

EMC TEST REPORT

The device described below is tested by LAB-QJRZ (Shenzhen) Co., Ltd. to determine the maximum emission levels emanating from the device, the severe levels which the device can endure and E.U.T.'s performance criterion. The test results are contained in this test report. LAB-QJRZ (Shenzhen) Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

Applicant : Eway Energy Technology (Wuhan) Co., Ltd

Address : NO.18 Liufangyuan South Road, East Lake New Technology Development Zone, Wuhan City, Hubei PRO

Manufacturer/ Factory : Eway Energy Technology (Wuhan) Co., Ltd

Address : NO.18 Liufangyuan South Road, East Lake New Technology Development Zone, Wuhan City, Hubei PRO

E.U.T. : Energy Storage System

Brand Name : N/A

Model No. : ESS 100kWh, ESS 200kWh, ESS 215kWh, ESS 233kWh, ESS 263kWh

Measurement Standard : EN 61000-6-4: 2007+A1: 2011/IEC 61000-6-4: 2018
EN 61000-3-12: 2011/IEC 61000-3-12: 2011,
EN 61000-3-11: 2000/IEC 61000-3-11: 2017,
EN 61000-6-2: 2005+AC:2005/IEC 61000-6-2: 2016
(EN 61000-4-2: 2009/IEC 61000-4-2: 2008, EN 61000-4-3: 2006+A2: 2010/
IEC 61000-4-3: 2010, EN 61000-4-4: 2012/IEC 61000-4-4: 2012,
EN 61000-4-5: 2014/IEC 61000-4-5: 2014, EN 61000-4-6: 2014/
IEC 61000-4-6: 2013, EN 61000-4-8: 2010/IEC 61000-4-8: 2009,
EN 61000-4-11: 2004/IEC 61000-4-11: 2004)

Date of Receiver : 2025-02-05

Date of Test : 2025-02-05 to 2025-02-12

Date of Report : 2025-02-12

This Test Report is Issued Under the Authority of :

Prepared by



Casen Zhang/ Engineer

Approved & Authorized Signer



Seven Zhang / Authorized Signatory

This report shows that the E.U.T. is technically compliant with the EN 61000-6-4, EN 61000-3-12, EN 61000-3-11 and EN 61000-6-2. This report applies to above tested sample only and shall not be reproduced in part without written approval of LAB-QJRZ (Shenzhen) Co., Ltd.

1. SUMMARY OF TEST RESULTS

The E.U.T. has been tested according to the following specifications:

EMISSION			
Standard	Test Type	Result	Remarks
EN 61000-6-4: 2007+A1: 2011 IEC 61000-6-4: 2018	Mains Terminal Disturbance Voltage Test	PASS	Uncertainty: 2.7dB
	Radiated Emission Test	PASS	Uncertainty: 3.4dB
☆EN61000-3-12:2011 IEC 61000-3-12: 2011	Harmonic current emission	PASS	Meets the requirements.
☆EN 61000-3-11:2000 IEC 61000-3-11:2017	Voltage fluctuations & flicker	PASS	Meets the requirements.

IMMUNITY (EN 61000-6-2: 2005+AC:2005/IEC 61000-6-2: 2016)			
Standard	Test Type	Result	Remarks
EN 61000-4-2: 2009 IEC 61000-4-2: 2008	Electrostatic discharge immunity test	PASS	Meets the requirements of Performance Criterion B
EN 61000-4-3: 2006+A2:2010/ IEC 61000-4-3:2010	Radio-frequency, electromagnetic field immunity test	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-4: 2012 IEC 61000-4-4:2012	Electrical fast transient/ burst immunity test	PASS	Meets the requirements of Performance Criterion B
EN 61000-4-5: 2014 IEC 61000-4-5: 2014	Surge immunity test	PASS	Meets the requirements of Performance Criterion B
EN 61000-4-6: 2014 IEC 61000-4-6: 2013	Injected Currents immunity test	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-8: 2010 EN 61000-4-8: 2009	Voltage Dips and Interruptions	PASS	Meets the requirements of Performance Criterion A
EN 61000-4-11: 2004 IEC 61000-4-11: 2004	Magnetic Field Immunity Test	PASS	Meets the requirements of Performance Criterion B&C

Note: "☆" Indicates that the test item is not within the CNAS accredited qualification scope of the laboratory.

2. GENERAL INFORMATION

2.1 Details of E.U.T.

E.U.T.	: Energy Storage System
Model No.	: ESS 100kWh
Brand Name	: N/A
Rating	: 100kWh-263kWh
Test Voltage	: None
Cable	: None
Description of model difference	: ESS 200kWh,ESS 215kWh,ESS 233kWh,ESS 263kWh
Remark	:

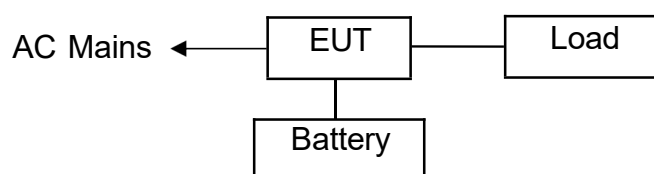
2.2 Description of Support Device

None

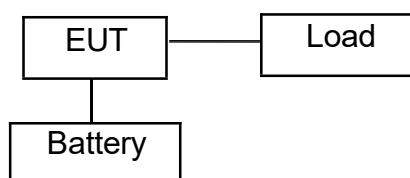
2.3 Block Diagram of Test Setup

Block diagram of connection between the E.U.T. and simulators

(1) For Normal operation mode



(2) For Stored energy operation mode



2.4 Test Facility

Site Description

Name of Firm	: LAB-QJRZ (Shenzhen) Co., Ltd.
Site Location	: Floor 3, Building A, No. 234, Gushu 1st road, Xixiang Street, Baoan District, Shenzhen City, China
Subcontractor	: EMTEK (SHENZHEN) CO., LTD.
Site Location	: Bldg 69, Majialong, Industry Zone, Nanshan District, Shenzhen, Guangdong, China
Subcontracted Items	: Harmonic Current Emission & Flicker,

2.5 Abnormalities from Standard Conditions

None

3. MEASURING DEVICES AND TEST EQUIPMENT

3.1. For Mains terminals Disturbance voltage Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI	101152	2024-08-12	1 Year
2.	L.I.S.N	Rohde & Schwarz	ENV 216	101317	2024-08-12	1 Year
3.	L.I.S.N	Schwarzbeck	NNLK8129	8129-212	2024-08-12	1 Year
4.	RF Switching Unit	Compliance Direction Systems Inc.	RSU-M2	38311	2024-08-12	1 Year
5.	Pulse Limiter	MTS-systemtechnik	MTS-IMP-136	26115-010-0007	2024-08-12	1 Year

3.2. For Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI7	100837	2024-08-12	1 Year
2.	Antenna	Schwarzbeck	VULB9162	9162-010	2024-08-12	1 Year
3.	Positioning Controller	UC	UC 3000	N/A	N/A	N/A
4.	Color Monitor	SUNSPO	SP-140A	N/A	N/A	N/A
5.	Single Phase Power Line Filter	SAEMC	PF201A-32	110210	N/A	N/A
6.	3 Phase Power Line Filter	SAEMC	PF401A-200	110318	N/A	N/A
7.	DC Power Filter	SAEMC	PF301A-200	110245	N/A	N/A
8.	Cable	Huber+Suhner	CBL3-NN-9M	21490001	2024-08-12	1 Year
9.	Cable	Huber+Suhner	RG223U	N/A	2024-08-12	1 Year
10.	Power Amplifier	HP	HP 8447D	1145A00203	2024-08-12	1 Year

3.3. For Harmonic/ Flicker Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Three Phase Harmonic Flicker Test System	California Instruments	MX45-3PI-400-413-C TSHL-LF-SNK	1424A00547	2024-08-12	1 Year

3.4. For Electrostatic Discharge Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	ESD Tester	TESEQ	NSG 437	432	2024-08-12	1 Year

3.5.For RF Electromagnetic Field Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Signal Generator	Agilent	N5181A	MY50142530	2024-08-12	1 Year
2.	Antenna	Schwarzbeck	VULB9162	9162-010	2024-08-12	1 Year
3.	RF Power Meter	ESE	4242	13984	2024-08-12	1 Year
4.	Power Amplifier	TESEQ	CBA 1G-150	T44029	2024-08-12	1 Year
5.	Power Sensor	ESE	51011EMC	35716	2024-08-12	1 Year

3.6.For Electrical Fast Transient /Burst Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Burst Tester	EM TEST	UCS 500N	V1104108683	2024-08-12	1 Year
2.	Coupling Clamp	EM TEST	HFK	0311-94	2024-08-12	1 Year
3.	Test Soft	EM TEST	lec. control	N/A	N/A	N/A

3.7.For Surge Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Surge Tester	EM TEST	UCS 500N	V1104108683	2024-08-12	1 Year
2.	Test Soft	EM TEST	lec. control	N/A	N/A	N/A

3.8.For Injected Currents Immunity Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	CDN	Luthi	L-801M2/M3	2024	2024-08-12	1 Year
2.	C/S Test System	HAEFELY	WinPAMP	NSEMC002	N/A	1 Year

3.9.For Voltage Dips and Interruptions Measurement

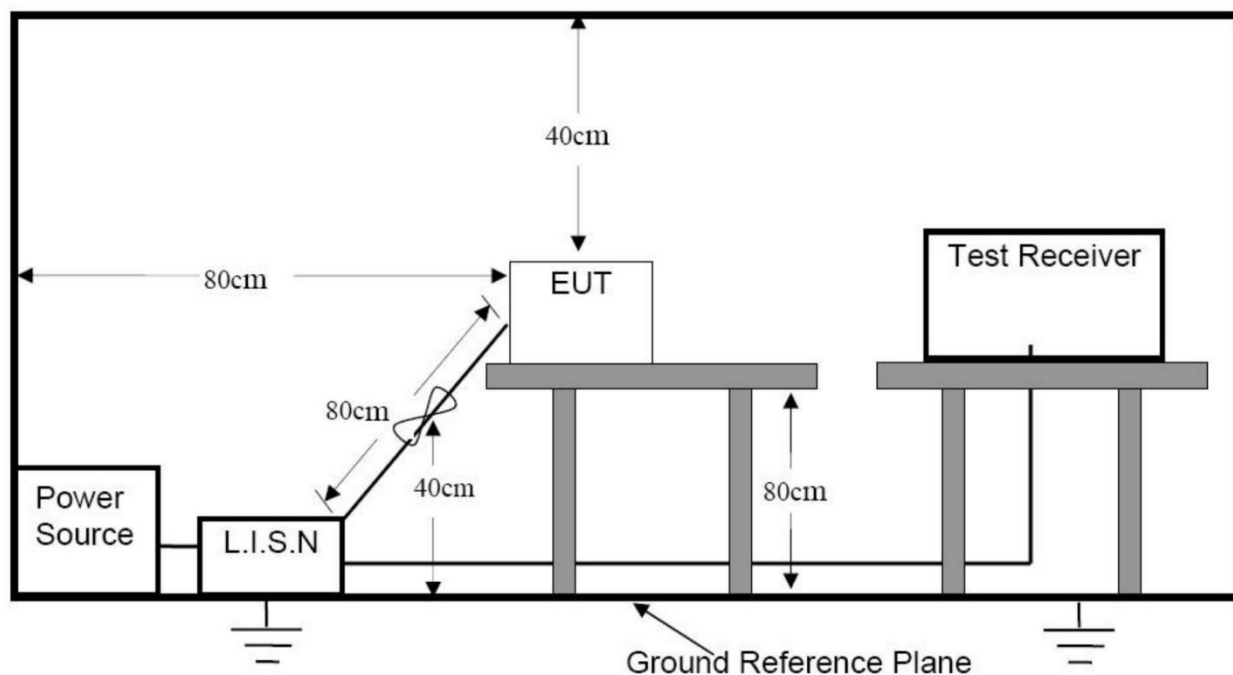
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Dips Tester	EM TEST	UCS500N	V1104108683	2024-08-12	1 Year
2.	Test Soft	EM TEST	lec.control	N/A	N/A	N/A
3.	Dips Modulator	EM TEST	V4780S2	0111-11	2024-08-12	1 Year

3.10.For Magnetic Field Immunity Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Magnetic Field Tester	EMC PARTNER	TRA2000	853	2024-08-12	1 Year
2.	Variac Module	EMC PARTNER	VAR-EXT10000	041	2024-08-12	1 Year
3.	Induction Coil	EMC PARTNER	MF1000-1	150	2024-08-12	1 Year

4. MAINS TERMINAL DISTURBANCE VOLTAGE MEASUREMENT

4.1 Block Diagram of Test Setup



4.2 Limit of Mains Terminal Disturbance voltage measurement

Test Standard: EN 61000-6-4/IEC 61000-6-4

Limits for conducted disturbance at the mains port.

Frequency range (MHz)	Limits (dB(uV))	
	Quasi-peak	Average
0.15 to 0.50	79	66
0.50 to 30	73	60

- Note:
1. The lower limit shall apply at the transition frequencies.
 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

4.3 Test Procedure

The E.U.T. is put on the 0.8 m high table 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 EN 61000-6-4 regulations during conducted emission test.

The bandwidth of the test receiver (R&S Test Receiver ESCI) is set at 9 KHz.

4.4 Operating Condition of E.U.T.

4.4.1 Setup the E.U.T. and simulators as shown in Section 2.3.

4.4.2 Turn on the power of all equipments.

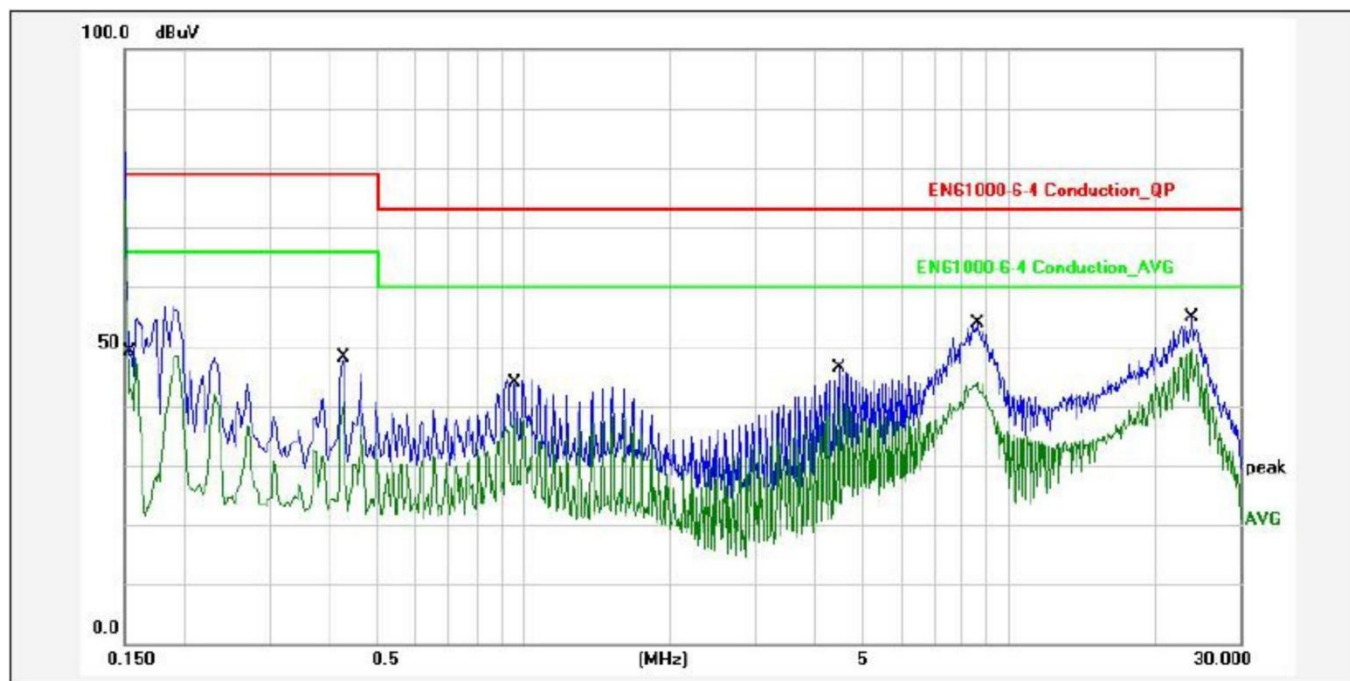
4.4.3 Let the E.U.T. work in test mode and test it.

4.5 Mains Terminal Disturbance Voltage Test Results

PASS.

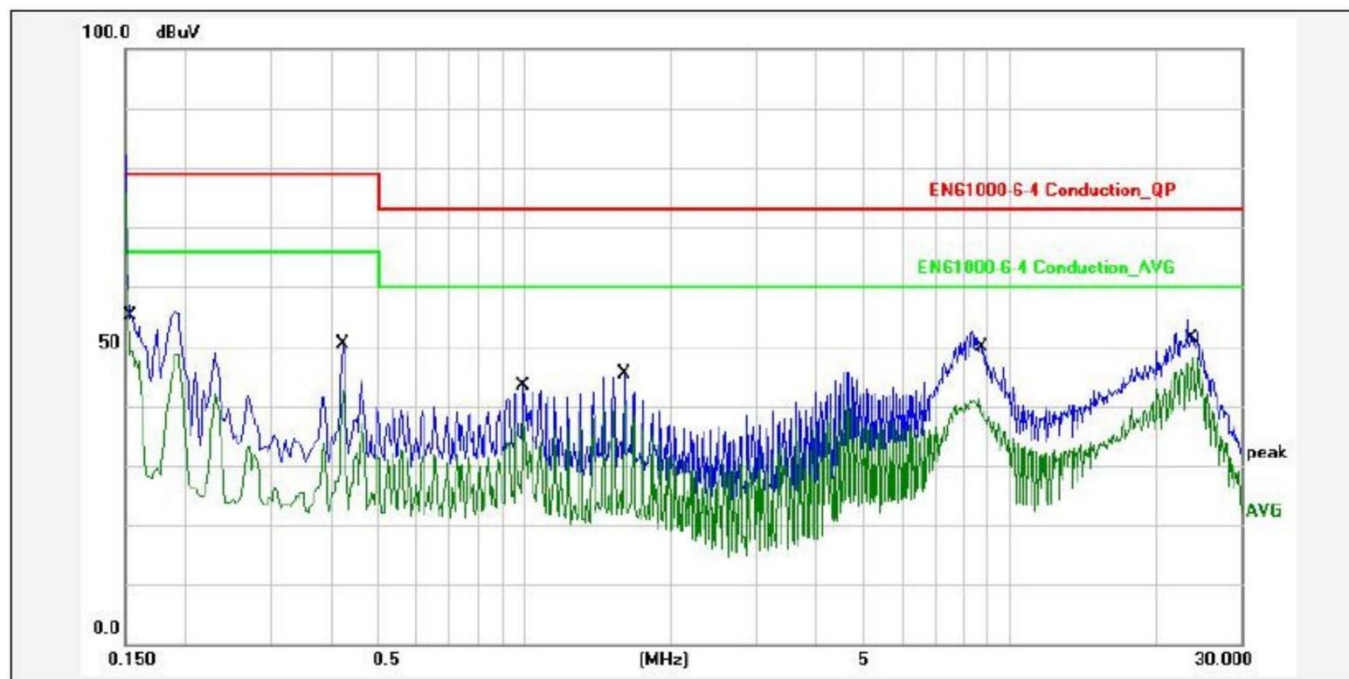
Please refer to the following pages.

E.U.T :	Energy Storage System	Model Name :	ESS 100kWh
Temperature :	26 °C	Relative Humidity :	55 %
Pressure :	1006 hPa	Test Voltage :	AC 230V/50Hz
Test Mode :	Normal operation mode	Phase:	Line



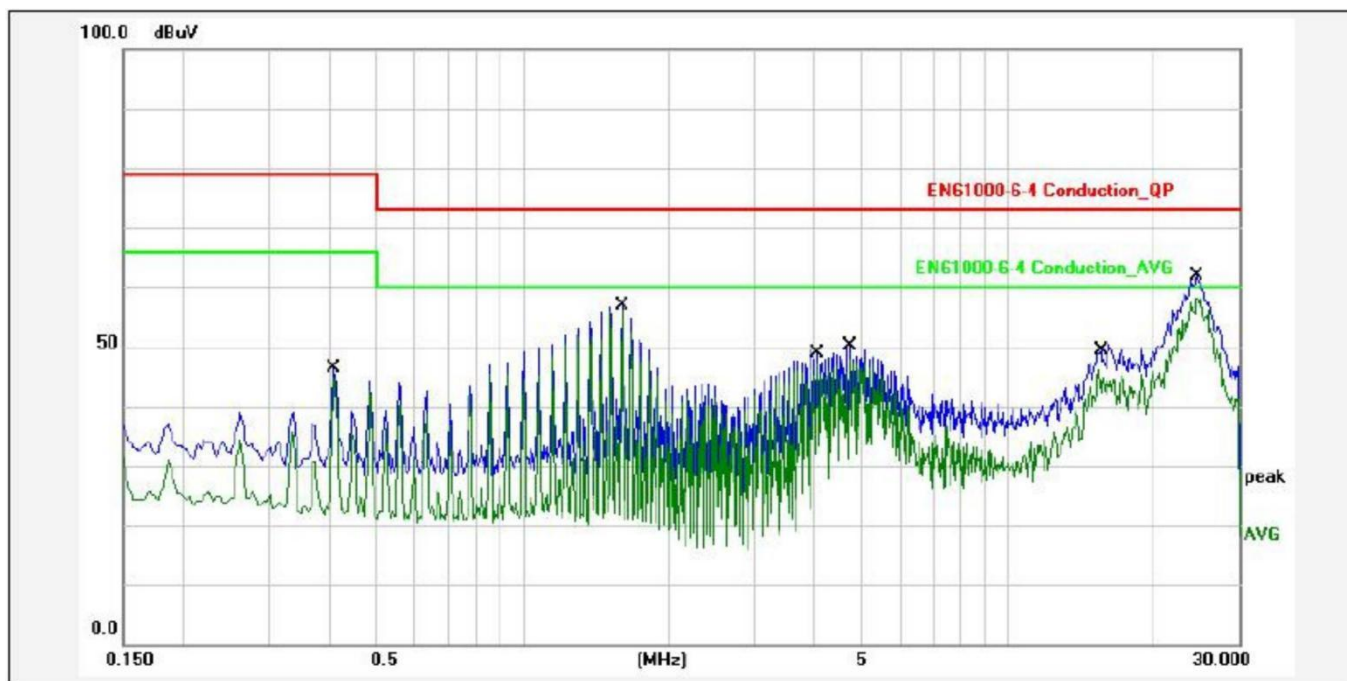
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1545	10.64	54.35	64.99	79.00	-14.01	QP	P	
2	0.1545	10.64	49.15	59.79	66.00	-6.21	AVG	P	
3	0.4259	10.51	37.65	48.16	79.00	-30.84	QP	P	
4	0.4259	10.51	30.16	40.67	66.00	-25.33	AVG	P	
5	0.9619	10.46	33.90	44.36	73.00	-28.64	QP	P	
6	0.9619	10.46	27.38	37.84	60.00	-22.16	AVG	P	
7	4.4618	10.57	35.73	46.30	73.00	-26.70	QP	P	
8	4.4618	10.57	30.43	41.00	60.00	-19.00	AVG	P	
9	8.6019	10.49	43.49	53.98	73.00	-19.02	QP	P	
10	8.6019	10.49	33.27	43.76	60.00	-16.24	AVG	P	
11	23.8180	10.64	44.11	54.75	73.00	-18.25	QP	P	
12	23.8180	10.64	38.66	49.30	60.00	-10.70	AVG	P	

E.U.T :	Energy Storage System	Model Name :	ESS 100kWh
Temperature :	26 °C	Relative Humidity :	55 %
Pressure :	1006 hPa	Test Voltage :	AC 230V/50Hz
Test Mode :	Normal operation mode	Phase:	Neutral



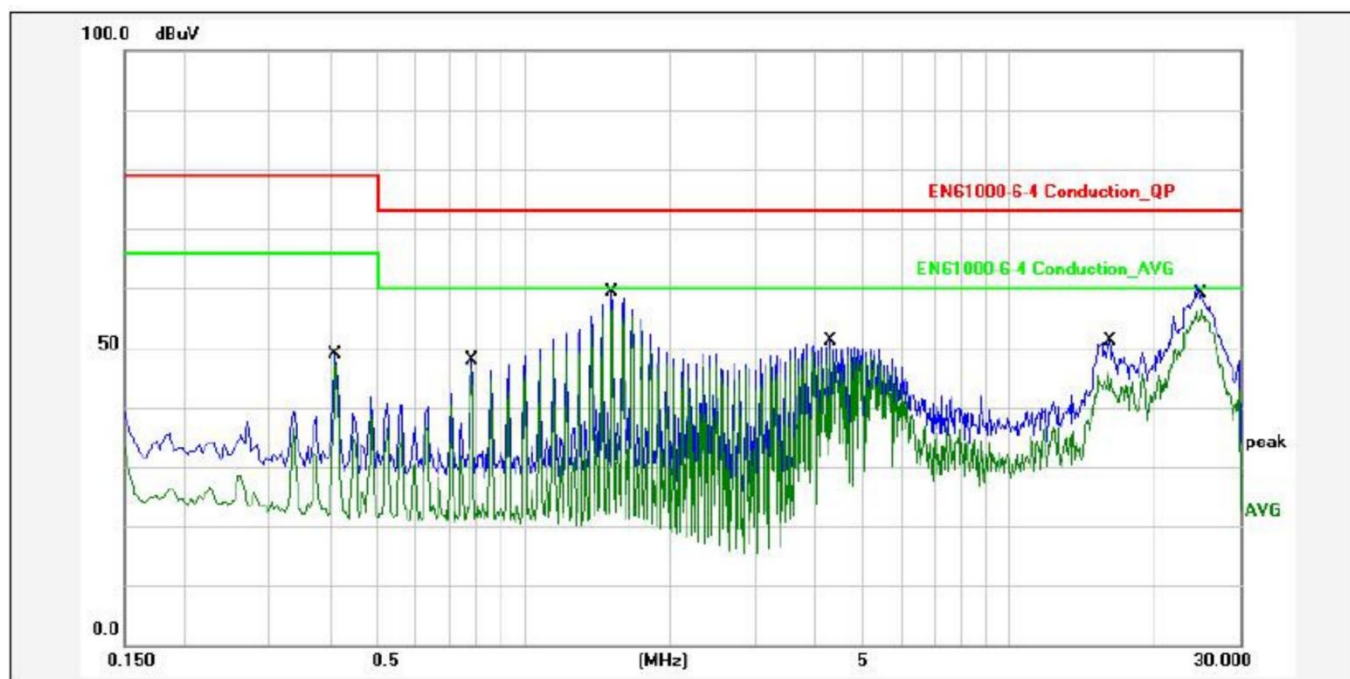
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1545	10.64	54.65	65.29	79.00	-13.71	QP	P	
2	0.1545	10.64	49.35	59.99	66.00	-6.01	AVG	P	
3	0.4220	10.51	39.89	50.40	79.00	-28.60	QP	P	
4	0.4220	10.51	32.13	42.64	66.00	-23.36	AVG	P	
5	0.9980	10.46	32.83	43.29	73.00	-29.71	QP	P	
6	0.9980	10.46	26.87	37.33	60.00	-22.67	AVG	P	
7	1.6060	10.50	34.93	45.43	73.00	-27.57	QP	P	
8	1.6060	10.50	29.60	40.10	60.00	-19.90	AVG	P	
9	8.6379	10.49	42.02	52.51	73.00	-20.49	QP	P	
10	8.6379	10.49	30.70	41.19	60.00	-18.81	AVG	P	
11	23.8420	10.64	43.66	54.30	73.00	-18.70	QP	P	
12	23.8420	10.64	37.46	48.10	60.00	-11.90	AVG	P	

E.U.T :	Energy Storage System	Model Name :	ESS 100kWh
Temperature :	26 °C	Relative Humidity :	55 %
Pressure :	1006 hPa	Test Voltage :	DC 24V
Test Mode :	Stored energy operation mode	Phase:	Line



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.4100	10.51	35.79	46.30	79.00	-32.70	QP	P	
2	0.4100	10.51	34.39	44.90	66.00	-21.10	AVG	P	
3	1.6019	10.50	46.48	56.98	73.00	-16.02	QP	P	
4	1.6019	10.50	45.51	56.01	60.00	-3.99	AVG	P	
5	4.0619	10.58	38.22	48.80	73.00	-24.20	QP	P	
6	4.0619	10.58	36.66	47.24	60.00	-12.76	AVG	P	
7	4.7339	10.57	39.57	50.14	73.00	-22.86	QP	P	
8	4.7339	10.57	37.32	47.89	60.00	-12.11	AVG	P	
9	15.3939	10.50	39.75	50.25	73.00	-22.75	QP	P	
10	15.3939	10.50	35.72	46.22	60.00	-13.78	AVG	P	
11	24.6200	10.67	48.29	58.96	73.00	-14.04	QP	P	
12	24.6200	10.67	45.49	56.16	60.00	-3.84	AVG	P	

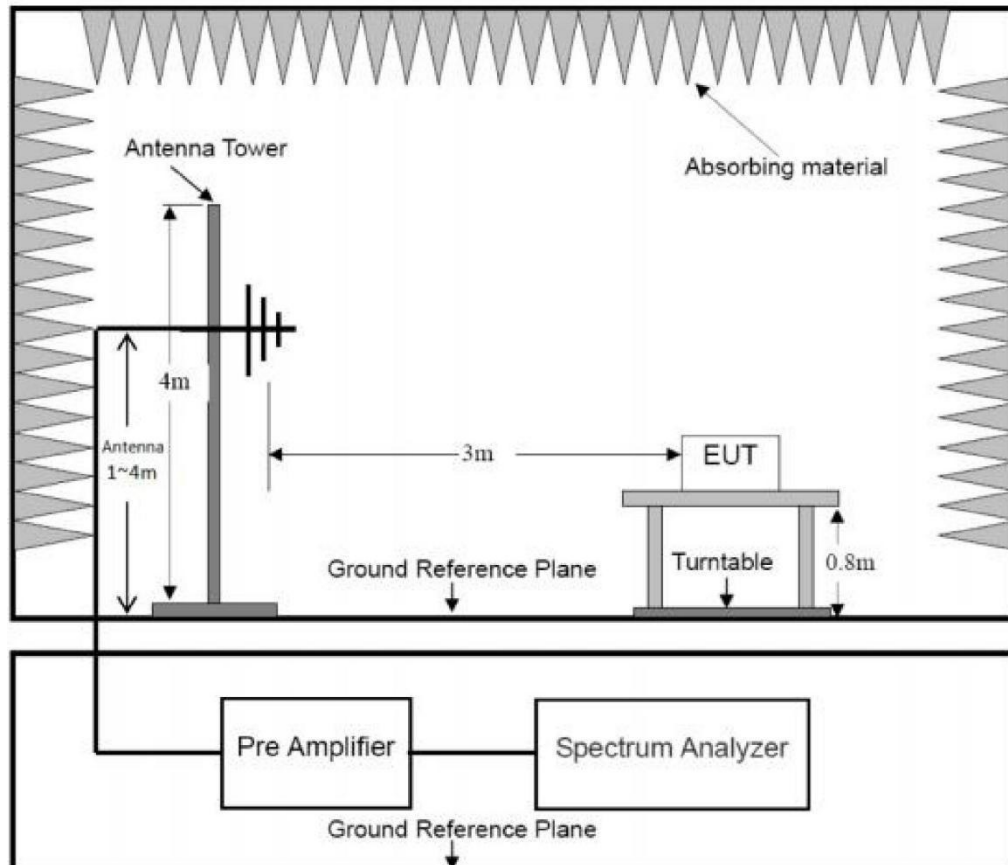
E.U.T :	Energy Storage System	Model Name :	ESS 100kWh
Temperature :	26 °C	Relative Humidity :	55 %
Pressure :	1006 hPa	Test Voltage :	DC 24V
Test Mode :	Stored energy operation mode	Phase:	Neutral



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.4100	10.51	38.45	48.96	79.00	-30.04	QP	P	
2	0.4100	10.51	37.01	47.52	66.00	-18.48	AVG	P	
3	0.7820	10.48	37.39	47.87	73.00	-25.13	QP	P	
4	0.7820	10.48	35.80	46.28	60.00	-13.72	AVG	P	
5	1.5300	10.50	48.79	59.29	73.00	-13.71	QP	P	
6	1.5300	10.50	45.76	56.26	60.00	-3.74	AVG	P	
7	4.2819	10.59	40.52	51.11	73.00	-21.89	QP	P	
8	4.2819	10.59	39.08	49.67	60.00	-10.33	AVG	P	
9	16.0499	10.50	40.66	51.16	73.00	-21.84	QP	P	
10	16.0499	10.50	35.42	45.92	60.00	-14.08	AVG	P	
11	24.8420	10.67	49.86	60.53	73.00	-12.47	QP	P	
12	24.8420	10.67	45.75	56.42	60.00	-3.58	AVG	P	

5. RADIATED EMISSION MEASUREMENT

5.1 Block Diagram of Test



5.2 Limit of Radiated Emission Measurement

Test Standard: EN 61000-6-4/IEC 61000-6-4

Limits for radiated disturbance at a measuring distance of 3m

Frequency range MHz	Quasi-peak limits dB(uV/m)
30 to 230	50
230 to 1000	57

Note 1 The lower limit shall apply at the transition frequency.
 Note 2 If the internal emission source is operating at a frequency below 9KHz, then measurements need only to be performed up to 230MHz

5.3 Test Procedure

E.U.T. and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. E.U.T. is set 3.0 meters away from the receiving antenna, which is mounted on a antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarization of the antenna is set on measurement. In order to find the maximum emission levels, all of the interface cables must be manipulated according to EN 61000-6-4 on radiated emission measurement.

The bandwidth of the EMI test receiver (R&S ESCI7) is set at 120 KHz.

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

5.4 Operating Condition of E.U.T.

5.4.1 Setup the E.U.T. and simulators as shown in Section 2.3.

5.4.2 Turn on the power of all equipments.

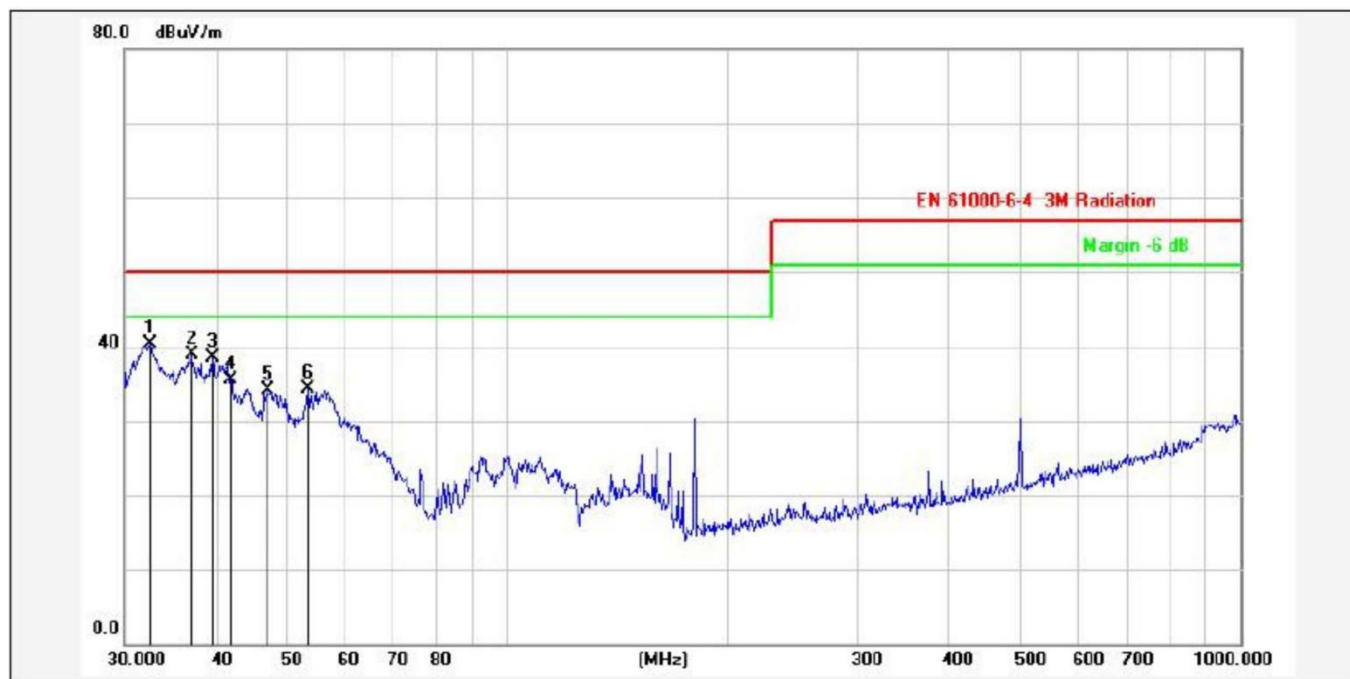
5.4.3 Let the E.U.T. work in test mode and test it.

5.5 Radiated Emission Measurement Result

PASS.

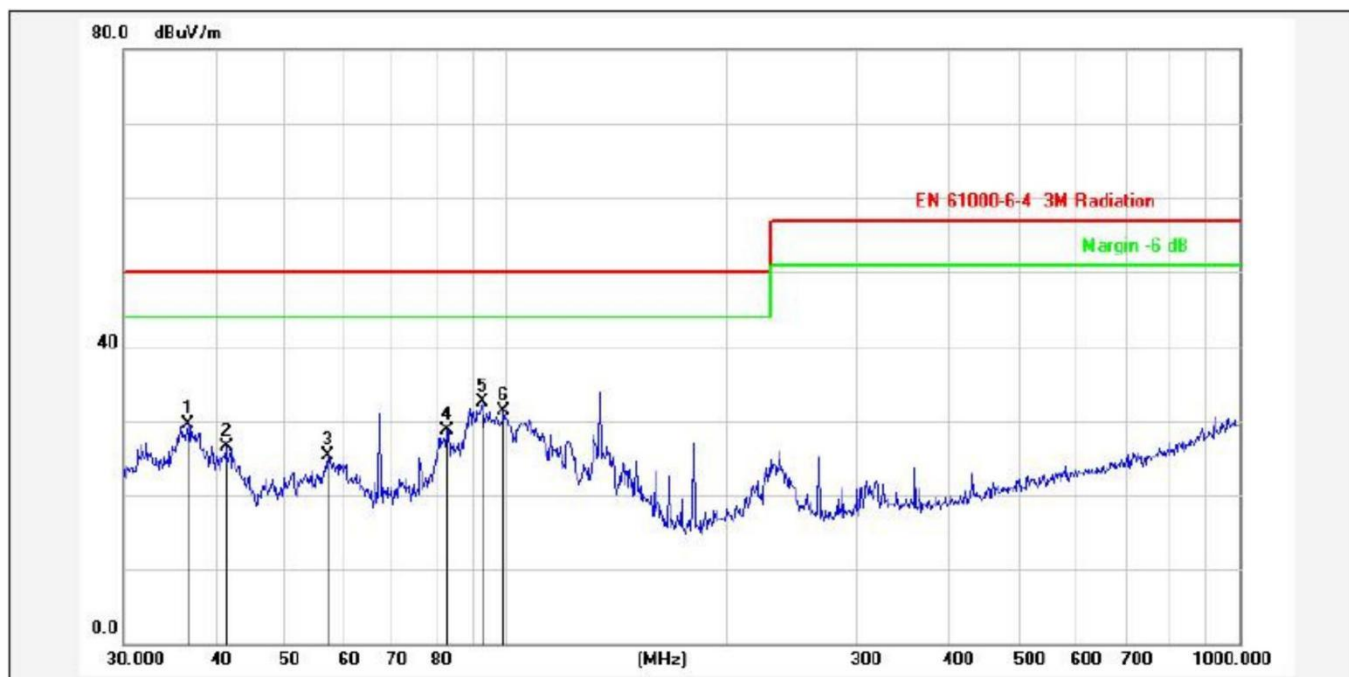
Please refer to the following pages.

E.U.T :	Energy Storage System	Model Name :	ESS 100kWh
Temperature :	25 °C	Relative Humidity :	60 %
Pressure :	1006 hPa	Test Voltage :	AC 230V/50Hz
Test Mode :	Normal operation mode	Polarization:	Vertical



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	32.5197	-1.42	41.65	40.23	50.00	-9.77	QP			P	
2	37.0248	-2.70	41.56	38.86	50.00	-11.14	QP			P	
3	39.5757	-3.43	41.92	38.49	50.00	-11.51	QP			P	
4	41.8595	-4.97	40.41	35.44	50.00	-14.56	QP			P	
5	47.1598	-9.03	43.20	34.17	50.00	-15.83	QP			P	
6	53.5052	-12.05	46.41	34.36	50.00	-15.64	QP			P	

E.U.T :	Energy Storage System	Model Name :	ESS 100kWh
Temperature :	25 °C	Relative Humidity :	60 %
Pressure :	1006 hPa	Test Voltage :	AC 230V/50Hz
Test Mode :	Normal operation mode	Polarization:	Horizontal



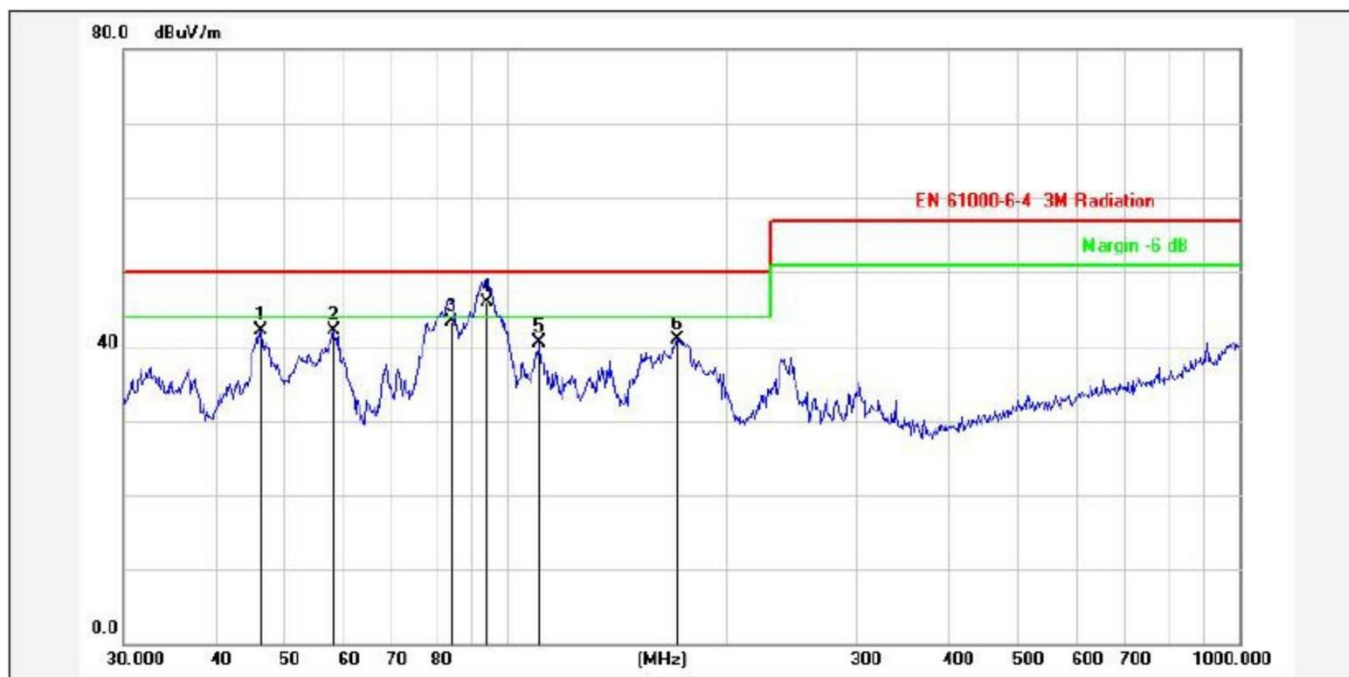
No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	36.7661	-2.63	32.20	29.57	50.00	-20.43	QP			P	
2	41.4215	-4.64	31.16	26.52	50.00	-23.48	QP			P	
3	56.9911	-12.90	38.13	25.23	50.00	-24.77	QP			P	
4	82.9384	-8.68	37.47	28.79	50.00	-21.21	QP			P	
5	92.7871	-7.51	39.92	32.41	50.00	-17.59	QP			P	
6	99.1796	-6.52	37.86	31.34	50.00	-18.66	QP			P	

E.U.T :	Energy Storage System	Model Name :	ESS 100kWh
Temperature :	25 °C	Relative Humidity :	60 %
Pressure :	1006 hPa	Test Voltage :	DC 24V
Test Mode :	Stored energy operation mode	Polarization:	Vertical



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	32.4059	-1.38	47.10	45.72	50.00	-4.28	QP			P	
2	37.8121	-2.92	48.62	45.70	50.00	-4.30	QP			P	
3	41.7129	-4.86	45.76	40.90	50.00	-9.10	QP			P	
4	47.8260	-9.53	54.58	45.05	50.00	-4.95	QP			P	
5	55.0274	-12.42	57.85	45.43	50.00	-4.57	QP			P	
6	99.8777	-6.42	46.68	40.26	50.00	-9.74	QP			P	

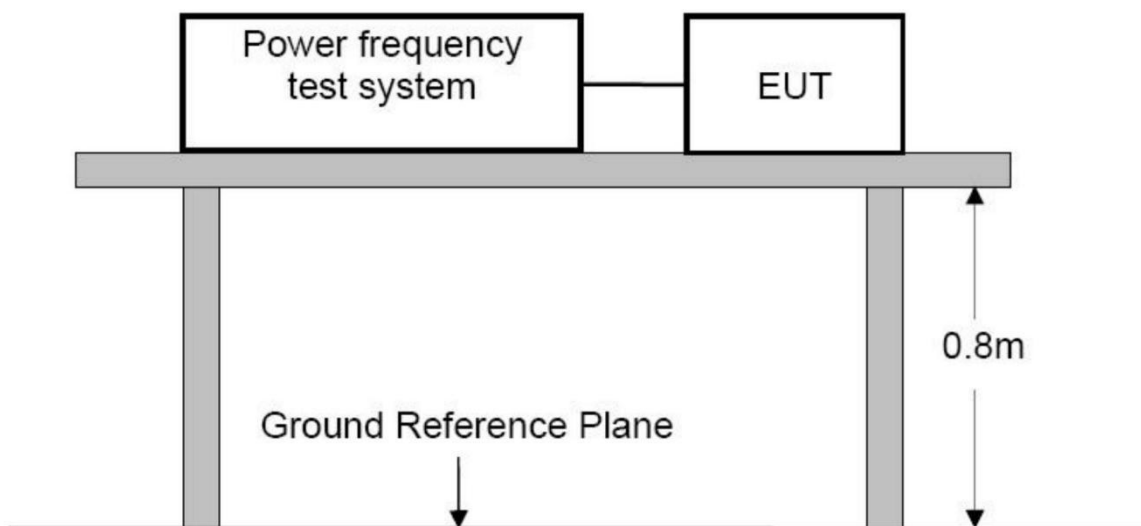
E.U.T :	Energy Storage System	Model Name :	ESS 100kWh
Temperature :	25 °C	Relative Humidity :	60 %
Pressure :	1006 hPa	Test Voltage :	DC 24V
Test Mode :	Stored energy operation mode	Polarization:	Horizontal



No.	Frequency (MHz)	Factor (dB/m)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	46.1779	-8.28	50.31	42.03	50.00	-7.97	QP			P	
2	57.9992	-13.14	55.24	42.10	50.00	-7.90	QP			P	
3	84.1100	-8.55	51.88	43.33	50.00	-6.67	QP			P	
4	94.0979	-7.31	53.21	45.90	50.00	-4.10	QP			P	
5	110.9569	-6.01	46.53	40.52	50.00	-9.48	QP			P	
6	171.3925	-7.22	48.22	41.00	50.00	-9.00	QP			P	

6. HARMONIC CURRENT EMISSION TEST

6.1 Block Diagram of Test Setup



6.2 Limits of Harmonics current measurement

Test Standard: EN 61000-3-12/IEC 61000-3-12

Current emission limits for equipment other than balanced three-phase equipment

Minimal $R_{s_{ce}}$	Admissible individual harmonic current I_n/I_1 ^a						Admissible harmonic current distortion factors	
	I_3	I_5	I_7	I_9	I_{11}	I_{13}	THD	$PWHD$
33	21,6	10,7	7,2	3,8	3,1	2	23	23
66	24	13	8	5	4	3	26	26
120	27	15	10	6	5	4	30	30
250	35	20	13	9	8	6	40	40
≥ 350	41	24	15	12	10	8	47	47

The relative values of even harmonics up to order 12 shall not exceed $16/n$ %. Even harmonics above order 12 are taken into account in THD and $PWHD$ in the same way as odd order harmonics.

NOTE Linear interpolation between successive $R_{s_{ce}}$ values is permitted. See also Annex B.

^a I_1 = reference fundamental current; I_n = harmonic current component.

6.3 Test Procedure

The E.U.T. was put on the top of a wooden table 0.8m above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.

6.4 Operating Condition of E.U.T.

6.4.1 Setup the E.U.T. and simulators as shown in Section 2.3.

6.4.2 Turn on the power of all equipments.

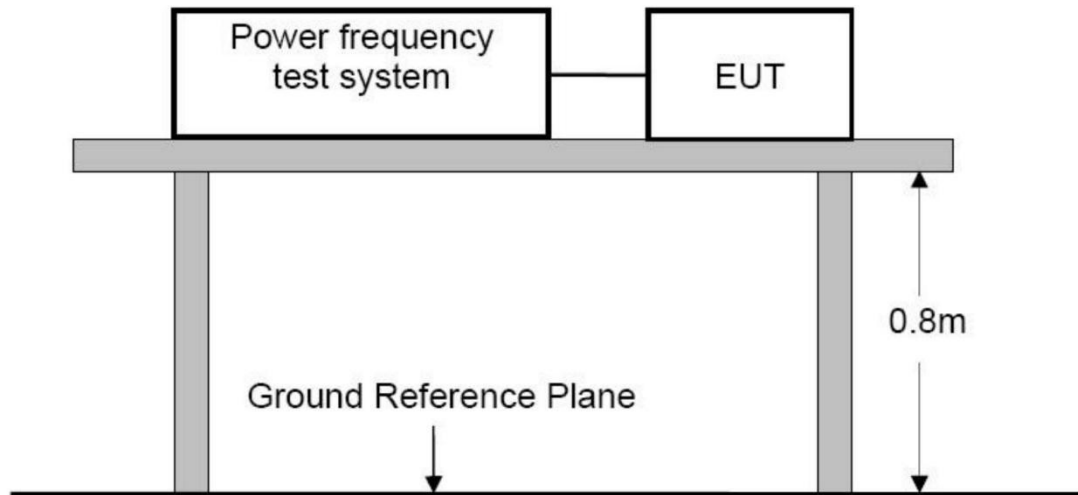
6.4.3 Let the E.U.T. work in test mode and test it.

6.5 Test Results

PASS

7. VOLTAGE FLUCTUATIONS & FLICKER TEST

7.1 Block Diagram of Test Setup



7.2 Limits of Voltage Fluctuations & Flicker Measurement

Test Standard: EN 61000-3-11/IEC 61000-3-11

The following limits apply:

- the value of the short-term flicker indicator, P_{st} shall not be greater than 1,0;
- the value of the long-term flicker indicator, P_{lt} shall not be greater than 0,65;
- the value of $d(t)$ during a voltage change shall not exceed 3,3% for more than 500ms;
- the relative steady-state voltage change, dc , shall not exceed 3,3%;
- the maximum relative voltage change d_{max} , shall not exceed:
 - a) 4% without additional conditions;
 - b) 6% for equipment with:
 - manual switching, or
 - automatic switching more frequently than twice per day and having a delayed restart (the delay being not less than a few tens of seconds) or, manual restart after a power supply interruption.
 - c) 7% for equipment which
- is attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawnmowers, portable tools such as electric drills); or
- is switched on automatically, or is intended to be switched on manually, no more than twice per day and has a delayed restart (the delay being not less than a few tens of seconds) or manual restart after a power supply interruption.

In the case of equipment incorporating multiple loads, limits b) and c) shall only apply if there is delayed or manual restart after a power supply interruption; for all equipment with automatic switching which is energized immediately on restoration of supply after a power supply interruption, limits a) shall apply; for all equipment with manual switching, limits b) or c) shall apply, depending on the rate of switching.

Pst and Plt requirements shall not be applicable to voltage changes caused by manual switching.

The limits shall not be applicable to emergency switching or emergency operations.

7.3 Test Procedure

The E.U.T. was put on the top of a wooden table 0.8m above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.

7.4 Operating Condition of E.U.T.

7.4.1 Setup the E.U.T. and simulators as shown in Section 2.3.

7.4.2 Turn on the power of all equipments.

7.4.3 Let the E.U.T. work in test mode and test it.

7.5 Test Results

PASS.

8. PERFORMANCE CRITERIA FOR IMMUNITY

The performance criteria are referred to the test standard:
EN 61000-6-2/IEC61000-6-2

The variety and the diversity of the apparatus within the scope of this standard makes it difficult to define precise criteria for the evaluation of the immunity test results.

If, as a result of the application of the tests defined in this standard, the apparatus becomes dangerous or unsafe, the apparatus shall be deemed to have failed the test.

A functional description and a definition of performance criteria, during or as a consequence of the EMC testing, shall be provided by the manufacturer and noted in the test report.

Performance Criterion 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. The performance level may be replaced by a permissible loss of performance. 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 and what the user may reasonably expect from the apparatus if used as intended.

Performance Criterion B:

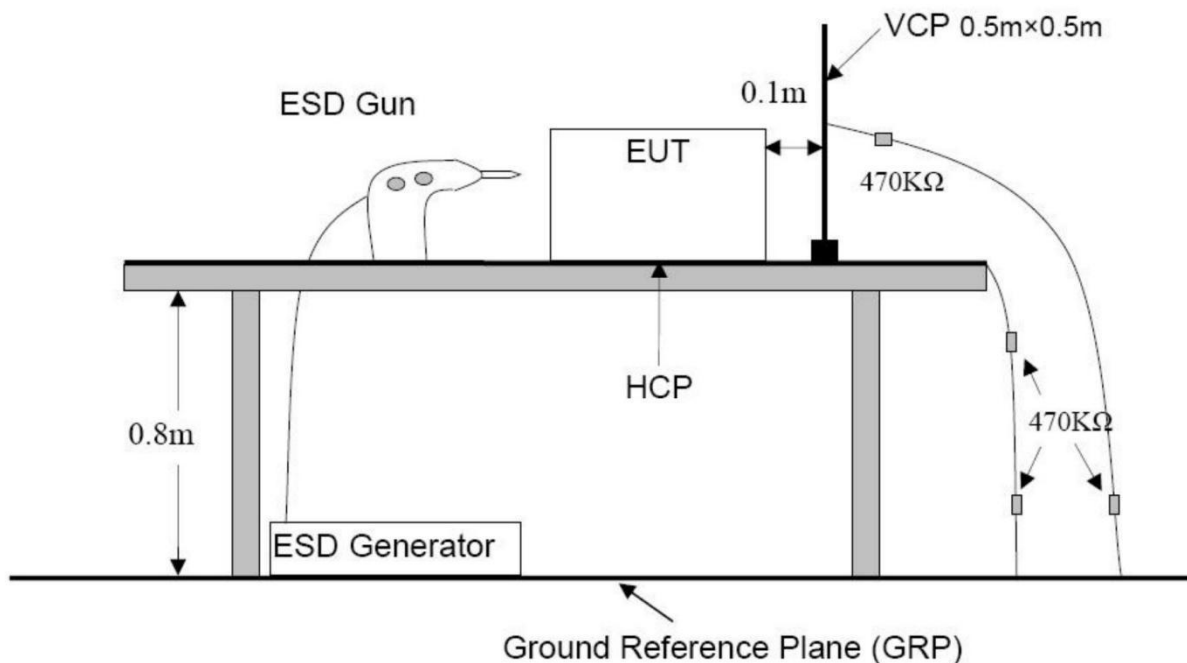
The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operation 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 and what the user may reasonably expect from the apparatus if used as intended.

Performance Criteria C

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

9. ELECTROSTATIC DISCHARGE TEST

9.1 Block Diagram of Test Setup



9.2 Test Standard and Severity Levels

9.2.1 Test Standard:

EN 61000-6-2/IEC 61000-6-2

(EN 61000-4-2/IEC 61000-4-2 Air Discharge: Severity Level: 3, ± 8 KV;

Contact Discharge: Level: 2, ± 4 KV)

9.2.2 Severity Levels:

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

9.3 Test Procedure

9.3.1 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 E.U.T.. After each discharge, the discharge electrode shall be removed from the E.U.T.. 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

9.3.2 Contact Discharge:

All the procedure shall be same as Section 9.3.1. except that the tip of the discharge electrode shall touch the E.U.T..

9.3.3 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 E.U.T. and 0.1m from the front of the E.U.T.. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

9.3.4 Indirect discharge for vertical coupling plane

At least 10 single discharge (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 E.U.T.. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the E.U.T. are completely illuminated.

9.4 Test Results

PASS.

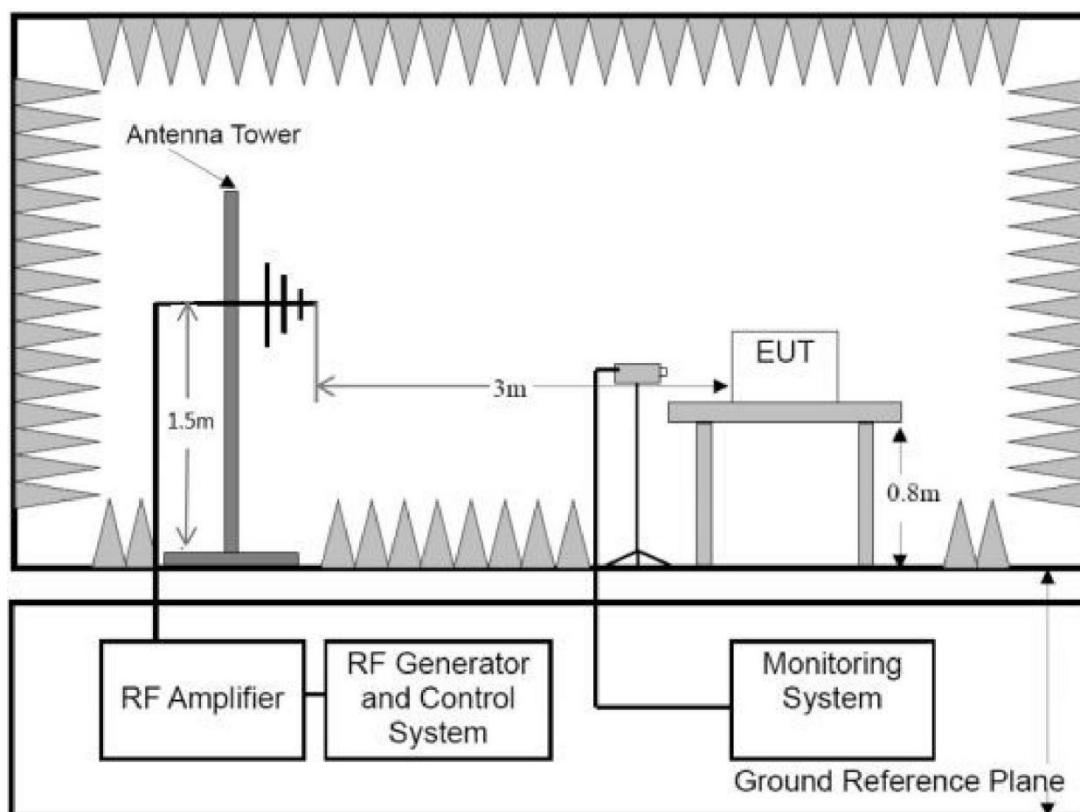
Please refer to the following page.

Electrostatic Discharge Test Results

Ambient Condition:	Temp.: 25 °C	R.H.: 51 %	Air Pressure: 101 kPa
Power Supply:	AC 230V 50Hz; DC 24V	Required Performance Criterion: B	
Test Specifications:	±2, 4 kV Contact Discharge; ±2, 4, 8 kV Air Discharge For each point positive 10 times and negative 10 times		
Tested mode:	Normal operation mode, Stored energy operation mode		
Test Point		Kind A-Air Discharge C-Contact Discharge	Result (Performance Criterion)
Screen		A	A
Gap		A	A
LED		A	A
Button		A	A
Metal		C	A
Port		C	A
Screw		C	A
Metal		C	A
Indirect Discharge (HCP)		C	A
Indirect Discharge (VCP)		C	A
Note:			
Test Equipment :		ESD Tester (TESEQ, NSG 437)	Test Engineer : Stan

10. RF FIELD STRENGTH SUSCEPTIBILITY TEST

10.1 Block Diagram of Test Setup



10.2 Test Standard and Severity Levels

10.2.1 Test Standard

EN 61000-6-2/IEC 61000-6-2
(EN 61000-4-3/IEC 61000-4-3,
80 to 1000MHz Severity Level: 3, 10V/m;
1.4 to 2.0GHz Severity Level: 2, 3V/m;
2.0 to 2.7GHz Severity Level: 1, 1V/m)

10.2.2 Severity Levels

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

10.3 Test Procedure

The E.U.T. and its simulators are placed on a turn table which is 0.8 meter above ground. E.U.T. is set 3 meter away from the transmitting antenna which is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna are set on test. Each of the four sides of E.U.T. must be faced this transmitting antenna and measured individually.

All the scanning conditions are as follows :

Condition of Test	Remarks
1. Fielded Strength	80 to 1000MHz Severity Level: 3, 10V/m; 1.4 to 2.0GHz Severity Level: 2, 3V/m; 2.0 to 2.7GHz Severity Level: 1, 1V/m
2. Radiated Signal	Modulated
3. Dwell time of radiated	0.0015 decade/s
4. Waiting Time	1 Sec.

10.4 Test Results

PASS.

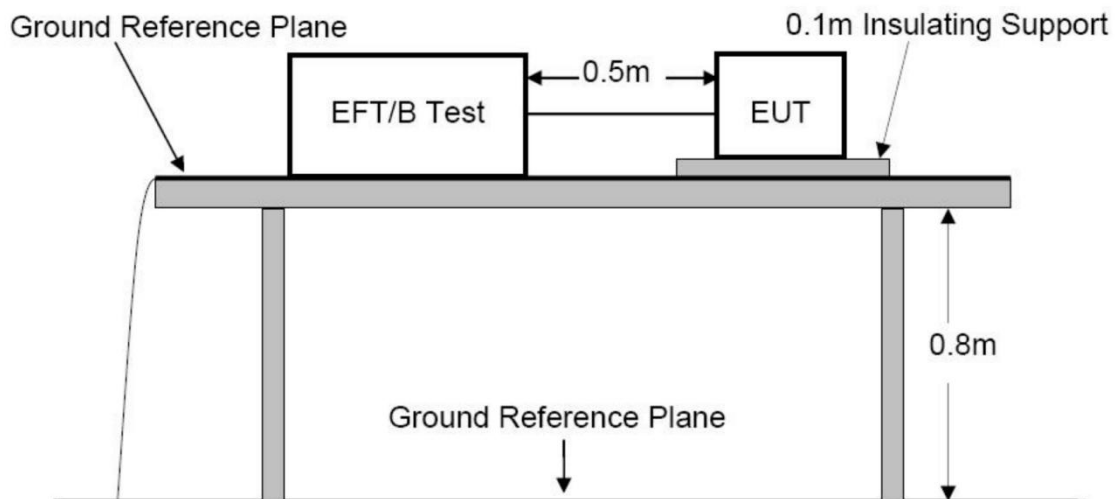
Please refer to the following page.

RF Field Strength Susceptibility Test Results

Ambient Condition:	Temp.: 25 °C	R.H.: 51 %	Air Pressure: 101 kPa	
Power Supply:	AC 230V 50Hz; DC 24V	Required Performance Criterion: A		
Test Specifications:	Modulation: 1kHz, 80%AM; Step Size: 1%; Dwell Time: 1s			
Tested mode:	Normal operation mode, Stored energy operation mode			
Frequency (MHz)	Level (V/m)	Antenna polarity	Side	Result (Performance Criterion)
80-1000	10	Horizontal/ Vertical	Front/ Left/ Right/ Back	A
1400-2000	3			A
2000-2700	1			A
Note:				
Test Equipment : 1. RF Power Meter : 4242 (ESE) 2. Power Amplifier : CBA 1G-150 (TESEQ) 3. Power Sensor: 51011EMC(ESE) 4. Antenna: VULB9162 (Schwarzbeck)				
Test Engineer : Stan				

11.ELECTRICAL FAST TRANSIENT/BURST TEST

11.1 Block Diagram of Test Setup



11.2 Test Standard and Severity Levels

11.2.1 Test Standard

EN 61000-6-2/IEC 61000-6-2

(EN 61000-4-4/IEC 61000-4-4, Severity Level, Level 3: 2KV)

11.2.2 Severity level

Open circuit output test voltage and repetition rate of the impulses				
Level	On power port, PE		On I/O (Input/Output) Signal data and control ports	
	Voltage peak KV	Repetition rate KHz	Voltage peak KV	Repetition rate KHz
1.	0.5	5 or 100	0.25	5 or 100
2.	1.0	5 or 100	0.5	5 or 100
3.	2.0	5 or 100	1.0	5 or 100
4.	4.0	5 or 100	2.0	5 or 100
X	Special	Special	Special	Special
Note 1 Use of 5 KHz repetition rates is traditional; however, 100 KHz is closer to reality. Product committees should determine which frequencies are relevant for specific products or product types. Note 2 With some products, there may be no clear distinction, between power ports and I/O ports, in which case it is up to product committees to make this determination for test purposes. Note 3 "X" is an open level. The level has to be specified in the dedicated equipment specification.				

11.3 Test Procedure

The E.U.T. is put on the table which is 0.8 meter high above the ground. This reference ground plane shall project beyond the E.U.T. by at least 0.1m on all sides and the minimum distance between E.U.T. and all other conductive structure, except the ground plane beneath the E.U.T., shall be more than 0.5m.

11.3.1 For input and output AC power ports:

The E.U.T. 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.

11.3.2 For signal lines ports:

It's unnecessary to test.

11.3.3 For DC ports:

It's unnecessary to test.

11.4 Test Result

PASS.

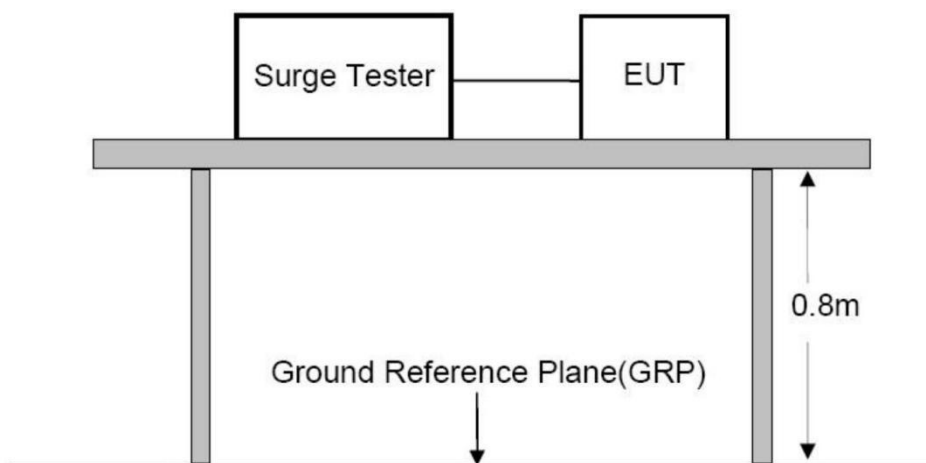
Please refer to the following page.

Electrical Fast Transient/Burst Test Results

Ambient Condition:	Temp.: 25 °C	R.H.: 51 %	Air Pressure: 101 kPa
Power Supply:	AC 230V 50Hz	Required Performance Criterion: B	
Test Specifications:	Repetition Frequency: 5kHz; Duration: 15ms; Period: 300ms		
Test mode:	Normal operation mode		
Line : ☒ AC Mains	☐ Signal line ☐ DC line		
Coupling : ☒ Direct	☐ Capacitive		
Line	Test Voltage	Result (Performance Criterion)	
L	±2KV	A	
N	±2KV	A	
PE	±2KV	A	
L、N	±2KV	A	
L、PE	±2KV	A	
N、PE	±2KV	A	
L、N、PE	±2KV	A	
Signal line			
DC line			
Note :			
Test Equipment : Burst Tester(EM TEST, UCS500N)		Test Engineer : Stan	

12. SURGE IMMUNITY TEST

12.1 Block Diagram of Test Setup



12.2 Test Standard and Severity Levels

12.2.1 Test Standard

EN 61000-6-2/IEC 61000-6-2
(EN 61000-4-5/IEC 61000-4-5,
Level: Line To Line, Level 2: 1.0KV
Line To Earth, level 3: 2.0KV)

Severity

12.2.2 Severity level

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

12.3 Test Procedure

1. Set up the E.U.T. and test generator as shown on Section 12.1.
2. For line to line coupling mode, provide a 1.0KV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to E.U.T. selected points. For line to earth coupling mode, provide a 2.0KV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to E.U.T. 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. Record the E.U.T. operating situation during compliance test and decide the E.U.T. immunity criterion for above each test.

12.4 Test Result

PASS.

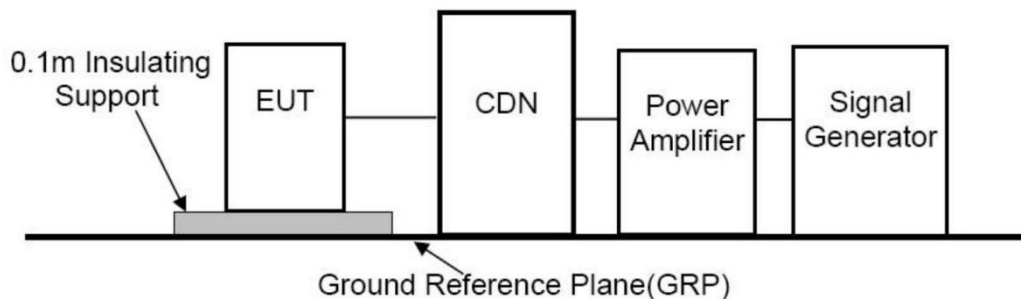
Please refer to the following page.

Surge Immunity Test Results

Ambient Condition:	Temp.: 25 °C	R.H.: 51 %	Air Pressure: 101 kPa
Power Supply:	AC 230V 50Hz	Required Performance Criterion: B	
Test Specifications:	Voltage surge 1.2/50 us ; Current surge 8/20 us .		
Test mode:	Normal operation mode		
Line	Phase Angle	Test Voltage	Result (Performance Criterion)
L-N	0°, 90°, 180°, 270°	±1KV	B
L-PE	0°, 90°, 180°, 270°	±2KV	B
N-PE	0°, 90°, 180°, 270°	±2KV	B
Signal line			
DC line			
Note : When L-N,L-PE and N-PE is electrostatically discharged, the EUT will jump to the Stored energy operation mode.			
Test Equipment : Burst Tester(EM TEST, UCS500N)		Test Engineer : Stan	

13. INJECTED CURRENTS SUSCEPTIBILITY TEST

13.1 Block Diagram of Test Setup



13.2 Test Standard and Severity Levels

13.2.1 Test Standard

EN 61000-6-2/IEC 61000-6-2

(EN 61000-4 -6/IEC 61000-4-6, Severity Level 3: 10V (rms), 0.15MHz ~ 80MHz)

13.2.2 Severity level

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

13.3 Test Procedure

1. Set up the E.U.T., CDN and test generators as shown on Section 13.1.
2. Let the E.U.T. work in test mode and measure it.
3. The E.U.T. 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 about 0.3m from E.U.T.. Cables between CDN and E.U.T. 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 E.U.T. through CDN.
5. The E.U.T. operates within its operational mode(s) under intended climatic conditions after power on.
6. The frequency range is swept from 150 KHz to 80 MHz using 10V 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 E.U.T. operating situation during compliance testing and decide the E.U.T. immunity criterion.

13.4 Test Result

PASS.

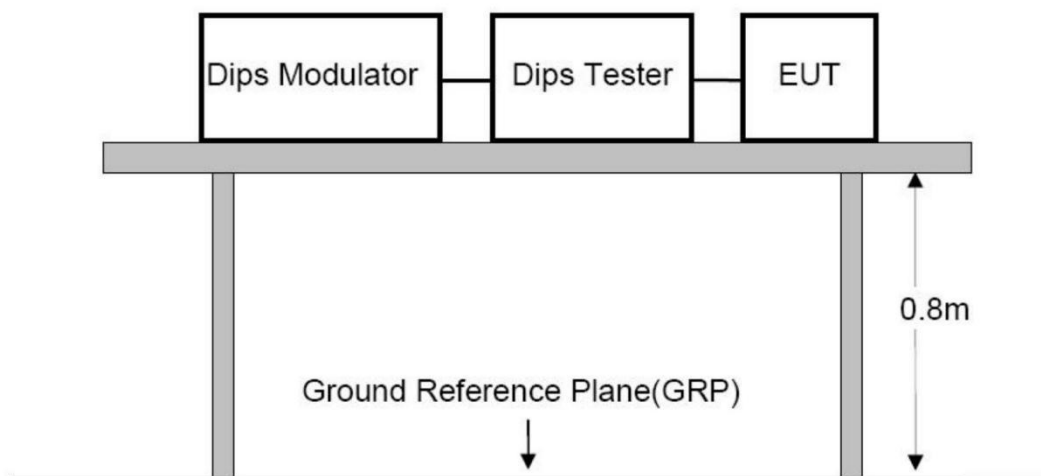
Please refer to the following page.

Injected Currents Susceptibility Test Results

Ambient Condition:	Temp.: 25 °C	R.H.: 51 %	Air Pressure: 101 kPa
Power Supply:	AC 230V 50Hz	Required Performance Criterion: A	
Test Specifications:	Modulation : 1KHz, 80%AM, Step Size : 1%, Dwell Time : 3s		
Test mode:	Normal operation mode		
Test Port	Frequency (MHz)	Level(V)	Result (Performance Criterion)
AC Mains	0.15~80	10	A
Note :			
Test Equipment : CDN (Luthi, L-801M2/M3)		Test Engineer : Stan	

14.VOLTAGE DIPS AND INTERRUPTIONS TEST

14.1 Block Diagram of Test Setup



14.2 Test Standard and Severity Levels

14.2.1 Test Standard

EN 61000-6-2/IEC 61000-6-2
(EN 61000-4-11/IEC 61000-4-11)

14.2.2 Severity level

Test Level $\%U_T$	Voltage dip and short interruptions $\%U_T$	Duration (in period)
0	100	0.5
40	60	1
70	30	5
		10
		25
		50
		-

14.3 Test Procedure

1. Set up the E.U.T. and test generator as shown on Section 14.1.
2. The interruption is introduced at selected phase angles with specified duration.
3. Record any degradation of performance.

14.4 Test Result

PASS.

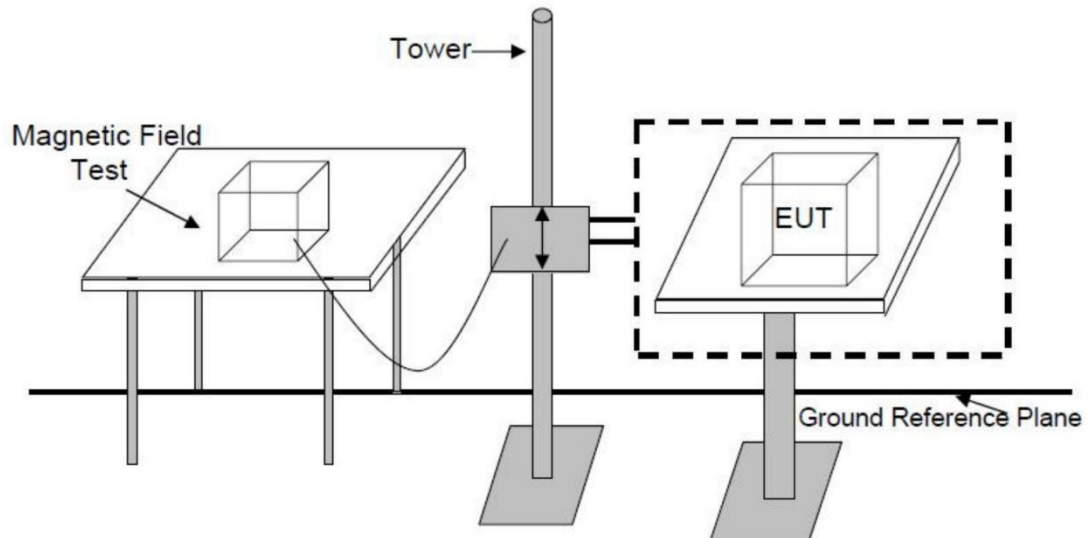
Please refer to the following page.

Voltage Dips And Interruptions Test Results

Ambient Condition:	Temp.: 25 °C	R.H.: 51 %	Air Pressure: 101 kPa
Power Supply:	AC 230V 50Hz	Required Performance Criterion: B & C	
Test Specifications:	0%U _T , 1Cycle; 40%U _T , 10/12Cycles at 50/60Hz ; 70% U _T , 25/30Cycles at 50/60Hz; 0%U _T , 250/300Cycles at 50/60Hz;		
Test mode:	Normal operation mode		
Test Level % UT	Duration (in period)		Result (Performance Criterion)
	50Hz	60Hz	
0	1.0P	--	B
40	10P	--	B
70	25P	--	A
0	250P	--	B
Note : When the test voltage drops to 0%, 40% and 0%, the tested device will lose power at 1P, 10P,250P and switch to the stored energy operation mode with an alarm sound.			
Test Equipment : Dips Tester: EM TEST, UCS 500N		Test Engineer : Stan	

15. MAGNETIC FIELD IMMUNITY TEST

15.1 Block Diagram of Test Setup



15.2 Test Standard and Severity Levels

15.2.1 Test Standard

EN 61000-6-2/IEC 61000-6-2

(EN 61000-4-8/IEC 61000-4-8, Severity level 4: 30A/m)

15.2.2 Severity level

Level	Magnetic Field Strength A/m
1	1
2	3
3	10
4	30
5	100
X	Special

15.3 Test Procedure

The E.U.T. is placed in the middle of a induction coil (1*1m), under which is a 1*1*0.1m (high) table, this small table is also placed on a larger table, 0.8m above the ground. X, Y and Z polarization of the induction coil are set on test, so that each side of the E.U.T. is affected by the magnetic field. Also can reach the same aim by change the position of the E.U.T..

15.4 Test Result

PASS.

Please refer to the following page.

Magnetic Field Immunity Test Results

Ambient Condition:	Temp.: 25 °C	R.H.: 51 %	Air Pressure: 101 kPa
Power Supply:	AC 230V 50Hz; DC 24V	Required Performance Criterion: A	
Test Specifications:	30A/m		
Test mode:	Normal operation mode, Stored energy operation mode		
Test Level	Testig Duration	Coil Orientati on	Result (Performance Criterion)
30A/m	5min	X	A
30A/m	5min	Y	A
30A/m	5min	Z	A
Note :			
Test Equipment : Magnetic Field Tester (EMC PARTNER, TRA2000) Test Engineer : Stan			

16.PHOTOGRAPH



---End---