



# EMC TEST REPORT

Report No: FCS202312153E01

Issued for

Applicant:	Mid Ocean Brands B.V.
Address:	7/F, Kings Tower, 111 King Lam Street, Cheung Sha Wan, Kowloon, Hong Kong.
Product Name:	Wireless Charger
Brand Name:	N/A
Model Name:	MO2242
Series Model:	N/A
Test Standard:	EN 55032:2015+A1:2020 EN 55035:2017+A11:2020 ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.1.1 (2019-03)
Issued By: Flux Compliance Service Laboratory Add: Room 105 Floor Bao hao Technology Building 1 NO.15 Gong ye West Road Hi-Tech Industrial, Song shan lake Dongguan Tel: 769-27280901 Fax:769-27280901 <a href="http://www.fcs-lab.com">http://www.fcs-lab.com</a>	

**TEST RESULT CERTIFICATION**

Applicant's Name.....: Mid Ocean Brands B.V.

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

Manufacture's Name.....: Mid Ocean Brands B.V.

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

**Product Description**

Product Name.....: Wireless Charger

Brand Name .....: N/A

Model Name.....: MO2242

Series Model.....: N/A

Test Standards.....: EN 55032:2015+A1:2020  
EN 55035:2017+A11:2020  
ETSI EN 301 489-1 V2.2.3 (2019-11)  
ETSI EN 301 489-3 V2.1.1 (2019-03)

This device described above has been tested by FCS, and the test results show that the equipment under test (EUT) is in compliance with the 2014/53/EU RED Directive 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.: Dec 10, 2023 ~ Dec 15 2023

Date of Issue.....: Dec 15, 2023

Test Result.....: Pass

Tested by : \_\_\_\_\_

*Sam Wang*

(Sam Wang)

Reviewed by : \_\_\_\_\_

*Duke Qian*

(Duke Qian)

Approved by : \_\_\_\_\_

*Jack Wang*

(Jack Wang)





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**Revision History**

Rev.	Issue Date	Report NO.	Effect Page	Contents
00	Dec 15. 2023	FCS202312153E01	N/A	N/A

## 1. TEST SUMMARY

Test procedures according to the technical standards:

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

ETSI EN 301 489-3 V2.1.1 (2019-03)

EMC Emission				
Standard	Test Item	Limit	Judgment	Remark
EN 55032:2015+A11:2020 EN 55035:2017+A11:2020	Conducted Emission On AC And Telecom Port 150kHz to 30MHz	Class B	PASS	
	Radiated Emission 30MHz to 1000MHz	Class B	N/A	
	Radiated Emission 1GHz to 6GHz	Class B	PASS	NOTE (1)
EN 61000-3-2:2019/A1:2021	Harmonic Current Emission	Class A	N/A	NOTE (2)
EN 61000-3-3:2013+A1:2019	Voltage Fluctuations & Flicker	-----	N/A	
EMC Immunity				
Section	Test Item	Performance Criteria	Judgment	Remark
EN 61000-4-2:2009	Electrostatic Discharge	B	PASS	
EN IEC 61000-4-3:2020	RF electromagnetic field	A	PASS	
EN 61000-4-4:2012	Fast transients	B	PASS	
EN 61000-4-5:2014/A1:2017	Surges	B	PASS	
EN 61000-4-6:2014	Injected Current	A	PASS	
EN 61000-4-8:2010	Volt. Interruptions Volt. Dips	B / C / C / C	PASS	NOTE (3)

Note:

(1) If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.

If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.

If the highest frequency of the internal sources of the EUT is between 500 MHz and 1GHz, measurement shall only be made up to 5 GHz.

If the highest frequency of the internal sources of the EUT is above 1 GHz, the Measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

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

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

(4) cription, the test will not be executed.

## 1.1 TEST FACTORY

Company Name:	Dongguan Funas Testing Technology Co., Ltd.
Address:	Room 105, 1/F.. Baohao Technology Building 1, No.15, Gongye West Road.Songshan Lake Hi-Tech Industrial Area, Dongguan, Guangdong, China

## 1.2 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
EACC01	ANSI	9KHz-150KHz	2.88	
		150 KHz ~ 30MHz	2.67	

### B. Radiated Measurement :

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
EACC02	ANSI	30MHz ~ 200MHz	3.73	
		200MHz ~ 1000MHz	3.92	
		1GHz ~ 6 GHz	3.31	

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Product Name	Wireless Charger
Brand Name	N/A
Model Name	MO2242
Series Model	N/A
Model Difference	N/A
Power Supply	Input: 5V2A 9V/2A Output:5W/7.5W/10W/15W(Max)
Hardware version number	V1.0
Software version number	V1.0

## 2.2 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	Full load

Note: The test modes were carried out for all operation modes(include link and idle).

The worst test mode for the final conducted data of EUT is Mode 2 and the worst test mode for radiation data is Mode 5, test data display.

## 2.3 DESCRIPTION OF TEST SETUP

System Diagram of Connections Between EUT and Simulators



## 2.4 MEASUREMENT INSTRUMENTS LIST

### 2.4.1 CONDUCTED TEST SITE

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last Calibration	Calibrated Until
EMI Test Receiver	R&S	ESCI	101427	2023.08.29	2024.08.28
LISN	R&S	ENV216	101242	2023.08.29	2024.08.28
LISN	ETS	3810/2NM	00023625	2023.08.29	2024.08.28
Absorbing Clamp	R&S	MDS-21	100668	2023.08.29	2024.08.28
CE Cable	N/A	C01	N/A	2023.08.29	2024.08.28
Temperature & Humidity	Mieo	HH660	N/A	2023.08.29	2024.08.28
Testing Software	EZ-EMC(Ver.STSLAB-03A1 CE)				

### 2.4.2 RADIATED TEST SITE

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last Calibration	Calibrated Until
EMI Test Receiver	R&S	ESCI	101427	2023.08.29	2024.08.28
Bi-log Antenna	TESEQ	CBL6111D	34678	2023.08.29	2024.08.28
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1343	2023.08.29	2024.08.28
Pre-amplifier(1G-18G)	SKET	LNPA-01018G-45	SK2018080901	2023.08.29	2024.08.28
Pre-amplifier(0.1M-3GHz)	EM	EM330	060665	2023.08.29	2024.08.28
Spectrum Analyzer	Agilent	N9020A	MY49100060	2023.08.29	2024.08.28
RE Cable (9K-1G)	N/A	R01	N/A	2023.08.29	2024.08.28
RE Cable (1G-18G)	N/A	R02	N/A	2023.08.29	2024.08.28
Temperature & Humidity	Mieo	HH660	N/A	2023.08.29	2024.08.28
Testing Software	EZ-EMC(Ver.STSLAB-03A1 RE)				

### 2.4.3 HARMONICS AND FLICKER

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Harmonic Voltage & Flicker	LAPLACE	AC 2000A	311217	2023.08.29	2024.08.28
AC Power Source	MTONI	PHF-5010	631169	2023.08.29	2024.08.28
Universal Radio Communication Tester	R&S	CMW500	117239	2023.08.29	2024.08.28

### 2.4.4 ESD

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
ESD TEST GENERATOR	HAEFELY	ONYX 16	173835	2023.08.29	2024.08.28
Universal Radio Communication Tester	R&S	CMW500	117239	2023.08.29	2024.08.28

## 2.4.5 SURGE, EFT/BURST, VOLTAGE INTERRUPTION/DIPS

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
Surger Generator	HTEC	HCWG 10	152101	2023.08.29	2024.08.28
Surger Generator	HTEC	TC0B4	143903	2023.08.29	2024.08.28
VOLTAGE DIPS & INTERRUPTIONS Generator	HAEFELY	ECOMPACT4	4770290/00	2023.08.29	2024.08.28
EFT/B Generator	HTEC	HEFT 51	143801	2023.08.29	2024.08.28
Universal Radio Communication Tester	R&S	CMW500	117239	2023.08.29	2024.08.28

## 2.4.6 RS

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
RF Relay matrix tsj	TSJ	RFM-S621	04261	2023.08.29	2024.08.28
Power meter	Agilent	E4419B	MY45102079	2023.08.29	2024.08.28
Power Sensor	Agilent	8481A	MY41097696	2023.08.29	2024.08.28
Power Sensor	Agilent	8481A	MY41097697	2023.08.29	2024.08.28
Signal Generator	Agilent	N5182A	MY46240556	2023.08.29	2024.08.28
Power Amplifier	MICOTOP	MPA-80-1000-250	1711488	2023.08.29	2024.08.28
Power Amplifier	MICOTOP	MPA-1000-3000-75	MPA1706275	2023.08.29	2024.08.28
Logarithmic-periodic Antenna	Schwarzbeck	VULP9118E	820	2023.08.29	2024.08.28
Microwave Horn Antenna	Schwarzbeck	BBHA 9120LF	F01008	2023.08.29	2024.08.28
Universal Radio Communication Tester	R&S	CMU200	111764	2023.08.29	2024.08.28
Universal Radio Communication Tester	R&S	CMW500	117239	2023.08.29	2024.08.28
Audio Analyzer	R&S	UPV	100419	2023.08.29	2024.08.28
Power Amplifier	MICOTOP	MPA-3000-6000-50	1711489	2023.08.29	2024.08.28

## 2.4.7 INJECTION CURRENT

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
CS	SCHLODER	CDG-6000-25	126A1280/2014	2023.08.29	2024.08.28
CDN	Frankonia	CDN-M2+3	A2210275/2014	2023.08.29	2024.08.28
EM Clamp	SCHLODER	EMCL-20	132A1283	2023.08.29	2024.08.28
Attenuator	Nemtest	ATT-6DB-100	A100W224	2023.08.29	2024.08.28
Audio Power Amplifier	B&K	2716-C-001	2610976	2023.08.29	2024.08.28
Mouth Simulator	B&K	4227	2630621	2023.08.29	2024.08.28
Sound Calibrator	B&K	4231	2637486	2023.08.29	2024.08.28
1/2" Pressure-field Microphone	B&K	4192	2641678	2023.08.29	2024.08.28
Ear Simulator for Telephonometry	B&K	4185	2553612	2023.08.29	2024.08.28
Telephone Test Head	B&K	4185	2631728	2023.08.29	2024.08.28
Universal Radio Communication Tester	R&S	CMU200	111764	2023.08.29	2024.08.28
Audio Analyzer	R&S	UPV	100419	2023.08.29	2024.08.28
Universal Radio Communication Tester	R&S	CMW500	117239	2023.08.29	2024.08.28

## 2.4.8 PFMF

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
MF Generator	HTEC	HMFG-COMB	143903	2023.08.29	2024.08.28
Magnetic field coil	HTEC	HCOIL 100	143808	2023.08.29	2024.08.28
Universal Radio Communication Tester	R&S	CMW500	117239	2023.08.29	2024.08.28

### 3. EMC EMISSION TEST

#### 3.1 CONDUCTED EMISSION MEASUREMENT

##### 3.1.1 REQUIREMENTS FOR CONDUCTED EMISSIONS FROM THE AC MAINS POWER PORTS OF THE CLASS A EQUIPMENT

FREQUENCY (MHz)	Coupling device	Detector type / bandwidth	Class A limits dB( $\mu$ V)
0.15 - 0.5	AMN	Quasi Peak / 9 kHz	79
0.50 - 30			63
0.15 - 0.5	AMN	Average / 9 kHz	66
0.50 - 30			60

##### 3.1.2 REQUIREMENTS FOR CONDUCTED EMISSIONS FROM THE AC MAINS POWER PORTS OF THE CLASS B EQUIPMENT

FREQUENCY (MHz)	Coupling device	Detector type / bandwidth	Class B limits dB( $\mu$ V)
0.15 - 0.5	AMN	Quasi Peak / 9 kHz	66 - 56*
0.50 - 5			56
5 - 30			60
0.15 - 0.5	AMN	Average / 9 kHz	56 - 46*
0.50 - 5			46
5 - 30			50

Note:

- C. The tighter limit applies at the band edges.
- D. The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

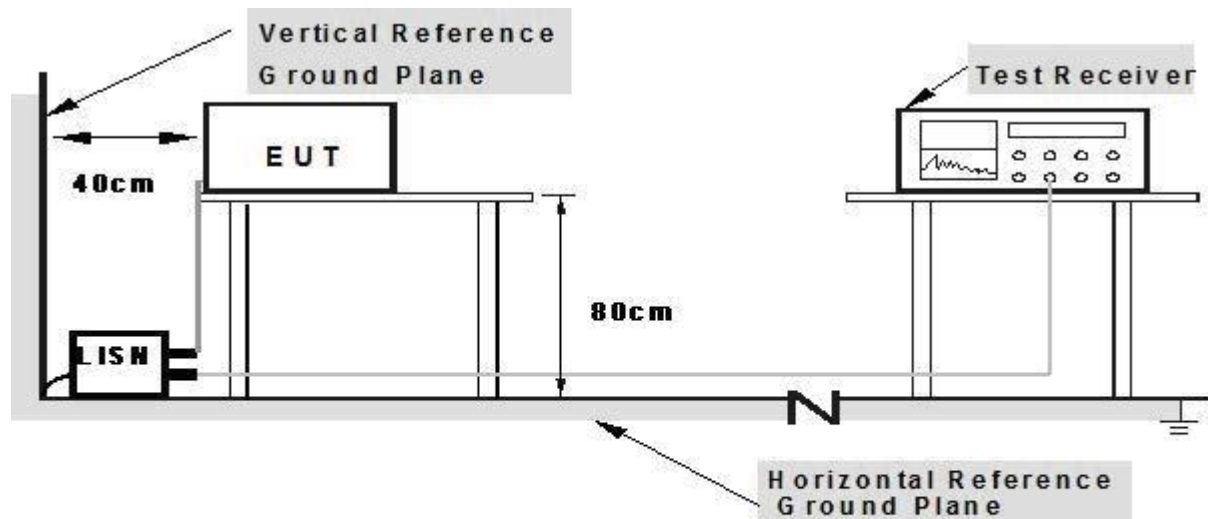
The following table is the setting of the receiver

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

### 3.1.3 TEST PROCEDURE

- The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment 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.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

#### • 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 2.3 Unless otherwise a special operating condition is specified in the following during the testing.

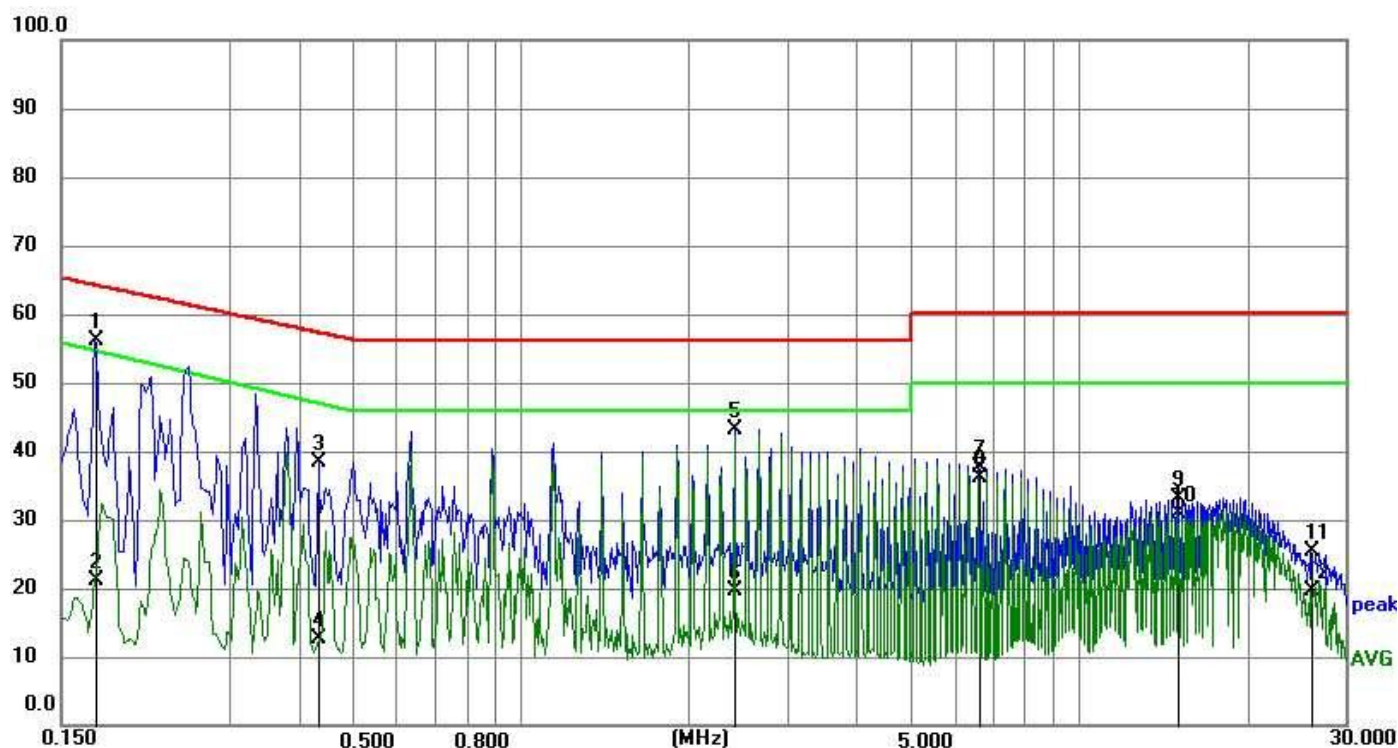
### 3.1.5 TEST RESULTS

Temperature:	25.3℃	Relative Humidity:	62%
Phase:	L	Test Mode:	Mode 1
Test Voltage:	DC 9V		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1725	46.12	10.11	56.23	63.96	7.73	QP
2	0.1725	10.94	10.11	21.05	54.84	33.79	AVG
3	0.4335	28.48	10.02	38.50	57.07	18.57	QP
4	0.4335	2.55	10.02	12.57	47.19	34.62	AVG
5	2.4135	33.25	9.96	43.21	56.00	12.79	QP
6	2.4135	9.71	9.96	19.67	46.00	26.33	AVG
7	6.6075	27.74	9.84	37.58	60.00	22.42	QP
8	6.6075	26.32	9.84	36.16	50.00	13.84	AVG
9	14.9910	23.28	9.81	33.09	60.00	26.91	QP
10	14.9910	21.18	9.81	30.99	50.00	19.01	AVG
11	26.0430	15.49	9.91	25.40	60.00	34.60	QP

Remark:

(A) All readings are Quasi-Peak and Average values.



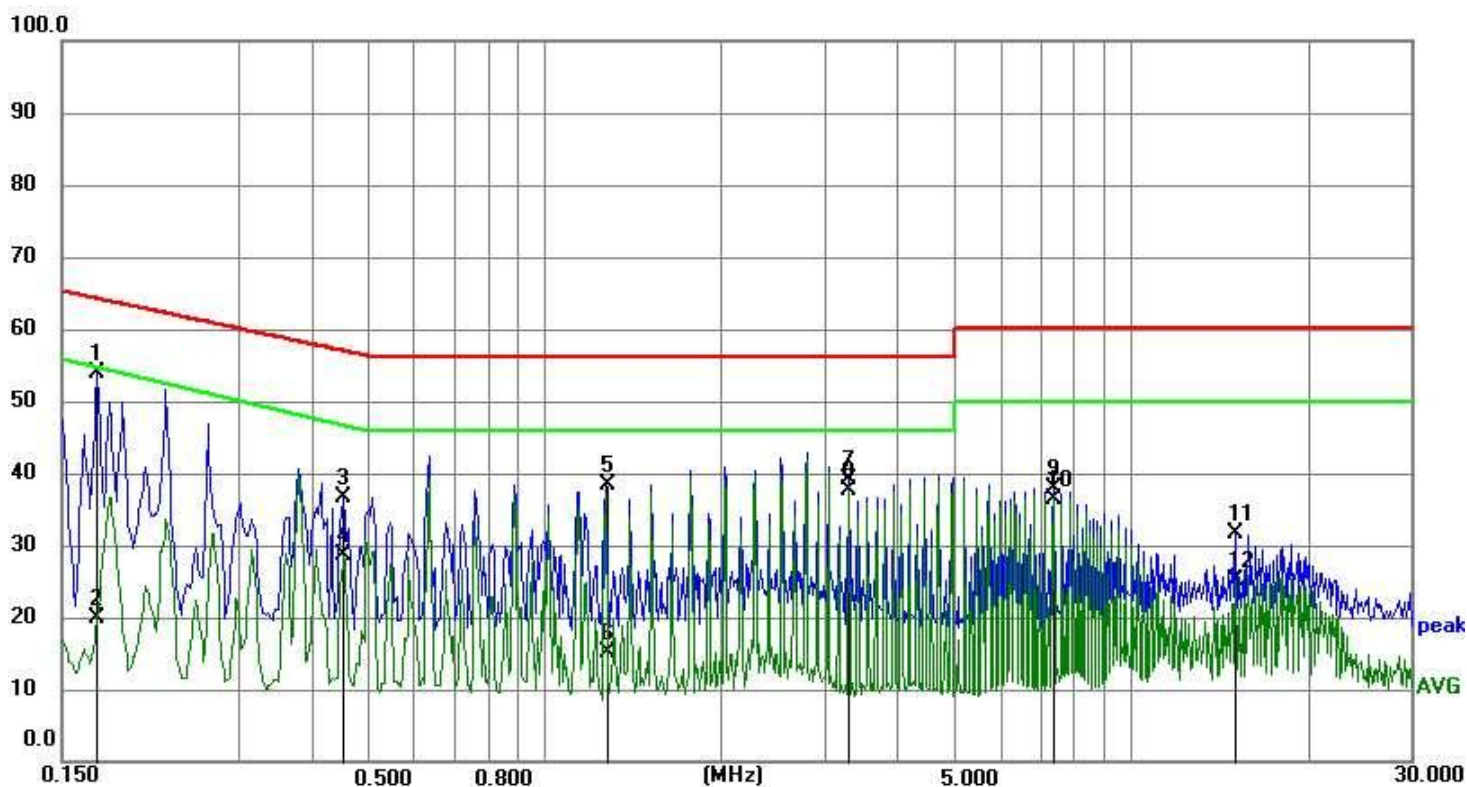


Temperature:	25.3°C	Relative Humidity:	62%
Phase:	N	Test Mode:	Mode 1
Test Voltage:	DC 9V		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1725	43.81	10.07	53.88	63.96	10.08	QP
2	0.1725	9.78	10.07	19.85	54.84	34.99	AVG
3	0.4560	26.70	10.01	36.71	56.69	19.98	QP
4	0.4560	18.53	10.01	28.54	46.77	18.23	AVG
5	1.2705	28.40	9.98	38.38	56.00	17.62	QP
6	1.2705	5.17	9.98	15.15	46.00	30.85	AVG
7	3.3045	29.17	9.93	39.10	56.00	16.90	QP
8	3.3045	27.68	9.93	37.61	46.00	8.39	AVG
9	7.3680	27.97	9.83	37.80	60.00	22.20	QP
10	7.3680	26.57	9.83	36.40	50.00	13.60	AVG
11	15.1170	21.86	9.82	31.68	60.00	28.32	QP
12	15.1170	15.27	9.82	25.09	50.00	24.91	AVG

Remark:

1. All readings are Quasi-Peak and Average values.



### 3.2 RADIATED EMISSION MEASUREMENT

#### 3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT (Below 1000MHz)

FREQUENCY (MHz)	Class A		Class B	
	At 10m	At 3m	At 10m	At 3m
	dBuV/m	dBuV/m	dBuV/m	dBuV/m
30 – 230	40	50	30	40
230 – 1000	47	57	37	47

#### 3.2.2 LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

FREQUENCY (MHz)	Class A (at 3m) dBuV/m		Class B (at 3m) 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 CISPR 32.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

#### 3.2.3 TEST PROCEDURE

- e. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- f. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- g. The height of the equipment 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.
- h. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured, above 1G Average detector mode will be instead.
- i. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP(AV) Limits and then no additional QP Mode measurement performed.
- j. For the actual test configuration, please refer to the related Item –EUT TestPhotos.



### 3.2.4 TEST SETUP

#### (B) Radiated Emission Test Setup Frequency Below 1 GHz

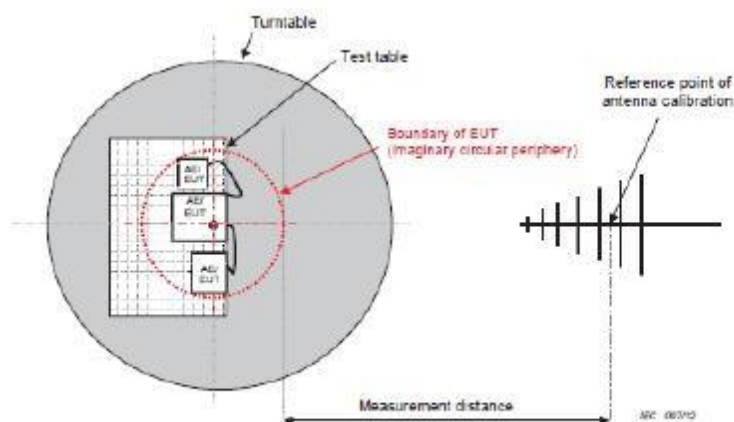


Figure C.1 – Measurement distance

#### (C) Radiated Emission Test Setup Frequency Above 1GHz

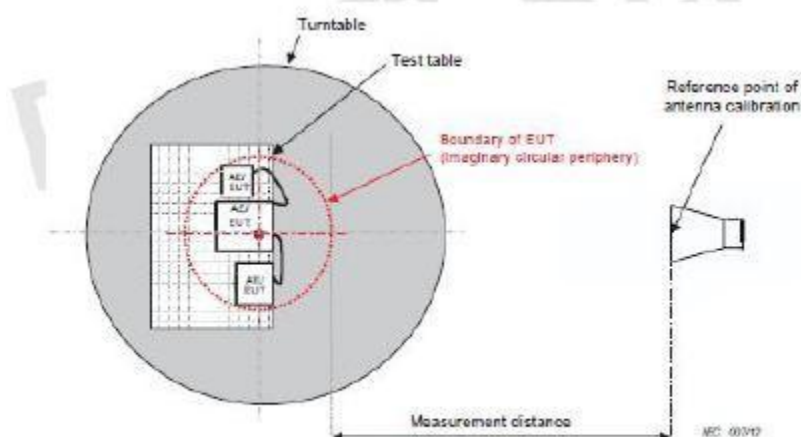


Figure C.1 – Measurement distance

### 3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

### 3.2.6 TEST RESULTS(30 - 1000 MHz)

Temperature:	22.1℃	Relative Humidity:	56%
Phase:	Horizontal	Test Mode:	Mode 1
Test Voltage:	DC 9V		

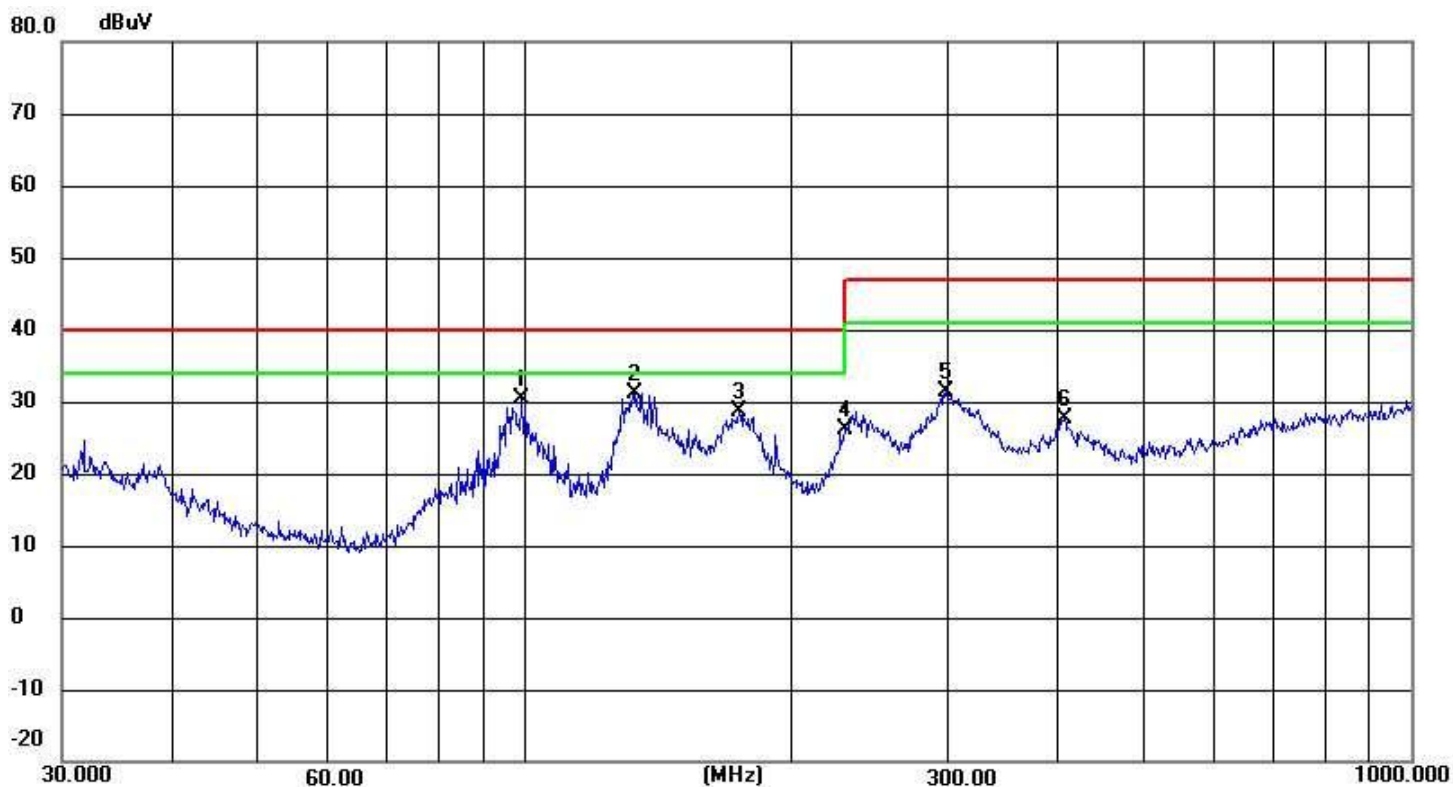
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	99.1797	62.68	-32.30	30.38	40.00	-9.62	QP
2	133.1511	63.40	-32.27	31.13	40.00	-8.87	QP
3	174.4241	60.77	-32.23	28.54	40.00	- 11.46	QP
4	229.2931	58.22	-32. 17	26.05	40.00	- 13.95	QP
5	298.2681	63.47	-32. 10	31.37	47.00	- 15.63	QP
6	406.0880	59.60	-31.99	27.61	47.00	- 19.39	QP

Remark:

2. All readings are Quasi-Peak.

3. Margin = Result (Result =Reading + Factor )-Limit

4. Factor= Cable Loss +Antenna Factor-Amplifier Gain

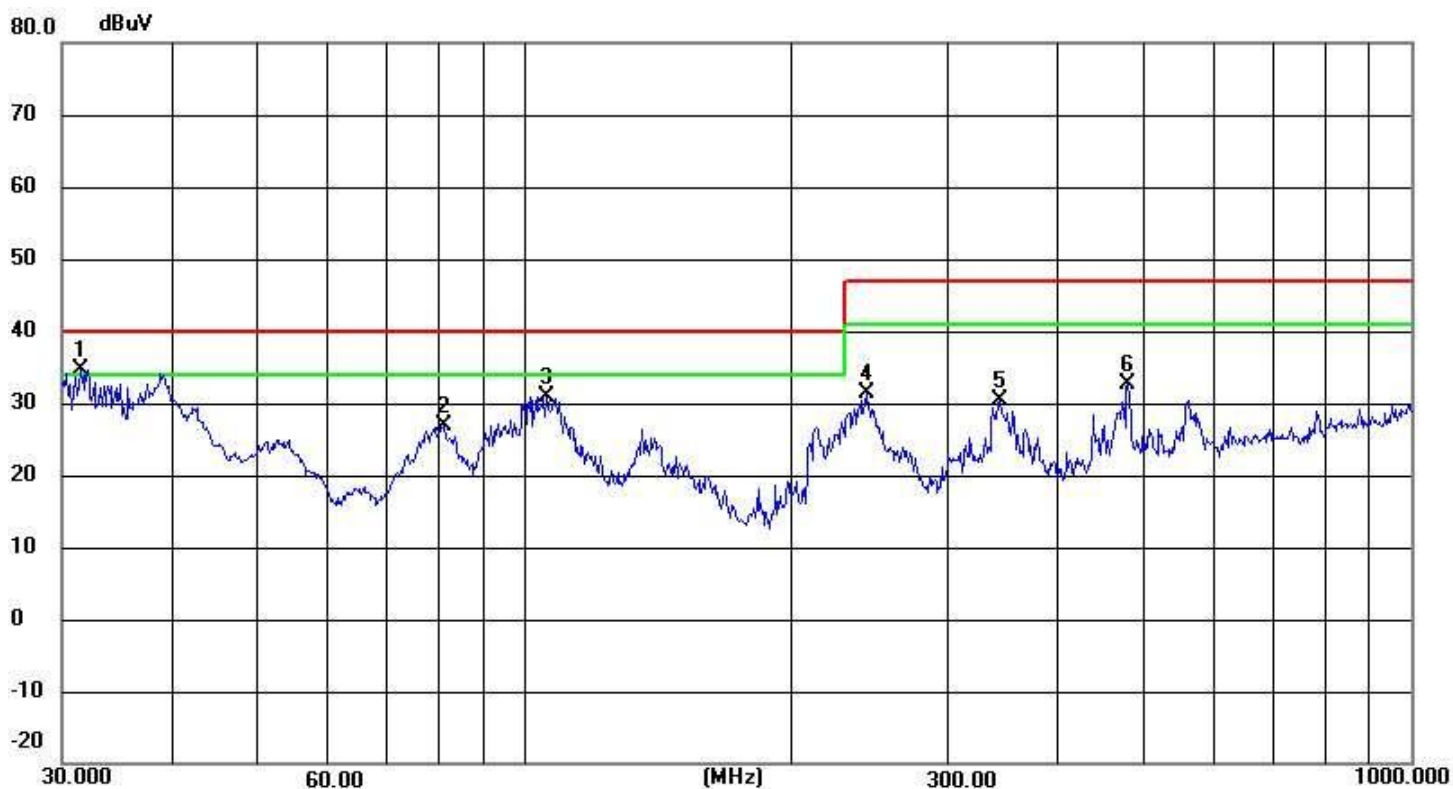


Temperature:	22.1℃	Relative Humidity:	56%
Phase:	Vertical	Test Mode:	Mode 1
Test Voltage:	DC 9V		

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	31.5095	42.84	-8. 19	34.65	40.00	-5.35	QP
2	80.9275	59.12	-32. 16	26.96	40.00	- 13.04	QP
3	105.6415	63.03	-32. 19	30.84	40.00	-9. 16	QP
4	242.5253	63.47	-31.99	31.48	47.00	- 15.52	QP
5	343.1800	62.17	-31.77	30.40	47.00	- 16.60	QP
6	478.8456	63.93	-31.36	32.57	47.00	- 14.43	QP

#### Remark:

1. All readings are Quasi-Peak.
2. Margin = Result (Result =Reading + Factor )-Limit
3. Factor= Cable Loss +Antenna Factor-Amplifier Gain



## 4. EMC IMMUNITY TEST

### 4.1 GENERAL PERFORMANCE CRITERIA

#### 4.1.1 PERFORMANCE CRITERIA (Bluetooth)

According to **ETSI EN 301 489-17** 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 ESD TESTING

### 4.2.1 TEST SPECIFICATION

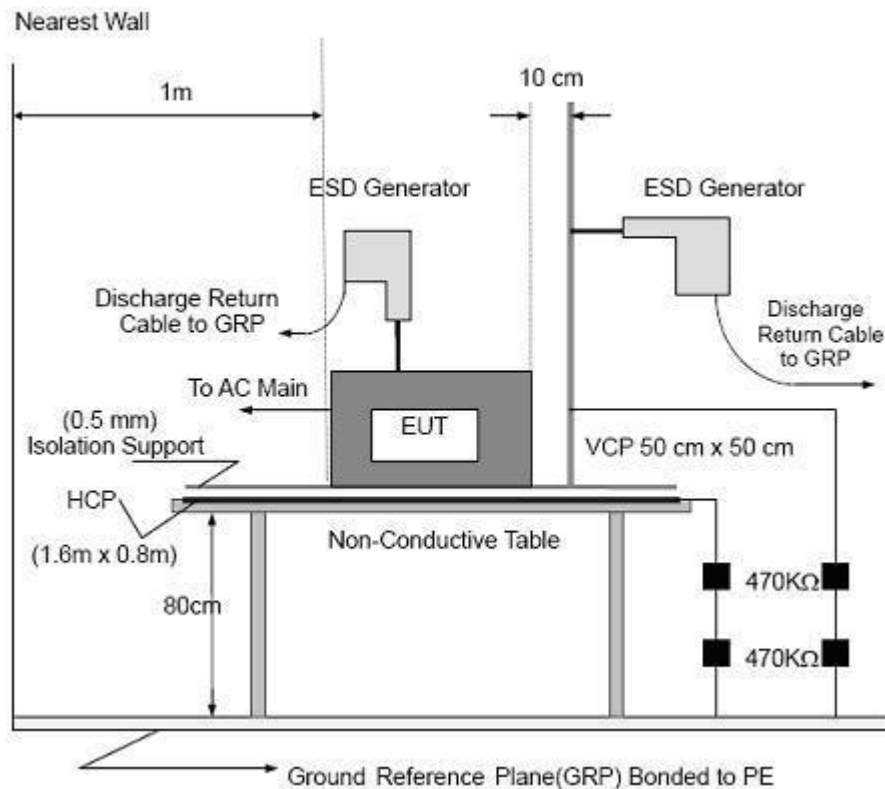
Basic Standard:	IEC/EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Required Performance:	B
Discharge Voltage:	Air Discharge: 2KV/4KV/8KV (Direct) Contact Discharge: 2KV/4KV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: min. 20 times at each test point Contact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

### 4.2.2 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. The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges.  
If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per 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.

### 4.2.3 TEST SETUP



Note:

#### TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940k total impedance. 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 placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

#### 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.

#### 4.2.4 TEST RESULT

Temperature:	21.8℃	Relative Humidity:	45%
Pressure:	1010hPa	Test Mode:	Mode1
Test Voltage:	DC 9V		

#### BT TEST RESULT

Discharge Level	Polarity	Test Points	Contact Discharge	Air Discharge	Criterion	Test Result
4	+/-	VCP/HCP	N/A	N/A	B	PASS
2,4,8	+/-	Gap, plastic shell, button	N/A	NOTE	B	PASS

Note: The EUT function was correct during the test.

Red Dot —Air Discharged

Blue Dot —Contact Discharged



### 4.3 RS TESTING

#### 4.3.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-3
Required Performance:	A
Frequency Range:	80 MHz - 6000 MHz
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

#### 4.3.2 TEST PROCEDURE

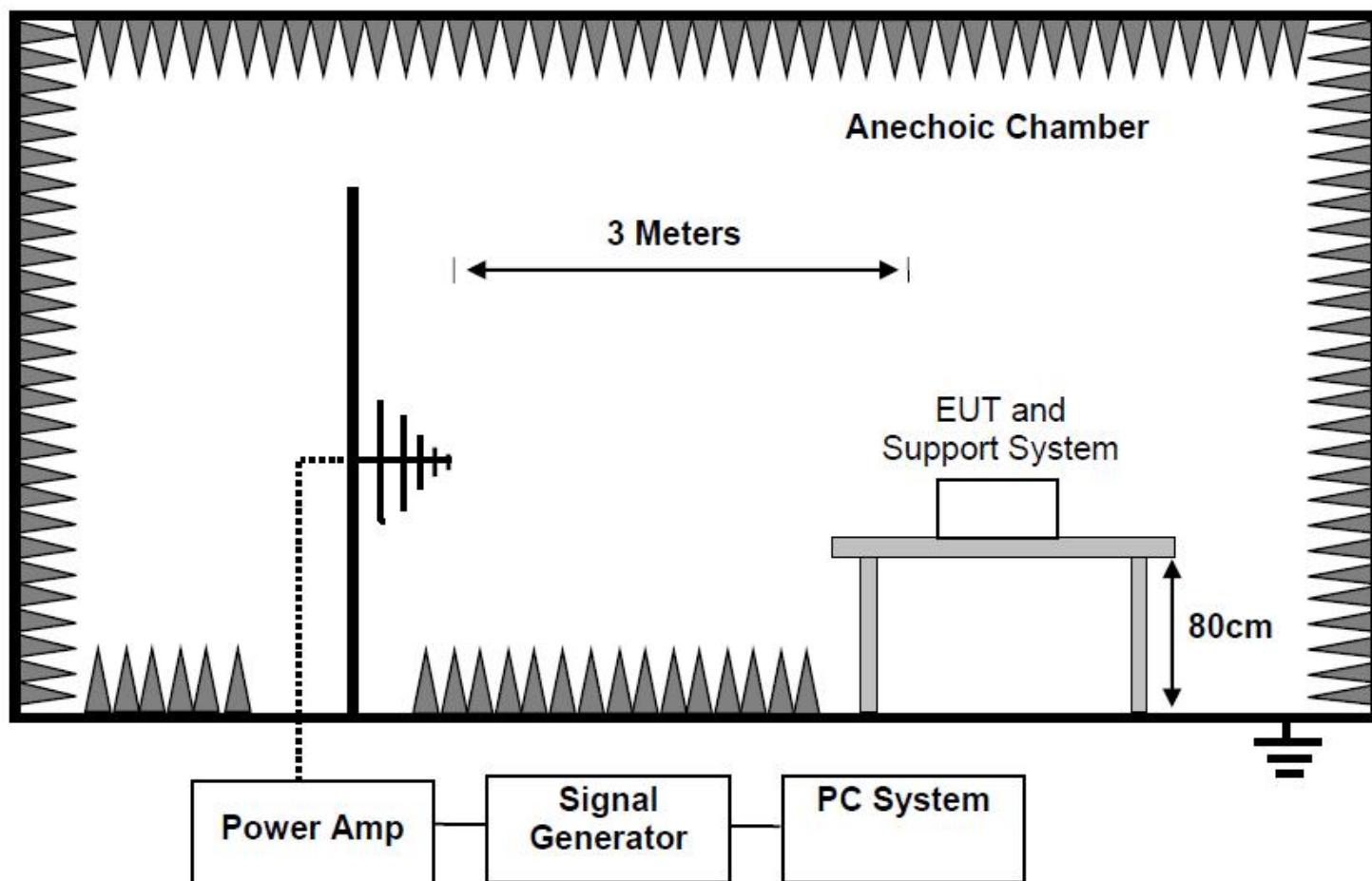
The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber.

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

The other condition as following manner:

- The frequency range is swept from 80 MHz to 6000 MHz with the signal 80% amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed  $1.5 \times 10^{-3}$  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.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

### 4.3.3 TEST SETUP



Note:

#### TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 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 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.

#### 4.3.4 TEST RESULTS

Temperature:	23.4℃	Relative Humidity:	48%
Test Voltage:	DC 9V	Test Mode:	Mode1

#### BT TEST RESULTS

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Azimuth	Observation	Perform. Criteria	Results	Judgment
80-6000	H / V	3 V/m (rms) AM Modulated 1000Hz, 80%	Front	<b>CT,CR</b>	<b>A</b>	<b>A</b>	<b>PASS</b>
			Rear				
			Left				
			Right				

Note: "A" stand for, during test, operate as intended no loss of function, no degradation of performance, no unintentional transmissions and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

Note:

1) N/A - denotes test is not applicable in this test report.

2) Criteria A: There was no change operated with initial operating during the test.

3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.

4) Criteria C: The system shut down during the test.

**APPENDIX I- TEST SETUP****RE****CE**

## ESD



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