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Project: 12CA64105

File: 17199

Report: 12CA64105

Date: December 20, 2012

Electromagnetic Compatibility Test Report For LED BULB

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UL India Pvt. Ltd

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“Underwriters Laboratories (UL) is an independent product safety certification organization that has been testing products and writing Standards for Safety for over a century.”

TEST REPORT DETAILS

Test Report No. 12CA64105

Tests Performed By: **UL India Pvt. Ltd**
Kundalahalli, K. R. Puram, Hobli, south Taluk
Whitefield Bangalore – 5600066 INDIA
Tel: +91-80-41384400, Fax: + 91-80-41384400

Test site: UL India Pvt. Ltd. &
TARANG-Product Qualification & Compliance Planet,
Wipro Technologies, Survey No. 70, 77, 78/8A, DoddaKannelli,
Sarjapur Road, Bangalore,
Karnataka. Pin – 560035, INDIA

Applicant: Info Power Technologies Limited

Applicant Address: A-4, Phase –II, Noida - 201305

Country: India

Test Report Date: December 20, 2012

Product Type: LED BULB

Product standards: EN 55015: 2009
EN 61547: 2009
IEC 61000-3-3 : 2008

Model Number: 7W-CW/WW

Tested Catalogue Numbers: Cool White E27 Assembled

Supplementary Catalogue Numbers: Warm White B22 Assembled
Remark: Supplementary Catalogue numbers are only different in exterior with tested model and with the same circuit construction

Sample Serial Number: Prototype

Sample Receive Date: November 08, 2012

Testing Start Date: November 08, 2012

Testing Complete Date: November 27, 2012

Overall Results: COMPLIED

UL India Pvt. Ltd. reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL India Pvt. Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL India Pvt. Ltd. issued reports.

TEST SUMMARY

Test Result

Sr. No.	Test requirements	Acceptance Criteria	Verdict
Emission			
1	Conducted Emission (9 kHz to 30MHz)	Met Limit	Complied
2	Radiated Emission (9 kHz to 30MHz)	Met Limit	Complied
3	Radiated Emission (30 MHz to 300 MHz)	Met Limit	Complied
4	Voltage Fluctuation and Flicker	Met Limit	Complied
Immunity (Refer section 4.1)			
5	Electrostatic Discharge (ESD)	Performance criteria B	Complied
6	RF Electromagnetic Field Immunity	Performance criteria A	Complied
7	Fast Transients Immunity	Performance criteria B	Complied
8	Surges Immunity	Performance criteria C	Complied
9	RF Conducted Continuous Immunity	Performance criteria A	Complied
10	Power Frequency Magnetic Field Immunity	Performance criteria A	Complied
11	Voltage Dips & Short Interruption	Performance criteria C & B	Complied

The tests listed in the Summary of Testing section of this report have been performed and the results recorded by UL India Pvt. Ltd. in accordance with the procedures stated in each test requirement and specification. The applicant determined the list of tests performed were applicable to the Equipment under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

The equipment under test has

- ☒ Met the technical requirements
☐ Not met the technical requirements

Tested by
Balaguru. A
Conformity Assessment Services - 3014BNG
UL India Pvt. Ltd.

Reviewed by
Narendra Rajurkar.
Conformity Assessment Services - 3014BNG
UL India Pvt. Ltd.

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1. EQUIPMENT UNDER TEST (EUT)

1.1 Equipment Description

The EUT (LED BULB) was powered by 230V, 50 Hz AC. It is a Self-ballasted LED lamp used for general lighting services. It consists of 7W LED Bulb with color temperature warm white and cool white having B22 / or E27 Holder type.

1.2 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
EUT	LED BULB	Info power Technologies Limited	7W-CW/WW	NA

* Note: **EUT** - Equipment Under Test, **AE** - Auxiliary/Associated Equipment,
SIM - Simulator (Not Subjected to Test)

1.3 Input/output Ports

Port #	Name	Type*	Cable Max. >3m	Cable Shielded	Comments
0	Enclosure	N/E	--	--	--
1	AC Power port	AC	No	No	E27 Holder

Note:

*AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
I/O = Signal Input or Output Port (Not Involved in Process Control)
TP = Telecommunication Ports

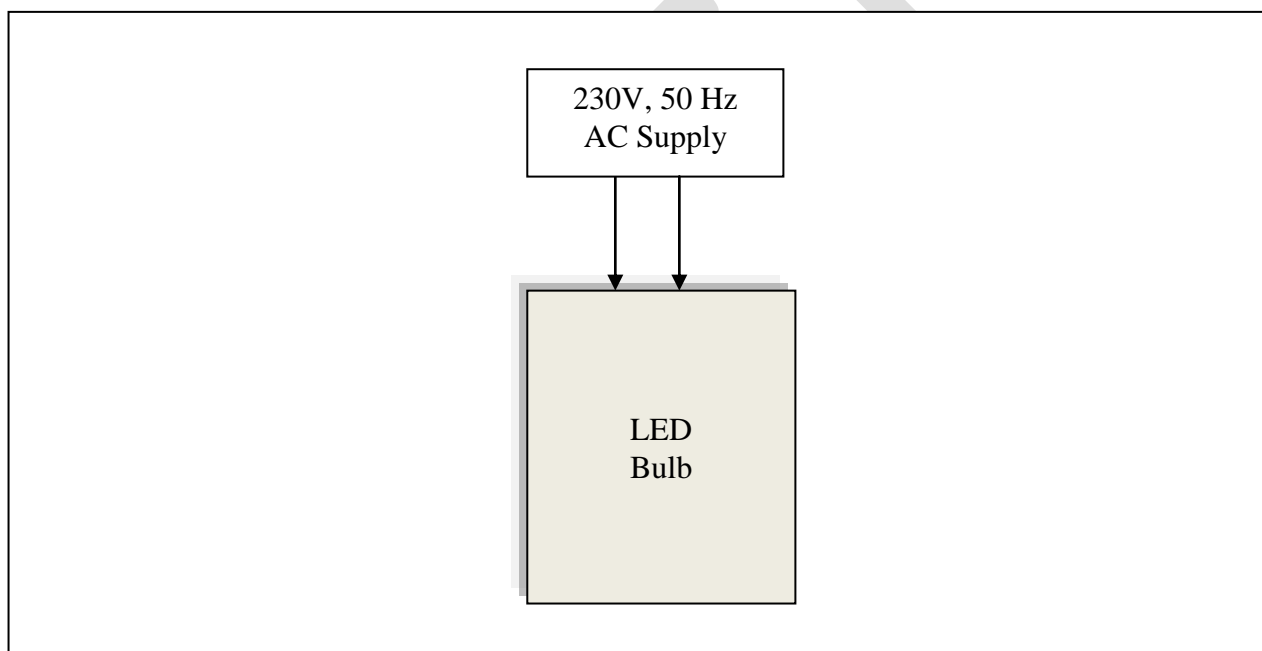
1.4 Power Interface Mode:

Mode #	Voltage (V)	Current (A)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	220-240V	30 mA per phase	AC-50 Hz	Single phase	None
Mode # (Tested)	Voltage (V)	Current (A)	Frequency (DC/AC-Hz)	Phases (#)	Comments
1	230 (Nominal)	30 mA per phase	AC-50 Hz	Single phase	None

1.5 EUT Operation Modes:

Mode #	Description
1	Light ON

2. EUT Configurations: Block Diagram



3. Performance Criteria

3.1 General Performance Criteria Description as per EN 61547

a) Performance criterion A

During the test, no change of the Luminous intensity shall be observed and the regulating control, if any, shall operate during the test as intended.

b) Performance criterion B

During the test, the Luminous intensity may change to any value. After the test, the Luminous intensity shall be restored to its initial value within 1 min. Regulating controls need not function during the test, but after the test, the mode of the control shall be the same as before the test provided that during the test no mode changing commands were given.

c) Performance criterion C

During and after the test, any change of the luminous intensity is allowed and the lamp(s) may be extinguished. After the test, within 30 min, all functions shall return to normal, if necessary by temporary interruption of the mains supply and/or operating the regulating control.

Additional requirement for lighting equipment incorporating a starting device: After the test, the lighting equipment is switched off. After half an hour, it is switched on again. The lighting equipment shall start and operate as intended.

4. Functions Monitored During Immunity

- (i) LED Bulb status
- (ii) Change of luminous intensity measured by lux meter

5. CONDUCTED EMISSION (Mains terminal Disturbance Voltage)

TEST	Limits of mains terminal disturbance voltage			
Method	Measurements were made on a ground plane. All power was connected to the system through Line Impedance Stabilization Network (LISN). The LISN placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane. Conducted voltage measurements on mains port were made at the output of the Line Impedance Stabilization Network (LISN).			
TEST ENVIRONMENT				
Parameters recorded during the test	Laboratory Ambient Temperature		23.2 °C	
	Relative Humidity		58.6 %	
	Frequency range on each side of line		Measurement Point	
Fully configured sample scanned over the following frequency range	9kHz to 30MHz		Input AC Power port	
Basic Standard		EN 55015 : 2009		
Frequency	Limit dB(μV)			
	Quasi-Peak	Results	Average	Results
9 kHz to 50 KHz	110	PASS	N/A	N/A
50 kHz to 150 kHz	90 to 80	PASS	N/A	N/A
150 kHz to 0.5 MHz	66 to 56	PASS	56 to 46	PASS
0.5 MHz to 5.0 MHz	56	PASS	46	PASS
5 MHz to 30MHz	60	PASS	50	PASS
Supplementary Information: Test was conducted in EUT Operation Mode 1				

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	Rhode and Schwarz	ESCI-3	101058	27.08.2012	27.08.2013
LISN	Rhode and Schwarz	ESH2-Z5	100277	07.08.2012	07.08.2013
Transient limiter	Rhode and Schwarz	ESH3-Z2	101153	07.08.2012	07.08.2013

Figure 1: Conducted Emission Test Setup

Table 1: Test data for conducted emission on Line (9 kHz to 150 kHz)

Frequency (MHz)	Emission Level (dBμV) (a)	Transducer (dB) (b)	Total Emission (dBμV) (c)	Limit Line (dBμV) (d)	Margin Level (dB) (e)
Quasi Peak measurement					
0.009	56.35	9.82	66.17	110.00	-43.83
0.056	34.51	9.82	44.33	88.97	-44.64
0.051	35.36	9.82	45.18	89.86	-44.68
0.066	31.77	9.82	41.59	87.47	-45.88
Supplementary information: Total Emission (c) = Emission Level (a) + Transducer (b) Margin Level (e) = Total Emission (c) - Limit Line (d)					

Table 2: Test data for conducted emission on Neutral (9 kHz to 150 kHz)

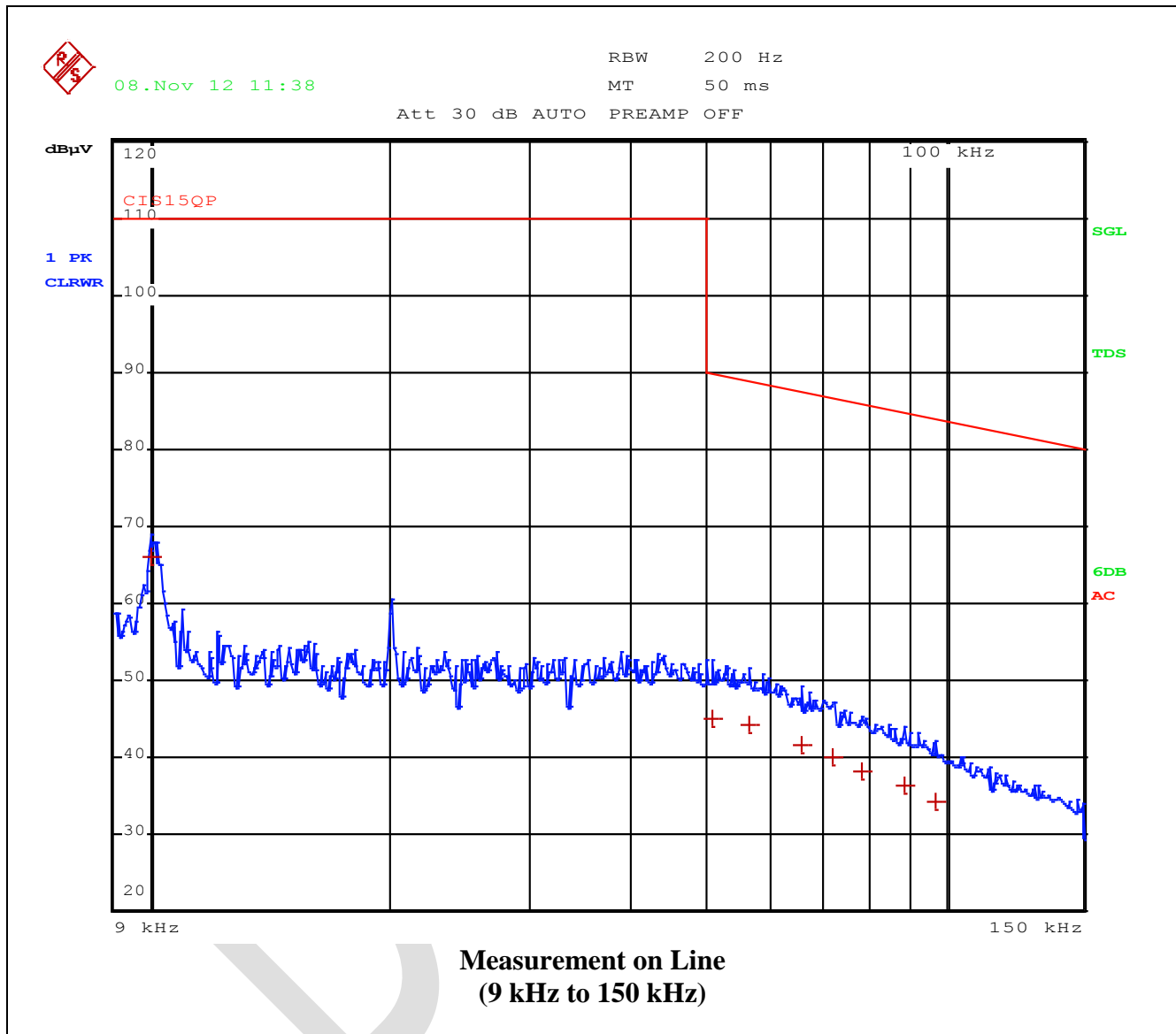
Frequency (MHz)	Emission Level (dBμV) (a)	Transducer (dB) (b)	Total Emission (dBμV) (c)	Limit Line (dBμV) (d)	Margin Level (dB) (e)
Quasi Peak measurement					
0.057	34.68	9.82	44.50	88.89	-44.39
0.052	35.13	9.82	44.95	89.68	-44.73
0.062	33.42	9.82	43.24	88.12	-44.88
0.070	30.63	9.82	40.45	86.99	-46.54
Supplementary information: Total Emission (c) = Emission Level (a) + Transducer (b) Margin Level (e) = Total Emission (c) - Limit Line (d)					

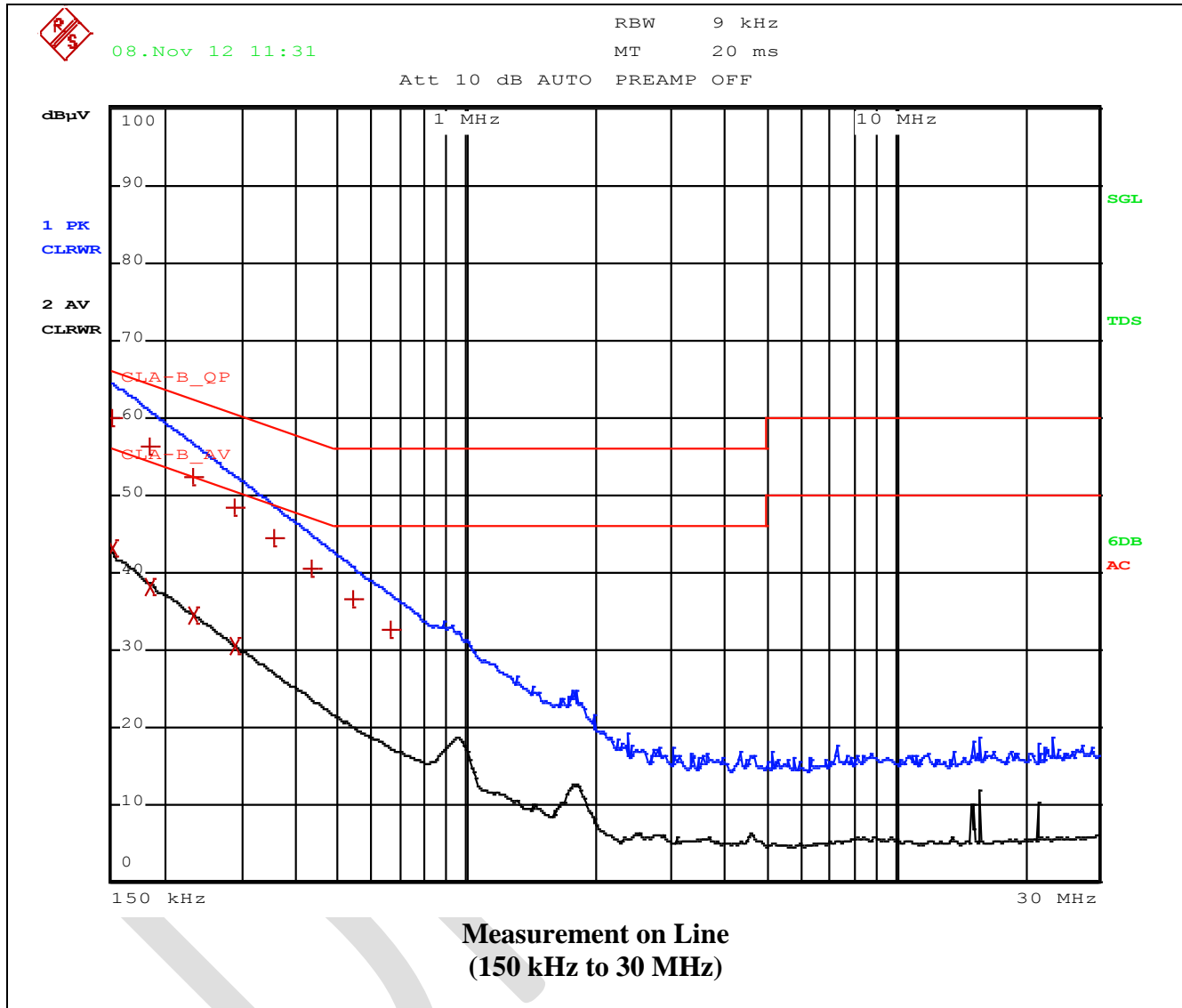
Table 3: Test data for conducted emission on Line (150 kHz to 30 MHz)

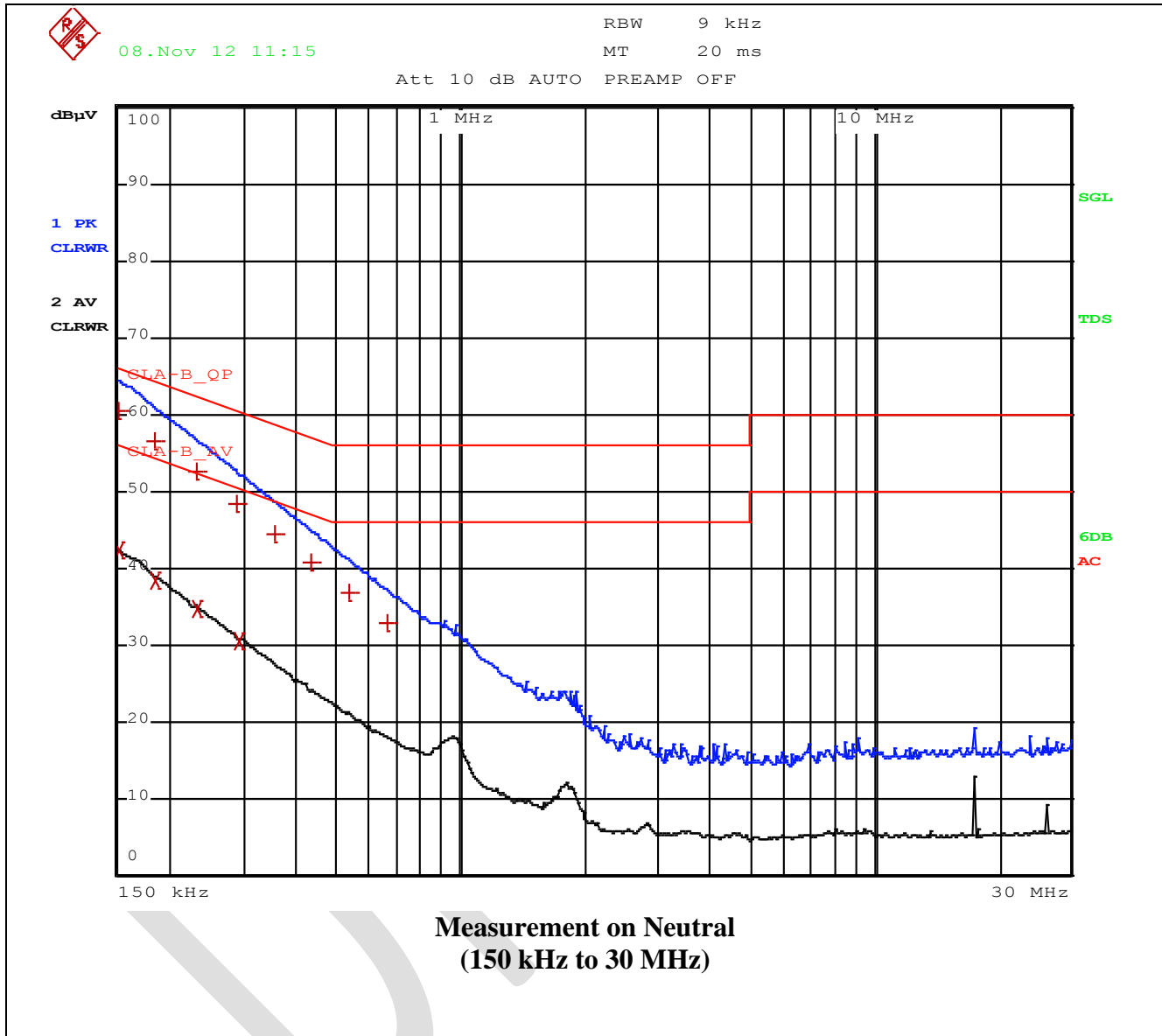
Frequency (MHz)	Emission Level (dBμV) (a)	Transducer (dB) (b)	Total Emission (dBμV) (c)	Limit Line (dBμV) (d)	Margin Level (dB) (e)
Quasi Peak measurement					
0.150	50.23	9.82	60.05	66.00	-5.95
0.186	46.54	9.82	56.36	64.21	-7.85
0.230	46.54	9.82	52.46	62.45	-9.99
0.286	42.64	9.82	48.39	60.64	-12.25
0.354	38.57	9.82	44.48	58.87	-14.39
Average measurement					
0.150	33.45	9.82	43.27	56.00	-12.73
0.186	28.41	9.82	38.23	54.21	-15.98
0.230	24.62	9.82	34.44	52.45	-18.01
0.286	20.75	9.82	30.57	50.64	-20.07
Supplementary information: Total Emission (c) = Emission Level (a) + Transducer (b) Margin Level (e) = Total Emission (c) - Limit Line (d)					

Table 4: Test data for conducted emission on Neutral (150 kHz to 30 MHz)

Frequency (MHz)	Emission Level (dBμV) (a)	Transducer (dB) (b)	Total Emission (dBμV) (c)	Limit Line (dBμV) (d)	Margin Level (dB) (e)
Quasi Peak measurement					
0.150	50.63	9.82	60.45	66.00	-5.55
0.186	46.63	9.82	56.45	64.21	-7.76
0.230	42.74	9.82	52.56	62.45	-9.89
0.286	38.68	9.82	48.50	60.64	-12.14
0.354	34.77	9.82	44.59	58.87	-14.28
Average measurement					
0.150	32.55	9.82	42.37	56.00	-13.63
0.186	28.58	9.82	38.40	54.21	-15.81
0.230	24.84	9.82	34.66	52.45	-17.79
0.290	20.81	9.82	30.63	50.52	-19.89
Supplementary information: Total Emission (c) = Emission Level (a) + Transducer (b) Margin Level (e) = Total Emission (c) - Limit Line (d)					

Figure 2 : Graphical representation of conducted emissions





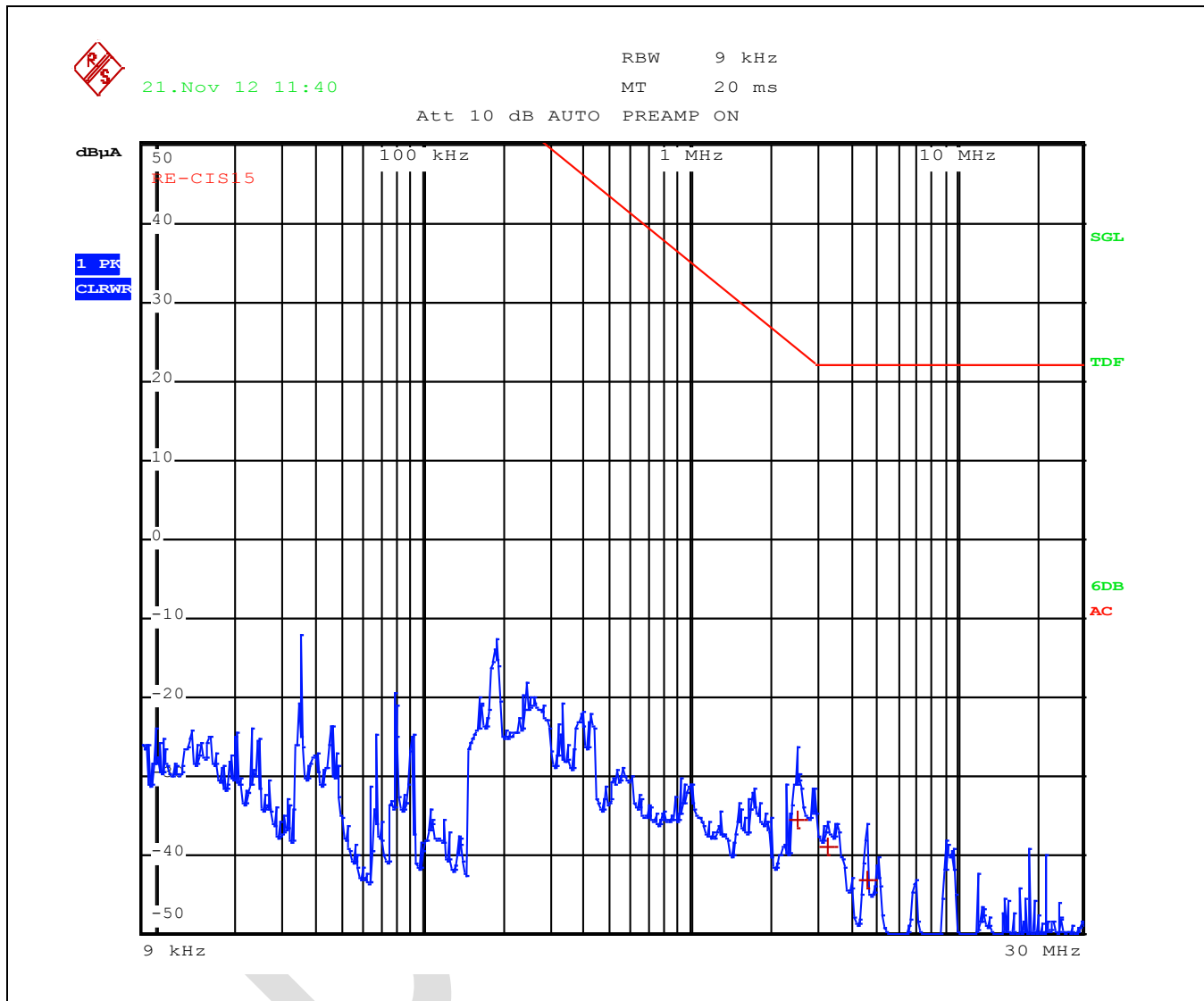
6. RADIATED ELECTROMAGNETIC DISTURBANCE (9 kHz-30 MHz)

TEST	Limits for electromagnetic radiated disturbance (9 kHz -30 MHz)				
Method	<p>Measurements were made by means of loop antenna of 2 m in 5.5.7 of CISPR 16-1. The EUT was placed in the center of the antenna.</p> <p>The induced current in the loop antenna was measured from 9 kHz to 30 MHz by means of a current probe (1 V/A) and CISPR measuring receiver. By means of a coaxial switch, the three field directions were measured in sequence.</p>				
TEST ENVIRONMENT					
Parameters recorded during the test	Laboratory Ambient Temperature			23.2°C	
	Relative Humidity			58.6 %	
	Frequency range			Measurement Point	
Fully configured sample scanned over the following frequency range	9kHz – 30MHz			Product Enclosure	
Basic Standard	EN 55015: 2009				
Limits					
Frequency (MHz)	Limits for loop diameter 2m				
	dB(μA)		Results		
9 kHz to 70 kHz	88		PASS		
70 kHz to 150 kHz	88 to 58		PASS		
150 kHz to 3.0 MHz	58 to 22		PASS		
3.0 MHz to 30 MHz	22		PASS		
Supplementary Information: Test was conducted in EUT Operation Mode 1					
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	Rohde & Schwarz	ESCI-3	101058	27.08.2012	27.08.2013
Triple-loop antenna (2m)	Laplace Instruments Ltd.	RF 300	9107	05-10- 2011	05-10- 2013

Figure 3: Radiated electromagnetic disturbance (9 kHz to 30 MHz) Test setup

Table 5: Test data for Radiated emission (9 kHz to 30 MHz)

Test Frequency (MHz)	QP Level (dBμA) (a)	Limit (dBμA) (b)	Margin (dB) (c)
2.534	-35.24	24.03	-59.27
0.190	-4.55	55.16	-59.71
3.286	-38.87	22.00	-60.87
1.750	-36.25	28.48	-64.73
4.606	-42.99	22.00	-64.99
Supplementary information: Margin (c) = QP Level (a) – Limit (b)			

Figure 4: Graphical representation of radiated electromagnetic disturbance

7. RADIATED EMISSION (Radiated Disturbance)

TEST	Limits for radiated disturbance	
Method	Measurements were made in Anechoic Shielded Chamber that complies to CISPR 22. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10-meter. The EUT was rotated 360° about its azimuth with the receive antenna located at 1, 2, 3 and 4 meter heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.	
TEST ENVIRONMENT		
Parameters recorded during the test	Laboratory Ambient Temperature	23°C
	Relative Humidity	55 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 300MHz	Product Enclosure
Basic Standard	EN 55015: 2009	
Limits		
Frequency (MHz)	Limit dB(μV/m)	
	Quasi-Peak	Results
30 to 230	30	PASS
230 to 300	37	PASS
Supplementary Information: Test was conducted in EUT Operation Mode 1		

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	R&S	ESU08	100324	30-01-2012	30-01-2013
Hybrid log periodic Antenna	TDK RF solution Inc.	HLP-3003C	130334	21-03-2012	21-03-2013
TDK Shielded chamber	TDK RF Solution Inc.	-	-	-	-

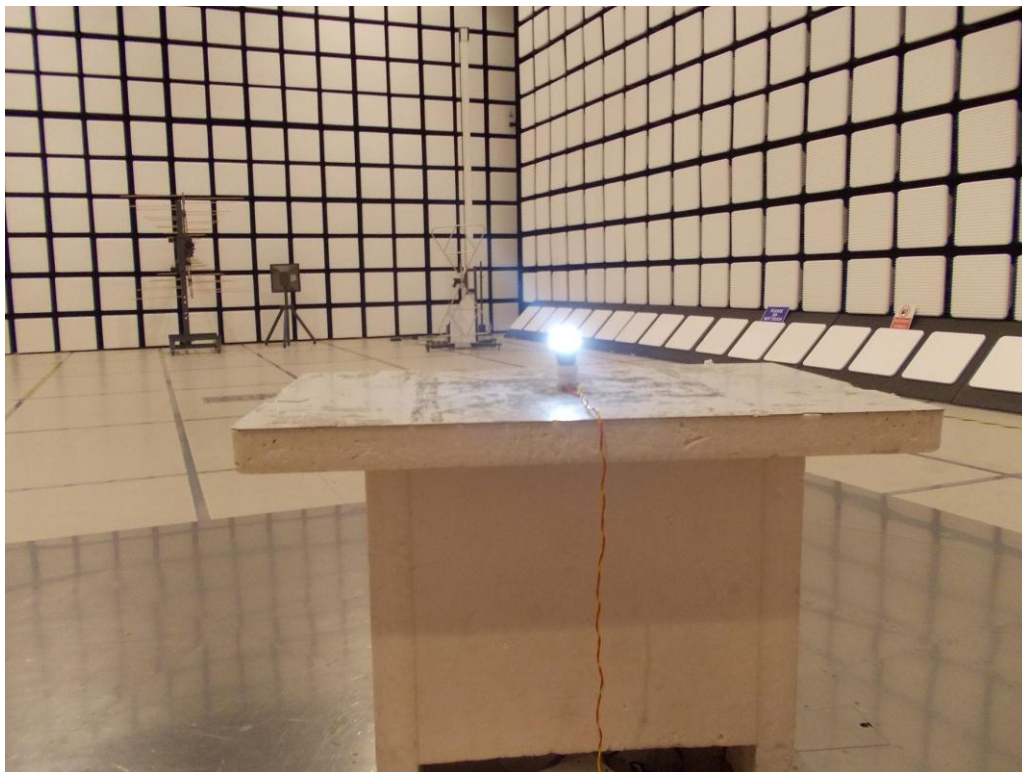
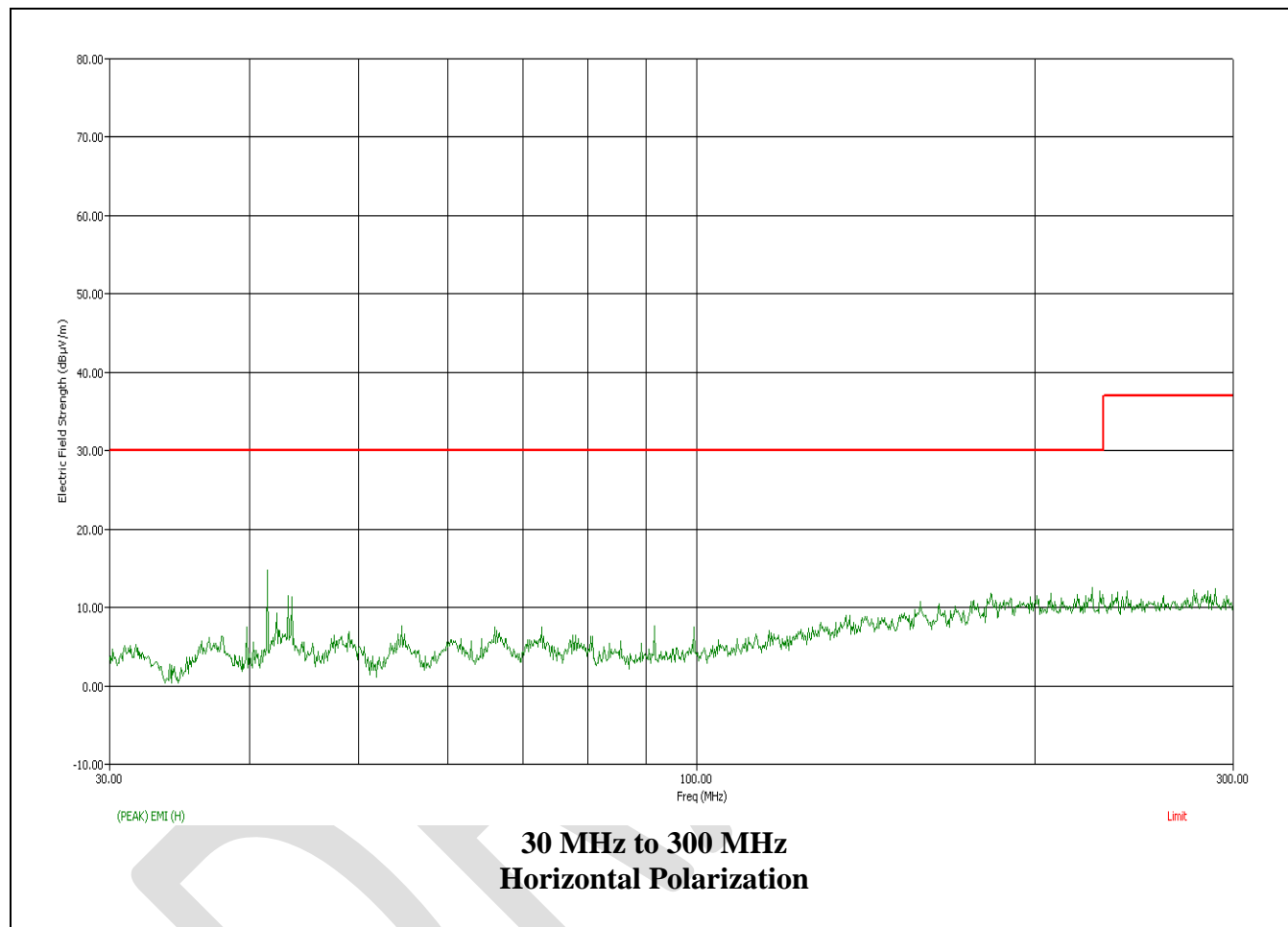
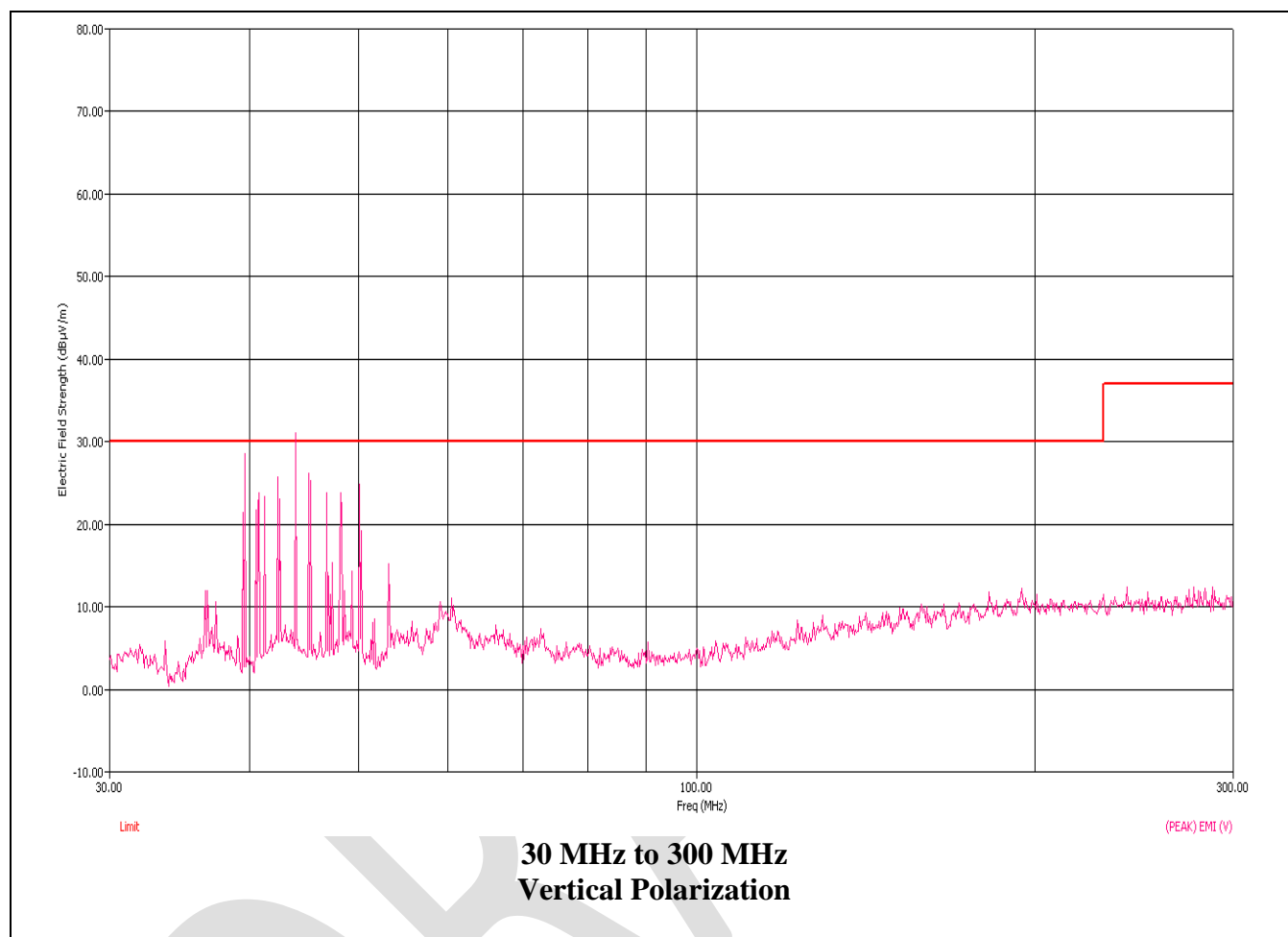
Figure 5: Radiated Disturbance (30 MHz to 300 MHz) Test setup

Table 6: Test data for Radiated emission (30 MHz to 300 MHz)

Test Frequency (MHz)	Polarity (V/H)	Azimuth (Deg.)	Antenna Height (m)	Meter Reading (dBμV) (a)	Cable Loss (dB) (b)	Antenna Factor (dB/m) (c)	Preamp (dB) (d)	QP Level dBμV/m (e)	Limit dBμV/m (f)	Margin (dB) (g)
40.13	V	326.50	2.58	24.45	1.32	9.99	32.34	3.42	30.00	-26.58
43.93	V	0.40	2.40	23.77	1.33	10.64	32.36	3.38	30.00	-26.62
42.48	V	353.30	3.89	23.28	1.31	10.40	32.35	2.64	30.00	-27.36
50.18	V	296.00	3.26	23.67	1.42	9.51	32.31	2.29	30.00	-27.71
48.29	V	162.00	2.40	23.16	1.42	9.94	32.33	2.19	30.00	-27.81
41.51	H	2.40	2.11	21.92	1.31	10.23	32.35	1.11	30.00	-28.89
39.47	V	314.10	3.90	22.00	1.30	9.87	32.34	0.83	30.00	-29.17
46.83	V	60.40	2.62	21.45	1.40	10.32	32.34	0.83	30.00	-29.17
45.27	V	164.60	2.85	20.67	1.36	10.74	32.36	0.41	30.00	-29.59
Supplementary information: Margin (g) = QP Level (e) – Limit (f) QP Level (e) = [Meter reading (a) + cable loss (b) + Antenna Factor (c) – Preamp (d)]										

Figure 6: Graphical representation of Radiated emissions



8. VOLTAGE FLUCTUATIONS AND FLICKER

TEST	Limits of voltage changes, voltage fluctuations and flicker		
Method	This test consists on the measurement of voltage changes, voltage fluctuations and flicker which may be produced by equipment having an input current ≤ 16 A per phase, and intended to be connected to public low-voltage distribution systems. The equipment is tested under specified conditions of operation.		
TEST ENVIRONMENT			
Parameters recorded during the test	Laboratory Ambient Temperature		24.5 °C
	Relative Humidity		54.0 %
	Atmospheric pressure		1033 mbar [abs]
Basic Standard	IEC 61000-3-3: 2008		
Test Equipment Used			
Test supply voltage specifications			
Voltage		± 2 % of the nominal value	
Frequency		50 Hz ± 0.5 %	
Percentage total harmonic distortion		Less than 3 %	
Reference impedance (according to IEC 60725)			
On phase	0.24 + j 0.15 Ω at 50 Hz		
On neutral	0.16 + j 0.10 Ω at 50 Hz		
Observation period (Tp)	For Pst Tp = 10 minutes For Plt Tp = 120 minutes		

Limits	<p>The value of Pst shall be not greater than 1.0 The value of Plt shall be not greater than 0.65 The value of d(t) during a voltage change shall not exceed 3.3 % for more than 500 ms</p> <p>The relative steady-state voltage change, dc shall not exceed 3.3 % The maximum relative voltage change dmax shall not exceed:</p> <p>a) 4 % without additional conditions b) 6 % for equipment which is: - switched manually, or - switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption c) 7 % for equipment which is - attended whilst in use (for example : hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as mowers, portable tools such as electric drills), or - switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.</p>
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Parameter	Results	Parameter	Results
Pst	PASS	dc	PASS
Plt	PASS	dmax	PASS
d(t)	PASS		

Supplementary Information: Test was conducted in EUT Operation Mode 1

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Harmonics & Flicker Analyzer	EMC Partner	HAR1000-1P	194	15.08.2012	15.08.2013

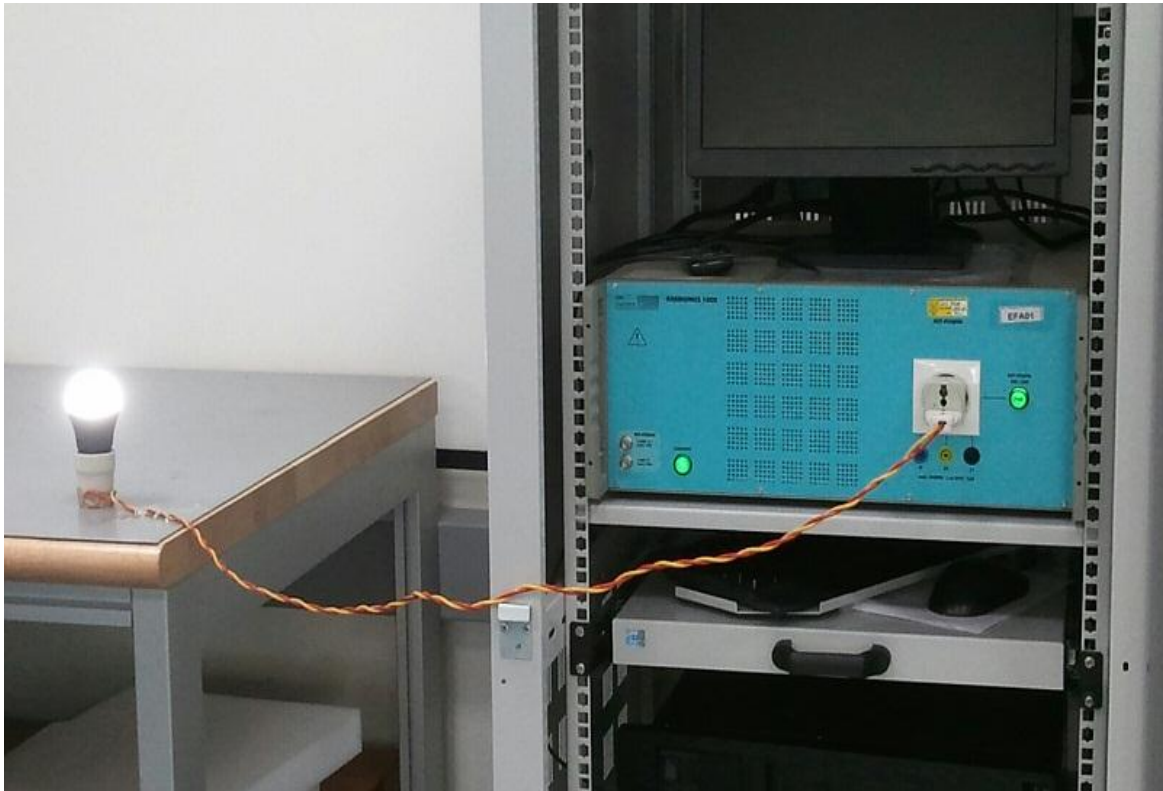
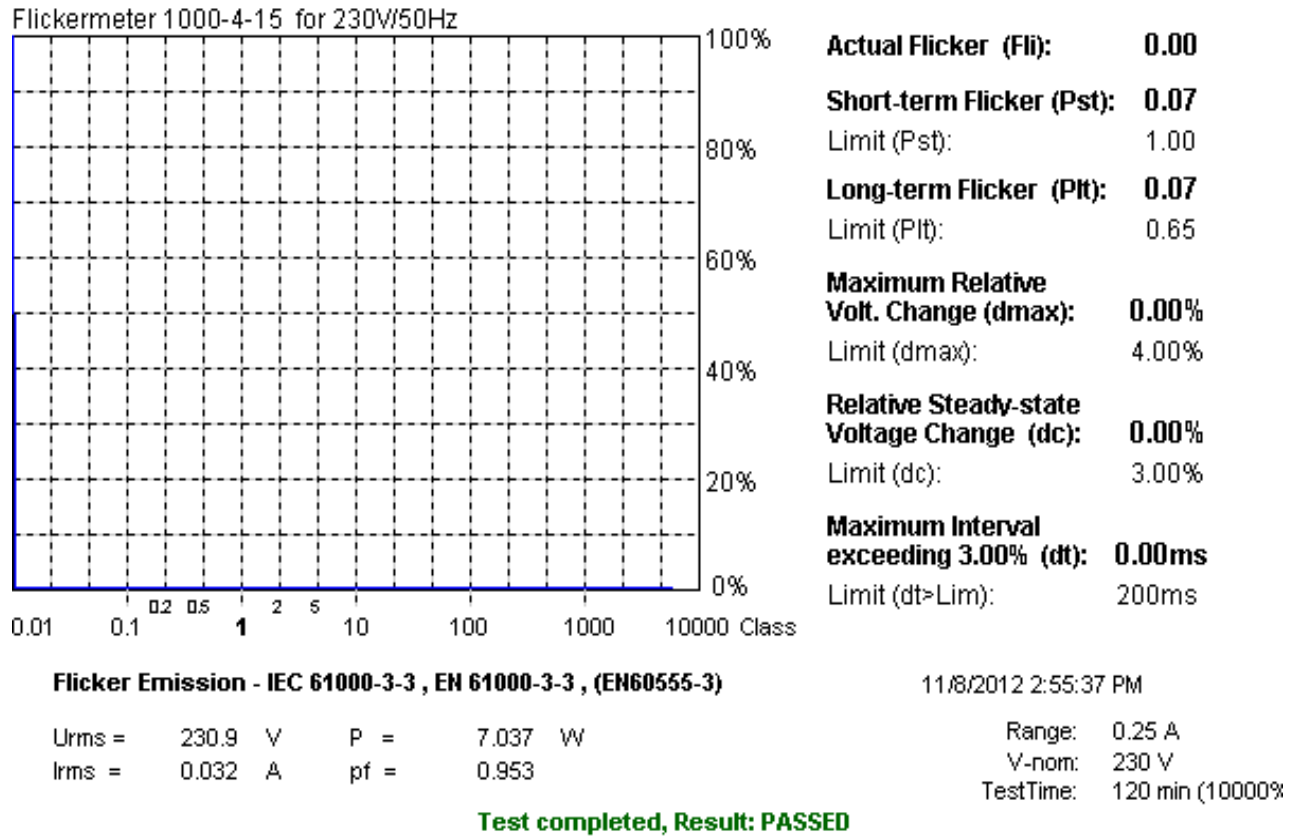
Figure 7: Test setup for Voltage fluctuation and Flicker

Figure 8: Graphical representation of Flicker emission



HAR-1000 EMC-Parber

Table 7: Voltage fluctuations and flicker data

Urms = 230.9V Freq = 49.780 Range: 0.25 A
Irms = 0.032A Ipk = 0.046A cf = 1.443
P = 7.037W S = 7.385VA pf = 0.953

Test - Time : 12 x 10min = 120min (100 %)

LIN (Line Impedance Network) : L: 0.24ohm +j0.15ohm N: 0.16ohm +j0.10ohm

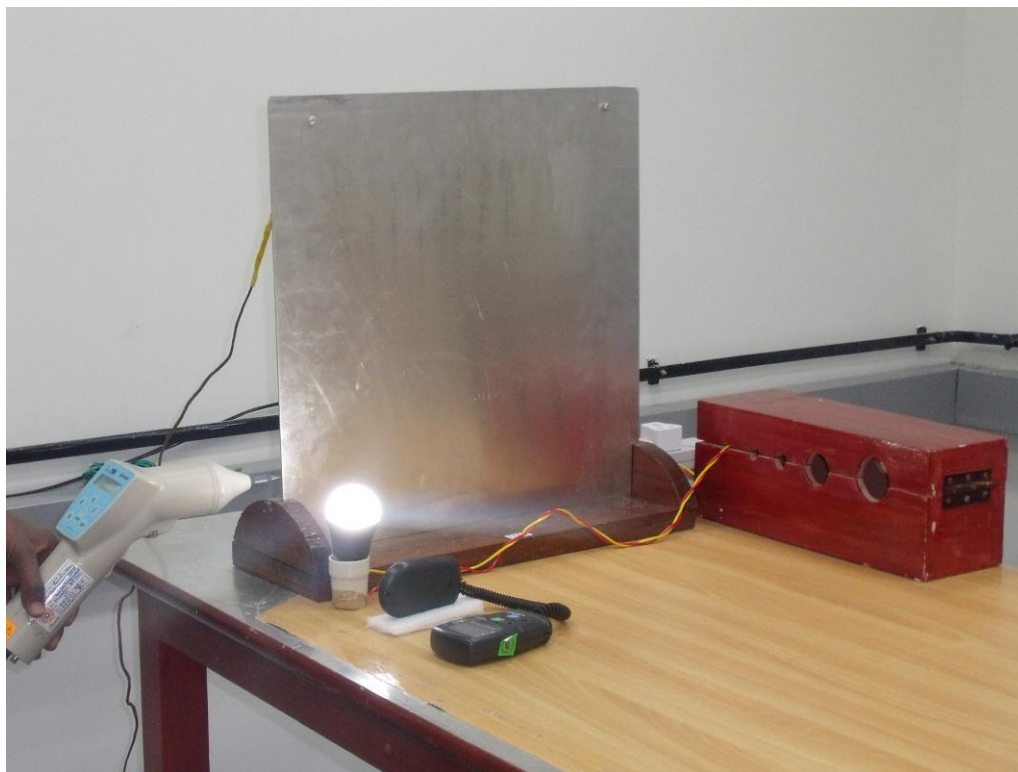
Limits : Plt : 0.65 Pst : 1.00
 dmax : 4.00 % dc : 3.00 %
 dtLim: 3.00 % dt>Lim: 200ms

	dmax [%]
1	0.000
2	0.000
3	0.000
4	0.000
5	0.000
6	0.000
7	0.000
8	0.000
9	0.000
10	0.000
11	0.000
12	0.000

9. ELECTROSTATIC DISCHARGE (ESD)

TEST	Electrostatic Discharge			
Method	Measurements were made on a ground plane. Air discharges were applied to non-metallic parts of the system. Contact discharges were applied to all accessible metallic parts. Discharges were also applied to the Horizontal and Vertical Coupling Planes, where applicable. Each discharge was applied at a rate of one (1) discharge per second.			
Parameters required prior to the test	Laboratory Ambient Temperature		15 to 35 °C	
	Relative Humidity		30 to 60 %	
	Air pressure		860 to 1060 mbar	
Parameters recorded during the test	Laboratory Ambient Temperature		28.5 °C	
	Relative Humidity		32.8 %	
	Air pressure		1033 mbar	
Basic Standard	IEC 61000-4-2: 2008			
Measurement Port	Product Enclosure			
Required Performance Criteria	B			
Test Levels				
Discharge type	Discharge Level (kV)		Number of discharges per location (each polarity)	Results
	Positive	Negative		
Air – Direct	2, 4, 8	2, 4, 8	10	PASS
Contact – Direct	2, 4	2, 4	10	-NA-
Contact – Indirect	2, 4	2, 4	10	PASS
Supplementary Information: Test was conducted in EUT Operation Mode 1				

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
ESD Generator	EMC Partner	ESD3000DM1	491/366	08.08.2012	08.08.2013

Figure 9: Test set-up for electrostatic discharge**Contact Discharge - Indirect**



Air Discharge points

Table 8: Results for Electrostatic Discharges – Indirect Contact Discharges

TEST POINT (HCP & VCP)	Positive Polarity		Negative Polarity	
	2 kV	4 kV	2 kV	4 kV
Front side	A	A	A	A
Left side	A	A	A	A
Right side	A	A	A	A
Back side	A	A	A	A

Results Descriptions:

A –During and after the test, the EUT continue to operate as intended without any degradation of Performance or loss of function and product specific performance requirement. No observed response from EUT

B –During the test, some degradation of performance or loss of function observed. But, after the test, the EUT continues to operate as intended. Some observed response from EUT

X - Not performed, nor required.

Table 9: Results for Electrostatic Discharges – Direct Contact Discharges

TEST POINT	Positive Polarity		Negative Polarity	
	2 kV	4 kV	2 kV	4 kV
There is no Direct Contact Discharge points in the EUT				

Results Descriptions:

A –During and after the test, the EUT continue to operate as intended without any degradation of Performance or loss of function and product specific performance requirement. No observed response from EUT

B –During the test, some degradation of performance or loss of function observed. But, after the test, the EUT continues to operate as intended. Some observed response from EUT

X - Not performed, nor required.

Table 10: Results for Electrostatic Discharges – Air Discharges

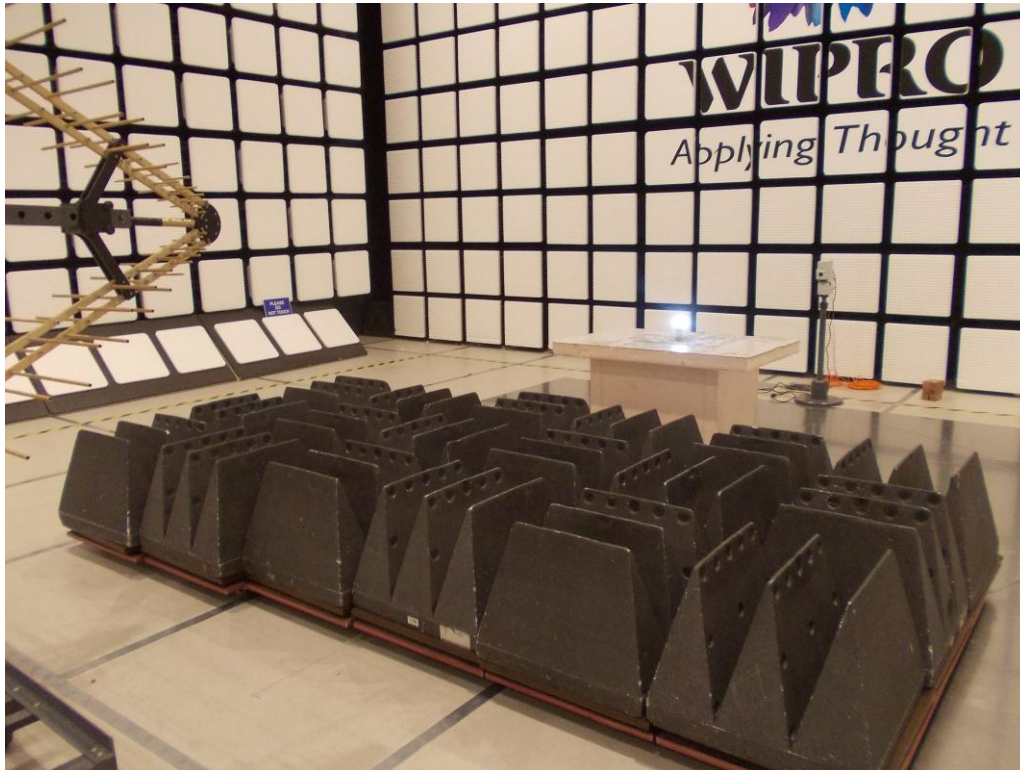
TEST POINT	Positive Polarity			Negative Polarity		
	2 kV	4 kV	8 kV	2 kV	4 kV	8 kV
Heat sink	A	A	A	A	A	A
Air gap	A	A	A	A	A	A

Results Descriptions:

A –During and after the test, the EUT continue to operate as intended without any degradation of Performance or loss of function and product specific performance requirement. No observed response from EUT
B –During the test, some degradation of performance or loss of function observed. But, after the test, the EUT continues to operate as intended. Some observed response from EUT
X - Not performed, nor required.

10. RF ELECTROMAGNETIC FIELD (Radiated Susceptibility)

TEST	Radio-frequency electromagnetic field				
Method	Measurements were made in a semi anechoic chamber and the indicated field strength was pre-calibrated prior to placement of the system under test. Tests were performed in both the horizontal and vertical polarities, where applicable. The antenna was placed 3 meters from the product under test. Front & Back sides of the EUT were investigated for anomalies.				
TEST ENVIRONMENT					
Parameters recorded during the test		Laboratory Ambient Temperature		22 °C	
		Relative Humidity		58 %	
		Air pressure		1002 mbar	
Basic Standard		IEC 61000-4-3:2010			
Measurement Port		Product Enclosure			
Required Performance Criteria		A			
Frequency range		80MHz – 1000MHz			
Applied Field Strength					
Frequency (MHz)	(V/m)		Modulation		Results
80 – 1000	3		80% AM (1kHz)		PASS
Supplementary Information: Dwell time: 2.85 sec., frequency step: 1%.					
Test was conducted in EUT Operation Mode 1					
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Signal generator	Agilent Technologies	E8257D	MY46410511	27-03-2012	27-03-2014
Electric Field Sensor	ETS-Lindgren	HI-6053	00069958	04-10-2011	04-10-2013
Power sensor	Agilent Technologies	E9326A	MY44420234	07-10-2011	07-10-2013
Power sensor	Agilent Technologies	E9326A	MY44420249	04-10-2011	04-10-2013
RF Power Amplifier	AR	250W1000AM1	0323535	22-02-2012	22-02-2014
Horn Antenna	AR	AT4002A	324686	NA	NA

Figure 10: RF Electromagnetic field test setup**Table 11: Description of Product Performance**

EUT SIDE	POLARITY	Met Performance Criteria	EUT SIDE	POLARITY	Met Performance Criteria
Front	Horizontal	A	Front	Vertical	A
Rear	Horizontal	A	Rear	Vertical	A

Results Descriptions:

A –During and after the test, the EUT continue to operate as intended without any degradation of Performance or loss of function and product specific performance requirement. No observed response from EUT
B –During the test, some degradation of performance or loss of function observed. But, after the test, the EUT continues to operate as intended. Some observed response from EUT
X - Not performed, nor required.

11. ELECTRICAL FAST TRANSIENTS

TEST	Electrical Fast Transients		
Method	Measurements were made on a ground plane. Mains power tests were conducted with the product connected to a Coupling/Decoupling Network (CDN). One of each unique interface was tested for a period of two (2) minute per polarity.		
TEST ENVIRONMENT			
Parameters recorded during the test	Laboratory Ambient Temperature	23.9 °C	
	Relative Humidity	56.4 %	
	Air pressure	1032 mbar	
Basic Standard	EN 61000-4-4: 2011		
Measurement Port	Input AC power port (230V, 50 Hz)		
Required Performance Criteria	B		
Applied Level			
Application Point	(KV)	Repetition Frequency (kHz)	Results
Input AC power port	±0.5, ±1	5	PASS
Supplementary Information: Test was conducted in EUT Operation Mode 1			

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EFT Generator	EMC Partner	TRA2000IN6	1050	08.08.2012	08.08.2013

Figure 11: Electrical fast transient test setup

Table 12: Results for electrical fast transients

Point of Application	Level	Polarity	Observations
Input AC power port L N - GND	0.5kV	Positive	A
		Negative	A
	1.0kV	Positive	A
		Negative	A

Results Descriptions:

A –During and after the test, the EUT continue to operate as intended without any degradation of Performance or loss of function and product specific performance requirement. No observed response from EUT
B –During the test, some degradation of performance or loss of function observed. But, after the test, the EUT continues to operate as intended. Some observed response from EUT
X - Not performed, nor required.

12. SURGES

TEST	Surges Immunity		
Method	Mains power tests were conducted with the product connected to a Coupling/Decoupling Network (CDN). The test voltage was increased from the lowest indicated level up to the maximum level. Five (5) positive polarity pulses at 90° and five (5) negative polarity pulses were applied to the AC Lines. Each surge was applied 60 seconds after the previous surge.		
TEST ENVIRONMENT			
Parameters recorded during the test	Laboratory Ambient Temperature	24.8 °C	
	Relative Humidity	50.0 %	
	Air pressure	1036 mbar	
Basic Standard – Mains	IEC 61000-4-5: 2005		
Measurement Port	Input AC Power Port (230V, 50 Hz)		
Required Performance Criteria	C		
Applied Level			
Application Point	(KV)	Required Surge Waveform	Results
Input AC power Port	±0.5 (Line to Line)	Combination Wave (1.2µs x 50µs Voltage, 8µs x 20µs Current)	PASS
	±1 (Line to Earth)	Combination Wave (1.2µs x 50µs Voltage, 8µs x 20µs Current)	
Supplementary Information: Test was conducted in EUT Operation Mode 1			

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Surge Generator	EMC Partner	TRA2000IN6	1050	08.08.2012	08.08.2013

Figure 12: Surges Immunity test setup

Table 13: Results for Surges

Mode of Application – Mains	Level	Polarity	Observations
Line to Neutral (Differential mode)	0.5kV	Positive	A
		Negative	A

Results Descriptions:

A –During and after the test, the EUT continue to operate as intended without any degradation of Performance or loss of function and product specific performance requirement. No observed response from EUT
B –During the test, some degradation of performance or loss of function observed. But, after the test, the EUT continues to operate as intended. Some observed response from EUT
X - Not performed, nor required.

13. CONTINUOUS CONDUCTED DISTURBANCES (Conducted RF Immunity)

TEST	Continuous Conducted Radio-Frequency		
Method	Measurements were made on a ground plane. The EUT was located 10cm above the reference ground plane. The indicated field was pre-calibrated prior to placement of the system under test.		
TEST ENVIRONMENT			
Parameters recorded during the test	Laboratory Ambient Temperature		23.3 °C
	Relative Humidity		59.4 %
	Air pressure		1036 mbar
Basic Standard	IEC 61000-4-6:2008		
Measurement Port	Input AC power port (230V, 50 Hz)		
Required Performance Criteria	A		
Frequency range	150 kHz to 80 MHz		
Applied Level			
Frequency (MHz)	(Vrms)	Modulation	Results
0.150 - 80 MHz	3	80% AM (1 kHz)	PASS
Supplementary Information: Dwell time: 2.85 sec., Frequency step: 1%.			
Test was conducted in EUT Operation Mode 1			

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
RF Signal Generator	EM Test	CWS500N1	V1019106601	23.08.2012	23.08.2013
CDN	EM Test	CDN-M2/M3	0610-09	01-07-2011	01-01-2013

Figure 13: Continuous conducted disturbance immunity test set up**Table 14: Results for Continuous Conducted Disturbances**

Point of application	Met Performance Criteria
230V, 50 Hz	A

Results Descriptions:

A –During and after the test, the EUT continue to operate as intended without any degradation of Performance or loss of function and product specific performance requirement. No observed response from EUT
B –During the test, some degradation of performance or loss of function observed. But, after the test, the EUT continues to operate as intended. Some observed response from EUT
X - Not performed, nor required.

14. POWER-FREQUENCY MAGNETIC FIELDS

TEST	Power-frequency magnetic field	
Method	Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. The indicated field was pre-calibrated prior to placement of the system under test.	
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C
	Relative Humidity	10 to 90 %
Parameters recorded during the test	Laboratory Ambient Temperature	23.3 °C
	Relative Humidity	59.4 %
	Frequency	Application Point
Fully configured sample tested at the power line frequency	50 Hz	Enclosure
Basic Standard	IEC 61000-4-8: 2009	
Required Performance Criteria	A	
Test Level		
Frequency (Hz)	Magnetic Field (A/m)	
50	3	
Supplementary Information: Test was conducted in EUT Operation Mode 1		

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Transient Generator	EMC Partner	TRA2000IN6	1050	08.08.2012	08.08.2013
Magnetic field Antenna	EMC Partner	MF 1000-1	188	---	---

Figure 14: Power frequency magnetic field test setup**X-axis****Y-axis**

Table 15: Description of Product Performance

Point of application	Observations
X-Axis	A
Y-Axis	A
Z-Axis	A

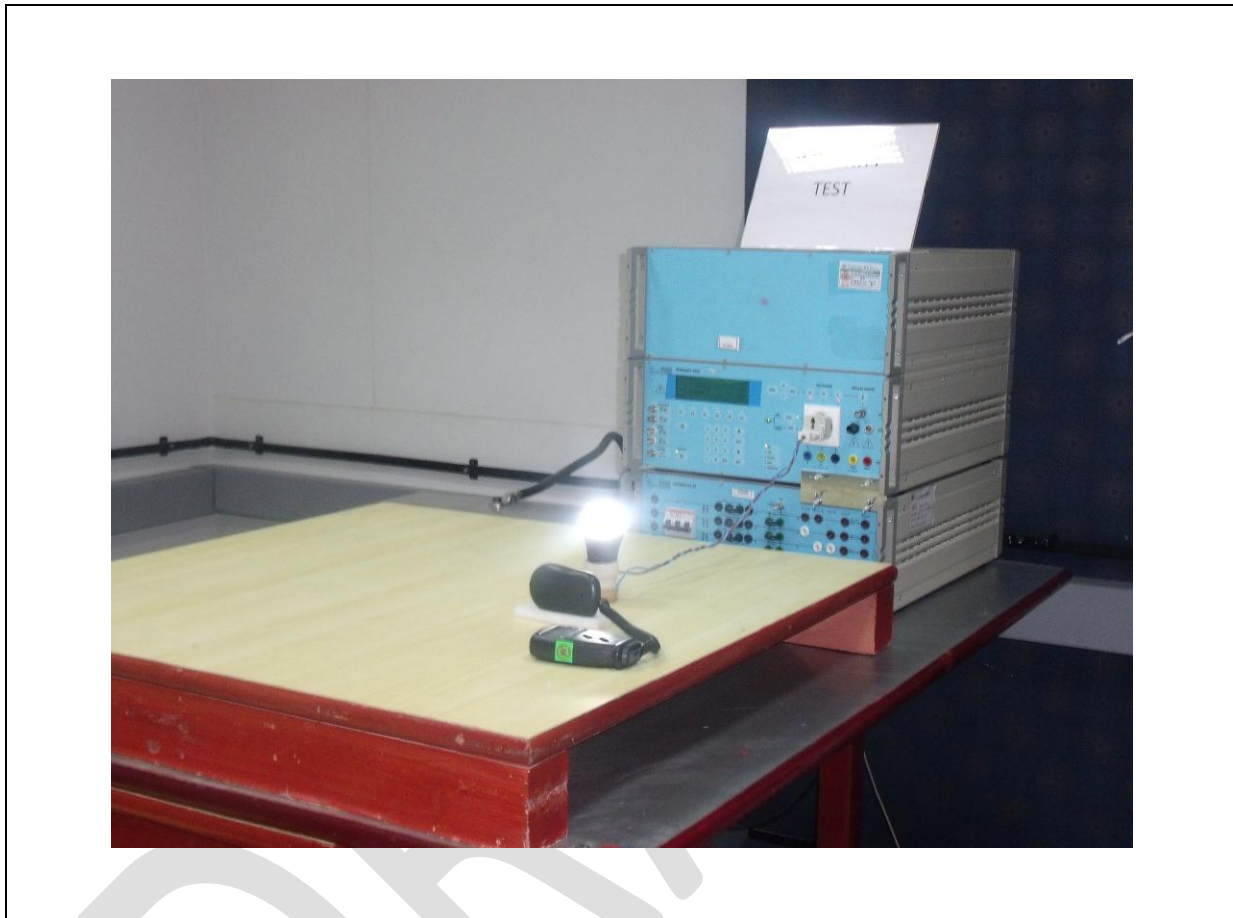
Results Descriptions:

A –During and after the test, the EUT continue to operate as intended without any degradation of Performance or loss of function and product specific performance requirement. No observed response from EUT
B –During the test, some degradation of performance or loss of function observed. But, after the test, the EUT continues to operate as intended. Some observed response from EUT
X - Not performed, nor required.

15. VOLTAGE DIPS & INTERRUPTIONS

TEST	Voltage Dips and Interruptions		
Method	The product was subjected to voltage dips and interruptions. Testing was performed with the product connected directly to a generator capable of simulating the voltage drops and interrupts as described.		
TEST ENVIRONMENT			
Parameters recorded during the test	Laboratory Ambient Temperature	24.1 °C	
	Relative Humidity	57 %	
	Air pressure	1032 mbar	
Basic Standard	IEC 61000-4-11:2004		
Measurement Port	Input AC Power Port (230V, 50 Hz)		
Applied Levels			
Test level (% of EUT)	Duration (cycle)	Required performance Criteria	Result
70%	10	C	PASS
0%	0.5	B	PASS
Supplementary Information: Test was conducted in EUT Operation Mode 1			

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Voltage Dips Generator	EMC Partner	TRA2000IN6	1050	08.08.2012	08.08.2013

Figure 15: Voltage dips and short interruptions test setup**Table 16: Results for voltage dips and interruptions**

Point of application	Test level (% of UT)	Observations
230V, 50 Hz	70%	B
230V, 50 Hz	0%	B

Results Descriptions:

A –During and after the test, the EUT continue to operate as intended without any degradation of Performance or loss of function and product specific performance requirement. No observed response from EUT
B –During the test, some degradation of performance or loss of function observed. But, after the test, the EUT continues to operate as intended. Some observed response from EUT Observation → Light is blinking during dips period
X - Not performed, nor required.