



TEST REPORT

FOR

Internal Power, AC to DC

MODEL : TPP 450-136BA-MB4, TPP 450-124BA-MB4

SERIES MODEL : Refer to item 5.1 for more details

REPORT NUMBER: 4789043511B-EN-E1-V0

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Prepared for

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Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	Sep. 2, 2019	Initial Issue	Cindy Hsin

Summary of Test Results				
EMISSION				
Standard	Test Item	Limit	Result	Remark
EN 55032:2015 +AC:2016	Conducted disturbance at mains terminals ports	Class B (Note 3)	PASS	N/A
	Conducted common mode (asymmetric mode) disturbance telecommunication ports	Class B	N/A	(Note 1)
	Radiated disturbance below 1GHz	Class A (Note 3)	PASS	N/A
	Radiated disturbance above 1 GHz	Class B	N/A	(Note 2)
EN 61000-3-2 : 2014 IEC 61000-3-2: 2018	Harmonic current disturbance	Class A	PASS	N/A
EN 61000-3-3 : 2013 IEC 61000-3-3: 2013+A1 :2017	Voltage Fluctuations & Flicker	Refer to 6.5.1	PASS	N/A

Note 1: Since the EUT does not contain telecom port, the test is unnecessary.

Note 2: Since the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.

Note 3: The test performed of laboratory was according to the client requirements

Summary of Test Results				
IMMUNITY				
Basic Standard	Test Item	Class / Severity	Require Performance Criteria	Result
IEC 61000-4-2 Ed 2.0 EN 61000-4-2 : 2009	Electrostatic discharge immunity	Contact ±4 kV Air ±8 kV	B	PASS
IEC 61000-4-3: 2006+A1: 2007+A2: 2010 Ed 3.2 EN 61000-4-3: 2006+A2: 2010	Radiated, radio frequency electromagnetic field immunity	3V/m 80%, 1kHz, AM	A	PASS
IEC 61000-4-4:Ed 3.0 EN 61000-4-4 :2012	Electrical fast transient/burst immunity	1kV(AC Mains) 5/50ns, 5kHz	B	PASS
		0.5kV(Signal Lines) 5/50ns, 5kHz or 100kHz (Note 3)	B	N/A (Note 4)
IEC 61000-4-5: 2014+A1: 2017 Ed 3.1 EN 61000-4-5 :2014+A1: 2017	Surge immunity	AC Mains 2.0kV(Common) 1.0kV(Differential) 1.2/50us	B	PASS
		Signal port 1.0kV(w/o primary protector) 4.0kV(w primary protector) 1.2/50us or 10/700us (Note 1)	C	N/A (Note 4)
IEC 61000-4-6: 2013/COR1: 2015 Ed 4.0 EN 61000-4-6: 2014+AC: 2015	Immunity to conducted disturbances, induced by radio-frequency fields	AC Mains 3V (e.m.f), 80%, 1kHz Amp. Mod. (Note 2)	A	PASS
		Signal line 3V (e.m.f), 80%, 1kHz Amp. Mod. (Note 2)	A	N/A (Note 4)
IEC 61000-4-8: Ed 2.0 EN 61000-4-8 :2010	Power frequency magnetic field immunity	50Hz, 1.00A/m(r.m.s)	A	PASS
IEC 61000-4-11 : 2004+A1: 2017 Ed 2.1 EN 61000-4-11 :2004+ A1:2017	Voltage dips, short interruptions and voltage variations immunity	Voltage dips, >95% reduction	B	PASS
		Voltage dips, 30% reduction	C	
		Voltage interruptions	C	

Note 1: Where the coupling network for the 10/700 μs waveform affects the functioning of high speed data ports, the test shall be carried out using a 1,2/50 (8/20) μs waveform and appropriate coupling network.

Note 2: The frequency range is scanned as specified. However, when specified in EN 55024 Annex A, an additional comprehensive functional test shall be carried out at a limited number of frequencies. The selected frequencies for conducted tests are: 0,2; 1; 7,1; 13,56; 21; 27,12 and 40,68 MHz (±1 %).

Note 3: For xDSL equipment, the repetition frequency for EFT testing shall be 100 kHz .

Note 4: Since the EUT does not contain telecom port, the test is unnecessary.

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: TRACO ELECTRONIC AG
 Sihlbruggstrasse 111 CH-6340 Baar Switzerland

EUT DESCRIPTION: Internal Power, AC to DC

MODEL: TPP 450-136BA-MB4, TPP 450-124BA-MB4

SERIES MODEL: Refer to item 5.1 for more details

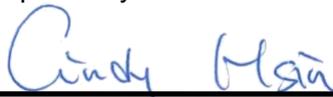
DATE of TESTED: Jul. 10, 2019 ~ Jul. 26, 2019

APPLICABLE STANDARDS	
STANDARDS	TEST RESULTS
EN 55032: 2015+AC: 2016 AS/NZS CISPR 32: 2015 CISPR 32 :2015/COR: 2016 EN 55024:2010+A1: 2015 CISPR 24 :2010+AMD1: 2015 EN 61000-3-2: 2014 IEC 61000-3-2: 2018 Ed 5.0 EN 61000-3-3: 2013 IEC 61000-3-3: 2013+A1: 2017 Ed 3.1	PASS

Underwriters Laboratories Taiwan Co., Ltd. Tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. Based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. And all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. Will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:



Cindy Hsin Date : Sep. 2, 2019
 Project Handler

Approved and Authorized By:



Roy Chen Date : Sep. 2, 2019
 Operations Manager

2. TEST METHODOLOGY

All tests were performed in accordance with the procedures documented AS/NZS CISPR 32, CISPR32, CISPR24, EN 55032, EN55024, IEC/EN 61000-3-2 and IEC/EN 61000-3-3

3. FACILITIES AND ACCREDITATION

Test Location	Underwriters Laboratories Taiwan Co., Ltd.,
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Description	All measurement facilities use to collect the measurement data are located at Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

4. CALIBRATION AND UNCERTAINTY

4.1. Measuring Instrument Calibration

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k=2$.

Electromagnetic interference:

Test Item	Measurement Frequency Range	K	U(dB)
Conducted disturbance at mains terminals ports	0.15MHz ~ 30MHz	2	1.7
966-1 Test Site			
Radiated disturbance below 1 GHz	30MHz ~ 1000MHz	2	5.2
Test Item	K	Voltage(%)	Current(%)
Harmonic&Flicker	2	0.1	0.15

Electromagnetic sensitivity:

Test Item	Measurement Frequency Range	K	U(dB)
Radiated, radio frequency electromagnetic field immunity	80MHz ~ 1000MHz	2	2.8
Immunity to conducted disturbances, induced by radio-frequency fields (CDN)	0.15MHz ~ 80MHz	2	2.2

Test Item	K	Voltage(%)	Rise Time(%)	First Peak Current (%)	Current @ 30ns (%)	Current @ 60ns (%)
Electrostatic discharge immunity	2	1.9	6.9	4.0	4.2	4.1

Test Item	K	Peak Voltage(%)	Pulse width(%)	Rise Time(%)
Electrical fast transient/burst immunity	2	6.0	5.1	5.5

Test Item	K	Voltage(%)	Current(%)	Front & Rise Time,Duration(For waveform of the surge voltage)(%)	Front & Rise Time,Duration(For waveform of the surge current)(%)
Surge immunity	2	5.6	4.8	4.6	3.4

Test Item	K	Magnetic field Strength(%)	Current (mA/A)
Power Frequency Magnetic Field Immunity Test	2	1.0	31

Test Item	K	Voltage(mV/V)	Time (%)
Voltage dips, short interruptions and voltage variations immunity	2	17.0	2.8%

5. EQUIPMENT UNDER TEST

5.1. Description of EUT

EUT Name :	Internal Power, AC to DC
Model:	TPP 450-136BA-MB4, TPP 450-124BA-MB4
Series Model:	TPP 450-112BA-MB4, TPP 450-115BA-MB4, TPP 450-118BA-MB4, TPP 450-124BA-MB4, TPP 450-128BA-MB4, TPP 450-136BA-MB4, TPP 450-136BA-MC2, TPP 450-142BA-MB4, TPP 450-148BA-MB4, TPP 450-153BA-MB4, TPP 450-112BA-M, TPP 450-115BA-M, TPP 450-118BA-M, TPP 450-124BA-M, TPP 450-128BA-M, TPP 450-136BA-M, TPP 450-142BA-M, TPP 450-148BA-M, TPP 450-153BA-M, TPP 450-112B-MB5, TPP 450-115B-MB5, TPP 450-118B-MB5, TPP 450-124B-MB5, TPP 450-128B-MB5, TPP 450-136B-MB5, TPP 450-142B-MB5, TPP 450-148B-MB5, TPP 450-153B-MB5, TPP 450-112B-MB6, TPP 450-115B-MB6, TPP 450-118B-MB6, TPP 450-124B-MB6, TPP 450-128B-MB6, TPP 450-136B-MB6, TPP 450-142B-MB6, TPP 450-148B-MB6, TPP 450-153B-MB6, TPP 450-112B-MB3, TPP 450-115B-MB3, TPP 450-118B-MB3, TPP 450-124B-MB3, TPP 450-128B-MB3, TPP 450-136B-MB3, TPP 450-142B-MB3, TPP 450-148B-MB3, TPP 450-153B-MB3, TPP 450-112B-MB1, TPP 450-115B-MB1, TPP 450-118B-MB1, TPP 450-124B-MB1, TPP 450-128B-MB1, TPP 450-136B-MB1, TPP 450-142B-MB1, TPP 450-148B-MB1, TPP 450-153B-MB1, TPP 450-112B-MB2, TPP 450-115B-MB2, TPP 450-118B-MB2, TPP 450-124B-MB2, TPP 450-128B-MB2, TPP 450-136B-MB2, TPP 450-142B-MB2, TPP 450-148B-MB2, TPP 450-153B-MB2, TPP 450-112B-M, TPP 450-115B-M, TPP 450-118B-M, TPP 450-124B-M, TPP 450-128B-M, TPP 450-136B-M, TPP 450-142B-M, TPP 450-148B-M, TPP 450-153B-M
Power Rating:	For TPP 450-136BA-MB4 : I/P: 85 – 264 Vac, O/P: 36 Vdc, 8.9A For TPP 450-124BA-MB4 : I/P: 85 – 264 Vac, O/P: 24 Vdc, 13.3A
Highest Frequency within EUT:	Less than 100MHz
Condition of EUT:	Pre-Production
Date Of Receipt Of Sample:	Jul. 10, 2019

5.2. Test Mode

The Pre-test modes:

Mode	Description	Conducted Emission	Radiated Emission
Mode 1	TPP 450-136BA-MB4	v	v
Mode 2	TPP 450-124BA-MB4	v	v

There are some DC output voltage, current and market segmentation between the serials model no. show as 5.1, others PCB layout and enclosure are the same. So client only provided TPP 450-136BA-MB4 and TPP 450-124BA-MB4 for lab test.

After pre-testing, the final test mode was displayed as below table.

Test Items		Test Mode
Emission	Conducted Emission	Mode 1,2
	Radiated Emission	Mode 1,2
	Harmonic & Flicker	Mode 1,2
Immunity	Electrostatic Discharge	Mode 1
	Radio Frequency Electromagnetic Field	Mode 1
	Electrical Fast Transients	Mode 1
	Surge immunity	Mode 1
	Conducted disturbances immunity	Mode 1
	Power frequency magnetic field	Mode 1
	Voltage Dip and Short interruption	Mode 1

5.3. EUT Operation Test Setup

Mode 1:

- a. The EUT was linked to resistance load with full load and the resistance load was connected with a meter during the testing.

Mode 2:

- a. The EUT was linked to resistance load with full load and the resistance load was connected with a meter during the testing.

5.4. Monitoring of EUT for All Immunity Test

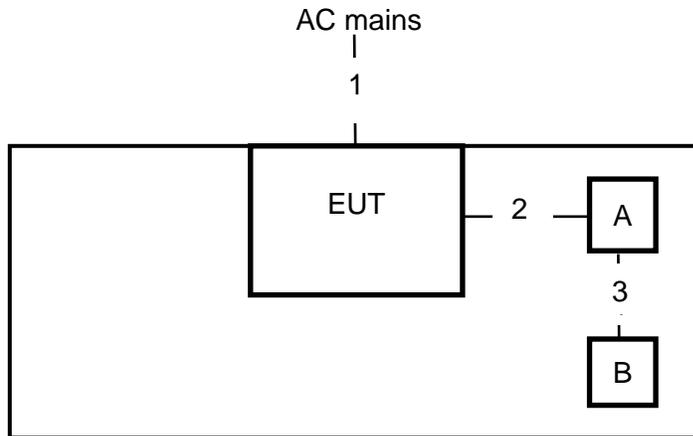
Audio	N/A
Visual	Monitor the output voltage through the power meter.

5.5. Accessory

Item	Accessory	Brand Name	Model Name	Note
-	N/A	N/A	N/A	N/A

5.6. Block diagram showing the configuration of system tested

Mode 1~2 :



5.7. Description of support units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	FCC ID	Note
A	Load	N/A	N/A	N/A	N/A	Supported by the client
B	Meter	N/A	N/A	N/A	N/A	N/A

Item	Connection	Shielded Type	Length	Note
1	Power cable	Non-Shielded	2.1 m	Supported by the client
2	Power cable	Non-Shielded	0.1 m	Supported by the client
3	Power Wire	Non-shielded	1.4 m	N/A

5.8. Measuring Instrument List

Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Expired date
Conducted Disturbance						
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESR7	101753	2018/11/14	2019/11/13
<input checked="" type="checkbox"/>	Two-Line V-Network	Rohde & Schwarz	ENV216	102136	2018/8/5	2019/8/4
<input type="checkbox"/>	RF Current Probe	FCC	F-52	171502	2019/1/9	2020/1/8
<input type="checkbox"/>	Coupling and Decoupling Network	TESEQ	ISN ST08	45105	2019/1/16	2020/1/15
<input type="checkbox"/>	Impedance Stabilization Network	TESEQ	ISN T800	42830	2019/1/18	2020/1/17
<input type="checkbox"/>	Impedance Stabilization Network	TESEQ	ISN T8-Cat6	39923	2019/1/9	2020/1/8
<input type="checkbox"/>	Capacitive Voltage Probe	TESEQ	CVP 2200A	44922	2019/1/10	2020/1/9
<input checked="" type="checkbox"/>	Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2018/8/2	2019/8/1
<input checked="" type="checkbox"/>	Measurement Software	Farad	EZ-EMC Ver: EMEC-3A1	N/A	N/A	N/A
Radiated Disturbance						
966-1						
<input checked="" type="checkbox"/>	EMI Test Receiver	Rohde & Schwarz	ESR7	101755	2018/11/27	2019/11/26
<input checked="" type="checkbox"/>	Trilog-Broadband Antena with 5dB Attenuator	SCHWARZ BECK	VULB 9168 & N-6-05	9168-773 & AT-N0539	2019/1/14	2020/1/13
<input type="checkbox"/>	Double Ridged Guide Horn Antenna	SCHWARZ BECK	BBHA 9120 D	1686	2019/1/16	2020/1/15
<input checked="" type="checkbox"/>	Preamplifier	EMC Instrument	EMC330E	980404	2019/1/8	2020/1/7
<input type="checkbox"/>	Preamplifier	EMC Instrument	EMC051835BE	980407	2019/1/8	2020/1/7
<input checked="" type="checkbox"/>	Measurement Software	Farad	EZ-EMC Ver: EMEC-3A1	N/A	N/A	N/A
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Expired date
Voltage Harmonic & Flicker						
<input checked="" type="checkbox"/>	single phase coupling unit	TESEQ	CCN1000-1	1652A01270	2019/3/14	2020/3/12
<input checked="" type="checkbox"/>	Programmable AC and DC Power Sources	TESEQ	NSG1007	1652A00760	2019/3/14	2020/3/12
<input checked="" type="checkbox"/>	Measurement Software	TESEQ	WIN2100(V4)	N/A	N/A	N/A
Electrostatic discharge						
<input checked="" type="checkbox"/>	ESD Generator	TESEQ	NSG 437	1125	2018/12/6	2019/12/5

Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Expired date
Radio frequency electromagnetic field immunity						
<input checked="" type="checkbox"/>	RF and Microwave Signal Generator	Rohde & Schwarz	SMB100A	113793	2019/2/22	2020/2/21
<input checked="" type="checkbox"/>	Power amplifier	Milmega	80RF1000-300	1077558	N/A	N/A
<input type="checkbox"/>	Power amplifier	Milmega	AS0860B	1077559	N/A	N/A
<input type="checkbox"/>	Directional coupler	Werlatone	C10117-10	111786	N/A	N/A
<input checked="" type="checkbox"/>	Directional coupler	Werlatone	C8719-20	111759	N/A	N/A
<input checked="" type="checkbox"/>	Antenna	AR	ATR80M6G	346008	N/A	N/A
<input type="checkbox"/>	Antenna	SCHWARZ BECK	STLP 9149	00441	N/A	N/A
<input checked="" type="checkbox"/>	RF switch	OSP	OSP	N/A	N/A	N/A
<input checked="" type="checkbox"/>	Power Meter	Rohde & Schwarz	NRP2	105524	2018/10/19	2019/10/18
<input checked="" type="checkbox"/>	Power Sensor	Rohde & Schwarz	NRP-Z91	103732	2018/10/19	2019/10/18
<input checked="" type="checkbox"/>	Power Sensor	Rohde & Schwarz	NRP-Z91	103733	2018/10/19	2019/10/18
<input checked="" type="checkbox"/>	Measurement Software	Rohde & Schwarz	EMC32, VER.10.01.00	N/A	N/A	N/A
Electrical fast transient						
<input checked="" type="checkbox"/>	Ultra Compact Simulator	EM TEST	UCS 500N7	P16281802 75	2018/12/18	2019/12/17
<input type="checkbox"/>	Capacitive Coupling Clamp	EM TEST	HFK	P16421857 90	2018/11/23	2019/11/22
<input checked="" type="checkbox"/>	Measurement Software	TESEQ	IEC.control, VER.6.0.2	N/A	N/A	N/A
Surge						
<input checked="" type="checkbox"/>	Ultra Compact Simulator	EM TEST	UCS 500N7	P16281802 75	2018/12/18	2019/12/17
<input type="checkbox"/>	Telecom Surge Generator	EM TEST	TSurge7	P16201800 15	2018/12/18	2019/12/17
<input type="checkbox"/>	Coupling and Decoupling Network	EM TEST	CNV 508T5	P16371840 38	2018/12/12	2019/12/11
<input type="checkbox"/>	Coupling and Decoupling Network	TESEQ	CDN HSS-2	45091	2018/12/10	2019/12/9
<input checked="" type="checkbox"/>	Measurement Software	TESEQ	IEC.control, VER.6.0.2	N/A	N/A	N/A

Instrument						
Used	Equipment	Manufac turer	Model No.	Serial No.	Last Cal.	Expired date
Immunity to conducted disturbances, induced by radio-frequency fields						
<input checked="" type="checkbox"/>	Signal Generator	Rohde & Schwarz	SMC100A	105811	2018/10/25	2019/10/24
<input checked="" type="checkbox"/>	Power amplifier	Rohde & Schwarz	BBA150-A125B125	102340	N/A	N/A
<input checked="" type="checkbox"/>	Coupling and Decoupling Network	TESEQ	CDN M016	45073	2019/3/18	2020/3/16
<input type="checkbox"/>	Coupling and Decoupling Network	TESEQ	CDN T2-10	45003	2019/3/18	2020/3/16
<input type="checkbox"/>	Coupling and Decoupling Network	TESEQ	CDN T4-10	44939	2019/3/18	2020/3/16
<input type="checkbox"/>	Coupling and Decoupling Network	TESEQ	CDN T8-10	49203	2018/12/14	2019/12/13
<input type="checkbox"/>	EM Injection Clamp	TESEQ	CAL 801A & KEMZ 801A	75454.1, 75454.2 & 45181	2019/3/18	2020/3/16
<input checked="" type="checkbox"/>	Power - Sensor	Rohde & Schwarz	NRP-Z91	103730	2018/12/3	2019/12/2
<input checked="" type="checkbox"/>	Power - Sensor	Rohde & Schwarz	NRP-Z91	103731	2018/12/3	2019/12/2
<input checked="" type="checkbox"/>	Measurement Software	Rohde & Schwarz	EMC32, VER.10.01.00	N/A	N/A	N/A
Power frequency magnetic field immunity						
<input checked="" type="checkbox"/>	Ultra Compact Simulator	EM TEST	UCS 500N7	P1628180275	2018/12/18	2019/12/17
<input checked="" type="checkbox"/>	Current Transformer	EM TEST	MC 2630	P1644186773	2018/11/20	2019/11/19
<input checked="" type="checkbox"/>	Magnetic Field Test Antena	EM TEST	MS 100N	P1627181324	2018/11/20	2019/11/19
Voltage dips and interruptions						
<input checked="" type="checkbox"/>	Ultra Compact Simulator	EM TEST	UCS 500N7	P1628180275	2018/12/18	2019/12/17
<input checked="" type="checkbox"/>	Motorized Variac	EM TEST	MV 2616 (varic NX1-260-16)	P1643186426	2018/12/18	2019/12/17
<input checked="" type="checkbox"/>	Measurement Software	TESEQ	IEC.control, VER.6.0.2	N/A	N/A	N/A

6. EMISSION TEST

6.1. Conducted Disturbance Measurement

6.1.1. Limits of conducted disturbance voltage and common mode disturbance.

AC mains port:

FREQUENCY (MHz)	<input type="checkbox"/> Class A (dB μ V)		<input checked="" type="checkbox"/> Class B (dB μ V)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79.00	66.00	66 - 56 *	56 - 46*
0.50 - 5.0	73.00	60.00	56.00	46.00
5.0 - 30.0	73.00	60.00	60.00	50.00

Telecommunications/network port:

FREQUENCY (MHz)	<input type="checkbox"/> Class A			
	Voltage limit (dB μ V)		Current limit(dB μ A)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	97 - 87 *	84 - 74*	53 - 43 *	40 - 30*
0.50 - 30.0	87.00	74.00	43.00	30.00
FREQUENCY (MHz)	<input type="checkbox"/> Class B			
	Voltage limit (dB μ V)		Current limit(dB μ A)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	84 - 74 *	74 - 64*	40 - 30 *	30 - 20*
0.50 - 30.0	74.00	64.00	30.00	20.00

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
- (3) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor
 Correct Factor = Insertion Loss + Cable Loss + Attenuator Factor(if use)
 Margin Level = Measurement Value - Limit Value

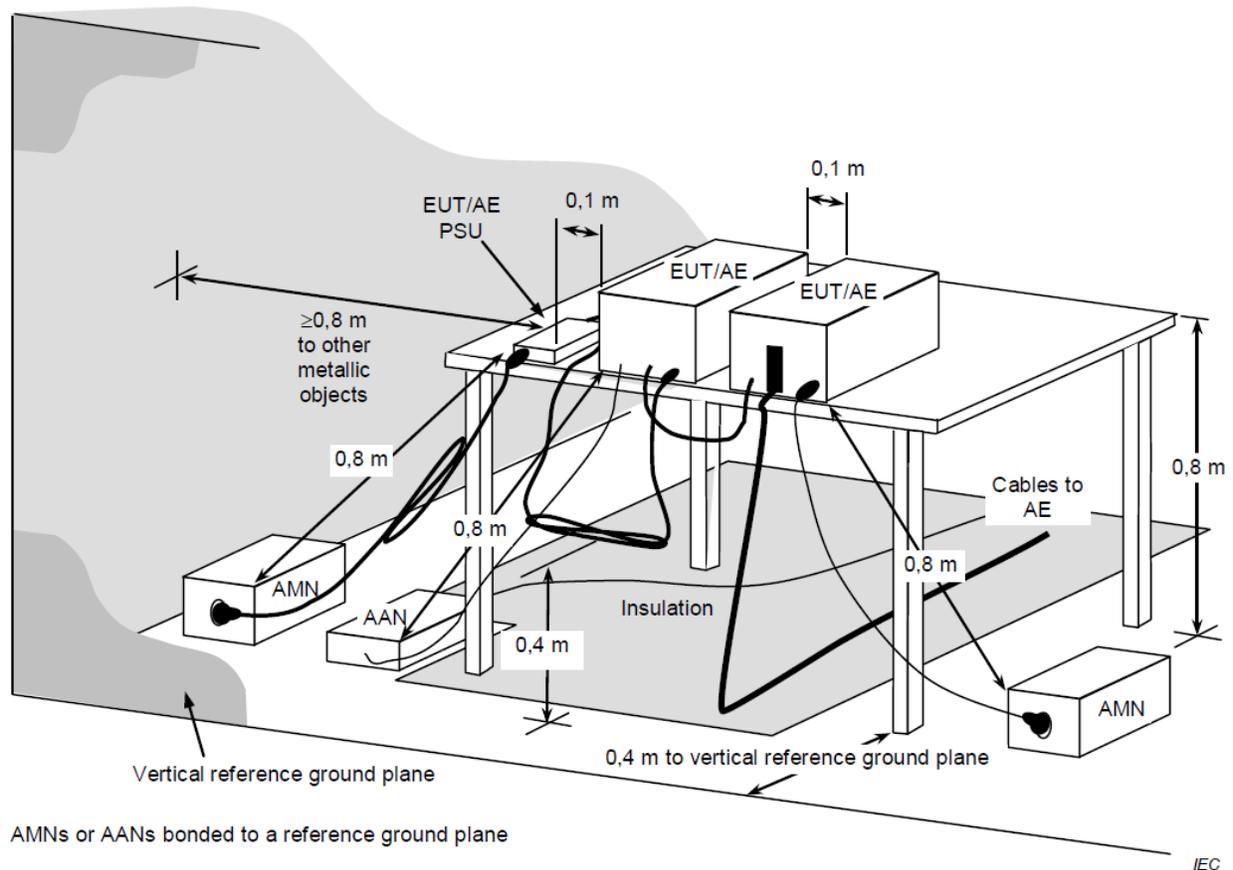
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

6.1.2. Test Procedure

- The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall at least 1 m.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item:EUT Test Photos.

6.1.3. Test Setup

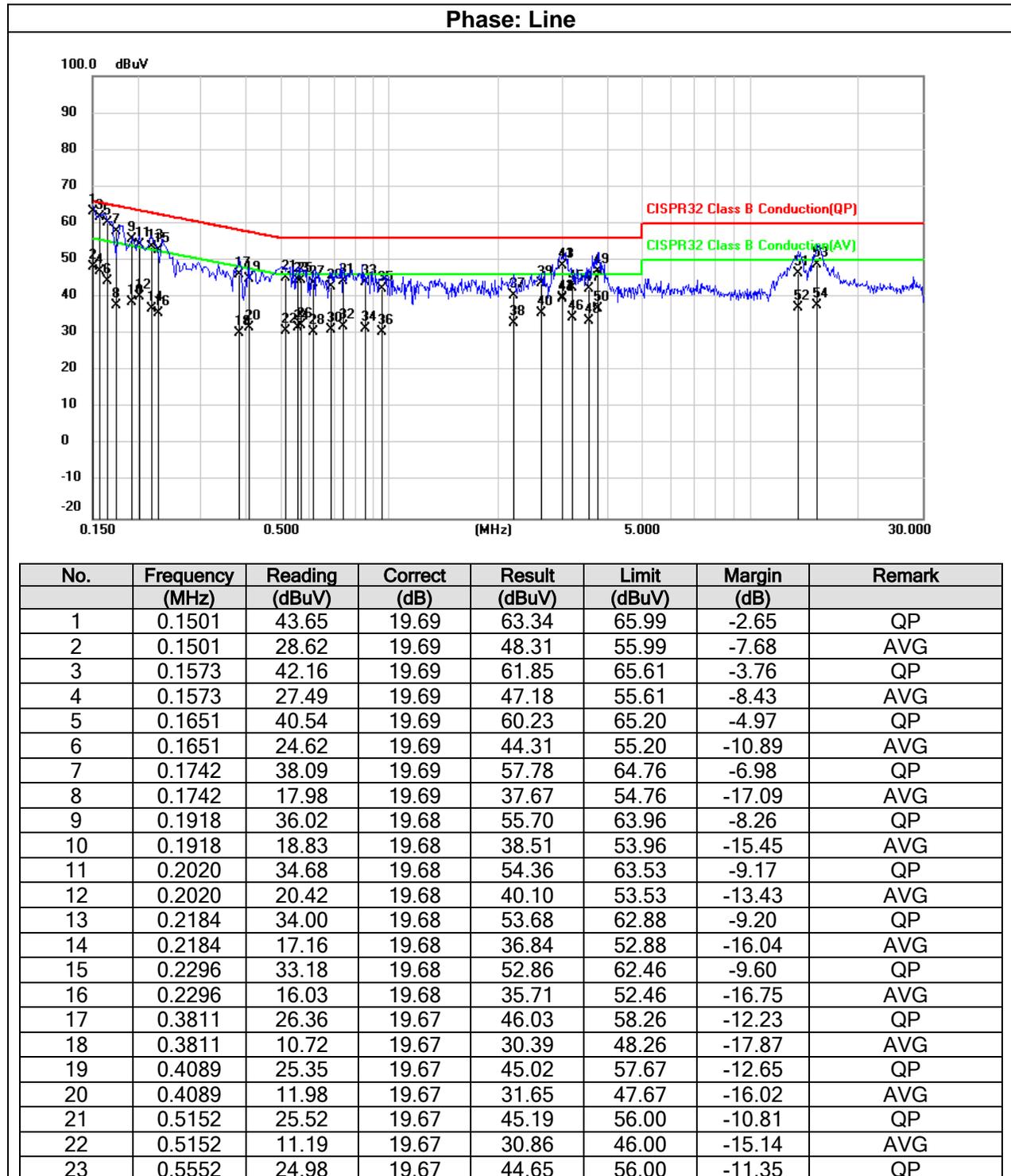


The 0,8 m distance specified between EUT/AE/PSU and AMN/AAN, is applicable only to the EUT being measured. If the device is AE then it shall be $\geq 0,8$ m.

For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

6.1.4. Test Result

Test Mode:	Mode 1	Temperature:	23°C
Test Voltage:	AC 230V/50Hz	Humidity:	60%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 11, 2019



24	0.5552	11.96	19.67	31.63	46.00	-14.37	AVG
25	0.5677	25.02	19.67	44.69	56.00	-11.31	QP
26	0.5677	12.71	19.67	32.38	46.00	-13.62	AVG
27	0.6167	24.19	19.67	43.86	56.00	-12.14	QP
28	0.6167	10.97	19.67	30.64	46.00	-15.36	AVG
29	0.6881	23.25	19.67	42.92	56.00	-13.08	QP
30	0.6881	11.40	19.67	31.07	46.00	-14.93	AVG
31	0.7471	24.77	19.68	44.45	56.00	-11.55	QP
32	0.7471	12.31	19.68	31.99	46.00	-14.01	AVG
33	0.8567	24.36	19.68	44.04	56.00	-11.96	QP
34	0.8567	11.89	19.68	31.57	46.00	-14.43	AVG
35	0.9537	22.70	19.68	42.38	56.00	-13.62	QP
36	0.9537	10.90	19.68	30.58	46.00	-15.42	AVG
37	2.2000	20.82	19.69	40.51	56.00	-15.49	QP
38	2.2000	13.40	19.69	33.09	46.00	-12.91	AVG
39	2.6416	23.98	19.70	43.68	56.00	-12.32	QP
40	2.6416	16.08	19.70	35.78	46.00	-10.22	AVG
41	3.0114	28.94	19.71	48.65	56.00	-7.35	QP
42	3.0114	20.02	19.71	39.73	46.00	-6.27	AVG
43	3.0116	28.72	19.71	48.43	56.00	-7.57	QP
44	3.0116	19.96	19.71	39.67	46.00	-6.33	AVG
45	3.2169	22.77	19.72	42.49	56.00	-13.51	QP
46	3.2169	14.82	19.72	34.54	46.00	-11.46	AVG
47	3.5601	22.42	19.72	42.14	56.00	-13.86	QP
48	3.5601	13.89	19.72	33.61	46.00	-12.39	AVG
49	3.7653	27.44	19.73	47.17	56.00	-8.83	QP
50	3.7653	17.02	19.73	36.75	46.00	-9.25	AVG
51	13.5713	26.75	19.83	46.58	60.00	-13.42	QP
52	13.5713	17.26	19.83	37.09	50.00	-12.91	AVG
53	15.4106	29.00	19.83	48.83	60.00	-11.17	QP
54	15.4106	18.06	19.83	37.89	50.00	-12.11	AVG

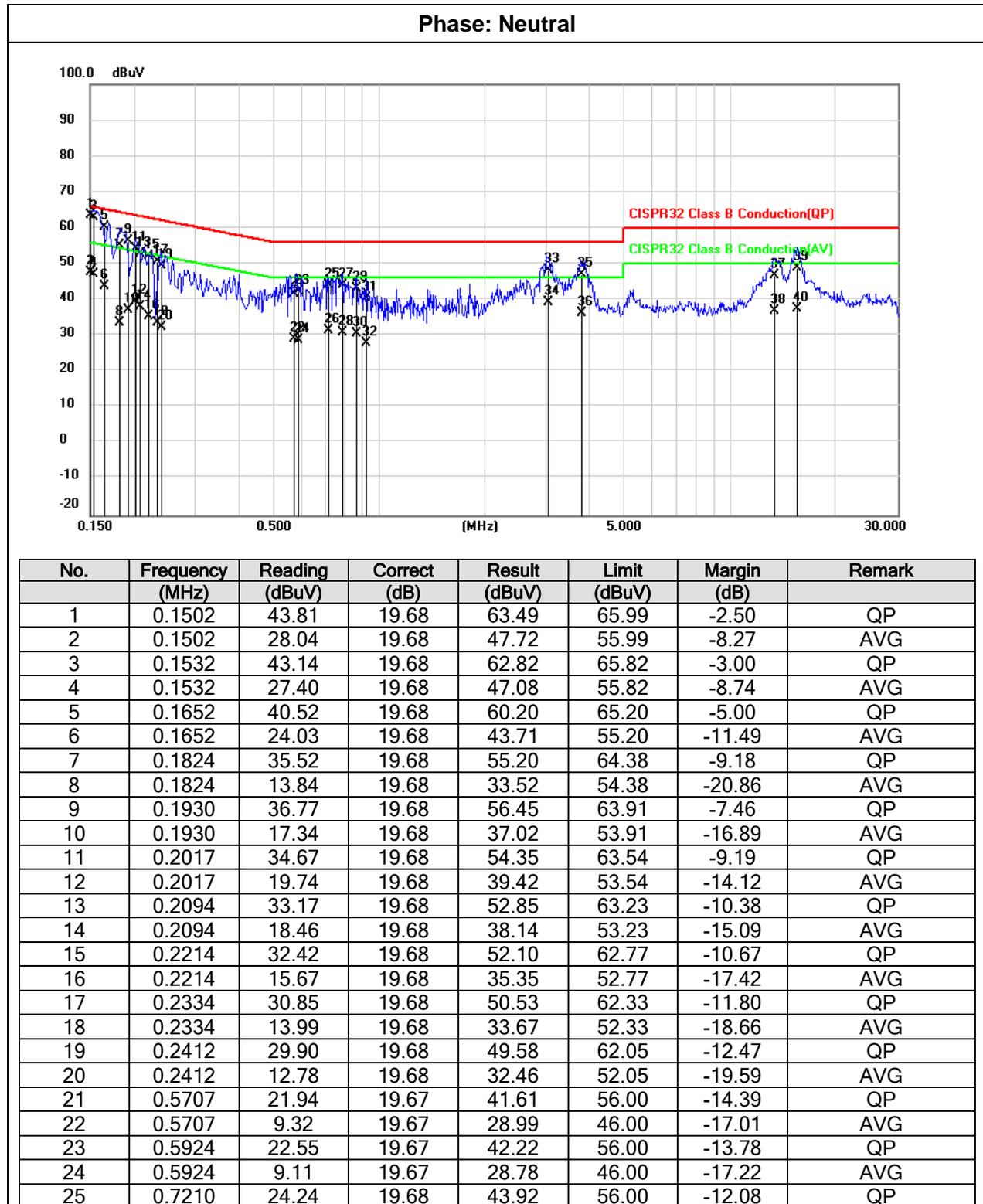
Remark:

Result = Reading +Correct

Correct = Insertion Loss + Cable Loss + Attenuator factor

Margin = Result – Limit

Test Mode:	Mode 1	Temperature:	23°C
Test Voltage:	AC 230V/50Hz	Humidity:	60%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 11, 2019



26	0.7210	11.65	19.68	31.33	46.00	-14.67	AVG
27	0.7864	24.30	19.68	43.98	56.00	-12.02	QP
28	0.7864	11.30	19.68	30.98	46.00	-15.02	AVG
29	0.8592	23.46	19.68	43.14	56.00	-12.86	QP
30	0.8592	10.81	19.68	30.49	46.00	-15.51	AVG
31	0.9254	20.63	19.68	40.31	56.00	-15.69	QP
32	0.9254	8.16	19.68	27.84	46.00	-18.16	AVG
33	3.0321	28.61	19.72	48.33	56.00	-7.67	QP
34	3.0321	19.59	19.72	39.31	46.00	-6.69	AVG
35	3.7855	27.35	19.74	47.09	56.00	-8.91	QP
36	3.7855	16.58	19.74	36.32	46.00	-9.68	AVG
37	13.3967	26.74	19.88	46.62	60.00	-13.38	QP
38	13.3967	17.00	19.88	36.88	50.00	-13.12	AVG
39	15.5038	28.83	19.90	48.73	60.00	-11.27	QP
40	15.5038	17.56	19.90	37.46	50.00	-12.54	AVG

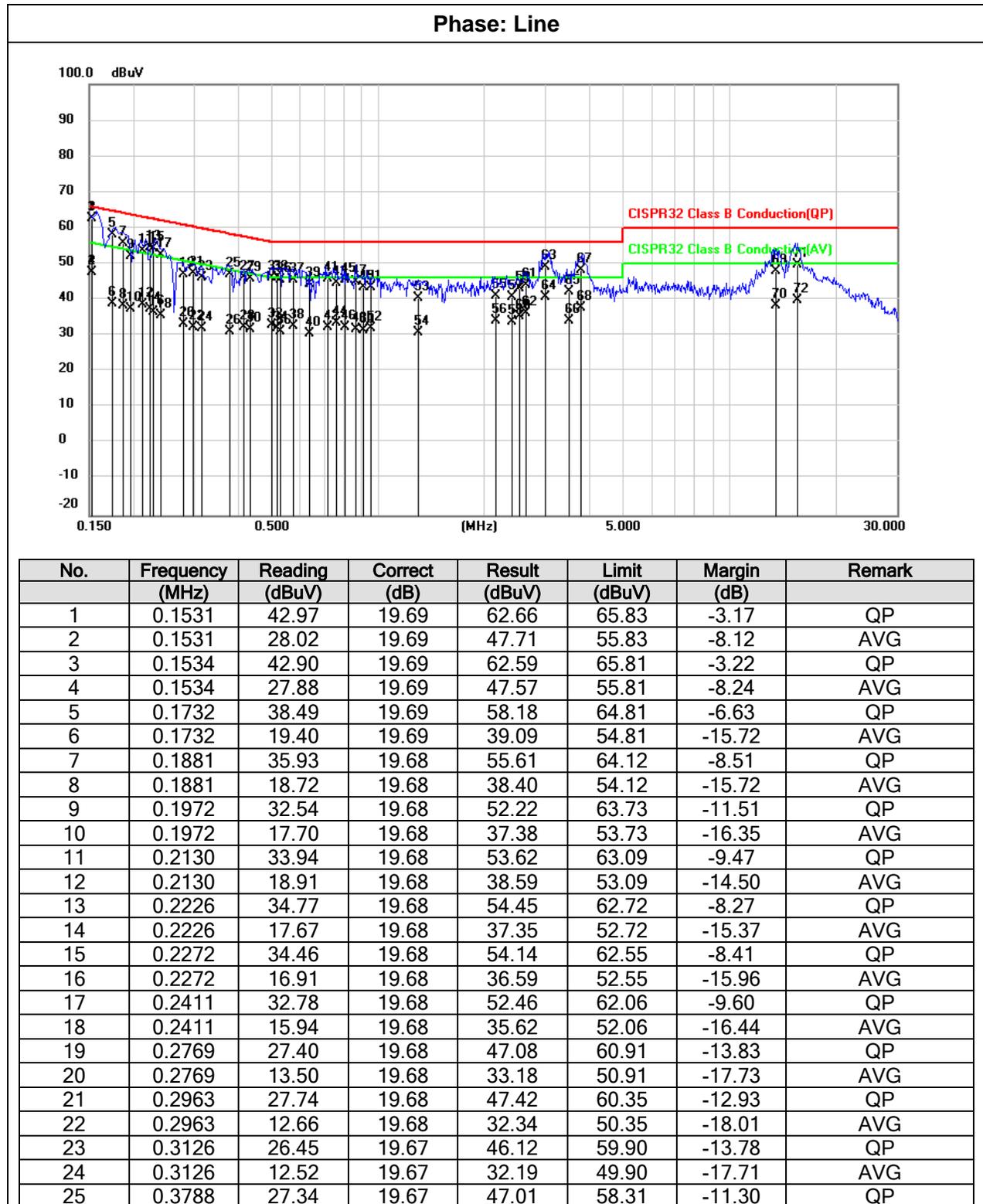
Remark:

Result = Reading +Correct

Correct = Insertion Loss + Cable Loss + Attenuator factor

Margin = Result – Limit

Test Mode:	Mode 2	Temperature:	23°C
Test Voltage:	AC 230V/50Hz	Humidity:	60%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 11, 2019



26	0.3788	11.37	19.67	31.04	48.31	-17.27	AVG
27	0.4109	26.48	19.67	46.15	57.63	-11.48	QP
28	0.4109	12.69	19.67	32.36	47.63	-15.27	AVG
29	0.4337	26.10	19.67	45.77	57.18	-11.41	QP
30	0.4337	12.18	19.67	31.85	47.18	-15.33	AVG
31	0.4962	26.52	19.67	46.19	56.06	-9.87	QP
32	0.4962	13.14	19.67	32.81	46.06	-13.25	AVG
33	0.5167	26.43	19.67	46.10	56.00	-9.90	QP
34	0.5167	12.31	19.67	31.98	46.00	-14.02	AVG
35	0.5273	25.99	19.67	45.66	56.00	-10.34	QP
36	0.5273	11.48	19.67	31.15	46.00	-14.85	AVG
37	0.5701	25.82	19.67	45.49	56.00	-10.51	QP
38	0.5701	13.02	19.67	32.69	46.00	-13.31	AVG
39	0.6348	24.55	19.67	44.22	56.00	-11.78	QP
40	0.6348	10.90	19.67	30.57	46.00	-15.43	AVG
41	0.7178	26.29	19.68	45.97	56.00	-10.03	QP
42	0.7178	12.81	19.68	32.49	46.00	-13.51	AVG
43	0.7626	25.06	19.68	44.74	56.00	-11.26	QP
44	0.7626	13.80	19.68	33.48	46.00	-12.52	AVG
45	0.8049	25.74	19.68	45.42	56.00	-10.58	QP
46	0.8049	12.68	19.68	32.36	46.00	-13.64	AVG
47	0.8636	25.26	19.68	44.94	56.00	-11.06	QP
48	0.8636	12.22	19.68	31.90	46.00	-14.10	AVG
49	0.9078	23.82	19.68	43.50	56.00	-12.50	QP
50	0.9078	11.80	19.68	31.48	46.00	-14.52	AVG
51	0.9575	23.68	19.68	43.36	56.00	-12.64	QP
52	0.9575	12.37	19.68	32.05	46.00	-13.95	AVG
53	1.3004	20.91	19.68	40.59	56.00	-15.41	QP
54	1.3004	11.06	19.68	30.74	46.00	-15.26	AVG
55	2.1697	21.46	19.69	41.15	56.00	-14.85	QP
56	2.1697	14.46	19.69	34.15	46.00	-11.85	AVG
57	2.3959	21.19	19.69	40.88	56.00	-15.12	QP
58	2.3959	14.24	19.69	33.93	46.00	-12.07	AVG
59	2.5189	23.37	19.70	43.07	56.00	-12.93	QP
60	2.5189	15.69	19.70	35.39	46.00	-10.61	AVG
61	2.6423	24.22	19.70	43.92	56.00	-12.08	QP
62	2.6423	16.51	19.70	36.21	46.00	-9.79	AVG
63	3.0116	29.47	19.71	49.18	56.00	-6.82	QP
64	3.0116	20.94	19.71	40.65	46.00	-5.35	AVG
65	3.4994	22.63	19.72	42.35	56.00	-13.65	QP
66	3.4994	14.58	19.72	34.30	46.00	-11.70	AVG
67	3.7653	28.45	19.73	48.18	56.00	-7.82	QP
68	3.7653	17.99	19.73	37.72	46.00	-8.28	AVG
69	13.5805	28.05	19.83	47.88	60.00	-12.12	QP
70	13.5805	18.64	19.83	38.47	50.00	-11.53	AVG
71	15.5320	29.93	19.83	49.76	60.00	-10.24	QP
72	15.5320	19.90	19.83	39.73	50.00	-10.27	AVG

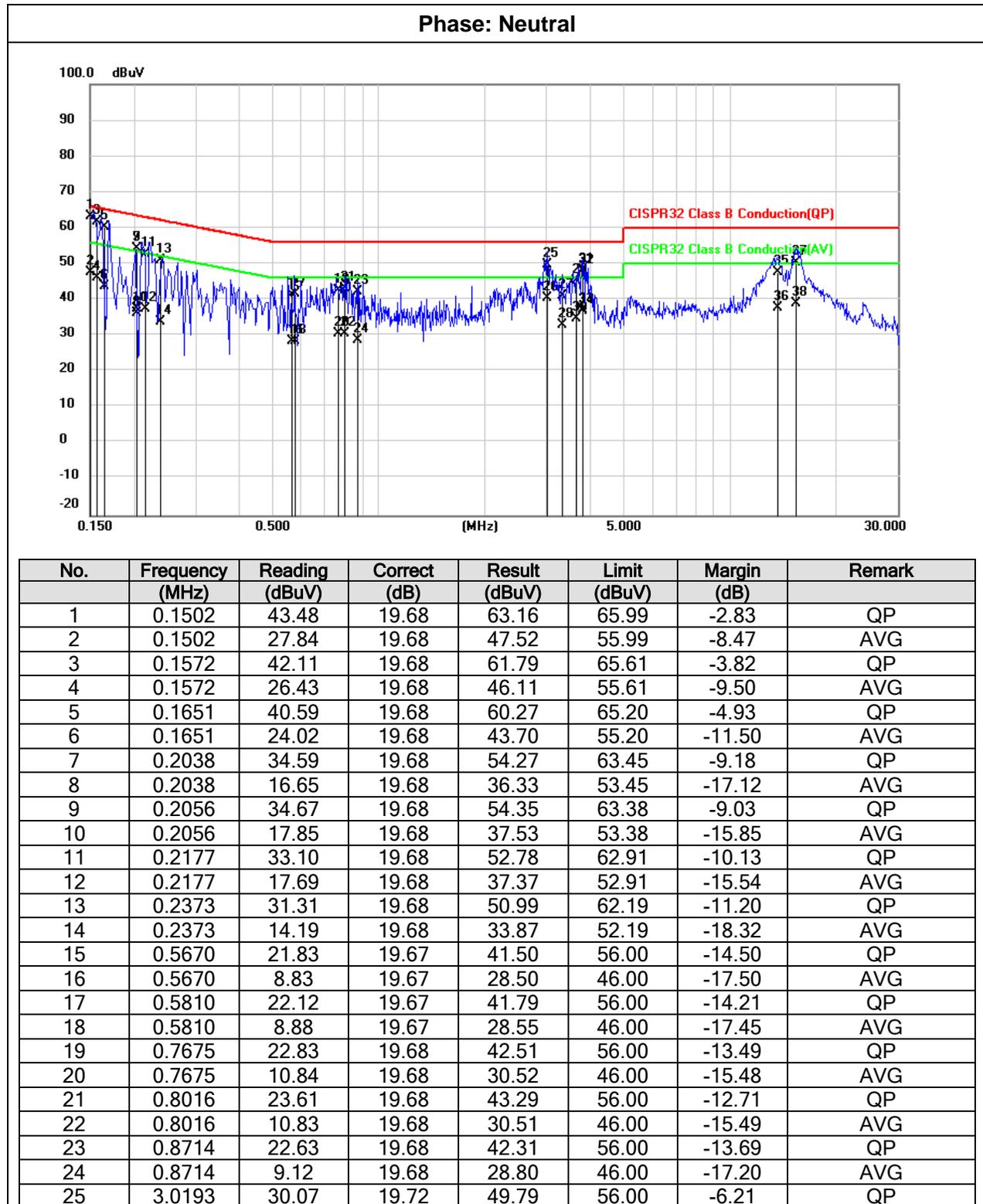
Remark:

Result = Reading +Correct

Correct = Insertion Loss + Cable Loss + Attenuator factor

Margin = Result - Limit

Test Mode:	Mode 2	Temperature:	23°C
Test Voltage:	AC 230V/50Hz	Humidity:	60%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 11, 2019



26	3.0193	20.75	19.72	40.47	46.00	-5.53	AVG
27	3.3402	21.47	19.72	41.19	56.00	-14.81	QP
28	3.3402	13.24	19.72	32.96	46.00	-13.04	AVG
29	3.6628	25.61	19.74	45.35	56.00	-10.65	QP
30	3.6628	15.07	19.74	34.81	46.00	-11.19	AVG
31	3.8060	28.49	19.74	48.23	56.00	-7.77	QP
32	3.8060	28.31	19.74	48.05	56.00	-7.95	QP
33	3.8060	17.32	19.74	37.06	46.00	-8.94	AVG
34	3.8060	17.00	19.74	36.74	46.00	-9.26	AVG
35	13.6232	27.71	19.88	47.59	60.00	-12.41	QP
36	13.6232	17.79	19.88	37.67	50.00	-12.33	AVG
37	15.4913	30.46	19.90	50.36	60.00	-9.64	QP
38	15.4913	19.08	19.90	38.98	50.00	-11.02	AVG

Remark:

Result = Reading +Correct

Correct = Insertion Loss + Cable Loss + Attenuator factor

Margin = Result – Limit

6.2. Radiated Disturbance Measurement (below 1GHz)

6.2.1. Limits of radiated disturbance measurement

FREQUENCY (MHz)	<input checked="" type="checkbox"/> Class A		<input type="checkbox"/> Class B	
	<input type="checkbox"/> At 10m	<input checked="" type="checkbox"/> At 3m	<input type="checkbox"/> At 10m	<input type="checkbox"/> At 3m
	dB μ V/m	dB μ V/m	dB μ V/m	dB μ V/m
30 – 230	40	50	30	40
230 – 1000	47	57	37	47

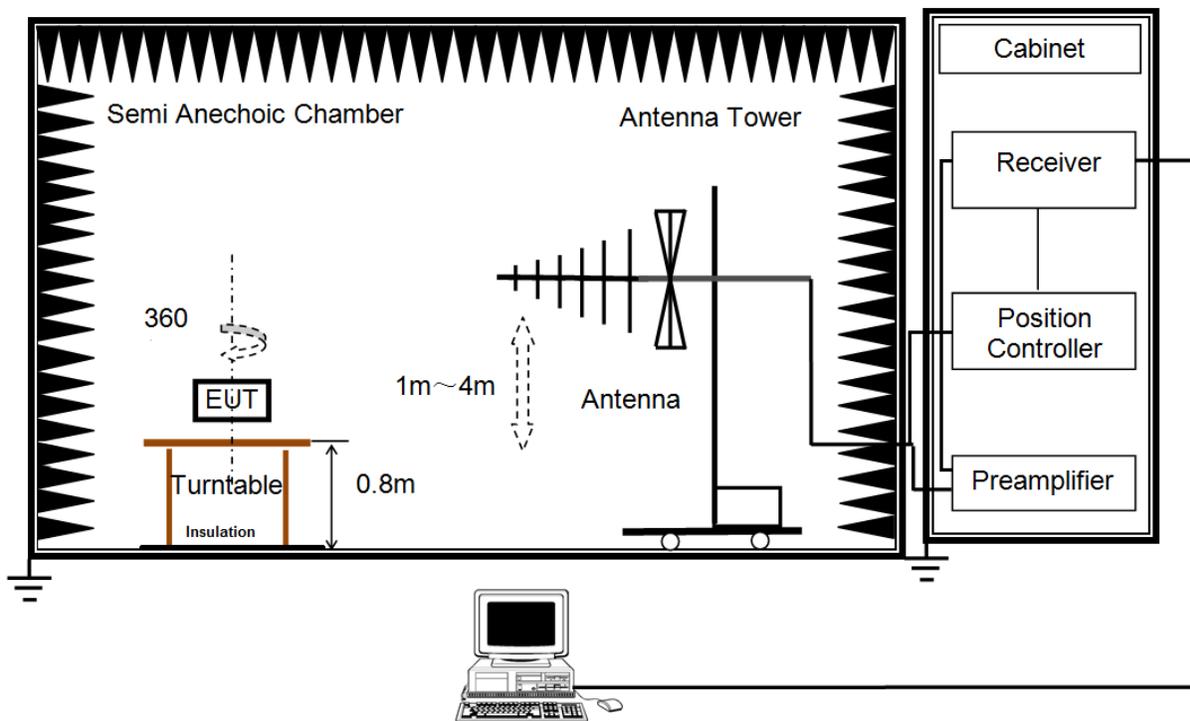
NOTE:

- (1) The limit for radiated test was performed according to EN55032.
- (2) The tighter limit applies at the band edges.
- (3) The test result calculated as following:
 Measurement Value = Reading Level + Correct Factor,
 Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use),
 Margin Level = Measurement Value - Limit Value.

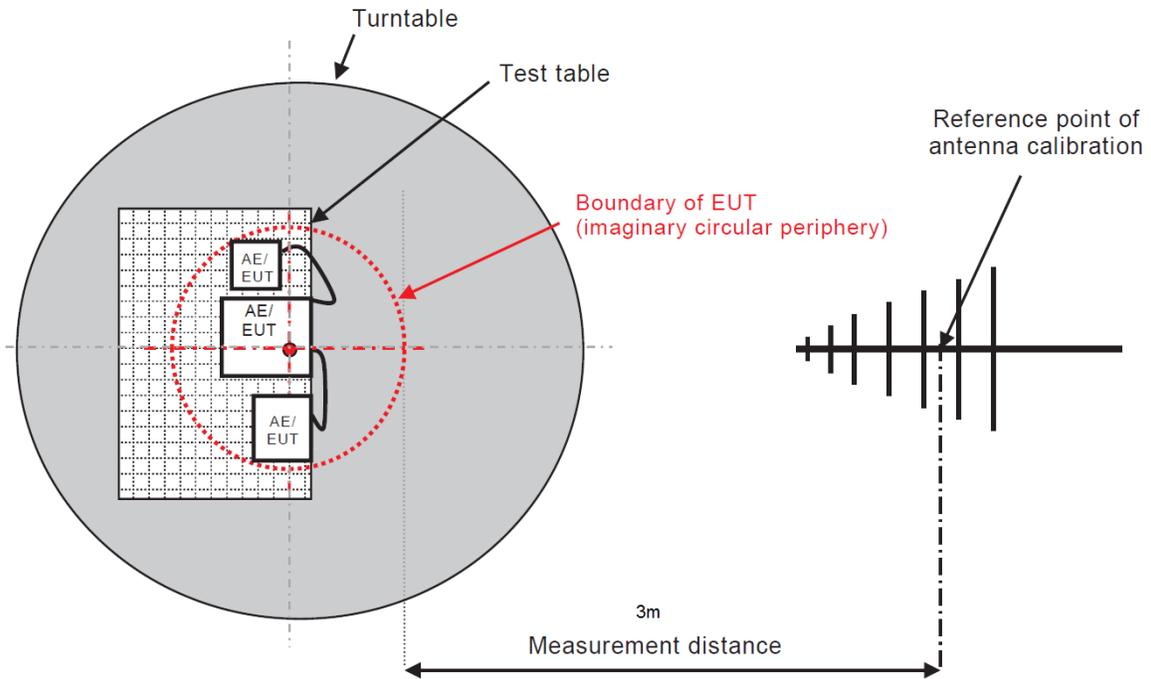
6.2.2. Test Procedure

- a. The measuring distance of at 3m shall be used for measurements at frequency from 30 to 1000MHz.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment shall be set at 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. The initial step in collecting radiated emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item:EUT Test Photos.

6.2.3. Test Setup

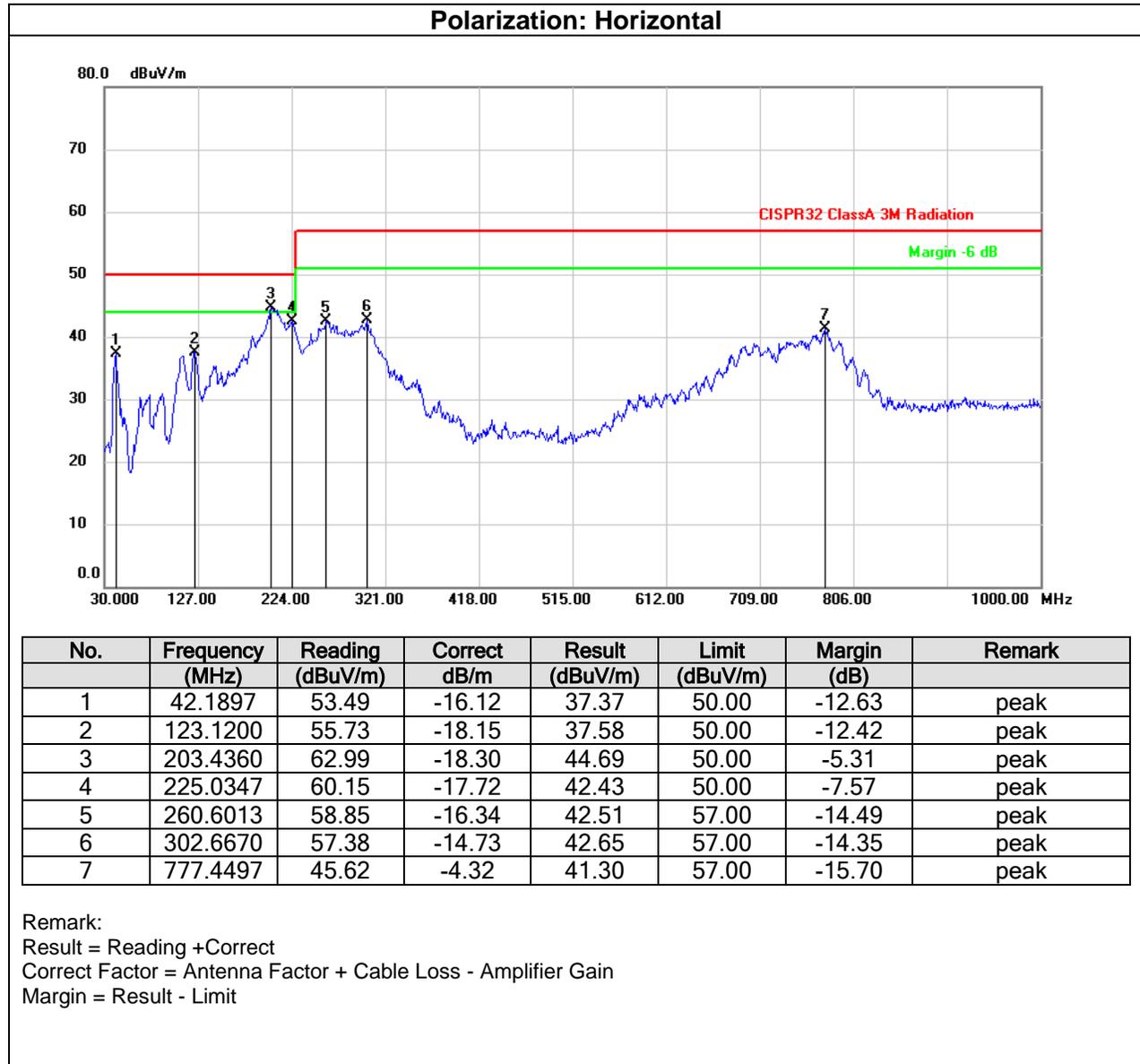


For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

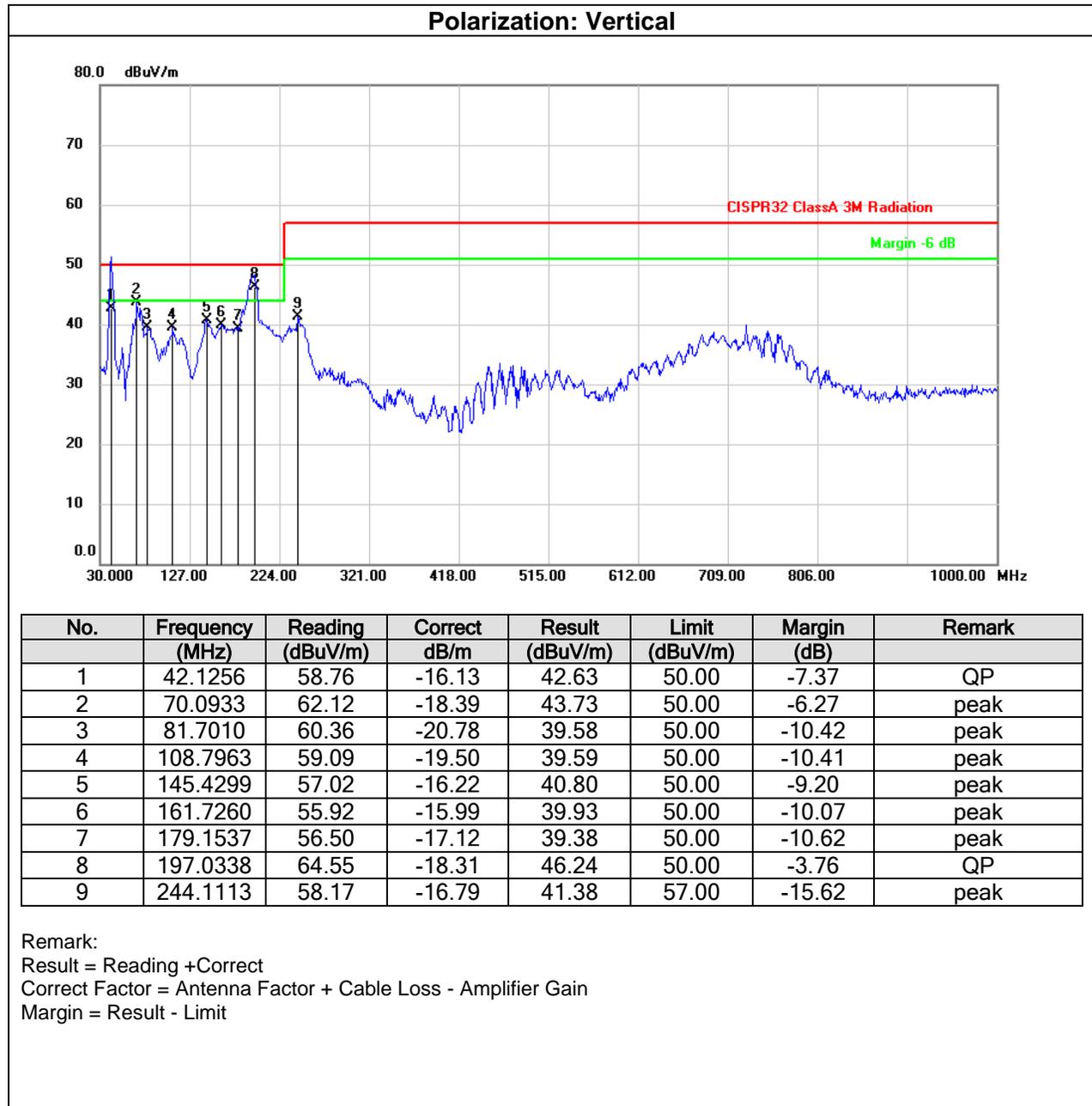


6.2.4. Test Result

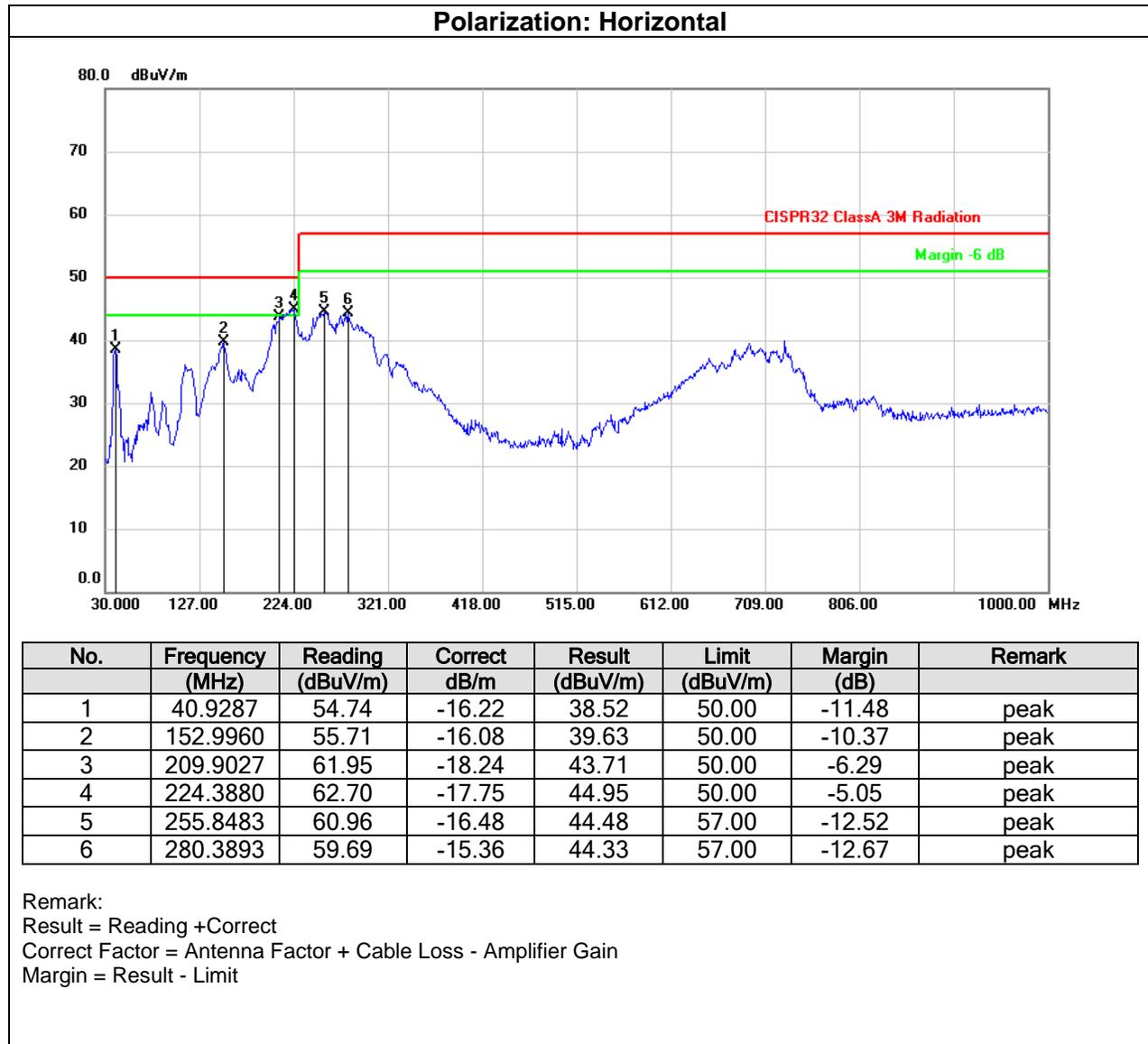
Test Mode:	Mode 1	Temperature:	25°C
Test Voltage:	AC 230V/50Hz	Humidity:	52%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 10, 2019



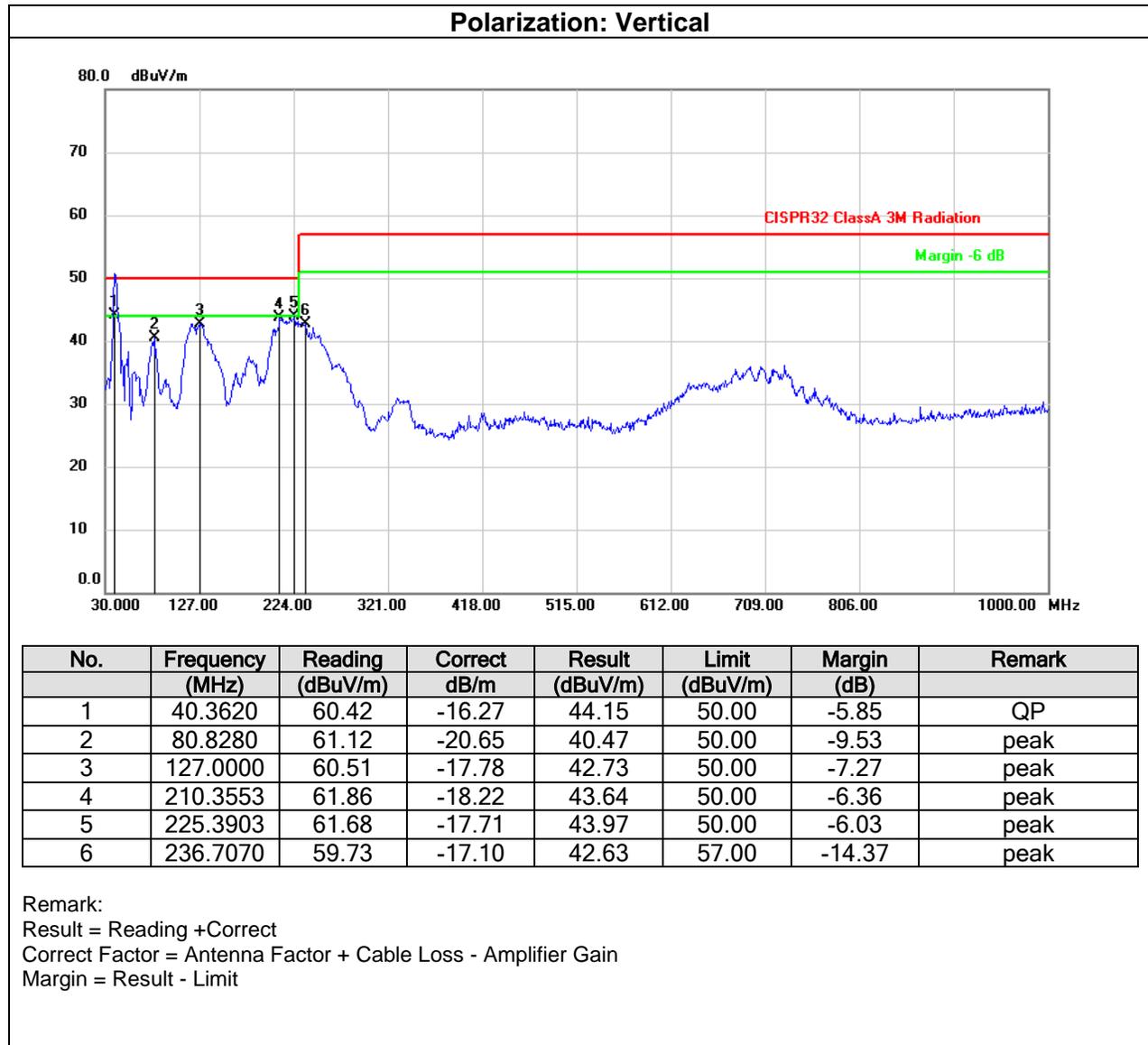
Test Mode:	Mode 1	Temperature:	25°C
Test Voltage:	AC 230V/50Hz	Humidity:	52%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 10, 2019



Test Mode:	Mode 2	Temperature:	25°C
Test Voltage:	AC 230V/50Hz	Humidity:	52%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 10, 2019



Test Mode:	Mode 2	Temperature:	25°C
Test Voltage:	AC 230V/50Hz	Humidity:	52%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 10, 2019



6.3. Harmonic Current Disturbance Measurement

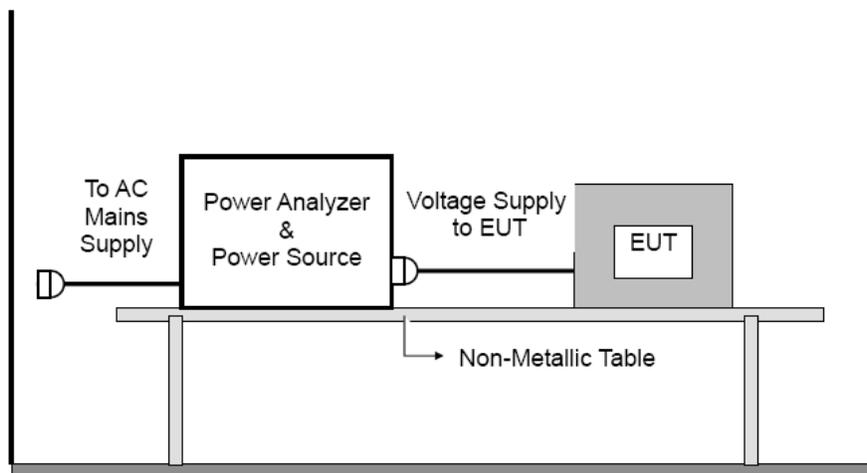
6.3.1. Limits of Harmonic Current

EN 61000-3-2/ IEC 61000-3-2						
Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current A	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current A mA/w	
Class A	Odd Harmonics		Class D	Odd Harmonics only		
	3	2.30		3	2.30	3.4
	5	1.14		5	1.14	1.9
	7	0.77		7	0.77	1.0
	9	0.40		9	0.40	0.5
	11	0.33		11	0.33	0.35
	13	0.21		13	0.21	0.296
	15 ≤ n ≤ 39	0.15 x 15/n		15 ≤ n ≤ 39	0.15 x 15/n	3.85/n
	Even Harmonics					
	2	1.08				
	4	0.43				
	6	0.30				
	8 ≤ n ≤ 40	0.23 x 8/n				

6.3.2. Test Procedure

- a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce under normal conditions
- b. Tests was performed according to the Test the measured values of the harmonics components of the input current in Clause 7 of IEC/EN 61000-3-2 depend on which standard adopted for compliance measurement.

6.3.3. Test Setup



For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

6.3.4. Test Condition

Test Mode:	Mode 1	Temperature:	23°C
Test Voltage:	230V/50Hz	Humidity:	60%RH
Tested By:	Eric T. Fan	Test Date:	July 15, 2018

Test Mode:	Mode 2	Temperature:	23°C
Test Voltage:	230V/50Hz	Humidity:	60%RH
Tested By:	Eric T. Fan	Test Date:	July 16, 2018

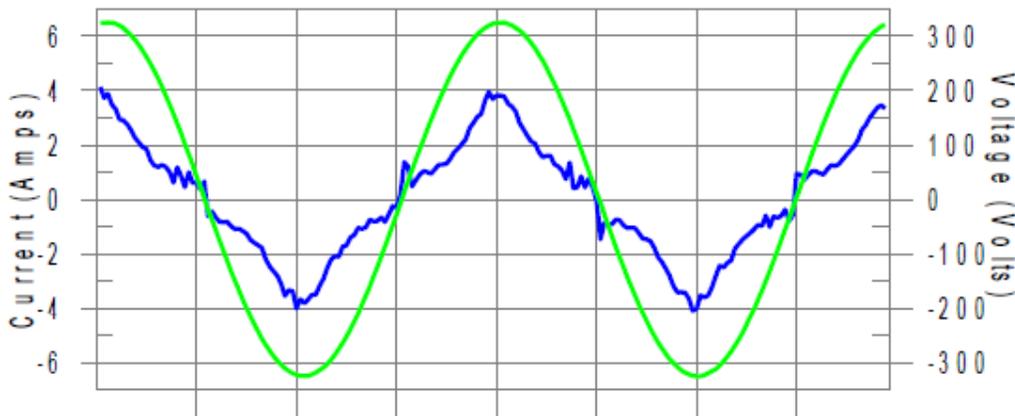
6.3.5. Test Result

Mode 1:

Harmonics – Class-A per Ed. 4.0 (2014)(Run time) incl. inter-harmonics

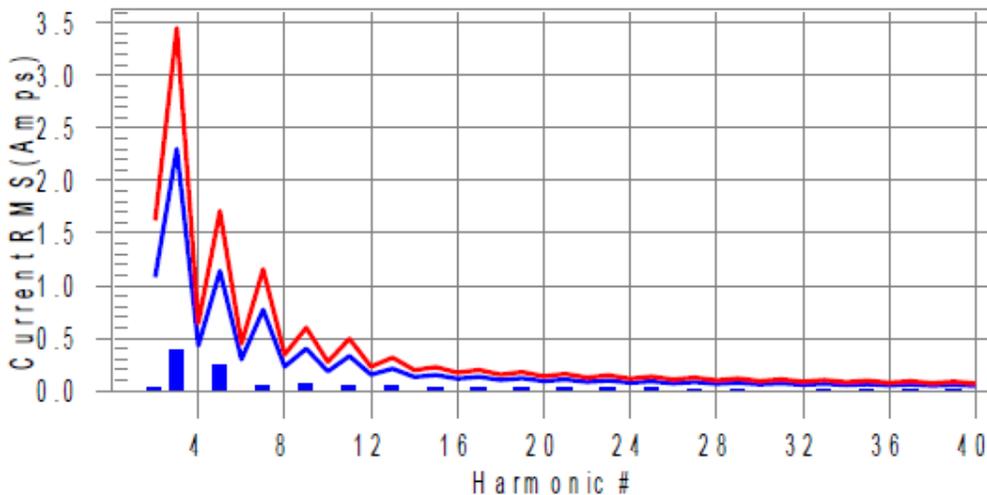
Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class A limit line

European Limits



Test result: Pass Worst harmonics H37-23.5% of 150% limit, H39-28.4% of 100% limit

Current Test Result Summary (Run time)

Test Result: Pass Source qualification: Normal
 THC(A): 0.474 I-THD(%): 22.9 POHC(A): 0.062 POHC Limit(A): 0.251

Highest parameter values during test:

V RMS (Volts):	229.97	Frequency(Hz):	50.00
I Peak (Amps):	4.437	I RMS (Amps):	2.134
I Fund (Amps):	2.075	Crest Factor:	2.130
Power (Watts):	475.7	Power Factor:	0.970

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.033	1.080	3.0	0.037	1.620	2.3	Pass
3	0.384	2.300	16.7	0.390	3.450	11.3	Pass
4	0.010	0.430	N/A	0.013	0.645	N/A	Pass
5	0.242	1.140	21.2	0.251	1.710	14.7	Pass
6	0.009	0.300	N/A	0.011	0.450	N/A	Pass
7	0.042	0.770	5.5	0.049	1.155	4.2	Pass
8	0.010	0.230	N/A	0.012	0.345	N/A	Pass
9	0.063	0.400	15.8	0.070	0.600	11.6	Pass
10	0.010	0.184	N/A	0.012	0.276	N/A	Pass
11	0.040	0.330	12.2	0.044	0.495	8.9	Pass
12	0.010	0.153	N/A	0.012	0.230	N/A	Pass
13	0.044	0.210	20.8	0.050	0.315	15.8	Pass
14	0.010	0.131	N/A	0.012	0.197	N/A	Pass
15	0.025	0.150	16.5	0.031	0.225	13.7	Pass
16	0.010	0.115	N/A	0.013	0.173	N/A	Pass
17	0.032	0.132	23.9	0.034	0.198	17.3	Pass
18	0.010	0.102	N/A	0.013	0.153	N/A	Pass
19	0.024	0.118	20.2	0.029	0.178	16.1	Pass
20	0.010	0.092	N/A	0.012	0.138	N/A	Pass
21	0.029	0.107	26.7	0.033	0.161	20.3	Pass
22	0.011	0.084	N/A	0.014	0.125	N/A	Pass
23	0.022	0.098	22.5	0.025	0.147	16.9	Pass
24	0.011	0.077	N/A	0.013	0.115	N/A	Pass
25	0.023	0.090	25.5	0.027	0.135	19.8	Pass
26	0.011	0.071	N/A	0.014	0.107	N/A	Pass
27	0.016	0.083	19.2	0.019	0.125	15.6	Pass
28	0.011	0.066	N/A	0.014	0.099	N/A	Pass
29	0.020	0.078	25.6	0.022	0.116	19.3	Pass
30	0.011	0.061	N/A	0.014	0.092	N/A	Pass
31	0.014	0.073	19.0	0.018	0.109	16.5	Pass
32	0.012	0.058	N/A	0.014	0.086	N/A	Pass
33	0.016	0.068	24.1	0.020	0.102	19.5	Pass
34	0.011	0.054	N/A	0.014	0.081	N/A	Pass
35	0.018	0.064	27.2	0.020	0.096	20.8	Pass
36	0.011	0.051	N/A	0.016	0.077	N/A	Pass
37	0.017	0.061	28.2	0.021	0.091	23.5	Pass
38	0.012	0.048	N/A	0.015	0.073	N/A	Pass
39	0.016	0.058	28.4	0.019	0.087	22.5	Pass
40	0.008	0.046	N/A	0.011	0.069	N/A	Pass

Voltage Source Verification Data (Run time)

Test Result: Pass Source qualification: Normal

Highest parameter values during test:

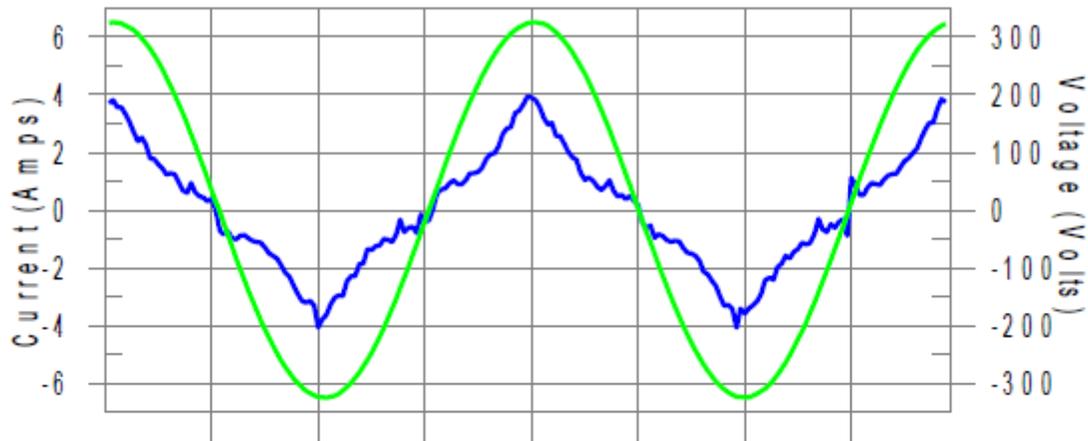
Voltage (Vrms): 229.97	Frequency(Hz): 50.00
I Peak (Amps): 4.437	I RMS (Amps): 2.134
I Fund (Amps): 2.075	Crest Factor: 2.130
Power (Watts): 475.7	Power Factor: 0.970

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.041	0.460	8.87	OK
3	0.420	2.069	20.30	OK
4	0.021	0.460	4.49	OK
5	0.042	0.920	4.56	OK
6	0.022	0.460	4.86	OK
7	0.018	0.690	2.66	OK
8	0.016	0.460	3.37	OK
9	0.028	0.460	5.99	OK
10	0.018	0.460	3.89	OK
11	0.022	0.230	9.58	OK
12	0.017	0.230	7.48	OK
13	0.032	0.230	13.75	OK
14	0.015	0.230	6.36	OK
15	0.025	0.230	11.05	OK
16	0.010	0.230	4.53	OK
17	0.019	0.230	8.41	OK
18	0.017	0.230	7.26	OK
19	0.019	0.230	8.07	OK
20	0.015	0.230	6.56	OK
21	0.027	0.230	11.70	OK
22	0.014	0.230	6.03	OK
23	0.023	0.230	9.79	OK
24	0.012	0.230	5.00	OK
25	0.026	0.230	11.47	OK
26	0.013	0.230	5.65	OK
27	0.018	0.230	7.74	OK
28	0.013	0.230	5.52	OK
29	0.021	0.230	9.14	OK
30	0.012	0.230	5.33	OK
31	0.021	0.230	9.12	OK
32	0.014	0.230	6.03	OK
33	0.019	0.230	8.22	OK
34	0.013	0.230	5.71	OK
35	0.024	0.230	10.57	OK
36	0.012	0.230	5.26	OK
37	0.023	0.230	10.11	OK
38	0.015	0.230	6.35	OK
39	0.023	0.230	9.99	OK
40	0.015	0.230	6.72	OK

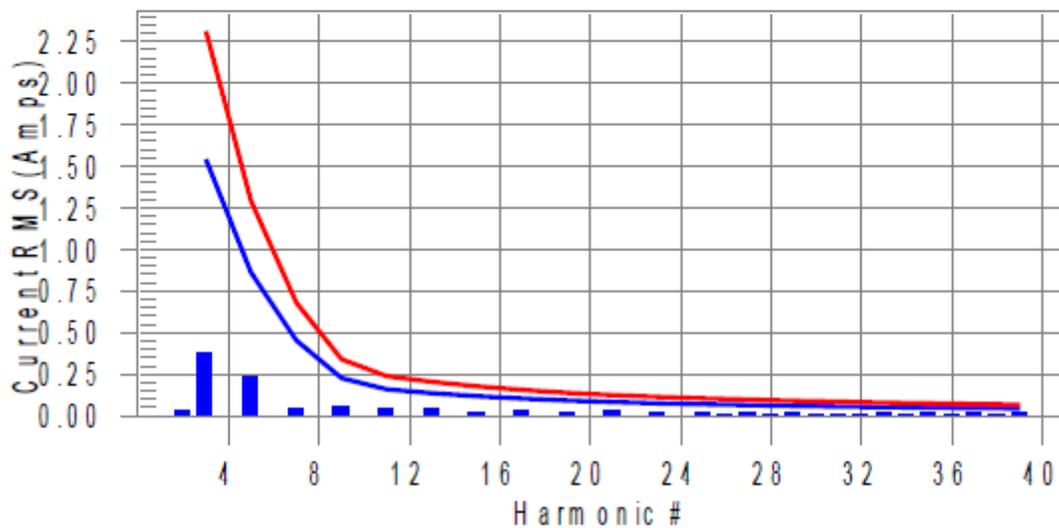
Harmonics – Class-D per Ed. 4.0 (2014)(Run time) incl. inter-harmonics

Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class D limit line European Limits



Test result: Pass Worst harmonics H39-27.2% of 150% limit, H35-34.8% of 100% limit

Current Test Result Summary (Run time)

Test Result: Pass Source qualification: Normal
 THC(A): 0.465 I-THD(%): 23.6 POHC(A): 0.058 POHC Limit(A): 0.195

Highest parameter values during test:

V RMS (Volts): 229.97	Frequency(Hz): 50.00
I Peak (Amps): 4.263	I RMS (Amps): 2.036
I Fund (Amps): 1.976	Crest Factor: 2.113
Power (Watts): 453.4	Power Factor: 0.969

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.032	0.000	N/A	0.036	0.000	N/A	Pass
3	0.381	1.542	24.7	0.382	2.312	16.5	Pass
4	0.010	0.000	N/A	0.012	0.000	N/A	Pass
5	0.235	0.861	27.3	0.238	1.292	18.4	Pass
6	0.009	0.000	N/A	0.011	0.000	N/A	Pass
7	0.038	0.453	8.5	0.041	0.680	6.0	Pass
8	0.009	0.000	N/A	0.013	0.000	N/A	Pass
9	0.060	0.227	26.3	0.063	0.340	18.6	Pass
10	0.009	0.000	N/A	0.012	0.000	N/A	Pass
11	0.038	0.159	24.3	0.041	0.238	17.3	Pass
12	0.009	0.000	N/A	0.011	0.000	N/A	Pass
13	0.040	0.136	29.2	0.043	0.204	21.0	Pass
14	0.010	0.000	N/A	0.011	0.000	N/A	Pass
15	0.022	0.118	19.0	0.027	0.177	15.1	Pass
16	0.009	0.000	N/A	0.012	0.000	N/A	Pass
17	0.030	0.104	28.7	0.033	0.156	21.3	Pass
18	0.010	0.000	N/A	0.013	0.000	N/A	Pass
19	0.022	0.092	23.9	0.026	0.138	18.7	Pass
20	0.009	0.000	N/A	0.012	0.000	N/A	Pass
21	0.027	0.083	32.3	0.029	0.124	23.6	Pass
22	0.010	0.000	N/A	0.013	0.000	N/A	Pass
23	0.021	0.076	28.2	0.024	0.114	20.8	Pass
24	0.010	0.000	N/A	0.013	0.000	N/A	Pass
25	0.021	0.070	29.6	0.023	0.105	22.4	Pass
26	0.011	0.000	N/A	0.013	0.000	N/A	Pass
27	0.015	0.065	23.2	0.018	0.097	18.1	Pass
28	0.011	0.000	N/A	0.015	0.000	N/A	Pass
29	0.019	0.060	31.6	0.022	0.090	23.9	Pass
30	0.011	0.000	N/A	0.013	0.000	N/A	Pass
31	0.013	0.056	22.6	0.016	0.084	18.7	Pass
32	0.011	0.000	N/A	0.014	0.000	N/A	Pass
33	0.016	0.053	30.4	0.019	0.079	24.1	Pass
34	0.011	0.000	N/A	0.013	0.000	N/A	Pass
35	0.017	0.050	34.8	0.019	0.075	26.0	Pass
36	0.012	0.000	N/A	0.014	0.000	N/A	Pass
37	0.016	0.047	34.6	0.018	0.071	26.1	Pass
38	0.012	0.000	N/A	0.014	0.000	N/A	Pass
39	0.015	0.045	34.5	0.018	0.067	27.2	Pass
40	0.008	0.000	N/A	0.011	0.000	N/A	Pass

Voltage Source Verification Data (Run time)

Test Result: Pass Source qualification: Normal

Highest parameter values during test:

Voltage (Vrms): 229.97	Frequency(Hz): 50.00
I _{Peak} (Amps): 4.263	I _{RMS} (Amps): 2.036
I _{Fund} (Amps): 1.976	Crest Factor: 2.113
Power (Watts): 453.4	Power Factor: 0.969

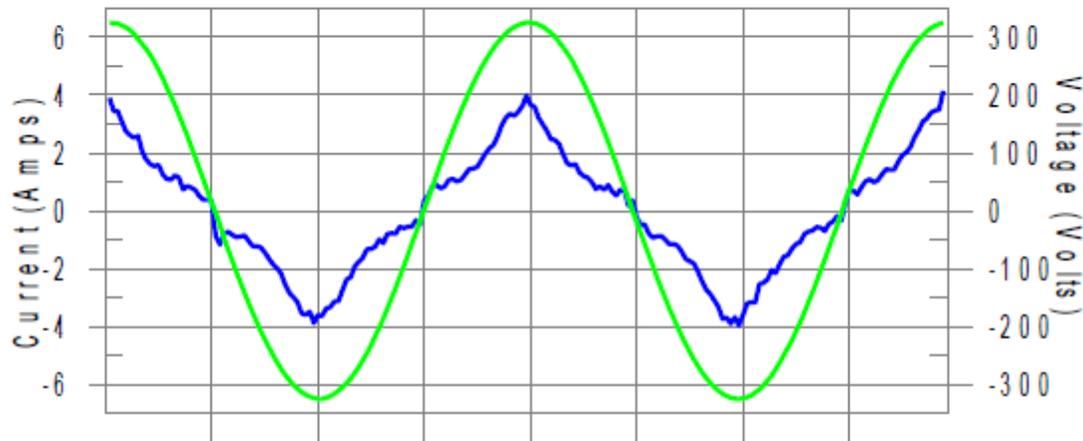
Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.039	0.460	8.45	OK
3	0.420	2.069	20.32	OK
4	0.020	0.460	4.37	OK
5	0.043	0.920	4.66	OK
6	0.020	0.460	4.37	OK
7	0.019	0.690	2.75	OK
8	0.015	0.460	3.37	OK
9	0.031	0.460	6.76	OK
10	0.014	0.460	3.06	OK
11	0.026	0.230	11.37	OK
12	0.018	0.230	7.87	OK
13	0.032	0.230	13.99	OK
14	0.012	0.230	5.10	OK
15	0.026	0.230	11.28	OK
16	0.010	0.230	4.41	OK
17	0.021	0.230	9.04	OK
18	0.014	0.230	5.89	OK
19	0.018	0.230	7.93	OK
20	0.013	0.230	5.46	OK
21	0.031	0.230	13.29	OK
22	0.011	0.230	4.72	OK
23	0.022	0.230	9.73	OK
24	0.011	0.230	4.72	OK
25	0.022	0.230	9.70	OK
26	0.010	0.230	4.55	OK
27	0.018	0.230	7.85	OK
28	0.011	0.230	4.58	OK
29	0.023	0.230	9.99	OK
30	0.012	0.230	5.22	OK
31	0.017	0.230	7.39	OK
32	0.013	0.230	5.66	OK
33	0.021	0.230	9.11	OK
34	0.012	0.230	5.26	OK
35	0.024	0.230	10.60	OK
36	0.012	0.230	5.16	OK
37	0.021	0.230	9.30	OK
38	0.014	0.230	5.92	OK
39	0.025	0.230	10.81	OK
40	0.016	0.230	7.03	OK

Mode 2:

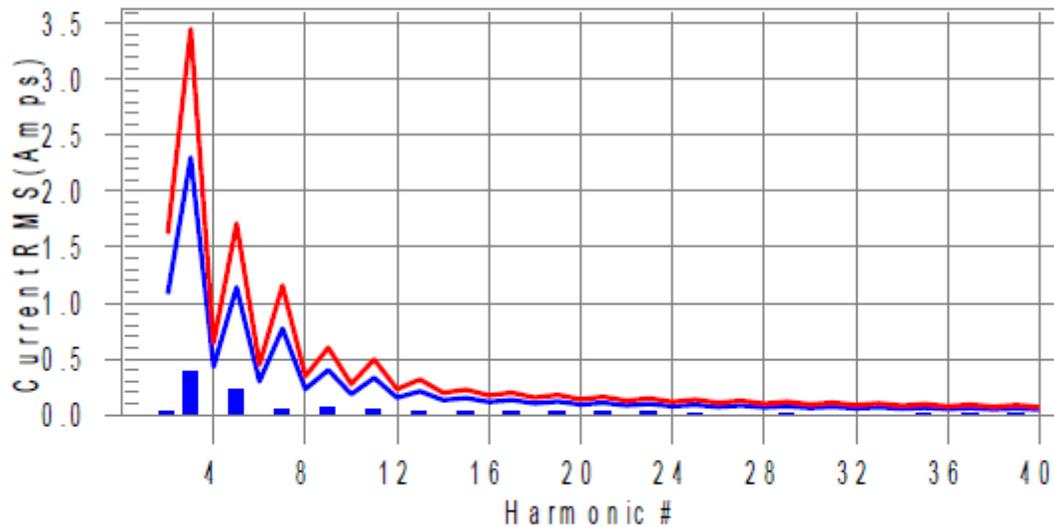
Harmonics – Class-A per Ed. 4.0 (2014)(Run time) incl. inter-harmonics

Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class A limit line European Limits



Test result: Pass Worst harmonics H39-21.1% of 150% limit, H39-27.9% of 100% limit

Current Test Result Summary (Run time)

Test Result: Pass **Source qualification: Normal**
 THC(A): 0.461 I-THD(%): 22.9 POHC(A): 0.057 POHC Limit(A): 0.251

Highest parameter values during test:

V _{RMS} (Volts): 229.97	Frequency(Hz): 50.00
I _{Peak} (Amps): 4.259	I _{RMS} (Amps): 2.068
I _{Fund} (Amps): 2.011	Crest Factor: 2.065
Power (Watts): 461.4	Power Factor: 0.971

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.035	1.080	3.3	0.037	1.620	2.3	Pass
3	0.378	2.300	16.4	0.380	3.450	11.0	Pass
4	0.010	0.430	N/A	0.011	0.645	N/A	Pass
5	0.232	1.140	20.4	0.235	1.710	13.7	Pass
6	0.010	0.300	N/A	0.012	0.450	N/A	Pass
7	0.042	0.770	5.4	0.044	1.155	3.8	Pass
8	0.011	0.230	N/A	0.013	0.345	N/A	Pass
9	0.056	0.400	14.1	0.058	0.600	9.7	Pass
10	0.010	0.184	N/A	0.012	0.276	N/A	Pass
11	0.039	0.330	11.8	0.041	0.495	8.3	Pass
12	0.009	0.153	N/A	0.010	0.230	N/A	Pass
13	0.036	0.210	17.0	0.038	0.315	12.1	Pass
14	0.010	0.131	N/A	0.012	0.197	N/A	Pass
15	0.024	0.150	15.8	0.025	0.225	11.3	Pass
16	0.010	0.115	N/A	0.011	0.173	N/A	Pass
17	0.029	0.132	22.1	0.031	0.198	15.4	Pass
18	0.010	0.102	N/A	0.012	0.153	N/A	Pass
19	0.022	0.118	18.2	0.023	0.178	13.0	Pass
20	0.009	0.092	N/A	0.011	0.138	N/A	Pass
21	0.028	0.107	26.0	0.029	0.161	18.3	Pass
22	0.010	0.084	N/A	0.012	0.125	N/A	Pass
23	0.021	0.098	21.3	0.024	0.147	16.1	Pass
24	0.010	0.077	N/A	0.012	0.115	N/A	Pass
25	0.018	0.090	20.5	0.020	0.135	15.1	Pass
26	0.010	0.071	N/A	0.012	0.107	N/A	Pass
27	0.014	0.083	17.1	0.016	0.125	12.7	Pass
28	0.010	0.066	N/A	0.012	0.099	N/A	Pass
29	0.016	0.078	21.2	0.018	0.116	15.8	Pass
30	0.011	0.061	N/A	0.014	0.092	N/A	Pass
31	0.014	0.073	19.0	0.016	0.109	14.7	Pass
32	0.011	0.058	N/A	0.012	0.086	N/A	Pass
33	0.015	0.068	22.3	0.019	0.102	18.6	Pass
34	0.011	0.054	N/A	0.012	0.081	N/A	Pass
35	0.016	0.064	25.3	0.018	0.096	18.4	Pass
36	0.010	0.051	N/A	0.012	0.077	N/A	Pass
37	0.017	0.061	27.7	0.019	0.091	20.6	Pass
38	0.012	0.048	N/A	0.013	0.073	N/A	Pass
39	0.016	0.058	27.9	0.018	0.087	21.1	Pass
40	0.007	0.046	N/A	0.009	0.069	N/A	Pass

Voltage Source Verification Data (Run time)

Test Result: Pass Source qualification: Normal

Highest parameter values during test:

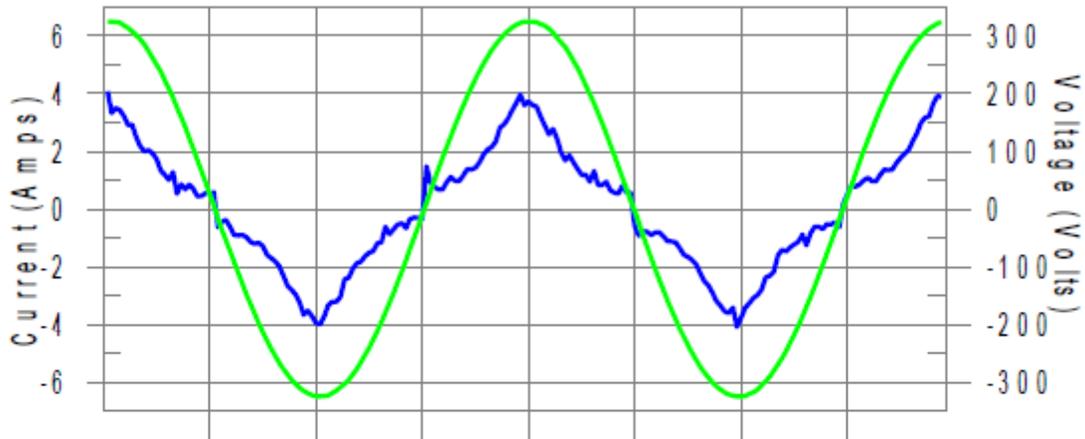
Voltage (Vrms): 229.97	Frequency(Hz): 50.00
I_Peak (Amps): 4.259	I_RMS (Amps): 2.068
I_Fund (Amps): 2.011	Crest Factor: 2.065
Power (Watts): 461.4	Power Factor: 0.971

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.026	0.460	5.72	OK
3	0.428	2.070	20.69	OK
4	0.020	0.460	4.31	OK
5	0.045	0.920	4.91	OK
6	0.019	0.460	4.06	OK
7	0.016	0.690	2.33	OK
8	0.019	0.460	4.22	OK
9	0.025	0.460	5.40	OK
10	0.013	0.460	2.77	OK
11	0.028	0.230	12.08	OK
12	0.021	0.230	9.07	OK
13	0.025	0.230	10.91	OK
14	0.012	0.230	5.08	OK
15	0.025	0.230	11.06	OK
16	0.011	0.230	4.67	OK
17	0.020	0.230	8.72	OK
18	0.016	0.230	6.84	OK
19	0.017	0.230	7.56	OK
20	0.014	0.230	5.96	OK
21	0.024	0.230	10.25	OK
22	0.011	0.230	4.73	OK
23	0.032	0.230	14.07	OK
24	0.010	0.230	4.54	OK
25	0.026	0.230	11.31	OK
26	0.010	0.230	4.16	OK
27	0.018	0.230	8.00	OK
28	0.008	0.230	3.56	OK
29	0.016	0.230	6.76	OK
30	0.011	0.230	4.93	OK
31	0.016	0.230	6.90	OK
32	0.011	0.230	4.87	OK
33	0.018	0.230	7.68	OK
34	0.010	0.230	4.34	OK
35	0.023	0.230	10.19	OK
36	0.009	0.230	3.85	OK
37	0.026	0.230	11.34	OK
38	0.014	0.230	5.92	OK
39	0.030	0.230	13.24	OK
40	0.015	0.230	6.52	OK

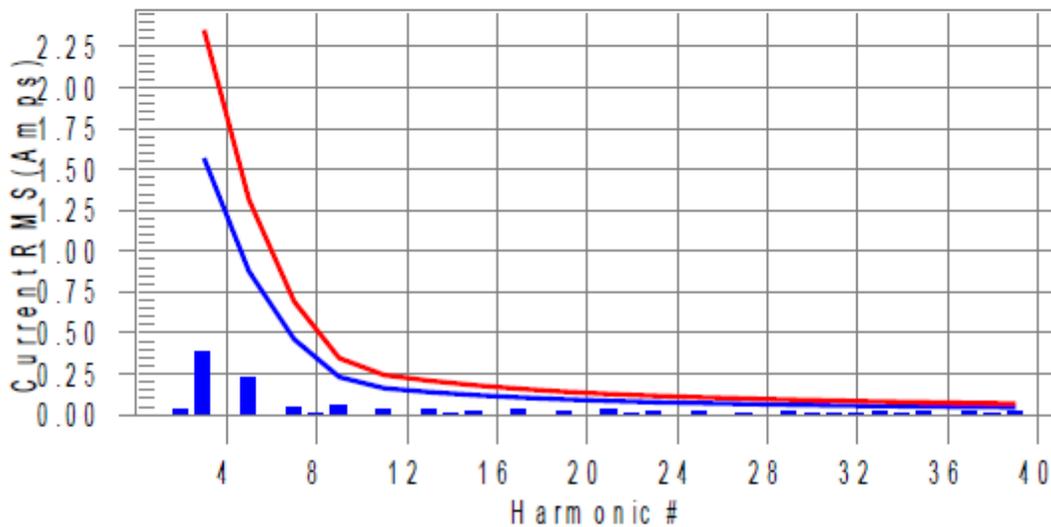
Harmonics – Class-D per Ed. 4.0 (2014)(Run time) incl. inter-harmonics

Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class D limit line European Limits



Test result: Pass Worst harmonics H39-29.2% of 150% limit, H39-33.8% of 100% limit

Current Test Result Summary (Run time)

Test Result: Pass Source qualification: Normal
 THC(A): 0.462 I-THD(%): 23.0 POHC(A): 0.056 POHC Limit(A): 0.198

Highest parameter values during test:

V RMS (Volts):	229.97	Frequency(Hz):	50.00
I Peak (Amps):	4.269	I RMS (Amps):	2.066
I Fund (Amps):	2.009	Crest Factor:	2.072
Power (Watts):	461.1	Power Factor:	0.971

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.035	0.000	N/A	0.037	0.000	N/A	Pass
3	0.380	1.568	24.2	0.383	2.352	16.3	Pass
4	0.010	0.000	N/A	0.012	0.000	N/A	Pass
5	0.231	0.876	26.4	0.233	1.314	17.8	Pass
6	0.010	0.000	N/A	0.013	0.000	N/A	Pass
7	0.040	0.461	8.8	0.043	0.692	6.2	Pass
8	0.011	0.000	N/A	0.014	0.000	N/A	Pass
9	0.056	0.231	24.1	0.058	0.346	16.8	Pass
10	0.010	0.000	N/A	0.012	0.000	N/A	Pass
11	0.038	0.161	23.7	0.040	0.242	16.7	Pass
12	0.009	0.000	N/A	0.011	0.000	N/A	Pass
13	0.035	0.138	25.1	0.037	0.208	17.9	Pass
14	0.011	0.000	N/A	0.013	0.000	N/A	Pass
15	0.023	0.120	19.5	0.025	0.180	14.1	Pass
16	0.010	0.000	N/A	0.012	0.000	N/A	Pass
17	0.029	0.106	27.2	0.031	0.159	19.3	Pass
18	0.009	0.000	N/A	0.011	0.000	N/A	Pass
19	0.021	0.094	22.2	0.023	0.140	16.1	Pass
20	0.008	0.000	N/A	0.012	0.000	N/A	Pass
21	0.028	0.084	32.7	0.029	0.127	23.0	Pass
22	0.011	0.000	N/A	0.013	0.000	N/A	Pass
23	0.020	0.077	26.2	0.023	0.116	19.9	Pass
24	0.010	0.000	N/A	0.012	0.000	N/A	Pass
25	0.019	0.071	26.5	0.020	0.107	19.2	Pass
26	0.010	0.000	N/A	0.011	0.000	N/A	Pass
27	0.013	0.066	19.9	0.016	0.099	16.2	Pass
28	0.009	0.000	N/A	0.013	0.000	N/A	Pass
29	0.016	0.061	25.7	0.018	0.092	19.2	Pass
30	0.012	0.000	N/A	0.013	0.000	N/A	Pass
31	0.013	0.057	23.2	0.017	0.086	20.2	Pass
32	0.011	0.000	N/A	0.013	0.000	N/A	Pass
33	0.016	0.053	29.0	0.018	0.080	22.1	Pass
34	0.011	0.000	N/A	0.012	0.000	N/A	Pass
35	0.017	0.051	33.1	0.021	0.076	27.0	Pass
36	0.010	0.000	N/A	0.014	0.000	N/A	Pass
37	0.015	0.048	32.2	0.019	0.072	25.7	Pass
38	0.011	0.000	N/A	0.013	0.000	N/A	Pass
39	0.015	0.046	33.8	0.020	0.068	29.2	Pass
40	0.007	0.000	N/A	0.008	0.000	N/A	Pass

Voltage Source Verification Data (Run time)

Test Result: Pass Source qualification: Normal

Highest parameter values during test:

Voltage (Vrms):	229.97	Frequency(Hz):	50.00
I Peak (Amps):	4.269	I RMS (Amps):	2.066
I Fund (Amps):	2.009	Crest Factor:	2.072
Power (Watts):	461.1	Power Factor:	0.971

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.026	0.460	5.71	OK
3	0.428	2.069	20.69	OK
4	0.020	0.460	4.31	OK
5	0.045	0.920	4.93	OK
6	0.017	0.460	3.69	OK
7	0.015	0.690	2.23	OK
8	0.025	0.460	5.49	OK
9	0.029	0.460	6.34	OK
10	0.013	0.460	2.89	OK
11	0.031	0.230	13.42	OK
12	0.020	0.230	8.80	OK
13	0.025	0.230	11.01	OK
14	0.011	0.230	4.76	OK
15	0.025	0.230	10.77	OK
16	0.017	0.230	7.39	OK
17	0.023	0.230	9.94	OK
18	0.015	0.230	6.31	OK
19	0.016	0.230	6.89	OK
20	0.016	0.230	7.04	OK
21	0.024	0.230	10.55	OK
22	0.010	0.230	4.37	OK
23	0.032	0.230	14.12	OK
24	0.014	0.230	6.24	OK
25	0.029	0.230	12.51	OK
26	0.010	0.230	4.47	OK
27	0.020	0.230	8.64	OK
28	0.013	0.230	5.76	OK
29	0.014	0.230	6.12	OK
30	0.011	0.230	4.71	OK
31	0.017	0.230	7.51	OK
32	0.013	0.230	5.68	OK
33	0.015	0.230	6.31	OK
34	0.010	0.230	4.47	OK
35	0.032	0.230	13.78	OK
36	0.013	0.230	5.71	OK
37	0.024	0.230	10.40	OK
38	0.011	0.230	4.89	OK
39	0.033	0.230	14.30	OK
40	0.014	0.230	6.13	OK

6.4. Voltage Fluctuation and Flick Measurement

6.4.1. Limits of Voltage Fluctuation and Flick

Test items	Limits	Descriptions
P_{st}	$\leq 1.0, T_p=10\text{min}$	short-term flicker indicator
P_{lt}	$\leq 0.65, T_p=2\text{h}$	long-term flicker indicator
d_c	$\leq 3.3\%$	relative steady-state voltage change
d_{max}	$\leq 4\%$ (or 6% ^{Note(1)} , 7% ^{Note(2)})	maximum relative voltage change:
$d_{(t)}$	$\leq 3.3\%$, more than 500ms	relative voltage change characteristic

Note:

(1)6 % for equipment which is:

- a. switched manually, or
- b. 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.

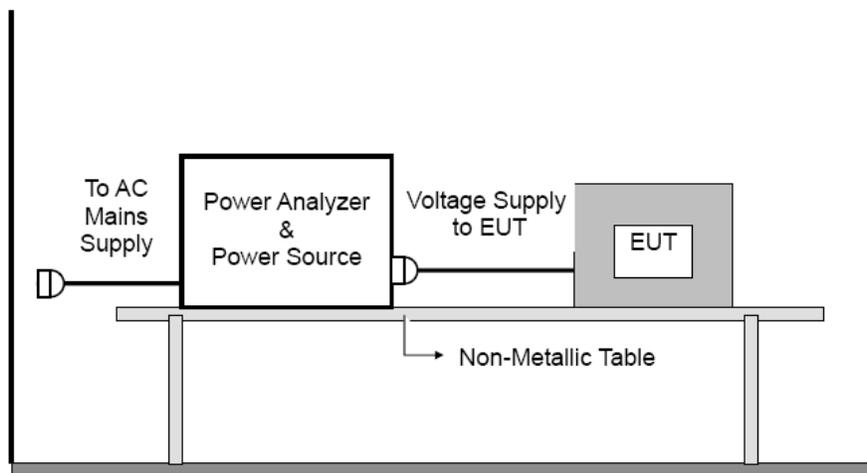
(2)7 % for equipment which is

- a. attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
- b. 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.

6.4.2. Test Procedure

- a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal conditions
- b. During the flick measurement, the measure time shall include that part of whole operation changes according to IEC/EN 61000-3-3 Annex A for each product type has different requirement.
- c. Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in Clause 6.0/4.0 of IEC/EN 61000-3-3 depend on which standard adopted for compliance measurement.
- d. All types of harmonic current and/or voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

6.4.3. Test Setup



For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

6.4.4. Test Condition

Test Mode:	Mode 1	Temperature:	23°C
Test Voltage:	230V/50Hz	Humidity:	60%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 15, 2019

Test Mode:	Mode 2	Temperature:	23°C
Test Voltage:	230V/50Hz	Humidity:	60%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 16, 2019

6.4.5. Test Result

Mode 1:

Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2013) (Run time)

Test Result: Pass

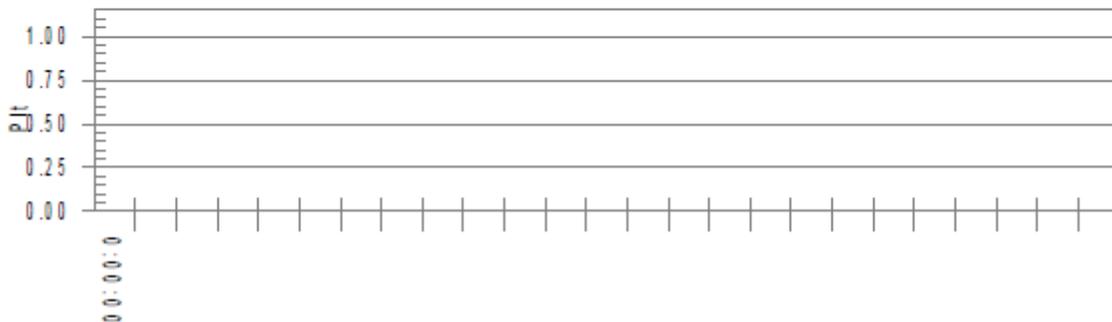
Status: Test Completed

Pst_t and limit line

European Limits



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	229.13		
Highest dt (%):	0.00	Test limit (%):	N/A
T-max (mS):	0	Test limit (mS):	500.0
Highest dc (%):	0.00	Test limit (%):	3.30
Highest dmax (%):	0.00	Test limit (%):	4.00
Highest Pst (10 min. period):	0.064	Test limit:	1.000
Highest Plt (2 hr. period):	0.028	Test limit:	0.650

Mode 2:

Flicker Test Summary per EN/IEC61000-3-3 Ed. 3.0 (2013) (Run time)

Test Result: Pass

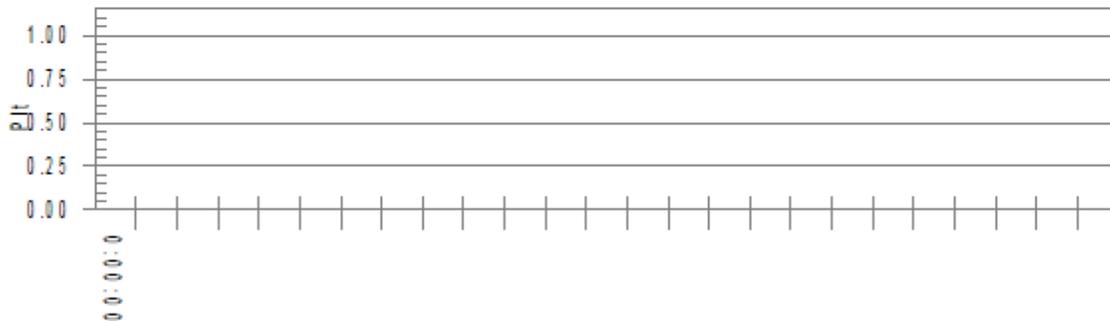
Status: Test Completed

Pst_t and limit line

European Limits



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt):	228.99		
Highest dt (%):	0.00	Test limit (%):	N/A
T-max (mS):	0	Test limit (mS):	500.0
Highest dc (%):	0.00	Test limit (%):	3.30
Highest dmax (%):	0.00	Test limit (%):	4.00
Highest Pst (10 min. period):	0.064	Test limit:	1.000
Highest Plt (2 hr. period):	0.028	Test limit:	0.650

7. IMMUNITY TEST

7.1. Performance Criteria

According to EN 55024 standard, the general performance criteria as following:

Criteria A	During and after the test the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a minimum performance level specified by the manufacturer when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. 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 by what the user may reasonably expect from the EUT if used as intended.
Criteria B	After the test, the EUT shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the EUT is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of 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 by what the user may reasonably expect from the EUT if used as intended.
Criteria C	During and after testing, a temporary loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls or cycling of the power to the EUT by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

7.2. Electrostatic Discharge Immunity Test

7.2.1. Test Specification

Standard:	EN 55024 (refer to IEC/EN 61000-4-2)
Discharge Impedance:	330(1±10%)Ω / 150(1±10%)pF
Discharge Voltage:	Air Discharge: ±2kV/±4kV/±8kV (Direct)
Polarity:	Contact Discharge: ±2kV/±4kV (Direct/Indirect) Positive and Negative
Discharge Mode of Operation:	Single discharges
Discharge Period:	1 second minimum

7.2.2. Test Procedure

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

- a. Contact discharge was applied to conductive surfaces and coupling planes of the EUT. During the test, it was performed with single discharges. For the single discharge time between successive single discharges was at least 1 second. On each pre-selected point at least 25 single discharges (in the most sensitive polarity) shall be applied. Test shall be performed at a maximum repetition rate of one discharge per second.

Vertical Coupling Plane (VCP):

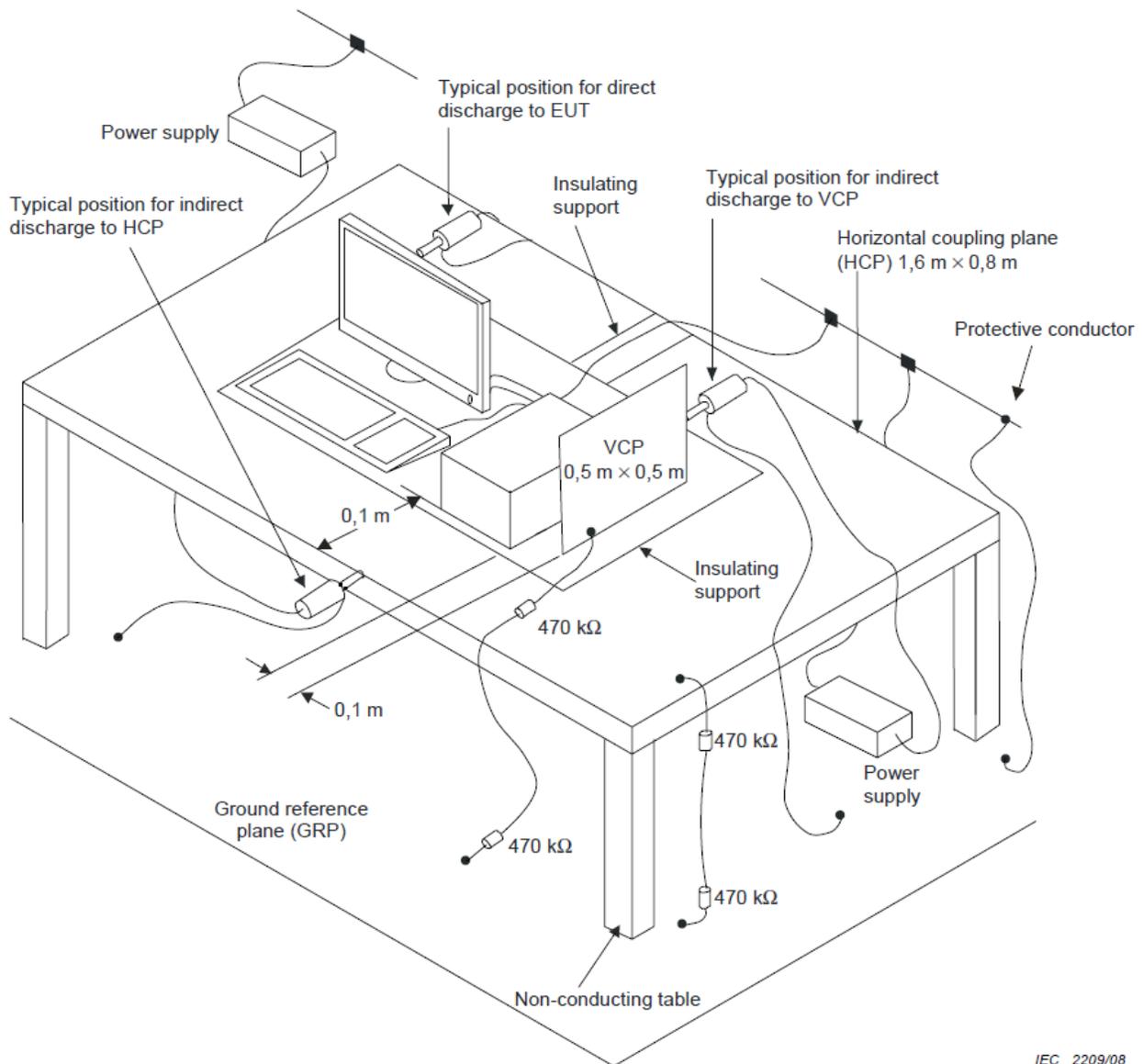
The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.

Horizontal Coupling Plane (HCP):

The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.

- b. Air discharges at insulation surfaces of the EUT.
It was at least 10 single discharges with positive and negative at the same selected point.
- c. For the actual test configuration, please refer to the related Item :EUT Test Photos.

7.2.3. Test Setup



IEC 2209/08

A distance of 0,8 m minimum shall be provided between the EUT and the walls of the laboratory and any other metallic structure.

For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

7.2.4. Test Result

Test Mode:	Mode 1	Temperature:	25°C
Test Voltage:	AC 230V/50Hz	Humidity:	46%RH
Discharge of times:	Air: 10 times Contact: 25 times	ATM pressure:	1018 hpa
Tested By:	Eric T. Fan	Test Date:	Jul. 16, 2019

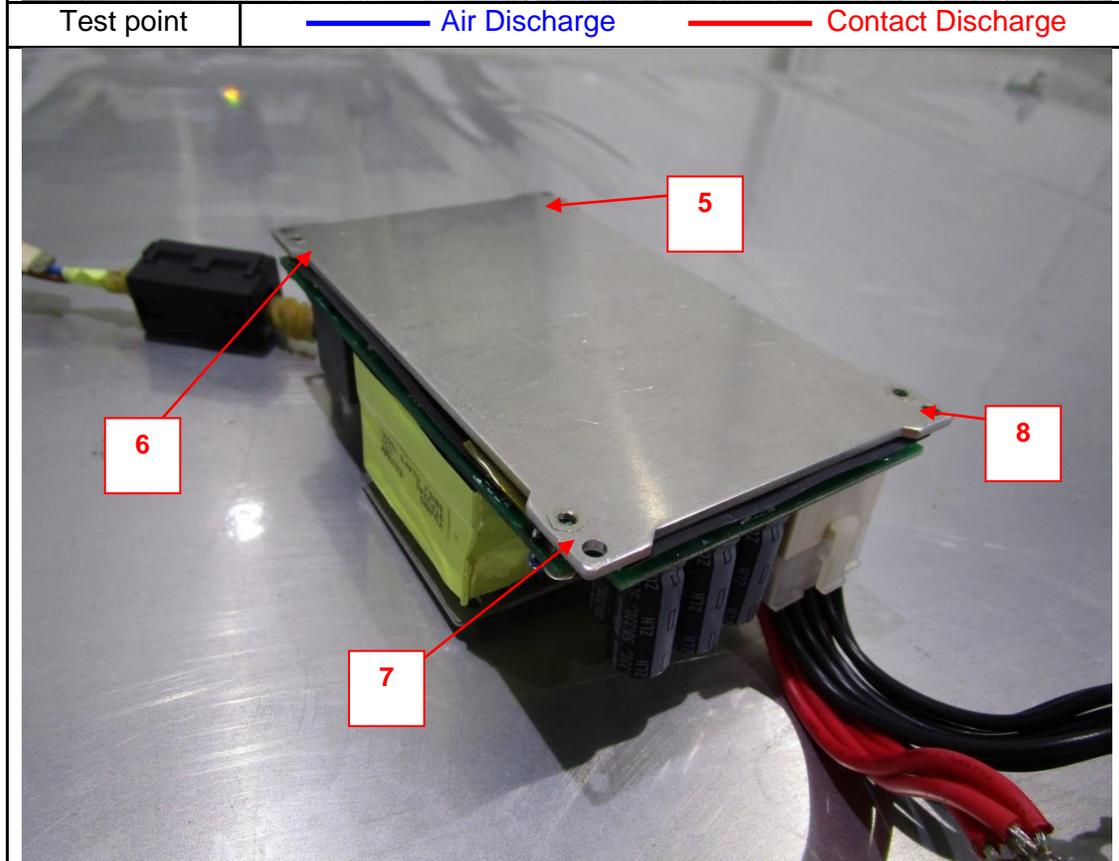
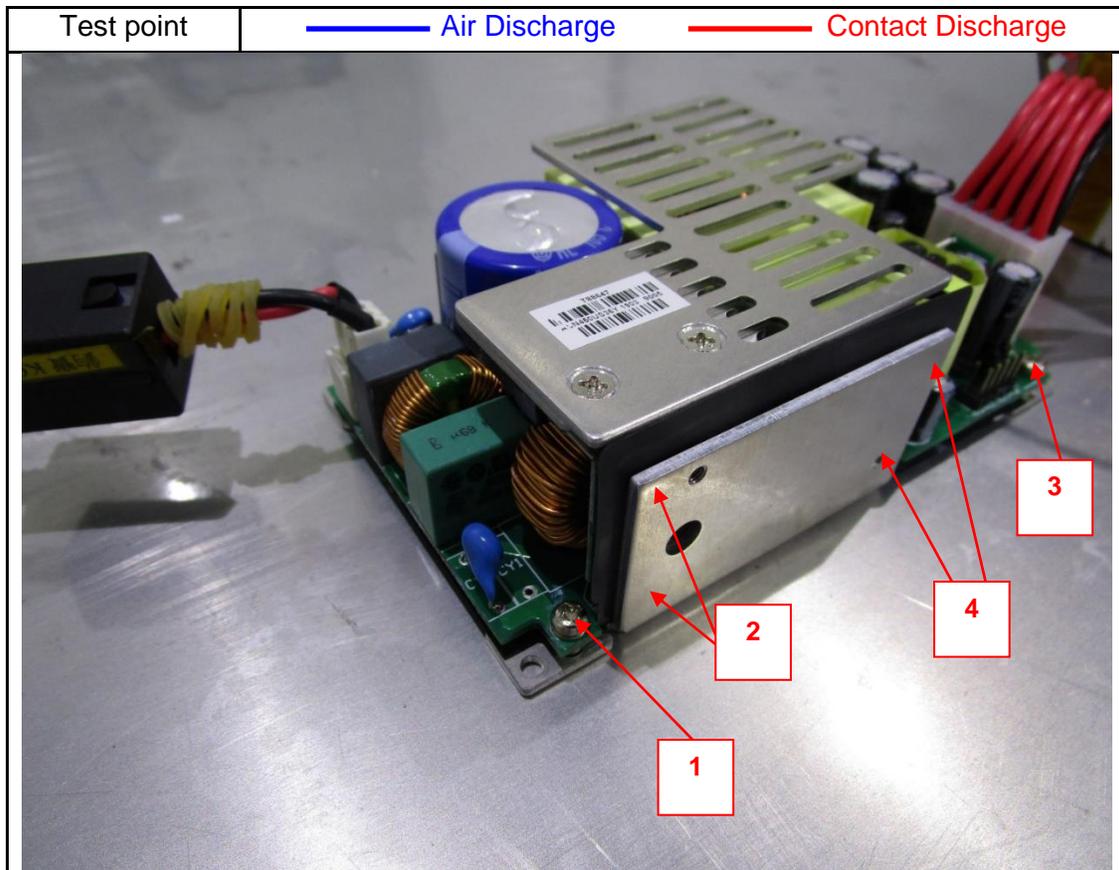
Mode	Air Discharge								Contact Discharge							
	2kV		4kV		8kV		-kV		2kV		4kV		-kV		-kV	
Location	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
1~8	-	-	-	-	-	-	-	-	A	A	A	A	-	-	-	-
Criteria	B								B							
Result	A								A							
Judgment	PASS															
Note	There was no abnormal situation during the test compared with initial operation.															

Mode	HCP Discharge								VCP Discharge							
	2kV		4kV		-kV		-kV		2kV		4kV		-kV		-kV	
Location	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
front	A	A	A	A	-	-	-	-	A	A	A	A	-	-	-	-
rear	A	A	A	A	-	-	-	-	A	A	A	A	-	-	-	-
left	A	A	A	A	-	-	-	-	A	A	A	A	-	-	-	-
right	A	A	A	A	-	-	-	-	A	A	A	A	-	-	-	-
Criteria	B				-				B				-			
Result	A				-				A				-			
Judgment	PASS															
Note	There was no abnormal situation during the test compared with initial operation.															

Customer request:

Mode	Air Discharge								Contact Discharge							
	2kV		4kV		8kV		-kV		2kV		4kV		8kV		-kV	
Location	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
1~8	-	-	-	-	-	-	-	-	-	-	-	-	A	A	-	-
Criteria	B								B							
Result	A								A							
Judgment	PASS															
Note	There was no abnormal situation during the test compared with initial operation.															

Mode	HCP Discharge								VCP Discharge							
	2kV		4kV		8kV		-kV		2kV		4kV		8kV		-kV	
Location	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
front	-	-	-	-	A	A	-	-	-	-	-	-	A	A	-	-
rear	-	-	-	-	A	A	-	-	-	-	-	-	A	A	-	-
left	-	-	-	-	A	A	-	-	-	-	-	-	A	A	-	-
right	-	-	-	-	A	A	-	-	-	-	-	-	A	A	-	-
Criteria	B								B							
Result	A								A							
Judgment	PASS															
Note	There was no abnormal situation during the test compared with initial operation.															



7.3. Radio Frequency Electromagnetic Field Immunity Test

7.3.1. Test Specification

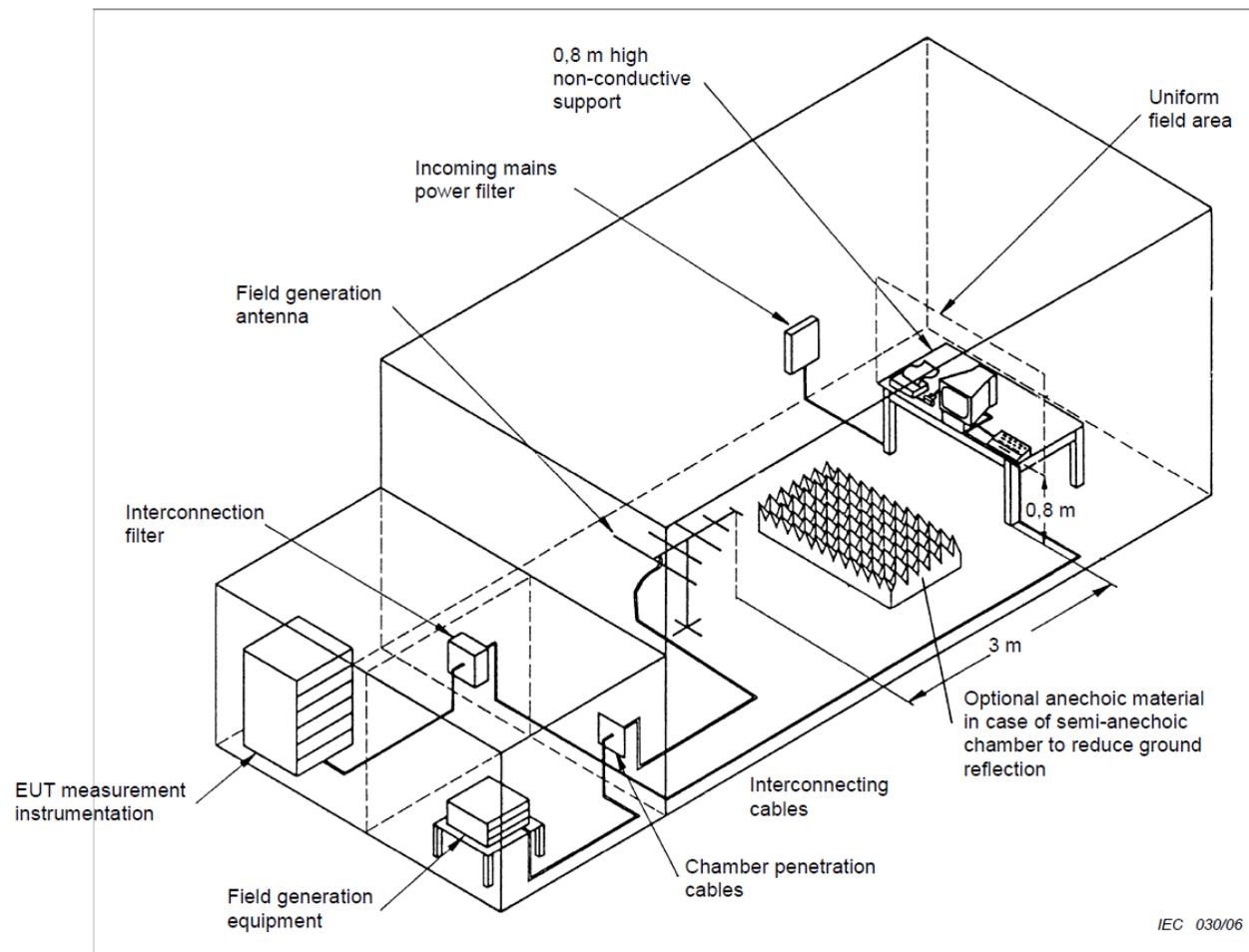
Standard:	EN 55024 (refer to IEC/EN 61000-4-3)
Frequency Range:	80 MHz to 1000MHz
Field Strength:	3V/m (unmodulated)
Modulation:	80%, AM(1 KHz)
Frequency Step:	1%
Polarity of Antenna	Vertical and Horizontal
Test Distance:	3 meters
Antenna Height:	1.55 meters
Dwell Time:	3 s

7.3.2. Test Procedure

The test procedure was in accordance with IEC/EN 61000-4-3.

- a. The testing was performed in a fully anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
- b. The frequency range is swept from 80 MHz to 1000MHz with the signal 80% amplitude modulated with a 1 KHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- d. The field strength level 80 MHz to 1000MHz was 3V/m.
- e. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

7.3.3. Test Setup



For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

7.3.4. Test Result

Test Mode:	Mode 1	Temperature:	25°C
Test Voltage:	AC 230V/50Hz	Humidity:	58%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 16, 2019

Freq. Range (MHz)	Position (Face)	Polarity (H or V)	Field Strength (V/m)	Criterion	Results	Judgment
80-1000	Front	H / V	3V/m	A	A	PASS
80-1000	Left	H / V	3V/m	A	A	PASS
80-1000	Right	H / V	3V/m	A	A	PASS
80-1000	Rear	H / V	3V/m	A	A	PASS
Note	There was no abnormal situation during the test compared with initial operation.					

7.4. Electrical Fast Transient/Burst Immunity Test

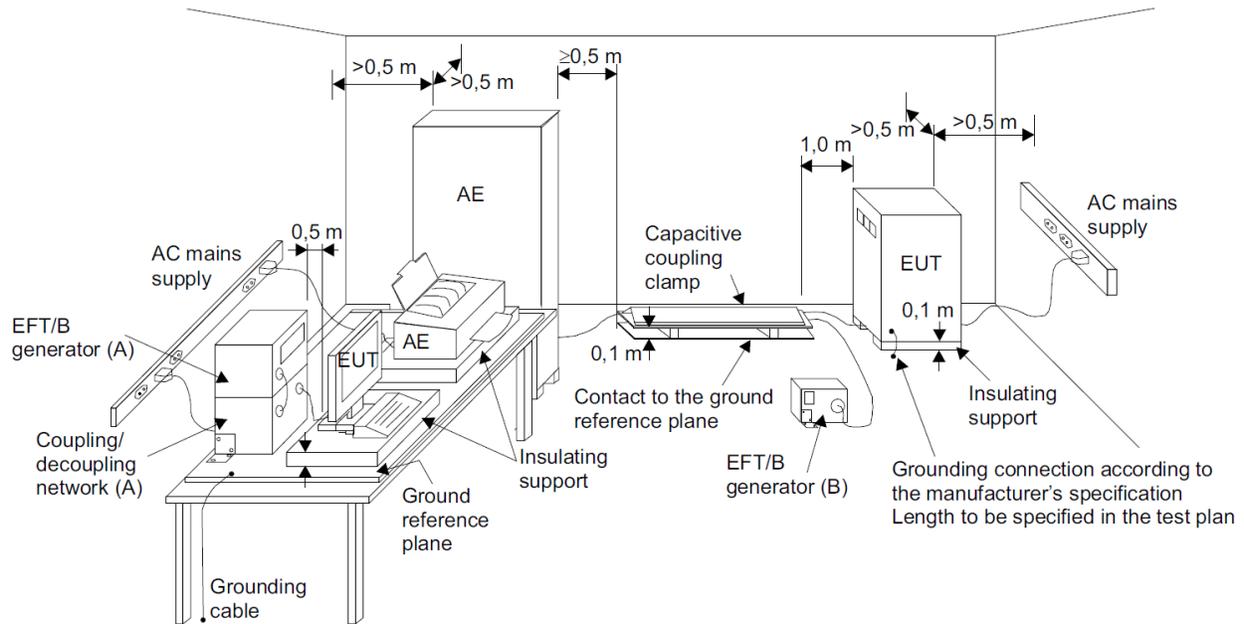
7.4.1. Test Specification

Standard:	EN 55024 (refer to IEC/EN 61000-4-4)
Test Voltage:	0.5,1 KV(Peak)
Polarity:	Positive and Negative
Impulse Frequency:	5 or 100 KHz
Impulse wave shape:	5/50 Tr/Th ns
Burst Duration:	15ms or 0.75ms
Burst Period:	300ms
Test Duration:	1 Minute

7.4.2. Test Procedure

- a. The EUT was tested with 1000 volt discharges to the AC power input leads, 500 volt discharges to the signal/control ports.
- b. Both positive and negative polarity discharges were applied.
- c. Table-top equipment and equipment normally mounted on ceilings or walls as well as built-in equipment shall be tested with the EUT located $(0,1 \pm 0,01)$ m above the ground reference plane.
- d. The EUT and the auxiliary equipment were placed on a table of 0.8 m heights above a metal ground reference plane. The size of ground plane is greater than 0.8m×1m and project beyond the EUT by at least 0.1m on all sides. The ground plane is connected to the protective earth. The minimum distance between the EUT and all other conductive structures (including the generator, AE and the walls of a shielded room), except the ground reference plane, shall be more than 0,5 m.
- e. The duration time of each test sequential was 1 minute.
- f. The transient/burst waveform was in accordance with IEC/EN 61000-4-4, 5/50ns.

7.4.3. Test Setup



IEC 645/12

- (A) location for supply line coupling
- (B) location for signal lines coupling

For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

7.4.4. Test Result

Test Mode:	Mode 1	Temperature:	25°C
Test Voltage:	AC 230V/50Hz	Humidity:	58%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 16, 2019

Test Port		Test Levels (kV)						Criteria	Result	Judgment
		+0.5	-0.5	+1.0	-1.0	-	-			
AC power port	L	-	-	A	A	-	-	B	A	PASS
	N	-	-	A	A	-	-	B	A	
	L + N	-	-	A	A	-	-	B	A	
Note		There was no abnormal situation during the test compared with initial operation.								

Customer request:

Test Port		Test Levels (kV)						Criteria	Result	Judgment
		+0.5	-0.5	+1.0	-1.0	+2.0	-2.0			
AC power port	L	-	-	-	-	A	A	B	A	PASS
	N	-	-	-	-	A	A	B	A	
	L + N	-	-	-	-	A	A	B	A	
Note		There was no abnormal situation during the test compared with initial operation.								

7.5. Surge Immunity Test

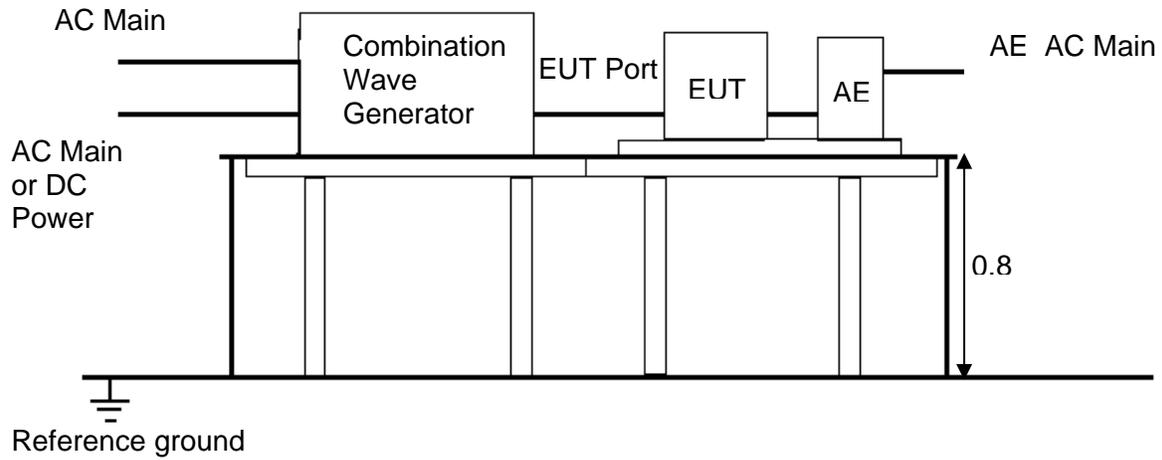
7.5.1. Test Specification

Standard:	EN 55024 (refer to IEC/EN 61000-4-5)
Waveform:	1.2/50 (8/20) Tr/Th μ s , 10/700 Tr/Th μ s
Test Voltage:	0.5,1 KV(Line to Line) 0.5,1,2 KV(Line to Earth)
Polarity:	Positive and Negative
Phase Angle:	0°/90°/180°/270°
Repetition Rate:	1 per minute
Times:	5 times each polarity

7.5.2. Test Procedure

- a. The EUT and the auxiliary equipment were placed on a table of 0.8m heights above a metal ground reference plane. The size of ground plane is greater than 1m \times 1m and project beyond the EUT by at least 0.1m on all sides. The ground plane is connected to the protective earth. The length of power cord between the coupling device and the EUT shall not exceed 2 meters (provided by the manufacturer).
- b. The EUT was connected to the power mains through a coupling device that directly couples the surge interference signal. The surge noise was applied synchronized to the voltage phase at the zero crossing and the peak value of the AC voltage wave (positive and negative).
- c. The surges were applied line to line and line(s) to earth. When testing line to earth the test voltage was applied successively between each of the lines and earth. Steps up to the test level specified increased the test voltage. All lower levels including the selected test level were tested. The polarity of each surge level included positive and negative test pulses.
- d. If EUT was included telecom port and connected to outdoor directly, test shall be applied to line to earth test using 10/700 surge wave form. If the wave form affects the functioning of high speed data port, the test shall be carried out using 1.2/50 wave form do the test.

7.5.3. Test Setup



For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

7.5.4. Test Result

Test Mode:	Mode 1	Temperature:	25°C
Test Voltage:	AC 230V/50Hz	Humidity:	58%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 16, 2019

Wave Form EUT Ports Tested	1.2/50(8/20)Ti/Th us						Criteria	Results	Judgment
	Polarity	Phase	Voltage						
			0.5kV	1kV	2kV	-kV			
L - N	+	0°	A	A	-	-	B	A	PASS
	-		A	A	-	-			
	+	90°	A	A	-	-			
	-		A	A	-	-			
	+	180°	A	A	-	-			
	-		A	A	-	-			
	+	270°	A	A	-	-			
	-		A	A	-	-			
Note	There was no abnormal situation during the test compared with initial operation.								

7.6. Immunity to Conducted Disturbances Induced by RF Fields

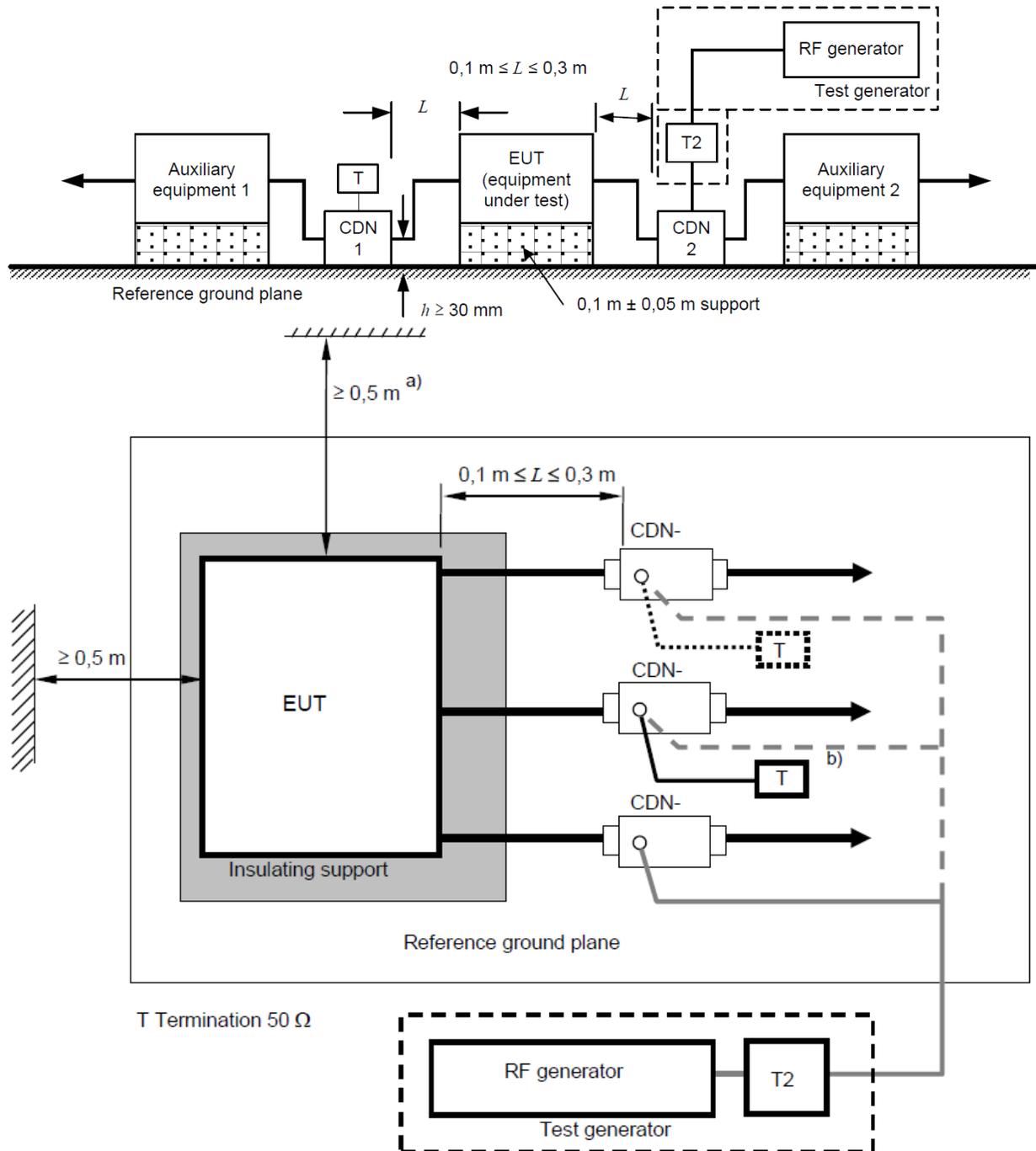
7.6.1. Test Specification

Standard:	EN 55024 (refer to IEC/EN 61000-4-6)
Frequency Range:	0.15-80MHz
Field Strength:	3V (unmodulated, r.m.s.)
Modulation:	80% AM (1 kHz)
Frequency Step:	1%
Dwell Time:	3s

7.6.2. Test Procedure

- a. The EUT shall be tested within its intended operating and climatic conditions.
- b. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.
- c. The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80% amplitude. The signal is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value where the frequency is swept incrementally.
- d. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequencies and harmonics or frequencies of dominant interest, shall be analyzed separately.
- e. Attempts should be made to fully exercise the EUT during test, and to fully interrogate all exercise modes selected for susceptibility.

7.6.3. Test Setup



- a) The EUT clearance from any metallic objects other than test equipment shall be at least 0,5 m.
- b) Only one of the CDNs not used for injection shall be terminated with 50 Ω, providing only a return path. All other CDNs shall be configured as decoupling networks.

For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

7.6.4. Test Result

Test Mode:	Mode 1	Temperature:	25°C
Test Voltage:	AC 230V/50Hz	Humidity:	58%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 26, 2019

Test Ports (Mode)	Freq. Range (MHz)	Field Strength	CDN	Criteria	Results	Judgment
AC Power Port	0.15 --- 80	3V(rms) AM Modulated 1000Hz, 80%	M016(M2)	A	A	PASS
Note	There was no abnormal situation during the test compared with initial operation.					

Customer request:

Test Ports (Mode)	Freq. Range (MHz)	Field Strength	CDN	Criteria	Results	Judgment
AC Power Port	0.15 --- 80	20V(rms) AM Modulated 1000Hz, 80%	M016(M2)	A	A	PASS
Note	There was no abnormal situation during the test compared with initial operation.					

7.7. Power frequency magnetic field immunity Test

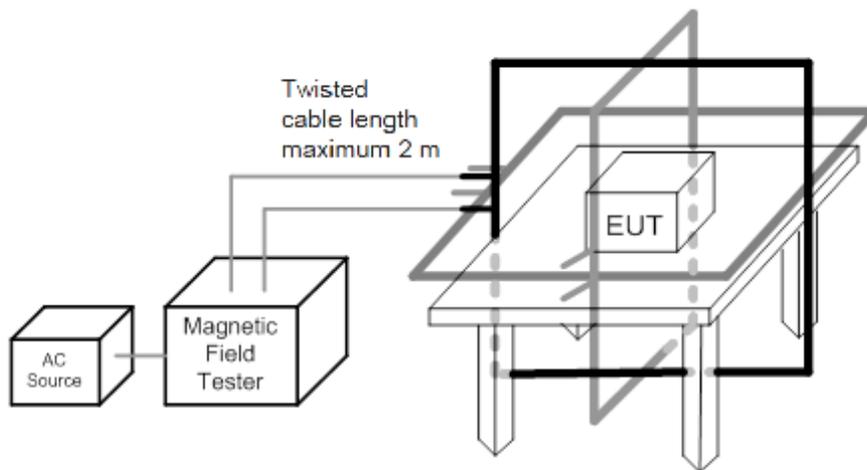
7.7.1. Test Specification

Standard:	EN 55024 (refer to IEC/EN 61000-4-8)
Frequency Range:	50/60Hz
Field Strength:	1 A/m
Observation Time:	1 minute
Inductance Coil:	Rectangular type, 1m x 1m

7.7.2. Test Procedure

- a. The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.
- b. The equipment cabinets shall be connected to the safety earth directly on the GRP via the earth terminal of the EUT.
- c. The cables supplied or recommended by the equipment manufacturer shall be used 1 meter of all cables used shall be exposed to the magnetic field.
- d. The EUT with coil shall be leave all magnetic material and wall 1m away in any axis during the test.
- e. The cable length from generator to coil shall be less than 2m
- f. The background noise shall be 20dB less than test field strength.
- g. Test shall be applied to three axis X, Y, Z and disturbance over 1 minute.
- h. All cables shall be exposed to the magnetic field for 1m of their length.

7.7.3. Test Setup



Note:

TABLE-TOP EQUIPMENT

The equipment shall be subjected to the test magnetic field by using the induction coil of standard dimension (1 m x 1 m). The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

FLOOR-STANDING EQUIPMENT

The equipment shall be subjected to the test magnetic field by using induction coils of suitable dimensions. The test shall be repeated by moving and shifting the induction coils, in order to test the whole volume of the EUT for each orthogonal direction. The test shall be repeated with the coil shifted to different positions along the side of the EUT, in steps corresponding to 50% of the shortest side of the coil. The induction coil shall then be rotated by 90 degrees in order to expose the EUT to the test field with different orientations.

For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

7.7.4. Test Results

Test Mode:	Mode 1	Temperature:	25°C
Test Voltage:	AC 230V/50Hz	Humidity:	58%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 16, 2019

Level	Magnetic Field Strength (A/m)	Criterion	Results			Judgment
			X	Y	Z	
1	1	A	A	A	A	PASS
2	3	/	/	/	/	
3	10	/	/	/	/	
4	30	/	/	/	/	
5	100	/	/	/	/	
X	Special	/	/	/	/	
Note	There was no abnormal situation during the test compared with initial operation.					

Customer request:

Level	Magnetic Field Strength (A/m)	Criterion	Results			Judgment
			X	Y	Z	
1	1	/	/	/	/	PASS
2	3	/	/	/	/	
3	10	/	/	/	/	
4	30	A	A	A	A	
5	100	/	/	/	/	
X	Special	/	/	/	/	
Note	There was no abnormal situation during the test compared with initial operation.					

7.8. Voltage Dips and Short Interruptions Immunity Test

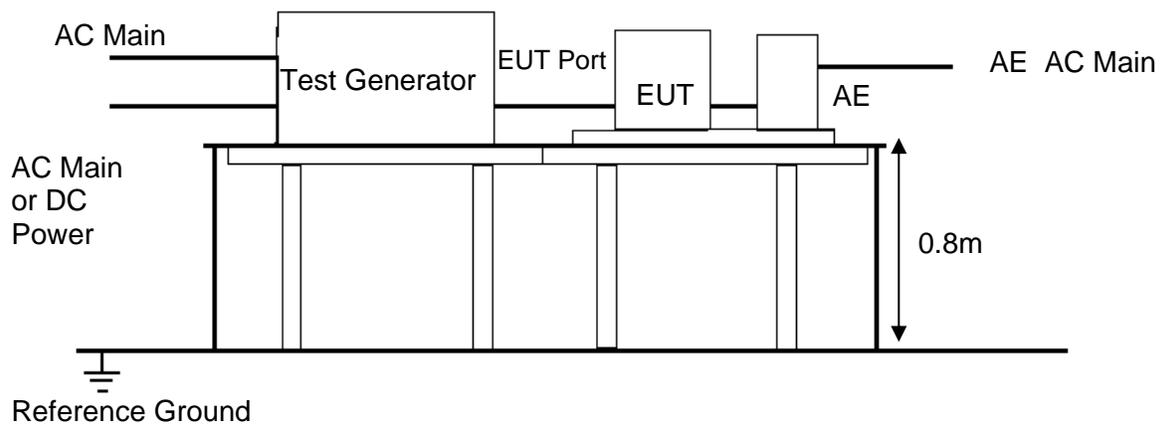
7.8.1. Test Specification

Standard:	EN 55024 (refer to IEC/EN 61000-4-11)
Voltage Dips:	>95% reduction ; 30% reduction
Voltage Interruptions:	>95%
Voltage Phase Angle:	0°/45°/90°/135°/180°/225°/270°/315°

7.8.2. Test Procedure

- The power cord was used as supplied by the manufacturer. The EUT was connected to the line output of the Voltage Dips and Interruption Generator.
- For voltage dips, changes in supply voltage shall occur at zero crossings of the voltage, and at additional angles considered critical by product committees or individual product specifications preferably selected from 45°, 90°, 135°, 180°, 225°, 270° and 315° on each phase.
- For short interruptions, the angle shall be defined by the product committee as the worst case. In the absence of definition, it is recommended to use 0° for one of the phases.

7.8.3. Test Setup



For the actual test configuration, please refer to Appendix I: Photographs of the Test Configuration.

7.8.4. Test Result

Test Mode:	Mode 1	Temperature:	25°C
Test Voltage:	AC 100V/50Hz, 240V/50Hz	Humidity:	58%RH
Tested By:	Eric T. Fan	Test Date:	Jul. 16, 2019

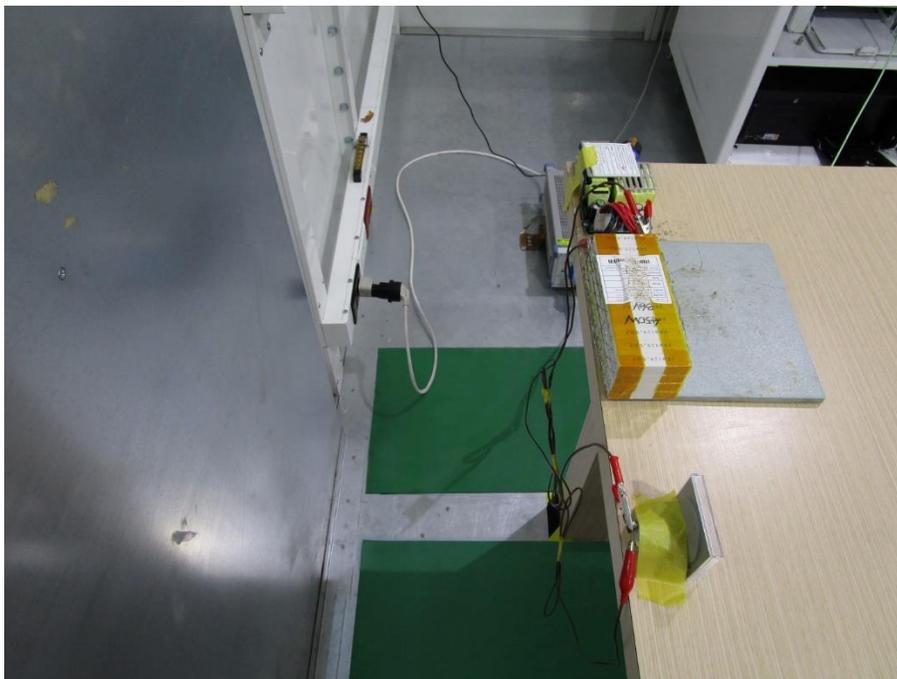
100V/50Hz					
Interruption & Dips	Duration (T)	Reduction voltage	Perform Criteria	Results	Judgment
Voltage dips	0.5	>95%	B	A	PASS
	25	30%	C	A	
Voltage interruptions	250	>95%	C	B	
Note	Results A: The equipment continue to operate as intended without operator intervention. Results C: The EUT was shut down during the test, but it will automatically return to normal conditions after the test.				

240V/50Hz					
Interruption & Dips	Duration (T)	Reduction voltage	Perform Criteria	Results	Judgment
Voltage dips	0.5	>95%	B	A	PASS
	25	30%	C	A	
Voltage interruptions	250	>95%	C	B	
Note	Results A: The equipment continue to operate as intended without operator intervention. Results B: The EUT was shut down during the test, but it will automatically return to normal conditions after the test.				

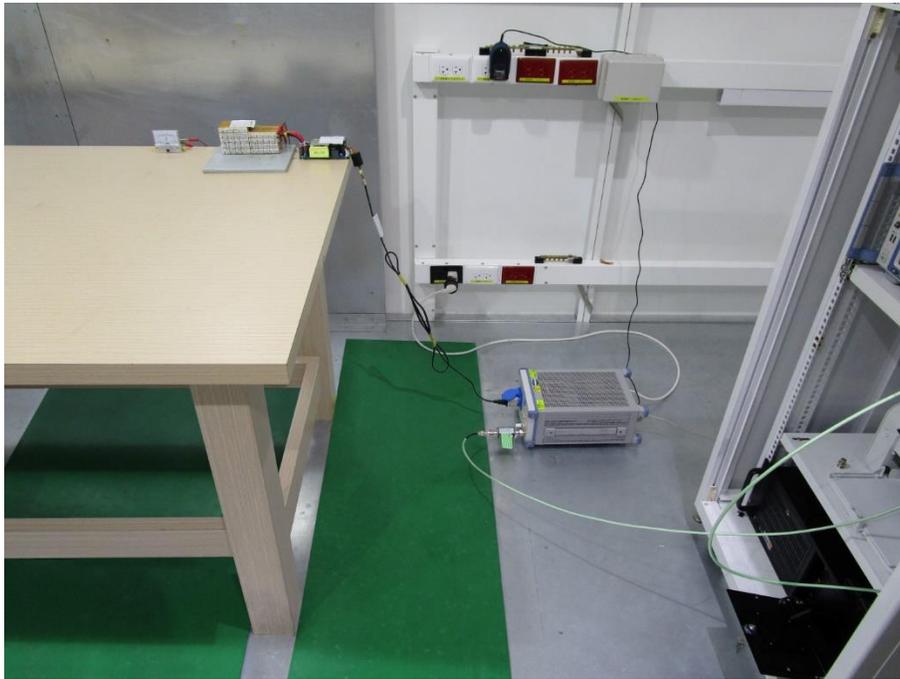
Appendix I: Photographs of EMC Test Configuration

Conducted Disturbance

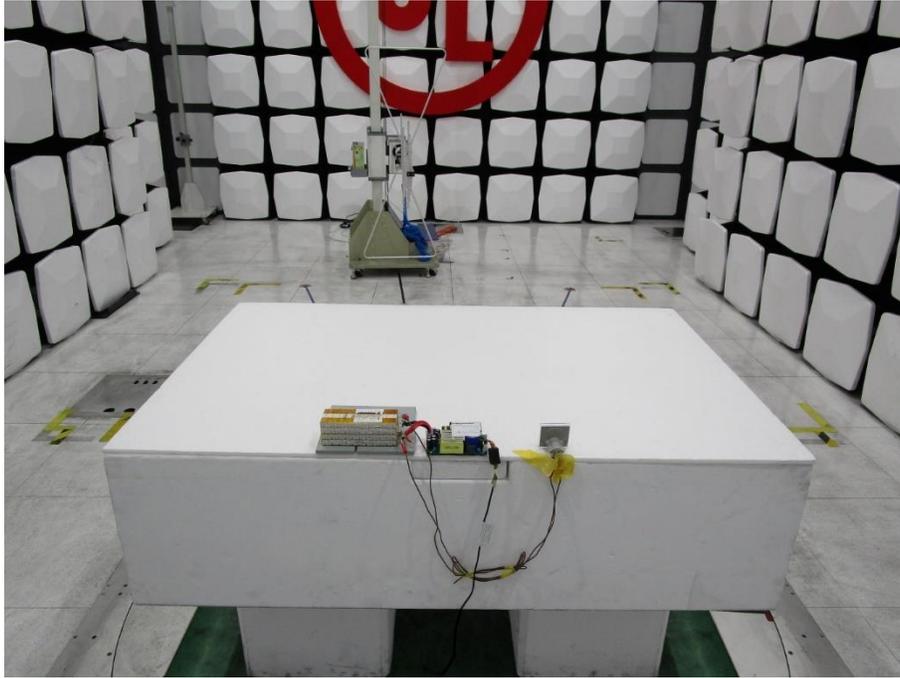
Mode 1



Mode 2



Radiated Disturbance
Below 1GHz
Mode 1

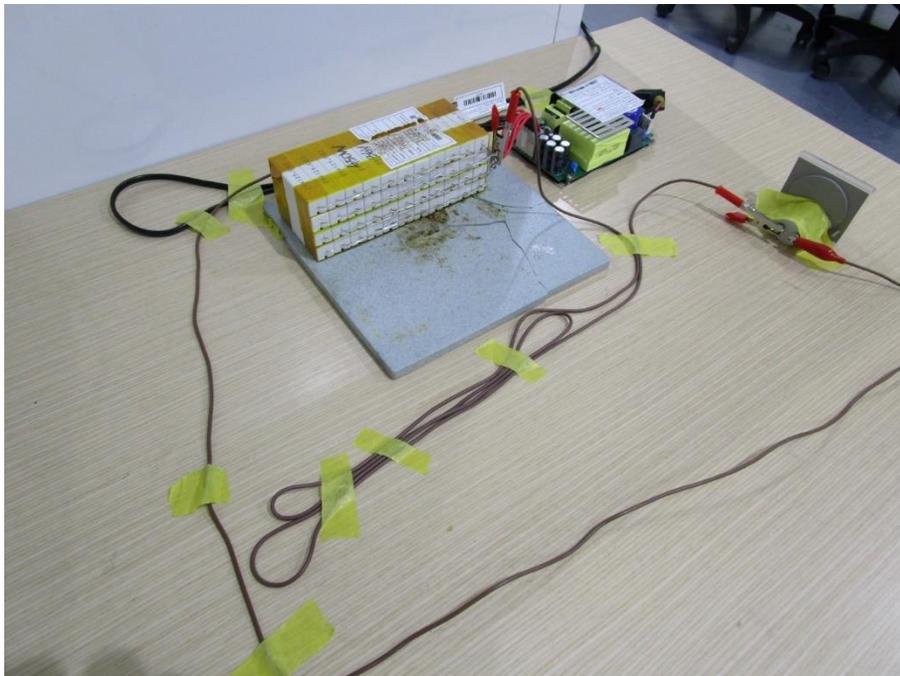


Mode 2

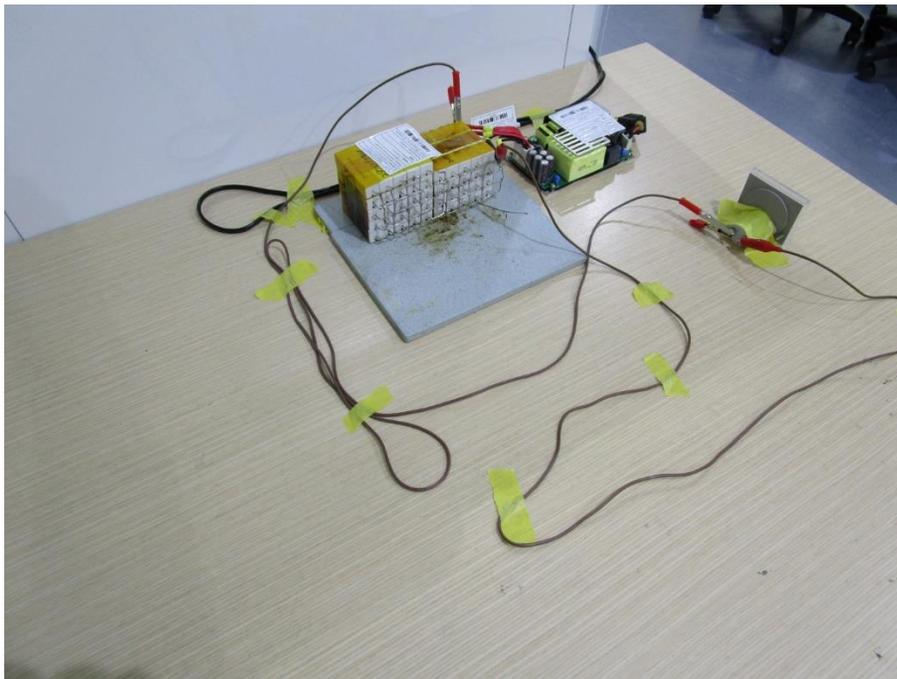


Harmonic and Flicker

Mode 1

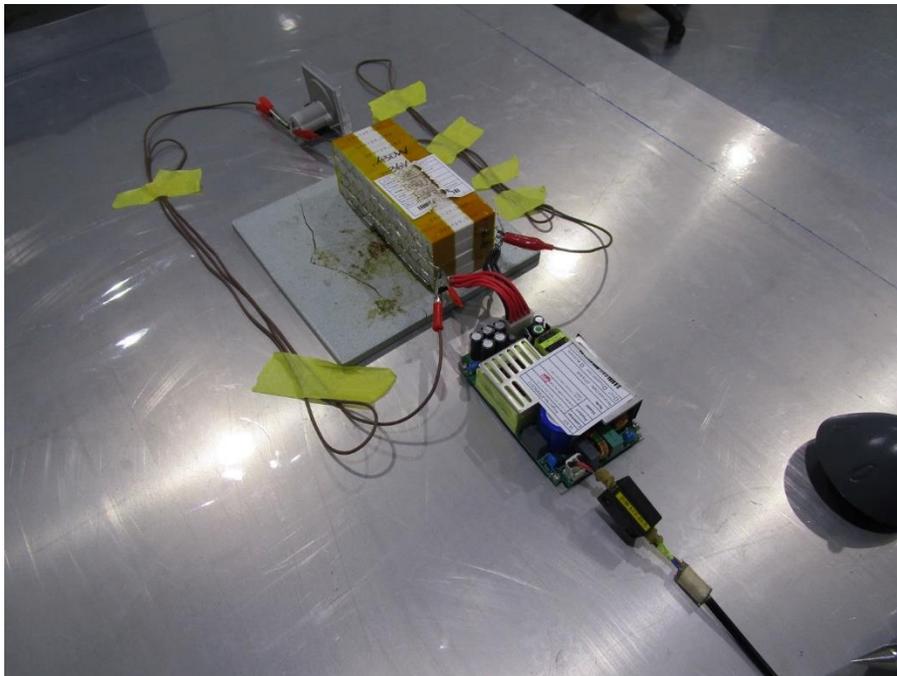


Mode 2



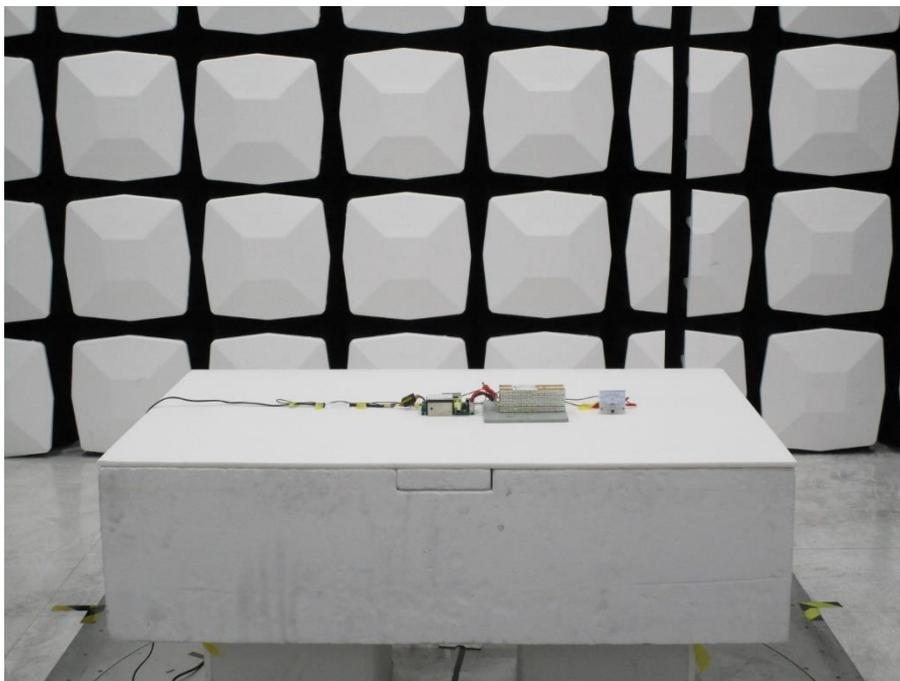
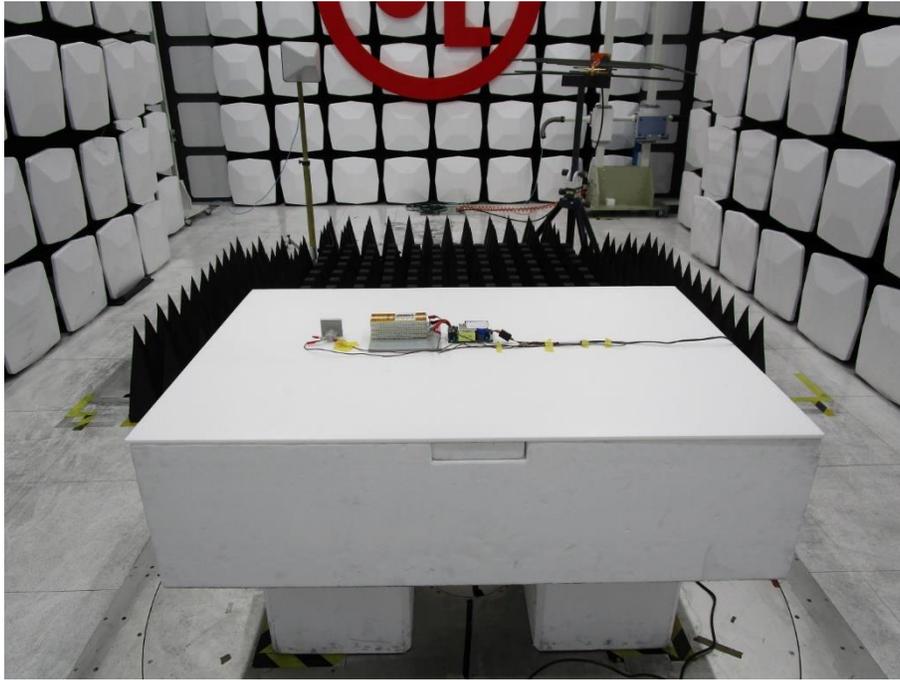
Electrostatic Discharge Immunity

Mode 1



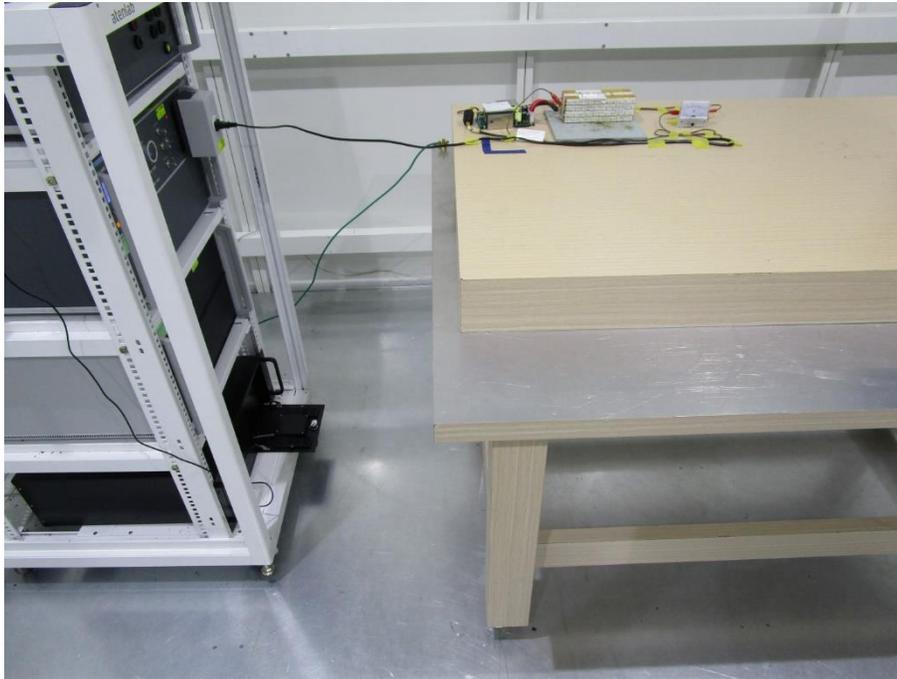
Radio Frequency Electromagnetic Field Immunity

Mode 1



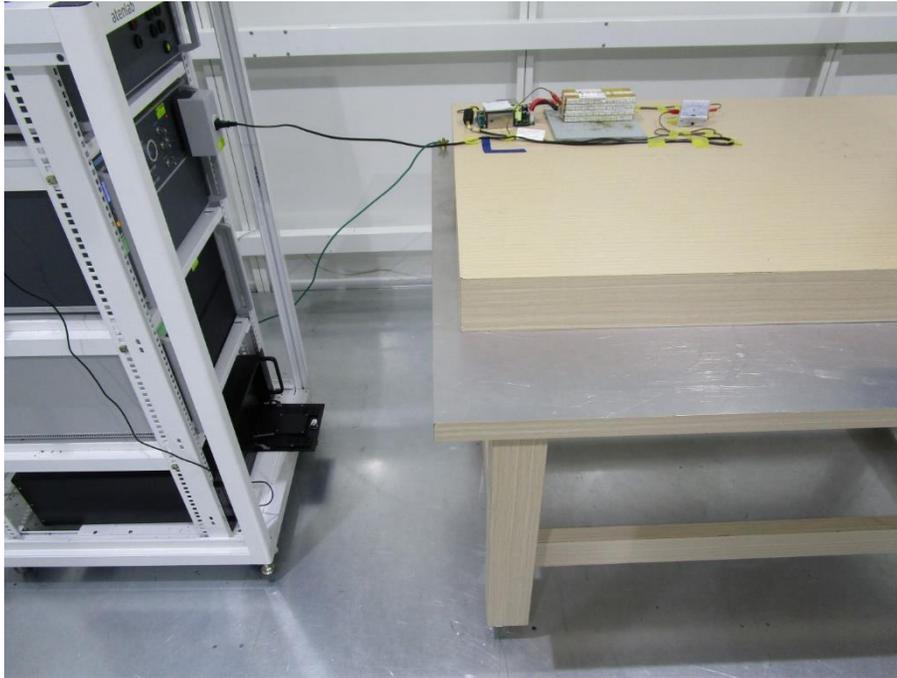
Electrical Fast Transient

Mode 1



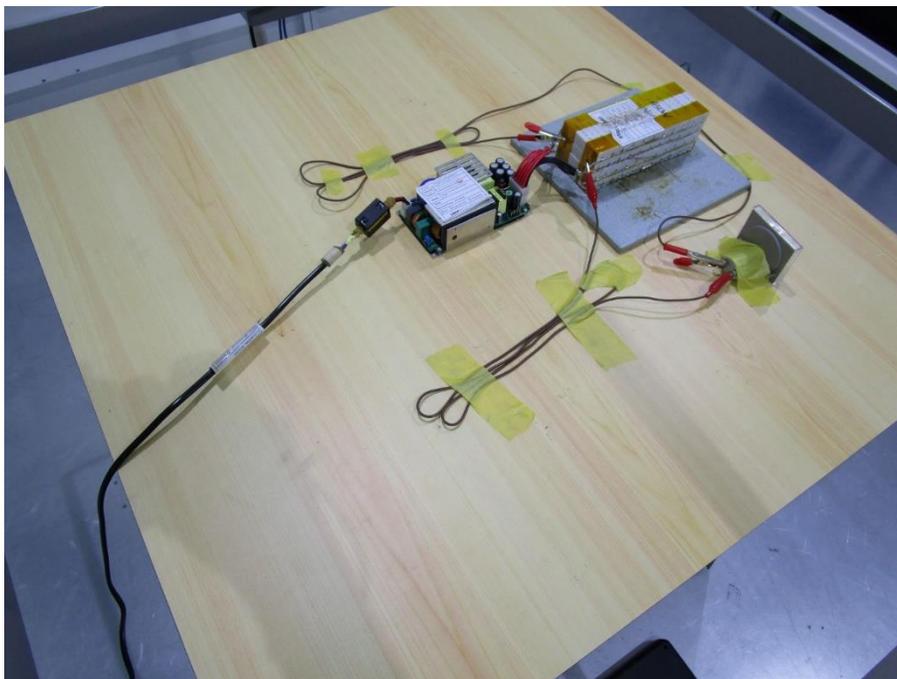
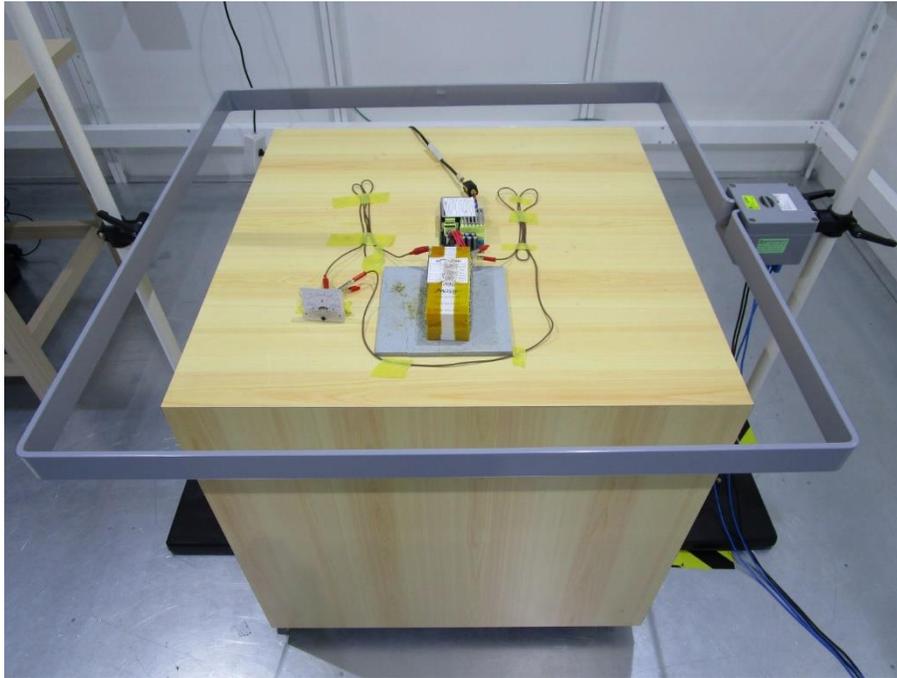
Surge/ Voltage Dips and Short Interruptions Immunity

Mode 1



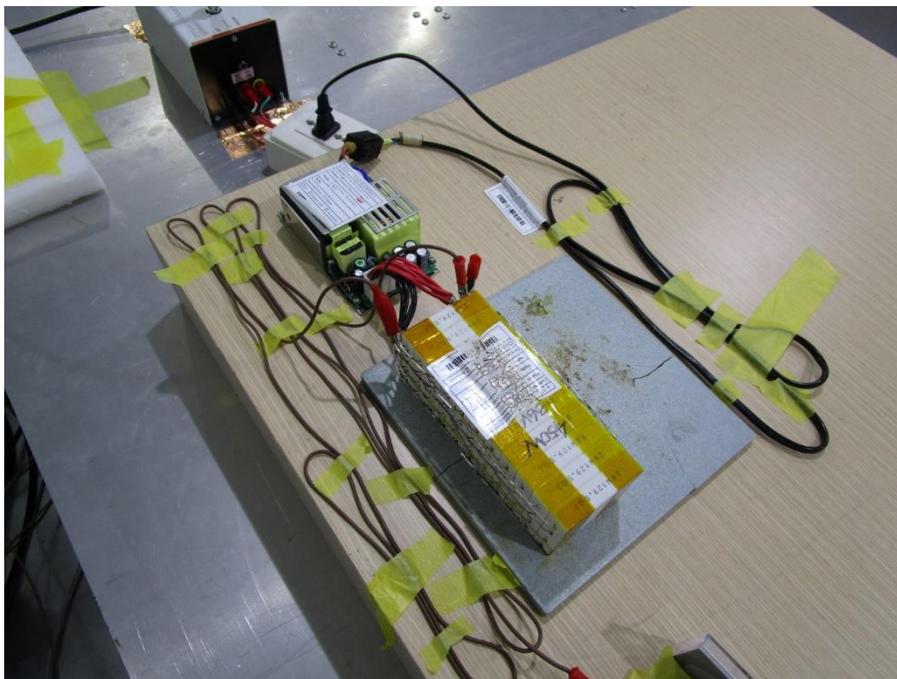
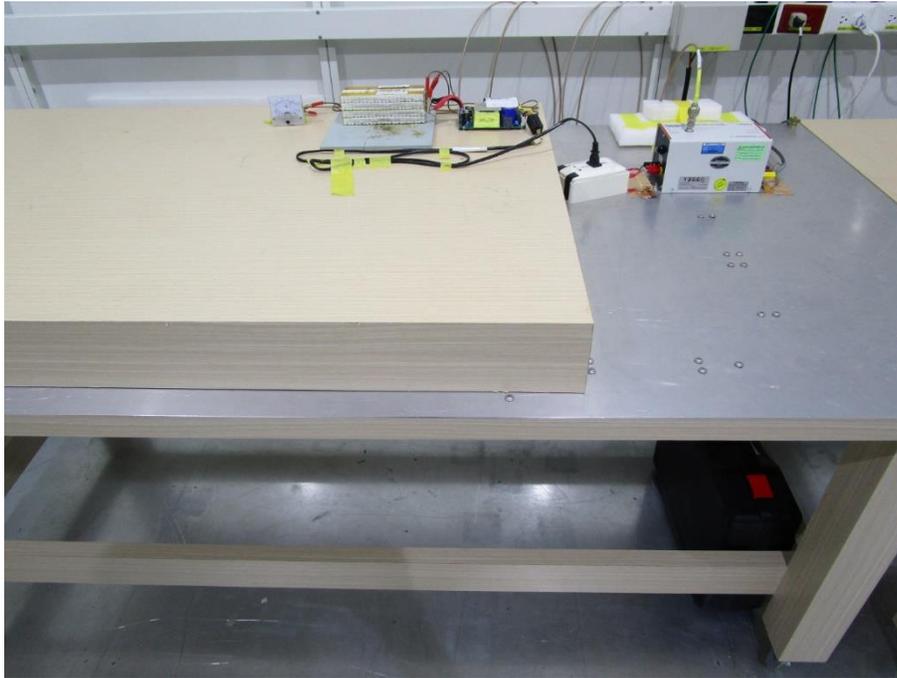
Power frequency magnetic field immunity

Mode 1



Immunity to conducted disturbances induced by RF fields

Mode 1



Appendix II: Photographs of the EUT

Please see the photographs of EUT in the test report no.: 4789043511-EP.

END OF REPORT