



CE EMC TEST REPORT For

Shanghai Haidong Intelligent Technology Co., Ltd

Product Name:	Electric Bike
Trademark:	N/A
Model :	Explorer Ninja
Prepared For :	Shanghai Haidong Intelligent Technology Co., Ltd
Address:	1 Jindi Plaza, Jiuting Town, Songjiang District, Shanghai, China
Prepared By :	Shenzhen BYS Testing Co., Ltd.
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Test Date:	Oct. 18, 2021 - Oct. 25, 2021
Date of Report :	Oct. 25, 2021
Report No.:	BC211031833-EMC



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TEST RESULT CERTIFICATION

Applicant's name : Shanghai Haidong Intelligent Technology Co., Ltd
Address : 1 Jindi Plaza, Jiuting Town, Songjiang District, Shanghai, China
Manufacture's Name..... : Wuxi Haidong Intelligent Technology Co., Ltd
Address : 999, Houhui Road, Xishan District, Dacheng Industrial Park, Wuxi, Jiangsu, China

Product description

Product name : Electric Bike
Brand Name : N/A
Model and/or type reference: Explorer
Ninja
Standards : EN 15194:2017
EN 61000-6-4:2019, EN 61000-6-2:2019
EN IEC 61000-3-2:2019+A1:2020, EN 61000-3-3:2013+A1:2019
EN 61000-4-2:2009, EN IEC 61000-4-3:2020,
EN 61000-4-4:2012, EN 61000-4-5:2014+A1:2017,
EN 61000-4-6:2014/AC:2015, EN 61000-4-8:2010,
EN IEC 61000-4-11:2020

This device described above has been tested by BYS, and the test results show that the equipment under test (EUT) is in compliance with the 2014/30/EU requirements. And it is applicable only to the tested sample identified in the report.

Date of Test

Date (s) of performance of tests : Oct. 18, 2021 –Oct. 25, 2021

Date of Issue : Oct. 25, 2021

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

Prepared by(Engineer): Mark

Reviewer(Supervisor): Pool

Approved(Manager): Justin Zhou



This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen BYS Testing Co., Ltd.



1. GENERAL INFORMATION

1.4 Description of Device (EUT)

EUT : **Electric Bike**

Model : **Explorer**

Number : **Ninja**

Power Supply : **Main unit: DC 48V**

1.5 1.2 Test Facility

Site Description

Name of Firm : Shenzhen BYS Testing Co., Ltd.

Site Location : Floor 4, Building 2, No.38 Guangda Road, Yuanshan Street, Longgang District, Shenzhen, China.

1.6 1.3 Tested System Details

Host Personal Computer : HP

Monitor : SONY

M/N : A1580TW

M/N : MNT1

Printer : EPSON STYLUS

Keyboard (USB) : Genuine

M/N : P320A

M/N : N/A

Modem : ACEEX

Mouse : DETROIS

M/N : DM-1414

M/N : CM309

1.7 Test Uncertainty

Conducted Emission : $\pm 2.66\text{dB}$

Uncertainty



1.8 Test Summary

EPCA

Test	Test Requirement	Test Method	Class / Severity	Result
Radiated Emission (30MHz to 1000MHz)	EN 15194 EN 61000-6-4	CISPR 12	N/A	PASS
ESD	EN 15194 EN 61000-6-2	EN 61000-4-2	Contact ± 4 kV Air ± 8 kV	PASS
Radiated immunity	EN 15194 EN 61000-6-2	ISO 11451-1 EN 61000-4-3	20MHz to 2000MHz	PASS

ESA

Test	Test Requirement	Test Method	Class / Severity	Result
Radiated Emission (30MHz to 1000MHz)	EN 15194 EN 61000-6-4	CISPR 12	N/A	PASS
Stripline test	EN 15194	ISO 11452-5	48V/m for 150mm & 12V/m for 800mm 0.01MHz to 400MHz	N/A
TEM cell	EN 15194	ISO 11452-3	60V/m 0.01MHz to 200MHz	N/A
Bulk Current Injection	EN 15194	ISO 11452-4	48mA 1MHz to 400MHz	N/A
Absorber lined Chamber test	EN 15194	ISO 11452-2	24V/m 20MHz to 2GHz	PASS

Battery charger

Test	Test Requirement	Test Method	Class / Severity	Result
Conducted Emission on Main Terminal (150K to 30MHz)	EN 15194 EN 61000-6-4	EN 61000-6-4	N/A	PASS
Disturbance Power 30MHz to 300MHz	EN 15194 EN 61000-6-4	EN 61000-6-4	N/A	PASS
Discontinuous Disturbance	EN 15194 EN 61000-6-4	EN 61000-6-4	N/A	N/A
Radiated Emission 30MHz to 1000MHz	EN 15194 EN 61000-6-4	EN 61000-6-4	N/A	N/A
Harmonic Current Emission on AC	EN 15194 EN 61000-3-2	EN 61000-3-2	Clause 5 of EN61000-3-2	PASS
Voltage Fluctuation and Flicker on AC	EN 15194 EN 61000-3-2	EN 61000-3-3	Clause 6 of EN61000-3-3	PASS
ESD	EN 15194 EN 61000-6-2	EN 61000-4-2	Contact ± 4 kV Air ± 8 kV	PASS
Radio frequency electromagnetic fields, 80MHz to 1GHz	EN 15194 EN 61000-6-2	EN 61000-4-3	3V/m 80%, 1kHz, AM	PASS
Electrical Fast Transients (EFT) on AC	EN 15194 EN 61000-6-2	EN 61000-4-4	AC ± 1.0 kV	PASS



Surges Immunity on AC	EN 15194 EN 61000-6-2	EN 61000-4-5	1kV D.M.† ±2kV C.M.†	PASS
Injected Currents on AC, 150kHz to 80MHz(230MHz)	EN 15194 EN 61000-6-2	EN 61000-4-6	3Vrms (emf), 80%, 1kHz Amp. Mod.	PASS
Voltage Dips and Interruptions on AC	EN 15194 EN 61000-6-2	EN 61000-4-11	0 % UT* for 0.5per 40 % UT* for 10per 70 % UT* for 25per	PASS

Note: Selected test(s) as requested by applicant:

Category I apparatus which containing no electronic control circuitry, for example motor operated appliances, toys, tools, heating appliances and similar electric apparatus, is deemed to fulfil the relevant immunity requirements without testing. shall be deemed to fulfil the requirement.

Radiated emission limits only toy is applicable.



2. TEST INSTRUMENT USED

2.1 For Conducted Emission Test

Conducted Emission Test (A --- site)					
Equipment	Manufacturer	MODEL#	SERIAL#	LASTCAL.	NEXT CAL.
EMI Receiver	Schwarzbeck	ESHS30	828985/018	Aug. 25,2021	Aug. 24,2022
LISN	Kyoritsu	KNW407	8-1789-4	Aug. 25,2021	Aug. 24,2022
Spectrum Analyzer	ADVANTENT	R3132	160400093	Aug. 25,2021	Aug. 24,2022
50Ω coaxial switch	Anritsu	MP59B	6200264417	Aug. 25,2021	Aug. 24,2022
Pulse Limiter	R&S	ESH3-Z2	100681	Aug. 25,2021	Aug. 24,2022

2.2 For Disturbance Power Test

Radiation Emission Test (966 chamber)					
Equipment	Manufacturer	MODEL#	SERIAL#	LASTCAL.	NEXT CAL.
EMI Receiver	Schwarzbeck	ESHS30	828985/018	Aug. 25,2021	Aug. 24,2022
Power Clamp	Schwarzbeck	MDS21	833711/025	Aug. 25,2021	Aug. 24,2022
50Ω coaxial switch	Anritsu	MP59B	6200264416	Aug. 25,2021	Aug. 24,2022

2.3 For Harmonic & Flicker Test

For Harmonic / Flicker Test (A --- site)					
Equipment	Manufacturer	MODEL#	SERIAL#	LASTCAL.	NEXT CAL.
Harmonic / Flicker Tester	Schaffner	CCN 1000-1	72472	Aug. 25,2021	Aug. 24,2022
Power source	Schaffner	NSG 1Explorer-5-208-413	57227	Aug. 25,2021	Aug. 24,2022

2.4 For Electrostatic Discharge Immunity Test

For Electrostatic Discharge Immunity Test (A --- site)					
Equipment	Manufacturer	MODEL#	SERIAL#	LASTCAL.	NEXT CAL.
ESD Simulator	SCHAFFNER	NSG 435	5866	Aug. 25,2021	Aug. 24,2022



2.5 For Electrical Fast Transient /Burst Immunity Test

For Electrical Fast Transient/Burst Immunity Test (A --- site)					
Equipment	Manufacturer	MODEL#	SERIAL#	LASTCAL.	NEXT CAL.
Burst Tester	HAEFELY	PEFT4010	080981-16	Aug. 25,2021	Aug. 24,2022
Coupling Clamp	HAEFELY	IP-4A	147147	Aug. 25,2021	Aug. 24,2022

2.6 For Surge Test

For Surge Test (A --- site)					
Equipment	Manufacturer	MODEL#	SERIAL#	LASTCAL.	NEXT CAL.
Surge Tester	HAEFELY	PSURGE4.1	080107-04	Aug. 25,2021	Aug. 24,2022

2.7 For Injected Currents Susceptibility Test

For Injected Currents Susceptibility Test (A --- site)					
Equipment	Manufacturer	MODEL#	SERIAL#	LASTCAL.	NEXT CAL.
Simulator	EMTEST	CWS500C	0900-12	Aug. 25,2021	Aug. 24,2022
CDN	EMTEST	CDN-M2	5100100100	Aug. 25,2021	Aug. 24,2022
VDN	EMTEST	CDN-M3	0900-11	Aug. 25,2021	Aug. 24,2022
Injection Clamp	EMTEST	F-2031-23MM	368	Aug. 25,2021	Aug. 24,2022
Attenuator	EMTEST	ATT6	0010222A	Aug. 25,2021	Aug. 24,2022

2.8 For Voltage Dips Interruptions Test

For Voltage Dips Interruptions Test (A --- site)					
Equipment	Manufacturer	MODEL#	SERIAL#	LASTCAL.	NEXT CAL.
Dips Tester	HEAFELY	PLINE 1610	083732-18	Aug. 25,2021	Aug. 24,2022

2.9 Absorber Line Chamber test

Absorber Line Chamber test					
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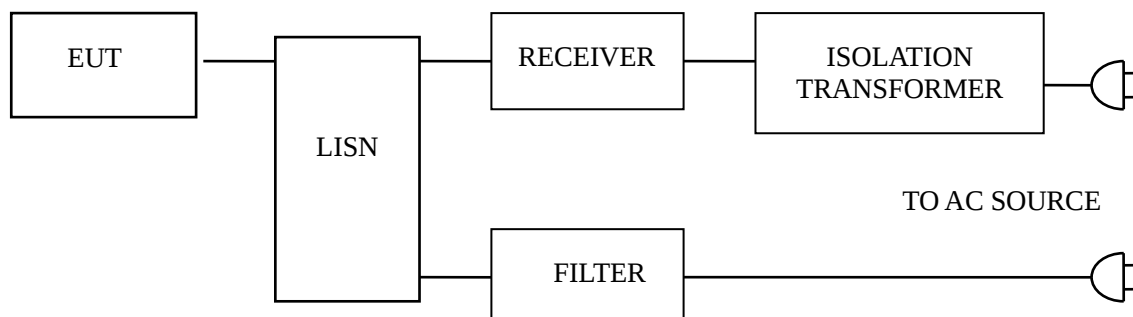
Equipment	Manufacturer	MODEL#	SERIAL#	LASTCAL.	NEXT CAL.
Generator	Schwarzbeck	SML03	838503/018	Aug. 25,2021	Aug. 24,2022
Log-periodic antenna	Schwarzbeck	HL 046	100001	Aug. 25,2021	Aug. 24,2022
High Gain Log-Periodic	AR	HL 046	020-02	Aug. 25,2021	Aug. 24,2022
Power amplifier	AR	500W 1000A	302108	Aug. 25,2021	Aug. 24,2022
Power amplifier	AR	30S1G3	302240	Aug. 25,2021	Aug. 24,2022
Electric Field Probe	AR	500W 1000A	020-01	Aug. 25,2021	Aug. 24,2022
High Gain Horn Antenna	AR	AT 4002A	002-15	Aug. 25,2021	Aug. 24,2022
Single path vehicle LISN	Schwarzbeck	NNBM 8126-D	010-14	Aug. 25,2021	Aug. 24,2022
Single path vehicle LISN	Schwarzbeck	NNBM 8126-D	010-15	Aug. 25,2021	Aug. 24,2022
Field monitor mainframe 4SLORS	AR	FM 5004	300546	Aug. 25,2021	Aug. 24,2022

2.10 Radiated Immunity

Radiated Immunity					
Equipment	Manufacturer	MODEL#	SERIAL#	LASTCAL.	NEXT CAL.
Ultra broadband antenna	Schwarzbeck	HL562	100227	Aug. 25,2021	Aug. 24,2022
Amplifier	AR	30W1000B	0327284	-	-
Amplifier	AR	30S1G3	0324978	-	-
Power meter	Schwarzbeck	NRP	101641	Aug. 25,2021	Aug. 24,2022
Single generator	Schwarzbeck	SMR40	100555	Aug. 25,2021	Aug. 24,2022

3. POWER LINE CONDUCTED EMISSION TEST

3.1 Block Diagram of Test Setup



3.2 Test Standard

EN 15194

(Test method: EN 55014-1)

3.3 Power Line Conducted Emission Limit

Frequency MHz	Limits dB(μV)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66 ~ 56*	56 ~ 46*
0.50 ~ 5.00	56	46
5.00 ~ 30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.

2. The lower limit shall apply at the transition frequencies.

3.4 EUT Configuration on Test

The following equipments are installed on conducted emission test to meet EN55014-1 requirement and operating in a manner which tends to maximize its emission characteristics in a normal application.

3.5 Operating Condition of EUT

3.5.1 Setup the EUT and simulators as shown in Section 3.1.

3.5.2 Turn on the power of all equipments.

3.5.3 Let the EUT work in test modes (On) and test it.

3.6 Test Procedure

The EUT is put on the ground and connected to the AC mains through a Artificial Mains Network (AMN). This provided a 50ohm coupling impedance for the tested equipments. Both sides of AC line are checked to find out the maximum conducted emission levels according to the **EN55014-1** regulations during conducted emission test.



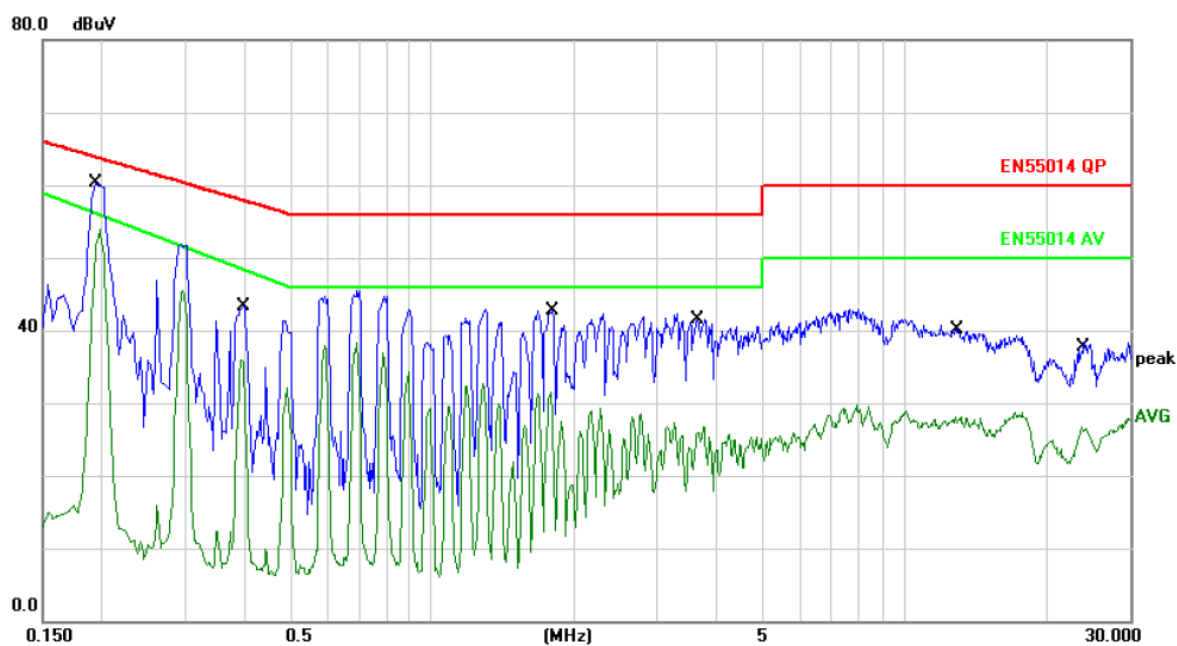
The bandwidth of the test receiver (R&S Test Receiver ESHS30) is set at 10KHz.

The frequency range from 150 KHz to 30 MHz is investigated.

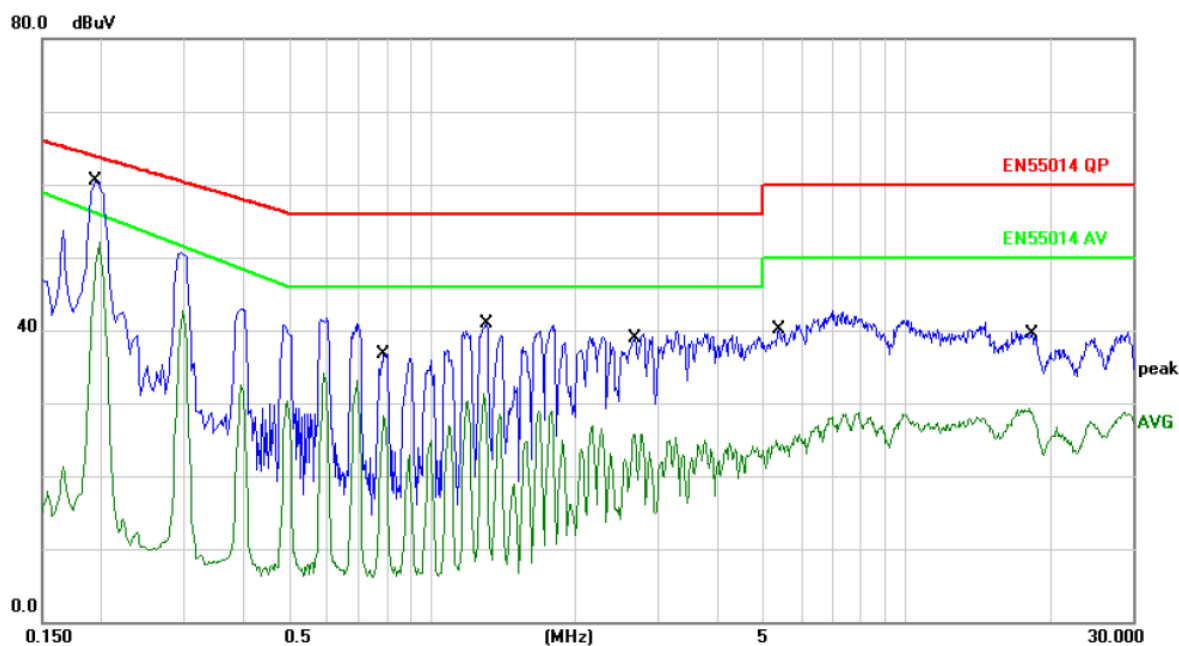
3.7 Test Result

PASS

Please refer to the following page.



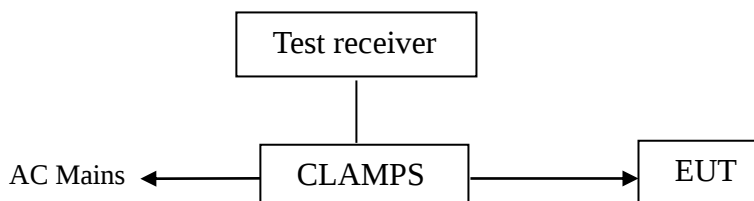
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1940	50.20	10.06	60.26	63.86	-3.60	QP	
2	*	0.1940	43.75	10.06	53.81	56.22	-2.41	AVG	
3		0.3940	33.16	10.10	43.26	57.98	-14.72	QP	
4		0.3940	25.78	10.10	35.88	48.57	-12.69	AVG	
5		1.7820	32.55	10.18	42.73	56.00	-13.27	QP	
6		1.7820	21.41	10.18	31.59	46.00	-14.41	AVG	
7		3.6540	31.39	10.17	41.56	56.00	-14.44	QP	
8		3.6540	16.46	10.17	26.63	46.00	-19.37	AVG	
9		12.8180	29.94	10.14	40.08	60.00	-19.92	QP	
10		12.8180	18.04	10.14	28.18	50.00	-21.82	AVG	
11		23.7060	28.25	10.19	38.44	60.00	-21.56	QP	
12		23.7060	16.45	10.19	26.64	50.00	-23.36	AVG	



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Detector	Comment
		MHz	Level	Factor	ment				
			dBuV	dB	dBuV	dBuV	dB		
1	*	0.1940	50.49	10.06	60.55	63.86	-3.31	QP	
2		0.1940	41.99	10.06	52.05	56.22	-4.17	AVG	
3		0.7900	26.64	10.14	36.78	56.00	-19.22	QP	
4		0.7900	18.09	10.14	28.23	46.00	-17.77	AVG	
5		1.2980	30.81	10.17	40.98	56.00	-15.02	QP	
6		1.2980	21.15	10.17	31.32	46.00	-14.68	AVG	
7		2.6619	28.41	10.19	38.60	56.00	-17.40	QP	
8		2.6619	15.57	10.19	25.76	46.00	-20.24	AVG	
9		5.3100	29.89	10.13	40.02	60.00	-19.98	QP	
10		5.3100	14.76	10.13	24.89	50.00	-25.11	AVG	
11		18.2060	29.38	10.16	39.54	60.00	-20.46	QP	
12		18.2060	19.07	10.16	29.23	50.00	-20.77	AVG	

4. DISTURBANCE POWER TEST

4.1 Block Diagram of Test Setup



4.2 Test Standard

EN 15194

(Test method: EN 55014-1)

4.3 Disturbance Power Limit

All emanations from devices or system including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below:

Frequency MHz	Interference Power Limits dB(pW)	
	Quasi-peak Value	Average Value
30 ~ 300	45 Increasing Linearly with Frequency to 55 (Q.P.)	35 Increasing Linearly with Frequency to 45 (A.V.)

4.4 EUT Configuration on Test

The EN55014-1 regulations test method must be used to find the maximum emission during disturbance power test.

The configuration of EUT is the same as used in conducted emission test. Please refer to Section 2.2.

4.5 Operating Condition of EUT

Same as conducted emission test, which is listed in Section 2.2 except the test set up replaced as Section 4.1.

4.6 Test Procedure

The EUT is placed on the ground and away from other metallic surface at least 0.4m. It is connected to the power mains through an extension cord of 6m min. The absorber clamp clamps the cord and moves from the far end to the EUT to measure the disturbing energy emitted from the cord.

The bandwidth of the test receiver(R&S Test Receiver ESHS30) is set at 120kHz.

All the test results are listed in Section 4.7.

The frequency spectrum from 30 MHz to 300 MHz is investigated.

As the peak value is too low against the limit, so the quasi-peak value and

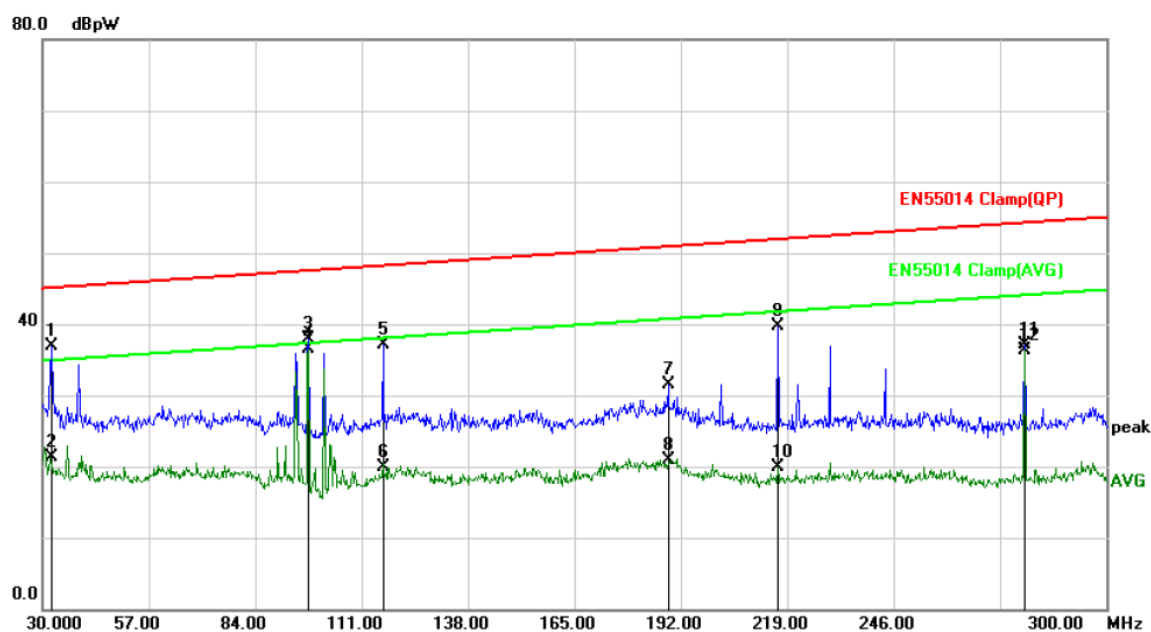


average value have omitted.

4.7 Test Result

PASS

Please refer to the following page.



Site Chamber #1

Temperature: 25

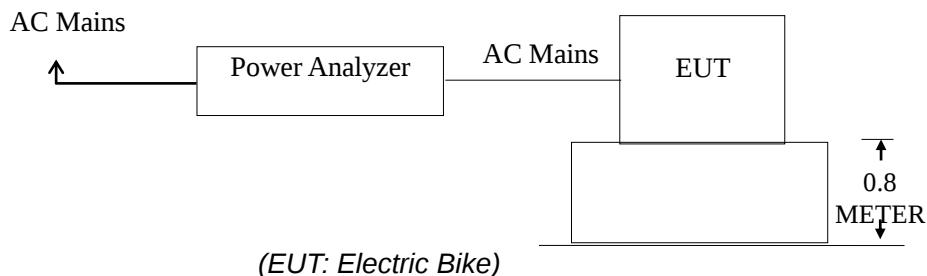
Limit: EN55014 Clamp(QP)

Humidity: 80 %

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Position	
		MHz	Level	Factor	ment			Detector	Comment
			dBpW	dB	dBpW	dBpW	dB	cm	
1		32.0400	12.00	24.97	36.97	45.08	-8.11	QP	
2		32.0400	-3.76	24.97	21.21	35.29	-14.08	AVG	
3		97.5199	13.01	24.98	37.99	47.50	-9.51	QP	
4	*	97.5199	11.53	24.98	36.51	40.12	-3.61	AVG	
5		116.5200	11.21	25.83	37.04	48.20	-11.16	QP	
6		116.5200	-6.01	25.83	19.82	40.89	-21.07	AVG	
7		188.9600	4.87	26.67	31.54	50.89	-19.35	QP	
8		188.9600	-5.74	26.67	20.93	42.99	-22.06	AVG	
9		216.7200	14.92	24.71	39.63	51.92	-12.29	QP	
10		216.7200	-4.81	24.71	19.90	43.59	-23.69	AVG	
11		279.3200	11.90	25.24	37.14	54.23	-17.09	QP	
12		279.3200	11.05	25.24	36.29	44.69	-8.40	AVG	

5. HARMONIC CURRENT EMISSION TEST

5.1 Block Diagram of Test Setup



5.2 Test Standard

EN 61000-3-2

5.3 Operating Condition of EUT

- 5.3.1 Setup the EUT as shown in Section 5.1.
- 5.3.2 Turn on the power of all equipments.
- 5.3.3 Let the EUT work in test mode (ON) and test it.

5.4 Test Procedure

The power cord of the EUT is connected to the output of the test system. Turn on the Power of the EUT and use the test system to test the harmonic current level.

5.5 Test Results

PASS



6. VOLTAGE FLUCTUATIONS & FLICKER TEST

6.1 Block Diagram of Test Setup

Same as Section 5.1..

6.2 Test Standard

EN 61000-3-3

6.3 Operating Condition of EUT

Same as Section 5.3.. The power cord of the EUT is connected to the output of the test system. Turn on the power of the EUT and use the test system to test the harmonic current level.

Flicker Test Limit

Test items	Limits
Pst	1.0
dc	3.3%
dmax	4.0%
dt	Not exceed 3.3% for 500ms

6.4 Test Results

PASS

Flicker Test Data			
Temperature:	24.5 °C	Relative Humidity:	54%
Pressure:	1009hPa	Phase :	Vertical
Test Voltage :	AC 230V/50Hz	Test Mode:	Mode 1

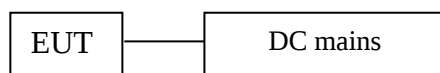
Voltage Fluctuation	Limit	Value
Relative Voltage Change Characteristic Tmax (dc>3%)	500 ms	0 ms
Maximum Relative Voltage Change dmax	4%	0.00
	6%	/
	7%	/
Relative Steady-state Voltage Change dc	3.3%	0.00

Flicker	Limit	Value
Short-term Flicker Indicator Pst	1.0	0.063
Long-term Flicker Indicator Plt	0.65	/

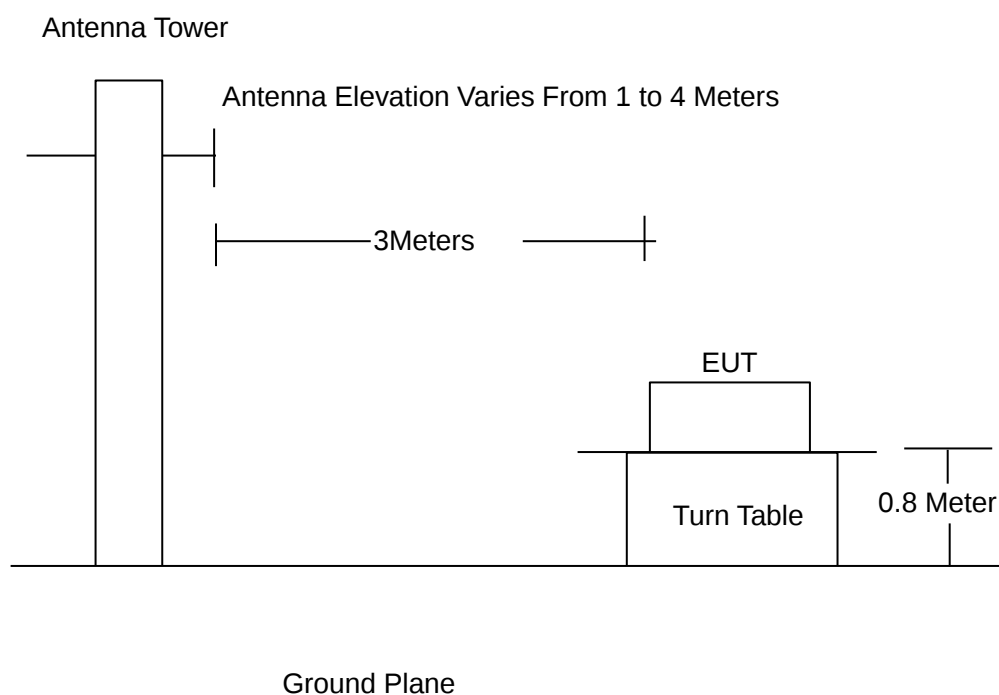
7. RADIATION EMISSION TEST

7.1 Block Diagram of Test Setup

7.1.1. Block Diagram of EUT Test Setup



7.1.2. Anechoic Chamber Setup Diagram



7.2 Test Standard

EN 15194

(Test method: CISPR 12)

7.3 Test Procedure

The EUT and its simulators are placed on a turned table that is 0.8 meter above the ground. The turned table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna that is mounted on the antenna tower. The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated biconical and log periodical antenna) is used as receiving antenna. Both horizontal and



vertical polarization of the antenna is set on test. In order to find the maximum emission levels, the interface cable must be manipulated according to CISPR 12 on radiated emission test.

The bandwidth setting on the field strength meter (R&S Test Receiver ESHS30) is set at 120KHz.

The frequency range from 30MHz to 1000MHz is checked.

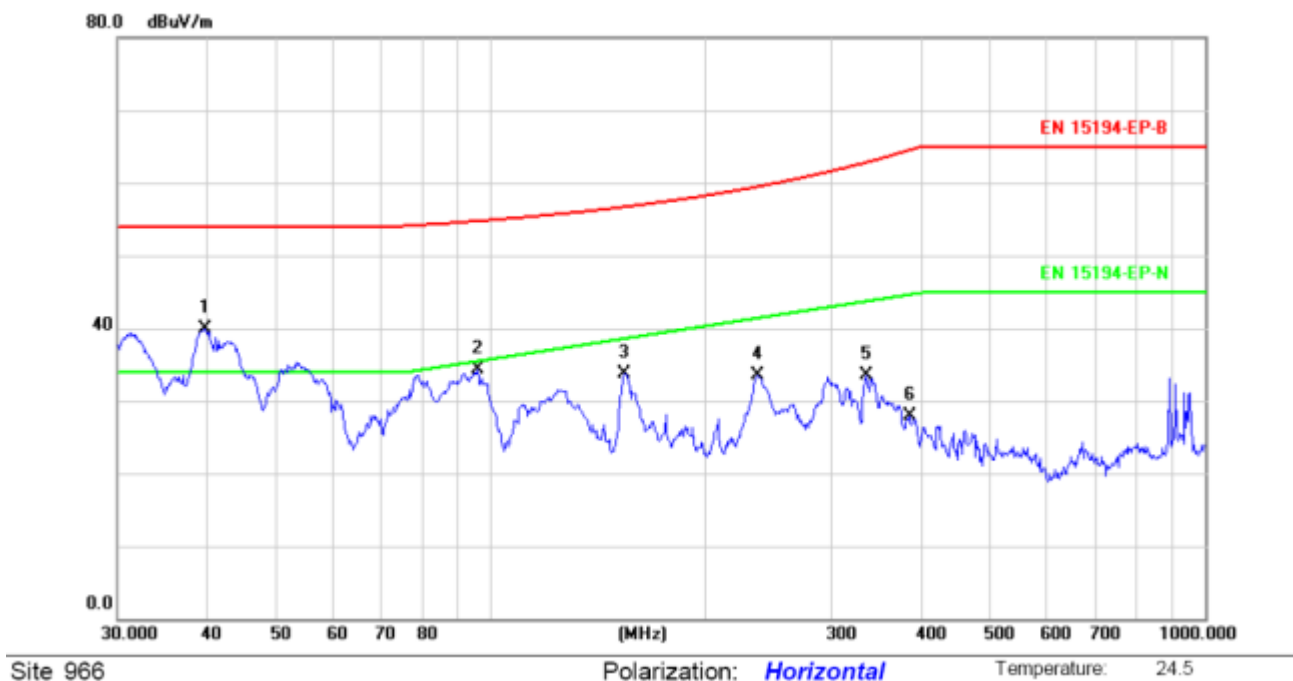
7.4 Test Result

PASS

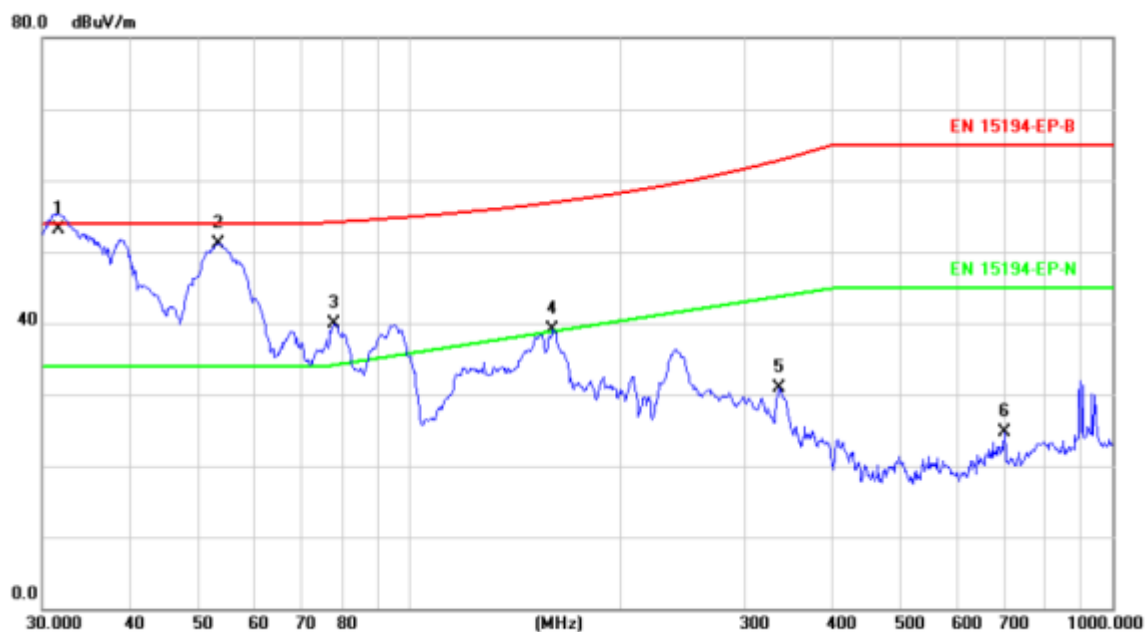
Please refer to the following page.



For charging EPAC



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	39.8542	48.75	-8.84	39.91	54.00	-14.09	QP		
2		95.7622	51.30	-16.93	34.37	55.61	-21.24	QP		
3		153.7385	46.59	-12.86	33.73	58.72	-24.99	QP		
4		235.8164	48.23	-14.72	33.51	61.53	-28.02	QP		
5		336.0352	45.12	-11.66	33.46	63.85	-30.39	QP		
6		385.2805	38.37	-10.54	27.83	64.75	-36.92	QP		



Site 966

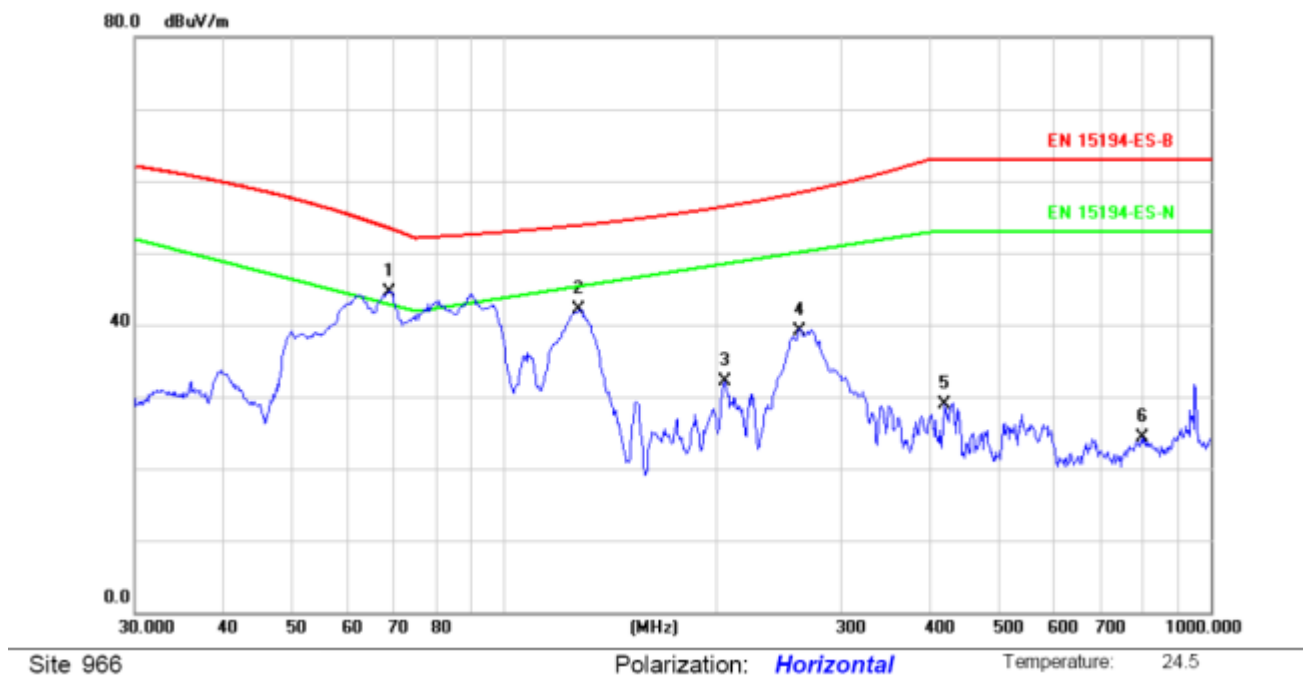
Polarization: **Vertical**

Temperature: 24.5

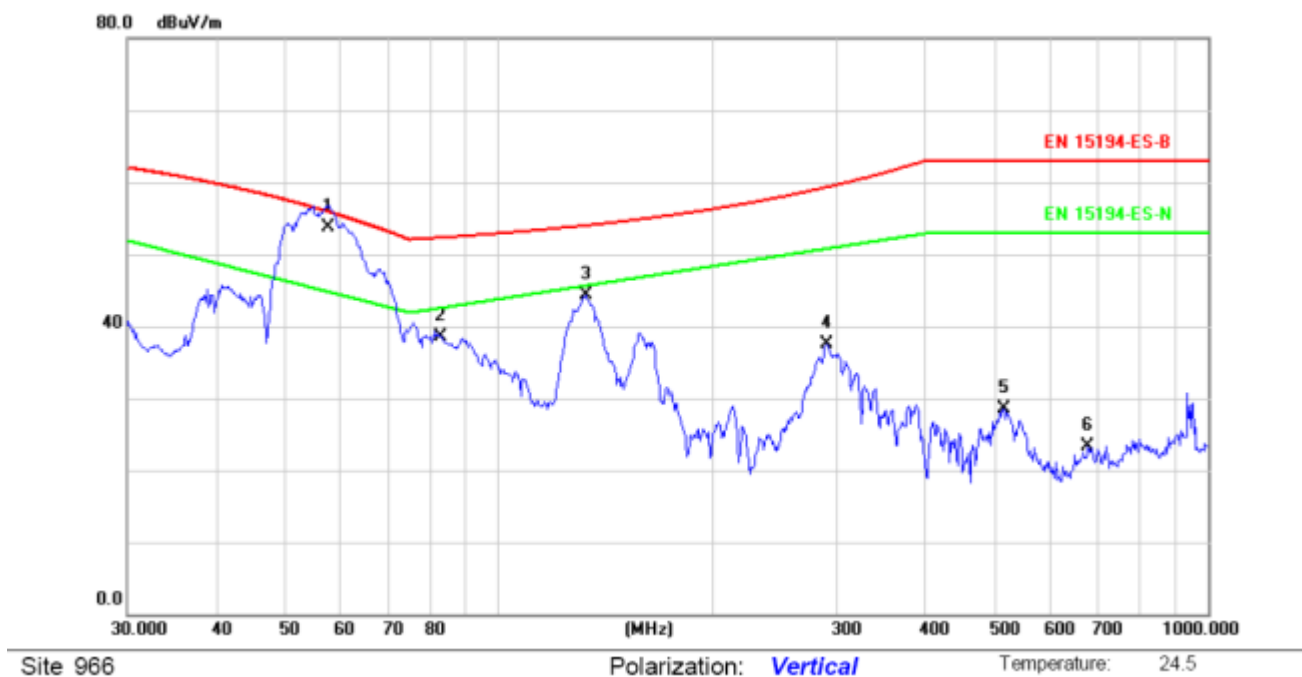
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	Comment
			dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree	
1	*	31.6202	61.40	-8.24	53.16	54.00	-0.84	QP		
2		53.5052	62.07	-10.88	51.19	54.00	-2.81	QP		
3		78.1389	57.37	-17.43	39.94	54.27	-14.33	QP		
4		159.7844	52.05	-12.87	39.18	58.97	-19.79	QP		
5		336.0352	42.55	-11.66	30.89	63.85	-32.96	QP		
6		701.7610	28.98	-4.37	24.61	65.00	-40.39	QP		



ESA



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree
1	*	68.3908	58.31	-13.89	44.42	53.01	-8.59	QP		
2		127.6645	56.32	-14.24	42.08	55.50	-13.42	QP		
3		204.9551	48.20	-16.06	32.14	58.61	-26.47	QP		
4		261.0583	53.01	-13.88	39.13	60.20	-21.07	QP		
5		420.5803	38.61	-9.73	28.88	63.00	-34.12	QP		
6		801.7863	26.74	-2.49	24.25	63.00	-38.75	QP		

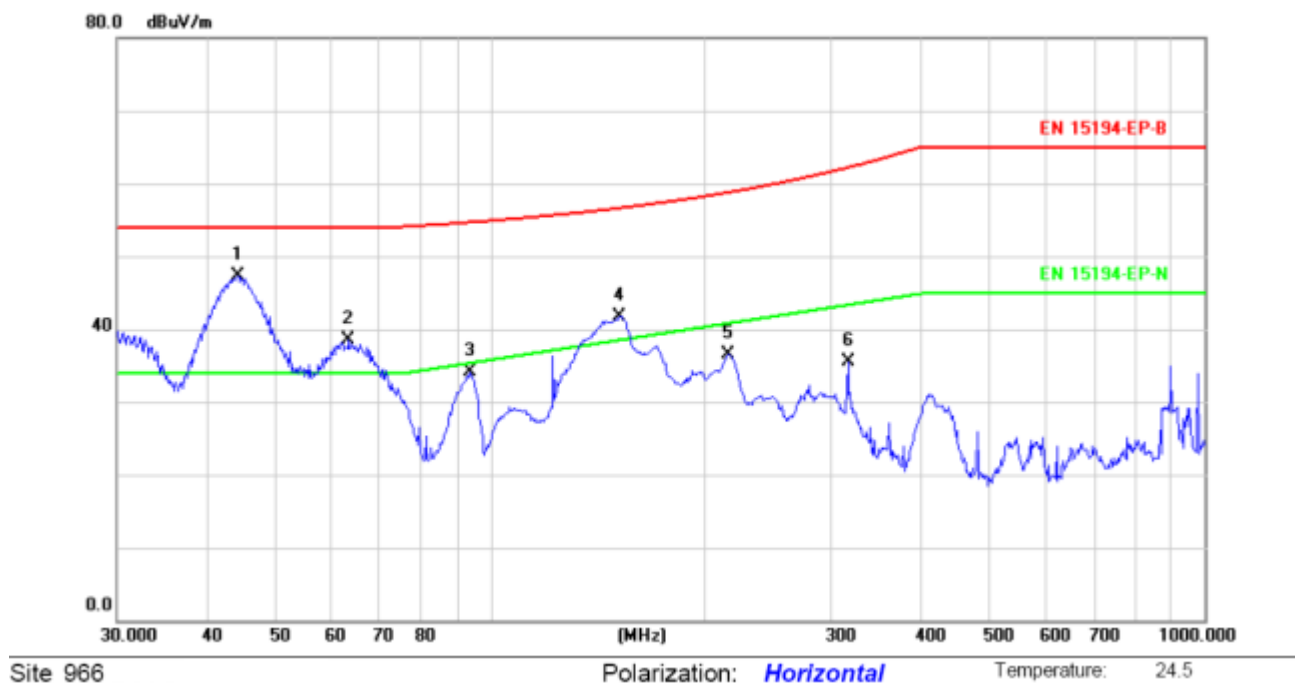


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	57.5938	65.11	-11.32	53.79	54.88	-1.09	QP		
2		82.9385	56.70	-18.12	38.58	52.66	-14.08	QP		
3		132.6850	58.19	-13.91	44.28	55.75	-11.47	QP		
4		290.0172	50.30	-12.84	37.46	60.89	-23.43	QP		
5		515.4374	36.51	-7.92	28.59	63.00	-34.41	QP		
6		677.5797	28.09	-4.74	23.35	63.00	-39.65	QP		

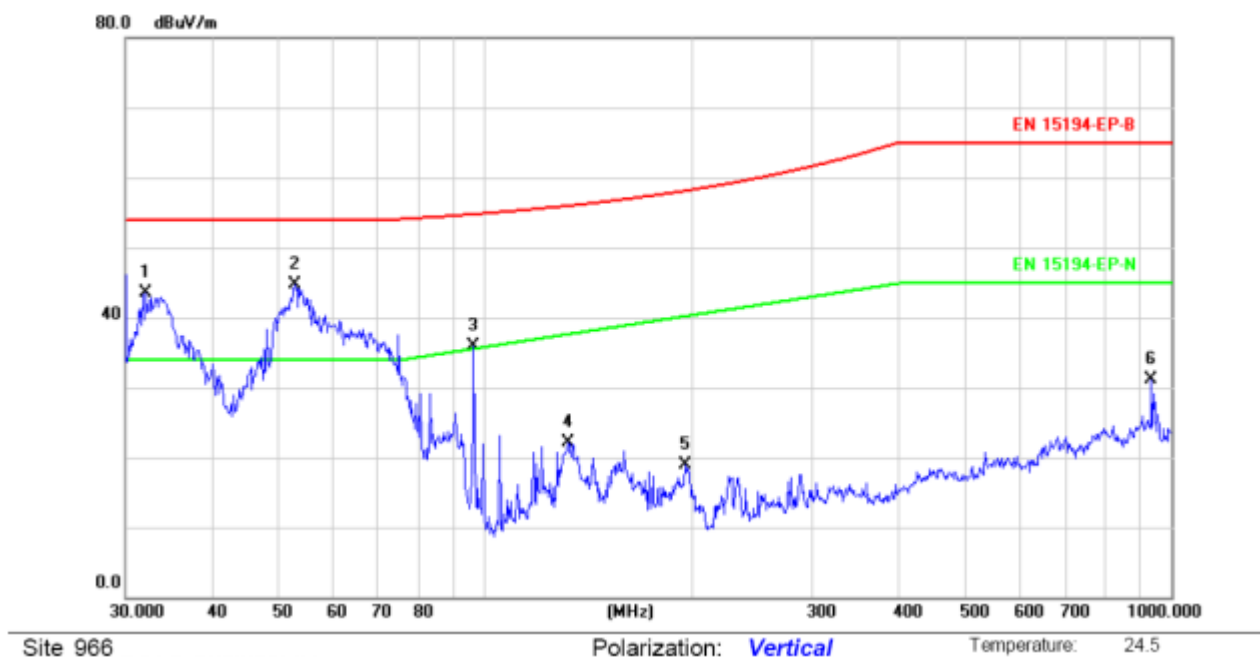


For discharging

EPAC



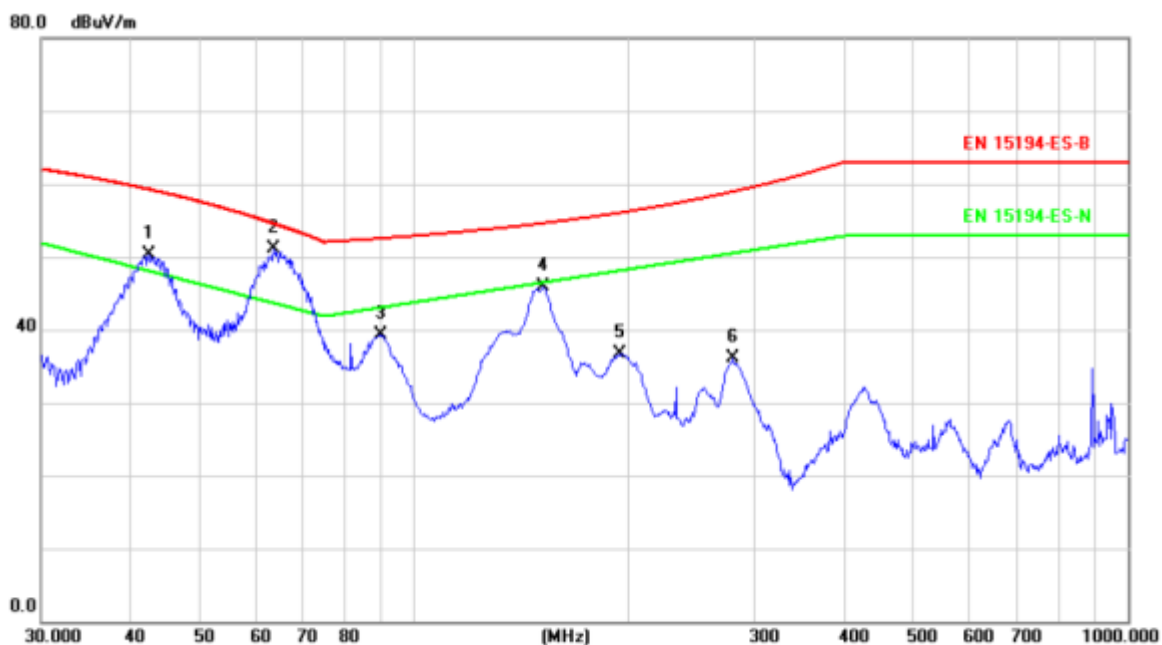
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree
1	*	44.2752	56.73	-9.38	47.35	54.00	-6.65	QP		Comment
2		63.3132	50.69	-12.18	38.51	54.00	-15.49	QP		
3		93.4402	51.33	-17.18	34.15	55.44	-21.29	QP		
4		151.5972	54.58	-12.86	41.72	58.62	-16.90	QP		
5		215.2678	52.26	-15.77	36.49	60.93	-24.44	QP		
6		316.5890	47.70	-12.15	35.55	63.46	-27.91	QP		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		32.0667	51.73	-8.31	43.42	54.00	-10.58	QP		
2	*	52.9453	55.57	-10.78	44.79	54.00	-9.21	QP		
3		96.4362	52.72	-16.87	35.85	55.65	-19.80	QP		
4		132.2206	35.98	-13.96	22.02	57.73	-35.71	QP		
5		195.8220	34.85	-15.94	18.91	60.31	-41.40	QP		
6		935.5463	31.89	-0.78	31.11	65.00	-33.89	QP		



ESA

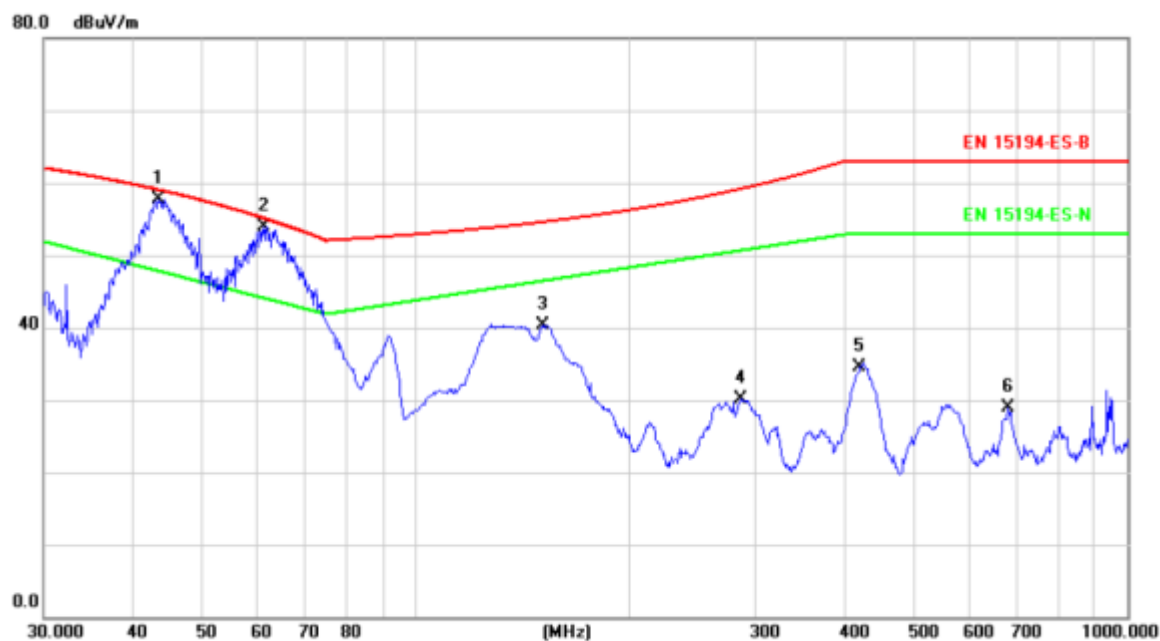


Site 966

Polarization: *Horizontal*

Temperature: 24.5

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		42.4508	59.50	-9.16	50.34	58.21	-7.87	QP		
2	*	63.5356	63.29	-12.22	51.07	53.81	-2.74	QP		
3		89.9047	56.75	-17.51	39.24	53.19	-13.95	QP		
4		151.5972	58.69	-12.86	45.83	56.62	-10.79	QP		
5		194.4534	52.64	-15.86	36.78	58.26	-21.48	QP		
6		279.0436	49.26	-13.13	36.13	60.63	-24.50	QP		



Site 966

Polarization: *Vertical*

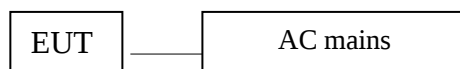
Temperature: 24.5

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree	Comment
1	*	43.5056	66.97	-9.28	57.69	57.94	-0.25	QP		
2		61.1315	65.59	-11.75	53.84	54.23	-0.39	QP		
3		150.5378	53.23	-12.86	40.37	56.58	-16.21	QP		
4		285.9778	43.04	-12.94	30.10	60.80	-30.70	QP		
5		420.5803	44.31	-9.73	34.58	63.00	-28.42	QP		
6		679.9600	33.65	-4.69	28.96	63.00	-34.04	QP		

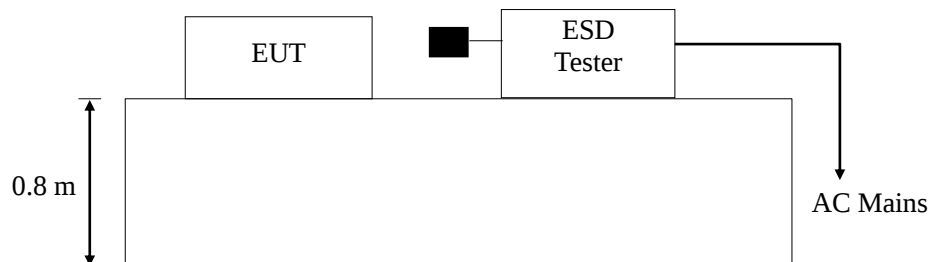
8. ELECTROSTATIC DISCHARGE IMMUNITY TEST

8.1 Block Diagram of Test Setup

8.1.1. Block Diagram of the EUT and the simulators



8.1.2. Test Setup



8.2 Test Standard

EN 15194

(Test method: EN 61000-4-2)

Severity Level: 3 / Air Discharge:±8K

Level: 2 / Contact Discharge:±4KV

8.3 Severity Levels and Performance Criterion

8.3.1 Severity level

Level	Test Voltage Contact Discharge (KV)	Test Voltage Air Discharge (KV)
1.	±2	±2
2.	±4	±4
3.	±6	±8
4.	±8	±15
X	Special	Special

8.3.2 Performance criterion : B

A. The apparatus 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 apparatus is used as intended.

B. The apparatus 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 apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.

- C.** Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

8.4 EUT Configuration

The following equipments are installed on Electrostatic Discharge Immunity test to meet EN 15194: 2017, EN 61000-4-2:2009, requirement and operating in a manner which tends to maximize its emission characteristics in a normal application. The configuration of EUT is the same as used in conducted emission test.

Please refer to Section 2.4.

8.5 Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 3.5 except the test setup replaced by Section 8.1.2.

8.6 Test Procedure

8.6.1 Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

8.6.2 Contact Discharge:

All the procedure shall be same as Section 8.6.1. Except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

8.6.3 Indirect discharge for horizontal coupling plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

8.6.4 Indirect discharge for vertical coupling plane

At least 10 single discharges (in the most sensitive polarity) shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of



the EUT are complete illuminated.

8.7 Test Results

PASS

Please refer to the following page.

Temperature:	25 °C	Relative Humidity:	45%
Pressure:	1010 hPa	Test Power :	AC 230V/50Hz
Test Mode	Mode1		

Mode	Air Discharge								Contact Discharge								Obser vation	Criterion	Result
Test level (kV)	4		8		10		15		2		4		6		8				
Test Location	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-			
HCP									A	A	A	A					TT,TR	B	PASS
enclosure	A	A	A	A															PASS
VCP									A	A	A	A							PASS
slit	A	A	A	A															PASS
port									A	A	A	A							PASS

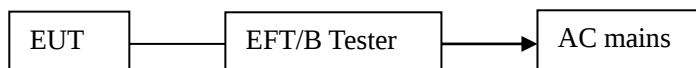
Note:

- 1) P/N denotes the Positive/Negative polarity of the output voltage.
- 2) Test condition:
Direct / Indirect (HCP/VCP) discharges: Minimum 50 times (Positive/Negative) at each point. Air discharges: Minimum 10 times (Positive/Negative) at each point.
- 3) N/A - denotes test is not applicable in this test report
- 4) There was not any unintentional transmission in standby mode



9. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

9.1 Block Diagram of EUT Test Setup



9.2 Test Standard

EN 15194

(Test method: EN 61000-4-4)

9.3 Severity Levels and Performance Criterion

Severity Level 2 at 1KV, Pulse Rise time & Duration: 5 nS / 50 nS

Severity Level:

Open Circuit Output Test Voltage $\pm 10\%$		
Level	On power ports	On I/O(Input/Output) Signal data and control ports
1.	0.5KV	0.25KV
2.	1KV	0.5KV
3.	2KV	1KV
4.	4KV	2KV
X.	Special	Special

Performance criterion: B

- D. The apparatus 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 apparatus is used as intended.
- E. The apparatus 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 apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
- F. Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

9.4 EUT Configuration on Test

The following equipments are installed on Electrical Fast Transient/Burst Immunity test to meet EExplorer5194: 2009+A1:2011, EN61000-4-4:2012, requirement and operating in a manner which tends to maximize its emission characteristics in a normal application. The configuration of EUT is the same as used in conducted emission test.

Please refer to Section 3.4.

9.5 Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 2.5



except the test setup replaced by Section 9.1.

9.6 Test Procedure

EUT shall be placed 0.8m high above the ground reference plane which is a min.1m*1m metallic sheet with 0.65mm minimum thickness. This reference ground plane shall project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane beneath the EUT, shall be more than 0.5m

9.6.1. For input and output AC power ports:

The EUT is connected to the power mains by using a coupling device which couples the EFT interference signal to AC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 minutes.

9.6.2. For signal lines and control lines ports:

It's unnecessary to measure.

9.6.3. For AC input and DC output power ports:

For DC ports .It's unnecessary to measure

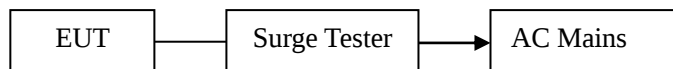
9.7 Test Results

PASS

EFT Test Data				
Temperature:	24.5℃	Humidity:	53%	
Power Supply :	AC 230V/50Hz	Test Mode:	Mode 1	
Coupling Line	Test Voltage		Performance Criterion	Result
	±0.5kV	±1kV		
L	±0.5kV	±1kV	B	PASS
N	±0.5kV	±1kV	B	PASS
L-N	±0.5kV	±1kV	B	PASS
Note: N/A				

10. SURGE TEST

10.1 Block Diagram of EUT Test Setup



10.2 Test Standard

EN 15194

(Test method: EN61000-4-5)

10.3 Severity Levels and Performance Criterion

Severity Level: Line to Line, Level 2 at 1KV;

Severity Level: Line to Earth, Level 3 at 2KV.

Severity Level	Open-Circuit Test Voltage (KV)
1.	0.5
2.	1.0
3.	2.0
4.	4.0
X.	Special

Performance criterion: B

- G. The apparatus 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 apparatus is used as intended.
- H. The apparatus 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 apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
- I. Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

10.4 EUT Configuration on Test

The following equipments are installed on Electrical Fast Transient/Burst Immunity test to meet EN 15194: 2017, EN61000-4-5:2014, requirement and operating in a manner which tends to maximize its emission characteristics in a normal application

The configuration of EUT is the same as used in conducted emission test. Please refer to Section 3.4.

10.5 Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 2.6 except the test setup replaced by Section 10.1.



10.6 Test Procedure

- 1) Set up the EUT and test generator as shown on section 10.1
- 2) For line to line coupling mode, provide a 1KV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.
- 3) At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
- 4) Different phase angles are done individually.
- 5) Repeat procedure 2) to 4) except the open-circuit test voltage change from 1KV to 2KV for line to earth coupling mode test.
- 6) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

10.7 Test Result

PASS

Surge Test Data						
Temperature:	24.5℃		Humidity:		53%	
Power Supply :	AC 230V/50Hz		Test Mode:		Mode 1	
Location	Polarity	Phase Angle	No of Pulse	Pulse Voltage (KV)	Performance Criterion	Result
L-N	±	0	5	1	B	Pass
	±	90	5	1		Pass
	±	180	5	1		Pass
	±	270	5	1		Pass
L-PE	±	0	5	2		Pass
	±	90	5	2		Pass
	±	180	5	2		Pass
	±	270	5	2		Pass
N-PE	±	0	5	2		Pass
	±	90	5	2		Pass
	±	180	5	2		Pass
	±	270	5	2		Pass
Signal Line	±			0.5		N/A
Note: N/A						

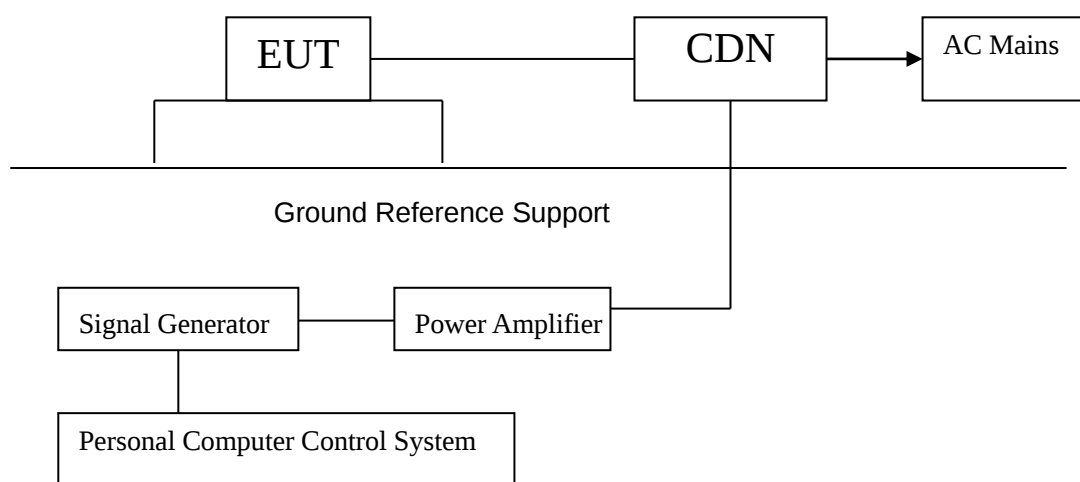
11. INJECTED CURRENTS SUSCEPTIBILITY TEST

11.1 Block Diagram of EUT Test Setup

11.1.1. Block Diagram of EUT Test Setup



11.1.2. Block Diagram of Test Setup



11.2 Test Standard

EN 15194

(Test method: EN61000-4-6)

11.3 Severity Levels and Performance Criterion

Severity Level 2: 3V(rms), 150KHz ~ 80MHz

Severity Level:

Level	Field Strength V/m
1.	1
2.	3
3.	10
X.	Special

Performance criterion: A

- J. The apparatus 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 apparatus is used as intended.
- K. The apparatus 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 apparatus is used as intended. The performance level may be replaced by a permissible loss of performance.

During the test, degradation of performance is however allowed.

- L. Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

11.4 EUT Configuration on Test

The configuration of EUT is the same as used in conducted emission test.
Please refer to Section 2.7.

11.5 Operating Condition of EUT

Same as conducted emission test, which is listed in Section 2.8 except the test set up replaced as Section 11.1.

11.6 Test Procedure

- 1) Set up the EUT, CDN and test generator as shown on section 11.1
- 2) Let EUT work in test mode and measure.
- 3) The EUT and supporting equipments are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane at above 0.1-0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
- 4) The disturbance signal described below is injected to EUT through CDN.
- 5) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
- 6) The frequency range is swept from 150KHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1KHz sine wave
- 7) The rate of sweep shall not exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.
- 8) Recording the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.



9)

11.7 Test Result

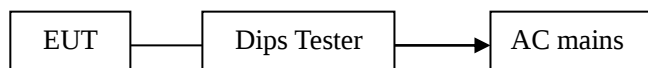
PASS

CS Test Data						
Temperature:		24.5℃		Humidity:		53%
Power Supply :		AC 230V/50Hz		Test Mode:		Mode 1
Frequency Range(MHz)	Injected Position	Strength	Modulation Signal	Freq. Step	Performance Criterion	Result
150KHz ~ 80MHz	AC Line	3V(rms), Unmodulated	AM 80%, 1kHz sine wave	1%	A	Pass
150KHz ~ 80MHz	DC Line	3V(rms), Unmodulated	AM 80%, 1kHz sine wave	1%	/	/
150KHz ~ 80MHz	Signal Line	3V(rms), Unmodulated	AM 80%, 1kHz sine wave	1%	/	/
Note: N/A						



12. VOLTAGE DIPS AND INTERRUPTIONS TEST

12.1 Block Diagram of EUT Test Setup



12.2 Test Standard

EN 15194: 2017
(Test method: EN61000-4-11:2004)

12.3 Severity Levels and Performance Criterion

Severity level

Test Level %U _T	Voltage dip and short interruptions %U _T	Duration (in period)
0	100	250p
40	60	5p
70	30	0.5p

Performance **criterion** : C & B

- M. The apparatus 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 apparatus is used as intended.
- N. The apparatus 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 apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed.
- O. Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

12.4 EUT Configuration on Test

The configuration of EUT is the same as used in conducted emission test.
Please refer to Section 2.8.

12.5 Operating Condition of EUT

Same as conducted emission test, which is listed in Section 2.8 except the test set up replaced as Section 12.1.

12.6 Test Procedure

Set up the EUT and test generator as shown on section 12.1



- 2) The interruptions is introduced at selected phase angles with specified duration.
3) Record any degradation of performance.

12.7 Test Result

PASS

DIPS Test Data			
Temperature:	24.5℃	Humidity:	53%
Power Supply :	AC 230V/50Hz	Test Mode:	Mode 1
Environmental Phenomena	Test Specification	Units	Performance Criterion
Voltage Dips	>0 250	% Reduction period	C
	40 5	% Reduction period	C
Voltage Interruptions	70 0.5	% Reduction period	B



13. ABSORBER LINE CHAMBER

Test Requirement: EN 15194
Test Method: ISO 11452-2
Test Date: Oct. 25, 2021
Frequency Range: 20MHz to 2 GHz
Test level: 24V/m on enclosure
Modulation: 80%, 1kHz Amplitude Modulation
Criteria: Refer to ISO 11452-2:2004

13.1 E.U.T. Operation

Operating Environment:
Temperature: 23 °C
Humidity: 51 % RH
Atmospheric Pressure: 1007 mbar
EUT Operation: The EUT is in representative work mode.

13.2 Test Result

PASS



14. RADIATED IMMUNITY

Test Requirement: EN 15194

Test Method: ISO 11452-1

Test Date: Oct. 25, 2021

Frequency Range: 20MHz to 2 GHz

Test level: 24V/m on enclosure

Modulation: 80%, 1kHz Amplitude Modulation

Criteria: Refer to ISO 11452-1: 2005+A1:2008 & ISO 11452-2:2004

14.1 E.U.T. Operation

Operating Environment:
Temperature: 23 °C
Humidity: 51 % RH
Atmospheric Pressure: 1007 mbar
EUT Operation: The EUT is in representative work mode.

14.2 Test Result

PASS

15. EUT PHOTO





***** END OF REPORT *****