EMC TEST REPORT
For

jiangsu relax sanitary ware co.,ltd

Hot tub

Model No.: RL-6016
Additional Model No.: RL-6011, RL-6012, RL-6013, Rl-6014, RL-6015, RL-J200, RL-J215, RL-J225, RL-J235, RL-J300, RL-J315, RL-J325, RL-J335, RL-J345, RL-J355, RL-J365, RL-J400, RL-J415, RL-J425, RL-J435, RL-J445, RL-J455, RL-J465, RL-J500, RL-J515, RL-J525, Rl-J535, RL-J545, RL-J555, RL-J565, RL-J700, RL-J715, Rl-J725, RL-J735, RL-J745, RL-J755, RL-J765, RL-Series

Prepared for	:	jiangsu relax sanitary ware co.,ltd
Address	:	NO.76 GOLDEN BATAN STREET, BATAN PRIVATE PIONEER PARK, BATAN TOWN, BINHAI CITY, YANCHENG CITY, JIANGSU PROVINCE, CHINA
Prepared by	:	Zhongshan LCS Compliance Testing Laboratory Ltd.
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Mail	:	webmaster@LCS-cert.com
Date of receipt of test sample	:	December 10, 2019
Number of tested samples	:	1
Serial number	:	Prototype
Date of Test	:	December 13, 2019
Date of Report	:	December 25, 2019

CE

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EMC TEST REPORT

EN 55014-1: 2017

Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission

EN 55014-2: 2015

Requirements for household appliances, electric tools and similar apparatus -- Part 2: Immunity - Product family standard

Report Reference No. .....:	**LCS191129006DE**
Date Of Issue.....:	December 25, 2019
Testing Laboratory Name .....:	**Zhongshan LCS Compliance Testing Laboratory Ltd.**
Address.....:	23F, Building A, Zhongshan Harbor of iDEAS, No. 25 Gangyi Road, Torch Development Zone, Zhongshan, Guangdong, China
RF Field Strength Susceptibility Testing Laboratory Name .....:	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address.....:	1F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue., Bao'an District, Shenzhen, Guangdong, China
Testing Location/ Procedure .....:	Full application of Harmonised standards ■ Partial application of Harmonised standards ☐ Other standard testing method ☐
Applicant's Name.....:	**jiangsu relax sanitary ware co.,ltd**
Address.....:	NO.76 GOLDEN BATAN STREET, BATAN PRIVATE PIONEER PARK, BATAN TOWN, BINHAI CITY, YANCHENG CITY, JIANGSU PROVINCE, CHINA
Test Specification:	
Standard .....:	EN 55014-1: 2017 EN 55014-2: 2015 EN 61000-3-2: 2014 EN 61000-3-3: 2013
Test Report Form No. .....:	GLCSEMC-1.0
TRF Originator.....:	Zhongshan LCS Compliance Testing Laboratory Ltd.
Master TRF .....:	Dated 2017-08

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Test Item Description.....:	**Hot tub**
Trade Mark.....:	RELAX
Model/ Type Reference.....:	RL-6016
Ratings .....:	220-240V~, 50/60Hz, 7500W, 34A
Result .....:	Positive

Compiled by:	Supervised by:	Approved by:
Evan Cao	Feng Zhang	Andy Yang
Evan Cao/ File administrators	Feng Zhang / Technique principal	Andy Yang / Manager

EMC -- TEST REPORT

Test Report No. : LCS191129006DE	December 25, 2019 Date of issue

Type / Model.....	: RL-6016
EUT.....	: Hot tub
Applicant.....	**: jiangsu relax sanitary ware co.,ltd**
Address.....	: NO.76 GOLDEN BATAN STREET, BATAN PRIVATE PIONEER PARK, BATAN TOWN, BINHAI CITY, YANCHENG CITY, JIANGSU PROVINCE, CHINA
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: jiangsu relax sanitary ware co.,ltd**
Address.....	: NO.76 GOLDEN BATAN STREET, BATAN PRIVATE PIONEER PARK, BATAN TOWN, BINHAI CITY, YANCHENG CITY, JIANGSU PROVINCE, CHINA
Telephone.....	: /
Fax.....	: /
Factory.....	**: jiangsu relax sanitary ware co.,ltd**
Address.....	: NO.76 GOLDEN BATAN STREET, BATAN PRIVATE PIONEER PARK, BATAN TOWN, BINHAI CITY, YANCHENG CITY, JIANGSU PROVINCE, CHINA
Telephone.....	: /
Fax.....	: /

Test Result according to the standards on page 8:	**Positive**

The test report merely corresponds to the test sample.
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Revision History

Revision	Issue Date	Revisions	Revised By
000	December 25, 2019	Initial Issue	Andy Yang

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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 (EN 55014-1: 2017)			
Description of Test Item	**Standard**	**Limits**	**Results**
Conducted disturbance at mains terminals	EN 55014-1: 2017	--------	PASS
Clicks measurement	EN 55014-1: 2017	--------	PASS
Disturbance Power	EN 55014-1: 2017	--------	PASS
Radiated disturbance	EN 55014-1: 2017	--------	N/A
Harmonic current emissions	EN 61000-3-2: 2014	Class A	PASS
Voltage fluctuations & flicker	EN 61000-3-3: 2013	--------	PASS

IMMUNITY (EN 55014-2: 2015)			
Description of Test Item	**Basic Standard**	**Performance Criteria**	**Results**
Electrostatic discharge (ESD)	EN 61000-4-2: 2009	B	PASS
Radio-frequency, Continuous radiated disturbance	EN 61000-4-3: 2006+A1: 2009	A	PASS
Electrical fast transient (EFT)	EN 61000-4-4: 2012	B	PASS
Surge (Input a.c. power ports)	EN 61000-4-5:2014+A1:2017	B	PASS
Radio-frequency, Continuous conducted disturbance	EN 61000-4-6: 2014	A	PASS
Power frequency magnetic field	EN 61000-4-8: 2010	A	N/A
Voltage dips, 60% reduction	EN 61000-4-11: 2004+A1: 2017	C	PASS
Voltage dips, 30% reduction		C	PASS
Voltage interruptions		C	PASS
N/A is an abbreviation for Not Applicable.			

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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.

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2. GENERAL INFORMATION

2.1.Description of Device (EUT)

EUT	:	Hot tub
Trade Mark	:	RELAX
Model Number	:	RL-6016
Power Supply	:	220-240V~, 50/60Hz, 7500W, 34A
EUT Clock Frequency	:	⩽15MHz

2.2.Statement of the measurement uncertainty

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 “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.

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2.3.Measurement Uncertainty

Test Item	Frequency Range	Expanded uncertainty (Ulab)	Expanded uncertainty (Ucispr)
Conducted Emission	Level accuracy (9kHz to 150kHz) (150kHz to 30MHz)	2.6 dB 2.4 dB	4.0 dB 3.6 dB
Power disturbance	Level accuracy (30MHz to 300MHz)	2.9dB	4.5 dB
Radiated Emission	Level accuracy (30MHz to 1000MHz)	3.5 dB	5.2 dB
Mains Harmonic	Voltage	0.51%	N/A
Voltage Fluctuations & Flicker	Voltage	0.51%	N/A

(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%.

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3. MEASURING DEVICES AND TEST EQUIPMENT

3.1.Conducted Disturbance

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	ROHDE & SCHWARZ	ESR3	102312	2019.06.11
2	10dB Attenuator	SCHWARZBECK	MTS-IMP136	61115-001-0032	2019.01.29
3	Artificial Mains Network	ROHDE & SCHWARZ	ESH2-Z5	100030	2019.01.29
4	EMI Test Software	Farad	EZ-EMC	/	/

3.2.Disturbance Power

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	EMI Test Receiver	ROHDE & SCHWARZ	ESR3	102312	2019.06.11
2	Absorbing clamp	Com-Power	CLA-050	431060	2019.02.19
3	EMI Test Software	Farad	EZ-EMC	/	/
4	6dB Attenuator	/	/	/	2019.01.29

3.3.Radiated Disturbance (Electric Field)

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	3m Semi Anechoic Chamber	Mao Rui	/	/	2018.02.03
2	EMI Test Receiver	ROHDE & SCHWARZ	ESR 3	102311	2019.06.11
3	Biconical Antenna	ROHDE & SCHWARZ	VHBB 9124	01015	2019.08.21
4	Log Periodic Broadband Antenna	ROHDE & SCHWARZ	VULP 9118B	873	2019.08.21
5	EMI Test Software	Farad	EZ-EMC	/	/

3.4.Harmonic Current

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Power Analyzer Test System	Voltech	PM6000	20000670053	2019.06.17

3.5.Voltage fluctuation and Flicker

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Power Analyzer Test System	Voltech	PM6000	20000670053	2019.06.17

3.6.Electrostatic Discharge

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	ESD Simulator	Teseq	NSG437	1211	2019.06.12

3.7.RF Field Strength Susceptibility

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	SIGNAL GENERATOR	R&S	SMB100A	105942	2019.09.13
2	Log-periodic Antenna	SCHWARZBECK	STLP9128D	043	2019.09.13
3	RF Power Amplifier	BONN Elektronik	BLWA0830-	128740	2019.09.13

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			160/100/40D		
4	Power Meter	R&S	102031	16829	2019.09.13

3.8.Electrical Fast Transient/Burst

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Immunity tester	EMC-Partner	Transient 2000	584	2019.02.19

3.9.Surge

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Immunity tester	EMC-Partner	Transient 2000	584	2019.02.19

3.10.Conducted Susceptibility

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Simulator	FRANKONIA	CIT-10	A126A1195	2019.06.17
2	CDN	FRANKONIA	CDN-M2	5100100100	2019.06.17
3	CDN	FRANKONIA	CDN-M3	0900-11	2019.06.17
4	Attenuator	FRANKONIA	ATT6	0010222A	2019.06.17
5	Infuse tongs	EMTEST	EM-Clamp	0513A031201	2019.06.17

3.11.Voltage Dips

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Immunity tester	EMC-Partner	Transient 2000	584	2019.02.19

3.12.Voltage Short Interruptions

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.
1	Immunity tester	EMC-Partner	Transient 2000	584	2019.02.19

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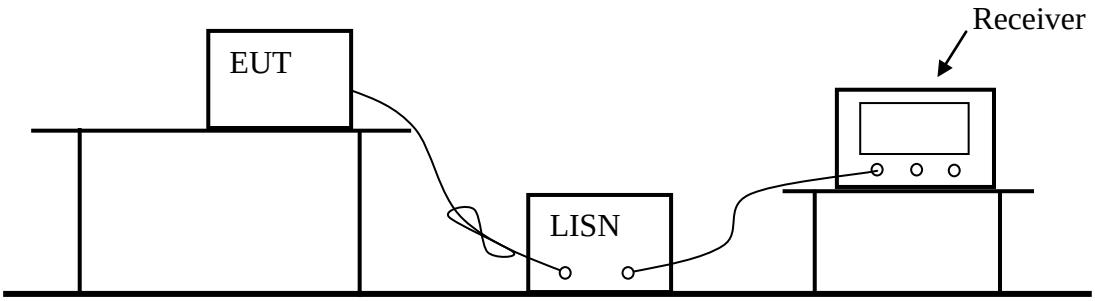
4. POWER LINE CONDUCTED EMISSION MEASUREMENT

4.1.Block Diagram of Test Setup



Ground

4.2.Power Line Conducted Emission Limits

Frequency (MHz)	Limit (dBμV)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0 ~ 56.0 *	59.0 ~ 46.0 *
0.50 ~ 5.00	56.0	46.0
5.00 ~ 30.00	60.0	50.0

Remark: * means decreasing linearly with logarithm of frequency.

4.3.EUT Configuration on Test

The configuration of EUT is same as Section 4.1.

4.4.Operating Condition of EUT

4.4.1.Setup the EUT as shown on Section 4.1.

4.4.2.Turn on the power of all equipments.

4.4.3.Let the EUT work in measuring mode (work) and measure it.

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4.5.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 55014-1 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.

4.6.Test Results

PASS.

The frequency range 150kHz to 30MHz is investigated.

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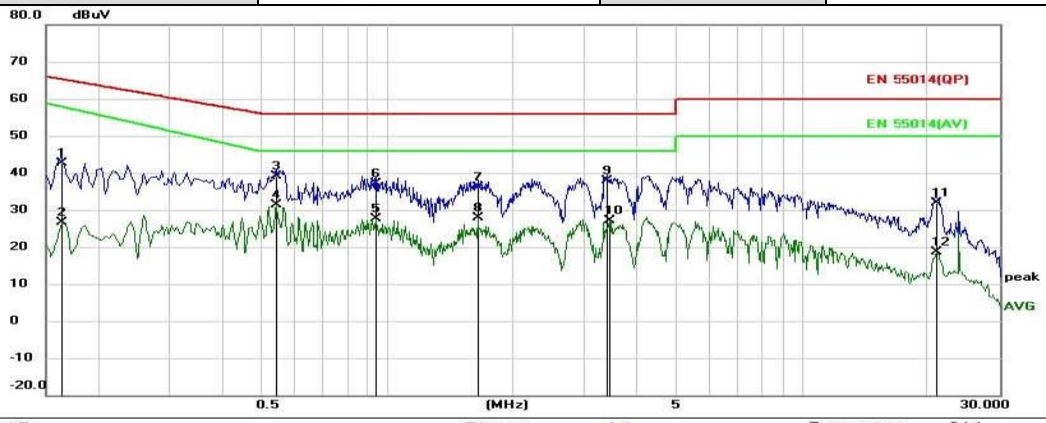
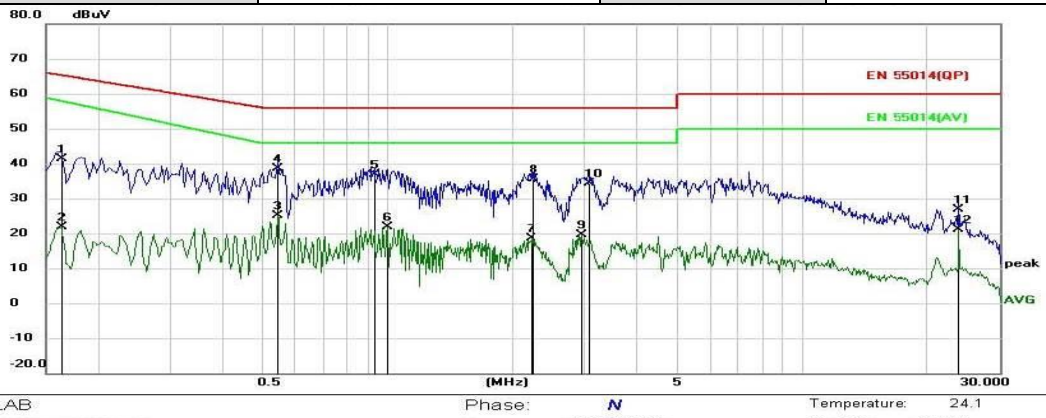
Model No.	RL-6016	Test Mode	work
Environmental Conditions	24.1℃ 58.0% RH	Test Engineer	Feng Zhang
Pol	Line		



Site LAB Phase: L1 Temperature: 24.1
Limit: EN 55014(QP) Power: AC230V/50Hz Humidity: 58.0 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1635	32.58	10.01	42.59	65.28	-22.69	QP	
2		0.1635	16.63	10.01	26.64	58.07	-31.43	AVG	
3		0.5414	28.86	10.22	39.08	56.00	-16.92	QP	
4	*	0.5414	21.23	10.22	31.45	46.00	-14.55	AVG	
5		0.9419	17.22	10.32	27.54	46.00	-18.46	AVG	
6		0.9420	26.72	10.32	37.04	56.00	-18.96	QP	
7		1.6484	25.84	10.23	36.07	56.00	-19.93	QP	
8		1.6484	17.63	10.23	27.86	46.00	-18.14	AVG	
9		3.3945	27.38	10.52	37.90	56.00	-18.10	QP	
10		3.4530	16.63	10.58	27.21	46.00	-18.79	AVG	
11		21.1965	21.65	10.25	31.90	60.00	-28.10	QP	
12		21.1965	8.40	10.25	18.65	50.00	-31.35	AVG	

Model No.	RL-6016	Test Mode	work
Environmental Conditions	24.1℃ 58.0% RH	Test Engineer	Feng Zhang
Pol	Neutral		



Site LAB Phase: N Temperature: 24.1
Limit: EN 55014(QP) Power: AC230V/50Hz Humidity: 58.0 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1635	31.47	10.00	41.47	65.28	-23.81	QP	
2		0.1635	11.80	10.00	21.80	58.07	-36.27	AVG	
3		0.5459	14.88	10.21	25.09	46.00	-20.91	AVG	
4	*	0.5460	28.53	10.21	38.74	56.00	-17.26	QP	
5		0.9329	26.63	10.31	36.94	56.00	-19.06	QP	
6		1.0004	11.51	10.32	21.83	46.00	-24.17	AVG	
7		2.2468	8.32	10.23	18.55	46.00	-27.45	AVG	
8		2.2559	25.41	10.23	35.64	56.00	-20.36	QP	
9		2.9580	9.51	10.16	19.67	46.00	-26.33	AVG	
10		3.0750	24.32	10.15	34.47	56.00	-21.53	QP	
11		24.0000	16.47	10.41	26.88	60.00	-33.12	QP	
12		24.0000	10.68	10.41	21.09	50.00	-28.91	AVG	

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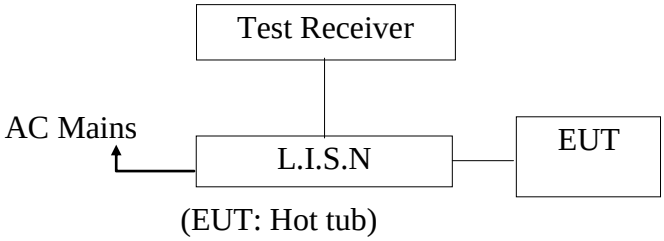
5. CLICKS MEASUREMENT

5.1.Block Diagram of Test Setup



(EUT: Hot tub)

5.2.Clicks Measurement Standard and limit

5.2.1.Test Standard

EN 55014-1: 2017

5.2.2.Test Limit

According to standard EN 55014-1, if click rate (N) less 5/min and the time of this discontinuous disturbances does not exceed 10ms, then the limit value are omitted.

5.3.EUT Configuration on Test

The configuration of EUT is same as Section 3.1.

5.4.Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 4.4, except the test set up replaced by Section 5.1.

5.5.Test Procedure

This test is done when switch operations in thermostatically controlled appliances, automatic program controlled machines and other electrically controlled or operated appliances may generate discontinuous disturbance (Click). The measurement of disturbance shall be performed at the following restricted number of frequencies: 150kHz, 500kHz, 1.4MHz and 30MHz. At each frequency, for appliances which stop automatically, duration of the minimum number of complete programs necessary to produce 40 counted clicks or, where relevant, 40 counted clicks have not been produced, the test is stopped at the end of the program in course. The relevant click rate N. The appliance under test shall be deemed to comply with the limit if not more than a quarter of the number of the counted click registered during the observation time.

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5.6.Test Results

PASS.

The click rate (N=1/2.1=0.48<5) of the EUT is less than 5/min and the time of this discontinuous disturbances (△T=4ms<10ms) does not exceed 10ms.According to EN 55014-1, the limit values are omitted.

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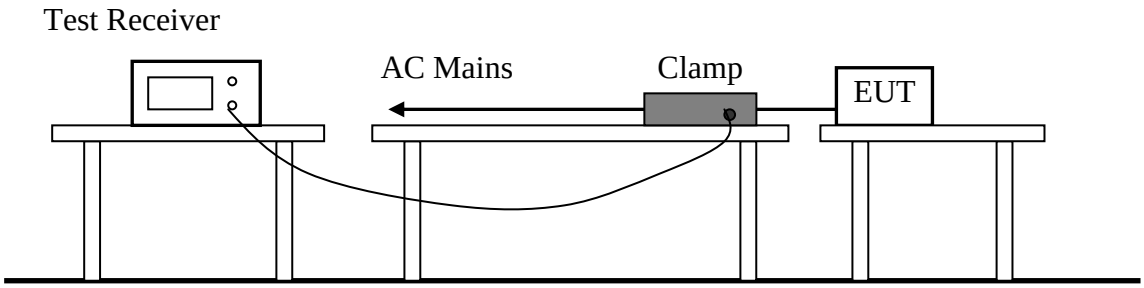
6. DISTURBANCE POWER MEASUREMENT

6.1.Block Diagram of Test Setup



6.2.Test Standard

EN 55014-1: 2017

6.3.Disturbance Power Limits

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

Frequency MHz	Limits dB(pW)	
	Quasi-peak Value	Average Value
30 ~ 300	45 Increasing Linearly with Frequency to 55	35 Increasing Linearly with Frequency to 45

	Household and similar appliances		Tools					
1	2	3	4	5	6	7	8	9
Frequency range			Rated motor power not exceeding 700 W		Rated motor power above 700 W and not exceeding 1000 W		Rated motor power above 1000 W	
(MHz)	dB (pW) Quasi-peak	dB (pW) Average	dB (pW) Quasi-peak	dB (pW) Average	dB (pW) Quasi-peak	dB (pW) Average	dB (pW) Quasi-peak	dB (pW) Average
Increasing linearly with the frequency from:								
200 to 300	0 to 10 dB	-	0 to 10 dB	-	0 to 10 dB	-	0 to 10 dB	-

NOTE 1 This table only applies if specified in 4.1.2.3.2.
NOTE 2 The measured result at a particular frequency shall be less than the relevant limit minus the corresponding margin (at that frequency).

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6.4.EUT Configuration on Test

The configuration of EUT is same as Section 3.2.

6.5.Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 4.4, except the test set up replaced by Section 6.1.

6.6.Test Procedure

The EUT is placed on the plane 0.8m high above the ground by insulating support and away from other metallic surface at least 0.4m. It is connected to the power mains through an extension cord of 6m min. The absorber clamp clamps the cord and moves from the far end to the EUT to measure the disturbing energy emitted from the cord.

The bandwidth of the field strength meter is set at 120kHz.

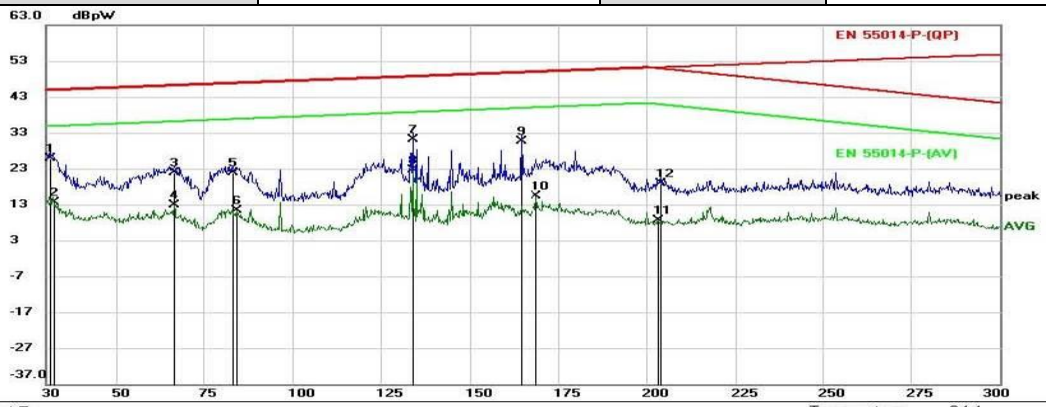
All the test results are listed in Section 6.7.

6.7.Test Results

PASS.

The frequency range 150kHz to 30MHz is investigated.

Model No.	RL-6016	**Test Mode**	work
Environmental Conditions	24.1℃ 58.0％ RH	**Test Engineer**	Feng Zhang
Pol	/		



Site LAB
Limit: EN 55014-P-(QP)
Temperature: 24.1
Humidity: 58.0 %

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Position	
		MHz	dBpW	dB	dBpW	dBpW	dB	Detector	cm	Comment
1		31.0800	-2.03	27.87	25.84	45.04	-19.20	QP		
2		32.4300	-14.23	27.84	13.61	35.09	-21.48	AVG		
3		66.4500	-4.30	26.28	21.98	46.35	-24.37	QP		
4		66.4500	-13.42	26.28	12.86	36.35	-23.49	AVG		
5		83.1900	-3.53	25.32	21.79	46.97	-25.18	QP		
6		84.0000	-13.82	25.27	11.45	37.00	-25.55	AVG		
7		133.6799	5.21	25.87	31.08	48.84	-17.76	QP		
8	*	133.6799	-3.29	25.87	22.58	38.84	-16.26	AVG		
9		164.4600	4.01	26.64	30.65	49.98	-19.33	QP		
10		168.7800	-11.21	26.71	15.50	40.14	-24.64	AVG		
11		203.3400	-16.69	25.21	8.52	40.97	-32.45	AVG		
12		203.8800	-6.22	25.19	18.97	50.91	-31.94	QP		

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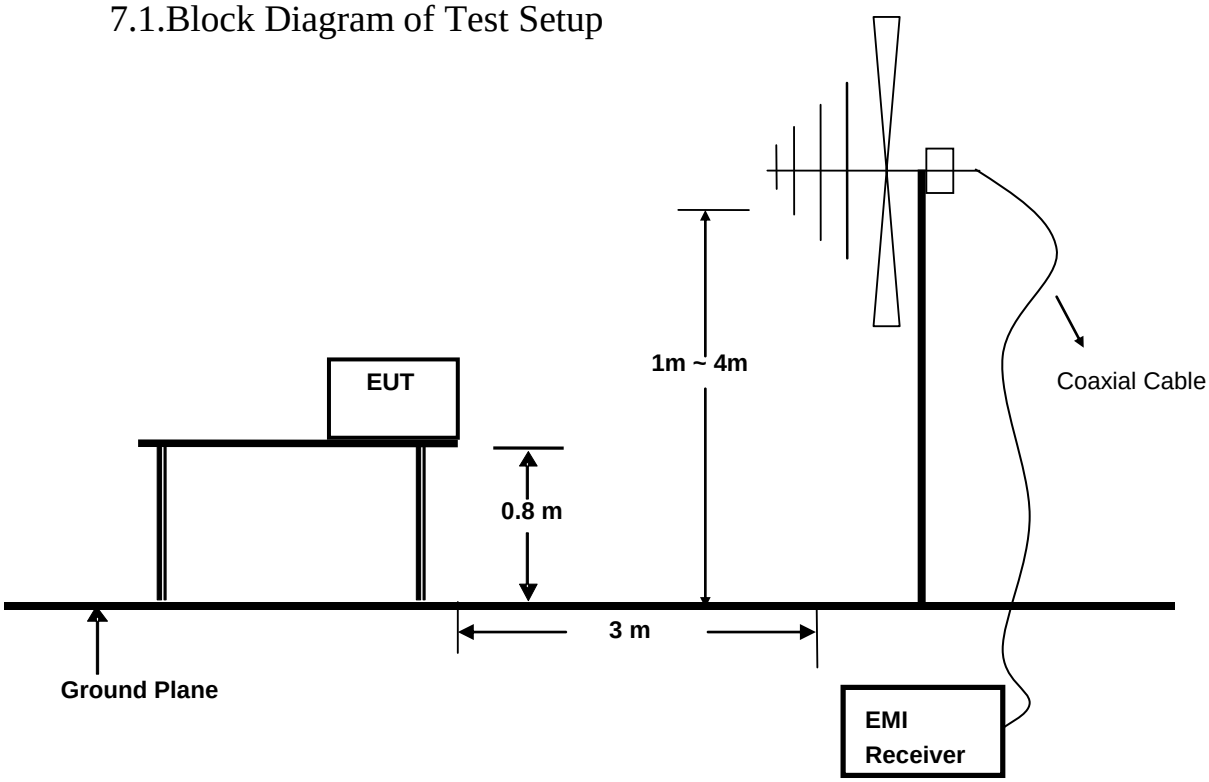
7. RADIATED EMISSION MEASUREMENT

7.1.Block Diagram of Test Setup



7.2.Test Standard

EN 55014-1: 2017

7.3.Radiated Emission Limits

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

FREQUENCY (MHz)	DISTANCE (Meters)	FIELD STRENGTHS LIMIT (dBμV/m)
30 ~ 230	3	40
230 ~ 1000	3	47

Note:
(1) The smaller limit shall apply at the combination point between two frequency bands.
(2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the EUT.

7.4.EUT Configuration on Test

The configuration of EUT is same as Section 3.3.

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7.5.Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 4.4, except the test set up replaced by Section 7.1.

7.6.Test Procedure

The EUT is placed on a turntable, which is 0.8 meter high above the ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. By-log antenna (calibrated by Dipole Antenna) is used as a receiving antenna. Both horizontal and vertical polarization of the antenna is set on test.

The bandwidth of the Receiver is set at 120kHz.

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

7.7.Test Results

N/A.

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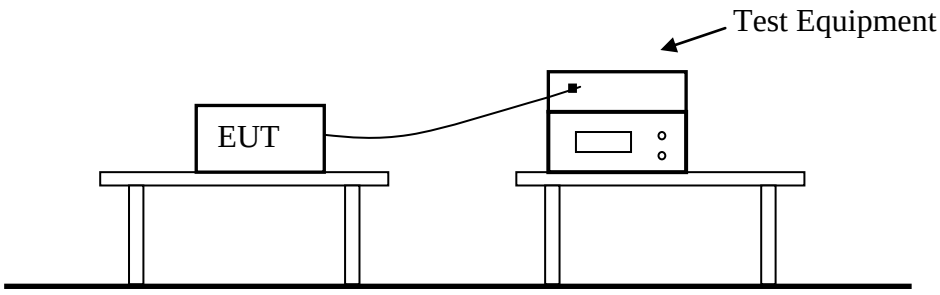
8. HARMONIC CURRENT EMISSION MEASUREMENT

8.1.Block Diagram of Test Setup



8.2.Test Standard

EN 61000-3-2: 2014, Class A

8.3.EUT Configuration on Test

The configuration of EUT is same as Section 3.4.

8.4.Operation Condition of EUT

Same as Section 4.4 except the test setup replaced as Section 8.1.

8.5.Test Results

PASS.

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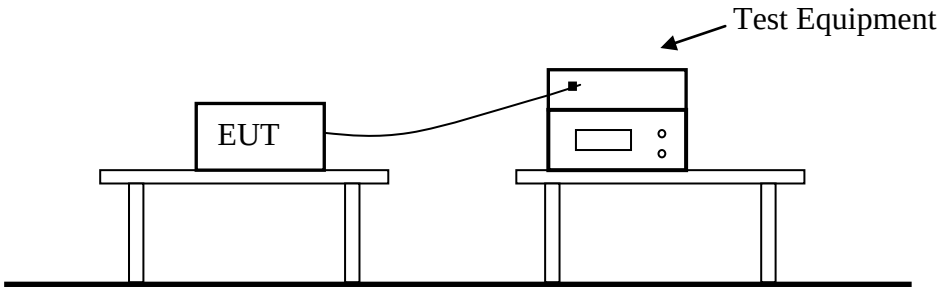
9. VOLTAGE FLUCTUATION AND FLICKER MEASUREMENT

9.1.Block Diagram of Test Setup



9.2.Test Standard

EN 61000-3-3: 2013

9.3.EUT Configuration on Test

The configuration of EUT is same as Section 3.5.

9.4.Operation Condition of EUT

Same as conducted emission measurement, which is listed in Section 4.4, except the test set up replaced by Section 9.1.

9.5.Test Results

PASS.

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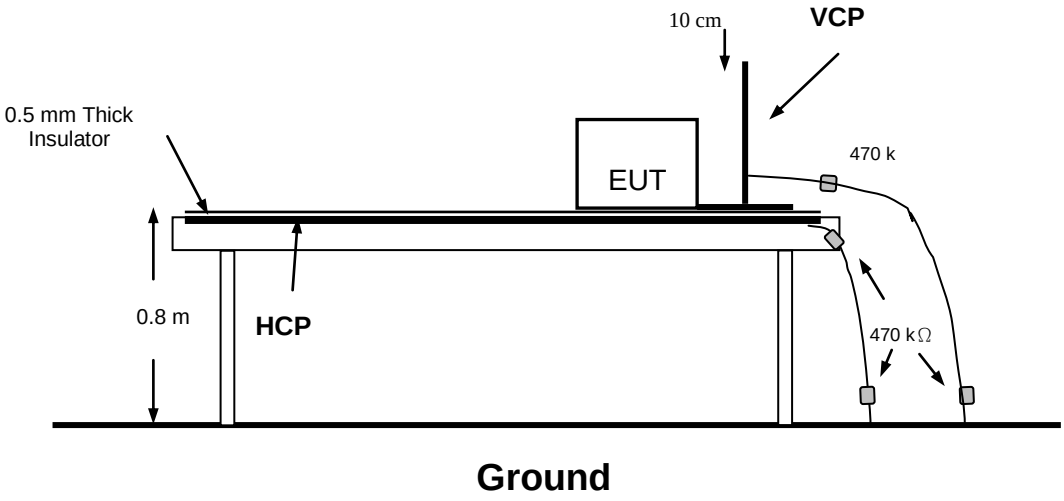
10. ELECTROSTATIC DISCHARGE IMMUNITY TEST

10.1.Block Diagram of Test Setup



10.2.Test Standard

EN 55014-2: 2015

(EN 61000-4-2: 2009, Severity Level: 3 / Air Discharge: ±8KV; Level: 2 / Contact Discharge: ±4KV)

10.3.Severity Levels and Performance Criterion

10.3.1.Severity level

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

10.3.2.Performance criterion: **B**

10.4.EUT Configuration on Test

The configuration of EUT is same as Section 3.6.

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10.5.Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 4.4, except the test set up replaced by Section 10.1.

10.6.Test Procedure

10.6.1.Air Discharge

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

10.6.2.Contact Discharge

All the procedure shall be same as Section 10.6.1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

10.6.3.Indirect Discharge For Horizontal Coupling Plane

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

10.6.4.Indirect Discharge For Vertical Coupling Plane

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

10.7.Test Results

PASS.

Please refer to the next page.

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Electrostatic Discharge Test Results

Standard	☐ IEC 61000-4-2 ☑ EN 61000-4-2		
Applicant	jiangsu relax sanitary ware co.,ltd		
EUT	Hot tub	**Temperature**	23.1℃
M/N	RL-6016	**Humidity**	44.7%
Criterion	B	**Test Engineer**	Feng Zhang
Test Mode	work		

Air Discharge

Test Points	Test Levels			Results		
	± 2kV	± 4kV	± 8kV	Passed	Fail	Performance Criterion
Front	☒	☒	☒	☒	☐	☐A ☒B
Back	☒	☒	☒	☒	☐	☐A ☒B
Left	☒	☒	☒	☒	☐	☐A ☒B
Right	☒	☒	☒	☒	☐	☐A ☒B
Top	☒	☒	☒	☒	☐	☐A ☒B
Bottom	☒	☒	☒	☒	☐	☐A ☒B

Contact Discharge

Test Points	Test Levels		Results		
	± 2 kV	±4 kV	Passed	Fail	Performance Criterion
Front	☒	☒	☒	☐	☐A ☒B
Back	☒	☒	☒	☐	☐A ☒B
Left	☒	☒	☒	☐	☐A ☒B
Right	☒	☒	☒	☐	☐A ☒B
Top	☒	☒	☒	☐	☐A ☒B
Bottom	☒	☒	☒	☐	☐A ☒B

Discharge To Horizontal Coupling Plane

Side of EUT	Test Levels		Results		
	± 2 kV	± 4 kV	Passed	Fail	Performance Criterion
Front	☒	☒	☒	☐	☐A ☒B
Back	☒	☒	☒	☐	☐A ☒B
Left	☒	☒	☒	☐	☐A ☒B
Right	☒	☒	☒	☐	☐A ☒B

Discharge To Vertical Coupling Plane

Side of EUT	Test Levels		Results		
	± 2 kV	± 4 kV	Passed	Fail	Performance Criterion
Front	☒	☒	☒	☐	☐A ☒B
Back	☒	☒	☒	☐	☐A ☒B
Left	☒	☒	☒	☐	☐A ☒B
Right	☒	☒	☒	☐	☐A ☒B

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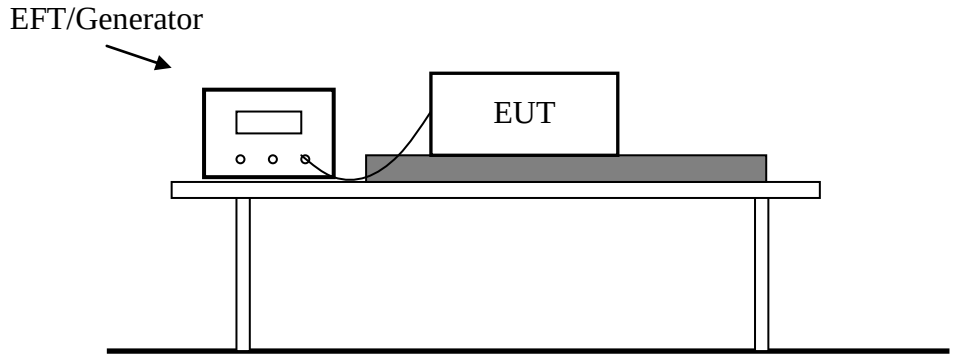
11. ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST

11.1.Block Diagram of Test Setup



11.2.Test Standard

EN 55014-2: 2015 (EN 61000-4-4: 2012, Severity Level: Level 2: 1KV)

11.3.Severity Levels and Performance Criterion

11.3.1.Severity level

Open Circuit Output Test Voltage ± 10%		
Level	On Power Supply Lines	On I/O (Input/Output) Signal data and control lines
1.	0.50KV	0.25KV
2.	1.00KV	0.50KV
3.	2.00KV	1.00KV
4.	4.00KV	2.00KV
X	Special	Special

11.3.2.Performance criterion: **B**

11.4.EUT Configuration on Test

The configuration of EUT is same as Section 3.8.

11.5.Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 4.4, except the test set up replaced by Section 11.1.

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11.6.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.

11.6.1.For input and output AC power ports:

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

11.6.2.For signal lines and control lines ports:

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

11.6.3.For DC output line ports:

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

11.7.Test Results

PASS.

Please refer to the following page.

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Electrical Fast Transient/Burst Test Results

Standard	☐ IEC 61000-4-4 ☑ EN 61000-4-4		
Applicant	jiangsu relax sanitary ware co.,ltd		
EUT	Hot tub	**Temperature**	23.6℃
M/N	RL-6016	**Humidity**	49.5%
Test Mode	work	**Criterion**	B
Test Engineer	Feng Zhang		

Line	Test Voltage	Result (+)	Result (-)
L	1KV	PASS	PASS
N	1KV	PASS	PASS
L-N	1KV	PASS	PASS

Note: N/A

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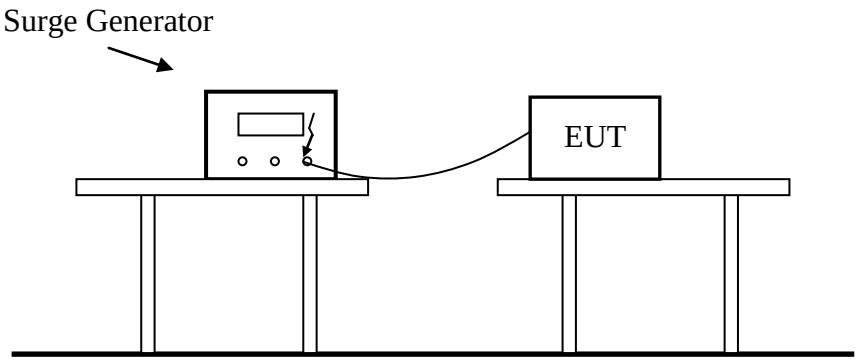
12. SURGE IMMUNITY TEST

12.1.Block Diagram of Test Setup



12.2.Test Standard

EN 55014-2: 2015
(EN 61000-4-5: 2014, Severity Level: Level 2, Line to Line: 1.0KV; Level 3: Line to Ground: 2.0KV)

12.3.Severity Levels and Performance Criterion

12.3.1.Severity level

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

12.3.2.Performance criterion: **B**

12.4.EUT Configuration on Test

The configuration of EUT is same as Section 3.9.

12.5.Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 4.4, except the test set up replaced by Section 12.1.

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12.6.Test Procedure

12.6.1.Set up the EUT and test generator as shown on Section 12.1.

12.6.2.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.

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

12.6.4.Different phase angles are done individually.

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

12.7.Test Results

PASS.

Please refer to the following pages

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Surge Immunity Test Result

Standard	☐ IEC 61000-4-5 ☑ EN 61000-4-5		
Applicant	jiangsu relax sanitary ware co.,ltd		
EUT	Hot tub	**Temperature**	24.0℃
M/N	RL-6016	**Humidity**	46.0％
Test Mode	work	**Criterion**	B
Test Engineer	Feng Zhang		

Location	Polarity	Phase Angle	Number of Pulse	Pulse Voltage (KV)	Result
L-N	+	90°	5	1.0	PASS
	-	270°	5	1.0	PASS
Note	N/A				

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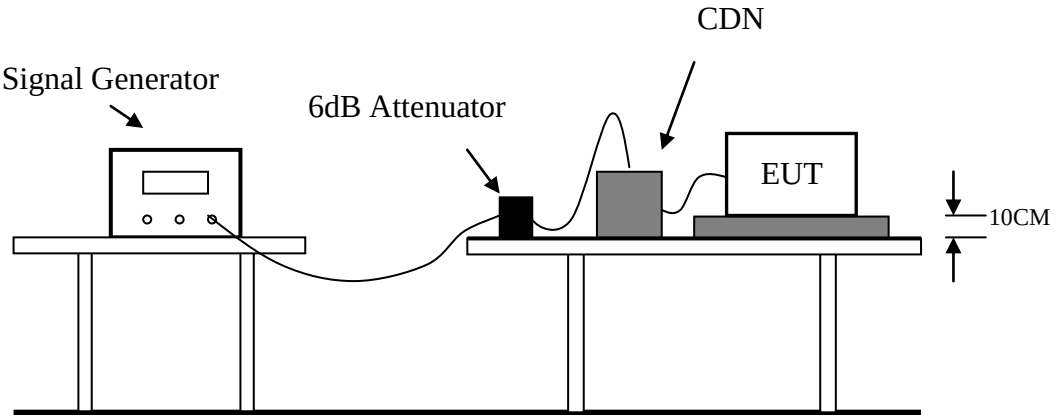
13. INJECTED CURRENTS SUSCEPTIBILITY TEST

13.1.Block Diagram of Test Setup



13.2.Test Standard

EN 55014-2: 2015
(EN 61000-4-6: 2014, Severity Level: 3V (rms), (0.15MHz ~ 230MHz))

13.3.Severity Levels and Performance Criterion

13.3.1.Severity level

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

13.3.2.Performance criterion: **A**

13.4.EUT Configuration on Test

The configuration of EUT is same as Section 3.10.

13.5.Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 4.4, except the test set up replaced by Section 13.1.

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13.6. Test Procedure

13.6.1. Set up the EUT, CDN and test generators as shown on Section 13.1.

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

13.6.3. 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).

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

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

13.6.6. 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.

13.6.7. 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.

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

13.7. Test Results

PASS.

Please refer to the following pages

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Injected Currents Susceptibility Test Results

Standard	☐ IEC 61000-4-6 ☑ EN 61000-4-6		
Applicant	jiangsu relax sanitary ware co.,ltd		
EUT	Hot tub	**Temperature**	23.5℃
M/N	RL-6016	**Humidity**	47.4%
Test Mode	work	**Criterion**	A
Test Engineer	Feng Zhang		

Frequency Range (MHz)	Injected Position	Strength (Unmodulated)	Criterion	Result
0.15 ~ 80	AC Mains	3V	A	PASS

Remark:
1. Modulation Signal:1kHz 80% AM
2. Measurement Equipment :
Simulator: CIT-10 (FRANKONIA)
CDN : ☑CDN-M2 (SWITZERLAND EMTEST)
☐CDN-M3 (SWITZERLAND EMTEST)

Note: N/A

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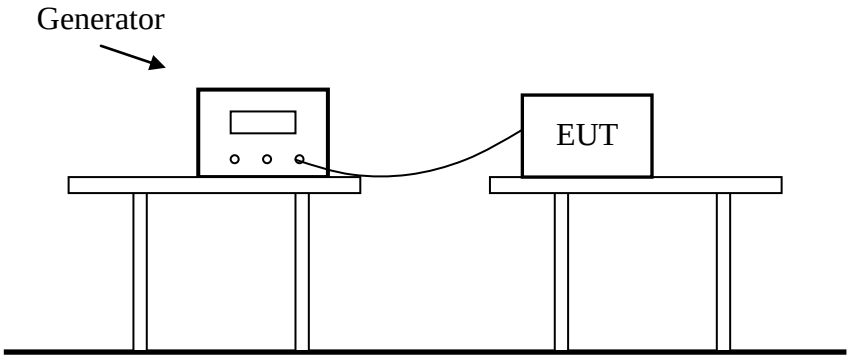
14. VOLTAGE DIPS AND INTERRUPTIONS TEST

14.1.Block Diagram of Test Setup



14.2.Test Standard

EN 55014-2: 2015 (EN 61000-4-11: 2004+A1: 2017)

14.3.Severity Levels and Performance Criterion

14.3.1.Severity level

Test Level (%U_T)	Voltage dip and short interruptions (%U_T)	Duration (in period)	
0	100	0.5	0.5
40	60	10	12
70	30	25	30

14.3.2.Performance criterion: **C**

14.4.EUT Configuration on Test

The configuration of EUT is same as Section 3.11 &3.12.

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14.5.Operating Condition of EUT

Same as conducted emission measurement, which is listed in Section 4.4, except the test set up replaced by Section 14.1.

14.6.Test Procedure

14.6.1.Set up the EUT and test generator as shown on Section 14.1.
14.6.2.The interruptions is introduced at selected phase angles with specified duration.
14.6.3.Record any degradation of performance.

14.7.Test Results

PASS.

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Voltage Dips And Interruptions Test Results

Standard	☐ IEC 61000-4-11 ☑ EN 61000-4-11		
Applicant	jiangsu relax sanitary ware co.,ltd		
EUT	Hot tub	**Temperature**	24.1℃
M/N	RL-6016	**Humidity**	50.1%
Test Mode	work	**Criterion**	C
Test Engineer	Feng Zhang		

Test Level % U_T	**Voltage Dips & Short Interruptions % U_T**	**Duration (in periods)**		**Criterion**	**Result**
		50Hz	**60Hz**		
40	60	10P	12P	C	PASS
70	30	25P	30P	C	PASS
0	100	0.5P	0.5P	C	PASS

Note: N/A

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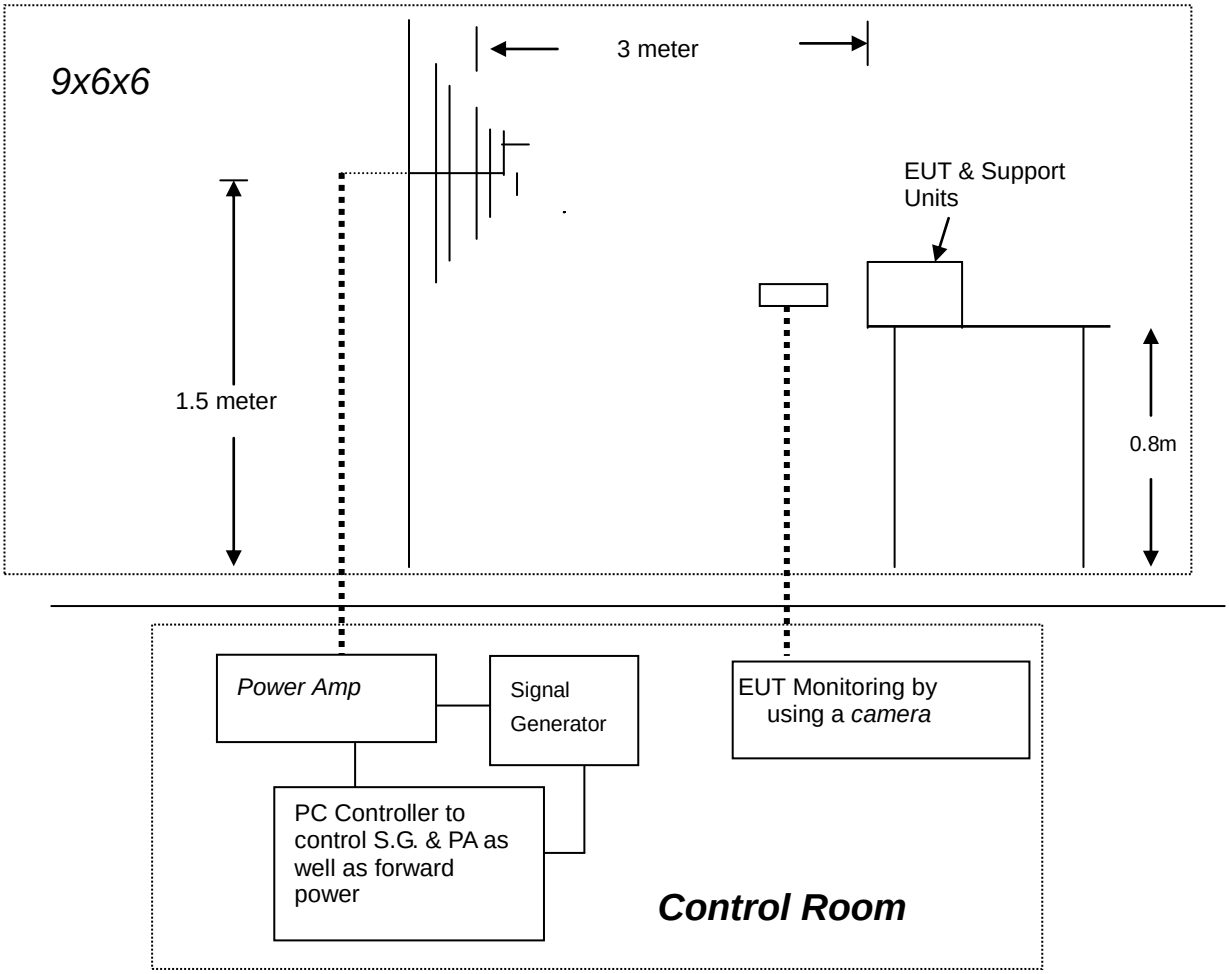
15. RF FIELD STRENGTH SUSCEPTIBILITY TEST

15.1.Block Diagram of Test Setup



15.2.Test Standard

EN 61547: 2009 (EN 61000-4-3: 2006+A2: 2010, Severity Level: 2, 3V / m)

15.3.Severity Levels and Performance Criterion

15.3.1.Severity level

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

15.3.2.Performance criterion: **A**

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15.4.EUT Configuration on Test

The configuration of EUT are listed in Section 3.13.

15.5.Operating Condition of EUT

15.5.1.Setup the EUT as shown in Section 15.1.
15.5.2.Turn on the power of all equipments.
15.5.3.Let the EUT work in test mode (work) and measure it.

15.6.Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. EUT 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 EUT must be faced this transmitting antenna and measured individually. In order to judge the EUT performance, a CCD camera is used to monitor EUT screen. All the scanning conditions are as follows:

Condition of Test	Remarks
1. Fielded Strength	3 V/m (Severity Level 2)
2. Radiated Signal	Unmodulated
3. Scanning Frequency	80 - 1000 MHz
4. Dwell time of radiated	0.0015 decade/s
5. Waiting Time	3 Sec.

15.7.Test Results

PASS.

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RF Field Strength Susceptibility Test Results

Standard	☐ IEC 61000-4-3 ☑ EN 61000-4-3		
Applicant	jiangsu relax sanitary ware co.,ltd		
EUT	Hot tub	**Temperature**	25.1℃
M/N	RL-6016	**Humidity**	47.5％
Field Strength	3 V/m	**Criterion**	A
Test Mode	work	**Test Engineer**	Feng Zhang
Frequency Range	80 MHz to 1000 MHz		
Modulation	☐None ☐ Pulse ☑AM 1KHz 80%		
Steps	1%		

	Horizontal	**Vertical**
Front	PASS	PASS
Right	PASS	PASS
Rear	PASS	PASS
Left	PASS	PASS

Note: N/A

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16. PHOTOGRAPHS

Fig.1

Fig.2

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Fig.3

Fig.4

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Fig.5

Fig.6

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