

Measurement of Maximum Permissible Exposure

1. Foreword

In adopt with the Human Exposure IEEE C95.1, and according to the FCC 1.1310. The *Maximum Permissible Exposure (MPE)* is obligated to measure in order to prove the safety of radiation harmfulness to the human body.

The *Gain* of the antenna used is measured in an *Anechoic chamber*. The *maximum total power to the antenna* is to be recorded. By adopting the ***Friis Transmission Formula*** and the *power gain of the antenna*, we can find the distance right away from the product, where the limit of the MPE is.

2. Description of EUT

FCC ID	:	KA2SL2640BB3
Product Name	:	Wireless ADSL2+
Model Name	:	DSL-2640B
Frequency Range	:	2.412GHz ~ 2.462GHz
Channel Spacing	:	5MHz
Support Channel	:	11 Channels
Modulation Skill	:	DBPSK, DQPSK, CCK, OFDM
Power Type	:	Powered by the switching adapter,

1. Manufacture: OEM

Model: ADS18B-W 120100

I/P: 100-240VAC ~ 50-60Hz 0.5A.

O/P: 12VDC 1.0A

155cm length, non-shielded, no ferrite core

2. Manufacture: OEM

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3. Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	100	6
3.0-30	1842/f	4.89/f	900/f ²	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	100	30
1.34-30	824/f	2.19/f	180/f ²	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

[The EUT is tested in transmit and receive modes and in the first, middle and the last channel separately.

The following shows only our observation have the greatest emissions.]

According to OET BULLETIN 56 Fourth Edition/August 1999, Equation for Predicting RF Fields:

$$\text{Friis Transmission Formula: } S = \frac{PG}{4\pi R^2} = \frac{190.11 \times 1.766}{4\pi(20)^2} = 0.067 \text{ mW} / \text{cm}^2$$

$$\text{Estimated safe separation: } R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{190.11 \times 1.766}{4\pi}} = 5.169 \text{ cm}$$

Note: "The safe estimated separation that the user must maintain from the antenna is at least 6.5cm"

Where: S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

The Numeric gain G of antenna with a gain specified in dB is determined by:

$$G = \text{Log}^{-1} (\text{dB antenna gain} / 10)$$

$$G = \text{Log}^{-1} (2.47 / 10) = 1.766$$

Appendix

Antenna Specification

納入仕様書

《新規・変更》

客 戸 PEGATRONCORP

制 定	2009 年 08 月 05 日
部品番號	1415-011X000
品 名	WSL002 Mini1.13 Flying Lead Antenna L220mm (Gray) (F5B)
公司番號	HY1A-17337

〔 驗收印欄 〕

蘇州萬旭電子元件有限公司
江蘇省蘇州市相城區望亭鎮問渡路168號
PC:215155
TEL:86-512-65381105
FAX:86-512-65381104

作 成	檢 圖	確 認	核 準
曹 吉	張永明	余海榮	陆晓东

變更記錄 1.

2.

A 3. A

TOLERANCES:	
X	±0.5
X.X	±0.3
X.XX	±0.1
ANGULAR	±5.0°
生產廠: 2F	

B

C

D

E

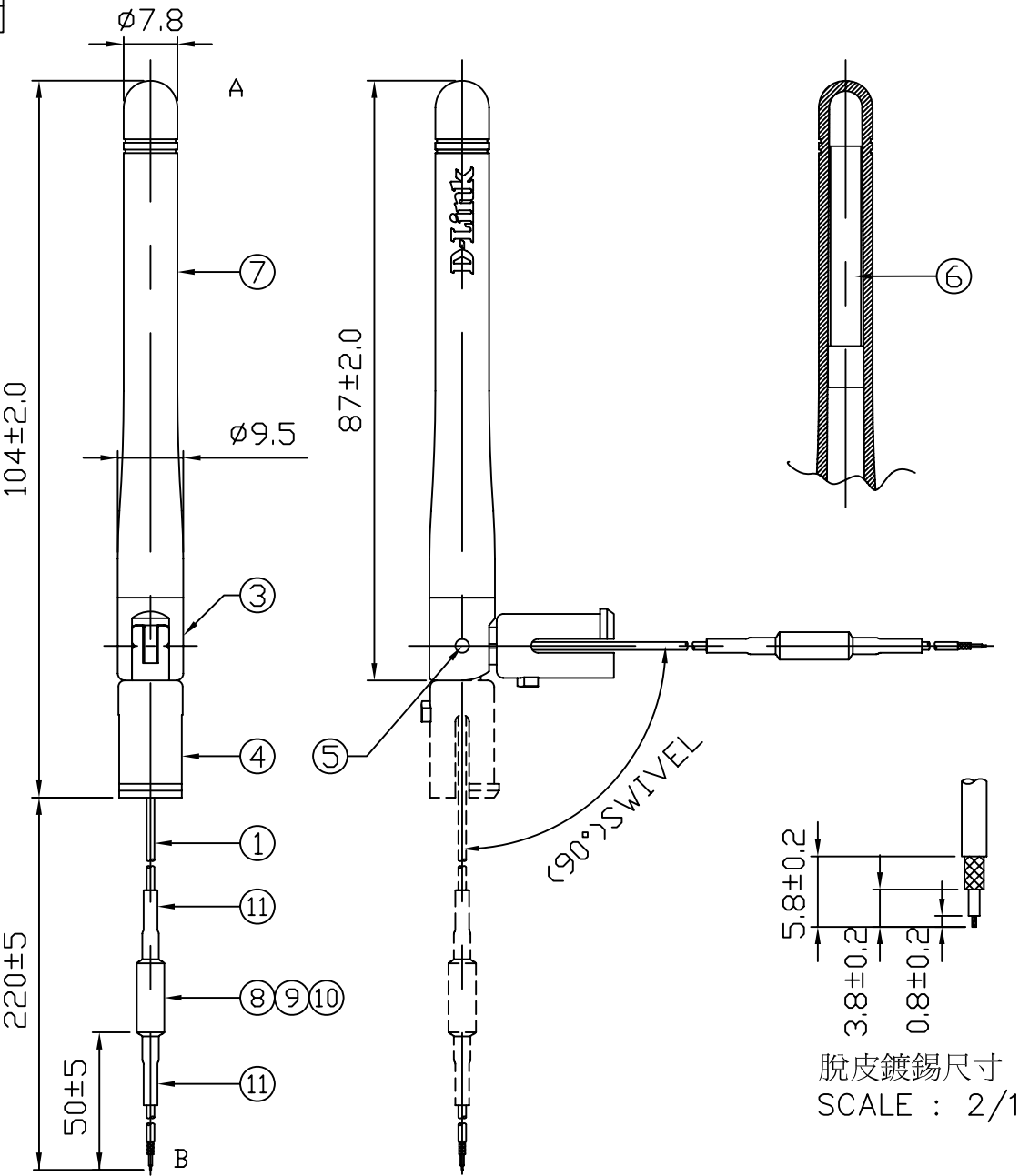
F

G

H

I

J



作業說明:

1. 天線本體組立依據天線作業標準指導書規定製作。
依據QC管理工程圖，執行品質管制。

第3角法

圖面不用實測

比例 FREE

作成 檢圖 確認 核准

單位: mm

09年08月05日

曹吉 張永明 余海榮 陸曉東

部品番號

1415-011X000

品名

WSL002 Mini1.13 Flying Lead
Antenna L220mm (Gray) (F5B)

公司番號

HY1A-17337

成品電腦編號 HY1A17337A



蘇州萬旭電子元件有限公司

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文件編號 FMT-0517-G1

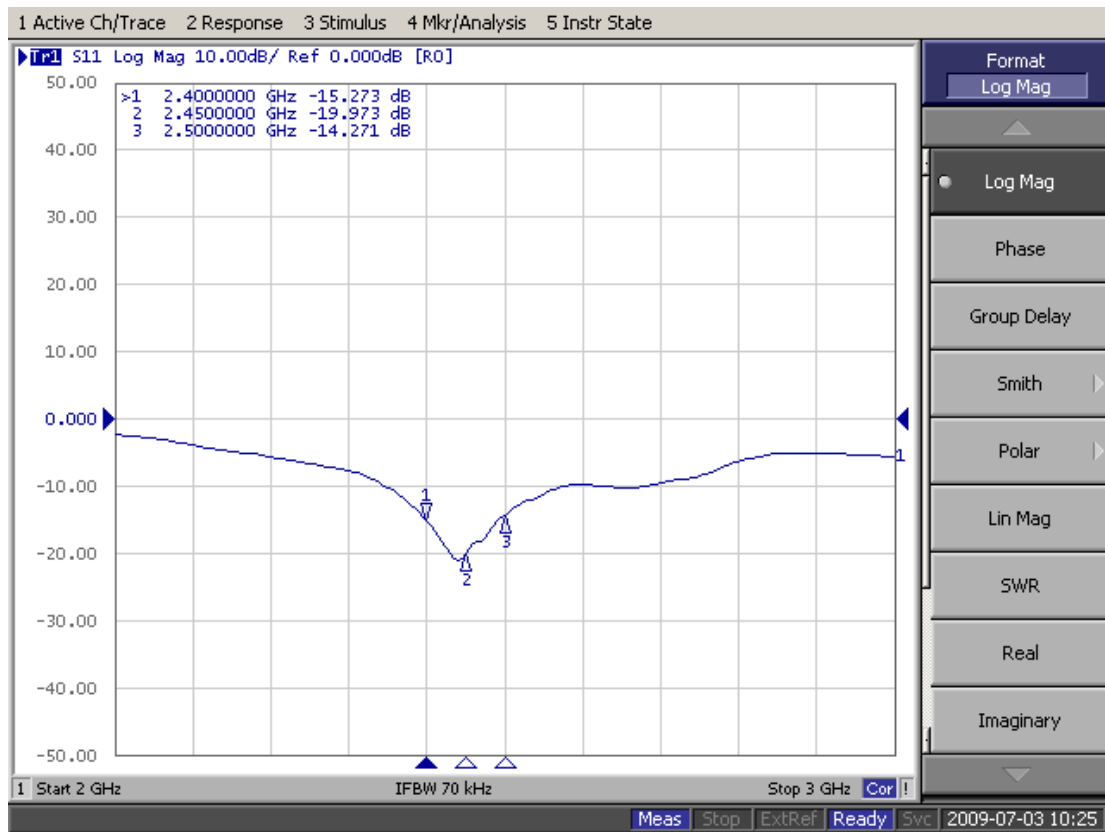
	1	2	3	4	5	6	7		
A	變更記錄1.							A	
	2.								
	3.								
B								B	
C								C	
D								D	
E								E	
F								F	
G	11	热缩套管	V		CB 无卤套管 2.5 黑 HF	黑	10	2	G
	10	热缩套管	V		CB 无卤套管 4.0 黑 HF	黑	20	1	
	9	热缩套管	V		CB 无卤套管 1.0 黑 HF	黑	10	1	
	8	铁粉芯	V		F5B RH 4*10*2 LF	黑		1	
	7	外套黑	V		IY072BK000 9.5Φ*75L 外套黑 LF D-link印字	黑		1	
	6	固定杆	V		5. 15Φ/4. 8Φ*43L固定杆	黑		1	
	5	固定铆钉	V		23-15-1固定铆钉镀黑 LF 1.9*3.8	黑		2	
	4	下座黑	V		IY158BK000 9.3Φ*24.7L下固定座 LF	黑		1	
	3	上座黑	V		IY114BK000 9.5Φ 上座<黑> LF	黑	15	1	
	2	铜管23. 5	V		5.2Φ*23.5L*0.25T 铜管 LF	银		1	
H	1	MINI 1. 13 Coaxial Cable	V		MINI RG OD:1.13 浅灰 (GY-193) LF HF	浅灰	310	1	H
	NO	材料名稱	環材	廠商	零 件 規 格	顏色	切斷尺寸	用量	
J	第3角法 圖 面 不 用 實 測				部品番號	1415-011X000			J
	比例 FREE	作 成	檢 圖	確 認	核 准	品 名	WSL002 Mini1.13 Flying Lead Antenna L220mm(Gray) (F5B)		
	單位: mm	曹 吉	张永明	余海荣	陆晓东	公司番號	HY1A-17337		
	09年08月05日								
成品電腦編號		HY1A17337A		蘇州萬旭電子元件有限公司				頁次 2/3	
									文件編號 FMT-0517-G1

Electrical Properties

Return Loss



Suzhou Wanshih Electronic Element Co., Ltd.

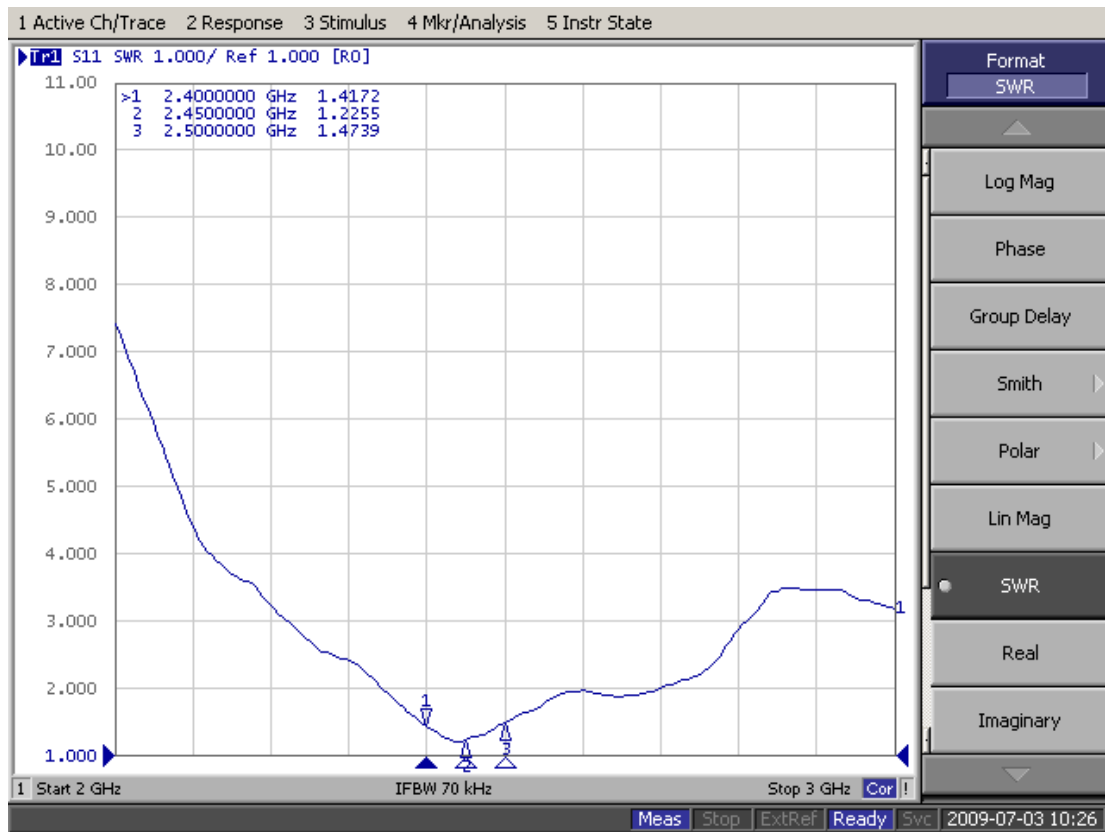


Electrical Properties

V.S.W.R



Suzhou Wanshih Electronic Element Co., Ltd.



Electrical Properties

H-Plane



Suzhou Wanshih Electronic Element Co., Ltd.

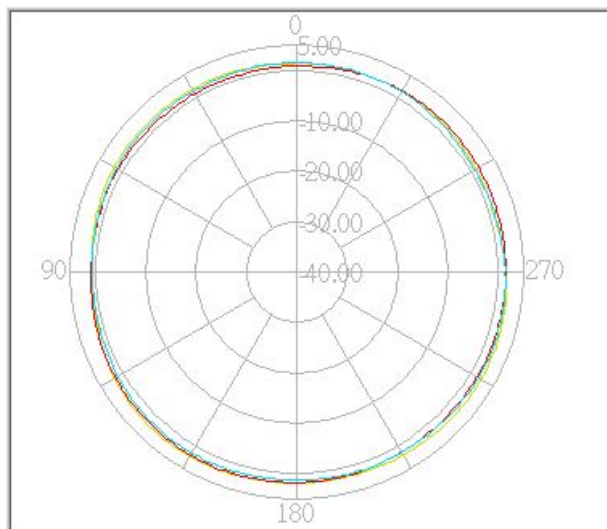


萬旭電業股份有限公司

Model No: 130

Antenna Position: Vertical

Test Mode: H-PLAN



Freq(MHz)	Peak(dBi)	Angle(o)	Avg(dBi)
2400.0	2.39	220.88	1.63
Freq(MHz)	Peak(dBi)	Angle(o)	Avg(dBi)
2450.0	2.03	207.46	1.32
Freq(MHz)	Peak(dBi)	Angle(o)	Avg(dBi)
2500.0	1.72	111.05	1.24

Test engineer: _____

Test date: 2009/7/3 at AM 10:46

Electrical Properties

E-Plane



Suzhou Wanshih Electronic Element Co., Ltd.

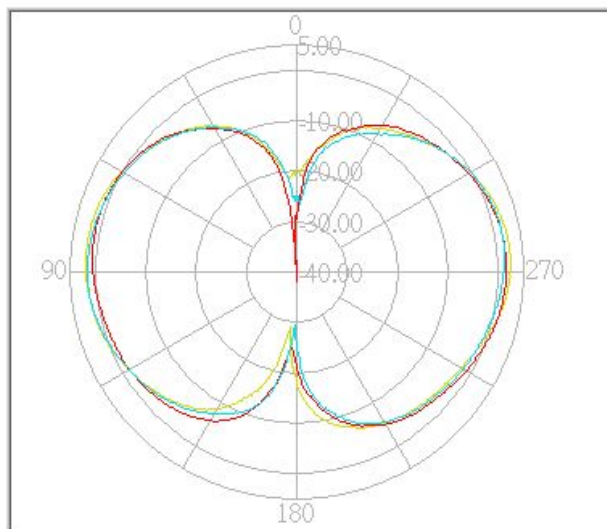


萬旭電業股份有限公司

Model No: 130

Antenna Position: Horizontal

Test Mode: E-PLAN






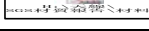
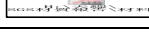


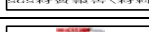








Freq(MHz)	Peak(dBi)	Angle(o)	Avg(dBi)
2400.0	2.47	86.42	-2.13
2450.0	1.58	86.42	-2.48
2500.0	1.54	268.60	-2.55

Test engineer: _____

Test date: 2009/7/3 at AM 10:37

零件成分表及第三公正單位測試報告

Composition table and 3'rd party test report

組成成份 Composition						模組類(04/0A/0C/0K/17/19/18/0B) Module type(04/0A/0C/0K/17/19/18/0B)		
使用部位 The position for use	原材料名 Raw materials	原材料料號 Material No.	原物料生產廠家 Vendor of Raw material	第三公正單位測試報告 3'rd party test report	原材料顏色 (塑膠、油墨及漆料必填) The color of raw material (Required for plastic, ink and paint)	鍍層存在與否/鍍層材質說明 If the plating layer exist or not?(Y/N)/If yes, please describe the material of the plating layer	是否為組裝到系統後之外露部位 If the module will be exposed outside after system assembly?(Y/N)	Notes
wire	copper	MINI1.13	万泰			Y,鍍錫	N	
wire	copper	MINI1.13				Y,鍍錫	N	
wire	plastic	MINI1.13			浅灰	N	N	
wire	plastic	MINI1.13				N	N	
銅管	copper tube	silvery metal	盈峰		银色	Y,鍍錫	N	
	Cu	Golden metal			金色	N	N	
上下座	plastic	white plastic PELLETS	广诚		白色	N	N	
	黑色色粉	Black powder			黑色	N	N	
固定铆钉	铆钉	黑色金属	明元		黑色	Y,鍍鋅	N	
	无铅易车削黄铜	黄色金属帮			金色	N	N	
固定杆	Gudinggan	Black plastic	盈峰		黑色	N	N	
外套	plastic	半透明塑胶颗粒	广诚			N	N	
	黑色色粉	Black powder			黑色	N	N	
铁粉芯	CORE	Dark-grey solid	优磁		黑色	N	N	
套管	CB 套管	Black tube	沃尔		黑色	N	N	
	油墨	WHITE INK			白色	N	N	

請附上該零件拆解至原物料階之測試報告或各原物料相對應之第三公正單位測試報告

Please attach the 3'rd party test report of this component by homogeneous level

or provide the 3'rd party test report of each raw materials.

Certificate of the Non-Use Hazardous Substances

Please fill in below information 請填寫以下資訊：

Date 日期： 2009 / 07 / 09

Vendor code 供應商代號： MC160TW1

Company name 公司名稱： 蘇州萬旭電子元件有限公司

(Authorized-person Sign or

Seal)



(Company Stamp/公司官

Company Representative 公司代表人： 詹進和

Company Representative Title 公司代表人職稱： 副總

Please Mark ☒ Warranty Application 請於適用保證範圍標示 ☒：

☒ All "Products" we sold to Pegatron/Unihan 所有我方售予和聯/永碩之“產品”

☐ Pegatron/Unihan Part number 和聯/永碩料號： _____

Vender PN 供應商料號： _____

Pegatron/Unihan Model name 和聯/永碩機種名稱： _____ (OEM/ODM/EMS vendor fill out ONLY 外包商填寫專用)

To Pegatron Corp., Unihan Corp., and their affiliates (collectively "Pegatron/Unihan Group")：

We hereby represent and warrant that the products and components ("Products") we sold to Pegatron/Unihan Group do not contain the level 1 hazardous substances listed in the then current Pegatron/Unihan SPT-00001 document*, as well as shall comply with all requirements listed in the then current Pegatron/Unihan GP2-00017 document, including but not limited to design, modification, purchasing, and manufacturing management, as well as the confirming and judging of the test, which the Pegatron/Unihan Group reserves the right to modify these documents at any time. The aforementioned Products include： [1] Products and all materials of the Products; [2] packaging materials; and [3] all materials used in design, manufacturing and reworking processes. In addition, the information of hazardous substances classified at level 3 should be disclosed when these substances are intentionally used in the said Products.

此致和碩聯合科技(股)公司/永碩聯合國際(股)公司及其關係企業("和聯/永碩集團")：

我們特此代表並保證所有售予和聯/永碩集團之產品及零組件("產品")，皆不含有當時和聯/永碩 SPT-00001 文件中所列的一級有害物質*並且遵守當時和聯/永碩 GP2-00017 文件中所列之各項要求，包括但不限於設計、變更、採購、生產管理及確認測定及判定，上述文件和聯/永碩集團保留隨時修改的權利。前述所提及的產品包含：[1]產品或產品所使用到的所有原物料；[2]包裝材料；[3]設計、生產及重工過程中所使用到的所有原物料；此外，若前述提及之產品中刻意添加三級有害物質，則須揭露資訊。

We further agree to indemnify and hold Pegatron/Unihan Group and their officers, directors, employees, successors and assigns, harmless from and against any losses, damages, claims, demands, suits, liabilities and expenses (including reasonable attorneys' fees and court costs) arising out of or resulting from any lawsuit, judicial action, or similar proceeding for any breach of the foregoing warranty.

我們進一步同意賠償和使和聯/永碩集團及其集團人員，包括高級主管、董事、員工、代理人、繼承者和受讓人，不受任何起因於我方違反前項保證所致之任何訴訟、司法上行為或類似行為而受有損失、損害、求償、請求、訴訟、責任及費用(包括合理的律師費用和法院費用)。

* If the Product contains the hazardous substances defined as the exemptions in SPT-00001, please check the appropriate box in the Appendix. (OEM/ODM/EMS vendor fill out ONLY).

*若您是外包商且產品所含有害物質屬於 SPT-00001 所定義之除外項目，請勾選附件之選項(零件供應商免填)。

Remarks 備註：

Appendix 附件

- ☐ 1. Cadmium in electrical contacts and the plating of electrical contacts, for which high reliability is required and which has no substitute materials. 鎘用於有高度安全標準或高度可靠度需求之電性接點與鎘鍍層。
- ☐ 2. Cadmium in optical glass, filter glass. 鎘用於光學玻璃及濾光玻璃。
- ☐ 3. Lead in high-melting temperature type solder for internal connections used for modules, parts and devices. (i.e. lead based alloys containing 85wt% or more) 鉛用於高熔點用途之鉛錫(含鉛量在 85 wt% 以上之鉛錫)。
- ☐ 4. Lead in solder for server, storage and storage array system, network infrastructure equipment for switching, signaling, transmission as well as network management for telecommunications. 鉛用於伺服器、儲存器與存取陣列系統和交換、信號產生和傳輸，以及電信網路管理的網路基礎建構設備之鉛錫。
- ☐ 5. Lead in electronic ceramic parts. (e.g. piezoelectric elements, dielectric ones, and magnetic ones [ferrites]) 鉛用於電子陶瓷零部件，如壓電元件、介電元件及磁性(鐵氧材質)元件等。
- ☐ 6. Lead in optical glass, filter glass. 鉛用於光學玻璃、濾光玻璃。
- ☐ 7. Lead in glass materials used for modules, electrical parts, cathode-ray tubes, or vacuum fluorescent displays. The glass materials include adhesives, resistor elements, glass frit, conductive pastes (silver or copper ones), and sealing materials. 鉛使用於外購模組、電子零件、陰極射線管或真空螢光顯示器的玻璃材料，包含黏著劑、電阻體、玻璃材質、導電膏(銀膏或銅膏)與密封材料。
- ☐ 8. Lead in solder consisting of more than two elements for the connection between the pins and the package of microprocessors with a lead content of more than 80wt% and less than 85wt%. 鉛用於微處理器構裝與接腳間之連接用(含有兩種元素以上)鉛錫(鉛含量為 80wt%-85wt%)。
- ☐ 9. Lead in solder to complete a viable electrical connection between semiconductor die and carrier within integrated circuit Flip Chip packages. (e.g. solder pastes used under C4 [Controlled Collapse Chip Connection] bumps) 鉛用於覆晶構裝中半導體晶片與承載電路板間電性訊號連接用之鉛錫(包含如 C4- Controlled Collapse Chip Connection 鉛錫凸塊之錫膏)。
- ☐ 10. Lead in lead-bronze bearing shells and bushes. 鉛用於青銅材質之軸承殼及軸襯。
- ☐ 11. Lead in a coating material for the thermal conduction module C-ring. 鉛用於熱傳導模組之 C-ring 環組的鍍層材料。
- ☐ 12. Lead in the compliant pin connector systems. 鉛用於插接式連接器系統(鉗接式連接器除外)，如插接腳之表面鍍層。
- ☐ 13. Lead as an alloying element in steel should less than 0.35 wt%. 鋼合金中的鉛允許濃度需在 0.35% 以下。
- ☐ 14. Lead as an alloying element in aluminum should less than 0.4 wt%. 鋁合金中的鉛允許濃度需在 0.4% 以下。
- ☒ 15. Lead as an alloying element in copper (including brass and phosphor bronze) should less than 4 wt%. 銅合金(包含黃銅及磷青銅)中的鉛允許濃度需在 4% 以下。
- ☐ 16. Lead oxide in glass used for bonding front and rear substrates of flat fluorescent lamps used for Liquid Crystal Displays (LCD). LCD 中用於保護平面螢光燈之前後支撐物的玻璃中可含氧化鉛。
- ☐ 17. Lead in solders for the soldering to machine through whole discoidal and planar array ceramic multilayer capacitors. 通孔盤狀及平面陣列陶瓷多層電容器焊料所含的鉛。

- ☐ 18. Lead alloys as solder for transducers used in high-powered (designated to operate for several hours at acoustic power levels of 125 dB SPL and above) loudspeakers. 在大功率揚聲器中作為轉換器焊料的鉛合金。
- ☐ 19. Mercury in lamps other than small-sized fluorescent lamps and straight-tube ones. (e.g. High-pressure mercury lamps). 汞用於小型及直式螢光燈管以外的其他燈管，如高壓汞燈、液晶顯示器背光燈。
- ☐ 20. PVC in binders made of resin. PVC 用於樹脂作成之黏合劑。
- ☐ 21. PVC in polyvinyl electrical wires for high voltage. PVC 用於高電壓使用聚乙烯電線材。
- ☐ 22. PVC in insulating tapes. PVC 用於絕緣膠帶。
- ☐ 23. PVC in speaker grilles. PVC 用於揚聲器拖架。
- ☐ 24. PVC in power supply cords for import into EU countries. PVC 用於出口至歐洲之電源供應線材。
- ☐ 25. PVC in transformer leads of which the joint is fixed by varnish impregnation. PVC 用於接腳部位經清漆浸漬之變壓器。
- ☐ 26. PVC in curl cords. PVC 用於捲線。
- ☐ 27. PVC in extra fine electrical wires that are AWG (American Wire Gauge) 36 or more. PVC 用於高於 AWG(American Wire Gauge) 36 規格之極細式電線材。
- ☐ 28. Use of PVC and PVC blends in the professional-use cables, to which general-purpose ones cannot be applied (e.g. cables for broadcast cameras and microphones). PVC 用於使用聚氯乙烯或聚氯乙烯混合物之專業用途線材(普通線材無法其應用要求)，如廣播電視所使用之攝影機電線材、麥克風電線材等。
- ☐ 29. PFOS in mist suppressants for nondecorative hard chromium (VI) plating and wetting agents for use in controlled electroplating systems. 全氟辛烷硫磺酸(PFOS)用於電鍍鉻抑制劑及濕潤劑。
- ☐ 30. Cadmium, lead, mercury and hexavalent chromium in cartons for returnable boxes owed by modules and parts suppliers. 鎘、鉛、汞及六價鉻用於外購模組及零部件供應商使用之可回收產品搬運箱。
- ☐ 31. Cadmium alloys as electrical/mechanical solder joints to electrical conductors located directly on the voice coil in transducers used in high-powered loudspeakers with sound pressure levels of 100 dB (A) and more. 使用於聲壓大於或等於 100 分貝的高功率音箱中的音圈轉換器上的電導體的電子或機械焊點中的鎘合金。
- ☐ 32. Lead in soldering materials in mercury free flat fluorescent lamps (which e.g. are used for liquid crystal displays, design or industrial lighting). 於無汞平面螢光燈(使用於液晶顯示器、設計或工業照明設備)中焊錫內含的鉛。
- ☐ 33. Lead oxide in seal frit used for making window assemblies for Argon and Krypton laser tubes. 封裝氬和氪雷射管的氧化鉛。