



EMC TEST REPORT

**EMC TEST REPORT
ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-17 V3.2.4 (2020-09)**

Prepared for :

Mid Ocean Brands B.V.

7/F., Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong

Product: Locator

Trade Name: N/A

Model Name: MO2277

Date of Test: May 30, 2024- June 03, 2024

Date of Report: June 03, 2024

Report Number: SIT240529160301ER-1

Prepared By :

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TEST RESULT CERTIFICATION

Applicant's name..... Mid Ocean Brands B.V.

Address..... 7/F., Kings Tower, 11I King Lam Street, Cheung Sha Wan, Kowloon,
Hong Kong

Manufacture's Name..... 114628

Product description

Product name..... Locator

Model and/or type reference . MO2277

Rating(s)..... Power supplied by 3V button battery

Standards..... ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-17 V3.2.4 (2020-09)

This device described above has been tested by SIT LAB, and the test results show that the equipment under test (EUT) is in compliance with the 2014/53/EU RED Directive Art.3.1b requirements. And it is applicable only to the tested sample identified in the report.

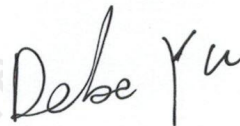
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Date of Test..... :

Date (s) of performance of tests.....: May 30, 2024- June 03, 2024

Date of Issue.....: June 03, 2024

Prepared by:



Project Engineer

Reviewed by:



Project Supervisor

Approved by:



Technical Director

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1. TEST SUMMARY

Test Procedures According To The Technical Standards:

ETSI EN 301 489-1 V2.2.3 (2019-11)

ETSI EN 301 489-17 V3.2.4 (2020-09)

EMC Emission				
Standard	Test Item	Limit	Judgment	ReNovk
EN 55032	Conducted Emission	Class B	N/A	
	Radiated Emission	Class B	PASS	
EN IEC 61000-3-2	Harmonic Current Emission	Class A or D NOTE (2)	N/A	
EN 61000-3-3	Voltage Fluctuations & Flicker	-----	N/A	
EMC Immunity				
Section EN 55035:2017+A11:2020	Test Item	Performance Criteria	Judgment	ReNovk
EN 61000-4-2	Electrostatic Discharge	B	PASS	
EN IEC 61000-4-3	RF electromagnetic field	A	PASS	
EN 61000-4-4	Fast transients	B	N/A	
EN 61000-4-5	Surges	B	N/A	
EN 61000-4-6	Injected Current	A	N/A	
EN IEC 61000-4-11	Volt. Interruptions Volt. Dips	B / C / C NOTE (3)	N/A	

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report

(2) The power consumption of EUT is less than 75W and no Limits apply.

(3) Voltage dip: 100% reduction – Performance Criteria **B**

Voltage dip: 30% reduction – Performance Criteria **C**

Voltage Interruption: 100% Interruption – Performance Criteria **C**

(4) For client's request and manual description, the test will not be executed.

1.1 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately **95 %**.

A. Conducted Measurement :

Test Site	Method	Measurement Frequency Range	U · (dB)	NOTE
C01	ANSI	150 KHz ~ 30MHz	1.94	

B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	Ant. H / V	U · (dB)	NOTE
OS01	ANSI	30MHz ~ 200MHz	V	3.82	
		30MHz ~ 200MHz	H	3.60	
		200MHz ~ 1,000MHz	V	3.86	
		200MHz ~ 1,000MHz	H	3.94	
OS02	ANSI	30MHz ~ 200MHz	V	2.48	
		30MHz ~ 200MHz	H	2.16	
		200MHz ~ 1,000MHz	V	2.50	
		200MHz ~ 1,000MHz	H	2.66	

Test Site	Method	Measurement Frequency Range	U · (dB)	NOTE
OS03		1GHz ~6000GHz	5.0	

2. GENERAL INFORMATION

GENERAL DESCRIPTION OF EUT

Equipment	Locator
Trade Name	N/A
Model Name	MO2277
Serial Model	N/A
Model Difference	All types of circuits and RF modules are the same, this report only test mode name: MO2277.
Frequency Bands:	2402-2480MHz
Modulation Mode:	GFSK
Power Rating	Power supplied by 3V button battery
Antenna:	PCB Antenna
Connecting I/O Port(s)	Please refer to the User's Manual
Hardware Version	N/A
Software Version	N/A

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.1 DESCRIPTION OF TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	Normal working

For Conducted Test	
Final Test Mode	Description
Mode 1	Normal working

For Radiated Test	
Final Test Mode	Description
Mode 1	Normal working

For EMS Test	
Final Test Mode	Description
Mode 1	Normal working

NOTE: The test modes were carried out for all operation modes. The final test mode of the EUT was the worst test mode for EMI, and its test data was showed.

2.2 DESCRIPTION OF TEST SETUP

A rectangular box with a black border, containing the text 'EUT' in a bold, black, sans-serif font.

EUT

2.3 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	Locator	N/A	MO2277	N/A	EUT
E-2	Adapter	N/A	N/A	N/A	

Item	Shielded Type	Ferrite Core	Length	Note
C-1	N/A	N/A	N/A	N/A

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

2.4 MEASUREMENT INSTRUMENTS LIST

CONDUCTED EMISSION

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	LISN	R&S	ENV216	101313	Sep. 17, 2023	Sep. 16, 2024	1 year
2	LISN	SCHWARZBECK	NNLK 8129	8129245	Sep. 25, 2023	Sep. 24, 2024	1 year
3	Pulse Limiter	SCHWARZBECK	VTSD 9561F	9716	Sep. 25, 2023	Sep. 24, 2024	1 year
4	50Ω Switch	ANRITSU CORP	MP59B	6200983704	Sep. 17, 2023	Sep. 16, 2024	1 year
5	Test Cable	N/A	C01	N/A	Sep. 20, 2023	Sep. 19, 2024	1 year
6	Test Cable	N/A	C02	N/A	Sep. 20, 2023	Sep. 19, 2024	1 year
7	Test Cable	N/A	C03	N/A	Sep. 17, 2023	Sep. 16, 2024	1 year
8	EMI Test Receiver	R&S	ESCI	101160	Sep. 17, 2023	Sep. 16, 2024	1 year
9	Passive Voltage Probe	ESH2-Z3	R&S	100196	Sep. 17, 2023	Sep. 16, 2024	1 year
10	Triple-Loop Antenna	EVERFINE	LIA-2	11020003	Sep. 25, 2023	Sep. 24, 2024	1 year
11	Absorbing Clamp	R&S	MDS-21	100423	Sep. 25, 2023	Sep. 24, 2024	1 year

RADIATED TEST SITE

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Bilog Antenna	TESEQ	CBL6111D	31216	Sep. 17, 2023	Sep. 16, 2024	1 year
2	Test Cable	N/A	R-01	N/A	Sep. 25, 2023	Sep. 24, 2024	1 year
3	Test Cable	N/A	R-02	N/A	Sep. 25, 2023	Sep. 24, 2024	1 year
4	EMI Test Receiver	R&S	ESCI-7	101318	Sep. 17, 2023	Sep. 16, 2024	1 year
5	Antenna Mast	EM	SC100_1	N/A	N/A	N/A	N/A
6	Turn Table	EM	SC100	060531	N/A	N/A	N/A
7	50Ω Switch	Anritsu Corp	MP59B	6200983705	Sep. 17, 2023	Sep. 16, 2024	1 year
8	Spectrum Analyzer	Agilent	E4407B	MY45108040	Sep. 18, 2023	Sep. 17, 2024	1 year
9	Horn Antenna	EM	EM-AH-10180	2011071402	Sep. 17, 2023	Sep. 16, 2024	1 year
10	Amplifier	EM	EM-30180	060538	Sep. 17, 2023	Sep. 16, 2024	1 year

HARMONICS AND FILCK

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Harmonic & Flicker	EM TEST	DPA500	0303-04	Sep. 17, 2023	Sep. 16, 2024	1 year

2	AC Power Source	EM TEST	ACS500	0203-01	Sep. 17, 2023	Sep. 16, 2024	1 year
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ESD

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	ESD TEST GENERATOR	SCHAFFNER	NSG438	859	Sep. 17, 2023	Sep. 16, 2024	1 year

RS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Signal Generator	R&S	SMT 06	832080/007	Sep. 26, 2023	Sep. 25, 2024	1 year
2	Log-Bicon Antenna	Schwarzbeck	VULB9161	4022	Sep. 17, 2023	Sep. 16, 2024	1 year
3	Power Amplifier	AR	150W1000M1	320946	Sep. 17, 2023	Sep. 16, 2024	1 year
4	Microwave Horn Antenna	AR	AT4002A	321467	Sep. 17, 2023	Sep. 16, 2024	1 year
5	Power Amplifier	AR	25S1G4A	308598	Sep. 17, 2023	Sep. 16, 2024	1 year

SURGE, EFT/BURST, VOLTAGE INTERRUPTION/DIPS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Surge Generator	EVERFINE	EMS61000-5A	1101002	Sep. 13, 2023	Sep. 12, 2024	1 year
2	DIPS Generator	EVERFINE	EMS61000-11 K	1011002	Sep. 13, 2023	Sep. 12, 2024	1 year
3	EFT/B Generator	EVERFINE	EMS61000-4A-V2	1012005	Sep. 13, 2023	Sep. 12, 2024	1 year

INJECTION CURRENT

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Signal Generator	IFR	2023A	202301/368	Sep. 25, 2023	Sep. 24, 2024	1 year
2	Power Amplifier	AR	75A250AM1	0320709	Sep. 25, 2023	Sep. 24, 2024	1 year
3	CDN	FCC	FCC-801-M2	06043	Sep. 13, 2023	Sep. 12, 2024	1 year
4	EM Clamp	FCC	F-203I-23MM	504	Sep. 13, 2023	Sep. 12, 2024	1 year

2.4.8 MF

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Generator	EVERFINE	EMS61000-8K	1007001	Sep. 17, 2023	Sep. 16, 2024	1 year

3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

3.1.1 POWER LINE CONDUCTED EMISSION (Frequency Range 150KHz-30MHz)

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79.00	66.00	66 - 56 *	56 - 46 *
0.50 -5.0	73.00	60.00	56.00	46.00
5.0 -30.0	73.00	60.00	60.00	50.00

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " Novked band means the limitation decreases linearly with the logarithm of the frequency in the range.

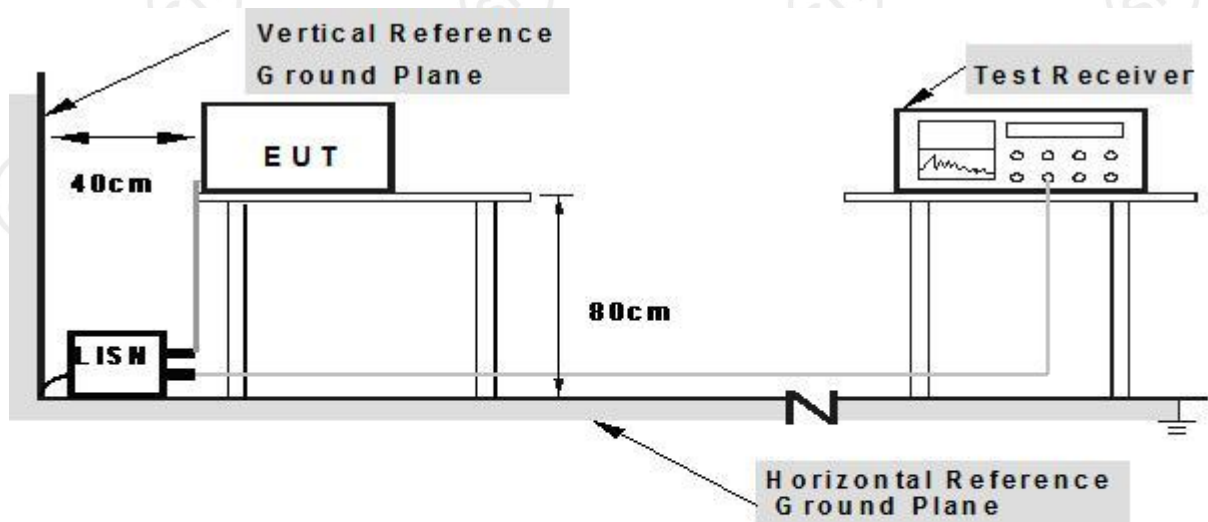
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.1.2 TEST PROCEDURE

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.3 TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.1.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.2 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT (Below 1000MHz)

FREQUENCY (MHz)	Class A (at 10m)	Class B (at 10m)
	dBuV/m	dBuV/m
30 – 230	40	30
230 – 1000	47	37

3.2.2 LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class A (at 10m) dBuV/m		Class B (at 10m) dBuV/m	
	Peak	Avg	Peak	Avg
1000-3000	76	56	70	50
3000-6000	80	60	74	54

Notes:

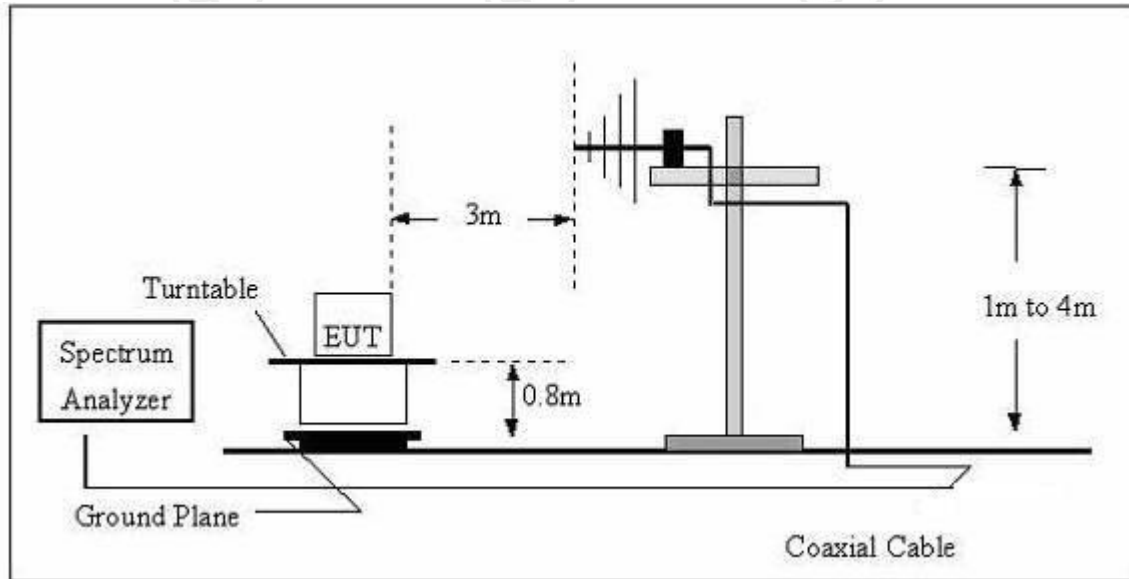
- (1) The limit for radiated test was performed according to as following: EN55032.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

3.2.3 TEST PROCEDURE

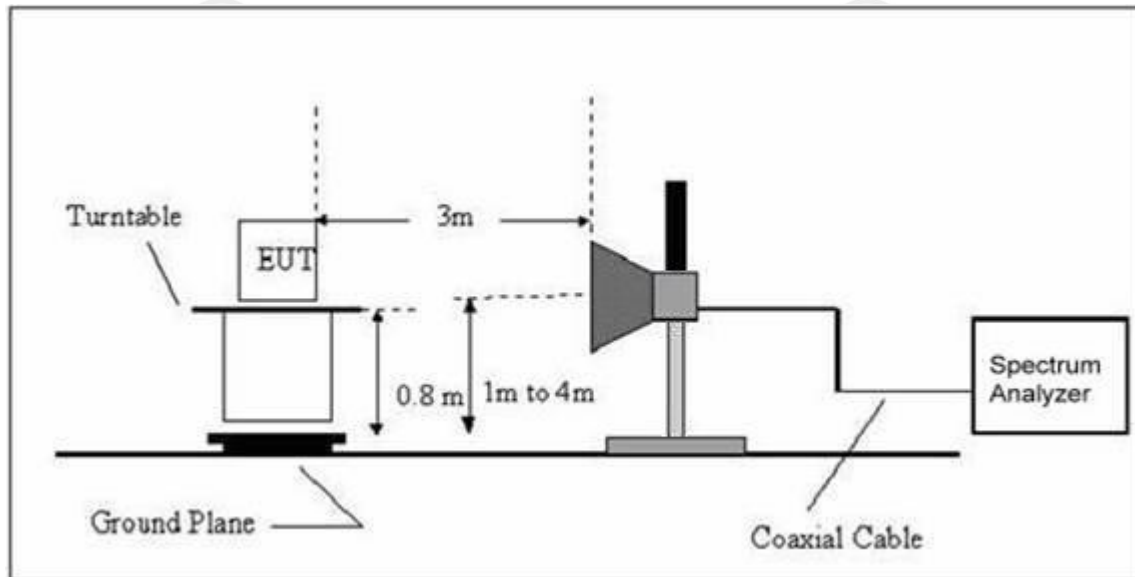
- a. The measuring distance of at 10 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. 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 Novked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.2.4 TEST SETUP

(A) Radiated Emission Test Set-Up Frequency Below 1 GHz



(B) Radiated Emission Test Set-Up Frequency Above 1GHz

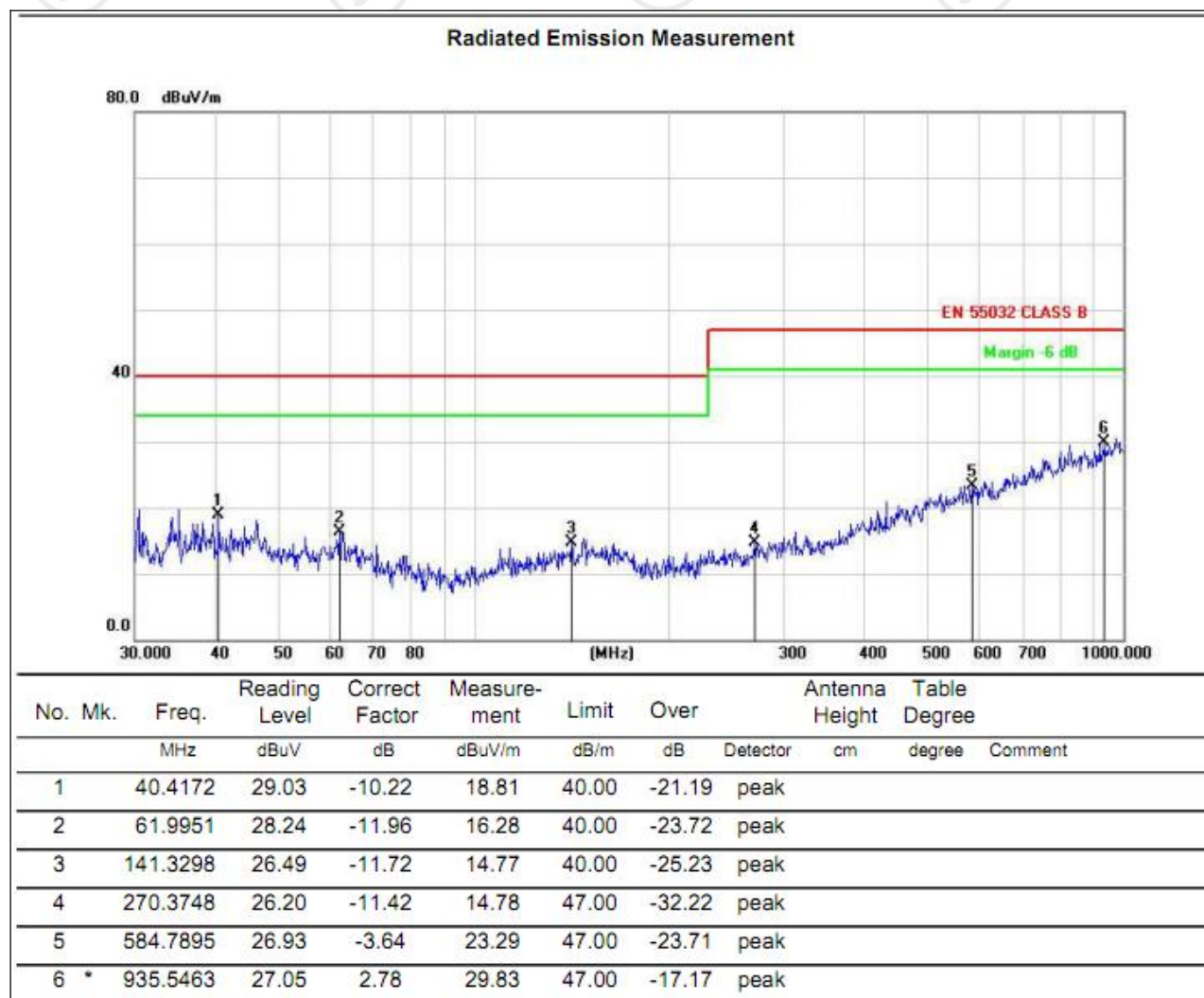


3.2.5 EUT OPERATING CONDITIONS

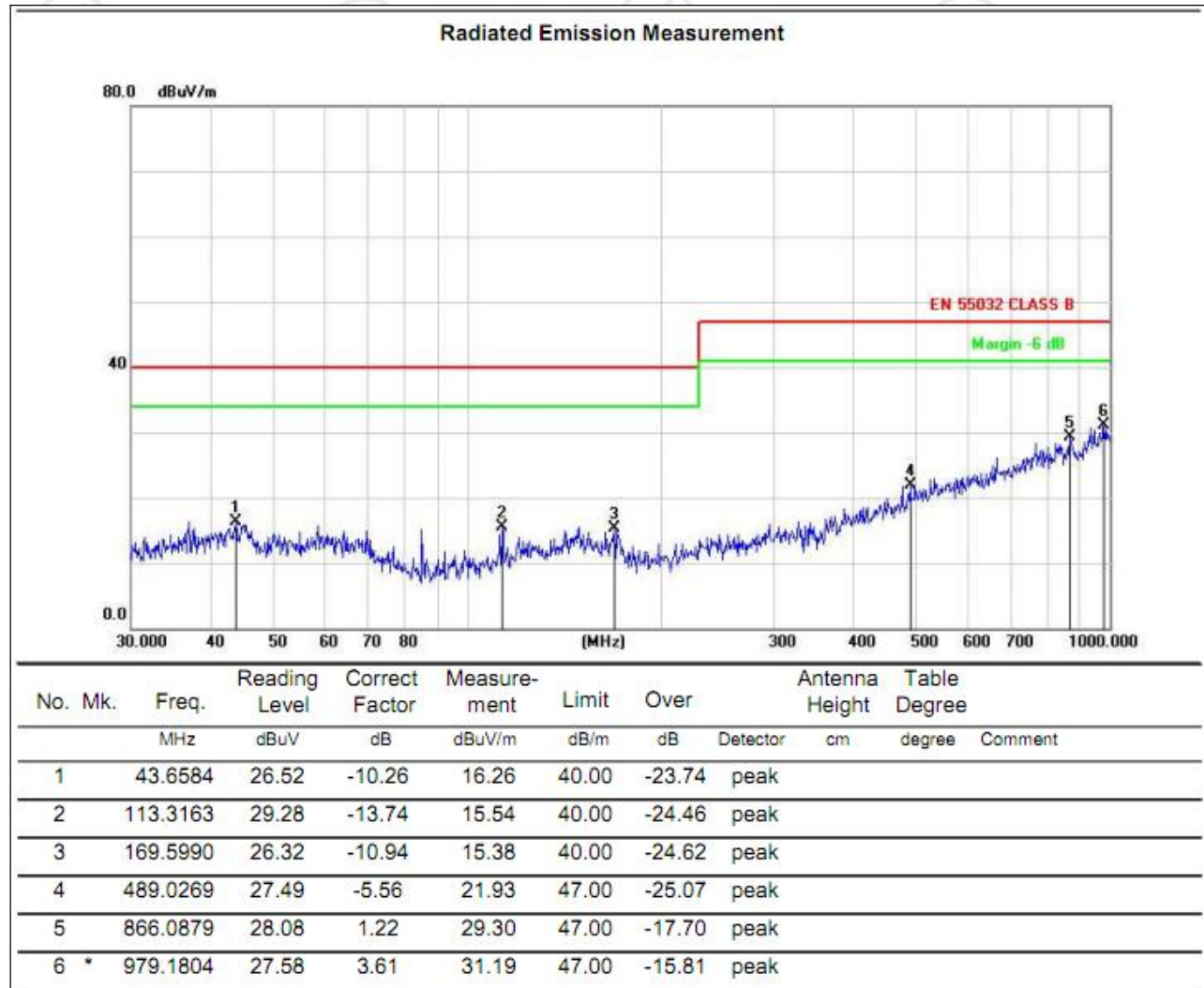
The EUT tested system was configured as the statements of 2.2 Unless otherwise a special operating condition is specified in the follows during the testing.

3.2.6 TEST RESULTS (30-1000MHz)

EUT :	Locator	Model Name :	MO2277
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Horizontal
Test Power :	DC 3V	Test Mode :	Mode 1



EUT :	Locator	Model Name :	MO2277
Temperature :	24 °C	Relative Humidity :	54%
Pressure :	1010 hPa	Polarization :	Vertical
Test Power :	DC 3V	Test Mode :	Mode 1



3.2.7 TEST RESULTS(1000-6000)

EUT :	Locator	Model Name :	MO2277
Temperature :	24 °C	Relative Humidity :	54 %
Pressure :	1010 hPa		
Test Power :	DC 3V	Test Mode :	Mode 1

Polar(H/V)	Frequency	Meter Reading	Factor	Emission level	Limits	Margin	Detector Type
	(Hz)	(dBm)	(dB)	(dBm)	(dBm)	(dB)	
V	1762.84	69.12	-15.21	52.36	70	-17.64	peak
V	1762.84	64.23	-15.21	34.15	50	-15.85	peak
V	2347.65	67.65	-13.31	54.79	70	-15.21	peak
V	2347.65	59.41	-13.31	35.42	50	-14.58	peak
V	3880.27	67.32	-7.13	60.85	74	-13.15	peak
V	3880.27	54.62	-7.13	36.72	54	-17.28	peak
H	1287.33	77.37	-17.84	54.17	70	-15.83	peak
H	1287.33	63.69	-17.84	35.93	50	-14.07	peak
H	2316.28	69.15	-12.96	54.12	70	-15.88	peak
H	2316.28	55.48	-12.96	36.83	50	-13.17	peak
H	3678.52	66.34	-8.85	54.81	74	-19.19	peak
H	3678.52	58.49	-8.85	42.36	54	-11.64	peak

Remark:

Absolute Level=Reading Level+Factor, Margin=Absolute Level-Limit

3.3 HARMONICS CURRENT

3.3.1 LIMITS OF HARMONICS CURRENT

IEC 555-2					
Table - I			Table - II		
Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Ampers)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Ampers)
Non Portable Tools or TV Receivers	Odd Harmonics		TV Receivers	Odd Harmonics	
	3	2.30		3	0.80
	5	1.14		5	0.60
	7	0.77		7	0.45
	9	0.40		9	0.30
	11	0.33		11	0.17
	13	0.21		13	0.12
	15≤n≤39	0.15 · 15/n		15≤n≤39	0.10 · 15/n
	Even Harmonics			Even Harmonics	
	2	1.08		2	0.30
	4	0.43		4	0.15
	8	0.30			
8≤n≤40	0.23 · 8/n	DC	0.05		

EN 61000-3-2/IEC 61000-3-2					
Equipment Category	Max. Permissible Harmonic Current (in Amperes)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in A) (mA/w)	
Class A	Same as Limits Specified in 4-2.1, Table - I, but only odd harmonics required	Class D	3	2.30	3.4
			5	1.14	1.9
			7	0.77	1.0
			9	0.40	0.5
			11	0.33	0.35
			13≤n≤39	see Table I	3.85/n
			only odd harmonics required		

3.3.1.1 TEST PROCEDURE

a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions.

b. The classification of EUT is according to section 5 of EN IEC 61000-3-2: 2000. The EUT is classified as follows:

Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.

Class B: Portable tools. Portable tools.; Arc welding equipment which is not professional equipment.

Class C: Lighting equipment.

Class D: Equipment having a specified power less than or equal to 600W of the following types: Personal computers and personal computer monitors and television receivers.

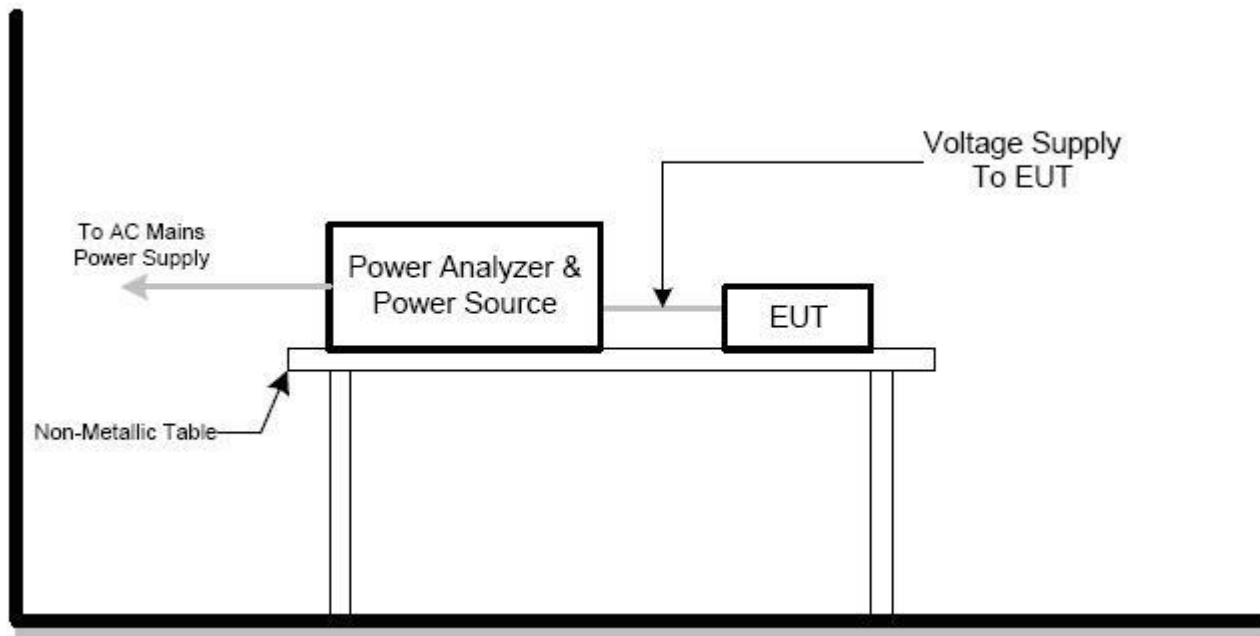
c. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.

d. For the actual test configuration, please refer to the related item –EUT Test Photos.

3.3.1.2 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.2** Unless otherwise a special operating condition is specified in the follows during the testing.

3.3.1.3 TEST SETUP



3.3.2 TEST RESULTS

EUT :	Locator	Model Name :	MO2277
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	N/A
Test Mode	N/A		

Note: The active input power of the EUT is less than 75 W. No limits apply for equipment with an active input power up to and including 75W

3.4 VOLTAGE FLUCTUATION AND FLICKERS

3.4.1 LIMITS OF VOLTAGE FLUCTUATION AND FLICKERS

Tests	Limits		Descriptions
	IEC555-3	IEC/EN 61000-3-3	
Pst	≤ 1.0 , $T_p = 10$ min.	≤ 1.0 , $T_p = 10$ min.	Short Term Flicker Indicator
Plt	N/A	≤ 0.65 , $T_p = 2$ hr.	Long Term Flicker Indicator
dc	$\leq 3\%$	$\leq 3.3\%$	Relative Steady-State V-Chang
dmax	$\leq 4\%$	$\leq 4\%$	Maximum Relative V-change
d (t)	N/A	$\leq 3.3\%$ for > 500 ms	Relative V-change characteristic

3.4.1.1 TEST PROCEDURE

a. Harmonic Current Test:

Test was performed according to the procedures specified in Clause 5.0 of IEC555-2 and/or Sub-clause 6.2 of IEC/EN IEC 61000-3-2 depend on which standard adopted for compliance measurement.

b. Fluctuation and Flickers Test:

Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in Clause 5.0/6.0 of IEC555-3 and/or Clause 6.0/4.0 of IEC/EN 61000-3-3 depend on which standard adopted for compliance measurement.

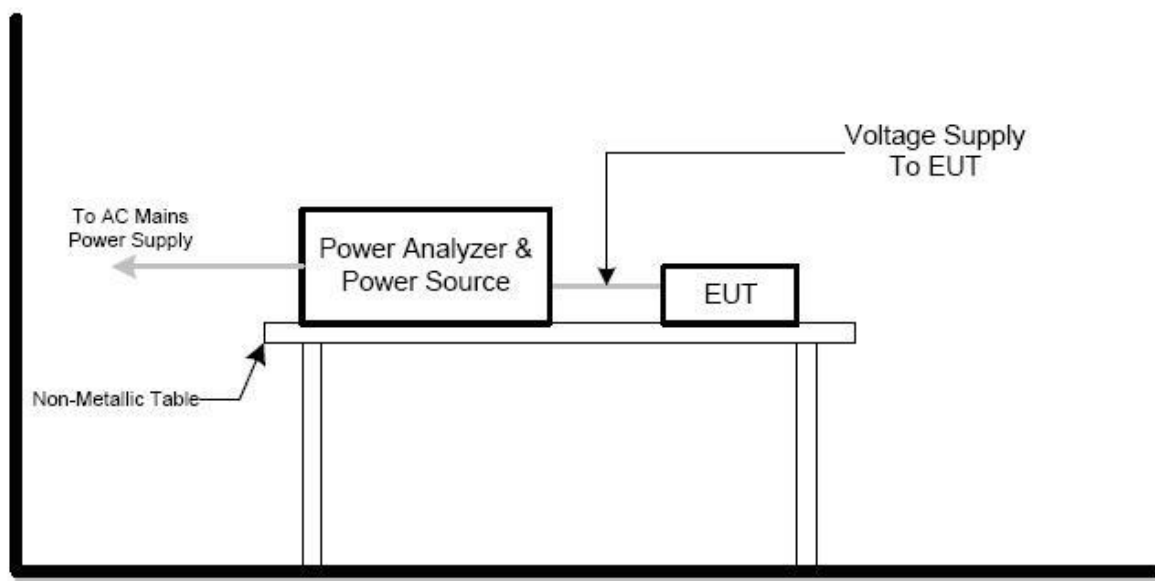
c. All types of harmonic current and/or voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

d. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.4.1.2 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.2 Unless otherwise a special operating condition is specified in the follows during the testing.

3.4.1.3 TEST SETUP



3.4.2 TEST RESULTS

EUT :	Locator	Model Name :	MO2277
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	DC 3V
Test Mode	Mode 1		

Test Parameter	Measurement Value	Limit	ReNovks
P _{st}	0.007	1.0	Pass
P _{It}	0.005	0.65	Pass
T _{dt(s)}	0.031	0.2	Pass
d _{max} (%)	0.00%	4%	Pass
d _c (%)	0.00%	3%	Pass

4. EMC IMMUNITY TEST

4.1. GENERAL PERFORMANCE CRITERIA

4.1.1 PERFORMANCE CRITERIA

According To **EN 301489 -17**standard, The General Performance Criteria As Following:

Criteria	During the test	After the test
A	Shall operate as intended May show degradation of performance (see note 1) Shall be no loss of function Shall be no unintentional transmissions	Shall operate as intended Shall be no degradation of performance (see note 2) Shall be no loss of function Shall be no loss of stored data or user programmable functions
B	May show loss of function (one or more) May show degradation of performance (see note 1) No unintentional transmissions	Functions shall be self-recoverable Shall operate as intended after recovering Shall be no degradation of performance (see note 2) Shall be no loss of stored data or user programmable functions
C	May be loss of function (one or more)	Functions shall be recoverable by the operator Shall operate as intended after recovering Shall be no degradation of performance (see note 2)

NOTE 1: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2: no degradation of performance after the test is understood as any degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

PERFORMANCE FOR TT

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

PERFORMANCE FOR TR

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration for which performance criteria C shall apply. Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

PERFORMANCE FOR CT

The performance criteria A shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an Acknowledgement (ACK) or Not Acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

PERFORMANCE FOR CR

The performance criteria A shall apply. Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

4.2 GENERAL PERFORMANCE CRITERIA TEST SETUP

The EUT tested system was configured as the statements of 2.2 Unless otherwise a special operating condition is specified in the follows during the testing.

4.3 ESD TESTING

4.3.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Required Performance	B
Discharge Voltage:	Air Discharge : 2kV/4kV/8kV (Direct) Contact Discharge : 2kV/4kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: min. 20 times at each test point Contact Discharge: min. 200 times in total
Discharge Mode:	AC Discharge
Discharge Period:	1 second minimum

4.3.2 TEST PROCEDURE

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

- a. Contact discharge was applied to conductive surfaces and coupling planes of the EUT.
During the test, it was performed with single discharges. For the single discharge time between successive single discharges was at least 1 second.
Vertical Coupling Plane (VCP):
The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane.
The four faces of the EUT will be performed with electrostatic discharge.
Horizontal Coupling Plane (HCP):
The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.
The four faces of the EUT will be performed with electrostatic discharge.
- b. Air discharges at insulation surfaces of the EUT.
It was at least ten single discharges with positive and negative at the same selected point.
- c. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Diagram illustrating the test setup for ESD immunity testing. The setup includes a Non-Conductive Table (1.6m x 0.8m) with a height of 80cm. The table is supported by HCP (0.5mm) Isolation Support. The table is connected to a VCP 50 cm x 50 cm and two 470KΩ resistors. The Ground Reference Plane (GRP) is Bonded to PE. The setup is located 1m from the Nearest Wall and 10cm from the ESD Generators. The EUT (Equipment Under Test) is connected to an AC Main and has a Discharge Return Cable to GRP. The ESD Generators are also connected to the EUT and have Discharge Return Cables to GRP.

TABLE-TOP EQUIPMENT

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC/EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

4.3.4 TEST RESULTS

EUT :	Locator	Model Name :	MO2277
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	DC 3V
Test Mode	Mode 1		

Mode	Contact Discharge (Indirect)							Criterion	Result
Test level (kV)	Test Point	2		4		6			
Test Location		+	-	+	-	+	-		
HCP	Front	A	A	A	A			B	PASS
	Rear	A	A	A	A				PASS
	Left	A	A	A	A				PASS
	Right	A	A	A	A				PASS
VCP	Front	A	A	A	A				PASS
	Rear	A	A	A	A				PASS
	Left	A	A	A	A				PASS
	Right	A	A	A	A				PASS

Mode	Air Discharge								Contact Discharge								Obser vation	Criterion	Result
Test level (kV)	2		4		8		15		2		4		6		8				
Test Location	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-			
Screw									A	A	A	A					PASS		
enclosure	A	A	A	A	A	A											PASS		

4.4 RS TESTING

4.4.1 TEST SPECIFICATION

Basic Standard:	IEC/EN IEC 61000-4-3
Required Performance	A
Frequency Range:	80 MHz - 1000 MHz ,1400MHz-2700MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5 m
Dwell Time:	at least 3 seconds

4.4.2 TEST PROCEDURE

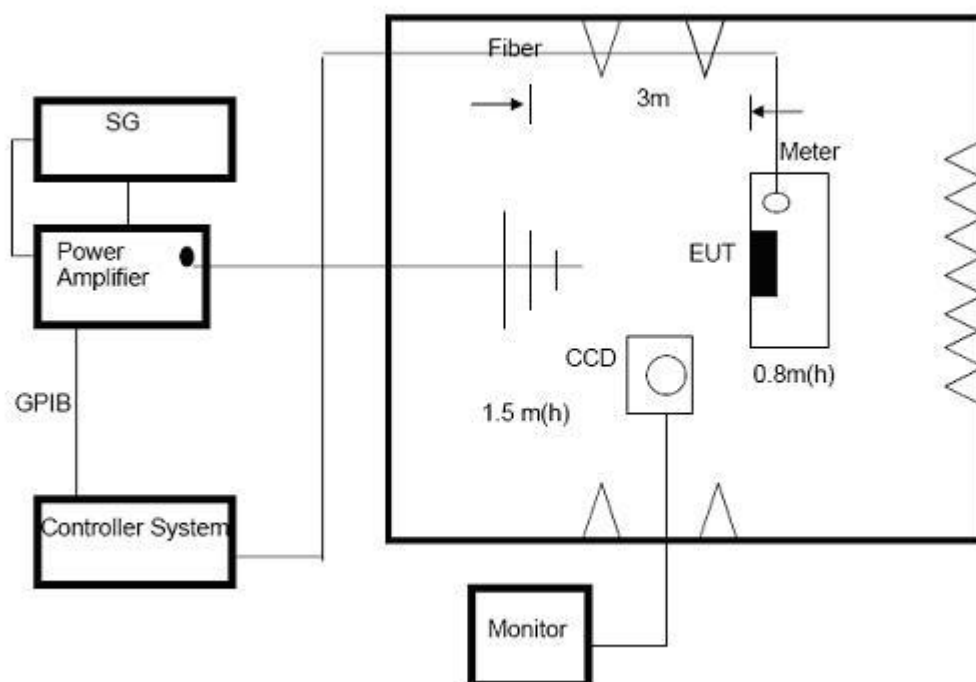
The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber.

The testing distance from antenna to the EUT was 3 meters.

The other condition as following manner:

- The field strength level was 3V/m.
- The frequency range is swept from 80 MHz to 1000 MHz, & 1400MHz - 2700MHz with the signal 80%amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5x 10-3 decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- Sweep Frequency 900 MHz, with the Duty Cycle:1/8 and Modulation: Pulse 217 Hz(if applicable)
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.4.3 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN IEC 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN IEC 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

4.4.4 TEST RESULTS

EUT :	Locator	Model Name :	MO2277
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	DC 3V
Test Mode	Mode 1		

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Azimuth	Observation	Perform. Criteria	Results	Judgment
80~1000 1400-2700	H / V	3 V/m (rms) AM Modulated 1000Hz, 80%	Front	CT,CR	A	A	PASS
			Rear				
			Left				
			Right				

Note:

- 1) There was no change operated with initial operating during the test.
- 2) There was not any unintentional transmission in standby mode

4.5 EFT/BURST TESTING

4.5.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-4
Required Performance	B
Test Voltage:	Power Line : 1 kV Signal/Control Line : 0.5 KV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave shape :	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	Not less than 1 min.

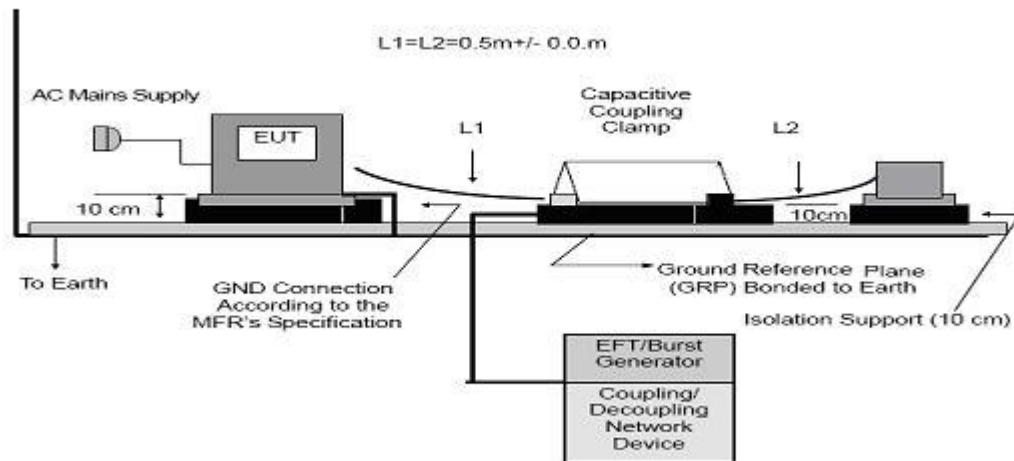
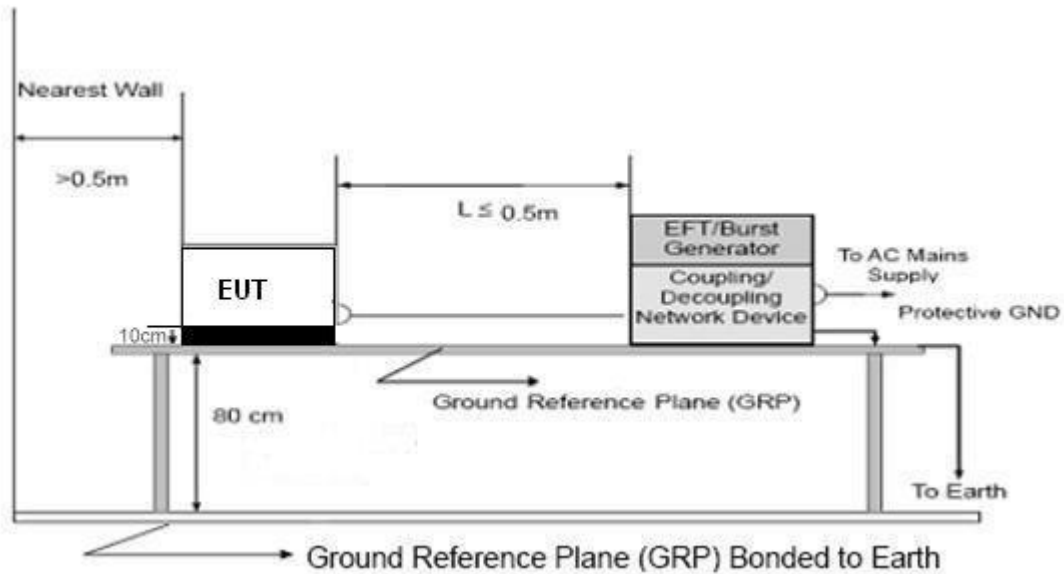
4.5.2 TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.

The other condition as following manner:

- The length of power cord between the coupling device and the EUT should not exceed 1 meter.
- Both positive and negative polarity discharges were applied.
- The duration time of each test sequential was 1 minute
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.5.3 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table (0.8m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

4.5.4 TEST RESULTS

EUT :	Locator	Model Name :	MO2277
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	DC 3V
Test Mode	Mode 1		

Coupling Line		Test level (kV)								Observation	Criterion	Result
		0.5		1		2		4				
		+	-	+	-	+	-	+	-			
AC line	L	A	A	A	A					TT,TR	B	N/A
	N	A	A	A	A							N/A
	PE											
	L+N	A	A	A	A							N/A
	L+PE											
	N+PE											
	L+N+PE											
DC Line												
Signal Line												

4.6 SURGE TESTING

4.6.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-5
Required Performance	B
Wave-Shape:	Combination Wave 1.2/50 us Open Circuit Voltage 8 /20 us Short Circuit Current
Test Voltage:	Power Line : 0.5 kV, 1 kV, 2kV
Surge Input/Output:	L-N, L-PE, N-PE
Generator Source:	2 ohm between networks
Impedance:	12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0 /90/180/270
Pulse Repetition Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

4.6.2 TEST PROCEDURE

a. For EUT power supply:

The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2meters in length (or shorter).

b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT:

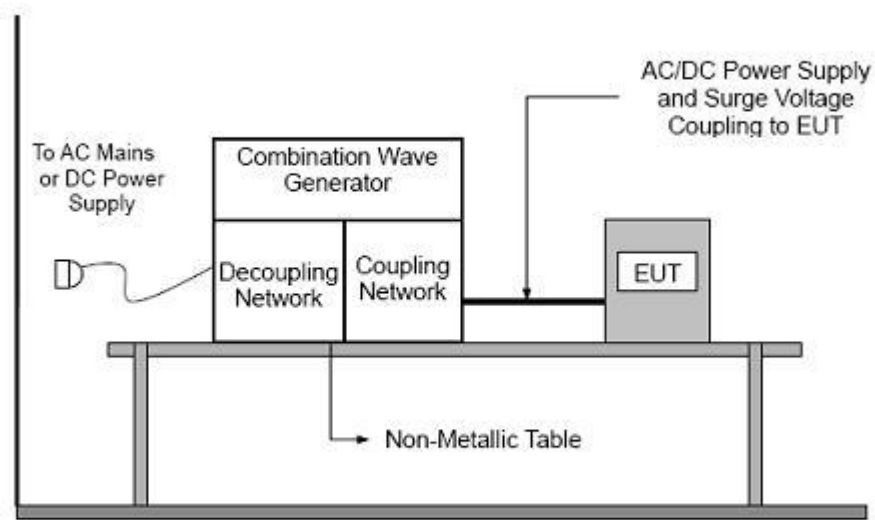
The surge is applied to the lines via the capacitive coupling. The coupling /decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

c. For test applied to unshielded symmetrically operated interconnection /telecommunication lines of EUT:

The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrester cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

d. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.6.3 TEST SETUP



4.6.4 TEST RESULTS

EUT :	Locator	Model Name :	MO2277
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	DC 3V
Test Mode	Mode 1		

Coupling Line			Test level								Observation	Criterion	Result
			0.5 kV		1 kV		2 kV		4 kV				
			+	-	+	-	+	-	+	-			
AC line	L-N	0°	A	A	A	A					TT,TR	B	N/A
		90°	A	A	A	A							
		180°	A	A	A	A							
		270°	A	A	A	A							
	L-PE	0°											
		90°											
		180°											
		270°											
	N-PE	0°											
		90°											
		180°											
		270°											
DC Line													
Signal Line													

Note:

- 1) There was not any unintentional transmission in standby mode

4.7 INJECTION CURRENT TESTING

4.7.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-6
Required Performance	A
Frequency Range:	0.15 MHz - 80 MHz
Field Strength:	3 Vr.m.s.
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Dwell Time:	at least 3 seconds

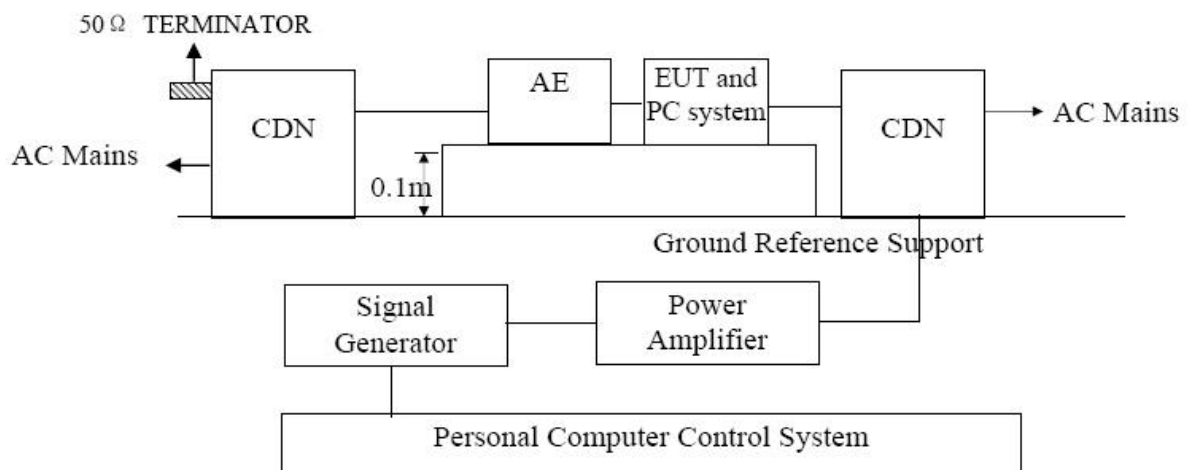
4.7.2 TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.

The other condition as following manner:

- The field strength level was 3V.
- The frequency range is swept from 150 KHz to 80 MHz, with the signal 80%amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.7.3 TEST SETUP



For the actual test configuration, please refer to the related Item –EUT Test Photos.

NOTE:

FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

4.7.4 TEST RESULTS

EUT :	Locator	Model Name :	MO2277
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	DC 3V
Test Mode	Mode 1		

Test Ports (Mode)	Freq. Range MHz)	Field Strength	Observation	Perform. Criteria	Results	Judgment
Input/ Output AC. Power Port	0.15 ---80	3V(rms) AM Modulated 1000Hz, 80%	CT, CR	N/A	N/A	N/A
Input/ Output DC. Power Port	0.15 --- 80		N/A	N/A	N/A	N/A
Signal Line	0.15 --- 80		N/A	N/A	N/A	N/A

Note:

There was not any unintentional transmission in standby mode.

4.8 VOLTAGE INTERRUPTION/DIPS TESTING

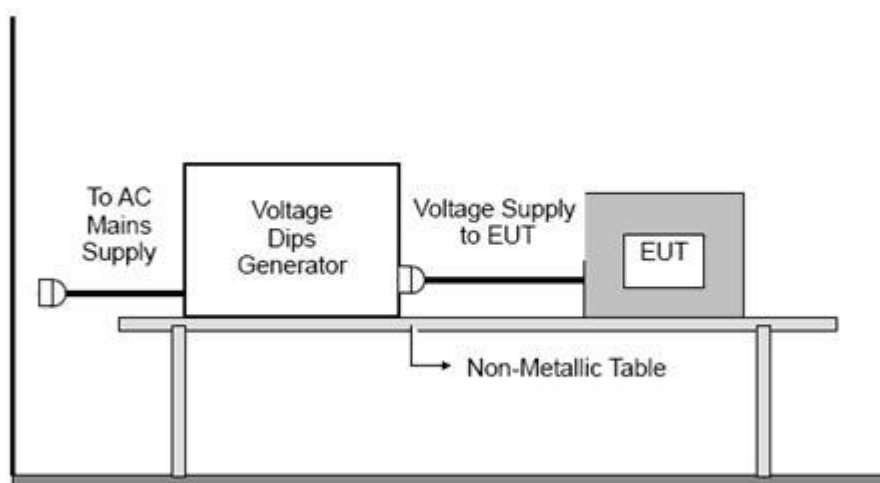
4.8.1 TEST SPECIFICATION

Basic Standard:	IEC/EN IEC 61000-4-11
Required Performance	100% reduction, 0.5 Cycle 100% reduction, 1.0 Cycle 30% reduction, 25 Cycles
Voltage Interruptions:	100% reduction, 250 Cycles
Test Duration Time:	Minimum three test events in sequence
Interval between Event:	Minimum ten seconds
Phase Angle:	0°/45°/90°/135°/180°/225°/270°/315°/360°
Test Cycle:	3 times

4.8.2 TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

4.8.3 TEST SETUP

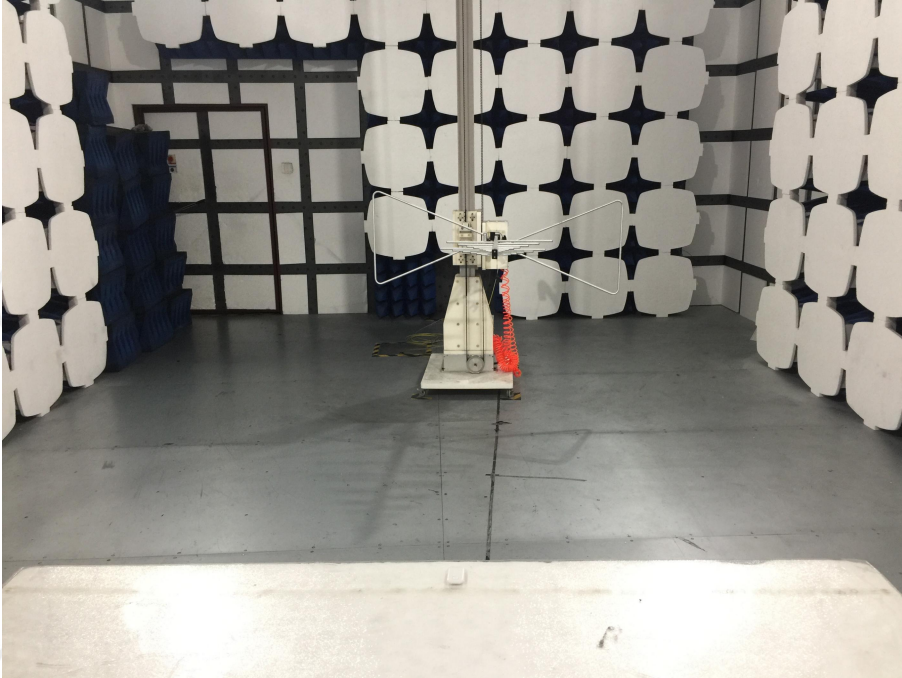


For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.8.4 TEST RESULTS

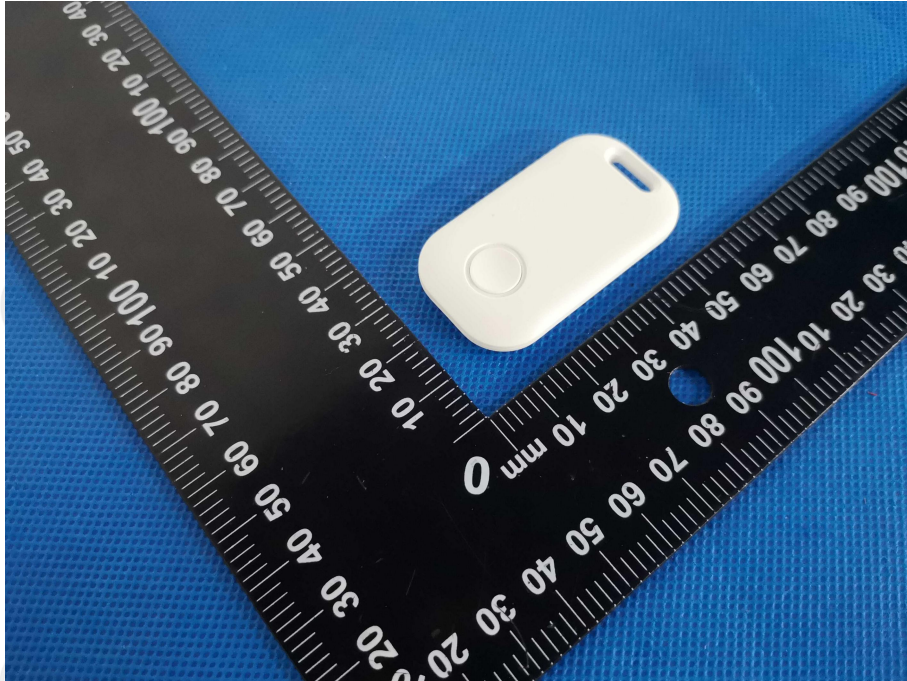
EUT :	Locator	Model Name :	MO2277
Temperature :	25 °C	Relative Humidity :	45%
Pressure :	1010 hPa	Test Power :	DC 3V
Test Mode	Mode 1		

Voltage Reduction	Duration (ms)	Observation	Perform Criteria	Results	Judgment
Voltage dip 0%	10	TT, TR	B	A	N/A
Voltage dip 0%	20	TT, TR	B	A	N/A
Voltage dip 70%	500	TT, TR	B	A	N/A
Voltage interruptions	5000	TT, TR	C	B	N/A

5. EUT TEST PHOTO**Radiated Measurement Photos**

6. PHOTOGRAPHS OF EUT

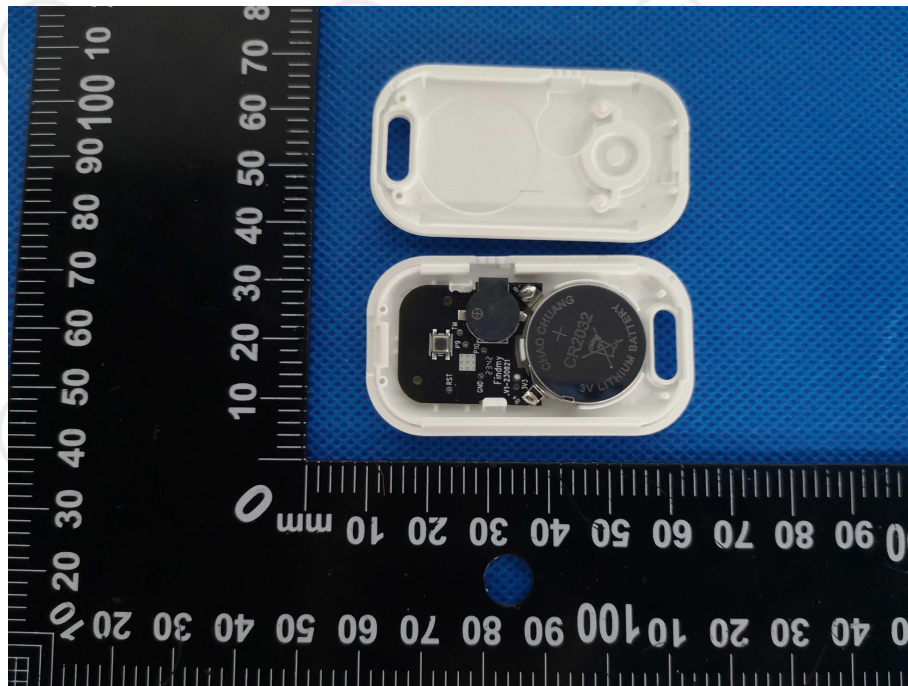
Appearance photograph of EUT



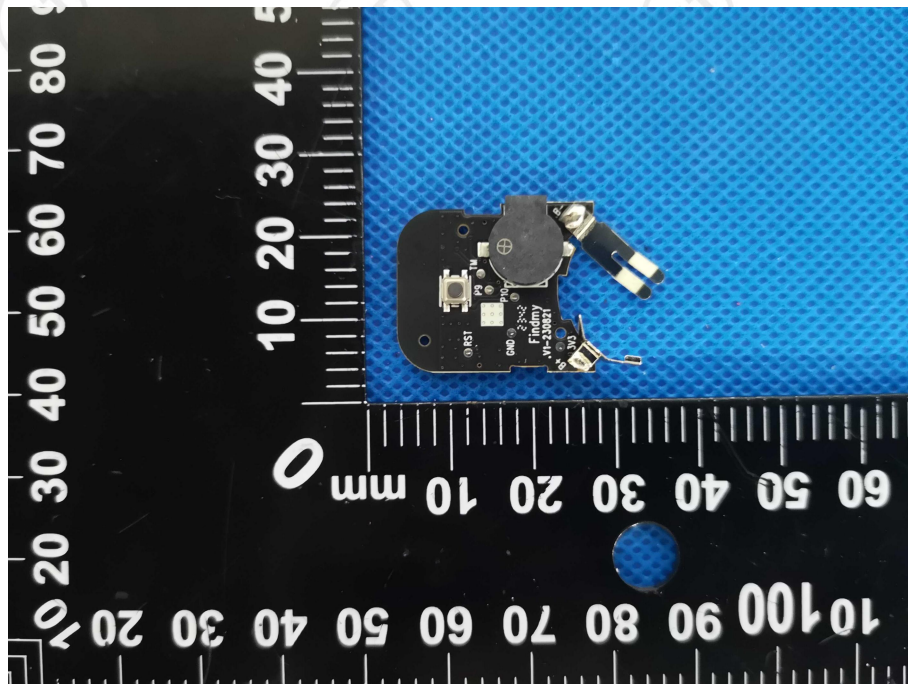
Appearance photograph of EUT

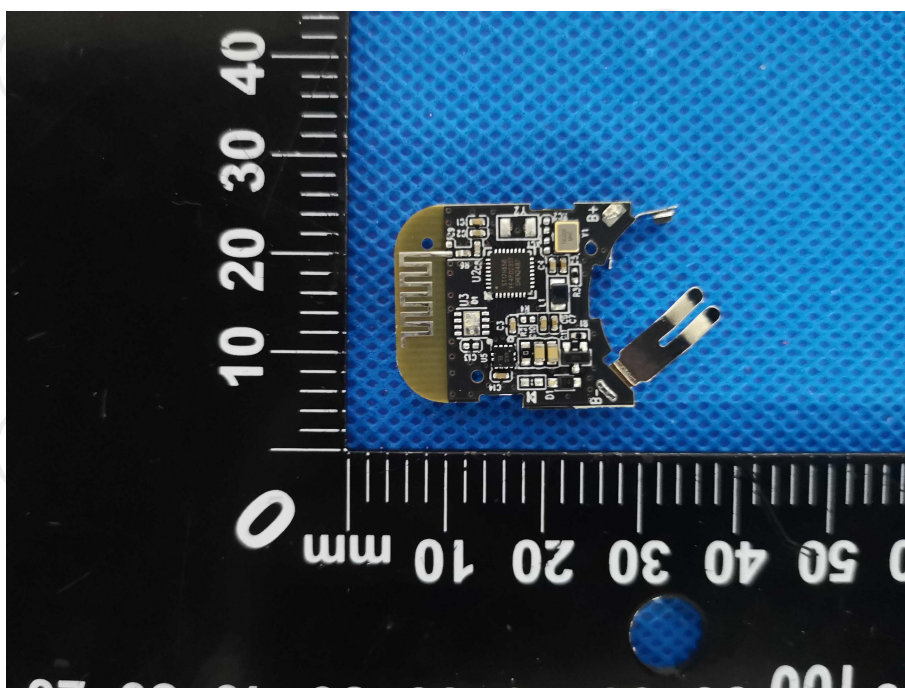


Appearance photograph of EUT



Appearance photograph of EUT



Appearance photograph of EUT

.....End of Report.....