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

Granted FCC ID	**:**	PY3WG311V2
Product name	**:**	IEEE 802.11g Wireless PCI Adapter
Model name	**:**	WG311 v2
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
Supported Channel	**:**	11 Channels
Modulation Skill	**:**	DBPSK, DQPSK, CCK, OFDM
Power Type	**:**	Powered by PCI interface of the client' s device

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/cm2)	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

According to *OET BULLETIN 56 Fourth Edition / August 1999, Equation for Predicting RF Fields:*

3.1 IEEE 802.11b, Lowest CH

Friis Transmission Formula: $S = \frac{PG}{4\pi R^2} = \frac{62.661 \times 1.514}{4\pi (20)^2} = 0.0189 mW/cm^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{62.661 \times 1.514}{4\pi}} = 2.747 cm$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 2.747cm."

3.2 IEEE 802.11b, Middle CH

Friis Transmission Formula: $S = \frac{PG}{4\pi R^2} = \frac{69.183 \times 1.514}{4\pi (20)^2} = 0.0385 mW/cm^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{69.183 \times 1.514}{4\pi}} = 2.887 cm$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 2.887cm."

3.3 IEEE 802.11b, Highest CH

Friis Transmission Formula: $S = \frac{PG}{4\pi R^2} = \frac{67.453 \times 1.514}{4\pi (20)^2} = 0.0203 mW/cm^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{67.453 \times 1.514}{4\pi}} = 2.8507 cm$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 2.851cm."

3.4 IEEE 802.11g, Lowest CH

Friis Transmission Formula: $S = \frac{PG}{4\pi R^2} = \frac{118.032 \times 1.514}{4\pi (20)^2} = 0.03555 mW/cm^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{118.0328 \times 1.514}{4\pi}} = 3.771 cm$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 3.771cm."

3.5 IEEE 802.11g, Middle CH

Friis Transmission Formula: $S = \frac{PG}{4\pi R^2} = \frac{127.938 \times 1.514}{4\pi (20)^2} = 0.0385 mW/cm^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{127.938 \times 1.514}{4\pi}} = 3.926 cm$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 3.926cm."

3.6 IEEE 802.11g, Highest CH

Friis Transmission Formula: $S = \frac{PG}{4\pi R^2} = \frac{125.314 \times 1.514}{4\pi (20)^2} = 0.03774 mW/cm^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{125.314 \times 1.514}{4\pi}} = 3.8856 cm$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 3.886cm."

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:

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

$G = \text{Log}^{-1}$ (1.8 / 10) = 1.514