

EMC TEST REPORT

Product: PMA Graphene Belly Belt

Trade Name: PMA

Model Name: S20

Serial Model: S21

Report No.: UNIA19070423ER-01

Prepared for

Anhui Aerospace & PMA Health Technology Co., Ltd.
No.16 Building International E-commerce Industrial Estate, No.1201 HuGuang
East Rd, Shushan District, Hefei city, Anhui, China

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name.....: Anhui Aerospace & PMA Health Technology Co., Ltd.

Address.....: No.16 Building International E-commerce Industrial Estate,
No.1201 HuGuang East Rd, Shushan District, Hefei city, Anhui,
China

Manufacture's Name.....: Anhui Aerospace & PMA Health Technology Co., Ltd.

Address.....: No.16 Building International E-commerce Industrial Estate,
No.1201 HuGuang East Rd, Shushan District, Hefei city, Anhui,
China

Product description

Product name.....: PMA Graphene Belly Belt

Trade Mark.....: PMA

Model and/or type reference : S20, S21

Standards.....: EN 55014-1:2017
EN 55014-2:2015

This device described above has been tested by Shenzhen United Testing Technology Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the EMC Directive 2014/30/EU requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test.....:

Date (s) of performance of tests.....: Jul. 04, 2019 ~ Jul. 09, 2019

Date of Issue.....: Jul. 09, 2019

Test Result.....: Pass

Prepared by:

Bob Liao

Bob Liao/Editor

Reviewer:

Kahn Yan
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Approved & Authorized Signer:

Liuze
Liuze/Manager

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1 TEST SUMMARY

TEST RESULTS

Test procedures according to the technical standards:

EMC Emission				
Standard	Test Item	Limit	Judgment	Remark
EN 55014-1:2017	Conducted Emission	Class B	N/A	
	Disturbance Power(30-300MHz)	---	N/A	
	Radiated Emission 30MHz to 1000MHz	Class B	PASS	NOTE (1)
EN 61000-3-2:2014	Harmonic Current Emission	Class A	N/A	
EN 61000-3-3:2013	Voltage Fluctuations & Flicker	---	N/A	
EMC Immunity				
Section EN 55014-2:2015	Test Item	Performance Criteria	Judgment	Remark
EN 61000-4-2:2009	Electrostatic Discharge	B	PASS	
EN 61000-4-3:2006 +A1:2008+A2:2010	RF Electromagnetic Field	A	PASS	
EN 61000-4-4:2012	Fast Transients	B	N/A	
EN 61000-4-5:2014 /A1:2017	Surges	B	N/A	
EN 61000-4-6:2014 /AC:2015	Injected Current	A	N/A	
EN 61000-4-11:2004 /A1:2017	Volt. Dips	C / C / C	N/A	NOTE (2)

Note:

- (1) Radiated Emission 30MHz to 1000MHz only apply when test fail in Disturbance Power (200-300MHz) or the maximum clock frequency more than 30 MHz.
- (2) Voltage Dip: 100% reduction – Performance Criteria C
Voltage Dip: 30% reduction – Performance Criteria C
Voltage Dip: 60% reduction – Performance Criteria C
- (3) For client's request and manual description, the test will not be executed.
- (4) "N/A" denotes test is not applicable in this Test Report

TEST FACTORY

Test Firm : Shenzhen United Testing Technology Co., Ltd.

Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19. The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

CNAS-LAB Code: L6494

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

Designation Number: CN1227

Test Firm Registration Number: 674885

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files.

MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

A. Conducted Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
UNI01	ANSI	9KHz ~ 150KHz	3.18	
		150 KHz ~ 30MHz	2.70	

B. Radiated Measurement:

Test Site	Method	Measurement Frequency Range	U, (dB)	NOTE
UNI02	ANSI	9KHz ~ 30MHz	2.50	
		30MHz ~ 200MHz	3.43	
		200MHz ~ 1000MHz	3.57	
		1GHz ~ 6 GHz	4.13	

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment:	PMA Graphene Belly Belt	
Trade Mark:	PMA	
Model Name:	S20	
Serial No.:	S21	
Model Difference:	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model: S20	
Product Description:	The EUT is a PMA Graphene Belly Belt.	
	Operating frequency:	N/A
	Connecting I/O port:	N/A
Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.		

2.2 DESCRIPTION OF THE TEST MODES

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

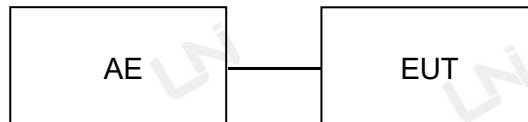
Pretest Mode	Description
Mode 1	Running

For Radiated Test	
Pretest Mode	Description
Mode 1	Running

For EMS Test	
Pretest Mode	Description
Mode 1	Running

Note: The test modes were carried out for all operation modes (include link and idle).

2.3 DESCRIPTION OF TEST SETUP



2.4 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Note
E-1	PMA Graphene Belly Belt	PMA	S20	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

1. The support equipment was authorized by Declaration of Confirmation.
2. For detachable type I/O cable should be specified the length in cm in 『Length』 column.
3. "YES" is means "shielded" "with core"; "NO" is means "unshielded" "without core".

2.5 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
Conduction Emissions Measurement					
1	AMN	Schwarzbeck	NNLK8121	8121370	2019.09.18
2	AMN	ETS	3810/2	00020199	2019.09.18
3	EMI TEST RECEIVER	Rohde&Schwarz	ESCI	101210	2019.09.18
4	AAN	TESEQ	T8-Cat6	38888	2019.09.25
Radiated Emissions Measurement					
1	Horn Antenna	Sunol	DRH-118	A101415	2019.10.09
2	Broadband Hybrid Antenna	Sunol	JB1 Antenna	A090215	2019.10.09
3	PREAMP	HP	8449B	3008A00160	2019.09.25
4	PREAMP	HP	8447D	2944A07999	2019.09.25
5	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2019.09.18
6	MXA Signal Analyzer	Keysight	N9020A	MY51110104	2019.09.28
7	Active Loop Antenna	COM-POWER	AL-310R	10160009	2020.05.11
8	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2019.08.22
9	Horn Antenna	A-INFOMW	LB-180400-KF	J211060660	2019.09.25
10	Loop Antenna	Beijing daze Technology	ZN30401	13015	2019.09.18
11	EM CAMLP	SCHWARZBECK	MDS21	03350	2019.09.25
Harmonic / Flicker Measurement					
1	AC Power Source	California Instrumnets	5001ix	HK53570	2019.09.18
Electrostatic Discharge Test					
1	ESD Generator	EVERFINE	EMS61000-2A	P185811CA837112 1	2019.08.14
RS Test					
1	RF Power sensor	DARE	RPR3006W	15I00041SNO88	2020.05.18
2	RF Power sensor	DARE	RPR3006W	15I00041SNO89	2020.05.18
3	Signal Generator	Agilent	E4421B	MY43351056	2019.09.18
4	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2019.09.18
5	Bilog Antenna	TESEQ	CBL6111D	45873	2019.09.18
6	Horn Antenna	SCHWARZBECK	BBHA 9120D	1201	2019.09.18
7	Power Amplifier	MICOTOP	MPA-80-1000-250	MPA1711489	2019.09.18
8	Power Amplifier	MICOTOP	MPA-3000-6000-5 0	MPA1711488	2019.09.18

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
Electrical Fast Transient / Burst Immunity Test					
1	EFT/B Generator	Shanghai Lioncel	EFT-404S	EFT404S0160601	2019.09.18
Surge Test					
1	Surge Generator	Shanghai Lioncel	LSG-506S	LSG506S0160601	2019.09.18
2	CDN	Shanghai Lioncel	CDN-532S	CDN532S0160601	2019.09.18
CS Test					
1	Signal Generator	Agilent	E4421B	MY43351056	2019.09.18
2	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2019.09.18
3	Attenuator	Nemtest	ATT-6DB-100	A100W224	2019.09.18
4	Integrated Conduction Sensitivity Test System	Schloder	CDG6000	20S1288/2016	2019.09.18
Power-frequency magnetic fields Test					
1	Magnetic Field Test System	Shanghai Lioncel	PMF801C-T	PMF801C-T	2019.09.09
Voltage dips and interruptions Test					
1	AC Power Source	California Instrumnets	5001ix	HK53570	2019.09.18

3 RADIATED EMISSIONS MEASUREMENT

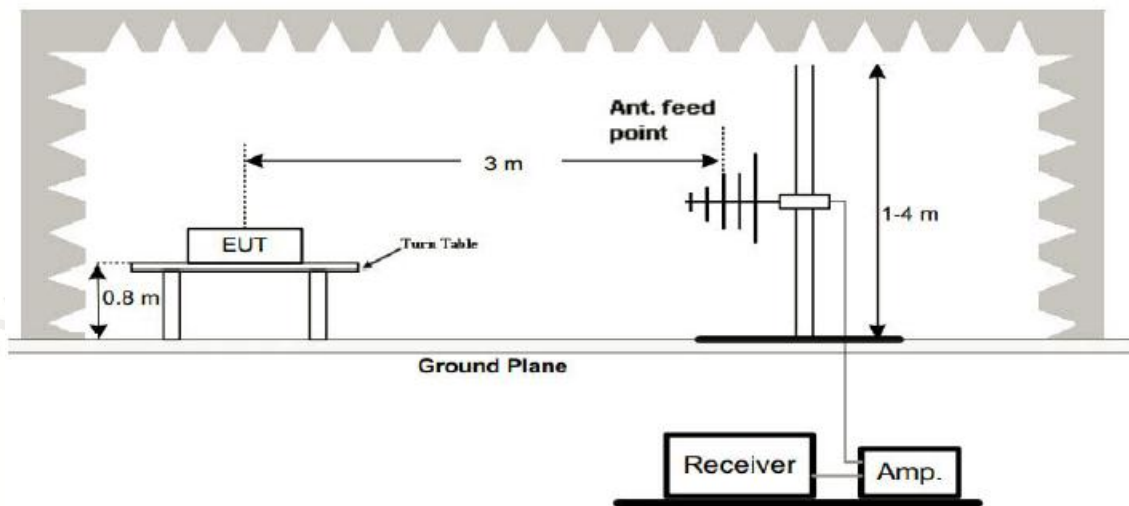
3.1 RADIATED EMISSION LIMIT

Frequency (MHz)	10m	3m
	dBuV/m	dBuV/m
30~230	30	40
230~1000	37	47

Note:

1. The limit for radiated test was performed according to as following: CISPR 14.
2. The tighter limit applies at the band edges.
3. Emission level (dBuV/m)=20log Emission level (uV/m).

3.2 TEST SETUP



3.3 EUT OPERATING CONDITIONS

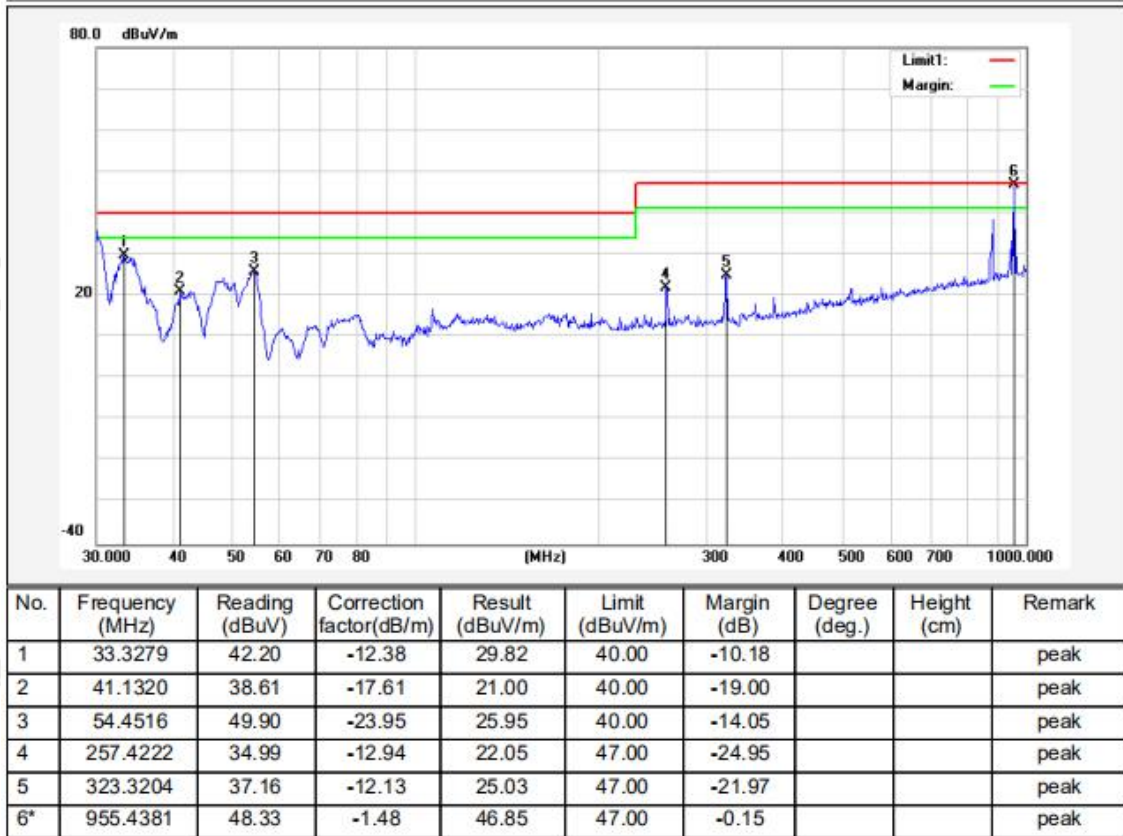
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the following during the testing.

3.4 TEST PROCEDURE

1. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
2. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
3. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured, above 1G Average detector mode will be instead.
5. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP(AV) Limits and then no additional QP Mode measurement performed.
6. For the actual test configuration, please refer to the related Item EUT Test Photos.

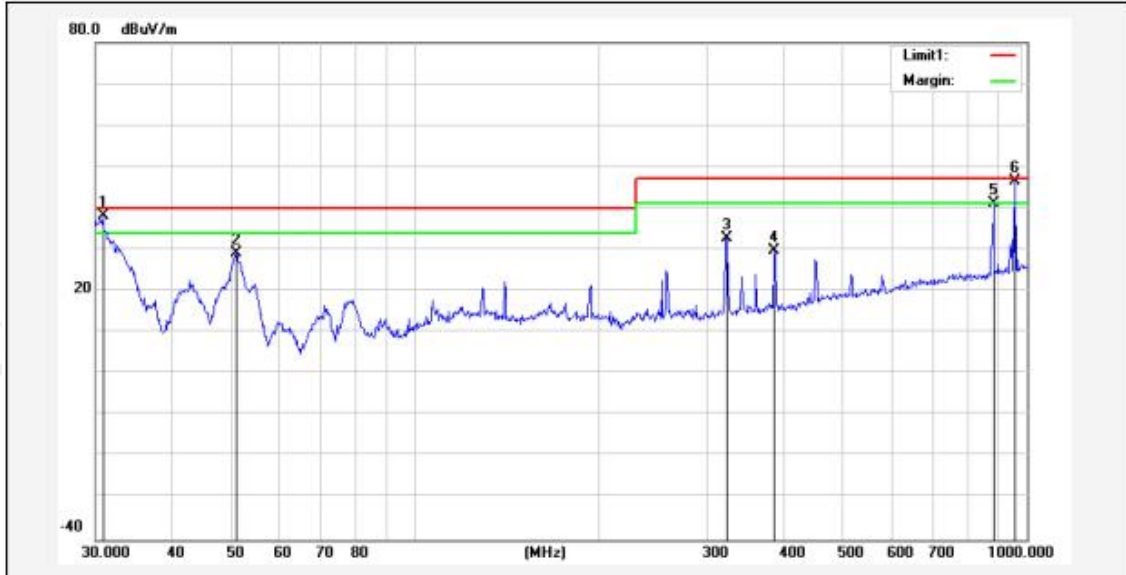
3.5 TEST RESULT

Temperature:	24°C	Relative Humidity:	48%
Test Mode:	Running	Pressure:	1010hPa
Polarization:	Horizontal		



Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit
Factor = Ant. Factor + Cable Loss – Pre-amplifier

Temperature:	24°C	Relative Humidity:	48%
Test Mode:	Running	Pressure:	1010hPa
Polarization:	Vertical		



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1!	30.8535	49.65	-11.39	38.26	40.00	-1.74			peak
2	50.9420	53.51	-24.50	29.01	40.00	-10.99			peak
3	323.3204	46.96	-14.07	32.89	47.00	-14.11			peak
4	386.6338	42.86	-13.15	29.71	47.00	-17.29			peak
5!	881.4067	46.54	-5.52	41.02	47.00	-5.98			peak
6*	955.4381	51.38	-4.90	46.48	47.00	-0.52			peak

Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit
Factor = Ant. Factor + Cable Loss – Pre-amplifier

4 EMC IMMUNITY TEST

4.1 STANDARD COMPLIANCE/SERVIRITY LEVEL/CRITERIA

Tests Standard No.	TEST SPECIFICATION	Test Mode Test Ports	Perform Criteria
ESD IEC/EN 61000-4-2	8kV air discharge 4kV contact discharge	Direct Mode	B
	4kV HCP discharge 4kV VCP discharge	Indirect Mode	B
RS IEC/EN 61000-4-3	80 MHz to 1000 MHz, 1000Hz, 80%, AM modulated	Enclosure	A

4.2 GENERAL PERFORMANCE CRITERIA

According to EN 55014-2 standard, the general performance criteria as following:

Criterion A	The equipment shall continue to operate as intended without operator intervention. No degradation of performance, loss of function or change of operating state is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criterion B	During the application of the disturbance, degradation of performance is allowed. However, no unintended change of actual operating state or stored data is allowed to persist after the test. After the test, the equipment shall continue to operate as intended without operator intervention; no degradation of performance or loss of function is allowed, below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level (or the permissible performance loss), or recovery time, is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criterion C	Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A reboot or re-start operation is allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

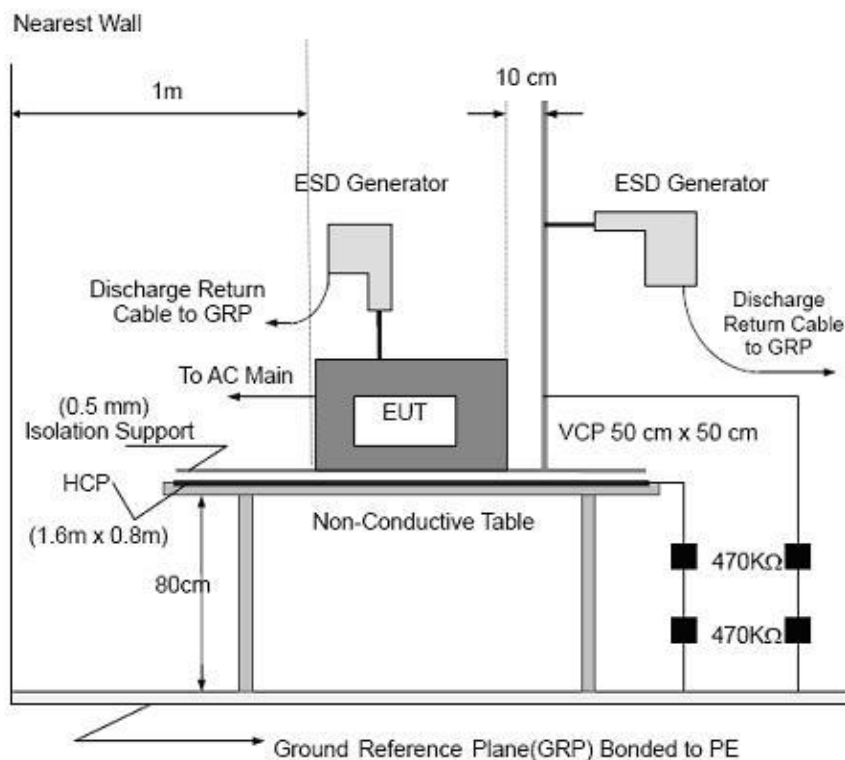
4.3 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the following during the testing.

5.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Required Performance:	B
Discharge Voltage:	Air Discharge: 2kV/4kV/8kV (Direct) Contact Discharge: 2kV/4kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: min. 20 times at each test point Contact Discharge: min. 20 times at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

5.2 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940k total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC /EN 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of 0.8-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC/EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1 meter thickness. The GRP was consisted of a sheet of aluminum that is at least 0.25mm thick, and extended at least 0.5 meters from the EUT on all sides.

5.3 TEST PROCEDURE

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manners:

1. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.

The time interval between two successive single discharges was at least 1 second.

The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.

Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.

Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.

Vertical Coupling Plane (VCP):

The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge.

Horizontal Coupling Plane (HCP):

The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.

The four faces of the EUT will be performed with electrostatic discharge.

2. Air discharges at insulation surfaces of the EUT.

It was at least ten single discharges with positive and negative at the same selected point.

5.4 TEST RESULT

Temperature:	22°C	Relative Humidity:	48%
Test Mode:	Running	Pressure:	1010hPa

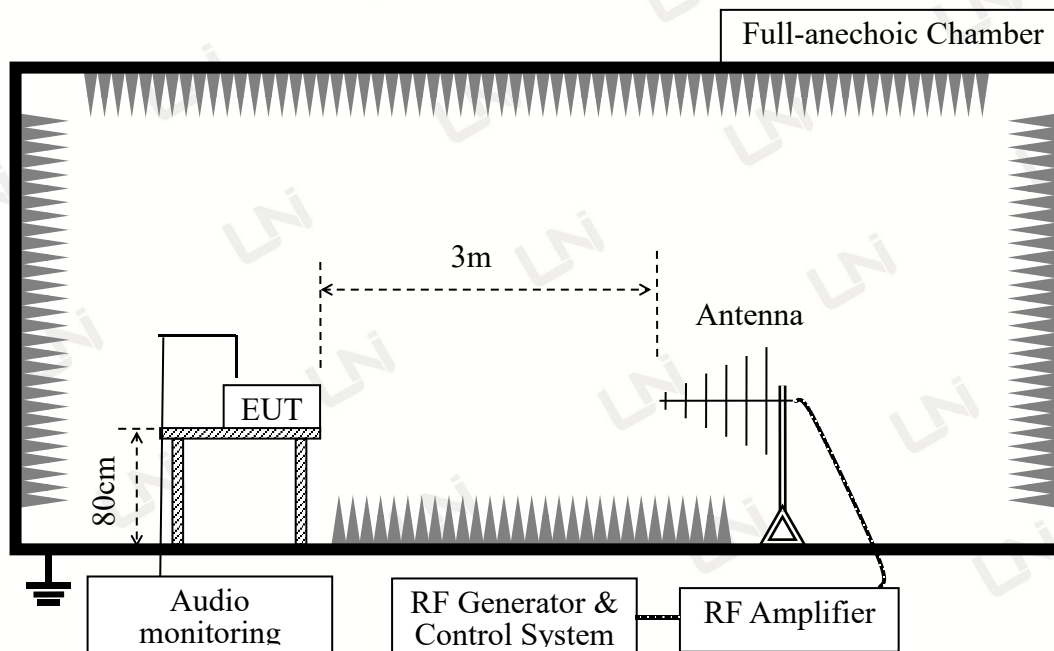
Mode	Air Discharge								Contact Discharge								Perform Criteria	Result
Test level (kV)	4		8		10		15		2		4		6		8			
Test Location	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-		
HCP									A	A	A	A					B	PASS
VCP									A	A	A	A						PASS
Slots	A	A	A	A														PASS
Surface	A	A	A	A														PASS

6 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

6.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-3
Required Performance:	A
Frequency Range:	80~1000MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5 m
Dwell Time:	at least 3 seconds

6.2 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

6.3 TEST PROCEDURE

The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber.

The testing distance from antenna to the EUT was 3 meters.

The other condition need as following manners:

1. The frequency range is swept from 80 MHz to 1000 MHz, with the signal 80% amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
2. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
3. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

6.4 TEST RESULT

Temperature:	22°C	Relative Humidity:	48%
Test Mode:	Running	Pressure:	1010hPa

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Azimuth	Perform Criteria	Result
80~1000	H / V	3 V/m (rms) AM Modulated 1000Hz, 80%	Front	A	PASS
			Rear		
			Left		
			Right		

7 PHOTO OF EUT

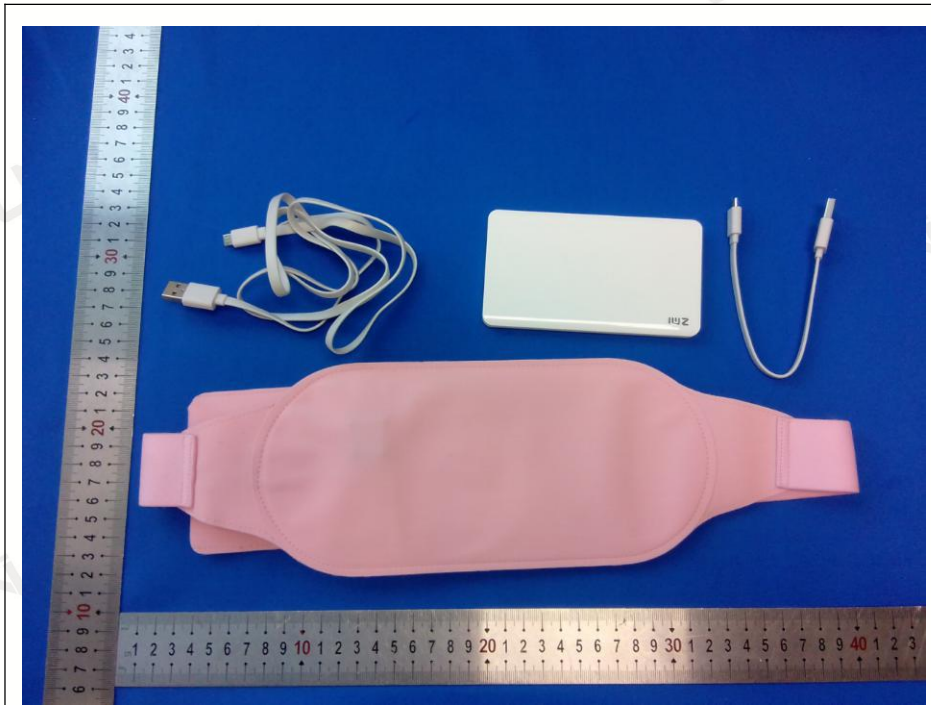


PHOTO 01

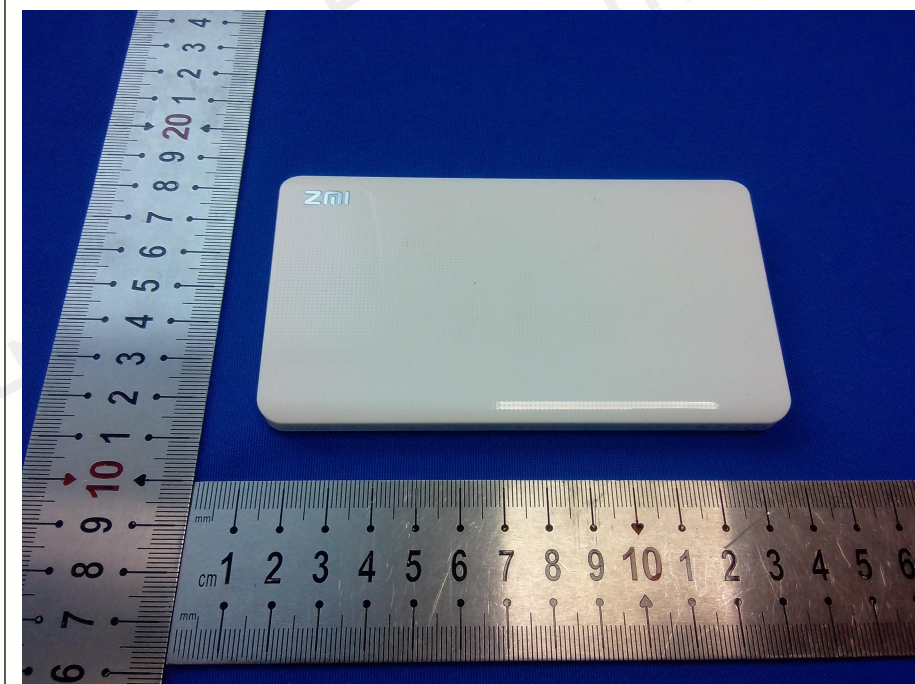


PHOTO 02

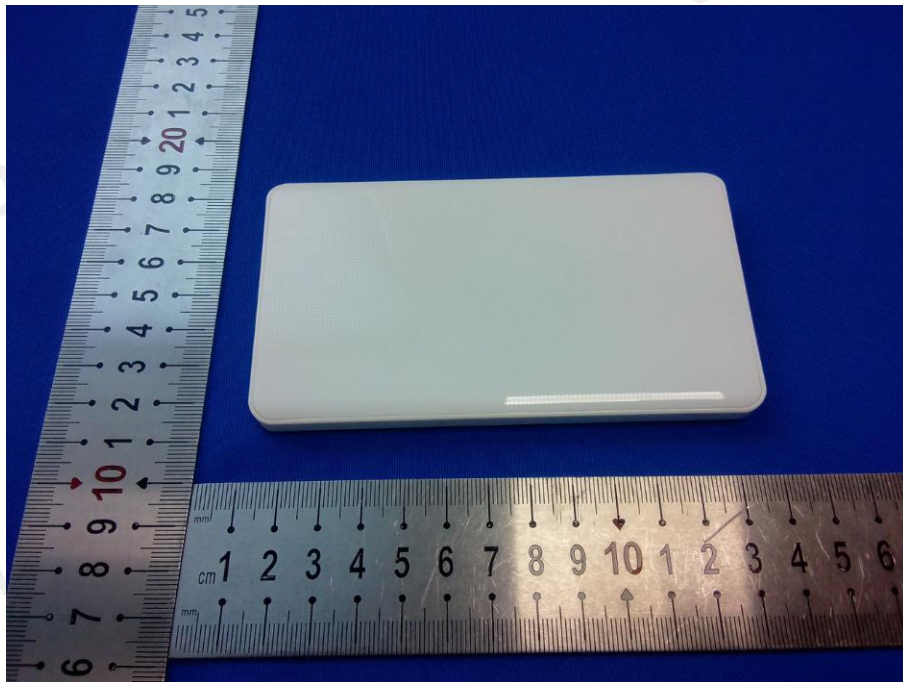


PHOTO 03

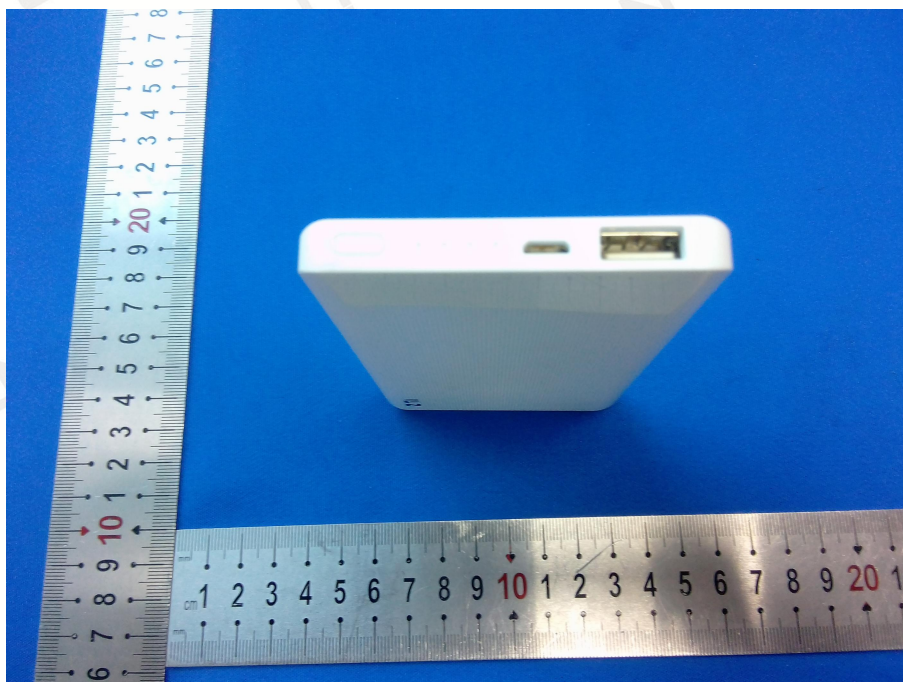


PHOTO 04



PHOTO 05

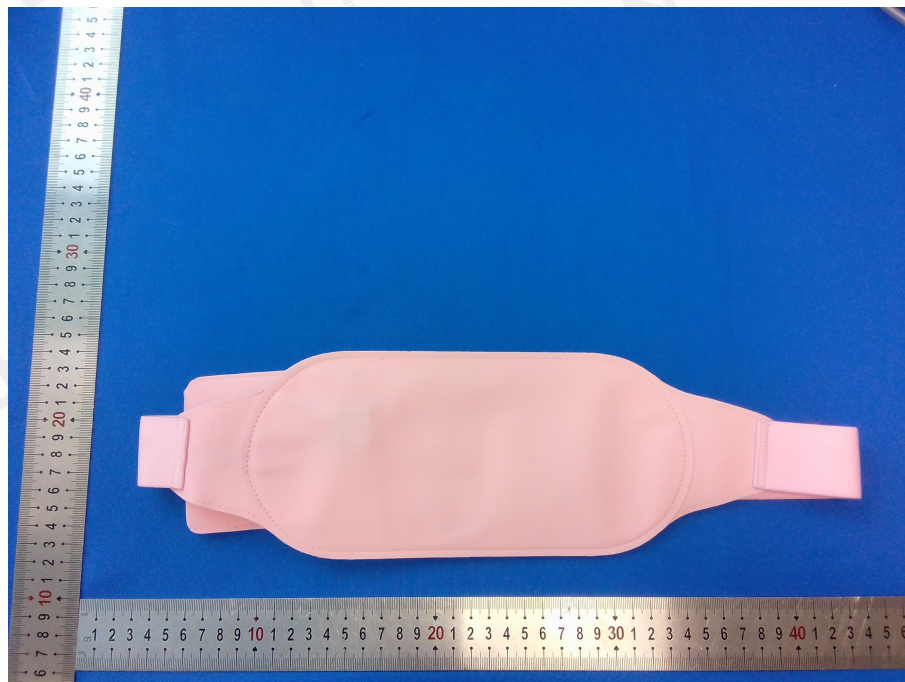


PHOTO 06

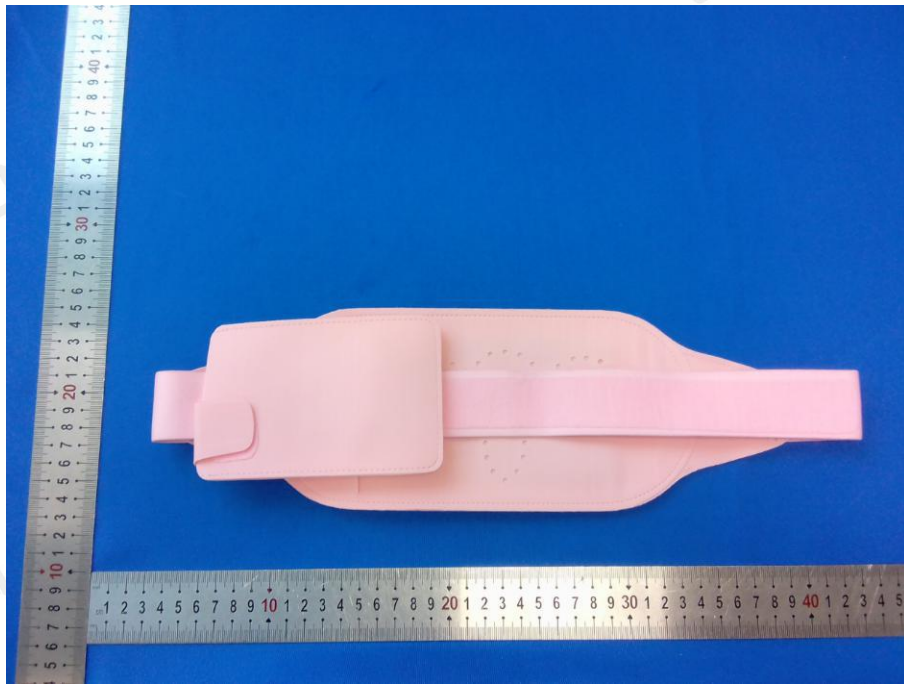


PHOTO 07

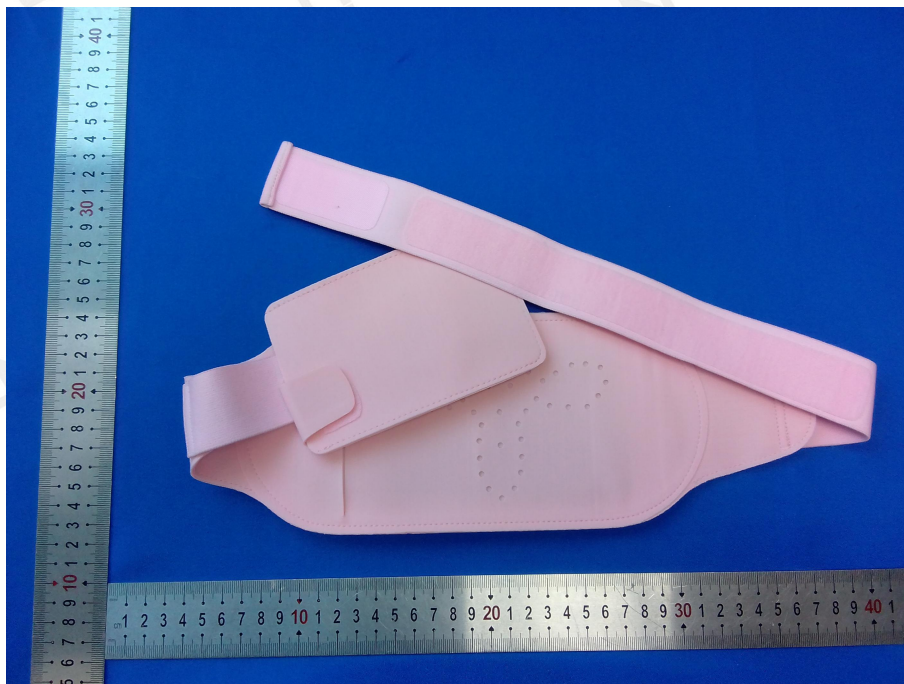


PHOTO 08



PHOTO 09

8 PHOTO OF TEST



End of Report