

# ELECTROMAGNETIC COMPATIBILITY TEST REPORT


Test Report No.		RAPA18-O-031
Applicant	Name	DADA Electric Co., Ltd.
	Address	175-3, Nae-dong, Ojeong-gu, Bucheon-city, Gyeonggi-do, Korea
Manufacturer	Name	DADA Electric Co., Ltd.
	Address	175-3, Nae-dong, Ojeong-gu, Bucheon-city, Gyeonggi-do, Korea
Type of Equipment		Tester Alternating Current119
Model Name		TAC119
Multi Model Name		N/A
Serial number		N/A
Total page of Report		20 pages (including this page)
Test period		June 14, 2018 to June 18, 2018
Issuing date of report		June 25, 2018

## SUMMARY

The equipment complies with the standards; EN 55011:2009/A1:2010, EN 61326-1:2013 and EN 61326-2-2:2013.

This test report contains only the result of a single test of the sample supplied for the examination.  
It is not a general valid assessment of the features of the respective products of the mass-production.

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## 1. APPLICANT AND MANUFACTURER INFORMATION

Applicant	Name	DADA Electric Co., Ltd.
	Address	175-3, Nae-dong, Ojeong-gu, Bucheon-city, Gyeonggi-do, Korea
Manufacturer	Name	DADA Electric Co., Ltd.
	Address	175-3, Nae-dong, Ojeong-gu, Bucheon-city, Gyeonggi-do, Korea
Name of contact		Se Young, Yoo / CEO
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## 2. TEST SUMMARY

### 2.1 Test standards and results

STANDARDS		RESULTS
EN 55011:2009 + A1:2010	Main Terminal Continuous Disturbance Voltage	N/A (See Note 2)
	Conducted common mode disturbance at TEL ports	N/A (See Note 3)
	Radiated Emission (Below 1 GHz)	Met / PASS
	Radiated Emission (Above 1 GHz)	N/A (See Note 4)
EN 61000-3-2:2014	Harmonic Current Emission	N/A (See Note 2)
EN 61000-3-3:2013	Voltage Change, Voltage fluctuations and Flicker	N/A (See Note 2)
EN 61326-1:2013 (Annex A: Immunity test requirements for portable test and measurement equipment powered by battery or from circuit being measured),	Electrostatic discharge immunity	Met / PASS
	Radio frequency electromagnetic fields	Met / PASS
	Electrical fast transient/burst immunity	N/A (See Note 2)
	Surge immunity	N/A (See Note 2)
	Conducted disturbance induced by RF fields immunity	N/A (See Note 2)
EN 61326-2-2:2013	Power frequency magnetic field immunity	Met / PASS
	Voltage Dips and Short interruptions	N/A (See Note 2)

NOTE 1: The equipment under test was not susceptible to magnetic fields, so this test was not executed.

NOTE 2: The equipment use battery power, so this test was not executed.

NOTE 3: The equipment doesn't have communication ports, so this test was not executed.

NOTE 4: The equipment operates at frequency 108 MHz, so this test was not executed.

### 2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standards.

### 2.3 Purpose of the test

To determine whether the equipment under test fulfills the EMC requirements of the standards stated in section 2.1.

## 2.4 Test facilities

- Place of test : Head office  
101 & B104, Anyang Megavalley, 268, Hagui-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Korea
- Open Area Test Site  
103, Anseok-dong, 138beon-gil, Hwaseong-si, Gyeonggi-do, Korea  
(FCC OATS Registration Number : 931589)  
(FCC Conformity Assessment Body, Registration Number : 608365)  
(IC Company address code : 9355B)  
(RRA Designation Number : KR0027)

## 2.5 Criterion description

Criterion	Descriptions
A	The equipment shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.
B	The equipment shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. 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, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended. EXAMPLE 1: A data transfer is controlled/checked by parity check or by other means. In the case of malfunctioning, such as caused by a lightning strike, the data transfer will be repeated automatically. The reduced data transfer rate at this time is acceptable. EXAMPLE 2: During testing, an analogue function value may deviate. After the test, the deviation vanishes. EXAMPLE 3: In the case of a monitor used only for man-machine monitoring. It is acceptable that some degradation takes place for a short time, such as flashes during the burst application. EXAMPLE 4: An intended change of the operating state is allowed if self-recoverable.
C	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls. EXAMPLE 1: In the case of an interruption in the mains longer than the specified buffer time, the power supply unit of the equipment is switched off. The switch-on may be automatic or carried out by the operator. EXAMPLE 2: After a programme interruption caused by a disturbance, the processor functions of the equipment stops at a defined position and is not left in a "crashed state". The operator's decision prompts may be necessary. EXAMPLE 3: The test results in an opening of an over-current protection device that is replaced or reset by the operator.

### 3. EUT (Equipment Under Test)

#### 3.1 Identification of the EUT

- Equipment : Tester Alternating Current119
- Model name : TAC119
- Serial number : N/A
- Manufacturer : DADA Electric Co., Ltd.

#### 3.2 Additional information about the EUT

The model TAC11 (referred to as the EUT in this report) of DADA Electric Co., Ltd. is a Tester Alternating Current119. Product specification described herein was obtained from product data sheet or user's manual.

Basic Specifications	
Temperature Range Operating	-30 to +50 °C
Temperature Storage And transport	-40 to +70 °C
Size	45 mm Diameter * 530 mm logn
Weight	570 g
Voltage	1.5 V Battery AAM or R6P 4PEC

#### 3.3 Peripheral equipment

It is defined as peripheral equipment needed for correct operation of the EUT but not considered as tested.

Model	Manufacturer	Description	Connected to
TAC119	DADA Electric Co., Ltd.	Tester Alternating Current119 [EUT]	-
PPP012L-E	HP	Adapter for laptop	AC Mains

#### 3.4 Mode of operation during the test

Upon the applicant,s request, The EUT has maintained normal operation and full loaded mode during the test. EUT Input power is 3.0 VDC but test was executed under the condition of full charged mode

#### 3.5 Alternative type(s)/model(s); also covered by this test report

The followings are added model names and their differences.

Model Name	Differences	Tested
None	None	<input type="checkbox"/>

NOTE1: Applicant asks only basic model to test. Therefore, testing laboratories just guarantee the unit which has been tested.

#### 3.6 EUT cable description

Ports name		Shielded	Ferrite bead	Metal hood	Length (m)	Connected to
Adapter for laptop	AC IN	NO	YES	YES	1.5	AC Mains

### 4. EUT MODIFICATIONS

- None

## 5. RADIO FREQUENCY DISTURBANCE TEST

### 5.1 Radiated electromagnetic field (Below 1 GHz)

#### 5.1.1 Operating environment

- Temperature : 33.0 °C
- Humidity : 20.0 % R.H.

#### 5.1.2 Test set-up

The radiated emissions were measured at the 10 m Open Area Test Site. The EUT was placed on a wooden table with 0.8 meters height above the ground plane.

The frequency spectrum from 30 MHz to 1 000 MHz was scanned and maximum emission levels at each frequency recorded. The table was rotated 360° and the antenna was varied in height between 1.0 m and 4.0 m in order to detect the maximum emission levels. This procedure was performed for both horizontal and vertical polarization of the receiving antenna.

The test set-up photos are included in appendix I.

#### 5.1.3 Measurement uncertainty

- Radiated emission electric field intensity in the range of 30 MHz ~ 1 000 MHz, Quasi-peak detection:  $\pm 4.36$  dB

Measurement uncertainty is calculated in accordance with WECC 19-1990. The measurement uncertainty is given with a confidence of 95 % with the coverage factor,  $k = 2$ .

#### 5.1.4 Test equipment used

Use	Model Number	Manufacturer	Description	Serial Number	Last Calibration
<input checked="" type="checkbox"/>	ESS	R&S	EMI Test Receiver	833776/011	Aug. 22, 2017
<input checked="" type="checkbox"/>	DS 1500 S-1t-O	Innco GmbH	Turn Table	N/A	N/A
<input checked="" type="checkbox"/>	MA4000-O	Innco GmbH	Antenna Mast	N/A	N/A
<input checked="" type="checkbox"/>	CO 2000	Innco GmbH	Controller	N/A	N/A
<input checked="" type="checkbox"/>	VHA9103	Schwarzbeck	Biconical Antenna	2217	Nov. 28, 2017
<input checked="" type="checkbox"/>	VULP9118A	Schwarzbeck	Log Periodic Antenna	382	Nov. 28, 2017
<input checked="" type="checkbox"/>	SCU 01	R&S	Pre-AMP	10020	Jan. 15, 2018

Remark: All test equipment used is calibrated on the regular basis.

**5.1.5 Test data**

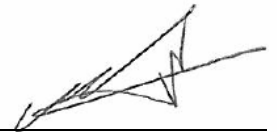
- Test date : June 15, 2018
- Resolution bandwidth : 120 kHz
- Frequency range : 30 MHz ~ 1 000 MHz
- Measurement distance : 10 meter

▪ **Test mode: Full charged Mode**

Frequency (MHz)	Reading (dBμV)	ANT Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)
54.61	44.10	V	1.00	160.00	9.45	-38.22	15.33	30.00	14.67
82.11	50.40	V	1.00	220.00	7.35	-38.11	19.64	30.00	10.36
109.48	48.10	H	4.00	170.00	11.45	-38.00	21.55	30.00	8.45
137.22	45.70	H	4.00	140.00	14.47	-37.86	22.31	30.00	7.69
220.04	47.20	H	4.00	80.00	16.82	-37.38	26.64	30.00	3.36
274.92	41.30	H	4.00	150.00	18.69	-37.27	22.72	37.00	14.28

**Tabulated test data for Radiated Electromagnetic Field**

Here, H = Horizontal, V = Vertical



**Tested by: Seounghyun Cho / Assistant Manager**

## 6. IMMUNITY TEST

### 6.1 Electrostatic discharge immunity test

The measurement of the Immunity against Electrostatic Discharge was performed in a shield room.

- Test location : Shielded Room (S121)
- Date : June 14, 2018

Here, S121 = Shield room number

#### 6.1.1 Operating environment

Item	Measured	Recommended
Ambient temperature	27.0 °C	15 °C ~ 35 °C
Humidity	48.0 % R.H.	30 % R.H ~ 60 % R.H
Atmospheric pressure	100.6 kPa	86.0 kPa ~ 106.0 kPa

#### 6.1.2 Test set-up

The EUT and all peripheral equipment were placed on non-metallic support with 0.8 m height above a reference ground plane (RGP) and were put into operation according to the specified operating mode.

The test set-up photo is included in appendix II.

#### 6.1.3 Measurement uncertainty

It has been demonstrated that the ESD generator meets the specified requirements in the standard with at least 95 % confidence.

#### 6.1.4 Test equipment used

Use	Model Number	Manufacturer	Description	Serial Number	Last Calibration
<input checked="" type="checkbox"/>	ESS-2000	NOISEKEN	ESD Simulator	ESS0308043	Jan. 30, 2018
<input checked="" type="checkbox"/>	TC-815P	NOISEKEN	ESD Gun	ESS0120522	Jan. 30, 2018

Remark: All test equipment used is calibrated on the regular basis.



**6.1.5 Test data**

- Test levels : Contact discharge 2 kV / 4 kV, Air discharge 2 kV / 4 kV / 8 kV
- Number of discharges : 25 each pol. at each point for contact discharge, 10 each pol. at each point for air discharge
- Polarity : Positive / Negative
- The EUT Position : Table Top
- Performance criterion required : B
- Test result : A
- Monitoring of the EUT : Observed the operating status of EUT

The test points of the EUT are each location on the surface touchable by hand (see test point in next page) and four sides of the EUT (through VCP and HCP).

The results of selected test points of the EUT are listed in the below table.

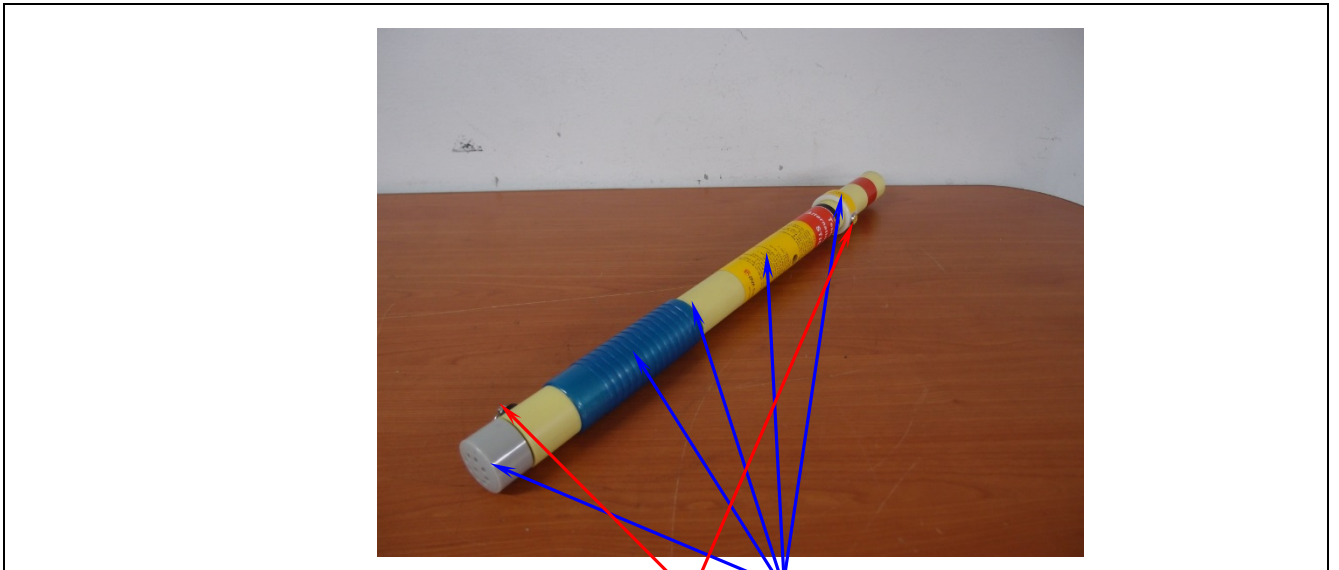
Point		Test level [± kV]	Pass / Fail	Description
(1)	Metal Frame	2 / 4 (Contact)	Pass	There was no deviation from normal operation condition.
(2)	Non-metal Frame	2 / 4 / 8 (Air)	Pass	
	HCP / VCP	HCP / VCP	Pass	



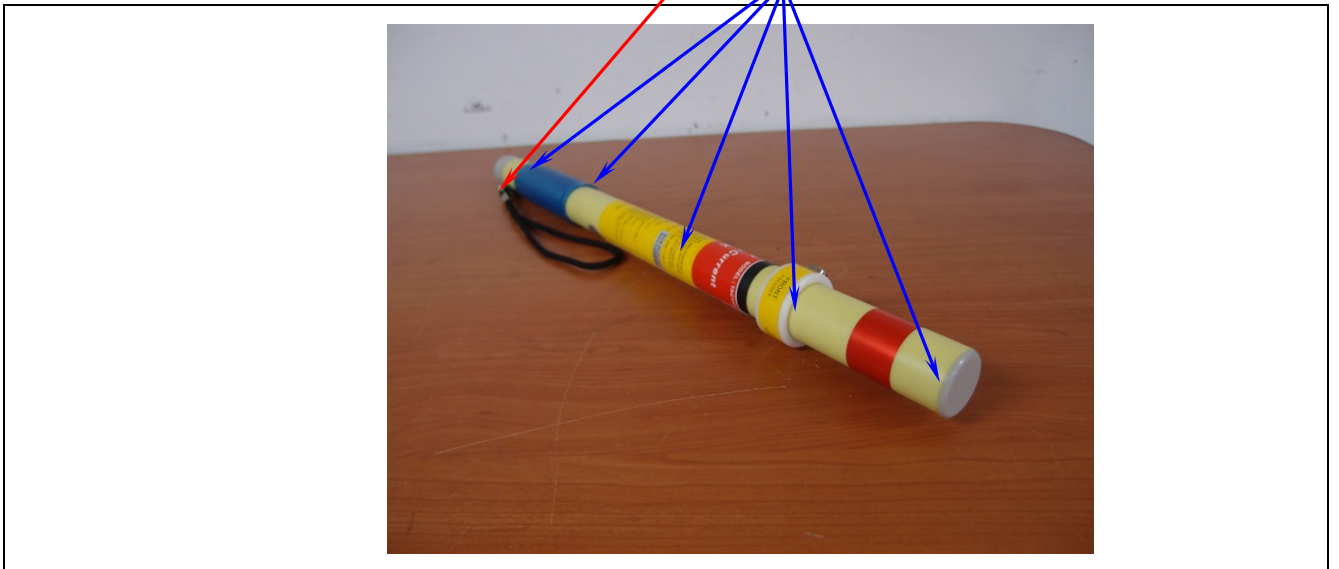
**Tested by: Seounghyun Cho / Assistant Manager**

**6.1.6 ESD Test point table**

ESD Point		Discharge voltage [ $\pm$ kV]	Results
(1)	Metal Frame	2 / 4 (Contact)	Criterion A
(2)	Non-metal Frame	2 / 4 / 8 (Air)	Criterion A
HCP / VCP		4 (Contact)	Criterion A



(1) (2)



## 6.2 Radiated RF-electromagnetic field immunity test

The measurement of the Immunity against Radiated RF-Electromagnetic Field was performed in an anechoic chamber.

- Test location : Anechoic Chamber (S111)
- Date : June 14, 2018

Here, S111 = Anechoic Chamber number

### 6.2.1 Operating environment

- Ambient temperature : 28.0 °C
- Humidity : 56.0 % R.H.
- Atmospheric pressure : 100.6 kPa

### 6.2.2 Test set-up

The EUT and all peripheral equipment were placed on a non-metallic support 0.8 m above a reference ground plane (RGP) and were put into operation according to the specified operating mode.

The test set-up photo is included in appendix III.

### 6.2.3 Measurement uncertainty

- The measurement uncertainty:  $\pm 0.23$  V/m for 1 V/m,  $\pm 0.70$  V/m for 3 V/m, and  $\pm 2.30$  V/m for 10 V/m.

Measurement uncertainty is calculated in accordance with WECC 19-1990. The measurement uncertainty is given with a confidence of 95%.

### 6.2.4 Test equipment used

Use	Model Number	Manufacturer	Description	Serial Number	Last Calibration
<input checked="" type="checkbox"/>	IMS	KTI	Integrated measurement system for EMS	-	-
<input checked="" type="checkbox"/>	E4432B	Agilent	ESG-D Series signal generator	MY43350147	Jan 15, 2018
<input checked="" type="checkbox"/>	NRP-Z91	Rohde & Schwarz	Power Sensor	100882	Aug 21, 2017
<input checked="" type="checkbox"/>	NRP-Z91	Rohde & Schwarz	Power Sensor	100883	Aug 21, 2017
<input checked="" type="checkbox"/>	ITRS-0830K	Infinitech	Power Amplifier	-	Jan 17, 2018
<input checked="" type="checkbox"/>	STLP9128D	Schwarzbeck	Log Periodic Dipole Antenna	9128D015	-

Remark: All test equipment used is calibrated on the regular basis.

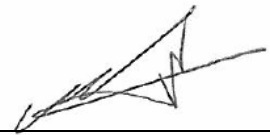
**6.2.5 Test data**

- Test level : 3 V/m (AM 80 %, 1 kHz), 1 V/m (AM 80 %, 1 kHz)
- Frequency range : 80 MHz ~ 1 000 MHz, 1.4 GHz ~ 2.0 GHz, 2.0 GHz ~ 2.7 GHz  
(80, 120, 145, 160, 230, 375, 435, 460, 600, 814, 835 MHz (±1 %))
- Frequency step : 1 %
- Dwell time at each frequency : 3 s
- Exposed side : Front / Rear / Left / Right
- Polarization of antenna : Horizontal / Vertical
- The EUT position : Table Top
- Distance from antenna to EUT : 3 m
- Performance criterion required : A
- Test result : Met criterion A
- Monitoring of the EUT : Observed the operating status of EUT

The results of test are listed in below table.

Freq. Range [MHz]	Ant. Pol.	Exposed side	Pass / Fail	Description
80 ~ 1 000	V	Front / Rear / Left / Right	Pass	There was no deviation from normal operation condition.
80 ~ 1 000	H	Front / Rear / Left / Right	Pass	
1 400 ~ 2 000	V	Front / Rear / Left / Right	Pass	
1 400 ~ 2 000	H	Front / Rear / Left / Right	Pass	
2 000 ~ 2 700	V	Front / Rear / Left / Right	Pass	
2 000 ~ 2 700	H	Front / Rear / Left / Right	Pass	

Here, H = Horizontal, V = Vertical



**Tested by: Seounghyun Cho / Assistant Manager**

### 6.3 Power frequency magnetic field immunity test

The measurement of the power frequency magnetic field immunity was performed in a shield room.

- Test location : Shielded Room (S121)
- Date : June 18, 2018

Here, S121 = Shield room number

#### 6.3.1 Operating environment

- Ambient temperature : 27.0 °C
- Humidity : 49.0 % R.H.
- Atmospheric pressure : 100.6 kPa

#### 6.3.2 Test set-up

The EUT and all peripheral equipment were placed on a non-metallic support 0.1 m above a reference ground plane (RGP) and were put into operation according to the specified operating mode.

The test set-up photo is included in appendix IV.

#### 6.3.3 Measurement uncertainty

It has been demonstrated that the Magnetic Field Meter met the specified requirements in the standard with at least 95 % confidence.

#### 6.3.4 Test equipment used

Use	Model Number	Manufacturer	Description	Serial Number	Last Calibration
<input checked="" type="checkbox"/>	UCS 500N7	EM Test	Ultra Compact Generator	V0937105138	Aug. 21, 2017
<input checked="" type="checkbox"/>	MV2616	EM Test	Motorized VARIAC	V0937105140	-
<input checked="" type="checkbox"/>	MS 100	EM Test	Magnetic Field Antenna	0809-09	Aug. 21, 2017
<input checked="" type="checkbox"/>	MC 2630	EM Test	Current Transformer	0309-52	-
<input checked="" type="checkbox"/>	TES 1394	TES	Magnetic Field Meter	090502156	Sep. 12, 2017
<input checked="" type="checkbox"/>	3280-10F	HIOKI	AC Clamp Meter	160517450	Sep. 12, 2017

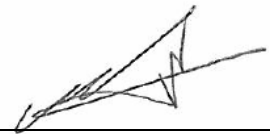
Remark: All test equipment used is calibrated on the regular basis.

**6.2.5 Test data**

- Test level : 3 A/m
- Frequency range : 50 / 60 Hz
- Duration : 120 s
- Axis of Orientation : X, Y, Z axis
- The EUT-position : Table Top
- Performance criterion required : A
- Test result : Met criterion A
- Monitoring of the EUT : Observed the operating status of EUT

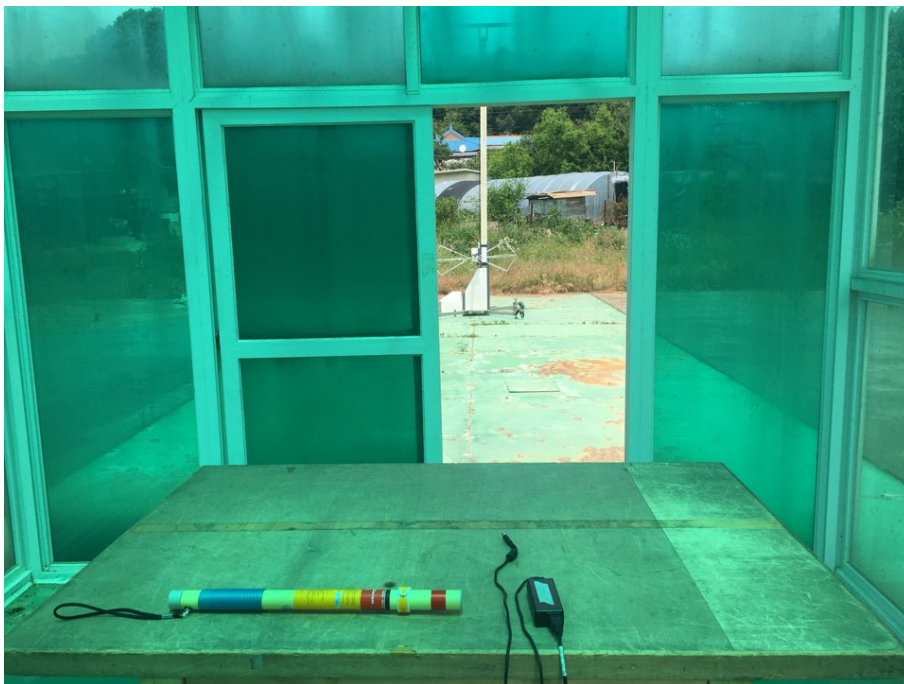
The results of test are listed in below table.

Test Point	Freq. Range[Hz]	Axis	Test level [A/m]	Pass / Fail	Description
Enclosure	50/60	X	3	Pass	There was no deviation from normal operation condition
Enclosure	50/60	Y	3	Pass	
Enclosure	50/60	Z	3	Pass	



**Tested by: Seounghyun Cho / Assistant Manager**

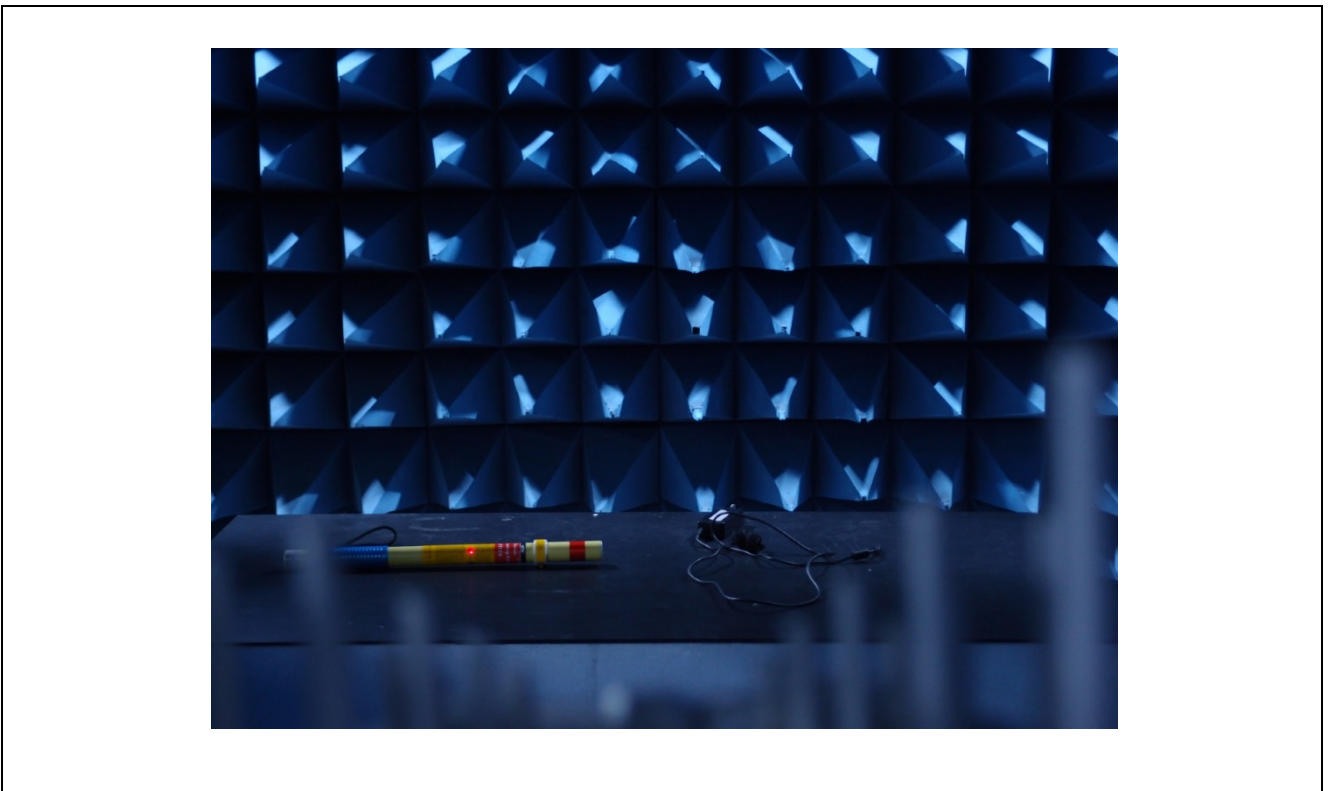
**APPENDIX I - TEST SET-UP PHOTOS: Radiated electromagnetic field (Below 1 GHz)**



**APPENDIX II - TEST SET-UP PHOTO: Electrostatic discharge immunity**

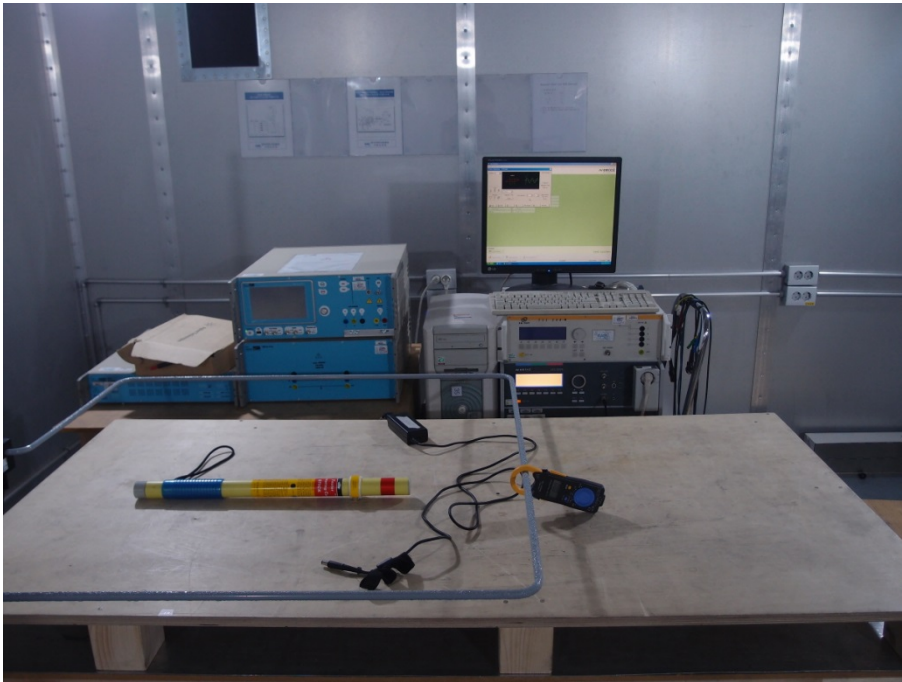


**APPENDIX III - TEST SET-UP PHOTO: Radiated frequency electromagnetic field immunity**





## APPENDIX IV - TEST SET-UP PHOTO: Power Frequency Magnetic Field



**APPENDIX V – PHOTOGRAPHS: Internal and External appearances**



