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EMC Test report for Rechargeable Shaver

**Models: RSCX-368A, RSCW-116, RSCW-108, RSCW-310, RSCW-218,
RSCW-228, RSCW-238, RSCW-258, RSCW-119, RSCX-368, RSCX-500,
RSCX-358, RSCX-311, RSCX-312, RSCX-318, RSCX-211**

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By order of

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DEKRA Testing and Certification (Shanghai) Ltd.

SH-F-PC4-005 v1.1

Document

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1 CONCLUSION

The report is issued to base on original test report Ref. No. 3184963.50 dated on 2016-04-26 including the following modifications:

- Update the standard;
- Change the address of the applicant;

After review, Radiated EM field immunity test is considered necessary.

The report is issued to base on original test report Ref. No. 3170151.50 dated on 2015-08-03 including the following modifications:

- Update new EMC directive

After review, no test is considered necessary.

The tests described in this report do not result in the right to use any approval mark as conferred by DEKRA. As far as the tests were based on certain specifications, these are mentioned in the report.

The conclusion and results stated in this test report are based on a non-recurrent examination of sample(s) provided by the applicant.

1.1 Model description

The apparatus as supplied for the test is a rechargeable shaver, model RSCX-368A intended for residential use. The product has electronic control unit but no earth connection.

According to the declaration from manufacturer, all models are identical except the model name.

Due to the similarity between them, model RSCX-368A was selected for the full tests and the corresponding data is representative for other models as well.



Figure 1 General view

1.2 Environment

The requirements and standards apply to equipment intended for use in:

✓	Residential (domestic) environment
	Commercial and light-industrial environment
	Industrial environment
	Medical environment

1.3 Classification

The standard EN 55014-2 is subdivided in four categories. For each category, the specific immunity requirements are formulated.

	Category 1	Apparatus containing no electronic control circuitry
✓	Category 2	Apparatus containing electronic control circuitry with no internal clock or oscillator frequency higher than 15 MHz.
✓	Category 3	Battery powered apparatus containing electronic control circuitry and has no cables attached.
	Category 4	All other apparatus.

2 SUMMARY

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

2.1 Applied standards

Standard	Year	Title
EN 55014-1	2006	Emission – Electrical motor-operated and thermal appliances for household and similar purposes, electrical tools and similar electrical apparatus
A1	2009	
A2	2011	
EN 55014-1	2017	
EN 55014-2	2015	Immunity - Household appliances, electric tools and similar
EN 61000-3-2	2014	Limits for harmonic currents emissions
EN 61000-3-3	2013	Limitation of voltage fluctuations and flicker

2.2 Overview of results

Emission tests	Result
Mains conducted disturbance voltage	PASS
Radiated emission	PASS
Harmonic current emission	PASS
Limitation of voltage fluctuations (flicker)	PASS

Immunity tests	Result
Electrostatic Discharges (ESD)	PASS
Radiated EM field immunity	PASS
Electrical fast transient (EFT)	PASS
Surge transients	PASS
Conducted RF disturbances	PASS
Power supply voltage interruptions & dips	PASS

3 GENERAL INFORMATION

3.1 Product Information

Equipment under test	Rechargeable Shaver
Trade mark	--
Tested Type	RSCX-368A
Representative types	RSCW-116, RSCW-108, RSCW-310, RSCW-218, RSCW-228, RSCW-238, RSCW-258, RSCW-119, RSCX-368, RSCX-500, RSCX-358, RSCX-311, RSCX-312, RSCX-318, RSCX-211
Ratings	220-240 V~, 50/60 Hz; 3 W; Class II

3.2 Customer Information

Applicant	
Address	

Manufacturer	
Address	

Factory	
Address	

3.3 Test data

For Radiated emission test:

Location	QuieTek Technology (Suzhou) Co., Ltd.
Address	No. 99, Hongye Road, Suzhou Industrial Park Loufeng Hi-New-Tech Development Area, Suzhou City, China
Date	2015-07, 2018-06
Supervised by	Zuyao Fan

For other tests:

Location	DEKRA Testing and Certification (Shanghai) Ltd.
Address	1 F., No. 250, Jiangchangsan Road, Shanghai, China
Date of receipt of test item	2015-06 (samples provided by applicant)
Date (s) of performance of tests	2015-06 to 2015-07
Supervised by	Zuyao Fan

3.4 Environmental conditions

Tests have been performed in a controlled laboratory environment, where the environmental conditions are maintained within the applicable ranges.

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

3.5 Measurement Uncertainty

Conducted Emission Expanded Uncertainty: U = 3.22 dB

Disturbance Power Expanded Uncertainty: U = 2.38 dB

Radiated Emission Expanded Uncertainty (30-200MHz):

U = 4.14 dB (horizontal)

U = 4.28 dB (vertical)

Radiated Emission Expanded Uncertainty (200M-1000 MHz):

U = 4.18 dB (horizontal)

U = 4.26 dB (vertical)

3.6 Equipment List

Equipment	Manufacturer	Model No.	Serial No.	Cal. due date
EMI test receiver	R&S	ESCI	101351	2015.08.05
2-line V-network	R&S	ENV216	101620	2015.08.05
EMC Shielding room	Changzhou FeiTe	8 x 5 x 3 mm	Nil	2015.12.24
EMI absorbing clamp	SCHWARZBECK	MDS 21B	4183	2015.08.05
Harmonic currents and flick tester	California Instruments	CTS	1306A00135	2016.05.18
AC power source	California Instruments	5001iX-CTS-400	1306A00135	2016.05.18
ESD generator	TESEQ	NSG 435	6716	2015.08.05
EFT, Surge, DIPS all-in-one	TESEQ	NSG-3040-MF	2006/EFT:0535 /SURGE:1234 /DIPS:2062	2015.08.05
Compact immunity test system (RF)	TESEQ	NSG 4070-30	35895	2015.08.05
Coupling decoupling network (CDN)	TESEQ	CDN M016S	34640	2015.08.05
Attenuator	TESEQ	ANT 6050	34847	2015.08.05
EMI Test Receiver	R&S	ESCI	100573	2015.09.16
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2015.10.10
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2016.03.01
Signal Generator	R&S	SML03	102324	2018.10.09
Power Meter	Agilent	E4416A	GB41293844	2018.09.16
Power Sensor	Agilent	E9323A	MY44420302	2018.09.16
Power Meter	Boonton	4231A	144502	2018.09.16
Power Sensor	Boonton	51011-EMC	33859	2018.09.16
Power Amplifier	Schaffner	CBA9428	43516	N/A
Power Amplifier	Schaffner	CBA9413B	43526	N/A
Horn Antenna	AR	AT4002A	312312	N/A
Bilog Antenna	Schaffner	CBL6141A	4278	N/A

4 EMISSION TEST RESULTS

4.1 Mains conducted disturbance voltage

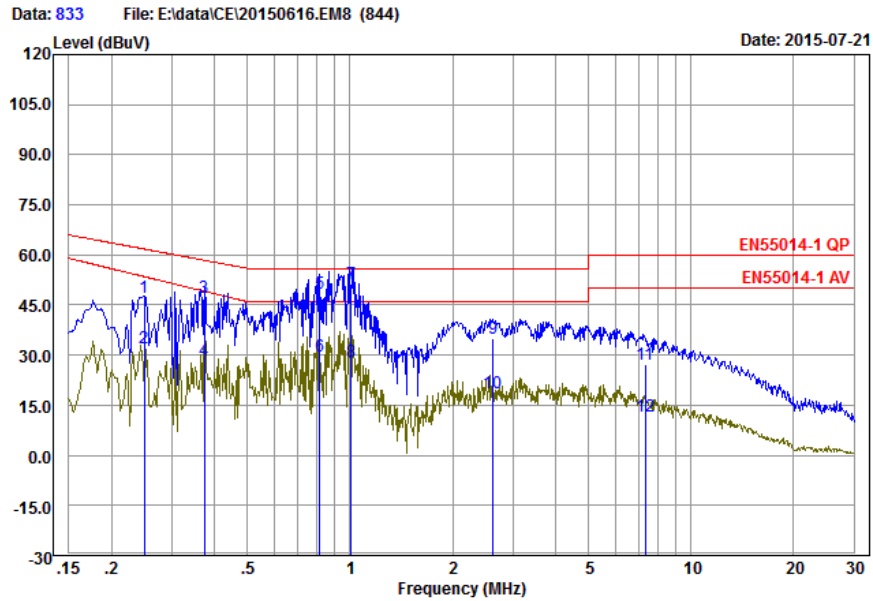
Standard	EN 55014-1					
Frequency [MHz]	QP [dB(μV)]			AV [dB(μV)]		
0,15 – 0,50	66	–	56 *)	59	–	46 *)
0,50 – 5	56			46		
5 – 30	60			50		

*) Limits decreasing linearly with the logarithm of the frequency

Port	AC mains
Test method	LISN
Mode	Charging mode

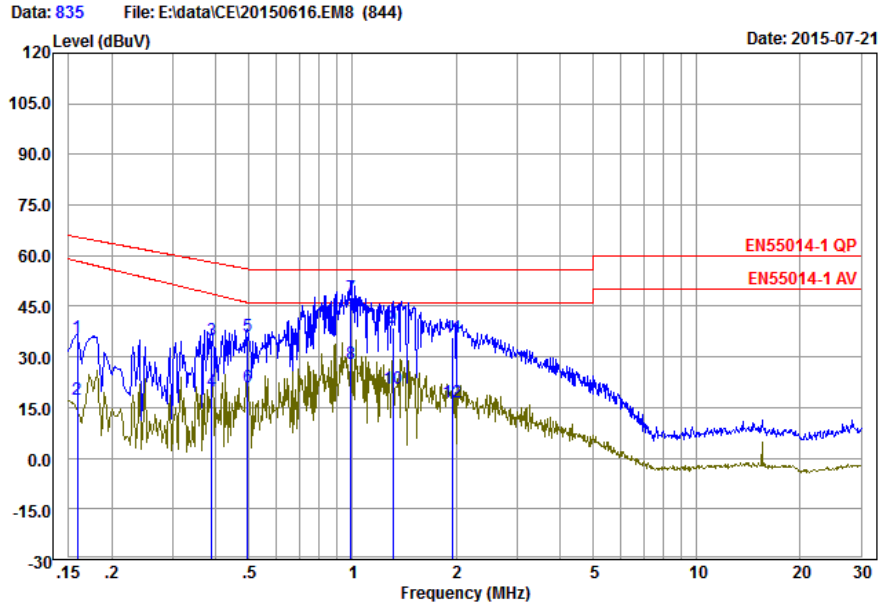
Results

Line



	Limit	Read	Cable	Over	Remark		
Freq	Line	Level	Level	Factor	Loss	Limit	Remark
MHz	dBuV	dBuV	dBuV	dB	dB	dB	
1	0.25	61.78	47.26	36.39	10.87	1.10	-14.52 QP
2	0.25	53.51	31.93	21.06	10.87	1.10	-21.58 Average
3	0.38	58.39	47.38	36.49	10.89	1.10	-11.01 QP
4	0.38	49.10	28.34	17.45	10.89	1.10	-20.76 Average
5	0.82	56.00	48.66	37.60	11.06	1.30	-7.34 QP
6 av	0.82	46.00	29.63	18.57	11.06	1.30	-16.37 Average
7 pp	1.01	56.00	51.50	40.46	11.04	1.30	-4.50 QP
8	1.01	46.00	28.02	16.98	11.04	1.30	-17.98 Average
9	2.62	56.00	35.03	23.96	11.07	1.37	-20.97 QP
10	2.62	46.00	18.63	7.56	11.07	1.37	-27.37 Average
11	7.33	60.00	27.04	15.98	11.06	1.35	-32.96 QP
12	7.33	50.00	11.71	0.65	11.06	1.35	-38.29 Average

Neutral



	Limit	Read	Cable	Over	Remark		
Freq	Line	Level	Level	Factor	Loss	Limit	Remark
MHz	dBuV	dBuV	dBuV	dB	dB	dB	
1	65.52	35.86	24.90	10.96	1.16	-29.66	QP
2	58.37	17.23	6.27	10.96	1.16	-41.14	Average
3	58.08	35.12	24.19	10.93	1.10	-22.96	QP
4	48.70	19.82	8.89	10.93	1.10	-28.88	Average
5	56.05	36.08	25.16	10.92	1.10	-19.97	QP
6	46.07	21.11	10.19	10.92	1.10	-24.96	Average
7 pp	56.00	47.59	36.56	11.03	1.30	-8.41	QP
8 av	46.00	28.01	16.98	11.03	1.30	-17.99	Average
9	56.00	38.63	27.56	11.07	1.34	-17.37	QP
10	46.00	20.63	9.56	11.07	1.34	-25.37	Average
11	56.00	35.73	24.59	11.14	1.40	-20.27	QP
12	46.00	16.70	5.56	11.14	1.40	-29.30	Average

Refer to chapter 6 for the test set-up.

Conclusion:

PASS

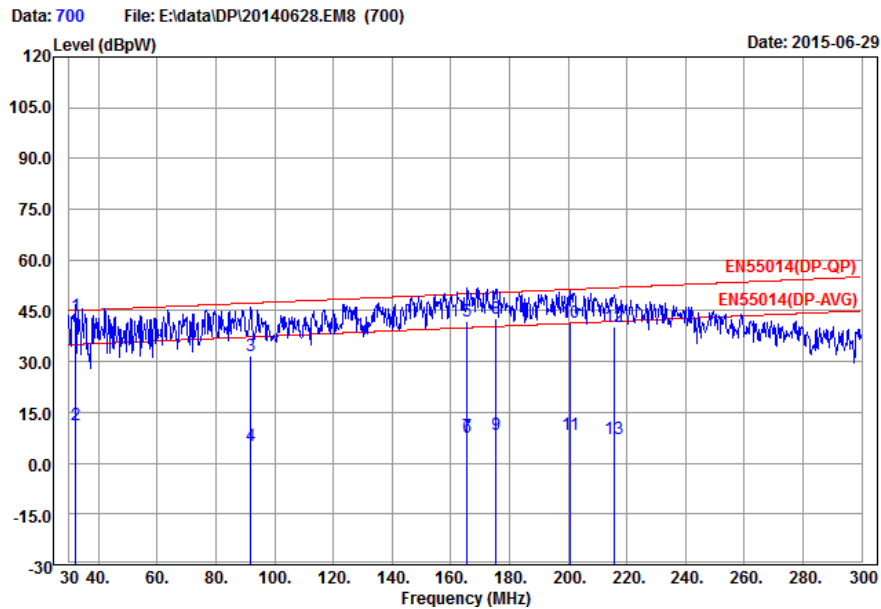
4.2 Radiated emission

Standard	EN 55014-1	
Frequency [MHz]	QP [dB(pW)]	AV [dB(pW)]
30 – 300	45 – 55 *)	35 – 45 *)

*) Limits increasing linearly with the frequency

Port	AC Mains
Mode	Charging mode

Results



	Freq	Limit Line	Level	Read Level	Factor	Cable Loss	Over Limit	Remark
	MHz	dBpW	dBpW	dBpW	dB	dB	dB	
1	pp	32.16	45.09	43.68	22.61	21.07	0.75	-1.41 QP
2	av	32.16	35.09	11.18	-9.89	21.07	0.75	-23.91 Average
3		91.83	47.30	31.75	13.21	18.54	1.58	-15.55 QP
4		91.83	37.30	5.05	-13.49	18.54	1.58	-32.25 Average
5		165.54	50.03	41.93	22.97	18.96	2.10	-8.10 QP
6		165.54	40.03	7.47	-11.49	18.96	2.10	-32.56 Average
7		165.54	40.03	7.83	-11.13	18.96	2.10	-32.20 Average
8		175.53	50.40	42.68	23.90	18.78	1.97	-7.72 QP
9		175.53	40.40	8.48	-10.30	18.78	1.97	-31.92 Average
10		200.91	51.34	41.61	22.45	19.16	2.36	-9.73 QP
11		200.91	41.34	8.41	-10.75	19.16	2.36	-32.93 Average
12		215.49	51.88	40.39	21.60	18.79	2.03	-11.49 QP
13		215.49	41.88	7.06	-11.73	18.79	2.03	-34.82 Average

Notice that the disturbance reaches the limits and at these frequencies precautions are advised.

Refer to chapter 6 for the test set-up.

According to clause 4.1.2.3.2 (EN 55014-1):

Appliances are deemed to comply in the frequency range from 300 MHz to 1 000 MHz if both of the following conditions (1) and 2)) are fulfilled:

- 1) All emission readings from the equipment under test shall be lower than the applicable limits (Table 2a) reduced by the margin (Table 2b);
- 2) The maximum clock frequency shall be less than 30 MHz;

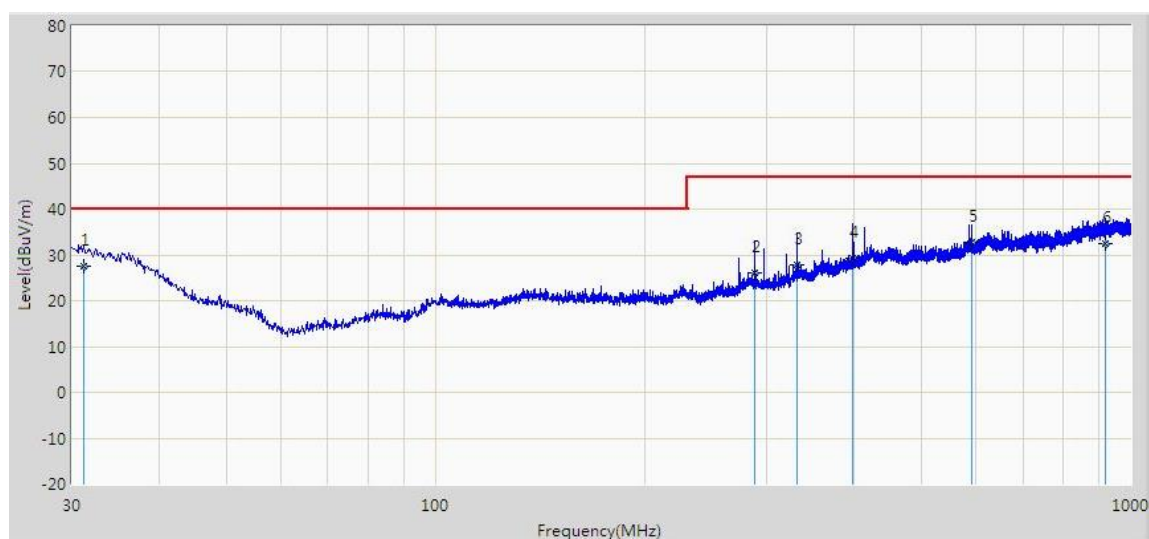
Standard	EN 55014-1
Measuring distance	3 meters

Frequency [MHz]	QP [dB(μV/m)] @ 3 m
30 – 230	40
230 – 1000	47

Port	Enclosure
Mode	Shaving mode

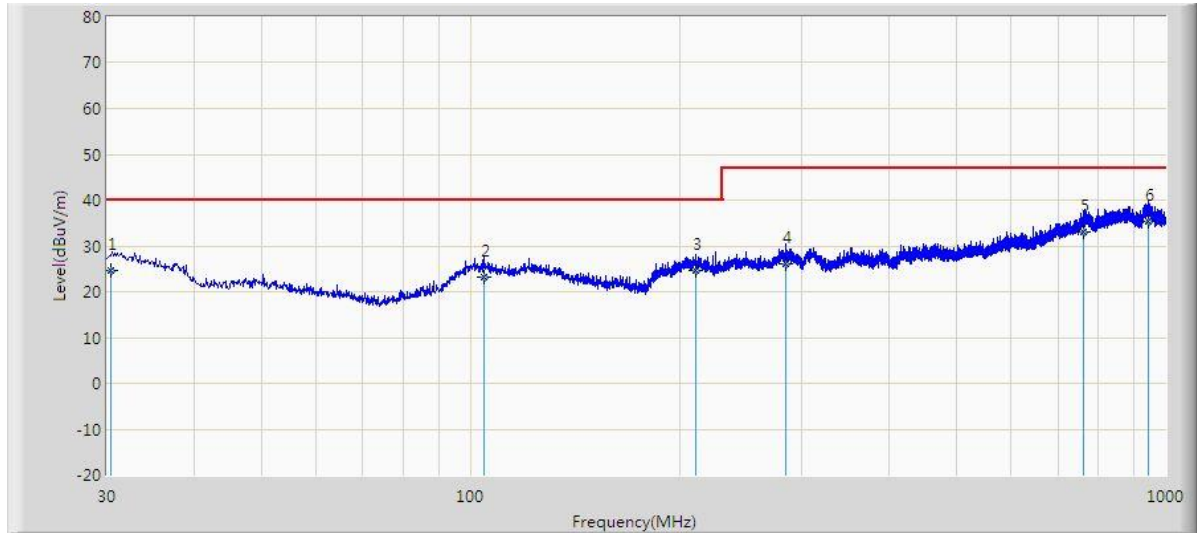
Results

Horizontal



Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
31.251	27.532	0.300	-12.468	40.000	20.770	6.462	0.000	100	93	QP
287.521	26.174	5.300	-20.826	47.000	13.297	7.577	0.000	100	5	QP
330.822	27.685	5.000	-19.315	47.000	14.975	7.710	0.000	200	42	QP
398.822	29.374	4.100	-17.626	47.000	17.371	7.903	0.000	200	136	QP
591.524	32.609	4.200	-14.391	47.000	20.004	8.405	0.000	133	360	QP
919.524	32.568	0.400	-14.432	47.000	23.031	9.138	0.000	100	106	QP

Vertical



Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
30.422	24.569	0.600	-15.431	40.000	17.513	6.456	0.000	100	199	QP
104.522	23.127	1.100	-16.873	40.000	15.158	6.869	0.000	100	2	QP
210.523	24.635	1.300	-15.365	40.000	16.016	7.318	0.000	300	87	QP
284.335	26.108	1.300	-20.892	47.000	17.239	7.569	0.000	100	147	QP
763.221	32.971	0.900	-14.029	47.000	23.270	8.802	0.000	200	104	QP
945.521	35.304	0.800	-11.696	47.000	25.305	9.199	0.000	200	326	QP

Refer to chapter 6 for the test set-up.

Conclusion:

PASS

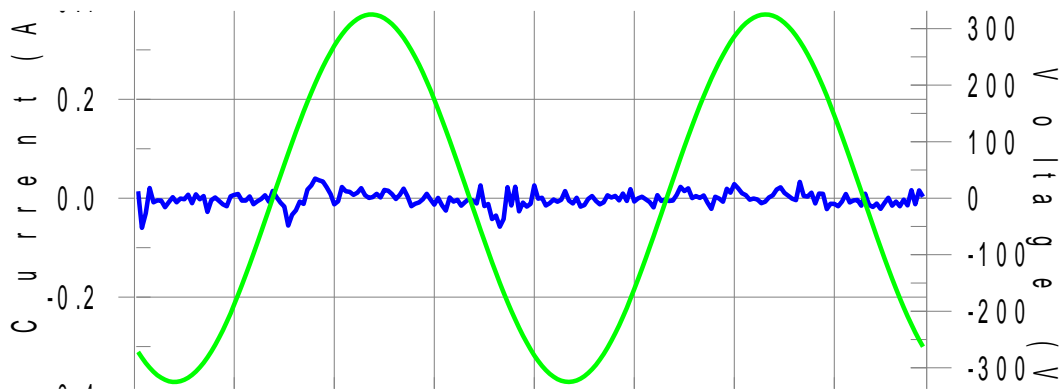
4.3 Harmonic currents

Standard	EN 61000-3-2
Port	AC Mains supply
Mode	Charging mode

✓	Class A	All apparatus not classified as Class B, C or D
	Class B	Portable tools
	Class C	Lighting equipment
	Class D	Personal computers, television receivers

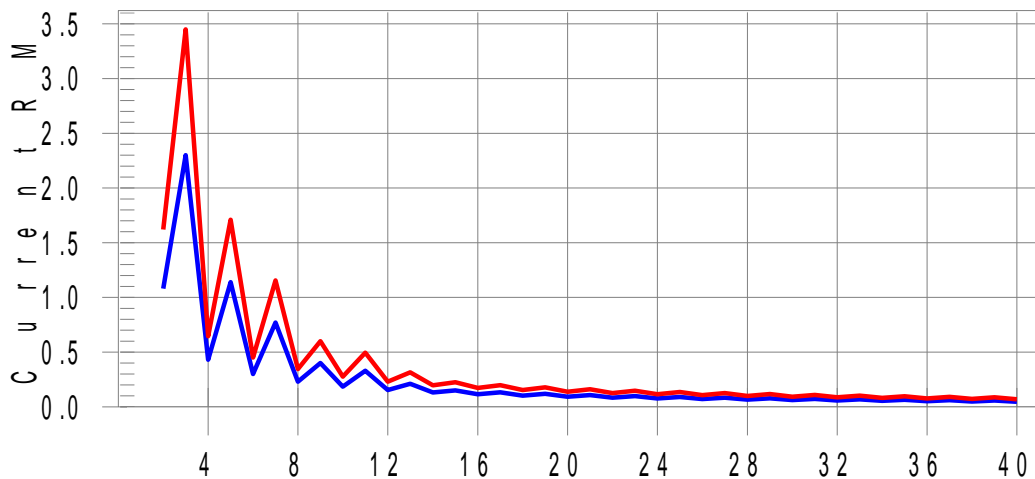
Results and limits

Current & voltage waveforms



Harmonics and Class A limit line

European Limits



Test Result: Pass Source qualification: Normal

THC(A): 0.016 I-THD(%): 353.6 POHC(A): 0.000 POHC Limit(A): 0.251

Highest parameter values during test:

V_RMS (Volts): 229.93	Frequency(Hz): 50.00
I_Peak (Amps): 0.195	I_RMS (Amps): 0.031
I_Fund (Amps): 0.005	Crest Factor: 7.621
Power (Watts): 1.2	Power Factor: 0.270

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.003	1.080	N/A	0.004	1.620	N/A	Pass
3	0.003	2.300	N/A	0.003	3.450	N/A	Pass
4	0.002	0.430	N/A	0.003	0.645	N/A	Pass
5	0.003	1.140	N/A	0.003	1.710	N/A	Pass
6	0.002	0.300	N/A	0.003	0.450	N/A	Pass
7	0.003	0.770	N/A	0.003	1.155	N/A	Pass
8	0.002	0.230	N/A	0.002	0.345	N/A	Pass
9	0.002	0.400	N/A	0.003	0.600	N/A	Pass
10	0.002	0.184	N/A	0.002	0.276	N/A	Pass
11	0.003	0.330	N/A	0.003	0.495	N/A	Pass
12	0.002	0.153	N/A	0.002	0.230	N/A	Pass
13	0.003	0.210	N/A	0.003	0.315	N/A	Pass
14	0.002	0.131	N/A	0.002	0.197	N/A	Pass
15	0.003	0.150	N/A	0.003	0.225	N/A	Pass
16	0.002	0.115	N/A	0.003	0.173	N/A	Pass
17	0.003	0.132	N/A	0.003	0.198	N/A	Pass
18	0.002	0.102	N/A	0.002	0.153	N/A	Pass
19	0.003	0.118	N/A	0.004	0.178	N/A	Pass
20	0.002	0.092	N/A	0.002	0.138	N/A	Pass
21	0.003	0.107	N/A	0.004	0.161	N/A	Pass
22	0.002	0.084	N/A	0.003	0.125	N/A	Pass
23	0.002	0.098	N/A	0.003	0.147	N/A	Pass
24	0.002	0.077	N/A	0.002	0.115	N/A	Pass
25	0.003	0.090	N/A	0.003	0.135	N/A	Pass
26	0.002	0.071	N/A	0.002	0.107	N/A	Pass
27	0.002	0.083	N/A	0.003	0.125	N/A	Pass
28	0.002	0.066	N/A	0.003	0.099	N/A	Pass
29	0.003	0.078	N/A	0.003	0.116	N/A	Pass
30	0.002	0.061	N/A	0.002	0.092	N/A	Pass
31	0.003	0.073	N/A	0.003	0.109	N/A	Pass
32	0.002	0.058	N/A	0.003	0.086	N/A	Pass
33	0.003	0.068	N/A	0.003	0.102	N/A	Pass
34	0.002	0.054	N/A	0.003	0.081	N/A	Pass
35	0.003	0.064	N/A	0.004	0.096	N/A	Pass
36	0.002	0.051	N/A	0.003	0.077	N/A	Pass
37	0.004	0.061	N/A	0.004	0.091	N/A	Pass
38	0.002	0.048	N/A	0.003	0.073	N/A	Pass
39	0.003	0.058	N/A	0.004	0.087	N/A	Pass
40	0.002	0.046	N/A	0.002	0.069	N/A	Pass

Conclusion:

PASS

4.4 Voltage fluctuations (Flicker)

Standard	EN 61000-3-3
Port	AC Mains supply
Voltage	230 V _{AC}
Mode	Charging mode

Equipment intended to be connected to 230/400 V_{AC} 50 Hz supply systems may not produce voltage fluctuations in the supply systems due to variation of the input current above the limits as stated below.

P _{ST}	≤ 1
P _{LT}	N/A
T _{max} (dt > 3,3%)	≤ 500 ms
d _C	≤ 3,3%
d _{MAX}	≤ 4%

Results

Relative voltage change characteristic T _{max}	0,0 ms
Average d _{MAX}	<0,050%
Relative Voltage change d _C	<0,050%
Short term flicker P _{ST}	0,064
Long term flicker P _{LT}	N/A

Conclusion:

PASS

5 IMMUNITY TEST RESULTS

5.1 Electrostatic discharge immunity

Electrostatic discharges (ESD) are the result of persons or objects that accumulate static electricity due to for instance walking on synthetic carpets. The ESD can influence the operation of equipment or damage its electronics, either by a direct discharge or indirectly by coupling or radiation. Both effects are simulated during the tests.

Requirements

Standard	EN 55014-2
Basic standard	EN 61000-4-2
Port	Enclosure
Performance criterion	B; During the test degradation is allowed. No change of operating state or stored data is allowed.
Air discharges	8 kV
Contact discharges	4 kV
Mode	Clipping, charging mode

Performed tests

Air discharges		4 kV	✓	8 kV		15 kV		
Contact discharges		2 kV	✓	4 kV		8 kV		
Via coupling planes	✓	Horizontal			✓	Vertical		
Polarity	✓	Positive			✓	Negative		
Set-up	✓	Table-top				Floor standing		
Ambient temperature	25 °C							
Relative Humidity air	48 %							

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

5.2 Radiated EM field immunity

During the test it is verified if the equipment under test has sufficient immunity against radiated electromagnetic fields. Walkie-talkies, radio transmitters, television transmitters and telecommunication equipment including cellular telephones and other emitting devices like industrial electromagnetic sources can generate these fields.

Requirements

Standard	EN 55014-2
Basic standard	EN 61000-4-3
Port	Enclosure
Performance criterion	A; Operation as intended
Frequency range	80 - 1000 MHz
Modulation	1 kHz – 80% AM
Field strength	3 V/m

Performed tests

Frequency range	80 - 1000 MHz
Tested Field strength	3 V/m
Dwell time	3 seconds
Test set-up	Full Anechoic Chamber
Mode	On mode

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

5.3 Electrical Fast Transient immunity

The EFT immunity test simulates disturbances by bursts of very short transients caused for example by switching off loads such as an AC motor or bouncing relay contacts. The transients are likely to disturb electronics but less likely to cause damage.

Requirements

Standard	EN 55014-2			
Basic standard	EN 61000-4-4			
Performance criterion	B; During the test degradation is allowed. No change of operating state or stored data is allowed.			
Pulse characteristics	5/50 ns			
Peak Voltage; Port	1 kV; AC input power port			
Repetition frequency	✓	5 kHz		2,5 kHz

Performed tests

Tested Voltage; Port	1 kV; AC input power port			
Mode	Charging mode			
Injection method	✓	CDN		Capacitive clamp
Polarity	✓	Positive	✓	Negative
Set-up	✓	Table-top		Floor standing

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

5.4 Surge transient immunity

The surge transient immunity test simulates the surges that are caused by overvoltages due to indirect (induced) lightning transients. The pulse is a slow transient with high-energy contents and due to its long duration may cause damage to an unprotected EUT.

Requirements

Standard	EN 55014-2
Basic standard	EN 61000-4-5
Performance criterion	B; During the test degradation is allowed. No change of operating state or stored data is allowed.
Pulse characteristics	1,2/50 μ s
Peak Voltage; Port	1 kV; AC input power port (Line to line)

Performed tests

Tested Voltage; Port	1 kV; AC input power port (Line to line)		
Mode	Charging mode		
Polarity	✓	Positive	✓ Negative

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

5.5 RF Conducted immunity

During this test the immunity of the equipment for induced or conducted electromagnetic fields is checked. Fields generated by radio and other transmitters cause RF voltages in long cables like the mains network. This test reproduces these induced disturbing voltages by injecting them to the EUT via the cabling.

Requirements

Standard	EN 55014-2
Basic standard	EN 61000-4-6
Performance criterion	A; Operation as intended
Frequency range	0,15 – 230 MHz
Modulation	1 kHz – 80% AM
Test level; Port	3 V; AC input power port

Performed tests

Tested level; Port	3 V; AC input power port		
Mode	Charging mode		
Frequency range	0,15 – 230 MHz		
Dwell time	3 seconds		
Injection method	✓	CDN-M2	EM clamp

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

5.6 Power supply interruptions and dips

Requirements

Basic standard	EN 61000-4-11
Performance criterion	B; During the test degradation is allowed. No change of operating state or stored data is allowed. C; Temporary, self-recoverable loss of function is allowed.

Standard	EN 55014-2		
AC input power port		50 Hz	60 Hz
	C	$U_{NOM} - 30\%$ (25 periods)	(30 periods)
	C	$U_{NOM} - 60\%$ (10 periods)	(12 periods)
	C	$U_{NOM} - 100\%$ (0,5 period)	(0,5 period)

Performed tests

Tested voltage	AC input power port,	
Mode	Charging mode	
AC input power port	50 Hz	60 Hz
	$U_{NOM} - 30\%$ (25 periods)	$U_{NOM} - 30\%$ (30 periods)
	$U_{NOM} - 60\%$ (10 periods)	$U_{NOM} - 60\%$ (12 periods)
	$U_{NOM} - 100\%$ (0,5 period)	$U_{NOM} - 100\%$ (0,5 period)

Observations

During the test no loss of performance was observed. After the test the EUT functioned as intended. No unacceptable loss of performance was observed.

Conclusion:

PASS

6 IDENTIFICATION OF THE EQUIPMENT UNDER TEST

The photograph shows the tested device.



Figure 2 Conducted Emission test setup



Figure 3 Disturbance power test setup



Figure 4 Radiated emission test setup

-----END-----