



EMC TEST REPORT

Report No.: STS2110087E01

Issued for

Mobile Action Technology Inc.

12F, NO.661, Bannan Rd., Zhonghe Dist. New Taipei City,
Taiwan (R.O.C.) 235030

Product Name:	Bluetooth GPS Logger
Brand Name:	Mobile Action
Model Name:	GT-120B
Series Model:	N/A
Test Standard:	ETSI EN 301 489-1 V2.2.3 (2019-11)
	ETSI EN 301 489-17 V3.2.4 (2020-09)
	ETSI EN 301 489-19 V2.1.1 (2019-04)

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**TEST REPORT CERTIFICATION**

Applicant's Name.....: Mobile Action Technology Inc.
Address: 12F, NO.661, Bannan Rd., Zhonghe Dist. New Taipei City, Taiwan
(R.O.C.) 235030

Manufacturer's Name: Heisei Technology Co., Ltd.
Address: 3F, No.5, Alley 8, Lane 45, Pao Hsin Rd. Hsin-Tien Dist. New
Taipei City 23145, Taiwan R.O.C.

Product Description

Product Name.....: Bluetooth GPS Logger

Brand Name: Mobile Action

Model Name: GT-120B

Series Model: N/A

Standards: ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-17 V3.2.4 (2020-09)
ETSI EN 301 489-19 V2.1.1 (2019-04)

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Date of Test

Date of Receipt of Test Item.....: 22 Oct. 2021

Date (s) of Performance of Tests: 22 Oct. 2021 ~ 02 Nov. 2021

Date of Issue.....: 02 Nov. 2021

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

Testing Engineer :

Jane Zeng

(Jane Zeng)

Technical Manager :

Bulun

(Bulun)

Authorized Signatory :

Vita Li

(Vita Li)





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**Revision History**

Rev.	Issue Date	Report No.	Effect Page	Contents
00	02 Nov. 2021	STS2110087E01	ALL	Initial Issue





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)

ETSI EN 301 489-19 V2.1.1 (2019-04)

EMC Emission				
Standard	Test Item	Limit	Judgement	Remark
EN 55032:2015/A11:2020	Conducted Emission on AC And Telecom Port 150kHz to 30MHz	Class B	N/A	
	Radiated Emission 30MHz to 1000MHz	Class B	PASS	
	Radiated Emission 1GHz to 6GHz	Class B	PASS	NOTE (1)
EN IEC 61000-3-2:2019	Harmonic Current Emission	-----	N/A	NOTE (2)
EN 61000-3-3:2013+A1:2019	Voltage Fluctuations & Flicker	-----	N/A	
EMC Immunity				
Section	Test Item	Performance Criteria	Judgement	Remark
EN 61000-4-2:2009	Electrostatic discharges	B	PASS	
EN IEC 61000-4-3:2020	Continuous RF electromagnetic field disturbances	A	PASS	
EN 61000-4-4:2012	Electrical fast transients/burst	B	N/A	
EN 61000-4-5:2014/A1:2017	Surges	B	N/A	
EN 61000-4-6:2014+AC:2015	Continuous induced RF disturbances	A	N/A	
EN 61000-4-11:2004/A1:2017	Voltage dips and interruptions	B / C / C	N/A	NOTE (2)

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, the 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 of 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**

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

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

(4) N/A=Not Applicable.



1.1 TEST FACTORY

Company Name:	SHENZHEN STS TEST SERVICES CO.,LTD.
Address:	A 1/F, Building B, Zhuoke Science Park, No.190 Chongqing Road, HepingShequ, Fuyong Sub-District, Bao'an District, Shenzhen, Guang Dong, China
Telephone:	+86-755 3688 6288
Fax:	+86-755 3688 6277
Registration No.:	FCC test Firm Registration Number: 625569
	IC test Firm Registration Number: 12108A
	A2LA Certificate No.: 4338.01

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expended 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
STSC01	CISPR 16-4-2	9KHz ~ 150KHz	2.79	
		150KHz ~ 30MHz	2.80	

B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	U · (dB)	NOTE
STSC02	CISPR 16-4-2	30MHz ~ 1000MHz	4.39	
		1GHz ~ 6GHz	5.10	



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF THE EUT

Product Name	Bluetooth GPS Logger	
Brand Name	Mobile Action	
Model Name	GT-120B	
Series Model	N/A	
Model Difference	N/A	
Frequency Bands	Bluetooth	2402 MHz to 2480 MHz
	GPS	1575.42MHz
Modulation Mode	BLE	GFSK
	GPS	BPSK
Rating	Input: DC 5V	
Battery	Rated Voltage: 3.7V Charge Limit: 4.2V Capacity: 380mAh	
Hardware Version Number	V1.1	
Software Version Number	V1.0	

2.2 DESCRIPTION OF THE 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 possibly 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	Adapter +BT +GPS Rx

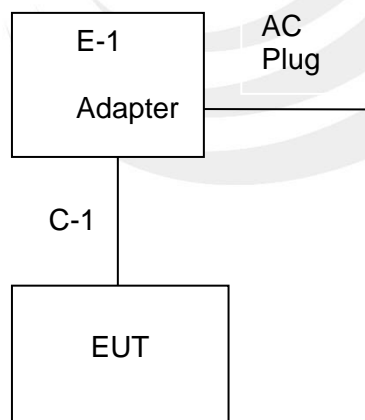
For Radiated Test	
Final Test Mode	Description
Mode 1	Adapter +BT +GPS Rx

For EMS Test	
Final Test Mode	Description
Mode 1	Adapter +BT +GPS Rx

Note:

- For radiated emission test, test mode 1 was the worst case and only this mode was presented in this report.

2.3 DESCRIPTION OF THE TEST SETUP





2.4 DESCRIPTION OF THE SUPPORT UNITS

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

Necessary accessories

Item	Equipment	Mfr/Brand	Model/Type No.	Length	Note
N/A	N/A	N/A	N/A	N/A	N/A

Support units

Item	Equipment	Mfr/Brand	Model/Type No.	Length	Note
E-1	Adapter	SZTY	TPA-46050100VU	N/A	N/A
C-1	DC Cable	N/A	N/A	30cm	NO

Note:

- (1) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (2) “YES” means “with core”; “NO” means “without core”.



2.5 MEASUREMENT INSTRUMENTS LIST

2.5.1 RADIATED TEST SITE

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last Calibration	Calibrated Until
EMI Test Receiver	R&S	ESCI	101427	2021.09.30	2022.09.29
Bi-log Antenna	TESEQ	CBL6111D	45873	2021.10.08	2023.10.07
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1343	2020.10.12	2022.10.11
Pre-amplifier(1G-26.5G)	Agilent	8449B	3008A02383	2021.10.09	2022.10.08
Pre-amplifier(0.1M-3GHz)	EM	EM330	060665	2021.10.09	2022.10.08
Spectrum Analyzer	Agilent	N9020A	MY49100060	2021.09.30	2022.09.29
RE Cable (9K-1G)	N/A	R01	N/A	2021.10.09	2022.10.08
RE Cable (1G-26G)	N/A	R02	N/A	2021.10.09	2022.10.08
Temperature & Humidity	Mieo	HH660	N/A	2021.10.09	2022.10.08
Testing Software	EZ-EMC(Ver.STSLAB-03A1 RE)				

2.5.2 ESD

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last Calibration	Calibrated Until
ESD TEST GENERATOR	TESEQ	NSG438	1175	2021.09.29	2022.09.28
Temperature & Humidity	N/A	WS1066	N/A	2021.03.04	2022.03.03

2.5.3 RS

Kind of Equipment	Manufacturer	Type No.	Serial No.	Last Calibration	Calibrated Until
Power Meter	Agilent	E4419B	QB43312265	2021.09.30	2022.09.29
Power Sensor	Hp	E9300A	US39210170	2021.09.30	2022.09.29
Power Sensor	Hp	E9300A	US39210476	2021.09.30	2022.09.29
Signal Generator	Agilent	N5181A	MY56144718	2021.09.30	2022.09.29
Power Amplifier	MICOTOP	MPA-80-1000-250	MPA1711489	2021.09.30	2022.09.29
Power Amplifier	MICOTOP	MPA-1000-6000-100	MPA1904132	2021.09.30	2022.09.29
RS Test Antenna (80-1GHz)	SCHWARZBECK	VULP 9118E	000999	N/A	N/A
RS Test Antenna (1G-10GHz)	SCHWARZBECK	STLP 9149	000648	N/A	N/A
Universal Radio Communication Tester	R&S	CMU200	111058	2021.09.29	2022.09.28
Audio Analyzer	R&S	UPL	100689	2021.03.04	2022.03.03
Audio Breakthrough Shielding Box	SKET	SB_ABTC35	N/A	N/A	N/A



Ear Simulator	SKET	AE_ABT/C35	N/A	N/A	N/A
Mouth Simulator	SKET	AM_ABT/C35	N/A	N/A	N/A
1KHz Standard Source	SKET	MSC_ABT/C35	N/A	2021.10.11	2022.10.10
Field Probe	Narda	EP601	611WX80261	2021.04.11	2022.04.10
Temperature & Humidity	Mieo	HH660	N/A	2021.10.09	2022.10.08
Testing Software	EMC-S V1.4.0.53				





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 *
0.5 ~ 5	73.00	60.00	56.00	46.00
5 ~ 30	73.00	60.00	60.00	50.00

Note:

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

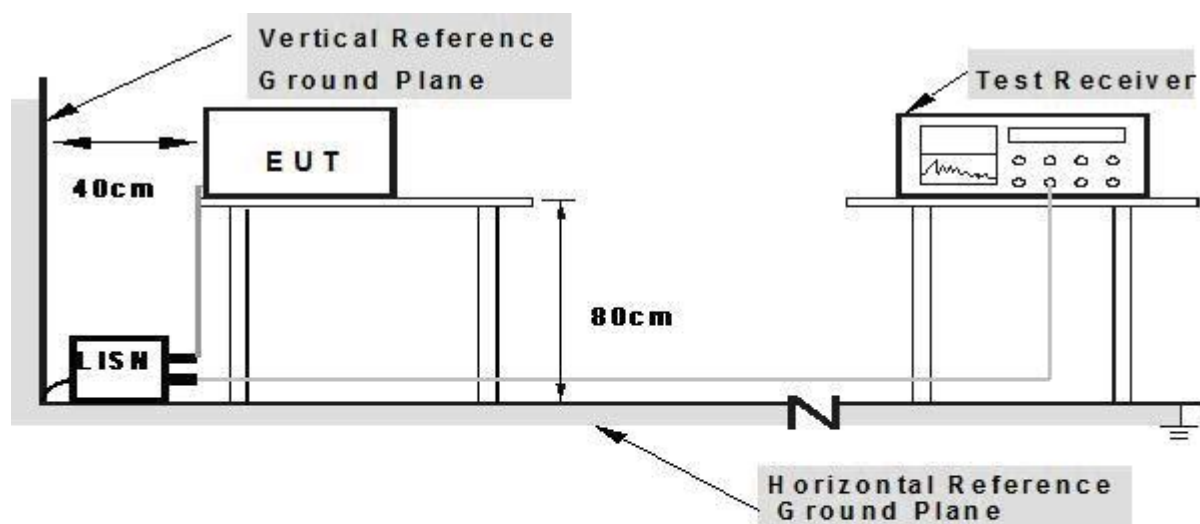
The following table is the setting of the receiver

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

3.1.2 TEST PROCEDURE

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs 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.

3.1.3 TEST SETUP



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

2.Both of LISN s (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 described unless otherwise a special operating condition is specified in the following during the testing.



3.1.5 TEST RESULTS

Temperature:	-- °C	Relative Humidity:	-- %
Phase:	L/N	Test Mode:	--
Test Voltage:	--	Test Date:	--

Note: N/A



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF THE 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 THE 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 in the following: 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

- a. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. EUT as the center to the edge of the auxiliary device, the distance from the maximum edge to the center of the antenna is 3 meter.
- c. The height of antenna is varied from 1 meter to 4 meter above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meter and the rotatable table was turned from 0 degrees to 360 degree to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1GHz.
- 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

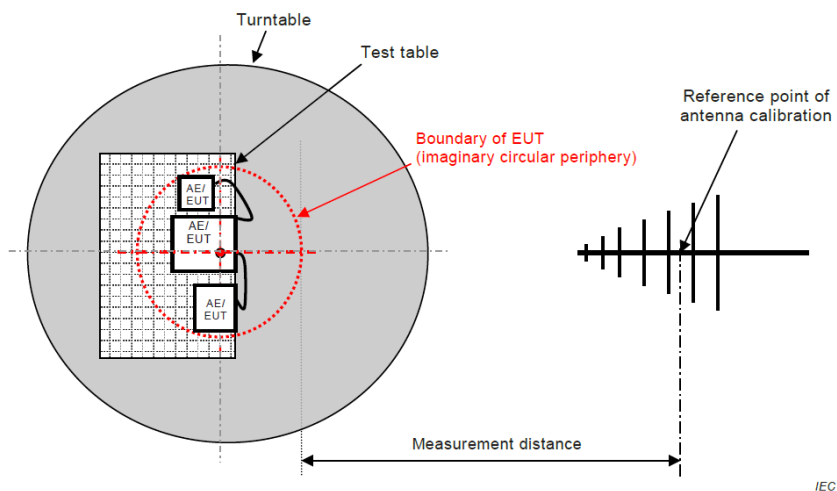


Figure C.1 – Measurement distance

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

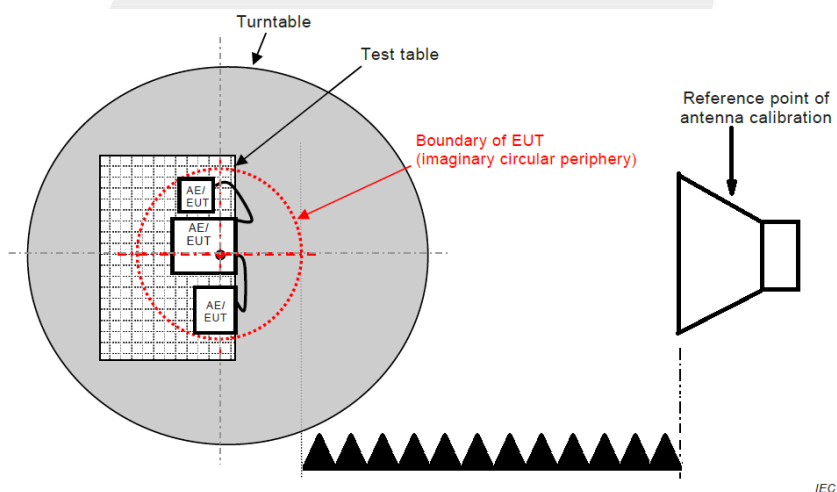


Figure C.1 – Measurement distance

3.2.5 EUT OPERATING CONDITIONS

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



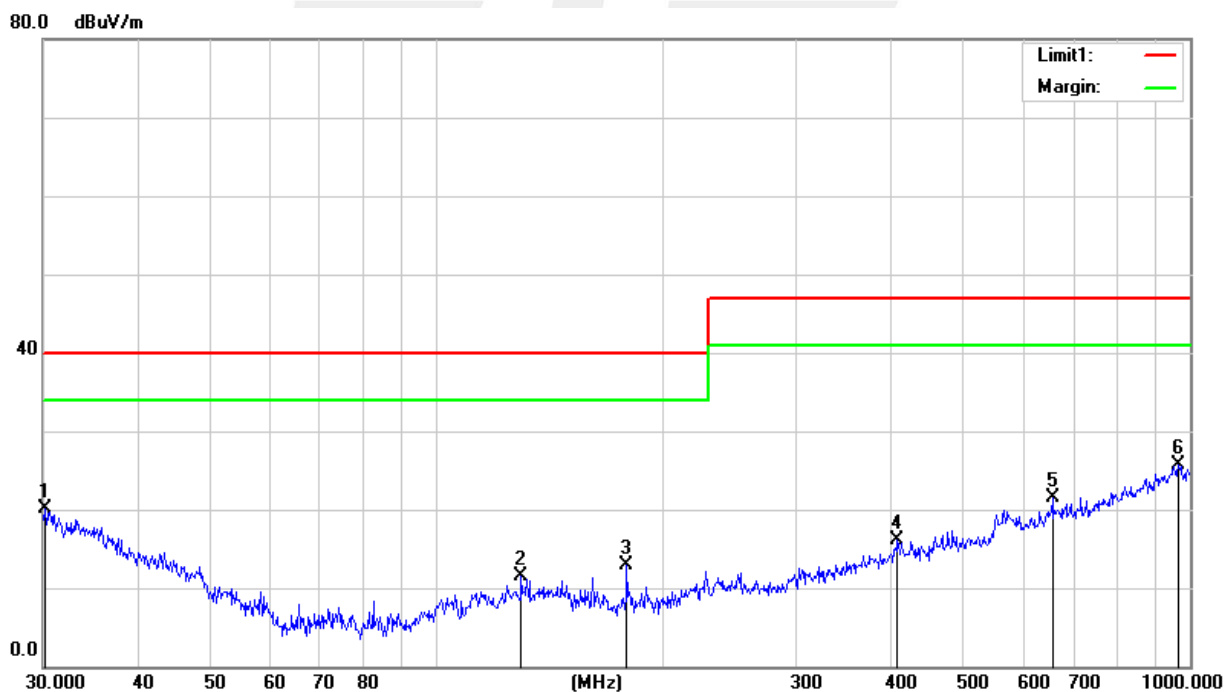
3.2.6 TEST RESULTS (30 - 1000 MHz)

Temperature:	25.6℃	Relative Humidity:	51%
Phase:	Horizontal	Test Mode:	Mode 1
Test Voltage:	AC 230V/50Hz	Test Date:	2021.10.22

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	30.2110	26.89	-6.75	20.14	40.00	-19.86	QP
2	129.4677	29.24	-17.69	11.55	40.00	-28.45	QP
3	178.7583	31.13	-18.24	12.89	40.00	-27.11	QP
4	408.9460	28.72	-12.60	16.12	47.00	-30.88	QP
5	656.5300	29.33	-7.91	21.42	47.00	-25.58	QP
6	965.5421	28.42	-2.71	25.71	47.00	-21.29	QP

Remark:

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



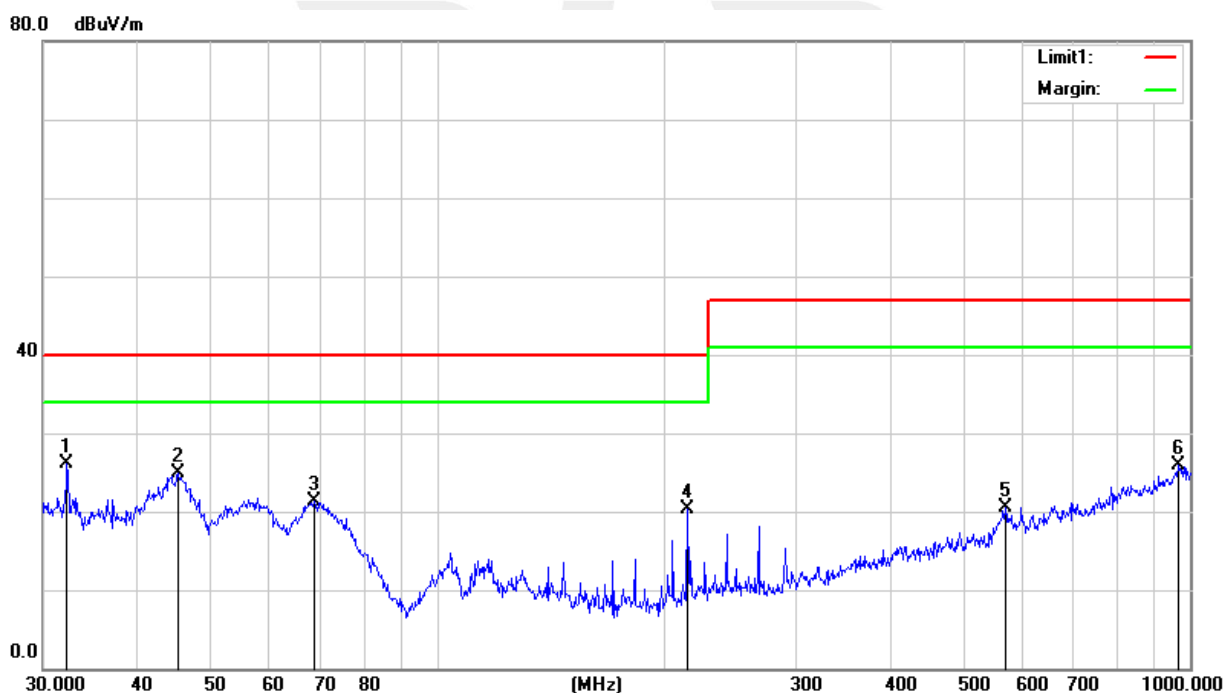


Temperature:	25.6°C	Relative Humidity:	51%
Phase:	Vertical	Test Mode:	Mode 1
Test Voltage:	AC 230V/50Hz	Test Date:	2021.10.22

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Results (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	32.2924	33.88	-7.84	26.04	40.00	-13.96	QP
2	45.3755	39.33	-14.51	24.82	40.00	-15.18	QP
3	68.8721	44.17	-22.85	21.32	40.00	-18.68	QP
4	215.2677	37.29	-16.92	20.37	40.00	-19.63	QP
5	568.6127	29.55	-9.05	20.50	47.00	-26.50	QP
6	965.5421	28.57	-2.71	25.86	47.00	-21.14	QP

Remark:

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





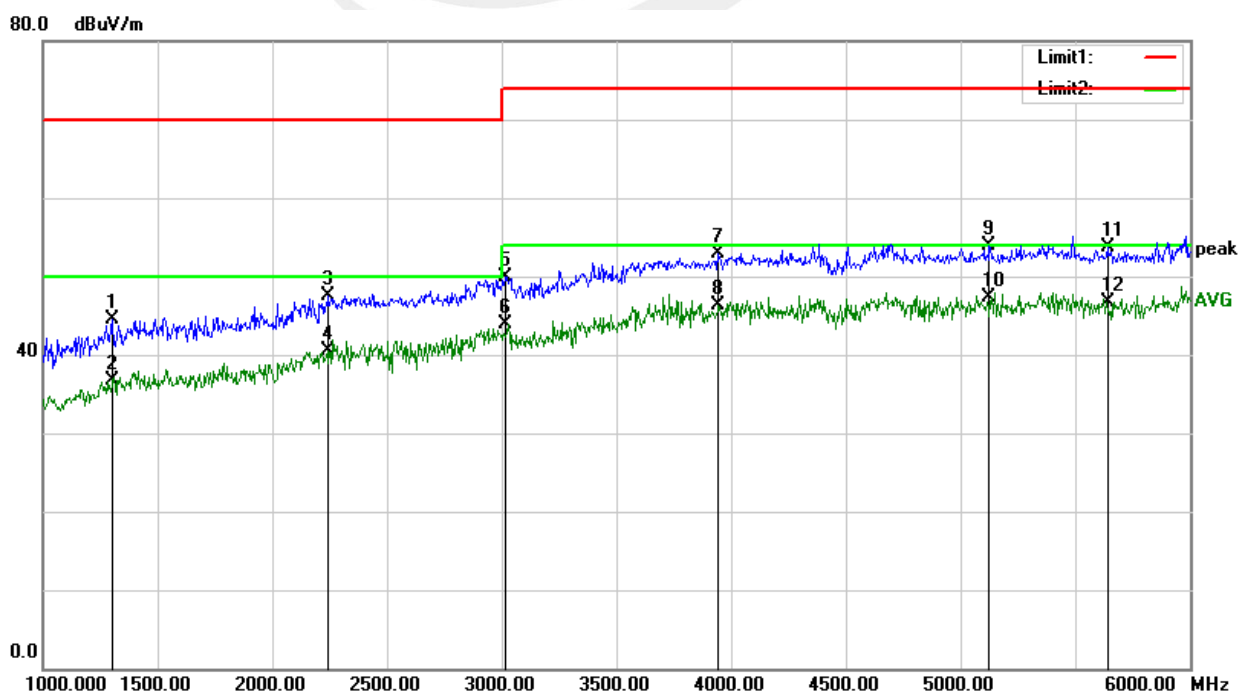
3.2.7 TEST RESULT (1000 - 6000 MHz)

Temperature:	25.6℃	Relative Humidity:	51%
Phase:	Horizontal	Test Mode:	Mode 1
Test Voltage:	AC 230V/50Hz	Test Date:	2021.10.22

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	1300.000	53.12	-8.59	44.53	70.00	-25.47	peak
2	1300.000	45.34	-8.59	36.75	50.00	-13.25	AVG
3	2245.000	52.06	-4.64	47.42	70.00	-22.58	peak
4	2245.000	45.05	-4.64	40.41	50.00	-9.59	AVG
5	3015.000	52.10	-2.23	49.87	74.00	-24.13	peak
6	3015.000	46.10	-2.23	43.87	54.00	-10.13	AVG
7	3940.000	51.97	1.01	52.98	74.00	-21.02	peak
8	3940.000	45.35	1.01	46.36	54.00	-7.64	AVG
9	5125.000	49.34	4.57	53.91	74.00	-20.09	peak
10	5125.000	42.71	4.57	47.28	54.00	-6.72	AVG
11	5640.000	48.11	5.56	53.67	74.00	-20.33	peak
12	5640.000	41.22	5.56	46.78	54.00	-7.22	AVG

Remark:

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



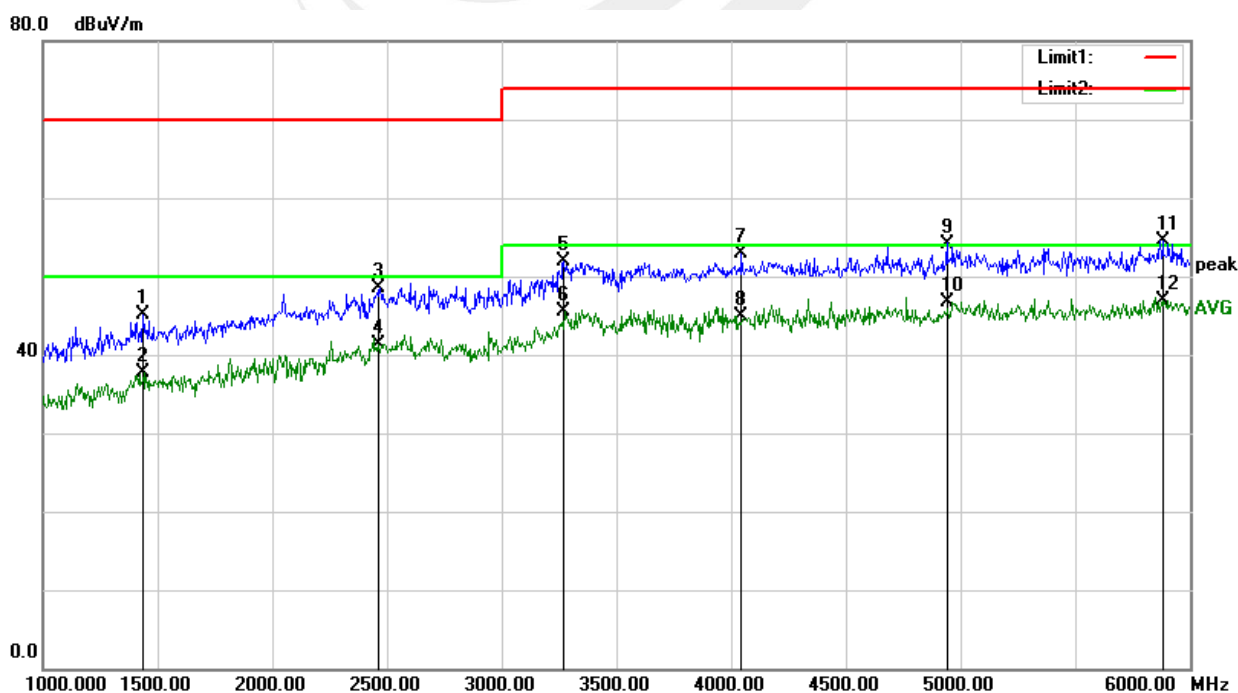


Temperature:	25.6℃	Relative Humidity:	51%
Phase:	Vertical	Test Mode:	Mode 1
Test Voltage:	AC 230V/50Hz	Test Date:	2021.10.22

No.	Frequency (MHz)	Reading (dBUV)	Correct Factor (dB)	Result (dBUV)	Limit (dBUV)	Margin (dB)	Remark
1	1435.000	52.87	-7.85	45.02	70.00	-24.98	peak
2	1435.000	45.64	-7.85	37.79	50.00	-12.21	AVG
3	2460.000	52.07	-3.56	48.51	70.00	-21.49	peak
4	2460.000	44.93	-3.56	41.37	50.00	-8.63	AVG
5	3270.000	53.78	-1.91	51.87	74.00	-22.13	peak
6	3270.000	47.33	-1.91	45.42	54.00	-8.58	AVG
7	4045.000	51.34	1.51	52.85	74.00	-21.15	peak
8	4045.000	43.38	1.51	44.89	54.00	-9.11	AVG
9	4940.000	50.70	3.50	54.20	74.00	-19.80	peak
10	4940.000	43.27	3.50	46.77	54.00	-7.23	AVG
11	5880.000	48.55	5.98	54.53	74.00	-19.47	peak
12	5880.000	40.83	5.98	46.81	54.00	-7.19	AVG

Remark:

1. All readings are Peak and Average values
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 are as follows:

Criteria	During the test	After the test
A	Shall operate as intended. (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: Operate as intended during the test allows a level of degradation 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: 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 3: No degradation of performance after the test is understood as no 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.

4.1.2 PERFORMANCE CRITERIA (GPS)

According to **ETSI EN 301 489-19** standard, the general performance criteria are as follows:

Performance criteria for Continuous phenomena applied to ROMES and ROGNSS receivers (CR)

For the EUT, excluding spot frequency tests as part of the immunity test with radiated RF electromagnetic fields (see ETSI EN 301 489-1 [1], clause 9.2):

the general performance criteria set out in clause 6.1;

during the test no false calls shall occur;

at the conclusion of the test comprising the series of individual exposures, the EUT shall operate as intended with no loss of function and/or stored data (messages), as declared by the manufacturer.

Performance criteria for Transient phenomena applied to ROMES and ROGNSS receivers (TR)

For the EUT:

the general performance criteria set out in clause 6.1;

during the test no false calls shall occur;

at the conclusion of the test comprising the series of individual exposures, the EUT shall operate as intended with no loss of function and/or stored data (messages), as declared by the manufacturer.



PERFORMANCE FOR TT

The performance criteria B shall apply, except for voltage dips of 100ms and voltage interruptions of 5 000ms 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 100ms and voltage interruptions of 5 000ms 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.

4.1.2 GENERAL PERFORMANCE CRITERIA TEST SETUP

The EUT tested system was configured as the statements of **2.2 or 2.3** unless otherwise a special operating condition is specified in the follows during the testing.



4.2 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

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: at least 10 times on each point Contact Discharge: at least 10 times on each point
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 manners:

- a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation
The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

The time interval between two successive single discharges was at least 1 second.

The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meter from the EUT.

Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.

Vertical Coupling Plane (VCP):

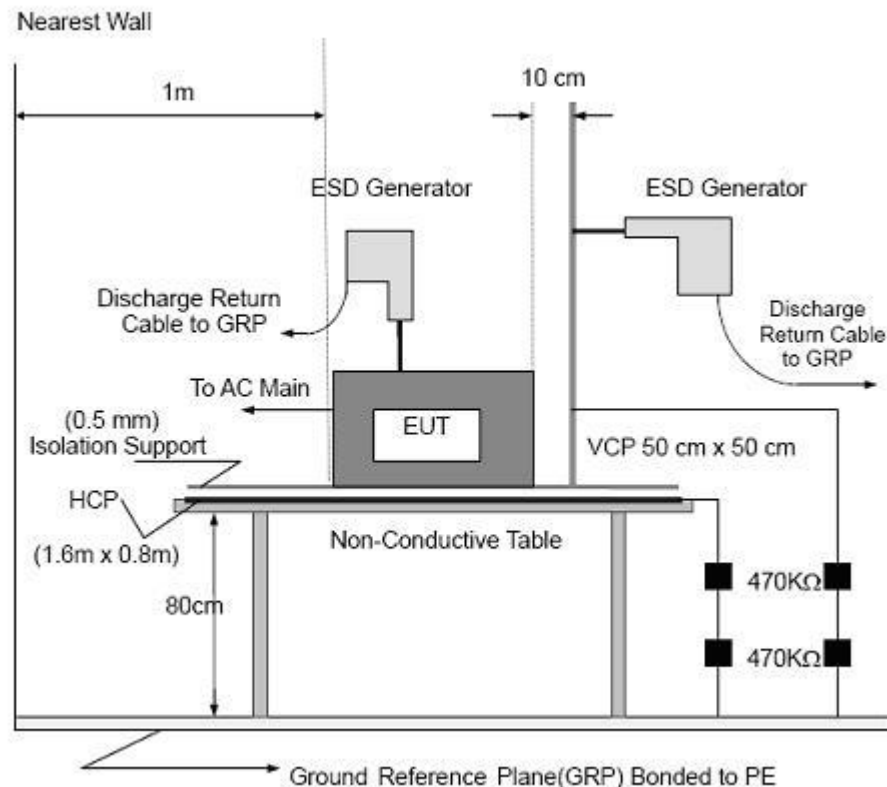
The coupling plane of dimensions 0.5m x 0.5m, is placed parallel to and positioned at a distance 0.1m from the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.

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 meter high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick. 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 940kΩ 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 0.8-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 was consisted of a sheet of aluminum that is at least 0.25mm thick, and extended at least 0.5 meter from the EUT on all sides.

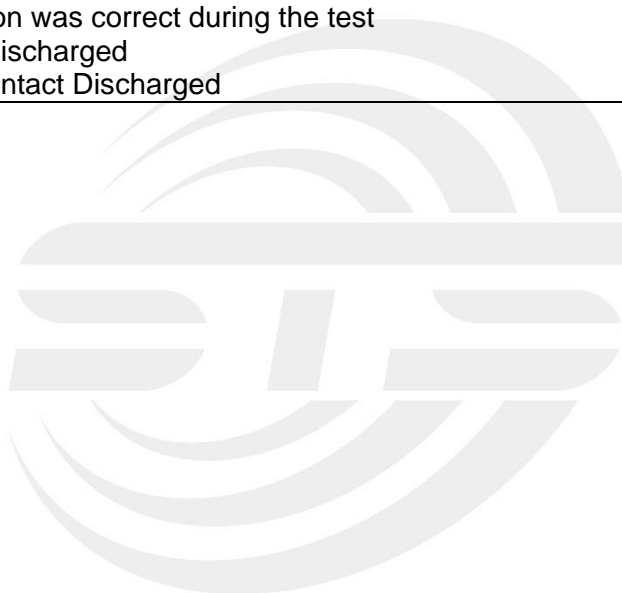


4.2.4 TEST RESULT

Temperature:	25.5℃	Relative Humidity:	46%
Pressure:	1017.8hPa	Test Voltage:	AC 230V/50Hz DC 3.7V
Test Mode:	Mode 1	Test Date:	2021.10.27

Discharge Level	Polarity	Test Points	Contact Discharge	Air Discharge	Criterion	Test Result
2,4	+/-	VCP/HCP	NOTE	N/A	B	A
2,4	+/-	Green Dot	NOTE	N/A	B	A
2,4,8	+/-	Red Dot	N/A	NOTE	B	A

Note: The EUT function was correct during the test
Red Dot —Air Discharged
Green Dot —Contact Discharged



The Photo for Discharge Points of EUT





4.3 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

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:	1.5×10^{-3} decade/s

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.

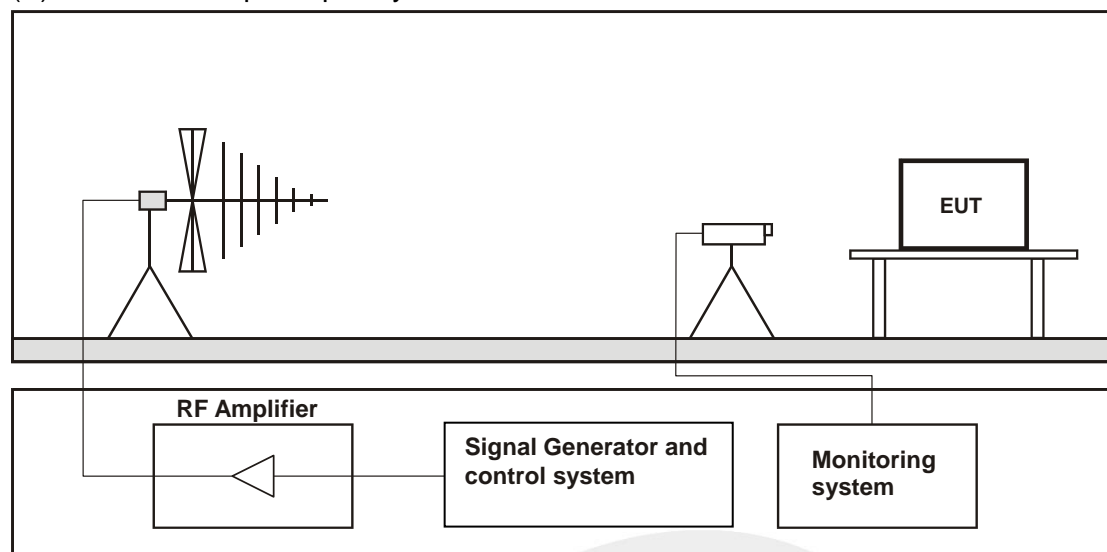
The testing distance from antenna to the EUT was 3 meters.

The other conditions required in the following manners:

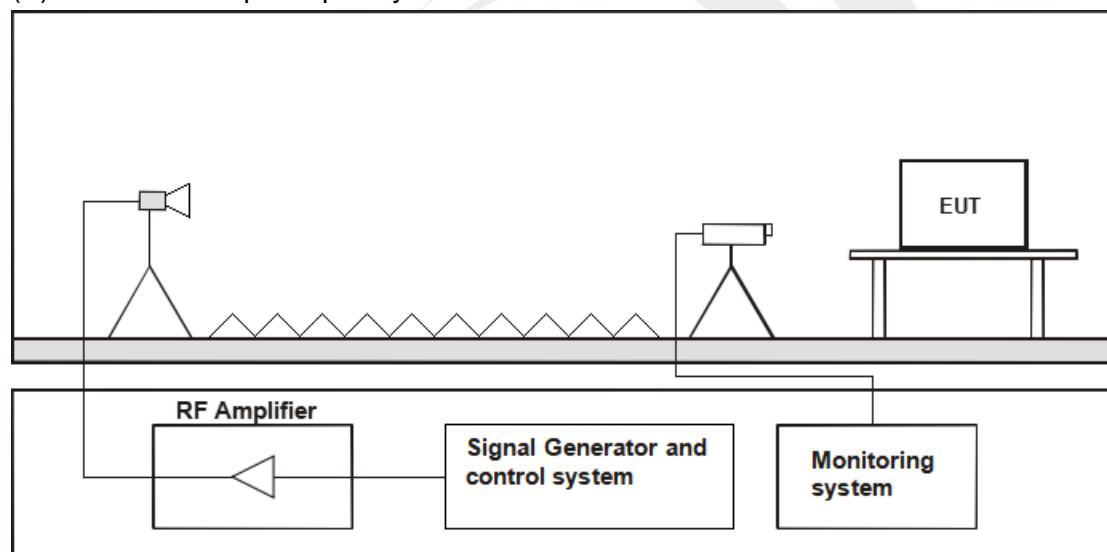
- The frequency range is swept from 80 MHz to 6000 MHz with the signal 80% amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- The dwell time at each frequency shall 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

(A) RS Test Set-Up Frequency Below 1GHz



(B) RS Test Set-Up Frequency Above 1GHz



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 meter in height. The system under test was connected to the power and signal wire according to the 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 meter in height. The system under test was connected to the power and signal wire according to the relevant installation instructions.



4.3.4 TEST RESULTS

Temperature:	25.5℃	Relative Humidity:	46%
Test Voltage:	AC 230V/50Hz DC 3.7V	Test Date:	2021.10.27
Test Mode:	Mode 1		

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

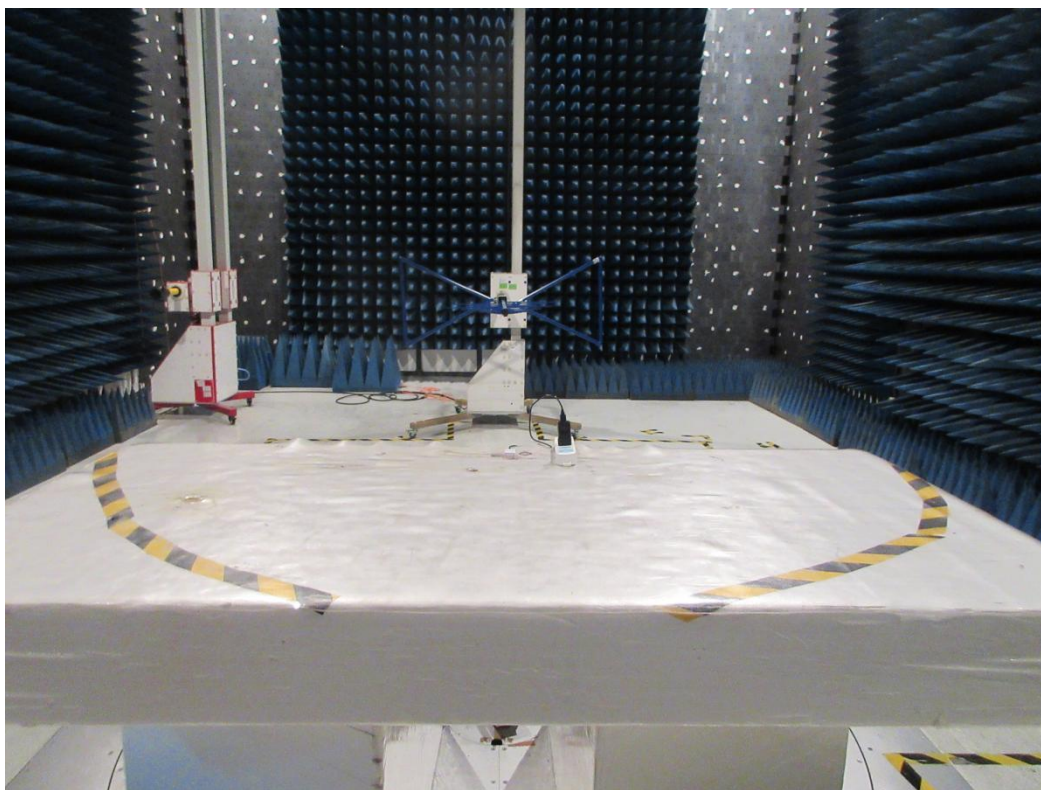
Note: "A" stand for, during test, operated as intended no loss of function, no degradation of performance, no unintentional transmissions and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

Note:

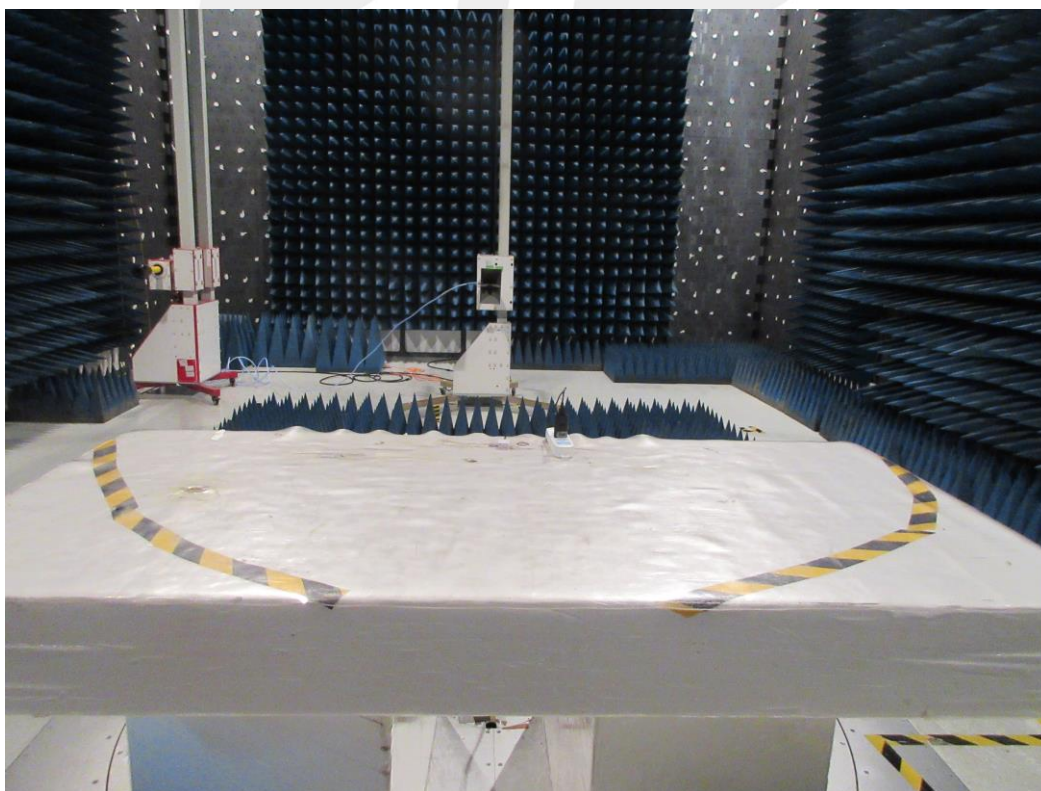
- 1) N/A - denotes test is not applicable in this test report.
- 2) Criteria A: There was no change operated with initial operating during the test.
- 3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
- 4) Criteria C: The system shut down during the test.

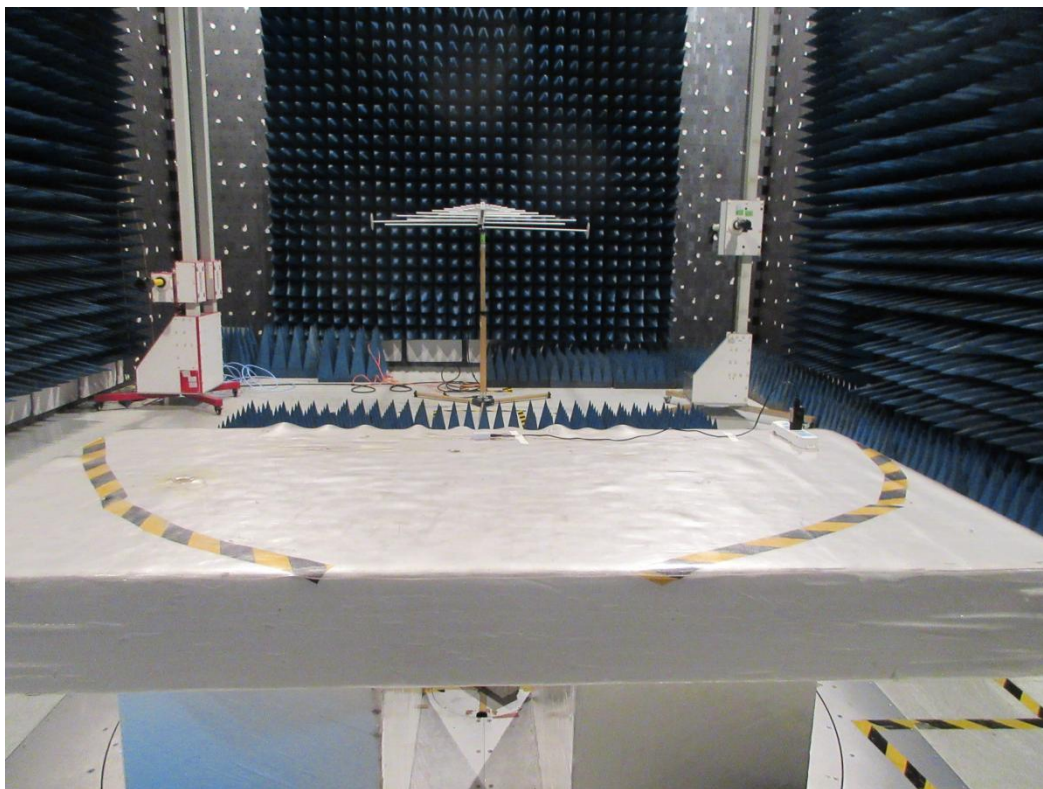
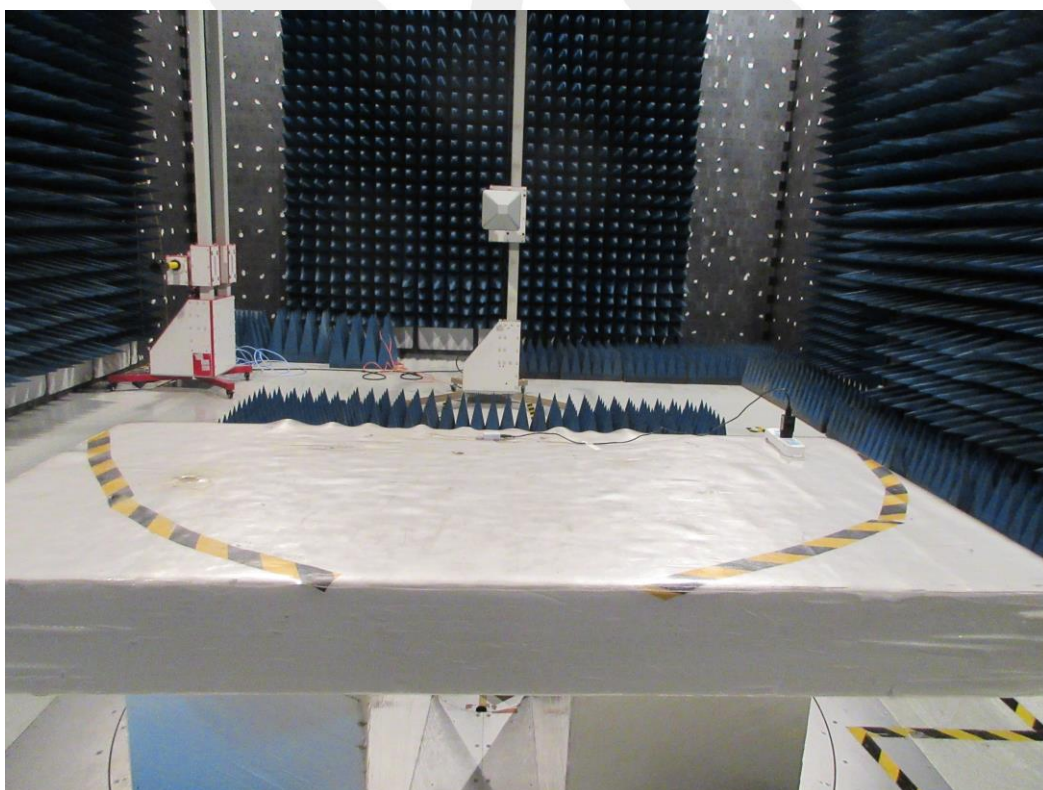
APPENDIX 1 - TEST SETUP

RE (30 - 1000 MHz)



RE (1000 - 6000 MHz)



RS (80 - 1000 MHz)**RS (1000 - 6000 MHz)**

ESD

※※※※※END OF THE REPORT※※※※※

