EMC TEST REPORT

EN IEC 61000-6-2:2019
EN IEC 61000-6-4:2019
MEASUREMENT AND TEST REPORT

For

Shenzhen ShenWangda Technology Co.,Ltd

4th floor, buiding C, KelunTe Low-carbonindustrial park, HuaRong Road, Longhua area, ShenZhen

Model: TBK938、TBK938M、TBK938L、TBK958、TBK958D、TBK983A、TBK988、TBK988C、TBK988D、TBK988Z、TBK968、TBK968C、TBK968D、TBK568、TBK568R、TBK228、TBK238、TBK258UV、TBK268、TBK288、TBK008、TBK009

2022-07-19

This Report Concerns:	Equipment Type:
♦ Original Report	LCD Temperature Controller

Test Engineer:	Eric Tao/ Eric Tao
Report Number:	TH2207169-C01-R01
Test Date:	2022-07-12 to 2022-07-19
Reviewed By:	Prince Huang/ Prince Huang
Approved By:	Prince Huang/ Prince Huang
Prepared By:	**Shenzhen Tian Hai Test Technology Co.,Ltd.** 125-126, No.66, Zhangge Road, Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong, China Tel : +86-755-86615100 Fax: +86-755-86615105

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior written consent of TianHai Compliance Testing Laboratory Ltd.

TABLE OF CONTENTS

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

1 - SUMMARY OF STANDARDS AND RESULTS

1.1 Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below.

EMISSION				
Description of Test Item	**Test Standard**	**Basic Standard**	**Requirement**	**Results**
Conducted disturbance	EN IEC 61000-6-4: 2019	EN IEC 61000-6-4: 2019	See Section 4	PASS
Radiated disturbance	EN IEC 61000-6-4 :2019	EN IEC 61000-6-4 :2019	See Section 5	PASS
Harmonic current emissions	/	/	/	N/A
Voltage fluctuations & flicker*	/	/	/	N/A
IMMUNITY				
Description of Test Item	**Test Standard**	**Basic Standard**	**Test configuration**	**Results**
Electrostatic discharge (ESD)	EN IEC 61000-6-2: 2019	IEC 61000-4-2：2008	See Section 6.1	PASS
Radio-frequency, Continuous radiated disturbance	EN IEC 61000-6-2: 2019	IEC 61000-4-3：2020	See Section 6.2	PASS
Electrical fast transient (EFT)	EN IEC 61000-6-2：2019	IEC 61000-4-4：2012	See Section 6.3	PASS
Surge (Input a.c. power ports)	EN IEC 61000-6-2：2019	IEC 61000-4-5; 2014+AMD1:2017	See Section 6.4	PASS
Radio-frequency, Continuous conducted disturbance	EN IEC 61000-6-2：2019	IEC 61000-4-6: 2013	See Section 6.5	PASS
Power frequency magnetic field*	/	/	/	N/A
Voltage dips and interruptions	EN IEC 61000-6-2：2019	IEC 61000-4-11: 2020	See Section 6.6	PASS

Note:
N/A is an abbreviation for Not Applicable
"*": The EUT does not contain devices susceptible to magnetic fields; therefore the Power-Frequency Magnetic Fields test is not necessary.

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

1.2 Description of Performance Criteria

General Performance Criteria

Examples of functions defined by the manufacturer to be evaluated during testing include, but are not limited to, the following:

— essential operational modes and states;
— tests of all peripheral access (hard disks, floppy disks, printers, keyboard, mouse,etc.);
— quality of software execution;
— quality of data display and transmission;
— quality of speech transmission.

1.2.1 Performance criterion A

The equipment shall continue to operate as intended without operator intervention.No degradation of performance or loss of function is allowed below a performance level specified by the manufacture when the equipment 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, then either of these may be deliver from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

1.2.2 Performance criterion B

After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacture, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance.

During the test, degradation of performance is allowed. However, no change of operation state or stored data is allowed to persist after the test.

If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be deliver from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.

1.2.3 Performance criterion C

Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacture’s instructions.

Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be loss.

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

2 - GENERAL INFORMATION

2.1 Product Description for Equipment under Test EUT

Client Information

Applicant:	Shenzhen ShenWangda Technology Co.,Ltd
Address:	4th floor, buiding C, KelunTe Low-carbonindustrial park, HuaRong Road, Longhua area, ShenZhen
Manufacturer:	Shenzhen ShenWangda Technology Co.,Ltd
Address:	4th floor, buiding C, KelunTe Low-carbonindustrial park, HuaRong Road, Longhua area, ShenZhen

General Description of E.U.T

EUT Name:	LCD Temperature Controller
Trade Mark:	TBK
Model No.:	TBK938、TBK938M、TBK938L、TBK958、TBK958D、TBK983A、TBK988、TBK988C、TBK988D、TBK988Z、TBK968、TBK968C、TBK968D、TBK568、TBK568R、TBK228、TBK238、TBK258UV、TBK268、TBK288、TBK008、TBK009
Model Difference	All models have the same circuit structure, only in different sizes
Sample No.:	TH2207169-C01
Ratings:	Input: AC 220V 50Hz 350W
Test Mode:	ON
Note:	All test results are based on model TBK568

2.2 Statement of the measurement uncertainty Test Facility

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration Limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16-4-2 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

2.3 Measurement Uncertainty

Test Item	Frequency range	Results	Limits
Conducted disturbance at mains terminals	9kHz to 150kHz 150kHz to 30MHz	±2.63 dB ±2.35 dB	±3.8 dB ±3.4 dB
Radiated disturbance	30MHz to 1GHz	±5.78dB	±6.3dB

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

(1) Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus.

(2) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

2.4 Test Location

All tests were performed at Shenzhen Tianhai Test Technology Co., Ltd.
125-126, No.66, Zhangge Road ,Zhangge Community, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, P.R. China

2.5 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 instructions for use.
Immunity: The equipment under test (EUT) was configured to have its highest possible susceptibility against the tested phenomena. The test modes were adapted accordingly in reference to the instructions for use.

2.6 Test Operation

Test operation refers to test setup in chapter 4 & 5 & 6
Pretest in all operation modes, and find out the worst case for compliance test.
According to section 2.1,all test results are based on model TBK568

2.7 SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT

The EUT was tested together with the following accessories:

Kind of Equipment	Manufacturer	Model Number	S/N
/	/	/	/

The EUT was tested with following cables:

Cable name	Length (m)	Shield	Core No.
/	/	/	/

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

3 - TEST EQUIPMENT LIST AND DETAILS

Kind of Equipment	Manufacturer	Type	S/N	Calibrate until
Conducted Emission				
EMI Test Receiver	R&S	ESRP3	102242	2022-11-15
L.I.S.N	Schwarzbeck	NNLK 8128	5089	2022-11-15
8-Wire ISN CAT6	Schwarzbeck	NTFM 8158	231	2022-11-15
Pulse Limiter	Schwarzbeck	VTSD 9561-F	847	2022-11-15
Disturbance power				
EMI Test Receiver	R&S	ESRP3	102242	2022-11-15
EMI Absorbing Clamp	Teseq	MDS 21B	58115	2022-11-20
LLAS Radiated Disturbance (2m)				
EMI Test Receiver	R&S	ESRP3	102242	2022-11-15
Loop Antenna	Schwarzbeck	HXYZ 9170	353	2022-11-15
Radiated Emission (3m)				
EMI Test Receiver	R&S	ESR7	102333	2022-11-15
MXA Signal Analyzer	Keysight	N9020A	MY51281805	2022-05-23
Bilog Antenna	Schwarzbeck	VULB 9168	01148	2022-11-20
Pre-Amplifier	Schwarzbeck	BBV 9718 B	00109	2022-11-16
Pre-Amplifier	Schwarzbeck	BBV 9743 B	00253	2022-11-15
Horn Antenna	Schwarzbeck	BBHA 9120	02379	2022-11-20
Harmonics & Flicker				
5kVA AC Power Source	AMETEK CTS	5001iX-CTS-400	2046A03237	2022-11-15
Signal Conditioning Unit	AMETEK CTS	PACS-1	2046A03238	2022-11-15
Electrostatic discharge (ESD)				
ESD Simulator	TESEQ	NSG 437	1569	2022-11-20
Radio-frequency,Continuous radiated disturbance (RS)				
Signal generator	R&S	SMB 100A	113650	2023-04-15
Power meter	Agilent	E4417A	MY45100899	2023-04-15
Power sensor	Agilent	E9300	US40390494	2023-04-15
Power sensor	Agilent	E9300	MY44420219	2023-04-15

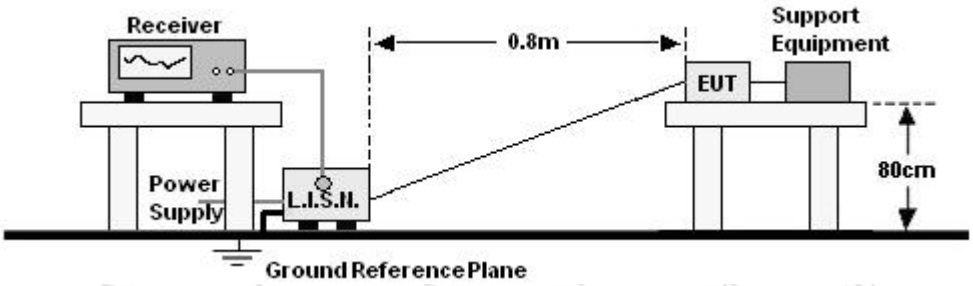
4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

Power amplifier	Micotop	MPA-80-1000-250	MPA2112426	2023-04-15
Power amplifier	Micotop	MPA-1000-6000-100	MPA2201013	2023-04-15
Stacked Log. Periodic Antenna	Schwarzbeck	STLP 9129	201	N/A
Field strength probe	PMM	EP601	811ZX10673	2023-04-17
RF Switch	Emtrace	SW X4	/	N/A
Software	Emtrace	EM 3	V1.2.1	N/A
Electrical fast transient (EFT)				
Burst Tester	3C test	EFT 500T	ES027000120015	2022-11-15
Coupling Clamp	3C test	CCC 100	CCC 20092269	2022-11-15
Surge				
Surge simulator	3C test	CWS 600CT	ES058000920005	2022-11-15
Three phases CDN	3C test	SPN 3832T	ES0911910	2022-11-15
CDN for unshielded symmetrical high-speed Telecom cable	3C test	CDN405T8A	ES064001220010	2022-11-15
CDN for Telecom cable	3C test	CDN405M40-5	ES1071910	2022-11-15
Radio-frequency,Continuous conducted disturbance (CS)				
Conducted Immunity Test System	3C test	CST 1075	ES096000120008	2022-11-15
6dB Attenuator	3C test	DTC75-6	ES095000120006	2022-11-15
Single phase CDN	3C test	CDN M2M3	ES064002620007	2022-11-15
Three phases CDN	3C test	CDN M5-16	ES064003320004	2022-11-15
Calibration Set	3C test	CDN 100KIT	ES064002820016	2022-11-15
Calibration Set	3C test	EM CL100KIT	EM C20032816	2022-11-15
EM-Clamp	3C test	EM CL100	EM C20032811	2022-11-15
Power Frequency Magnetic Field (PFMF)				
PFMF simulator	3C test	MFS 400	ES045000720001	2022-11-15
Transformer	3C test	MFT 400	ES046000220003	2022-11-15
Magnetic field antenna	3C test	TCXS111	TCXS20060910	2022-11-15
Voltage dips &Voltage interruptions				
Power failure simulator	3C test	PFS 2216SD	ES049001220003	2022-11-15

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

4 - CONDUCTED EMISSION MEASUREMENT

4.1 Block Diagram of Test Setup



4.2 Limits

Frequency Range (MHz)	Limits (dBuV)	
	Quasi-Peak	Average
0.150～0.500	79	66
0.500～30.000	73	60

NOTE: The lower limit shall apply at the transition frequencies.

4.3 Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and connected to the AC mains through a Line Impedance Stability Network (L.I.S.N). This provided a 50ohm coupling impedance for the tested equipments. Both sides of AC line are investigated to find out the maximum conducted emission according to the EN IEC 61000-6-4 regulations during conducted emission measurement.

The bandwidth of the field strength meter is set at 9kHz.

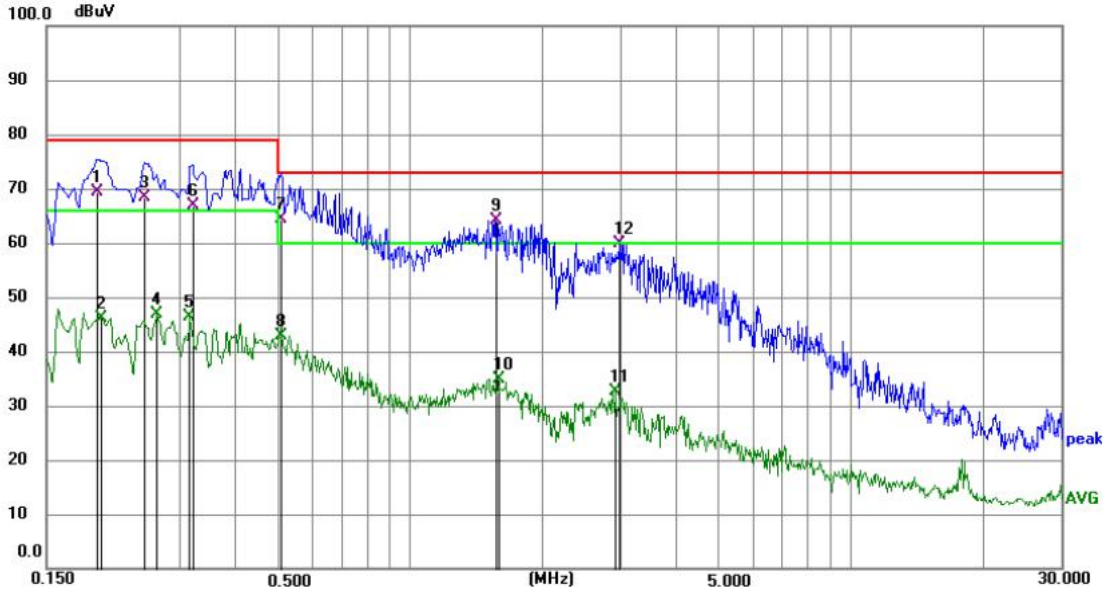
The frequency range from 150kHz to 30MHz is investigated. The scanning waveform please refer to the next page.

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

4.4 Test Results And Data

EUT:	LCD Temperature Controller
M/N:	TBK568
Test Mode:	ON
Ratings:	Input: AC 220V 50Hz
Temperature:	23℃
Humidity:	55%
Atmosphere pressure:	101Kpa
Test Results	Pass

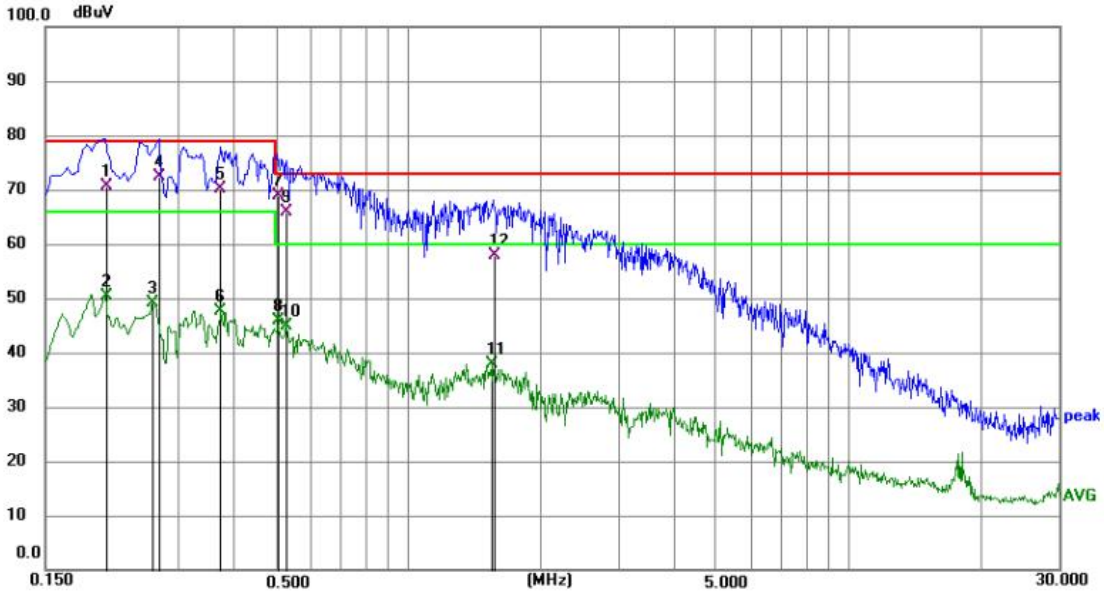
Phase:L1



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1949	59.11	10.29	69.40	79.00	-9.60	QP	P
2	0.1995	35.92	10.29	46.21	66.00	-19.79	AVG	P
3	0.2490	58.00	10.30	68.30	79.00	-10.70	QP	P
4	0.2670	36.60	10.30	46.90	66.00	-19.10	AVG	P
5	0.3165	36.06	10.30	46.36	66.00	-19.64	AVG	P
6	0.3209	56.60	10.30	66.90	79.00	-12.10	QP	P
7 *	0.5100	54.08	10.32	64.40	73.00	-8.60	QP	P
8	0.5100	32.55	10.32	42.87	60.00	-17.13	AVG	P
9	1.5675	53.74	10.37	64.11	73.00	-8.89	QP	P
10	1.5855	24.46	10.37	34.83	60.00	-25.17	AVG	P
11	2.9219	22.26	10.40	32.66	60.00	-27.34	AVG	P
12	2.9895	49.51	10.40	59.91	73.00	-13.09	QP	P

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

Phase:N

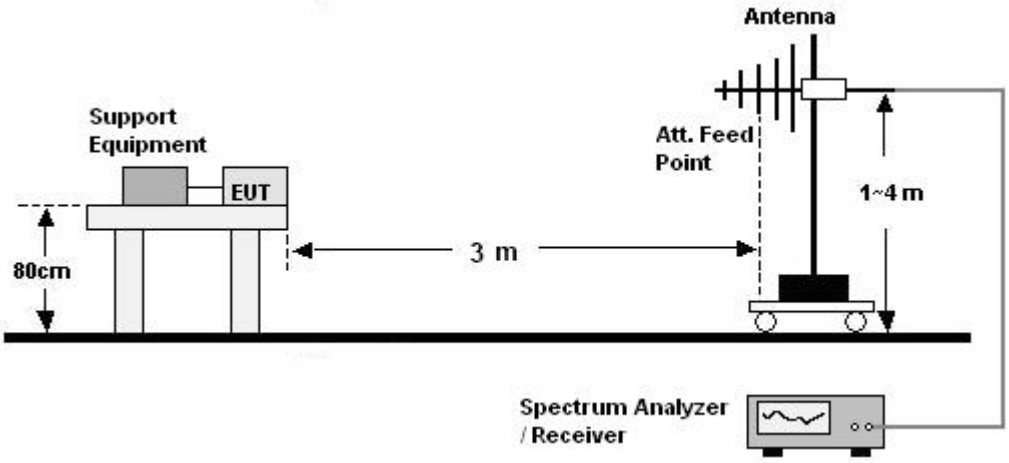


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.2040	60.39	10.31	70.70	79.00	-8.30	QP	P
2	0.2040	40.17	10.31	50.48	66.00	-15.52	AVG	P
3	0.2625	38.76	10.33	49.09	66.00	-16.91	AVG	P
4	0.2714	61.97	10.33	72.30	79.00	-6.70	QP	P
5	0.3750	59.77	10.33	70.10	79.00	-8.90	QP	P
6	0.3750	37.27	10.33	47.60	66.00	-18.40	AVG	P
7 *	0.5055	58.46	10.34	68.80	73.00	-4.20	QP	P
8	0.5055	35.65	10.34	45.99	60.00	-14.01	AVG	P
9	0.5280	55.66	10.34	66.00	73.00	-7.00	QP	P
10	0.5280	34.46	10.34	44.80	60.00	-15.20	AVG	P
11	1.5540	27.49	10.39	37.88	60.00	-22.12	AVG	P
12	1.5630	47.51	10.39	57.90	73.00	-15.10	QP	P

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

5- RADIATED DISTURBANCE MEASUREMENT

5.1 Block Diagram of Test Setup



5.2 Limits

Frequency (MHz)	Quasi-peak Limits at 3m dB(μV/m)
30-230	50
230-1000	57

NOTE: The lower limit shall apply at the transition frequencies.

5.3 Test Procedure

a. The Product was placed on the non-conductive turntable 0.8/0.1 m above the ground at a chamber.

b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.

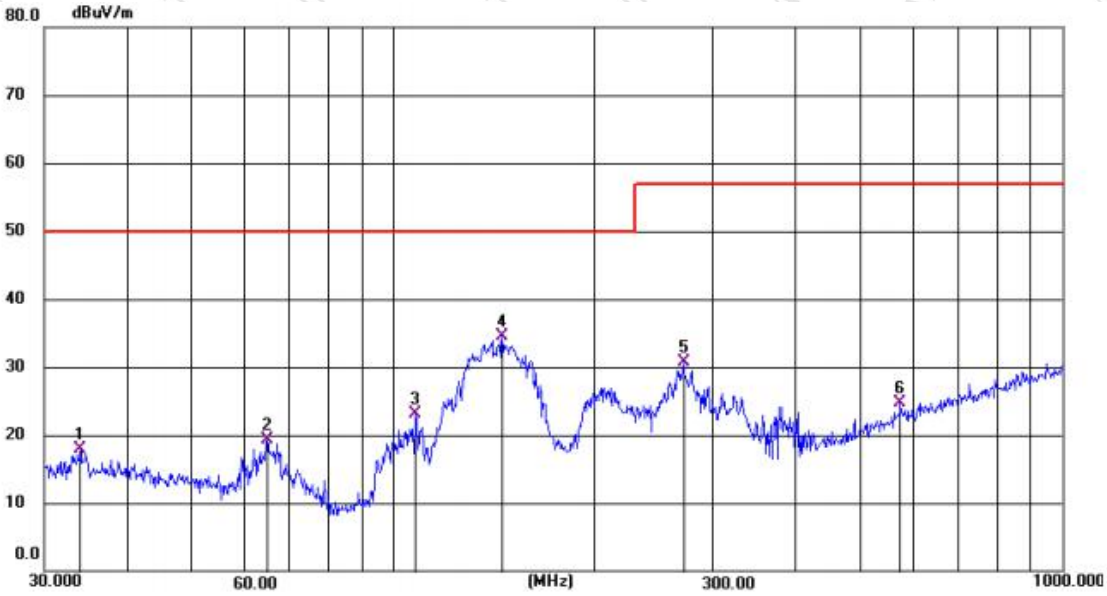
c. For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna’s height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

5.4 Test Results and Data

EUT:	LCD Temperature Controller
M/N:	TBK568
Test Mode:	ON
Ratings:	Input: AC 220V 50Hz
Temperature:	24℃
Humidity:	60%
Atmosphere pressure:	101Kpa
Test Results	Pass

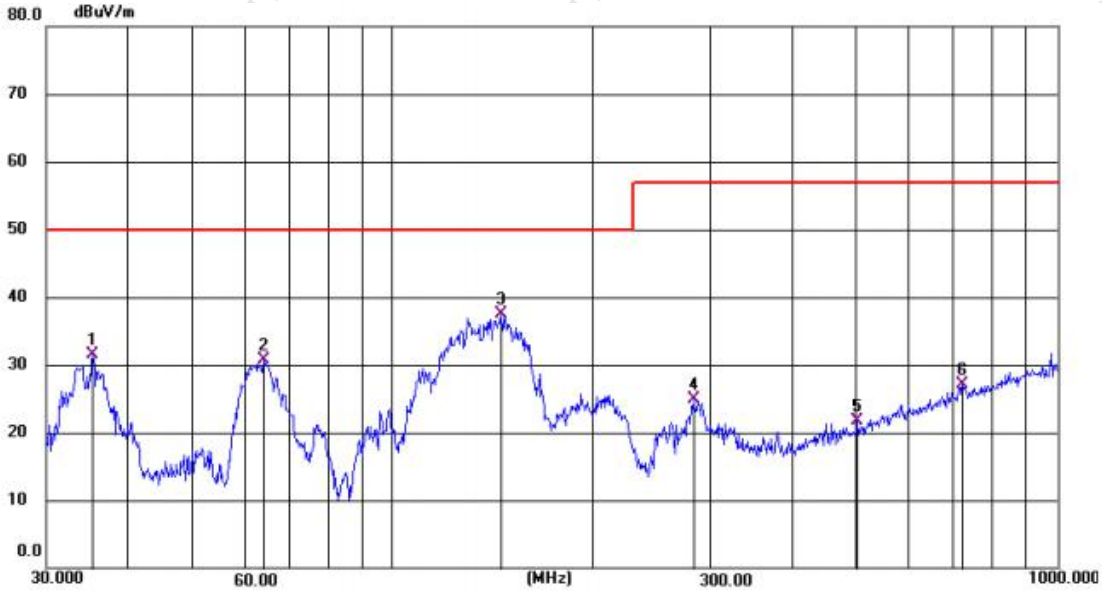
Polarization:Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	34.0363	31.59	-13.68	17.91	50.00	-32.09	QP
2	64.6594	35.91	-16.63	19.28	50.00	-30.72	QP
3	107.8877	41.05	-18.04	23.01	50.00	-26.99	QP
4 *	145.3505	50.01	-15.41	34.60	50.00	-15.40	QP
5	271.3245	46.07	-15.41	30.66	57.00	-26.34	QP
6	572.6144	33.01	-8.23	24.78	57.00	-32.22	QP

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

Polarization:Vertical



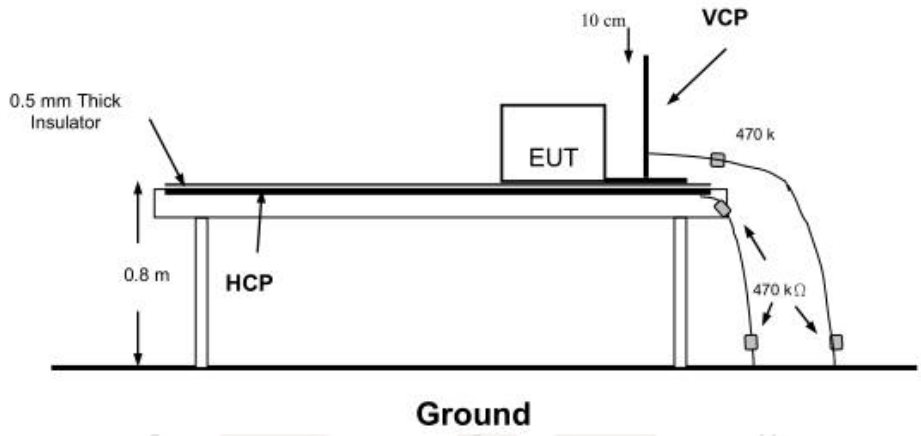
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	35.3750	45.04	-13.63	31.41	50.00	-18.59	QP
2	63.9828	47.20	-16.56	30.64	50.00	-19.36	QP
3 *	145.3506	52.94	-15.41	37.53	50.00	-12.47	QP
4	282.9852	39.84	-14.96	24.88	57.00	-32.12	QP
5	501.1790	31.65	-10.04	21.61	57.00	-35.39	QP
6	721.7259	32.73	-5.72	27.01	57.00	-29.99	QP

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

6 - IMMUNITY TEST

6.1 ELECTROSTATIC DISCHARGE IMMUNITY TEST

6.1.1 Block Diagram of Test Setup



6.1.2 Test Specification

Basic Standard	:	IEC 61000-4-2:2008
Test Port	:	Enclosure port
Discharge Impedance	:	330 ohm / 150 pF
Discharge Mode	:	Single Discharge
Discharge Period	:	one second between each discharge

6.1.3 Test Procedure

6.1.3.1. 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 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.

6.1.3.2. Contact Discharge

All the procedure shall be same as Section 6.1.3.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

6.1.3.3. 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 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.

6.1.3.4. 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

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

6.1.4 Test Results

Electrostatic Discharge	
Basic Standard	IEC 61000-4-2:2008
EUT	LCD Temperature Controller
M/N	TBK568
Test Mode	ON
Temperature:	25℃
Humidity:	55%
Atmosphere pressure:	101Kpa

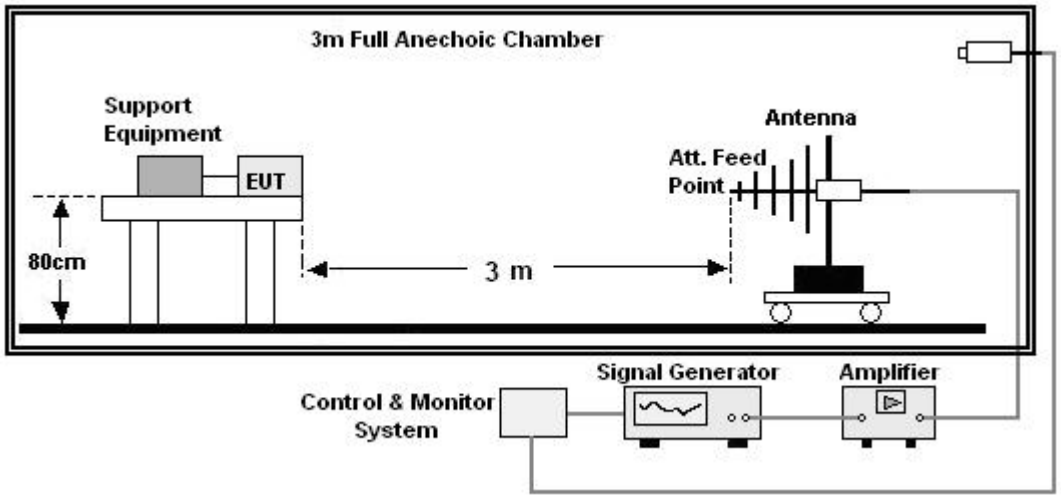
Discharge Method	Discharge Position	Voltage (±kV)	Min. No. of Discharge per polarity (Each Point)	Required Level	Results
Contact Discharge	Conductive Surfaces	2，4	10	B	Pass
	Indirect Discharge HCP	2，4	10	B	Pass
	Indirect Discharge VCP	2，4	10	B	Pass
Air Discharge	Slots, Apertures, and Insulating Surfaces	2，4，8	10	B	Pass

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

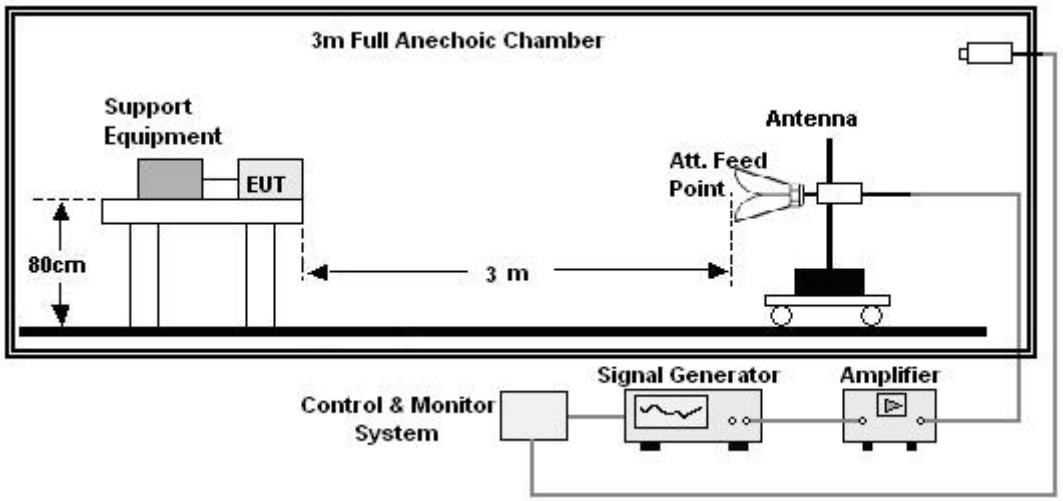
6.2 Radio frequency electromagnetic fields

6.2.1 Block Diagram of Test Setup

80-1000MHz:



1000-6000MHz:



4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

6.2.2 Test Specification

Basic Standard	:	IEC 61000-4-3:2020
Test Port	:	Enclosure port
Step Size	:	1%
Modulation	:	1kHz, 80% AM
Dwell Time	:	1 second
Polarization	:	Horizontal & Vertical

6.2.3 Test Procedure

a. The testing was performed in a fully-anechoic chamber. The transmit antenna was located at a distance of 3 meters from the Product.

b. The frequency range is swept from 80MHz to 1000MHz, with the signal 80% amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed 1.5x 10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1%.

c. The test was performed with the Product exposed to both vertically and horizontally polarized fields on each of the four sides.

6.2.4 Test Results

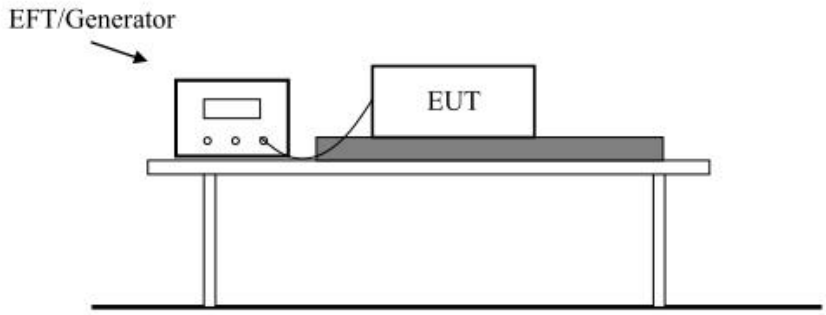
Radio frequency electromagnetic fields	
Basic Standard	IEC 61000-4-3:2020
EUT	LCD Temperature Controller
M/N	TBK568
Test Mode	ON
Temperature:	26℃
Humidity:	55%
Atmosphere pressure:	101Kpa

Frequency (MHz)	Position	Field Strength (V/m)	Required Level	Results
80 - 1000	Front, Right, Back, Left	10	A	Pass
1400-6000	Front, Right, Back, Left	3	A	Pass

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

6.3 ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

6.3.1 Block Diagram of Test Setup



6.3.2 Test Specification

Basic Standard	:	IEC 61000-4-4:2012
Test Port	:	input a.c. / d.c. power port signal lines and control lines
Impulse Frequency	:	5 or 100 kHz
Impulse Wave-shape	:	5/50 ns
Burst Duration	:	15 ms
Burst Period	:	300 ms
Test Duration	:	2 minutes per polarity

6.3.3 Test Procedure

The EUT is put on the table which is 0.8 meter high above the ground. 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.

6.3.3.1. 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 mins.

6.3.3.2. For signal lines and control lines ports:

No I/O ports. It’s unnecessary to test.

6.3.3.3. For DC output line ports:

No DC output ports. It’s unnecessary to test.

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

6.3.4 Test Results

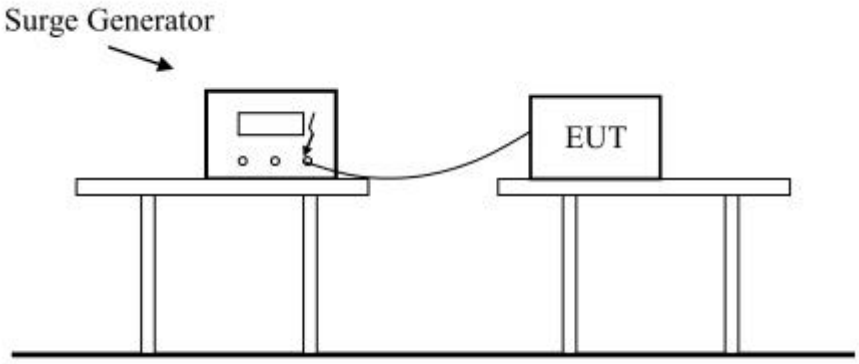
Electrical Fast Transient/Burst	
Basic Standard	IEC 61000-4-4:2012
EUT	LCD Temperature Controller
M/N	TBK568
Test Mode	ON
Temperature:	24℃
Humidity:	60%
Atmosphere pressure:	101Kpa

Line	Test Voltage	Polarity	Required Level	Results
L+N+PE	2kv	±	B	Pass

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

6.4 SURGE IMMUNITY TEST

6.4.1Block Diagram of Test Setup



6.4.2 Test Specification

Basic Standard	IEC 61000-4-5:2014+AMD1:2017
Test Port	input a.c. power port
Wave-Shape	Open Circuit Voltage - 1.2 / 50 us Short Circuit Current - 8 / 20 us
Pulse Repetition Rate	1 pulse / min.
Test Events	Five positive polarity pulses and five negative polarity pulses

6.4.3 Test Procedure

6.4.3.1. Set up the EUT and test generator as shown on Section 6.4.1.

6.4.3.2. For line to line coupling mode, provide a 1.0 KV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.

6.4.3.3. At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test

6.4.3.4. Different phase angles are done individually.

6.4.3.5. Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

6.4.4 Test Results

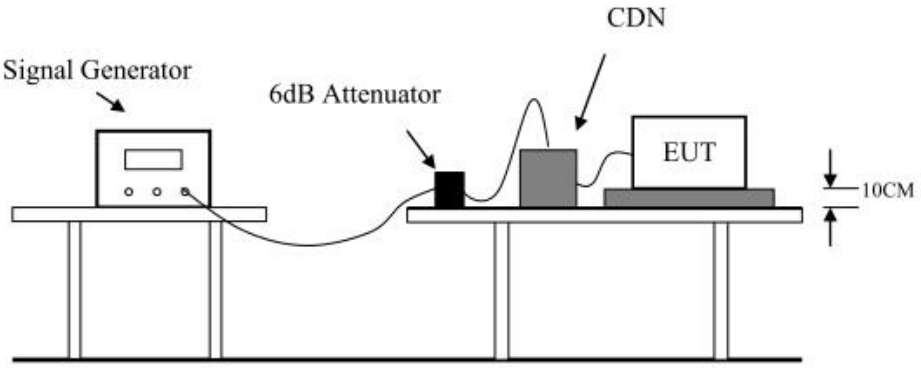
SURGE IMMUNITY	
Basic Standard	IEC 61000-4-5:2014+AMD1:2017
EUT	LCD Temperature Controller
M/N	TBK568
Test Mode	ON
Temperature:	24℃
Humidity:	60%
Atmosphere pressure:	101Kpa

Coupling Line	Voltage (kV)	Phase Angle	Required Level	Results
L - N	±1	0° ,90° ,180° ,270°	B	Pass
L - PE	±2	0° ,90° ,180° ,270°	B	Pass
N - PE	±2	0° ,90° ,180° ,270°	B	Pass

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

6.5 INJECTED CURRENTS SUSCEPTIBILITY TEST

6.5.1 Block Diagram of Test Setup



6.5.2 Test Specification

Basic Standard	:	IEC 61000-4-6:2013
Test Port	:	input a.c. / d.c. power port signal lines and control lines
Step Size	:	1%
Modulation	:	1kHz,80% AM
Dwell Time	:	1 second

6.5.3 Test Procedure

6.5.3.1. Set up the EUT, CDN and test generators as shown on Section 6.5.1.

6.5.3.2. Let the EUT work in test mode and measure it.

6.5.3.3. The EUT 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 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).

6.5.3.4. The disturbance signal described below is injected to EUT through CDN.

6.5.3.5. The EUT operates within its operational mode(s) under intended climatic conditions after power on.

6.5.3.6. The frequency range is swept from 150kHz to 230MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1kHz sine wave.

6.5.3.7. 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.

6.5.3.8. Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

6.5.4 Test Results

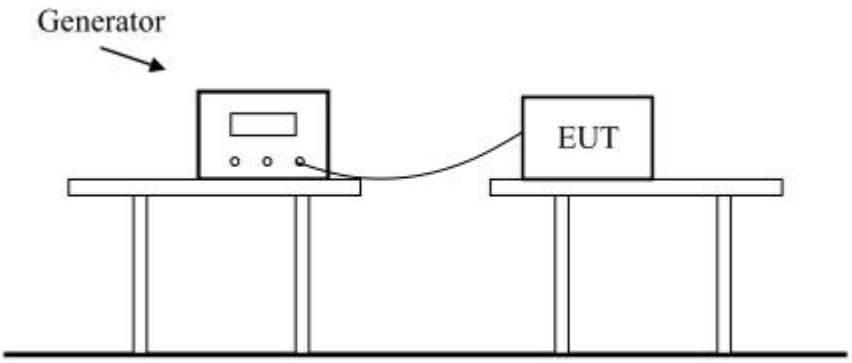
INJECTED CURRENTS SUSCEPTIBILITY	
Basic Standard	IEC 61000-4-6:2013
EUT	LCD Temperature Controller
M/N	TBK568
Test Mode	ON
Temperature:	24℃
Humidity:	58%
Atmosphere pressure:	101Kpa

Frequency Range (MHz)	Injected Position	Strength (Non-modulated)	Required Level	Results
0.15 ~ 80	AC Mains	10V r.m.s.	A	PASS
Remark:1. Modulation Signal:1kHz 80% AM				

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

6.6 VOLTAGE DIPS AND INTERRUPTIONS TEST

6.6.1 Block Diagram of Test Setup



6.6.2 Test Specification

Basic Standard	:	IEC 61000-4-11:2020
Test Port	:	input a.c. power port
Phase Angle	:	0°, 180°

6.6.3 Test Procedure

6.6.3.1. Set up the EUT and test generator as shown on Section 6.6.1.

6.6.3.2. The interruptions is introduced at selected phase angles with specified duration.

6.6.3.3. Record any degradation of performance.

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

6.6.4 Test Results

VOLTAGE DIPS AND INTERRUPTIONS	
Basic Standard	IEC 61000-4-11:2020
EUT	LCD Temperature Controller
M/N	TBK568
Test Mode	ON
Temperature:	24℃
Humidity:	60%
Atmosphere pressure:	101Kpa

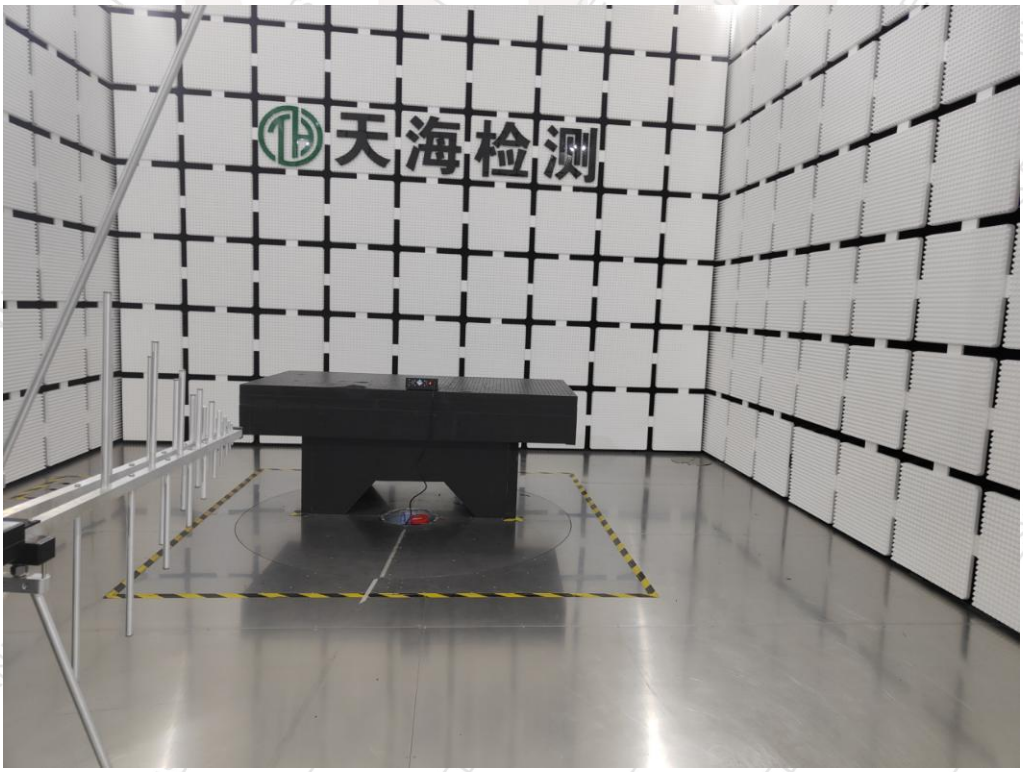
Test Level % U_T	Voltage dips in % U_T	Duration (cycles)		Required Level	Results
		50Hz	60Hz		
0	100	1	1	B	Pass
40	60	10	12	C	Pass
70	30	25	30	C	Pass
0	100	250	300	C	Pass

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

APPENDIX A - TEST SETUP PHOTOGRAPHS

Setup for Conducted Emission

Setup for Radiated Emission



4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

Setup for Electrostatic Discharge

Setup for Radio Frequency Electromagnetic Fields

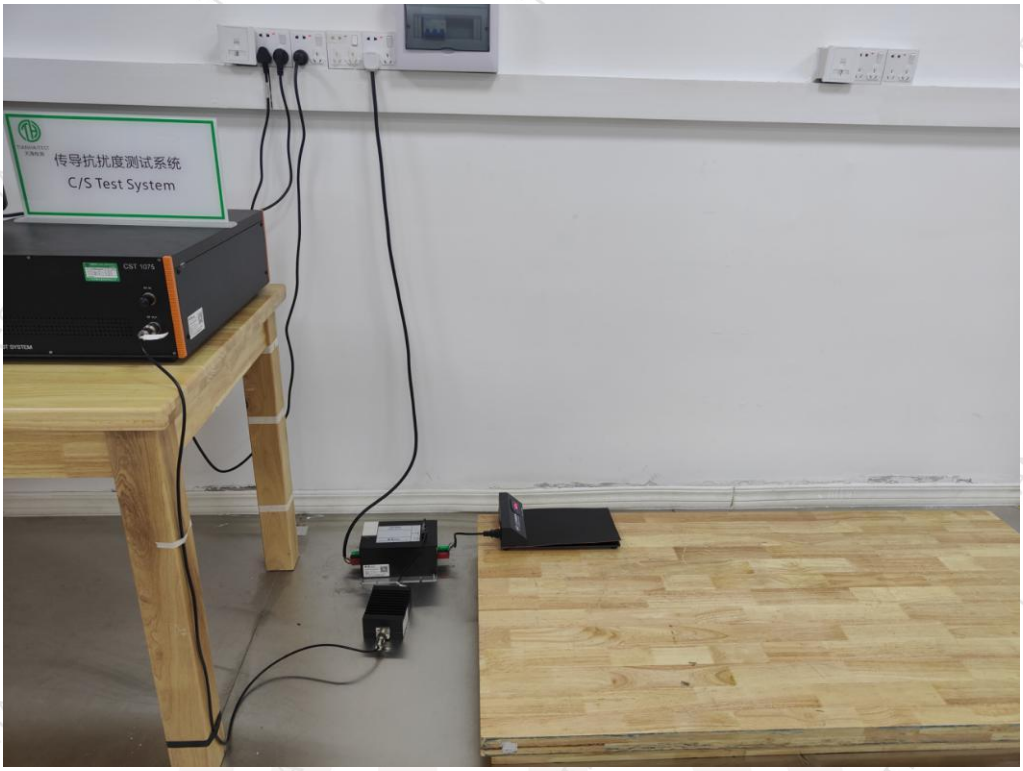
4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

Setup for Electrical Fast Transient/Burst

Setup for Surge

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

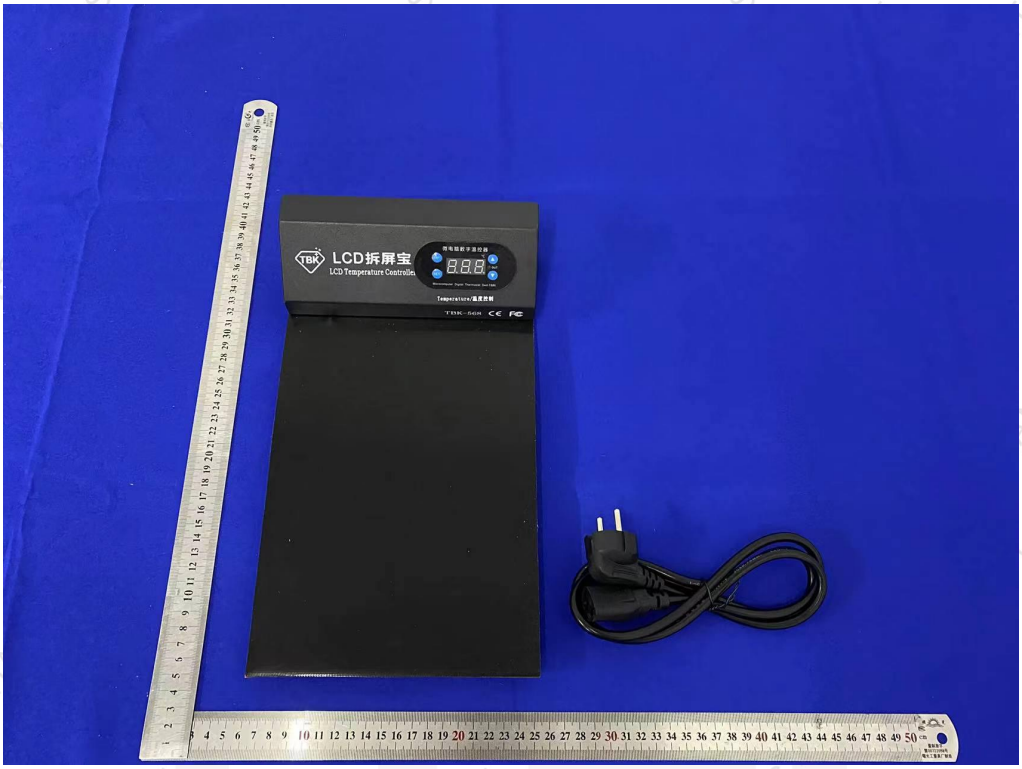
Setup for Injected Currents Susceptibility

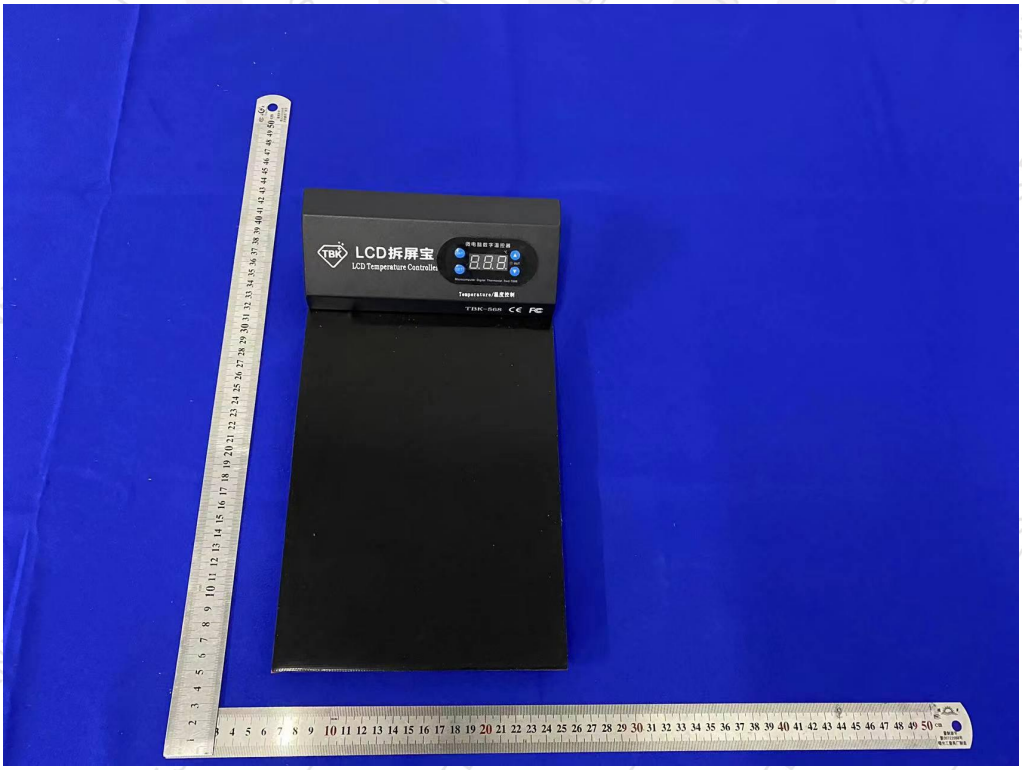


Setup for Voltage Dips And Interruptions

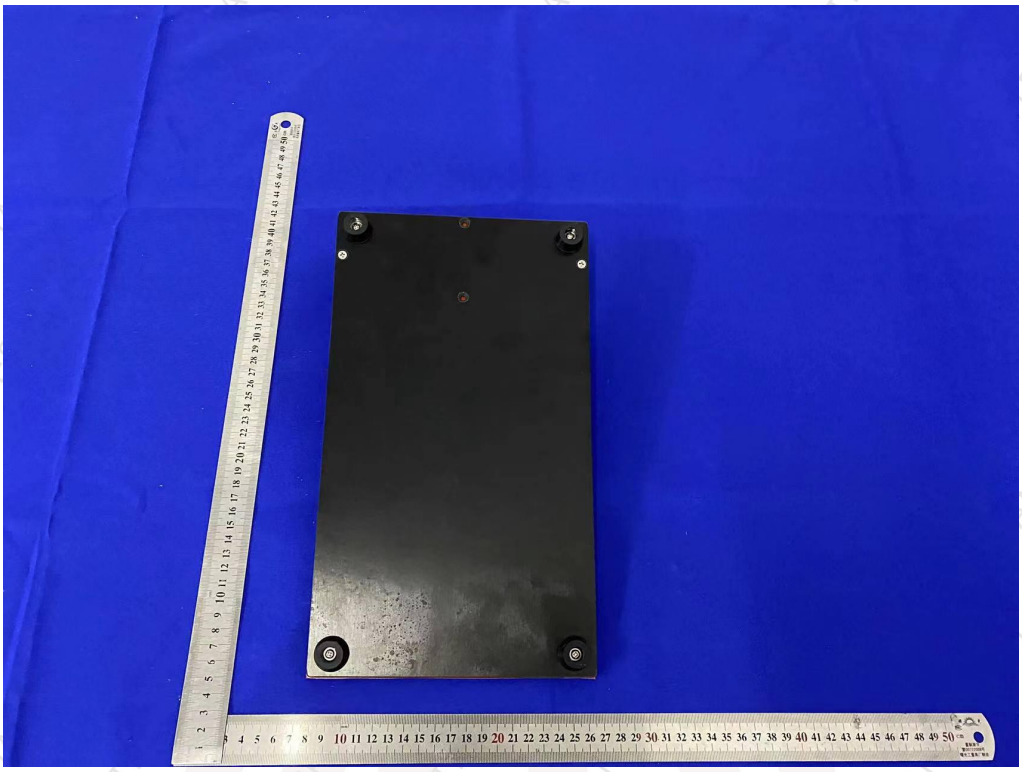
4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com

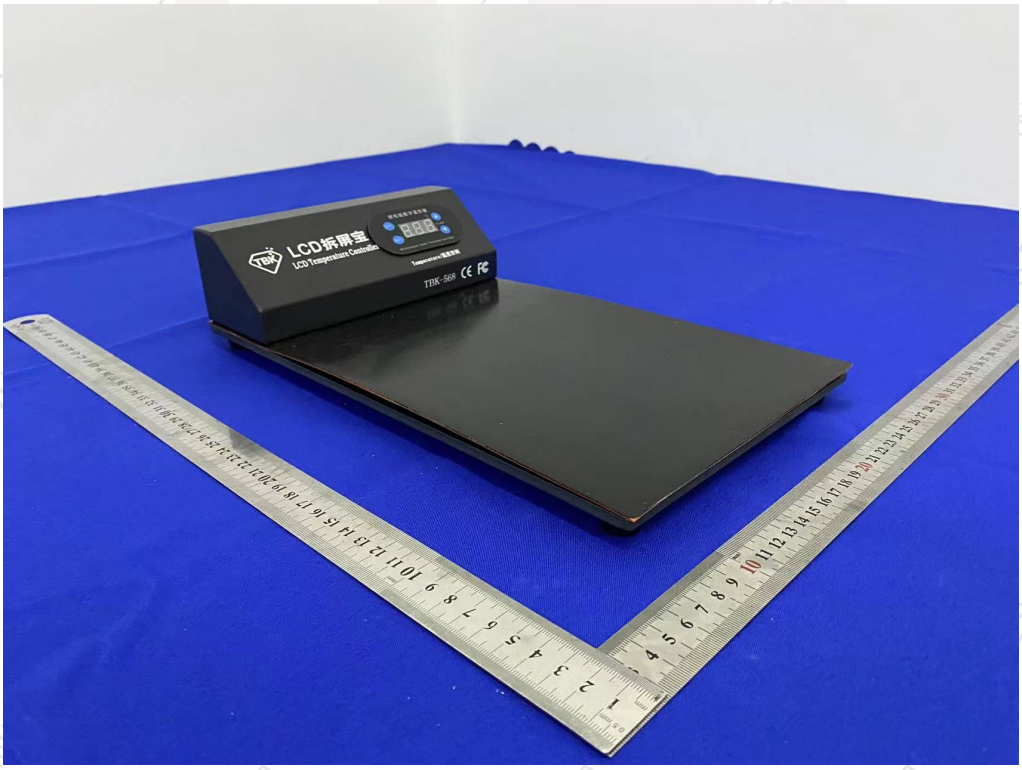
APPENDIX B - EUT PHOTOGRAPHS



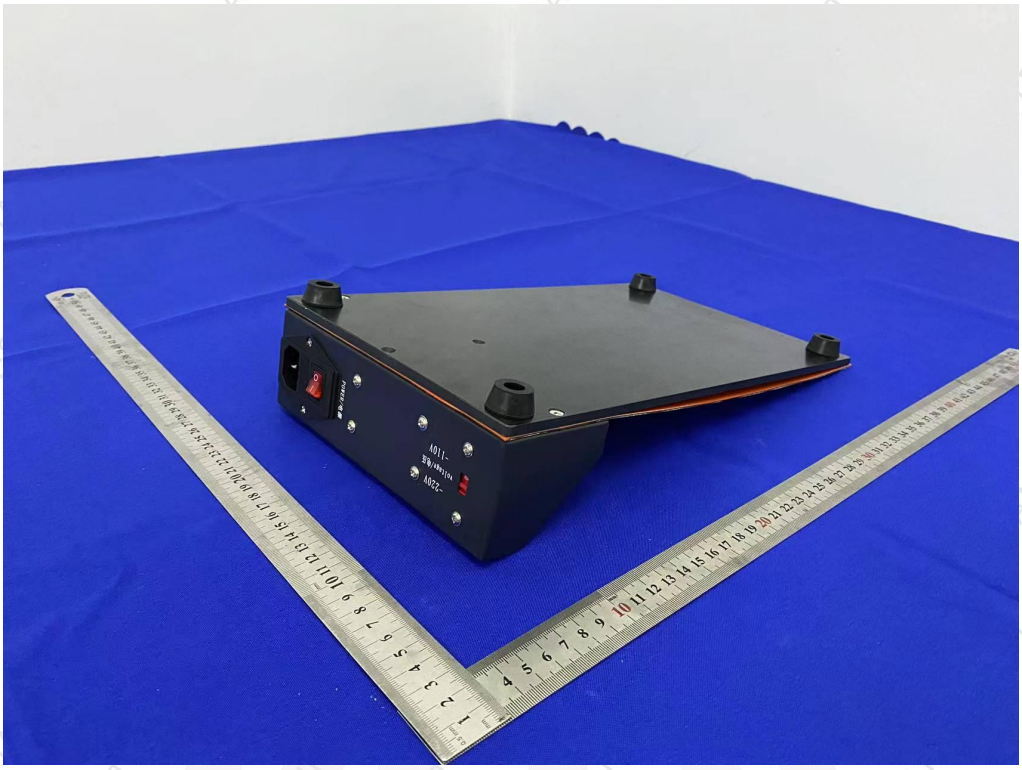


4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com





4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com



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

4F,A3 BLDG,The Silicon Valley Power intelligent terminal industrial park,Guan lan street,Longhua district,Shenzhen
Tel:+86-755-86615100 Fax:+86-755-86615105 http://www.tianhaitest.com