EN 55032:2015/AC:2016
EN 55035:2017

TEST REPORT

FOR

RealScan-G10

MODEL NUMBER : RS-G10

REPORT NUMBER: 4789903109-CE1V3

ISSUE DATE: Aug. 10, 2023

Prepared for

Xperix Inc.
1207, 37, Sagimakgl-ro, 62beon-gill, Jungwon-gu,
Seongnam-si, Gyeonggi-do 13211 Republic of Korea

Prepared by

UL Korea, Ltd. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu,
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TEL: (031) 337-9902
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IAS ACCREDITED
Testing Laboratory
TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	06/14/21	Initial issue	Hyerim Song
V2	03/25/22	added Variant Model	Hyerim Song
V3	08/10/23	Changed company name and manufacturer name	Hyerim Song

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME :	Xperix Inc.
MANUFACTURER NAME :	Xperix Inc. 1207, 37, Sagimakgol-ro 62beon-gil, Jungwon-gu, Seongnam-si, Gyeonggi-do 13211 Republic of Korea
EUT DESCRIPTION :	RealScan-G10
MODEL NUMBER :	RS-G10
VARIANT MODEL :	RealScan-G10i, RS-G10i
MODEL DIFFIERENCE:	RealScan-G10i and RS-G10i are no technical difference from basic model only except for model number because of marketing purposes.
SERIAL NUMBER :	N/A
DATE TESTED :	May 31 ~ Jun. 08, 2021

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APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
EN 55032:2015/AC:2016 / EN 55035:2017	PASS

UL Korea, 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 UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. 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 UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, 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 IAS, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:

Anthony Kim
Senior Laboratory Engineer
UL Korea, Ltd

Tested By:

Hyerim Song
Laboratory Engineer
UL Korea, Ltd.

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2. TEST METHODOLOGY

All tests were performed in accordance with the procedures documented in EN 55032:2015/AC:2016 and EN 55035:2017.

[EMI]

Reference standards	Test requirements	Results
EN 55032:2015/AC:2016	Radiated emission	Compliant
EN 55032:2015/AC:2016	Conducted emission	Compliant
EN 61000-3-2: 2014	Harmonic current emission	Compliant
EN 61000-3-3: 2013	Voltage fluctuation and flicker	Compliant
Note: N/A		

[EMS]

Reference standards	Test requirements	Results
EN 61000-4-2: 2009	Electrostatic Discharges (ESD)	Compliant
EN 61000-4-3:2006+A1: 2008+A2:2010	RF electromagnetic field	Compliant
EN 61000-4-4:2012	Electrical Fast Transients (EFT) / Burst	Compliant
EN 61000-4-5:2014/A1:2017	Surge	Compliant
EN 61000-4-6:2014/AC:2015	Immunity to Conducted Disturbances	Compliant
EN 61000-4-8:2010	Power frequency magnetic field	N/A[Note1]
EN 61000-4-11:2004/A1:2017	Voltage Dips and Interruptions	Compliant
Note1: The EUT insensitive for Magnetic field effect.		

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3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

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☒	Semi-anechoic 10 m chamber - RE
☒	Full-anechoic chamber
☒	Shield room 5
☒	Shield room 6

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf.

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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. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

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

Test Item	Measurement uncertainty
Conducted Emission (0.15 to 30 MHz Below)	2.87 dB, Note 1
Radiated emission (1 GHz Below)	4.40 dB, Note 1
Radiated emission (1 GHz Above)	4.31 dB, Note 1
Note 1: Measurement uncertainty is calculated in according with CISPR 16-4-2 (2011-06). The measurement uncertainty is given with a confidence of 95 % with the coverage factor, *k*=2.	

Uncertainty figures are valid to a confidence level of 95%, k=2.

4.4. Decision Rule

Decision rule for statement(s) of conformity is based on Accuracy Method specified in Procedure 2, Clause 4.4.3 in IEC Guide 115:2007.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Description	: RealScan-G10
Model No.	: RS-G10
Serial No.	: N/A
EUT Power	: DC 5 V / 500 mA
AC adapter power requirements	: N/A
List of frequencies generated or used by the EUT	: Above 108 MHz

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6. DESCRIPTION OF TEST SETUP

6.1. Operating mode

The mode(s) : The EUT was tested in continuous operating mode.

6.2. Description of EUT and Support equipment

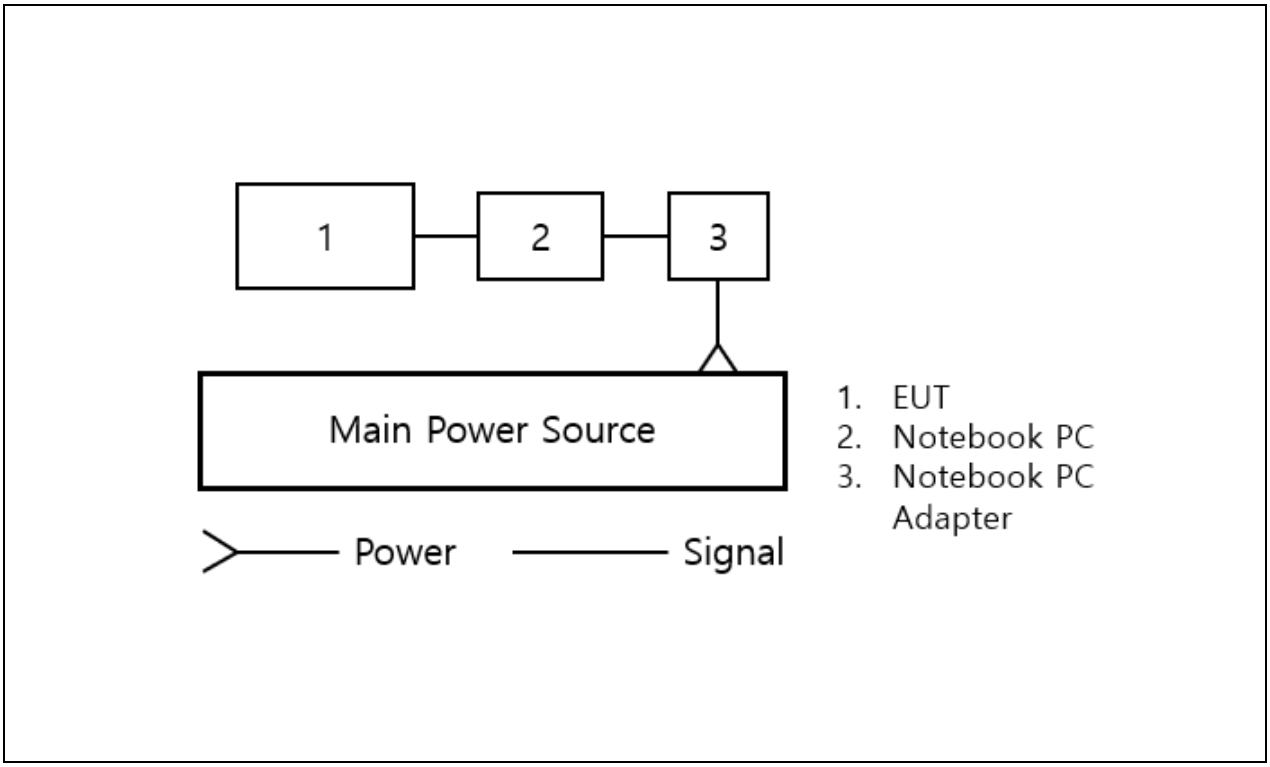
Support Equipment List				
Description	Manufacturer	Model	Serial Number	Remark
RealScan-G10	Xperix Inc.	RS-G10	N/A	EUT
Notebook PC	HP	15-cs1010TU	N/A	-
Notebook PC Adapter	LITE ON TECHNOLOGY(CHANGZHOU) CO.,LTD.	HSTNN-LA40	N/A	-

6.3. List of cables used

I/O Cable List							
Cable No	Start		End		Cable		
	Name	I/O Port	Name	I/O Port	Cable Length (m)	Shield	With Ferrite
1	EUT	USB	Notebook PC	USB	1.2	Shield	-
2	Notebook PC	DC In	AC Adapter	DC Out	1.2	Shield	-
3	Notebook PC Adapter	AC In	AC Outlet	AC Out	2.0	Unshield	-

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6.4. Configuration and peripherals



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7. Performance criteria

For the EUT, the customer has decided that the performance criteria defined in EN 55035:2017, should be applied as follows:

Criteria	Description
A	The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment 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 equipment if used as intended.
B	During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test. After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment 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), or recovery time, 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 equipment if used as intended.
C	Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.
General performance criteria are defined in 8.2, 8.3 and 8.4. These criteria shall be used during the testing of primary functions where no relevant annex is applicable. When assessing the impact of a disturbance on a function, the assessment should take into consideration the function's performance prior to the application of the disturbance and only identify as failures those changes in performance that are a result of the disturbance.	

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8. Test condition and results

8.1. Conducted emission

TEST: Limits of Conducted emission	
Method	EUT was placed on a wooden platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the horizontal ground plane. The rear of tabletop was located 40 cm to the vertical ground plane. The rear of EUT and its peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from LISN/AMN and excess AC cable was bundled in center. I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN/ an AMN to the input power source. All unused 50 ohm connectors of the LISN/ AMN were resistively terminated in 50 ohm when not connected to the measuring equipment. An overview sweep with peak detection has been performed. The measurements had been performed with a quasi-peak detector and if required, with a CISPR average detector (CAV). The conducted emission measurements were made with the following dete function of the test receiver. Detector Type : QP/CAV IF Bandwidth : 9 kHz / 9 kHz

Basic Standard	EN 55032:2015/AC:2016	
Parameters recorded during the test	Laboratory Ambient Temperature	23.7 ± 1 °C
	Relative Humidity	35.2 ± 1 % R.H
-	Frequency range on each side of line	Measurement Point
Fully configured sample scanned over the following frequency range	150 kHz to 30 MHz	AC Power input ports

Limits - Class A				
Frequency (MHz)	Limit (dBµV)			
	Quasi-Peak	Result	Average	Result
0.15 to 0.50	79	**PASS**	66	**PASS**
0.50 to 30	73	**PASS**	60	**PASS**

Limits – Class B				
Frequency (MHz)	Limit (dBµV)			
	Quasi-Peak	Result	Average	Result
0.15 to 0.50	66 to 56	N/A	0.15 to 0.50	N/A
0.50 to 5	56	N/A	0.50 to 5	N/A
5 to 30	60	N/A	5 to 30	N/A

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Limits - Class A (AAN)				
Frequency (MHz)	Limit (dBµV)			
	Quasi-Peak	Result	Average	Result
0.15 to 0.50	97 to 87	N/A	97 to 87	N/A
0.50 to 30	87	N/A	87	N/A

Limits - Class B (AAN)				
Frequency (MHz)	Limit (dBµV)			
	Quasi-Peak	Result	Average	Result
0.15 to 0.50	84 to 74	N/A	74 to 64	N/A
0.50 to 30	74	N/A	64	N/A

Test Equipment used:					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Test Receiver	R&S	ESR-3	102592	2020.08.06	2021.08.06
LISN	R&S	ENV216	102478	2020.08.07	2021.08.07

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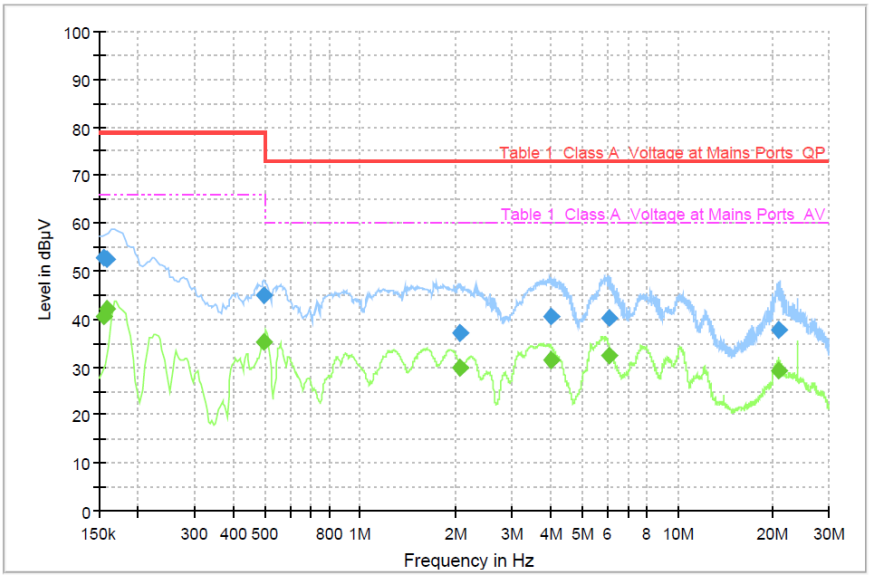
Table 1. Conducted emission

Test Date: Jun. 02, 2021 Test Engineer: Hyerim Song

[Line 1]

Common Information

Test Description	4789903109
Comment1:	230 V 50 Hz
Comment2:	L1



Final_Result_QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.155500	52.85	79.00	26.15	L1	ON	9.8
0.158000	52.67	79.00	26.33	L1	ON	9.9
0.494000	44.95	79.00	34.05	L1	ON	10.0
2.057750	36.95	73.00	36.05	L1	ON	9.8
3.991750	40.41	73.00	32.59	L1	ON	9.9
6.073167	40.23	73.00	32.77	L1	ON	9.9
20.952167	37.86	73.00	35.14	L1	ON	10.1

Final_Result_CAV

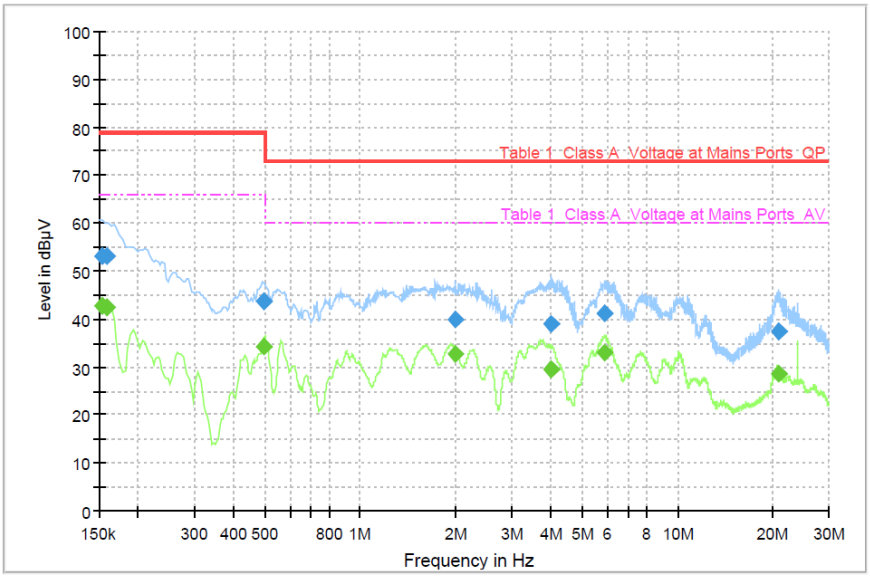
Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.155500	40.61	66.00	25.39	L1	ON	9.8
0.158000	42.29	66.00	23.71	L1	ON	9.9
0.494000	35.11	66.00	30.89	L1	ON	10.0
2.057750	30.01	60.00	29.99	L1	ON	9.8
3.991750	31.53	60.00	28.47	L1	ON	9.9
6.073167	32.53	60.00	27.47	L1	ON	9.9
20.952167	29.31	60.00	30.69	L1	ON	10.1

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[Neutral]

Common Information

Test Description	4789903109
Comment1:	230 V 50 Hz
Comment2:	N



Final_Result_QPK

Frequency (MHz)	QuasiPeak (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.154000	53.28	79.00	25.72	N	ON	9.8
0.158000	53.04	79.00	25.96	N	ON	9.9
0.497500	43.77	79.00	35.23	N	ON	9.9
1.994000	40.01	73.00	32.99	N	ON	9.7
4.008750	38.85	73.00	34.15	N	ON	9.8
5.897000	41.30	73.00	31.70	N	ON	9.9
20.785667	37.54	73.00	35.46	N	ON	10.2

Final_Result_CAV

Frequency (MHz)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.154000	42.76	66.00	23.24	N	ON	9.8
0.158000	42.51	66.00	23.49	N	ON	9.9
0.497500	34.36	66.00	31.64	N	ON	9.9
1.994000	32.78	60.00	27.22	N	ON	9.7
4.008750	29.58	60.00	30.42	N	ON	9.8
5.897000	33.13	60.00	26.87	N	ON	9.9
20.785667	28.72	60.00	31.28	N	ON	10.2

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8.2 Radiated emission

TEST: Limits for Radiated emission			
Method	EUT was placed on a wooden platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The rear of EUT and peripherals was aligned and flushed with rear of tabletop. I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged 40 cm height to the ground plane. The Radiated Electric Field Strength intensity has been measured on the semi anechoic chamber with a ground plane at a distance of 10 m. *Measuring distance The boundary of the EUT is defined by an imaginary straight-line periphery describing a simple geometric. Measurements were performed with a quasi-peak detector. The measuring antenna height was varied between 1 to 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity. The measurements were performed for both vertical and horizontal antenna polarization.		
Basic Standard	EN 55032:2015/AC:2016		
Parameters recorded during the test	Laboratory Ambient Temperature	24.1 ± 1 °C	
	Relative Humidity	35.6 ± 1 % R.H	
	Frequency range	Measurement Point	
Fully configured sample scanned over the following frequency range	30 MHz – 6.0 GHz	Enclosure	

Limits_ Class A

Frequency (MHz)	Limit (dBµV/m)		
	Quasi-Peak	Results	
30 to 230	40	**PASS**	
230 to 1000	47	**PASS**	
Frequency (GHz)	Peak	Average	Results
1.0 to 3.0	76	56	**PASS**
3.0 to 6.0	80	60	**PASS**

Limits_ Class B

Frequency (MHz)	Limit (dBµV/m)		
	Quasi-Peak	Results	
30 to 230	30	N/A	
230 to 1000	37	N/A	
Frequency (GHz)	Peak	Average	Results
1.0 to 3.0	70	50	N/A
3.0 to 6.0	74	54	N/A

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Test Equipment Used:					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Receiver	R&S	ESW44	101848	2020.08.03	2021.08.03
Open Switch and Control Platform	R&S	OSP220	101456	N/A	N/A
TRILOG Broadband Antenna	SCHWARZBECK	VULB9163	1241	2019.09.30	2021.09.30
Double-Ridged Guide Antenna	ETS-Lindgren	3117	227048	2019.09.18	2021.09.18
Pre-Amplifier	R&S	SCU08F2	100725	2020.08.03	2021.08.03
Pre-Amplifier	R&S	SCU18F	100726	2020.08.03	2021.08.03

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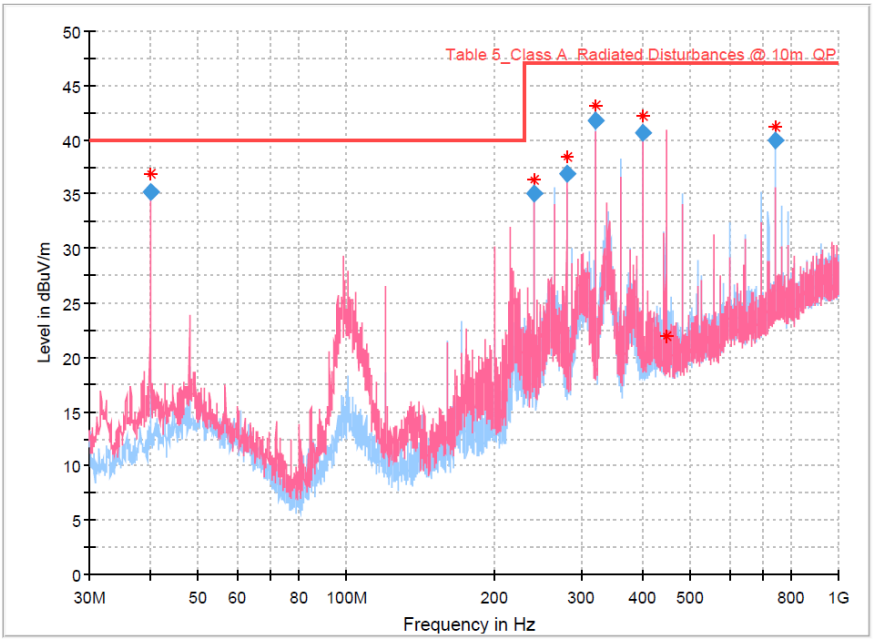
Table 2. Radiated Disturbance Test data

Test Date: May 31, 2021 Test Engineer: Hyerim Song

[Below 1 GHz]

Common Information

Test Description: 4789903109
Comment1: 230 V 50 Hz



Final Result

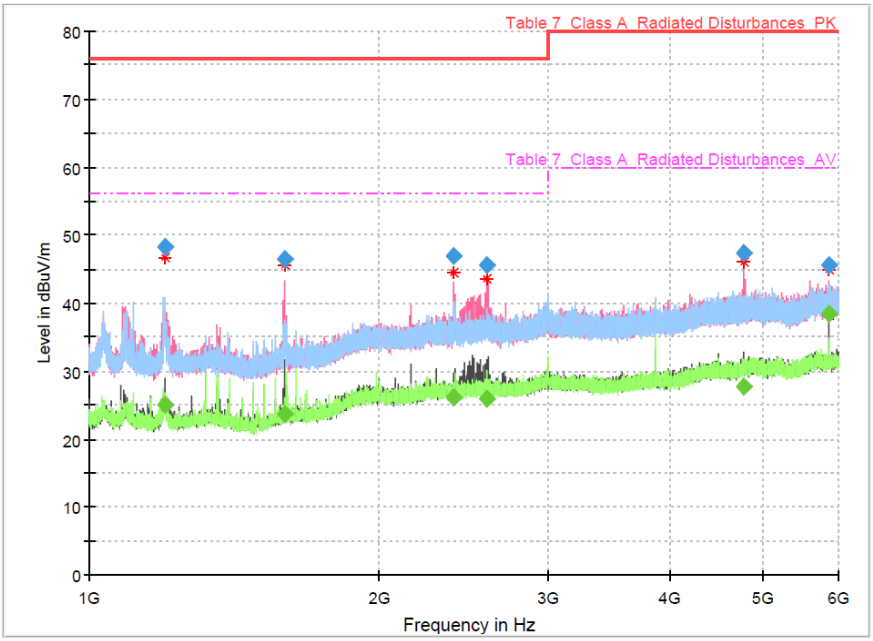
Frequency (MHz)	QuasiPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
39.989444	35.22	40.00	4.78	303.0	V	213.0	-21.2
239.985000	35.05	47.00	11.95	110.0	V	0.0	-20.2
280.010556	36.94	47.00	10.06	104.0	V	43.0	-19.7
319.996111	41.72	47.00	5.28	277.0	H	40.0	-18.6
399.981111	40.70	47.00	6.30	100.0	V	95.0	-16.2
743.953889	39.92	47.00	7.08	126.0	H	0.0	-9.9

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[Above 1 GHz]

Common Information

Test Description: 4789903109
Comment1: 230 V 50 Hz



Final Result PK+

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1199.475000	48.31	76.00	27.69	139.0	H	285.0	-9.6
1593.850000	46.54	76.00	29.46	126.0	V	331.0	-8.1
2391.450000	46.92	76.00	29.08	100.0	V	323.0	-2.8
2590.450000	45.68	76.00	30.32	107.0	V	354.0	-2.3
4786.450000	47.29	80.00	32.71	113.0	V	192.0	3.4
5865.050000	45.54	80.00	34.46	103.0	V	178.0	6.3

Final Result CAV

Frequency (MHz)	CAverage (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1199.475000	24.99	56.00	31.01	139.0	H	285.0	-9.6
1593.850000	23.64	56.00	32.36	126.0	V	331.0	-8.1
2391.450000	26.18	56.00	29.82	100.0	V	323.0	-2.8
2590.450000	26.00	56.00	30.00	107.0	V	354.0	-2.3
4786.450000	27.65	60.00	32.35	113.0	V	192.0	3.4
5865.050000	38.54	60.00	21.46	103.0	V	178.0	6.3

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8.3. Harmonic current emissions

TEST: Harmonic current emissions			
Method	This test consists on the measurement of harmonics components of the input current which may be produced by equipment having an input current up to and including 16 A per phase, and intended to be connected to public low-voltage distribution systems. The equipment is tested under specified conditions of operation.		
Basic Standard		EN 61000-3-2:2014	
Parameters recorded during the test		Laboratory Ambient Temperature	24.4 ± 1 °C
		Relative Humidity	35.4 ± 1 % R.H
		Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range		50 Hz – 2.0 kHz	AC Main

Limits - Class A	
Harmonic order n	Maximum permissible harmonic current A
Odd harmonics	
3	2,30
5	1,14
7	0,77
9	0,40
11	0,33
13	0,21
15 ≤ n ≤ 39	0,15 15/n

Test Equipment Used:

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
6KVA AC+DC Programable Power	NEWTONS4TH LTD	N4A06	91J-11894	2020.08.06	2021.08.06
S DFT 1Phase Power analyzer	NEWTONS4TH LTD	PPA5511	162-04955	2020.08.06	2021.08.06
Impedance Network	NEWTONS4TH LTD	IMP161	91G-11811	2020.08.06	2021.08.06

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Table 3. Harmonic current Emission Test data

Test Date: Jun. 03, 2021 Test Engineer: Hyerim Song

IEC61000-3-2:2014 Fluctuating Harmonics		
	Instrumentation Details	
Measurement Equipment	Newtons4th PPA5511 STD SN: 162-04955 Firmware: v2.179	
AC Source	Controlled manually	
Impedance Network ID	N/A	
EUT Details	Brand: N/A Model: N/A Serial: N/A	
	Test Information	
Rated Voltage	User: N/A	Measured: 230.475V
Rated Current	User: N/A	Measured: 440.702mA
Rated Frequency	User: N/A	Measured: 50.000Hz
Rated Power	User: N/A	Measured: 40.932W
Measured Power Factor	0.4030	
Max Current THD	0.000%	
Average THC	398.382mA	
Max Power	41.489W	
Max F. Current	187.249mA	
Average F. Current	184.539mA	
Minimum Current	100A	
	Test Settings	
Test Class	Class A	
Test Mode	Measured	
Test Duration	2.5 minutes	
	Operating Conditions	
Operator	N/A	
Lab Name	N/A	
Location	N/A	
Notes		
Signature		
Results	**Test - N/A. Rated Power < 75W**	

Test not applicable
With the exception of lighting equipment section 7 of the IEC61000-3-2:2014 standard declares that no Harmonic current limits are specified for equipment with a rated power of 75W or less.

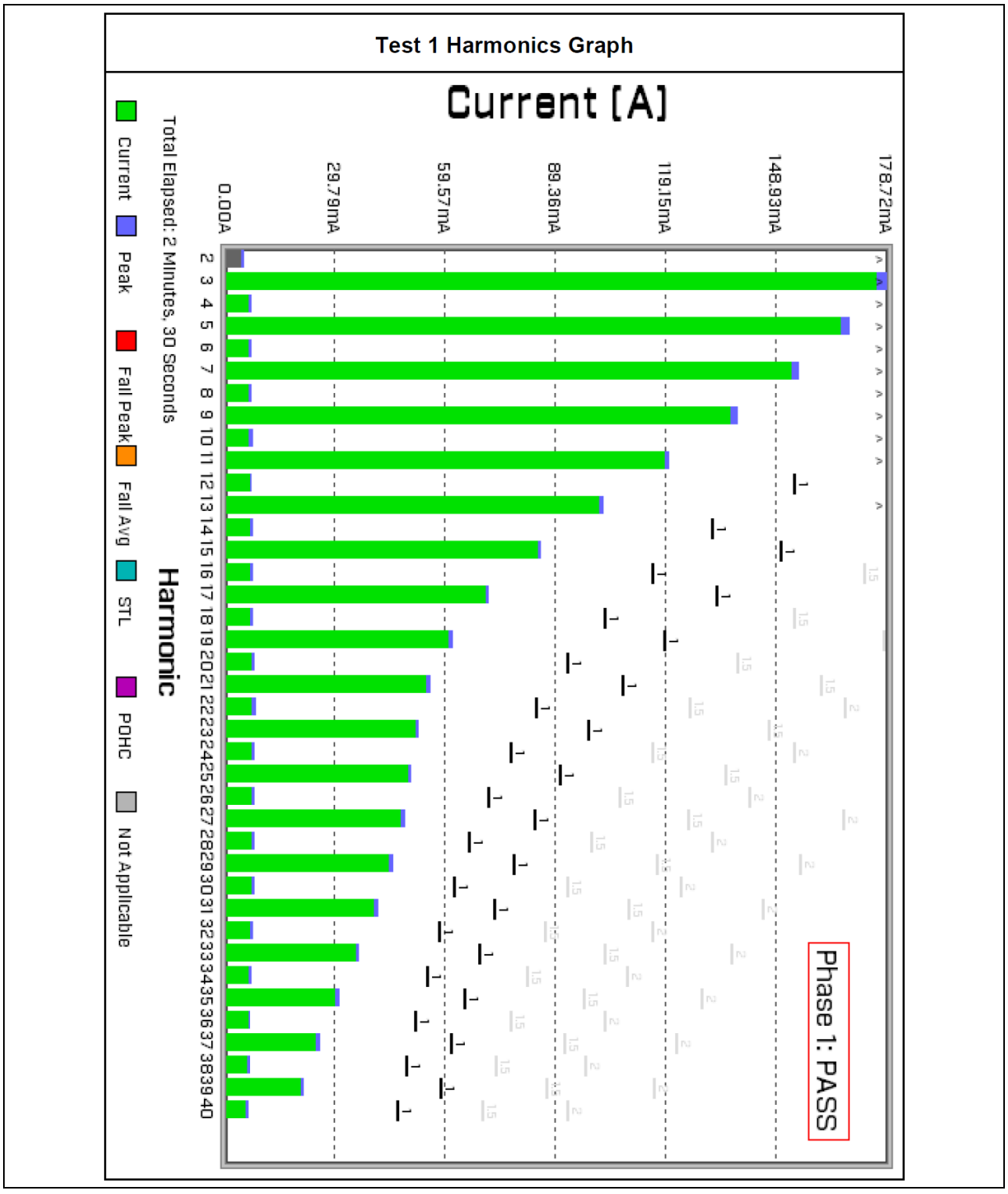
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Test 1 Harmonics Data

	Test Conditions		
THC	Average: 398.382mA	Maximum: 402.313mA	Limit: N/A
POHC	Average: 130.284mA	Maximum: 131.973mA	Limit: 251.375mA
Voltage Crest Factor	Average: 1.411	Maximum: 1.412	Limit: N/A
Current Crest Factor	Average: 4.873	Maximum: 5.028	Limit: N/A
Current THDG	216.470%		

Harmonic	Average	Peak	Average Limit	% of Limit	Peak Limit	% of Limit	Status
1	184.540mA	187.250mA	N/A	N/A	N/A	N/A	N/A
2	4.417mA	5.097mA	N/A	N/A	N/A	N/A	N/A
3	175.970mA	178.720mA	N/A	N/A	N/A	N/A	N/A
4	6.277mA	7.172mA	N/A	N/A	N/A	N/A	N/A
5	166.490mA	168.960mA	N/A	N/A	N/A	N/A	N/A
6	6.284mA	7.039mA	N/A	N/A	N/A	N/A	N/A
7	153.070mA	155.020mA	N/A	N/A	N/A	N/A	N/A
8	6.291mA	7.020mA	N/A	N/A	N/A	N/A	N/A
9	136.750mA	138.490mA	N/A	N/A	N/A	N/A	N/A
10	6.415mA	7.359mA	N/A	N/A	N/A	N/A	N/A
11	118.960mA	120.220mA	N/A	N/A	N/A	N/A	N/A
12	6.474mA	7.235mA	N/A	N/A	N/A	N/A	N/A
13	100.920mA	102.090mA	N/A	N/A	N/A	N/A	N/A
14	6.520mA	7.446mA	N/A	N/A	N/A	N/A	N/A
15	84.369mA	85.258mA	N/A	N/A	N/A	N/A	N/A
16	6.720mA	7.571mA	N/A	N/A	N/A	N/A	N/A
17	70.487mA	71.397mA	N/A	N/A	N/A	N/A	N/A
18	6.789mA	7.496mA	N/A	N/A	N/A	N/A	N/A
19	60.511mA	61.467mA	N/A	N/A	N/A	N/A	N/A
20	6.976mA	7.900mA	N/A	N/A	N/A	N/A	N/A
21	54.405mA	55.354mA	N/A	N/A	N/A	N/A	N/A
22	7.010mA	8.176mA	N/A	N/A	N/A	N/A	N/A
23	51.297mA	52.421mA	N/A	N/A	N/A	N/A	N/A
24	7.034mA	7.732mA	N/A	N/A	N/A	N/A	N/A
25	49.332mA	50.286mA	N/A	N/A	N/A	N/A	N/A
26	7.105mA	7.881mA	N/A	N/A	N/A	N/A	N/A
27	47.288mA	48.513mA	N/A	N/A	N/A	N/A	N/A
28	6.976mA	7.983mA	N/A	N/A	N/A	N/A	N/A
29	44.289mA	45.230mA	N/A	N/A	N/A	N/A	N/A
30	6.870mA	7.787mA	N/A	N/A	N/A	N/A	N/A
31	40.133mA	41.229mA	N/A	N/A	N/A	N/A	N/A
32	6.662mA	7.544mA	N/A	N/A	N/A	N/A	N/A
33	35.166mA	36.030mA	N/A	N/A	N/A	N/A	N/A
34	6.366mA	7.110mA	N/A	N/A	N/A	N/A	N/A
35	29.805mA	30.729mA	N/A	N/A	N/A	N/A	N/A
36	6.074mA	6.740mA	N/A	N/A	N/A	N/A	N/A
37	24.596mA	25.425mA	N/A	N/A	N/A	N/A	N/A
38	5.828mA	6.565mA	N/A	N/A	N/A	N/A	N/A
39	20.238mA	20.987mA	N/A	N/A	N/A	N/A	N/A
40	5.587mA	6.291mA	N/A	N/A	N/A	N/A	N/A

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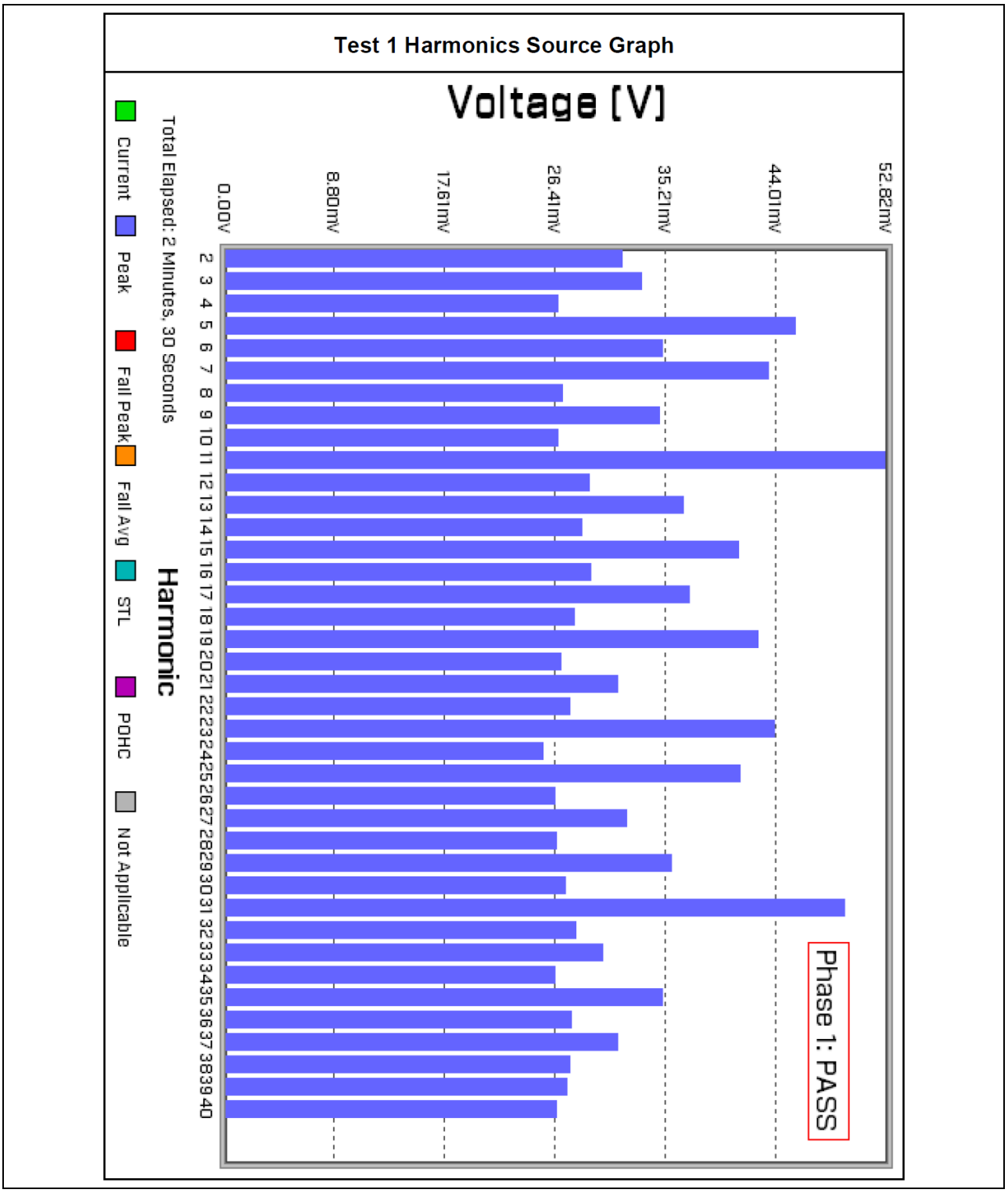
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Test 1 Harmonics Source Data

Voltage THDS	Test Conditions 0.079%

Harmonic	Average	Peak	Limit	Status
1	230.440V	230.470V	No Limit	PASS
2	26.496mV	31.804mV	460.951mV	PASS
3	28.246mV	33.298mV	2.074V	PASS
4	22.171mV	26.683mV	460.951mV	PASS
5	39.077mV	45.564mV	921.901mV	PASS
6	26.274mV	35.007mV	460.951mV	PASS
7	36.903mV	43.399mV	691.426mV	PASS
8	22.463mV	26.990mV	460.951mV	PASS
9	29.237mV	34.741mV	460.951mV	PASS
10	22.242mV	26.613mV	460.951mV	PASS
11	46.890mV	52.816mV	230.475mV	PASS
12	23.557mV	29.095mV	230.475mV	PASS
13	31.008mV	36.668mV	230.475mV	PASS
14	22.533mV	28.526mV	230.475mV	PASS
15	34.556mV	41.067mV	230.475mV	PASS
16	24.138mV	29.264mV	230.475mV	PASS
17	31.220mV	37.100mV	230.475mV	PASS
18	22.424mV	27.923mV	230.475mV	PASS
19	35.433mV	42.653mV	230.475mV	PASS
20	22.150mV	26.852mV	230.475mV	PASS
21	26.996mV	31.471mV	230.475mV	PASS
22	21.956mV	27.582mV	230.475mV	PASS
23	36.279mV	43.914mV	230.475mV	PASS
24	21.411mV	25.507mV	230.475mV	PASS
25	34.407mV	41.238mV	230.475mV	PASS
26	21.439mV	26.376mV	230.475mV	PASS
27	26.649mV	32.173mV	230.475mV	PASS
28	21.185mV	26.558mV	230.475mV	PASS
29	30.402mV	35.756mV	230.475mV	PASS
30	21.731mV	27.298mV	230.475mV	PASS
31	42.148mV	49.510mV	230.475mV	PASS
32	21.859mV	28.028mV	230.475mV	PASS
33	25.202mV	30.208mV	230.475mV	PASS
34	22.102mV	26.427mV	230.475mV	PASS
35	28.139mV	35.042mV	230.475mV	PASS
36	22.305mV	27.729mV	230.475mV	PASS
37	26.157mV	31.417mV	230.475mV	PASS
38	21.993mV	27.643mV	230.475mV	PASS
39	22.620mV	27.312mV	230.475mV	PASS
40	21.625mV	26.564mV	230.475mV	PASS

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8.4. Voltage fluctuations and flicker

TEST: 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.		
Basic Standard		EN 61000-3-3:2013	
Parameters recorded during the test		Laboratory Ambient Temperature	24.4 ± 1 °C
		Relative Humidity	35.4 ± 1 % R.H
The test circuit consists of a test supply voltage, a reference impedance, the equipment under test and a flicker meter compliant with IEC 60868.			
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	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 The relative steady-state voltage change, dc shall not exceed 3.3 % The maximum relative voltage change dmax shall not exceed: 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 tool 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.		

Test Equipment Used:

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
6KVA AC+DC Programable Power	NEWTONS4TH LTD	N4A06	91J-11894	2020.08.06	2021.08.06
S DFT 1Phase Power analyzer	NEWTONS4TH LTD	PPA5511	162-04955	2020.08.06	2021.08.06
Impedance Network	NEWTONS4TH LTD	IMP161	91G-11811	2020.08.06	2021.08.06

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Table 4. Voltage fluctuations and flicker data

Test Date: Jun. 03, 2021 Test Engineer: Hyerim Song

IEC61000-3-3:2013 Ed.3.0 Flickermeter

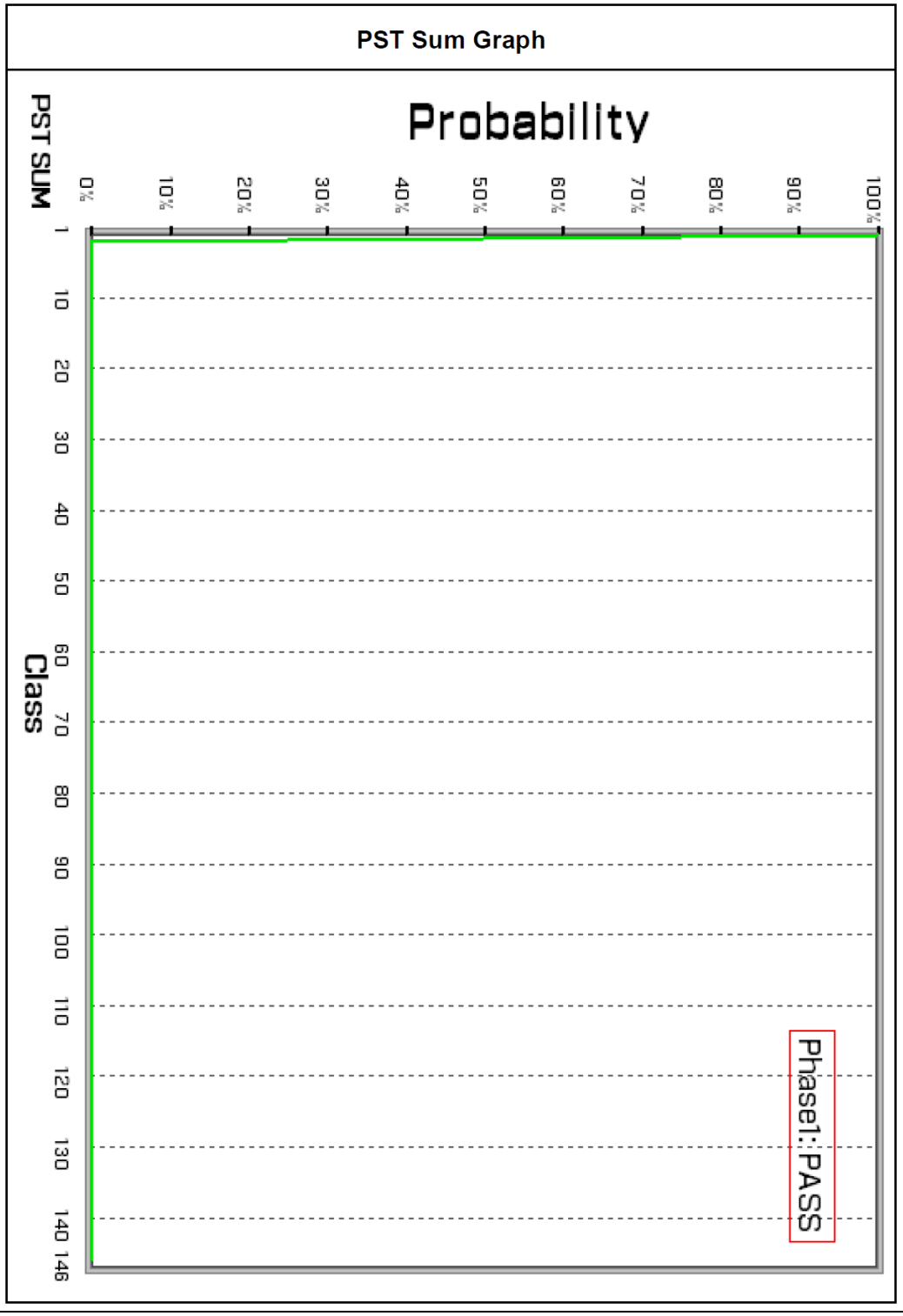
	Instrumentation Details
Measurement Equipment	Newtons4th PPA5511 STD SN: 162-04955 Firmware: v2.179
AC Source	Controlled manually
Impedance Network ID	N/A
EUT Details	Brand: N/A Model: N/A Serial: N/A
	Test Information
Rated Voltage	User: N/A Measured: 230.368V
Rated Current	User: N/A Measured: N/A
Rated Frequency	User: N/A Measured: 50.000Hz
Rated Power	User: N/A Measured: N/A
Class	Voltage
Mode	Normal (4.0%)
Minimum Current	10A
PST	10 minute(s)
PLT	12 PSTs
D max	0.04988% (Limit: 4%)
T max	0 s (Limit: 0.5 s)
DC max	0.008714% (Limit: 3.3%)
	Operating Conditions
Operator	N/A
Lab Name	N/A
Location	N/A
Notes	
Signature	
Results	**Phase1: PASS**

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Test Data Page 1

PST No.	DC	Dmax	Tmax	PST	PST Limit	PLT	PLT Limit	Result
1	0.00871%	0.0477195%	0s	0.08226	1.000	0.0822598	N/A	PASS
2	0.00871%	0.0477195%	0s	0.08226	1.000	0.0822598	N/A	PASS
3	0.00871%	0.0477195%	0s	0.08226	1.000	0.0822598	N/A	PASS
4	0.00871%	0.0477195%	0s	0.08226	1.000	0.0822598	N/A	PASS
5	0.00871%	0.0477195%	0s	0.08226	1.000	0.0822598	N/A	PASS
6	0.00871%	0.0477195%	0s	0.08226	1.000	0.0822598	N/A	PASS
7	0.00871%	0.0477195%	0s	0.08226	1.000	0.0822598	N/A	PASS
8	0.00871%	0.0477195%	0s	0.08226	1.000	0.0822598	N/A	PASS
9	0.00871%	0.0477195%	0s	0.08226	1.000	0.0822598	N/A	PASS
10	0.00871%	0.0498772%	0s	0.08226	1.000	0.0822598	N/A	PASS
11	0.00871%	0.0498772%	0s	0.08226	1.000	0.0822598	N/A	PASS
12	0.00871%	0.0498772%	0s	0.08226	1.000	0.0822598	0.65	PASS

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8.5. Electrostatic discharge

TEST: Electrostatic Discharge						
Method	Measurements were made on a ground plane that extends 0.5-meter minimum beyond all sides of the system under test and the minimum distance between the equipment under test and any laboratory walls or any other metallic surfaces shall be at least 1-meter. 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.					
Test Environments						
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	23.7 ± 1 °C			
		Relative Humidity	36.1 ± 1 % R.H			
		Air pressure	1011 mbar			
Basic Standard		EN 61000-4-2:2009				
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	A		
Contact – Direct	4	4	10	A		
Contact – Indirect	4	4	10	A		
Supplementary information: The test were performed for each model and results of the test were same.						
Test Equipment Used						
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due	
ESD Simulator	NOISEKEN	ESS-S3011	ESS15Y2243	2020.08.05	2021.08.05	
ESD Gun	NOISEKEN	GT-30R	ESS15Y2319	2020.08.05	2021.08.05	

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Table 5. Results for Electrostatic Discharges

Test Date: Jun. 02, 2021 Test Engineer: Hyerim Song

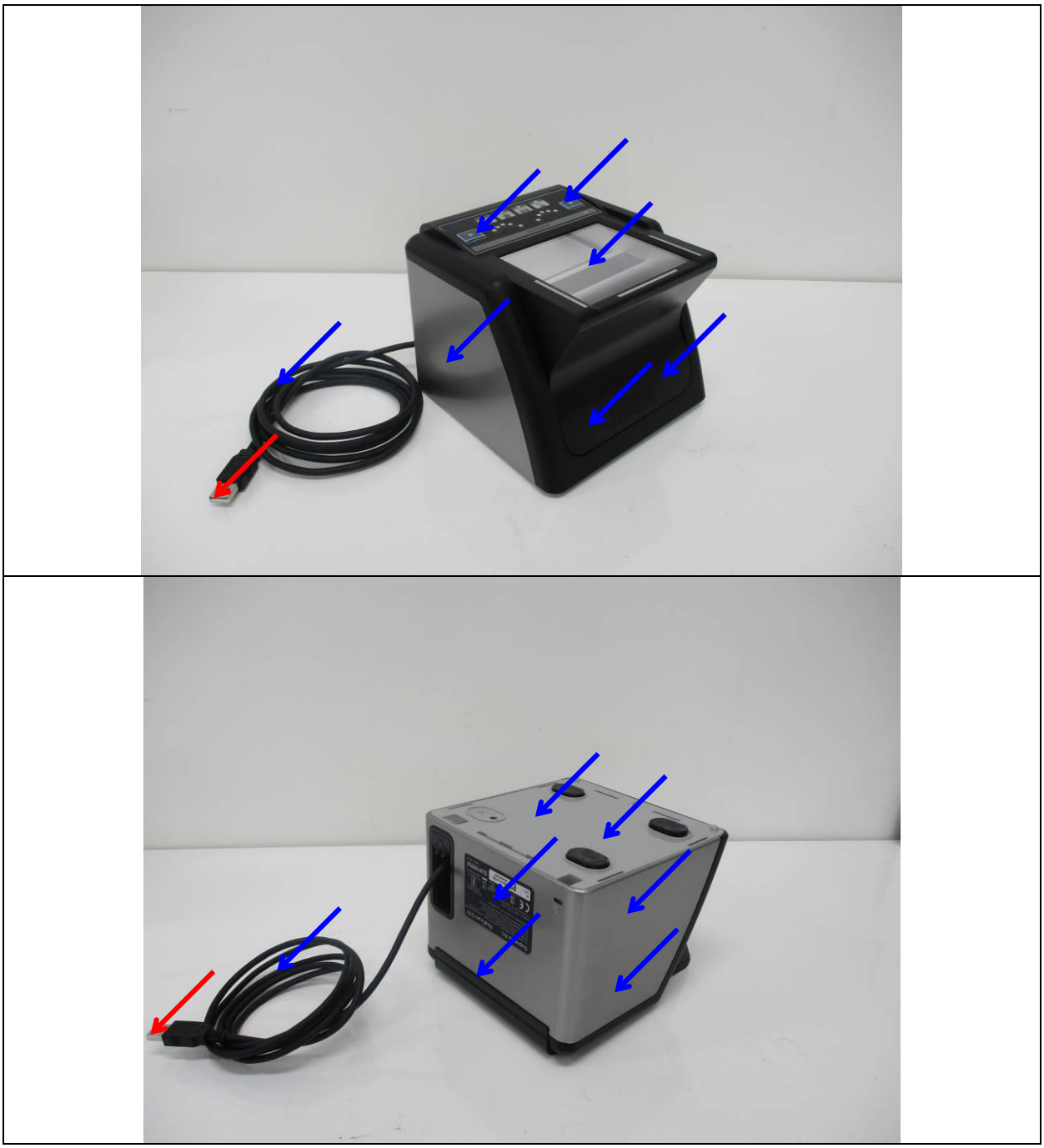
Contact Discharges			
Test Point		Positive Polarity	Negative Polarity
		4 kV	4 kV
1	HCP	A	A
2	VCP	A	A
3	USB port	A	A

Air Discharges							
Test Point		Positive Polarity			Negative Polarity		
		2 kV	4 kV	8 kV	2 kV	4 kV	8 kV
1	Non-Metal enclosure	A	A	A	A	A	A
2	Cable	A	A	A	A	A	A

- A: The EUT normally operate during and after the test

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Figure 1. Photographs of EUT showing the selected test points



Note: (*RED LINE:* CONTACT DISCHARGE, *BLUE LINE:* AIR DISCHARGE)

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8.6. Radio frequency electromagnetic field

TEST: Radio frequency electromagnetic field						
Method	Measurements were made in a fully 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. All sides of the EUT were investigated for anomalies.					
Test Environments						
Parameters recorded during the test		Laboratory Ambient Temperature	23.9 ± 1 °C			
		Relative Humidity	36.1 ± 1 % R.H			
		Air pressure	1 010 mbar			
Basic Standard		EN 61000-4-3: 2006/A2:2010				
Measurement Port		Product Enclosure				
Required Performance Criteria		A				
Audio output function test		In the case of the audio output function, the ratio of the acoustic interference measured during the test and / or the measured acoustic and electrical interference ratio was -20 dB or more and passed				
Frequency range		80 MHz – 1 GHz				
Spot frequency		1.8 GHz, 2.6 GHz, 3.5 GHz, 5 GHz				
Applied Field Strength						
Swept test						
Frequency (MHz)	(V/m)	Modulation	Dwell time	Frequency step	Results	
80 – 1 000	3	80% AM (1kHz)	1 sec	1%	A	
Spot frequency						
1 800 2 600 3 500 5 000	3	80% AM (1kHz)	1 sec	N/A	A	

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Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Signal Generator	R&S	SMB100A	113804	2020.08.06	2021.08.06
Power Meter	R&S	NRP2	105575	2020.08.06	2021.08.06
Power Sensor	R&S	NRP6A	101019	2020.08.06	2021.08.06
Power Sensor	R&S	NRP6A	101020	2020.08.06	2021.08.06
Open Switch and Control Unit	R&S	OSP120	101741	N/A	N/A
Power Amp	R&S	BBA150	102016	N/A	N/A
Power Amp	R&S	BBA150	102143	N/A	N/A
Log-Per Antenna	R&S	STLP9129	9129 023	N/A	N/A
Pressure-Field 1/2" Microphone	R&S	4192	3074177	2020.08.10	2021.08.10
Amplifier	R&S	2690	3009345	2020.08.06	2021.08.06
Audio Analyzer	R&S	UPV	104454	2020.08.05	2021.08.05

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Table 6. Description of Product Performance

Test Date: Jun. 08, 2021 Test Engineer: Hyerim Song

Frequency (MHz)	Test level (V/m)	Pol. Hor / Ver	Exposed Side	Results
80 – 1 000	3.0	H / V	Front Rear Left Right	A

Spot test

Frequency (MHz)	Test level (V/m)	Pol. Hor / Ver	Exposed Side	Results
1 800 2 600 3 500 5 000	3.0	H / V	Front Rear Left Right	A

Audio output function test

Audio output function		Result
Acoustic	Reference level : 78 dBuV	Pass

- A: The EUT normally operates during and after the test

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8.7. Fast transients, common mode

TEST: Fast Transients			
Method	Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. 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 one (1) minute per polarity.		
Test Environments			
Parameters recorded during the test		Laboratory Ambient Temperature	24.4 ± 1 °C
		Relative Humidity	35.8 ± 1 % R.H
		Air pressure	1 011 mbar
Basic Standard		EN 61000-4-4:2012	
Measurement Port		AC Power input ports	
Required Performance Criteria		B	

Applied Level

Application Point	(kV)	Repetition Frequency (kHz)	Results
AC mains power input ports	±1.0	5	A
DC power input ports	±0.5	5	N/A
Signal ports, Wired network ports	±0.5	5	N/A
xDSL wired network ports	±0.5	100	N/A

Supplementary information: The test were performed for each model and results of the test were same.

Test Equipment Used

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Ultra Compact Simulator	EM TEST	UCS 500N7	P1623180276	2020.08.06	2021.08.06
Motorized Variac	EM TEST	NX1-260-16	P1643186425	2020.08.06	2021.08.08

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Table 7. Description of Product Performance

Test Date: Jun. 04, 2021 Test Engineer: Hyerim Song

1) AC mains power input ports

Line	Test Level (kV)	Polarity (+/-)	Results
L1+N+PE	1.0	+/-	A

- A: The EUT normally operates during and after the test

2) DC power input ports

Line	Test Level (kV)	Polarity (+/-)	Results
-	-	-	-

3) Signal ports, Wired network ports

Line	Test Level (kV)	Polarity (+/-)	Results
-	-	-	A-

4) xDSL wired network ports

Line	Test Level (kV)	Polarity (+/-)	Results
-	-	-	-

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8.8. SURGES

TEST: Surges			
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 surges and five (5) negative surges were applied at each of phases of the a.c. waveform: 90° and 270°. Each surge was applied 60 seconds after the previous surge. Signal and Telecommunications ports were subject to five (5) positive and five (5) negative surges applied through the appropriate Coupling/Decoupling Network (CDN).		
Basic Standard	EN 61000-4-5:2014/A1:2017		
Parameters recorded during the test	Laboratory Ambient Temperature	24.4 ± 1 °C	
	Relative Humidity	35.8 ± 1 % R.H	
	Air pressure	1 011 mbar	
Measurement Point	AC mains power input ports		
Required Performance Criteria	B		

Applied Level:			
Application Point	(kV)	Required Surge Waveform	Results
AC MAINS POWER INPUT PORTS	Line to Line ±0.5 kV, ±1.0 kV	Combination Wave (1.2 µS x 50 µS Voltage, 8 µS x 20 µS Current)	A
	Line to Earth ±0.5 kV, ±1.0 kV, ±2.0 kV		A
ANALOGUE/DIGITAL DATA PORTS	±1.0 kV or 4 kV for unshielded symmetrical port	Combination Wave (10 µS x 700 µS Voltage, 5 µS x 320µS Current)	N/A
	±0.5 kV, ±1.0 kV For coaxial or shielded port	Combination Wave (1.2 µS x 50 µS Voltage, 8 µS x 20 µS Current)	N/A
Supplementary information			
Number of pulses applied	Five positive pulses L1 to N and L1 to PE at 90° phase Five negative pulses L1 to N and L1 to PE at 270° phase Five positive pulses N to PE at 270° phase Five negative pulses N to PE at 90° phase		
Repetition rate	1.0 min.		

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Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Ultra Compact Simulator	EM TEST (Switzerland)	UCS 500N7	P1623180276	2020.08.06	2021.08.06
Motorized Variac	EM TEST (Switzerland)	NX1-260-16	P1643186425	2020.08.06	2021.08.08

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Table 8. Description of Product Performance

Test Date: Jun. 04, 2021 Test Engineer: Hyerim Song

1) AC mains power input ports

Line	Test Level (kV)	Polarity (+/-)	Results
L1-N	0.5	+/-	A
	1	+/-	A
L1-PE	0.5	+/-	A
	1	+/-	A
	2	+/-	A
N-PE	0.5	+/-	A
	1	+/-	A
	2	+/-	A

- A: The EUT normally operates during and after the test

2) DC power input ports

Line	Test Level (kV)	Polarity (+/-)	Results
-	-	-	-

3) Signal ports, Wired network ports

Line	Test Level (kV)	Polarity (+/-)	Results
-	-	-	-

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8.9. Immunity to Conducted Disturbances

TEST: Immunity to Conducted Disturbances					
Method	Measurements were made on a ground plane that extends 0.5-meter minimum beyond all sides of the system under test. The EUT was located 10 cm above the reference ground plane and any associated I/O cables attached to the EUT were located between 30 mm and 50 mm above the ground plane. The indicated field was pre-calibrated prior to placement of the system under test.				
Basic Standard	EN 61000-4-6:2014/AC:2015				
Parameters recorded during the test	Laboratory Ambient Temperature	24.5 ± 1 °C			
	Relative Humidity	35.4 ± 1 % R.H			
	Air pressure	1 010 mbar			
-	Frequency range	Measurement Point			
Fully configured sample scanned over the following frequency range	150 kHz to 80 MHz	AC mains power input ports			
Required Performance Criteria	A				
Applied Level:					
Frequency (MHz)	(Vrms)	Modulation	Results		
0.15 kHz – 10 MHz	3 V	80 % AM (1kHz)	A		
10 MHz – 30 MHz	(3 V ~ 1 V)				
30 MHz – 80 MHz	1 V				
Audio output function test	In the case of the audio output function, the ratio of the acoustic interference measured during the test and / or the measured acoustic and electrical interference ratio was -20 dB or more and passed				
Supplementary information: Frequency step: 1 %, Dwell time at each frequency: 1 s					

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Compact immunity test system	TESEQ INC.	NSG 4070B-80	44676	2020.08.06	2021.08.06
CDN [M2/3]	TESEQ INC.	CDN M016	45060	2020.08.06	2021.08.06
Attenuator	Bird	150-A-FFN-06	1831	2020.08.06	2021.08.06
Pressure-Field 1/2" Microphone	R&S	4192	3074177	2020.08.10	2021.08.10
Amplifier	R&S	2690	3009345	2020.08.06	2021.08.06
Audio Analyzer	R&S	UPV	104454	2020.08.05	2021.08.05

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Table 9. Description of Product Performance

Test Date: Jun. 07, 2021 Test Engineer: Hyerim Song

1) AC mains power ports

Test line	Frequency (MHz)	Coupling method	Test level (V)	Results
AC Main	0.15 kHz ~ 80 MHz	CDN(M3)	3 ~ 1	A

- A: The EUT normally operates during and after the test

2) DC power input ports

Test line	Frequency (MHz)	Coupling method	Test level (V)	Results
-	-	-	-	-

3) Signal ports, Wired network ports

Test line	Frequency (MHz)	Coupling method	Test level (V)	Results
-	-	-	-	-

4) Audio output function test

Audio output function		Result
Acoustic	Reference level : 77 dBuV	Pass

- A: The EUT normally operates during and after the test

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8.10. Voltage dips and 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				
Basic Standard	EN 61000-4-11:2004/A1:2017				
Parameters recorded during the test	Laboratory Ambient Temperature	24.4 ± 1 °C			
	Relative Humidity	35.8 ± 1 % R.H			
	Air pressure	1 011 mbar			
Measurement Point	AC mains power ports				
Required Performance Criteria	B, C, C				
Number of dips	3				

Applied Levels:			
Test level	Period (cycles)_50 Hz / 60 Hz	Sync Angle (degrees)	Results
0 % U_T	0.5	0, 180	A
70 % U_T	25 / 30	0, 180	A
0 % U_T	250 / 300	0, 180	B

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Ultra Compact Simulator	EM TEST (Switzerland)	UCS 500N7	P1623180276	2020.08.06	2021.08.06
Motorized Variac	EM TEST (Switzerland)	NX1-260-16	P1643186425	2020.08.06	2021.08.08

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Table 10. Description of Product Performance

Test Date: Jun. 04, 2021

Test Engineer: Hyerim Song

[MIN Voltage 100 V]

Test level	Phase angle of insertion	Duration in periods of rated frequency (50 Hz / 60 Hz)	Results
<5 %	0, 180 deg.	0.5	A
70 %	0, 180 deg	25 /30	A
<5 %	0, 180 deg	250 / 300	A

- A: The EUT normally operate during and after the test

[MAX Voltage 240 V]

Test level	Phase angle of insertion	Duration in periods of rated frequency (50 Hz / 60 Hz)	Results
<5 %	0, 180 deg.	0.5	A
70 %	0, 180 deg	25 /30	A
<5 %	0, 180 deg	250 / 300	A

- A: The EUT normally operate during and after the test

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9. SETUP PHOTOS

9.1. POWERLINE CONDUCTED EMISSIONS

[FRONT PHOTO]



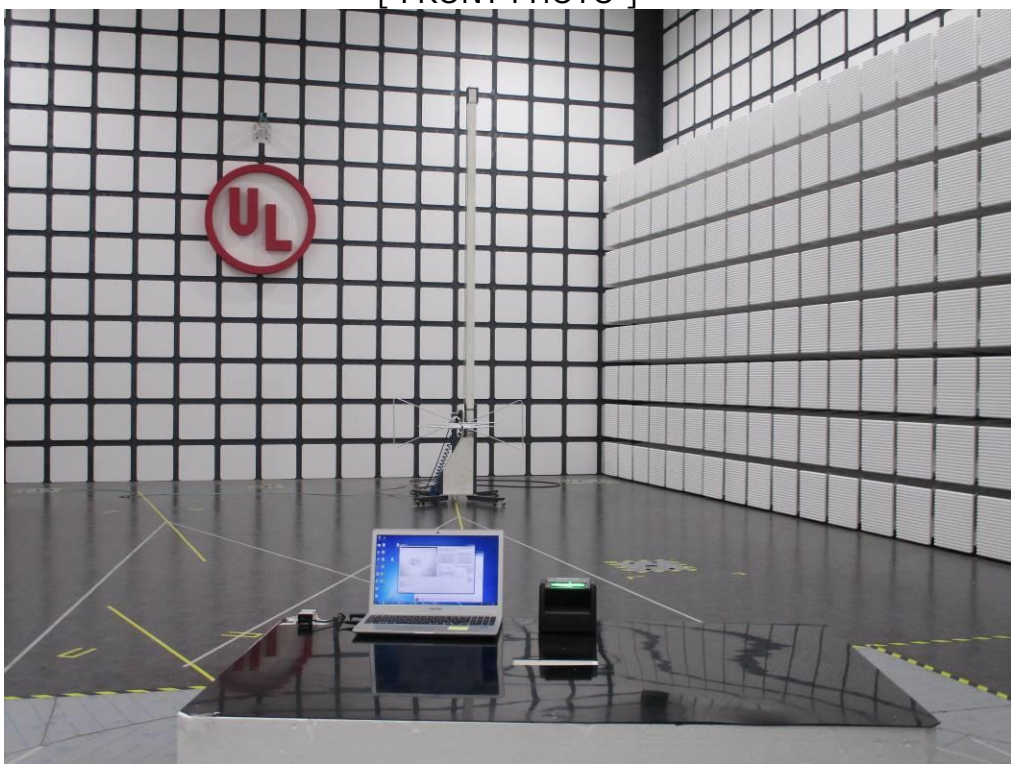
[REAR PHOTO]



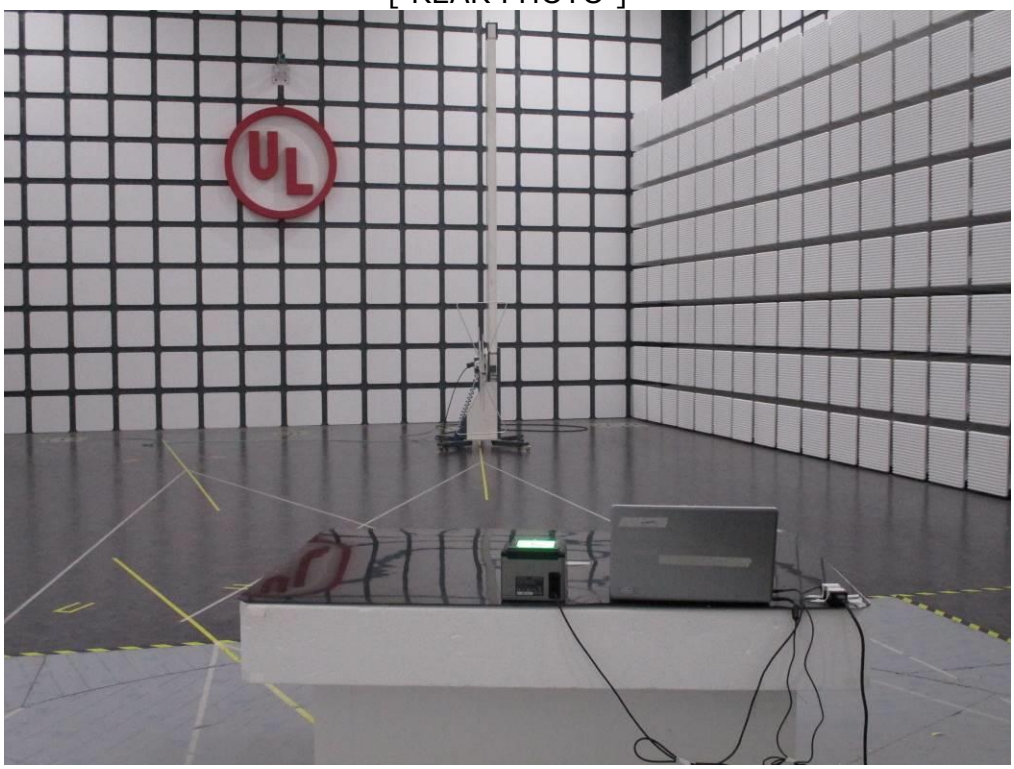
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9.2. RADIATED EMISSIONS EMISSIONS (Below 1 GHz)

[FRONT PHOTO]



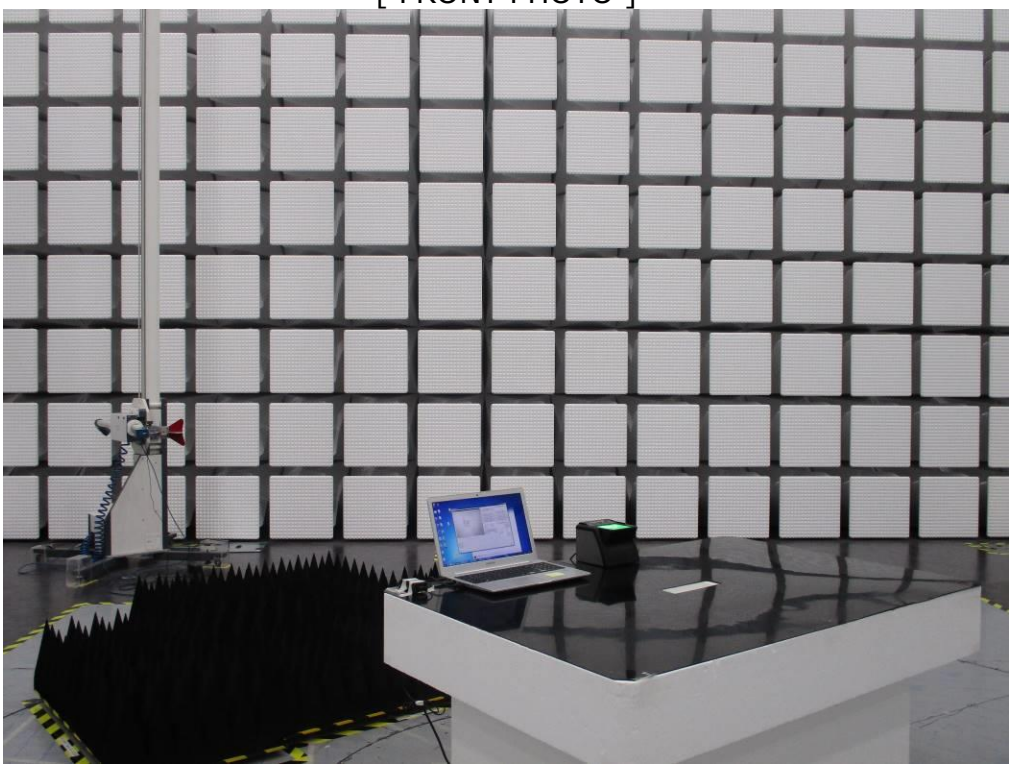
[REAR PHOTO]



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9.3. RADIATED EMISSIONS EMISSIONS (Above 1 GHz)

[FRONT PHOTO]

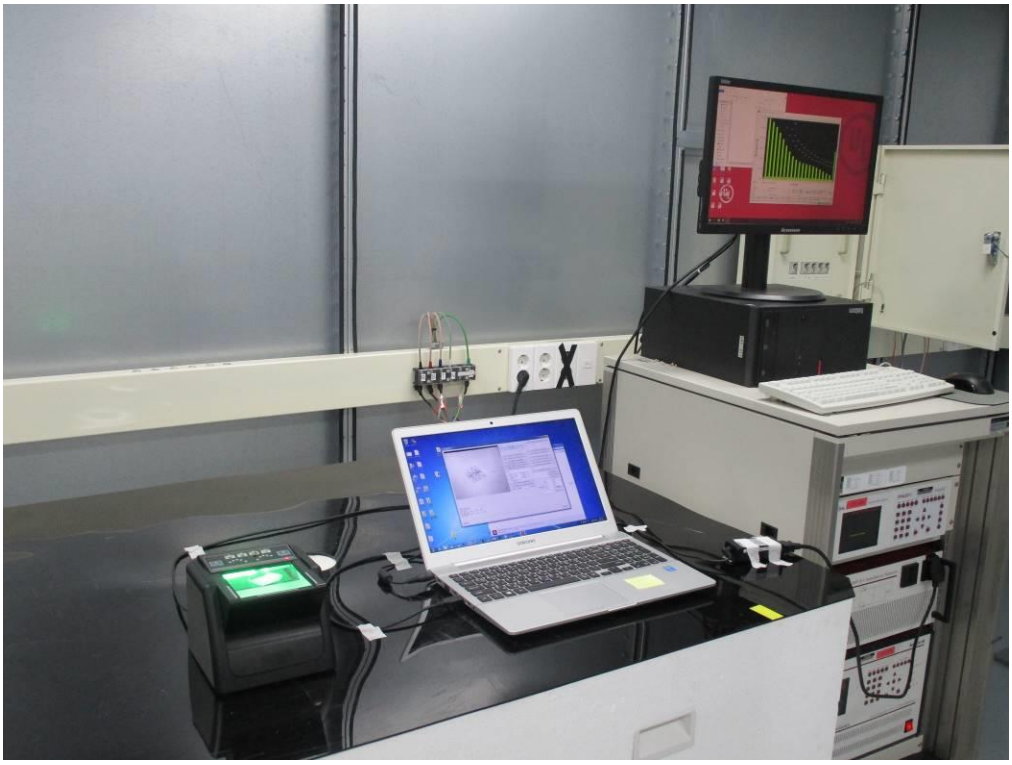


[REAR PHOTO]



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9.4. Harmonic current emissions, Voltage fluctuations and flicker

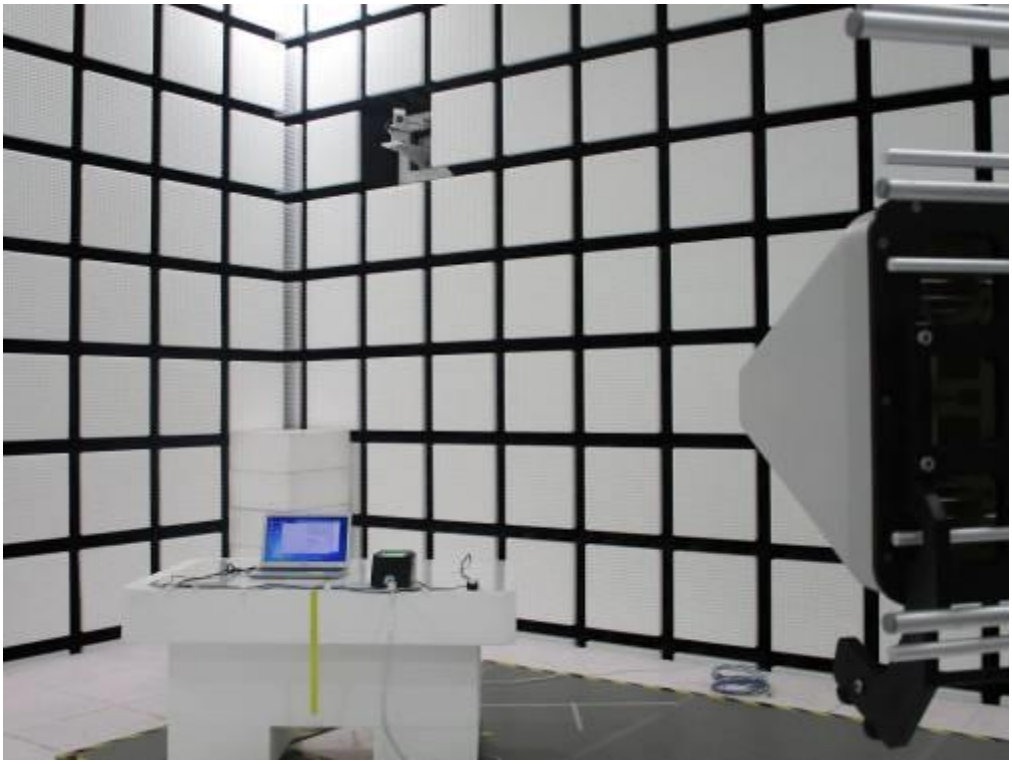


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9.5. Electrostatic discharge

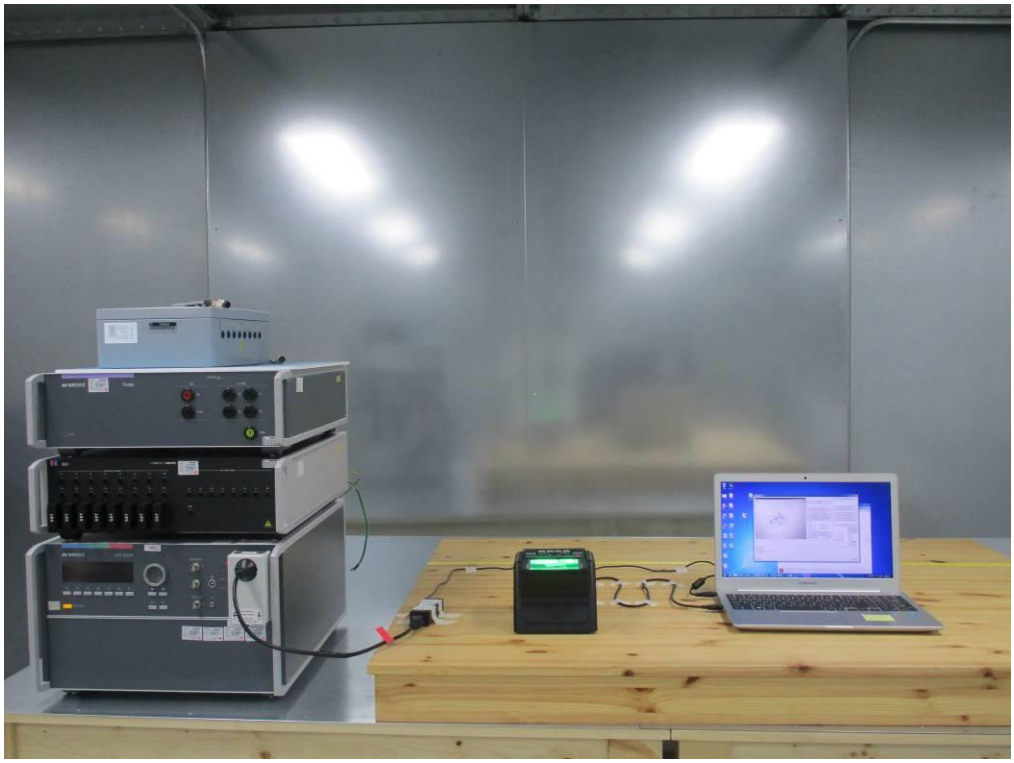


9.6. Radio frequency electromagnetic field

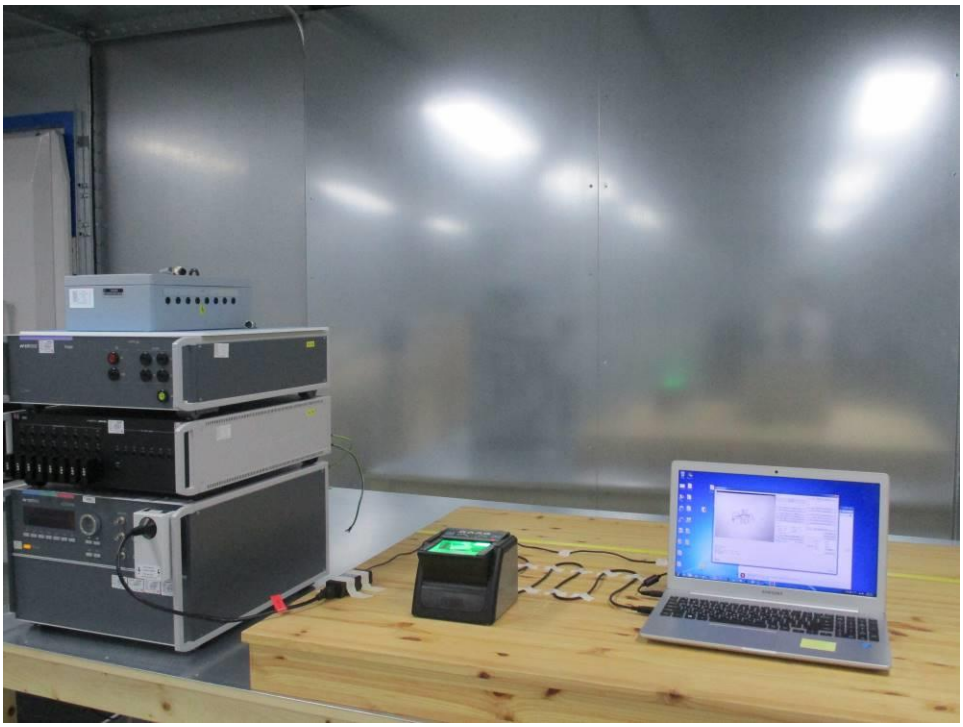


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9.7. Fast transients, common mode



9.8. Surge

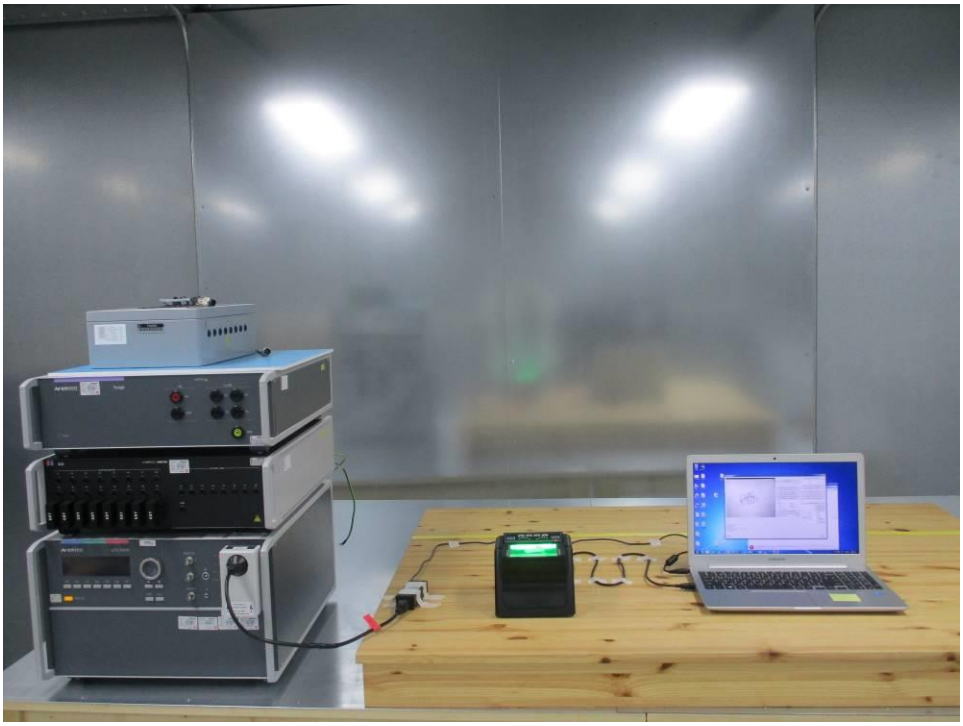


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9.9. Radio frequency, common mode



9.10. Powerline Voltage Dips and Interruptions



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10. EUT PHOTOS

[FRONT]



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[INSIDE(Left)]



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[INSIDE(Right)]



End of Test Report

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