

Measurement of MPE

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

EUT	:	USB Client
Classification	:	Mobile Device
		(i) Under normal use condition, the antenna is at least 20cm away from the user;
		(ii) Warning statement for keeping 20cm separation distance and the prohibition of operating next to the person has been printed in the user's manual
Model No.	:	LC_USB
Granted FCC ID	:	IXMUSB114401
Frequency Range	:	2.412 GHz ~ 2.462GHz
Antenna Kit	:	2 monopole antenna
Supported Channel:		11 Channel
Modulation Skill	:	DBPSK, DQPSK, CCK
Power Type	:	Powered by the USB port of the client's device
Applicant	:	Universal Scientific Industrial Co., Ltd.
		135, Lane 351, Taiping Rd., Sect.1, Tsao Tuen, Nan-Tou 542, Taiwan, R.O.C.

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:**

$$\text{Friis Transmission Formula: } S = \frac{PG}{4pR^2} = \frac{30.58 \times 1.585}{4p(20)^2} = 9.64 \times 10^{-3} \text{ mW/cm}^2$$

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:

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

$$G = \text{Log}^{-1} (2 / 10) = 1.585$$

MONOPOLE ANTENNA FOR WLAN IEEE 802.11b (2.45GHz ISM Band)

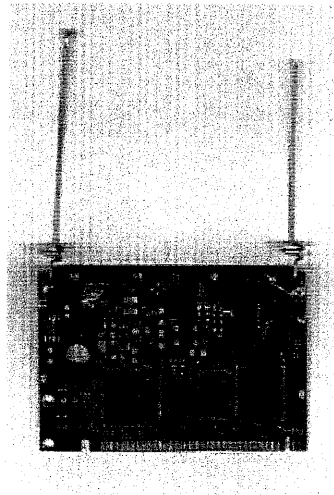
QUICK REFERENCE DATA

Dimension	77.0 * 4.0 * 1.0 mm
Central Frequency	2.45 GHz
Bandwidth	>100 MHz
Gain	2.0 dBi max
VSWR	2.0 max
Polarization	Linear
Azimuth	Omni-directional
Impedance	50Ω
Operating Temperature	-55~125 °C
Maximum Power	1W

PICTURE



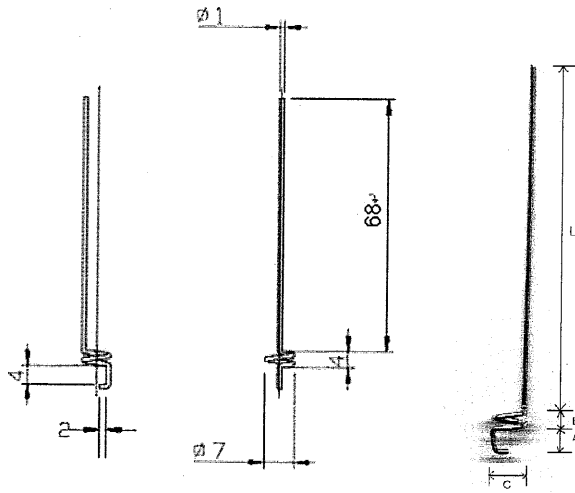
APPLICATION



HF R&D	Print date 02/09/12		
	Metal Type		Sep. 12, 02
	Monopole Antenna for ISM Band	AN2300000708031K	
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DIMENSIONAL DATA

Picture:



C: Feed Termination

Dimension:

L: 68.0 mm

B: 4.0 mm

A: 5.0 mm

C: 7.0 mm

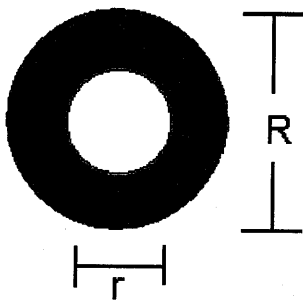
D: 1.0 mm

T: 2.0 mm

MATERIAL: SWCS

COATING: TIN (Thickness 6-8 μm)

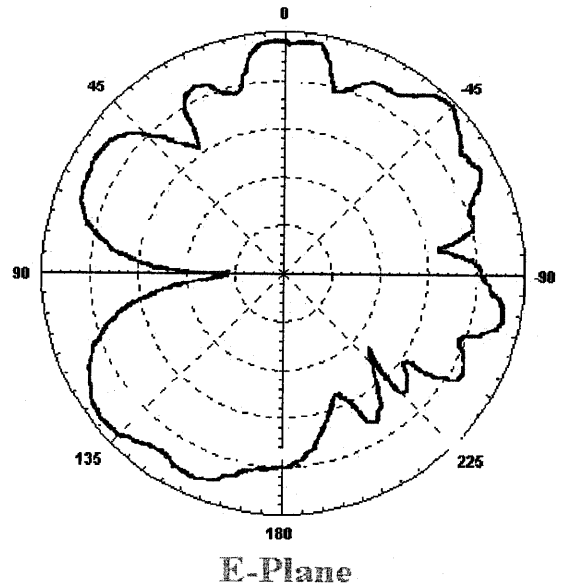
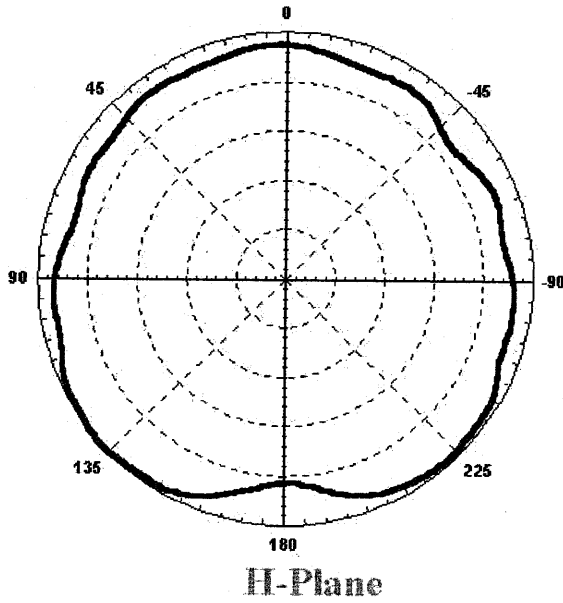
Solder Land Pattern:



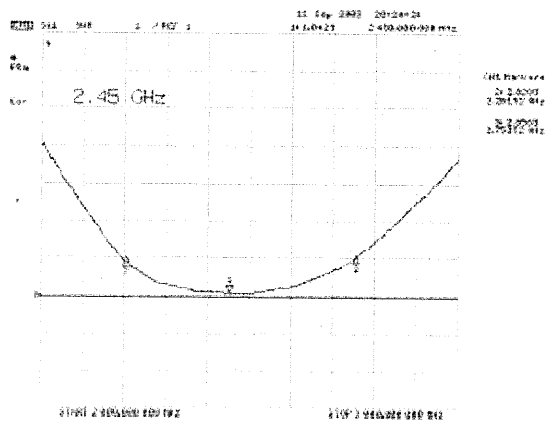
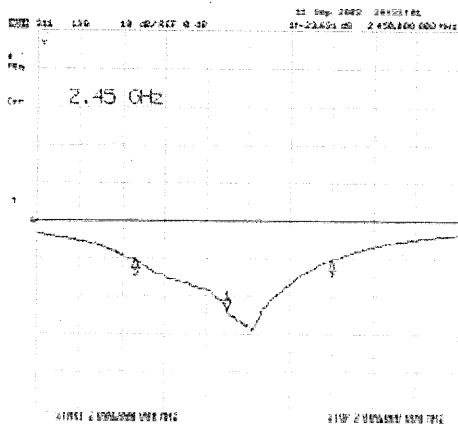
R: 2.0 mm r: 1.2 mm

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Typical Radiation Pattern Polar Plot



Typical Return Loss and SWR



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