

## *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** : MSQWL500W
- Product Name** : MIMO Wireless Router
- Model Name** : WL-500W
- Frequency Range** : IEEE 802.11b/g/n Draft 1.0 20M: 2.412GHz ~ 2.462GHz  
IEEE 802.11n Draft 1.0 40M: 2.422GHz ~ 2.452GHz
- Channel Spacing** : 5MHz
- Support Channel** : IEEE 802.11b/g/n Draft 1.0 20M: 11 Channels  
IEEE 802.11n Draft 1.0 40M: 7 Channels
- Modulation Skill** : DBPSK, DQPSK, CCK, OFDM
- Power Type** : Powered by the switching adapter,

Trade mark	LE	UMEC
Mfg.	Leader Electronics Inc.	UMEC
Model	MU18-2050300-A1	UP018B-05PC
I/P:	100-240VAC, 50/60Hz 0.6A	100-240VAC, 60/50Hz, 0.4A
O/P	5VDC, 3A	5VDC, 2.5A, 12.5W
Power cable	190cm length, non-shielded, without ferrite core	180cm length, shielded, without ferrite core

**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 <sup>2</sup> )	Averaging Time  E  <sup>2</sup> ,  H  <sup>2</sup> or S (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
0.3-3.0	614	1.63	100	6
3.0-30	1842/f	4.89/f	900/f <sup>2</sup>	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	100	30
1.34-30	824/f	2.19/f	180/f <sup>2</sup>	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:

**Friis Transmission Formula:** 
$$S = \frac{PG}{4\pi R^2} = \frac{284.90 \times 1.51}{4\pi (20)^2} = 0.086mW / cm^2$$

**Estimated safe separation:** 
$$R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{284.90 \times 1.51}{4\pi}} = 5.851cm$$

**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/cm<sup>2</sup>)

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)

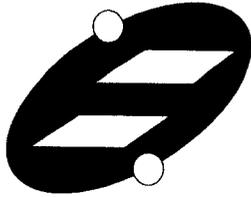
The Numeric gain G of antenna with a gain specified in dB is determined by:

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

$$G = \text{Log}^{-1} ( 1.80 / 10 ) = 1.51$$

## *Appendix*

### **Antenna Specification**



WHA YU INDUSTRIAL CO., LTD. (HEAD OFFICE)  
 TAI HWA ELECTRONIC CO., LTD.(CHINA)  
 SHANGHAI HUA YU ELECTRONIC CO., LTD.(CHINA)  
 AEON TECH CO., LTD. (CHINA)

## SPECIFICATION FOR APPROVAL

**CUSTOMER:** 華碩電腦股份有限公司

**PART NAME:** RF Antenna Cable Assembly

**PART NO.:** 14G151028012

**REVISION:**

**W. Y. P/NO.:** C660-510126-A

**REV.:** XI

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :		
DATE :	6/2/00	

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# RF Antenna Cable Assembly

## Specification

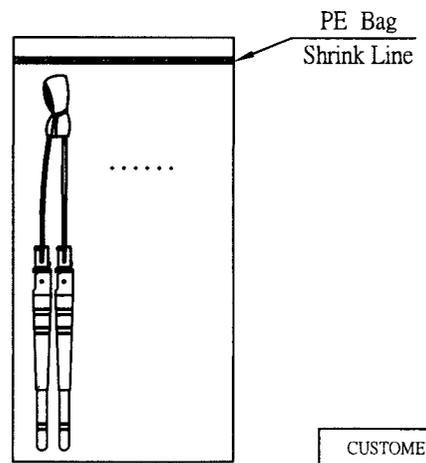
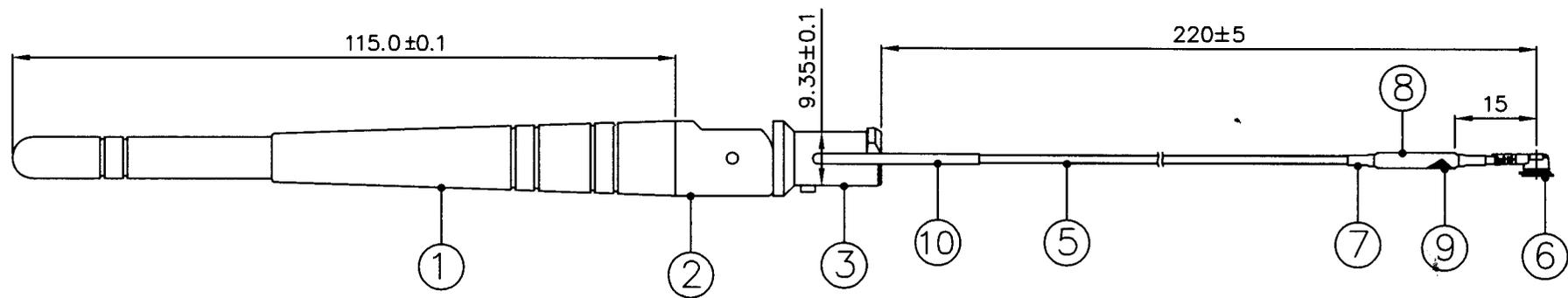
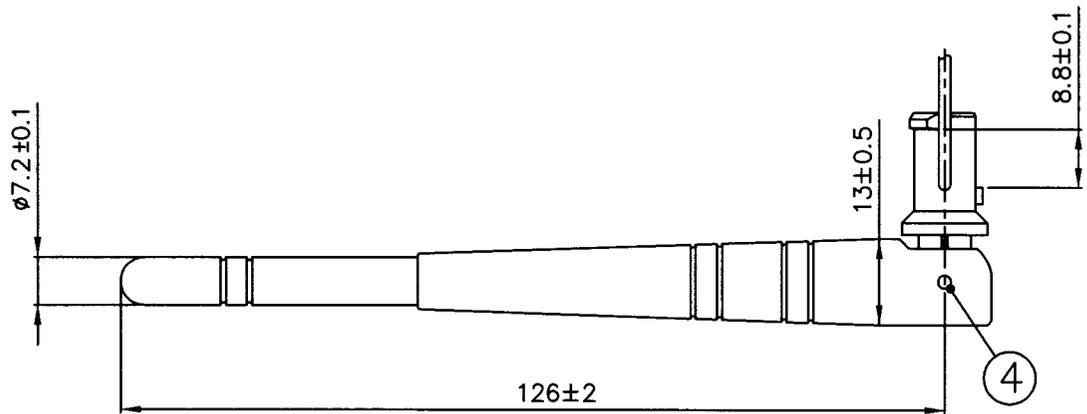
### 1. Electrical Properties :

- 1.1 Frequency Range..... 2.4GHz ~ 2.5GHz
- 1.2 Impedance ..... 50Ω Nominal
- 1.3 VSWR ..... 1.92 Max.
- 1.4 Return Loss..... -10 dB Maximum
- 1.5 Radiation ..... Omni-directional
- 1.6 Gain(peak)..... 1.8dBi (excluding cable loss)
- 1.7 Cable Loss..... 1.0dB
- 1.8 Polarization..... Linear Vertical
- 1.9 Admitted Power..... 1W

### 2. Physical Properties :

- 2.1 Cable..... 1.13 Coaxial Cable
- 2.2 Antenna Cover..... TPE
- 2.3 Antenna Base..... PC
- 2.4 Operating Temp. .... -20 ~ +65
- 2.5 Storage Temp. .... -30 ~ +75
- 2.6 Color ..... White
- 2.7 Connector ..... I-PEX MHF connector
- 2.8 Core ..... RH 4\*25\*1.5

REV	DATE	DESCRIPTION
X1	5/25-2006	New Issue



Packing : 10 pcs/bag

NOTE : MHF具有方向性，方向朝下

10	H.S Tube	Heat Shrink Tube	1	
9	Core	RH 4*25*1.5	1	
8	H.S Tube	Heat Shrink Tube	1	
7	H.S Tube	Heat Shrink Tube	2	
6	Connector	MHF Connector	1	
5	Cable	$\phi 1.13$ Coaxial Cable	1	
4	Rivet	POM ; White	2	
3	Antenna Base	PC ; Color : White	1	
2	Antenna Base	PC ; Color : White	1	
1	Antenna Cover	TPE ; Color : White	1	
NO	DESCRIPTION		QTY	REMARK

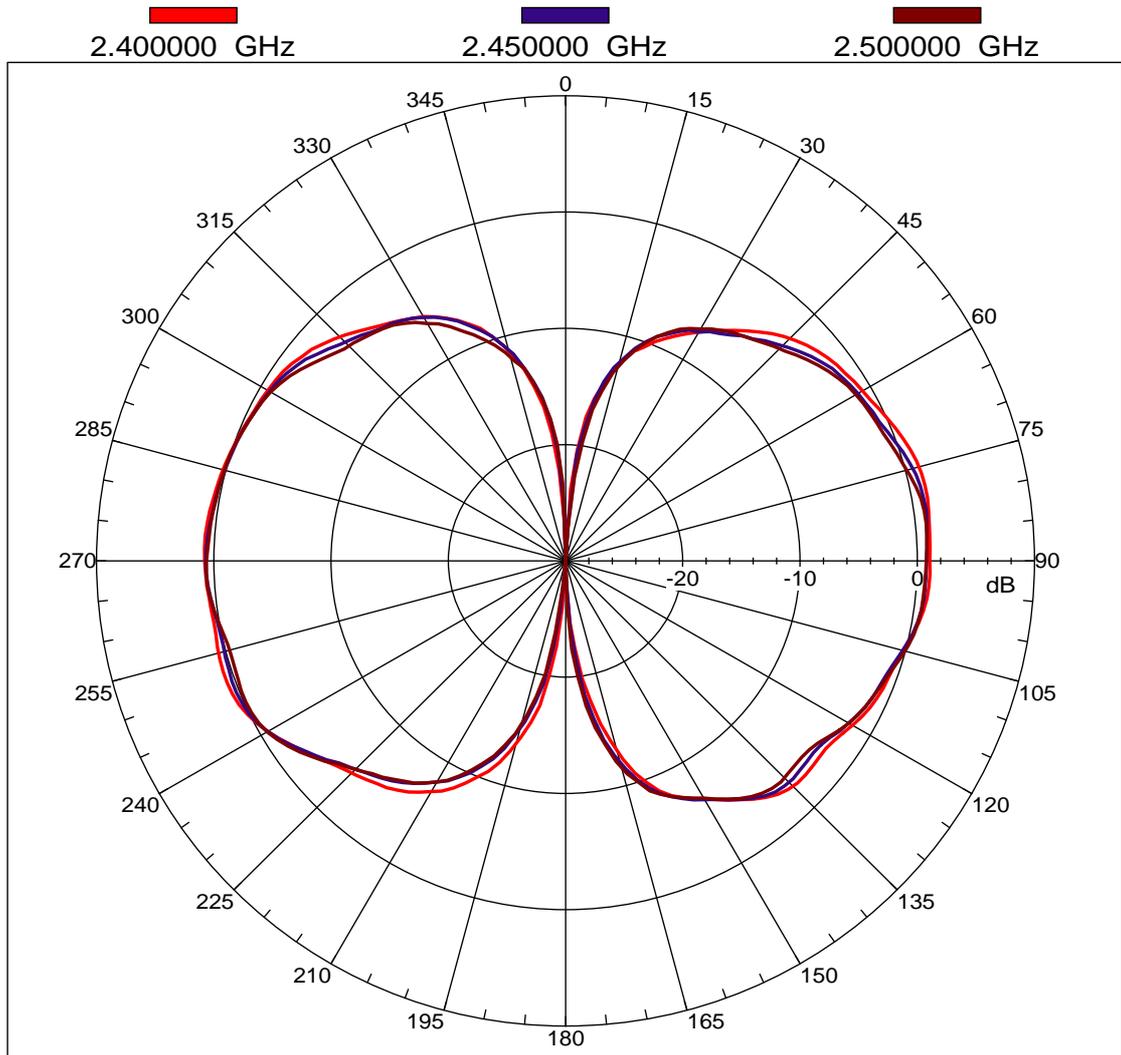
CUSTOMER'S SINGATURE

APPROVED  
X.  $\pm 3.0$   
X.  $\pm 1.0$   
XX.  $\pm 0.5$   
XXX.  $\pm 0.1$   
DRAWING  
程淑娟

CUSTOMER: ASUS  
PART NO : 14G151028012  
PARTNAME: RF Antenna Cable Assembly  
W.Y P/NO : C660-510126-A  
REV UNIT FILE :  
X1 m/m SHEET : 1/1

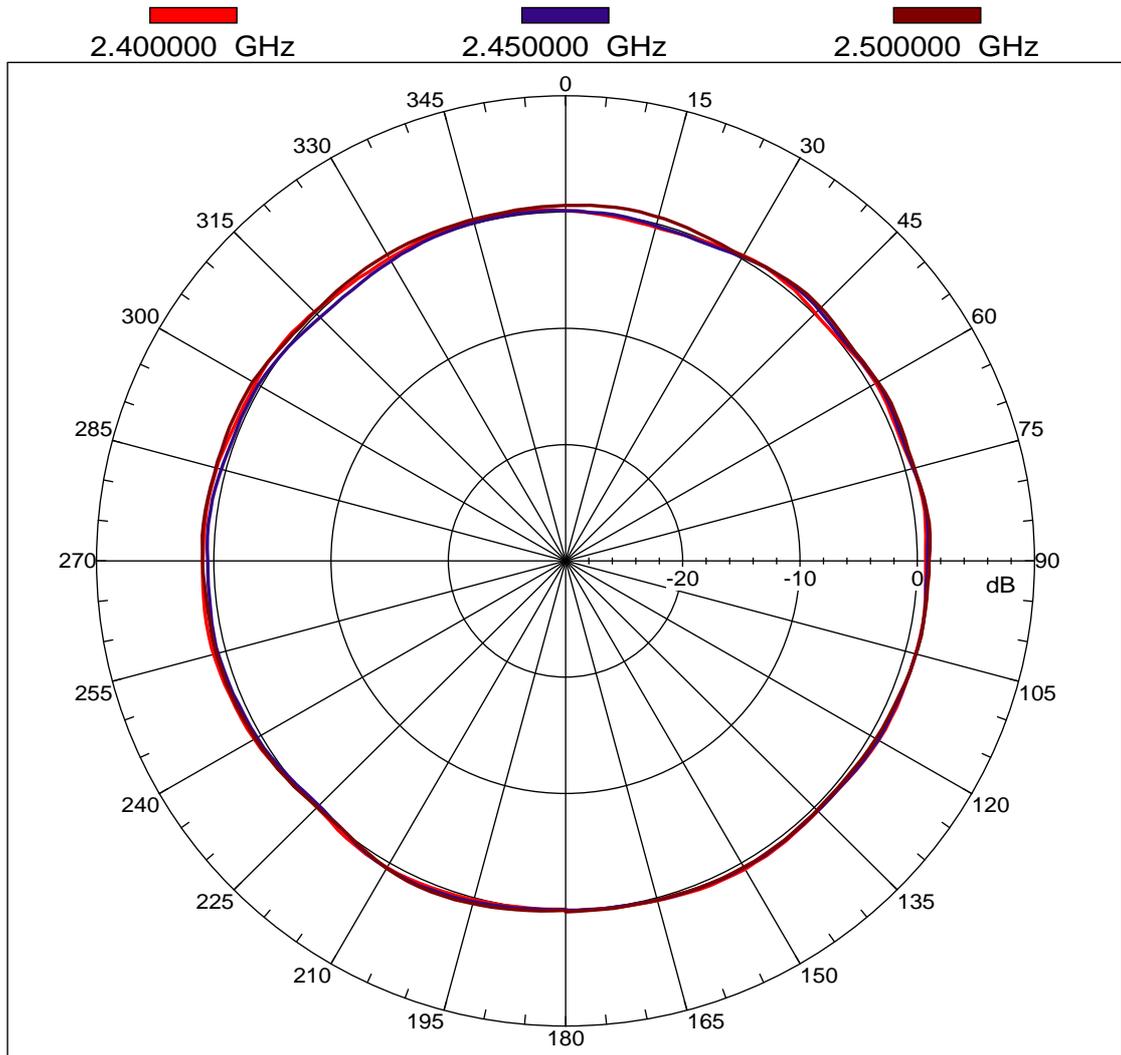
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### Far-field amplitude of C660-510126-A-H.nsi



6/1/2006

### Far-field amplitude of C660-510126-A-V.nsi



6/1/2006