

Prüfbericht-Nr.: Test Report No.:	CN21T3BG 001	Auftrags-Nr.: Order No.:	244311556	Seite 1 von 40 Page 1 of 40
Kunden-Referenz-Nr.: Client Reference No.:	2043337	Auftragsdatum: Order date.:	2021-02-01	
Auftraggeber: Client:				
Prüfgegenstand: Test item:	Li-ion Battery Charger			
Bezeichnung / Typ-Nr.: Identification / Type No.:	GPLC084V42Y, GPLC058V29Y,DPLC110V55Y			
Auftrags-Inhalt: Order content:	TÜV Rheinland EMC service			
Prüfgrundlage: Test specification:	EN 55014-1:2017+A11 EN IEC 61000-3-2:2019+A1:2021	EN 55014-2:2015 EN 61000-3-3:2013+A1		
Wareneingangsdatum: Date of receipt:	2021-02-09			
Prüfmuster-Nr.: Test sample No.:	A003000489-001 to 002			
Prüfzeitraum: Testing period:	2021-02-20~2021-02-22			
Ort der Prüfung: Place of testing:	Refer to clause 1.1			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: / tested by: Stefan Zhao		genehmigt von: / authorized by: Jiayi Zhou		
Datum: / Date: 2021-03-01 		Datum: / Date: 2021-03-01 		
Stellung: / Position: Senior Project engineer		Stellung: / Position: Senior manager		
Sonstiges / Other:	Refer to clause 2.2 for detail.			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: P(ass) = passed a.m. test specifications(s) F(ail) = failed a.m. test specifications(s) N/A = not applicable N/T = not tested 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 only 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 test mark.</i>				

V05

TEST SUMMARY

4.1.1 HARMONICS ON AC MAINS

Result:

Passed

4.1.2 VOLTAGE CHANGES, VOLTAGE FLUCTUATIONS AND FLICKER ON AC MAINS

Result:

Passed

4.1.3 MAINS TERMINAL CONTINUOUS DISTURBANCE VOLTAGE

Result:

Passed

4.1.4 DISCONTINUOUS INTERFERENCE ON AC MAINS

Result:

N/A

4.2.1 DISTURBANCE POWER

Result:

Passed

4.2.2 RADIATED EMISSION

Result:

Passed

5.1.1 ELECTROSTATIC DISCHARGE

Result:

Passed

5.2.1 FAST TRANSIENTS ON AC POWER PORT

Result:

Passed

5.2.2 INJECTED CURRENT INTO AC POWER PORT

Result:

Passed

5.2.3 SURGES TO AC POWER PORT

Result:

Passed

5.2.4 VOLTAGE DIPS TO AC POWER PORT

Result:

Passed

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1 Test Sites

1.1 Test Facilities

Laboratory: TÜV Rheinland (Shanghai) Co., Ltd.

Address: No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China

The used test equipment is in accordance with CISPR 16-1 series standards for measurement of radio interference.

Refer to Clause 7 for test and measurement instruments.

2 General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is an ordinary battery charger for household and similar use. For the further information, refer to the user's manual.

2.2 Ratings and System Details

Rated voltage : AC 180 – 240 V; 1.8 A for GPLC084V42Y
AC 180 – 240 V; 1.4 A for GPLC058V29Y

Rated frequency : 47-63 Hz

Rated Output: : DC 42 V, 2 A for GPLC084V42Y
DC 29.4 V, 2 A for GPLC058V29Y

Protection class : II

Identities and differences,

Both models have the same electrical characteristics. The differences between them are mechanical aspects, input current and some electrical components' parameter. Therefore, the EMC tests were performed on the model GPLC084V42Y as representative and conducted emission and disturbance power tests were performed on the model GPLC058V29Y.

2.3 Independent Operation Modes

The basic operation modes are: "on" and "off".

The test modes are following:

Mode A: power on with maximum specified load

Mode B: power on without load

2.4 Noise Generating and Noise Suppressing Parts

Refer to the circuit diagram for further information.

2.5 Submitted Documents

Circuit diagram, user's manual and rating labels.

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 emission 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

During the tests, the EUT's DC output port was connected with matched resistance. The multimeter was used to monitor the output voltage.

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:	Passed
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Date of testing : 2021-02-20
Test procedure : EN IEC 61000-3-2:2019
Test duration : 2.5 min
Harmonic order : 2 – 40th
Frequency range : 0 – 2 kHz
Ambient condition : Temperature: 20.3 °C; Relative humidity: 39.4 %

Following are the measurement results, which were obtained via an automatic measurement system.

Table 1: Harmonic currents measurement result

Equipment category: Class A; Test voltage: AC 229.720 V; 50 Hz

Fundamental current I: 0.420 A; Power factor: 0.468; Active input power: 91.2 W

Harmonic order	Result (avg.) (A)	100% limit (A)	Result (max.) (A)	150% limit (A)	Result
2	0.003	1.080	0.004	1.620	Pass
3	0.388	2.300	0.390	3.450	Pass
4	0.003	0.430	0.004	0.645	Pass
5	0.355	1.140	0.356	1.710	Pass
6	0.004	0.300	0.004	0.450	Pass
7	0.309	0.770	0.310	1.155	Pass
8	0.003	0.230	0.003	0.345	Pass
9	0.257	0.400	0.258	0.600	Pass
10	0.003	0.184	0.004	0.276	Pass
11	0.203	0.330	0.205	0.495	Pass
12	0.004	0.153	0.004	0.230	Pass
13	0.155	0.210	0.157	0.315	Pass
14	0.004	0.131	0.004	0.197	Pass
15	0.117	0.150	0.119	0.225	Pass
16	0.004	0.115	0.004	0.173	Pass
17	0.093	0.132	0.094	0.198	Pass
18	0.004	0.102	0.004	0.153	Pass
19	0.080	0.118	0.082	0.178	Pass
20	0.003	0.092	0.004	0.138	Pass
21	0.073	0.107	0.075	0.161	Pass
22	0.003	0.084	0.003	0.125	Pass
23	0.066	0.098	0.067	0.147	Pass
24	0.003	0.077	0.003	0.115	Pass
25	0.056	0.090	0.057	0.135	Pass
26	0.002	0.071	0.003	0.107	Pass
27	0.044	0.083	0.045	0.125	Pass
28	0.002	0.066	0.003	0.099	Pass
29	0.034	0.078	0.035	0.116	Pass
30	0.002	0.061	0.002	0.092	Pass
31	0.026	0.073	0.027	0.109	Pass
32	0.002	0.058	0.002	0.086	Pass
33	0.024	0.068	0.024	0.102	Pass
34	0.002	0.054	0.002	0.081	Pass
35	0.023	0.064	0.023	0.096	Pass
36	0.003	0.051	0.003	0.077	Pass
37	0.022	0.061	0.022	0.091	Pass
38	0.007	0.048	0.007	0.073	Pass
39	0.019	0.058	0.019	0.087	Pass
40	0.002	0.046	0.003	0.069	Pass

4.1.2 Voltage changes, voltage fluctuations and flicker on AC mains**Result:****Passed**

Test procedure : EN 61000-3-3:2013+A1

With the check of EUT's circuit diagram and specification (low rated power), it is unlikely to produce significant voltage fluctuations or flicker. According to clause 6.1 of EN 61000-3-3:2013+A1, the EUT is deemed to meet the requirements of EN 61000-3-3:2013+A1 without actual testing.

4.1.3 Mains Terminal Continuous Disturbance Voltage

Result:	Passed
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Date of testing : 2021-02-20
 Test procedure : EN 55014-1:2017+A11 and CISPR 16-1 series standards
 Frequency range : 0.15 – 30 MHz
 Kind of test site : Shielded room
 Ambient condition : Temperature: 19.1 °C; Relative humidity: 37.2 %
 Expanded measurement uncertainty ($k=2$) : 3.39 dB

Test Setup

Input voltage : AC 230 V, 50 Hz
 Operational mode : Mode A and Mode B as defined in clause 2.3.
 Artificial hand : N/A
 Earthing : No earthing. (as Class II equipment)

The measurement setup was made according to EN 55014-1:2017+A11 clause 5.2 in a shielded room.

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.

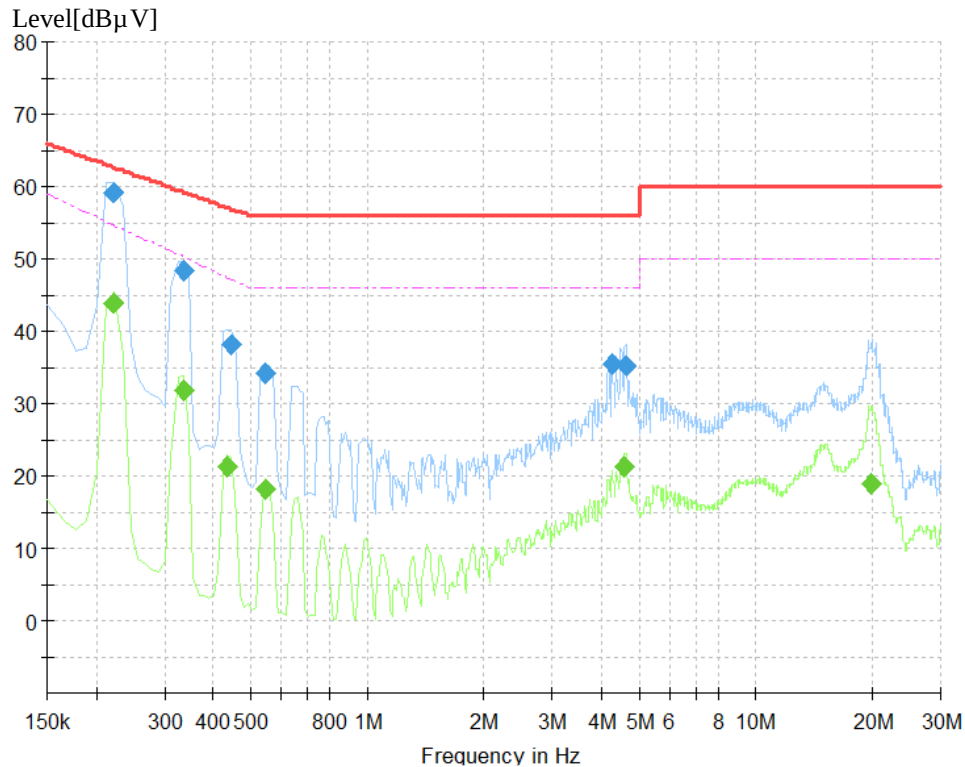
Furthermore an internal calibration with the test receiver was conducted prior to each measurement.

The tested object was set-up on a 0.4 m wooden support. The EUT was set 0.8 m 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 0.3 m and 0.4 m.

The disturbance voltage was determined according to clause 5.2 of EN 55014-1:2017+A11 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. In addition, by adjusting input voltage, Quasi-peak and Average value were measured and listed respectively where they had a maximum in previous scanning survey.

In the Figures, “◆” means Quasi-Peak Value and “◆” means Average Value which was measured in final measurement.

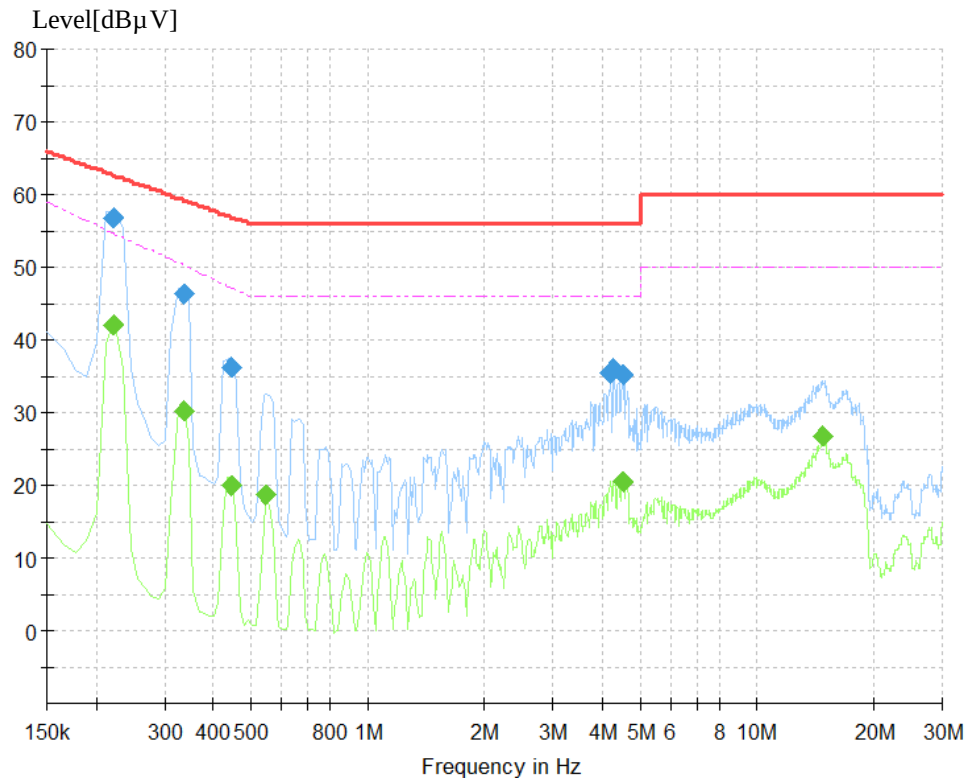
Figure 1: Spectral diagram, conducted emission, 150 kHz – 30 MHz, L line for GPLC084V42Y mode A


Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.223125	59.27	62.70	3.44	1000.0	9.000	L1	10.4
0.335625	48.41	59.31	10.90	1000.0	9.000	L1	10.4
0.448125	38.17	56.91	18.74	1000.0	9.000	L1	10.4
0.549375	34.12	56.00	21.88	1000.0	9.000	L1	10.4
4.273125	35.64	56.00	20.36	1000.0	9.000	L1	10.6
4.610625	35.39	56.00	20.61	1000.0	9.000	L1	10.6

Final average measurement results:

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.223125	43.96	54.71	10.75	1000.0	9.000	L1	10.4
0.335625	31.76	50.30	18.55	1000.0	9.000	L1	10.4
0.436875	21.28	47.46	26.17	1000.0	9.000	L1	10.4
0.549375	18.20	46.00	27.80	1000.0	9.000	L1	10.4
4.599375	21.38	46.00	24.62	1000.0	9.000	L1	10.6
19.753125	19.02	50.00	30.98	1000.0	9.000	L1	11.3

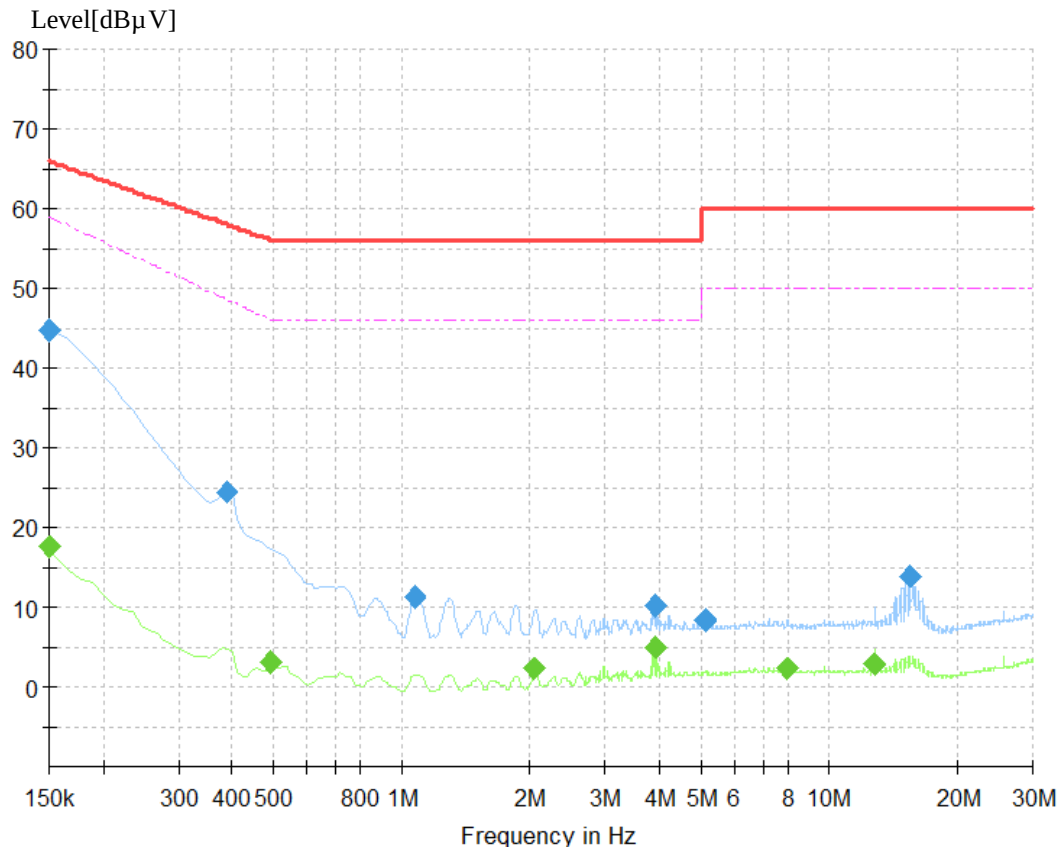
Figure 2: Spectral diagram, conducted emission, 150 kHz – 30 MHz, N line for GPLC084V42Y mode A


Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.223125	56.90	62.70	5.80	1000.0	9.000	N	10.4
0.335625	46.28	59.31	13.03	1000.0	9.000	N	10.4
0.448125	36.33	56.91	20.58	1000.0	9.000	N	10.4
4.194375	35.62	56.00	20.38	1000.0	9.000	N	10.6
4.295625	36.02	56.00	19.98	1000.0	9.000	N	10.6
4.520625	35.22	56.00	20.78	1000.0	9.000	N	10.6

Final average measurement results:

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.223125	42.20	54.71	12.52	1000.0	9.000	N	10.4
0.335625	30.19	50.30	20.11	1000.0	9.000	N	10.4
0.448125	19.90	47.18	27.29	1000.0	9.000	N	10.4
0.549375	18.59	46.00	27.41	1000.0	9.000	N	10.4
4.520625	20.55	46.00	25.45	1000.0	9.000	N	10.6
14.791875	26.88	50.00	23.12	1000.0	9.000	N	11.2

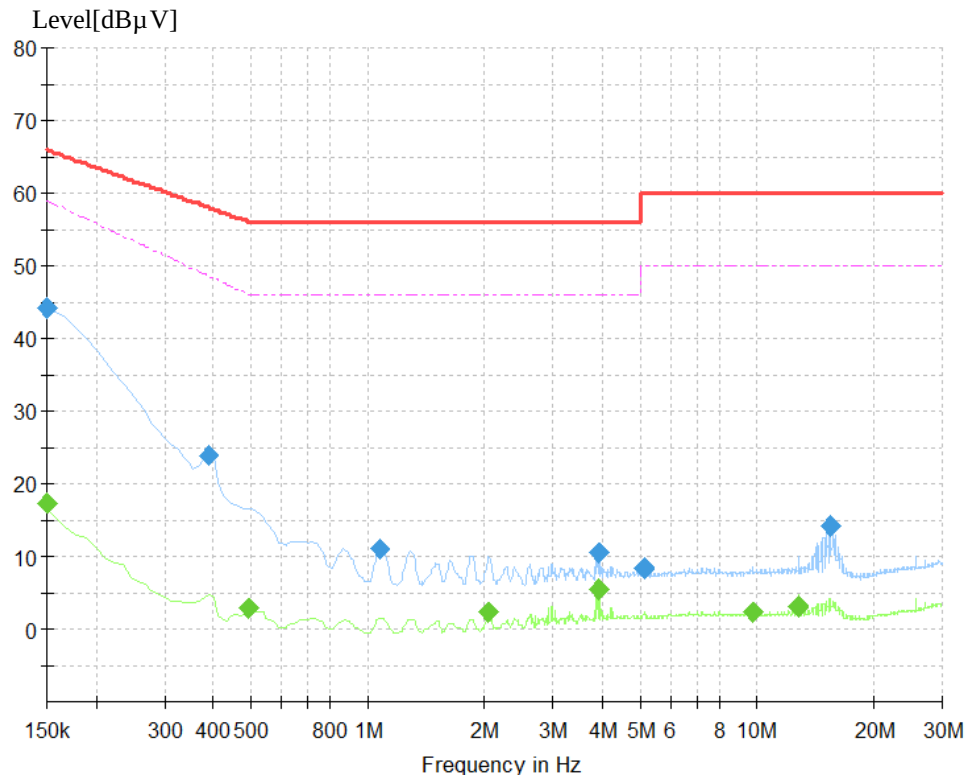
Figure 3: Spectral diagram, conducted emission, 150 kHz – 30 MHz, L line for GPLC084V42Y mode B


Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	44.63	66.00	21.37	1000.0	9.000	L1	10.4
0.391875	24.51	58.02	33.51	1000.0	9.000	L1	10.4
1.078125	11.20	56.00	44.80	1000.0	9.000	L1	10.5
3.901875	10.33	56.00	45.67	1000.0	9.000	L1	10.6
5.139375	8.49	60.00	51.51	1000.0	9.000	L1	10.6
15.388125	13.89	60.00	46.11	1000.0	9.000	L1	11.2

Final average measurement results:

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	17.54	59.00	41.46	1000.0	9.000	L1	10.4
0.493125	3.13	46.15	43.02	1000.0	9.000	L1	10.4
2.045625	2.24	46.00	43.76	1000.0	9.000	L1	10.5
3.901875	5.04	46.00	40.96	1000.0	9.000	L1	10.6
7.996875	2.34	50.00	47.66	1000.0	9.000	L1	10.8
12.800625	2.93	50.00	47.07	1000.0	9.000	L1	11.1

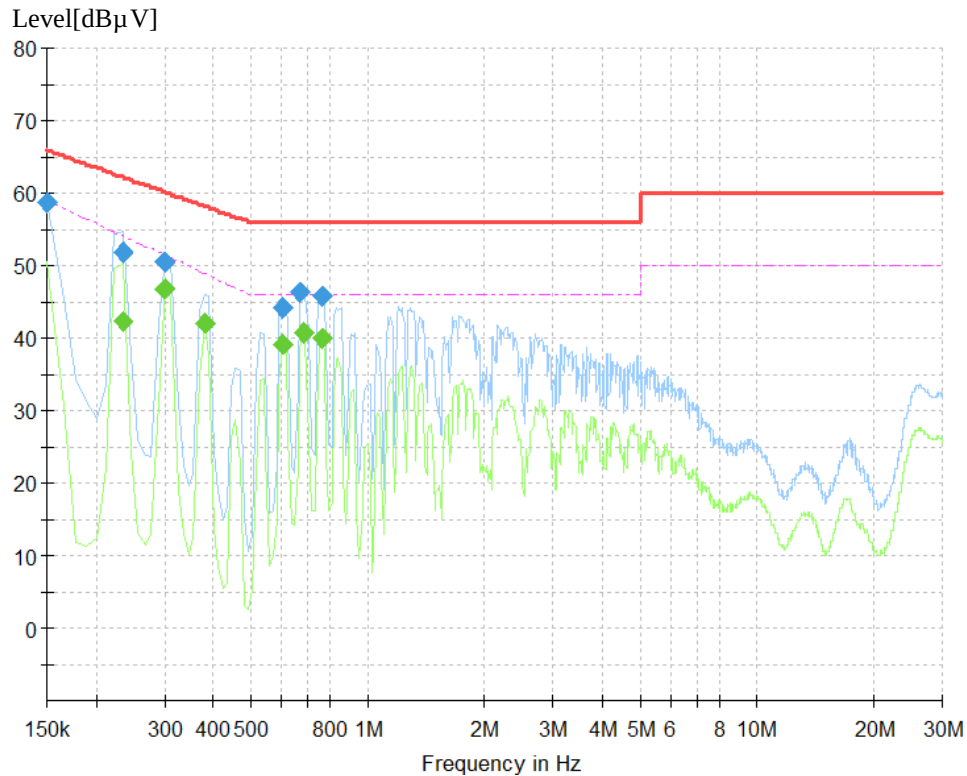
Figure 4: Spectral diagram, conducted emission, 150 kHz – 30 MHz, N line for GPLC084V42Y mode B


Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	44.13	66.00	21.87	1000.0	9.000	N	10.4
0.391875	23.94	58.02	34.08	1000.0	9.000	N	10.4
1.078125	11.12	56.00	44.88	1000.0	9.000	N	10.5
3.901875	10.48	56.00	45.52	1000.0	9.000	N	10.6
5.139375	8.32	60.00	51.68	1000.0	9.000	N	10.6
15.388125	14.14	60.00	45.86	1000.0	9.000	N	11.3

Final average measurement results:

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	17.31	59.00	41.69	1000.0	9.000	N	10.4
0.493125	2.94	46.15	43.21	1000.0	9.000	N	10.4
2.045625	2.26	46.00	43.74	1000.0	9.000	N	10.5
3.901875	5.45	46.00	40.55	1000.0	9.000	N	10.6
9.729375	2.30	50.00	47.70	1000.0	9.000	N	11.0
12.800625	3.23	50.00	46.77	1000.0	9.000	N	11.1

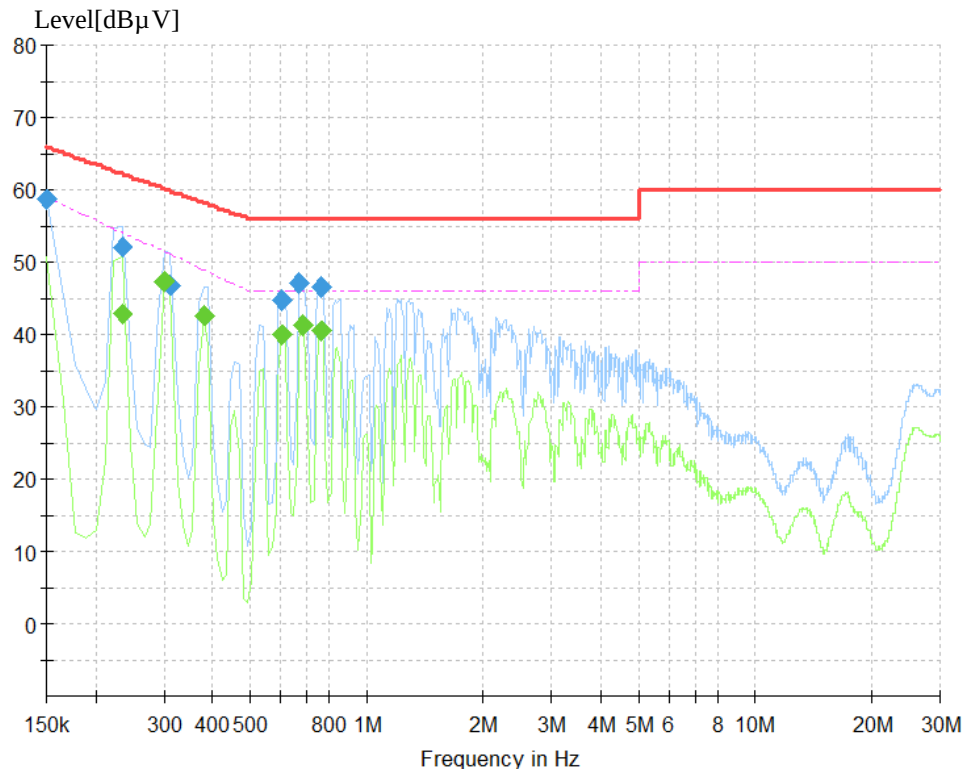
Figure 5: Spectral diagram, conducted emission, 150 kHz – 30 MHz, L line for GPLC058V29Y mode A


Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	58.71	66.00	7.29	1000.0	9.000	L1	10.4
0.234375	51.73	62.29	10.56	1000.0	9.000	L1	10.4
0.301875	50.56	60.19	9.63	1000.0	9.000	L1	10.4
0.605625	44.20	56.00	11.80	1000.0	9.000	L1	10.4
0.673125	46.41	56.00	9.59	1000.0	9.000	L1	10.4
0.763125	45.88	56.00	10.12	1000.0	9.000	L1	10.4

Final average measurement results:

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.234375	42.29	54.18	11.89	1000.0	9.000	L1	10.4
0.301875	46.76	51.45	4.69	1000.0	9.000	L1	10.4
0.380625	42.09	48.95	6.86	1000.0	9.000	L1	10.4
0.605625	39.32	46.00	6.68	1000.0	9.000	L1	10.4
0.684375	40.69	46.00	5.31	1000.0	9.000	L1	10.4
0.763125	39.97	46.00	6.03	1000.0	9.000	L1	10.4

Figure 6: Spectral diagram, conducted emission, 150 kHz – 30 MHz, N line for GPLC058V29Y mode A


Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.150000	58.75	66.00	7.25	1000.0	9.000	N	10.4
0.234375	52.12	62.29	10.18	1000.0	9.000	N	10.4
0.313125	46.85	59.89	13.04	1000.0	9.000	N	10.4
0.605625	44.78	56.00	11.22	1000.0	9.000	N	10.5
0.673125	47.00	56.00	9.00	1000.0	9.000	N	10.5
0.763125	46.48	56.00	9.52	1000.0	9.000	N	10.5

Final average measurement results:

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.234375	42.79	54.18	11.39	1000.0	9.000	N	10.4
0.301875	47.40	51.45	4.05	1000.0	9.000	N	10.4
0.380625	42.72	48.95	6.23	1000.0	9.000	N	10.4
0.605625	39.93	46.00	6.07	1000.0	9.000	N	10.5
0.684375	41.28	46.00	4.72	1000.0	9.000	N	10.5
0.763125	40.58	46.00	5.42	1000.0	9.000	N	10.5

4.1.4 Discontinuous Interference on AC Mains

Result:	N/A
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The EUT's discontinuous disturbance is mainly caused by switching for mains connection or disconnection or the control of speed. Therefore, according to EN 55014-1:2017+A11 clause 5.4.3.2, these kinds of discontinuous disturbance are exempted from the click definition and this test is not applicable to the EUT.

4.2 Emission in the Frequency Range above 30 MHz

4.2.1 Disturbance Power

Result:	Passed
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Date of testing	: 2021-02-22
Port	: AC Mains and control line
Basic standard	: EN 55014-1:2017+A11
Frequency range	: 30 – 300 MHz
Limit	: EN 55014-1:2017+A11, table 2a for household EN 55014-1:2017, table 7 for household
Ambient condition	: Temperature: 20.2 °C; Relative humidity: 36.2 %
Expanded measurement uncertainty ($k=2$)	: 4.32 dB

Test Setup

Input voltage	: AC 230 V, 50 Hz
Operational mode	: Mode A and Mode B as defined in clause 2.3.
Earthing	: No earthing. (as Class II equipment)

Measuring configuration and description

The measurement setup was made according to EN 55014-1:2017+A11.

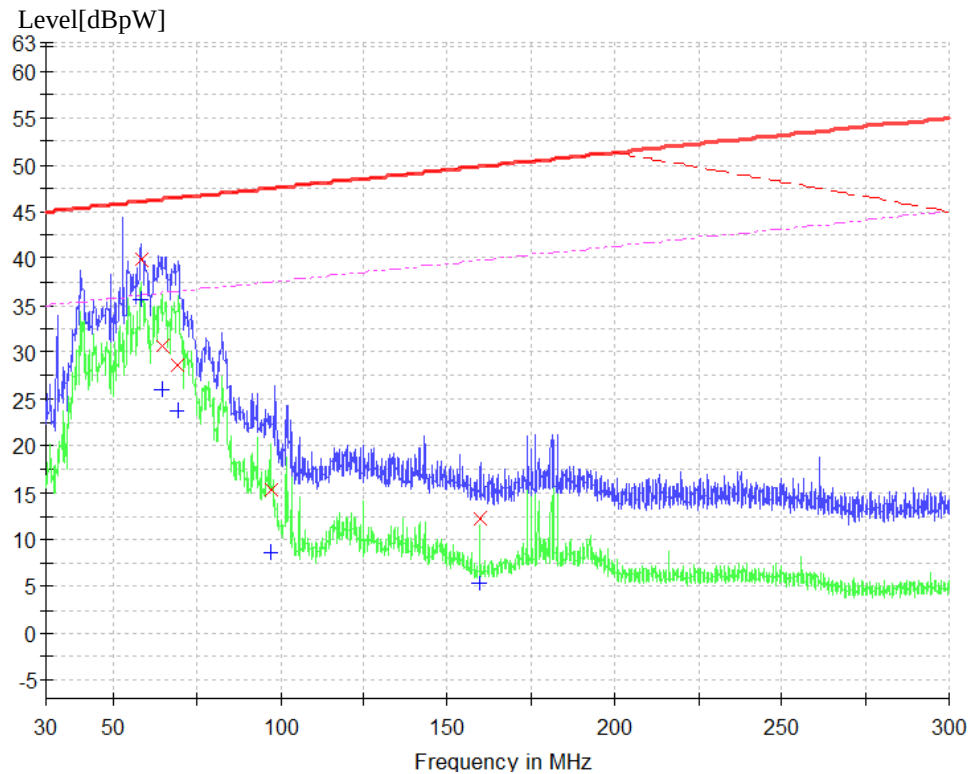
The measurement equipment like test receivers and absorption clamp are in compliance with CISPR 16-1 series standards. The test object has been operated by its rated voltage and rated frequency. Prior to the measurements the test objects operated about 10 minutes (warm-up) in order to stabilize their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

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

The tested object was set-up on a wooden support.

The disturbance power was determined according to clause 4.3.4 of EN 55014-1:2017+A11. The length of power cord of EUT plus that of the extension cord was 6.0 m. 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, and meanwhile adjust input voltage, Quasi-peak and Average value were measured and listed respectively where they had a maximum in previous scanning survey.

In the Figures, “×” means Quasi-Peak Value and “+” means Average Value which was measured in final measurement.

Figure 7: Spectral diagram, disturbance power, 30 – 300 MHz, AC Mains for GPLC084V42Y mode A


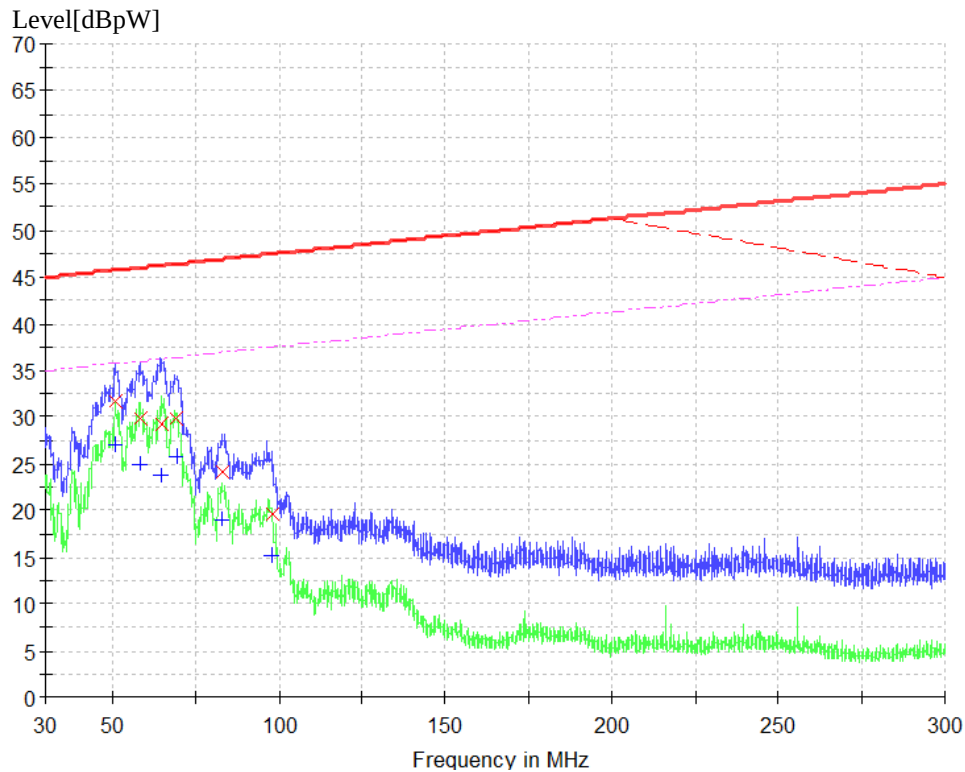
Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBpW)
58.500000	40.0	1000.0	120.000	3.5	6.1	46.1
64.560000	30.6	1000.0	120.000	5.0	15.7	46.3
69.420000	28.6	1000.0	120.000	3.8	17.9	46.5
97.122000	15.3	1000.0	120.000	4.4	32.2	47.5
159.762000	12.2	1000.0	120.000	1.4	37.7	49.8

Final average measurement results:

Frequency (MHz)	CAverage (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBpW)
58.500000	35.7	1000.0	120.000	3.5	0.4	36.1
64.560000	25.9	1000.0	120.000	5.0	10.4	36.3
69.420000	23.6	1000.0	120.000	3.8	12.9	36.5
97.122000	8.6	1000.0	120.000	4.4	28.9	37.5
159.762000	5.3	1000.0	120.000	1.4	34.5	39.8

Figure 8: Spectral diagram, disturbance power, 30 – 300 MHz, DC port towards battery charger for GPLC084V42Y mode A

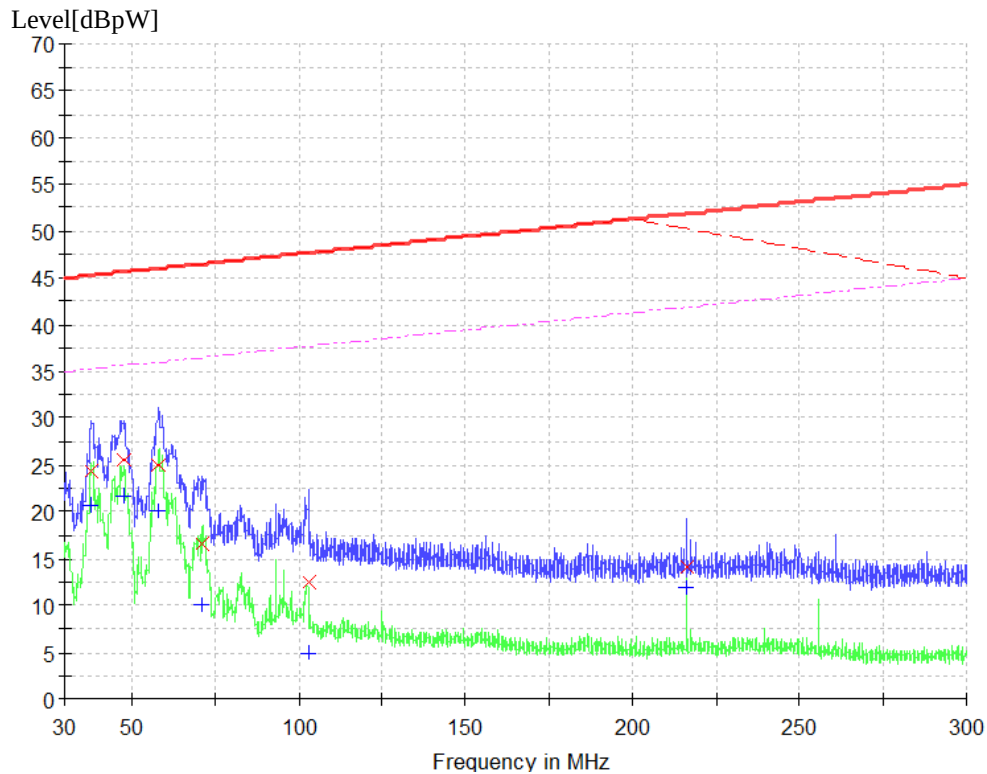


Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBpW)
50.952000	31.6	1000.0	120.000	6.3	14.1	45.8
58.350000	29.9	1000.0	120.000	3.5	16.2	46.1
64.776000	29.2	1000.0	120.000	5.0	17.1	46.3
69.474000	29.9	1000.0	120.000	3.8	16.6	46.5
82.920000	24.1	1000.0	120.000	2.9	22.8	47.0
97.770000	19.8	1000.0	120.000	4.5	27.8	47.5

Final average measurement results:

Frequency (MHz)	CAverage (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBpW)
50.952000	27.1	1000.0	120.000	6.3	8.7	35.8
58.350000	25.0	1000.0	120.000	3.5	11.1	36.1
64.776000	23.8	1000.0	120.000	5.0	12.5	36.3
69.474000	25.9	1000.0	120.000	3.8	10.6	36.5
82.920000	19.0	1000.0	120.000	2.9	17.9	37.0
97.770000	15.2	1000.0	120.000	4.5	22.3	37.5

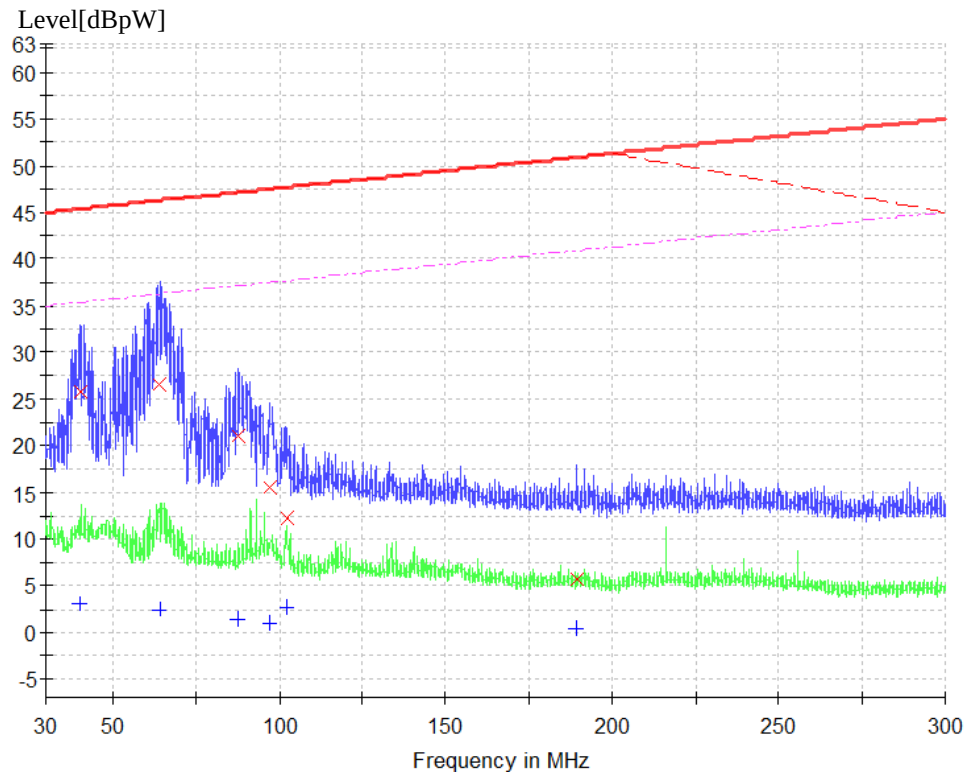
Figure 9: Spectral diagram, disturbance power, 30 – 300 MHz, DC port towards output port for GPLC084V42Y mode A


Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBpW)
38.208000	24.4	1000.0	120.000	5.3	21.0	45.3
47.874000	25.5	1000.0	120.000	6.8	20.1	45.7
58.080000	25.0	1000.0	120.000	3.5	21.0	46.0
71.310000	16.6	1000.0	120.000	3.6	30.0	46.5
102.900000	12.5	1000.0	120.000	2.6	35.2	47.7
215.976000	14.2	1000.0	120.000	1.3	37.7	51.9

Final average measurement results:

Frequency (MHz)	CAverage (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBpW)
38.208000	20.6	1000.0	120.000	5.3	14.7	35.3
47.874000	21.7	1000.0	120.000	6.8	13.9	35.7
58.080000	20.1	1000.0	120.000	3.5	16.0	36.0
71.310000	10.0	1000.0	120.000	3.6	26.6	36.5
102.900000	4.9	1000.0	120.000	2.6	32.8	37.7
215.976000	11.9	1000.0	120.000	1.3	30.0	41.9

Figure 10: Spectral diagram, disturbance power, 30 – 300 MHz, AC Mains for GPLC084V42Y mode B


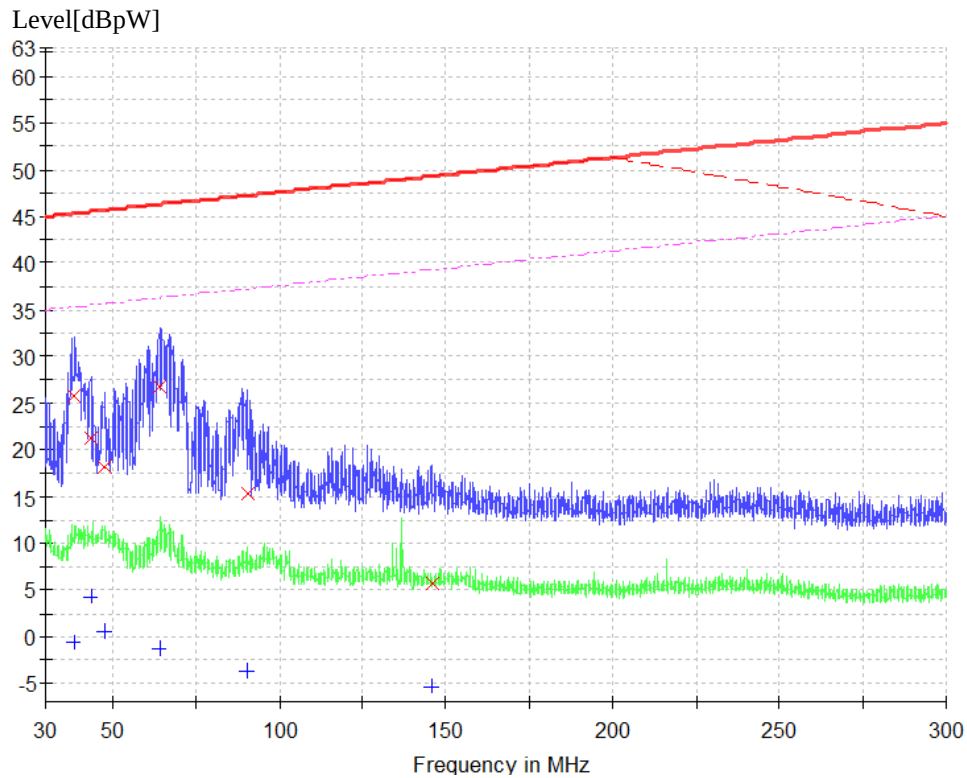
Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBpW)
40.422000	25.7	1000.0	120.000	5.7	19.7	45.4
64.506000	26.5	1000.0	120.000	5.1	19.8	46.3
87.726000	21.0	1000.0	120.000	2.9	26.1	47.1
97.392000	15.5	1000.0	120.000	4.5	32.0	47.5
102.468000	12.3	1000.0	120.000	2.7	35.4	47.7
189.462000	5.6	1000.0	120.000	1.1	45.3	50.9

Final average measurement results:

Frequency (MHz)	CAverage (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBpW)
40.422000	3.1	1000.0	120.000	5.7	32.3	35.4
64.506000	2.5	1000.0	120.000	5.1	33.8	36.3
87.726000	1.3	1000.0	120.000	2.9	35.8	37.1
97.392000	0.9	1000.0	120.000	4.5	36.6	37.5
102.468000	2.6	1000.0	120.000	2.7	35.1	37.7
189.462000	0.3	1000.0	120.000	1.1	40.6	40.9

Figure 11: Spectral diagram, disturbance power, 30 – 300 MHz, DC port towards battery charger for GPLC084V42Y mode B



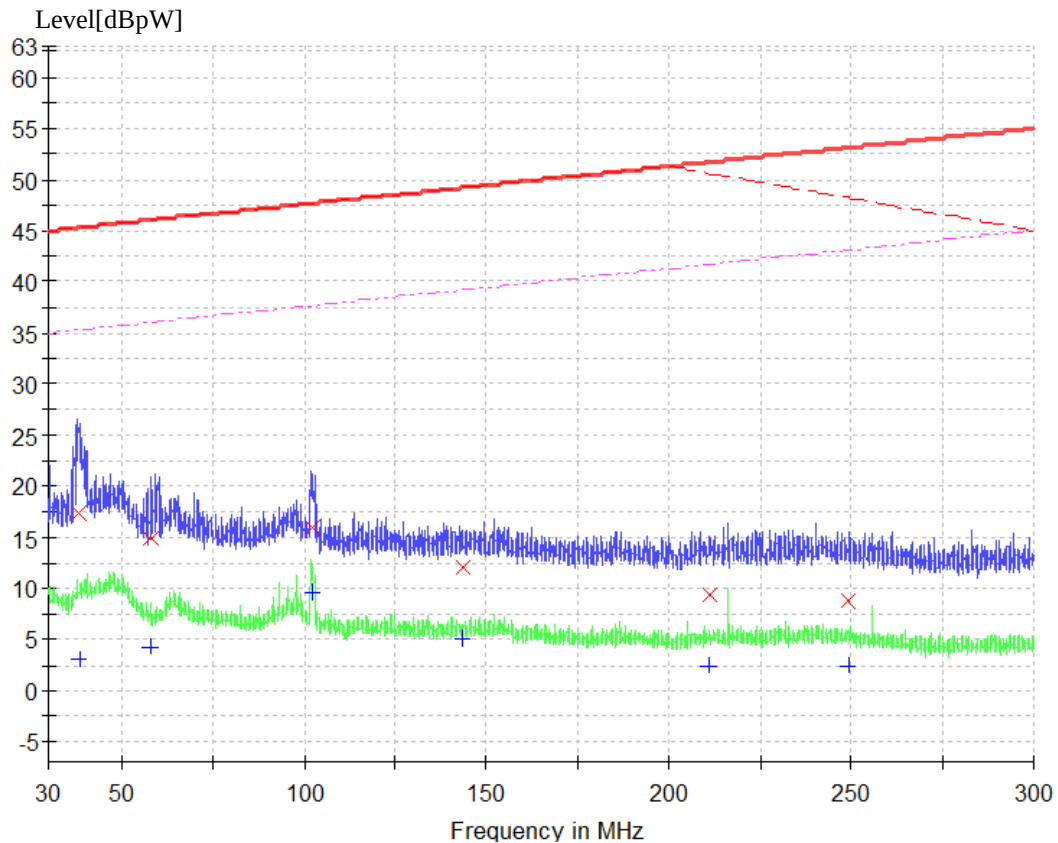
Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBpW)
38.532000	25.8	1000.0	120.000	5.3	19.5	45.3
43.446000	21.2	1000.0	120.000	6.3	24.3	45.5
47.550000	18.1	1000.0	120.000	6.8	27.5	45.7
64.398000	26.7	1000.0	120.000	5.1	19.6	46.3
90.426000	15.3	1000.0	120.000	3.3	31.9	47.2
145.938000	5.7	1000.0	120.000	2.0	43.6	49.3

Final average measurement results:

Frequency (MHz)	CAverage (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBpW)
38.532000	-0.7	1000.0	120.000	5.3	36.0	35.3
43.446000	4.3	1000.0	120.000	6.3	31.2	35.5
47.550000	0.7	1000.0	120.000	6.8	35.0	35.7
64.398000	-1.2	1000.0	120.000	5.1	37.5	36.3
90.426000	-3.7	1000.0	120.000	3.3	41.0	37.2
145.938000	-5.5	1000.0	120.000	2.0	44.8	39.3

Figure 12: Spectral diagram, disturbance power, 30 – 300 MHz, DC port towards output port for GPLC084V42Y mode B

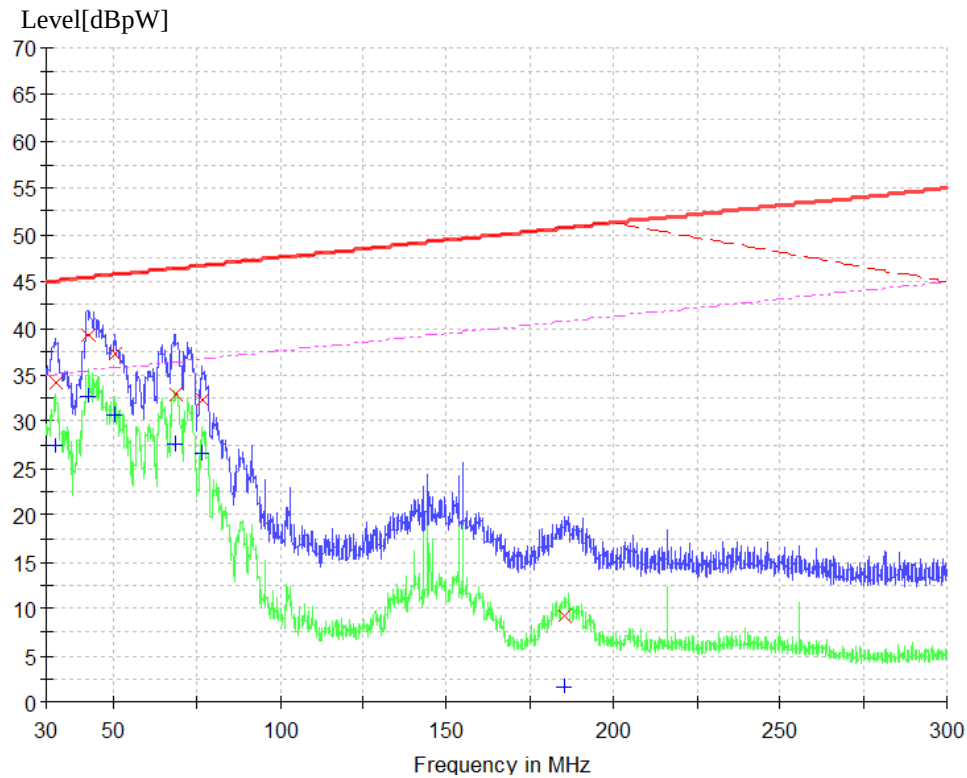


Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBpW)
38.802000	17.4	1000.0	120.000	5.4	28.0	45.3
58.026000	14.8	1000.0	120.000	3.5	31.2	46.0
102.252000	16.0	1000.0	120.000	2.8	31.7	47.7
143.778000	12.1	1000.0	120.000	1.9	37.1	49.2
211.170000	9.3	1000.0	120.000	1.2	42.4	51.7
249.348000	8.7	1000.0	120.000	1.2	44.4	53.1

Final average measurement results:

Frequency (MHz)	CAverage (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBpW)
38.802000	3.0	1000.0	120.000	5.4	32.3	35.3
58.026000	4.3	1000.0	120.000	3.5	31.7	36.0
102.252000	9.5	1000.0	120.000	2.8	28.2	37.7
143.778000	5.1	1000.0	120.000	1.9	34.1	39.2
211.170000	2.4	1000.0	120.000	1.2	39.3	41.7
249.348000	2.4	1000.0	120.000	1.2	40.7	43.1

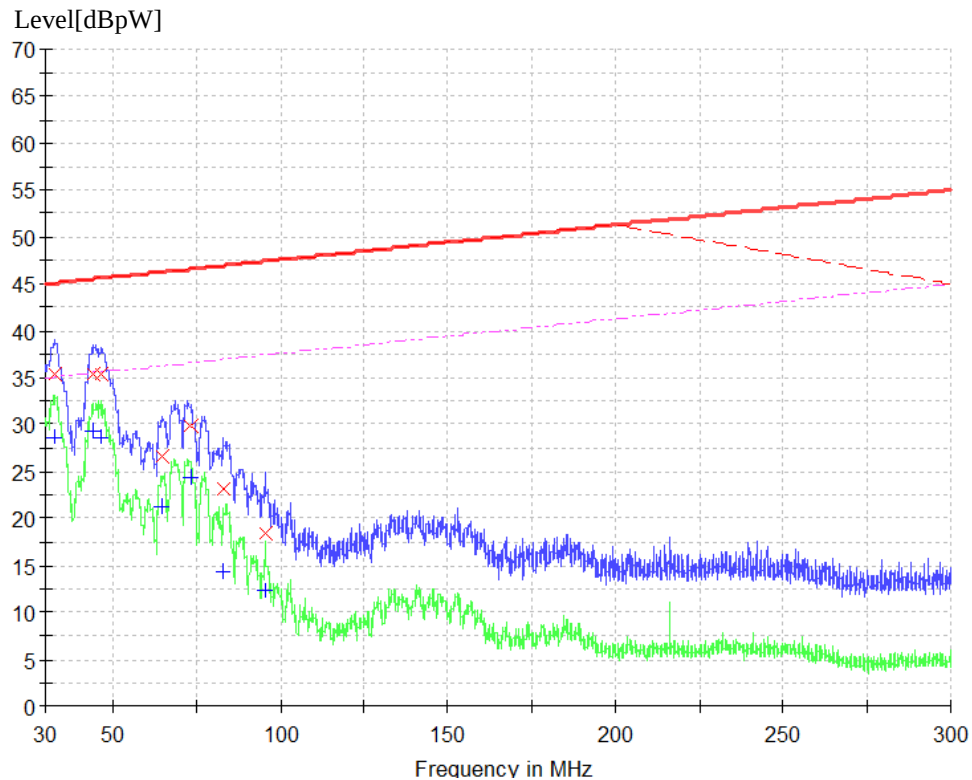
Figure 13: Spectral diagram, disturbance power, 30 – 300 MHz, AC Mains for GPLC058V29Y mode A


Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBpW)
32.592000	34.1	1000.0	120.000	5.2	11.0	45.1
42.312000	39.2	1000.0	120.000	6.1	6.2	45.5
50.412000	37.2	1000.0	120.000	6.5	8.6	45.8
50.412000	37.2	1000.0	120.000	6.5	8.6	45.8
68.772000	33.1	1000.0	120.000	3.9	13.4	46.4
76.872000	32.3	1000.0	120.000	3.3	14.4	46.7
185.358000	9.3	1000.0	120.000	1.3	41.5	50.8

Final average measurement results:

Frequency (MHz)	CAverage (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBpW)
32.592000	27.4	1000.0	120.000	5.2	7.7	35.1
42.312000	32.7	1000.0	120.000	6.1	2.8	35.5
50.412000	30.7	1000.0	120.000	6.5	5.1	35.8
50.412000	30.7	1000.0	120.000	6.5	5.1	35.8
68.772000	27.6	1000.0	120.000	3.9	8.9	36.4
76.872000	26.5	1000.0	120.000	3.3	10.2	36.7
185.358000	1.6	1000.0	120.000	1.3	39.2	40.8

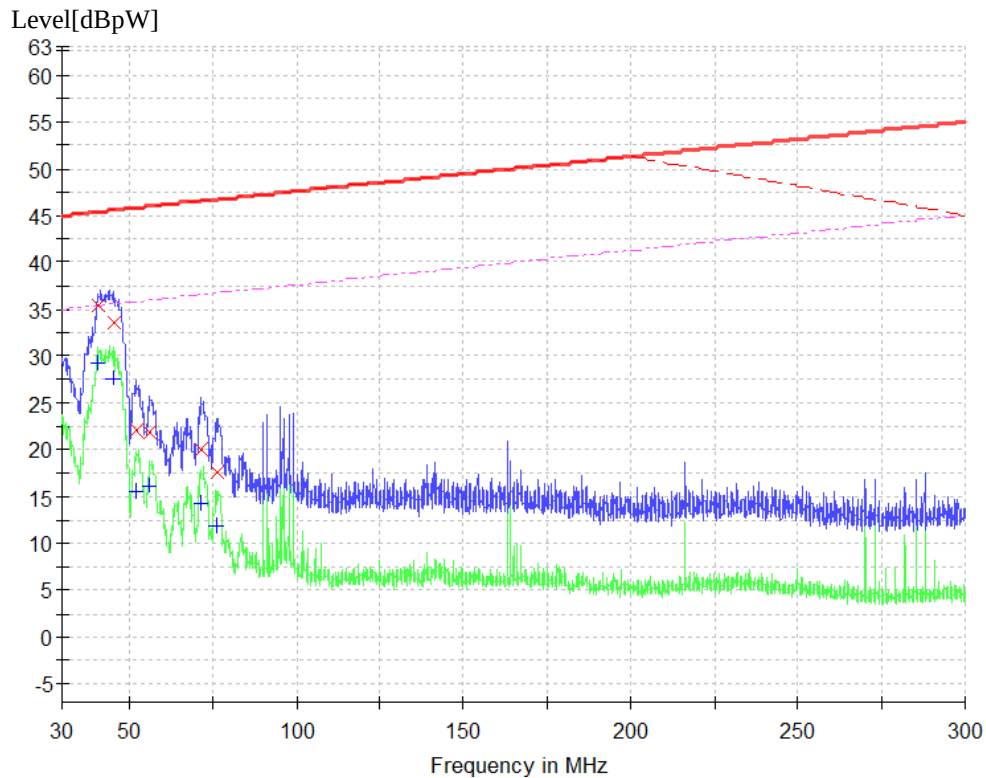
Figure 14: Spectral diagram, disturbance power, 30 – 300 MHz, DC port towards battery charger for GPLC058V29Y mode A


Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBpW)
32.808000	35.4	1000.0	120.000	5.2	9.7	45.1
44.472000	35.5	1000.0	120.000	6.4	10.0	45.5
46.794000	35.4	1000.0	120.000	6.7	10.2	45.6
64.614000	26.6	1000.0	120.000	5.0	19.7	46.3
73.416000	29.9	1000.0	120.000	3.6	16.7	46.6
82.920000	23.1	1000.0	120.000	2.9	23.9	47.0
95.502000	18.3	1000.0	120.000	4.2	29.1	47.4

Final average measurement results:

Frequency (MHz)	CAverage (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBpW)
32.808000	28.8	1000.0	120.000	5.2	6.4	35.1
44.472000	29.3	1000.0	120.000	6.4	6.2	35.5
46.794000	28.7	1000.0	120.000	6.7	6.9	35.6
64.614000	21.3	1000.0	120.000	5.0	15.0	36.3
73.416000	24.4	1000.0	120.000	3.6	12.2	36.6
82.920000	14.3	1000.0	120.000	2.9	22.7	37.0
95.502000	12.3	1000.0	120.000	4.2	25.2	37.4

Figure 15: Spectral diagram, disturbance power, 30 – 300 MHz, DC port towards output port for GPLC058V29Y mode A


Final quasi-peak measurement results:

Frequency (MHz)	QuasiPeak (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBpW)
41.016000	35.3	1000.0	120.000	5.9	10.1	45.4
45.336000	33.5	1000.0	120.000	6.5	12.1	45.6
52.032000	22.1	1000.0	120.000	5.7	23.7	45.8
56.298000	21.9	1000.0	120.000	3.7	24.1	46.0
71.850000	20.0	1000.0	120.000	3.6	26.6	46.6
76.494000	17.6	1000.0	120.000	3.3	29.1	46.7

Final average measurement results:

Frequency (MHz)	CAverage (dBpW)	Meas. Time (ms)	Bandwidth (kHz)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBpW)
41.016000	29.3	1000.0	120.000	5.9	6.1	35.4
45.336000	27.7	1000.0	120.000	6.5	7.9	35.6
52.032000	15.6	1000.0	120.000	5.7	20.2	35.8
56.298000	16.0	1000.0	120.000	3.7	20.0	36.0
71.850000	14.2	1000.0	120.000	3.6	22.4	36.6
76.494000	11.9	1000.0	120.000	3.3	24.8	36.7

4.2.2 Radiated emission

Result:**Passed**

Test procedure : EN 55014-1:2017+A11 and CISPR 16-2-3
Test port : Enclosure
Frequency range : 30 – 1000 MHz
Limit : Quasi-peak limits (3 m test distance):
30-230 MHz, 40 dB μ V/m;
230-1000 MHz, 47 dB μ V/m;

According to a) of Clause 4.3.4.2 of EN 55014-1:2017:

“The EUT shall be also deemed to comply with the requirement of this standard in the frequency range from 300 MHz to 1 000 MHz without further testing if both conditions 1) and 2) below are fulfilled:

1) the disturbance power emission from the EUT is lower than the limits of (Table 7) reduced by the values of (Table 8);

2) the maximum clock frequency is less than 30 MHz

If either of the conditions 1) or 2) is not fulfilled, radiated measurements in the frequency range from 300 MHz to 1 000 MHz shall be performed and the limits of (Table 8) for that range applied. In any case, the limits of (Table 7) in the frequency range 30 MHz to 300 MHz shall be met.”

The EUT is deemed to meet the requirements without actual testing, as the EUT fulfilled the two conditions from test results of Clause 4.2.1 and the circuit diagram.

5 Test Results I M M U N I T Y

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. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if 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, however no change of actual operating state or stored data is allowed to persist after the test. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

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: 2021-02-20

Room temperature	:	18.7 – 20.9 °C
Relative humidity	:	34.7 – 44.2 %

According to the electrical characteristics and EN 55014-2:2015, the EUT belongs to category II equipment.

5.1 Enclosure

5.1.1 Electrostatic Discharge

Result:
Passed

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.

The EUT is placed on 0.1 m wood support 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 0.5 m.

The reference ground plane is an aluminium sheet of 0.25 mm minimum thickness. The reference ground plane is connected to the protective earth. The size of the ground plane is 2 m × 2 m.

A horizontal coupling plane (HCP), 1.6 m × 0.8 m, placed on the table and isolate the EUT 0.5 mm thick. Vertical coupling plane of dimensions 0.5 m × 0.5 m is placed parallel to and positioned at a distance of 0.1 m from the EUT.

Charge voltage	: ± 4.0 kV (Contact Discharge), ± 8.0 kV (Air Discharge)
Polarity	: positive / negative
Number of discharges	: ≥ 10
Performance criteria	: B
Atmospheric Pressure	: 100.1 kPa

Table 2: ESD, Positive / Negative Polarity

Position	Kind of Discharge	Result	Remarks
Shell(Plastic)	Air discharge ± 8 kV	Pass	No disturbance of function
Power line	Air discharge ± 8 kV	Pass	No disturbance of function
LED light	Air discharge ± 8 kV	Pass	No disturbance of function
Coupling plane (Both HCP and VCP)	Contact discharge ± 4 kV	Pass	No disturbance of function

5.2 Input and Output AC Power Port

5.2.1 Fast Transients on AC Power port

Result:**Passed**

The immunity against fast transients on AC power port and control port was tested in accordance to EN 55014-2:2015. Test setup and the fast transient noise generator was according to EN 61000-4-4 which is specified by EN 55014-2:2015.

The EUT is placed on 0.1 m wood support 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 0.5 m.

The length between the coupling device and the EUT is less than 1.0 m. The excess length of the cable shall be folded to avoid a flat coil and situated at a distance of 0.1 m above the ground reference plane.

The reference ground plane is an aluminum sheet of 0.25 mm minimum thickness. The reference ground plane is connected to the protective earth. The size of the ground plane is 2 m × 2 m.

Test voltage	: 1 kV for AC port
Polarity	: negative/positive
Repetition frequency	: 5 kHz
Test duration	: 120 sec
T_r/T_d	: 5 ns / 50 ns
Performance criteria	: B

Table 3: Burst, AC Power port and signal port, Positive and Negative Polarity

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

5.2.2 Injected Current into AC Power Port

Result:**Passed**

The immunity against injected current into AC power port and control port was tested according to EN 55014-2:2015 in a shielded room. The Test setup and the test generator was according to EN 61000-4-6 which is specified by EN 55014-2:2015.

The EUT is placed on a ground reference plane and shall be insulated from it by an insulating support 0.1 m thick. And the minimum distance between the EUT and all other conductive structures except the ground plane beneath the EUT is more than 0.5 m.

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 50 mm.

Voltage level	: 3 V(rms)(unmodulated)
Environmental phenomena	: r.f. current, common mode, 1 kHz, 80 %AM
Source impedance	: 150 Ω
Frequency range	: 0.15 – 230 MHz
Frequency scan speed	: Frequency step: 1 %; Dwell time: 3 s
Performance criteria	: A

Table 4: Injected current, AC Power Port

Line	Result	Remarks
AC Input port	Pass	No disturbance of function

5.2.3 Surges to AC Power Port

Result:**Passed**

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) was according to EN 61000-4-5 which is specified EN 55014-2:2015.

The EUT is placed on wood table above the ground plane.

Open-circuit test voltage : 1 kV
 T_r/T_d : 1.2 / 50 μ s (open-circuit voltage)
8 / 20 μ s (short-circuit current)
Test numbers : 5 positive and 5 negative pulses
Repetition rate : 1 surge/min
Performance criteria : B

Table 5: Surges to AC Power lines, positive/negative

Line	Result	Remarks
Line to line 1 kV	Pass	No disturbance of function

5.2.4 Voltage dips to AC Power Port

Result:
Passed

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 was according to EN 61000-4-11 which is specified by EN 55014-2:2015.

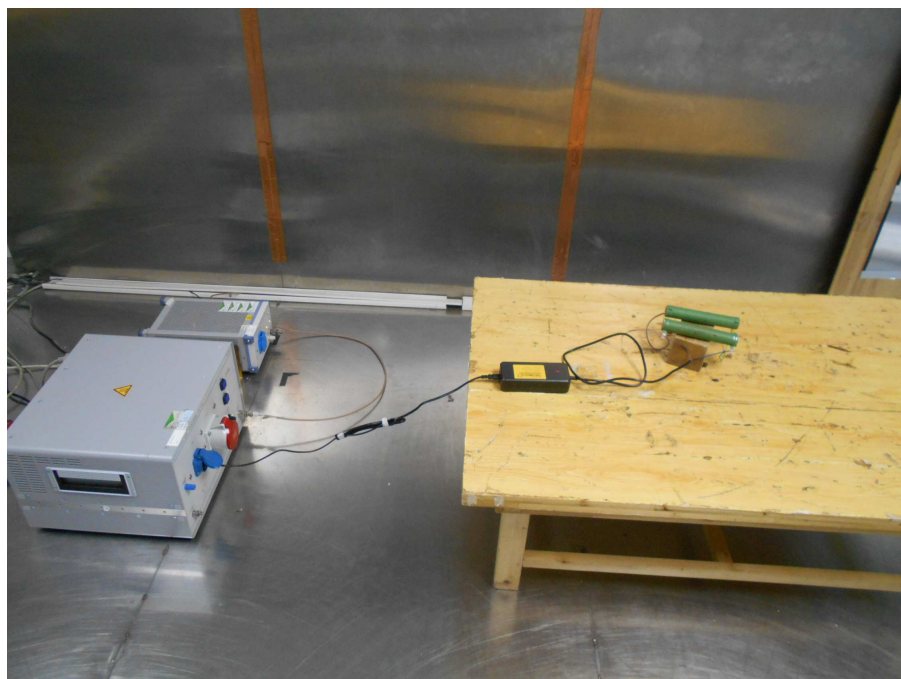
Performance criteria	:	C
Test level (in % U_T) and	:	0 0.5 periods
duration (in periods of the	40	10 periods (50 Hz) and 12 periods (60 Hz)
rated frequency)	70	25 periods (50 Hz) and 30 periods (60 Hz)

Table 6: Test condition and Test Result for Voltage dips

Test level (in % U_T)	Duration period (cycle)	Performance criteria	Result	Remarks
0	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

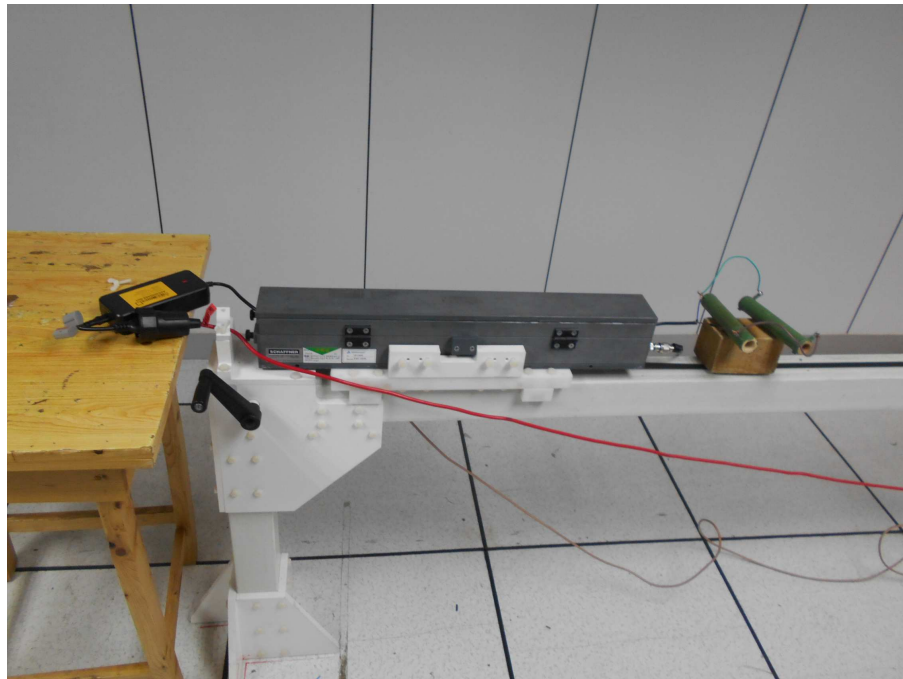
Photograph 1: Set-up for measurement of continuous disturbance voltage



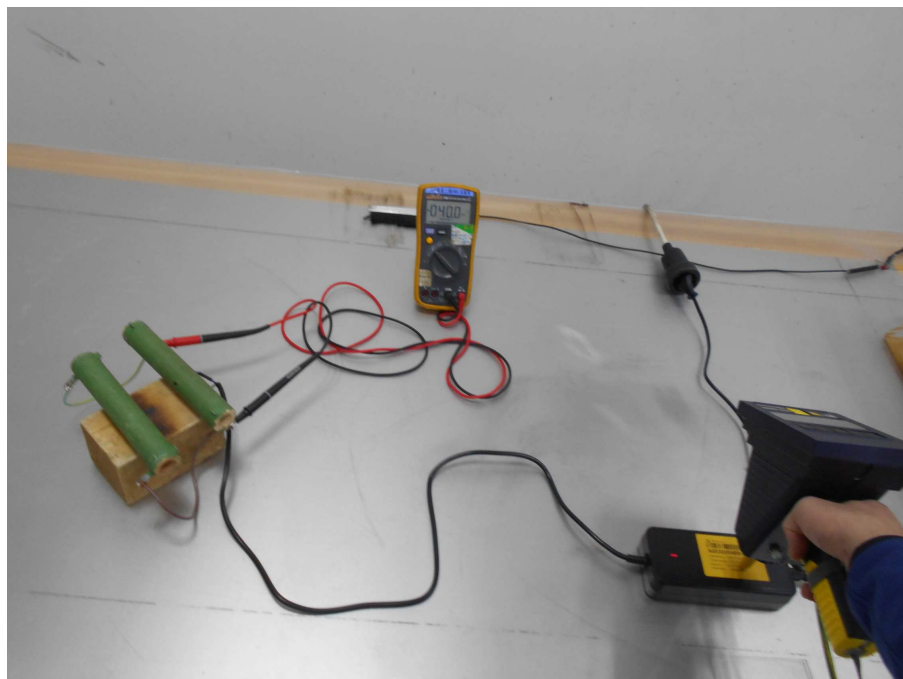
Photograph 2: Set-up for measurement of disturbance power



AC mains



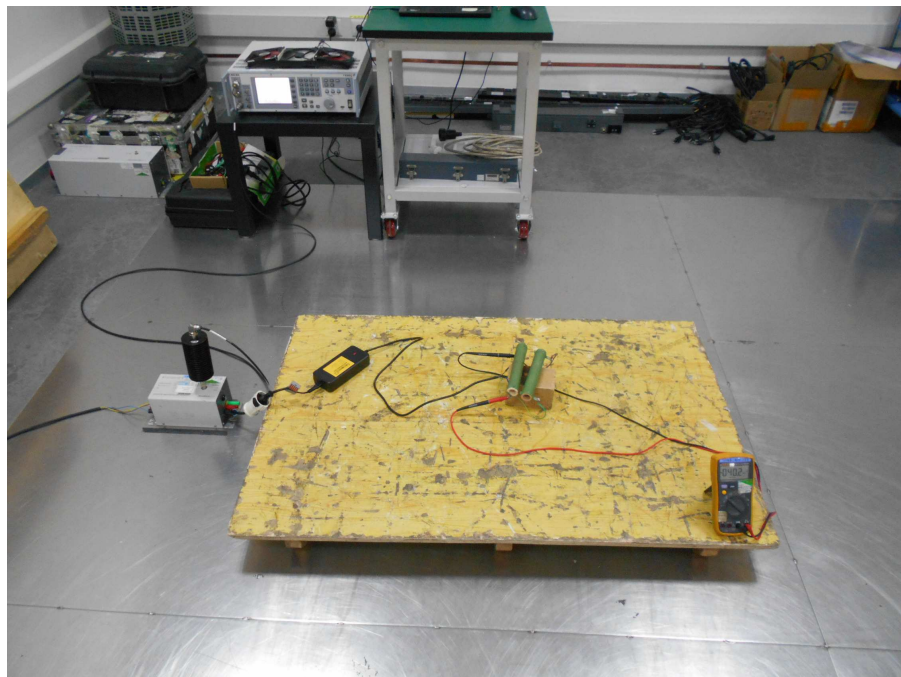
DC port

Photograph 3: Set-up for immunity test of ESD

Photograph 4: Set-up for immunity test of EFT & surge



Photograph 5: Set-up for immunity test of injected current



Photograph 6: Set-up for immunity test of voltage dips

7 List of Test and Measurement Instruments

Equip.	Description	Model	Manufacturer	Last Date DD.MM.YYYY	Due Date DD.MM.YYYY
G1811391	EMI test receiver	ESCI	Rohde&Schwarz	13.10.2020	13.10.2021
G1830003	Artificial mains network	ENV432	Rohde&Schwarz	02.11.2020	02.11.2021
G1811382	Harmonics/voltage fluctuation tester	Proflin 2105-400	Schaffner	03.04.2020	03.04.2021
G1811385	Power source	NSG 1007-5	Schaffner	22.04.2019	22.04.2021
G1825638	Harmonics/flicker measurement software	Win2100 (V4.23)	Teseq	NA*	NA*
G1811381	ESD generator	NSG 435	Schaffner	15.07.2020	15.07.2021
G1811396	Barometer	DYM3	Ningbo Jiangshan Glass	04.04.2018	04.04.2021
G1811406	Absorbing clamp	AMZ41	Schaffner	07.05.2020	07.05.2022
G1811413	EMC test system	NSG 3060	Teseq	13.08.2020	13.08.2021
G1814624	Coupling/decoupling network	CDN M016	Schaffner	09.02.2018	09.02.2021
G1811423	Conducted immunity test system	NSG 4070B-75	Teseq	18.09.2020	18.09.2021
G1811428	3-phase voltage dips simulator	CSS-20P3	Shanghai Skylark	30.10.2020	30.10.2021
G1824845	EMC measurement software	EMC32 (Ver 10.20.01)	Rohde&Schwarz	NA*	NA*

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End of test report