

CE EMC Test Report



(Declaration of Conformity)

For
Electromagnetic compatibility
Of

Product : PMA Graphene Heating Warm Vest

Trade Mark : PMA

Model Number : PMA-K10

Prepared for

Anhui Aerospace & PMA Anti-radiation 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 Anti-radiation Technology Co., Ltd.

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

Manufacturer's Name: Anhui Aerospace & PMA Anti-radiation Technology Co., Ltd.

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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 Heating Warm Vest

Model and/or type reference: PMA-K10

Standards: EN 55014-1: 2006+A1: 2009+A2: 2011
EN 55014-2: 2015

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Date of Test

Date (s) of performance of tests: 22 Oct. 2018~27 Oct. 2018

Date of Issue: 27 Oct. 2018

Test Result.....: **Pass**

Testing Engineer :

Korka Lin

(Korka Lin)

Technical Manager :

Sky Zhang

(Sky Zhang)

Authorized Signatory :

Sam Chen

(Sam Chen)

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1. TEST SUMMARY

Test procedures according to the technical standards:

EMC Emission				
Standard	Test Item	Limit	Judgment	Remark
EN 55014-1: 2006+A1:2009+A2:2011	Conducted Emission	-----	N/A	
	Radiated Emission	-----	PASS	
EMC Immunity				
Section EN55014-2: 2015	Test Item	Performance Criteria	Judgment	Remark
EN 61000-4-2	Electrostatic Discharge	B	PASS	
EN 61000-4-3	RF electromagnetic field	A	N/A	NOTE (2)
EN 61000-4-4	Fast transients	B	N/A	
EN 61000-4-5	Surges	B	N/A	
EN 61000-4-6	Injected Current	A	N/A	
EN 61000-4-11	Volt. Interruptions Volt. Dips	C / C / C	N/A	NOTE (3)

NOTE:

- (1) 'N/A' denotes test is not applicable in this Test Report
- (2) This test is not required when the EUT is judged to be category II according to EN55014-2.
- (3) Voltage Interruption: 100% reduction – Performance Criteria C
Voltage dip: 30% reduction – Performance Criteria C
Voltage dip: 60% reduction – Performance Criteria C
- (4) For client's request and manual description, the test will not be executed.

1.1 TEST FACILITY

Shenzhen NTEK Testing Technology Co., Ltd.

Add. : 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street Bao'an District, Shenzhen 518126 P.R. China

CNAS-Lab. : The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2005)
The Certificate Registration Number is L5516

IC-Registration : The Certificate Registration Number is 9270A-1

FCC- Accredited : Test Firm Registration Number: 463705
Designation Number: CN1184

A2LA-Lab. : The Certificate Registration Number is 4298.01
This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories.
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

1.2 MEASUREMENT UNCERTAINTY

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

Test Item	Measurement Frequency Range	K	U(dB)
AC Mains Conducted Emission	0.009kHz ~ 0.15MHz	2	2.66
AC Mains Conducted Emission	0.15MHz ~ 30MHz	2	2.80
Telecom Conducted Emission (Cat 3)	0.15MHz ~ 30MHz	2	2.40
Telecom Conducted Emission (Cat 5)	0.15MHz ~ 30MHz	2	2.58
Radiated Emission	30MHz ~ 1000MHz	2	2.64
Radiated Emission	1000MHz ~ 6000MHz	2	2.40
Radiated Emission	6000MHz ~ 18000MHz	2	2.52
Power Clamp	30MHz ~ 300MHz	2	2.20

Revision History

[illegible]

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	PMA Graphene Heating Warm Vest	
Model Name	PMA-K10	
Additional Model Number(s)	N/A	
Model Difference	N/A	
Product Description	The EUT is a PMA Graphene Heating Warm Vest.	
	Operating frequency:	N/A
	Connecting I/O port:	Micro USB
	Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as a Household Device. More details of EUT technical specifications, please refer to the User's Manual.	
Power Source	DC Voltage	
Power Rating	DC 5V, 2A	

2.2 DESCRIPTION OF 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.

All test modes in the table below are tested, the worst case is listed on this report.

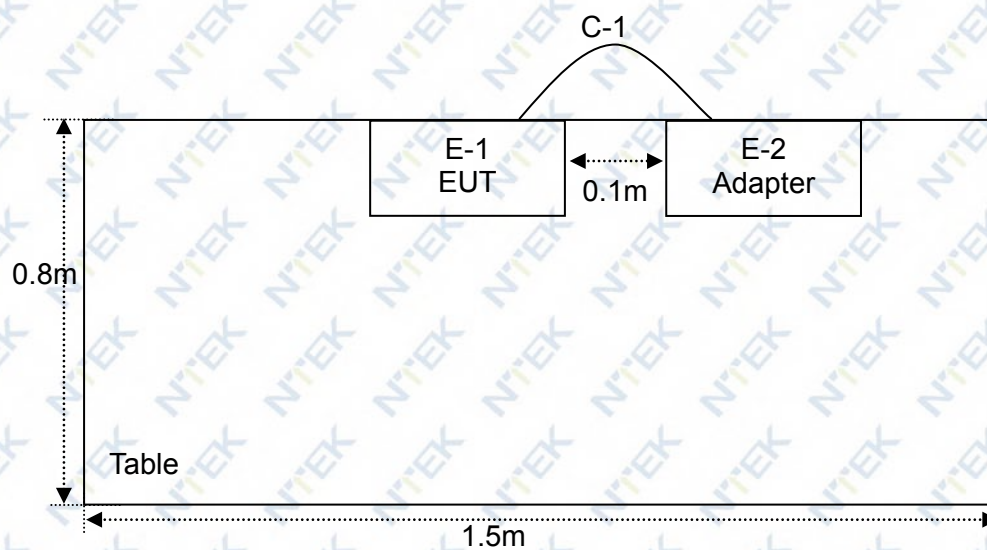
Pretest Mode	Description
Mode 1	Working(High / Middle / Low)

For Radiated Test	
Final Test Mode	Description
Mode 1	Working(High / Middle / Low)

For EMS Test	
Final Test Mode	Description
Mode 1	Working(High / Middle / Low)

2.3 DESCRIPTION OF TEST SETUP

Mode RE : Working



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	Brand	Model/Type No.	Series No.	Note
E-1	PMA Graphene Heating Warm Vest	PMA	PMA-K10	N/A	EUT
E-2	Adapter	N/A	N/A	N/A	

Item	Shielded Type	Ferrite Core	Length	Note
C-1	NO	NO	120cm	

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' means 'shielded' 'with core'; 'NO' means 'unshielded' 'without core'.

2.5 MEASUREMENT INSTRUMENTS LIST

2.5.1 RADIATED TEST SITE

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Antenna Mast	SKET	N/A	N/A	N/A	N/A	N/A
2	Antenna Mast	EM	SC100	N/A	Apr. 26, 2017	Apr. 25, 2020	3 years
3	50Ω Switch	Anritsu	MP59B	6200983705	May 19, 2018	May 18, 2020	2 years
4	Test Cable	N/A	R-01	N/A	Aug. 08, 2016	Aug. 07, 2019	3 years
5	Pre-Amplifier	EMC	EMC051835S E	980246	Aug. 05, 2018	Aug. 04, 2019	1 year
6	Test Cable	N/A	R-03	N/A	Jun. 26, 2016	Jun. 25, 2019	3 years
7	EMI Test Receiver	R&S	ESCI	101160	May 19, 2018	May 18, 2019	1 year
8	Bilog Antenna	TESEQ	CBL6111D	31216	Apr. 08, 2018	Apr. 07, 2019	1 year
9	Broadband Horn Antenna	EM	EM-AH-10180	2011071402	Apr. 08, 2018	Apr. 07, 2019	1 year
10	Spectrum Analyzer	Agilent	E4440A	MY41000130	Mar. 28, 2018	Mar. 28, 2019	1 year
11	50Ω Switch	Anritsu	MP59B	6200983704	May 19, 2018	May 18, 2020	2 years
12	Test Cable	N/A	P-01	N/A	Jun. 26, 2016	Jun. 25, 2019	3 years
13	Absorbing Clamp	R&S	MDS-21	100423	Oct. 08, 2018	Oct. 07, 2019	1 year

2.5.2 ESD

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	ESD TEST GENERATOR	Lioncel	ESD-203B	ESD203B015 0402	Oct. 08, 2018	Oct. 07, 2019	1 year

3. EMC EMISSION TEST

3.1 RADIATED EMISSION MEASUREMENT

3.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT (Below 1000MHz)

FREQUENCY (MHz)	☐ At 10m	☒ At 3m
	dB μ V/m	dB μ /m
30 – 230	30	40
230 – 1000	37	47

3.1.2 LIMITS OF DISTURBANCE POWER MEASUREMENT (Below 1000MHz)

Household and similar appliances			Tools					
Frequency Range			Rated motor power not exceeding 700 W		Rated motor power above 700 W and not exceeding 1 000 W		Rated motor power above 1 000 W	
(MHz)	dB(pW) Quasi-peak	dB (pW) Average *	dB (pW) Quasi-peak	dB (pW) Average *	dB (pW) Quasi-peak	dB (pW) Average *	dB (pW) Quasi-peak	dB (pW) Average *
30-300	44-55	35-45	44-55	35-45	49-59	39-49	55-65	45-55

* If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

Notes:

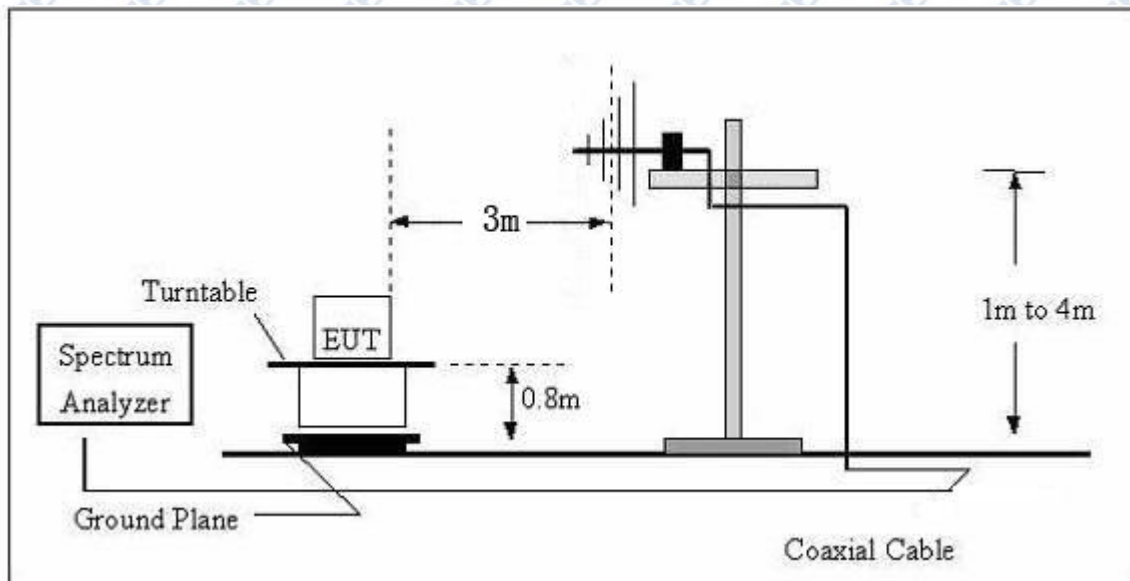
- (1) The limit for radiated test was performed according to as following: CISPR 14.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dB μ V/m)=20log Emission level (uV/m).

3.1.3 TEST PROCEDURE

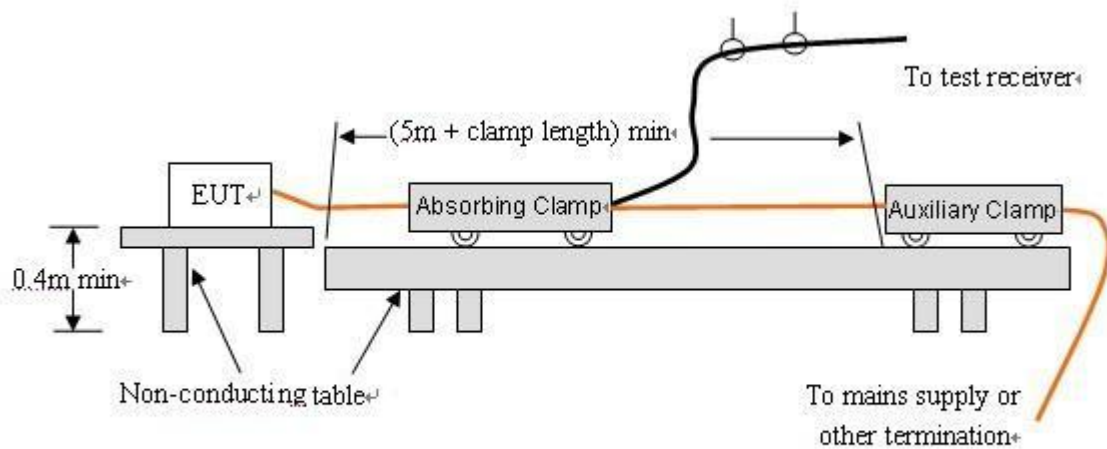
- a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. 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.
- d. 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.
- e. 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.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.1.4 TEST SETUP

(A) Radiated Emission Test Set-Up Frequency Below 1 GHz.



(B) Radiated Emission Test Set-Up Frequency Above 30 MHz



3.1.5 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 follows during the testing.

3.1.6 TEST RESULTS (30MHz ~1000MHz)

EUT:	PMA Graphene Heating Warm Vest	Model Name:	PMA-K10
Temperature:	21℃	Relative Humidity:	53%
Pressure:	1010hPa	Test Date:	2018-10-24
Test Mode:	Working (Middle)	Polarization:	Horizontal
Test Power:	DC 5V Power by Adapter		

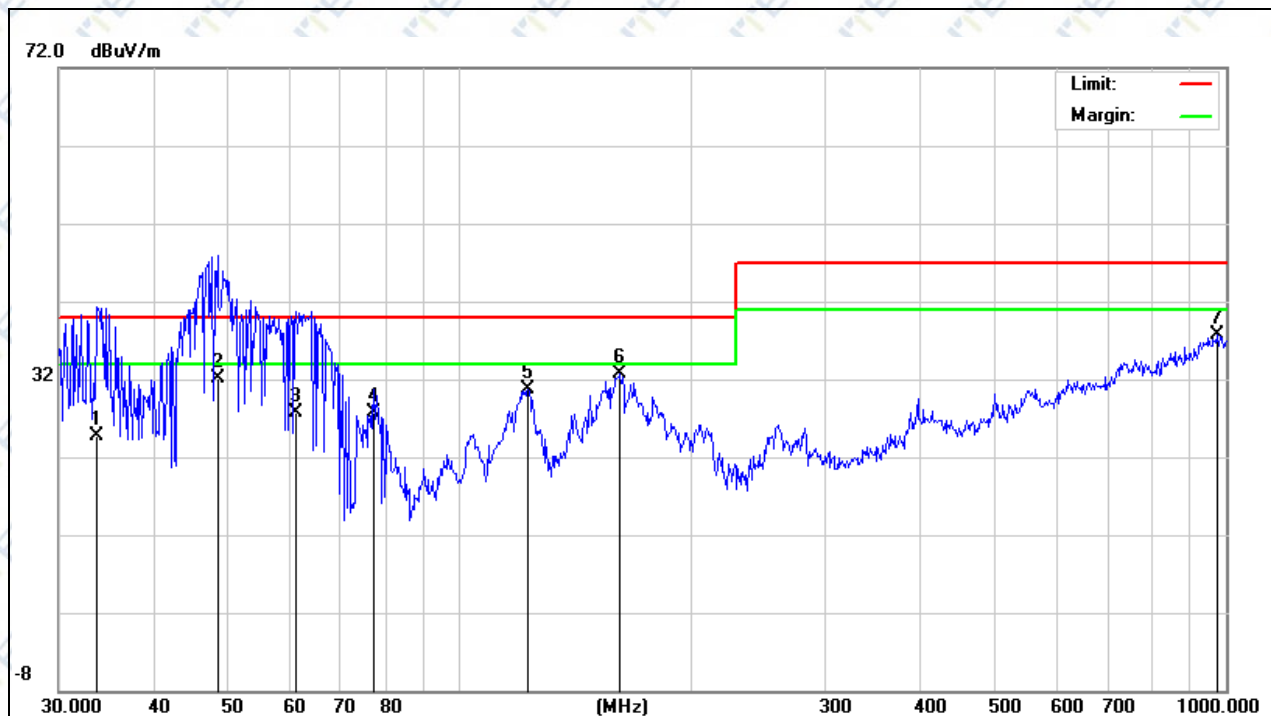


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		35.1278	10.20	16.67	26.87	40.00	-13.13	QP		
2	*	47.6586	21.67	11.31	32.98	40.00	-7.02	QP		
3		52.3912	24.16	7.87	32.03	40.00	-7.97	QP		
4		65.3431	22.02	6.54	28.56	40.00	-11.44	QP		
5		125.0066	15.76	13.32	29.08	40.00	-10.92	QP		
6		279.0436	10.09	17.02	27.11	47.00	-19.89	QP		

Remark:

Factor = Antenna Factor + Cable Loss - Amplifier.

EUT:	PMA Graphene Heating Warm Vest	Model Name:	PMA-K10
Temperature:	21°C	Relative Humidity:	53%
Pressure:	1010hPa	Test Date:	2018-10-24
Test Mode:	Working (Middle)	Polarization:	Vertical
Test Power:	DC 5V Power by Adapter		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		33.6802	7.51	17.29	24.80	40.00	-15.20	QP		
2		48.3318	21.12	10.98	32.10	40.00	-7.90	QP		
3		61.1315	21.32	6.43	27.75	40.00	-12.25	QP		
4		77.3212	19.49	8.14	27.63	40.00	-12.37	QP		
5		122.8340	17.47	13.26	30.73	40.00	-9.27	QP		
6	*	162.0414	21.23	11.51	32.74	40.00	-7.26	QP		
7		972.3374	6.45	31.21	37.66	47.00	-9.34	QP		

Remark:

Factor = Antenna Factor + Cable Loss - Amplifier.

4. EMC IMMUNITY TEST

4.1 STANDARD COMPLIANCE/ SEVERITY LEVEL/ CRITERIA

Tests Standard No.	TEST SPECIFICATION	Test Mode Test Ports	Perform. Criteria
1. ESD IEC/EN 61000-4-2	8kV air discharge 4kV contact discharge	Direct Mode	B
	4kV HCP discharge 4kV VCP discharge	Indirect Mode	B

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 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, 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	After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena 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 allowed. However, no change of operating state or stored data is allowed to persist after the test.
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. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

4.3 GENERAL PERFORMANCE CRITERIA TEST SETUP

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

4.4 ESD TESTING

4.4.1 TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-2
Discharge Impedance:	330ohm / 150pF
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 at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

4.4.2 TEST PROCEDURE

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

a. Indirect application of the discharge:

Vertical Coupling Plane (VCP):

At least 10 single discharges (in the most sensitive polarity) shall be applied to the centre of one vertical edge of the coupling plane. The coupling plane, of dimensions 0,5 m × 0,5 m, is placed parallel to, and positioned at a distance of 0,1 m from, the EUT.

Discharges shall be applied to the coupling plane, with sufficient different positions such that the four faces of the EUT are completely illuminated. One VCP position is considered to illuminate 0,5 m × 0,5 m area of the EUT surface.

Horizontal Coupling Plane (HCP):

Discharge to the HCP shall be made horizontally to the edge of the HCP.

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the centre point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

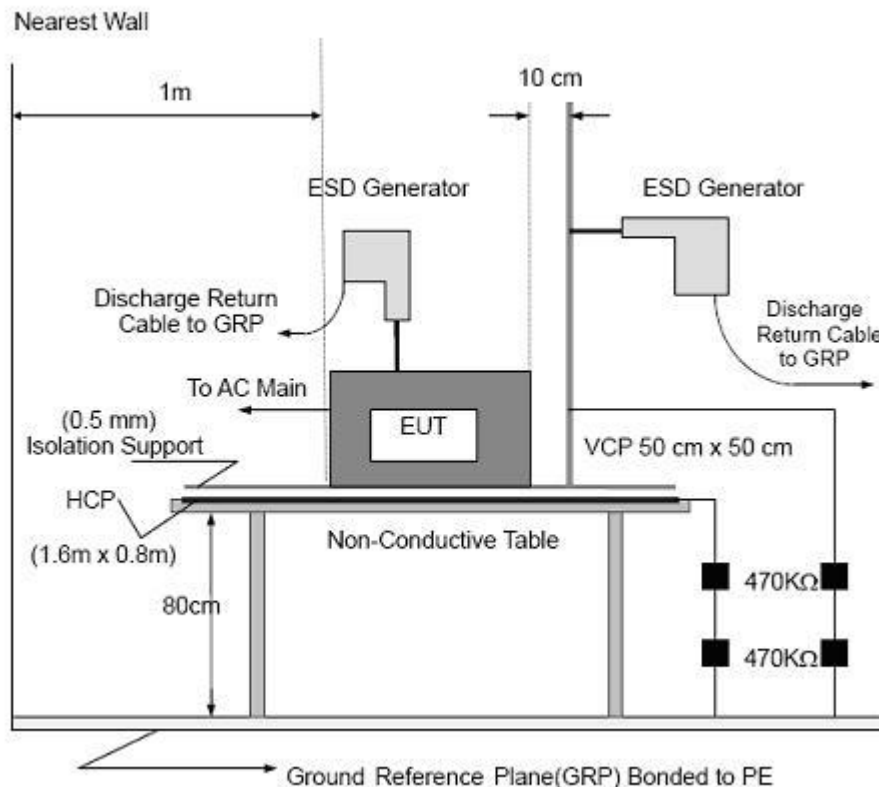
The discharge electrode shall be in contact with the edge of the HCP before the discharge switch is operated

b. Direct application of discharges to the EUT

The test shall be performed with single discharges. On each pre-selected point at least 10 single discharges (in the most sensitive polarity) shall be applied.

For the time interval between successive single discharges an initial value of 1 s is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.

4.4.3 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, and 2.5 meters square connected to the protective grounding system. 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 1-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 consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

4.4.4 TEST RESULTS

EUT:	PMA Graphene Heating Warm Vest	Model Name:	PMA-K10
Temperature:	21℃	Relative Humidity:	49%
Pressure:	1010hPa	Test Date :	2018-10-24
Test Mode:	Working		
Test Power:	DC 5V Power by Adapter		

Mode	Contact Discharge (Indirect)							Criterion	Result		
Test level(kV)	Test Point	2		4		6					
Test Location		+	-	+	-	+	-				
HCP	Front	P	P	P	P			B	Complies		
	Rear	P	P	P	P						
	Left	P	P	P	P						
	Right	P	P	P	P						
VCP	Front	P	P	P	P						
	Rear	P	P	P	P						
	Left	P	P	P	P						
	Right	P	P	P	P						

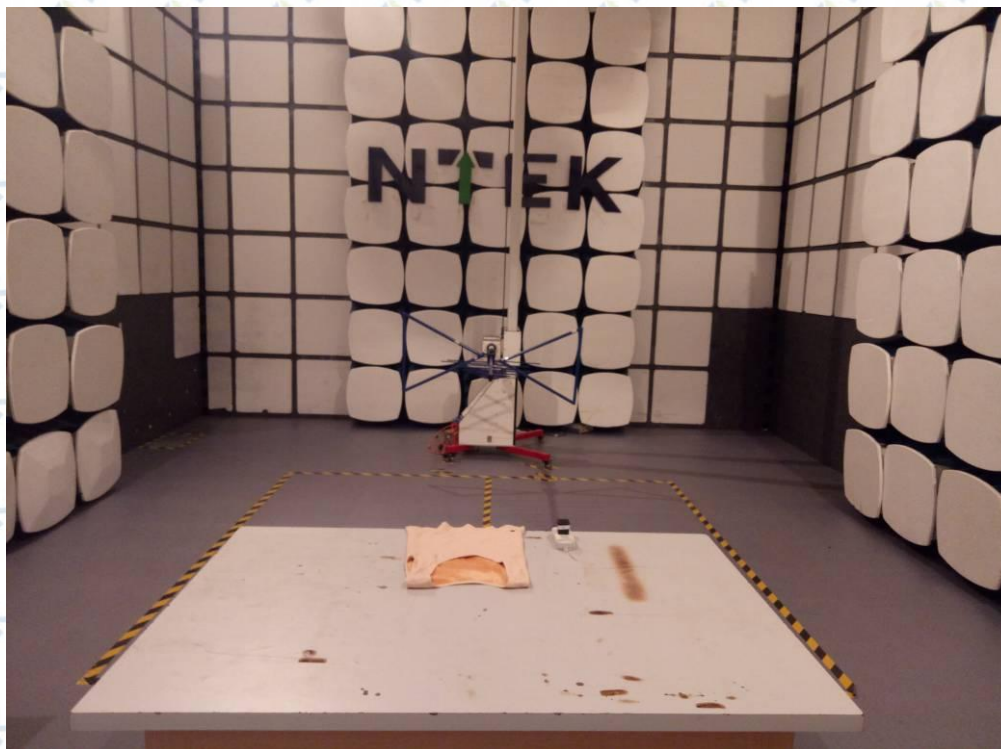
Mode	Air Discharge								Contact Discharge								Criterion	Result
Test level(kV)	2		4		8		15		2		4		6		8			
Test Location	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-		
Gap	P	P	P	P	P	P											B	Complies
Button	P	P	P	P	P	P												
LED	P	P	P	P	P	P												

Note:

- 1) +/- denotes the Positive/Negative polarity of the output voltage.
- 2) Test location(s) in which discharge (Air and contact discharge) to be applied illustrated by photos shown in next page(s)
- 3) In the table: 'P' represents 'PASS'; 'F' represents 'FAIL'.
- 4) Criteria A: Normal performance within limits specified by the manufacturer, requestor or purchaser.
- 5) Criteria B: Temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the EUT recovers its normal performance, without operator intervention.
- 6) Criteria C: Temporary loss of function or degradation of performance, the correction of which requires operator intervention.
- 7) Criteria D: Loss of function or degradation of performance which is not recoverable, owing to damage to hardware or software, or loss of data.

5. EUT TEST PHOTO

Radiated Measurement Photos



ATTACHMENT PHOTOGRAPHS OF EUT

Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10

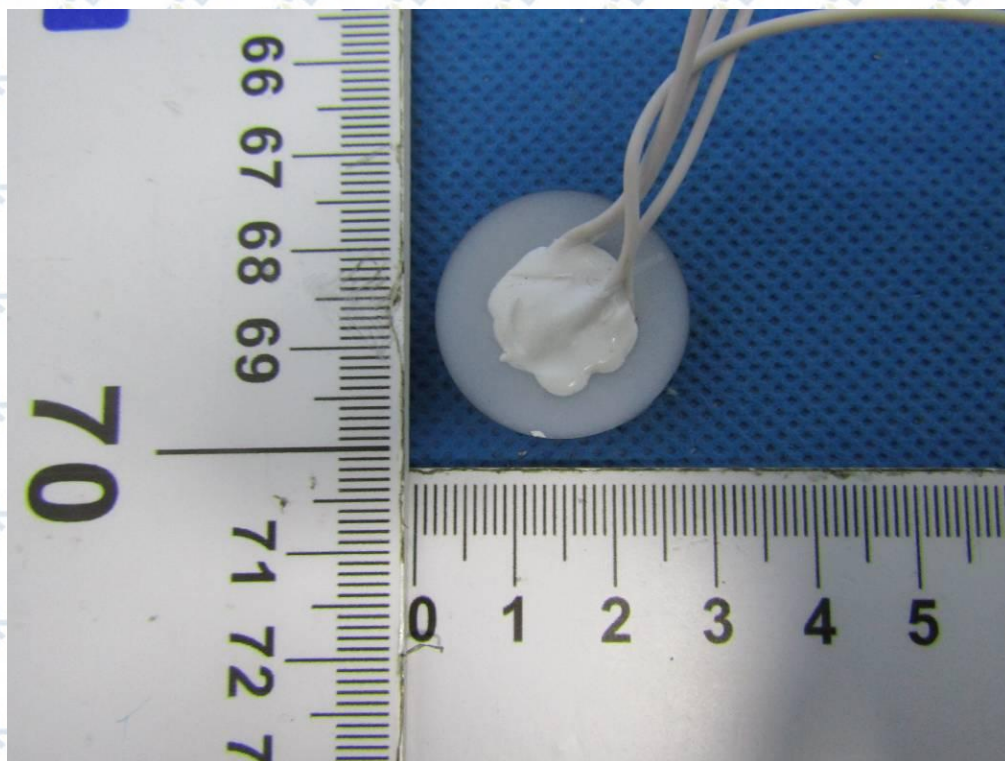


Photo 11

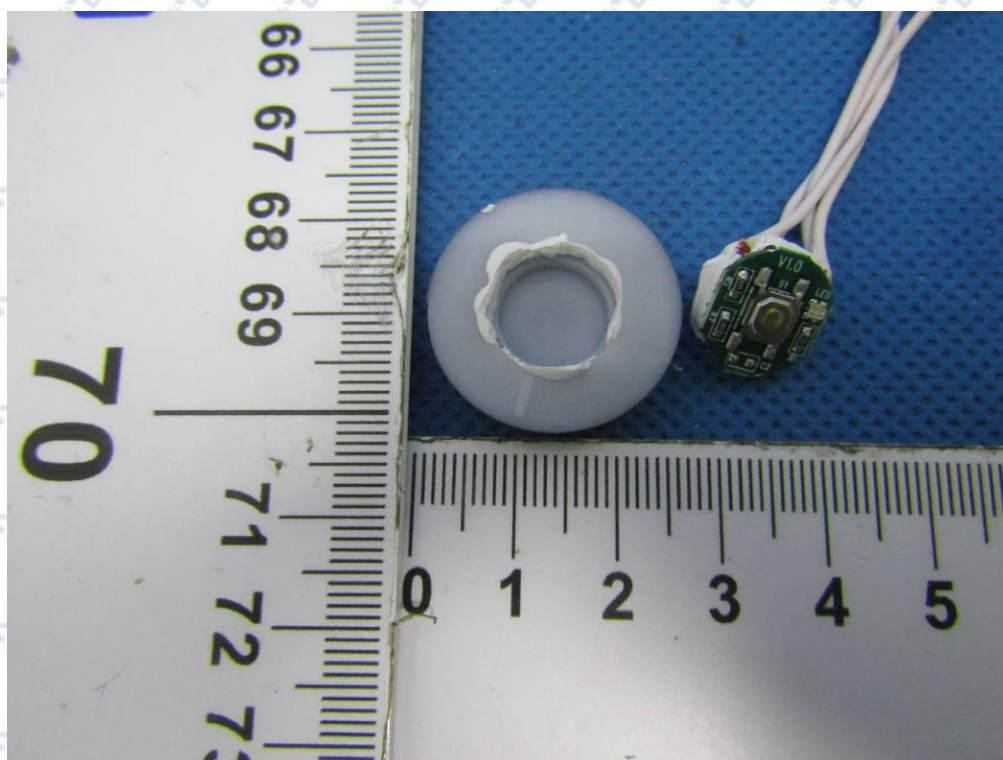


Photo 12

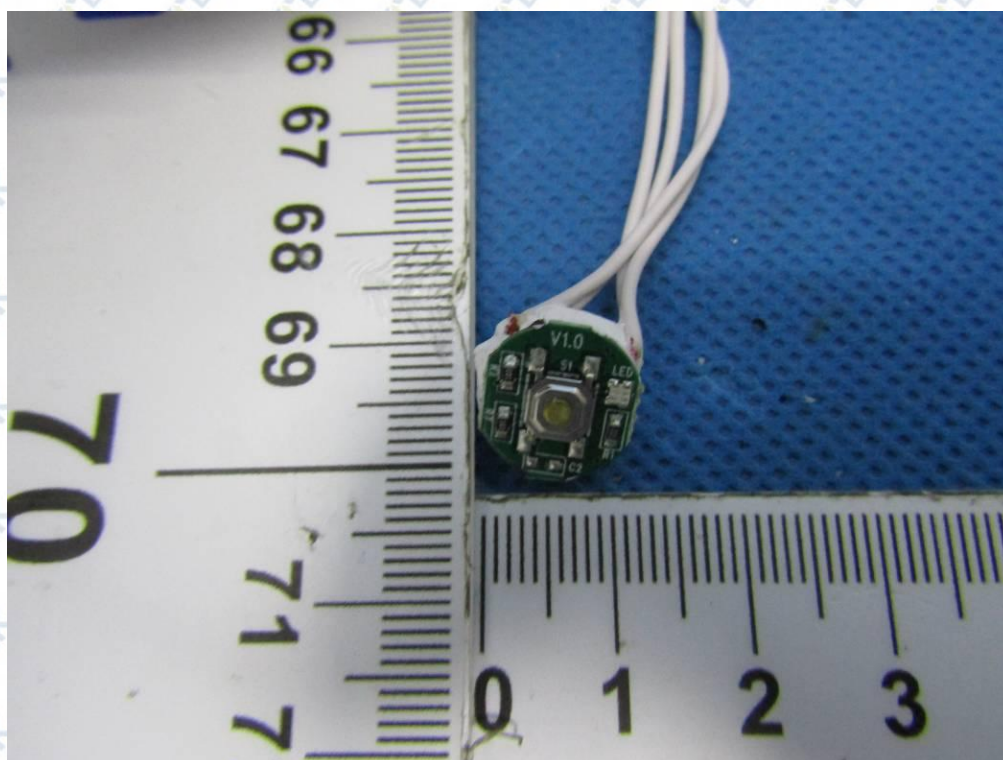


Photo 13

