO are for the RF modulator carrier signal and harmonics.

The term 'other' refers to all emissions other than the fundamental and the harmonics of the LO.

The measurement shall cover the entire frequency range.

The EUT shall be tuned in accordance with Table B.3 and clause C.4.2.1.

The limits for radiated spurious domain emissions are specified in EN 55032 [4], tables A.4 and A6.

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.					

Table A.6 – Requirements for radiated emissions from FM receivers

Table Clause	Frequency Range MHz	Measurement			Class B Limit dB(μV/m)	
		Facility (see Table A.1)	Distance m	Detector type / Bandwidth	Fundamental	Harmonics
A6.1	30 to 230	OATS/SAC	10	Quasi Peak / 120 kHz	50	42
	230 to 300					42
	300 to 1 000					46
A6.2	30 to 230	OATS/SAC	3		60	52
	230 to 300					52
	300 to 1 000					56
A6.3	30 to 230	FAR	10	Quasi Peak / 120 kHz	52 to 45	44 to 37
	230 to 300				45	37
	300 to 1 000				45	41
A6.4	30 to 230	FAR	3		62 to 55	54 to 47
	230 to 300				55	47
	300 to 1 000				55	51
Apply only A6.1 or A6.2 or A6.3 or A6.4 across the entire frequency range. These relaxed limits apply only to emissions at the fundamental and harmonic frequencies of the LO. Signals at all other frequencies shall be compliant with the limits given in Table A.4.						

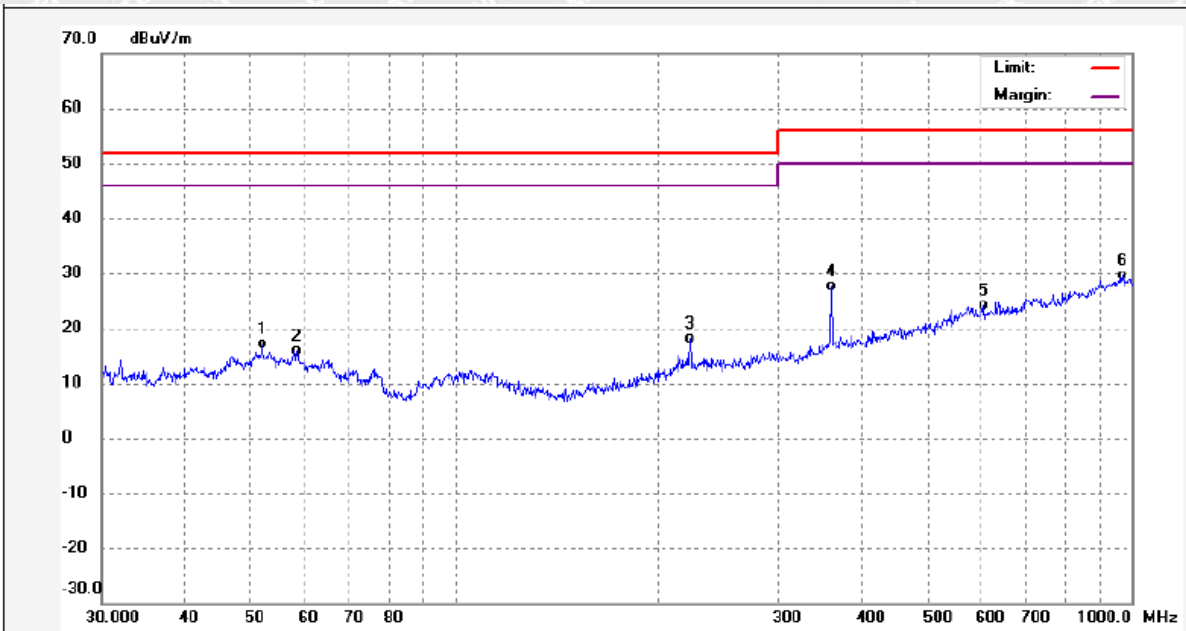
8.2 Test Procedure

Manufacturers shall provide a representative sample of the receiver system. The level of spurious emissions shall be measured according to EN 55032 [4], clause 6.3, clause 8, table A.1,clause A.8.5 in table A.8, annex B, clause C.2.1, clause C.2.2, clause C.2.3, clause C.3.1, clause C.3.2, clause C.3.3,clause C.3.4, clause C.3.7, clause C.4.2, clause C.4.4 and annex D and carried out by conducted (conducted differential voltage) emissions from an external RF port and/or radiated emissions from the cabinet and structure of the equipment (cabinet radiation).

If the limits given in clause 4.4.2 are met then the receiver has passed the unwanted emissions in the spurious domain requirement.

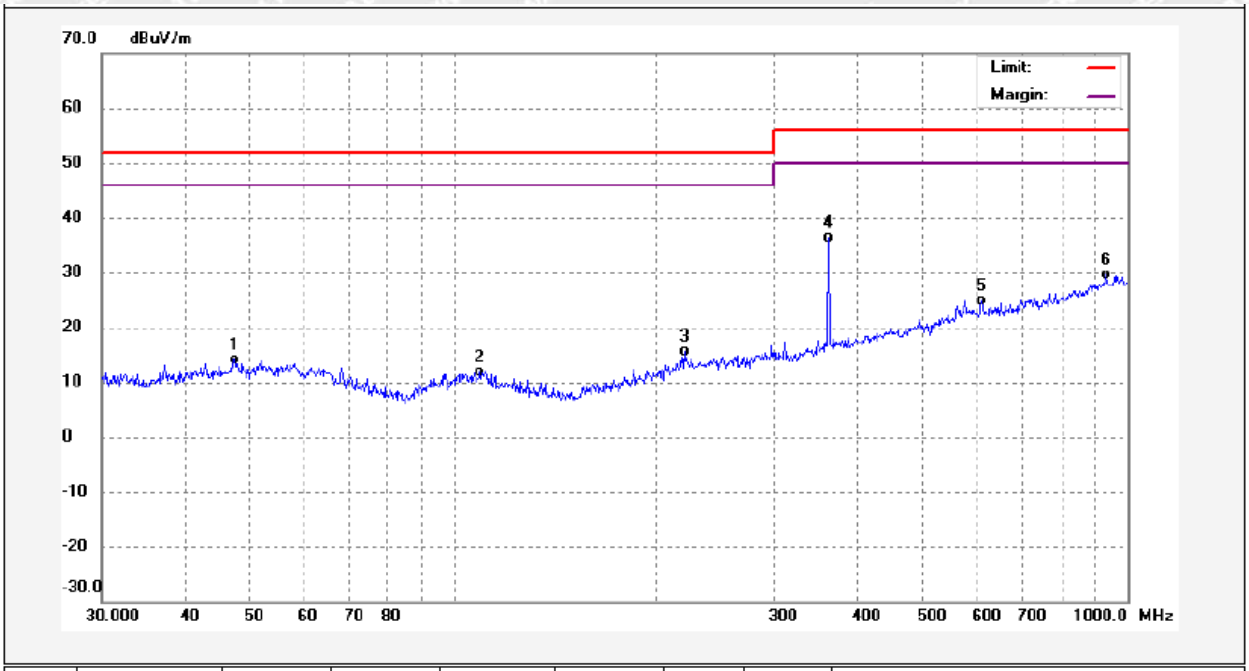
8.3 Test Result

Antenna Polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	51.9340	2.70	14.36	17.06	52.00	-34.94	QP	
2	58.6126	1.79	14.19	15.98	52.00	-36.02	QP	
3	222.7158	3.67	14.34	18.01	52.00	-33.99	QP	
4	360.3214	9.81	17.81	27.62	56.00	-28.38	QP	
5	605.6592	1.58	22.55	24.13	56.00	-31.87	QP	
6	970.9745	1.99	27.76	29.75	56.00	-26.25	QP	

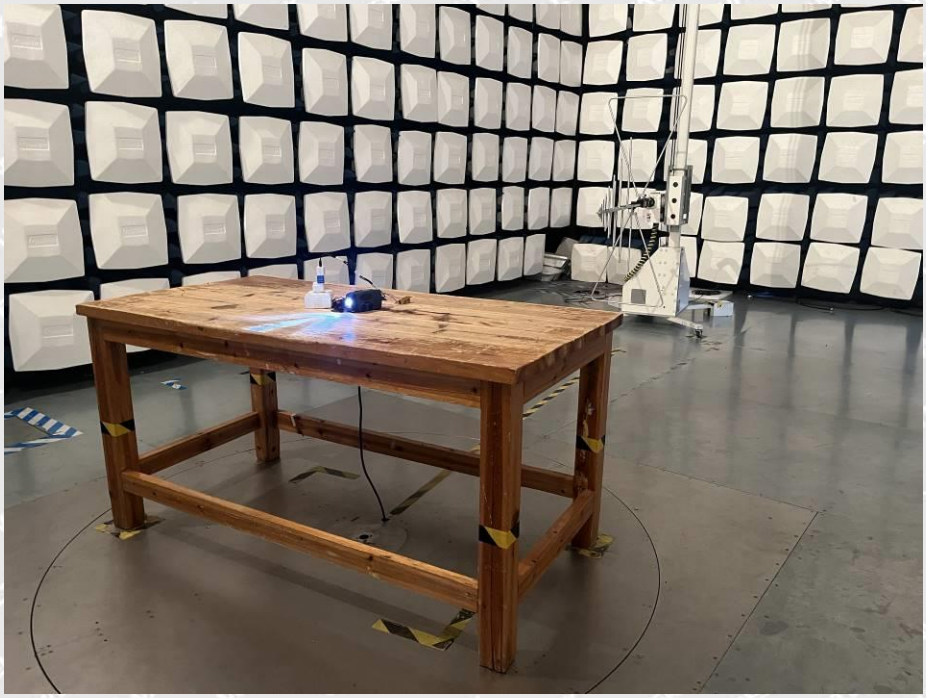
Antenna Polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	47.3421	-0.19	14.29	14.10	52.00	-37.90	QP	
2	109.5268	-0.85	12.76	11.91	52.00	-40.09	QP	
3	220.3079	1.37	14.29	15.66	52.00	-36.34	QP	
4	360.3214	18.51	17.81	36.32	56.00	-19.68	QP	
5	608.6398	2.40	22.52	24.92	56.00	-31.08	QP	
6	930.6384	2.08	27.48	29.56	56.00	-26.44	QP	

9 Photographs – Test Setup

9.1 Photograph – Spurious Emissions Test Setup



10 Photographs – EUT Constructional Details

Please refer to “ANNEX” (Reference No. WTF25F06167111W).

======End of Report======