

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	:	HUFWU04001
Product Name	:	Wireless Printer Server
Model Name	:	PU210W PUN2100W AXIS OFFICEBASIC USB WIRELESS G PRINT SERVER
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
Frequency Range	:	2.412GHz ~ 2.462GHz
Support Channel	:	11 Channels
Modulation Skill	:	DBPSK, DQPSK, CCK, OFDM
Power Type	:	Powered by the AC-DC adapter, Model: HORIZON-7943u I/P: 100-240VAC, 50/60Hz, 0.5A O/P: 5VDC, 2A 187cm length, non-shielded, with 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 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:

$$\text{Friis Transmission Formula: } S = \frac{PG}{4\pi R^2} = \frac{121.34 \times 1.33}{4\pi(20)^2} = 0.03211 \text{ mW} / \text{cm}^2$$

$$\text{Estimated safe separation: } R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{124.34 \times 1.33}{4\pi}} = 3.58363 \text{ cm}$$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 3.58cm"

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:

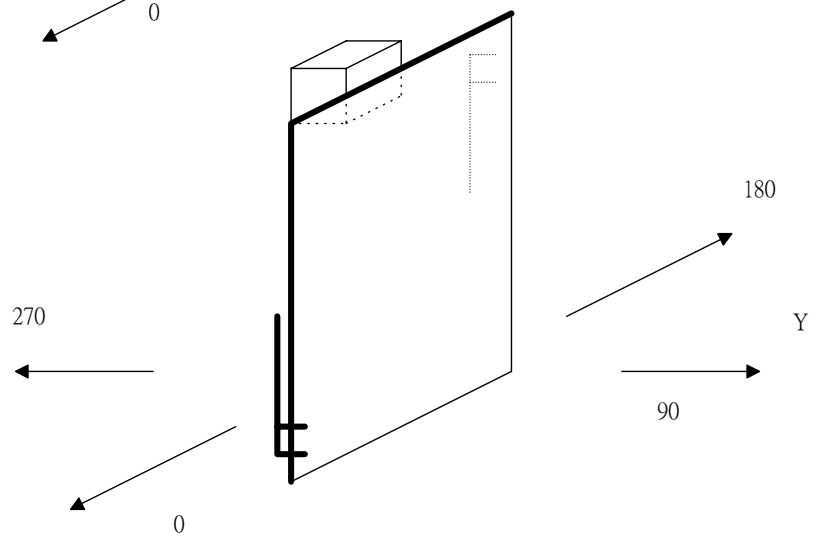
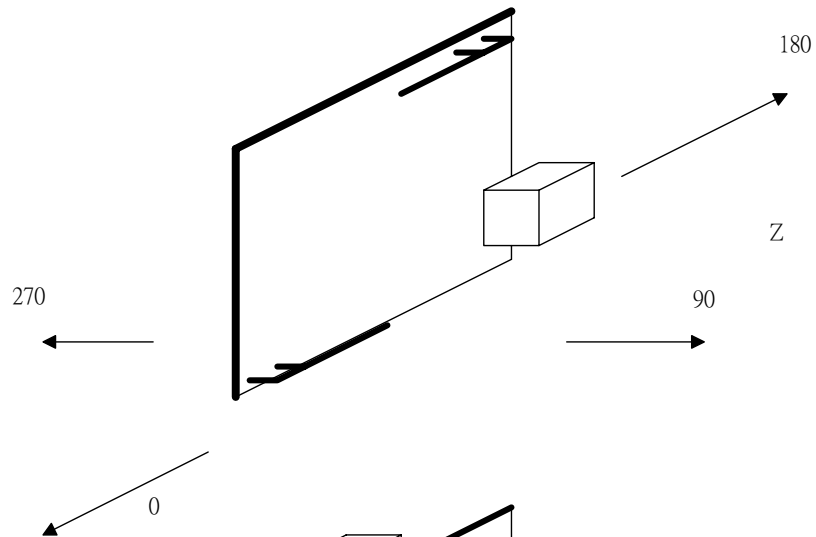
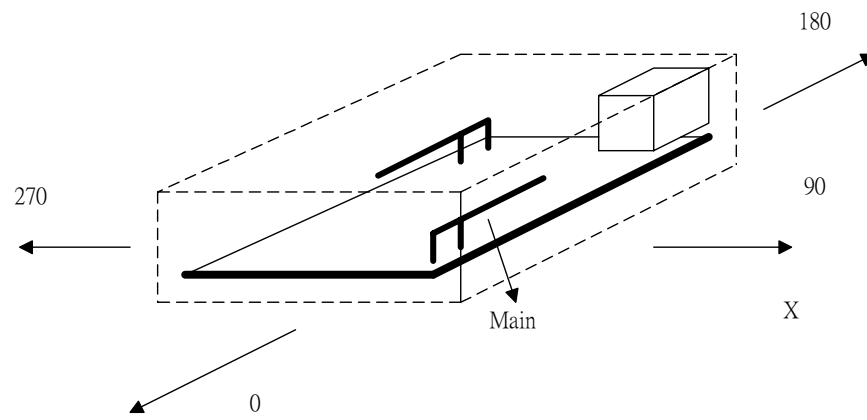
$$G = \text{Log}^{-1} (\text{dB antenna gain} / 10)$$

$$G = \text{Log}^{-1} (1.25 / 10) = 1.33352$$

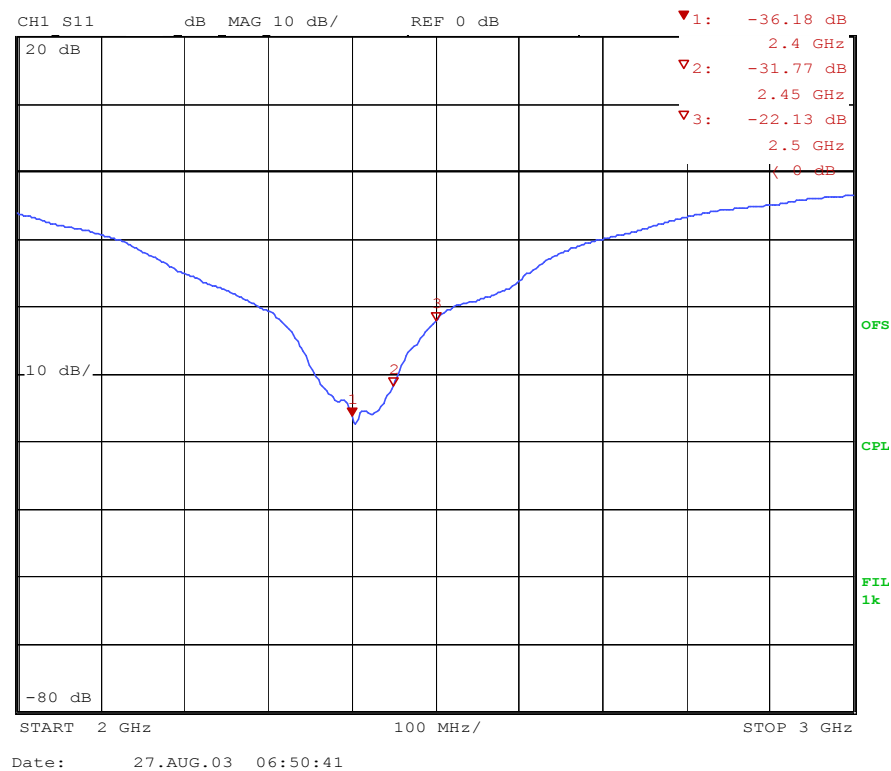
Appendix

Antenna Specification

Antenna Measurement for WL007G Wireless Printer Server

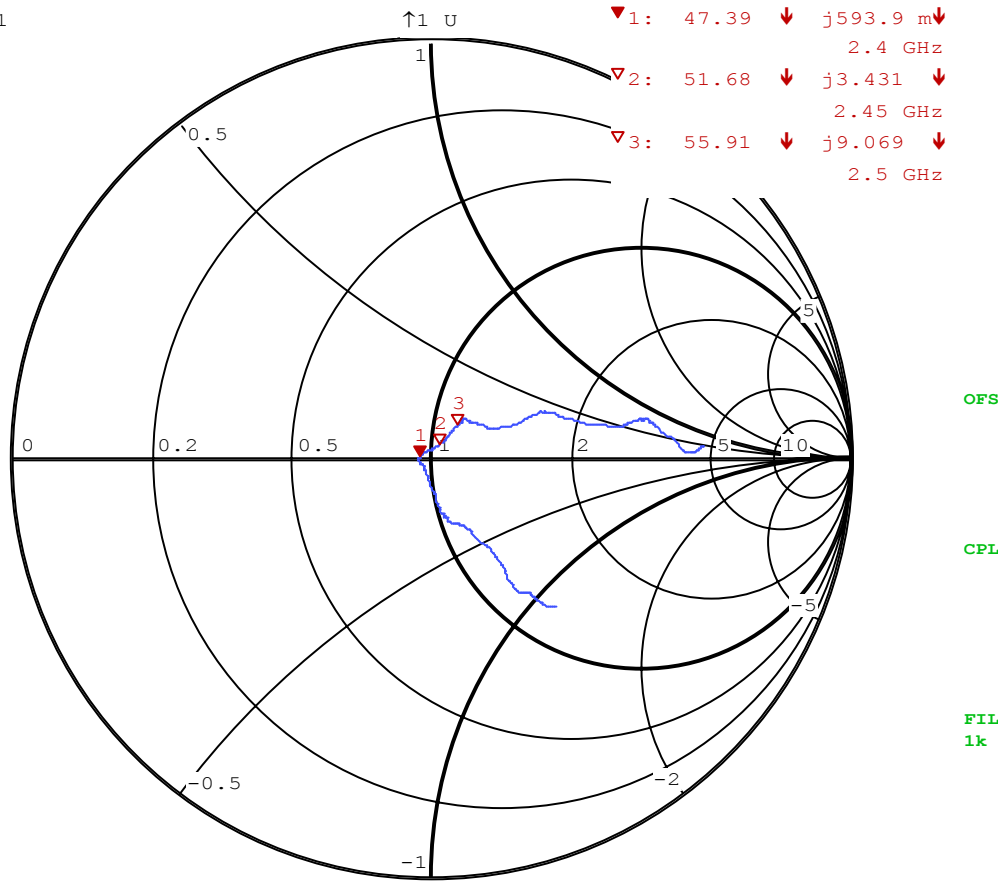


1. with covering



2. Smith Chart

CH1 S11

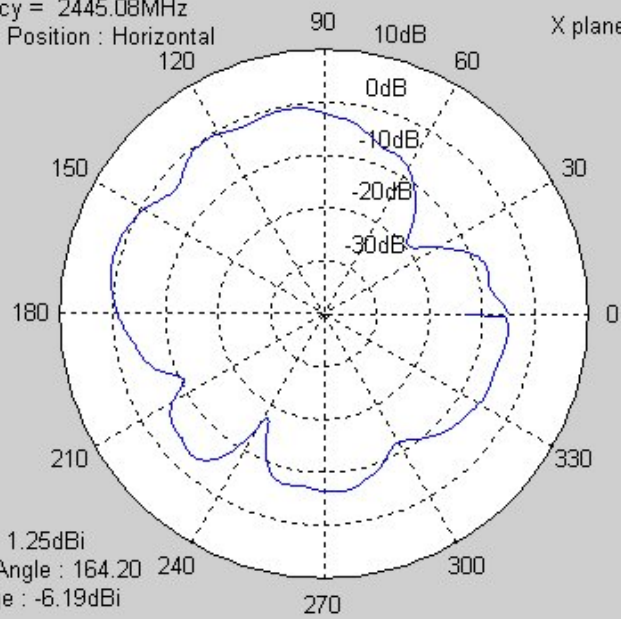


START 2 GHz

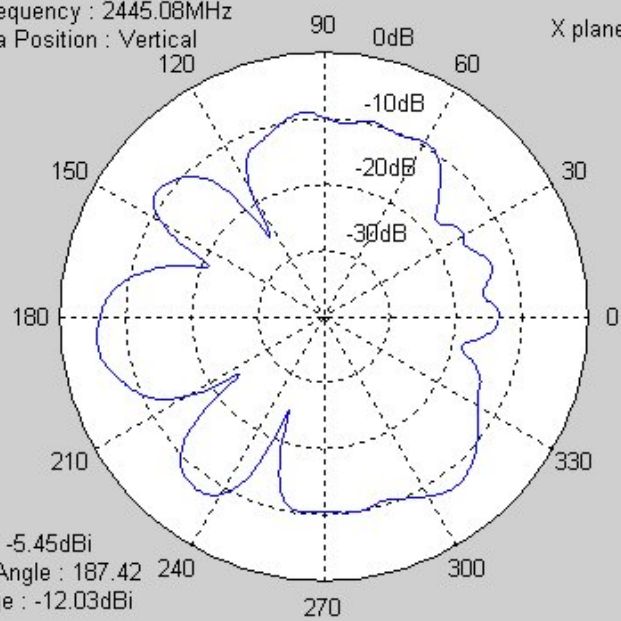
STOP 3 GHz

Date: 27.AUG.03 08:38:17

Frequency = 2445.08MHz
Antenna Position : Horizontal

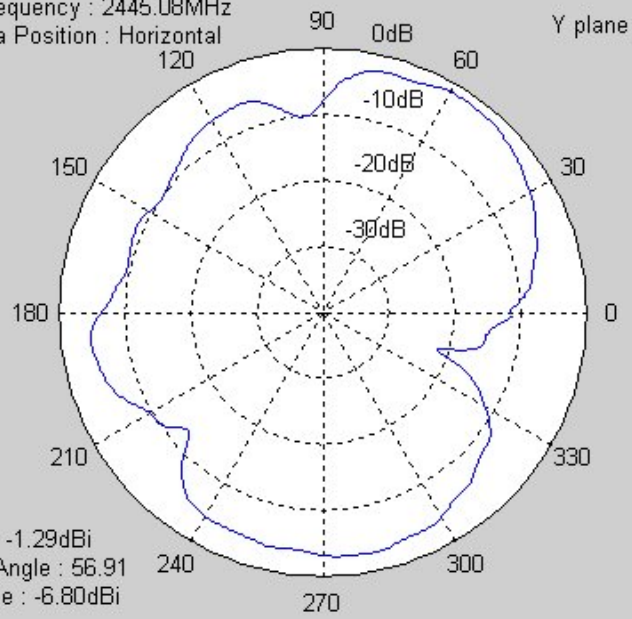


Test Frequency : 2445.08MHz
Antenna Position : Vertical



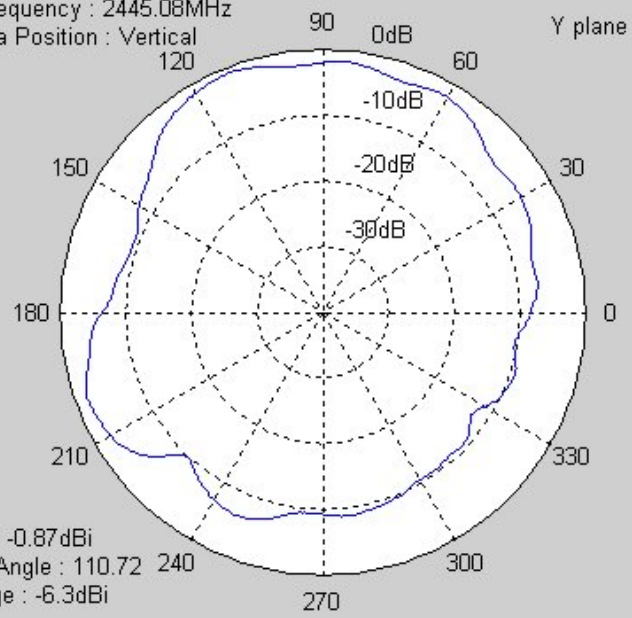
Test Frequency : 2445.08MHz

Antenna Position : Horizontal



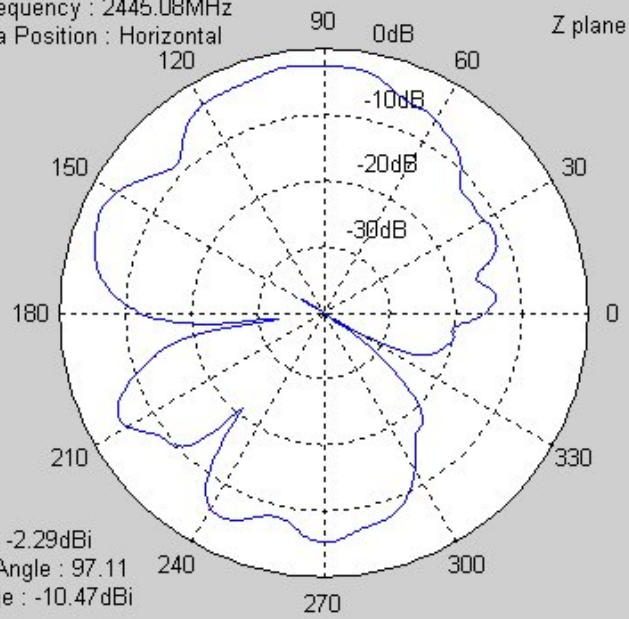
Test Frequency : 2445.08MHz

Antenna Position : Vertical



Test Frequency : 2445.08MHz

Antenna Position : Horizontal



Test Frequency : 2445.08MHz

Antenna Position : Vertical

