

CE/EMC TEST REPORT

for

Envium Enterprises Inc.

GrindE

Model Number: DK-01

Prepared for : Envium Enterprises Inc.
Address : #210-1901 Barclay St Vancouver, BC V6G 1L1 Canada

Prepared by : Guangdong Keyway Testing Technology Co., Ltd.
Address : No.7 of Zhangmutou District, Guanzhang Road,
Zhangmutou town, Dongguan Guangdong China.

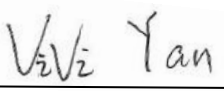
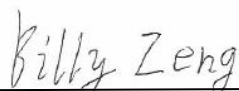

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Report No. : TR20060082-E-000
Date of Project : Jun. 3 ~ 4, 2020
Date of Report : Jun. 4, 2020

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Guangdong keyway Testing Technology Co., Ltd.

Applicant:	Envium Enterprises Inc.		
Address:	#210-1901 Barclay St Vancouver, BC V6G 1L1 Canada		
Manufacturer:	DKR ELECTRONICS TECHNOLOGY CO. LTD		
Address:	3-4/F Keji Road No.2 He Ban Qiao Village, Chong He District, Qingxi Town, Dongguan City, Guangdong Province		
E.U.T:	GrindE		
Model Number:	DK-01		
Trade Name:	N/A		
Date of Receipt:	Jun. 3, 2020	Date of Project:	Jun. 3 ~ 4, 2020
Test Specification :	EN 55014-1:2017 EN 55014-2:2015 EN IEC 61000-3-2:2019 EN 61000-3-3:2013+A1:2019		
Test Result:	The equipment under test was found to be compliance with the requirements of the standards applied.		
		Issue Date: Jun. 4, 2020	
Tested by:	Reviewed by:	Approved by:	
 _____ Vivi Yan / Engineer	 _____ Billy Zeng / Supervisor	 _____ Andy Gao / Supervisor	
Other Aspects:			
Note. Update Applicant based on the report TR20050057-E-000 from Guangdong keyway Testing Technology Co., Ltd.			
Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested			
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 Guangdong keyway Testing Technology Co., Ltd.			

1. GENERAL PRODUCT INFORMATION

1.1.Product Function

Refer to Technical Construction Form and User Manual.

1.2.Description of Device (EUT)

Description : GrindE
M/N : DK-01
Power Input : DC 5V/1500mA from Adapter (Only Charging)
Battery : DC 3.7V/1200mA
Clock Frequency : Less than 15 MHz

1.3.Difference between Model Numbers

None.

1.4.Independent Operation Modes

Pretest Mode	Description
Mode 1	Charging
Mode 2	On

1.5.Test Supporting System

Adapter (Provided by Lab)

Adapter Information:	Brand: Lenovo Model : SC-41 Input: AC 100-240V, 50/60Hz, 0.5A Output: DC 5V/1.5A
----------------------	---

2. TEST SITES

2.1. Test Facilities

- Lab Qualifications : 944 Shielded Room built by ETS-Lindgren, USA
Date of completion: March 28, 2011
- 966 Chamber built by ETS-Lindgren, USA
Date of completion: March 28, 2011
- Certificated by TUV Rheinland, Germany.
Registration No.: UA 50207153
Date of registration: July 13, 2011
- Certificated by UL, USA
Registration No.: 100567237
Date of registration: September 5, 2012
- Certificated by Intertek
Registration No.: 2016-RTL-L2-199
Date of registration: May 10, 2016
- Certificated by VCCI
Member No.3498
Facility:966 Chamber: Registration No.: R-4045
Facility:944 Shielded Room :Registration No.:C-4522
Date of registration: September 10, 2016
- Certificated by PHOENIX TESTLAB GmbH
Registration No.: 702860c
Date of registration: May 11, 2016
- Certificated by CNAS China
Registration No.: CNAS L5783
Date of registration: August 8, 2012
- Name of Firm : Guangdong Keyway Testing Technology Co., Ltd.
- Site Location : No.7 of Zhangmutou District, Guanzhang Road,
Zhangmutou town, Dongguan Guangdong China.

2.2. Test Summary

Test Item	Condition	Standard	Result
Conducted Emission at mains terminals	150kHz to 30MHz	EN 55014-1:2017	Pass
Conducted Emission at the load and additional terminals	150kHz to 30MHz	EN 55014-1:2017	N/A
Discontinuous Emission	150kHz to 30MHz	EN 55014-1:2017	N/A
Disturbance Power	30MHz to 300MHz	EN 55014-1:2017	Pass
Radiated Emission	30MHz to 1000MHz	EN 55014-1:2017	Pass
Harmonic of current	CLASS A	EN IEC 61000-3-2: 2019	N/A
Flicker	4%	EN 61000-3-3: 2013+A1:2019	Pass
ESD immunity	C:±4kV; A:±8kV	EN 55014-2:2015 Reference: EN 61000-4-2:2009	Pass
Radiated EM field immunity	80MHz to 1000MHz 3V/m	EN 55014-2:2015 Reference: EN 61000-4-3:2010	Pass
EFT immunity	±1kV	EN 55014-2:2015 Reference: EN 61000-4-4:2012	Pass
Surge immunity	<input checked="" type="checkbox"/> Line to Line:±1.0kV; <input type="checkbox"/> Line to earth:±2.0kV	EN 55014-2:2015 Reference: EN 61000-4-5:2014+A1:2017	Pass
Inject current immunity	150KHz to 230MHz 3Vrms	EN 55014-2:2015 Reference: EN 61000-4-6:2014	Pass
Voltage dips and interruption immunity	70%,40%, 0%, of EUT	EN 55014-2:2015 Reference: EN 61000-4-11:2004+A1:2017	Pass

Remark: 1. The symbol "N/A" in above table means Not Applicable.

2. When determining the test results, measurement uncertainty of tests has been considered.

3. According to EN IEC 61000-3-2, for products ≤75 watts, no limits are defined for the harmonics test except discharging light.

4. Classification of the EUT: The product is belongs to Category II.

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Radiated Emission in 3m chamber	3.60dB
Uncertainty for Conducted Emission.	2.60dB
Uncertainty for Radiated Electromagnetic Disturbances	2.60dB

2.3.List of Test and Measurement Instruments

2.3.1.For Conducted Disturbance at the mains terminals and signal port test



Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr 10,20	Apr 09,21
Artificial Mains Network	Rohde&Schwarz	ENV216	101315	Apr 10,20	Apr 09,21
Artificial Mains Network (AUX)	Rohde&Schwarz	ENV216	101314	Apr 10,20	Apr 09,21
RF Cable	FUJIKURA	3D-2W	944 Cable	Apr 10,20	Apr 09,21
ISN	FRANKONIA	KWE-041	A3011081	Apr 10,20	Apr 09,21

2.3.2.For radiated emission test (30MHz-1GHz)



Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr 10,20	Apr 09,21
TRILOG Broadband Antenna	SCHWARZBECK	VULB 9168	00829	Apr 12,19	Apr 11,21
3m Semi-anechoic Chamber	ETS-LINDGREN	966	170326	Apr 20,19	Apr 19,21
Signal Amplifier	SONOMA	310	186956	Apr 10,20	Apr 09,21
RF Cable	IMRO	IMRO-400	966 Cable 1#	Apr 10,20	Apr 09,21
MULTI-DEVICE Controller	ETS-LINDGREN	2090	126913	N/A	N/A
Antenna Holder	ETS-LINDGREN	2070B	00109601	N/A	N/A

2.3.3.For disturbance power test



Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr 10,20	Apr 09,21
Absorbing Clamp	Luthi	MDS-21	4056	Apr 12,20	Apr 11,21
Clamp Attenuation	HUBER+SUHNER	CBL2-NB-9m	100104-22 39000-01	Apr 10,20	Apr 09,21

2.3.4.For harmonic current emissions and voltage fluctuations/flicker test



Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
5kVA AC Power Source	California Instruments	5001iX	60138	Apr 10,20	Apr 09,21
Harmonic/Flicker Test System	California Instruments	PACS-1	72847	Apr 10,20	Apr 09,21

2.3.5.For electrostatic discharge immunity test



Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
ESD Generator	TESEQ	NSG437	433	Apr 11,20	Apr 12,21

2.3.6.For electrical fast transient/burst immunity test



Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EFT Tester	EMtest	EFT500N5	V1105108698	Apr 10,20	Apr 09,21
EFT Coupling Clamp	EMtest	HFK	0211-168	Apr 10,20	Apr 09,21

2.3.7.For surge immunity test



Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Surge Tester	EMtest	UDK-01 N7	V1105108699	Apr 10,20	Apr 09,21

2.3.8.For Immunity to conducted disturbance, induced by radio-frequency fields test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
C/S Test System	FRANKONIA	CIT-10	126B1164	Apr 10,20	Apr 09,21
CDN	Luthi	L-801 M2/M3	2789	Apr 10,20	Apr 09,21
Electromagnetic Injection Clamp	Luthi	EM101	36041	Apr 10,20	Apr 09,21

2.3.9.For power frequency magnetic field immunity test:

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Magnetic Field Generator	EVERFINE	EMS61000-8K	YG100376N11080002	Apr 10,20	Apr 09,21

2.3.10.For voltage dips and short interruptions immunity test:

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Dips Tester	EVERFINE	EMS61000-11K	YG100319N11040005	Apr 10,20	Apr 09,21

2.3.11.For radio frequency electromagnetic field immunity (R/S) test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Bilog Antenna	ETS	3142D	00135452	Apr 22,19	Apr 21,21
Amplifier (80-1000MHz)	SKET	AP801000_250	MPA1708341	Apr 10,20	Apr 09,21
Amplifier (1-3GHz)	SKET	AP0103_75	MPA1708342	Apr 10,20	Apr 09,21
Amplifier (3-6GHz)	SKET	AP0206_50	MPA1708343	Apr 10,20	Apr 09,21
RF Switch	EMC TOYO	/	/	Apr 10,20	Apr 09,21
Power Sensor	Agilent	E9300A	MY41496069	Apr 10,20	Apr 09,21
Signal Generator	Agilent	N5181B	MY53050432	Apr 10,20	Apr 09,21
Power Meter	Agilent	E4418B	MY41294414	Apr 10,20	Apr 09,21

3. TEST SET-UP AND OPERATION MODES

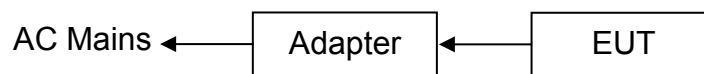
3.1.Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

Immunity: The equipment under test (EUT) was configured to the representative operating mode and conditions.

3.2.Block Diagram of Test Setup

System Diagram of Connections between EUT and Simulators



(EUT: GrindE)

3.3.Test Operation Mode and Test Software

Note: Refer to Test Setup in clause 4 & 5.

3.4.Special Accessories and Auxiliary Equipment

None.

3.5.Countermeasures to Achieve EMC Compliance

None.

4. TEST RESULTS

4.1. Conducted Emission at the Mains Terminals Test

Result : **Pass**
Test Site : 944 Shielded Room
Limits : EN 55014-1

Frequency range MHz	Limits dB(μ V)	
	Quasi-peak	Average
0.15 to 0.5	66 to 56	59 to 46
0.5 to 5	56	46
5 to 30	60	50

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 0.05 MHz to 0.15MHz and 0.15MHz to 0.50MHz

Test Specification

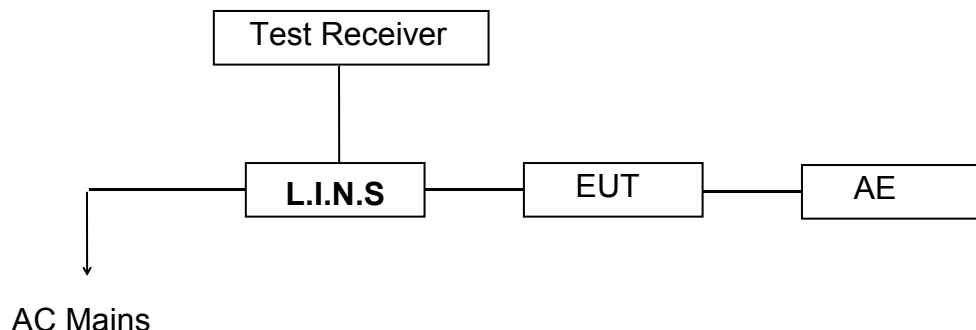
The EUT was put on a wooden table which was 0.8 m high above the ground and connected to the AC mains through the Artificial Mains Network (AMN). Where the mains cable supplied by the manufacture was longer than 1 m, the excess was folded back and forth parallel to the cable at the center so as to form a bundle no longer than 0.4 m.

The EUT was kept 0.4 m from any other earthed conducting surface. Both sides of AC line were checked to find out the maximum conducted emission levels according to the test procedure during the conducted emission test.

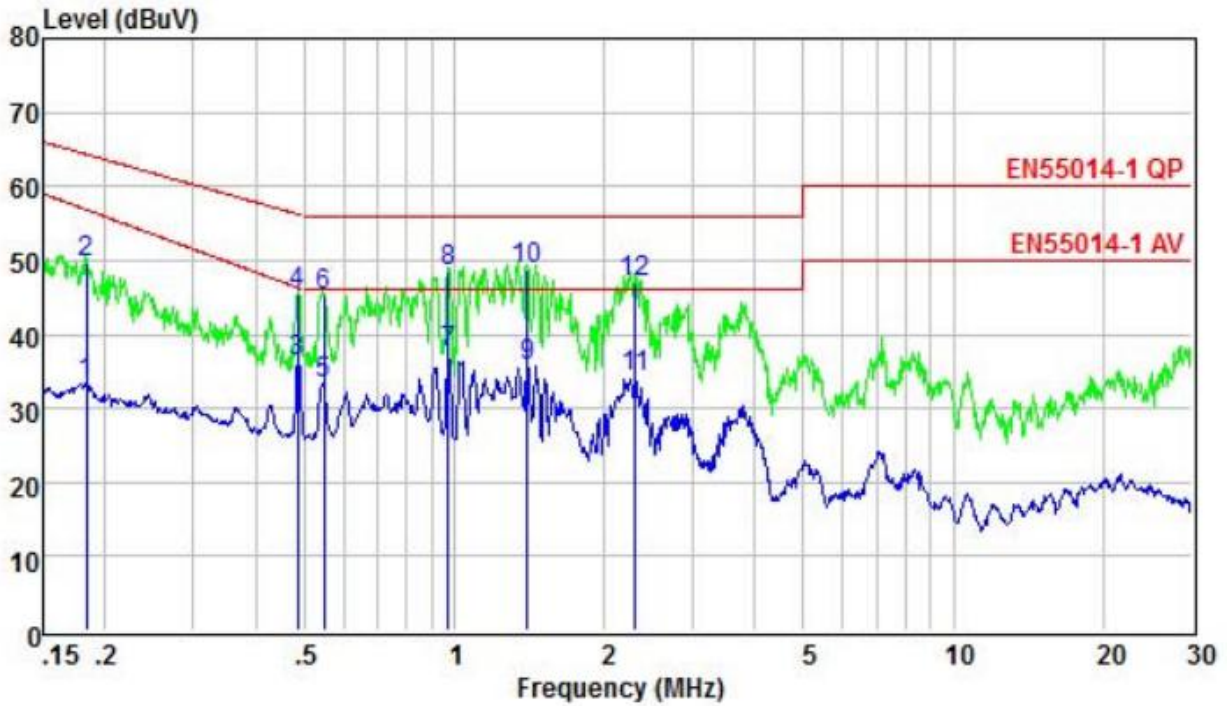
The bandwidth of the test receiver was set at 9 kHz.

The worst test data were reported on the following page.

Test Set-up

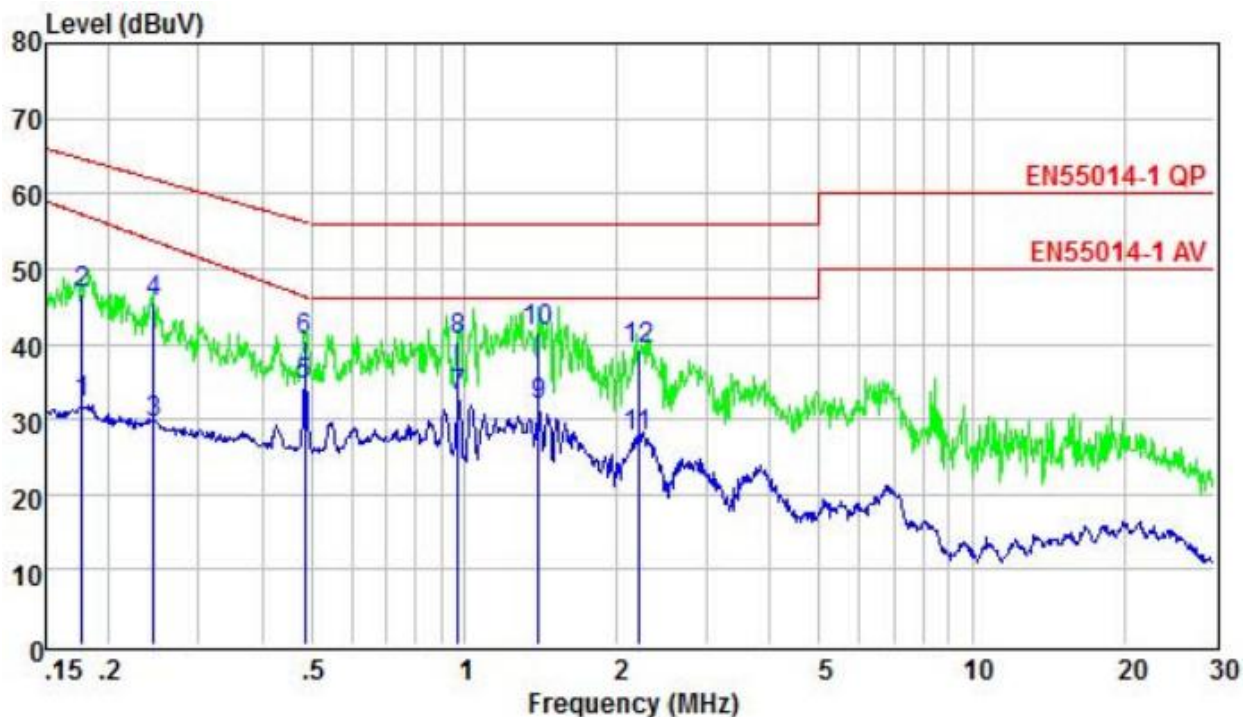


M/N : DK-01
 Operation Mode : Mode 1
 Test Voltage : DC 5V/1.5A from Adapter Input AC 230V/50Hz
 Test Specification : Power Line; Line
 Temperature (° C) : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015



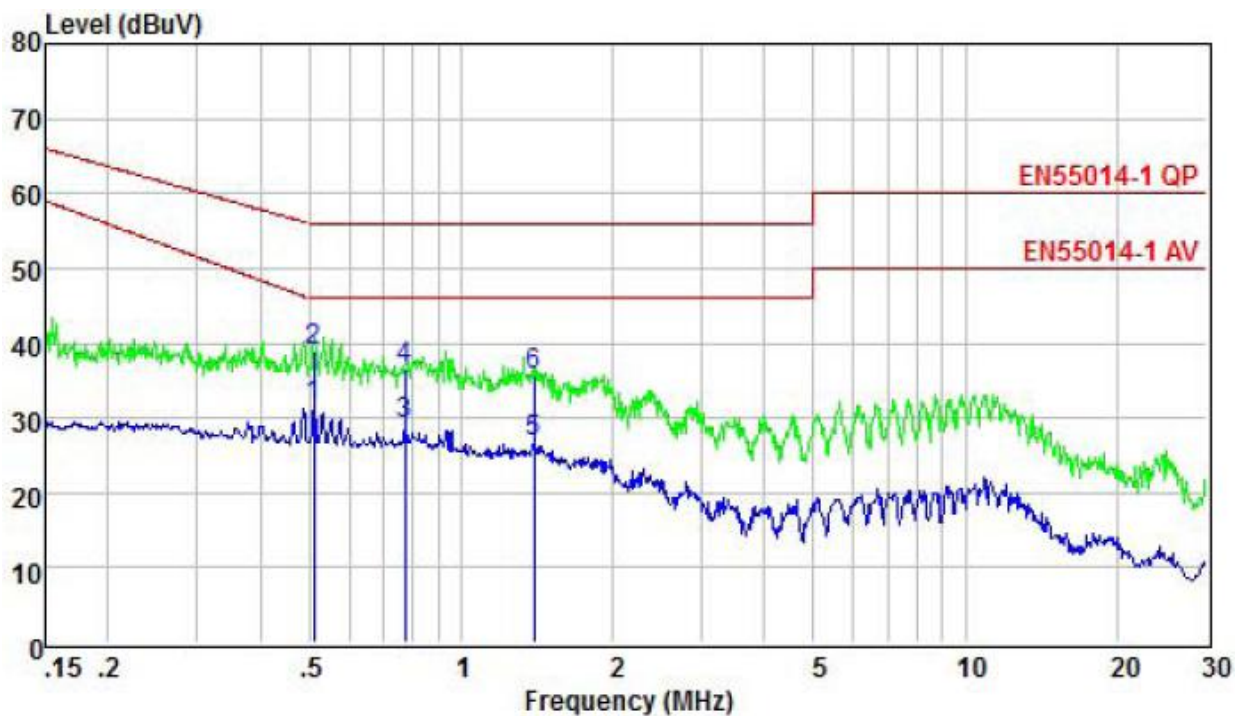
	Freq	Level	Limit	Over	Remark
	MHz	dBuV	dBuV	dB	
1	0.18	33.23	56.83	-23.60	Average
2	0.18	49.60	64.33	-14.73	QP
3	0.49	36.41	46.30	-9.89	Average
4	0.49	45.50	56.23	-10.73	QP
5	0.55	33.41	46.00	-12.59	Average
6	0.55	45.32	56.00	-10.68	QP
7	0.97	37.60	46.00	-8.40	Average
8	0.97	48.50	56.00	-7.50	QP
9	1.40	35.75	46.00	-10.25	Average
10	1.40	48.65	56.00	-7.35	QP
11	2.31	34.17	46.00	-11.83	Average
12	2.31	46.90	56.00	-9.10	QP

M/N : DK-01
 Operation Mode : Mode 1
 Test Voltage : DC 5V/1.5A from Adapter Input AC 230V/50Hz
 Test Specification : Power Line; Neutral
 Temperature (° C): : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015



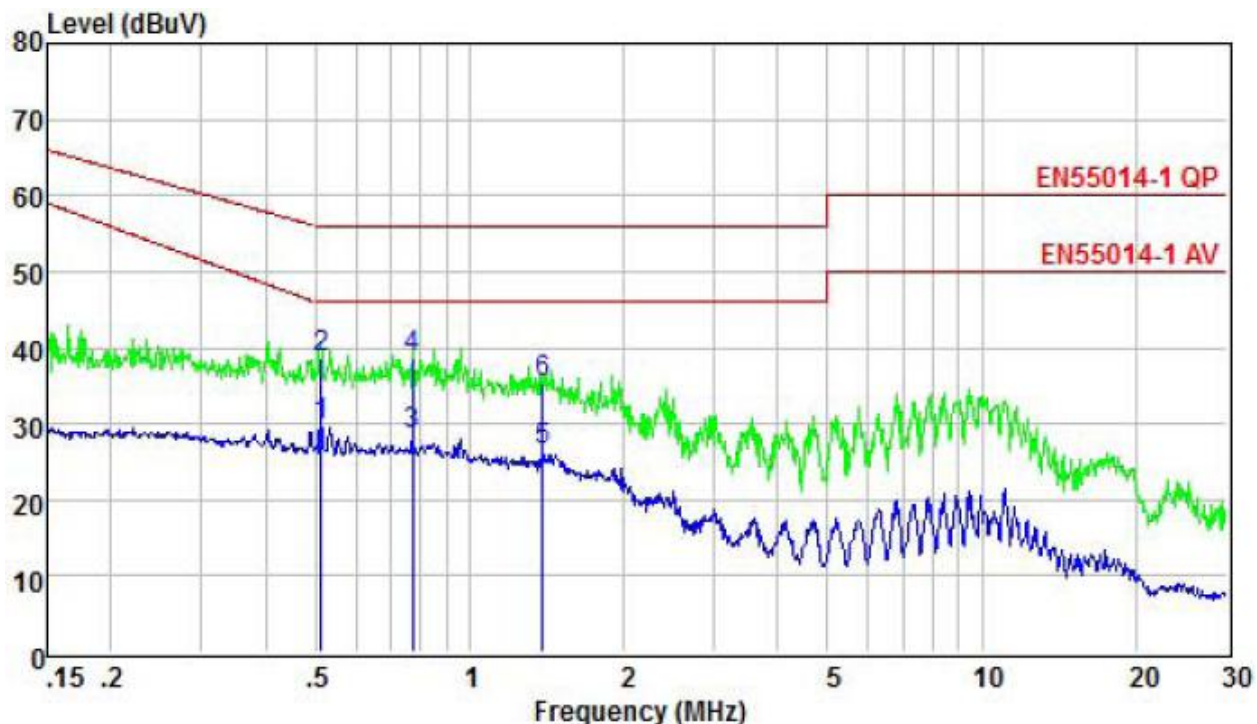
	Freq	Level	Limit	Over	Remark
	MHz	dBuV	dBuV	dB	
1	0.18	31.99	57.23	-25.24	Average
2	0.18	46.80	64.64	-17.84	QP
3	0.24	29.58	53.74	-24.16	Average
4	0.24	45.50	61.95	-16.45	QP
5	0.49	34.64	46.30	-11.66	Average
6	0.49	40.50	56.23	-15.73	QP
7	0.97	32.92	46.00	-13.08	Average
8	0.97	40.50	56.00	-15.50	QP
9	1.40	31.79	46.00	-14.21	Average
10	1.40	41.65	56.00	-14.35	QP
11	2.20	27.59	46.00	-18.41	Average
12	2.20	39.20	56.00	-16.80	QP

M/N : DK-01
 Operation Mode : Mode 1
 Test Voltage : DC 5V/1.5A from Adapter Input AC 120V/60Hz
 Test Specification : Power Line; Line
 Temperature (° C) : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015



	Freq	Level	Limit	Over	Remark
	MHz	dBuV	dBuV	dB	
1	0.51	31.64	46.00	-14.36	Average
2	0.51	38.98	56.00	-17.02	QP
3	0.78	29.20	46.00	-16.80	Average
4	0.78	36.65	56.00	-19.35	QP
5	1.40	26.65	46.00	-19.35	Average
6	1.40	35.68	56.00	-20.32	QP

M/N : DK-01
 Operation Mode : Mode 1
 Test Voltage : DC 5V/1.5A from Adapter Input AC 120V/60Hz
 Test Specification : Power Line; Neutral
 Temperature (° C): : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015



	Freq	Level	Limit	Over	Remark
	MHz	dBuV	dBuV	dB	
1	0.51	29.85	46.00	-16.15	Average
2	0.51	38.68	56.00	-17.32	QP
3	0.78	28.60	46.00	-17.40	Average
4	0.78	38.65	56.00	-17.35	QP
5	1.39	26.46	46.00	-19.54	Average
6	1.39	35.35	56.00	-20.65	QP

4.2. Conducted Emission at the load and additional terminals Test

Result : N/A
Test Site : 944 Shielded Room
Limits : EN 55014-1

Frequency range MHz	Limits dB(μ V)	
	Quasi-peak	Average
0.15 to 0.50	80	70
0.50 to 30	74	64

Test Specification

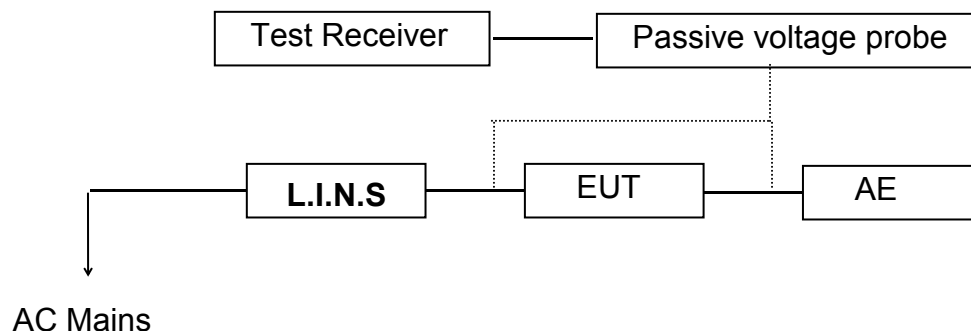
The EUT was put on a wooden table which was 0.8 m high above the ground and connected to the AC mains through the Artificial Mains Network (AMN). Where the mains cable supplied by the manufacture was longer than 1 m, the excess was folded back and forth parallel to the cable at the center so as to form a bundle no longer than 0.4 m. Artificial hand is used if appropriate (for handheld apparatus). The load/control terminal disturbance voltage was measured with passive voltage probe if appropriate.

The EUT was kept 0.4 m from any other earthed conducting surface. Both sides of AC line were checked to find out the maximum conducted emission levels according to the test procedure during the conducted emission test.

The bandwidth of the test receiver was set at 9 kHz.

The worst test data were reported on the following page.

Test Set-up



4.3. Terminal Discontinuous Disturbance Voltage Emission Test

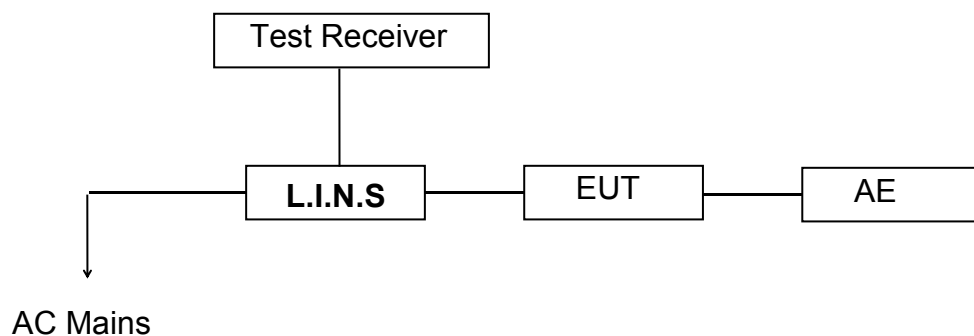
Result : N/A
Test Site : STC Lab Shielded Room
Limits : EN 55014-1

44dB	for $N < 0,2$, or
$20 \lg (30/N)$ dB	for $0,2 \leq N < 30$
Note: N=click rate : In general the number of clicks or switching operations within one minute; this Figure is being used to determine the click limit	

Test Specification

- 1.The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN) and switching operation.
- 2.Connect the control cable between Click Analyzer and switching operation and connect the interface cable between Click Analyzer and the PC.
- 3.The LISN power output was connected to the EUT power input and its power input was connected to the switching operation power output.
- 4.Connect the switching operation power input to the mains power outlet.
- 5.Switch the switching operation, LISN and the test equipment power-on.
- 6.The Click Analyzer BNC 50 Ω coaxial input was connected to the LISN BNC 50 Ω coaxial output through coaxial cable.
- 7.Using the Click Analyzer software, select the appropriate line in which the current is going to be measured. This line should be the same as the one selected on the LISN.
- 8.The measurement time was decided by the shorter time of either:
- 9.The time to register 40 clicks, or, where relevant, 40 switching operations, or 120 minutes.
- 10.These clicks of frequencies were searched and reported for 150 kHz, 500kHz, 1.4MHz and 30MHz.
- 11.All the test data were reported on the following page.
- 12.Measurement Uncertainty: ± 2.3 dB at a level of confidence of 95%.

Test Set-up



Remarks:

*:If all the clicks are less than 10ms & $N \leq 5$, then the product is deemed to comply with the clicks requirements of EN55014-1.

SC: Short clicks < 10ms

LC: Long Clicks > 10ms but < 200ms

n1: The number of clicks greater than Limit 1 or the number of switching operations

n2: The number of clicks greater than Limit 2

T: Total time of run

n3: The number of clicks allowed above the Limit 2 (Refer to clause C4.3 for calculation of limit using upper quartile method)

Limit2 = limit1 + $20 \log(30/N)$ dB for $0.2 < N < 30$

Limit1 + 44 dB for $N < 0.2$

4.4. Disturbance Power Test (30MHz to 300MHz)

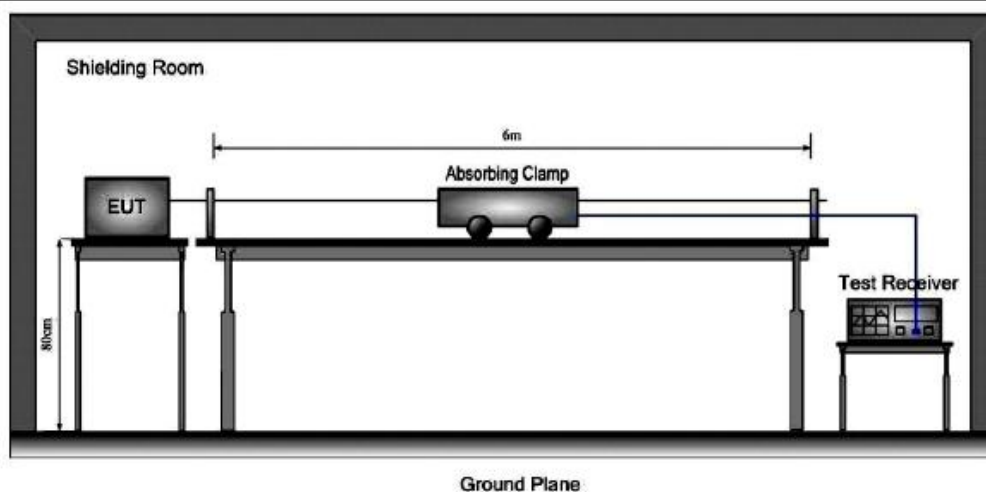
Result : **Pass**
Test Site : 944 Shielded Room
Limits : EN 55014-1

Frequency range MHz	Limits dB(pW)	
	Quasi-peak	Average
30 to 300	45 to 55	35 to 45
Note: The limit decreases linearly with the logarithm of the frequency in the range 30 MHz to 300MHz		
Margin (dB)		
200 to 300	0 to 10 dB	--
NOTE: 1) All the measurement result are lower than the applicable limits minus the corresponding margin ; or the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector. 2) No clock frequency or oscillator frequency of the EUT is more than or equal to 30 MHz. 3) The measured result at a particular frequency shall be less than the relevant limit minus the corresponding margin (at that frequency).		

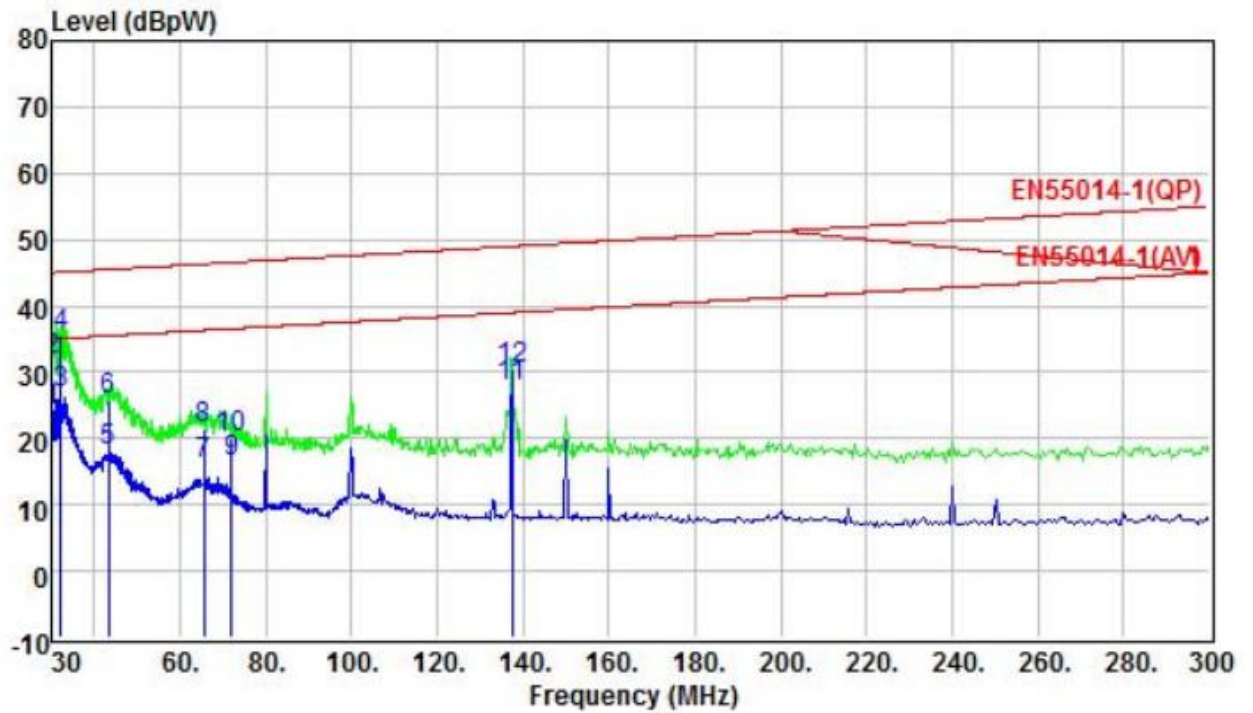
Test Specification

1. The EUT was placed on a non-metallic table of 0.8 m of height above the floor and at least 0.4 m from other metallic objects and from any person.
2. The lead to be measured was stretched in a straight horizontal line for a length sufficient to accommodate the absorbing clamp and to permit the necessary adjustment of its position for tuning. The absorbing clamp was placed around the lead to be measured, with its current transformer towards the EUT, so as to measure a quantity proportional to the disturbance power on the lead.
3. At each test frequency the absorbing clamp was moved along the lead until the maximum value was found between a position adjacent to the EUT and a distance of about a half wavelength from it. The connected leads were extended to have a length of 6 m.
4. The bandwidth of the test receiver was set at 120 kHz.
5. All the test data were reported on the following page.

Test Set-up

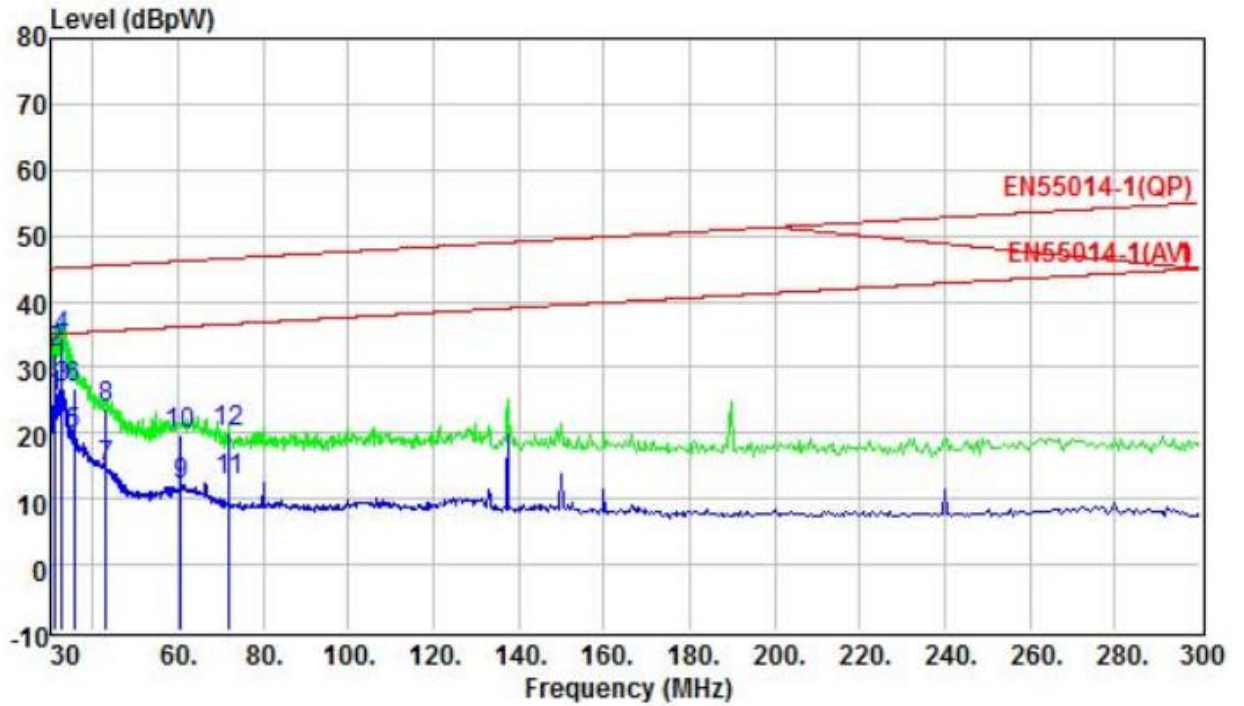


M/N : DK-01
 Operation Mode : Mode 1
 Test Voltage : DC 5V/1.5A from Adapter Input AC 230V/50Hz
 Test Specification : AC Line
 Temperature (° C) : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015



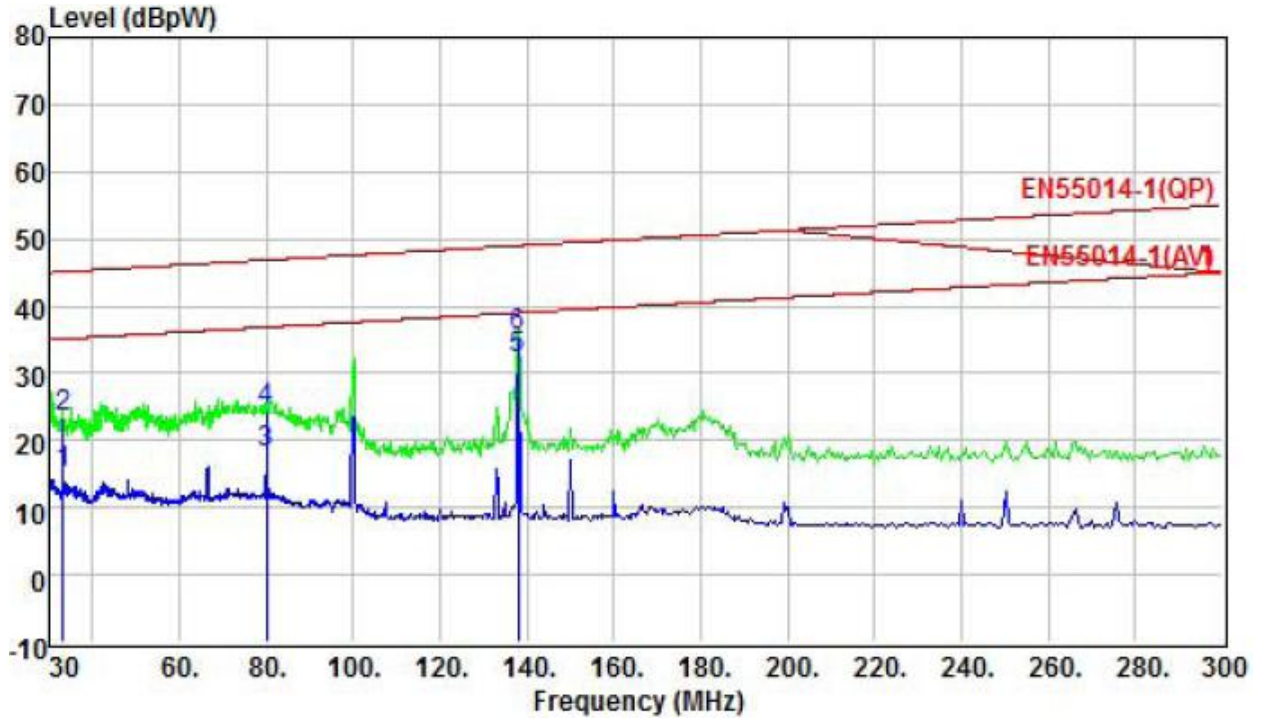
	Freq	Level	Limit	Over	Remark
	MHz	dBpW	Line	Limit	
			dBpW	dB	
1	30.14	24.24	35.02	-10.78	Average
2	30.14	31.70	45.02	-13.32	QP
3	32.29	26.82	35.10	-8.28	Average
4	32.29	35.65	45.10	-9.45	QP
5	43.26	18.06	35.50	-17.44	Average
6	43.26	25.90	45.50	-19.60	QP
7	65.63	15.98	36.33	-20.35	Average
8	65.63	21.50	46.33	-24.83	QP
9	71.96	16.56	36.56	-20.00	Average
10	71.96	20.00	46.56	-26.56	QP
11	137.44	27.90	38.99	-11.09	Average
12	137.44	30.60	48.99	-18.39	QP

M/N : DK-01
 Operation Mode : Mode 1
 Test Voltage : DC 5V/1.5A from Adapter Input AC 230V/50Hz
 Test Specification : DC Line
 Temperature (° C) : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015



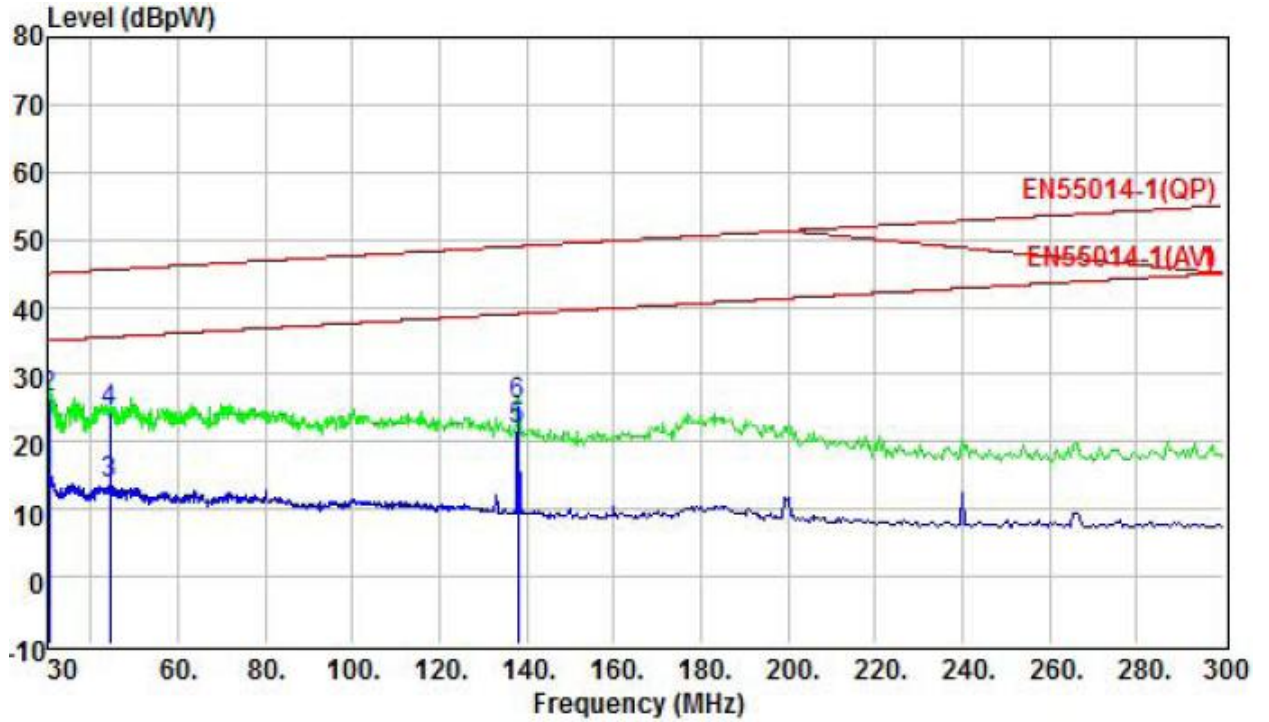
	Freq	Level	Limit	Over	Remark
	MHz	dBpW	Line	Limit	
			dBpW	dB	
1	31.13	25.36	35.05	-9.69	Average
2	31.13	32.10	45.05	-12.95	QP
3	32.74	26.82	35.11	-8.29	Average
4	32.74	34.50	45.11	-10.61	QP
5	35.66	19.64	35.22	-15.58	Average
6	35.66	26.70	45.22	-18.52	QP
7	42.97	14.85	35.49	-20.64	Average
8	42.97	23.80	45.49	-21.69	QP
9	60.69	12.17	36.15	-23.98	Average
10	60.69	19.90	46.15	-26.25	QP
11	71.96	12.85	36.56	-23.71	Average
12	71.96	20.00	46.56	-26.56	QP

M/N : DK-01
 Operation Mode : Mode 1
 Test Voltage : DC 5V/1.5A from Adapter Input AC 120V/60Hz
 Test Specification : AC Line
 Temperature (° C) : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015



	Freq	Level	Limit	Over	Remark
	MHz	dBpW	Line	Limit	
			dBpW	dB	
1	33.28	15.13	35.13	-20.00	Average
2	33.28	23.60	45.13	-21.53	QP
3	80.01	18.23	36.86	-18.63	Average
4	80.01	24.30	46.86	-22.56	QP
5	138.08	32.22	39.01	-6.79	Average
6	138.08	35.50	49.01	-13.51	QP

M/N : DK-01
 Operation Mode : Mode 1
 Test Voltage : DC 5V/1.5A from Adapter Input AC 120V/60Hz
 Test Specification : DC Line
 Temperature (° C) : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015



	Freq	Level	Limit	Over	Remark
	MHz	dBpW	Line	Limit	
			dBpW	dB	
1	30.49	15.23	35.03	-19.80	Average
2	30.49	26.50	45.03	-18.53	QP
3	44.27	13.63	35.54	-21.91	Average
4	44.27	24.50	45.54	-21.04	QP
5	138.08	21.71	39.01	-17.30	Average
6	138.08	25.60	49.01	-23.41	QP

4.5. Radiated Emission Test (30MHz to 1000MHz)

Result : **Pass**
Test Site : 966 Chamber
Limits : EN 55014-1

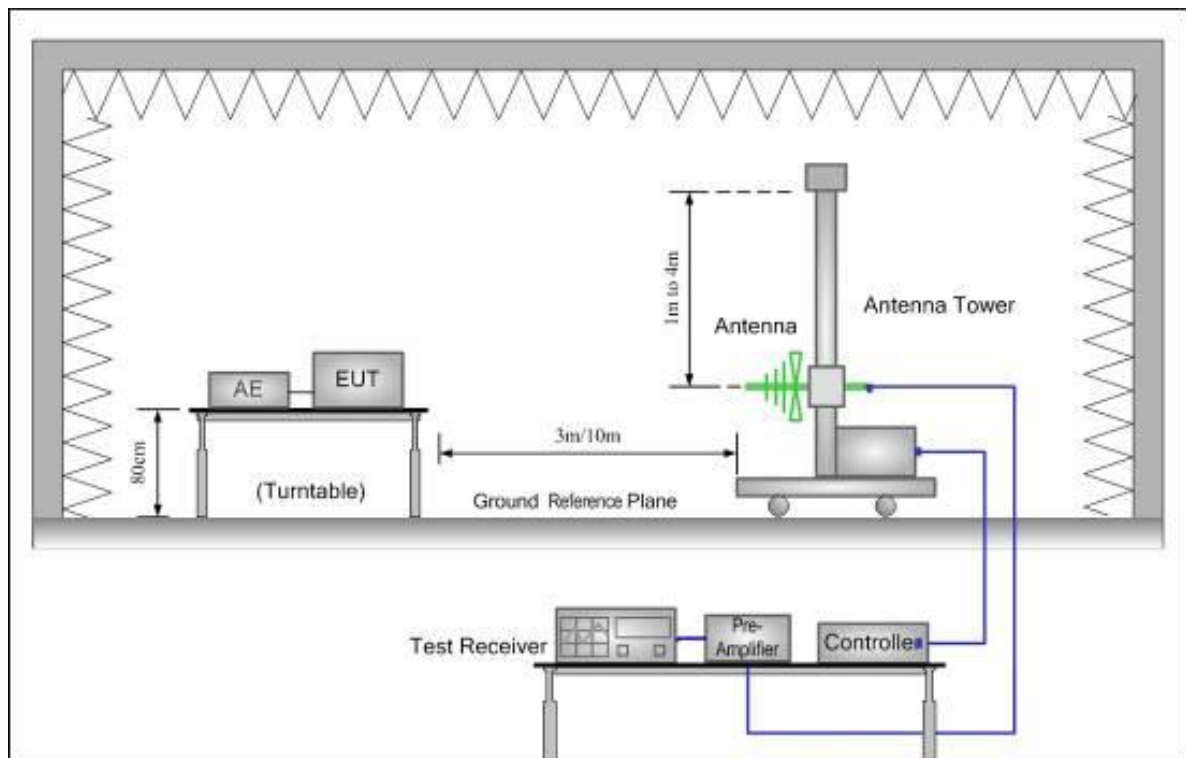
Frequency range MHz	Quasi-peak limits dB(μ V/m)
30-230	40
230-1000	47

Note: 1. The lower limit shall apply at the transition frequency.
 2. Additional provisions may be required for cases where interference occurs.

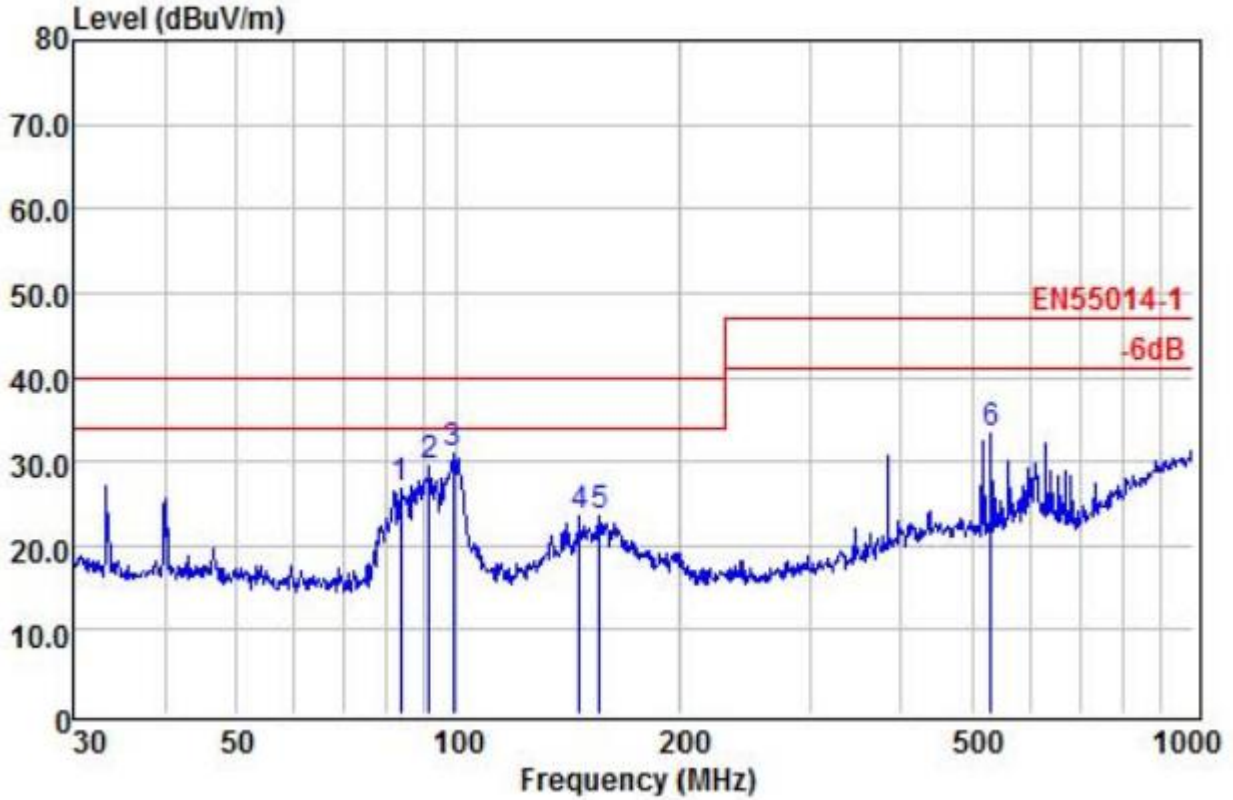
Test Specification

1. The EUT was placed on a turn table which was 0.8 m above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 m away from the receiving antenna which was mounted on an antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 m to 4 m for both horizontal and vertical polarizations.
2. The EUT was tested in the Chamber Site. It was pre-scanned with a Peak detector from the spectrum, and all the final readings from the test receiver were measured with the Quasi-Peak detector.
3. The bandwidth setting on the test receiver was 120 kHz.
4. All the test data were reported on the following pages.
5. Emission Level = Antenna Factor + Cable Loss + Meter Reading

Test Set-up

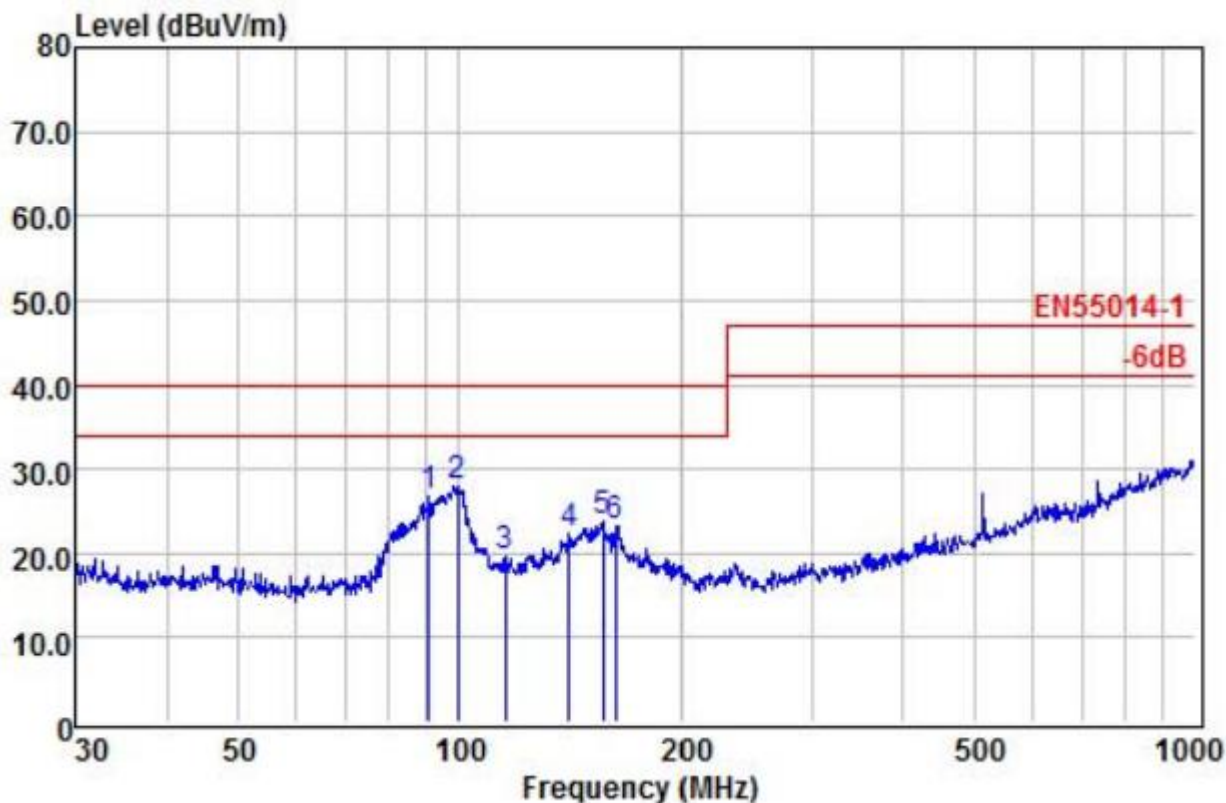


M/N : DK-01
 Operation Mode : Mode 2
 Test Voltage : DC 3.7V
 Test Specification : Vertical
 Temperature (° C) : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015



	Read	Antenna	Cable	Limit	Over		
Freq	Level	Factor	Loss	Line	Limit	Remark	
MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	83.52	15.43	11.21	0.15	26.79	40.00	-13.21 QP
2	91.49	17.92	11.37	0.16	29.45	40.00	-10.55 QP
3	98.83	19.66	11.22	0.17	31.05	40.00	-8.95 QP
4	146.37	8.01	15.37	0.23	23.61	40.00	-16.39 QP
5	155.91	7.56	15.61	0.23	23.40	40.00	-16.60 QP
6	530.10	15.46	16.73	1.17	33.36	47.00	-13.64 QP

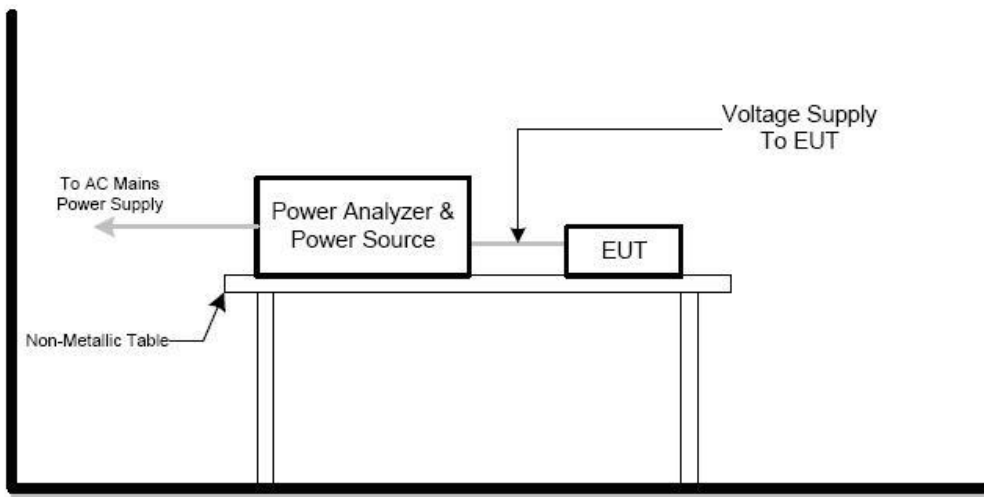
M/N : DK-01
 Operation Mode : Mode 2
 Test Voltage : DC 3.7V
 Test Specification : Horizontal
 Temperature (° C) : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015



	ReadAntenna	Cable	Limit	Over			
Freq	Level	Factor	Loss	Level	Line	Limit	Remark
MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	90.86	14.36	12.28	0.16	26.80	40.00	-13.20 QP
2	99.53	16.65	11.24	0.17	28.06	40.00	-11.94 QP
3	115.32	7.31	12.07	0.20	19.58	40.00	-20.42 QP
4	140.84	6.98	15.23	0.23	22.44	40.00	-17.56 QP
5	156.46	7.91	15.62	0.23	23.76	40.00	-16.24 QP
6	163.18	7.83	15.17	0.23	23.23	40.00	-16.77 QP

4.6. Harmonic Current Emissions on AC Mains Test

Result : N/A
Limits : EN IEC 61000-3-2 Class A
Test Set-up



There is no need for Harmonics test to be performed on this product (rated power is less than 75W) in accordance with EN IEC 61000-3-2.

For further details, please refer to Clause 7, Note 1 of EN IEC 61000-3-2 which states:-

“For the following categories of equipment limits are not specified in this edition of the standard.

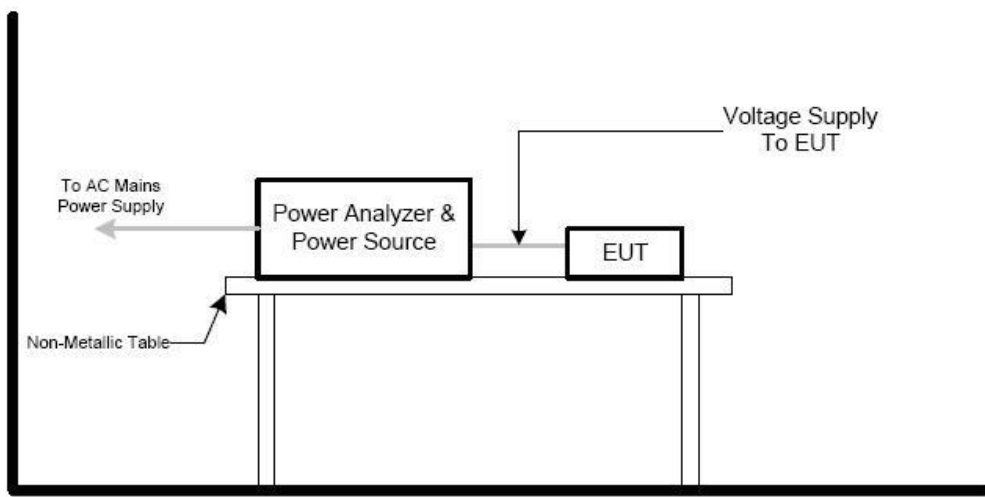
Note 1: Equipment with a rated power of 75W or less, other than lighting equipment.”

4.7.Voltage Fluctuations and Flicker on AC Mains Test

Result : **Pass**

Limits : EN 61000-3-3

Test Set-up



Test Data

M/N : DK-01

Operation Mode : Mode 1

Test Voltage : DC 5V/1.5A from Adapter Input AC 230V/50Hz

Temperature (° C) : 24 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015

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	0.064
Long-term Flicker Indicator Plt	0.65	/

5. IMMUNITY TEST RESULTS

5.1. Description of Performance Criteria

Performance criteria A

The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance criteria 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 (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however, 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, then either of these may be derived from the product description and documentation, and from 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, or by any operation specified in the instructions for use.

Classification of the EUT

- Category I apparatus containing no electronic control circuitry.
- Category II ESD EFT SURGE C/S DIPS
- Category III ESD RS
- Category IV ESD RS EFT SURGE C/S DIPS
- : Used.
- : Not Used.

5.2. Electrostatic Discharge Immunity Test

Result	: Pass
Test Procedure	: EN 55014-2
Test Specification	: ± 4 kV (Contact discharge); ± 8 kV (Air discharge)
Number of Discharges	: 10 (Air discharge for single polarity discharge) 10 (Contact discharge for single polarity discharge)
Repetition Rate	: One discharge per second
Performance Criterion	: B
Test Site	: LAB 1

Test Specification

The EUT was put on a 0.8m high wooden table/0.1m high for floor standing equipment standing on the ground reference plane (GRP) 3m by 2m in size, made by iron 1.0 mm thick.

A horizontal coupling plane (HCP) 1.6m by 0.8m in size was placed on the table, and the EUT with its cables were isolated from the HCP by an insulating support thick than 0.5mm. The VCP 0.5m by 0.5m in size & HCP were constructed from the same material type & thickness as that of the GRP, and connected to the GRP via a 470k Ω resistor at each end.

The distance between EUT and any of the other metallic surface excepted the GRP, HCP & VCP was greater than 1m.

The EUT was arranged and connected according to its functional requirements.

Direct static electricity discharges was applied only to those points and surface which are accessible to personnel during normal usage

On each preselected points 10 times of each polarity single discharge were applied The time interval between successive single discharges is at least 1s.

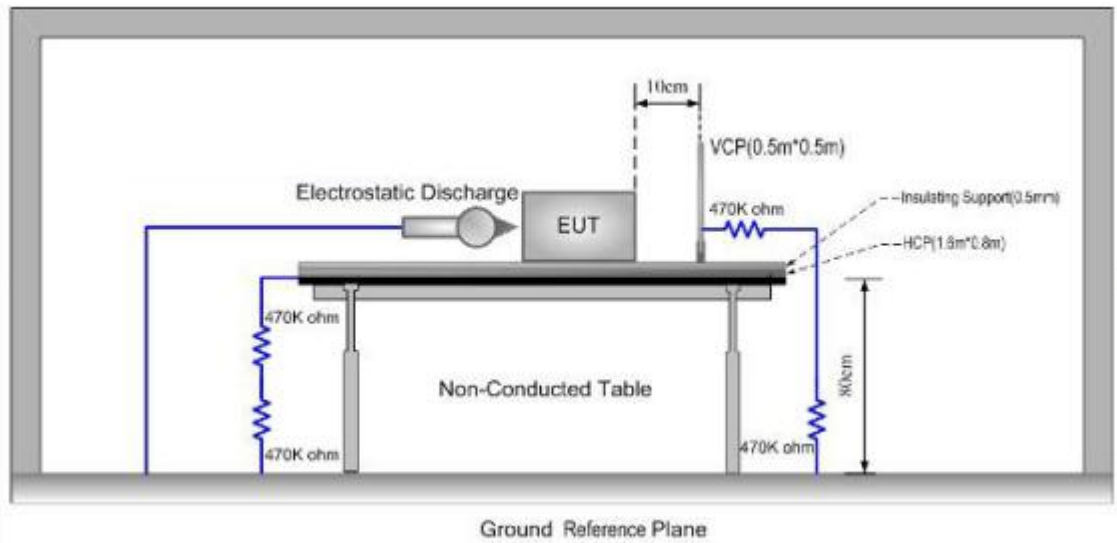
The ESD generator was held perpendicular to the surface to which the discharge is applied. The discharge return cable of the generator was kept at a distance of 0.2m whilst the discharge is being applied. During the contact discharges, the tip of the discharge electrode was touch the EUT before the discharge switch is operated. During the air discharges, the round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT.

Indirect discharge was conducted to objects placed near the EUT, simulated by applying the discharges of the ESD generator to a coupling plane, in the contact discharge mode.

After each discharge, the ESD generator was removed from the EUT, the generator is then retriggered for a new single discharge. For ungrounded product, a grounded carbon fibre brush with bleeder resistors (2 \times 470 k Ω) in the grounding cable was used after each discharge to remove remnant electrostatic voltage.

10 times of each polarity single discharge were applied to HCP and VCP. The detail selected points are listed in the following table.

Test Set-up



Test data

M/N : DK-01

Operation Mode : Mode 1, Mode 2

Test Voltage : DC 5V/1.5A from Adapter Input AC 230V/50Hz, DC 3.7V

Temperature (° C) : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015

Discharge Location		Type of Discharge	Result
HCP	4 points	Contact	Pass
VCP	4 points	Contact	Pass
DC Port	1 point	Air	Pass
Slot	8 points	Air	Pass

*Remark: 1. No obvious change of function was found after the test.
2. Discharge should be considered on Contact, Air, Horizontal Coupling Plane (HCP) and Vertical Coupling Plane (VCP).*

5.3. Radio Frequency Electromagnetic Field Immunity Test

Result	: Pass
Test Procedure	: EN 55014-2
Test Field Strength	: 3 V/m (unmodulated)
Test Signal	: 1 kHz sine wave, AM 80% modulated
Frequency Range	: 80 to 1000 MHz
Performance Criterion	: A
Test Site	: 966 Full Anechoic Chamber

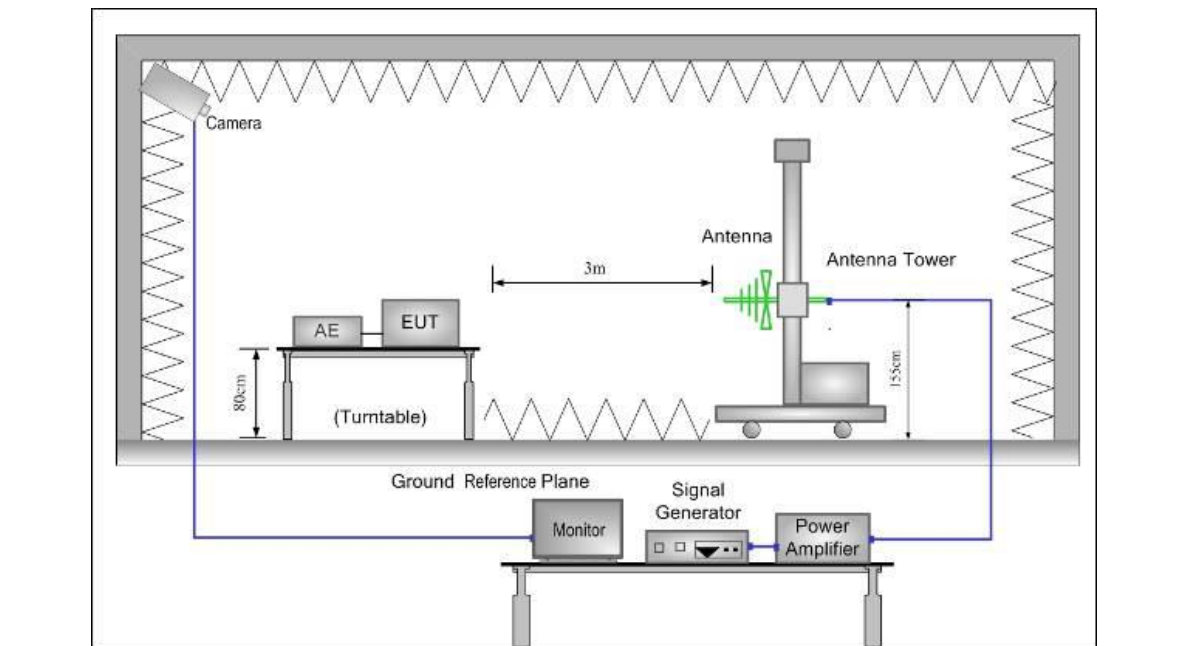
Test Specification

The EUT and its simulators were placed on a turn table which was 0.8 meter above the ground.

The EUT was set 3 m away from the transmitting antenna which was mounted on an antenna tower. Both horizontal and vertical polarizations of the antenna were set on the test. Each of the four sides of the EUT was faced the transmitting antenna and measured individually.

The test was carried out in the Anechoic Chamber which was that of a size adequate to maintain a uniform field of sufficient dimensions with respect to the EUT. Additional absorbers were used to damp reflections in chambers which were not fully lined.

Test Set-up



Test data

M/N : DK-01

Operation Mode : Mode 1, Mode 2

Test Voltage : DC 5V/1.5A from Adapter Input AC 230V/50Hz, DC 3.7V

Temperature (° C) : 24 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015

Position	Test Level	Frequency Range	Modulated Signal	Freq. Step	Dwell Time	Result
Front	3 V/m	80 to 1000 MHz	AM 80%, 1kHz sine wave	1%	3 s	Pass
Right						Pass
Rear						Pass
Left						Pass

Remark: The EUT was operated as intended during and after the test.

5.4. Electrical Fast Transient/Burst Immunity Test

Result	: Pass
Test Procedure	: EN 55014-2
Performance Criterion	: B
Waveshape of the pulse	: $T_r/T_d = 5/50$ ns
Repetition Frequency	: 5 kHz
Burst Duration	: 15 ms
Burst Period	: 300 ms
Test Duration	: 120 s
Test Site	: LAB 3

Test Specification

The EUT was placed on a ground reference plane (GRP) insulated by an insulating support 0.1 m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment.

For floor standing equipment, the EUT was placed on a GRP and be insulated form it by an insulating support with a thickness of 0.1 m.

The GRP shall project beyond the EUT and the clamp by at least 0.1m on all sides. The distance between the EUT and any other of the metallic surface except the GRP was greater than 0.5m. All cables to the EUT were placed on the insulation support 0.1m above GRP. Cables not subject to EFT were routed as far as possible from cable under test to minimize the coupling between the cables.

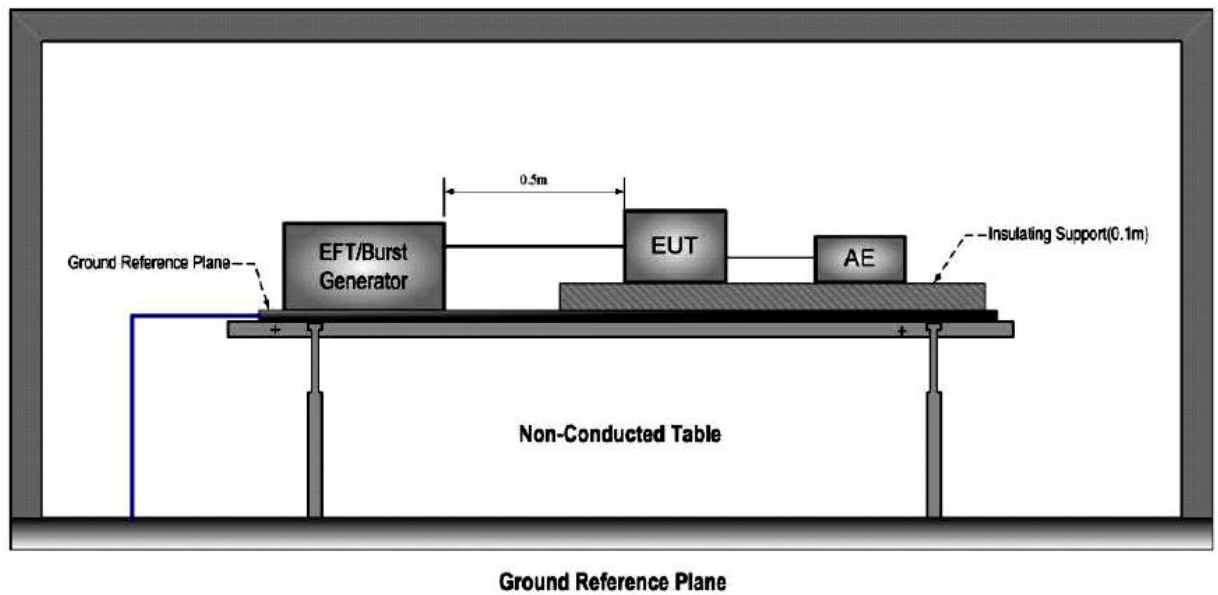
The distance between any coupling devices and the EUT shall be (0,5 - 0/+0,1) m for tabletop equipment testing, and (1,0 ± 0,1) m for floor standing equipment. If the cable is a non-detachable supply cable more than 0.5m, the excess length of this cable shall be bundled and situated at a distance of 0.1m above the GRP.

The EUT was conducted the below specified level voltage test for line to neutral or line to neutral to earth (for clamp coupling is for the signal line), 120 seconds duration.

If the equipment contains identical ports, only one was tested; multi-conductor cables, such as a 50-pair telecommunication cable, were tested as a single cable. Cables did not be split or divided into groups of conductors for this test; interface ports, which were intended by the manufacturer to be connected to data cables not longer than 3 m, did not be tested.

The coupling Clamp was used for measurements on signal ports.

Test Set-up



Test data

M/N : DK-01

Operation Mode : Mode 1

Test Voltage : DC 5V/1.5A from Adapter Input AC 230V/50Hz

Temperature (° C) : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015

Coupling Ports		Coupling Voltage	Inject Method	Result	
AC Power Ports	L	<input checked="" type="checkbox"/>	±1 kV	Pass	
	N	<input checked="" type="checkbox"/>	±1 kV	Pass	
	L-N	<input checked="" type="checkbox"/>	±1 kV	Pass	
	PE	<input type="checkbox"/>	±1 kV	N/A	
	L-PE	<input type="checkbox"/>	±1 kV	N/A	
	N-PE	<input type="checkbox"/>	±1 kV	N/A	
	L-N-PE	<input type="checkbox"/>	±1 kV	N/A	
DC line		<input type="checkbox"/>	±0.5 kV	Clamp	N/A
<i>Remark: No obvious change of function was found after the test.</i>					

5.5.Surge Immunity Test

Result : **Pass**

Test Procedure : EN 55014-2

Performance Criterion : B

Waveform Parameters : Open-circuit voltage: 1.2/50 μ s
Short-circuit current: 8/20 μ s

Test Site : LAB 3

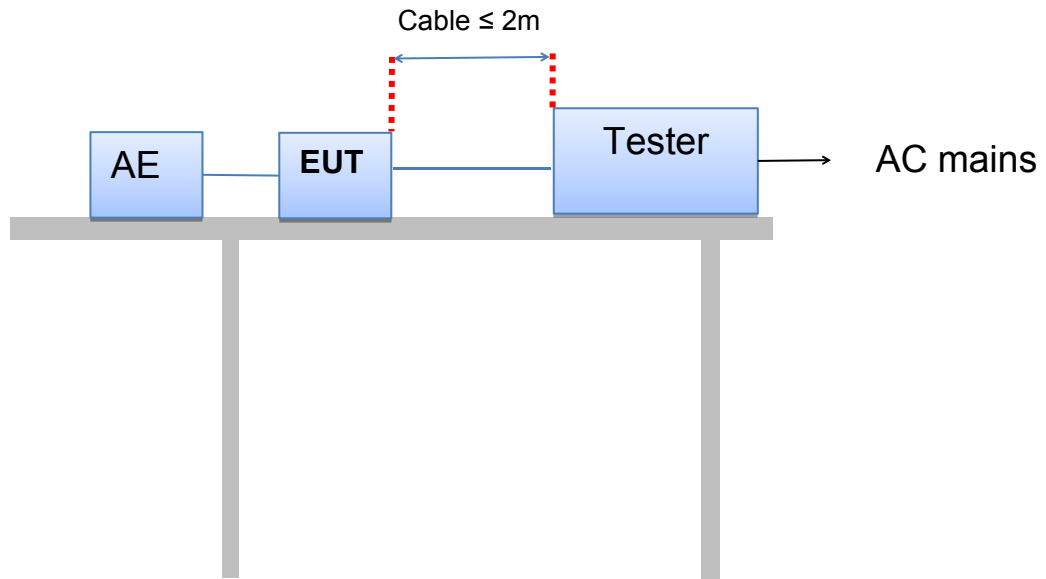
Test Specification:

The effective output impedance of the generator was 2 Ω for L-N test, and 12 Ω for L-PE and N-PE test.

For d.c. power ports and interconnection lines, the surge pulses were 5 positive and 5 negative. For a.c. power ports, the surge pulses were 5 positive 90° and 5 negative at 270°. The time between successive pulses was 1 minute.

For double-insulated products without PE or external earth connections, the test was done in a similar way as for grounded products but without additional external grounded connections. If there were no other possible connections to earth, line-to-ground tests were omitted. The power cord or/and interconnection line between the EUT and the coupling/decoupling network was less than 2 m in length.

Test Set-up



Test data

M/N : DK-01

Operation Mode : Mode 1

Test Voltage : DC 5V/1.5A from Adapter Input AC 230V/50Hz

Temperature ($^{\circ}\text{C}$) : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015

Coupling Ports			Repetition Rate	Coupling Voltage	Coupling Phase / Result			
					0 $^{\circ}$	+90 $^{\circ}$	180 $^{\circ}$	-270 $^{\circ}$
AC power ports	L-N	<input checked="" type="checkbox"/>	60 s	1 kV	N/A	Pass	N/A	Pass
	L-PE	<input type="checkbox"/>	60 s	2 kV	N/A	N/A	N/A	N/A
	N-PE	<input type="checkbox"/>	60 s	2 kV	N/A	N/A	N/A	N/A

Remark: No obvious change of function was found after the test.

5.6. Injected Currents Susceptibility Test

Result	: Pass
Test Procedure	: EN 55014-2
Test Voltage	: 3 V (r.m.s) unmodulated
Test Signal	: 1kHz sine wave, AM 80% modulated
Frequency Range	: 150 kHz to 230 MHz
Performance Criterion	: A
Test Site	: LAB 1

Test Specification:

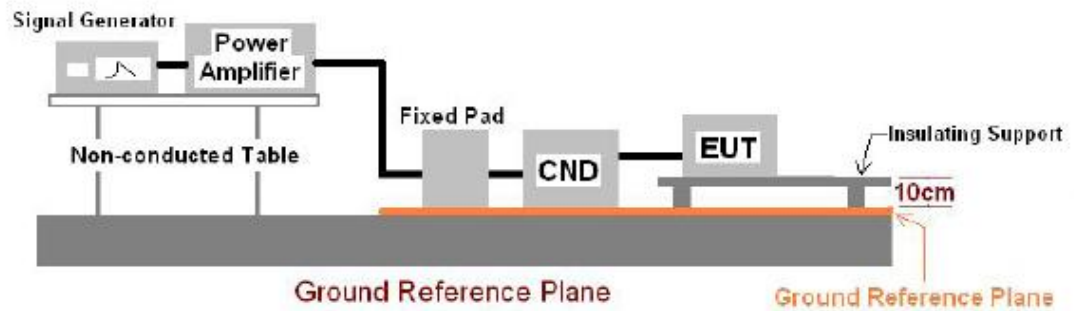
The EUT was placed on an insulating support of 0.1m height above a ground reference Plane, arranged and connected to satisfy its functional requirement. All cables exiting the EUT was supported at a height of at least 30 mm above the ground reference plane.

The coupling and decoupling devices were required, they were located between 0.1m and 0.3m from the EUT. This distance was to be measured horizontally from the projection of the EUT on to the ground reference plane to the coupling and decoupling device.

Each AE, used with clamp injection, shall be placed on an insulating support 0.1m above the ground reference plane. A decoupling network shall be installed on each cable between the EUT and AE except the cable under test. All cables connected to each AE, other than those being connected to the EUT, shall be provided with decoupling networks. The decoupling networks connected to each AE (except those on cables between the EUT and AE) shall be applied no further than 0.3m from the AE. The cable(s) between the AE and the decoupling network (s) or in between the AE and the injection clamp shall not be bundled nor wrapped and shall be kept between 30 mm and 50 mm above the ground reference plane.

The frequency range was swept from 150 kHz to 230 MHz, using the signal levels established during the setting process, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or to change coupling devices as necessary. Where the frequency was swept incrementally, the step size do not exceed 1% of the preceding frequency value. The dwell time of the amplitude modulated carrier at each frequency was not less than the time necessary for the EUT to be exercised and to respond, and was not less than 0.5 s.

Test Set-up



Test data

M/N : DK-01

Operation Mode : Mode 1

Test Voltage : DC 5V/1.5A from Adapter Input AC 230V/50Hz

Temperature (° C) : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015

Coupling ports	Voltage (r.m.s)	Frequency Range	Modulation Signal	Freq. Step	Dwell Time	Coupling Method	Result
AC Power Ports	3 V	150 kHz to 230 MHz	AM 80%, 1kHz sine	1%	1.5 s	CDN	Pass

Remark: The EUT was operated as intended during and after the test.

5.7.Voltage Dips and Short Interruptions Immunity Test

Result	: Pass
Test Procedure	: EN 55014-2
Criterion	: C
Test Specification	: 0% of UT (Supply Voltage) for 0.5 Periods 40 % of UT (Supply Voltage) for 10 Periods 70 % of UT (Supply Voltage) for 25 Periods
Test Site	: LAB 4

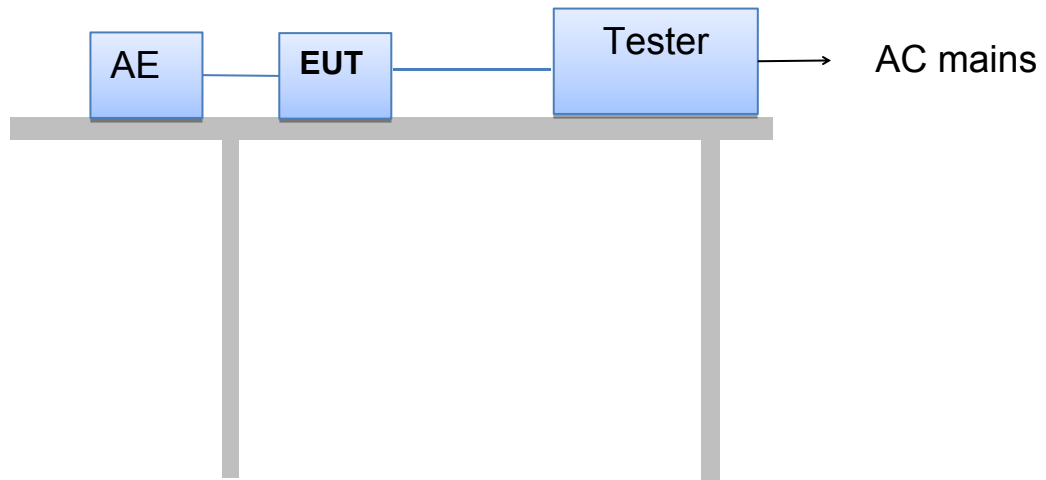
Test Specification

The test was performed with the EUT connected to the test generator with the shortest possible length suitable to the application of the EUT.

The EUT was tested for each selected combination of test level and duration with a sequence of three dips/interruptions with intervals of 10 s (between each test event). Each representative mode of operation was to be tested.

For voltage dips and short interruptions, changes in supply voltage were to occur at zero crossings of the voltage.

Test Set-up



Test data

M/N : DK-01

Operation Mode : Mode 1

Test Voltage : DC 5V/1.5A from Adapter Input AC 230V/50Hz

Temperature (° C) : 24.9 Relative Humidity (%) : 56 Atmospheric Pressure(mbar) : 1015

Test Level in % U_T	Voltage Dips & Short Interruptions in % U_T	Durations (in Period)	Criterion	Result
0	100	0.5 P	C	Pass
40	60	10 P	C	Pass
70	30	25 P	C	Pass

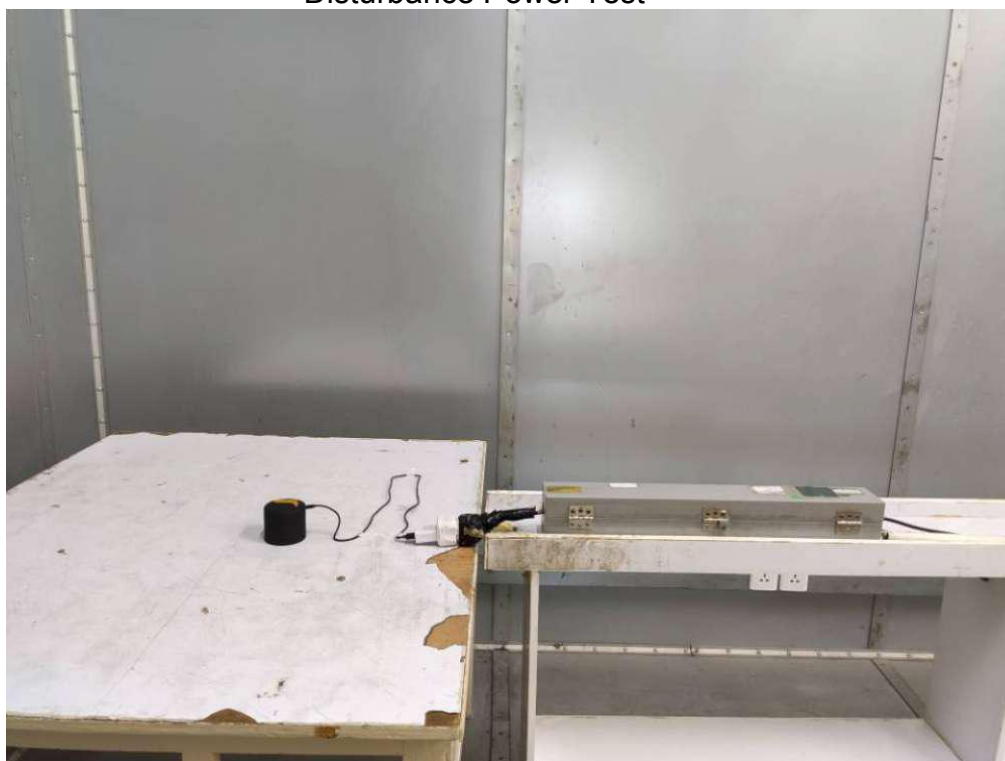
Remark: No obvious change of function was found after the test.

6. PHOTOGRAPHS OF TEST SET-UP

Conducted Emission at the Mains Terminals Test



Disturbance Power Test



Radiated Emission Test



Harmonic Current and Voltage Fluctuations/Flicker Test



Electrostatic Discharge Immunity Test



Electrical Fast Transient/Burst Immunity Test



Surge Immunity Test



Injected Currents Susceptibility Test



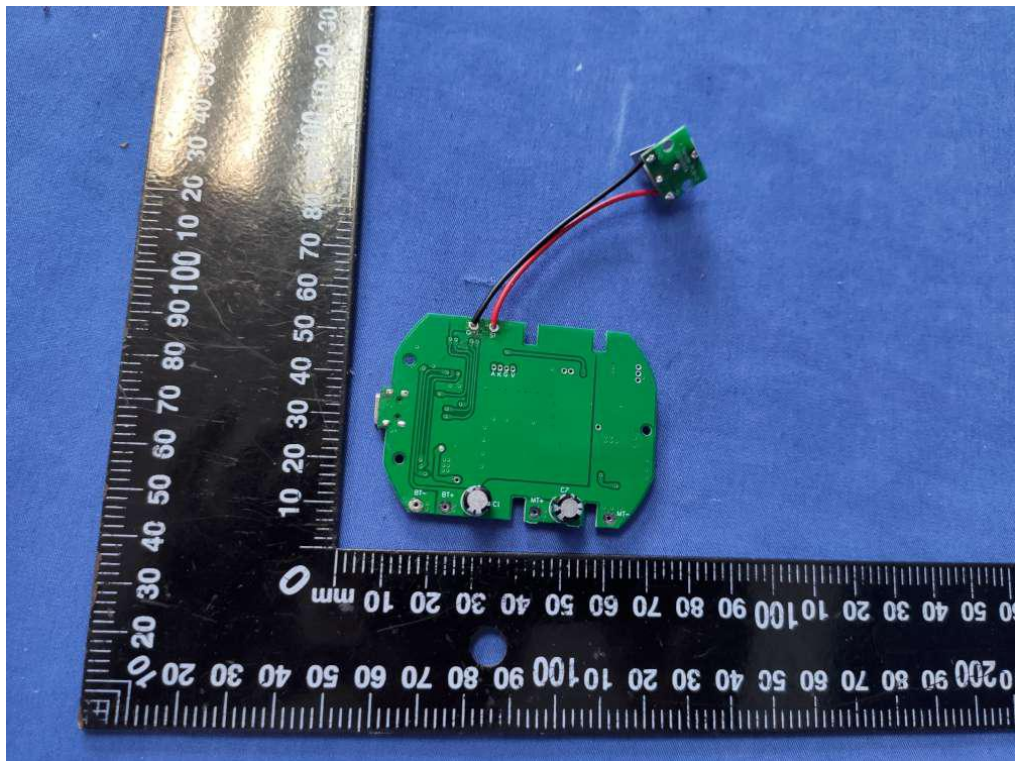
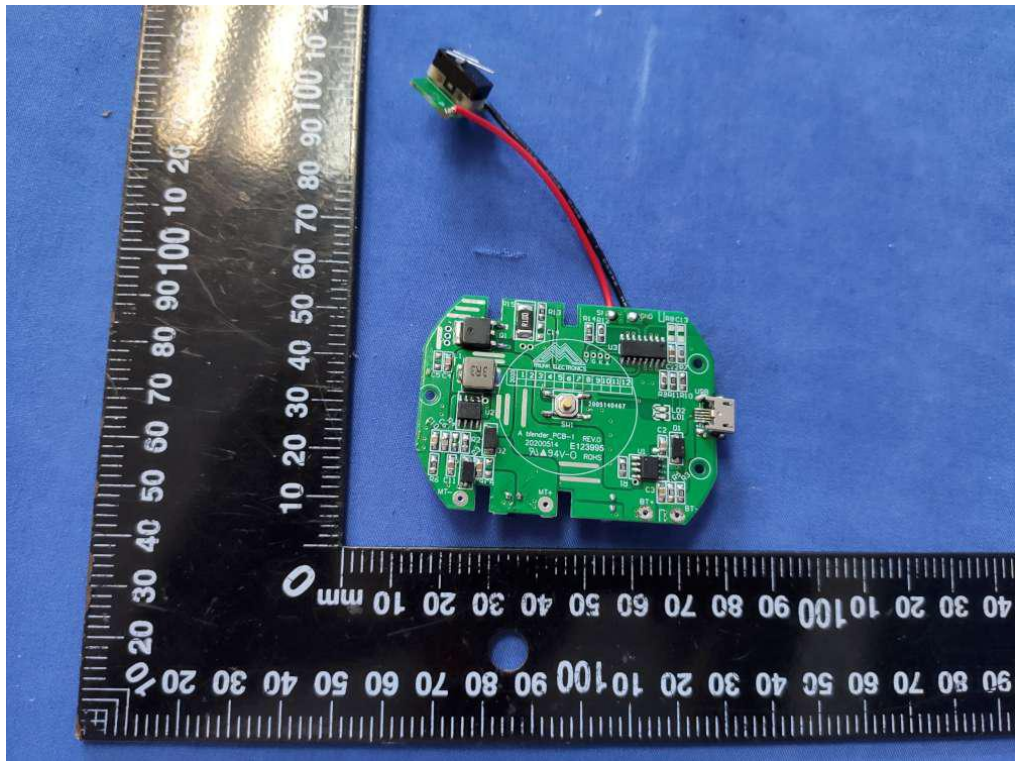
Voltage Dips and Short Interruptions Immunity Test

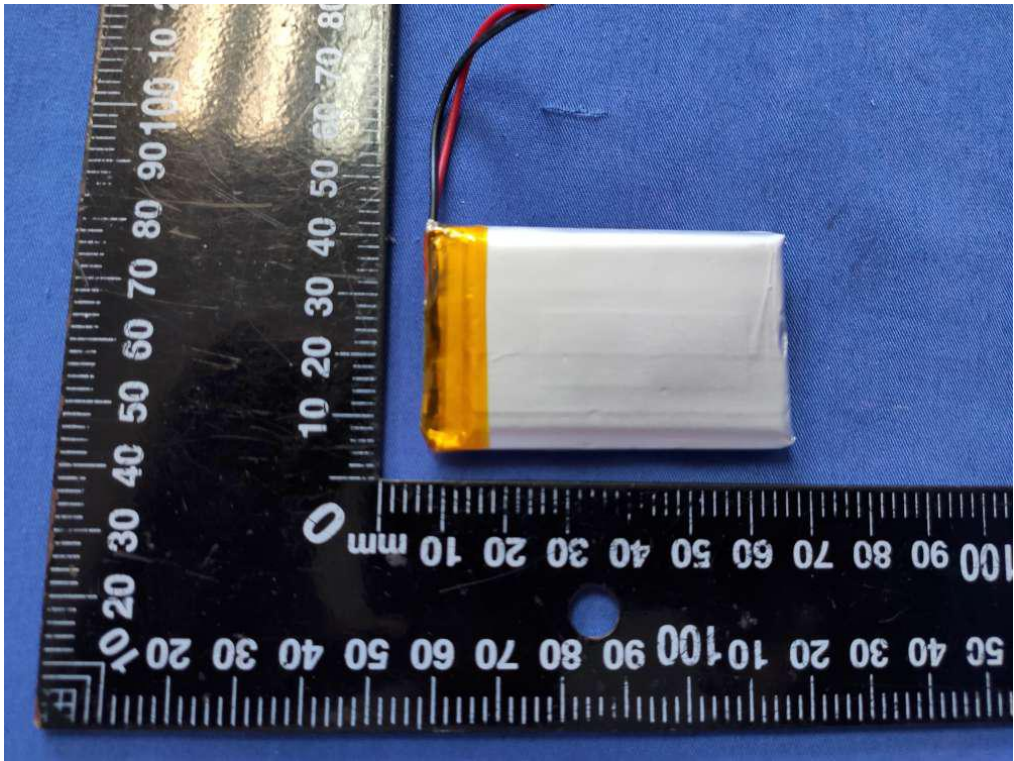
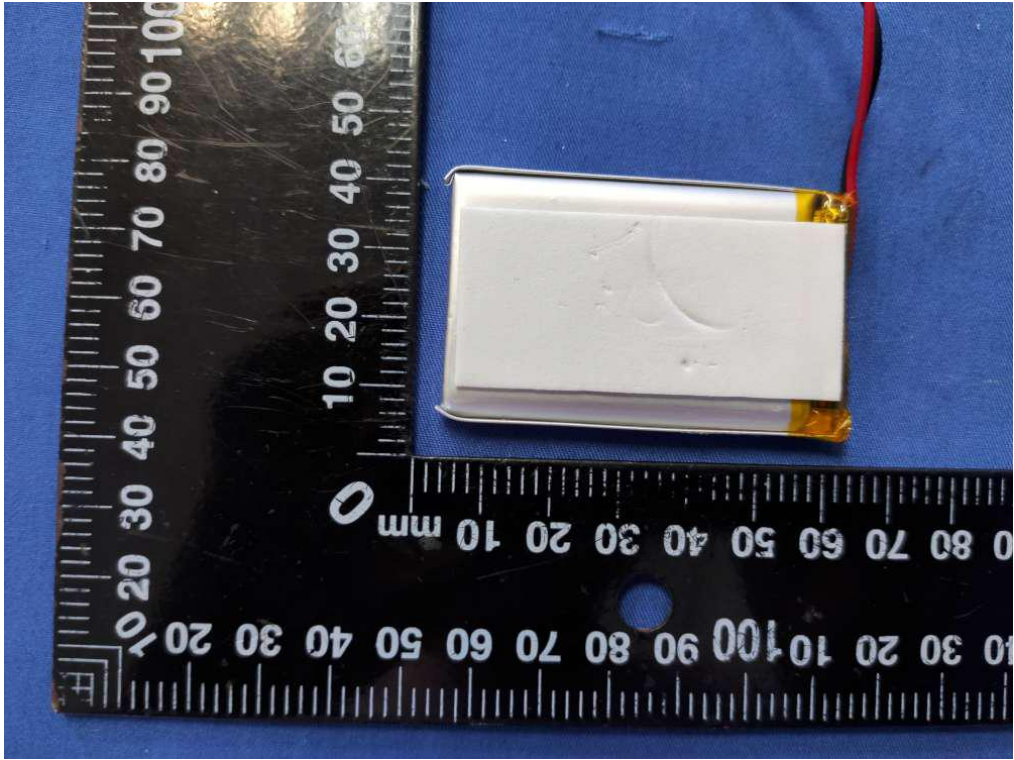


7. PHOTOGRAPHS OF THE EUT









*** the end of report ***