


Prüfbericht - Nr.: <i>Test Report No.:</i>	60370959 001	Auftrags-Nr.: <i>Order No.:</i>	180124429	Seite 1 von 54 <i>Page 1 of 54</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2020.03.19		
Auftraggeber: <i>Client:</i>	Loctek Ergonomic Technology Corp. 588 Qihang South Road, Binhai Industrial Zone, Yinzhou District, Ningbo 315145 Zhejiang P. R. China				
Prüfgegenstand: <i>Test item:</i>	Control Box				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	Refer to page 2				
Auftrags-Inhalt: <i>Order content:</i>	TÜV Rheinland – EMC Service				
Prüfgrundlage: <i>Test specification:</i>	EN 55014-1:2017 EN 55014-2:2015 EN IEC 61000-3-2:2019 EN 61000-3-3:2013+A1				
Wareneingangsdatum: <i>Date of receipt:</i>	2020.03.19				
Prüfmuster-Nr.: <i>Test sample No.:</i>	A001075486 001 A002862418 001				
Prüfzeitraum: <i>Testing period:</i>	2020.04.08-2020.08.03				
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:				
2020.09.08 Caidong Xie/PE <i>Caidong Xie</i>	2020.09.08	Season Yang/TC	<i>Season Yang</i>		
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</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>		
<p>*Legende: 1= Sehr gut 2 = gut 3= befriedigend 4= ausreichend 5 = mangelhaft P(ass) =entspricht o.g. Prüfgrundlage(n) F(ail)= entspricht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T =nicht getestet Legend: 1= very good 2 = good 3= satisfactory 4= sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail)= failed a.m. test specification(s) N/A = not applicable N/T = not tested</p>					
<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>					

V04

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

4.2.1 RADIATED DISTURBANCE

Result:

Pass

5.1.1 ELECTROSTATIC DISCHARGE

Result:

Pass

5.1.2 RADIO FREQUENCY ELECTROMAGNETIC FIELD

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

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1 Test Sites

1.1 Test Facilities

Laboratory: TÜV Rheinland /CCIC(Ningbo) Co., Ltd.

1st Floor, Building 11, Scholar Innovation Park, No.1188 Zhongguan Road, Zhenhai District, Ningbo 315200 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.	EMI test receiver	ESR7	101929	2020.11.24
2.	Bilog Antenna	CBL6112D	49033	2021.04.12
3.	EMI receiver	ESR3	102331	2020.11.24
4.	LISN	ENV216	102250	2020.11.24
5.	CS immunity test	NSG 4070C-80	47606	2020.11.24
6.	CDN	CDN M016S	47812	2020.11.10
7.	ESD generator	NX30.1	11744	2020.11.24
8.	Signal generator	SMB100A	180488	2020.11.24
9.	Amplifier	BBA150-BC250	102749	2020.11.24
10.	Stacked Log-Per Antenna	STLP 9128 ES	219	N/A
11.	EFT & Surge & Dips Immunity test system	IMU4000F-S-D-V	1574	2020.11.24
12.	Harmonic power supply	5001IX-CTS-400-413	1735A02292	2020.11.10
13.	Harmonics/voltage fluctuation Analyser	PACS-1	1736A00799	2020.11.10

1.3 Measurement Uncertainty

Test Item	Expanded Measurement Uncertainty (k=2)
Conducted Emission (9-150kHz)	3.70dB
Conducted Emission (150k-30MHz)	3.30dB
Disturbance Power	4.27dB
Radiated Emission (30-1000MHz)	4.39dB
Radiated Emission (1-18GHz)	4.67dB
Radiated Emission (CDNE method)	4.05dB

2 General Product Information

2.1 Product Function and Intended Use

The EUTs (equipment under test) are a Control Box for Electric Height-Adjustable Desk. For the further information, refer to the user's manual.

2.2 Ratings and System Details

Input	:	Refer to page 2	For all models
Output	:	Refer to page 2	For all models
Protection class	:	II	For all models

Refer to the User's Manual for further information.

2.3 Independent Operation Modes

The basic operation mode is: "ON", and "OFF".

Refer to the User's Manual for further information.

2.4 Noise Generating and Noise Suppressing Parts

Refer to the circuit diagram for more information.

2.5 Submitted Documents

Circuit diagram, user's manual, labels, 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

Motor supplied by Loctek, HS11A-1

3.5 Countermeasures 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
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Date of testing	: 2020.04.08-2020.07.21
Test procedure	: EN IEC 61000-3-2:2019
Test duration	: 2.5min
Harmonic order	: 2 – 40 th
Frequency range	: 0 – 2kHz
Test voltage	: AC 230, 50Hz
Ambient condition	: Temperature: 18-21°C Humidity: 51-55%

The harmonics on AC Mains in the frequency from 0 to 2 kHz were measured in accordance with EN IEC 61000-3-2:2019.

The measurement was conducted with an automatic current harmonic analyzing system. This equipment is in compliance with the requirements of EN IEC 61000-3-2:2019.

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

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Table 2: Harmonic currents measurement result for model CB28M1J(IB)-1, mode Motor operation

Equipment category: Class A

Highest parameter values during test:

V_RMS (Volts): 229.51

I_Peak (Amps): 2.547

I_Fund (Amps): 0.165

Power (Watts): 36.2

Frequency(Hz): 50.00

I_RMS (Amps): 0.454

Crest Factor: 15.785

Power Factor: 0.357

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	1.080	N/A	0.002	1.620	N/A	Pass
3	0.122	2.300	5.3	0.158	3.450	4.6	Pass
4	0.001	0.430	N/A	0.003	0.645	N/A	Pass
5	0.119	1.140	10.4	0.153	1.710	9.0	Pass
6	0.001	0.300	N/A	0.002	0.450	N/A	Pass
7	0.115	0.770	14.9	0.147	1.155	12.7	Pass
8	0.001	0.230	N/A	0.002	0.345	N/A	Pass
9	0.110	0.400	27.4	0.139	0.600	23.1	Pass
10	0.001	0.184	N/A	0.002	0.276	N/A	Pass
11	0.104	0.330	31.4	0.130	0.495	26.2	Pass
12	0.002	0.153	N/A	0.003	0.230	N/A	Pass
13	0.097	0.210	46.1	0.119	0.315	37.9	Pass
14	0.002	0.131	N/A	0.003	0.197	N/A	Pass
15	0.089	0.150	59.6	0.109	0.225	48.3	Pass
16	0.002	0.115	N/A	0.003	0.173	N/A	Pass
17	0.082	0.132	61.8	0.098	0.198	49.3	Pass
18	0.002	0.102	N/A	0.003	0.153	N/A	Pass
19	0.074	0.118	62.1	0.087	0.178	48.9	Pass
20	0.002	0.092	N/A	0.003	0.138	N/A	Pass
21	0.066	0.107	61.2	0.076	0.161	47.6	Pass
22	0.002	0.084	N/A	0.004	0.125	N/A	Pass
23	0.058	0.098	58.9	0.066	0.147	45.3	Pass
24	0.002	0.077	N/A	0.004	0.115	N/A	Pass
25	0.050	0.090	55.7	0.057	0.135	42.5	Pass
26	0.002	0.071	N/A	0.004	0.107	N/A	Pass
27	0.043	0.083	51.6	0.049	0.125	39.3	Pass
28	0.002	0.066	N/A	0.004	0.099	N/A	Pass
29	0.036	0.078	46.9	0.042	0.116	35.9	Pass
30	0.002	0.061	N/A	0.003	0.092	N/A	Pass
31	0.030	0.073	41.8	0.035	0.109	32.2	Pass
32	0.002	0.058	N/A	0.003	0.086	N/A	Pass
33	0.025	0.068	36.6	0.029	0.102	28.5	Pass
34	0.001	0.054	N/A	0.003	0.081	N/A	Pass
35	0.020	0.064	31.4	0.024	0.096	24.8	Pass
36	0.001	0.051	N/A	0.002	0.077	N/A	Pass
37	0.016	0.061	26.4	0.019	0.091	21.2	Pass
38	0.001	0.048	N/A	0.002	0.073	N/A	Pass
39	0.013	0.058	21.7	0.015	0.087	17.7	Pass
40	0.001	0.046	N/A	0.001	0.069	N/A	Pass

Table 3: Harmonic currents measurement result for model CB28M1G(IB)-1, mode Motor operation

Equipment category: Class A

Highest parameter values during test:

V_RMS (Volts): 229.57

I_Peak (Amps): 2.218

I_Fund (Amps): 0.128

Power (Watts): 27.9

Frequency(Hz): 50.00

I_RMS (Amps): 0.379

Crest Factor: 17.338

Power Factor: 0.335

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	1.080	N/A	0.003	1.620	N/A	Pass
3	0.105	2.300	4.6	0.121	3.450	3.5	Pass
4	0.001	0.430	N/A	0.003	0.645	N/A	Pass
5	0.103	1.140	9.0	0.119	1.710	7.0	Pass
6	0.001	0.300	N/A	0.003	0.450	N/A	Pass
7	0.100	0.770	13.0	0.116	1.155	10.0	Pass
8	0.002	0.230	N/A	0.002	0.345	N/A	Pass
9	0.097	0.400	24.2	0.111	0.600	18.5	Pass
10	0.002	0.184	N/A	0.003	0.276	N/A	Pass
11	0.092	0.330	28.0	0.106	0.495	21.4	Pass
12	0.002	0.153	N/A	0.003	0.230	N/A	Pass
13	0.087	0.210	41.6	0.100	0.315	31.7	Pass
14	0.002	0.131	N/A	0.003	0.197	N/A	Pass
15	0.082	0.150	54.5	0.093	0.225	41.4	Pass
16	0.002	0.115	N/A	0.003	0.173	N/A	Pass
17	0.076	0.132	57.4	0.086	0.198	43.5	Pass
18	0.002	0.102	N/A	0.003	0.153	N/A	Pass
19	0.070	0.118	58.7	0.079	0.178	44.3	Pass
20	0.002	0.092	N/A	0.003	0.138	N/A	Pass
21	0.063	0.107	58.9	0.071	0.161	44.2	Pass
22	0.002	0.084	N/A	0.003	0.125	N/A	Pass
23	0.057	0.098	57.8	0.063	0.147	43.2	Pass
24	0.002	0.077	N/A	0.003	0.115	N/A	Pass
25	0.050	0.090	55.6	0.056	0.135	41.7	Pass
26	0.002	0.071	N/A	0.003	0.107	N/A	Pass
27	0.044	0.083	52.5	0.049	0.125	39.5	Pass
28	0.002	0.066	N/A	0.003	0.099	N/A	Pass
29	0.038	0.078	48.5	0.042	0.116	36.5	Pass
30	0.002	0.061	N/A	0.003	0.092	N/A	Pass
31	0.032	0.073	43.9	0.036	0.109	33.1	Pass
32	0.002	0.058	N/A	0.003	0.086	N/A	Pass
33	0.027	0.068	38.9	0.030	0.102	29.5	Pass
34	0.002	0.054	N/A	0.002	0.081	N/A	Pass
35	0.022	0.064	33.6	0.025	0.096	25.5	Pass
36	0.001	0.051	N/A	0.002	0.077	N/A	Pass
37	0.017	0.061	28.4	0.020	0.091	21.6	Pass
38	0.001	0.048	N/A	0.002	0.073	N/A	Pass
39	0.013	0.058	23.3	0.015	0.087	17.7	Pass
40	0.001	0.046	N/A	0.002	0.069	N/A	Pass

4.1.2 Voltage changes, voltage fluctuations and flicker on AC mains

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

Date of testing : 2020.04.08-2020.07.21
 Test procedure : EN 61000-3-3:2013+A1
 Ambient condition : Temperature: 18-21°C; Humidity: 51-55%

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 6%.
- the value of P_{st} shall not be greater than 1.0;
- the value of P_{lt} shall not be greater than 0.65;

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

Table 4: Voltage fluctuations and flicker measurement results for model CB28M1J(IB)-1, mode Motor operation

	d_c	d_{max} (average)	$d(t)$	P_{st}
Limits	3.3%	6%	3.3%/500ms	1.0
Result	0.00%	0.00%	0ms	0.064

Table 5: Voltage fluctuations and flicker measurement results for model CB28M1G(IB)-1, mode Motor operation

	d_c	d_{max} (average)	$d(t)$	P_{st}
Limits	3.3%	6%	3.3%/500ms	1.0
Result	0.00%	0.00%	0ms	0.064

4.1.3 Mains Terminal Continuous Disturbance Voltage

Result:

Pass

Date of testing : 2020.04.13-2020.07.21
 Test procedure : EN 55014-1:2017 and CISPR 16-1 series standards
 Frequency range : 0.15-30MHz
 Ambient condition : Temperature: 21-22°C
 Humidity: 49%
 Kind of test site : EMC Chamber

Test Setup

Input Voltage : AC 230V, 50Hz; AC 120V, 50Hz
 Operational mode : ON(Motor operation, DC output)
 Artificial hand : Not applied
 Earthing : No

The measurement setup was made according to EN 55014-1:2017 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.

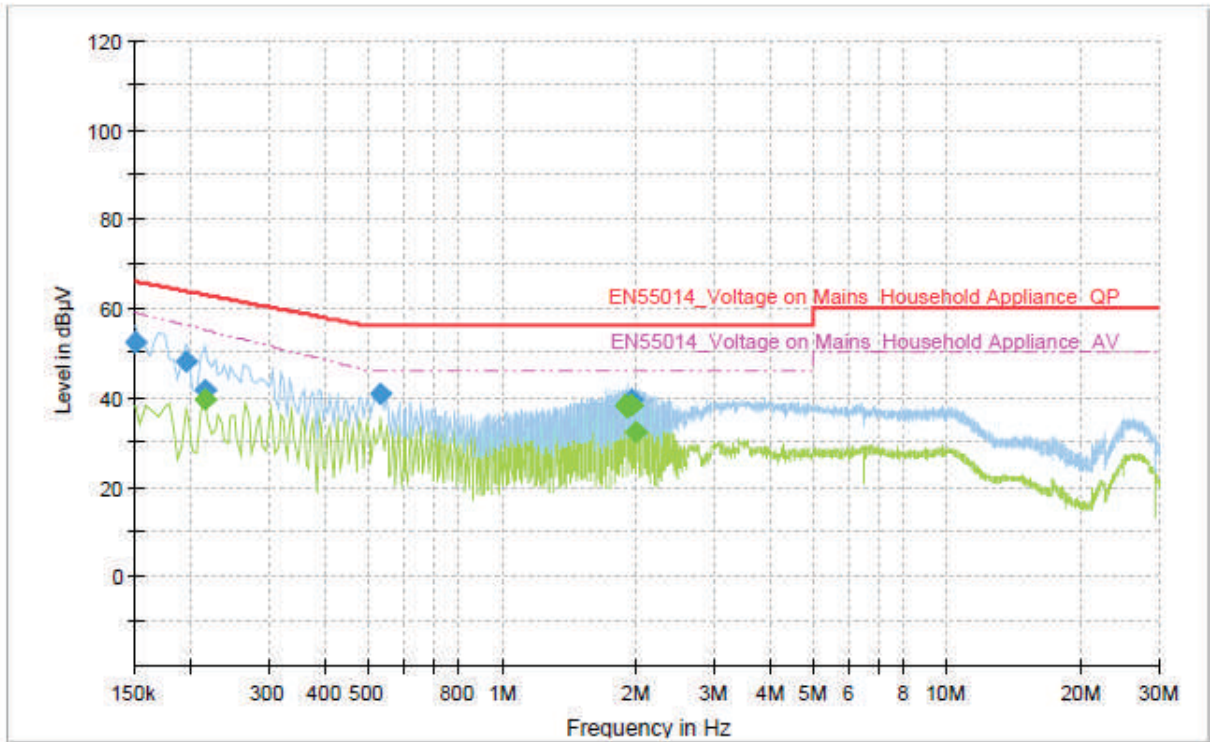
The tested object was set-up on a wooden table. The EUT was set 0.8m away from the AMN. The cord longer than necessary to be connected to the AMN was folded forth and back parallel so as to form a bundle with a length between 0.3m and 0.4m.

The Interference Voltage was determined according to clause 5 of EN 55014-1:2017 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, AC 230V, 50Hz, model CB28M1J(IB)-1, mode Motor operation

Full Spectrum

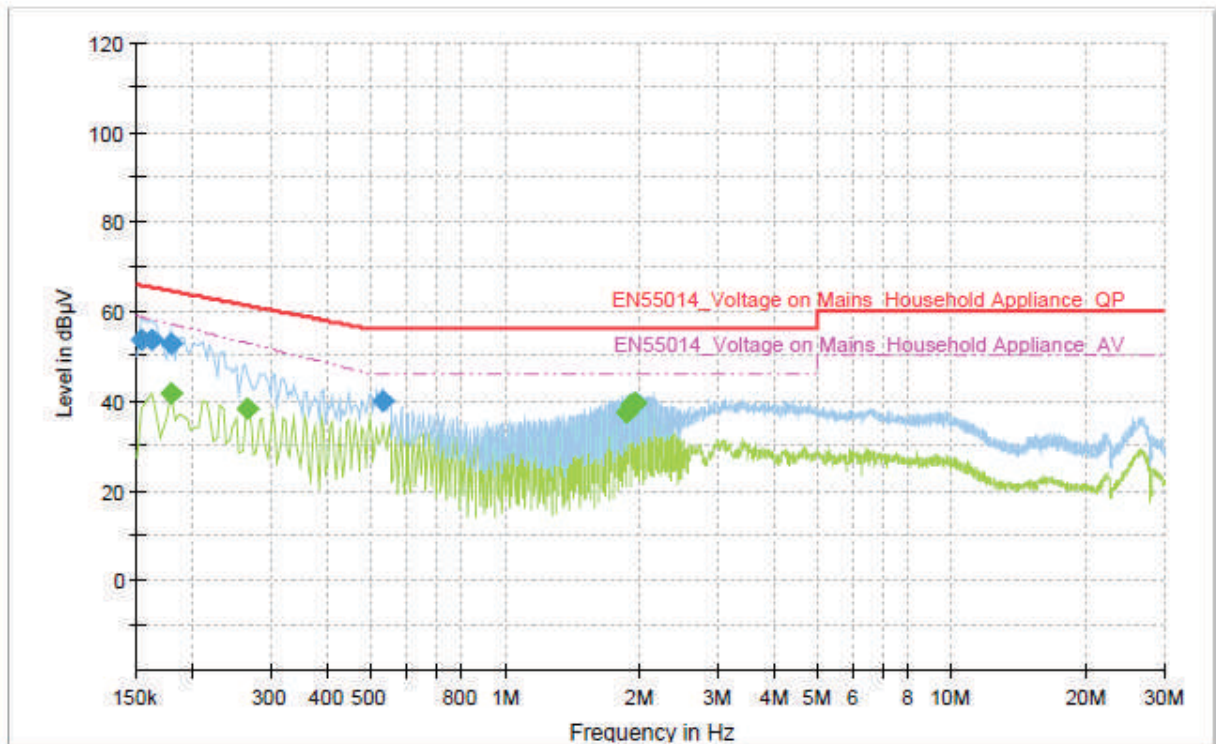


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	52.38	---	66.00	13.62	1000.0	9.000	L1	ON	9.6
0.194000	48.01	---	63.86	15.86	1000.0	9.000	L1	ON	9.5
0.214000	---	39.40	55.16	15.76	1000.0	9.000	L1	ON	9.5
0.214000	41.80	---	63.05	21.25	1000.0	9.000	L1	ON	9.5
0.534000	40.82	---	56.00	15.18	1000.0	9.000	L1	ON	9.5
1.882000	---	38.04	46.00	7.96	1000.0	9.000	L1	ON	9.6
1.918000	---	37.92	46.00	8.08	1000.0	9.000	L1	ON	9.6
1.954000	---	38.08	46.00	7.92	1000.0	9.000	L1	ON	9.6
1.954000	39.60	---	56.00	16.40	1000.0	9.000	L1	ON	9.6
1.990000	---	32.39	46.00	13.61	1000.0	9.000	L1	ON	9.6

Figure 2: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, N, AC 230V, 50Hz, model CB28M1J(IB)-1, mode Motor operation

Full Spectrum

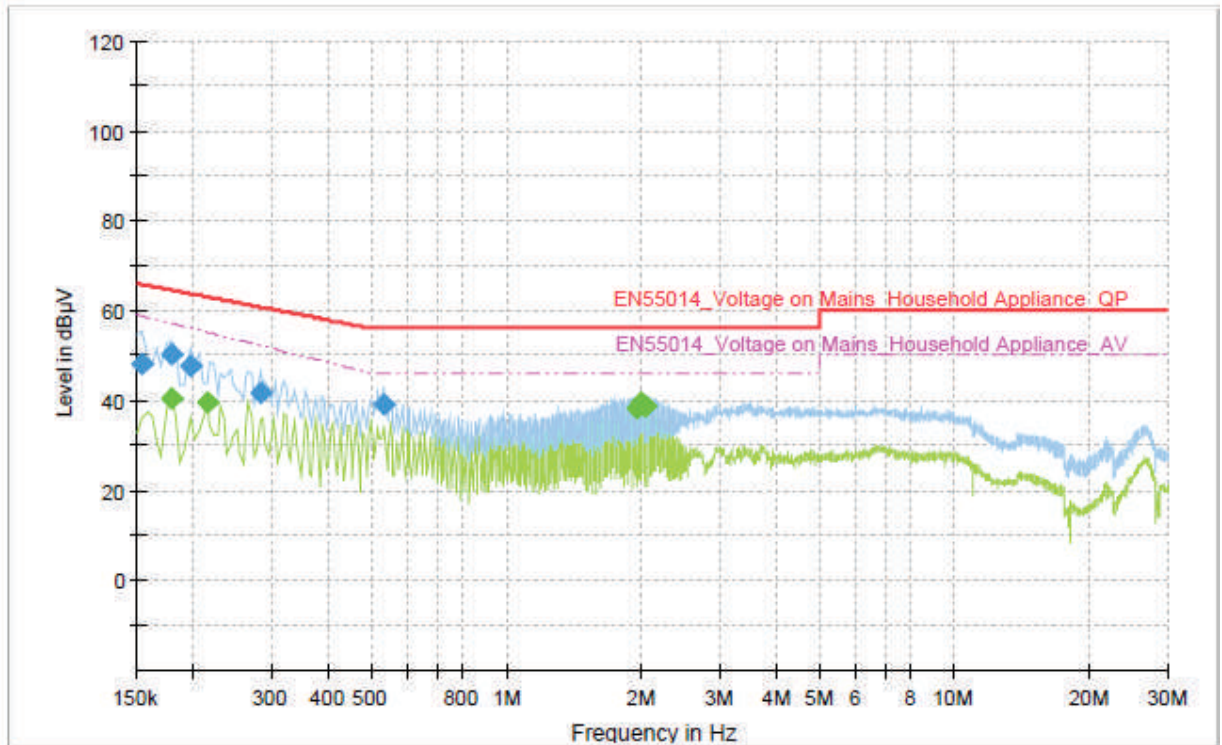


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154000	53.83	---	65.78	11.95	1000.0	9.000	N	ON	9.6
0.162000	53.54	---	65.36	11.82	1000.0	9.000	N	ON	9.6
0.178000	---	41.72	57.15	15.44	1000.0	9.000	N	ON	9.6
0.178000	52.79	---	64.58	11.78	1000.0	9.000	N	ON	9.6
0.266000	---	38.35	52.81	14.46	1000.0	9.000	N	ON	9.6
0.534000	39.89	---	56.00	16.11	1000.0	9.000	N	ON	9.5
1.866000	---	37.56	46.00	8.44	1000.0	9.000	N	ON	9.6
1.918000	---	39.23	46.00	6.77	1000.0	9.000	N	ON	9.6
1.954000	---	39.36	46.00	6.64	1000.0	9.000	N	ON	9.6
1.954000	39.62	---	56.00	16.38	1000.0	9.000	N	ON	9.6

Figure 3: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, L, AC 120V, 50Hz, model CB28M1J(IB)-1, mode Motor operation

Full Spectrum

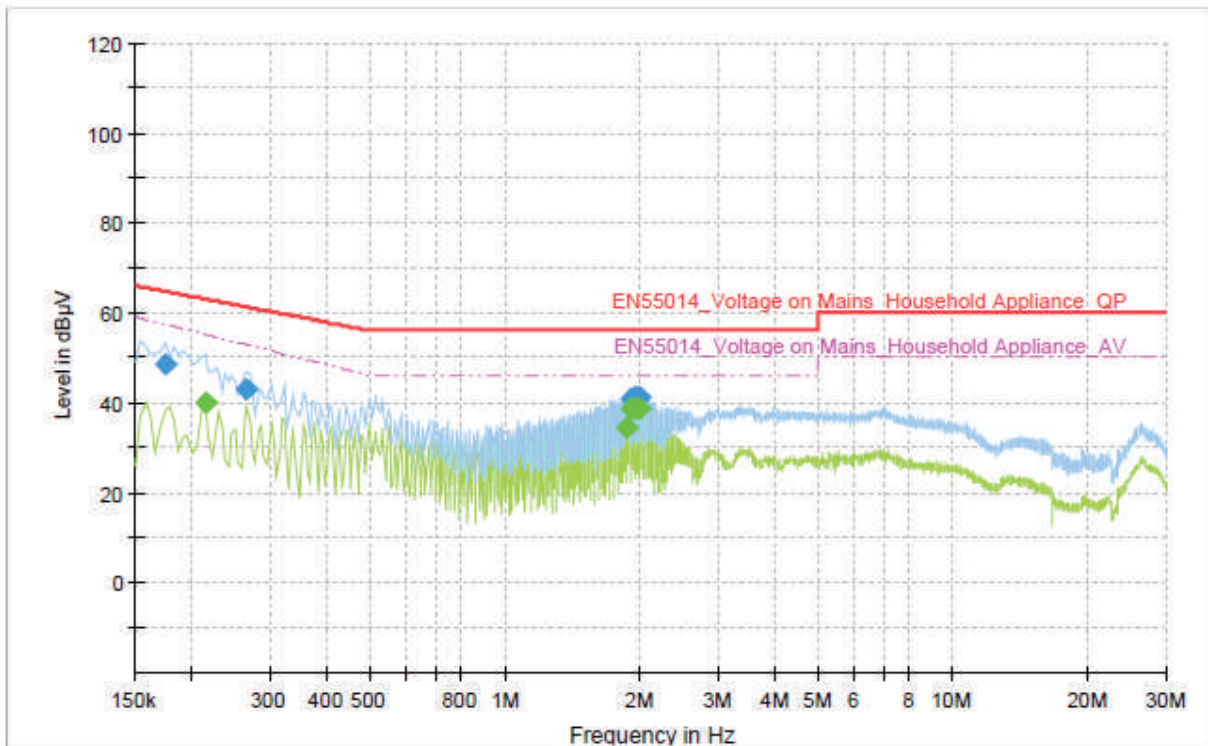


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154000	48.16	---	65.78	17.62	1000.0	9.000	L1	ON	9.6
0.178000	---	40.23	57.15	16.92	1000.0	9.000	L1	ON	9.6
0.178000	50.29	---	64.58	14.29	1000.0	9.000	L1	ON	9.6
0.198000	47.60	---	63.69	16.09	1000.0	9.000	L1	ON	9.5
0.214000	---	39.36	55.16	15.80	1000.0	9.000	L1	ON	9.5
0.282000	41.62	---	60.76	19.14	1000.0	9.000	L1	ON	9.5
0.530000	38.90	---	56.00	17.10	1000.0	9.000	L1	ON	9.5
1.954000	---	38.01	46.00	7.99	1000.0	9.000	L1	ON	9.6
1.990000	---	39.34	46.00	6.66	1000.0	9.000	L1	ON	9.6
2.042000	---	38.73	46.00	7.27	1000.0	9.000	L1	ON	9.6

Figure 4: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, N, AC 120V, 50Hz, model CB28M1J(IB)-1, mode Motor operation

Full Spectrum

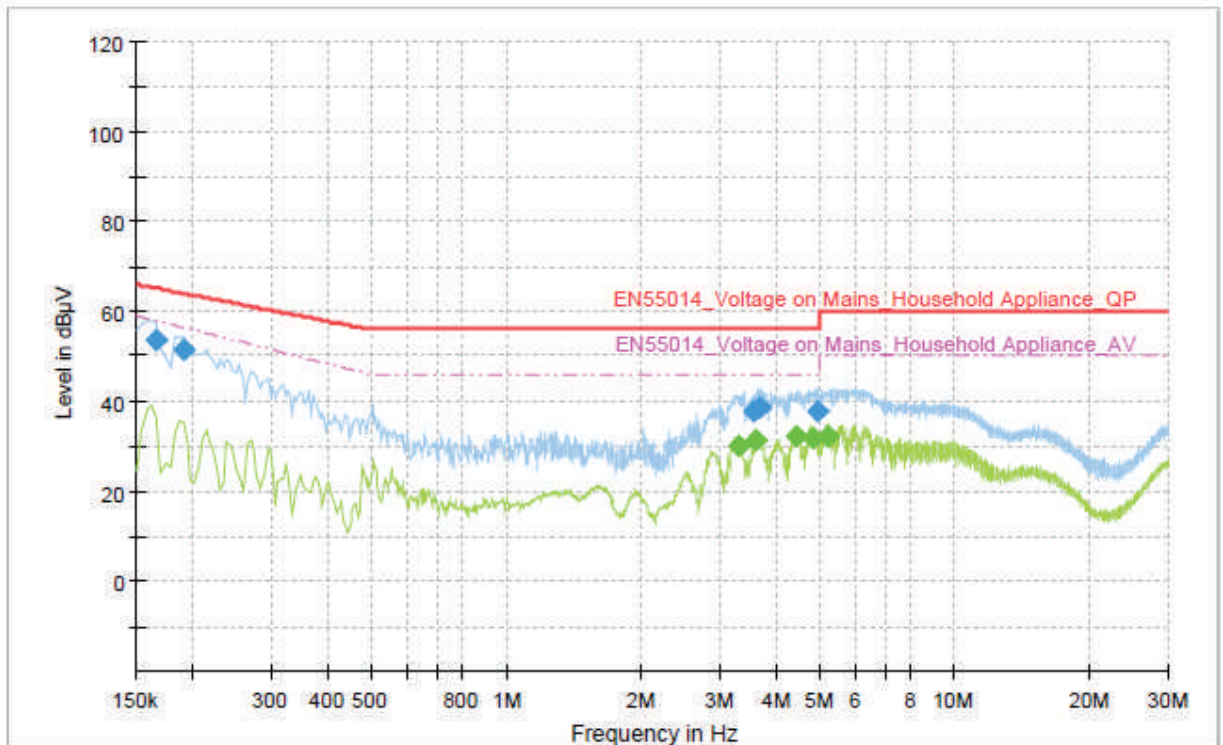


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.174000	48.40	---	64.77	16.37	1000.0	9.000	N	ON	9.6
0.214000	---	40.11	55.16	15.05	1000.0	9.000	N	ON	9.6
0.266000	42.83	---	61.24	18.41	1000.0	9.000	N	ON	9.6
1.866000	---	34.32	46.00	11.68	1000.0	9.000	N	ON	9.6
1.918000	40.94	---	56.00	15.06	1000.0	9.000	N	ON	9.6
1.918000	---	38.51	46.00	7.49	1000.0	9.000	N	ON	9.6
1.954000	41.30	---	56.00	14.70	1000.0	9.000	N	ON	9.6
1.954000	---	38.74	46.00	7.26	1000.0	9.000	N	ON	9.6
1.990000	---	38.52	46.00	7.48	1000.0	9.000	N	ON	9.6
1.990000	41.14	---	56.00	14.86	1000.0	9.000	N	ON	9.6

Figure 5: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, L, AC 230V, 50Hz, model CB28M1J(IB)-1, mode DC output

Full Spectrum

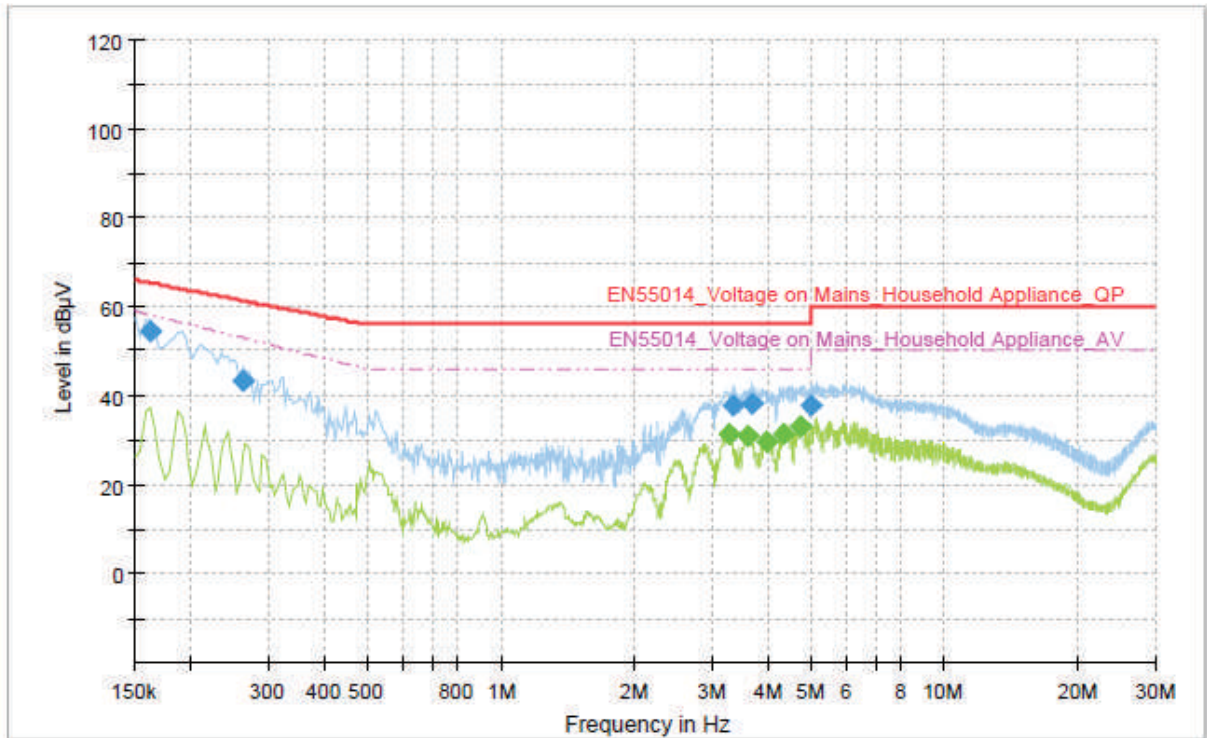


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.166000	53.63	---	65.16	11.53	1000.0	9.000	L1	ON	9.6
0.190000	51.59	---	64.04	12.45	1000.0	9.000	L1	ON	9.5
3.298000	---	30.29	46.00	15.71	1000.0	9.000	L1	ON	9.6
3.570000	37.97	---	56.00	18.03	1000.0	9.000	L1	ON	9.6
3.606000	---	31.51	46.00	14.49	1000.0	9.000	L1	ON	9.6
3.674000	38.70	---	56.00	17.30	1000.0	9.000	L1	ON	9.6
4.414000	---	32.28	46.00	13.72	1000.0	9.000	L1	ON	9.7
4.850000	---	31.90	46.00	14.10	1000.0	9.000	L1	ON	9.7
4.970000	37.68	---	56.00	18.32	1000.0	9.000	L1	ON	9.7
5.222000	---	32.42	50.00	17.58	1000.0	9.000	L1	ON	9.7

Figure 6: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, N, AC 230V, 50Hz, model CB28M1J(IB)-1, mode DC output

Full Spectrum

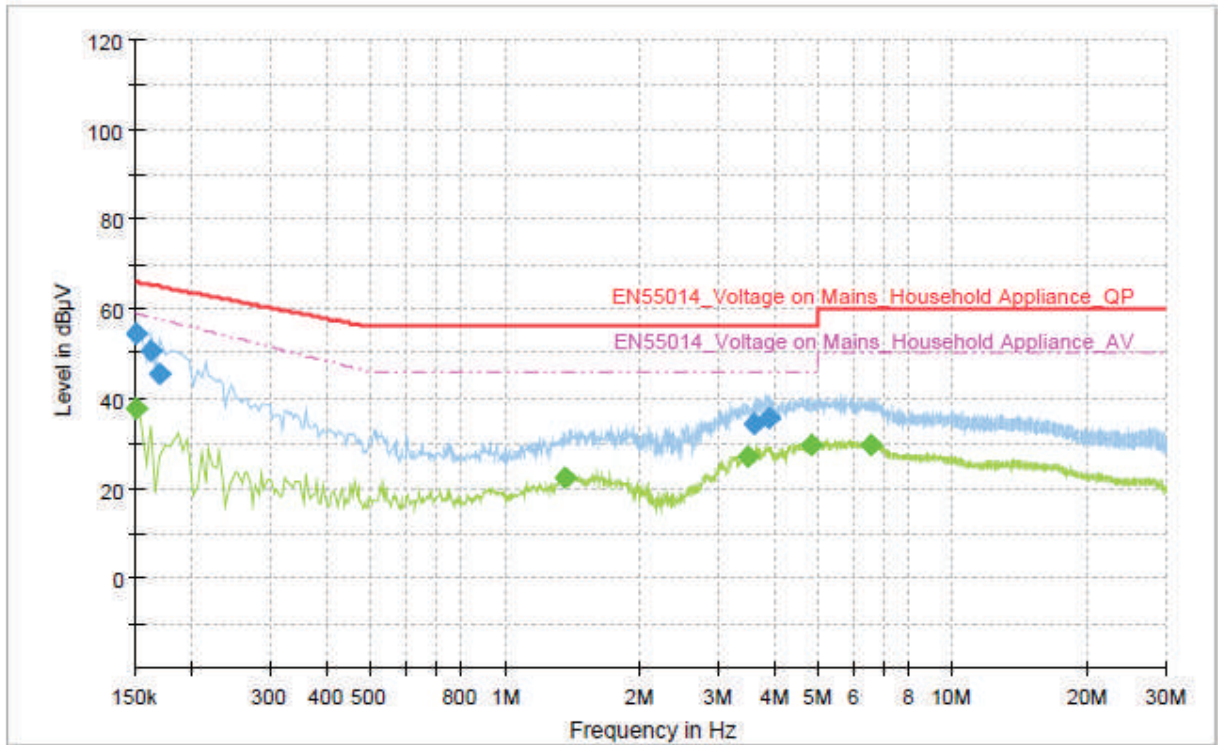


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.162000	54.36	---	65.36	11.00	1000.0	9.000	N	ON	9.6
0.262000	43.27	---	61.37	18.10	1000.0	9.000	N	ON	9.6
3.262000	---	31.29	46.00	14.71	1000.0	9.000	N	ON	9.6
3.322000	37.69	---	56.00	18.31	1000.0	9.000	N	ON	9.6
3.598000	---	31.01	46.00	14.99	1000.0	9.000	N	ON	9.7
3.694000	38.08	---	56.00	17.92	1000.0	9.000	N	ON	9.7
3.958000	---	29.46	46.00	16.54	1000.0	9.000	N	ON	9.7
4.350000	---	31.56	46.00	14.44	1000.0	9.000	N	ON	9.7
4.750000	---	33.24	46.00	12.76	1000.0	9.000	N	ON	9.7
4.998000	37.69	---	56.00	18.31	1000.0	9.000	N	ON	9.7

Figure 7: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, L, AC 120V, 50Hz, model CB28M1J(IB)-1, mode DC output

Full Spectrum

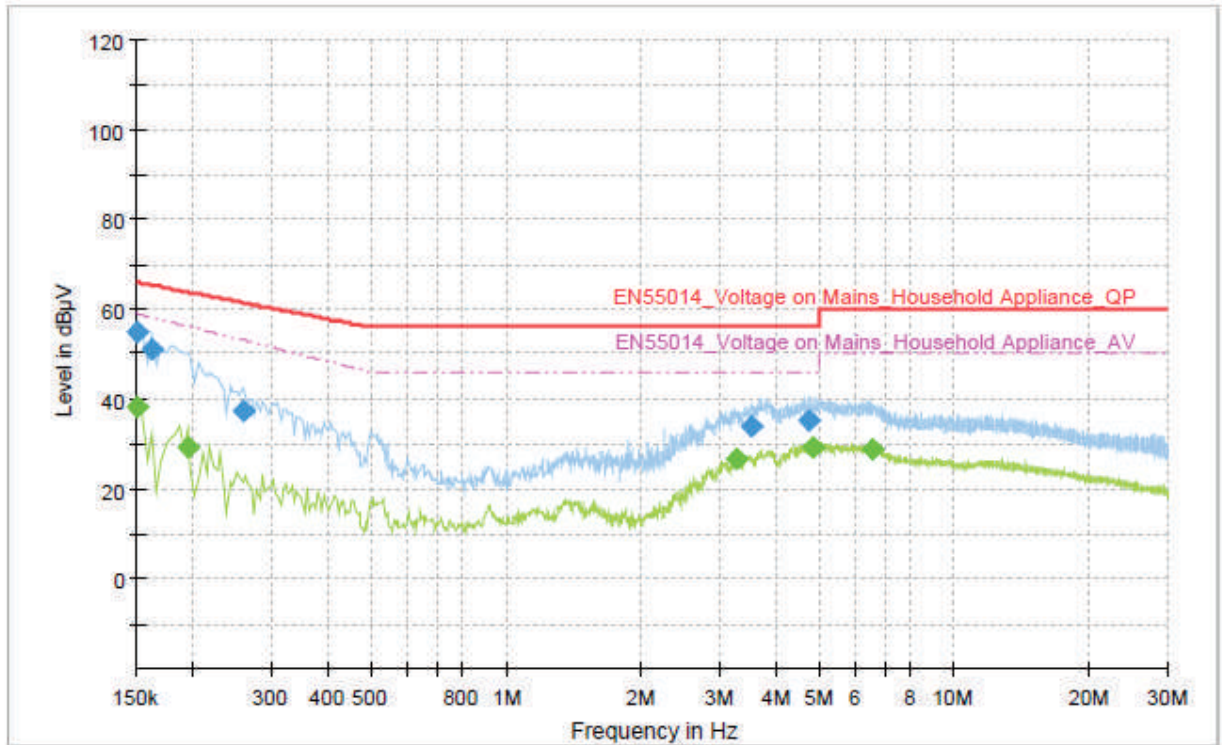


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	---	37.59	59.00	21.41	1000.0	9.000	L1	ON	9.6
0.150000	54.65	---	66.00	11.35	1000.0	9.000	L1	ON	9.6
0.162000	50.46	---	65.36	14.90	1000.0	9.000	L1	ON	9.6
0.170000	45.61	---	64.96	19.35	1000.0	9.000	L1	ON	9.6
1.366000	---	22.36	46.00	23.64	1000.0	9.000	L1	ON	9.5
3.502000	---	26.98	46.00	19.02	1000.0	9.000	L1	ON	9.6
3.594000	34.19	---	56.00	21.81	1000.0	9.000	L1	ON	9.6
3.878000	35.55	---	56.00	20.45	1000.0	9.000	L1	ON	9.6
4.814000	---	29.66	46.00	16.34	1000.0	9.000	L1	ON	9.7
6.602000	---	29.87	50.00	20.13	1000.0	9.000	L1	ON	9.7

Figure 8: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, N, AC 120V, 50Hz, model CB28M1J(IB)-1, mode DC output

Full Spectrum

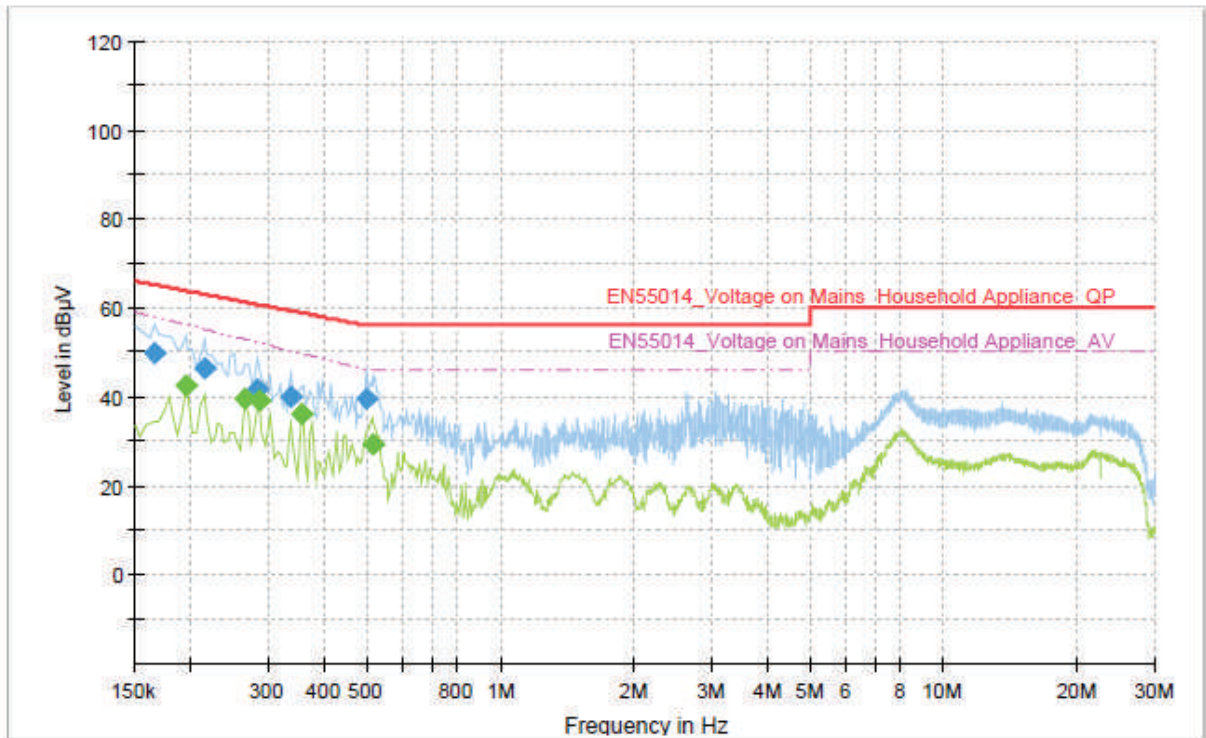


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	54.99	---	66.00	11.01	1000.0	9.000	N	ON	9.6
0.150000	---	38.31	59.00	20.69	1000.0	9.000	N	ON	9.6
0.162000	50.88	---	65.36	14.48	1000.0	9.000	N	ON	9.6
0.194000	---	29.28	56.22	26.95	1000.0	9.000	N	ON	9.6
0.258000	37.18	---	61.50	24.32	1000.0	9.000	N	ON	9.6
3.278000	---	26.51	46.00	19.49	1000.0	9.000	N	ON	9.6
3.510000	33.78	---	56.00	22.22	1000.0	9.000	N	ON	9.7
4.758000	35.10	---	56.00	20.90	1000.0	9.000	N	ON	9.7
4.866000	---	29.19	46.00	16.81	1000.0	9.000	N	ON	9.7
6.570000	---	28.95	50.00	21.05	1000.0	9.000	N	ON	9.8

Figure 9: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, L, AC 230V, 50Hz, model CB28M2G(IB)-1, mode Motor operation

Full Spectrum

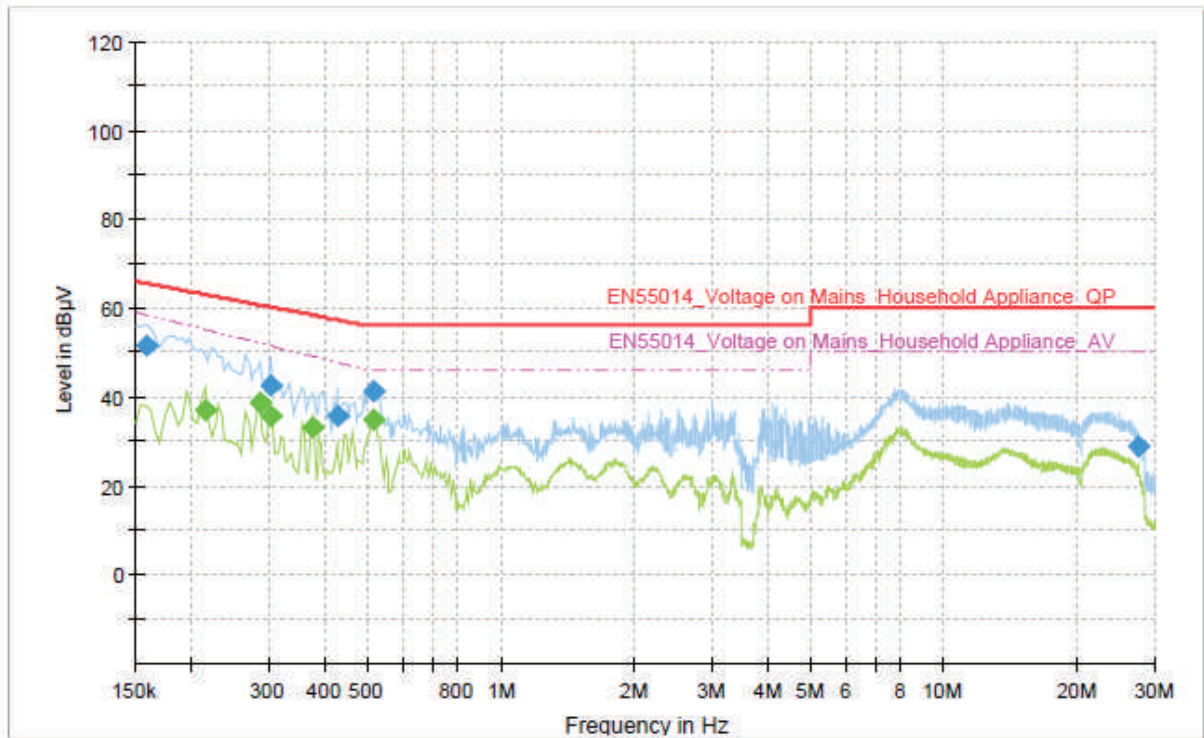


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.166000	49.62	---	65.16	15.53	1000.0	9.000	L1	ON	9.6
0.194000	---	42.46	56.22	13.77	1000.0	9.000	L1	ON	9.5
0.214000	46.44	---	63.05	16.61	1000.0	9.000	L1	ON	9.5
0.266000	---	39.53	52.81	13.28	1000.0	9.000	L1	ON	9.5
0.282000	41.83	---	60.76	18.93	1000.0	9.000	L1	ON	9.5
0.286000	---	39.01	52.03	13.03	1000.0	9.000	L1	ON	9.5
0.338000	40.13	---	59.25	19.13	1000.0	9.000	L1	ON	9.5
0.354000	---	36.08	49.73	13.65	1000.0	9.000	L1	ON	9.5
0.498000	39.69	---	56.03	16.34	1000.0	9.000	L1	ON	9.5
0.514000	---	29.13	46.00	16.87	1000.0	9.000	L1	ON	9.5

Figure 10: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, N, AC 230V, 50Hz, model CB28M2G(IB)-1, mode Motor operation

Full Spectrum

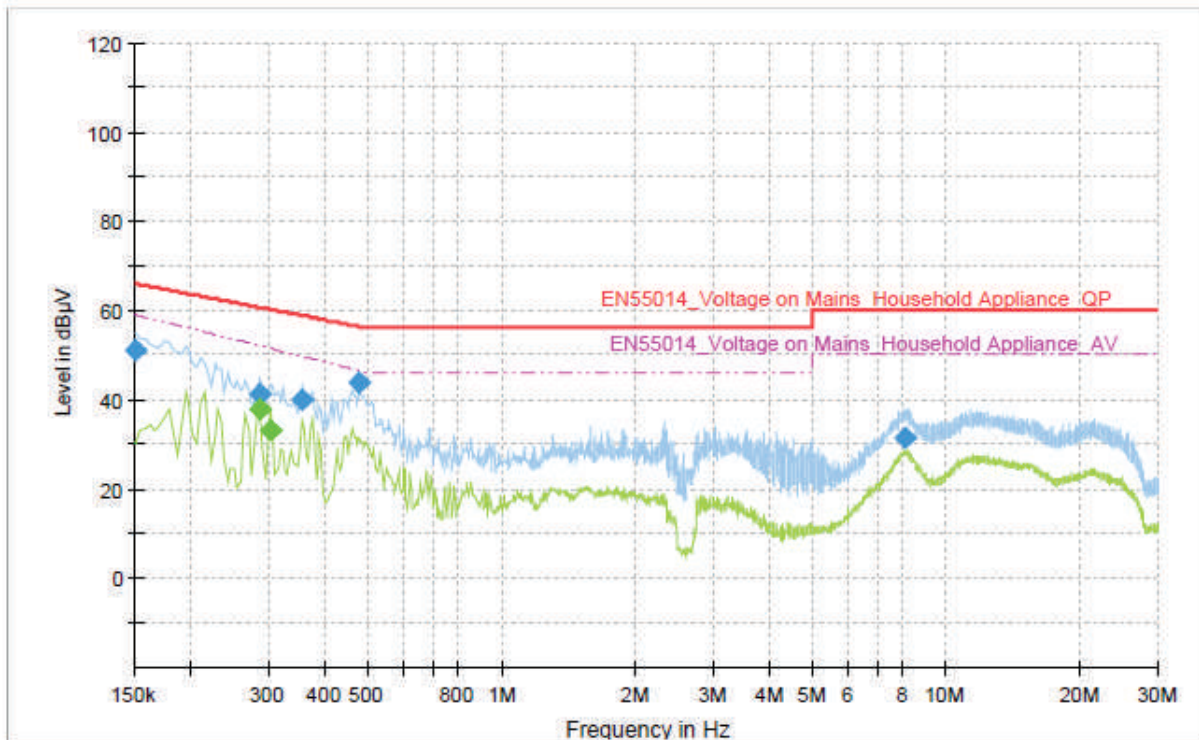


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.158000	51.61	---	65.57	13.96	1000.0	9.000	N	ON	9.6
0.214000	---	36.92	55.16	18.24	1000.0	9.000	N	ON	9.6
0.286000	---	38.62	52.03	13.41	1000.0	9.000	N	ON	9.6
0.302000	---	35.49	51.44	15.96	1000.0	9.000	N	ON	9.5
0.302000	42.56	---	60.19	17.63	1000.0	9.000	N	ON	9.5
0.374000	---	32.89	49.14	16.25	1000.0	9.000	N	ON	9.5
0.426000	35.50	---	57.33	21.83	1000.0	9.000	N	ON	9.5
0.514000	41.23	---	56.00	14.77	1000.0	9.000	N	ON	9.5
0.514000	---	34.95	46.00	11.05	1000.0	9.000	N	ON	9.5
27.446000	28.89	---	60.00	31.11	1000.0	9.000	N	ON	10.2

Figure 11: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, L, AC 120V, 50Hz, model CB28M2G(IB)-1, mode Motor operation

Full Spectrum

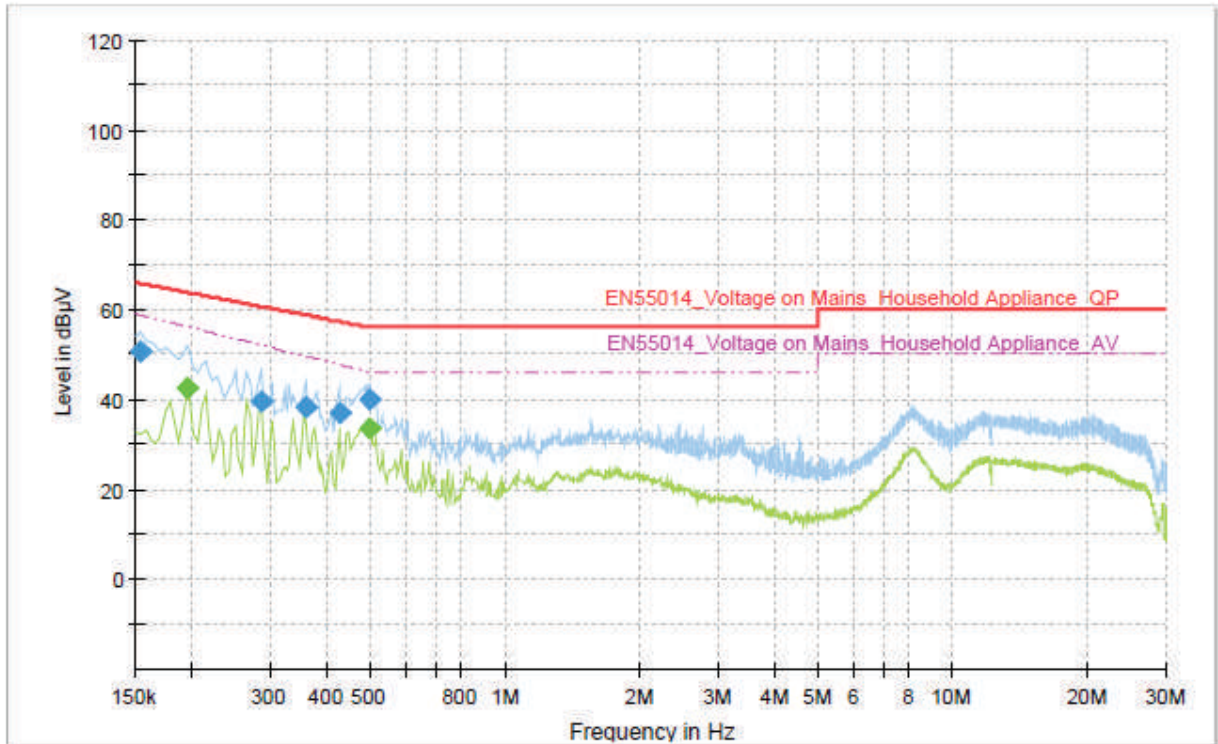


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	51.23	---	66.00	14.77	1000.0	9.000	L1	ON	9.6
0.286000	41.38	---	51.98	14.21	1000.0	9.000	L1	ON	9.5
0.286000	---	37.77	50.64	12.87	1000.0	9.000	L1	ON	9.5
0.302000	---	33.24	51.46	18.22	1000.0	9.000	L1	ON	9.5
0.354000	40.08	---	58.87	18.79	1000.0	9.000	L1	ON	9.5
0.478000	43.87	---	56.37	12.50	1000.0	9.000	L1	ON	9.5
8.070000	31.43	---	60.00	28.57	1000.0	9.000	L1	ON	9.8

Figure 12: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, N, AC 120V, 50Hz, model CB28M2G(IB)-1, mode Motor operation

Full Spectrum

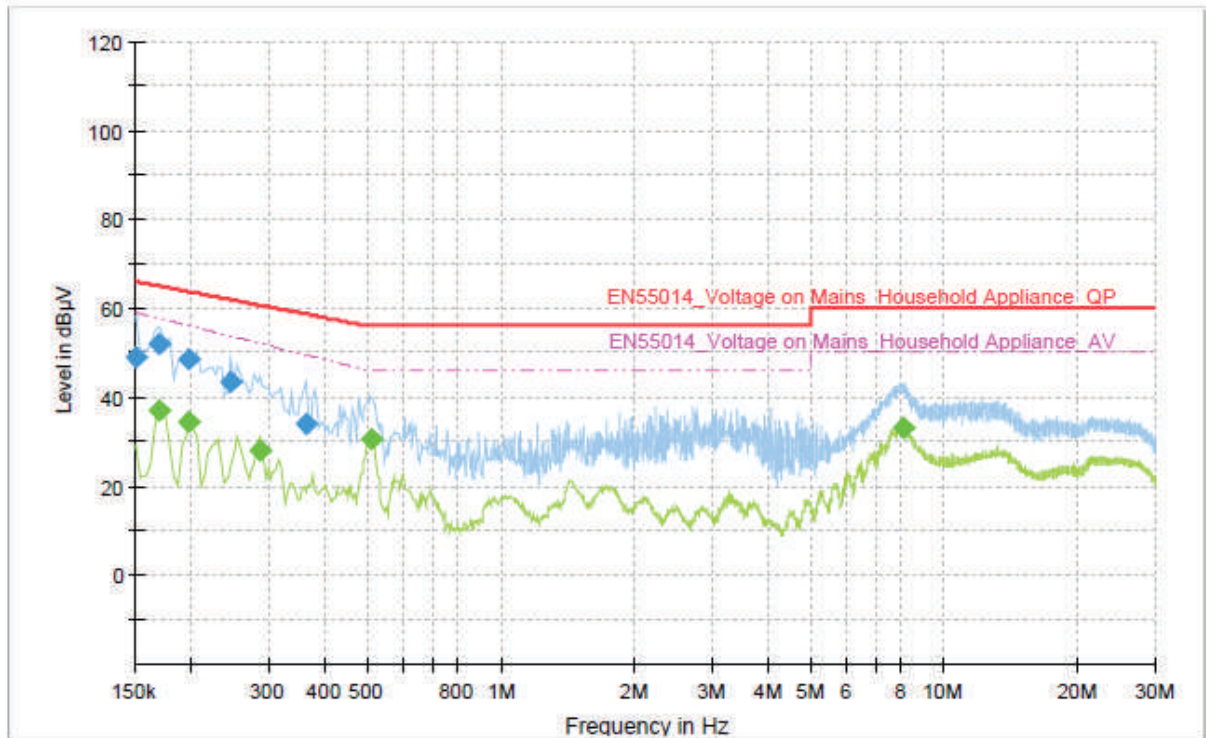


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154000	50.84	---	65.78	14.95	1000.0	9.000	N	ON	9.6
0.194000	---	42.52	56.27	13.75	1000.0	9.000	N	ON	9.6
0.286000	39.31	---	60.64	21.33	1000.0	9.000	N	ON	9.6
0.358000	38.44	---	58.78	20.33	1000.0	9.000	N	ON	9.5
0.426000	36.74	---	57.33	20.59	1000.0	9.000	N	ON	9.5
0.498000	40.08	---	56.03	15.96	1000.0	9.000	N	ON	9.5
0.498000	---	33.66	46.03	12.37	1000.0	9.000	N	ON	9.5

Figure 13: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, L, AC 230V, 50Hz, model CB28M2G(IB)-1, mode DC output

Full Spectrum

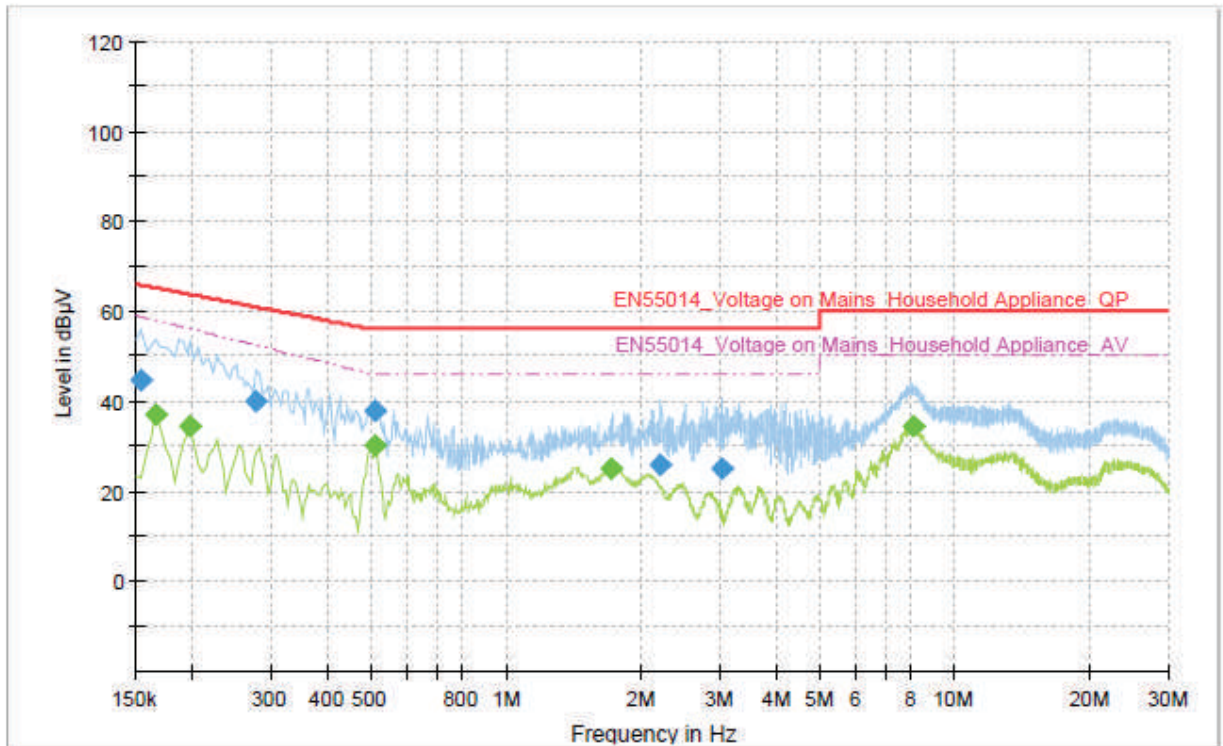


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	49.02	---	66.00	16.98	1000.0	9.000	L1	ON	9.6
0.170000	---	36.97	57.65	20.68	1000.0	9.000	L1	ON	9.6
0.170000	51.73	---	64.96	13.23	1000.0	9.000	L1	ON	9.6
0.198000	---	34.58	56.00	21.42	1000.0	9.000	L1	ON	9.5
0.198000	48.53	---	63.69	15.17	1000.0	9.000	L1	ON	9.5
0.246000	43.17	---	61.89	18.72	1000.0	9.000	L1	ON	9.5
0.286000	---	28.05	52.03	23.98	1000.0	9.000	L1	ON	9.5
0.362000	34.07	---	58.68	24.61	1000.0	9.000	L1	ON	9.5
0.510000	---	30.37	46.00	15.63	1000.0	9.000	L1	ON	9.5
8.050000	---	33.27	50.00	16.73	1000.0	9.000	L1	ON	9.8

Figure 14: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, N, AC 230V, 50Hz, model CB28M2G(IB)-1, mode DC output

Full Spectrum

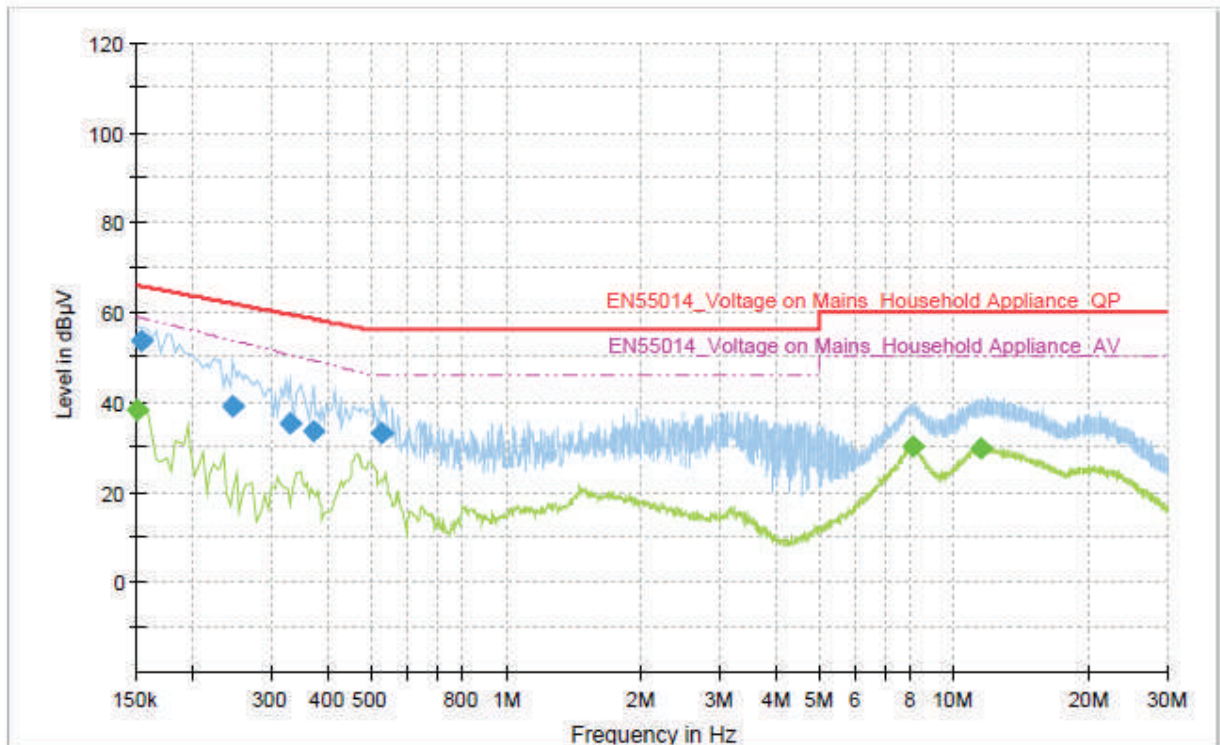


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.154000	44.80	---	65.78	20.98	1000.0	9.000	N	ON	9.6
0.166000	---	36.82	57.91	21.09	1000.0	9.000	N	ON	9.6
0.198000	---	34.54	56.00	21.46	1000.0	9.000	N	ON	9.6
0.278000	40.15	---	60.88	20.72	1000.0	9.000	N	ON	9.6
0.510000	37.77	---	56.00	18.23	1000.0	9.000	N	ON	9.5
0.510000	---	29.96	46.00	16.04	1000.0	9.000	N	ON	9.5
1.722000	---	25.06	46.00	20.94	1000.0	9.000	N	ON	9.6
2.214000	25.60	---	56.00	30.40	1000.0	9.000	N	ON	9.6
3.018000	24.96	---	56.00	31.04	1000.0	9.000	N	ON	9.6
8.050000	---	34.22	50.00	15.78	1000.0	9.000	N	ON	9.8

Figure 15: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, L, AC 120V, 50Hz, model CB28M2G(IB)-1, mode DC output

Full Spectrum

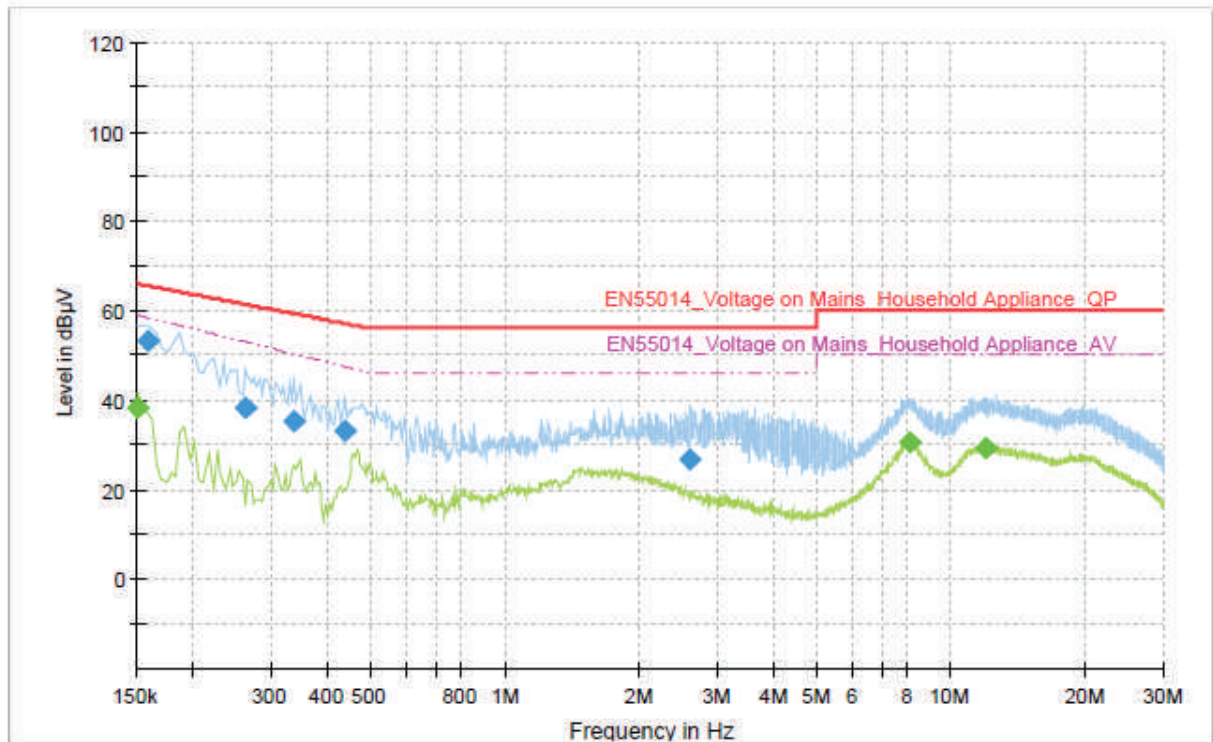


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	---	38.21	59.00	20.79	1000.0	9.000	L1	ON	9.6
0.154000	53.73	---	65.78	12.05	1000.0	9.000	L1	ON	9.6
0.246000	39.14	---	61.89	22.75	1000.0	9.000	L1	ON	9.5
0.330000	35.16	---	59.45	24.30	1000.0	9.000	L1	ON	9.5
0.370000	33.43	---	58.50	25.07	1000.0	9.000	L1	ON	9.5
0.526000	33.18	---	56.00	22.82	1000.0	9.000	L1	ON	9.5
8.070000	---	29.90	50.00	20.10	1000.0	9.000	L1	ON	9.8
11.418000	---	29.50	50.00	20.50	1000.0	9.000	L1	ON	9.9

Figure 16: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, N, AC 120V, 50Hz, model CB28M2G(IB)-1, mode DC output

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.150000	---	38.38	59.00	20.62	1000.0	9.000	N	ON	9.6
0.158000	53.05	---	65.57	12.52	1000.0	9.000	N	ON	9.6
0.262000	38.10	---	61.37	23.26	1000.0	9.000	N	ON	9.6
0.338000	35.40	---	59.25	23.85	1000.0	9.000	N	ON	9.5
0.438000	33.17	---	57.10	23.93	1000.0	9.000	N	ON	9.5
2.598000	26.81	---	56.00	29.19	1000.0	9.000	N	ON	9.6
8.086000	---	30.61	50.00	19.39	1000.0	9.000	N	ON	9.8
12.010000	---	29.18	50.00	20.82	1000.0	9.000	N	ON	9.9

4.2 Emission in the Frequency Range above 30 MHz

4.2.1 Radiated disturbance

Result:	Pass
Date of testing	: 2020.04.10-2020.07.21
Test procedure	: EN 55014-1:2017
Frequency range	: 30-1000MHz
Kind of test site	: Semi-anechoic Chamber
Measurement Distance	: 3m
Polarization of Antenna	: Both horizontal and vertical
Limit	: EN 55014-1:2017 Table 9

Test Setup

Input voltage	: AC 230V, 50Hz, AC 120V, 50Hz
Operational mode	: ON(Motor operation, DC output)
Temperature	: 17-21°C
Relative humidity	: 62-64%

Measuring configuration and description

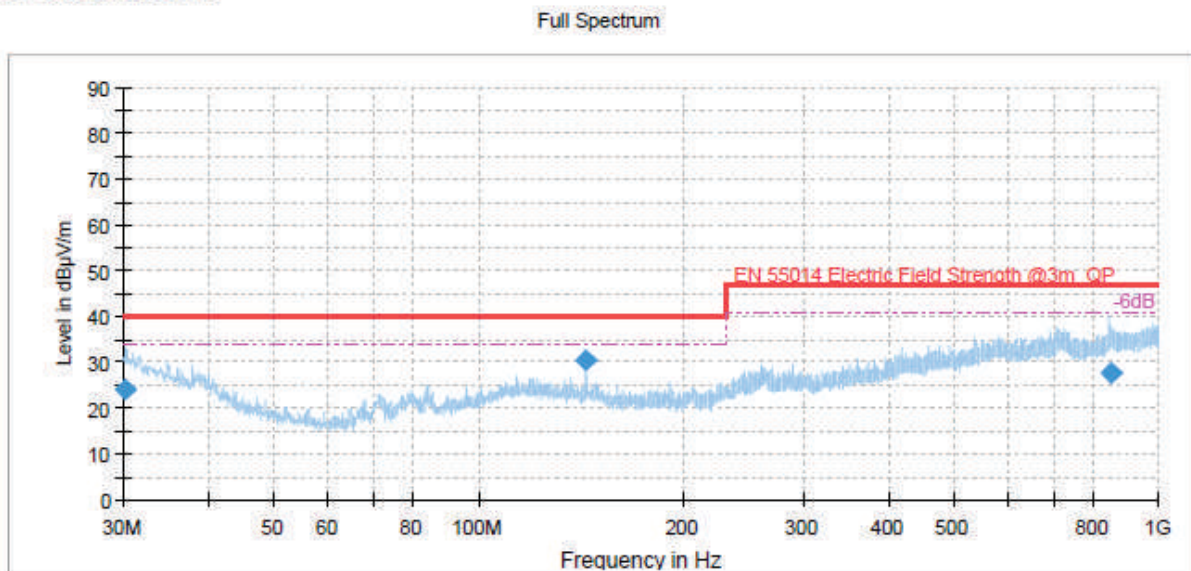
The radiated disturbance was measured in the frequency range from 30MHz to 1000MHz according to EN 55014-1:2017. The measurement was performed in accordance with the method specified in CISPR 16-2-3

The radiated disturbance test was performed in a 3m semi-anechoic chamber. The test distance is 3m. The 10m radiated emission limits are converted to 3m radiated emission limits by an inverse proportionality of 20 dB per decade. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a 0.8m high wooden support above the reference ground plane. The turntable was rotated 360° around and the antenna was varied from 1m to 4m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures were those measured and recorded by a test receiver. The curves in the figure were those measured with a Peak detector. The symbols “x” in the figures are those of QP value, AV value and peck value which were measured in final measurement. Quasi-peak measurements were only performed at those critical frequencies obtained during the test with Peak Detector.

Figure 17: Spectral Diagrams, Radiated disturbance, horizontal, for AC 230V, 50Hz, model CB28M1J(IB)-1, mode Motor operation

Full Spectrum

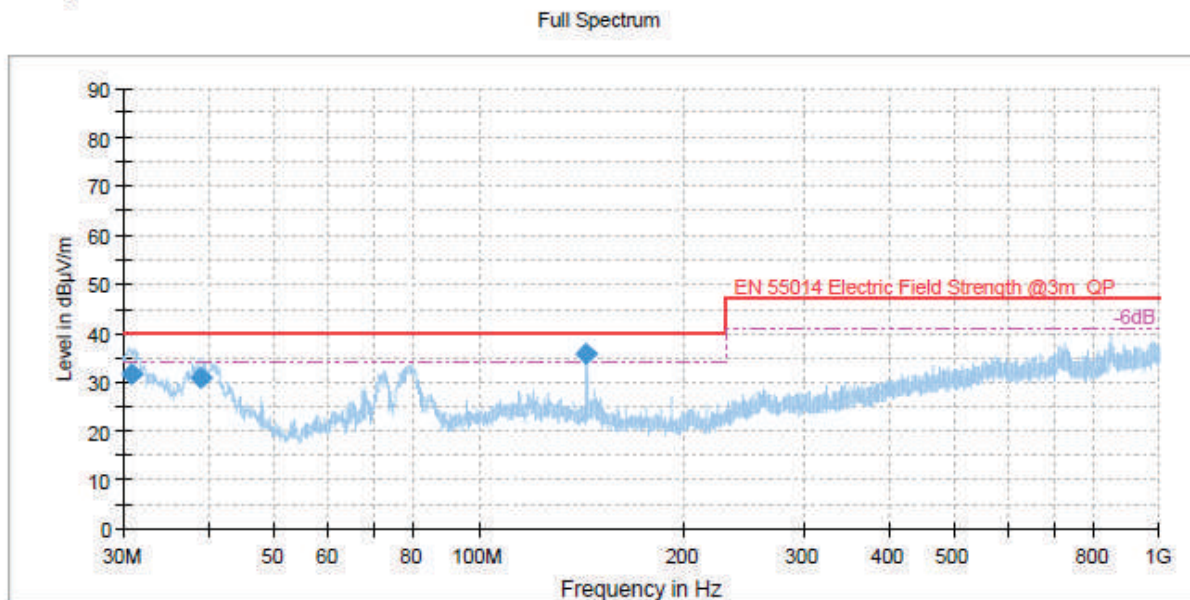


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.223333	23.99	40.00	16.01	1000.0	120.000	296.0	H	233.0	25.2
144.008889	30.53	40.00	9.47	1000.0	120.000	181.0	H	248.0	17.9
852.321111	27.63	47.00	19.37	1000.0	120.000	136.0	H	98.0	29.1

Figure 18: Spectral Diagrams, Radiated disturbance, vertical, for AC 230V, 50Hz, model CB28M1J(IB)-1, mode Motor operation

Full Spectrum

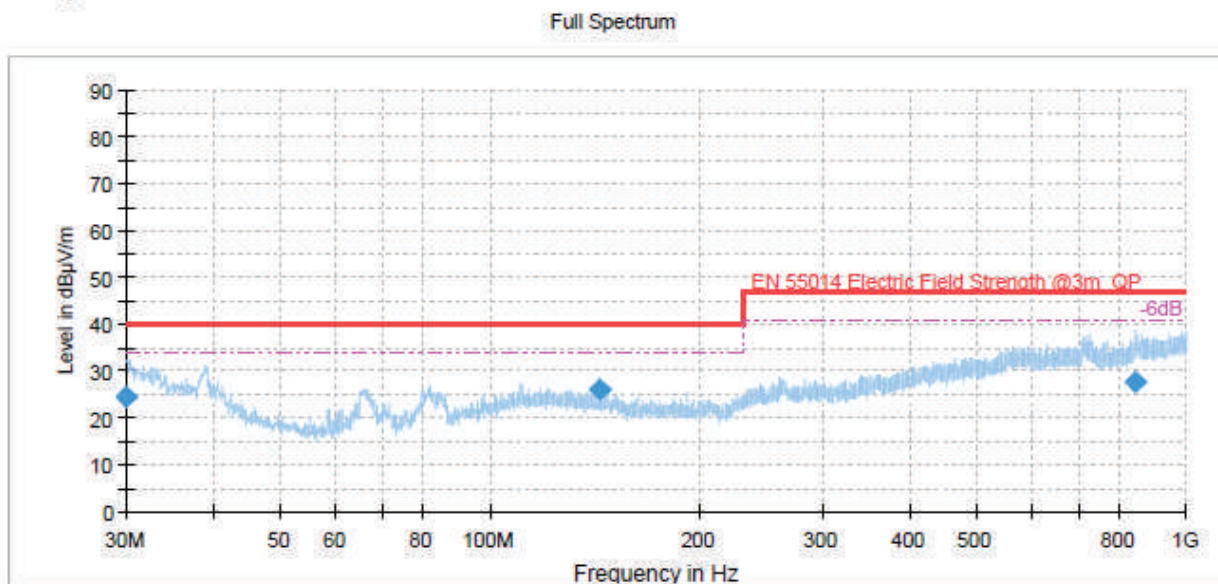


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.812778	31.51	40.00	8.49	1000.0	120.000	111.0	V	290.0	24.9
39.048889	30.73	40.00	9.27	1000.0	120.000	150.0	V	294.0	20.4
143.995000	35.81	40.00	4.19	1000.0	120.000	100.0	V	186.0	17.9

Figure 19: Spectral Diagrams, Radiated disturbance, horizontal, for AC 120V, 50Hz, model CB28M1J(IB)-1, mode Motor operation

Full Spectrum

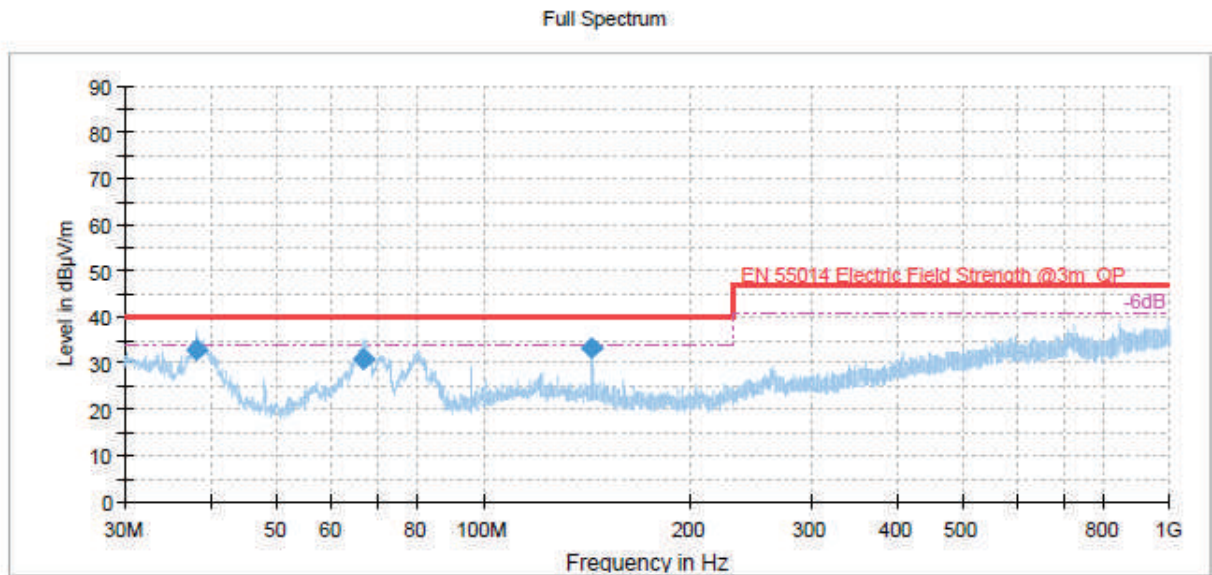


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.080000	24.51	40.00	15.49	1000.0	120.000	350.0	H	202.0	25.2
144.035000	26.17	40.00	13.83	1000.0	120.000	250.0	H	257.0	17.9
844.620000	27.79	47.00	19.21	1000.0	120.000	277.0	H	54.0	29.2

Figure 20: Spectral Diagrams, Radiated disturbance, vertical, for AC 120V, 50Hz, model CB28M1J(IB)-1, mode Motor operation

Full Spectrum

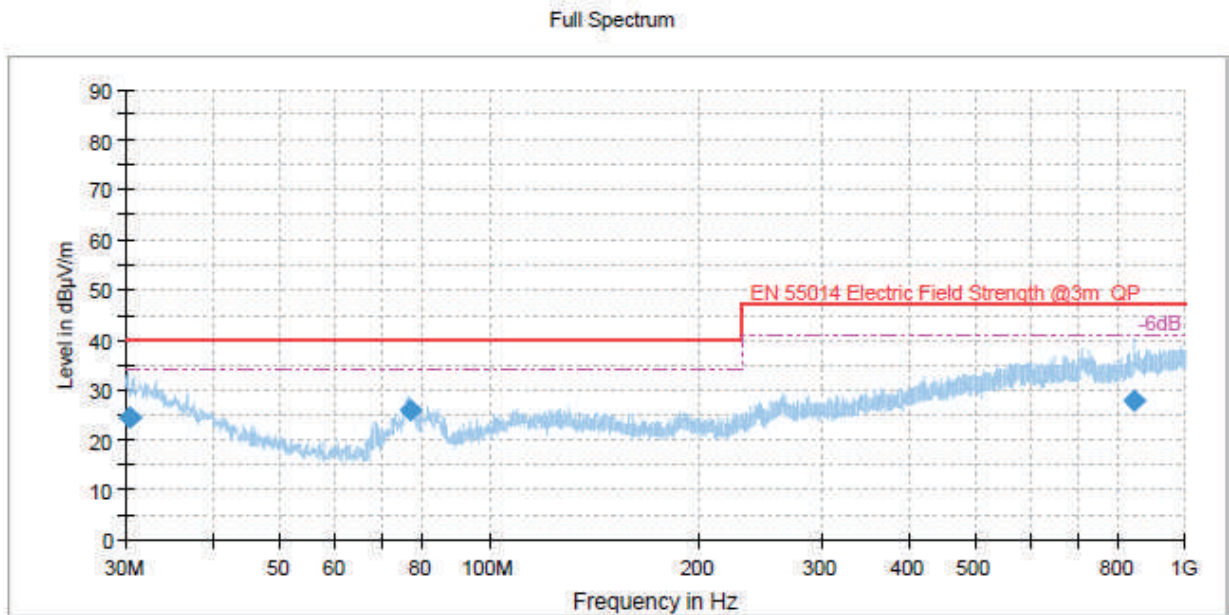


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
38.185000	32.64	40.00	7.36	1000.0	120.000	157.0	V	101.0	20.8
66.973889	30.81	40.00	9.19	1000.0	120.000	150.0	V	324.0	12.7
143.995000	33.28	40.00	6.72	1000.0	120.000	128.0	V	180.0	17.9

Figure 21: Spectral Diagrams, Radiated disturbance, horizontal, for model CB28M1J(IB)-1, mode DC output

Full Spectrum

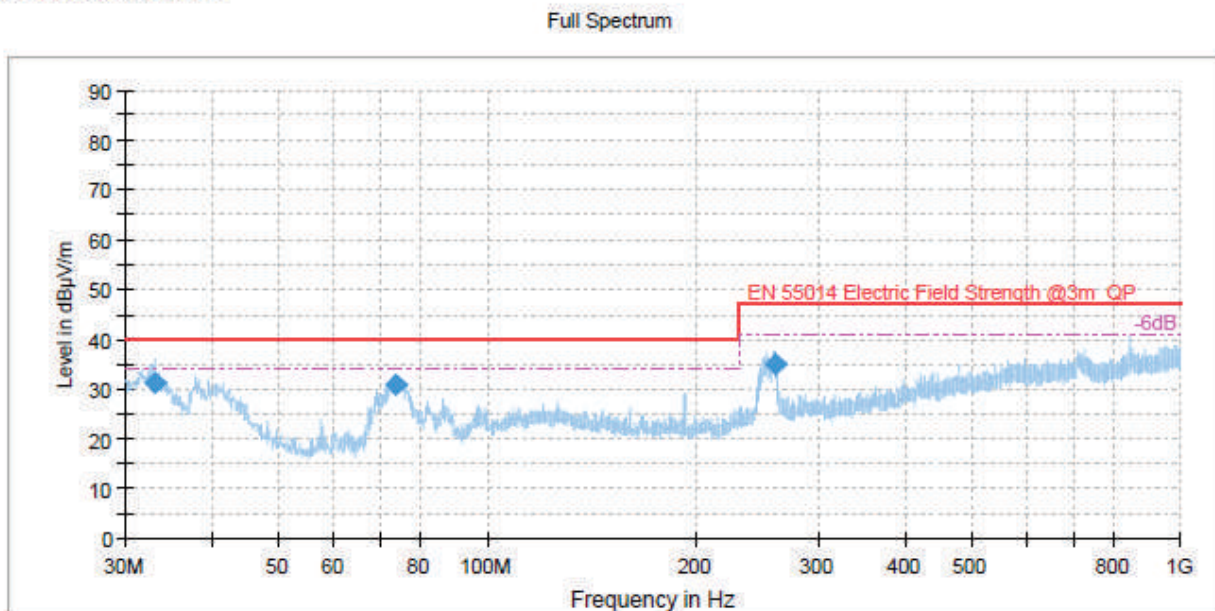


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.360000	24.55	40.00	15.45	1000.0	120.000	303.0	H	168.0	25.1
76.753889	26.14	40.00	13.86	1000.0	120.000	232.0	H	189.0	13.3
846.071667	27.97	47.00	19.03	1000.0	120.000	227.0	H	182.0	29.4

Figure 22: Spectral Diagrams, Radiated disturbance, vertical, for model CB28M1J(IB)-1, mode DC output

Full Spectrum

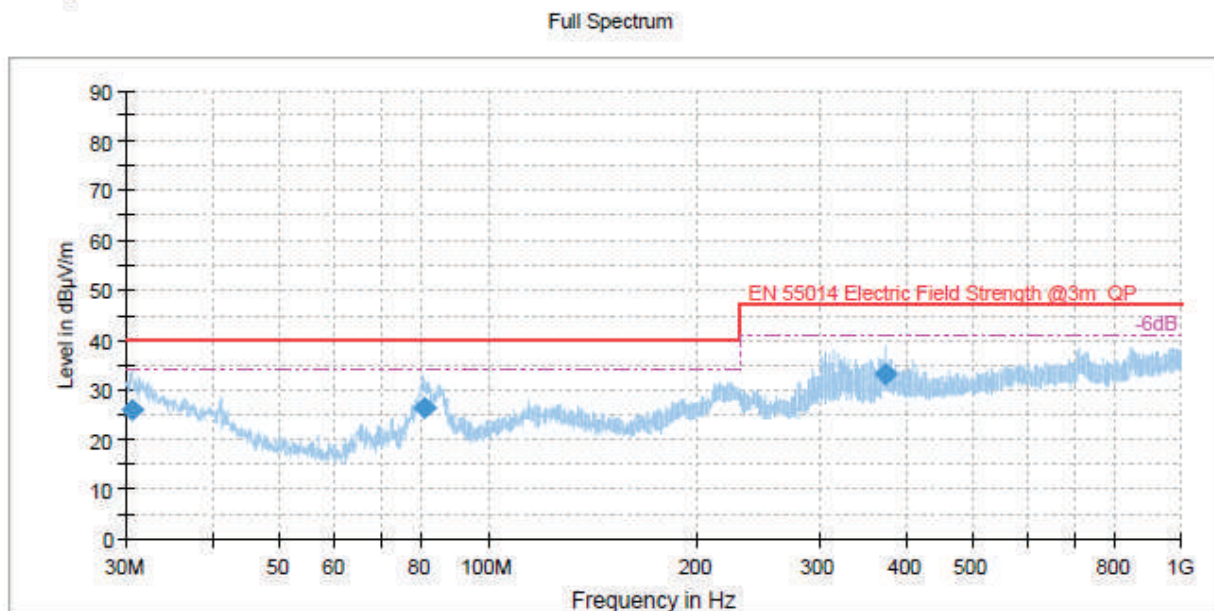


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
33.105556	31.07	40.00	8.93	1000.0	120.000	104.0	V	255.0	23.6
73.925556	30.91	40.00	9.09	1000.0	120.000	133.0	V	175.0	13.1
259.882222	35.07	47.00	11.93	1000.0	120.000	273.0	V	56.0	21.3

Figure 23: Spectral Diagrams, Radiated disturbance, horizontal, for AC 230V, 50Hz, model CB28M1G(IB)-1, mode Motor operation

Full Spectrum

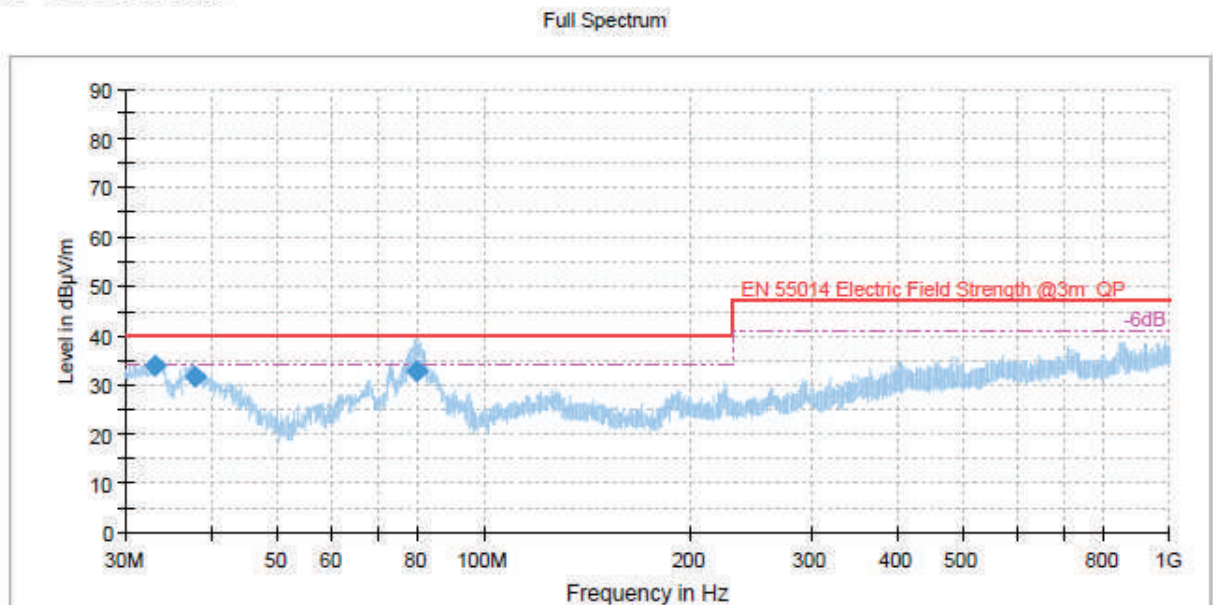


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.545000	25.86	40.00	14.14	1000.0	120.000	374.0	H	38.0	25.0
80.753889	26.47	40.00	13.53	1000.0	120.000	400.0	H	47.0	14.1
372.763889	33.06	47.00	13.94	1000.0	120.000	104.0	H	284.0	22.8

Figure 24: Spectral Diagrams, Radiated disturbance, vertical, for AC 230V, 50Hz, model CB28M1G(IB)-1, mode Motor operation

Full Spectrum

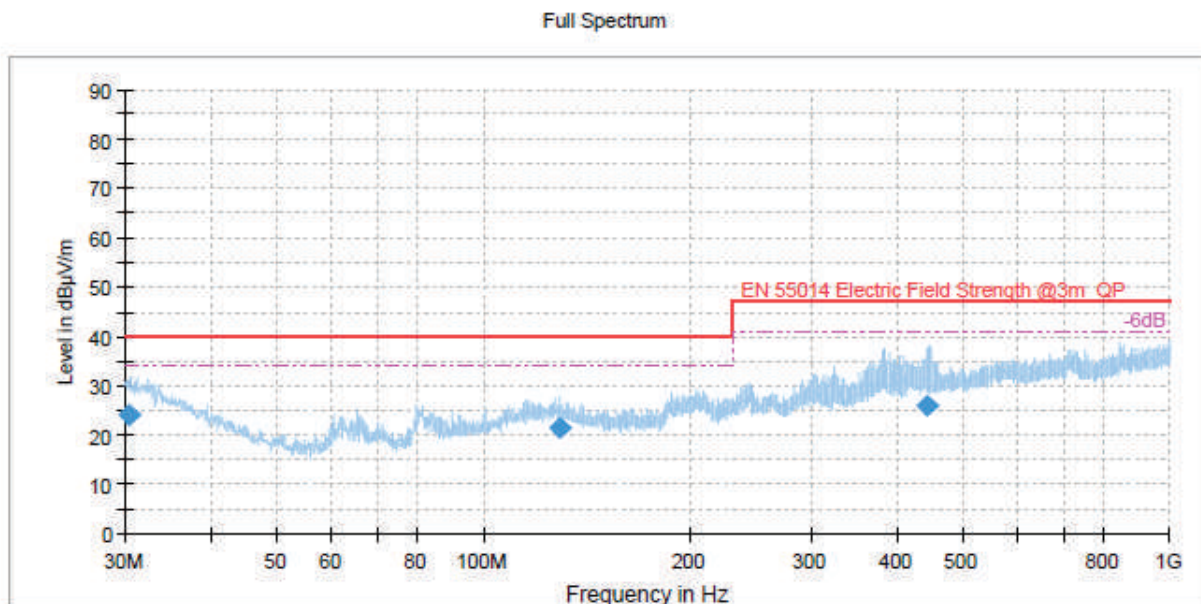


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
33.121111	33.90	40.00	6.10	1000.0	120.000	100.0	V	219.0	23.7
37.872222	31.53	40.00	8.47	1000.0	120.000	117.0	V	252.0	21.1
79.676111	32.66	40.00	7.34	1000.0	120.000	250.0	V	22.0	13.9

Figure 25: Spectral Diagrams, Radiated disturbance, horizontal, for AC 120V, 50Hz, model CB28M1G(IB)-1, mode Motor operation

Full Spectrum

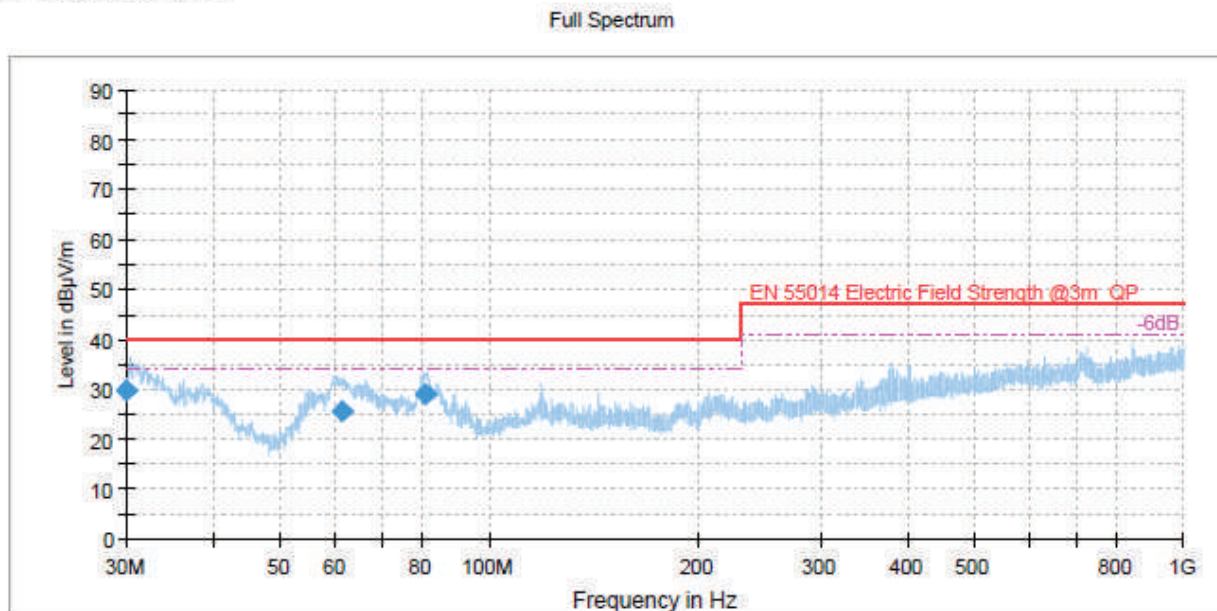


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.508333	24.23	40.00	15.77	1000.0	120.000	104.0	H	243.0	25.1
129.405000	21.61	40.00	18.39	1000.0	120.000	133.0	H	306.0	19.0
441.958889	26.16	47.00	20.84	1000.0	120.000	150.0	H	147.0	24.6

Figure 26: Spectral Diagrams, Radiated disturbance, vertical, for AC 120V, 50Hz, model CB28M1G(IB)-1, mode Motor operation

Full Spectrum

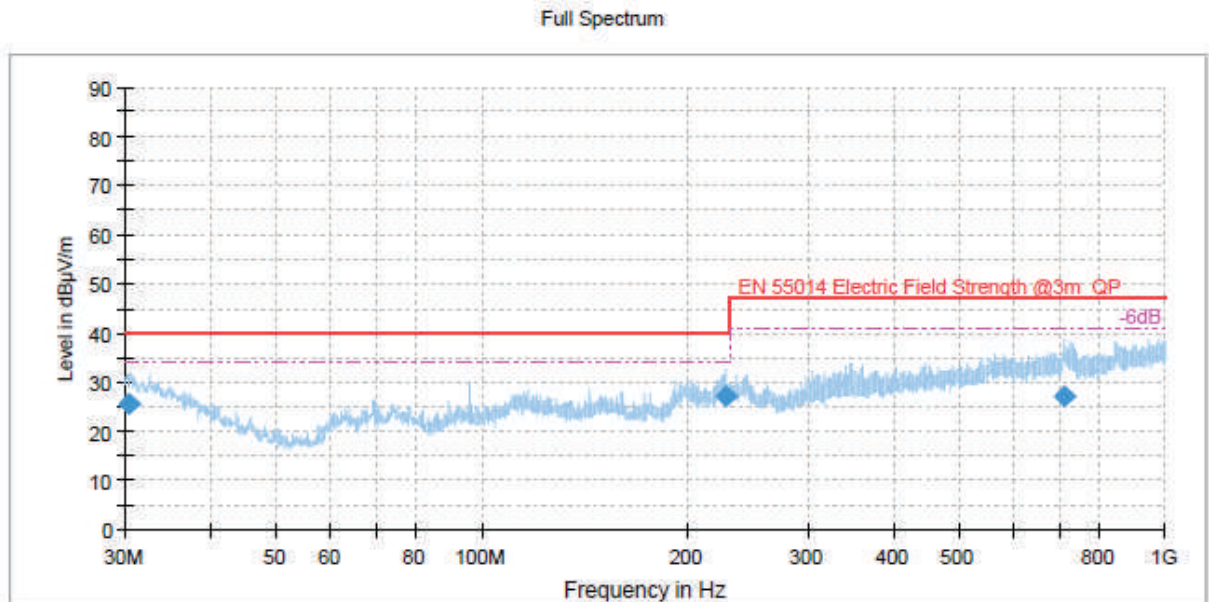


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.023333	29.87	40.00	10.13	1000.0	120.000	114.0	V	120.0	25.3
61.171111	25.65	40.00	14.35	1000.0	120.000	232.0	V	210.0	13.0
80.623333	29.18	40.00	10.82	1000.0	120.000	150.0	V	27.0	14.0

Figure 27: Spectral Diagrams, Radiated disturbance, horizontal, for model CB28M1G(IB)-1, mode DC output

Full Spectrum

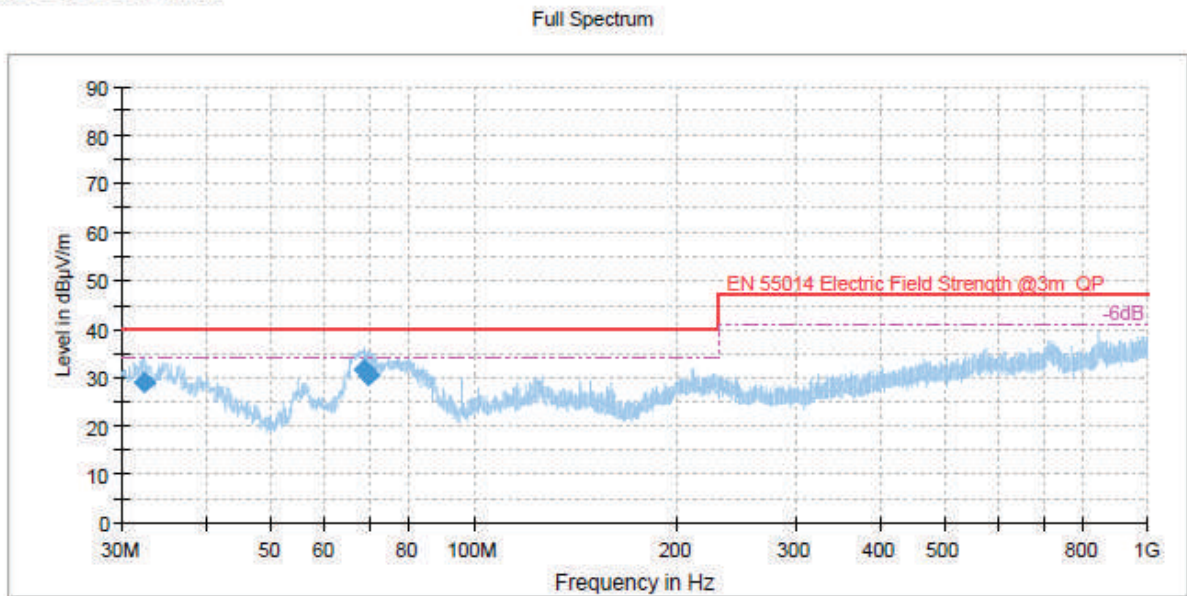


Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.438889	25.46	40.00	14.54	1000.0	120.000	354.0	H	223.0	25.1
227.051667	27.09	40.00	12.91	1000.0	120.000	177.0	H	315.0	17.4
709.451111	27.12	47.00	19.88	1000.0	120.000	350.0	H	300.0	27.8

Figure 28: Spectral Diagrams, Radiated disturbance, vertical, for model CB28M1G(IB)-1, mode DC output

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
32.497222	28.97	40.00	11.03	1000.0	120.000	127.0	V	66.0	24.0
68.630556	31.74	40.00	8.26	1000.0	120.000	150.0	V	164.0	12.9
69.901111	30.42	40.00	9.58	1000.0	120.000	150.0	V	152.0	12.9

5 Test Results I M M U N I T Y

According to the electrical characteristics above and EN 55014-2:2015, equipment which in normal use, is connected to a power network and internal clock frequency or oscillator frequency is higher than 15MHz, so the EUT belongs to category IV equipment.

Category I: apparatus containing no electronic control circuitry.

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.

Category III: equipment which in normal use, is not connected to a power network and has no cables attached.

Category IV: all other apparatus covered by the scope of this standard.

During the immunity tests, the EUT was operated under cooling condition.

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: 2020.04.08-2020.08.03

ESD

Room temperature: 18-20°C

Relative Humidity: 50-55%

Atmospheric pressure: 102.1 kPa

RS, Surge, CS, Dips, EFT

Room temperature: 18-21°C

Relative Humidity: 50-55%

5.1 Enclosure

5.1.1 Electrostatic Discharge

Result:

Pass

The immunity against electrostatic discharge was tested in accordance with EN 55014-2:2015. Test setup and ESD-Generator are according to EN 61000-4-2 which is specified by EN 55014-2:2015.

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 6: ESD, Positive / Negative Polarity

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

5.1.2 Radio Frequency Electromagnetic Field

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

The immunity against radio-frequency electromagnetic fields in the frequency range between 80MHz and 1000MHz was tested in accordance to IEC 61000-4-3 which is specified by EN 55014-2:2015.

The test was performed inside a 3m modified semi-anechoic chamber. During the test the part of the ground plane between the field generating antenna and the equipment under test was covered by absorbing material. The distance between the tip of the antenna and the side of the system tested is 3m. The field uniformity of the 1.5mx1.5m plane where the surface of the EUT tested coincides with is regularly calibrated to ensure the 0-6dB field uniformity criterion as specified by IEC 61000-4-3 is met.

Test Level	:	3V/m
Frequency Range(Swept test)	:	80-1000MHz
Modulation	:	80%AM, 1kHz
Frequency Sweep Speed	:	1% step size
Dwell Time	:	3s
Performance Criterion	:	A

Table 7: Radiated Susceptibility, Field Strength

Test mode	Position	Result	Remarks
Swept test	Antenna in vertical orientation	Pass	No disturbance of function
	Antenna in horizontal orientation	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 55014-2:2015. Test setup and the fast transient noise generator are according to EN 61000-4-4 which is specified by EN 55014-2:2015.

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 (for AC power port)
Polarity	: negative/positive
Repetition frequency	: 5kHz
Test duration	: ≥120sec
Tr/Tn	: 5ns/50ns
Performance criteria	: B

Table 8: Burst, Positive and Negative Polarity

Coupling Port	Test Voltage / Result	Remark
AC mains: L1 (L), 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 55014-2:2015 in a shielded room. The Test setup and the test generator are according to EN 61000-4-6 which is specified by EN 55014-2:2015.

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) for AC power port;
Environmental phenomena	: r.f. current, common mode, 1kHz, 80%AM
Source impedance	: 150 Ω
Frequency range	: 0.15 - 80MHz
Sweeping rate	: $\leq 1,5 \times 10^{-3}$ decades/s
Performance criteria	: A

Table 9: Injected current

Line	Result	Remarks
AC Input port	Pass	No disturbance of function

5.2.3 Surges to AC Power Port

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

The immunity against surges to AC power port was tested in accordance to EN 55014-2:2015. Test setup and the Combination Wave Generator (CWG) are according to EN 61000-4-5 which is specified by EN 55014-2:2015.

Open-circuit Test Voltage	: ±1kV (differential mode)
Tr/Tn	: 1.2/50µs (open-circuit voltage) 8/20µs (short-circuit current)
Test numbers	: 5 positive and 5 negative pulses
Test angle	: 90° and 270°
Repetition rate	: 1 surge/min
Performance criteria	: B

Table 10: Surges to AC Power lines, positive/negative

Line	Result	Remarks
Phase to neutral ±1kV	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 55014-2:2015. Test setup and the test generator are according to EN 61000-4-11 which is specified by EN 55014-2:2015. The EUT was placed directly on the table of aluminum.

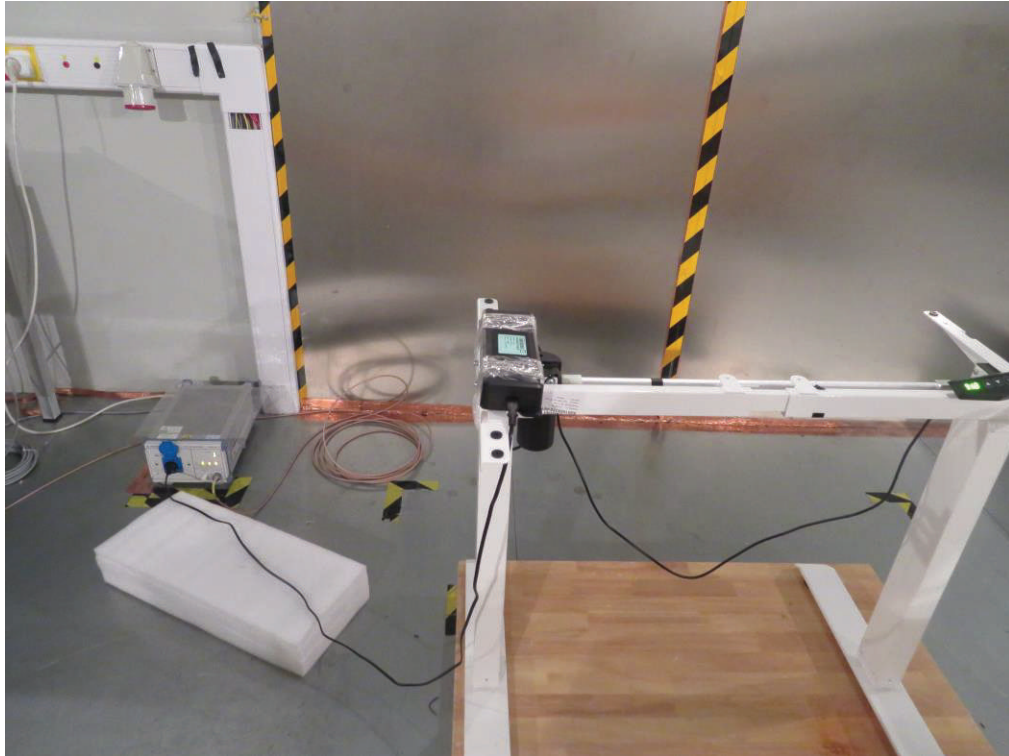
Performance criteria	:	C	
Test level (in % UT) and duration (in periods of the rated frequency)	:	0	0.5/0.5 periods(50/60Hz)
		40	10/12 periods(50/60Hz)
		70	25/30 periods(50/60Hz)

Table 11: Test condition and Test Result for Voltage dips and Short interruptions

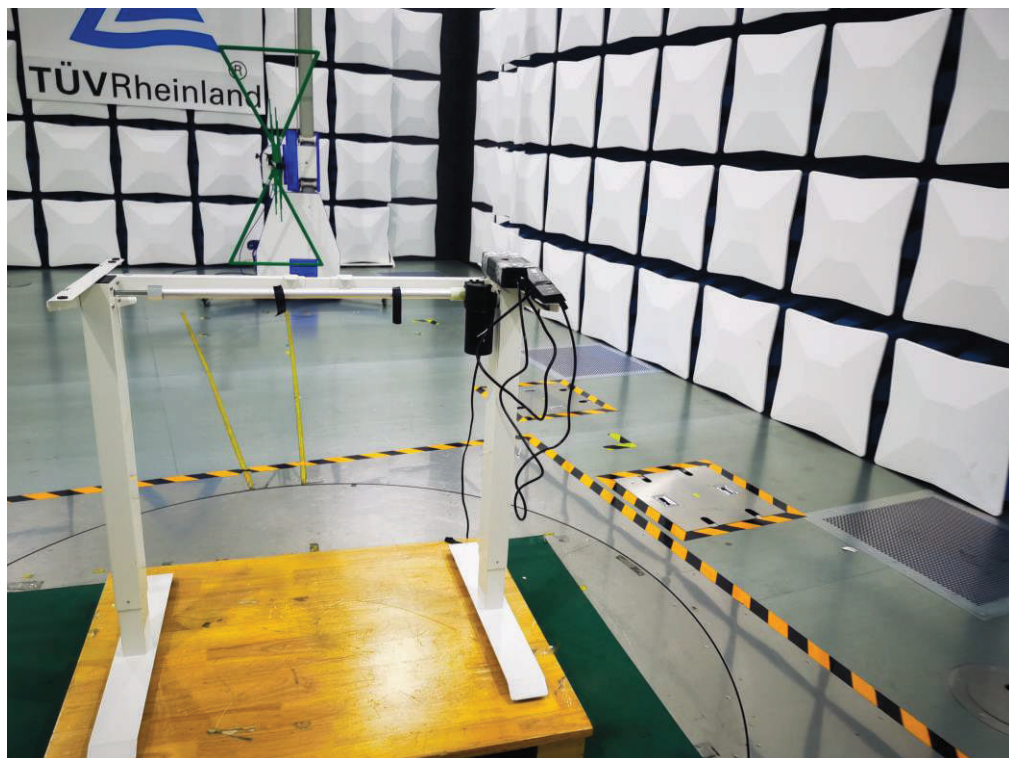
Test level (in % UT)	Duration	Performance criteria	Result	Remarks
0	0.5/0.5	C	Pass	No disturbance of function
40	10/12	C	Pass	No disturbance of function
70	25/30	C	Pass	No disturbance of function

6 Photographs of the Test Set-Up

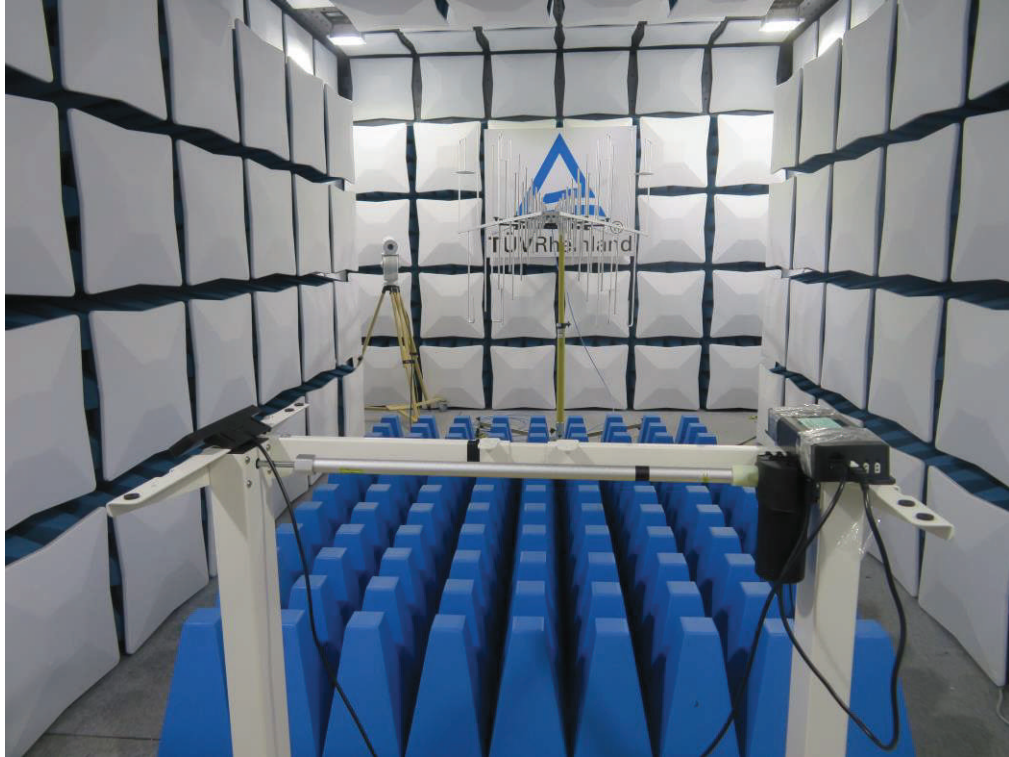
Photograph 1: Set-up for Conducted Emission



Photograph 2: Set-up for Radiated Emission



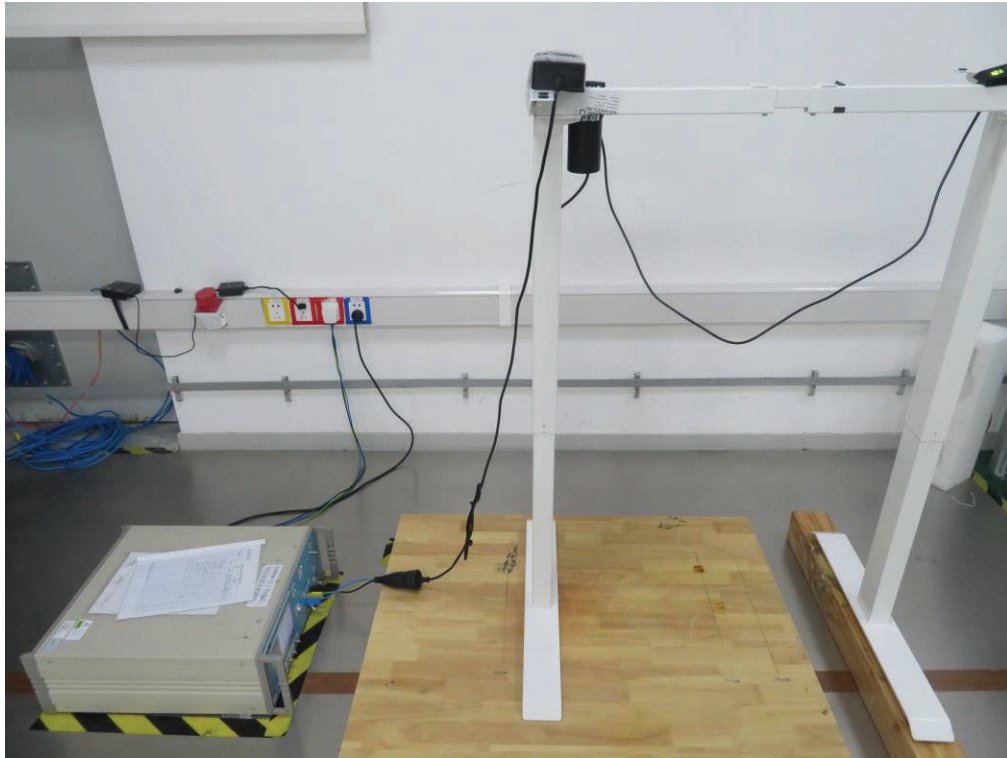
Photograph 3: Set-up for Radio Frequency Electromagnetic Field (RS)



Photograph 4: Setup for Electrostatic Discharges (ESD)



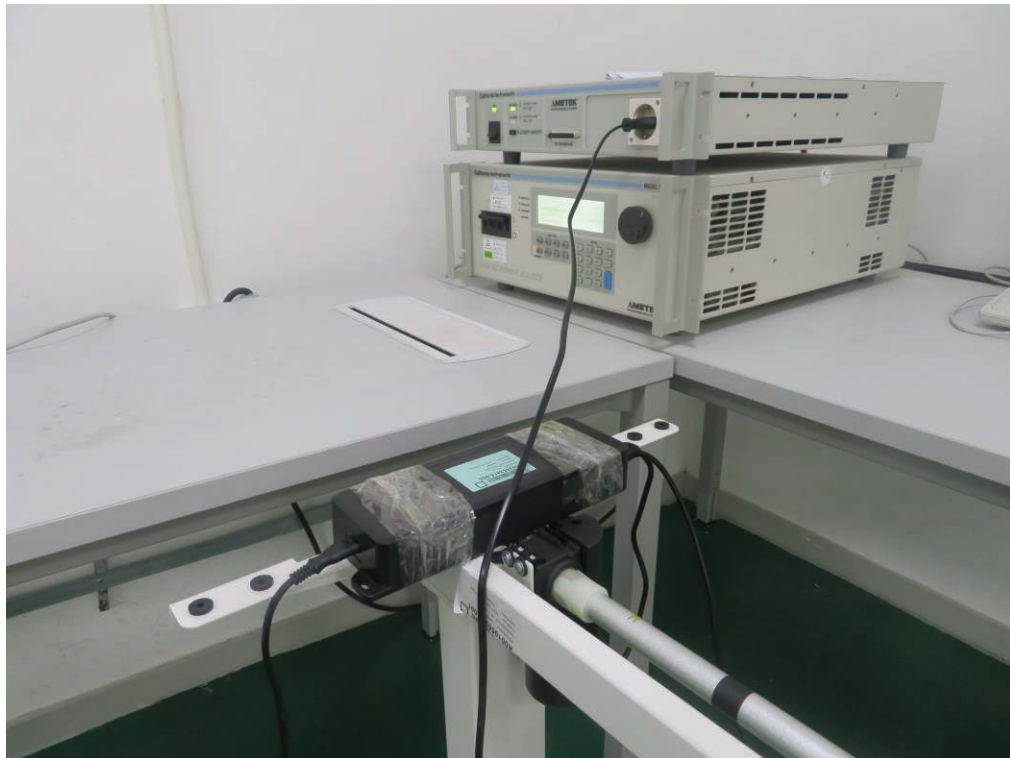
Photograph 5: Setup for EFT, Surge, Voltage dips and interruptions



Photograph 6: Setup for Radio-frequency continuous conducted (CS)



Photograph 7: Setup for Harmonic and Flicker



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-- The END --