



中国认可
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TESTING
CNAS L5313



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1942106E-IT-CE-P05V01

Grid-Connected PV Inverter

Models: EA5KTSI,EA6KTSI,EA8KTSI,EA10KTSI,EA13KTSI,EA16KTSI

Suzhou, date of issue: 2019-05-14

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1 CONCLUSION

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

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

1.1 Model description

The apparatus as supplied for the test is Grid-Connected PV Inverter, models EA5KTSI, EA6KTSI, EA8KTSI, EA10KTSI, EA13KTSI, EA16KTSI.

According to the declaration from manufacturer, all the models are identical except for the power.

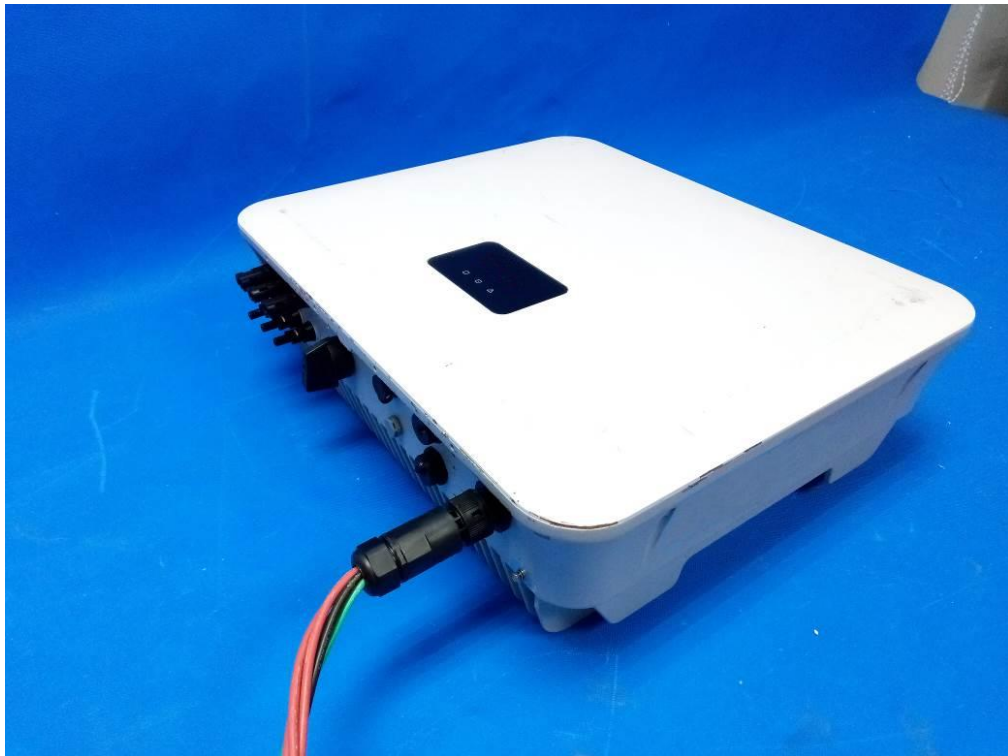


Figure 1 Overview



Figure 2 Overview

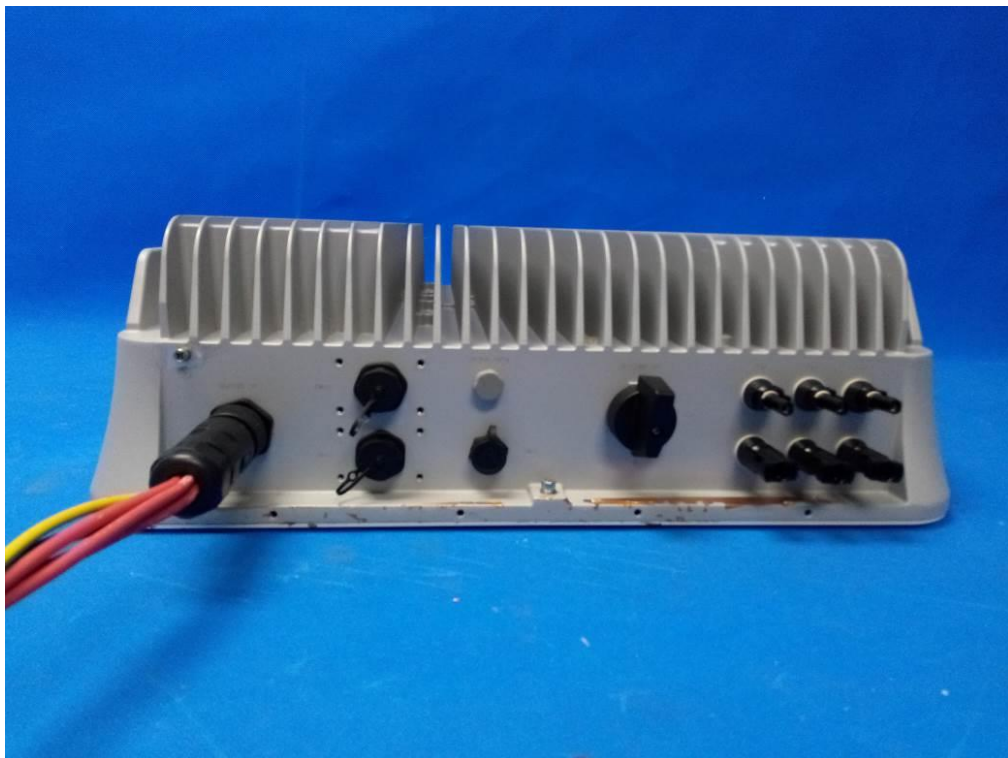


Figure 3 Overview

2 SUMMARY

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

2.1 Applied standards

Standard	Year	Title
EN 61000-6-4	2007	Generic standards — Emission standard for industrial environments
A1	2011	
EN 61000-6-2	2005	Generic standards — Immunity for industrial environments

Standard	Year	Title
EN 61000-6-3	2007	Generic standards — Emission standard for residential, commercial and light-industrial environments
A1	2011	
AC	2012	
EN 61000-6-1	2007	Generic standards — Immunity for residential, commercial and light-industrial environments

Note: The test in this report uses the lower limit (EN 61000-6-3) for Emission, uses the higher level (EN 61000-6-2) for Immunity. Use EN 61000-6-1 and EN 61000-6-2 for Voltage dips and interruptions.

2.2 Overview of results

Emission tests	Result
Conducted Emission(Mains Ports)	PASS
Conducted Emission(Telecommunication Ports)	N/A
Radiated Emission	PASS
Harmonic current emission	PASS
Voltage fluctuations and flicker	PASS

Immunity tests	Result
Electrostatic discharge	PASS
Radio frequency electromagnetic field	PASS
Electrical fast transients	PASS
Surges	PASS
Radio-frequency continuous conducted	PASS
Power frequency magnetic field	PASS
Voltage dips and interruptions	PASS

3 GENERAL INFORMATION

Equipment under test	Grid-Connected PV Inverter	
Trade Mark	EAST	
Types	EA5KTSI, EA6KTSI, EA8KTSI	EA10KTSI, EA13KTSI, EA16KTSI
Ratings	Input: max 1000Vdc, MPPT voltage range: 120-950Vdc Output: 230/400Vac, 50Hz, 5000VA / 6000VA / 8000VA	Input: max 1000Vdc, MPPT voltage range: 200-950Vdc Output: 230/400 Vac, 50Hz, 10000VA / 13000VA / 16000VA

3.1 Customer Information

Applicant	EAST Group Co., Ltd.
Address	No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industrial Park, Dongguan City, Guangdong Province, China

Manufacturer	EAST Group Co., Ltd.
Address	No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industrial Park, Dongguan City, Guangdong Province, China

Factory	EAST Group Co., Ltd.
Address	No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industrial Park, Dongguan City, Guangdong Province, China

3.2 Test data

Location	DEKRA Testing & Certification (Suzhou) Co., Ltd.
Address	No.99 Hongye Rd., Suzhou Industrial Park, Suzhou,215006, Jiangsu, China
Date of receipt of test item	Apr. 2019 (samples provided by applicant)
Date (s) of performance of tests	Apr. 2019
Supervised by	Star Wang

3.3 Environmental conditions

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

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

3.4 Measurement Uncertainty

Conducted Emission (Mains Ports) / TR1
The maximum measurement uncertainty is evaluated as: Mains: 9kHz~150kHz: 2.80dB 150kHz~30MHz: 2.40dB
Conducted Emission (Telecommunication Ports) / TR1
The maximum measurement uncertainty is evaluated as: ISN T800: 150kHz~30MHz: 3.60 dB ISN T8-Cat6: 150kHz~30MHz: 3.50 dB ISN ST08: 150kHz~30MHz: 3.10 dB
Radiated emission / AC1
The maximum measurement uncertainty is evaluated as: Horizontal: 30MHz~300MHz: 3.50 dB 300MHz~1GHz: 3.20 dB 1GHz~18GHz: 4.80 dB Vertical: 30MHz~300MHz: 3.60 dB 300MHz~1GHz: 3.10 dB 1GHz~18GHz: 4.50 dB
Radiated emission / AC5
The maximum measurement uncertainty is evaluated as: Horizontal: 30MHz~300MHz: 3.90 dB 300MHz~1GHz: 3.60 dB 1GHz~18GHz: 5.00 dB Vertical: 30MHz~300MHz: 3.80 dB 300MHz~1GHz: 3.50 dB 1GHz~18GHz: 4.80 dB
Harmonic current emissions / TR20
The maximum measurement uncertainty is evaluated as: 1.8 %.
Voltage fluctuation and flicker / TR20
The maximum measurement uncertainty is evaluated as: 1.5 %.
Electrostatic discharge / AC4
The maximum measurement uncertainty is evaluated as Rise Time: 6.4 %, Peak Current: 6 %, Current at 30 ns: 6 %, Current at 60 ns: 6 %.
Radio frequency electromagnetic field / AC4
The maximum measurement uncertainty is evaluated as 1.48dB.
Electrical fast transients / TR2
The maximum measurement uncertainty is evaluated as Voltage: 4%, Time: 2%.

Surges / TR2
The maximum measurement uncertainty is evaluated as Voltage: 4%, Time: 2%.
Radio-frequency continuous conducted / TR2
The maximum measurement uncertainty is evaluated as CDN: 1.52dB, EM Clamp: 1.92dB.
Power-frequency magnetic field / TR20
The maximum measurement uncertainty is evaluated as 10%.
Voltage dips and interruptions / TR20
The maximum measurement uncertainty is evaluated as Voltage: 4%, Time: 2%.

3.5 Equipment List

Conducted Emission(Mains Ports)/ TR1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100906	2020.04.20
Two-Line V-Network	R&S	ENV216	101189	2019. 11.24
Two-Line V-Network	R&S	ENV216	101044	2019.06.09
Artificial Mains Network	SCHWARZBECK	NSLK 8128	8128-287	2019.10.20
Current Probe	R&S	EZ-17	100678	2020.03.07
50ohm Termination	SHX	TF2	07081402	2019.09.08
50ohm Termination	SHX	TF2	07081403	2019.09.08
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	N/A
Coaxial Cable	Suhner	RG 223	TR1-C1	2019.09.27
Temperature/Humidity Meter	ruitesi	RTS-8S	TR1-TH	2019.09.27

Conducted Emission (Telecommunication Ports) / TR1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100906	2020.03.04
Two-Line V-Network	R&S	ENV216	101189	2019.06.09
Two-Line V-Network	R&S	ENV216	101044	2019.06.09
Impedance Stabilization Network	Teseq GmbH	ISN T800	30306	2020.01.22
Impedance Stabilization Network	Teseq GmbH	ISN T8-Cat6	29680	2020.01.22
Current Probe	R&S	EZ-17	100678	2019.09.08
50ohm Termination	SHX	TF2	07081402	2019.09.08
50ohm Termination	SHX	TF2	07081403	N/A
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2019.09.27
Coaxial Cable	Suhner	RG 223	TR1-C1	2019.09.27
Temperature/Humidity Meter	ruitesi	RTS-8S	TR1-TH	2019.10.24

Radiated Emission / AC1

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Test Receiver	R&S	ESCI	100175	2019.09.08
EMI Test Receiver	R&S	ESCI	100726	2019.09.08
EMI Receiver	Agilent	N9038A	MY51210196	2019.06.09
Preamplifier	Quietek	AP-025C	CHM-0602008	2020.04.13
Preamplifier	Quietek	AP-025C	CHM-0503006	2020.04.13
Bilog Antenna	Schaffner	CBL6112B	2931	2020.05.18
Bilog Antenna	Schaffner	CBL6112B	2933	2020.05.18
DRG Horn Antenna	ETS-Lindgren	3117	00167055	2019.06.09
Coaxial Cable	Huber+Suhner	RG 214_U	AC1-L	2019.10.10
Coaxial Cable	Huber+Suhner	RG 214_U	AC1-R	2019.10.10
Temperature/Humidity Meter	ruitesi	RTS-8S	AC1-TH	2019.10.24

Radiated disturbance / AC5

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
EMI Receiver	Agilent	N9038A	MY51210196	2019.06.09
Preamplifier	Miteq	NSP1800-25	1364185	2019.07.16
DRG Horn Antenna	ETS-Lindgren	3117	00167055	2019.06.09
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2020.02.28
Temperature/Humidity Meter	ruitesi	RTS-8S	AC5-TH	2019.10.24

Harmonic current emissions / TR20

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Proflin 2145 Harmonics & Flicker and power line immunity test system	Teseq GmbH	Proflin 2145	1736A02510, 1646A, 01490, 1736A02428, 1736A00944, A41547	2019.09.08
Temperature/Humidity Meter	ruitesi	RTS-8S	TR20-TH	2019.10.24

Voltage fluctuation and flicker / TR20

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Proflin 2145 Harmonics & Flicker and power line immunity test system	Teseq GmbH	Proflin 2145	1736A02510, 1646A, 01490, 1736A02428, 1736A00944, A41547	2019.09.08
Temperature/Humidity Meter	ruitesi	RTS-8S	TR20-TH	2019.10.24

Electrostatic discharge / AC4

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
ESD Simulator	EM TEST	Dito	V0616101367	2019.12.12
Barometer	Fengyun	DYM3	506048	2019.10.23
Temperature/Humidity Meter	ruitesi	RTS-8S	TR3-TH	2019.10.24

Radio-frequency electromagnetic field / AC4

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Signal Generator	Keysight	N5171B	MY53051907	2019.10.20
Power Meter	Agilent	E4416A	GB41293844	2019.10.20
Power Sensor	Agilent	E9323A	MY44420302	2019.10.20
Power Meter	Boonton	4231A	144502	2019.10.20
Power Sensor	Boonton	51011-EMC	33859	2019.11.15
RF Switch	MF	SW1072	RFSW980005	2020.01.24
Power Amplifier	rflight	NTWPAS-103050	16033031	2020.01.24
Power Amplifier	rflight	NTWPAS-00810250E	16033039	2020.01.24

Directional Coupler	Schaffner	CHA 9652B	121	N/A
Directional Coupler	A&R	DC7144A	312249	N/A
Electric Field Probe	ETS-LINDGREN	HI-6105	00114789	2020.09.19
Bilog Antenna	Schaffner	CBL6141A	4278	2019.10.24
Horn Antenna	A&R	AT4002A	312312	2019.10.20
Temperature/Humidity Meter	ruitesi	RTS-8S	AC4-TH	2019.10.20

Electrical fast transients / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Immunity Test System	Teseq GmbH	NSG 3060	4019	2019.09.03
CDN	Teseq GmbH	CDN 3061	5010	2019.09.03
Automatic Step transformer	Teseq GmbH	VAR 3005-S16	3010	2020.04.20
CDN	Teseq GmbH	CDN 3063	1997	2020.03.27
CDN	Teseq GmbH	CDN 3425	2029	2019.10.20
Temperature/Humidity Meter	ruitesi	RTS-8S	TR2-TH	2019.10.24

Surges / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Immunity Test System	Teseq GmbH	NSG 3060	4019	2019.09.03
CDN	Teseq GmbH	CDN 3061	5010	2019.09.03
Automatic Step transformer	Teseq GmbH	VAR 3005-S16	3010	2020.04.20
CDN	Teseq GmbH	CDN 3063	1997	2020.03.27
CDN	Teseq GmbH	CDN 118	40652	2019.10.20
CDN	Teseq GmbH	CDN 118	40644	2019.10.20
CDN	Teseq GmbH	CDN 117	31806	2020.03.04
Temperature/Humidity Meter	ruitesi	RTS-8S	TR2-TH	2019.10.24

Radio-frequency continuous conducted / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
RF-Generator	Teseq GmbH	NSG 4070B-80	43711	2019.06.09
Attenuation	Teseq GmbH	ATN 6050	33651	2020.04.13
Coupling / Decoupling Network	Schaffner	CDN M016	21249	2019.10.20
Coupling / Decoupling Network	Teseq GmbH	CDN M016	24484	2019.10.20
Coupling / Decoupling Network	Schaffner	CDN T400	19083	2019.10.20
Coupling / Decoupling Network	Teseq GmbH	CDN T400	22461	2020.01.07
Coupling / Decoupling Network	Teseq GmbH	CDN T800	26167	2020.03.04
Coupling / Decoupling Network	EM TEST	CDN M5	P1620179992	2019.11.02

EM Clamp	Schaffner	KEMZ 801	21041	2019.10.24
Temperature/Humidity Meter	ruitesi	RTS-8S	TR2-TH	2019.06.09

Power-frequency magnetic field / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Immunity Test System	Teseq GmbH	NSG 3060	4019	2019.09.03
CDN	Teseq GmbH	CDN 3061	5010	2019.09.03
Automatic Step transformer	Teseq GmbH	VAR 3005-S16	3010	2020.04.20
Magnetic field Coil	Teseq GmbH	INA 702	306	2019.07.20
Magnetic Field Generator	Teseq GmbH	MFO 6502	201	2019.07.20
Temperature/Humidity Meter	RTS	RTS-8S	TR2-TH	2019.10.24

Voltage dips and interruptions / TR2

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Immunity Test System	Teseq GmbH	NSG 3060	4019	2019.09.03
CDN	Teseq GmbH	CDN 3061	5010	2019.09.03
Automatic Step transformer	Teseq GmbH	VAR 3005-S16	3010	2020.04.20
Temperature/Humidity Meter	RTS	RTS-8S	TR2-TH	2019.10.24

4 EMISSION TEST RESULTS

Conducted emission (Main Ports)

Limits of conducted emission for AC mains power input/output ports		
Frequency range MHz	Limits dB(μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

NOTE 1: The lower limit shall apply at the transition frequencies.
NOTE 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

Limits of conducted emission for DC power input/output ports		
Frequency range MHz	Limits dB(μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

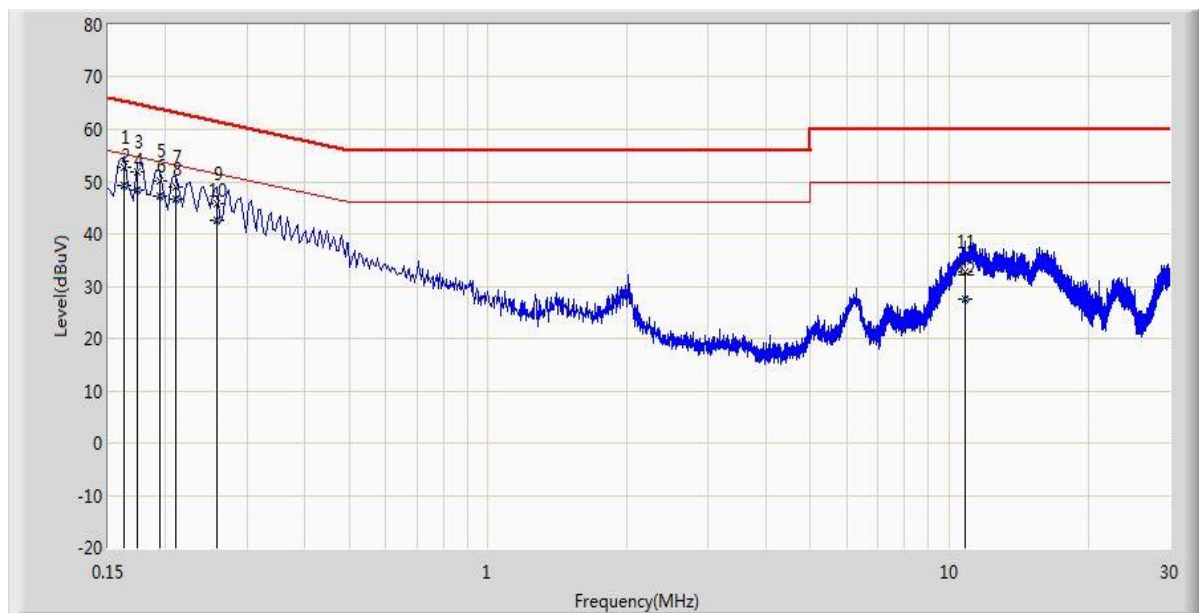
Note 1: At transitional frequencies the lower limit applies.
Note 2: Applicable only to ports intended for connection to:

- a local DC power network, or
- a remote local battery by a connecting cable exceeding a length of 30 m.

Port	AC output
Test method	LISN
Mode	Normal Operation

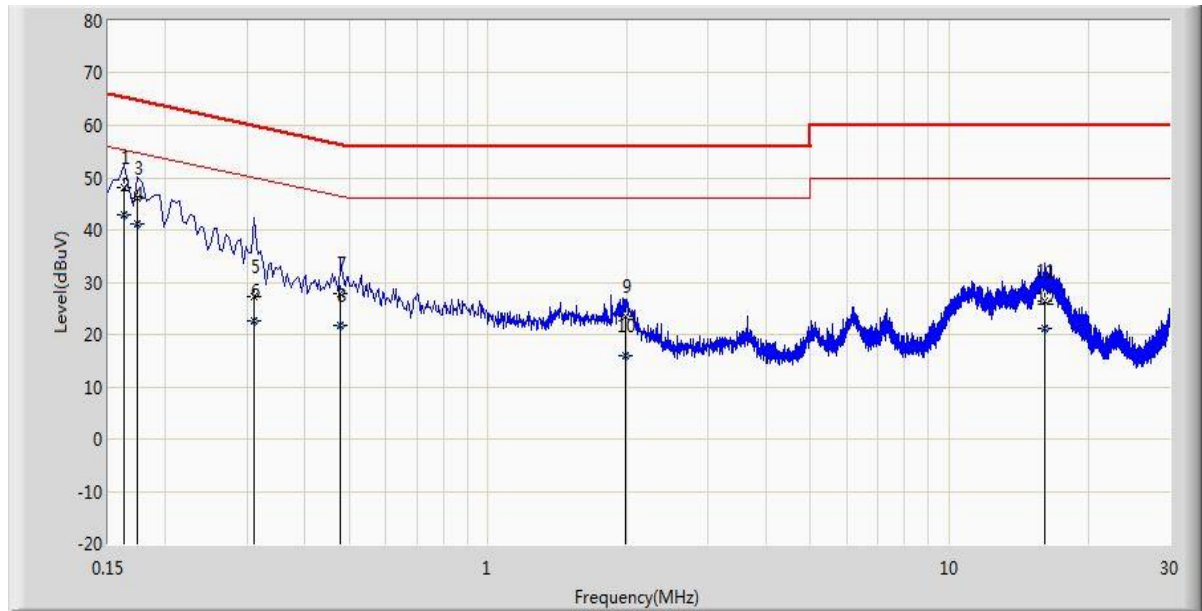
Test Result

Neutral



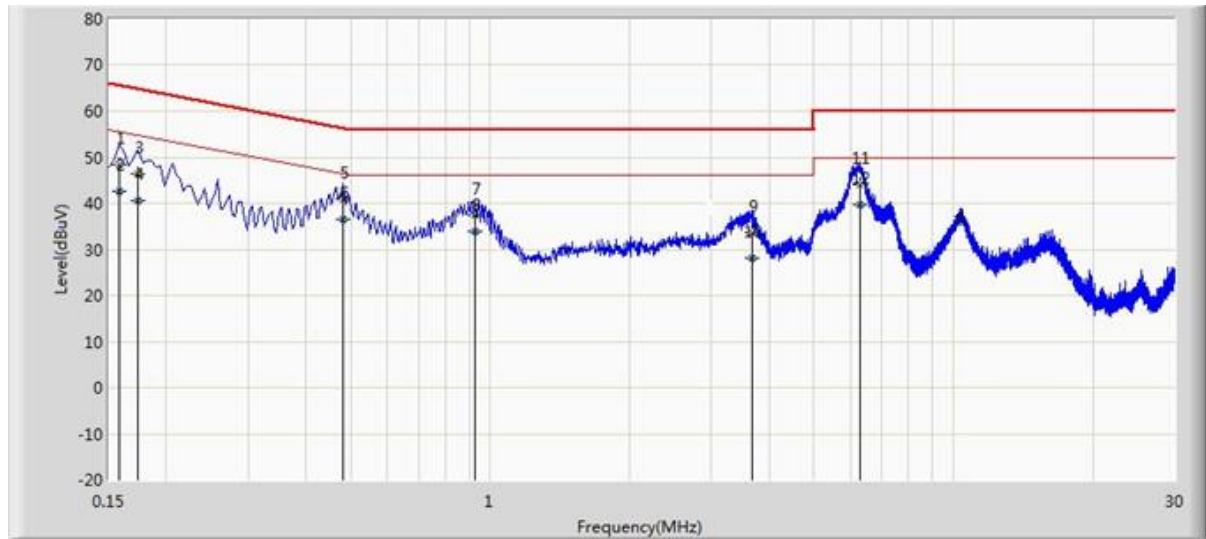
Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
0.162	52.652	32.510	-12.708	65.361	0.032	20.110	0.000	QP
0.162	49.299	29.157	-6.062	55.361	0.032	20.110	0.000	AV
0.174	51.857	31.733	-12.910	64.767	0.031	20.093	0.000	QP
0.174	48.439	28.315	-6.328	54.767	0.031	20.093	0.000	AV
0.194	50.109	29.923	-13.754	63.864	0.031	20.155	0.000	QP
0.194	47.298	27.112	-6.566	53.864	0.031	20.155	0.000	AV
0.210	49.089	28.824	-14.117	63.205	0.031	20.234	0.000	QP
0.210	46.535	26.271	-6.670	53.205	0.031	20.234	0.000	AV
0.258	45.829	25.660	-15.667	61.496	0.032	20.137	0.000	QP
0.258	42.639	22.470	-8.857	51.496	0.032	20.137	0.000	AV
10.850	32.611	12.119	-27.389	60.000	0.210	20.282	0.000	QP
10.850	27.618	7.126	-22.382	50.000	0.210	20.282	0.000	AV

Line1



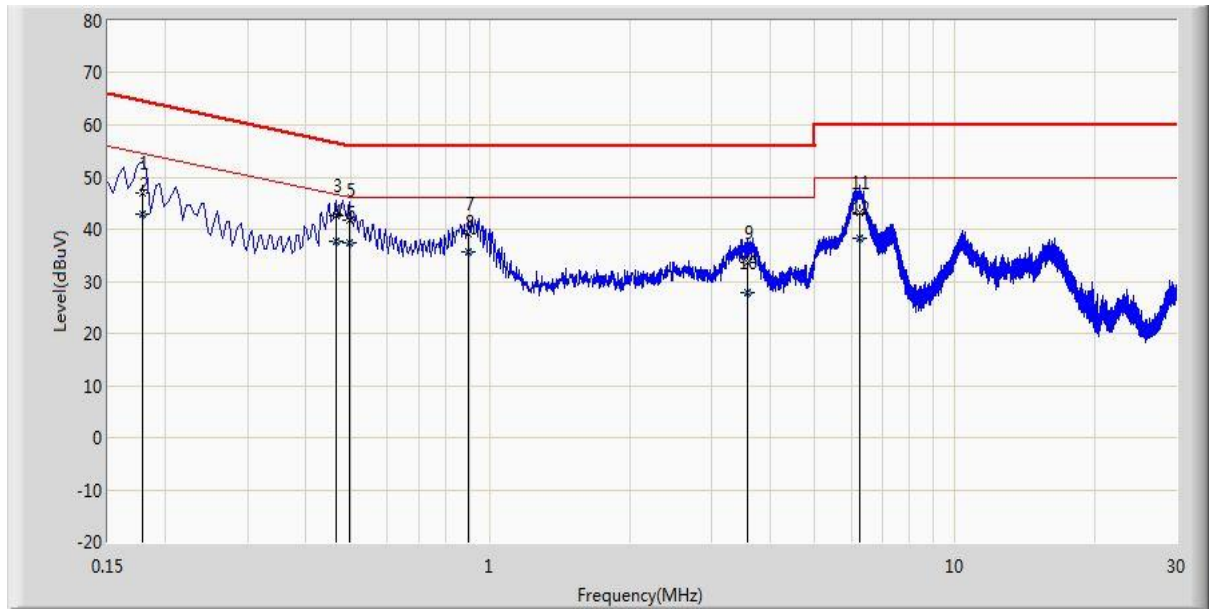
Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
0.162	48.042	27.900	-17.319	65.361	0.032	20.110	0.000	QP
0.162	42.852	22.710	-12.508	55.361	0.032	20.110	0.000	AV
0.174	45.964	25.840	-18.803	64.767	0.031	20.093	0.000	QP
0.174	41.099	20.974	-13.669	54.767	0.031	20.093	0.000	AV
0.310	27.333	7.260	-32.638	59.970	0.032	20.041	0.000	QP
0.310	22.605	2.532	-27.366	49.970	0.032	20.041	0.000	AV
0.478	27.827	7.644	-28.547	56.374	0.034	20.149	0.000	QP
0.478	21.761	1.578	-24.613	46.374	0.034	20.149	0.000	AV
1.990	23.452	3.165	-32.548	56.000	0.058	20.229	0.000	QP
1.990	15.865	-4.422	-30.135	46.000	0.058	20.229	0.000	AV
16.130	26.428	5.850	-33.572	60.000	0.252	20.326	0.000	QP
16.130	21.302	0.724	-28.698	50.000	0.252	20.326	0.000	AV

Line2



Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
0.158	48.308	28.159	-17.260	65.568	0.033	20.116	0.000	QP
0.158	42.571	22.422	-12.997	55.568	0.033	20.116	0.000	AV
0.174	46.312	26.187	-18.456	64.767	0.032	20.093	0.000	QP
0.174	40.683	20.558	-14.085	54.767	0.032	20.093	0.000	AV
0.482	40.820	20.656	-15.484	56.305	0.035	20.130	0.000	QP
0.482	36.542	16.377	-9.763	46.305	0.035	20.130	0.000	AV
0.926	37.258	17.067	-18.742	56.000	0.043	20.149	0.000	QP
0.926	33.896	13.705	-12.104	46.000	0.043	20.149	0.000	AV
3.666	33.562	13.281	-22.438	56.000	0.084	20.198	0.000	QP
3.666	27.999	7.718	-18.001	46.000	0.084	20.198	0.000	AV
6.270	44.189	23.851	-15.811	60.000	0.125	20.213	0.000	QP
6.270	39.602	19.264	-10.398	50.000	0.125	20.213	0.000	AV

Line3



Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
0.178	47.007	26.886	-17.571	64.578	0.034	20.087	0.000	QP
0.178	42.788	22.667	-11.790	54.578	0.034	20.087	0.000	AV
0.466	42.593	22.415	-13.992	56.585	0.038	20.139	0.000	QP
0.466	37.555	17.378	-9.030	46.585	0.038	20.139	0.000	AV
0.498	41.729	21.645	-14.305	56.033	0.039	20.045	0.000	QP
0.498	37.504	17.420	-8.530	46.033	0.039	20.045	0.000	AV
0.898	39.088	18.907	-16.912	56.000	0.046	20.136	0.000	QP
0.898	35.769	15.587	-10.231	46.000	0.046	20.136	0.000	AV
3.586	33.731	13.517	-22.269	56.000	0.087	20.127	0.000	QP
3.586	27.882	7.668	-18.118	46.000	0.087	20.127	0.000	AV
6.238	43.288	23.028	-16.712	60.000	0.131	20.130	0.000	QP
6.238	38.403	18.142	-11.597	50.000	0.131	20.130	0.000	AV

Refer to chapter 6 for the test set-up.

Conclusion:

PASS

4.1 Conducted Emissions (Telecommunication Ports)

Limits of conducted common mode (asymmetric mode) disturbance at telecommunication ports in the frequency range 0.15MHz to 30 MHz				
Frequency range MHz	Voltage Limits dB(μV)		Current limits dB(μA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 to 0.50	84 - 74	74 - 64	40 - 30	30 - 20
0.50 to 30	74	64	30	20

NOTE 1: The limits decrease linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

NOTE 2: The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150Ω to the telecommunication port under test (conversion factor is $20 \log_{10} 150 / I = 44\text{dB}$).

Test Result

The EUT does not contain the wired network port, so it needs not to perform this test item.

4.2 Radiated Emission

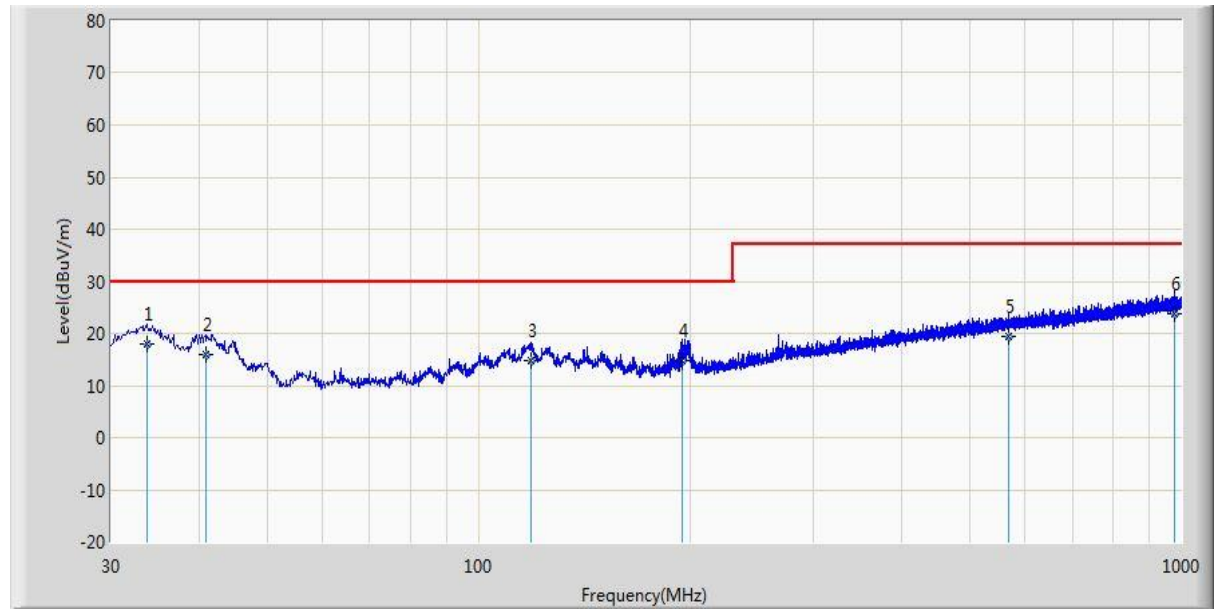
Limits for radiated emission at a measuring distance of 10m		
Frequency range MHz	Quasi-peak limits dB(μ V/m)	
30 to 230	30	
230 to 1000	37	
Limits for radiated emission at a measuring distance of 3m		
Frequency range GHz	Average limit dB(μ V/m)	Peak-peak dB(μ V/m)
1 to 3	50	70
3 to 6	54	74

Note 1: If the internal emission source(s) is operating at a frequency below 9 kHz then measurements need only to be performed up to 230 MHz.

Note 2: At transitional frequencies the lower limit applies.

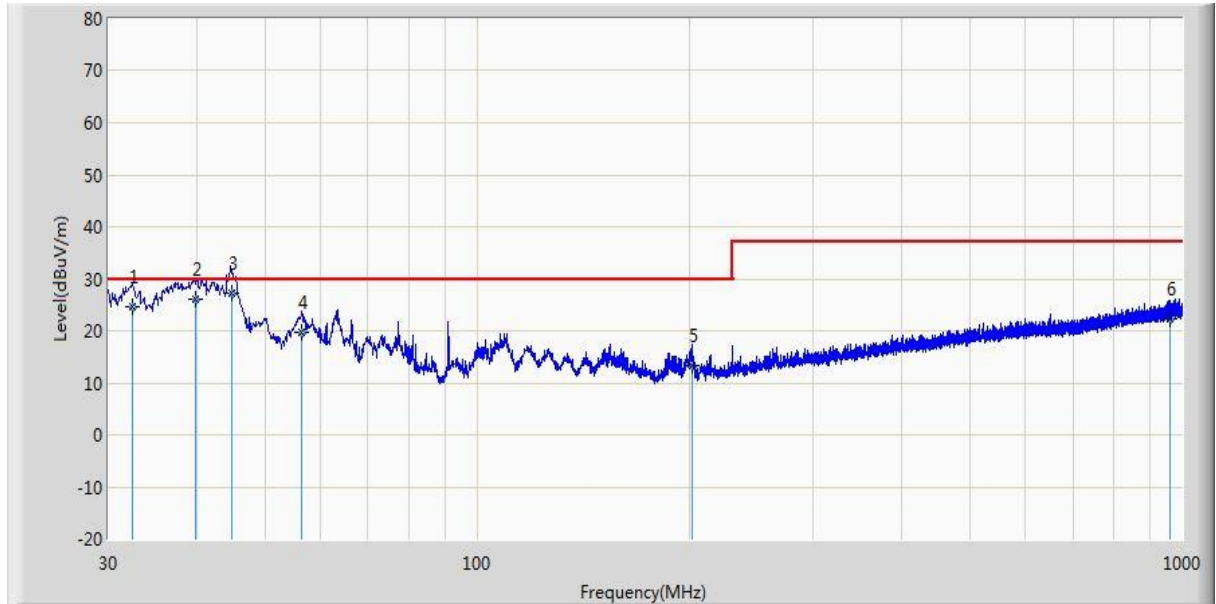
Test Result of Below 1GHz

Horizontal



Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
33.759	18.096	23.800	-11.904	30.000	14.936	1.023	21.662	300	265	QP
40.912	15.895	23.500	-14.105	30.000	12.935	1.135	21.675	400	38	QP
118.997	14.757	21.600	-15.243	30.000	12.769	2.039	21.651	356	360	QP
194.900	14.734	24.400	-15.266	30.000	9.198	2.700	21.564	400	55	QP
567.986	19.279	17.100	-17.721	37.000	17.880	5.062	20.763	200	335	QP
976.963	23.885	16.300	-13.115	37.000	20.639	7.077	20.131	100	340	QP

Vertical



Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
32.425	24.572	31.100	-5.428	30.000	15.169	1.120	22.818	100	2	QP
39.821	26.134	34.500	-3.866	30.000	13.218	1.249	22.833	300	222	QP
44.844	27.199	38.400	-2.801	30.000	10.294	1.333	22.828	400	300	QP
56.432	19.658	34.300	-10.342	30.000	6.686	1.513	22.841	400	28	QP
201.932	13.226	23.600	-16.774	30.000	9.372	3.062	22.808	400	73	QP
963.261	22.442	15.900	-14.558	37.000	20.669	7.777	21.904	400	73	QP

Refer to chapter 6 for the test set-up.

Conclusion:

PASS

4.3 Harmonic current emissions

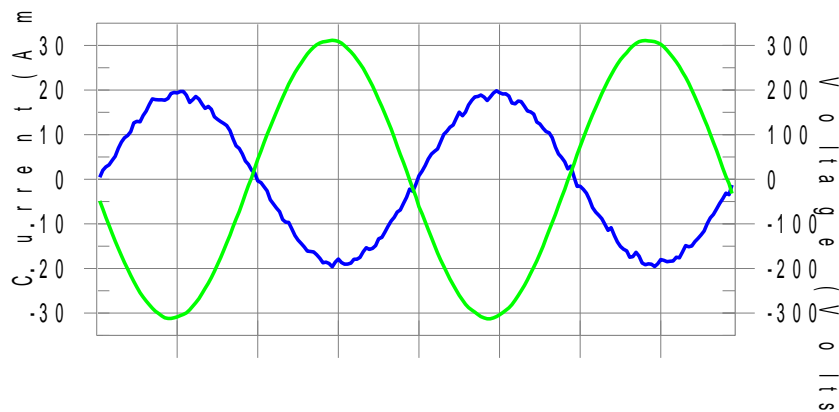
Standard	EN 61000-3-2 $\leq 16A$ EN 61000-3-12 $> 16A$ and $\leq 75A$
Port	AC Mains supply
Mode	Normal Operation

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

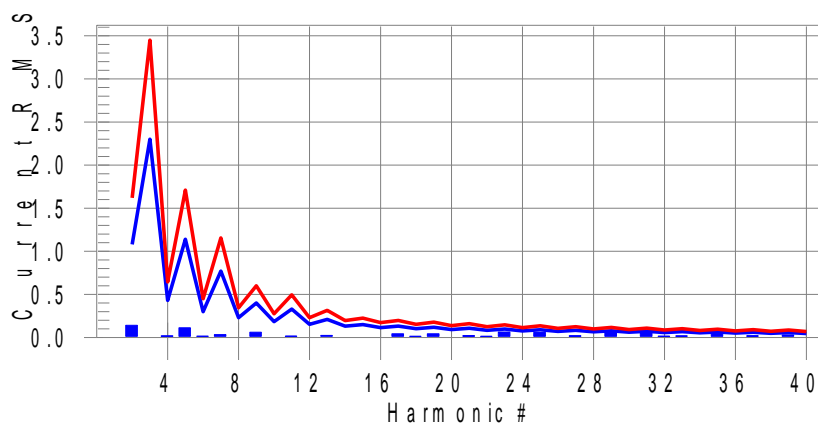
Results and limits of (EN 61000-3-2)

Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class A limit line European Limits



Test result: Pass

Test Result: Pass Source qualification: Normal
 THC(A): 0.252 I-THD(%): 1.9 POHC(A): 0.137 POHC Limit(A): 0.251

Highest parameter values during test:

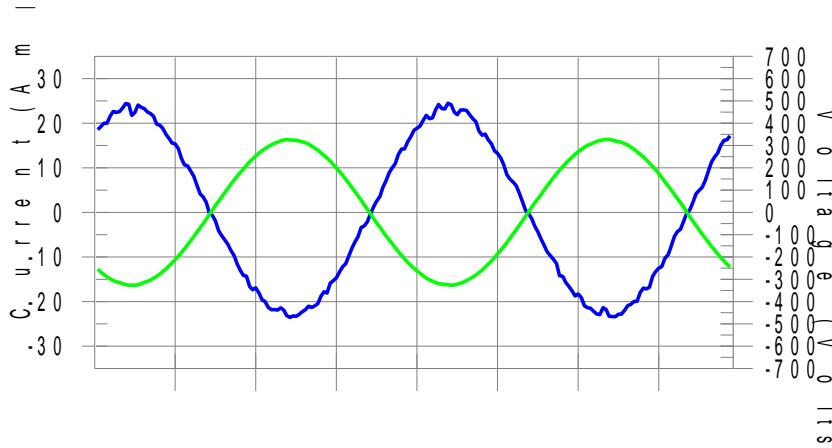
V_RMS (Volts): 220.783 Frequency(Hz): 50.00
 I_Peak (Amps): 20.996 I_RMS (Amps): 13.553
 I_Fund (Amps): 13.535 Crest Factor: 1.552
 Power (Watts): -2947.3 Power Factor: -0.987

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.141	1.080	13.1	0.153	1.620	9.4	Pass
3	0.012	2.300	0.5	0.025	3.450	0.7	Pass
4	0.019	0.430	4.4	0.025	0.645	3.9	Pass
5	0.113	1.140	9.9	0.120	1.710	7.0	Pass
6	0.015	0.300	5.2	0.022	0.450	4.9	Pass
7	0.033	0.770	4.3	0.041	1.155	3.5	Pass
8	0.013	0.230	5.9	0.020	0.345	5.8	Pass
9	0.062	0.400	15.5	0.071	0.600	11.9	Pass
10	0.006	0.184	N/A	0.011	0.276	N/A	Pass
11	0.016	0.330	4.8	0.021	0.495	4.2	Pass
12	0.007	0.153	N/A	0.012	0.230	N/A	Pass
13	0.024	0.210	11.5	0.031	0.315	9.9	Pass
14	0.004	0.131	N/A	0.008	0.197	N/A	Pass
15	0.009	0.150	5.9	0.016	0.225	7.0	Pass
16	0.012	0.115	10.2	0.017	0.173	9.6	Pass
17	0.043	0.132	32.6	0.048	0.198	24.2	Pass
18	0.014	0.102	14.1	0.020	0.153	13.1	Pass
19	0.043	0.118	36.6	0.052	0.178	29.1	Pass
20	0.008	0.092	N/A	0.013	0.138	N/A	Pass
21	0.021	0.107	19.9	0.028	0.161	17.6	Pass
22	0.014	0.084	16.9	0.021	0.125	16.8	Pass
23	0.064	0.098	65.8	0.070	0.147	47.4	Pass
24	0.010	0.077	12.4	0.015	0.115	12.9	Pass
25	0.058	0.090	64.6	0.066	0.135	48.8	Pass
26	0.012	0.071	17.3	0.017	0.107	15.9	Pass
27	0.020	0.083	23.8	0.032	0.125	25.7	Pass
28	0.013	0.066	19.4	0.019	0.099	18.8	Pass
29	0.059	0.078	75.8	0.065	0.116	55.9	Pass
30	0.007	0.061	N/A	0.011	0.092	N/A	Pass
31	0.054	0.073	73.8	0.063	0.109	58.0	Pass
32	0.015	0.058	25.4	0.021	0.086	24.6	Pass
33	0.019	0.068	28.1	0.026	0.102	25.7	Pass
34	0.008	0.054	N/A	0.011	0.081	N/A	Pass
35	0.049	0.064	76.0	0.055	0.096	56.9	Pass
36	0.009	0.051	16.8	0.012	0.077	15.3	Pass
37	0.020	0.061	33.5	0.027	0.091	30.0	Pass
38	0.009	0.048	19.2	0.014	0.073	19.5	Pass
39	0.030	0.058	51.7	0.038	0.087	44.1	Pass
40	0.010	0.046	22.5	0.014	0.069	20.4	Pass

Results and limits of (EN 61000-3-12)

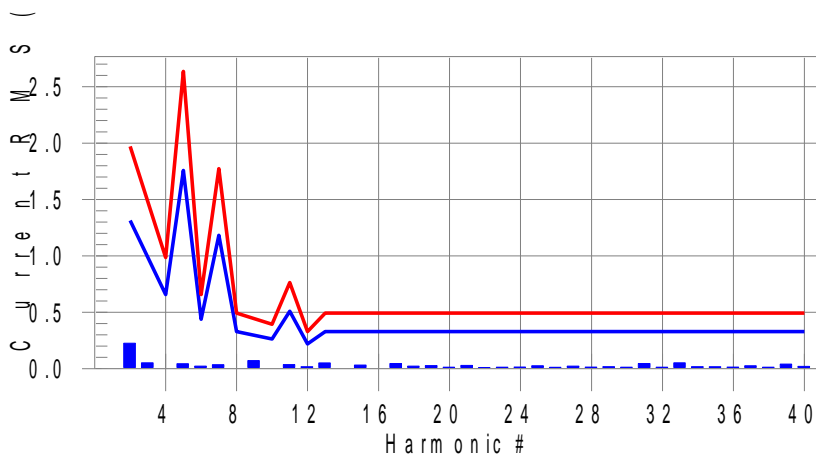
Test Result: Pass **Source qualification: Normal**

Current & voltage waveforms



Harmonics and Class 2 limit line

European Limits



Test result: Pass

Test Result: Pass Measured I-ref: 16.445(Amps) Source: Distorted
 I-THC(%): 1.8 Limit(%): 13.0 PWHC(%): 4.1 PWHC Limit(%): 22.0

Highest parameter values during test:

V_RMS (Volts): 230.79 Frequency(Hz): 50.00
 I_Peak (Amps): 26.329 I_RMS (Amps): 16.445
 I_Fund (Amps): 16.415 Crest Factor: 1.603
 Power (Watts): -3791 Power Factor: -0.999

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.226	1.314	17.2	0.244	1.971	12.4	Pass
3	0.052	N/A	N/A	0.060	N/A	N/A	N/A
4	0.007	0.657	1.1	0.012	0.986	1.2	Pass
5	0.044	1.757	2.5	0.052	2.636	2.0	Pass
6	0.023	0.438	5.2	0.032	0.657	4.9	Pass
7	0.035	1.183	3.0	0.042	1.774	2.4	Pass
8	0.007	0.329	2.2	0.011	0.493	2.3	Pass
9	0.072	N/A	N/A	0.077	N/A	N/A	N/A
10	0.004	0.263	N/A	0.006	0.394	1.5	Pass
11	0.036	0.509	7.0	0.041	0.764	5.3	Pass
12	0.017	0.219	7.9	0.021	0.329	6.4	Pass
13	0.051	0.329	15.6	0.069	0.493	13.9	Pass
14	0.010	N/A	N/A	0.023	N/A	N/A	N/A
15	0.032	N/A	N/A	0.042	N/A	N/A	N/A
16	0.008	N/A	N/A	0.011	N/A	N/A	N/A
17	0.046	N/A	N/A	0.051	N/A	N/A	N/A
18	0.023	N/A	N/A	0.033	N/A	N/A	N/A
19	0.027	N/A	N/A	0.053	N/A	N/A	N/A
20	0.013	N/A	N/A	0.024	N/A	N/A	N/A
21	0.029	N/A	N/A	0.100	N/A	N/A	N/A
22	0.011	N/A	N/A	0.018	N/A	N/A	N/A
23	0.013	N/A	N/A	0.020	N/A	N/A	N/A
24	0.015	N/A	N/A	0.021	N/A	N/A	N/A
25	0.026	N/A	N/A	0.036	N/A	N/A	N/A
26	0.012	N/A	N/A	0.017	N/A	N/A	N/A
27	0.023	N/A	N/A	0.054	N/A	N/A	N/A
28	0.014	N/A	N/A	0.019	N/A	N/A	N/A
29	0.018	N/A	N/A	0.026	N/A	N/A	N/A
30	0.013	N/A	N/A	0.019	N/A	N/A	N/A
31	0.046	N/A	N/A	0.056	N/A	N/A	N/A
32	0.013	N/A	N/A	0.019	N/A	N/A	N/A
33	0.052	N/A	N/A	0.065	N/A	N/A	N/A
34	0.018	N/A	N/A	0.025	N/A	N/A	N/A
35	0.017	N/A	N/A	0.027	N/A	N/A	N/A
36	0.014	N/A	N/A	0.022	N/A	N/A	N/A
37	0.026	N/A	N/A	0.035	N/A	N/A	N/A
38	0.013	N/A	N/A	0.020	N/A	N/A	N/A
39	0.041	N/A	N/A	0.061	N/A	N/A	N/A
40	0.020	N/A	N/A	0.030	N/A	N/A	N/A

Note: Measured I-ref was applied for this test.

Conclusion:

PASS

4.4 Voltage fluctuations and flicker

Standard	EN 61000-3-3 $\leq 16A$ EN 61000-3-11 $> 16A$ and $\leq 75A$
Port	AC Mains supply
Voltage	230 V
Mode	Normal Operation

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

P _{ST}	≤ 1
P _{LT}	≤ 0.65
T _{max}	$\leq 500ms$
d _C	$\leq 3,3\%$
d _{MAX}	$\leq 4\%$

Results of (EN 61000-3-3)

Relative voltage change characteristic T _{max}	0 ms
Maximum voltage change d _{MAX}	0.07%
Relative Voltage change d _C	0.00%
Short term flicker P _{ST}	0.064
Long term flicker P _{LT}	0.064

Results of (EN 61000-3-11)

Relative voltage change characteristic T _{max}	0 ms
Maximum voltage change d _{MAX}	0.06%
Relative Voltage change d _C	0.00%
Short term flicker P _{ST}	0.255
Long term flicker P _{LT}	0.237

Conclusion:

PASS

5 IMMUNITY TEST RESULTS

5.1 Electrostatic discharge immunity

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

Environmental phenomenon	Test specification	Units	Performance criterion
Enclosure port			
Electrostatic discharge	±4 (Contact discharge)	kV (Charge voltage)	B
	±8 (Air discharge)	kV (Charge voltage)	

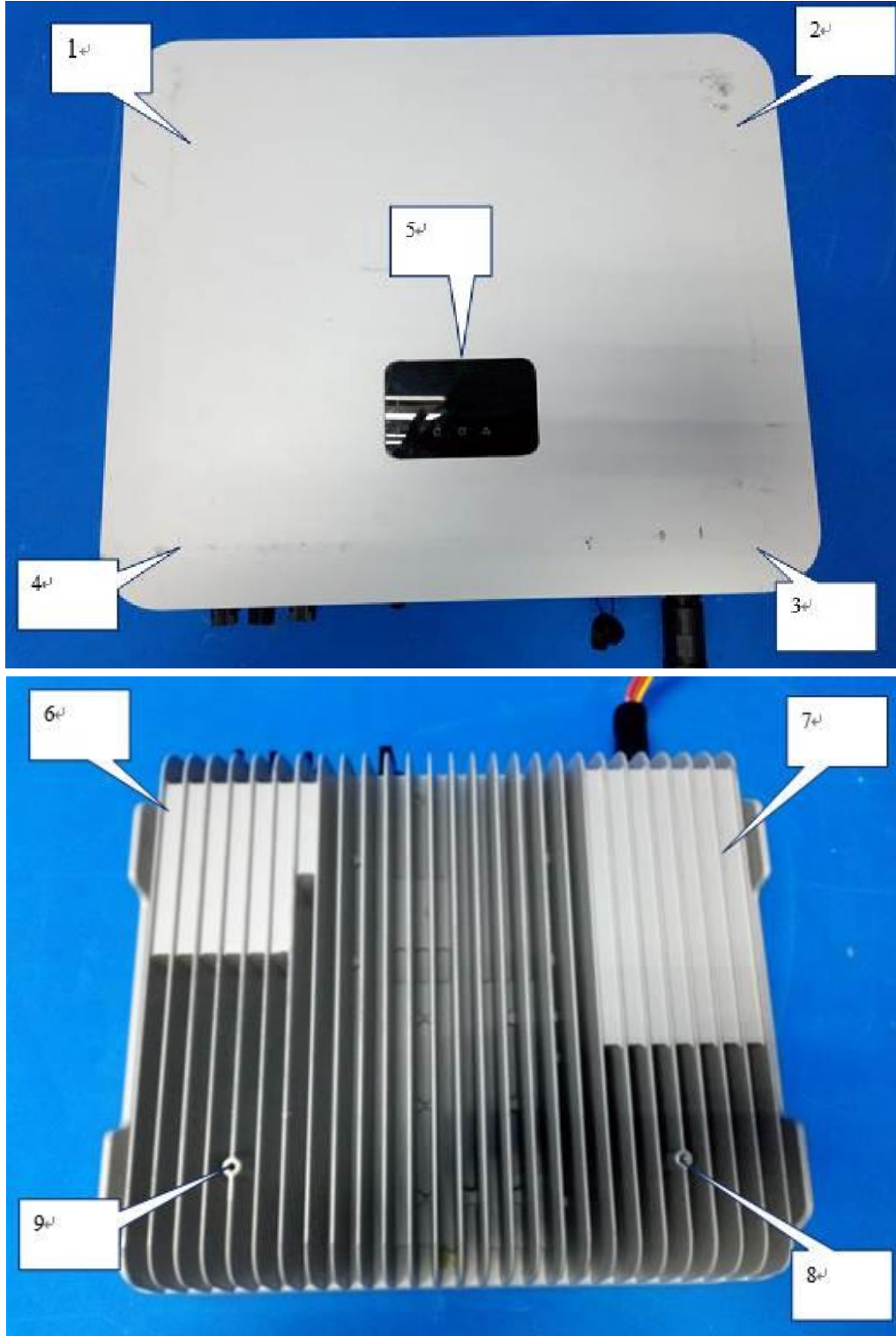
Performed tests

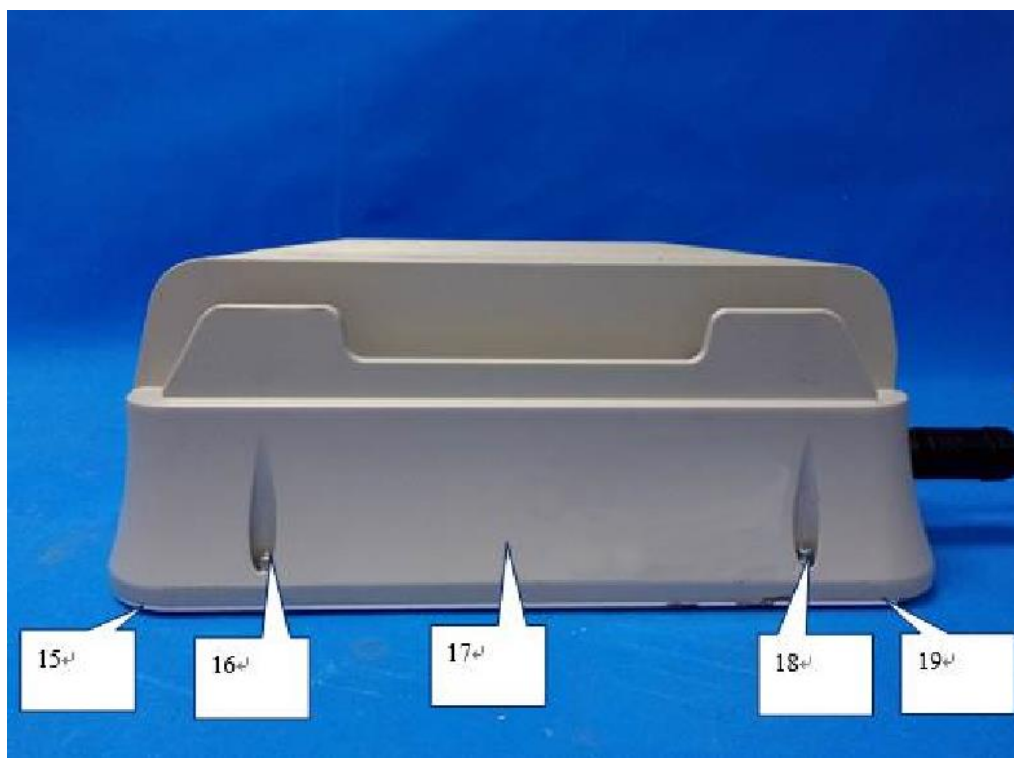
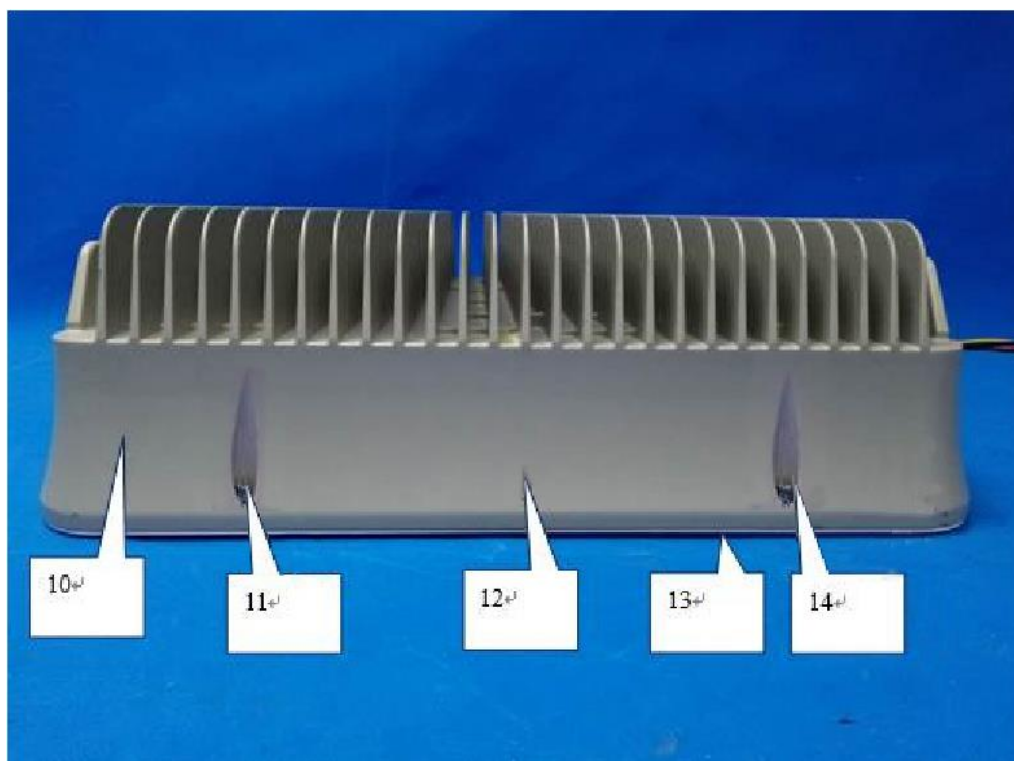
Air discharges	✓	2 kV	✓	4 kV	✓	8 kV	Test Location (28-30)
Contact discharges	✓	2 kV	✓	4 kV		8 kV	Test Location (1-27)
Via coupling planes	✓	Horizontal			✓	Vertical	
Polarity	✓	Positive			✓	Negative	
Set-up	✓	Table-top				Floor standing	
Ambient temperature	24 °C						
Relative Humidity air	48 %						
Mode	Normal Operation						

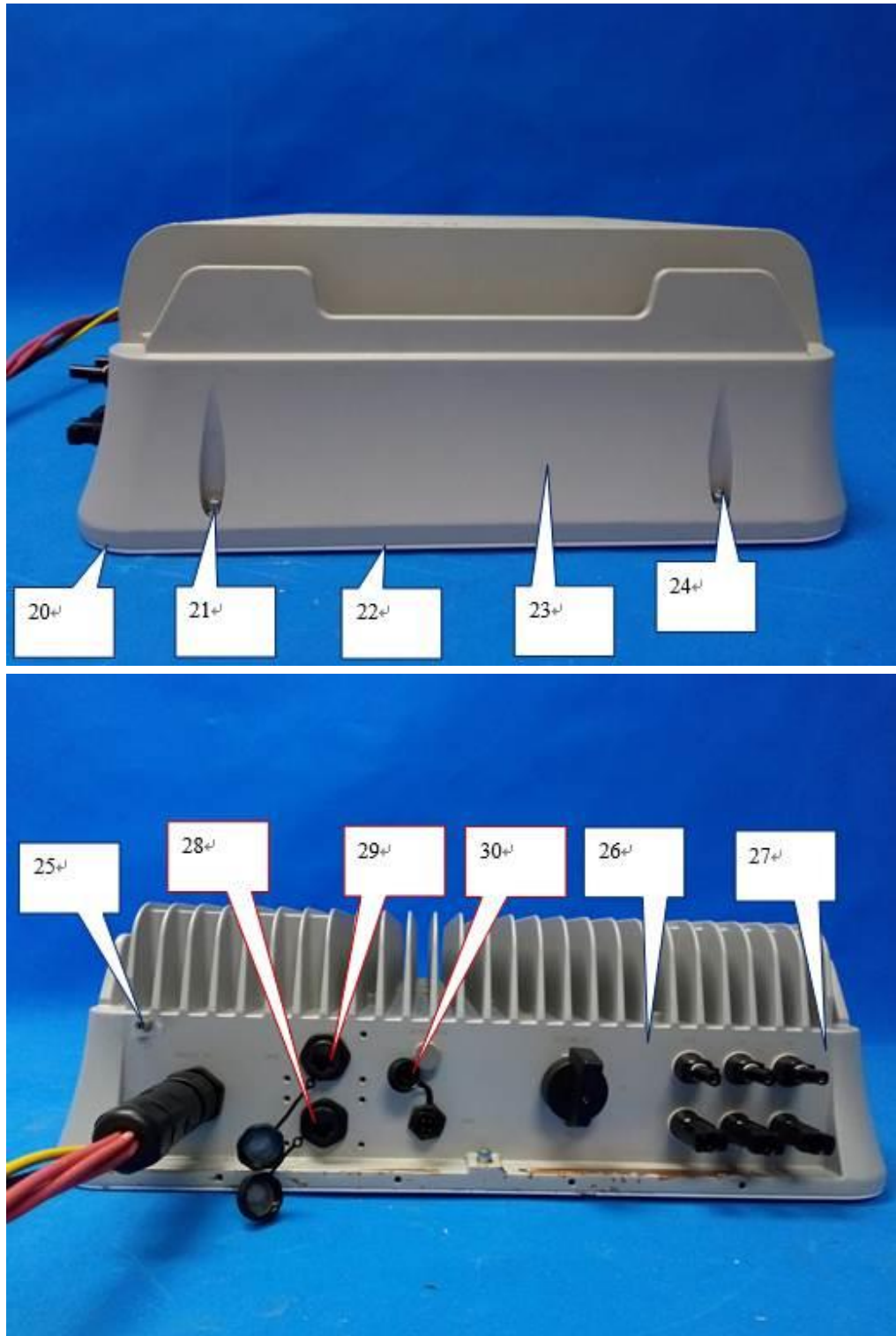
Observations

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

Electrostatic discharge Test Location







Conclusion:

PASS

5.2 Radio frequency electromagnetic field

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

Item	Environmental Phenomena	Units	Test Specification	Performance Criteria
Enclosure port				
Radio-Frequency Electromagnetic Field Amplitude Modulated (See Note 1,2)		MHz V/m (Un-modulated, rms) % AM (1kHz)	80 – 1000 10 80	A
Radio-Frequency Electromagnetic Field Amplitude Modulated (See Note 2,3)		MHz V/m (Un-modulated, rms) % AM (1kHz)	1400 – 2000 3 80	A
Radio-Frequency Electromagnetic Field Amplitude Modulated (See Note 2,3)		MHz V/m (Un-modulated, rms) % AM (1kHz)	2000 - 2700 1 80	A
Note :				
1. Except for the ITU broadcast frequency bands 87 MHz to 108 MHz, 174 MHz to 230 MHz, and 470 MHz to 790 MHz, where the level shall be 3 V/m.				
2. IEC 61000-4-20 may be used for small EUTs as defined in IEC 61000-4-20 subclause 6.1.				
3. The frequency range has been selected to cover the frequencies with the highest potential risk of a disturbance.				

All the scanning conditions are as follows:

	Condition of Test	Remarks
1.	Field Strength	10V/m, 3V/m,1V/m
2.	Radiated Signal	AM 80% Modulated with 1kHz
3.	Scanning Frequency	80 - 1000MHz, 1400 - 2000MHz, 2000 - 2700MHz
4.	Dwell Time	3 Seconds
5.	Frequency Step Size Δf	1%

Performed tests

Frequency range	80 - 1000MHz, 1400 - 2000MHz, 2000 - 2700MHz
Tested Field strength	10V/m, 3V/m,1V/m
Dwell time	3 seconds
Test set-up	Full Anechoic Chamber
Mode	Normal Operation

Observations

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

Conclusion:**PASS**

5.3 Fast transients common mode

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

Environmental phenomenon	Test specification	Units	Performance criterion
Input a.c. power ports			
Fast transients	±2 5/50 5	kV (open circuit test voltage) Tr/Th (ns) Repetition frequency (kHz)	B
Input d.c. power ports			
Fast transients	±2 5/50 5	kV (open circuit test voltage) Tr/Th (ns) Repetition frequency (kHz)	B
Signal ports and telecommunication ports (See Note 1)			
Fast transients	±1 5/50 5	kV (open circuit test voltage) Tr/Th (ns) Repetition frequency (kHz)	B
NOTE 1: Applicable only to ports interfacing with cables whose total length according to the manufacturer's functional specification may exceed 3 m.			

Performed tests

Tested Voltage	2 kV; AC output power port			
Mode	Normal Operation			
Injection method	✓	CDN		Capacitive clamp
Polarity	✓	Positive	✓	Negative
Set-up	✓	Table-top		Floor standing

Observations

During the test, the alarm will be raised and the disturbance will be restored to normal after it is stopped.

Conclusion:**PASS**

5.4 Surge

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

Environmental phenomenon	Test specification	Units	Performance criterion
Input a.c. power ports			
Surges	1.2/50 (8/20) ±1 line to line ±2 line to earth (ground)	Tr/Th (us) kV (open circuit test voltage) kV (open circuit test voltage)	B
Input d.c. power ports (See Note 1)			
Surges	1.2/50 (8/20) ±0.5 line to line ±0.5 line to earth (ground)	Tr/Th (us) kV (open circuit test voltage)	B
Signal ports and telecommunication ports (See Note 2, 3)			
Surges Line to Ground	1.2/50 (8/20) ±1	Tr/Th (us) kV (open circuit test voltage)	B
NOTE:			
<p>1. Not applicable to input ports intended for connection to a battery or a rechargeable battery which must be removed or disconnected from the apparatus for recharging. Apparatus with a DC power input port intended for use with an AC–DC power adaptor shall be tested on the AC power input of the AC- DC power adaptor specified by the manufacturer or, where none is so specified, using a typical AC–DC power adaptor. The test is applicable to DC power input ports intended to be connected permanently to cables longer than 3 m.</p> <p>2. Applicable only to ports interfacing with cables whose total length according to the manufacturer’s functional specification may exceed 30 m.</p> <p>3. Where normal functioning cannot be achieved because of the impact of the CDN on the EUT, this test is not required.</p>			

Performed tests

Tested Voltage; Port	1 kV; AC output power port (Line to Line) 2 kV; AC output power port (Line to Ground)		
Mode	Normal Operation		
Polarity	✓	Positive	✓ Negative

Observations

During the test, the alarm will be raised and the disturbance will be restored to normal after it is stopped.

Conclusion:**PASS**

5.5 Radio frequency common mode

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

Environmental phenomenon	Test specification	Units	Performance criterion
Input a.c. power ports (See Note 1,2)			
Radio-frequency	0.15 - 80	MHz	A
continuous	10	V (unmodulated, r.m.s)	
conducted	80	% AM (1kHz)	
Input d.c. power ports (See Note 1,2)			
Radio-frequency	0.15 - 80	MHz	A
continuous	10	V (unmodulated, r.m.s)	
conducted	80	% AM (1kHz)	
Signal ports and telecommunication ports (See Note 1,2,3)			
Radio-frequency	0.15 - 80	MHz	A
continuous	10	V (unmodulated, r.m.s)	
conducted	80	% AM (1kHz)	
NOTE:			
1. The test level can also be defined as the equivalent current into a 150 Ω load.			
2. Except for the ITU broadcast frequency band 47 MHz to 68 MHz, where the level shall be 3 V.			
3. Applicable only to ports interfacing with cables whose total length according to the manufacturer's functional specification may exceed 3 m.			

All the scanning conditions are as follows:

	Condition of Test	Remarks
1.	Field Strength	10V
2.	Radiated Signal	AM 80% Modulated with 1kHz
3.	Scanning Frequency	0.15 - 80MHz
4.	Dwell Time	3 Seconds
5.	Frequency Step Size Δf	1%

Performed tests

Tested level; Port	10 V; AC output power port		
Mode	Normal Operation		
Frequency range	0,15 – 80 MHz		
Dwell time	3 seconds		
Injection method	✓	CDN	EM clamp

Observations

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

Conclusion:**PASS**

5.6 Power-frequency magnetic field

Environmental phenomenon	Test specification	Units	Performance criterion
Enclosure port(See Note 1,2)			
Power-frequency magnetic field	50,60 30	Hz A/m (r.m.s)	A
<p>NOTE:</p> <p>1. Applicable only to apparatus containing devices susceptible to magnetic fields.</p> <p>2. For CRTs, the acceptable jitter depends upon the character size and is calculated for a test level of 1 A/m as follows:</p> $J \leq \frac{(3C + 1)}{40}$ <p>where jitter J and character size C are in millimetres.</p> <p>As jitter is linearly proportional to the magnetic field strength, tests can be carried out at other test levels extrapolating the maximum jitter level appropriately.</p>			

Performed tests

Tested level	30 A/m					
Mode	Normal Operation					
Frequency	50 Hz					
Dwell time	60 seconds					
Test Coil Position	✓	X Axis	✓	Y Axis	✓	Z Axis

Observations

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

Conclusion:

PASS

6 IDENTIFICATION OF THE EQUIPMENT UNDER TEST

The photograph shows the tested device.



Figure 4 Conducted Emission test setup

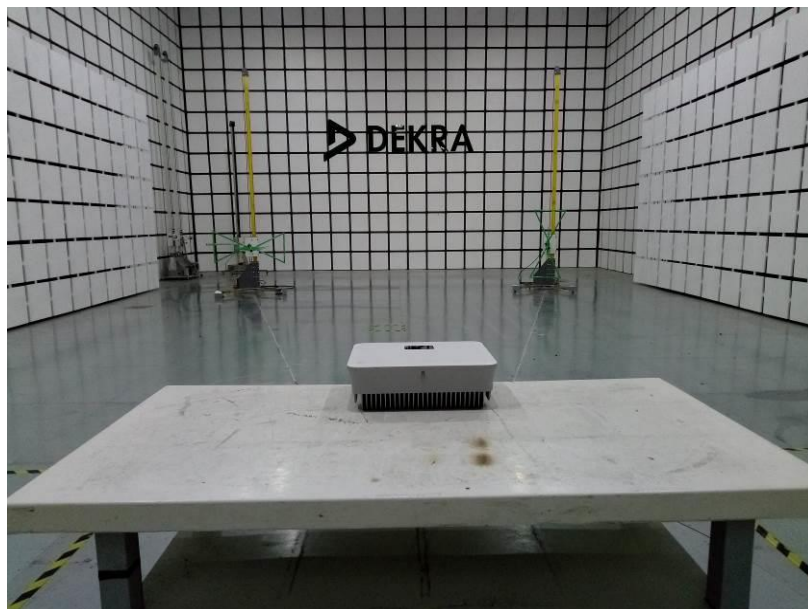


Figure 5 Radiated Emission test setup (Below 1GHz)



Figure 6 Harmonic current emission test setup



Figure 7 Voltage fluctuations and flicker test setup



Figure 8 Electrostatic discharge test setup

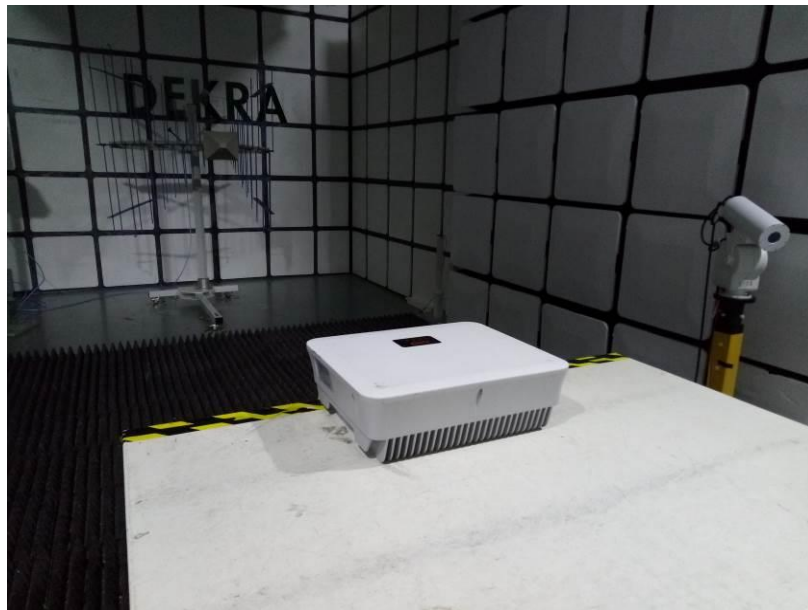


Figure 9 Radio frequency electromagnetic field test setup (Below 1GHz)

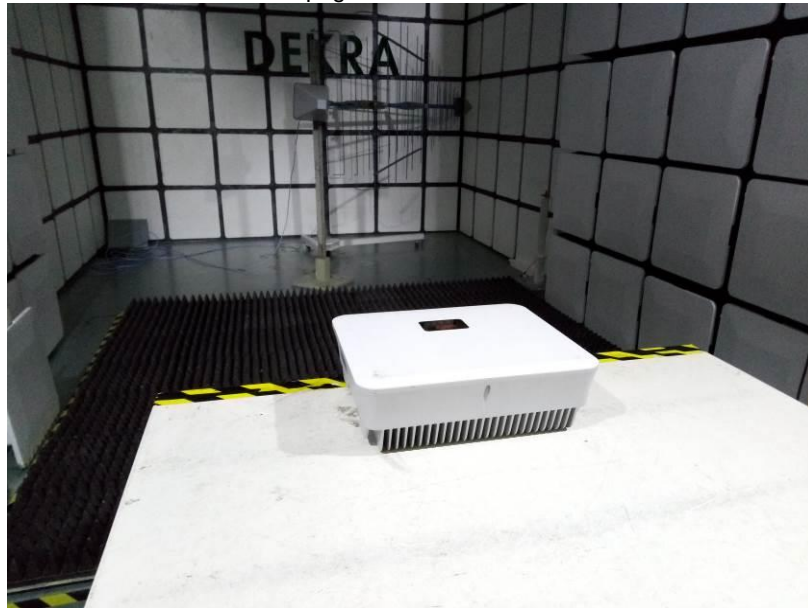


Figure 10 Radio frequency electromagnetic field test setup (Above 1GHz)



Figure 11 Electrical fast transients test setup



Figure 12 Surges test setup



Figure 13 Radio-frequency continuous conducted test setup



Figure 14 Power frequency magnetic field test setup

-----END-----