

ETSI EN 301 489-1 V2.2.0 (2017-03)
ETSI EN 301 489-17 V3.2.0 (2017-03)

TEST REPORT

No.98-99 LiWu Swan Industrial District, QiaoTou Town, DongGuan, GuanDong, China

Tested Model:

Report Type: Original Report	Product Type: Music Backpack Speaker
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Report Number: RSHA171013001-00A	
Report Date: 2017-10-25	
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	
Model	
Product	Music Backpack Speaker
Rate Voltage	DC 5.0V , battery voltage 3.7V
Highest Operating Frequency	2480MHz
Dimension	Ø120 mm × 40.55 mm

**All measurement and test data in this report was gathered from production sample serial number: 20171013001 (Assigned by BACL, Kunshan).The EUT supplied by the applicant was received on 2017-10-13.*

Objective

This test report is prepared on behalf of DongGuan XingYue Electronics Co., Ltd in accordance with:

ETSI EN 301489-1 V2.2.0 (2017-03), ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements.

ETSI EN 301489-17 V3.2.0 (2017-03), ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems.

The objective is to determine compliance with ETSI EN 301489-1 V2.2.0 (2017-03), ETSI EN 301489-17 V3.2.0 (2017-03).

Test Methodology

All measurements contained in this report were conducted with ETSI EN 301 489-1 V2.2.0 (2017-03).

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 815570. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a typical fashion (as normally used by a typical user)

Test mode: Charging & play music

EUT Exercise Software

No exercise software was used to test.

Equipment Modifications

No modifications were made to the EUT.

Support Equipment List and Details

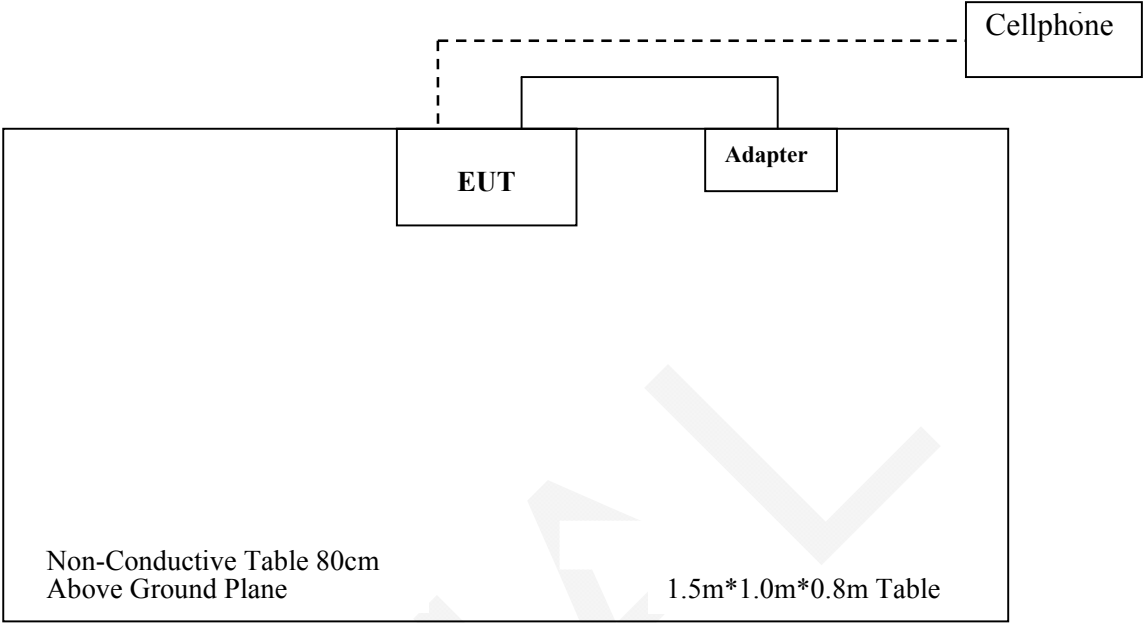
Manufacturer	Description	Model	Serial Number
Apple	Cellphone	6s	/
GENAI	Adapter	GN-19	/

External I/O Cable

Cable Description	Length (m)	From/Port	To
Power Cable	0.25	EUT	Adapter

Configuration of Radiation Test Setup

Test mode: Charging & play music



SUMMARY OF TEST RESULTS

	Description of Test	Result
§7.1	Reference to clauses EN 301 489-1 §8.2 Enclosure of ancillary equipment measured on a stand alone basis	Compliance
	Reference to clauses EN 301 489-1 §8.3 DC power input/output ports	Not Applicable
	Reference to clauses EN 301 489-1 §8.4 AC mains power input/output ports	Compliance
	Reference to clauses EN 301 489-1 §8.5 Harmonic current emissions (AC mains input port)	Not Applicable
	Reference to clauses EN 301 489-1 §8.6 Voltage fluctuations and flicker (AC mains input port)	Not Applicable
	Reference to clauses EN 301 489-1 §8.7 Wired network ports	Not Applicable
§7.2	Reference to clauses EN 301 489-1 §9.3 Electrostatic discharge (EN 61000-4-2)	Compliance
	Reference to clauses EN 301 489-1 §9.2 Radio frequency electromagnetic field (80 MHz to 6000 MHz) (EN 61000-4-3)	Compliance
	Reference to clauses EN 301 489-1 §9.4 Fast transients, common mode (EN 61000-4-4)	Not Applicable
	Reference to clauses EN 301 489-1 §9.8 Surges (EN 61000-4-5)	Not Applicable
	Reference to clauses EN 301 489-1 §9.5 Radio frequency, common mode (EN 61000-4-6)	Not Applicable
	Reference to clauses EN 301 489-1 §9.7 Voltage dips and interruptions (EN 61000-4-11)	Not Applicable
	Reference to clauses EN 301 489-1 §9.6 Transients and surges in the vehicular environment(ISO 7637-2)	Not Applicable*

Note:

Not Applicable*: This equipment will not be used in the vehicular environment.

Not Applicable: This equipment was power supply by battery, so it was not to test.
The EUT's DC port cable is less than 3m, so it was not to test.

Immunity test performance criteria:

“A “ means : CT/CR Reference to clauses EN 301 489-1 §6.1 /EN 301 489-17 §6.3 §6.5

“B” means : TT/TR Reference to clauses EN 301 489-1 §6.2/EN 301 489-17 §6.4 §6.6

7.1 - CONDUCTED EMISSIONS

Measurement Uncertainty

Compliance or non-compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

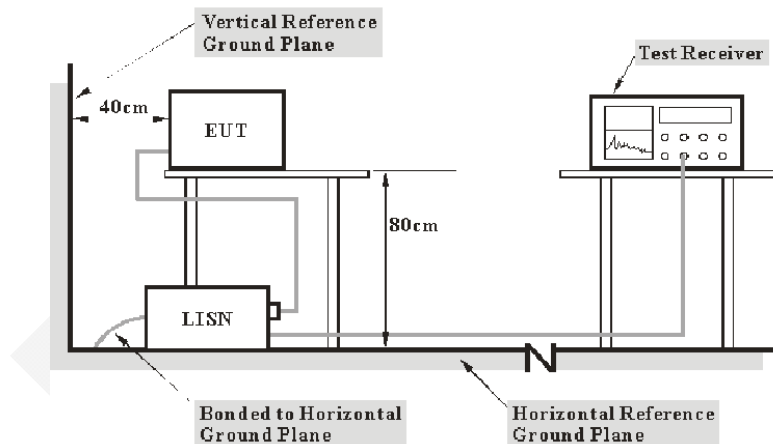
If U_{lab} is greater than U_{cispr} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit.

Table 1 – Values of U_{cispr}

Item		Measurement Uncertainty	U_{cispr}
AMN	150kHz~30MHz	3.19 dB	3.4~3.8 dB

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per EN 301489-1 measurement procedures. The specification used was with the EN 301 489-1 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-24
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2017-10-10	2018-10-09
ROHDE&SCHWARZ	LISN	ENV216	3560655016	2016-11-25	2017-11-24
BACL	BACL-EMC	V1.0	CE001	--	--
MICRO-COAX	Coaxial Cable	Cable-6	006	2017-09-08	2018-09-07

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$$V_C = V_R + A_C + VDF$$

Herein,

V_C : corrected voltage amplitude

V_R : reading voltage amplitude

A_C : attenuation caused by cable loss

VDF: voltage division factor of AMN or ISN

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Data**Environmental Conditions**

Temperature:	19 °C
Relative Humidity:	47 %
ATM Pressure:	101.0 kPa

The testing was performed by Phil Zhu on 2017-10-18.

Test mode : Charging & play music

Line

No.	Frequency (MHz)	Reading (dBμV)	Correction (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/AV/QP)
1	0.535	37.31	16.06	56.00	18.69	QP
2	0.535	30.55	16.06	46.00	15.45	AV
3	0.590	39.00	16.02	56.00	17.00	QP
4	0.590	28.96	16.02	46.00	17.04	AV
5	1.600	36.04	15.86	56.00	19.96	QP
6	1.600	29.91	15.86	46.00	16.09	AV
7	3.200	31.41	15.85	56.00	24.59	QP
8	3.200	21.72	15.85	46.00	24.28	AV
9	8.000	30.04	16.01	60.00	29.96	QP
10	8.000	23.09	16.01	50.00	26.91	AV
11	11.750	29.91	16.11	60.00	30.09	QP
12	11.750	23.92	16.11	50.00	26.08	AV

Neutral:

No.	Frequency (MHz)	Reading (dBμV)	Correction (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/AV/QP)
1	0.525	41.05	16.10	56.00	14.95	QP
2	0.525	35.44	16.10	46.00	10.56	AV
3	0.595	42.73	16.05	56.00	13.27	QP
4	0.595	34.04	16.05	46.00	11.96	AV
5	1.900	33.64	15.91	56.00	22.36	QP
6	1.900	23.99	15.91	46.00	22.01	AV
7	2.650	40.68	15.90	56.00	15.32	QP
8	2.650	34.85	15.90	46.00	11.15	AV
9	5.300	34.79	15.88	60.00	25.21	QP
10	5.300	27.28	15.88	50.00	22.72	AV
11	6.900	32.52	15.92	60.00	27.48	QP
12	6.900	26.53	15.92	50.00	23.47	AV

7.1 - RADIATED EMISSIONS

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner:

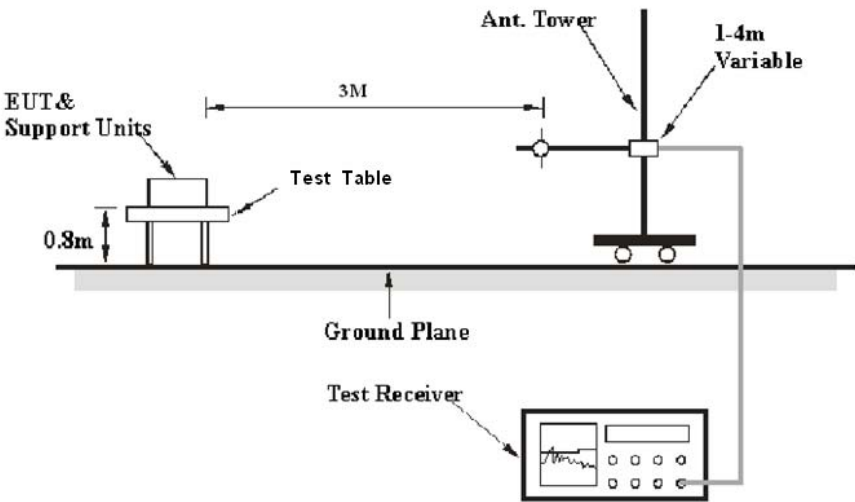
- If U_{lab} is less than or equal to $U_{cisp\text{r}}$ of Table 1, then:
- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
 - Non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
- If U_{lab} is greater than $U_{cisp\text{r}}$ of Table 1, then:
- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cisp\text{r}})$, exceeds the disturbance limit;
 - Non - compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cisp\text{r}})$, exceeds the disturbance limit.

Table 1 – Values of $U_{cisp\text{r}}$

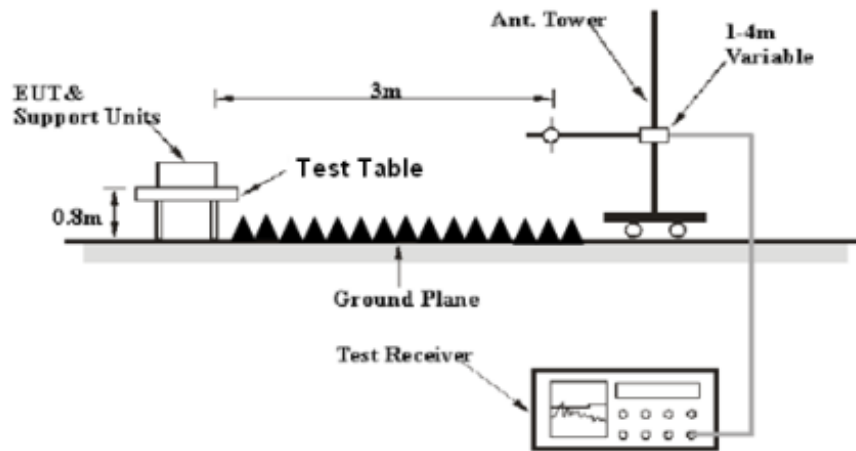
Item		Measurement Uncertainty	$U_{cisp\text{r}}$
Radiated Emission	30MHz~1GHz	5.91dB	6.3 dB
	1GHz~6GHz	4.68dB	5.2 dB
	6 GHz ~18 GHz	4.92dB	5.5 dB

Test System Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters, using the setup accordance with the ETSI EN 301 489-1 V2.2.0 (2017-03). The specification used was the ETSI EN 301 489-1 V2.2.0 (2017-03).

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 6 GHz.

During the radiated emission test, the EMI test receiver Setup was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30MHz – 1000 MHz	120 kHz	300 kHz	120kHz	QP
Above 1 GHz	1MHz	3 MHz	/	Peak
	1MHz	1 Hz	/	Av

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sonoma Instrument	Amplifier	310N	171205	2017-08-14	2018-08-13
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-24
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2019-01-08
Champrotek	Chamber	Chamber A	T-KSEMC049	-	-
R&S	Auto test Software	EMC32	100361	-	-
ETS	Horn Antenna	3115	6229	2016-01-11	2019-01-10
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2016-11-25	2017-11-25
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-12-12	2017-12-11
MICRO-COAX	Coaxial Cable	Cable-8	001	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-9	002	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-10	003	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-4	004	2016-12-12	2017-12-11
MICRO-COAX	Coaxial Cable	Cable-5	005	2016-12-12	2017-12-11

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test Procedure

During the radiated emissions, the adapter was connected to the first AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detection mode from 30MHz to 1GHz, Peak and average detection mode above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter reading. The basic equation is as follows:

$$\text{Corr. Amp.} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amp}$$

Test Data

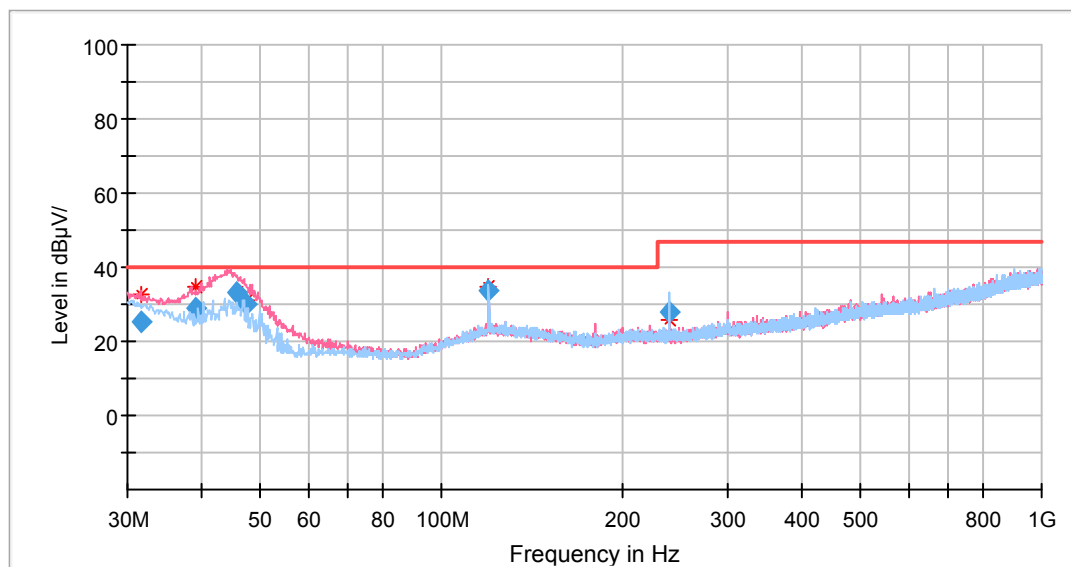
Environmental Conditions

Temperature:	24.1°C
Relative Humidity:	55%
ATM Pressure:	101.2 kPa-

* The testing was performed by Phil Zhu on 2017-10-20.

Test mode: Charging & play music

1) Below 1GHz



Frequency (MHz)	Peak (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB /m)
31.646450	25.15	40.00	14.85	101.0	V	46.0	-5.5
38.917900	28.79	40.00	11.21	101.0	V	62.0	-10.4
45.567850	33.18	40.00	6.82	101.0	V	239.0	-15.0
47.449250	29.92	40.00	10.08	101.0	V	298.0	-16.2
119.958200	33.86	40.00	6.14	199.0	H	193.0	-11.6
240.057800	28.05	47.00	18.95	101.0	H	207.0	-12.6

Above 1 GHz:

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1396.474390	33.42	---	70.00	36.58	100.0	H	161.0	-8.7
1397.150390	---	20.07	50.00	29.93	200.0	H	148.0	-8.7
1944.394442	---	22.03	50.00	27.97	200.0	V	167.0	-6.2
1947.234442	35.70	---	70.00	34.30	200.0	V	167.0	-6.2
2403.383896	---	22.38	50.00	27.62	100.0	H	33.0	-4.9
2404.983896	46.19	---	70.00	23.81	100.0	H	33.0	-4.9
4182.234182	---	29.39	54.00	24.61	200.0	H	210.0	1.2
4191.506182	42.33	---	74.00	31.67	100.0	H	161.0	1.2
4866.480364	---	31.35	54.00	22.65	100.0	H	233.0	2.6
4870.736364	58.06	---	74.00	15.94	100.0	H	233.0	2.6
4921.339429	---	31.29	54.00	22.71	100.0	H	172.0	2.7
4925.643429	63.47	---	74.00	10.53	100.0	H	172.0	2.8

7.2 - ELECTROSTATIC DISCHARGE

Measurement Uncertainty

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-2) please refer to the following:

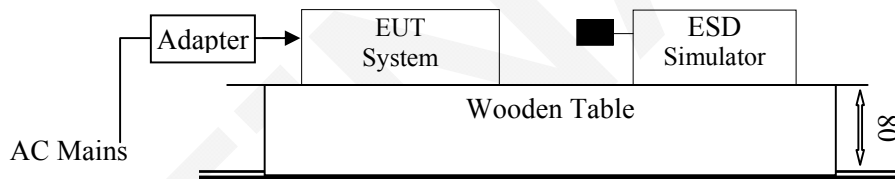
Parameter	U_{EN}	U_{lab}
Rise time t_r	$\leq 15\%$	15%
Peak current I_p	$\leq 7\%$	6.30%
Current at 30 ns	$\leq 7\%$	6.30%
Current at 60 ns	$\leq 7\%$	6.30%

Test Equipment

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
EM Test	ESD Simulator	Dito	V0824103870	2016-10-11	2017-10-11

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements, traceable to National Primary Standards and International System of Units (SI).

Test System Setup



Remark: ■ is the tip of the electrode

EN 61000-4-2 specifies that a tabletop EUT shall be placed on a non-conducting table which is 80 centimeters above a ground reference plane and that floor mounted equipment shall be placed on a insulating support approximately 10 centimeters above a ground plane. During the tests, the EUT is positioned over a ground reference plane in conformance with this requirement.

For tabletop equipment, a 1.6 by 0.8-meter metal sheet (HCP) is placed on the table and connected to the ground plane via a metal strap with two 470 k Ohms resistors in series. The EUT and attached cables are isolated from this metal sheet by 0.5-millimeter thick insulating material. A Vertical Coupling Plane (VCP) grounded on the ground plane through the same configuration as in the HCP is used.

Test Standard

ETSI EN 301 489-1 V2.2.0 (2017-03) / EN 61000-4-2: 2009

Test Level 3 for Air Discharge at ± 8 kV

Test Level 2 for Contact Discharge at ± 4 kV

Test Level

Level	Test Voltage Contact Discharge ($\pm$ kV)	Test Voltage Air Discharge ($\pm$ kV)
1.	2	2
2.	4	4
3.	6	8
4.	8	15
X.	Special	Special

Performance criterion: B**Test Procedure****Air Discharge:**

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

Contact Discharge:

All the procedure shall be same as Section 8.3.1 of EN 61000-4-2, except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

Indirect discharge for horizontal coupling plane

At least 50 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

Indirect discharge for vertical coupling plane

At least 50 single discharges shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

Test Data and Setup Photo**Environmental Conditions**

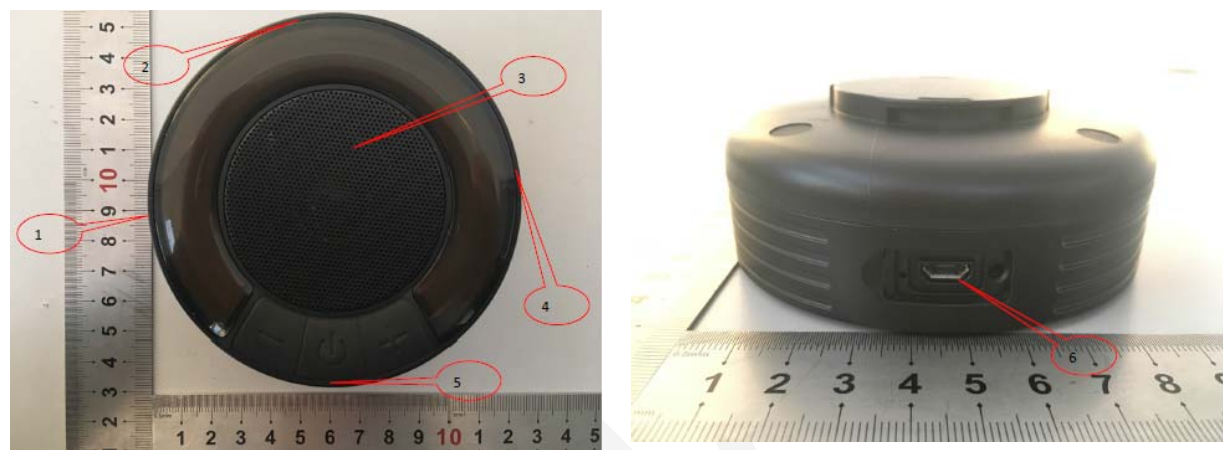
Temperature:	19 °C
Relative Humidity:	47 %
ATM Pressure:	101.0 kPa

The testing was performed by Phil Zhu on 2017-10-25.

Test mode: Charging & play music

	Contact discharge				Air discharge			
Test Points	±2kV	±4kV	±6kV	±8kV	±2kV	±4kV	±8kV	±15kV
VCP	A	A	/	/	/	/	/	/
HCP	A	A	/	/	/	/	/	/
1~6	/	/	/	/	A	A	A	/

Test point as follows:



7.2 -RF ELECTROMAGNETIC FIELD (80 MHz - 6000MHz)

Measurement Uncertainty

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-3) please refer to the following:

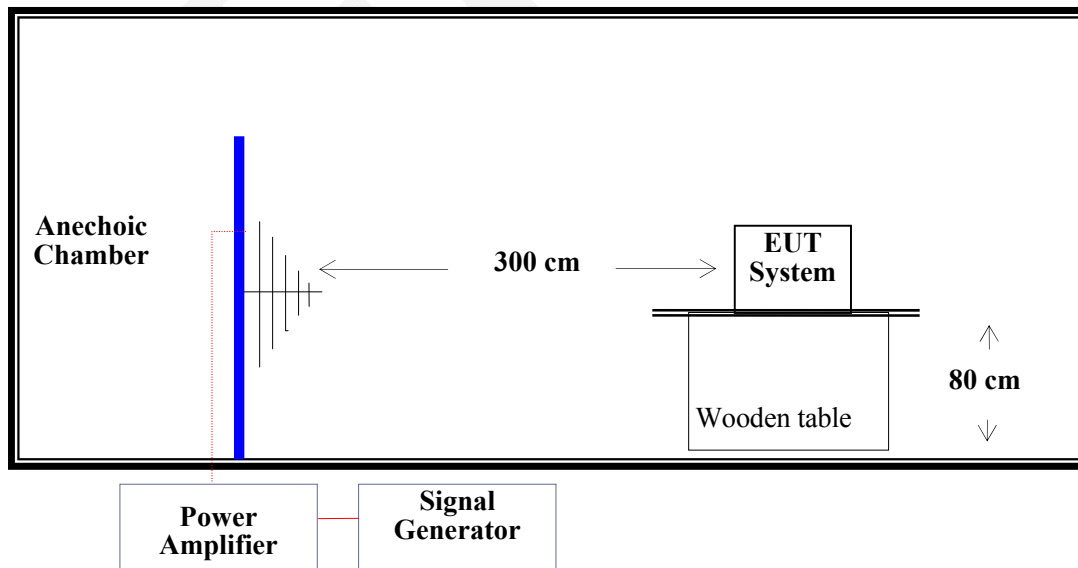
Parameter	U_{EN}	U_{lab}
Calibration process	1.88 dB	1.88 dB
Level setting	2.19 dB	2.19 dB

Test Equipment

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Signal Generator	E4421B	US38440505	2015-11-25	2017-11-24
Agilent	Signal Generator	8665B	3744A01692	2017-01-12	2018-01-12
Amplifier Research	Power Amplifier	200W1000M3A	18062	NCR	NCR
A&R	Power Amplifier	500W100B	0348446	NCR	NCR
A&R	Power Amplifier	60S1G6	0348712	NCR	NCR
Sunol Sciences	Bi-log Antenna	JB3	A040904-1	2016-01-09	2019-01-08
Amplifier Research	Power Amplifier	10S1GRM1	18060	NCR	NCR
ETS	Horn Antenna	3115	6229	2016-01-11	2019-01-10

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Kunshan) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

Test System Setup



Test Standard

ETSI EN 301 489-1 V2.2.0 (2017-03) / EN 61000-4-3:2006+A1:2008+A2:2010
Test Level 2 at 3V / m
Test Levels and Performance Criterion

Test Level

Level	Field Strength V/m
1.	1
2.	3
3.	10
X.	Special

Performance Criterion: A**Test Procedure**

The EUT and its simulators are placed on a turn table which is 0.8 meter above the ground. The EUT is set 3 meters away from the Receiving antenna which is mounted on an antenna tower. Both horizontal and vertical polarizations of the antenna are set on test. Each of the four sides of EUT must be faced this Receiving antenna and measured individually. In order to judge the EUT performance, a CCD camera is used to monitor the EUT.

All the scanning conditions are as follows:

Condition of Test	Remarks
1. Field Strength	3 V/m (Test Level 2)
2. Radiated Signal	1 kHz, 80% AM, sine wave
3. Scanning Frequency	80 MHz– 6000 MHz
4. Scanning Frequency Step	1%
5. Dwell Time	3 Sec.

Test Data and Setup Photo**Environmental Conditions**

Temperature:	19 °C
Relative Humidity:	47 %
ATM Pressure:	101.0 kPa

The testing was performed by Phil Zhu on 2017-10-25.

Test mode: Charging & play music

Frequency Range (MHz)	Front Side (3 V/m)		Rear Side (3 V/m)		Left Side (3 V/m)		Right Side (3 V/m)	
	VERT	HORI	VERT	HORI	VERT	HORI	VERT	HORI
80-6000	A	A	A	A	A	A	A	A

Note: “A” stand for, during test, operate as intended No loss function, no degradation of performance, no unintentional transmissions. and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

EXHIBIT A - EUT PHOTOGRAPHS

EUT – All View



EUT – Top View



EUT – Bottom View



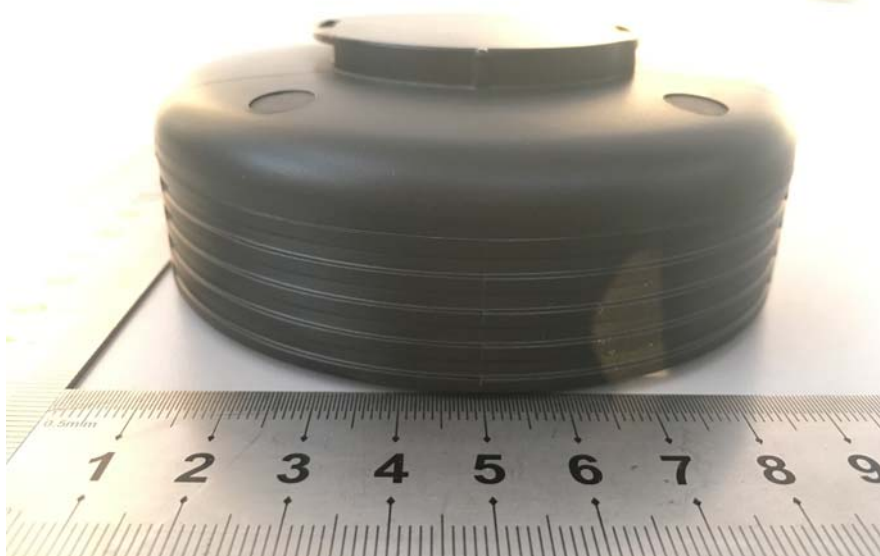
EUT – Front View



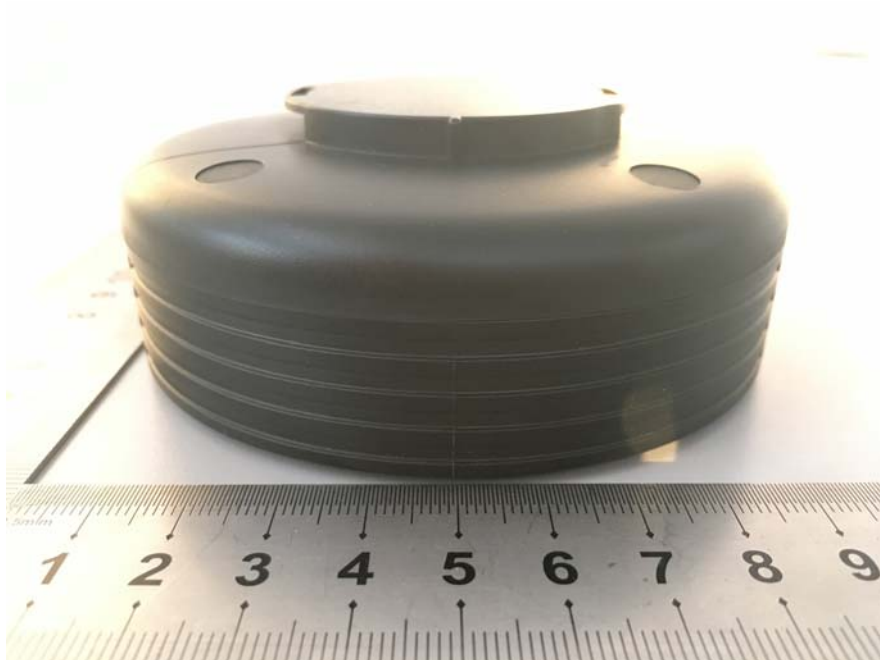
EUT – Rear View



EUT – Left View



EUT – Right View



EUT – Cover off View-1



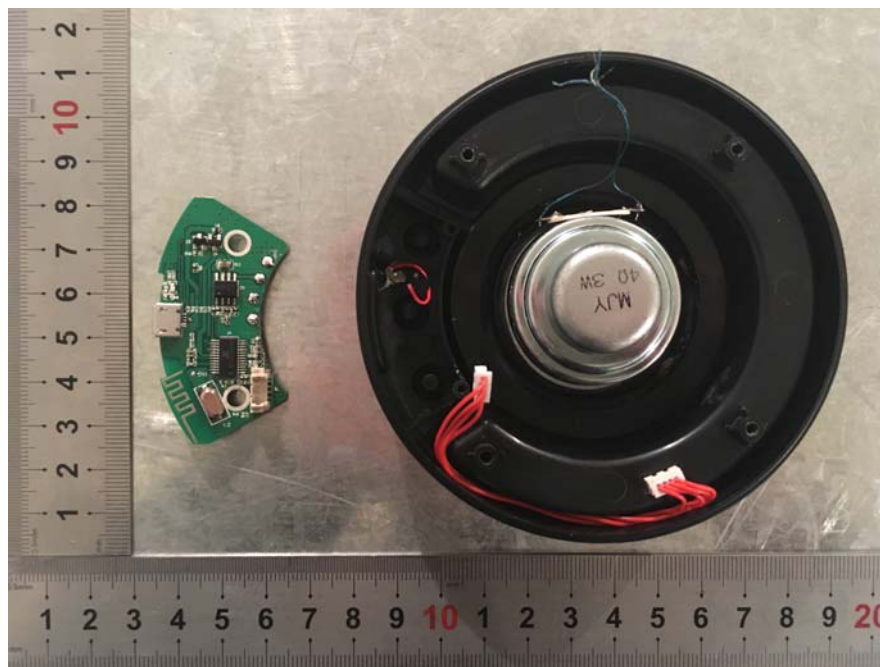
EUT –Cover off View-2



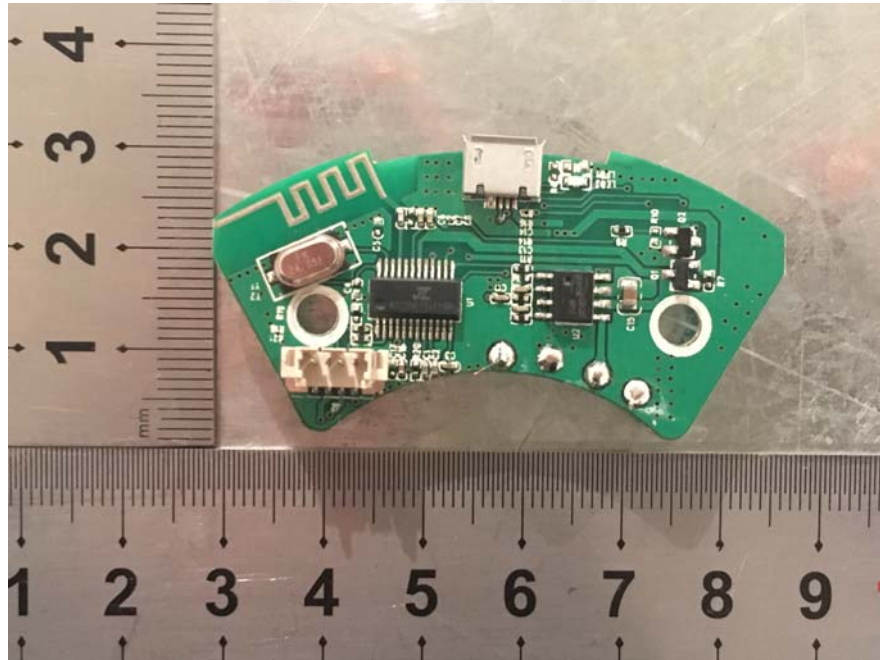
EUT – Battery View



EUT –Cover off View-3



EUT – PCB Top View



EUT – PCB Bottom View

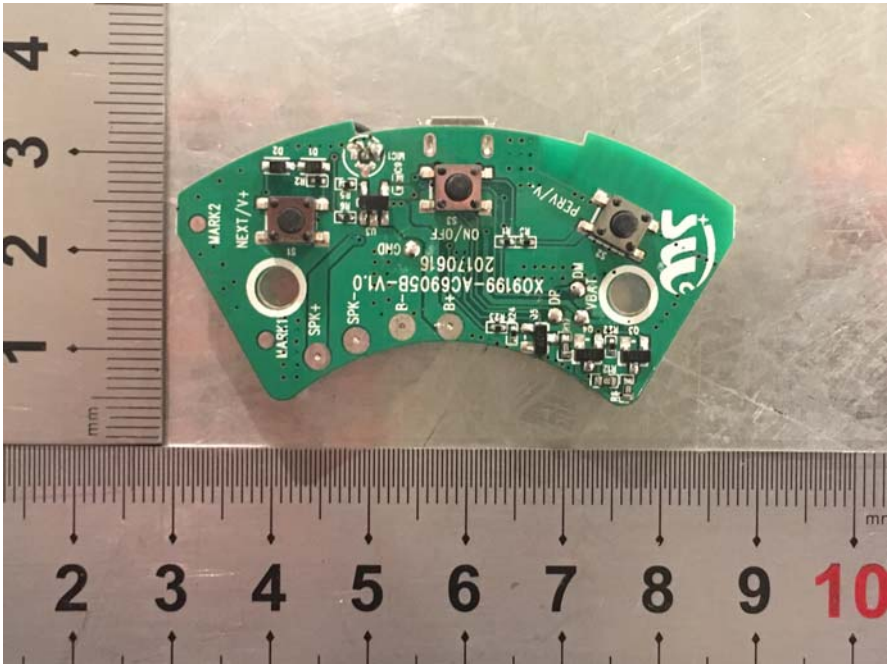


EXHIBIT B – TEST SETUP PHOTOGRAPHS

Conducted Emissions- Front View



Conducted Emissions- Rear View



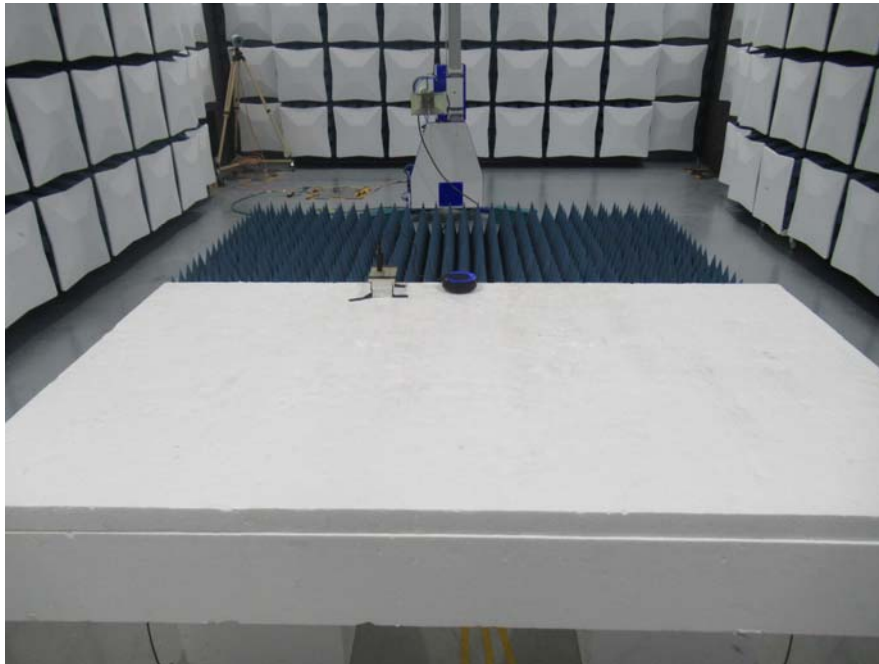
Radiated Emissions- Front View (Below 1G)



Radiated Emissions- Rear View (Below 1G)



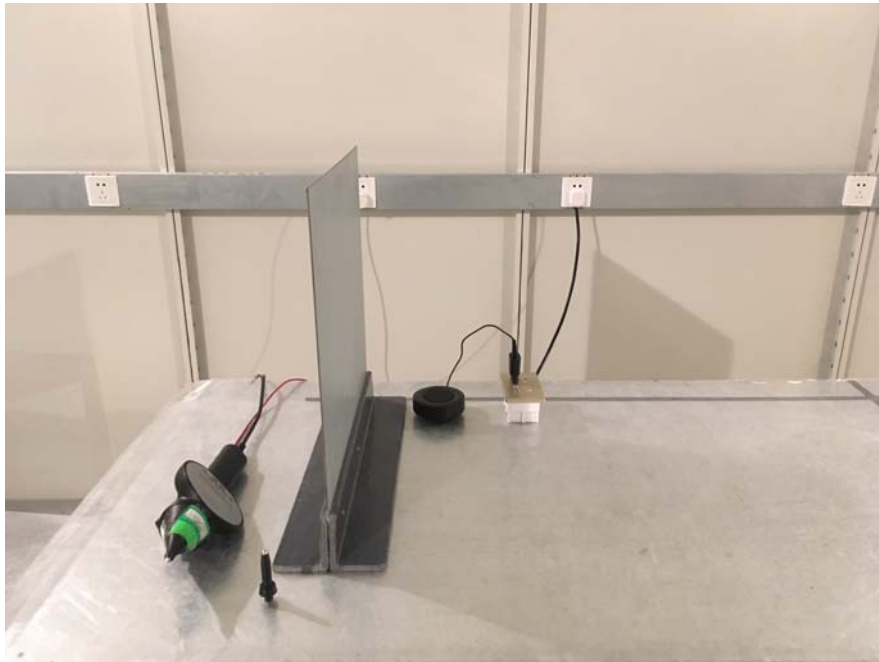
Radiated Emissions- Front View (Above 1G)



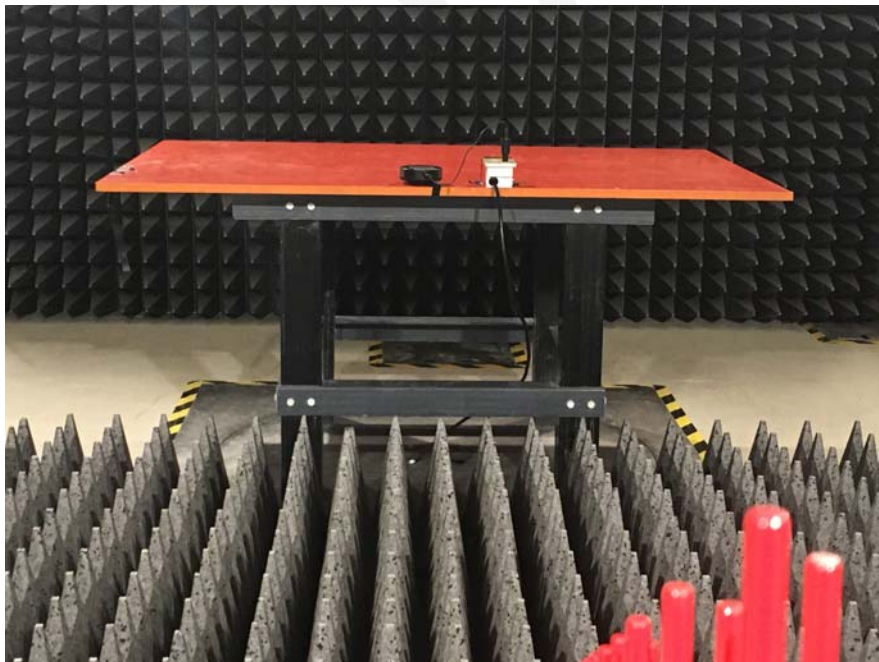
Radiated Emissions- Rear View (Above 1G)



ESD Test Setup Photo



RS Test Setup photo



***** END OF REPORT *****