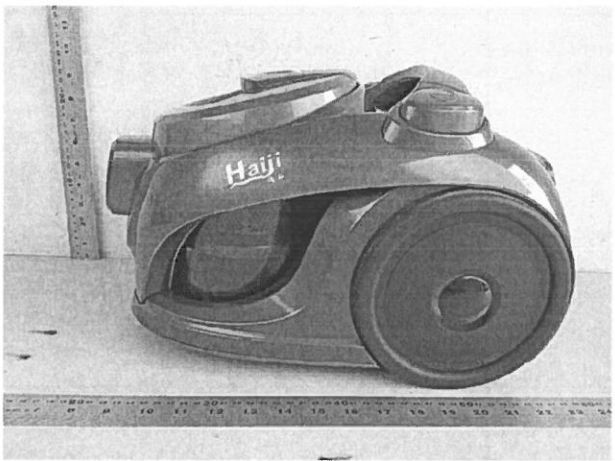




Prüfbericht - Nr.: <i>Test Report No.:</i>	14717192 001	Auftrags-Nr.: <i>Order No.:</i>	1160019440	Seite 1 von 29 Page 1 of 29
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	416004	Auftragsdatum: <i>Order date:</i>	10.10.2015	
Auftraggeber: <i>Client:</i>	Ningbo Haiji Electric Appliance Co., Ltd. NO.1-9 Wangongchi Road, Xiaodong industrial zone. Yuyao. Zhejiang 315400 P.R. China			
Prüfgegenstand: <i>Test item:</i>	Vacuum Cleaner			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	HJX1502-C, HJX1502-D, HJX1502-E, HJX1502-F, HJX1502-G, HJX1502-H, HJX1502-I, HJX1502-J, HJX1502-K, HJX1502-L			
Auftrags-Inhalt: <i>Order content:</i>	TÜV Rheinland – EMC Service			
Prüfgrundlage: <i>Test specification:</i>	EN 55014-1:2006+A1+A2 EN 55014-2:1997+A1+A2 EN 61000-3-3:2013 EN 61000-3-2:2014			
Wareneingangsdatum: <i>Date of receipt:</i>	28.10.2015			
Prüfmuster-Nr.: <i>Test sample No.:</i>	N/A			
Prüfzeitraum: <i>Testing period:</i>	28.10.2015-20.11.2015			
Ort der Prüfung: <i>Place of testing:</i>	Refer to section 1.1			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland / CCIC (Ningbo) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von/ tested by:		kontrolliert von/ reviewed by:		
01.12.2015	Tracy Zhang/PE		04.12.2015	Feng Liang/TC
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>
				
Sonstiges/ Other:				
Refer to page 2 for further information.				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
*Legende:	1= Sehr gut	2 = gut	3= befriedigend	4= ausreichend
	P(ass) =entspricht o.g.	Prüfgrundlage(n)	F(ail)= entspricht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar
Legend:	1= very good	2 = good	3= satisfactory	4= sufficient
	P(ass) = passed a.m. test specification(s)	F(ail)= failed a.m. test specification(s)	N/A = not applicable	5 = mangelhaft
				N/T =nicht getestet
				5 = poor
				N/T = not tested
<p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i></p>				

Model List:

Model	Rated voltage	Rated power	Speed adjustment function
HJX1502-C	AC220-240V; 50/60Hz	800W	Yes
HJX1502-D		800W	No
HJX1502-E		899W	Yes
HJX1502-F		899W	No
HJX1502-G		1000W	Yes
HJX1502-H		1000W	No
HJX1502-I		1200W	Yes
HJX1502-J		1200W	No
HJX1502-K		1400W	Yes
HJX1502-L		1400W	No

Others:

1. In electrical characteristics, all models are similar. The differences among them are the speed adjustment function, rated power marked on the label and in the mechanical aspect.
2. Therefore all EMC tests were performed on HJX1502-K.

TEST SUMMARY

4.1.1 HARMONICS ON AC MAINS

Result:

Pass

4.1.2 VOLTAGE CHANGES, VOLTAGE FLUCTUATIONS AND FLICKER ON AC MAINS

Result:

Pass

4.1.3 MAINS TERMINAL CONTINUOUS DISTURBANCE VOLTAGE

Result:

Pass

4.1.4 DISCONTINUOUS INTERFERENCE ON AC MAINS

Result:

Pass

4.2.1 DISTURBANCE POWER ON MAINS

Result:

Pass

4.2.2 RADIATED DISTURBANCE IN THE FREQUENCY RANGE FROM 30MHZ TO 1000MHZ

Result:

Pass

5.1.1 ELECTROSTATIC DISCHARGE

Result:

Pass

5.2.1 FAST TRANSIENTS ON AC POWER LINES

Result:

Pass

5.2.2 INJECTED CURRENT INTO AC POWER PORT

Result:

Pass

5.2.3 SURGES TO AC POWER PORT

Result:

Pass

5.2.4 VOLTAGE DIPS AND INTERRUPTIONS TO AC POWER PORT

Result:

Pass

Contents

1	TEST SITES	5
1.1	TEST FACILITIES	5
1.2	LIST OF TEST AND MEASUREMENT INSTRUMENTS.....	5
2	GENERAL PRODUCT INFORMATION	6
2.1	PRODUCT FUNCTION AND INTENDED USE	6
2.2	RATINGS AND SYSTEM DETAILS	6
2.3	INDEPENDENT OPERATION MODES	6
2.4	NOISE GENERATING AND NOISE SUPPRESSING PARTS	6
2.5	SUBMITTED DOCUMENTS	6
3	TEST SET-UP AND OPERATION MODES	7
3.1	PRINCIPLE OF CONFIGURATION SELECTION.....	7
3.2	PHYSICAL CONFIGURATION FOR TESTING	7
3.3	TEST OPERATION AND TEST SOFTWARE.....	7
3.4	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	7
3.5	COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE.....	7
4	TEST RESULTS EMISSION	8
4.1	EMISSION IN THE FREQUENCY RANGE UP TO 30 MHZ	8
4.1.1	<i>Harmonics on AC Mains.....</i>	8
4.1.2	<i>Voltage changes, voltage fluctuations and flicker on AC mains</i>	11
4.1.3	<i>Mains Terminal Continuous Disturbance Voltage.....</i>	12
4.1.4	<i>Discontinuous Interference on AC Mains</i>	15
4.2	EMISSION IN THE FREQUENCY RANGE ABOVE 30 MHZ	16
4.2.1	<i>Disturbance Power on Mains.....</i>	16
4.2.2	<i>Radiated Disturbance in the Frequency Range from 30MHz to 1000MHz.....</i>	18
5	TEST RESULTS IMMUNITY	19
5.1	ENCLOSURE	20
5.1.1	<i>Electrostatic Discharge.....</i>	20
5.2	INPUT AND OUTPUT AC POWER PORTS	21
5.2.1	<i>Fast Transients on AC Power Lines.....</i>	21
5.2.2	<i>Injected Current into AC Power Port</i>	22
5.2.3	<i>Surges to AC Power Port</i>	23
5.2.4	<i>Voltage dips and interruptions to AC Power Port</i>	24
6	PHOTOGRAPHS OF THE TEST SET-UP	25
7	LIST OF TABLES.....	29
8	LIST OF FIGURES.....	29
9	LIST OF PHOTOGRAPHS	29

1 Test Sites

1.1 Test Facilities

Laboratory A: Ningbo Entry-Exit Inspection and Quarantine Bureau.
Electrical Safety Testing Center for Optics & Electronics products
(NOETC)

**5-9 Zhufeng Road Ningbo Export Processing Zone, Beilun Ningbo,
Zhejiang province, 315800, P. R. China**

The used test equipments of Lab are in accordance with CISPR 16-1 series standards for measurement of radio interference.

1.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment of Laboratory

No.	Equipment	Model	Inventory no.	Cal. due date
1.	Artificial mains network	ENV216	101022	2016.04.28
2.	EMI test receiver	ESCI	100708	2016.04.28
3.	Absorbing clamp	ADS-Z21	100309	2016.04.28
4.	Harmonics/flicker analyzer	DPA503	V0828104013	2016.04.28
5.	ESD generator	DITO	B07040	2016.04.28
6.	Dip Surge Burst Test System	UCS500-M6B	V0746103125	2016.04.28
7.	CDN	FCC-801-M2/M3-16A	7079	2016.04.28
8.	6 dB Attenuator	75-A-FFN-06	141733	2016.04.28

2 General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is an ordinary Vacuum Cleaner for household and similar use.

For the further information, refer to the user's manual.

2.2 Ratings and System Details

System input voltage : Refer to page 2

Rated Input power : Refer to page 2

Protection class : II

Refer to the User's Manual for further information.

2.3 Independent Operation Modes

The basic operation modes are: "On" or "Off".

Refer to the User's Manual for further information.

2.4 Noise Generating and Noise Suppressing Parts

Noise suppression components are used to suppress the noise.

Refer to the Circuit Diagram for more information.

2.5 Submitted Documents

Circuit diagram, user's manual, labels and construction drawings etc.

3 Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test conditions were adapted accordingly in reference to the instructions for use.

Refer to the related paragraph of this report.

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

Refer to the related paragraph of this report.

3.2 Physical Configuration for Testing

Refer to the related paragraph of this report.

3.3 Test Operation and Test Software

Refer to the related paragraph of this report. No software was used.

3.4 Special Accessories and Auxiliary Equipment

None.

3.5 Countermeasures to achieve EMC Compliance

The tested sample contained no noise suppression capacitors to achieve EMC compliance. No special measure is employed to achieve the requirement.

4 Test Results EMISSION

4.1 Emission in the Frequency Range up to 30 MHz

4.1.1 Harmonics on AC Mains

Result:

Pass

Date of testing : 2015.11.10
Test procedure : EN 61000-3-2:2014
Test duration : 6min
Harmonic order : 2 – 40th
Frequency range : 0 – 2kHz
Test voltage : 230V, 50Hz

The harmonics on AC Mains in the frequency from 0 to 2 kHz were measured in accordance with EN 61000-3-2:2014.

The measurement was conducted with an automatic current harmonic analyzing system. This equipment is in compliance with the requirements of EN 61000-3-2:2014.

The results indicated in the following tables and figures were those measured and recorded by an automatic measuring system.

Table 2: Harmonic currents measurement result

Equipment category: Class A;

Fundamental current I₁: 2.738A; Power factor: 0.986; Active input power: 845.3W.

Average harmonic current results

Hn	I _{eff} [A]	% of Limit	Limit [A]	Result
1	2.738			
2	40.721E-3	3.770	1.08	PASS
3	1.155	50.233	2.30	PASS
4	34.479E-3	8.018	430.00E-3	PASS
5	471.822E-3	41.388	1.14	PASS
6	27.263E-3	9.088	300.00E-3	PASS
7	251.922E-3	32.717	770.00E-3	PASS
8	20.328E-3	8.838	230.00E-3	PASS
9	136.660E-3	34.165	400.00E-3	PASS
10	14.339E-3			PASS
11	82.103E-3	24.880	330.00E-3	PASS
12	10.234E-3			PASS
13	38.518E-3	18.342	210.00E-3	PASS
14	6.202E-3			PASS
15	29.995E-3	19.996	150.00E-3	PASS
16	4.472E-3			PASS
17	14.527E-3			PASS
18	4.046E-3			PASS
19	12.902E-3			PASS
20	6.968E-3			PASS
21	11.614E-3			PASS
22	10.488E-3			PASS
23	13.983E-3			PASS
24	10.956E-3			PASS
25	14.054E-3			PASS
26	8.088E-3			PASS
27	12.872E-3			PASS
28	16.891E-3			PASS
29	13.893E-3			PASS
30	16.229E-3			PASS
31	10.799E-3			PASS
32	6.020E-3			PASS
33	11.052E-3			PASS
34	5.484E-3			PASS
35	9.056E-3			PASS
36	5.157E-3			PASS
37	8.024E-3			PASS
38	4.759E-3			PASS
39	7.633E-3			PASS
40	4.494E-3			PASS

Harmonic currents less than 0.6% of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

Maximum harmonic current results

Hn	leff [A]	% of Limit	Limit [A]	Result
1	3.672			
2	84.091E-3	5.191	1.62	PASS
3	1.629	47.209	3.45	PASS
4	70.688E-3	10.959	645.00E-3	PASS
5	750.505E-3	43.889	1.71	PASS
6	54.937E-3	12.208	450.00E-3	PASS
7	403.970E-3	34.976	1.15	PASS
8	39.769E-3	11.527	345.00E-3	PASS
9	238.326E-3	39.721	600.00E-3	PASS
10	26.494E-3	9.599	276.00E-3	PASS
11	139.920E-3	28.267	495.00E-3	PASS
12	16.446E-3			PASS
13	69.150E-3	21.952	315.00E-3	PASS
14	10.874E-3			PASS
15	45.160E-3	20.071	225.00E-3	PASS
16	10.186E-3			PASS
17	28.411E-3	14.311	198.52E-3	PASS
18	9.818E-3			PASS
19	24.050E-3	13.539	177.63E-3	PASS
20	13.380E-3			PASS
21	23.224E-3	14.451	160.71E-3	PASS
22	22.928E-3	18.275	125.46E-3	PASS
23	32.233E-3	21.965	146.74E-3	PASS
24	22.265E-3			PASS
25	29.673E-3	21.980	135.00E-3	PASS
26	14.887E-3			PASS
27	27.974E-3	22.380	124.99E-3	PASS
28	31.845E-3	32.309	98.57E-3	PASS
29	23.406E-3	20.111	116.39E-3	PASS
30	29.855E-3	32.453	92.00E-3	PASS
31	19.491E-3			PASS
32	10.177E-3			PASS
33	18.253E-3			PASS
34	9.680E-3			PASS
35	15.971E-3			PASS
36	8.881E-3			PASS
37	15.418E-3			PASS
38	8.286E-3			PASS
39	13.509E-3			PASS
40	7.569E-3			PASS

Harmonic currents less than 0.6% of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

4.1.2 Voltage changes, voltage fluctuations and flicker on AC mains

Result:	Pass
----------------	-------------

Date of testing : 2015.11.10
 Test procedure : EN 61000-3-3:2013

According to the EN 61000-3-3:2013:

According to the characteristics of the sample, as specified by clause 5 of the basic standard, following limits apply:

- the value of $d(t)$ during a voltage change shall not exceed 3.3% for more than 500ms;
- the relative steady-state voltage change, d_c , shall not exceed 3.3%;
- the maximum relative voltage change d_{max} , shall not exceed 7%.

Following are the measurement results obtained via an automatic testing system.

Table 3: Voltage fluctuations and flicker measurement results

	d_c	d_{max} (average)	$d(t)$	P_{st}	P_{lt}
Limits	3.3%	7%	3.3%/500ms	N/A	N/A
Result	1.321%	6.364%	110ms	---	---

4.1.3 Mains Terminal Continuous Disturbance Voltage

Result:	Pass
----------------	-------------

Date of testing : 2015.11.13
 Test procedure : EN 55014-1:2006+A1+A2 and CISPR 16-1 series standards
 Frequency range : 0.15-30MHz
 Kind of test site : EMC Chamber

Test Setup

Input Voltage : AC 220-240V, 50/60Hz
 Operational mode : ON
 Artificial hand : Yes
 Earthing : No. (as class II equipment)

The measurement setup was made according to EN 55014-1:2006+A1+A2 in an EMC Chamber.

The measurement equipment like test receivers, quasi-peak detector and Artificial Mains Network (AMN) are in compliance with CISPR 16-1 series standards. The tested object was operated under its rated voltage and its rated frequency. Prior to the measurements the test object operated about 15 minutes (warm-up) in order to stabilize its operating conditions and to ensure reliable measurement values.

Furthermore an internal calibration with the test receiver was conducted prior to each measurement. And the measurement was made in the state the maximum disturbance was obtained.

The tested object was set-up on a wooden table. The length of the power cord of the tested object was about 3.0m. The EUT was set 0.8m away from the AMN. The cord longer than necessary to be connected to the AMN was folded forth and back parallel so as to form a bundle with a length between 0.3m and 0.4m.

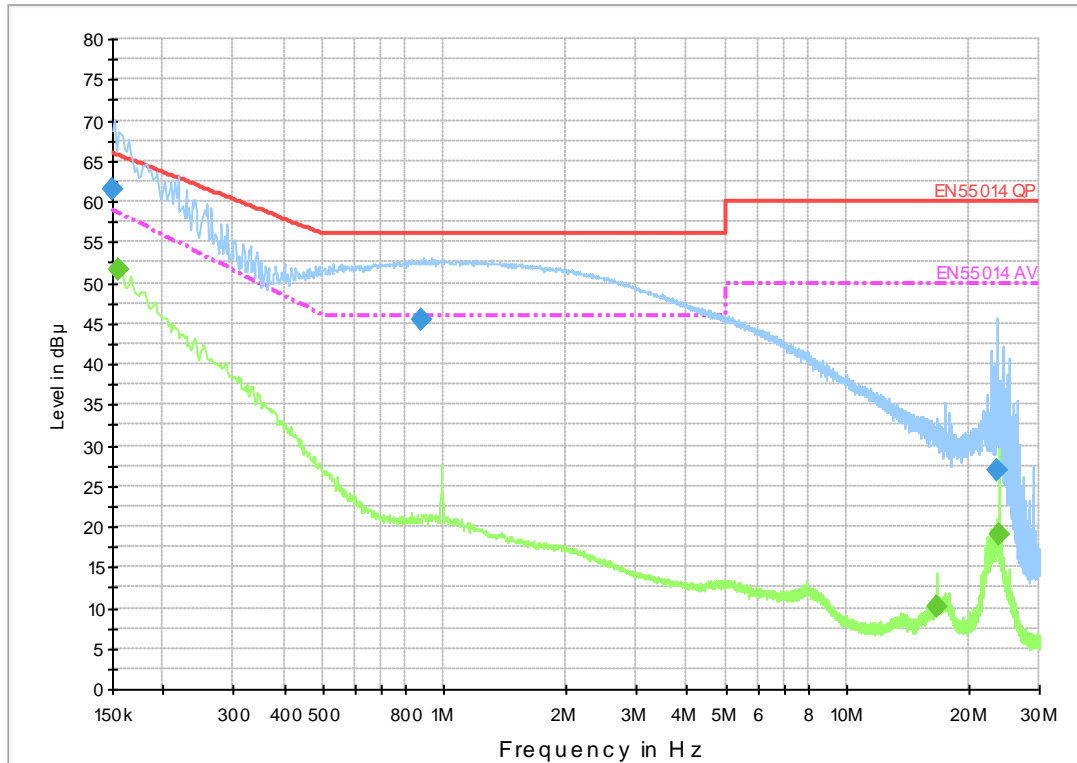
The Interference Voltage was determined according to clause 5 of EN 55014-1:2006+A1+A2 while measuring the line and neutral conductor by turns.

The following figures and tables were those measured by an automatic measuring system. Both Quasi Peak and Average Value were measured. Quasi-Peak and Average Value were measured and listed respectively where they had a maximum in previous scanning survey. In the figures, the symbol “◆” in blue color means Quasi-Peak Value and the symbol “◆” in green color means Average Value which was measured in final measurement.

Figure 1: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, L

1160019440-HJX1502-K-DV-L

Voltage with 2-Line-LISN



Final Result 1

Frequency (MHz)	QuasiPeak (dB µV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB µV)	Comment
0.150000	61.4	1000.0	9.000	Off	L1	10.8	4.6	66.0	
0.878000	45.4	1000.0	9.000	Off	L1	10.8	10.6	56.0	
23.573000	26.8	1000.0	9.000	Off	L1	11.0	33.2	60.0	

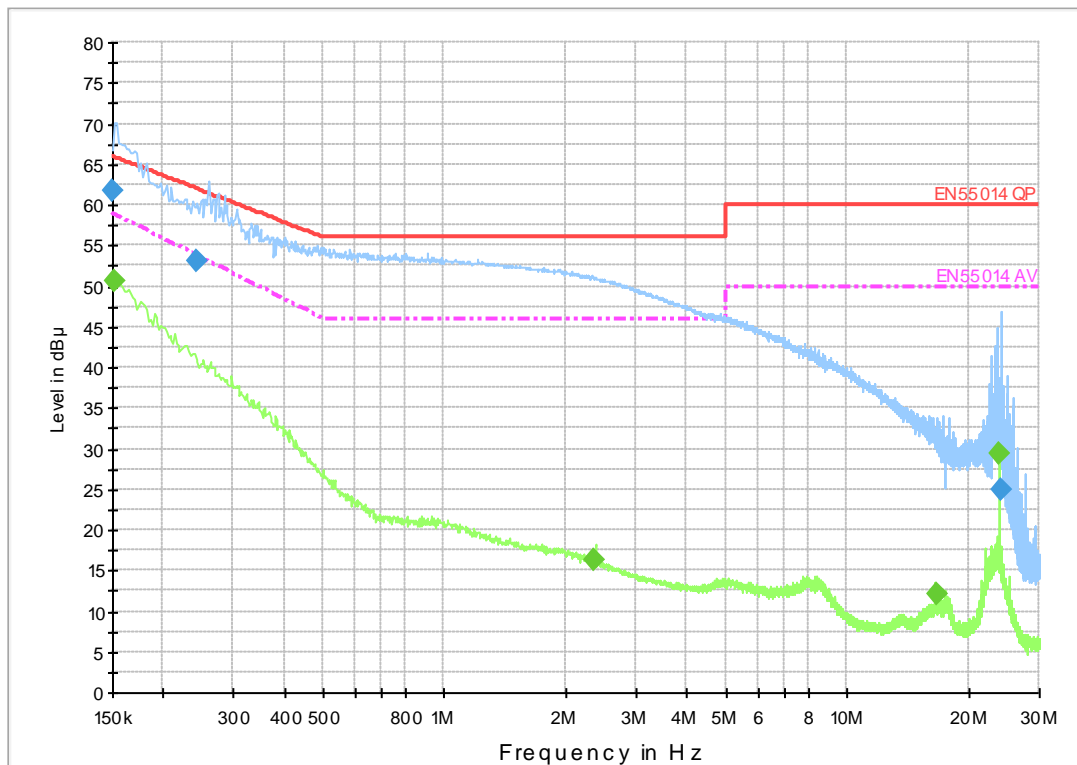
Final Result 2

Frequency (MHz)	CAverage (dB µV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB µV)	Comment
0.155000	51.6	1000.0	9.000	Off	L1	10.8	7.0	58.6	
16.654000	10.2	1000.0	9.000	Off	L1	10.9	39.8	50.0	
23.946000	18.9	1000.0	9.000	Off	L1	11.0	31.9	50.0	

Figure 2: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, N

1160019440-HJX1502-K-DV-N

Voltage with 2-Line-LISN



Final Result 1

Frequency (MHz)	QuasiPeak (dB µ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)	Comment
0.150000	61.6	1000.0	9.000	Off	N	10.7	3.7	65.3	
0.243000	53.2	1000.0	9.000	Off	N	10.7	8.8	62.0	
24.231000	24.9	1000.0	9.000	Off	N	11.1	35.1	60.0	

Final Result 2

Frequency (MHz)	CAverage (dB µ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)	Comment
0.152000	50.7	1000.0	9.000	Off	N	10.7	8.1	58.9	
2.362000	16.3	1000.0	9.000	Off	N	10.8	29.7	46.0	
16.626000	12.2	1000.0	9.000	Off	N	11.0	37.8	50.0	
23.946000	29.5	1000.0	9.000	Off	N	11.1	20.5	50.0	

Prüfbericht - Nr.: 14717192 001
Test Report No.:

Seite 15 von 29
Page 15 of 29

4.1.4 Discontinuous Interference on AC Mains

Result:	N.A.
----------------	-------------

4.2 Emission in the Frequency Range above 30 MHz

4.2.1 Disturbance Power on Mains

Result:	Pass
----------------	-------------

Date of testing	: 2015.11.20
Port	: Mains
Basic Standard	: EN 55014-1:2006+A1+A2
Frequency Range	: 30-300MHz
Limit	: EN 55014-1:2006+A1+A2, clause 4.1.2.1, Household and similar appliances

Test Setup

Input Voltage	: AC 220-240V, 50/60Hz
Operational mode	: ON
Earthing	: No (as class II equipment)

Measuring configuration and description

The measurement setup was made according to EN 55014-1:2006+A1+A2.

The measurement equipment like test receivers and absorption clamp are in compliance with CISPR 16-1 series standards. The test object has been operated by its rated voltage, rated frequency. Prior to the measurements the test objects operated about 10 minutes (warm-up) in order to stabilize their operating conditions and to ensure reliable measurement values.

Furthermore an internal calibration with the test receiver was conducted prior to each measurement.

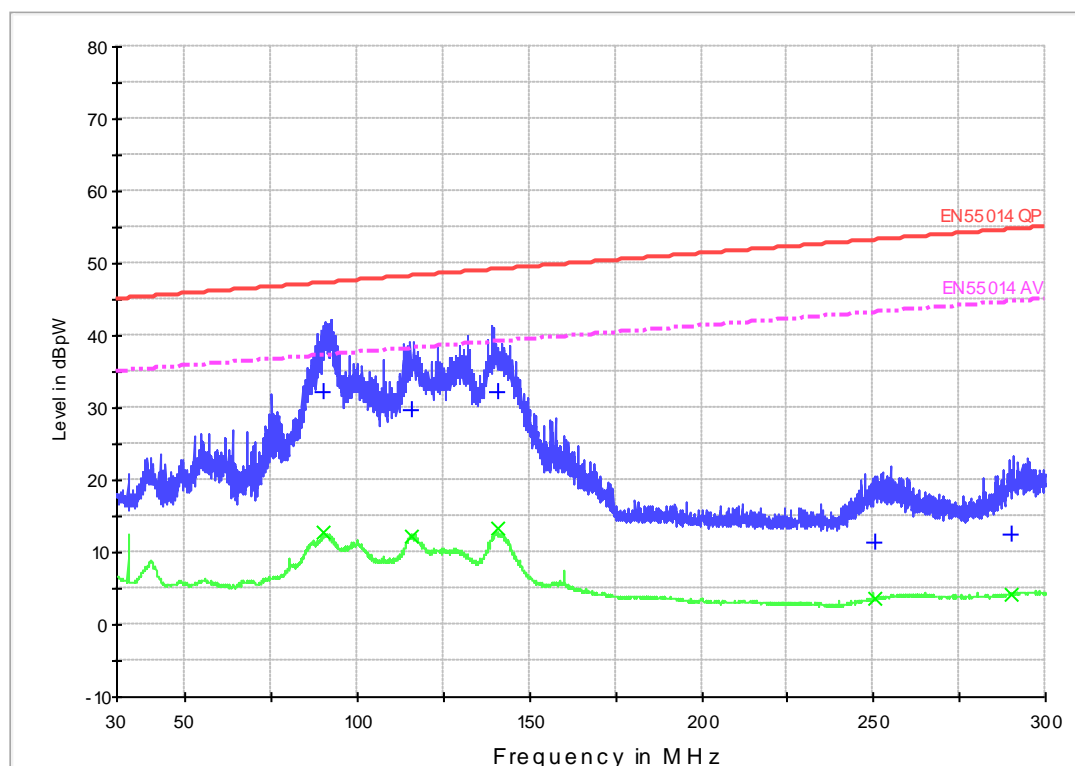
The disturbance power was determined according to clause 6 of EN 55014-1:2006+A1+A2. The tested object was set-up on a wooden bench. The length of the power cord of the test object was about 3.0m. The length of power cord of EUT plus that of the extension cord was approximately 6.0m.

The measurement was performed by operating the EUT in normal operation mode. The figures and tables below were those measured in the operation mode. Both Quasi Peak and Average Value were measured. In final measurement, by moving the absorption clamp along the power supply cord and the extension-power cord from the test object, Quasi-Peak and Average Value were measured and listed respectively where they had a maximum in previous scanning survey. In the Figures, the symbol “+” means Quasi-Peak Value and the symbol “x” means Average Value which was measured in final measurement.

Figure 3: Spectral Diagrams, Power Disturbance, Mains, 30–300MHz

1160019440-HJX1502-K-DP

Power EMI pre



Limit and Margin-QP

Frequency (MHz)	QuasiPeak (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBpW)	Comment
90.060000	32.1	1000.0	120.000	6.5	15.1	47.2	
115.620000	29.6	1000.0	120.000	6.7	18.6	48.2	
140.580000	32.1	1000.0	120.000	6.4	17.0	49.1	
250.680000	11.3	1000.0	120.000	5.6	41.8	53.2	
290.100000	12.5	1000.0	120.000	6.2	42.1	54.6	

Limit and Margin-AV

Frequency (MHz)	Average (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBpW)	Comment
90.060000	12.7	1000.0	120.000	6.5	24.5	37.2	
115.620000	12.3	1000.0	120.000	6.7	25.9	38.2	
140.580000	13.5	1000.0	120.000	6.4	25.6	39.1	
250.680000	3.6	1000.0	120.000	5.6	39.6	43.2	
290.100000	4.3	1000.0	120.000	6.2	40.3	44.6	

Prüfbericht - Nr.: 14717192 001

Test Report No.:

Seite 18 von 29

Page 18 of 29

4.2.2 Radiated Disturbance in the Frequency Range from 30MHz to 1000MHz

Result:

Pass

Port : Enclosure
Basic Standard : EN 55014-1:2006+A1+A2
Frequency Range : 30-1000MHz
Limit : EN 55014-1:2006+A1+A2, clause 4.1.2.2, Table 3.

According to a) of clause 4.1.2.3.2 of EN 55014-1:2006+A1+A2:

“Appliances are deemed to comply in the frequency range from 300MHz to 1000MHz 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 30MHz.

Because the EUT meets the two conditions mentioned above, the EUT is deemed to meet the radiated requirements without actual testing.

5 Test Results I M M U N I T Y

According to the electrical characteristics above and EN 55014-2:1997+A1+A2, the EUT belongs to category II equipment .

“Category II: mains powered motor operated appliances, tools, heating appliances and similar electric apparatus (for example – UV radiators, IR radiators and microwave ovens) containing electronic control circuitry with no internal clock frequency or oscillator frequency higher than 15MHz.”

During the immunity tests, the EUT was operated under conditions specified by clause 3.1 of this report.

Performance criterion A: The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended.

Performance criterion B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed.

Performance criterion C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.

Date of testing: 2015.11.10-2015.11.20

Room temperature : 20-25 °C
Relative Humidity : 45-55%

5.1 Enclosure

5.1.1 Electrostatic Discharge

Result:

Pass

The immunity against electrostatic discharge was tested in accordance with EN 55014-2:1997+A1+A2. Test setup and ESD-Generator are according to EN 61000-4-2 which is specified by EN 55014-2:1997+A1+A2.

The EUT is placed on 0,8m wood table above the ground plane. And the minimum distance between the EUT and all other conductive structures except the ground plane beneath the EUT is more than 0,5m.

The reference ground plane is an aluminium sheet of 0,25mm minimum thickness. The reference ground plane is connected to the protective earth. The size of the ground plane is 2m × 2m.

A horizontal coupling plane (HCP), 1,6m × 0,8m, is placed on the table and isolated from the EUT and cables by an insulating support 0,5mm thick. Vertical coupling plane (VCP) of dimensions 0,5m × 0,5m is placed parallel to and positioned at a distance of 0,1m from the EUT.

Charge voltage : ±4.0kV (Contact Discharge), ±8.0kV (Air Discharge)
Polarity : positive / negative
Number of discharges : ≥10
Performance criteria : B

Table 4: ESD, Positive / Negative Polarity

Position	Kind of Discharge	Result	Remarks
Accessible nonmetal Enclosure	Air discharge ±8kV	Pass	No disturbance of function
Power cord	Air discharge ±8kV	Pass	No disturbance of function
Switch	Air discharge ±8kV	Pass	No disturbance of function
Coupling plane (Both HCP and VCP)	Contact discharge ±4kV	Pass	No disturbance of function

5.2 Input and Output AC Power Ports

5.2.1 Fast Transients on AC Power Lines

Result:

Pass

The immunity against fast transients on AC power lines was tested in accordance to EN 55014-2:1997+A1+A2. Test setup and the fast transient noise generator are according to EN 61000-4-4 which is specified by EN 55014-2:1997+A1+A2.

The EUT is placed on 0,1m wood table above the ground plane. And the minimum distance between the EUT and all other conductive structures except the ground reference plane is more than 0,5m.

The length between the coupling device and the EUT is less than 1m. The cord length more than 1m, the excess length of the cable shall gathered into a flat coil with a 0,4m diameter, and situated at a distance of 0,1m above the ground reference plane.

The reference ground plane is an aluminium sheet of 0,25mm minimum thickness. The reference ground plane is connected to the protective earth. The size of the ground plane is 2m × 2m.

Test Voltage : 1kV
 Polarity : negative/positive
 Repetition frequency : 5kHz
 Test duration : ≥120sec
 Tr/Tn : 5ns/50ns
 Performance criteria : B

Table 5: Burst, AC Power lines, Positive and Negative Polarity

Line	Result	Remarks
AC Input L1 (L)	±1kV Pass	No disturbance of function
AC Input L2 (N)	±1kV Pass	No disturbance of function

5.2.2 Injected Current into AC Power Port

Result:	Pass
----------------	-------------

The immunity against injected current into AC power port was tested according to EN 55014-2:1997+A1+A2 in a shielded room. The Test setup and the test generator are according to EN 61000-4-6 which is specified by EN 55014-2:1997+A1+A2.

The EUT is placed on 0,1m wood table above the ground plane. And the minimum distance between the EUT and all other conductive structures except the reference ground plane is more than 0,5m.

The EUT comprised a single unit. The coupling and decoupling networks were inserted on the power supply connection. The coupling and decoupling networks was placed on the ground reference plane, making direct contact with it at about 0,1-0,3 meter from EUT. The cable between EUT and CDN is as short as possible and not bundled nor wrapped. The height of cable between the EUT and the coupling and decoupling networks above the ground reference plane was 50mm.

- Voltage Level : 3V(rms)(unmodulated)
- Environmental phenomena : r.f. current, common mode, 1kHz, 80% AM
- Source impedance : 150 Ω
- Frequency range : 0.15 - 230 MHz
- Sweeping rate : $\leq 1,5 \times 10^{-3}$ decades/s
- Performance criteria : A

Table 6: Injected current, AC Power Port

Line	Result	Remarks
AC Input port	Pass	No disturbance of function

5.2.4 Voltage dips and interruptions to AC Power Port

Result:	Pass
----------------	-------------

The immunity against voltage dips and interruptions to AC power port was tested in accordance to EN 55014-2:1997+A1+A2. Test setup and the test generator are according to EN 61000-4-11 which is specified by EN 55014-2:1997+A1+A2. The EUT was placed directly on the table of aluminum.

Performance criteria	:	C	
Test level (in % UT) and duration (in periods of the rated frequency)	:	0	0.5/0.5 periods(50/60Hz)
		40	10/12 periods(50/60Hz)
		70	25/30 periods(50/60Hz)

Table 8: Test condition and Test Result for Voltage dips and Short interruptions

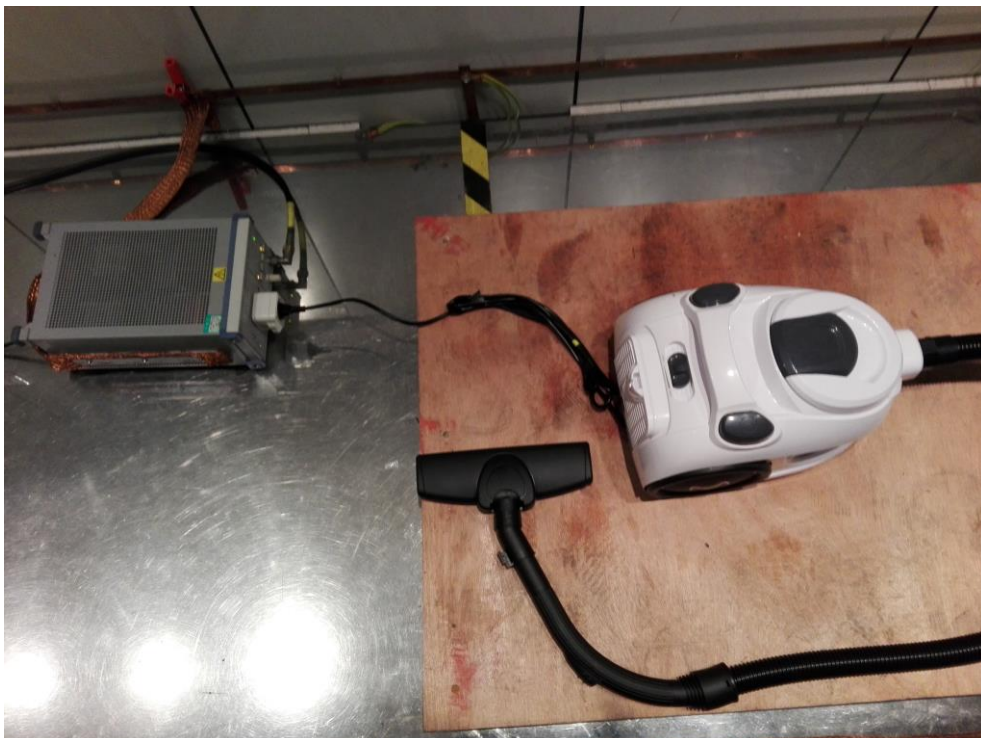
Test level (in % UT)	Duration	Performance criteria	Result	Remarks
0	0.5/0.5	C	Pass	No disturbance of function
40	10/12	C	Pass	No disturbance of function
70	25/30	C	Pass	No disturbance of function

6 Photographs of the Test Set-Up

Photograph 1: Set-up for Harmonics, Voltage Fluctuation and Flicker



Photograph 2: Set-up for Disturbance Voltage on AC mains terminal



Photograph 3: Set-up for Disturbance Power on AC mains



Photograph 4: Set-up for ESD



Photograph 5: Set-up for EFT



Photograph 6: Set-up for Inject Current



Prüfbericht - Nr.: 14717192 001
Test Report No.:

Seite 28 von 29
Page 28 of 29

Photograph 7: Set-up for Surge and Voltage Dips and Short Interruptions



7 List of Tables

Table 1: List of Test and Measurement Equipment of Laboratory	5
Table 2: Harmonic currents measurement result.....	9
Table 3: Voltage fluctuations and flicker measurement results	11
Table 4: ESD, Positive / Negative Polarity	20
Table 5: Burst, AC Power lines, Positive and Negative Polarity	21
Table 6: Injected current, AC Power Port.....	22
Table 7: Surges to AC Power lines, positive/negative	23
Table 8: Test condition and Test Result for Voltage dips and Short interruptions	24

8 List of Figures

Figure 1: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, L	13
Figure 2: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, N.....	14
Figure 3: Spectral Diagrams, Power Disturbance, Mains, 30–300MHz	17

9 List of Photographs

Photograph 1: Set-up for Harmonics, Voltage Fluctuation and Flicker	25
Photograph 2: Set-up for Disturbance Voltage on AC mains terminal	25
Photograph 3: Set-up for Disturbance Power on AC mains	26
Photograph 4: Set-up for ESD.....	26
Photograph 5: Set-up for EFT	27
Photograph 6: Set-up for Inject Current.....	27
Photograph 7: Set-up for Surge and Voltage Dips and Short Interruptions	28