



TEST REPORT

Applicant Name: Shenzhen Jimou Sensor Technology Co., Limited

Product Name: Inductive Proximity Sensor

Model: Details refer the page 10 of this document

Test Report Number: WD24111022EM

Worldtest (GuangDong) Co., Ltd.

Building 6, No. 6, North Industrial Road, Songshan Lake(SSL) ,
Dongguan, Guangdong, China

Tel.: 400 888 2955 & 0769-22891258
Email: service.vip@worldtest.cn

Fax: 0769-22891235
Web: www.worldtest.cn&www.worldtest.com.cn

Applicant Information

Company Name: Shenzhen Jimou Sensor Technology Co., Limited
Address: 301, No. 13, West of Shengchang Factory, Dongfang Firt Road, Dongfang Community, Songgang Street, Bao'an District, Shenzhen, Guangdong, China.

Manufacturer Information

Company Name: Shenzhen Jimou Sensor Technology Co., Limited
Address: 301, No. 13, West of Shengchang Factory, Dongfang Firt Road, Dongfang Community, Songgang Street, Bao'an District, Shenzhen, Guangdong, China.

EUT Information

EUT Name: Inductive Proximity Sensor
Model: Details refer the page 10 of this document
Brand: JM
Sample Received Date: Dec. 03, 2024
Sample Status: Normal
Sample ID: WD-YP241203002
Date of Tested: Dec. 04, 2024 to Dec. 05, 2024

Standard(s)
EN IEC 61000-6-3:2021
EN IEC 61000-6-1:2019

Issued By: Worldtest (GuangDong) Co., Ltd.
Address: Building 6, No. 6, North Industrial Road, Songshan Lake (SSL), Dongguan, Guangdong, China

Prepared by: Cloud Qiu
Cloud Qiu / Dec. 16, 2024

Reviewer by: Dick Liu
Dick Liu / Dec. 16, 2024

Approved by: Barlow Lv
Barlow Lv / Dec. 16, 2024



Table of Contents

Release Control Record	5
1 Summary of Test Results.....	6
1.1 Test Methodology	7
1.2 Test Facilities.....	7
1.3 Measurement Uncertainty	7
1.4 Test Equipment List and Details	8
2 General Information	10
2.1 General Description of EUT	10
2.2 Operating Modes of EUT	11
3 Configuration and Connections with EUT	12
3.1 Test Program Used and Operation Descriptions.....	12
3.2 Connection Diagram of EUT and Peripheral Devices	12
3.3 Configuration of peripheral devices and cable connections	12
4 Emission Test	13
4.1 Radiated Emissions up to 1 GHz	13
4.1.1 Limits.....	13
4.1.2 Test Instruments.....	13
4.1.3 Test Procedure	13
4.1.4 Test Setup	14
4.1.5 Deviation from test standard	14
4.1.6 Test Results.....	15
4.2 Radiated Emissions above 1 GHz	17
4.2.1 Limits.....	17
4.2.2 Test Instruments.....	17
4.2.3 Test Procedure	18
4.2.4 Test Setup	18
4.2.5 Deviation from test standard	18
4.2.6 Test Results.....	18
5 Immunity test	19
5.1 General description	19
5.2 Performance criteria	20
5.3 Electrostatic discharge immunity test	21
5.3.1 Test specification.....	21
5.3.2 Test Instruments.....	21
5.3.3 Test Procedure	21
5.3.4 Deviation from test standard	21
5.3.5 Test setup.....	22
5.3.6 Test result.....	24
5.4 Radiated, radio-frequency, electromagnetic field immunity test	25
5.4.1 Test specification.....	25
5.4.2 Test Instruments.....	25
5.4.3 Test procedure	25
5.4.4 Deviation from test standard	25
5.4.5 Test setup.....	26
5.4.6 Test results	27
5.5 Electrical Fast Transient/Burst Immunity Test	28
5.5.1 Test Specification	28
5.5.2 Test Instruments.....	28

5.5.3	Test Procedure	28
5.5.4	Deviation from test standard	28
5.5.5	Test Setup	29
5.5.6	Test Results.....	30
5.6	Surge Immunity Test	31
5.6.1	Test Specification	31
5.6.2	Test Instruments.....	31
5.6.3	Test Procedure	31
5.6.4	Deviation from test standard	31
5.6.5	Test Setup	32
5.6.6	Test Results.....	33
5.7	Immunity to Conducted Disturbances Induced by RF Fields	34
5.7.1	Test Specification	34
5.7.2	Test Instruments.....	34
5.7.3	Test Procedure	34
5.7.4	Deviation from test standard	34
5.7.5	Test Setup	35
5.7.6	Test Results.....	36
5.8	Power frequency magnetic field immunity test	37
5.8.1	Test Specification	37
5.8.2	Test Instruments.....	37
5.8.3	Test Procedure	37
5.8.4	Deviation from test standard	37
5.8.5	Test Setup	38
5.8.6	Test Results.....	39
5.9	Voltage Dip/Short Interruptions/Voltage Variations Immunity Test.....	40
5.9.1	Test Specification	40
5.9.2	Test Instruments.....	40
5.9.3	Test Procedure	40
5.9.4	Test Setup	41
5.9.5	Deviation from test standard	41
5.9.6	Test Results.....	42
6	Appendix A - Test Setup photographs	43
6.1	Radiated Emissions up to 1GHz	43
6.2	Electrostatic discharge immunity test –ESD	43
6.3	Radiated, radio-frequency, electromagnetic field immunity test.....	44
6.4	EFT immunity test	44
6.5	Immunity to Conducted Disturbances Induced by RF Fields	45
6.6	Power frequency magnetic field immunity test.....	45
7	Appendix B – E.U.T. photographs.....	46

Release Control Record

Issue No.	Description	Issued Date
WD24111022EM	Original release.	Dec. 16, 2024

1 Summary of Test Results

EMISSION			
Standards	Test Item	Result	Remark
EN IEC 61000-6-3:2021	Conducted Emissions - AC mains port	N/A	Note 1
	Conducted Emissions – wired network port	N/A	Note 1
	Conducted Emissions – DC Power port	N/A	Note 1
	Radiated Emissions 30 MHz to 1 GHz	Pass	/
	Radiated Emissions above 1 GHz	N/A	Note 2
IMMUNITY (EN IEC 61000-6-1:2019)			
Standards	Test Item	Performance criteria	Result
EN 61000-4-2:2009 IEC 61000-4-2:2008	Electrostatic discharge immunity test	Meets the requirements of Performance Criterion B	Pass
IEC 61000-4-3:2010 IEC 61000-4-3:2010	Radiated, radio-frequency, electromagnetic field immunity test	Meets the requirements of Performance Criterion A	Pass
EN 61000-4-4:2012 IEC 61000-4-4:2012	Electrical fast transient / burst immunity test.	Meets the requirements of Performance Criterion B	Pass
EN 61000-4-5:2014 IEC 61000-4-5:2014	Surge immunity test	Meets the requirements of Performance Criterion B	N/A
EN 61000-4-6:2014 IEC 61000-4-6:2013	Immunity to conducted disturbances, induced by radio-frequency fields	Meets the requirements of Performance Criterion A	Pass
EN 61000-4-8:2010 IEC 61000-4-8:2009	Power frequency magnetic field immunity test.	Meets the requirements of Performance Criterion A	Pass
EN 61000-4-11:2009 IEC 61000-4-11:2009	Voltage dips, short interruptions and voltage variations immunity tests	Meets the requirements of Performance Criterion B Performance Criterion C Performance Criterion C	N/A

Note:

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

(2) the frequency range need to be tested base on F_x , highest fundamental frequency generated or used within the EUT, or the highest frequency at which it operates.

Highest internal frequency (F_x)	Highest measured frequency
$F_x \leq 108 \text{ MHz}$	1 GHz
$108 \text{ MHz} < F_x \leq 500 \text{ MHz}$	2 GHz
$500 \text{ MHz} < F_x \leq 1 \text{ GHz}$	5 GHz
$F_x > 1 \text{ GHz}$	$5 \times F_x$ up to a maximum of 6 GHz
NOTE 1 Where the highest internal frequency is not known, tests are performed up to 6 GHz.	
NOTE 2 F_x is defined in 3.1.10.	

(3) If EUT rated power is less than 75 W, there is no need for Harmonics test to be performed.

1.1 TestMethodology

All tests were performed in accordance with the standard EN IEC 61000-6-3, EN IEC 61000-6-1

1.2 Test Facilities

Location 1:

Company Name:	Worldtest (GuangDong) Co.,Ltd.
Address:	Building 6, No. 6, North Industrial Road, Songshan Lake (SSL), Dongguan, Guangdong, China

Note: All tests facilities except Radiated Immunity used to collect the measurement data are located at Building 6, No. 6, North Industrial Road, Songshan Lake (SSL), Dongguan, Guangdong, China

Location 2:

Company Name:	SMQ Group (Dongguan) Quality Technology Service Co., Ltd.
Address:	Building 2, No. 7 Industrial North Road, Songshan Lake Park, Dongguan City, Guangdong Province

Note: All tests facilities for Radiated Immunity test used to collect the measurement data are located at Building 2, No. 7 Industrial North Road, Songshan Lake Park, Dongguan City, Guangdong Province

1.3 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

The listed uncertainties are the worst-case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the Pass/Fail results.

Measurement	Frequency	Expanded Uncertainty(k=2) (±)
Conducted disturbance at mains port using AMN	9 kHz to 30 MHz	3.61 dB
Conducted disturbance at mains port using voltage probe	9 kHz to 30 MHz	3.17 dB
Conducted disturbance at telecommunication port using AAN	150 kHz to 30 MHz	4.03 dB
Conducted disturbance at telecommunication port using current probe	150 kHz to 30 MHz	2.77 dB
Radiated Emissions	0.009 MHz ~ 30 MHz	2.15 dB
Radiated Emissions	30 MHz ~ 1 GHz	5.34 dB
Radiated Emissions	1 GHz ~ 18 GHz	4.84 dB
Radiated Emissions	18 GHz ~ 40 GHz	5.73 dB

1.4 Test Equipment List and Details

Equipment Name	Model	Manufacturer	Serial No.	Cal. date	Interval
853 Shielding chamber	SR-853	yiheng	853	2022.09.13	3 Years
EMI Receiver	ESCI3	R&S	101168	2024.01.16	1 Year
LISN	ENV216	R&S	102857	2024.01.16	1 Year
CE test software	EZ-CE	FARA	N/A	N/A	N/A
3m semi-anechoic chamber	3m SAC	yiheng	966	2022.09.13	3 Years
EMI Receiver	ESPI3	R&S	100605	2024.01.16	1 Year
Spectrum analyzer	N9010A	Agilent	MY50483285	2024.01.16	1 Year
60cm Loop Antenna	FMZB 1513-60	Schwarzbeck	00006	2023.03.03	3 Years
log-periodic antenna	VULB 9168	Schwarzbeck	1314	2022.12.09	3 Years
Horn Antenna	BBHA 9120D	Schwarzbeck	2557	2022.12.08	3 Years
Horn Antenna	BBHA 9170	Schwarzbeck	1173	2022.12.09	3Years
Pre-amplifier	RP01	Emtrace	1917	2024.01.16	1 Year
Pre-amplifier	TAP0118045	Tonscend	6150	2024.01.16	1 Year
Pre-amplifier	TAP-184050	Tonscend	6214	2024.01.16	1 Year
9kHz~1GHz cable 7m	LMR400UF	NMNM	N/A	2024.01.16	3 Year
9kHz~1GHz cable1.5m	LMR400UF	NMNM	N/A	2024.01.16	3 Year
9kHz~1GHz cable 1m	LMR400UF	NMNM	N/A	2024.01.16	3 Year
9kHz~1GHz cable 1.5m	LMR400UF	NMNM	N/A	2024.01.16	3 Year
1~18GHz cable 1.5m	SFT205PUR	NMNM	N/A	2024.01.16	3 Year
1~18GHz cable 2.0m	HF160	NMNM	N/A	2024.01.16	3 Year
1~18GHz cable 0.3m	SFT205PUR	NMSWSM	N/A	2024.01.16	3 Year
1~18GHz cable 7.0m	SFT205PUR	NMSWSM	N/A	2024.01.16	3 Year
18~40GHz cable 0.3m	HF160	KMKM	N/A	2024.01.16	3 Year
18~40GHz cable 4.0m	HF160	KMKM	N/A	2024/01/16	1 Year
RE test software	EZ-RE	FARA	N/A	N/A	N/A
Harmonic&Flicker test system	HFA5000S	ZES	221021-09	2024.01.16	1 Year
ESD generator	SKS-0220GS	SANKI	020413019E321	2024.01.19	1 Year
EFT,SURGE,DipsImmunity test system	CCS 600	3ctest	ES014002222008	2024.01.16	1 Year
Inductive coupling clamp EFT	CCC 100	3ctest	CCC22090017	2024.01.16	1 Year
Immunity test system DIPS Module	VMT 2216SV	3ctest	ES047000221015	2024.01.16	1 Year
Signal Generator	SML	R&S	101709	2024.01.16	1 Year
Power meter	E4419B	Agilent	MY45108826	2024.01.16	1 Year

Power sensor	E9304	Agilent	MY51110016	2024.01.16	1 Year
Power sensor	E9304	Agilent	MY52270014	2024.01.16	1 Year
power amplifier	MPA-0.15-230-110	Maiketuo	9332	2024.01.16	1 Year
Single phase CDN	CDN_M3PE_16A	Schwarzbeck	00124	2024.01.16	1 Year
Electromagnetic injection clamp	KEMZ 801AS	TEQ	64524	2023.03.06	1 Year
CS test system	EM6	Emtrace	N/A	N/A	N/A
Immunity test system	CCS 600	3ctest	ES014002222008	2024.01.16	1 Year
magnetic field coil PFMF	TCXS113	3ctest	TCXS22045959	2024.01.16	1 Year
Signal Generator	RS	SMA100B-B106	DQN0737	2024. 11.30	1 Year
Power Amplifier	RS	BBA150-BC250	DQN0276	2024.11.27	1 Year
Power Amplifier	RS	BBA150-D110E100	DQN0276	2024.11.27	1 Year
antenna	Schwarzbeck	STLP 9128D sp-N	DQN0103	2024.11.21	1 Year
antenna	Schwarzbeck	BBHA 9120 J	DQN0103	2024.11.21	1 Year

Note, this item was tested at SMQ Group (Dongguan)Quality Technology Service Co., Ltd.

2 General Information

2.1 General Description of EUT

General Description of E.U.T.	
EUT Description:	Inductive Proximity Sensor
Brand:	JM
Model No.:	XYZ#-X0802Y-XYZ# First X: can be I, C, T, M, P and W. I stands for inductive type, C stands for capacitive type. T stands for high temperature type, M stands for full metal type, P stands for the high pressure-rated type, W stands for the wild field immune type. First Y: can be A, B, D, E. A stands for DC 10-30V, B stands for DC 5V, D stands for DC 10-30V(2 wire). E stands for DC 18-30V. First Z: can be 1 or 2, 1 stands for flush/shielded type, 2 stands for non-flush/non-shielded type. First #: can be T, D or Q, T stands for cylindrical pipe fittings with threaded teeth, D stands for smooth body pipe fittings, Q stands for square case. Second X: can be B, S or P, B stands for brass housing, S stands for stainless steel housing, P stands for plastic housing. 08: can be different sensor sizes, stands for product diameter M8 (mm), 12 for product diameter M12 (mm)..... 02: detection distance 2(mm), 03 detection distance 3(mm)..... Second Y: can be N, P, C, G. N stands for NPN, P stands for PNP, C stands for DC2 wire, G stands for analog output. Third X: can be O, C, S, I, V or M, O stands for normal open, C stands for normal close, S stands for normal open and normal close, I stands for analog current output, V stands for analog voltage output, M stands for Analog current and voltage output. Third Y: can be 2, 3, 4, P, E or T, 2 stands for 2 wire, 3 stands for 3 wire, 4 stands for 4 wire. P stands for M8 Connector type (fixed 3-pin), E stands for M12 Connector type (fixed 4-pin), T stands for Pigtail type. Second Z: can be A, B, S, R, F or L, A stands for standard type with short circuit protection, B stands for standard type without short circuit protection, S stands for short type with short circuit protection, R stands for ultra short type with short circuit protection, F stands for Separate type, L stands for long tube type. Second #: can be 2, 3 or 4, 2 stands for the cable length is 2 meters, 3 stands for M8 Connector type (3-pin), 4 stands for M12 Connector type (4-pin). That depend on the connection way of the sensors.
Test Model:	IA1T-B0802N-O3A2-45
Model Difference:	the product's circuit principle, structure, and key components are all exactly the same, only the size and shape are different.
Power Supply:	DC 24V
I/O Port:	Input: DC 12V or DC 24V, 150mA, 0.225W
Cable Supply:	DC input

Note:

1. For a more detailed features description, please refer to the manufacturer's specification or the User's Manual.
2. For the test results, the EUT had been tested with all conditions, and only the worst case was shown in the test report.

2.2 Operating Modes of EUT

The EUT has been pre-tested under the following test modes, and the worst-case test mode was presented in the report.

Radiated emission below 1GHz		
Test Date:		2024-12-04
Environmental Conditions:		25°C, 63%RH
Test By:		Mike Xiao
Worst case mode (presented in the report):		Mode 1
Mode	Test Condition	Voltage supply
1	working	DC 24V

Immunity testing			
Test items	Test Date	Environmental Conditions	Test By
ESD	2024-12-05	25°C, 52%RH, 101KPa	Mike Xiao
RS	2024-12-05	25°C, 54%RH	Mike Xiao
EFT/B	2024-12-05	25°C, 54%RH	Mike Xiao
CS	2024-12-05	25°C, 54%RH	Mike Xiao
PFMF	2024-12-05	25°C, 54%RH	Mike Xiao

Immunity testing		
ESD -Electrostatic Discharge Immunity Test		
RS -Radiated, Radio-Frequency, Electromagnetic Field Immunity Test*		
PFMF - Power frequency magnetic field immunity		
EFT/B -Electrical Fast Transient / Burst Immunity Test		
Surge -Immunity Test		
CS -Immunity To Conducted Disturbances, Induced By Radio-Frequency Fields*		
Dips -Voltage Dips, Short Interruptions And Voltage Variations Immunity Tests		
Mode	Test Condition	Voltage Supply
1	working	DC 24V

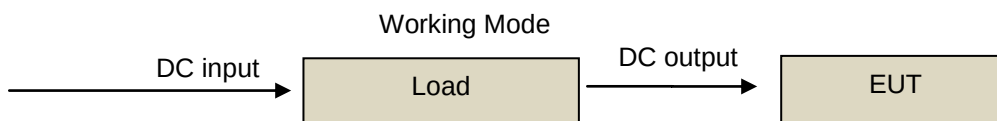
3 Configuration and Connections with EUT

3.1 Test Program Used and Operation Descriptions

- Turned on the power of all equipment.
- EUT was operated according to the type described in manufacturer's specifications or the user's manual.

3.2 Connection Diagram of EUT and Peripheral Devices

The I/O connection port of the product is shown in the figure below. The use of the port is based on the user manual. For the actual test, please see the test photos.



3.3 Configuration of peripheral devices and cable connections

No.	Product	Brand	Model No.	Serial No.	Spec.	Remarks
1	Load-100Ω	/	/	/	/	/

No.	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1	DC Cable	1	1.5	NO	No	/

4 Emission Test

4.1 Radiated Emissions up to 1 GHz

4.1.1 Limits

Frequencies (MHz)	3m	10m
	Quasi-peak(dBuV)	Quasi-peak(dBuV)
30– 230	40	30
230 – 1000	47	37

Notes: 1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).

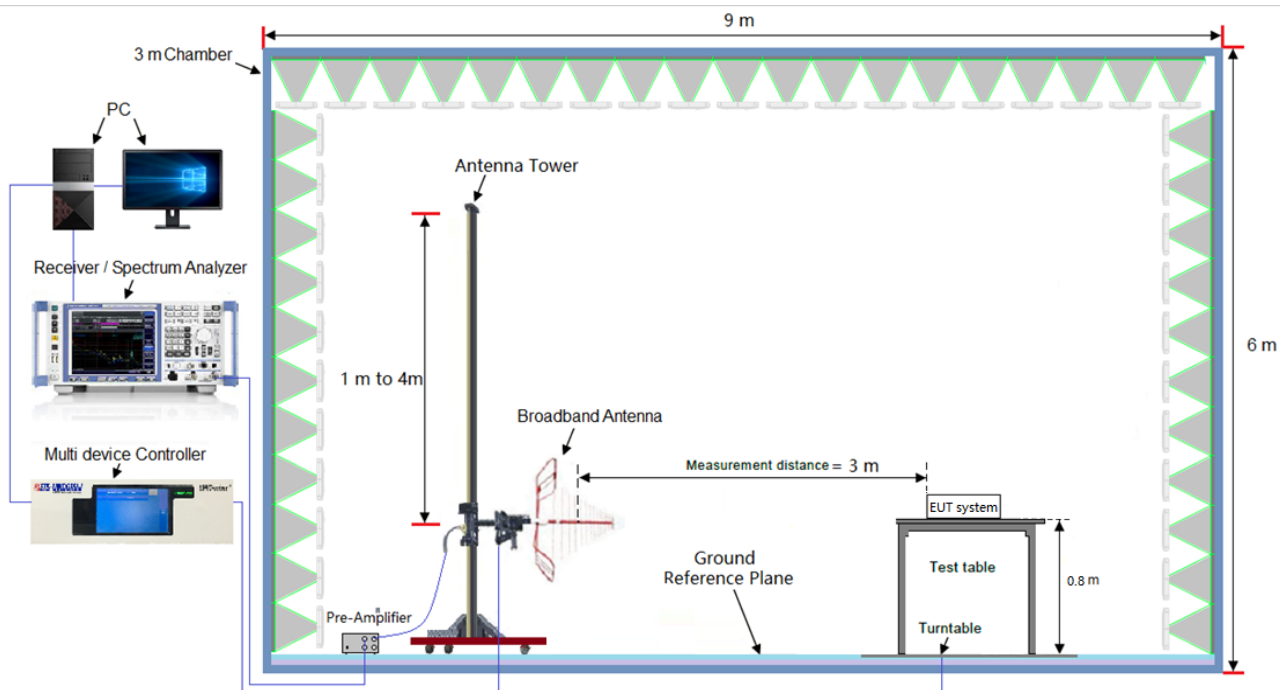
4.1.2 Test Instruments

See the section 1.4.

4.1.3 Test Procedure

- The EUT was placed on the top of a rotating table (0.1 meter for floor-standing device, 0.8 meter for tabletop) above the ground reference plane at an accredited test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground reference plane to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 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 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum emissions.
- The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- Note:
 - The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
 - Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
 - Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) (if the raw value not contains the amplifier)
 - Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain(dB) (if the raw value contains the amplifier)
 - Margin value = Emission level – Limit value.

4.1.4 Test Setup

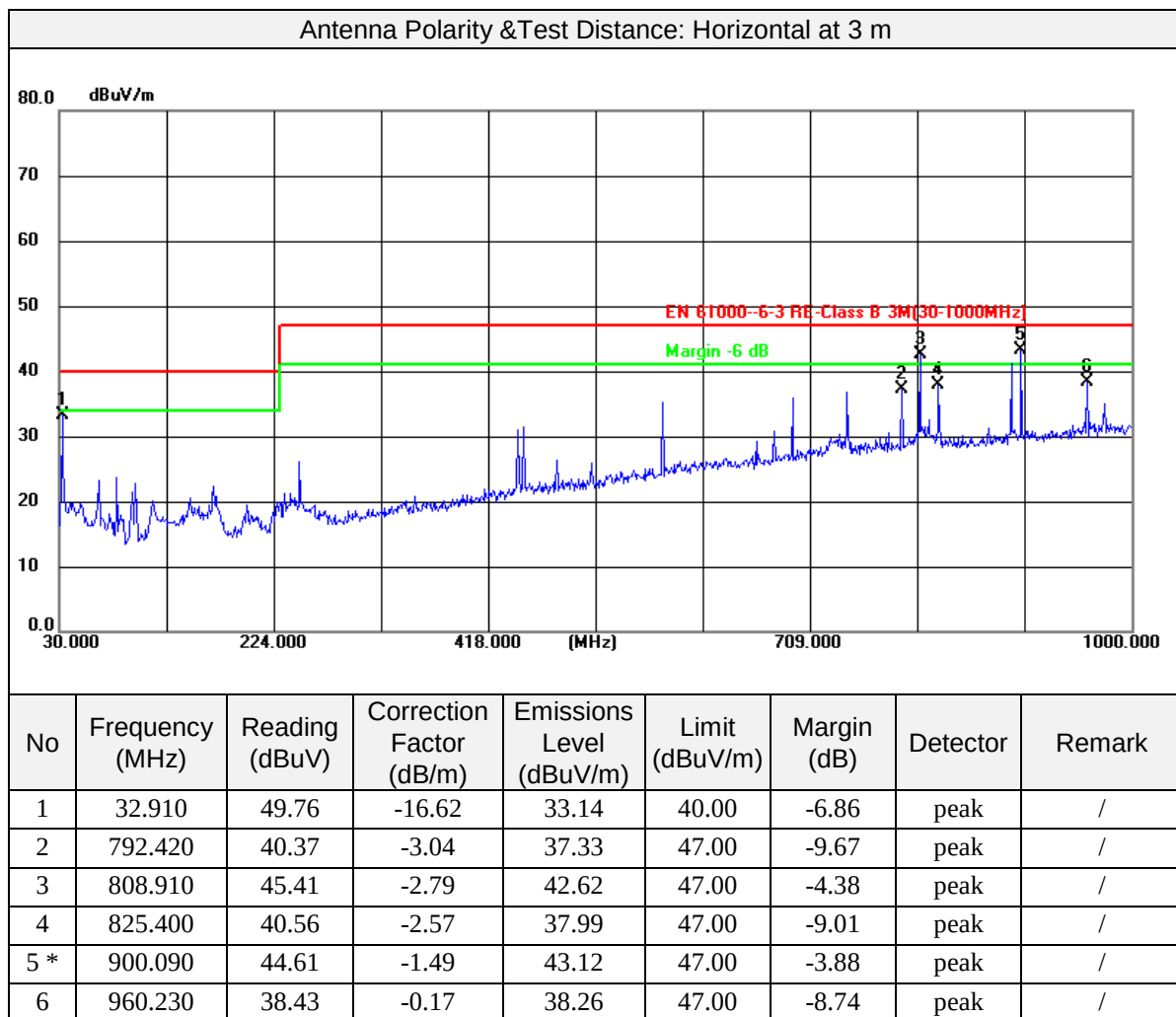


4.1.5 Deviation from test standard

No deviation.

4.1.6 Test Results

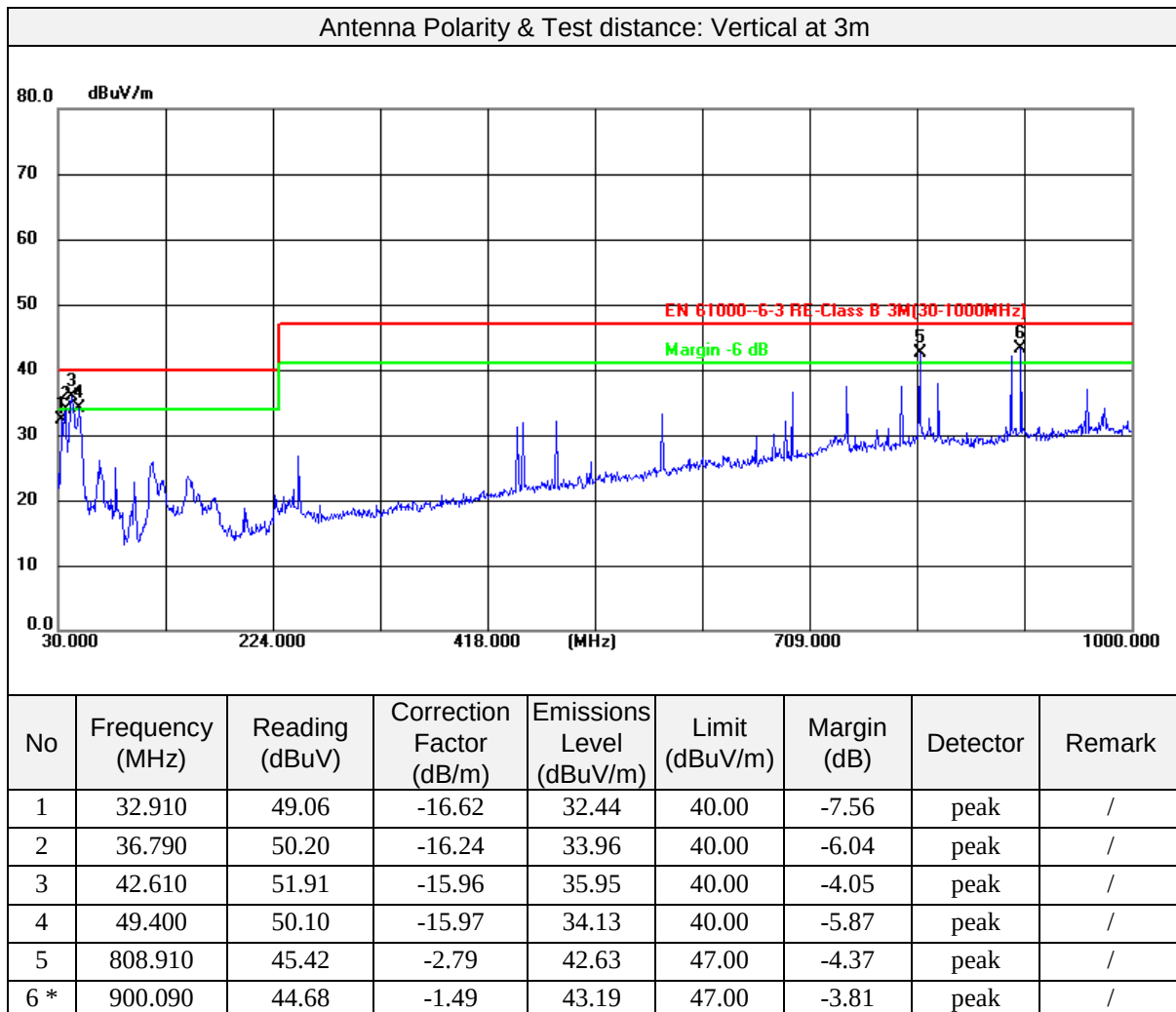
FrequencyRange	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Test mode	See section 2.2		



Remarks:

1. Emission Level(dBuV/m) = Reading Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
- Pre-Amplifier gain (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value

Frequency Range	30MHz ~ 1GHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP), 120kHz
Test mode	See section 2.2		



Remarks:

1. Emission Level(dBuV/m) = Reading Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) - Pre-Amplifier gain (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level - Limit value

4.2 Radiated Emissions above 1 GHz

4.2.1 Limits

FREQUENCY (MHz)	3m Distance dBμV/m	
	Peak	Avg
1000-3000	70	50
3000-6000	74	54

Note:

- (1) The limit for radiated test was performed according to EN 61000-6-3.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBμV/m)=20log Emission level (uV/m).
- (4) the frequency range need to be tested base on F_x , highest fundamental frequency generated or used within the EUT, or the highest frequency at which it operates.

Highest internal frequency (F_x)	Highest measured frequency
$F_x \leq 108 \text{ MHz}$	1 GHz
$108 \text{ MHz} < F_x \leq 500 \text{ MHz}$	2 GHz
$500 \text{ MHz} < F_x \leq 1 \text{ GHz}$	5 GHz
$F_x > 1 \text{ GHz}$	$5 \times F_x$ up to a maximum of 6 GHz
NOTE 1 Where the highest internal frequency is not known, tests are performed up to 6 GHz.	
NOTE 2 F_x is defined in 3.1.10.	

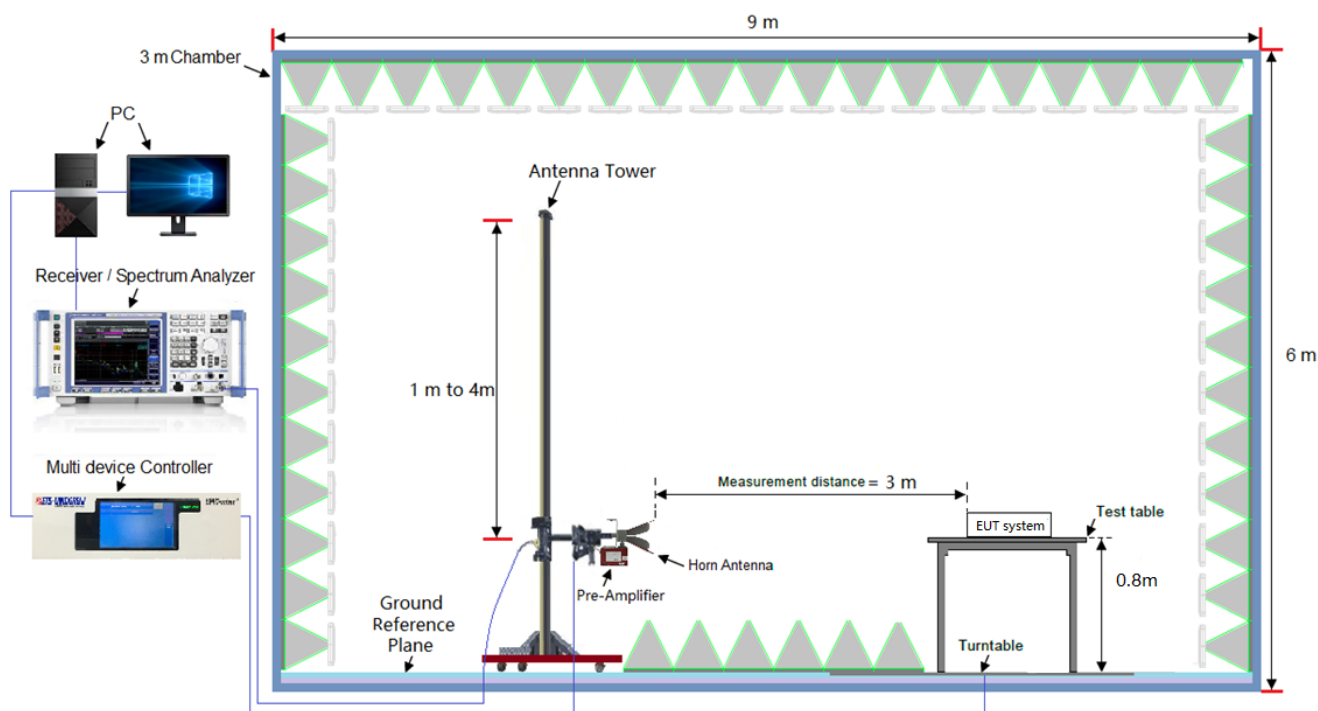
4.2.2 Test Instruments

See the section 1.4.

4.2.3 Test Procedure

- The EUT was placed on the top of a rotating table (0.1 meter for floor-standing device, 0.8 meter for tabletop) above the ground reference plane at an accredited test facility. The table was rotated 360 degrees to determine the position of the highest radiation.
- For frequency range 1GHz ~ 6GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna can be varied from one meter to four meters, the height of adjustment depends on the EUT height and the antenna 3dB beamwidth both, to detect the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The spectrum analyzer system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

4.2.4 Test Setup



4.2.5 Deviation from test standard

No deviation.

4.2.6 Test Results

N/A, Fxofwith EUT islessthan 108MHz.

5 Immunity test

5.1 General description

Product Standard	EN IEC 61000-6-1:2019	
Basic Standard, specification requirement, and Performance Criteria:	IEC 61000-4-2	Electrostatic Discharge – ESD: ● 4kV Contact discharge, ● 8kV air discharge, Performance Criterion B
	IEC 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: ● 80-1000 MHz, 3V/m, 80% AM (1kHz), ● 1400-6000 MHz, 3V/m, 80% AM (1kHz), Performance Criterion A
	IEC 61000-4-4	Electrical Fast Transient/Burst – EFT ● AC Power port: 1kV, 5/50ns, 5 kHz or 100kHz ● DC Power port: 0.5kV, 5/50ns, 5 kHz or 100kHz ● Signal/Control port: 0.5kV, 5/50ns, 5 kHz or 100kHz Performance Criterion B
	IEC 61000-4-5	Surge Immunity Test: 1.2/50 us Open Circuit Voltage, 8 /20 us Short Circuit Current, 10/700 us Open Circuit Voltage, 5 /320 us Short Circuit Current, ● AC Power port: line to line 1kV ● AC Power port: Line to earth 2kV ● Signal/Control port: Line to earth 1kV ● DC power port: line to line 0.5kV ● DC power port: line to earth 1kV Performance Criterion B
	IEC 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: ● 0.15-80 MHz, 3Vrms, 80% AM, 1kHz Performance Criterion A
	IEC 61000-4-8	Power Frequency Magnetic Field Test, 50Hz, 60Hz, 3A/m, Performance Criterion A
	IEC 61000-4-11	Meets the requirements of Voltage Dips: ● 0% residual voltage, 0.5 cycle; Performance Criterion B ● 0% residual voltage, 1 cycle; Performance Criterion B ● 70% residual voltage, 25/30 at 50/60 Hz; Performance Criterion C Meets the requirements of Voltage Interruptions: ● 0% residual voltage, 250/300cycle at 50/60Hz; Performance Criterion C

5.2 Performance criteria

Criterion A
The EUT shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. If the performance level is not specified by the manufacturer, this may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.
Criterion B
The EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. However, during the test degradation of performance is allowed but no change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation .
Criterion C
Temporary loss of function is allowed during the test, provided the function is self-recoverable or can be restored by the operation of the controls.
Additional, If, as a result of the application of the tests defined in this standard, the EUT becomes dangerous or unsafe, it shall be deemed to have failed the test.

5.3 Electrostatic discharge immunity test

5.3.1 Test specification

Basic Standard:	IEC 61000-4-2, EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Air Discharge: 8 kV (Direct) Contact Discharge: 4 kV (Direct and Indirect)
Polarity:	Positive & Negative
Number of Discharge:	20 times on each test points
Discharge Mode:	Single Discharge
Discharge Period:	1 second

5.3.2 Test Instruments

See the section 1.4.

5.3.3 Test Procedure

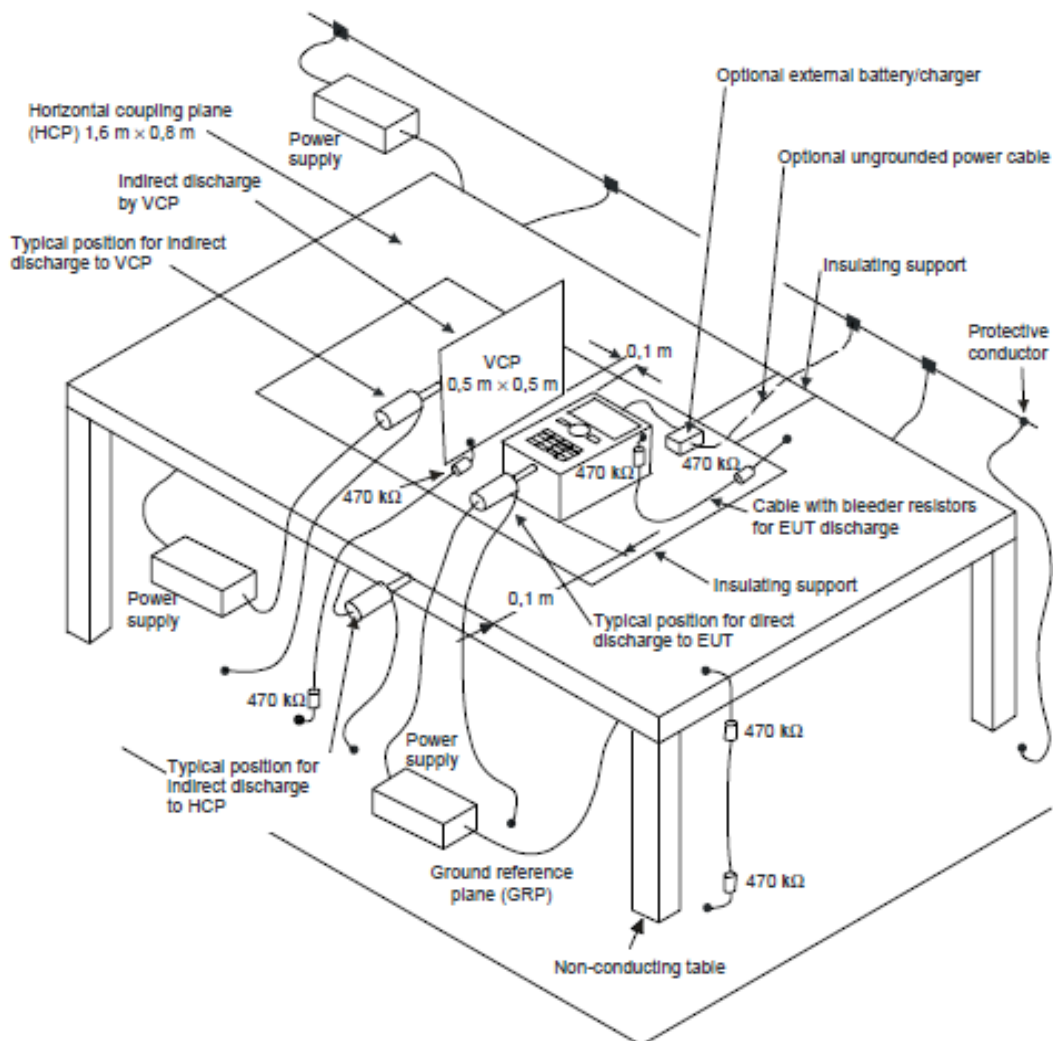
- Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- The time interval between two successive single discharges was at least 1 second.
- The discharge return cable of the generator shall be kept at a distance of at least 0.2 m from the EUT whilst the discharge is being applied and should not be held by the operator.
- 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.
- At least ten single discharges (in the most sensitive polarity) were applied to the Horizontal Coupling Plane at points on each side of the EUT. The ESD generator was positioned horizontally at a distance of 0.1 meters from the EUT with the discharge electrode touching the HCP.
- At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

5.3.4 Deviation from test standard

No deviation.

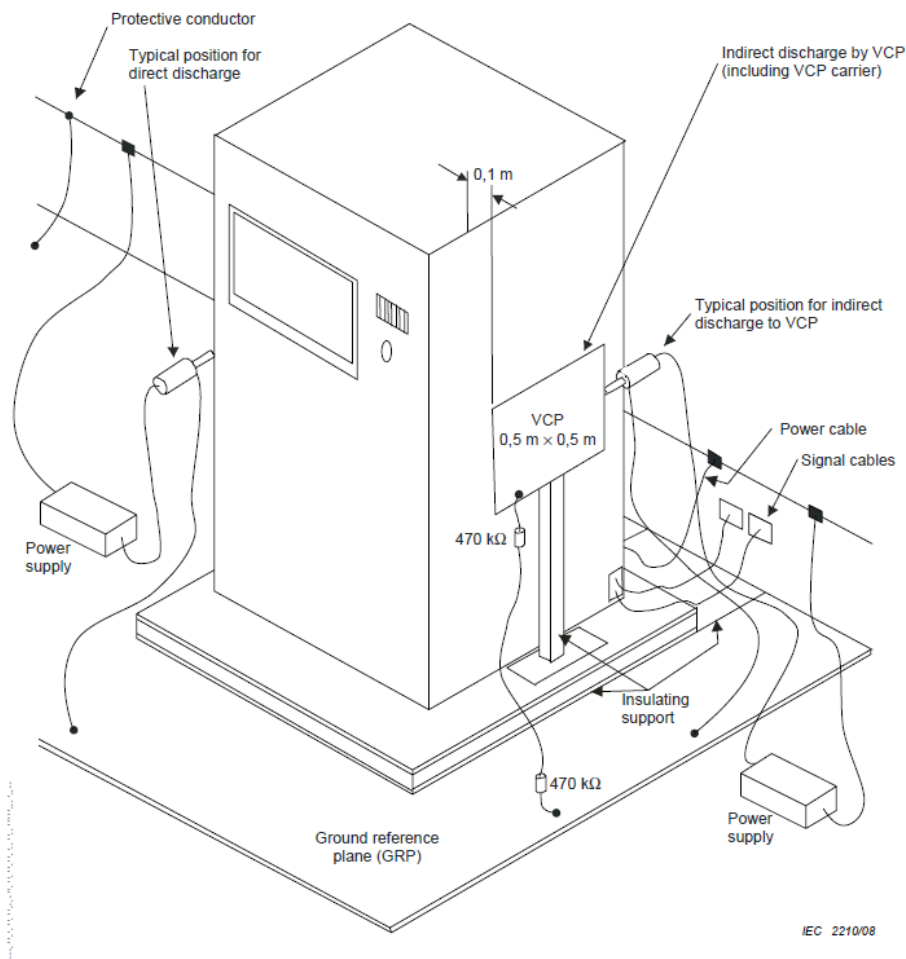
5.3.5 Test setup

Table-top



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

Floor standing



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

5.3.6 Test result

Test Mode	See section 2.2
-----------	-----------------

Direct Discharge Application				
Test Level (kV)	Polarity	Test Point	Test Result of Contact Discharge	Test Result of Air Discharge
4	+ / -	All metal parts	A	N/A
8	+ / -	Other non-metal parts	N/A	A

Indirect Discharge Application				
Discharge Level (kV)	Polarity	Test Point	Test Result of HCP	Test Result of VCP
4	+ / -	HCP	A	N/A
4	+ / -	VCP	N/A	A

Note:

Test Result of A: There was no change compared with initial operation during the test.

5.4 Radiated, radio-frequency, electromagnetic field immunity test

5.4.1 Test specification

Basic Standard:	IEC 61000-4-3; EN 61000-4-3
Frequency Range:	80-1000MHz,1400-6000MHz
Field Strength:	80-1000 MHz,3V/m 1400-6000 MHz, 3V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5m
Dwell Time:	1 seconds

5.4.2 Test Instruments

See the section 1.4.

5.4.3 Test procedure

The test procedure was in accordance with EN 61000-4-3.

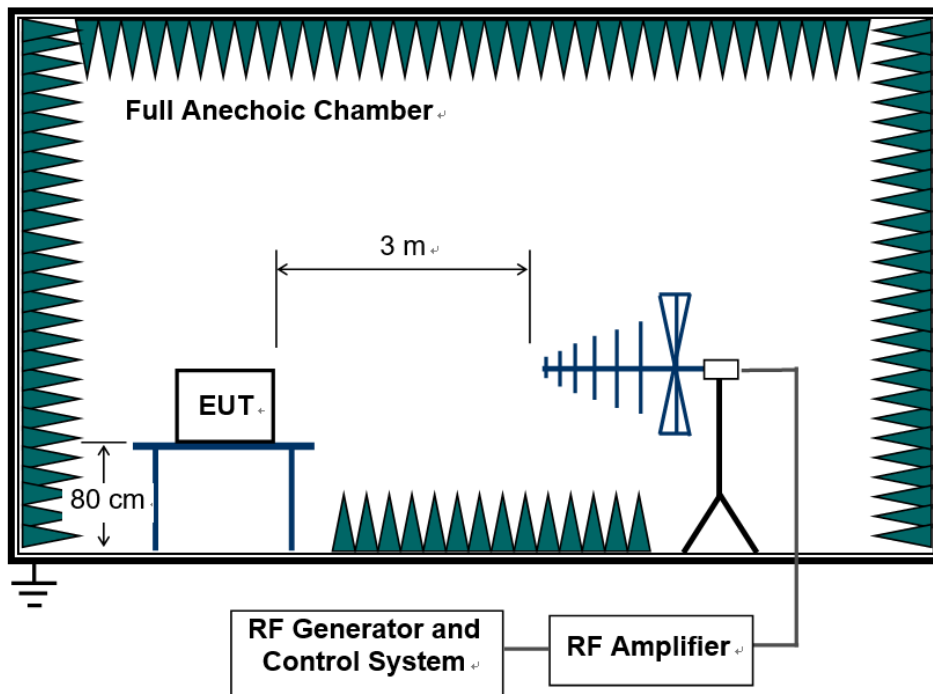
- The testing was performed in a fully-anechoic chamber.
- The frequency range is swept from 80 MHz to 1000 MHz and 1400MHz to 6000MHz with the signal 80% amplitude modulated with a 1kHz sinewave.
- The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and respond it, but no case be less than 0.5s.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

5.4.4 Deviation from test standard

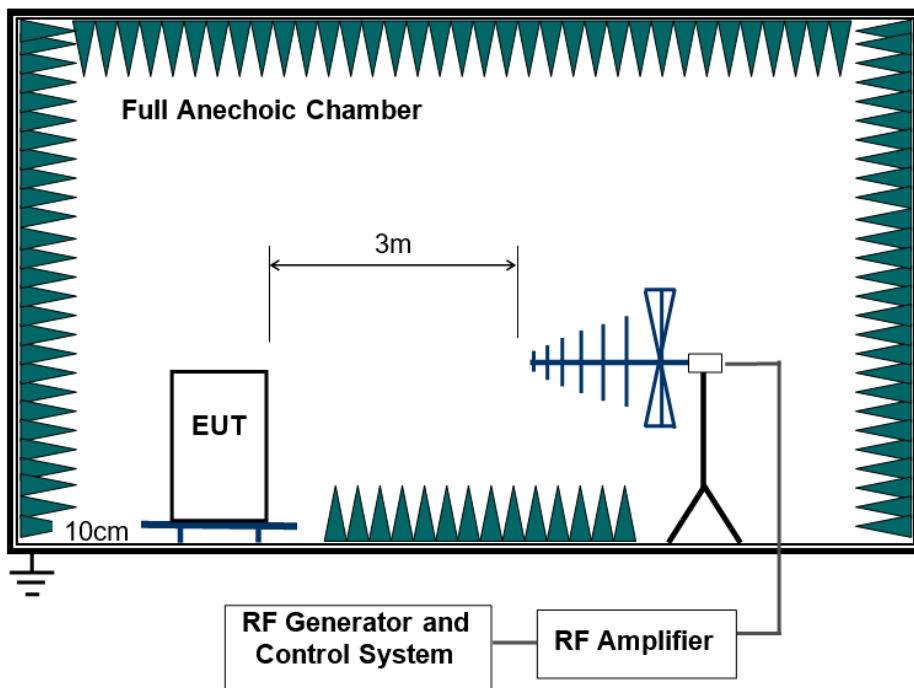
No deviation.

5.4.5 Test setup

Table-top



Floor standing



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

Floor standing

5.4.6 Test results

Test Mode	See section 2.2
-----------	-----------------

Freq. Range (MHz)	Position (Face)	Polarity (H or V)	Field Strength (V/m) (unmodulated, r.m.s.)	Criterion	Results	Judgement
80-1000	0°	H&V	3V/m	A	A	Pass
80-1000	90°	H&V	3 V/m	A	A	Pass
80-1000	180°	H&V	3V/m	A	A	Pass
80-1000	270°	H&V	3 V/m	A	A	Pass
1400-6000	0°	H&V	3V/m	A	A	Pass
1400-6000	90°	H&V	3 V/m	A	A	Pass
1400-6000	180°	H&V	3V/m	A	A	Pass
1400-6000	270°	H&V	3 V/m	A	A	Pass

Note:

Test Result of A: There was no change compared with initial operation during the test.

5.5 Electrical Fast Transient/Burst Immunity Test

5.5.1 Test Specification

Basic Standard:	IEC 61000-4-4, EN 61000-4-4
Test Voltage:	AC Power port: 1kV, 5/50ns, 5 kHz or 100kHz DC Power port: 0.5kV, 5/50ns, 5 kHz or 100kHz Signal/Control port: 0.5kV, 5/50ns, 5 kHz or 100kHz
Polarity:	Positive&Negative
Impulse Frequency:	5 kHz
Impulse Wave-shape:	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	1 min.

5.5.2 Test Instruments

See the section 1.4.

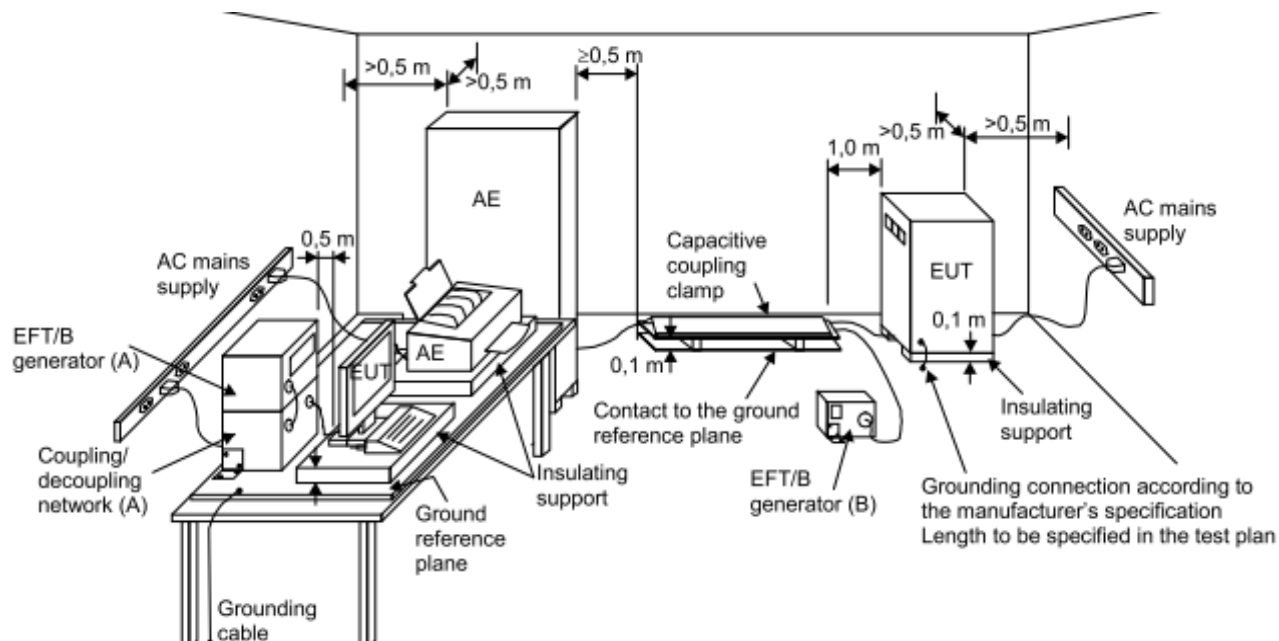
5.5.3 Test Procedure

- Both positive and negative polarity discharges were applied.
- The distance between any coupling devices and the EUT should be $(0.5 - 0/+0.1)$ m for table-top equipment testing, and (1.0 ± 0.1) m for floor standing equipment.
- The duration time of each test sequential was 1 minute.
- The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.

5.5.4 Deviation from test standard

No Deviation.

5.5.5 Test Setup



(A) Location for supply line coupling; (B) Location for signal lines coupling

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

5.5.6 Test Results

Test Mode			See section 2.2								
Pulse Voltage	0.5kV		1kV		kV		kV		Criterion	Results	Judgement
Pulse Polarity	+	-	+	-	+	-	+	-			
Signal/Control Port	A	A	/	/	/	/	/	/	B	A	Pass

Note:

Test Result of A: There was no change compared with initial operation during the test.

5.6 Surge Immunity Test

5.6.1 Test Specification

Basic Standard:	IEC 61000-4-5, EN 61000-4-5
Wave-Shape:	1.2/50 us Open Circuit Voltage 8/20 us Short Circuit Current
Test Voltage:	AC Power port: line to line 1kV AC Power port: Line to earth 2kV Signal/Control port: Line to earth 1kV DC power port: line to line 0.5kV DC power port: line to earth 1kV
Polarity:	Positive/Negative
Phase Angle:	0°/90°/180°/270°
Pulse Repetition Rate:	1 time / 60 sec.
Number of Tests:	5 @positive and 5 @negative at selected points

5.6.2 Test Instruments

See the section 1.4.

5.6.3 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 to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and provide to sufficient the decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

b. For test applied to unshielded un-symmetrically 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).

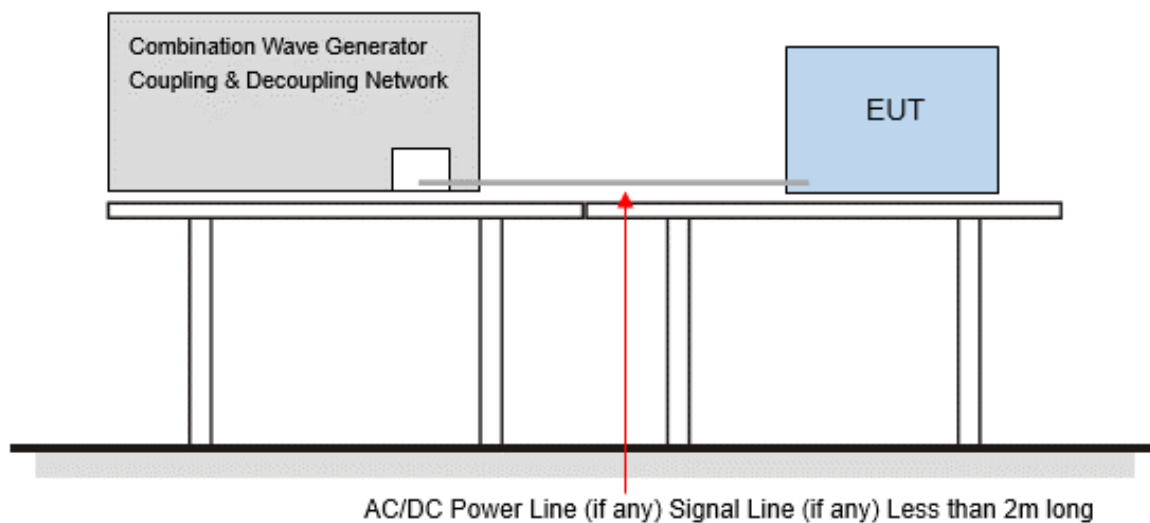
c. For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:

5.6.4 Deviation from test standard

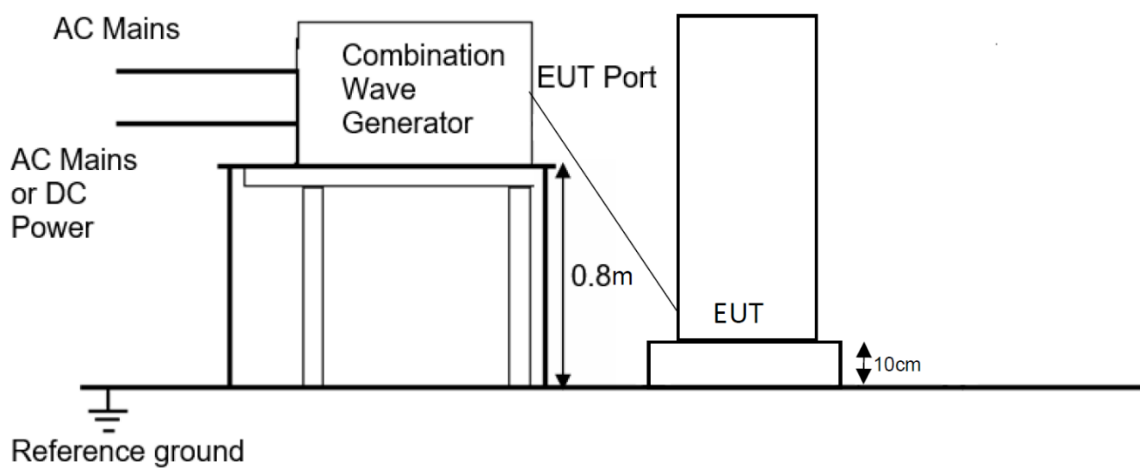
No deviation.

5.6.5 Test Setup

Table-top



Floor standing



5.6.6 Test Results

N/A, The EUT supply is DC, and the power supply is not directly connected to the power supply network, so this test does not require evaluation

5.7 Immunity to Conducted Disturbances Induced by RF Fields

5.7.1 Test Specification

Basic Standard:	EN 61000-4-6; IEC 61000-4-6
Frequency Range & Field Strength:	0.15-80 MHz, 3Vrms, 80% AM, 1kHz
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Coupled Cable:	Power Mains, Unshielded
Coupling Device:	Clamp

5.7.2 Test Instruments

See the section 1.4.

5.7.3 Test Procedure

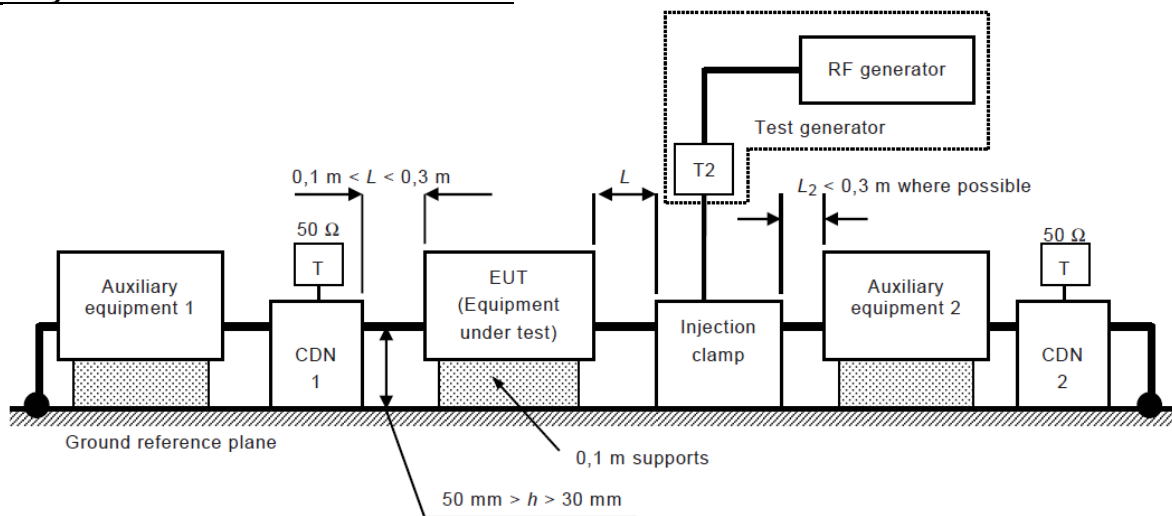
- The EUT shall be tested within its intended operating and climatic conditions.
- An artificial hand was placed on the hand-held accessory and connected to the ground reference plane.
- The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.
- The frequency range is swept from 0.15 MHz - 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. Where the frequency is swept incrementally, the step size shall not exceed 1 % of the preceding frequency value.
- The dwell time of the amplitude modulated carrier at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0,5 s. The sensitive frequencies (e.g. clock frequencies) shall be analyzed separately.
- Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

5.7.4 Deviation from test standard

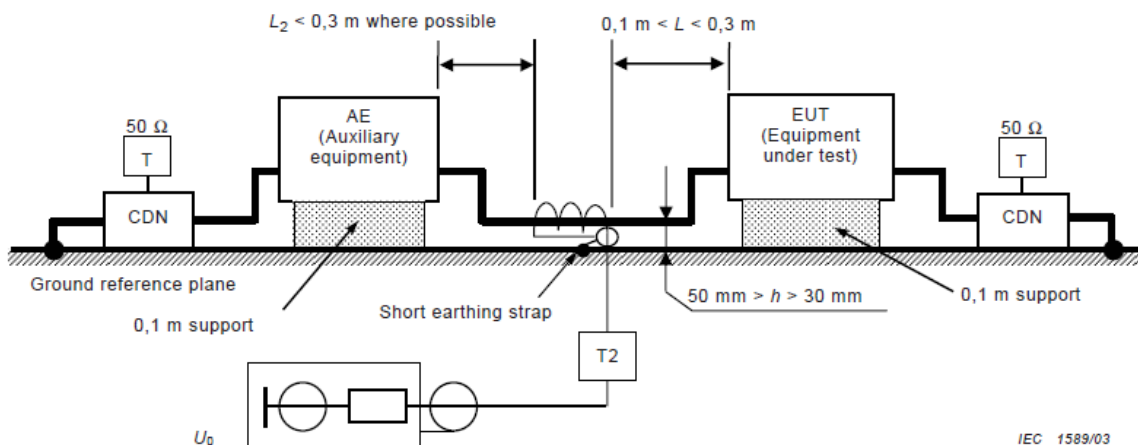
No deviation.

5.7.5 Test Setup

Immunity test to RF conducted disturbances

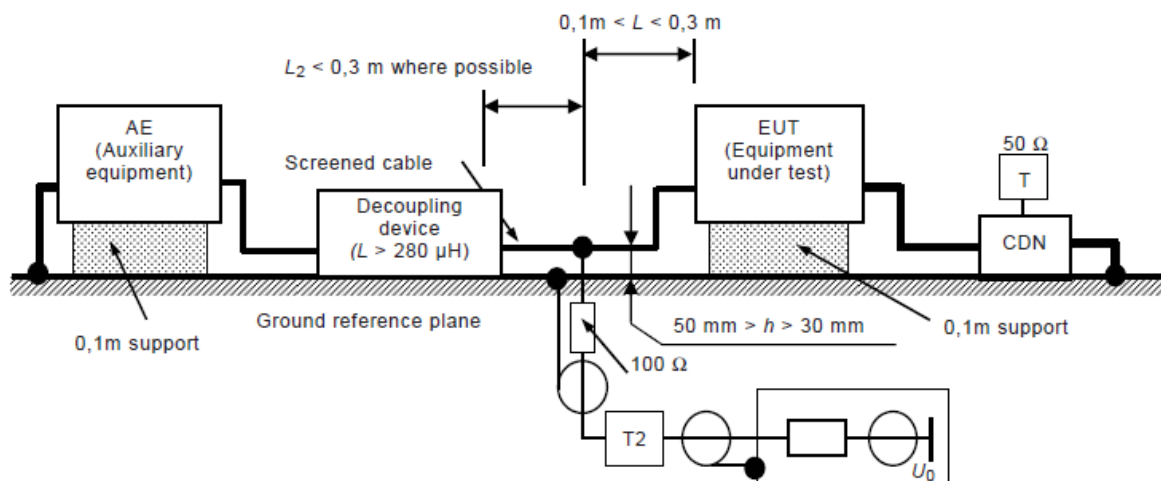


Coupling and decoupling according to the clamp injection



IEC 1589/03

Direct injection to screened cables



Note: 1. The EUT clearance from any metallic obstacles shall be at least 0.5m.
2. All non-excited input ports of the CDNs shall be terminated by 50Ω loads.

5.7.6 Test Results

Test Mode		See section 2.2				
Voltage (V)	Test Frequency (MHz)	Tested Line	Injection Method.	Criterion	Results	Judgement
3	0.15-80	AC power port	CDN-M3	/	/	/
3	0.15-80	DC power port	Clamp	/	/	/
3	0.15-80	Signal/Control port	Clamp	A	A	Pass

Note:

Test Result of A: There was no change compared with initial operation during the test.

5.8 Power frequency magnetic field immunity test

5.8.1 Test Specification

Basic Standard:	IEC 61000-4-8, EN 61000-4-8
Frequency Range:	50Hz, 60Hz
Field Strength:	3A/m
Observation Time:	1 minute
Inductance Coil:	Rectangular type, 1mx1m

5.8.2 Test Instruments

See the section 1.4.

5.8.3 Test Procedure

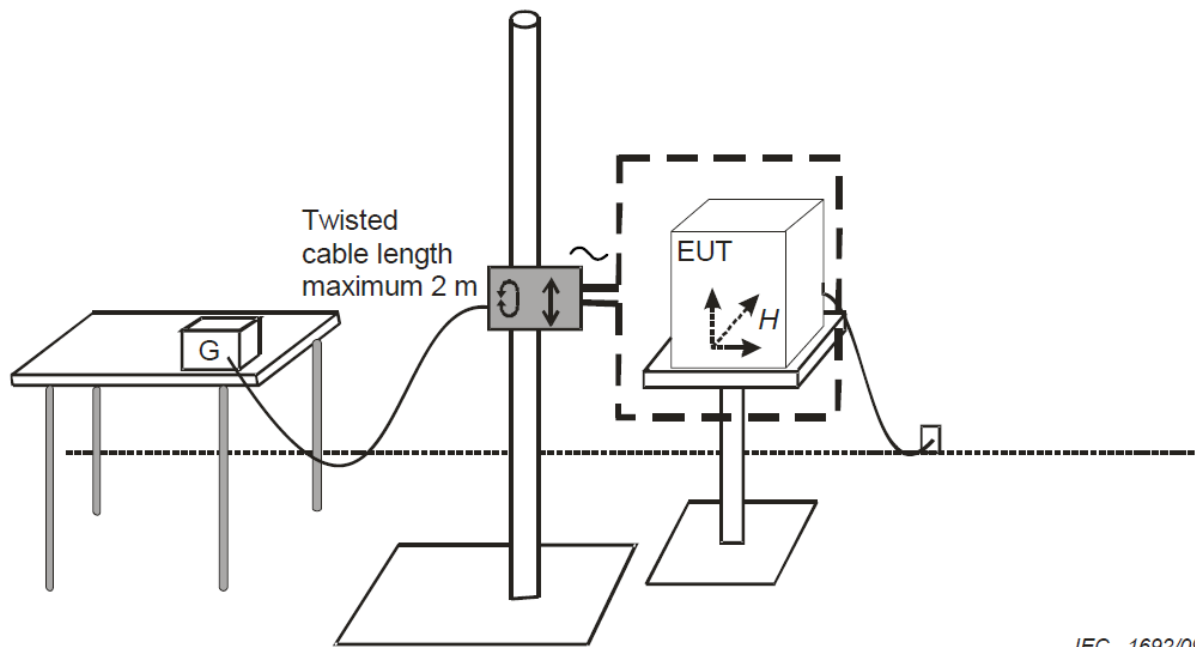
- The equipment is configured and connected to satisfy its functional requirements.
- The power supply, input and output circuits shall be connected to the sources of power supply, control and signal.
- The cables supplied or recommended by the equipment manufacturer shall be used. 1 meter of all cables used shall be exposed to the magnetic field.

5.8.4 Deviation from test standard

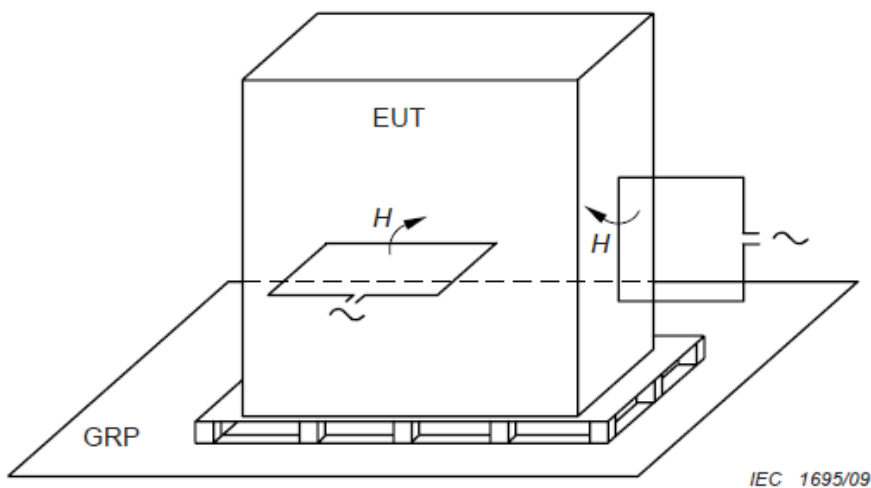
No deviation.

5.8.5 Test Setup

Table-top



Floor standing



5.8.6 Test Results

Test Mode	See section 2.2
-----------	-----------------

Magnetic field direction	Magnetic field level	Criterion	Results	Judgement
X - Axis	3A/m	A	A	Pass
Y - Axis	3A/m	A	A	Pass
Z - Axis	3A/m	A	A	Pass

Note:

Test Result of A: There was no change compared with initial operation during the test.

5.9 Voltage Dip/Short Interruptions/Voltage Variations Immunity Test

5.9.1 Test Specification

Basic Standard:	IEC 61000-4-11, EN 61000-4-11
Test Specification	0% residual voltage, 1cycle 40% residual voltage, 10/12 at 50/60 Hz 70% residual voltage, 25/30 at 50/60 Hz 0% residual voltage, 250/300cycle at 50/60Hz
Test Duration Time:	Minimum three test events in sequence
Interval between Event:	Minimum ten seconds
Phase Angle:	0°
Test Cycle:	3 times

5.9.2 Test Instruments

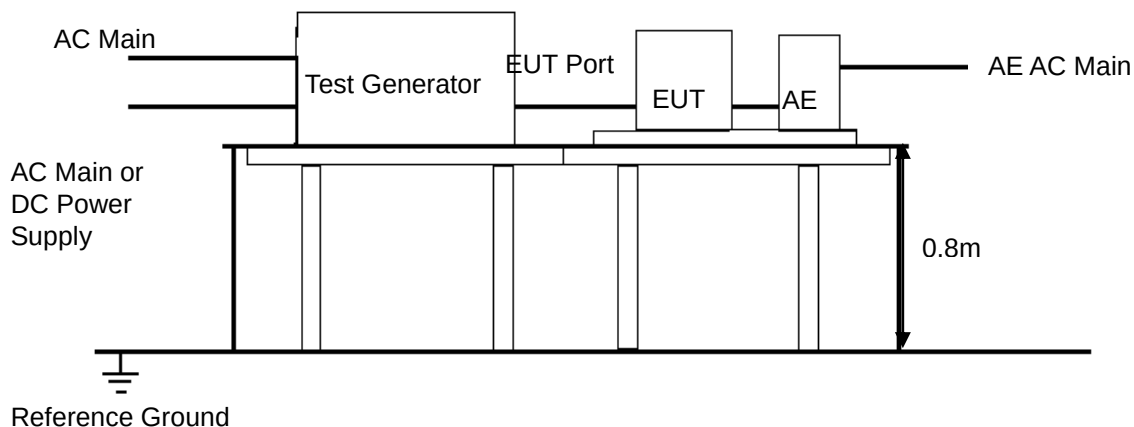
See the section 1.4.

5.9.3 Test Procedure

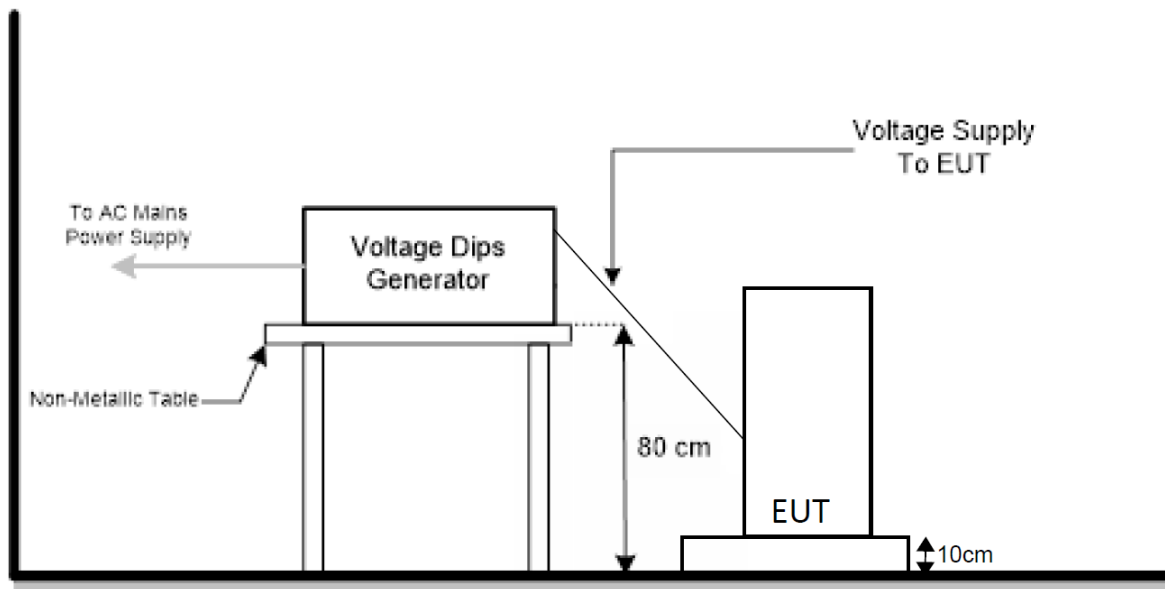
The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings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

5.9.4 Test Setup

Table-top



Floor standing



5.9.5 Deviation from test standard

No deviation.

5.9.6 Test Results

N/A, The EUT supply is DC, and the power supply is not directly connected to the power supply network, so this test does not require evaluation

6 Appendix A - Test Setup photographs

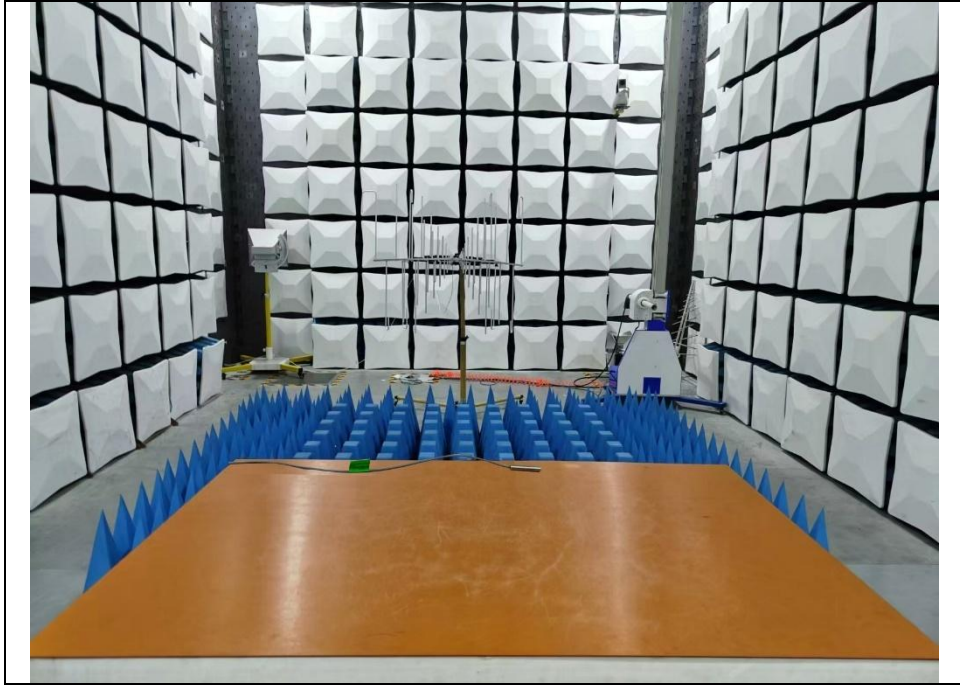
6.1 Radiated Emissions up to 1GHz



6.2 Electrostatic discharge immunity test –ESD



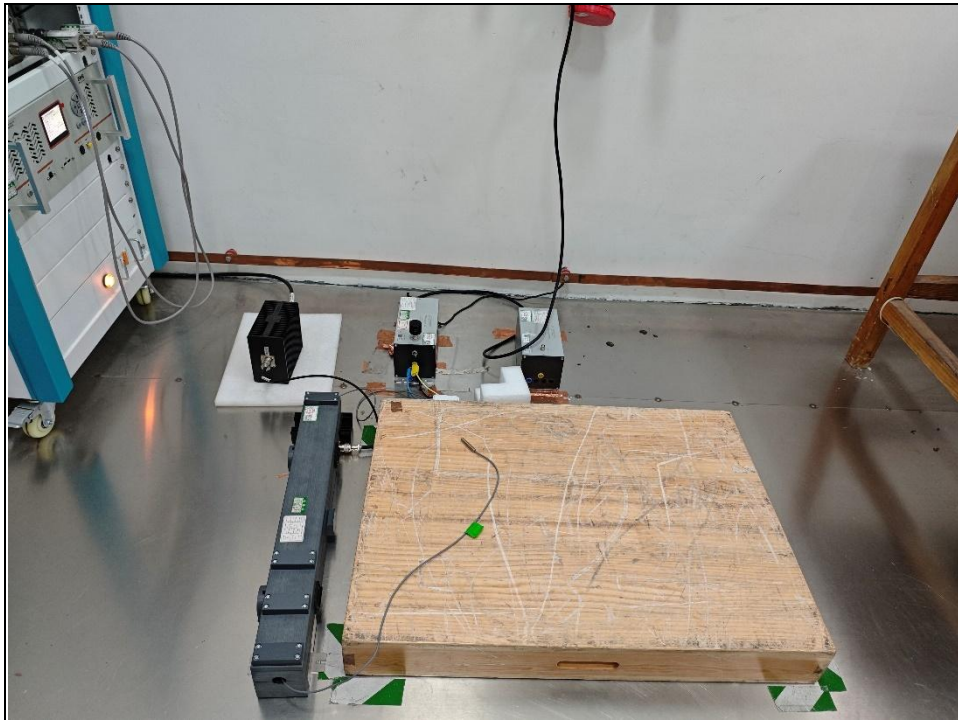
6.3 Radiated, radio-frequency, electromagnetic field immunity test



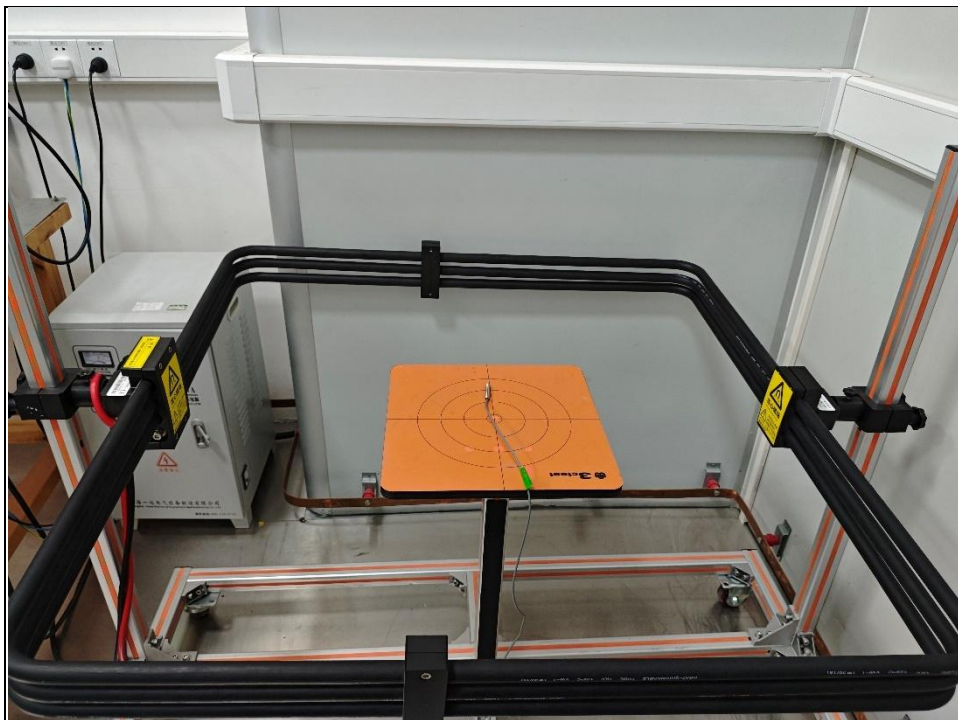
6.4 EFT immunity test



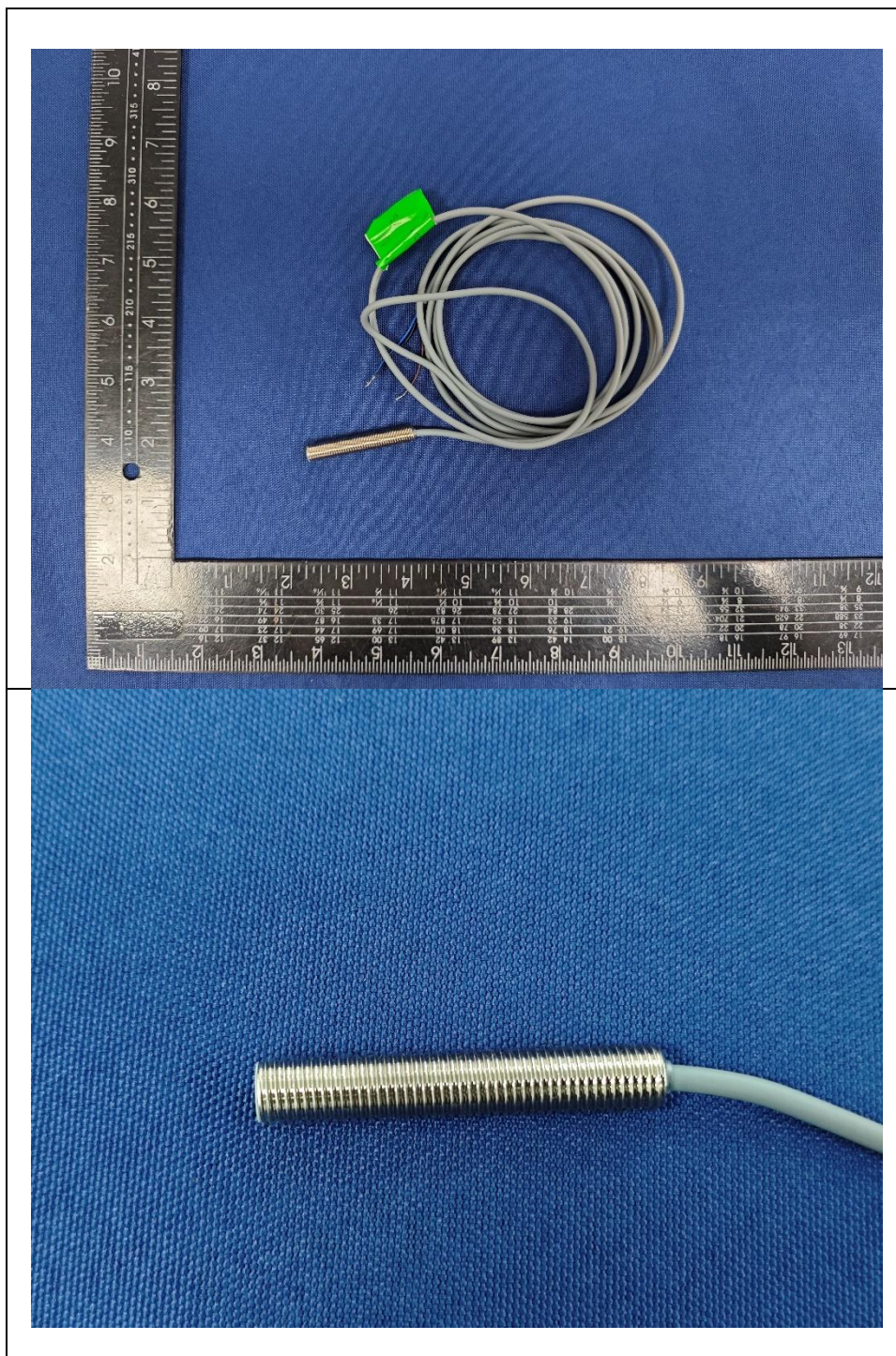
6.5 Immunity to Conducted Disturbances Induced by RF Fields



6.6 Power frequency magnetic field immunity test



7 Appendix B – E.U.T. photographs



--- END ---