



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (1) of (71)

EMC TEST REPORT For CE

Test Report No. : KES-EM-21T0121
Date of Issue : Feb. 25, 2021
Product name : PLACURE
Model/Type No. : PLC01
Variant Mode : -
Applicant : JNL Co., Ltd.
Applicant Address : 04799 3F, o-bok Bldg, 34, Ahasan-ro 15gil, Seongdong-gu, Seoul, Korea
Manufacturer : JNL Co., Ltd.
Manufacturer Address : 04799 3F, o-bok Bldg, 34, Ahasan-ro 15gil, Seongdong-gu, Seoul, Korea
Date of Receipt : Feb. 09, 2021
Test date : Feb. 15, 2021 ~ Feb. 17, 2021
Test Results : ☒ In Compliance ☐ Not in Compliance

Tested by

Dae Hyun, Kim
EMC Test Engineer

Reviewed by

Dong-Hun, Jang
EMC Technical Manager

This test report is not related to KS Q ISO/IEC 17025 and KOLAS.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0121
Page (2) of (71)

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
Feb. 25, 2021	KES-EM-21T0121	Issued

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd. This document may be altered or revised by KES Co., Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by KES Co., Ltd. will constitute fraud and shall nullify the document.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (3) of (71)

TABLE OF CONTENTS

1.0	General Product Description	5
1.1	Test Voltage & Frequency	6
1.2	Variant Model Differences.....	6
1.3	Device Modifications	6
1.4	Equipment Under Test.....	6
1.5	Support Equipments	6
1.6	External I/O Cabling	7
1.7	EUT Operating Mode(s)	7
1.8	Configuration.....	8
1.9	Remarks when standards applied	9
1.10	Calibration Details of Equipment Used for Measurement.....	9
1.11	Test Facility	9
1.12	Laboratory Accreditations and Listings	9
2.0	Test Regulations.....	10
2.1	Conducted Emissions at Mains Power Ports	12
2.2	Disturbance Voltage(Associated ports)	13
2.3	Conducted Emissions at Telecommunication Ports	14
2.4	Discontinuous Disturbances (Click)	15
2.5	Disturbance power measurement(30 MHz ~ 300 MHz).....	16
2.6	Radiated Electric Field Emissions(Below 1 GHz)	17
2.7	Harmonic Current Emissions.....	18
2.8	Voltage Fluctuations and Flicker	19
3.0	Criteria for compliance.....	20
3.1	Electrostatic Discharge.....	21
3.2	Radiated Electric Field Immunity	28
3.3	Fast Transients.....	31
3.4	Surges.....	33
3.5	Injected currents	36
3.6	Voltage Dips.....	39
APPENDIX A – TEST DATA.....		41
Conducted Emissions at Mains Power Ports.....		41
Conducted Emissions at Telecommunication Ports		43
Discontinuous Disturbances (Click).....		44
Disturbance power measurement (30 MHz ~ 300 MHz)		45
Radiated Electric Field Emissions(Below 1 GHz)		46
Harmonic Current Emissions and Voltage Fluctuations and Flicker		53
APPENDIX B - Test Setup Photos and Configuration		56
Conducted Emissions at Mains Power Ports.....		56
Disturbance Voltage(Associated ports)		57
Conducted Emissions at Telecommunication Ports		58
Discontinuous Disturbances (Click).....		59
Disturbance power measurement (30 MHz ~ 300 MHz)		59
Radiated Electric Field Emissions(Below 1 GHz)		60
Harmonic Current Emissions and Voltage Fluctuations and Flicker		62
Electrostatic Discharge		63
Radiated Electric Field Immunity.....		64
Fast transients.....		64
Surges.....		65
Injected currents		65
Voltage Dips.....		66

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

The authenticity of the test report, contact shchoi@kes.co.kr



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0121
Page (4) of (71)

APPENDIX C - EUT Photographs	67
EUT External Photographs	67
EUT Internal Photographs	68
Label Photographs.....	71

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0121
Page (5) of (71)

1.0 General Product Description

Main Specifications of EUT are:

Item	Issue
Power	Charge : DC 5 V (USB) Operating : DC 3.7 V (Battery)
Dimension	(120 x 92 x 62) mm
Weight	64 g

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr



1.1 Test Voltage & Frequency

Unless indicated otherwise on the individual data sheet or test results, the test voltage and frequency was as indicated below.

Voltage ☐ 220 Vac ☒ 230 Vac ☒ 3.7 Vdc (Battery) ☐ 12 Vdc
Frequency ☒ 50 Hz ☐ 60 Hz ☐ Hz

1.2 Variant Model Differences

Not applicable

1.3 Device Modifications

Not applicable

1.4 Equipment Under Test

Description	Model Number	Serial Number	Manufacturer	Remarks
PLACURE	PLC01	-	JNL Co., Ltd.	EUT

1.5 Support Equipments

Description	Model Number	Serial Number	Manufacturer	Remarks
Adapter	XM-QC3.0	-	SHENZHEN RUIYU TECHNOLOGY CO.,LTD	-



1.6 External I/O Cabling

■ Charge Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
PLACURE (EUT)	Micro 5 Pin	Adapter	USB	0.2	U

* Unshielded=U, Shielded=S

■ Operating Mode

Start		END		Cable Spec.	
Description	I/O Port	Description	I/O Port	Length	Shield
PLACURE (EUT)	-	-	-	-	-

* Unshielded=U, Shielded=S

1.7 EUT Operating Mode(s)

Equipment under test was operated during the measurement under the following conditions:

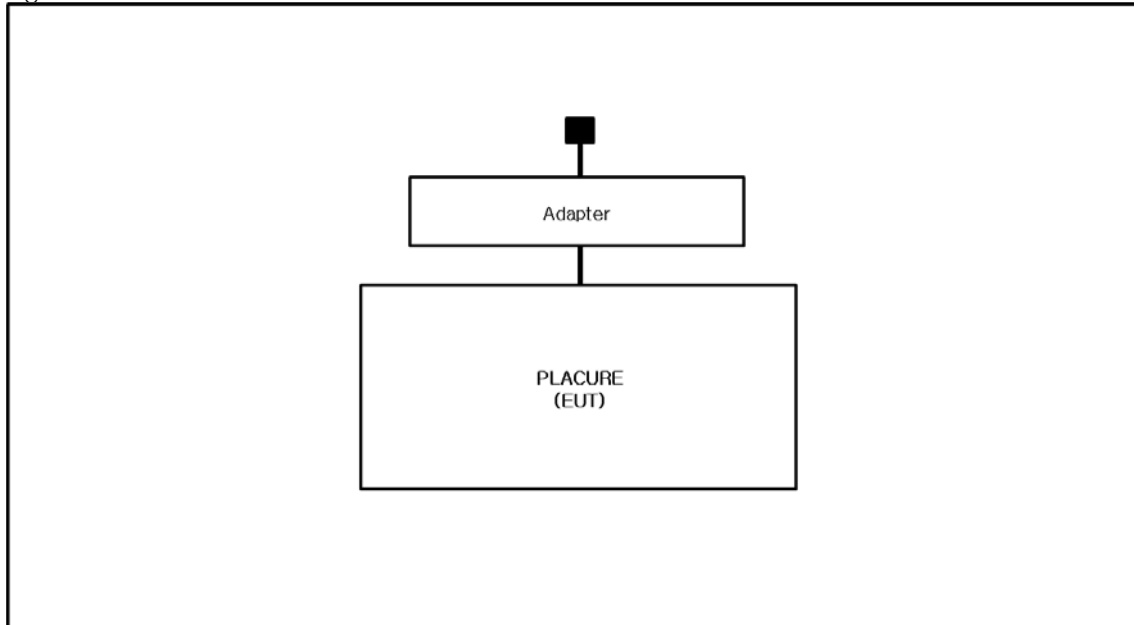
Test mode	operating
Charge	Tested while checking the normal state of charge
Operating	Test was conducted under the maximum load condition.

EUT Test operating S/W		
Name	Version	Manufacture Company
-	-	-

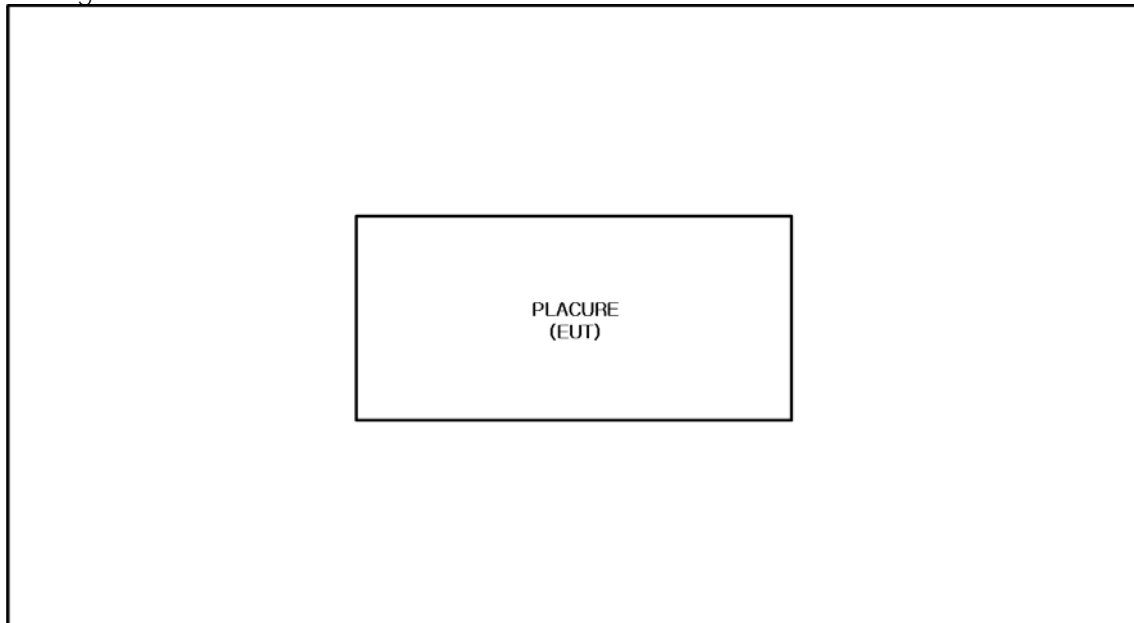
1.8 Configuration

■ AC Main
□ DC Main

■ Charge Mode



■ Operating Mode



1.9 Remarks when standards applied

- 55014-2 category II : Tested in internal battery charging mode.
- 55014-2 category III : Tested in standalone mode.

1.10 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less.

1.11 Test Facility

The measurement facility is located at 473-21 Gayeo-ro, Yeosu-si, Gyeonggi-do, 12658, Korea. The sites are constructed in conformance with the requirements of ANSI C63.4: 2014 and CISPR 16-1-4: 2012

1.12 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
KOREA	RRA	EMI (3 m & 10 m Semi-Anechoic Chamber, 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KR0100
International	KOLAS	EMI (3 m & 10 m Semi-Anechoic Chamber , and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 KT489
USA	FCC	3 m & 10 m Semi-Anechoic Chamber, 10 m Open Area and Conducted test site to perform FCC Part 15/18 measurements.	 KR0100
Canada	ISED	3 m & 10 m Semi-Anechoic Chamber and Conducted test site	 23298-1
JAPAN	VCCI	Mains Ports Conducted Interference Measurement, Telecommunication Ports Conducted Disturbance Measurement and Radiation 10 meter site, Facility for measuring radiated disturbance above 1 GHz	 R-20056, C-20036 T-20040, G-20057
Europe	TÜV SÜD	EMI (3 m & 10 m Semi-Anechoic Chamber, 10 m Open Area and conducted test site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 CARAT 001633 0004

2.0 Test Regulations

The emissions tests were performed according to following regulations:

☒ EMC – Directive 2014/30/EU

☐ EN 61000-6-3: 2011

☐ EN 61000-6-1: 2007

☐ EN 61000-6-4: 2007 +A1: 2011

☐ EN 61000-6-2: 2005

☐ EN 55011: 2007 +A1: 2010

☐ Group 1
☐ Class A

☐ Group 2
☐ Class B

☒ EN 55014-1: 2017

☒ EN 55014-2: 2015

☐ Category I

☒ Category II

☒ Category III

☐ Category IV

☐ EN 55015: 2013

☐ EN 61547: 2009

☐ EN 55032: 2015

☐ Class A

☐ Class B

☐ EN 55024: 2010 +A1: 2015

☐ EN 50130-4: 2011 +A1: 2014

☐ EN 61000-3-2: 2014

☒ EN 61000-3-3: 2013

☐ EN 61326-1: 2013

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (11) of (71)

-
- | | | |
|---|----------------------------------|----------------------------------|
| <input type="checkbox"/> VCCI V-3 / 2015.04 | <input type="checkbox"/> Class A | <input type="checkbox"/> Class B |
| <input type="checkbox"/> AS/NZS CISPR32:2013 | <input type="checkbox"/> Class A | <input type="checkbox"/> Class B |
| <input type="checkbox"/> 47 CFR Part 15, Subpart B | | |
| <input type="checkbox"/> CISPR 22:2009 +A1:2010 | <input type="checkbox"/> Class A | <input type="checkbox"/> Class B |
| <input type="checkbox"/> ANSI C63.4-2014 | <input type="checkbox"/> Class A | <input type="checkbox"/> Class B |
| <input type="checkbox"/> IC Regulation ICES-003 : 2016 | | |
| <input type="checkbox"/> CAN/CSA CISPR 22-10 | <input type="checkbox"/> Class A | <input type="checkbox"/> Class B |
| <input type="checkbox"/> ANSI C63.4-2014 | | |
| <input type="checkbox"/> RE- Directive 2014/53/EU | | |
| <input type="checkbox"/> EN 301 489-1 V2.2.3 | | |
| <input type="checkbox"/> Equipment for fixed use | | |
| <input type="checkbox"/> Equipment for vehicular use | | |
| <input type="checkbox"/> Equipment for portable use | | |
| <input type="checkbox"/> EN 301 489-3 V1.6.1 | | |
| <input type="checkbox"/> EN 301 489-17 V2.2.1 | | |
| <input type="checkbox"/> EN 60945:2002 | | |
| <input type="checkbox"/> 05/2014/TT-BTTTT | | |
| <input type="checkbox"/> TCVN 7189:2009 (CISPR 22 : 2006) | <input type="checkbox"/> Class A | <input type="checkbox"/> Class B |
| <input type="checkbox"/> TCVN 7137:2003 (CISPR 24 : 1997) | | |
| <input type="checkbox"/> QCVN 18:2014/BTTTT | <input type="checkbox"/> Class A | <input type="checkbox"/> Class B |

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (12) of (71)

2.1 Conducted Emissions at Mains Power Ports

Test Date

Feb. 16, 2021

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESR3	R & S	101783	01, 15, 2022
<input checked="" type="checkbox"/>	LISN	ENV216	R & S	101787	12, 29, 2021
<input type="checkbox"/>	LISN	ESH2-Z5	R & S	100450	12, 29, 2021
<input checked="" type="checkbox"/>	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 29, 2021

Test Conditions

Temperature: (23,0 ± 0,1) °C

Relative Humidity: (45,0 ± 0,1) % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (13) of (71)

2.2 Disturbance Voltage(Associated ports)

Test Date

N/A

Test Location

Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-
<input type="checkbox"/>	EMI TEST RECEIVER	ESR3	R & S	101783	01, 15, 2022
<input type="checkbox"/>	LISN	ENV216	R & S	101787	12, 29, 2021
<input type="checkbox"/>	LISN	ESH2-Z5	R & S	100450	12, 29, 2021
<input type="checkbox"/>	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 29, 2021

Test Conditions

Temperature: °C

Relative Humidity: %

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☐ PASS
☐ NOT PASS
☒ NOT APPLICABLE

Remarks

None, Load Port. Test is not applicable.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (14) of (71)

2.3 Conducted Emissions at Telecommunication Ports

Test Date

N/A

Test Location

Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-
<input type="checkbox"/>	EMI TEST RECEIVER	ESR3	R & S	101783	01, 15, 2022
<input type="checkbox"/>	LISN	ENV216	R & S	101787	12, 29, 2021
<input type="checkbox"/>	LISN	ESH2-Z5	R & S	100450	12, 29, 2021
<input type="checkbox"/>	PULSE LIMITER	ESH3-Z2	R & S	101915	12, 29, 2021
<input type="checkbox"/>	8-WIRE ISN CAT3,5	ENY81	R & S	100174	12, 30, 2021
<input type="checkbox"/>	8-WIRE ISN CAT6	ENY81-CAT6	R & S	101665	12, 30, 2021
<input type="checkbox"/>	CDN	CDNS502A	TESEQ	40431	12, 29, 2021

Test Conditions

Temperature:

℃

Relative Humidity:

% R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

☐ PASS☐ NOT PASS☒ NOT APPLICABLE

Remarks

N/A

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (15) of (71)

2.4 Discontinuous Disturbances (Click)

Test Date

Feb. 16, 2021

Test Location

Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	AFJ Click Meter	AFJ	6.05	-
<input checked="" type="checkbox"/>	CLICK METER	CL55C	AFJ INSTRUMENTS	55041222168	08, 05, 2021
<input checked="" type="checkbox"/>	LISN	ENV216	R & S	101787	12, 29, 2021

Test Conditions

Temperature: (23,0 ± 0,3) °C

Relative Humidity: (45,0 ± 0,4) % R.H.

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (16) of (71)

2.5 Disturbance power measurement(30 MHz ~ 300 MHz)

Test Date

N/A

Test Location

Electro wave Shieldroom

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input type="checkbox"/>	EMI Test S/W	EMC32	R & S	9.12.00	-
<input type="checkbox"/>	EMI TEST RECEIVER	ESR3	R & S	101783	01, 15, 2022
<input type="checkbox"/>	ABSORBING CLAMP	MDS21	R & S	100389	03, 17, 2021

Test Conditions

Temperature:

℃

Relative Humidity:

% R.H.

Frequency Range of Measurement

30 MHz to 300 MHz

Instrument Settings

IF Band Width: 120 kHz

Test Results

The requirements are:

☐ PASS☐ NOT PASS☒ NOT APPLICABLE

Remarks

N/A

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

The authenticity of the test report, contact shchoi@kes.co.kr



2.6 Radiated Electric Field Emissions(Below 1 GHz)

Test Date
Feb. 16, 2021

Test Location
SEMI ANECHOIC CHAMBER #4(10 m)

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	EP5/RE	TOYO Corporation	6.0.0	-
<input checked="" type="checkbox"/>	EMI TEST RECEIVER	ESU26	R & S	100551	04, 01, 2021
<input checked="" type="checkbox"/>	AMPLIFIER	SCU 01	R & S	100603	11, 25, 2021
<input checked="" type="checkbox"/>	TRILOG-BROADBAND ANTENNA	VULB9163	Schwarzbeck	715	12, 08, 2022
<input checked="" type="checkbox"/>	ATTENUATOR	8491A	HP	32173	03, 10, 2021
<input checked="" type="checkbox"/>	COMMON MODE ABSORPTION DEVICE	CMAD1614	SCHWARZBECK	00142	01, 19, 2022

Test Conditions

Temperature: (21,9 ± 2,0) °C
Relative Humidity: (43,8 ± 4,0) % R.H.

Frequency Range of Measurement

30 MHz to 1 GHz

Instrument Settings

IF Band Width: 120 kHz

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (18) of (71)

2.7 Harmonic Current Emissions

Test Date

N/A

Test Location

Electro wave Shieldroom#3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input type="checkbox"/>	EMI Test S/W	net.control	EM TEST	2.1.4	-
<input type="checkbox"/>	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	04, 06, 2021
<input type="checkbox"/>	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature:

℃

Relative Humidity:

% R.H.

Classification of Equipment for Harmonic Current Emissions

- ☐ Class A
- ☐ Class B
- ☐ Class C(Below 25 W)
- ☐ Class C(Above 25 W)
- ☐ Class D

Test Results

The requirements are:

- ☐ PASS
- ☐ NOT PASS
- ☒ NOT APPLICABLE

Remarks

Equipment with a rated power of 75W or less, other than lighting equipment.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (19) of (71)

2.8 Voltage Fluctuations and Flicker

Test Date

Feb. 15, 2021

Test Location

Electro wave Shieldroom#3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMI Test S/W	net.control	EM TEST	2.1.4	-
<input checked="" type="checkbox"/>	DIGITAL POWER ANALYZER	DPA 500N	EM TEST	V1024106759	04, 06, 2021
<input checked="" type="checkbox"/>	POWER SOURCE	ACS 500N6	EM TEST	V1024106760	-

Test Conditions

Temperature: (23,3 ± 0,2) °C

Relative Humidity: (42,9 ± 0,2) % R.H.

Test Results

The requirements are:

- ☒ PASS
☐ NOT PASS
☐ NOT APPLICABLE

Remarks

See Appendix A for test data.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

3.0 Criteria for compliance

Criteria for compliance was based on the following guidelines:

General performance criteria

A functional description and a definition of performance criteria, during or as a consequence of the EMC testing, shall be provided by the manufacturer and noted in the test report, based on the following criteria.

Performance criterion A

The apparatus shall continue to operate as intended during the test.

No degradation of performance or loss of function is allowed below a performance level

(or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended.

If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance criterion B

The apparatus shall continue to operate as intended after the test.

No degradation of performance or loss of function is allowed below a performance level

(or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended.

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

Performance criterion C

Temporary loss of function is allowed, provided the function is selfrecoverable

or can be restored by the operation of the controls, or by any operation specified in the instructions for use.

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (21) of (71)

3.1 Electrostatic Discharge

Reference Standard
EN 61000-4-2: 2009

Test Date
Feb. 17, 2021

Test Location
EMS-ESD: Electro wave Shieldroom#7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	ESD SIMULATOR	ESS-2000	Noise Ken	ESS01Z0454	02, 01, 2022
<input checked="" type="checkbox"/>	HCP	-	KES	-	-
<input checked="" type="checkbox"/>	VCP	-	KES	-	-

Test Conditions

Temperature: (22,5 ± 0,2) °C
Relative Humidity: (44,9 ± 0,2) % R.H.
Atmospheric Pressure: (100,4 ± 0,1) kPa

Test Specifications

Discharge Factor: ≥ 1 s

Discharge Impedance: 330 ohm / 150 pF

Kind of Discharge: Air, Contact (direct and indirect)

Polarity: Positive and Negative

Number of Discharge: **10 at all locations for Air discharge**
10 at all locations for Contact discharge

Discharge Voltage:	Contact	Air	HCP	VCP
	<input type="checkbox"/> 2 kV	<input type="checkbox"/> 2 kV	<input type="checkbox"/> 2 kV	<input type="checkbox"/> 2 kV
	<input checked="" type="checkbox"/> 4 kV	<input type="checkbox"/> 4 kV	<input checked="" type="checkbox"/> 4 kV	<input checked="" type="checkbox"/> 4 kV
	<input type="checkbox"/> 6 kV	<input type="checkbox"/> 6 kV	<input type="checkbox"/> 6 kV	<input type="checkbox"/> 6 kV
	<input type="checkbox"/> 8 kV	<input checked="" type="checkbox"/> 8 kV	<input type="checkbox"/> 8 kV	<input type="checkbox"/> 8 kV
	<input type="checkbox"/> 15 kV	<input type="checkbox"/> 15 kV	<input type="checkbox"/> 15 kV	<input type="checkbox"/> 15 kV

Notes: HCP: Horizontal coupling plane
VCP: Vertical coupling plane

Required Performance Criteria: ☒ B

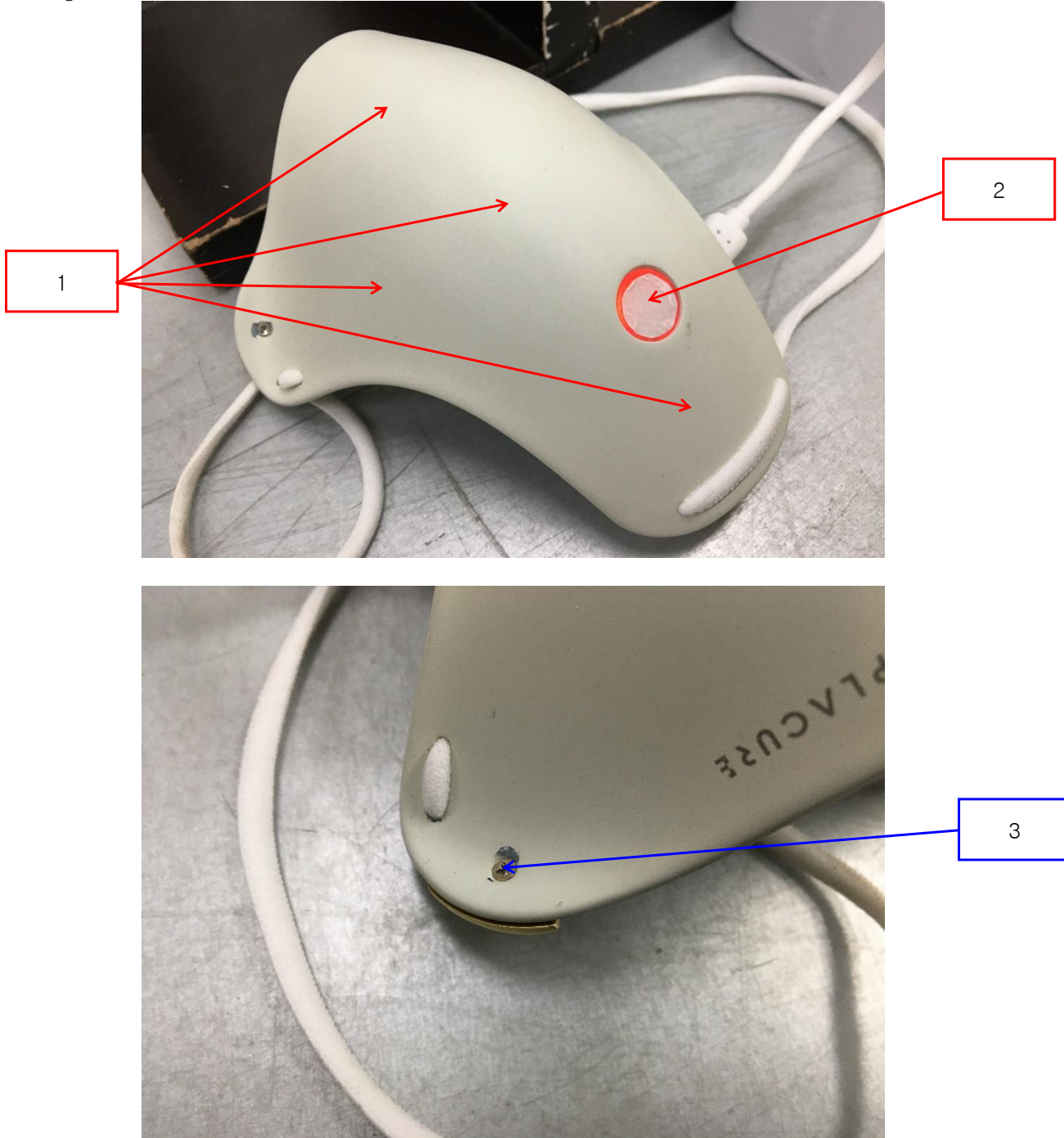
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

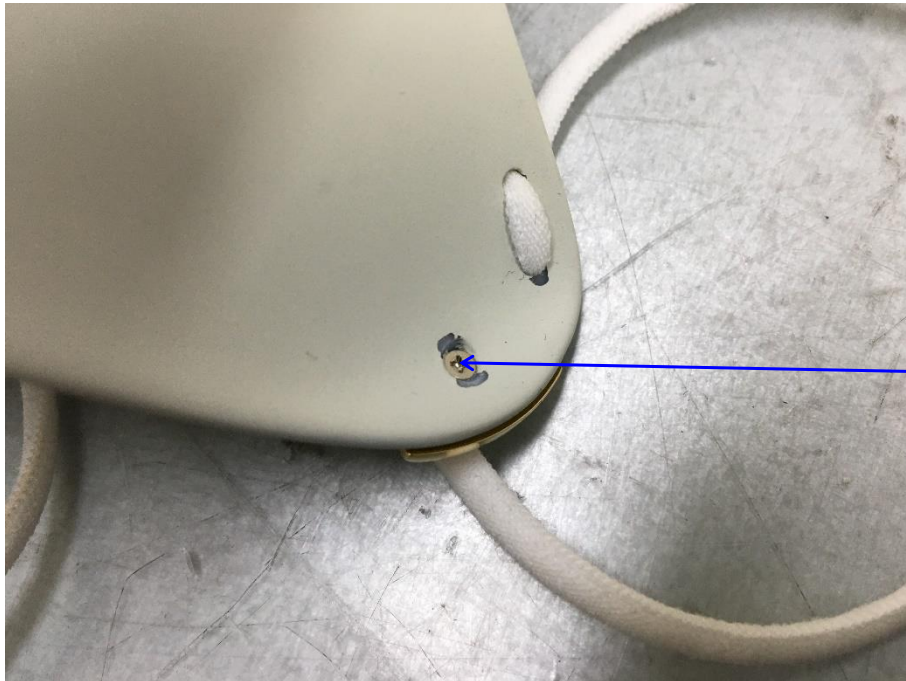
Location of Discharge:

Air
Contact

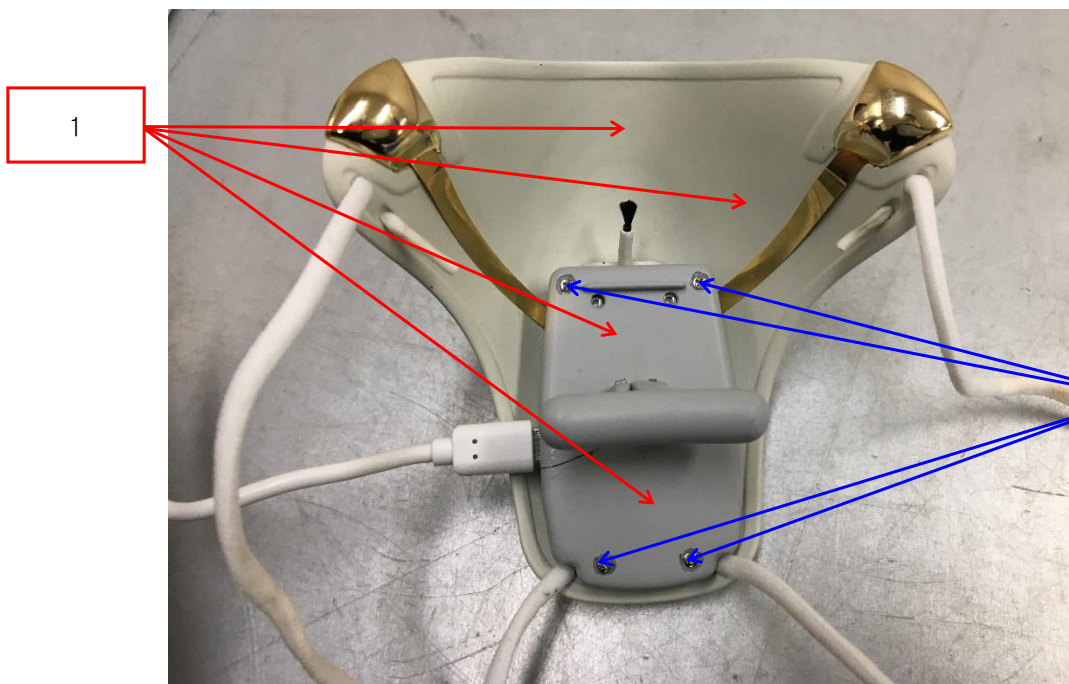


■ Charge Mode





3

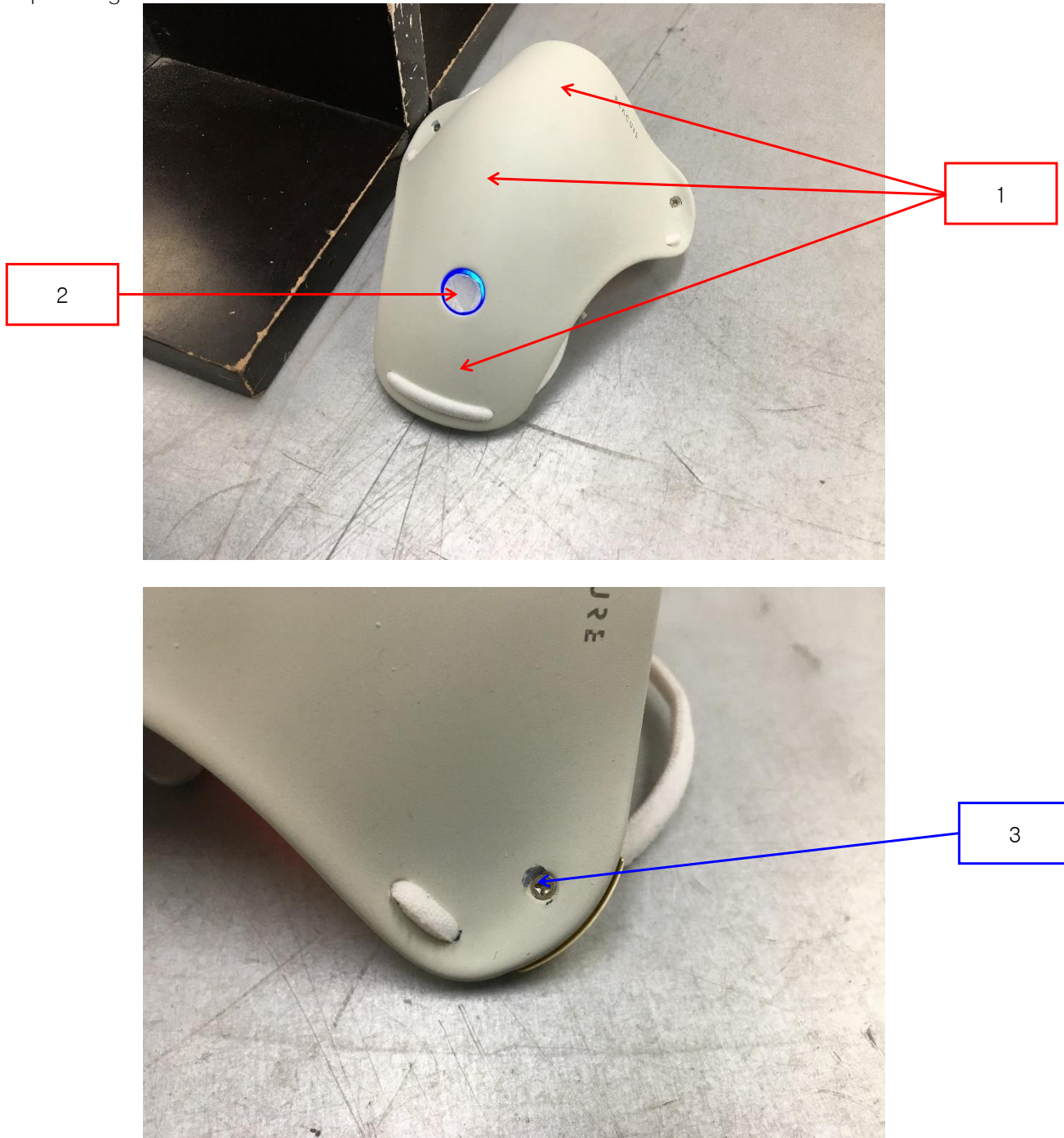


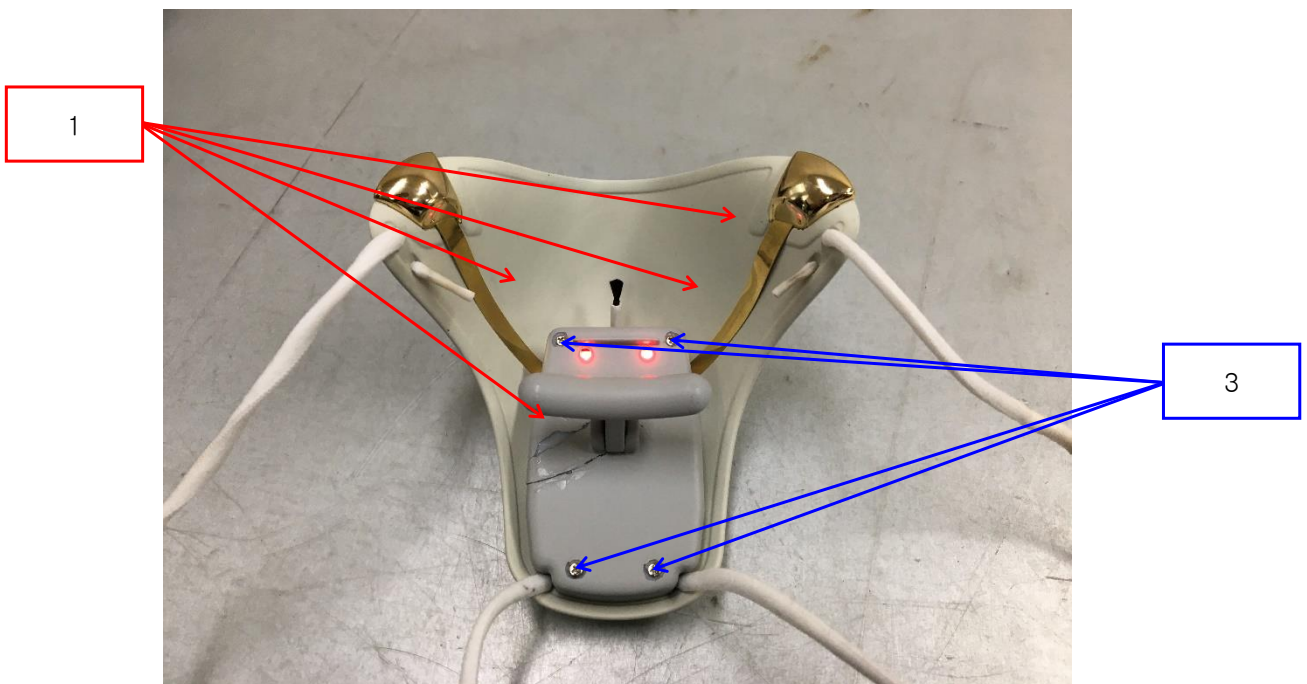
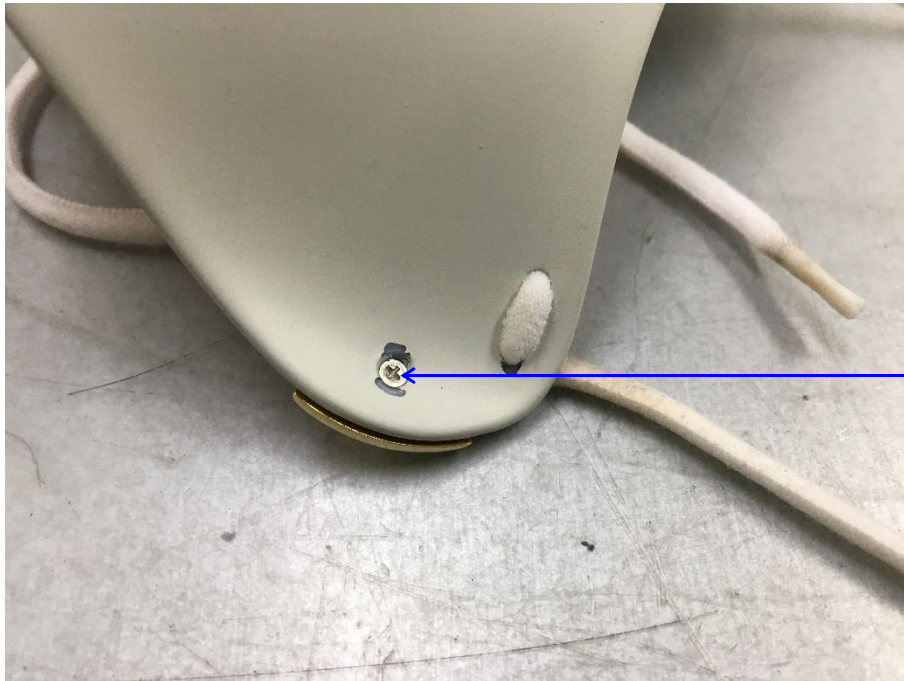
1

3



■ Operating Mode





**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (27) of (71)

Test Data

■ Charge Mode

Indirect Discharge

No.	Test Point	Discharge Method	Performance Criteria	Results	Remarks
1	HCP Contact	Contact Discharge	B	A	-
2	VCP Contact	Contact Discharge	B	A	-

Direct Discharge

No.	Test Point	Discharge Method	Performance Criteria	Results	Remarks
1	Enclosure	Air Discharge	B	A	-
2	Button	Air Discharge	B	A	-
3	Screws	Contact Discharge	B	A	-
4	Port	Air Discharge	B	A	-

Note: "Blank" = Not performed

■ Operation Mode

Indirect Discharge

No.	Test Point	Discharge Method	Performance Criteria	Results	Remarks
1	HCP Contact	Contact Discharge	B	A	-
2	VCP Contact	Contact Discharge	B	A	-

Direct Discharge

No.	Test Point	Discharge Method	Performance Criteria	Results	Remarks
1	Enclosure	Air Discharge	B	A	-
2	Button	Air Discharge	B	A	-
3	Screws	Contact Discharge	B	A	-

Note: "Blank" = Not performed

Results:

A – No degradation of function

B – Distortion/Error of function (self-recoverable)

C – Loss of function

Test Results

☒ PASS Required Performance Criteria☐ NOT PASS Required Performance Criteria☐ NOT APPLICABLE

Remarks

Any degradations of performance was not observed during in the test.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (28) of (71)

3.2 Radiated Electric Field Immunity

Reference Standard

EN 61000-4-3: 2006 +A2: 2010

Test Date

N/A

Test Location

EMS-RS: ☐ Semi Anechoic Chamber #2☐ Semi Anechoic Chamber #3

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input type="checkbox"/>	EMS Test S/W	EMC32	R & S	9.12.00	-
<input type="checkbox"/>	SIGNAL GENERATOR	SMB 100A	Rohde & Schwarz	108252	08, 05, 2021
<input type="checkbox"/>	HIGH POWER DUAL AMP	SSA532	SUNGSAN	SSA532-001	-
<input type="checkbox"/>	POWER METER	E4419B	Agilent	GB40203000	04, 20, 2021
<input type="checkbox"/>	CW POWER SENSOR	E4412A	Agilent	US38488240	04, 20, 2021
<input type="checkbox"/>	CW POWER SENSOR	E4412A	Agilent	MY41501662	04, 20, 2021
<input type="checkbox"/>	STACKED DOUBLE LOG-PER- ANTENNA	STPL9128 E	Schwarzbeck	9128ES-121	-
<input type="checkbox"/>	DOUBLE RIDGED HORN ANTENNA	SAS-571	A.H.SYSTEM, INC	781	03, 11, 2021

Test Conditions

Temperature: °C

Relative Humidity: %

Atmospheric Pressure: kPa

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

The authenticity of the test report, contact shchoi@kes.co.kr



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0121
Page (29) of (71)

Test Specifications

Antenna Polarization: Horizontal & vertical unless indicated otherwise

Antenna Distance: ☐ 3 m

Field Strength: ☐ 1 V/m ☐ 3 V/m
☐ 10 V/m

Frequency Range: ☐ 80 MHz to 1 GHz ☐ 2,0 GHz to 2,7 GHz
☐ 1,4 GHz to 2,0 GHz

Modulation: ☐ AM, 80 %, 1 kHz sine wave
☐ PM, 1 Hz (0,5 s ON : 0,5 s OFF)

Frequency step: ☐ 1 % step

Dwell Time: ☐ 1 s ☐ 3 s

of Sides Radiated: ☐ 4

Required Performance Criteria: ☐ A

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0121
Page (30) of (71)

Test Data

Side Exposed	Performance Criteria	Results	
		Horizontal	Vertical
Front	A	-	-
Right	A	-	-
Back	A	-	-
Left	A	-	-

Note: "Blank" = Not performed

Results:

A – No degradation of function
B – Distortion/Error of function (self-recoverable)
C – Loss of function

Test Results

- ☐ PASS Required Performance Criteria
☐ NOT PASS Required Performance Criteria
☒ NOT APPLICABLE

Remarks

N/A : 55014-2 category II / 55014-2 category III

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (31) of (71)

3.3 Fast Transients

Reference Standard
EN 61000-4-4: 2012

Test Date
Feb. 17, 2021

Test Location
EMS-EFT: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMS Test S/W	iec.control	EM TEST	5.4.7	-
<input checked="" type="checkbox"/>	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 26, 2021
<input checked="" type="checkbox"/>	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 26, 2021
<input type="checkbox"/>	CAPACITIVE COUPLING CLAMP	HFK	EM TEST	P1633183115	11, 26, 2021

Test Conditions

Temperature: (22,5 ± 0,1) °C
Relative Humidity: (44,9 ± 0,1) % R.H.
Atmospheric Pressure: (100,4 ± 0,0) kPa

Test Specifications

Pulse Amplitude & Polarity:
(Power Lines) ☐ ± 0.5 kV ☒ ± 1.0 kV
☐ ± 2.0 kV ☐ ± 4.0 kV

Pulse Amplitude & Polarity:
(Signal Lines) ☐ ± 0.5 kV ☐ ± 1.0 kV
☐ ± 2.0 kV

Burst Period: ☒ 300 ms ☐ 2 s

Repetition Rate: ☒ 5 kHz ☐ 100 kHz

Duration of Test Voltage: ☒ ≥ 2 min

Required Performance Criteria: ☒ B

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (32) of (71)

Test Data

■ Charge Mode

☒ Input a.c. power ports – Coupling/Decoupling Network used

Mode of Application	Performance Criteria	Results	
		(+) Burst (kV)	(-) Burst (kV)
L	B	A	A
N	B	A	A
L – N	B	A	A

☐ Input d.c. power ports – Coupling/Decoupling Network used

Mode of Application	Performance Criteria	Results	
		(+) Burst (kV)	(-) Burst (kV)
-	B	-	-

☐ Signal ports and telecommunication ports – Coupling Clamp used

Mode of Application	Performance Criteria	Results	
		(+) Burst (kV)	(-) Burst (kV)
-	B	-	-

Note: “Blank” = Not performed

Results:

A – No degradation of function

B – Distortion/Error of function (self-recoverable)

C – Loss of function

Test Results

☒ PASS Required Performance Criteria☐ NOT PASS Required Performance Criteria☐ NOT APPLICABLE

Remarks

Any degradations of performance was not observed during in the test.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (33) of (71)

3.4 Surges

Reference Standard

EN 61000-4-5: 2014

Test Date

Feb. 17, 2021

Test Location

EMS-Surge: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMS Test S/W	iec.control	EM TEST	5.4.7	-
<input checked="" type="checkbox"/>	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 26, 2021
<input checked="" type="checkbox"/>	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 26, 2021

Test Conditions

Temperature: (22,5 ± 0,2) °C

Relative Humidity: (44,9 ± 0,1) % R.H.

Atmospheric Pressure: (100,4 ± 0,1) kPa

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (34) of (71)

Test Specifications

AC Power Lines

Source Impedance:

12 ohm for common mode and 2 ohm for differential mode

Surge Amplitude :

Common Mode☐ (0,5 / 1,0 / 2,0) kVDifferential Mode☒ (0,5 / 1,0) kV

Number of Surges:

☒ 5 surges per angle

Angle:

☒ 90°, 270°

Polarity:

☒ Positive & Negative

Repetition Rate:

☐ 1 surge per min ☒ 1 surge per 30 sec.Required Performance Criteria: ☒ B

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (35) of (71)

Test Data

■ Charge Mode

☒ Line to Line – Differential Mode

Mode of Application	Performance Criteria	Results	
		(+) Surge (kV)	(-) Surge (kV)
L – N	B	A	A

☐ Line to Earth – Common Mode

Mode of Application	Performance Criteria	Results	
		(+) Surge (kV)	(-) Surge (kV)
L – PE	B	-	-
N – PE	B	-	-

Note: “Blank” = Not performed

Results:

A – No degradation of function

B – Distortion/Error of function (self-recoverable)

C – Loss of function

Test Results

☒ PASS Required Performance Criteria☐ NOT PASS Required Performance Criteria☐ NOT APPLICABLE

Remarks

Any degradations of performance was not observed during in the test.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (36) of (71)

3.5 Injected currents

Reference Standard
EN 61000-4-6: 2014

Test Date
Feb. 15, 2021

Test Location
EMS-CS: Electro wave Shieldroom #6

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMS Test S/W	icd.control	EM TEST	5.3.11	-
<input checked="" type="checkbox"/>	CONTINUOUS WAVE SIMULATOR	CWS 500N1.4	EM TEST	P1602169880	11, 25, 2021
<input checked="" type="checkbox"/>	ATTENUATOR	ATT 6/80	EM TEST	P1614178148	11, 25, 2021
<input checked="" type="checkbox"/>	CDN	CDN M016	TESEQ	43694	11, 25, 2021
<input type="checkbox"/>	CDN	CDN M016	TESEQ	43697	11, 25, 2021
<input type="checkbox"/>	CDN	CDN T800	TESEQ	42800	11, 25, 2021

Test Conditions

Temperature: (22,5 ± 0,2) °C
Relative Humidity: (46,7 ± 0,3) % R.H.
Atmospheric Pressure: (100,6 ± 0,1) kPa

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (37) of (71)

Test Specifications

Frequency range:

☐ 150 kHz to 100 MHz

☒ 150 kHz to 230 MHz

Voltage Level:

☐ 1 Vrms

☒ 3 Vrms

☐ 10 Vrms

Modulation:

☒ AM, 80 %, 1 kHz sine wave

☐ PM, 1 Hz (0,5 s ON : 0,5 s OFF)

Frequency step:

☒ 1 % step

Dwell Time:

☒ 1 s

☐ 3 s

Required Performance Criteria: ☒ A

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (38) of (71)

Test Data

■ Charge Mode

☒ Input a.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Performance Criteria	Results
L - N	CDN	A	A

☐ Input d.c. power ports

Coupling Location (Line Stressed)	Coupling Method	Performance Criteria	Results
-	-	A	-

☐ Signal ports and telecommunication ports

Coupling Location (Line Stressed)	Coupling Method	Performance Criteria	Results
-	-	A	-

Notes: CDN = Coupling Decoupling Network

"blank" = Not performed

Results:

A - No degradation of function

B - Distortion/Error of function (self-recoverable)

C - Loss of function

Test Results

☒ PASS Required Performance Criteria☐ NOT PASS Required Performance Criteria☐ NOT APPLICABLE

Remarks

Any degradations of performance was not observed during in the test.

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (39) of (71)

3.6 Voltage Dips

Reference Standard
EN 61000-4-11:2004

Test Date
Feb. 17, 2021

Test Location
EMS-Voltage dip: Electro wave Shieldroom #7

Test Equipment

Used	Description	Model Number	Manufacturer	Serial Number	Cal. Due
<input checked="" type="checkbox"/>	EMS Test S/W	iec.control	EM TEST	5.4.7	-
<input checked="" type="checkbox"/>	ULTRA COMPACT SIMULATOR	UCS 500N7	EM TEST	P1608172950	11, 26, 2021
<input checked="" type="checkbox"/>	MOTOR VARIAC	MV2616	EM TEST	P1552169719	11, 26, 2021

Test Conditions

Temperature: (22,5 ± 0,1) °C
Relative Humidity: (44,9 ± 0,1) % R.H.
Atmospheric Pressure: (100,4 ± 0,0) kPa

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0121
Page (40) of (71)

Test Data**■ Charge Mode**

% reduction	Period / ms	Performance Criteria	Result
60 % dip	10	C	A
30 % dip	25	C	A
100 % dip	0.5	C	A

Results:

- A – No response observed from EUT
- B – Unit shuts down then automatically restarts when full voltage is restored.
- C – Unit shuts down then manually restarts when full voltage is restored or Loss of function.

Test Results

- ☒ PASS Required Performance Criteria
- ☐ NOT PASS Required Performance Criteria
- ☐ NOT APPLICABLE

Remarks

Any degradations of performance was not observed during in the test.



APPENDIX A – TEST DATA

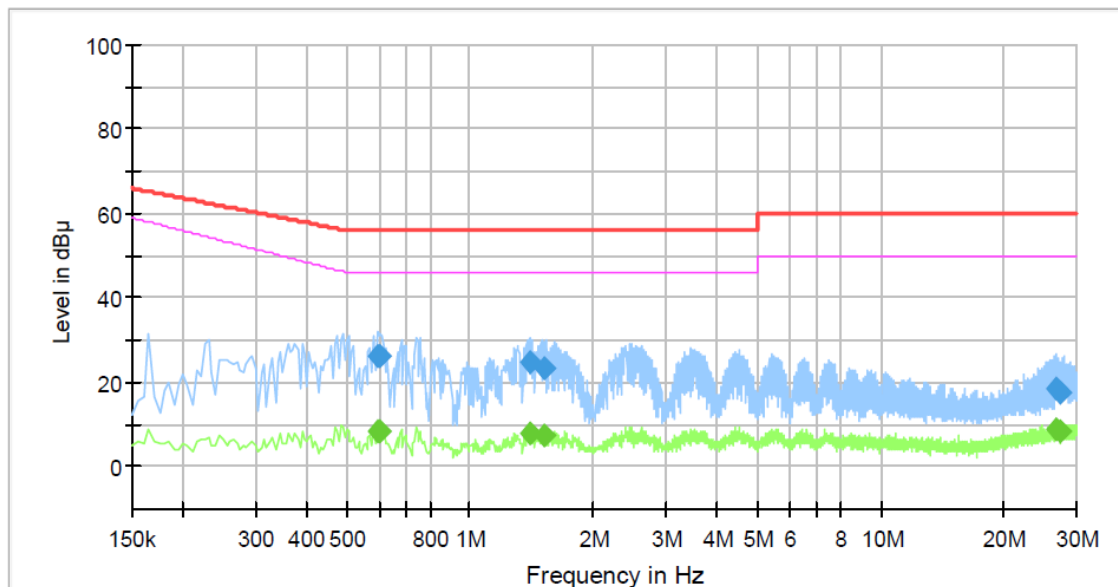
Conducted Emissions at Mains Power Ports

■ Charge Mode

[HOT]

Common Information

Test Description:	Conducted Emission
Model No.:	PLC01
Phase:	
Mode:	Charge
Operator Name:	KES



Final_Result

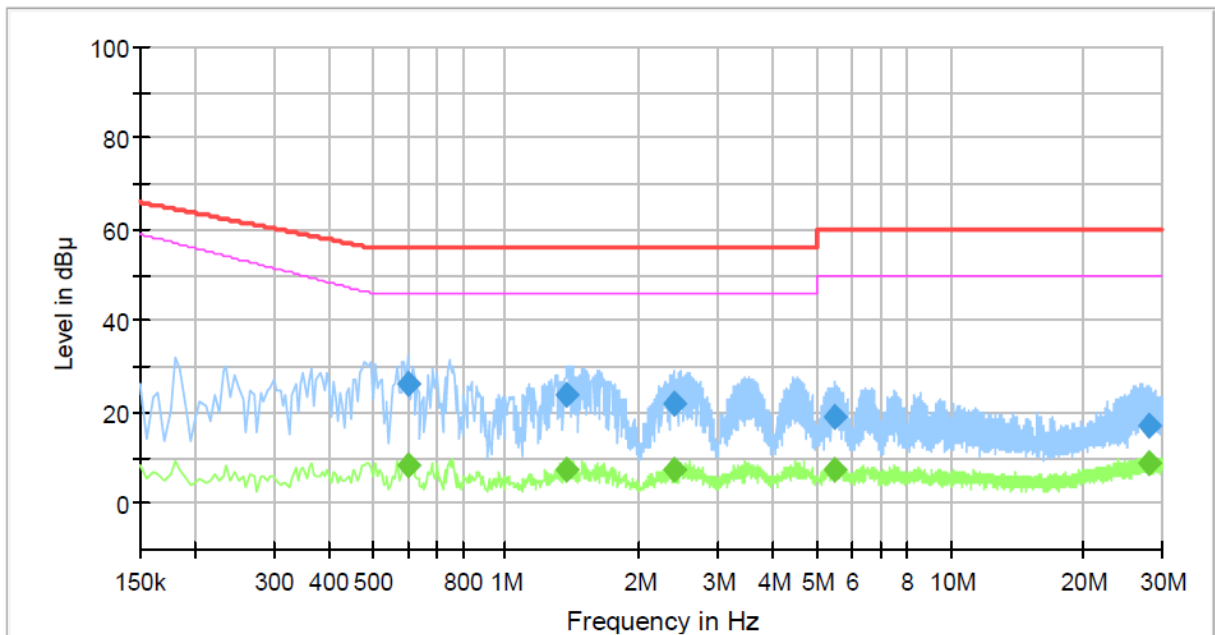
Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.595000	---	8.39	46.00	37.61	1000.0	9.000	L1	19.8
0.595000	26.18	---	56.00	29.82	1000.0	9.000	L1	19.8
0.600000	---	8.31	46.00	37.69	1000.0	9.000	L1	19.8
0.600000	26.04	---	56.00	29.96	1000.0	9.000	L1	19.8
1.395000	---	7.82	46.00	38.18	1000.0	9.000	L1	20.1
1.395000	24.53	---	56.00	31.47	1000.0	9.000	L1	20.1
1.510000	---	7.30	46.00	38.70	1000.0	9.000	L1	20.1
1.510000	23.31	---	56.00	32.69	1000.0	9.000	L1	20.1
26.890000	---	8.70	50.00	41.30	1000.0	9.000	L1	20.2
26.890000	18.51	---	60.00	41.49	1000.0	9.000	L1	20.2
27.430000	---	8.55	50.00	41.45	1000.0	9.000	L1	20.2
27.430000	17.28	---	60.00	42.72	1000.0	9.000	L1	20.2

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

[NEUTRAL]

Common Information

Test Description:	Conducted Emission
Model No.:	PLC01
Phase:	
Mode:	Charge
Operator Name:	KES



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.600000	---	8.31	46.00	37.69	1000.0	9.000	N	19.8
0.600000	26.03	---	56.00	29.97	1000.0	9.000	N	19.8
1.375000	---	7.36	46.00	38.64	1000.0	9.000	N	20.1
1.375000	23.66	---	56.00	32.34	1000.0	9.000	N	20.1
2.380000	---	7.16	46.00	38.84	1000.0	9.000	N	20.1
2.380000	21.96	---	56.00	34.04	1000.0	9.000	N	20.1
5.490000	---	7.20	50.00	42.80	1000.0	9.000	N	19.6
5.490000	19.08	---	60.00	40.92	1000.0	9.000	N	19.6
28.135000	---	8.64	50.00	41.36	1000.0	9.000	N	20.3
28.135000	16.96	---	60.00	43.04	1000.0	9.000	N	20.3

◆ Calculation

QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

Corr. : Correction values (LISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
 The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
 The authenticity of the test report, contact shchoi@kes.co.kr



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0121
Page (43) of (71)

Conducted Emissions at Telecommunication Ports

[1 000 Mbps]

N/A

◆ Calculation

QuasiPeak[dBuV] / CAverage [dBuV] = Reading Value[dBuV] + Corr. [dB]

QuasiPeak / CAverage : The Final Value

Reading Value : Not shown in the table.

Corr. : Correction values (ISN FACTOR + (Cable Loss + Pulse Limiter FACTOR))

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0121
Page (44) of (71)

Discontinuous Disturbances (Click)

AFJ **AFJ CL55c Click Analyser ver 6.05**
Test Report - Printed 16-02-2021 03:49:15

Title

Test# 1

Date 16/02/2021 03:48:5 Time 120:08.905

Required

Executed by

Description

Model PLC01

SN

Type

Report

LINE : L1

Pass

Mode: Switch Op ☐ f= 1.00 Click Rate ☒

Rx1 150kHz

No Clicks

Rx2 500kHz

No Clicks

Rx3 1.4MHz

No Clicks

Rx4 30MHz

No Clicks

Remote

Input Offset

External Attenuator

NONE

0.0

0 dB

Att. Rx1 150kHz

Att. Rx2 500kHz

Att. Rx3 1.4MHz

Att. Rx4 30MHz

10dB

10dB

10dB

10dB

ClickMeter for Windows?
c:\Data\Default\Test001911 - Analysis print nr: 1**First Pass**

CISPR

Short

0

0

0

0

4-1:2005 + A1:200

Long

0

0

0

0

Fast Long

0

0

0

0

Total Clicks

0

0

0

0

Continuous Int.

Events

0

0

0

0

Correction

TIME (s)

0.00

0.00

0.00

0.00

Manual

Switch Op

0

0

0

0

2 Click

0

0

0

0

Limit dBuV

66.0

56.0

56.0

60.0

7.4.2.2

N

0.00

0.00

0.00

0.00

Limit dBuV

Allowed Clicks

Second Pass

Short

0

0

0

0

Long

0

0

0

0

Preview

Total Clicks

0

0

0

0

Continuous Int.

Events

0

0

0

0

TIME (s)

0.00

0.00

0.00

0.00

2 Click

0

0

0

0

PASS

☒

☒

☒

☒

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0121
Page (45) of (71)

Disturbance power measurement (30 MHz ~ 300 MHz)

N/A

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr



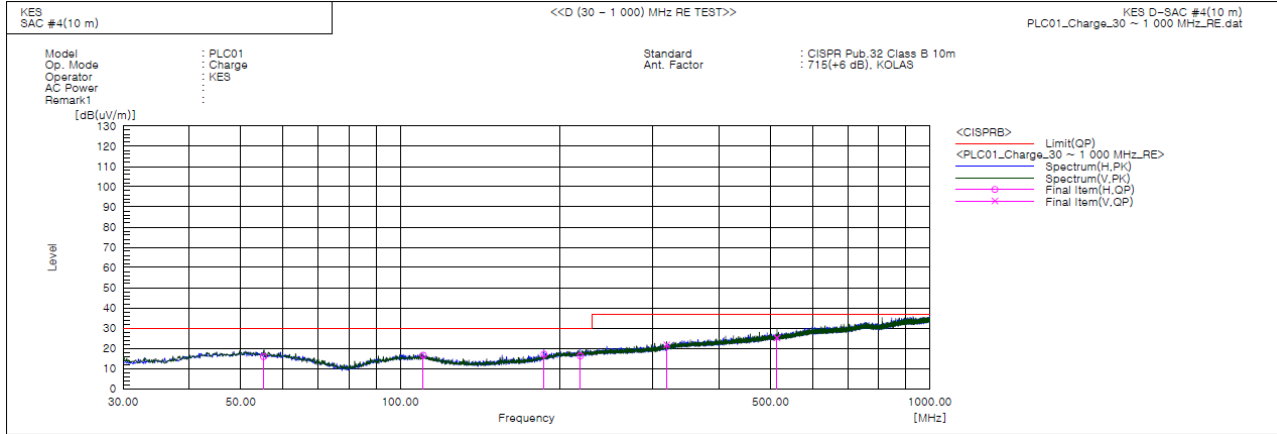
KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0121
Page (46) of (71)

Radiated Electric Field Emissions(Below 1 GHz)

■ Charge Mode



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	55.220	H	37.2	-21.4	15.8	30.0	14.2	400.0	61.0	
2	110.510	H	38.9	-22.3	16.6	30.0	13.4	400.0	66.0	
3	186.898	H	39.6	-22.5	17.1	30.0	12.9	400.0	52.0	
4	218.786	H	36.4	-20.2	16.2	30.0	13.8	400.0	177.0	
5	318.575	V	38.6	-16.8	21.8	37.0	15.2	110.0	344.0	
6	514.273	V	36.5	-11.3	25.2	37.0	11.8	110.0	105.0	

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr



KES Co., Ltd.

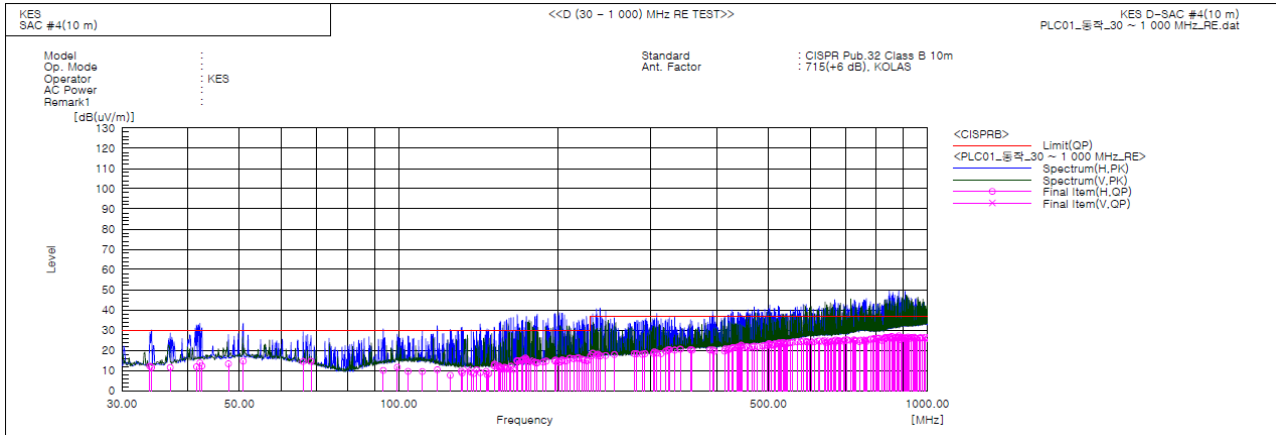
3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (47) of (71)

Operation Mode



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	33.880	H	36.9	-24.9	12.0	30.0	18.0	100.0	35.0	
2	34.123	H	36.4	-24.9	11.5	30.0	18.5	340.0	70.0	
3	37.033	H	35.8	-24.3	11.5	30.0	18.5	100.0	31.0	
4	41.519	H	34.0	-22.1	11.9	30.0	18.1	120.0	38.0	
5	42.125	H	35.7	-21.9	13.8	30.0	16.2	100.0	236.0	
6	42.489	H	34.0	-21.8	12.2	30.0	17.8	100.0	217.0	
7	47.703	H	34.5	-21.2	13.3	30.0	16.7	100.0	357.0	
8	50.855	H	35.6	-21.0	14.6	30.0	15.4	100.0	58.0	
9	66.011	H	38.0	-23.6	14.4	30.0	15.6	140.0	259.0	
10	68.315	H	38.8	-24.3	14.5	30.0	15.5	130.0	247.0	
11	93.535	H	33.7	-23.7	10.0	30.0	20.0	400.0	7.0	
12	99.476	H	34.2	-22.6	11.6	30.0	18.4	400.0	30.0	
13	104.205	H	32.0	-22.4	9.6	30.0	20.4	100.0	244.0	
14	110.874	H	31.8	-22.3	9.5	30.0	20.5	200.0	280.0	
15	118.391	H	34.2	-23.8	10.4	30.0	19.6	400.0	324.0	
16	125.303	H	32.4	-24.8	7.6	30.0	22.4	400.0	88.0	
17	131.365	H	34.8	-25.2	9.6	30.0	20.4	160.0	43.0	
18	131.850	H	33.9	-25.2	8.7	30.0	21.3	400.0	49.0	
19	135.003	V	35.8	-25.3	10.5	30.0	19.5	100.0	337.0	
20	137.185	H	34.5	-25.4	9.1	30.0	20.9	100.0	46.0	
21	138.519	H	33.9	-25.4	8.5	30.0	21.5	400.0	4.0	

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (48) of (71)

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
22	140.459	H	35.6	-25.3	10.3	30.0	19.7	390.0	4.0	
23	142.763	H	34.2	-25.3	8.9	30.0	21.1	400.0	22.0	
24	146.521	H	34.8	-25.2	9.6	30.0	20.4	400.0	305.0	
25	147.006	H	33.1	-25.2	7.9	30.0	22.1	400.0	81.0	
26	148.098	H	33.6	-25.1	8.5	30.0	21.5	400.0	237.0	
27	151.614	H	37.2	-25.0	12.2	30.0	17.8	400.0	41.0	
28	151.856	H	38.1	-25.0	13.1	30.0	16.9	400.0	358.0	
29	167.619	H	39.0	-24.2	14.8	30.0	15.2	400.0	275.0	
30	182.896	H	36.8	-23.0	13.8	30.0	16.2	400.0	278.0	
31	201.448	H	34.9	-20.7	14.2	30.0	15.8	400.0	233.0	
32	236.610	H	36.9	-19.5	17.4	37.0	19.6	400.0	37.0	
33	240.490	H	36.6	-19.4	17.2	37.0	19.8	400.0	57.0	
34	882.388	H	31.3	-4.1	27.2	37.0	9.8	100.0	50.0	
35	155.130	H	36.0	-24.8	11.2	30.0	18.8	400.0	72.0	
36	154.766	H	36.9	-24.8	12.1	30.0	17.9	100.0	194.0	
37	155.858	H	35.5	-24.7	10.8	30.0	19.2	340.0	233.0	
38	155.494	H	36.0	-24.8	11.2	30.0	18.8	400.0	228.0	
39	157.070	H	35.4	-24.7	10.7	30.0	19.3	400.0	228.0	
40	158.525	H	36.1	-24.6	11.5	30.0	18.5	390.0	16.0	
41	159.010	H	35.8	-24.6	11.2	30.0	18.8	100.0	213.0	
42	160.101	H	35.6	-24.5	11.1	30.0	18.9	400.0	103.0	
43	161.920	H	35.1	-24.4	10.7	30.0	19.3	400.0	85.0	
44	163.133	H	36.4	-24.4	12.0	30.0	18.0	400.0	207.0	
45	164.951	H	34.8	-24.3	10.5	30.0	19.5	400.0	62.0	
46	159.738	H	35.4	-24.5	10.9	30.0	19.1	400.0	26.0	
47	167.861	H	38.9	-24.2	14.7	30.0	15.3	400.0	210.0	
48	171.014	H	38.9	-24.0	14.9	30.0	15.1	400.0	41.0	
49	171.620	H	39.2	-24.0	15.2	30.0	14.8	380.0	256.0	
50	173.803	H	40.0	-23.9	16.1	30.0	13.9	350.0	247.0	
51	174.409	H	39.2	-23.8	15.4	30.0	14.6	400.0	237.0	
52	176.591	V	38.6	-23.7	14.9	30.0	15.1	100.0	329.0	
53	178.168	V	37.9	-23.5	14.4	30.0	15.6	140.0	105.0	
54	180.956	H	37.3	-23.2	14.1	30.0	15.9	400.0	31.0	
55	182.169	H	36.9	-23.1	13.8	30.0	16.2	400.0	46.0	
56	187.746	H	36.6	-22.4	14.2	30.0	15.8	400.0	194.0	
57	190.171	H	36.6	-22.0	14.6	30.0	15.4	400.0	301.0	
58	197.446	H	35.6	-20.9	14.7	30.0	15.3	400.0	244.0	
59	198.174	H	35.9	-20.8	15.1	30.0	14.9	400.0	107.0	
60	201.205	H	34.9	-20.7	14.2	30.0	15.8	400.0	233.0	
61	203.509	H	35.7	-20.7	15.0	30.0	15.0	290.0	249.0	
62	203.994	H	35.9	-20.7	15.2	30.0	14.8	400.0	33.0	
63	205.934	H	35.2	-20.6	14.6	30.0	15.4	380.0	229.0	
64	207.753	H	35.4	-20.6	14.8	30.0	15.2	330.0	202.0	
65	210.663	H	36.5	-20.5	16.0	30.0	14.0	200.0	240.0	
66	214.300	H	36.2	-20.4	15.8	30.0	14.2	360.0	260.0	
67	217.453	H	36.3	-20.3	16.0	30.0	14.0	400.0	286.0	
68	219.029	H	36.4	-20.2	16.2	30.0	13.8	400.0	256.0	

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (49) of (71)

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
69	222.788	H	35.5	-20.1	15.4	30.0	14.6	390.0	51.0	
70	224.243	H	35.2	-20.0	15.2	30.0	14.8	150.0	70.0	
71	226.668	H	34.7	-19.9	14.8	30.0	15.2	400.0	114.0	
72	228.244	H	34.8	-19.8	15.0	30.0	15.0	100.0	54.0	
73	231.033	H	36.9	-19.7	17.2	37.0	19.8	400.0	202.0	
74	232.851	H	38.2	-19.7	18.5	37.0	18.5	400.0	263.0	
75	238.186	H	37.5	-19.5	18.0	37.0	19.0	350.0	107.0	
76	246.431	H	36.6	-19.2	17.4	37.0	19.6	400.0	267.0	
77	255.768	H	36.7	-18.9	17.8	37.0	19.2	400.0	301.0	
78	279.048	H	36.8	-18.5	18.3	37.0	18.7	400.0	256.0	
79	282.079	H	36.7	-18.5	18.2	37.0	18.8	400.0	103.0	
80	288.869	H	36.3	-18.3	18.0	37.0	19.0	400.0	7.0	
81	292.264	H	36.5	-18.2	18.3	37.0	18.7	400.0	68.0	
82	303.661	H	36.1	-17.7	18.4	37.0	18.6	400.0	228.0	
83	304.631	H	36.8	-17.7	19.1	37.0	17.9	400.0	199.0	
84	307.663	H	36.1	-17.5	18.6	37.0	18.4	400.0	233.0	
85	313.483	H	35.4	-17.1	18.3	37.0	18.7	400.0	45.0	
86	320.151	H	36.2	-16.7	19.5	37.0	17.5	400.0	305.0	
87	323.425	H	36.6	-16.5	20.1	37.0	16.9	400.0	244.0	
88	325.123	H	36.6	-16.4	20.2	37.0	16.8	400.0	214.0	
89	332.640	H	36.0	-16.0	20.0	37.0	17.0	400.0	241.0	
90	341.006	H	36.1	-15.6	20.5	37.0	16.5	400.0	49.0	
91	356.648	H	35.4	-15.2	20.2	37.0	16.8	400.0	233.0	
92	358.951	H	35.1	-15.1	20.0	37.0	17.0	400.0	241.0	
93	387.930	H	34.6	-14.5	20.1	37.0	16.9	400.0	167.0	
94	392.659	H	34.5	-14.4	20.1	37.0	16.9	350.0	156.0	
95	395.448	H	33.9	-14.4	19.5	37.0	17.5	400.0	341.0	
96	413.393	H	33.6	-14.0	19.6	37.0	17.4	360.0	118.0	
97	414.726	H	34.6	-14.0	20.6	37.0	16.4	400.0	141.0	
98	419.698	H	33.9	-13.8	20.1	37.0	16.9	100.0	100.0	
99	421.880	H	34.6	-13.8	20.8	37.0	16.2	200.0	73.0	
100	426.488	H	34.7	-13.7	21.0	37.0	16.0	400.0	88.0	
101	428.913	H	35.0	-13.7	21.3	37.0	15.7	400.0	140.0	
102	436.430	H	34.8	-13.5	21.3	37.0	15.7	400.0	186.0	
103	438.370	H	35.0	-13.4	21.6	37.0	15.4	390.0	96.0	
104	441.280	H	34.9	-13.4	21.5	37.0	15.5	400.0	213.0	
105	442.856	H	35.0	-13.3	21.7	37.0	15.3	400.0	77.0	
106	444.433	H	35.7	-13.3	22.4	37.0	14.6	290.0	245.0	
107	446.130	H	34.4	-13.2	21.2	37.0	15.8	400.0	85.0	
108	455.466	H	34.8	-13.0	21.8	37.0	15.2	200.0	99.0	
109	457.528	H	34.0	-12.9	21.1	37.0	15.9	200.0	46.0	
110	466.136	H	34.4	-12.7	21.7	37.0	15.3	400.0	290.0	
111	470.259	H	34.5	-12.5	22.0	37.0	15.0	360.0	255.0	
112	477.655	H	34.1	-12.3	21.8	37.0	15.2	400.0	228.0	
113	487.598	H	34.1	-12.0	22.1	37.0	14.9	200.0	260.0	
114	492.326	H	34.1	-11.8	22.3	37.0	14.7	400.0	252.0	
115	498.025	H	34.2	-11.7	22.5	37.0	14.5	400.0	272.0	

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (50) of (71)

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
116	501.299	H	34.8	-11.6	23.2	37.0	13.8	200.0	2.0	
117	502.996	H	34.7	-11.6	23.1	37.0	13.9	400.0	11.0	
118	506.755	H	34.3	-11.5	22.8	37.0	14.2	400.0	232.0	
119	507.604	H	33.9	-11.4	22.5	37.0	14.5	400.0	58.0	
120	512.696	H	33.7	-11.3	22.4	37.0	14.6	400.0	299.0	
121	514.758	H	34.5	-11.3	23.2	37.0	13.8	390.0	310.0	
122	522.275	H	34.1	-11.1	23.0	37.0	14.0	400.0	283.0	
123	522.518	H	34.6	-11.1	23.5	37.0	13.5	200.0	256.0	
124	524.579	H	34.2	-11.1	23.1	37.0	13.9	390.0	96.0	
125	526.761	H	34.6	-11.0	23.6	37.0	13.4	400.0	301.0	
126	529.914	H	34.3	-11.0	23.3	37.0	13.7	400.0	191.0	
127	533.794	H	34.7	-10.9	23.8	37.0	13.2	100.0	126.0	
128	535.855	H	33.8	-10.8	23.0	37.0	14.0	100.0	259.0	
129	538.523	H	33.5	-10.7	22.8	37.0	14.2	100.0	313.0	
130	540.826	H	33.9	-10.7	23.2	37.0	13.8	400.0	241.0	
131	543.736	H	34.1	-10.6	23.5	37.0	13.5	400.0	251.0	
132	550.405	H	34.1	-10.4	23.7	37.0	13.3	390.0	221.0	
133	556.589	H	34.1	-10.1	24.0	37.0	13.0	400.0	39.0	
134	567.138	H	33.8	-9.6	24.2	37.0	12.8	400.0	287.0	
135	576.716	H	33.5	-9.2	24.3	37.0	12.7	400.0	195.0	
136	582.415	H	33.6	-9.0	24.6	37.0	12.4	380.0	62.0	
137	589.569	H	33.0	-8.7	24.3	37.0	12.7	400.0	77.0	
138	592.721	H	32.9	-8.7	24.2	37.0	12.8	400.0	62.0	
139	598.299	V	32.8	-8.6	24.2	37.0	12.8	140.0	290.0	
140	602.664	V	32.6	-8.5	24.1	37.0	12.9	400.0	109.0	
141	610.788	V	33.0	-8.4	24.6	37.0	12.4	110.0	1.0	
142	621.336	V	32.5	-8.2	24.3	37.0	12.7	130.0	337.0	
143	624.368	H	32.8	-8.2	24.6	37.0	12.4	400.0	347.0	
144	638.796	H	32.7	-8.0	24.7	37.0	12.3	400.0	118.0	
145	640.494	V	32.9	-8.0	24.9	37.0	12.1	100.0	318.0	
146	641.949	H	31.8	-8.0	23.8	37.0	13.2	300.0	103.0	
147	646.071	V	32.1	-7.9	24.2	37.0	12.8	110.0	306.0	
148	648.981	V	32.0	-7.9	24.1	37.0	12.9	100.0	295.0	
149	655.650	H	32.1	-7.8	24.3	37.0	12.7	400.0	286.0	
150	660.015	H	32.4	-7.8	24.6	37.0	12.4	400.0	263.0	
151	664.501	V	31.8	-7.7	24.1	37.0	12.9	150.0	87.0	
152	667.775	H	32.3	-7.7	24.6	37.0	12.4	400.0	199.0	
153	670.443	H	32.7	-7.6	25.1	37.0	11.9	350.0	96.0	
154	677.960	H	32.1	-7.5	24.6	37.0	12.4	400.0	92.0	
155	678.688	H	32.2	-7.5	24.7	37.0	12.3	250.0	92.0	
156	683.053	H	32.0	-7.4	24.6	37.0	12.4	390.0	141.0	
157	684.386	V	32.4	-7.4	25.0	37.0	12.0	400.0	14.0	
158	693.601	H	31.8	-7.3	24.5	37.0	12.5	400.0	61.0	
159	697.724	H	32.4	-7.3	25.1	37.0	11.9	400.0	114.0	
160	704.514	H	32.4	-7.2	25.2	37.0	11.8	200.0	233.0	
161	716.154	V	31.9	-6.9	25.0	37.0	12.0	100.0	299.0	
162	721.125	V	31.6	-6.7	24.9	37.0	12.1	130.0	40.0	

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (51) of (71)

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
163	725.975	H	31.7	-6.5	25.2	37.0	11.8	400.0	26.0	
164	728.764	H	31.0	-6.4	24.6	37.0	12.4	200.0	38.0	
165	731.674	H	30.9	-6.2	24.7	37.0	12.3	400.0	236.0	
166	743.556	H	30.1	-5.8	24.3	37.0	12.7	400.0	92.0	
167	745.133	H	30.8	-5.8	25.0	37.0	12.0	400.0	129.0	
168	758.228	V	30.9	-5.7	25.2	37.0	11.8	110.0	194.0	
169	760.895	H	30.7	-5.7	25.0	37.0	12.0	400.0	213.0	
170	761.744	H	30.2	-5.7	24.5	37.0	12.5	100.0	213.0	
171	765.745	H	30.1	-5.8	24.3	37.0	12.7	400.0	221.0	
172	766.594	V	31.1	-5.8	25.3	37.0	11.7	120.0	198.0	
173	780.174	H	31.7	-6.1	25.6	37.0	11.4	400.0	57.0	
174	788.783	H	31.6	-6.2	25.4	37.0	11.6	400.0	183.0	
175	791.814	H	32.1	-6.3	25.8	37.0	11.2	400.0	37.0	
176	799.695	V	31.6	-6.3	25.3	37.0	11.7	100.0	221.0	
177	803.575	H	32.2	-6.3	25.9	37.0	11.1	400.0	153.0	
178	807.455	H	32.0	-6.2	25.8	37.0	11.2	400.0	275.0	
179	810.001	H	32.2	-6.2	26.0	37.0	11.0	200.0	268.0	
180	820.308	H	30.7	-5.9	24.8	37.0	12.2	400.0	207.0	
181	827.461	H	31.2	-5.7	25.5	37.0	11.5	200.0	202.0	
182	829.159	H	31.8	-5.6	26.2	37.0	10.8	400.0	343.0	
183	832.069	H	31.8	-5.5	26.3	37.0	10.7	400.0	30.0	
184	832.675	H	31.5	-5.5	26.0	37.0	11.0	400.0	256.0	
185	837.525	H	31.7	-5.4	26.3	37.0	10.7	400.0	96.0	
186	840.435	V	31.9	-5.3	26.6	37.0	10.4	110.0	53.0	
187	844.921	V	30.9	-5.1	25.8	37.0	11.2	100.0	357.0	
188	847.104	H	31.6	-5.1	26.5	37.0	10.5	100.0	356.0	
189	848.074	H	31.4	-5.0	26.4	37.0	10.6	400.0	348.0	
190	855.106	H	31.6	-4.8	26.8	37.0	10.2	100.0	107.0	
191	860.078	H	31.4	-4.7	26.7	37.0	10.3	100.0	50.0	
192	860.684	H	30.5	-4.7	25.8	37.0	11.2	400.0	161.0	
193	864.685	V	30.7	-4.6	26.1	37.0	10.9	200.0	73.0	
194	867.231	H	30.8	-4.5	26.3	37.0	10.7	400.0	111.0	
195	876.689	H	30.2	-4.2	26.0	37.0	11.0	400.0	129.0	
196	878.265	H	30.8	-4.2	26.6	37.0	10.4	400.0	203.0	
197	880.326	H	30.6	-4.2	26.4	37.0	10.6	400.0	99.0	
198	883.843	H	30.3	-4.1	26.2	37.0	10.8	400.0	96.0	
199	884.691	H	29.4	-4.1	25.3	37.0	11.7	400.0	19.0	
200	889.905	H	30.0	-4.0	26.0	37.0	11.0	400.0	309.0	
201	893.664	V	30.2	-3.9	26.3	37.0	10.7	100.0	349.0	
202	896.089	H	30.3	-3.9	26.4	37.0	10.6	200.0	194.0	
203	901.666	H	30.0	-3.9	26.1	37.0	10.9	400.0	152.0	
204	905.668	V	29.4	-3.8	25.6	37.0	11.4	130.0	228.0	
205	907.123	H	29.6	-3.8	25.8	37.0	11.2	400.0	248.0	
206	909.426	H	29.8	-3.8	26.0	37.0	11.0	390.0	266.0	
207	912.215	H	29.9	-3.8	26.1	37.0	10.9	200.0	306.0	
208	915.125	H	29.7	-3.8	25.9	37.0	11.1	400.0	195.0	
209	919.126	H	30.4	-3.8	26.6	37.0	10.4	380.0	28.0	

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:

KES-EM-21T0121

Page (52) of (71)

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
210	924.704	H	29.6	-3.8	25.8	37.0	11.2	200.0	338.0	
211	930.039	V	29.9	-3.7	26.2	37.0	10.8	400.0	260.0	
212	932.100	H	30.1	-3.7	26.4	37.0	10.6	400.0	172.0	
213	939.011	H	29.7	-3.7	26.0	37.0	11.0	400.0	43.0	
214	942.528	H	30.2	-3.7	26.5	37.0	10.5	380.0	43.0	
215	947.135	H	29.7	-3.6	26.1	37.0	10.9	400.0	96.0	
216	950.409	H	29.4	-3.6	25.8	37.0	11.2	400.0	157.0	
217	957.926	V	30.1	-3.5	26.6	37.0	10.4	200.0	179.0	
218	965.686	H	29.5	-3.4	26.1	37.0	10.9	400.0	218.0	
219	968.233	H	29.6	-3.4	26.2	37.0	10.8	400.0	179.0	
220	977.690	H	29.4	-3.2	26.2	37.0	10.8	400.0	103.0	
221	983.753	V	29.1	-3.1	26.0	37.0	11.0	100.0	309.0	
222	987.875	V	28.8	-3.0	25.8	37.0	11.2	110.0	99.0	
223	991.028	H	29.4	-2.9	26.5	37.0	10.5	400.0	175.0	

◆ Calculation – SAC #4(10 m)

$$\text{Result(QP)} [\text{dB}(\mu\text{V/m})] = (\text{Reading(QP)} [\text{dB}(\mu\text{V})] + \text{c.f} [\text{dB}(1/\text{m})])$$
$$\text{Margin(QP)} [\text{dB}] = \text{Limit} [\text{dB}(\mu\text{V/m})] - \text{Result(QP)} [\text{dB}(\mu\text{V/m})]$$

Reading(QP) : Reading value, Result(QP) : Reading value + Factor value

Limit(QP) : Limit value, c.f : (ANT Factor + Cable Loss - Preamp Factor), Margin: Margin value

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

The authenticity of the test report, contact shchoi@kes.co.kr

**KES Co., Ltd.**

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0121
Page (55) of (71)

Test Data - Voltage Fluctuations**■ Charge Mode**

Flicker Measurements					
	P_{It}	Max P_{st}	Max D_c	Max D_{max}	Max T_{max}
Line 1:	0.028	0.028	0	< 0.2	0
Limits:	0.65	1	3.3	4	0.5
Results:	PASS	PASS	PASS	PASS	PASS

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

APPENDIX B - Test Setup Photos and Configuration

Conducted Emissions at Mains Power Ports

■ Charge Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0121
Page (57) of (71)

Disturbance Voltage(Associated ports)

N/A

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr



KES Co., Ltd.

3701, 40, Simin-daero 365beon-gil,
Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Report No.:
KES-EM-21T0121
Page (58) of (71)

Conducted Emissions at Telecommunication Ports

N/A

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Discontinuous Disturbances (Click)

■ Charge Mode



Disturbance power measurement (30 MHz ~ 300 MHz)

N/A

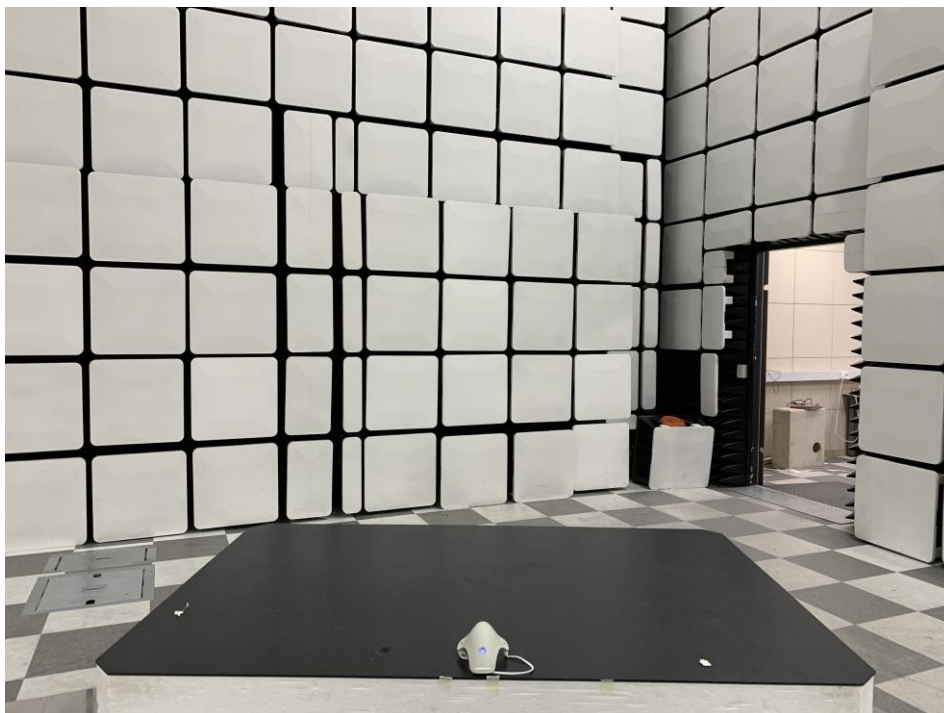
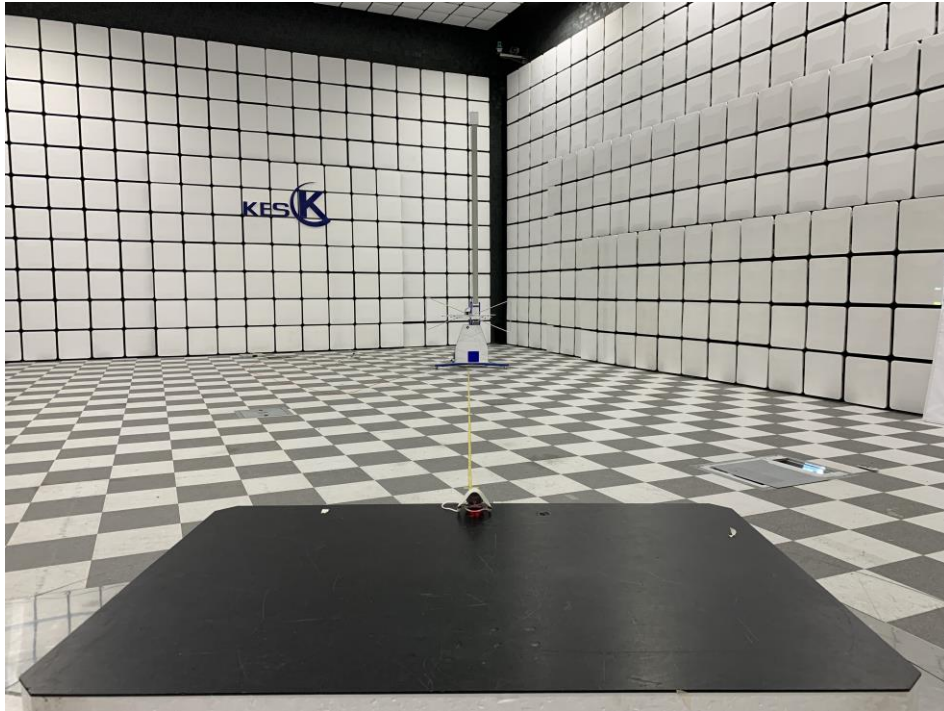
Radiated Electric Field Emissions(Below 1 GHz)

■ Charge Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

■ Operating Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Harmonic Current Emissions and Voltage Fluctuations and Flicker

■ Charge Mode



Electrostatic Discharge

■ Charge Mode



■ Operating Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Radiated Electric Field Immunity

N/A

Fast transients

■ Charge Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

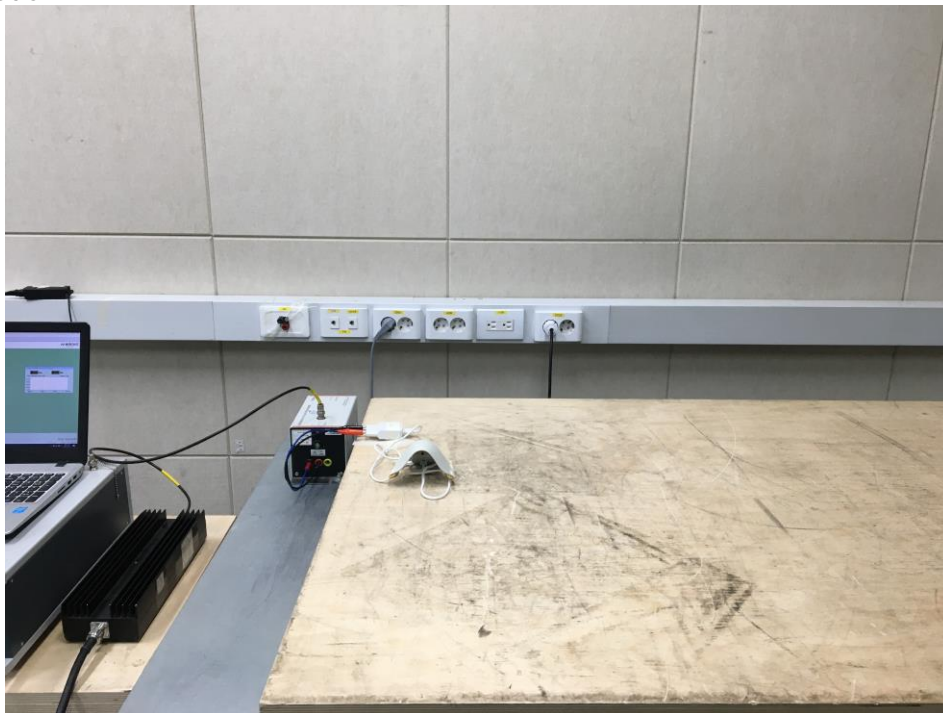
Surges

■ Charge Mode



Injected currents

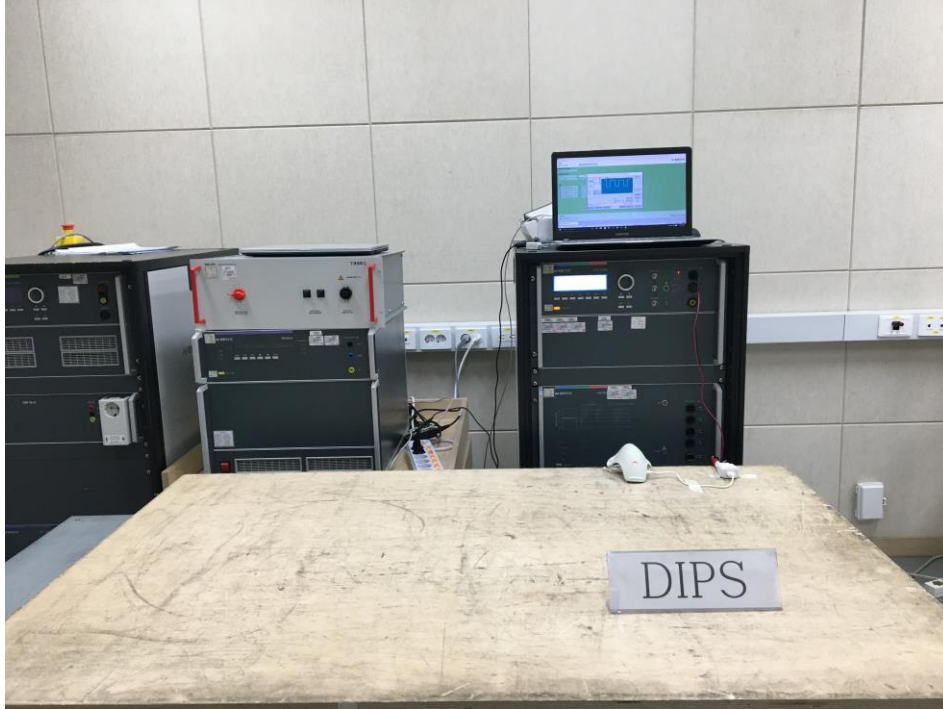
■ Charge Mode



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Voltage Dips

■ Charge Mode



APPENDIX C - EUT Photographs

EUT External Photographs

(Top)



(Bottom)



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

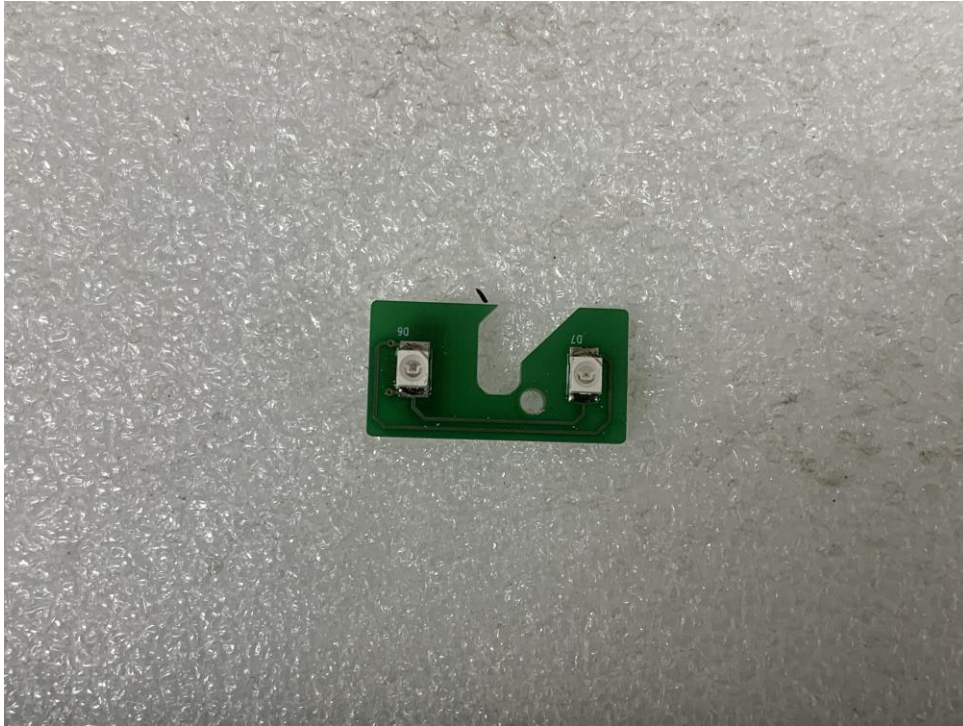
EUT Internal Photographs

(Internal View)



EUT Internal View – Board 1

(Top)



(Bottom)



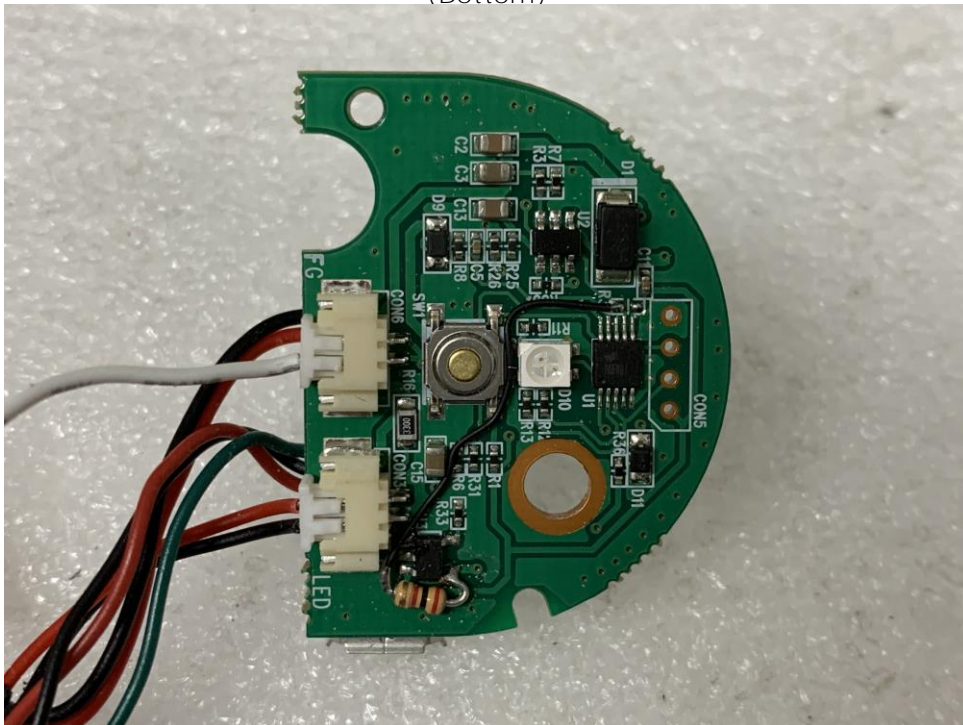
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

EUT Internal View – Board 2

(Top)

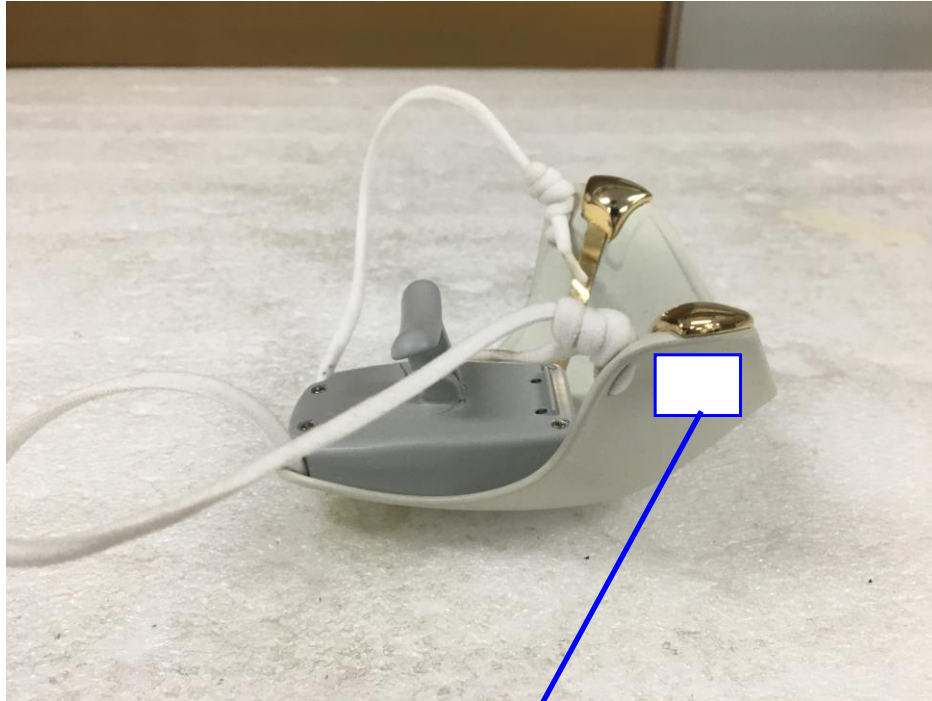


(Bottom)



This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
 The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
 The authenticity of the test report, contact shchoi@kes.co.kr

Label Photographs



[LABEL VIEW]

PLACURE

Model No : PLC01

Manufacturer : JNL Co., Ltd.

Made in Korea

