

天线测试报告书

ANTENNA TEST REPORT

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一、 变更事前通知:

当产品的规格，材料，生产过程管理发生变更时，质量及可靠性数据需要事先提供，变更内容需提前6个月提供，文档记录需送至客户处。

Change information of the alteration in advance:

When the product specifications, materials, production process management is changed, the quality and reliability of data need to be provided in advance, to provide the content of change 6 months in advance, document need to send to the customer.

二、 生产场所情报 Production site:

天线组装	公司名称	禾邦电子(苏州)有限公司
	公司所在地	苏州市相城区黄埭潘阳工业园春秋路5号
	生产场所	制造车间
Antenna Assy	Company Name	Inpaq Technology (Su Zhou) CO.,LTD
	Company Address	No.5,Chunqiu Road, Panyang Industrial Park, Huangdai Town, Xiangcheng Zone, Suzhou
	Production Site	Manufacturing Factory

三、 工程规格 Engineering Specification:

规格 LIST

编号	品名	线出钣金长度	线缆颜色	驻波比	平均增益
1	WA-M-LA-03-041-B	102±5mm	灰色	≤3.0	>-5dBi
NO.	Model name	Cable out of sheet metal length	Cable color	VSWR	Average gain
1	WA-M-LA-03-041-B	102±5mm	Gray	≤3.0	>-5dBi

四、 环境条件 Environmental Conditions

工作温度 Operating Temperature -40 to +85°C
相对湿度 Relative Humidity 10 to 90% RH

存储温度 Storage Temperature -40 to +90°C
相对湿度 Relative Humidity 10 to 95% RH

推荐存储条件 室内存储条件如下
Recommended Storage condition Store in room condition as listed below:
Temperature -10°C~+40°C, Humidity 85% Max.

五、 推定故障率

Failure Rate (λ) : 0.0000108783 (MTBF : 91926hrs)

WA-M-LA-03-041-B Specification

1. Explanation of part number :

WA _ M _ LA _ 03 _ 041 _ B
(1) (2) (3) (4) (5) (6)

- (1) Product Type: wireless antenna
- (2) Material: Holder+ Metal sheet+ Cable
- (3) Frequency :2400–2500 MHz
- (4) Coaxial Cable Type : 03
- (5) Suffix : 041
- (6) Vehicle use: Before loading

2. Electrical Specification :

(1) Frequency Band:

Frequency Band	MHz
BT	2400-2500

(2) Impedance

50 ohm nominal

(3) Efficiency and Gain

量测仪器: 微波暗室, 网络分析仪, 标准天线。

(3.1) 微波暗室说明:

这是本公司设置在苏州的微波暗室, 本微波暗室是属于一套近场量测系统,暗室的大小为4M*4M*4M 。

Measuring instrument: Microwave chamber, Network analyzer, and standard antenna.

Instructions for microwave chamber:

This is a microwave chamber set up by our company in Suzhou, This microwave chamber belongs to a set of near-field measurement system. The size of the chamber is 4M * 4M * 4M.

UNLESS OTHER SPECIFIED TOLERANCES: +/-0.2



INPAQ TECHNOLOGY CO., LTD.

DRAWN BY: 徐健

CHECKED BY: 李志强

DESIGNED BY : 王俐

APPROVED BY : 唐龙

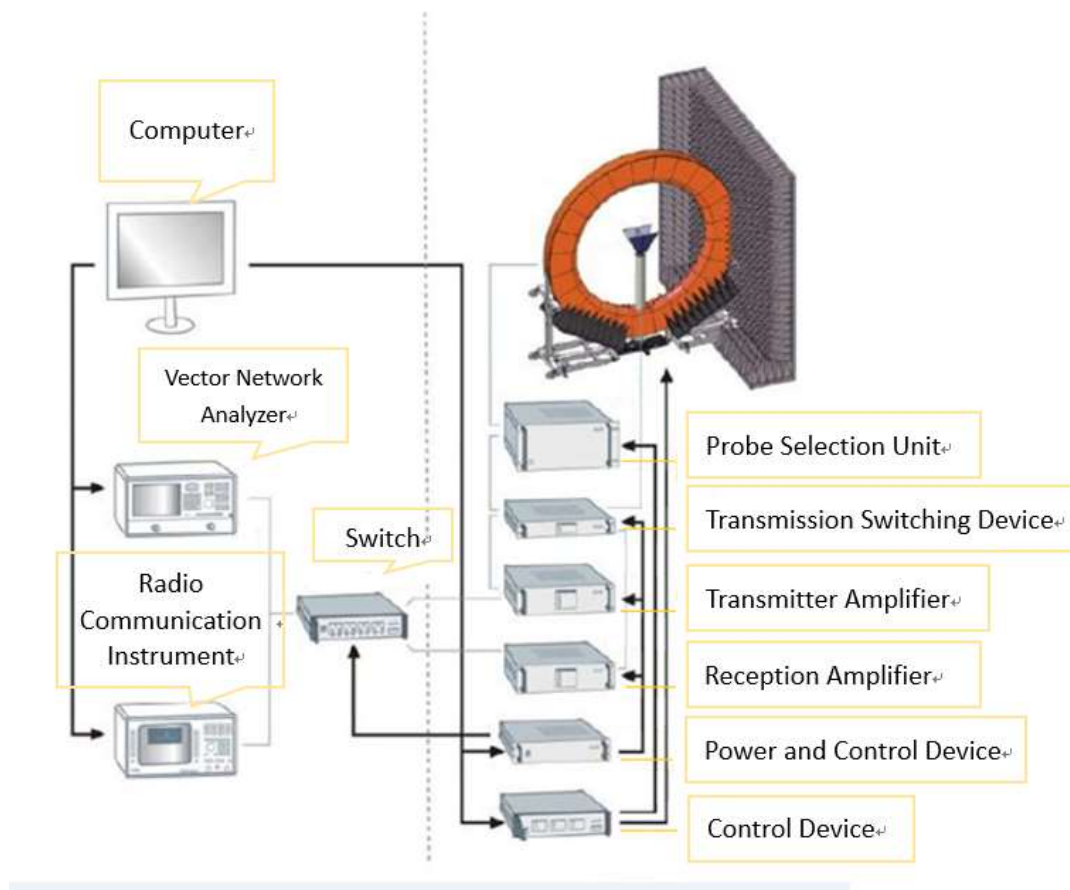
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上图为微波暗室是一种独特的多探头技术，旨在降低整个测量系统的测量时间。测量系统用多探头阵列替代了以往的单探头来扫描被测天线的被测面，单个探头具有正交极化幅度和相位测量能力，同时具有很宽的频率范围，对应的多探头阵列通过电子开关快速切换，极大的提高了测量效率。

探头型号：HD-400 (400MHz~6.0GHz)。因为系统测量探头的宽带频率和正交极化功能减少了系统所需配备的探头数量；探头的小尺寸减小了探头间耦合的同时，使在探头间插入其他频带范围的探头成为可能，单一系统可支持的频率范围更宽。

The microwave chamber, shown above, using a unique multi-probe technique, The aim is to reduce the measurement time of the whole measurement system. The measuring system use multi-probe array instead of single probe to scan the measured surface of the antenna under test, a single probe has the capability of measuring orthogonal polarization amplitude and phase, it also has a wide frequency range, the corresponding multi-probe array is switched quickly by electronic switch, greatly improved the measurement efficiency.

The probe model: HD-400(400MHz~6.0GHz) . Because of its capability of broadband frequency and the orthogonal polarization function, the number of probes needed to be equipped with the system is reduced; The small size of the probe reduces the coupling between the probes, make it is possible to insert probes of other frequency bands between probes, then a single system can support a wider frequency range.

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(3.2) Testing instrument

Equipment	manufacture	Brand	Serial No.	Last Cal.	Due Data
Network Analyzer	E5071C	Agilent	DB6RB-WBDF8-TBP4X-WK4BT-49JMG	2022.11.07	2023.11.06

(3.3) certification standard

Name	Parameter	Method	Standard no.
Antenna performance	Radiation efficiency	IEEE Standard Test Procedures for Antennas	ANSI/IEEE Std149-2021

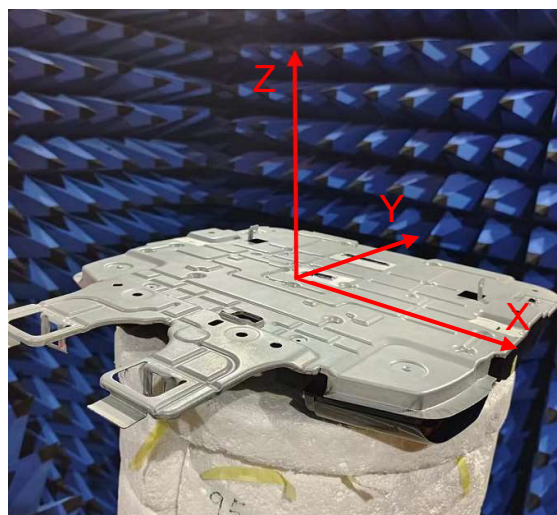
(3.4) Test site

Laboratory name	ETS
Laboratory Address	No. 5, Chunqiu Road, Panyang Industrial Park, Huangdai Town, Xiangcheng Zone, Suzhou

(3.5) Test dates and names

Test dates	2022. 07. 19
Tester	Dongchen. Liu

(4) 3D Radiation Pattern



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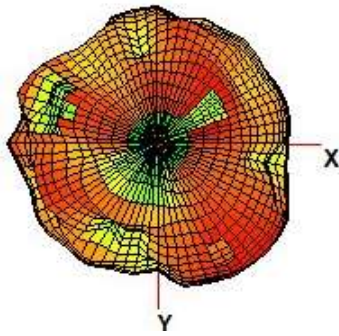
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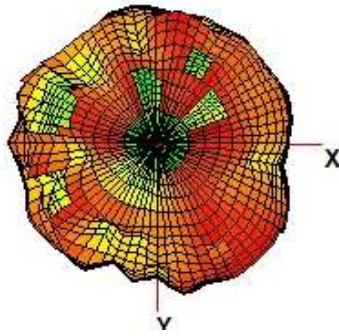
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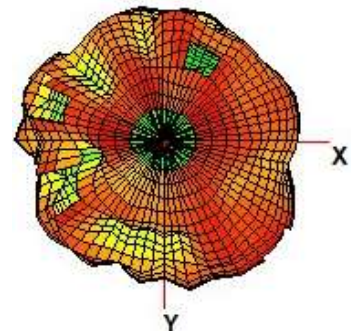
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@2400MHz



@2450MHz



@2500MHz

(5) Antenna 2D Radiation Gain Pattern

周波数(MHz)	平面	偏波面	PEAK (dBi)	360° 平均 (dBi)	360° 真値平均	合成真値	合成 (dBi)	DIP (dBi)	DIP-AVG (dB)
2400	θ=126°	水平(H)	2.87	-6.91	0.20	0.69	-1.62	-4.74	-3.12
		垂直(V)	1.22	-3.15	0.48				
	θ=160°	水平(H)	2.77	-2.99	0.50	0.80	-0.98	-5.22	-4.24
		垂直(V)	-0.26	-5.28	0.30				
	θ=150°	水平(H)	2.86	-6.49	0.22	0.62	-2.10	-6.24	-4.14
		垂直(V)	0.07	-4.07	0.39				
2450	θ=126°	水平(H)	3.42	-6.20	0.24	0.82	-0.86	-5.24	-4.38
		垂直(V)	1.26	-2.36	0.58				
	θ=160°	水平(H)	3.70	-3.26	0.47	0.84	-0.75	-4.26	-3.51
		垂直(V)	1.05	-4.32	0.37				
	θ=150°	水平(H)	2.94	-7.97	0.16	0.66	-1.80	-2.19	-0.39
		垂直(V)	1.05	-3.00	0.50				
2500	θ=126°	水平(H)	1.83	-5.18	0.30	0.75	-1.27	-2.84	-1.57
		垂直(V)	3.34	-3.53	0.44				
	θ=160°	水平(H)	0.41	-2.71	0.54	0.78	-1.07	-7.36	-6.29
		垂直(V)	2.89	-6.09	0.25				
	θ=150°	水平(H)	-1.26	-11.38	0.07	0.61	-2.16	-8.10	-5.94
		垂直(V)	3.40	-2.72	0.53				
AVG(dBi)			-1.37			Max peak (dBi)		3.70	
SPEC>-5dBi			√						

3. Mechanical Specification:

(1) Mechanical Configuration (Unit: mm)

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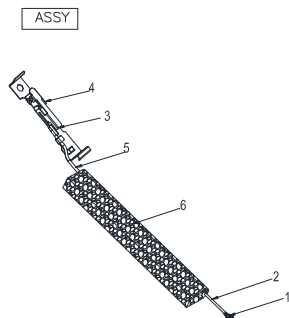
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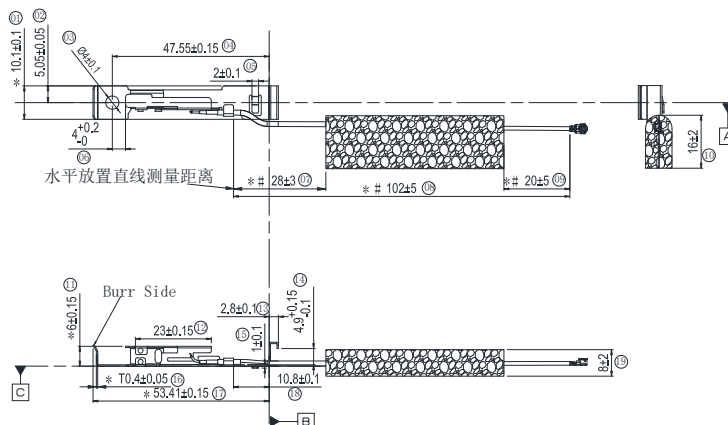


技术要求:

1. 未标注尺寸依照图档, 未注公差 ± 0.2
2. 无脏污, 油污, 符合INPAQ 外观检验标准
3. 产品符合ROHS 标准
4. 产品出货检验, *出货及生产检, #为100%全检, 电性100%全检
5. 温度使用范围 $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$

Note:

1. Dimensions not marked shall be in accordance with the drawings and documents, and no tolerance shall be noted ± 0.2
2. No dirt and oil stain, meeting inpaq appearance inspection standard
3. The product complies with ROHS standards
4. Product delivery inspection, "*" shipment inspection and production inspection, "#" 100% full inspection and 100% full inspection for electrical property
5. Temperature range: $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$



ITEM	DESCRIPTION	MATERIAL SPECIFICATION	QUANTITY	UNIT
1	Connector	HRS (U.FL-LP(P)-068A2)	1	PCS
2	Cable	OD1.13mm Gray (神宇)	1	PCS
3	Holder	PC Black	1	PCS
4	Metal sheet	SUS304 t=0.4mm	1	PCS
5	Heat Shrink Tube	OD 1.5mm (沃尔/Black)	1	PCS
6	SM55 for WA-M-LA-03-041-B	SM55	1	PCS

4. Product Picture:

Follow-up will also be updated

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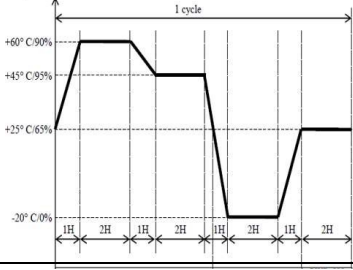
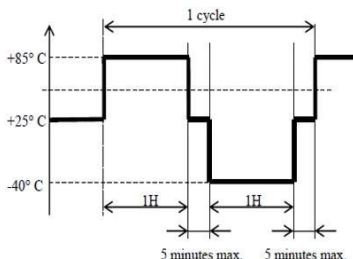
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可靠度与信赖性测试项目

Reliability and Trustworthiness test items

项次 P/N	试验项目 Test Item	测试条件 TEST	判定标准 Standard	结果 Result
1	高温放置 High temperature placement test	+90℃, 118 小时后常温放置 1 小时 Temperature:+90 ℃, 118H and then it is placed at normal temperature for 1H	产品外观无异常 No abnormality in product appearance 电性符合规格 The electrical property accord with the specification	OK
2	低温放置 Low temperature placement test	-40℃, 96 小时后常温放置 1 小时 Temperature:-40℃, 96H and then it is placed at normal temperature for 1H	产品外观无异常 No abnormality in product appearance 电性符合规格 The electrical property accord with the specification	OK
3	高湿放置 High humidity placement test	+55℃, 湿度 95%, 48 小时后 常温放置 1小时 Temperature:+55℃, humidity:95% 48H and then it is placed at normal temperature for 1H	产品外观无异常 No abnormality in product appearance 电性符合规格 The electrical property accord with the specification	OK
4	高温高湿 Damp heat test	+80℃, 湿度 90%, 96 小时 后常温放置 1小时 Temperature:+80℃, humidity:90% 96H and then it is placed at normal temperature for 1H	产品外观无异常 No abnormality in product appearance 电性符合规格 The electrical property accord with the specification	OK
5	加湿冷热 Add heat and add humidity Test	共: 8 个循环 (一个循环 12 个小时) Total: 8 cycles (12H per cycle) 	产品外观无异常 No abnormality in product appearance 电性符合规格 The electrical property accord with the specification	OK
6	冷热冲击 Thermal Shock Test	共: 500 个循环 (一个循环 2 小时 10 分) Total: 500 cycles (2 hours and 10 minutes per cycle) 	产品外观无异常 No abnormality in product appearance 电性符合规格 The electrical property accord with the specification	OK

UNLESS OTHER SPECIFIED TOLERANCES



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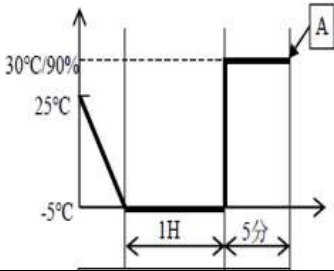
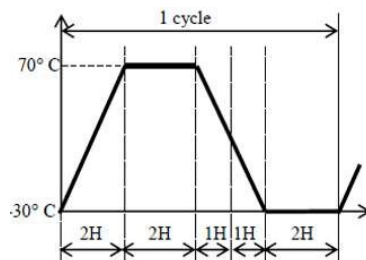
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7	结露试验 Condensation test	-5℃ 1小时; +30℃ 湿度90% 5分; ——循环 1 次 Temperature:- 5℃ 1H Temperature:+30℃, humidity:90% 5minutes —— 1 cycle 	产品外观无异常 No abnormality in product appearance 电性符合规格 The electrical property accord with the specification	OK
8	温度循环 Temperature cycling test	-30℃, +70℃, 40个循环 (1个循环8个小时) Temperature: -30℃, +70℃ 40cycle(1 cycle for 8H) 	产品外观无异常 No abnormality in product appearance 电性符合规格 The electrical property accord with the specification	OK
9	拉拔力测试 Drawing force test	线与天线本体拉力$\geq 1\text{kgf}$ Tension between wire and antenna body$\geq 1\text{kgf}$ 线与连接器拉力$\geq 1\text{kgf}$ Wire and connector tension$\geq 1\text{kgf}$	符合标准 Accord with standards	OK
10	包装运输测试 Packaging and transportation test	1箱产品, 从1M高度自由落下, 摔4个面各一次 1Box of products, fall freely from a height of 1M, and fall on 4 sides once each	产品外观无异常 No abnormality in product appearance 电性符合规格 The electrical property accord with the specification	OK

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WA-M-LA-03-041-B 包装信息

WA-M-LA-03-041-B Packaging information:

1. 天线信息 (Antenna information):

品名 (Part No): WA-M-LA-03-041-B

组成 (composition):

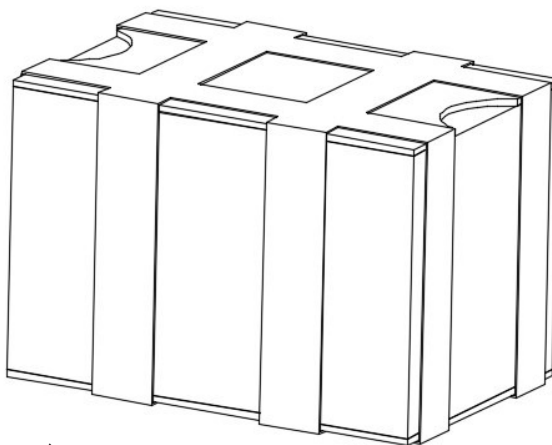
钣金+塑件+线材+套管+HRS 端子+泡棉

(Sheet metal + plastic parts + wire + casing +HRS terminal + foam)

端子 (terminal): 镀金 (Gold plated)

重量 (weight): 4.2g

2. 包装结构图 (Package structure drawing):



3. 包装方法 (Packing method):

3.1 包装状态, 数量 (Packing condition & quantity):

包装形态 (Packaging form):

Tray&隔板&胶带&PE 袋&纸箱 (Partition&Insulating&Tape&PE bag&Carton)

包装数量 (Number of packages): 528pcs

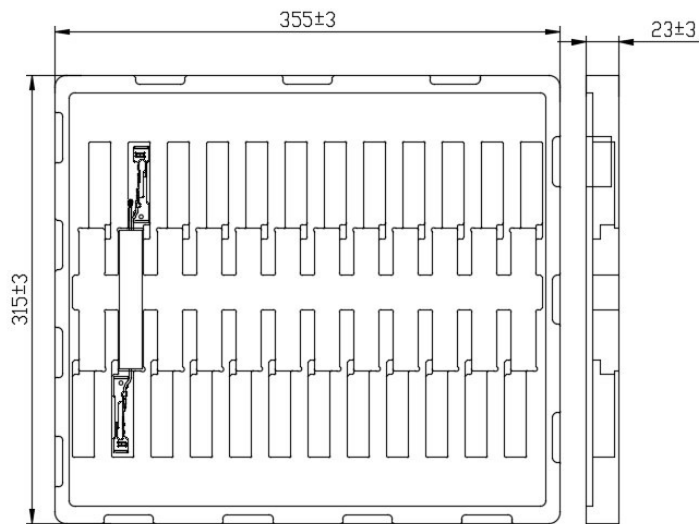
3.2 包装材质 (packaging material):

材料名字 (Material name)	材质 (texture)
Tray	PET T0.6MM 透明, 抗静电 $10^9 \sim 10^{11}$ PET T0.6MM transparent, antistatic $10^9 \sim 10^{11}$
Partition A/Partition B	AF 瓦楞楞纸/AB 楞瓦楞纸 AF corrugated paper /AB corrugated paper

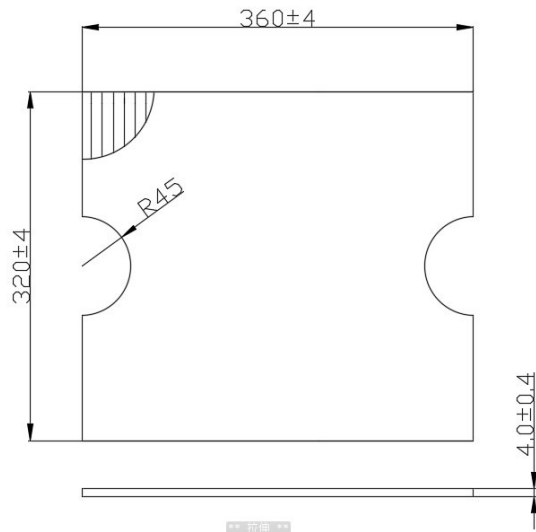
胶带(Isulating tape)	NA
防静电袋(Atistatic bag)	防潮防静电屏蔽材质 抗静电 $10^8 \sim 10^{11}$ Moisture-proof and antistatic shielding material antistatic $10^8 \sim 10^{11}$
纸箱(Carton)	AB 楞瓦楞纸 AB corrugated paper

3.3 包装材料尺寸(Packing material size):

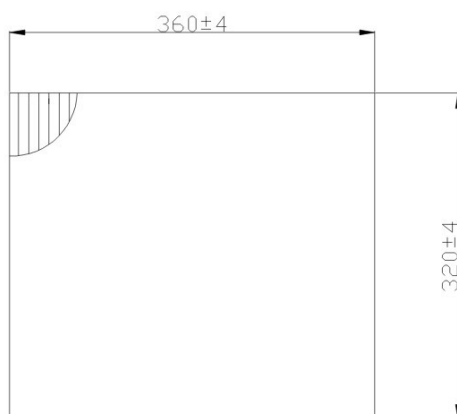
331 Tray 盘尺寸(Tray size):



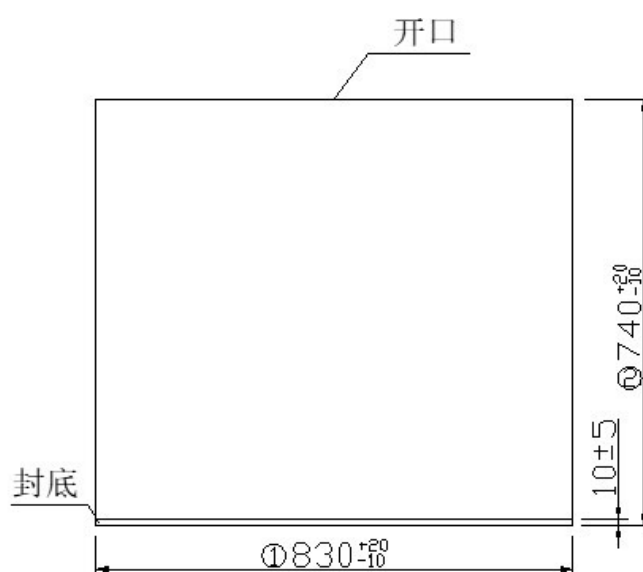
332 隔板 A 尺寸(Partition A size):



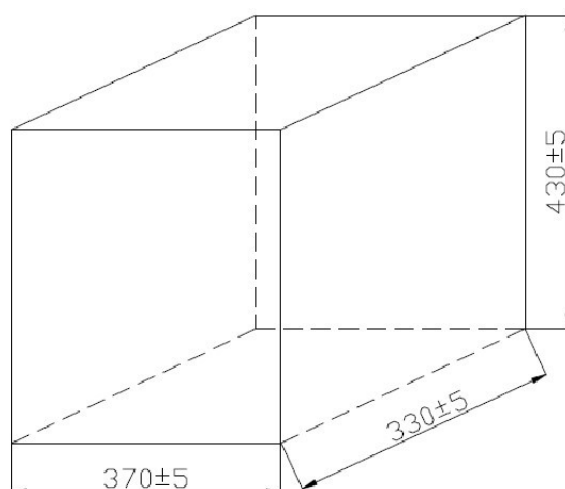
333 隔板 B 尺寸 (Partition B size):



334 PE 袋尺寸 (PE bag size):

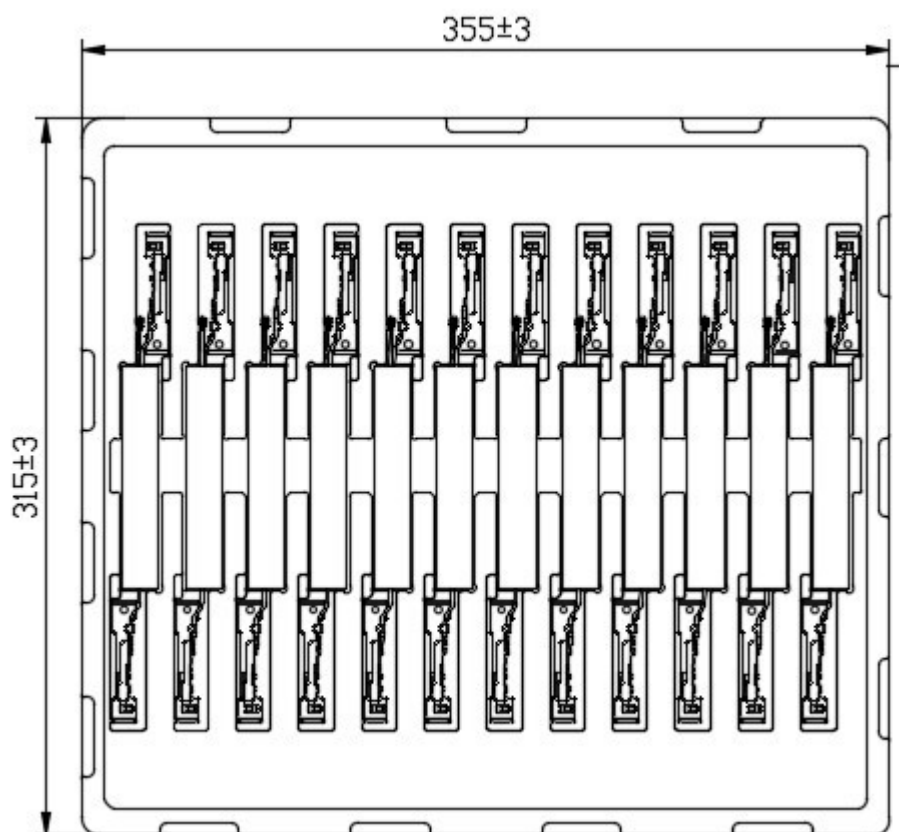


335 纸箱尺寸 (Carton size):



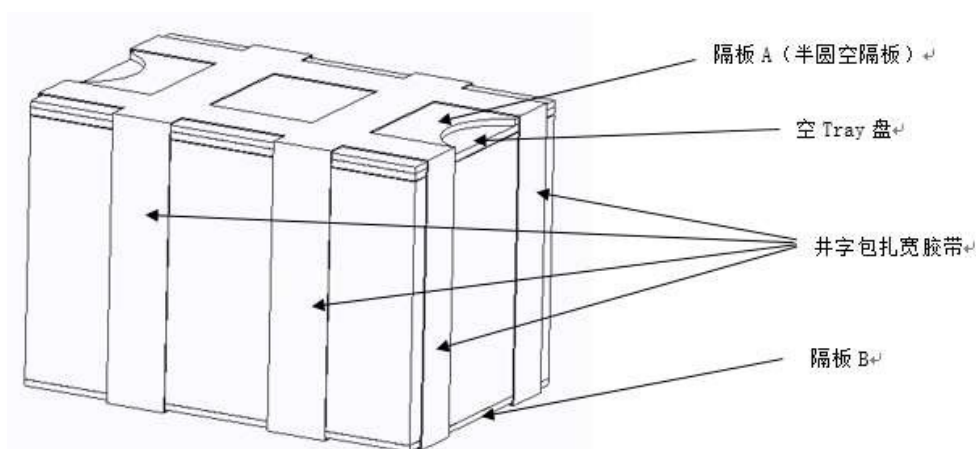
4. 包装方法(Packing method):

4.1 每Tray盘放置24pcs产品 (24pcs of products per tray):



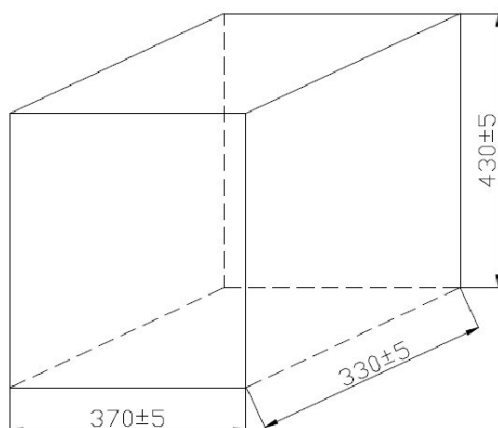
4.2 每Tray盘放置24pcs产品： 22个Tray 放置产品+1个空Tray 置顶，
每箱产品数量： $24 \times 22 = 528$ pcs, 每箱tray 盘上下各放一隔板，上面隔板有2个半圆孔，方便取出，
再用宽胶带按井字格方式包扎，宽胶带不可遮住半圆拉手，最后用PE袋包袱

24pcs of products per tray: 22 trays placed products +1 empty Tray placed on top,
quantity of products per box: $24 \times 22 = 528$ pcs. A partition board is placed above and below each tray in each box, and the upper partition board has two semi-circular holes for easy removal. Then wrap with wide tape in tic-tac-toe pattern, wide tape cannot be available to cover the half-circle handle, finally with PE bag baggage



4.3 1 个包装放入 1 个外箱内，然后封箱

Put 1 package into 1 outer box, and then seal the box



4.4 外箱需贴客户LABEL，具体参见如下

Customer LABEL shall be attached to the outer case. For details, see below

Part No:	品名
Project:	客户专案名称
Customer P/N:	客户料号
Quantity:	数量 PCS
Date:	日期
	

5. 保存条件(Preservation conditions):

5.1 保存环境(Preserving environment)

推荐保存条件(Recommended preserve Conditions)

	Min	Max	单位 unit
温度 (Temperature)	-10	40	℃
湿度 (Humidity)	10	85	% RH

5.2 保存期限（自纳入期算起）

Retention period (From the inclusion period)

	Min	Max	单位
保管时间(Storage time)	-	1	年

5.3 干燥处理(Dry processing)

此产品安装前不用干燥处理

This product does not need to be dried before installation

6. 对于包装好的货物禁止以下行为：

The following acts are prohibited for packaged goods:

- 61 从 30 厘米以上的高度摔落 Falling from a height of more than 30 centimeters
- 62 震动或撞击造成的变形 Deformation caused by shock or impact
- 63 运输过程中连续震动 Continuous vibration during transportation

7. 安装注意事项 (Installation Precautions):

7.1 安装过程中需注意，不可撞击到天线本体，以免天线变形影响性能和强度。

During installation, do not hit the antenna body to avoid antenna deformation affecting performance and strength.

7.2 线材尽量不要有拉扯动作，以免端子松动导致接触不良。

The wire should not have pulling action as far as possible, lest the terminal is loose, leading to poor contact.

7.3 尽量不要触摸端子接口处，以免异物进入。

Do not touch the terminal interface to avoid foreign objects entering

7.4 尽量不要直接用手触摸天线走线区域，以免汗渍污染天线。

Do not touch the antenna wiring area directly with your hands to avoid the antenna being contaminated by sweat.

Test Procedure

Test Step Flow

1. Maintain the test ambient temperature of 23 ± 2 °C, the instrument is powered on and preheated for more than 30 minutes
2. Turn on the darkroom power supply, connect the test cable, and set up the sample according to the standard
3. Outline sets the test content objectives and conducts calibration tests
4. Run the EMQuest OTA software, the test is complete, export the corresponding test diagram and test data, and save to the corresponding directory

Test Principle

The test principle can be seen in accordance with the standard ANSI/IEEE std 149-2021

Test Conditions

1. The analyte, the network analyzer for testing, the test equipment and the test cable connector should have good reliability, stability, dynamic range and measurement accuracy to ensure the correctness of the measurement accuracy
2. The measuring instrument should have a certificate of conformity and be within the effective calibration period
3. The analyte should be complete and undamaged, and the test environment should be kept clean

Test software being used: EM QUEST data acquisition and analysis software

Software Version: V1.08