

EC declaration Of Conformity



according to EMC Directive 2014/30/EU

that the following equipment complies with the appropriate basic safety and health requirements of the EC Directive based on its design and type, as brought into circulation by us. In case of alteration of the equipment, not agreed upon by us, this declaration will lose its validity.

Applicant : SAE HAN TESTER CO.
Address : 132, UN pyeonghwa-ro 47beon-gil, Nam-gu, Busan-si, Korea.
Manufacturer : SAE HAN TESTER CO.
Address : 132, UN pyeonghwa-ro 47beon-gil, Nam-gu, Busan-si, Korea.
Report No. : STD-CE-19034
Equipment Description : INSULATION MULTIMETERS
Equipment Type : SH-3207R
Test Required : EN 61326-1:2013
EN 55011:2016 [Class A]

TESTED by :

Date: April 5, 2019

Signature

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EMC Laboratory
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새한계기

SEONG-HWAN KIM / President



COMPLIANCE REPORT

Emission & Immunity of Electromagnetic disturbance

Test Report No.: STD-CE-19034

Equipment: INSULATION MULTIMETERS

Type/Model: SH-3207R

Applicant: SAE HAN TESTER CO.

Manufacturer: SAE HAN TESTER CO.

Date of Test: April 1, 2019 ~ April 4, 2019

Date of Issued: April 5, 2019

Test Standard: EN 61326-1:2013
EN 55011:2016 [Class A]

Test Result: ☒ Positive ☐ Negative

This product complies with the requirements of the EMC Directive 2014/30/EU. The results in this report apply only to the sample tested. This test report shall not be reproduced except in full, without the written approval of Standard Engineering Laboratory.

Tested by KB Lee
KB Lee / Test Engineer

Approved by SS Seo
SS Seo / Director



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1. Information of EMC Laboratory

Name of test laboratory

Standard Engineering Co., Ltd.

Location

145, Hwanggeumteo-gil, Eumam-myeon, Seosan-si, Chungcheongnam-do, 31941,
Republic of Korea.

Phone No. : +82-41-663-9436~7

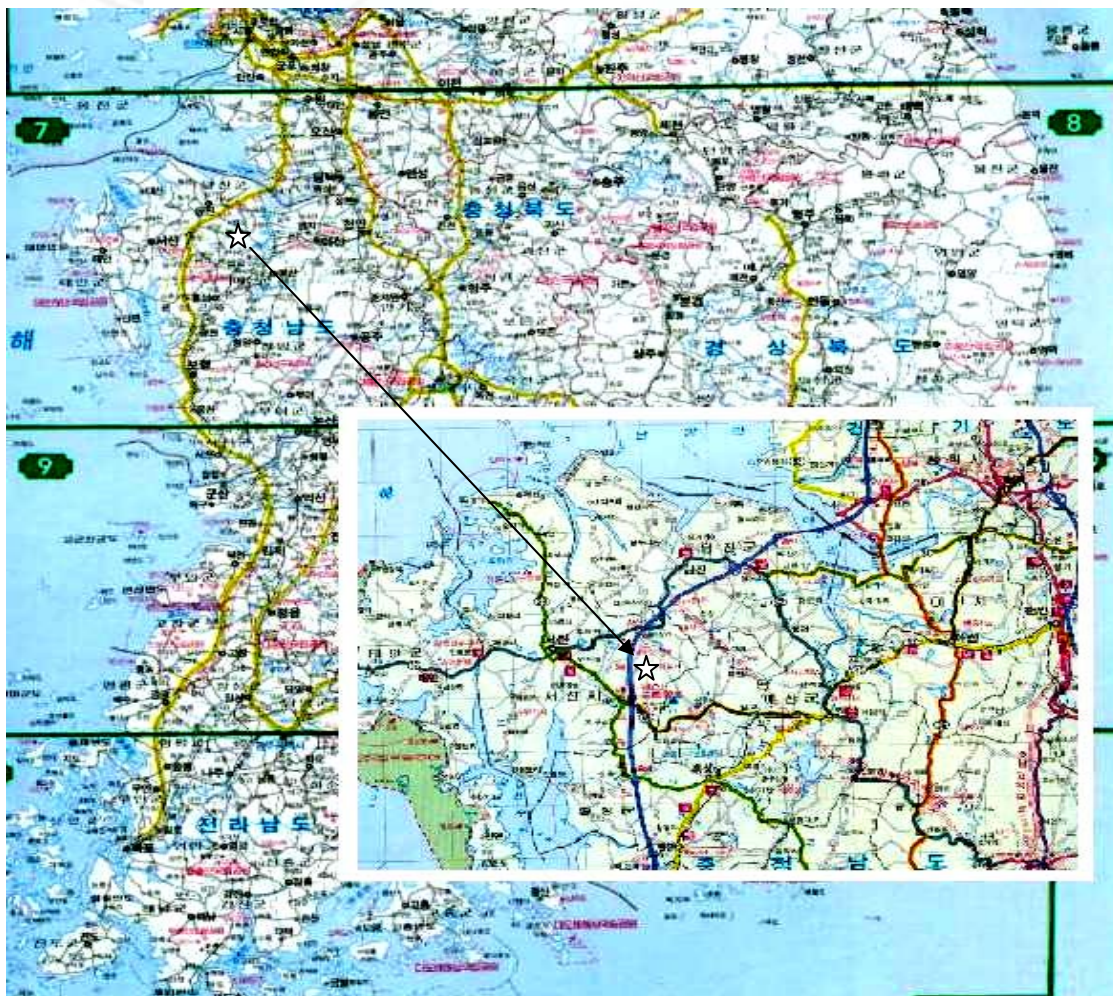
Fax. No. : +82-41-663-9434

Homepage: www.stdeng.com

Environment of Laboratory

This location can keep accuracy in measuring more than anywhere because surrounding noise ambient is low and silent excellently to be suitable in EMI's measuring.

Map



2. General Information

2.1 Product information

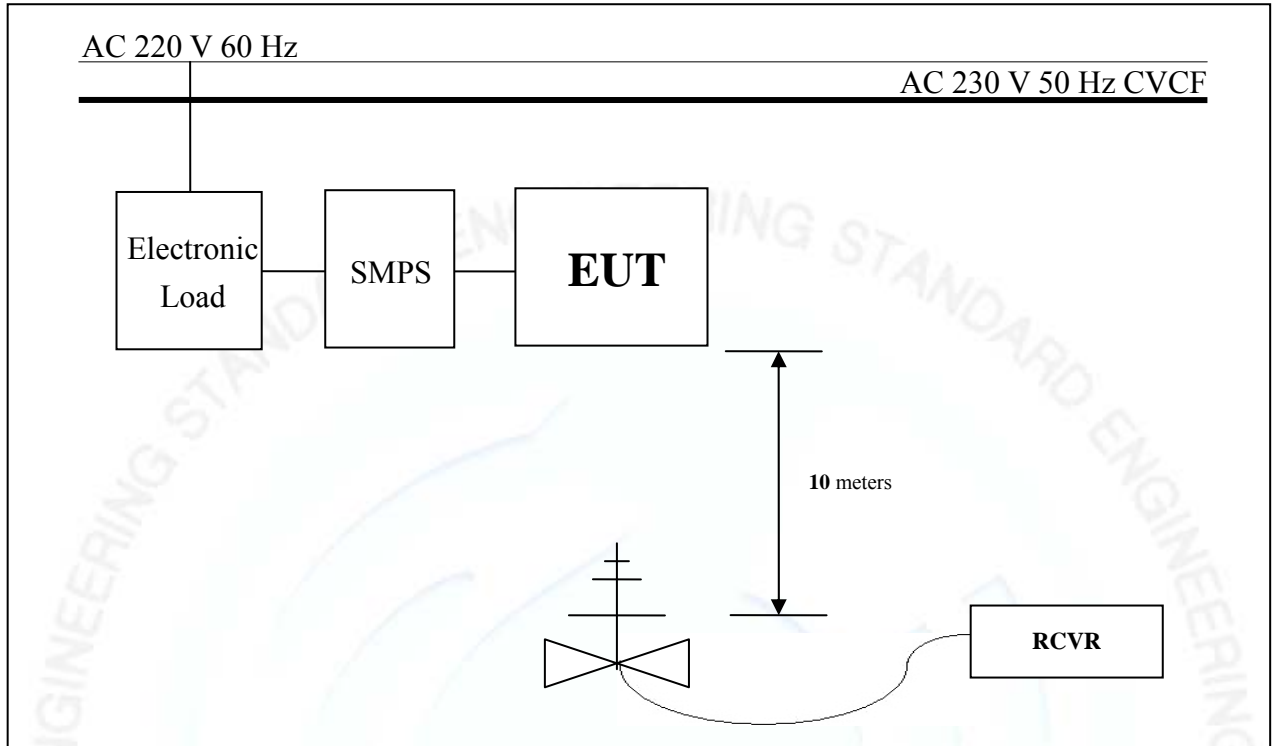
Description of EUT : INSULATION MULTIMETERS
Type/Model : SH-3207R
Specification : DC 9 V
Applied Standard : EN 61326-1:2013
EN 55011:2016 [Class A]
EN 61000-4-2:2009
EN 61000-4-3:2006/A2:2010

2.2 Client information

Applicant : SAE HAN TESTER CO.
Address : 132, UN pyeonghwa-ro 47beon-gil, Nam-gu, Busan-si, Korea.
Phone No. : +82-51-621-5589
Fax. No. : +82-51-627-8923
Contact person : SEONG-HWAN KIM / President

Manufacturer : SAE HAN TESTER CO.
Address : 132, UN pyeonghwa-ro 47beon-gil, Nam-gu, Busan-si, Korea.
Phone No. : +82-51-621-5589
Fax. No. : +82-51-627-8923

2.3 Peripherals



Used Peripherals

Descriptions	Maker	Type	S/No.	Remarks
EUT	SAE HAN TESTER CO.	SH-3207R	N/A	
SMPS	Dongguan Chengliang Intelligent Technology Co., Ltd.	P600W12V	N/A	
Electronic Load	DAE GIL	EL-200P	N/A	

EUT Operation

Operating Mode.

EMI Test Report

Emission of Electromagnetic disturbance

3. Procedure of measurement

3.1 Conducted emission

3.1.1 Configuration of measurement

This measurement executed in shield-room and EUT was tested on wooden table height 0.8m above the reference ground plane.

EUT's rear part had 0.4m distance from VCP(Vertical Conducted Plane), 0.8m any other grounded conducting surface and LISN placed on the grounded plane with 1m distance from EUT's side part .

Excess power cord and cables fixed in bundle style of 30~40cm length with non-inductive material, and power line was connected to power source through LISN to detect maximum EMI without external RFI from aux. instruments.

The conducted common mode disturbance voltage at telecommunication port was measured with the EUT in shield room. The measurement was conducted with ISN. The EUT was placed on non-metallic table 0.4 m above the metallic grounded floor.

Measuring equipments and EUT confirmed that warming-up was performed during enough time and calibration of antenna as well as calibration of measuring equipment also completed beforehand.

This measurement was performed on condition of worst-case emission.

3.1.2 Detector function selection

Amplitude measurements were performed with quasi-peak and an average detector.

3.1.3 Frequency range to be scanned

For conducted emissions measurement, frequency range of 150 kHz to 30 MHz included, was investigated.

3.2 Radiated Emission

3.2.1 Configuration of measurement

Preliminary measurement was performed in 3 meter semi-anechoic chamber to detect correct EMI frequency.

Final measurement was executed at 10 meters OATS(Open Area Test Site) using Quasi-peak detector and TRILOG antenna.

EUT was placed on 0.8m height wooden table located on the reference ground plane. Excess power cord and other excess cables fixed in bundle style of 30~40cm length with non-inductive material to detect maximum EMI emission from EUT.

The height of the measuring antenna is varied 1 to 4 meters and table was rotated a full revolution in order to obtain maximum electric field intensity. The measurement is made in both the vertical and horizontal polarization, and measurement is performed with a quasi-peak detector.

The highest emissions between 1 GHz to 6 GHz were analyzed in details by operating the spectrum analyzer in peak and average mode to determine the precise amplitude of the emissions.

At the highest amplitudes observed, the EUT is rotated in the horizontal plane while changing the antenna polarization in the vertical plane to maximize the reading.

The interconnecting cables were arranged and moved to get the maximum measurement.

Once the maximum reading is obtained, the antenna elevation and polarization will be varied between specified limits to maximize the readings.

The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes. If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz. If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz. If the highest frequency of the internal sources of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz. If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

3.2.2 Detector function selection

Amplitude measurements were performed with quasi-peak and an average detector.

3.2.3 Frequency range to be scanned

For Radiated emissions measurement, frequency range of 30 MHz ~ 1000 MHz included, was investigated.

3.3 Method of Calculation

3.3.1 Unit of Conducted emission measurement

Conducted Emission Test results for conducted emissions are reported in micro-volts.

3.3.2 Unit of Radiated emission measurement

Test results of radiated emissions measurement are reported in micro-volts per meter at the specific distance. Using the unit of dB μ V on the test instrument, the indication unit was converted to field strength unit of μ V/m as following method;

$$F (\mu V/m) = 10^{\{(R+CL+AF)/20\}} (\mu V/m)$$

F: Field Strength in μ V/m, R: Meter Reading Level in dB(μ V),

CL: Cable Loss from antenna to meter in dB,

AF: Antenna Factor of receiving antenna in dB(/m)

Sample calculation (Radiated emission)

Emission level is calculated as follows;

Emission Level(dB μ V/m)

= Reading Level + Ant. Factor + Cable Loss – Amp Gain

Margin Level is calculated as follows;

Margin(dB μ V) = Limit Level – Emission Level

Example) Standard limit = 40 dB μ V/m,

Reading Level = 10 dB μ V,

Ant. Factor = 15 dB,

Cable Loss = 1 dB

Emission Level(dB μ V/m) = 10 + 15 + 1 = 26 (dB μ V/m)

Margin(dB μ V) = 40 – 26 = 14 (dB μ V)

4. Environments of measurement

4.1 Condition of environment

Shield room	Temperature	19 °C
	Humidity	31 %R.H.
	Pressure	1019 hPa
OATS	Temperature	6 °C
	Humidity	38 %R.H.
	Pressure	1019 hPa

4.2 Measurement uncertainty

All measurements, especially EUT's measurement includes uncertain level that can happen for the reason as following;

Variation of antenna factor by changes of height, center, polarization, directivity.

Uncertainty factor by change of measurement distance, site's imperfection.

Radiated emissions measurements: ± 3.97 dB

Mains terminal disturbance voltage: Quasi-peak & Average Detection: ± 2.69 dB

Telecom terminal disturbance voltage: Quasi-peak & Average Detection: ± 3 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT in the above mentioned way.

The measurement uncertainty was calculated in accordance with NAMAS NIS 81 : The treatment of uncertainty in EMC measurement.”

The measurement uncertainty was given with a confidence of 95%.

4.3 List of Test equipments for EMI test

Used	Equipment	Maker	Model No.	S/No.	Cal.due date.
<input checked="" type="checkbox"/>	EMI Test Receiver	Rhode & Schwarz	ESIB7	100119	09/06/2019
<input checked="" type="checkbox"/>	EMI Test Receiver	LIG	ER-265	L1009B016	03/14/2020
<input type="checkbox"/>	Artificial Mains	Rhode & Schwarz	ESH2-Z5	100064	11/09/2019
<input type="checkbox"/>	Artificial Mains	Rhode & Schwarz	ESH3-Z5	100204	11/09/2019
<input type="checkbox"/>	Signal Generator	Rhode & Schwarz	SML03	101003	11/08/2019
<input type="checkbox"/>	Absorbing Clamp	Rhode & Schwarz	MDS-21	100076	11/09/2019
<input checked="" type="checkbox"/>	TRILOG Antenna	Schwarzbeck	VULB9163	164	11/21/2019
<input type="checkbox"/>	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100137	11/09/2019
<input type="checkbox"/>	Precision Power Analyzer	ZES ZIMMER Electronic Systems	LMG610	01151711	11/29/2019
<input type="checkbox"/>	Auxiliary Power Supply	ZES ZIMMER Electronic Systems	NI2415-1	A1708118	11/29/2019
<input type="checkbox"/>	Horn Antenna	Schwarzbeck	BBHA9120A	346	02/12/2020
<input type="checkbox"/>	ISN CAT3	Schwarzbeck	NTFM8158	8158-0030	11/15/2019
<input type="checkbox"/>	ISN CAT5	Schwarzbeck	NTFM8158	8158-0040	11/15/2019
<input type="checkbox"/>	ISN CAT6	Schwarzbeck	NTFM8158	8158-0039	05/11/2019
<input type="checkbox"/>	Attenuator	Rhode & Schwarz	MDS-2	100274	11/09/2019
<input type="checkbox"/>	Click Meter	AFJ INSTRUMENTS	CL55C	55041331216	03/18/2020
<input type="checkbox"/>	Switching Box	AFJ INSTRUMENTS	SW04	SW041304057	03/18/2020

4.4 List of Peripherals & Cables for EMI test

Used	Descriptions	Maker	Type	S/No.	Approval
<input type="checkbox"/>	DC Power Supply	HP	6574A	US36340515	
<input checked="" type="checkbox"/>	M/W Cable/2GHz 5m	H+Suhner	SF104/2x11BNC	14354	
<input type="checkbox"/>	M/W Cable/2GHz10m	"	"	14353	
<input type="checkbox"/>	M/W Cable/18GHz18m	"	SF104/2x11N	6025	
<input type="checkbox"/>	M/W Cable/18GHz18m	"	"	6026	
<input checked="" type="checkbox"/>	M/W Cable/18GHz10m	"	"	6027	
<input checked="" type="checkbox"/>	M/W Cable/2GHz43m	Thermax	MS-P400		
<input type="checkbox"/>	Function Generator	HP	3311A	1244A25104	
<input checked="" type="checkbox"/>	CCD Color Camera	Sung Eun	PSS-C5327		

5. Result of Measurement

5.1 Conducted Emission

5.1.1 Test data

The measurement is not available for this EUT(Battery use only).

5.1.2 Result : N/A

5.2 Radiated Emission

5.2.1 Test data

Below 1GHz

Frequency [MHz]	Polarization [Ver/Hor]	Limit [dBuV/m]	Result [dBuV/m]	Factor [dB]	Margin [dBuV/m]
82.51	H	40.00	22.91	10.21	17.09
86.42	H	40.00	21.82	11.53	18.18
91.25	V	40.00	23.53	12.99	16.47
98.78	H	40.00	21.14	14.47	18.86
106.99	H	40.00	21.29	13.63	18.71
176.98	H	40.00	23.38	12.77	16.62

* Detector function was set into Quasi-peak mode.

* Factor = Antenna Factor + Cable loss

5.2.2 Result

Complied

EMS Test Report

Immunity of Electromagnetic disturbance

6. Test Specifications

6.1 Standards

EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use – EMC requirements
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Basic standards

<input checked="" type="checkbox"/> EN 61000-4-2:2009 Required test level	Electrostatic discharge immunity test Contact discharge ± 4 kV, Air discharge ± 8 kV
<input checked="" type="checkbox"/> EN 61000-4-3/A2:2010 Required test level	Radiated disturbance induced by RF fields 10 V/m, AM 80%(1 kHz), 80-1000 MHz 3 V/m, AM 80%(1 kHz), 1.4-2.0 GHz 1 V/m, AM 80%(1 kHz), 2.0-2.7 GHz
<input type="checkbox"/> EN 61000-4-4:2012 Required test level ^(b)	Electrical fast transient burst immunity test AC/DC input ± 2 kV, Telecomm. & signal line ± 1 kV
<input type="checkbox"/> EN 61000-4-5:2014 Required test level ^(b)	Surge immunity test Differential mode ± 1 kV on DC supply Common mode ± 2 kV on DC supply
<input type="checkbox"/> EN 61000-4-6/AC:2015 Required test level ^(b)	Conducted disturbance induced by RF fields 3 V, AM 80%(1KHz), 0.15~80 MHz AC/DC Mains, Telecommunication & Signal line.
<input type="checkbox"/> EN 61000-4-8:2010 Required test level ^(a)	Magnetic field immunity test 3 A/m(RMS), 60 Hz
<input type="checkbox"/> EN 61000-4-11/A1:2017 Required test level ^(b)	Voltage dips, short interruptions and voltage variation immunity tests 70% 25 cycle, 40% 10 cycle, 0% 1 cycle, 0% 250 cycle
(a) The EUT is not affected by magnetic fields, so this test was not applied.	
(b) The measurement is not available for this EUT(Battery use only).	

6.2 Performance criteria

The performance criteria are based on the general criteria of the standard and specified by the manufacturer.

Criterion A : The EUT shall be operated to the normal mode. The measurement shall be done by the subjective observation of a observer to operate a intended during the test.

Criterion B : The EUT shall continue to operate as intended after the test. During the test, degradation of performance is allowed however.

Criterion C : Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by power on/off.

The monitoring performance of EUT during the test was performed by observation of the EUT communication condition.

7. Test and Results

7.1 Electrostatic discharge Immunity Test

7.1.1 Configuration of measurement

The EUT was placed on a non-metallic support 0.8m above a reference ground plane(RGP) and floor standing EUT was placed on 0.1m wooden table above the RGP. The return cable of the ESD generator was connected to the RGP.

A vertical coupling plane(VCP) and horizontal coupling plan(HCP) connected to the RGP with a cable through two 470 k ohms register's each ends.

0.5mm insulating supporter between EUT and HCP was used to locate the EUT.

7.1.2 Operating environment

This test was performed in a shield room

Temperature: 19 °C(15~35°C) Relative Humidity: 31 %R.H. (30~60 %)

7.1.3 Test Equipment

	Equipment	Model No.	Maker	Serial No.	Cal. due date
■	ESD Simulator	ESS-2000	Noiseken	ESS0281014	03/18/2020
■	Discharge gun	TC-815P	Noiseken	ESS02X1137	03/18/2020
□	Loading Resistor	05-00001A	Noiseken	-	N/A
■	HCP	-	-	-	N/A
■	VCP	-	-	-	N/A

7.1.4 Test Conditions

Discharge voltage	± 4 kV contact, ± 8 kV Air discharge
Polarity	Positive and Negative
Discharge method	Direct & Indirect(VCP/HCP)
Discharge impedance	330 ohm / 150 pf
Discharge interval	1 second
Number of discharge	20 of each polarity
Criterion	B
Test point Air discharge Contact discharge	EUT

7.1.5 Test result

No.	Test point	Air/Contact	Result	Remarks
1	Enclosure	Air	Pass (A)	Normally operated
2	Display	Air	Pass (A)	Normally operated
3	Button	Air	Pass (A)	Normally operated
	HCP/VCP	Contact	Pass (A)	Normally operated

ESD Test Points

Contact

Air



7.2 Radiated, RF Electromagnetic Field Immunity Test

7.2.1 Configuration of measurement

The EUT was placed on a non-metallic table 0.8m above the reference ground plane covered with ferrite tiles in semi-anechoic chamber which field uniformity chamber was calibrated for 18V/m.

The horizontal/vertical polarization and all side of EUT was tested.

7.2.2 Operating environment

Temperature: 19 °C Relative Humidity: 31 %R.H.

7.2.3 Test Equipment

	Equipment	Model No.	Maker	Serial No.	Cal.due date
■	RF Amplifier	NA80MF3G201003	Noiseken	A30358	11/09/2019
■	Signal Generator	SML01	R & S	101539	11/08/2019
■	Power Meter	ECC418B	Agilent	GB42421309	11/08/2019
■	E-Field Meter	EMC-20	Narda	AP-0182	11/19/2019
■	E-Field Probe	Type 8.4	Narda	AR-0041	11/19/2019
■	Bi-Log Antenna	CC5131	Schaffner	2740	11/19/2019
■	Power Sensor	8482A	Agilent	MY41091630	09/22/2019
■	Horn Antenna	BBHA9120A	Schwarzbeck	346	11/08/2019

7.2.4 Test Conditions

Frequency Range	80 ~ 1000 MHz, 1400 ~ 2000 MHz, 2000 ~ 2700 MHz
Field strength	80~1000 MHz (10 V/m) 1400 ~ 2000 MHz (3 V/m) 2000 ~ 2700 MHz (1 V/m)
Modulation	AM 80% with 1 kHz sine wave
Frequency Step	1 %
Field Polarization	Horizontal and Vertical
Exposed sides	Front/Back/Right/Left
Antenna distance from EUT	3 m
Dwell time	3 seconds
Criterion	A

7.2.5 Test result

Frequency Range	Polarization	Test point	Result	Remarks
80 ~ 1000 MHz (10 V/m)	Horizontal / Vertical	Front side	Pass (A)	Normally operated
		Rear side		
		Left side		
		Right side		
1400 ~ 2000 MHz (3 V/m)	Horizontal / Vertical	Front side	Pass (A)	Normally operated
		Rear side		
		Left side		
		Right side		
2000 ~ 2700 MHz (1 V/m)	Horizontal / Vertical	Front side	Pass (A)	Normally operated
		Rear side		
		Left side		
		Right side		

7.3 Electrical Fast Transient/Burst Immunity Test

7.3.1 Configuration of measurement

The EUT was placed on a non-metallic table 0.8m above the reference ground plane and floor standing EUT was placed on 0.1m wooden table above the RGP. The capacitive coupling clamp was also placed at a distance of 0.1 m above the RGP and the length between clamp and EUT should not be more than 1m.

7.3.2 Operating environment

This test was performed in a shield room

Temperature: 19 °C(15~35) Relative Humidity: 31 %R.H.(25~75)

Atmosphere pressure: 1019 hPa(860~1060)

7.3.3 Test Equipment

	Equipment	Model	Maker	S/N	Cal.due date
<input type="checkbox"/>	EMC Immunity Tester (BURST)	IMU4000	EMC PARTNER	F-S-1511	11/08/2019
<input type="checkbox"/>	Attenuator	AT810	Noiseken	INS0260279	N/A
<input type="checkbox"/>	Coupling Clamp	15-00001A	Noiseken	-	N/A

7.3.4 Test Conditions

The measurement is not available for this EUT(Battery use only).

7.3.5 Test result: N/A

7.4 Surge Immunity Test

7.4.1 Configuration of measurement

The EUT was placed on a non-metallic table 0.8m above the reference ground plane and floor standing EUT was placed on 0.1m wooden table above the RGP.

7.4.2 Operating environment

This test was performed in a shield room

Temperature: 19 °C(15~35) Relative Humidity: 31 %R.H.(10~75)

Atmosphere pressure: 1019 hPa(861~1061)

7.4.3 Test Equipment

	Equipment	Model	Maker	S/N	Cal.due date
<input type="checkbox"/>	Surge Simulator	LSS-6030	Noiseken	LSS0270120	11/09/2019
<input type="checkbox"/>	CDN (Telecom. Lines)	IJ6401tel	Noiseken	LSS0310164	11/09/2019
<input type="checkbox"/>	EM clamp	EM23	Noiseken	-	-

7.4.4 Test Conditions

The measurement is not available for this EUT(Battery use only).

7.4.5 Test result: N/A

7.5 Immunity to Conducted Disturbances, Induced by RF Field

7.5.1 Configuration of measurement

The EUT was placed on a non-metallic table 0.8m above the RGP and floor standing EUT was placed on 0.1m isolating support above the RGP.

This test was performed using CDN for mains, clamp for signal and injection probe.

A power meter for calibration was connected to the EUT side of the CDN through a 150-50ohms adapter.

The auxiliary equipment(AE) side of the network was terminated with 150 ohm to ground during the calibration.

7.5.2 Operating environment

Temperature: 19 °C Relative Humidity: 31 %R.H.

7.5.3 Test Equipment

	Equipment	Model No.	Maker	Serial No.	Cal.due date
<input type="checkbox"/>	Amplifier	NA10K230M75	Noiseken	A30358-2	11/09/2019
<input type="checkbox"/>	Signal Generator	SML01	R & S	101539	11/08/2019
<input type="checkbox"/>	CDN	NCDN-M3-16A	FCC	03005	11/08/2019
<input type="checkbox"/>	CDN	NCDN-M2-16A	FCC	03006	11/08/2019
<input type="checkbox"/>	CDN	NCDN-M1-16A	FCC	03006	11/08/2019
<input type="checkbox"/>	EM clamp	NEM-23MM	FCC	412	03/19/2020
<input type="checkbox"/>	Power Meter	ECC418B	Agilent	GB42421306	11/08/2019
<input type="checkbox"/>	De/Coupling Network	NAE-23MM	FCC	32	N/A

7.5.4 Test Conditions

The measurement is not available for this EUT(Battery use only).

7.5.5 Test result: N/A

7.6 Voltage Dips, Short Interruptions & Voltage variations Immunity Test

7.6.1 Configuration of measurement

The shortest possible mains cable is used, unless otherwise specified by the manufacturer.

7.6.2 Operating environment

This test was performed in a shield room

Temperature: 19 °C(15~35)

Relative Humidity: 31 %R.H.(25~75)

Atmosphere pressure: 1019 hPa(860~1060)

7.6.3 Test Equipment

	Equipment	Model	Maker	S/N	Cal.due date
<input type="checkbox"/>	Voltage dip/interruption Simulator	VDS-2002	Noiseken	VDS0290031	11/09/2019

7.6.4 Test Conditions

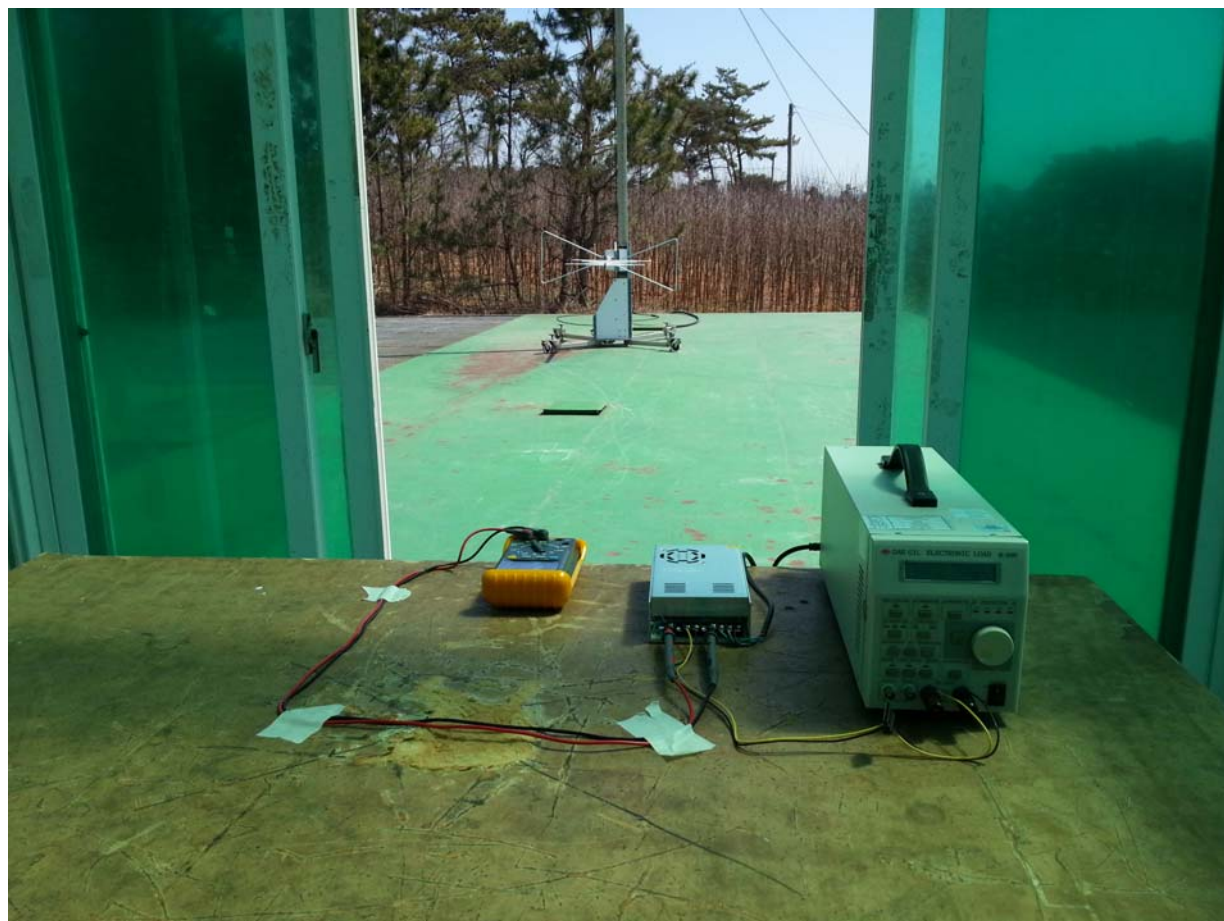
The measurement is not available for this EUT(Battery use only).

7.6.5 Test result: N/A

8. Appendix

8.1 Photograph of Set-up

Radiated Emission (Below 1GHz)



Electrostatic discharge



Radiated, RF Electromagnetic Field



8.2 Photographs of EUT

Front View



Rear View



Side View-1



Side View-2



Inside View

