

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

Granted FCC ID	: NUSTMW1052
Product name	: 2.4G Wireless LAN Mini-PCI Card
Model name	: TMW1052
Classification	: Portable Device (i) Under normal use condition, the antenna is at least 2.5cm away from the user; (ii) Warning statement for keeping 2.5cm separation distance and the prohibition of operating next to the person has been printed in the user's manual
Frequency Range	: 2.412 GHz ~ 2.462GHz
Supported Channel	: 11 Channel
Modulation Skill	: DBPSK, DQPSK, CCK
Channel Spacing	: 5MHz
Power Type	: Powered by Mini-PCI interface of notebook PC

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:

$$\text{Friis Transmission Formula: } S = \frac{PG}{4pR^2} = \frac{13.366 \times 1.637}{4p(2.5)^2} = 0.278 \text{ mW/cm}^2$$

$$\text{Estimated safe separation: } R = \sqrt{\frac{PG}{4p}} = \sqrt{\frac{13.366 \times 1.637}{4p}} = 1.319 \text{ cm}$$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 1.319 cm."

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:

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

$$G = \text{Log}^{-1} (2.14 / 10) = 1.637$$