

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.

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Taiwan, R.O.C.

3. Limits for Maximum Permissible Exposure (MPE)

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Filed 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:**

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

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:

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

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

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

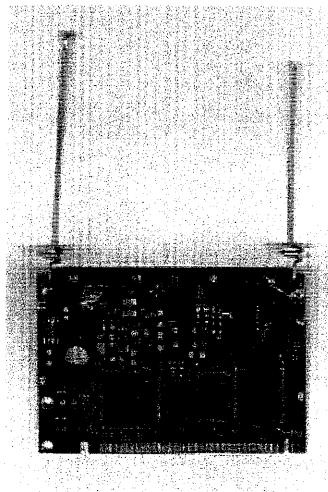
QUICK REFERENCE DATA

| | |
|-----------------------|---------------------|
| 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



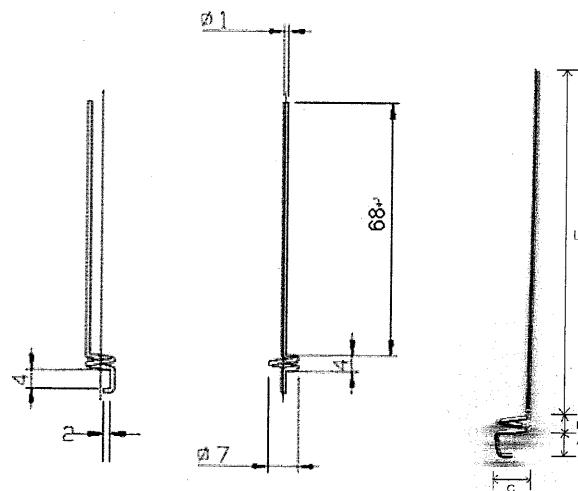
APPLICATION



| | | | | | |
|----------|-------------------------------|--------|-------------|------------------|----|
| 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

MATERIAL: SWCS

B: 4.0 mm

COATING: TIN (Thickness 6-8 μm)

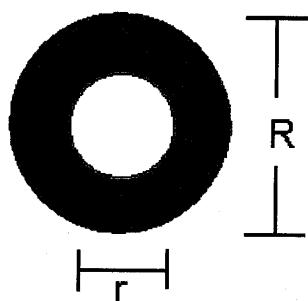
A: 5.0 mm

C: 7.0 mm

D: 1.0 mm

T: 2.0 mm

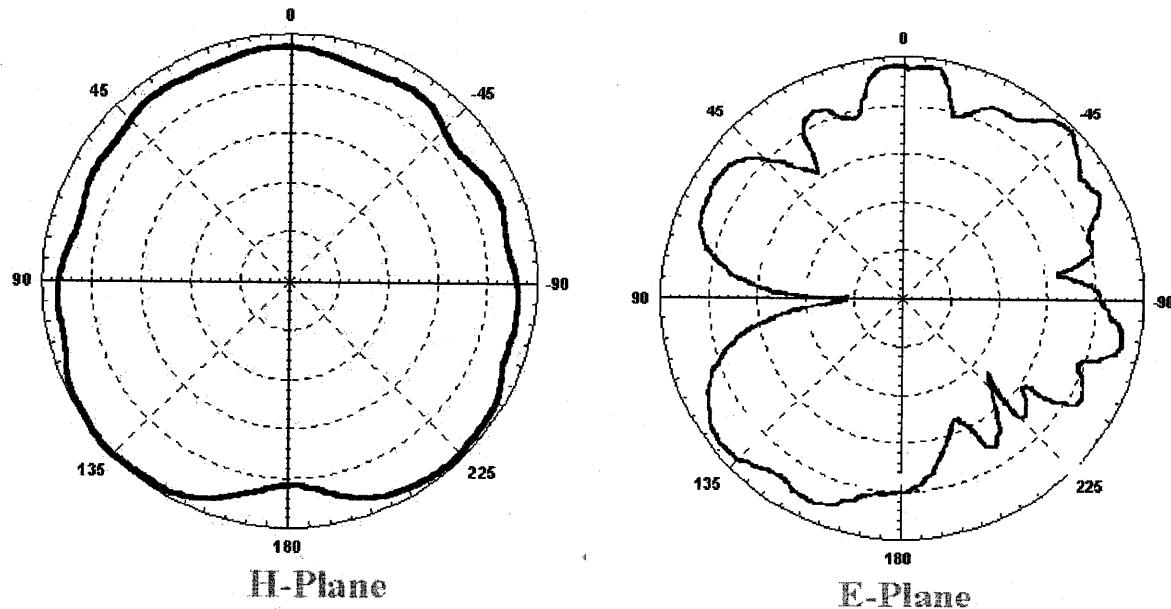
Solder Land Pattern:



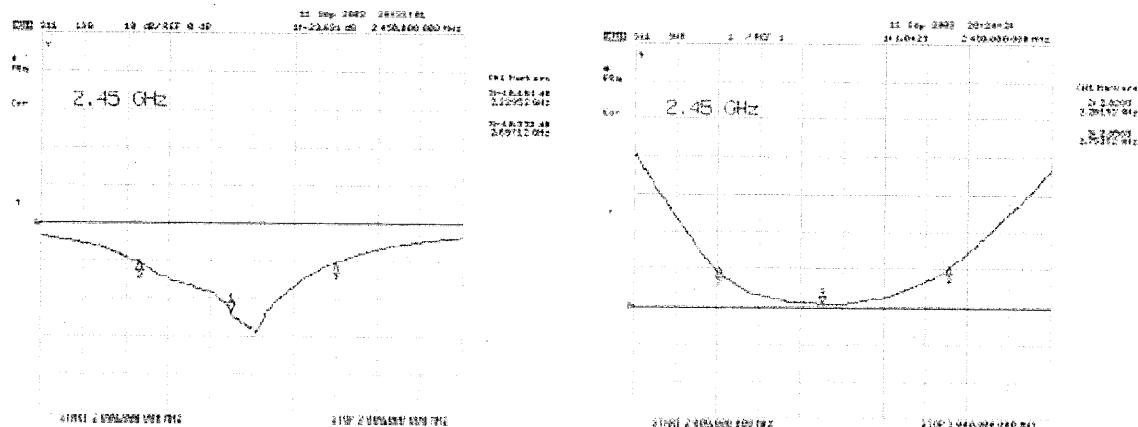
R: 2.0 mm r: 1.2 mm

| | | | | |
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Typical Radiation Pattern Polar Plot



Typical Return Loss and SWR



| | | | | | |
|-------------------------------|-------------------------------|--|--------|-------------|----|
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