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	**:**	MSQWL160G
Product name	**:**	Wireless LAN USB Adapter
Model name	**:**	WL-160G
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	**:**	2.412 GHz ~ 2.462GHz
Supported Channel	**:**	11 Channels
Modulation Skill	**:**	DBPSK, DQPSK, CCK, OFDM
Power Type	**:**	Powered by USB of client' s device
Data Cable	**:**	USB Cable, 3feet length, shielded, no ferrite core

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

[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:**

Friis Transmission Formula: $S = \frac{PG}{4\pi R^2} = \frac{151.356 \times 1.3335}{4\pi (20)^2} = 0.0402 mW/cm^2$

Estimated safe separation: $R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{151.356 \times 1.3335}{4\pi}} = 4.008 cm$

Remarks: "The safe estimated separation that the user must maintain from the antenna is at least 4.008 cm."

Where: S = *power density* (in appropriate units, e.g. mW/cm2)

P = *power input* to the antenna (in appropriate units, e.g., mW)

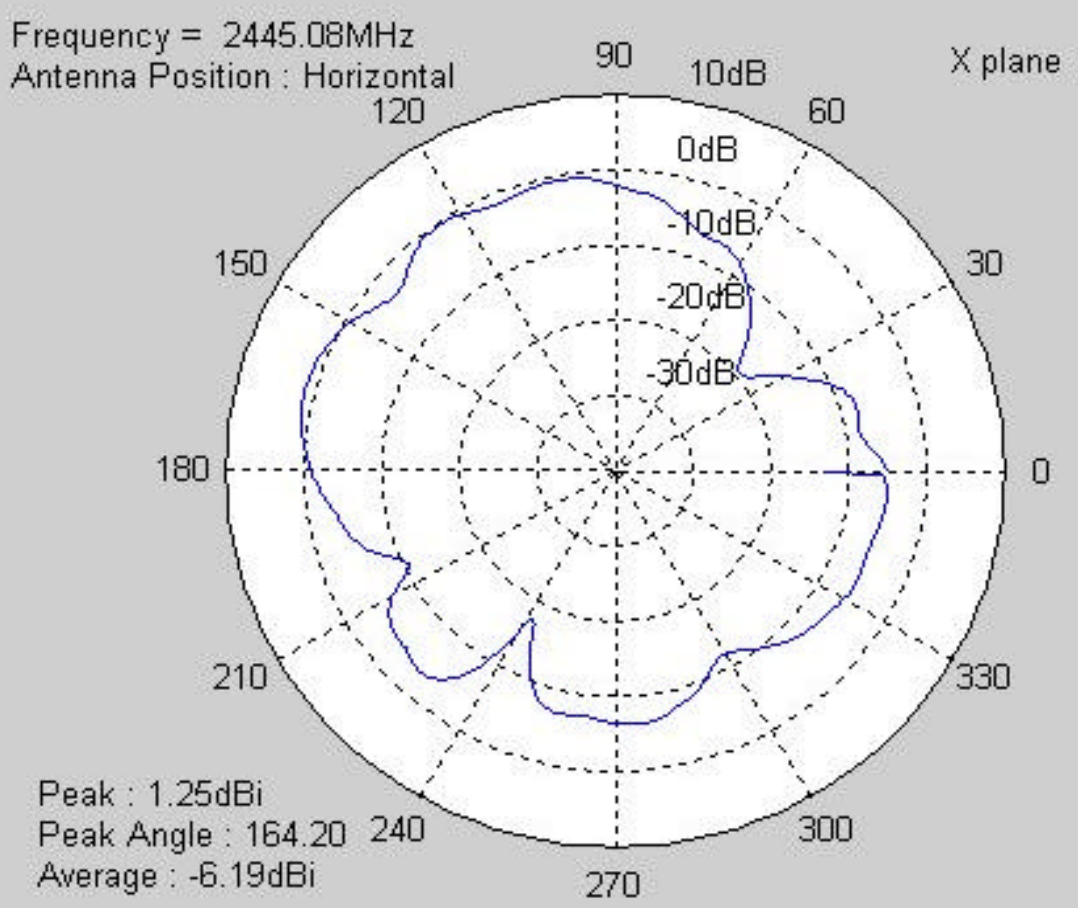
G = *power gain* of the antenna in the direction of interest relative to an isotropic radiator

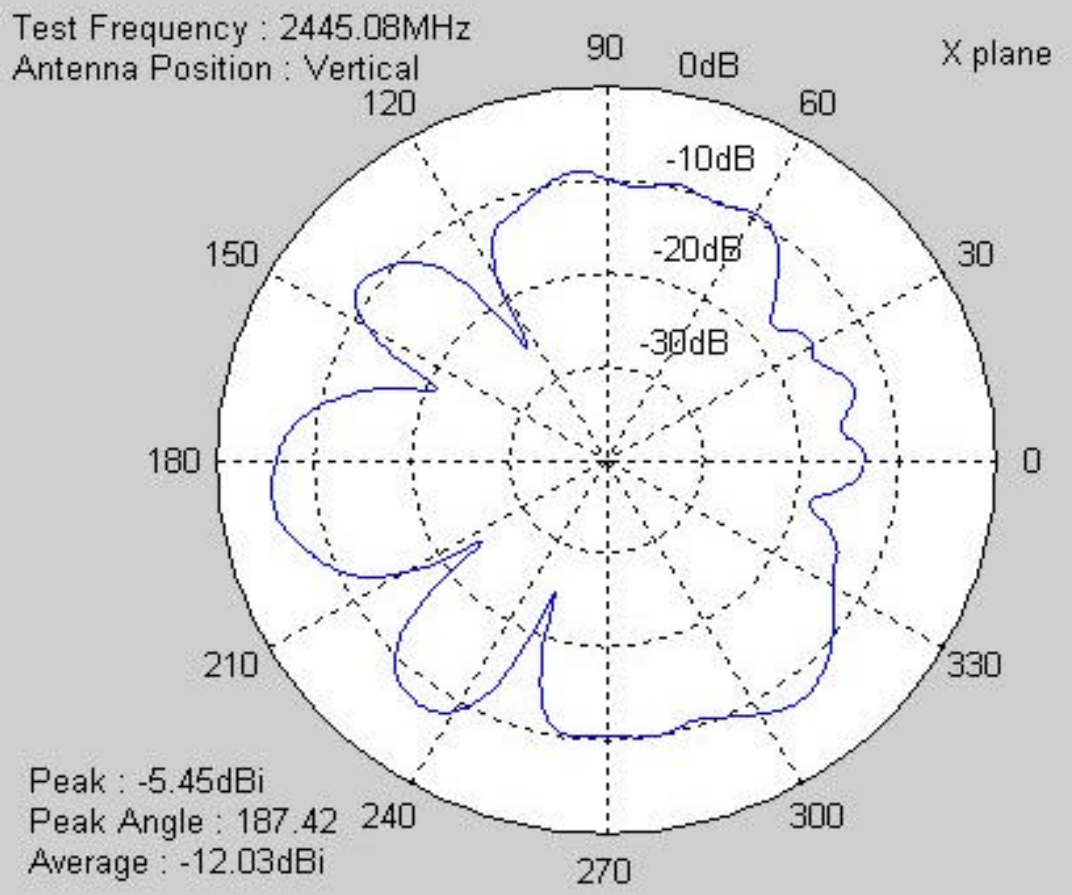
R = *distance* to the center of radiation of the antenna (appropriate units, e.g., cm)

The *Numeric gain G* of antenna with a gain specified in dB is determined by:

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

G = Log $^{-1}$ (1.25 / 10) = 1.3335


Frequency = 2445.08MHz
Antenna Position : Horizontal
X plane
90
10dB
120
60
0dB
-10dB
150
30
-20dB
-30dB
180
0
210
330
Peak : 1.25dBi
Peak Angle : 164.20
Average : -6.19dBi
240
300
270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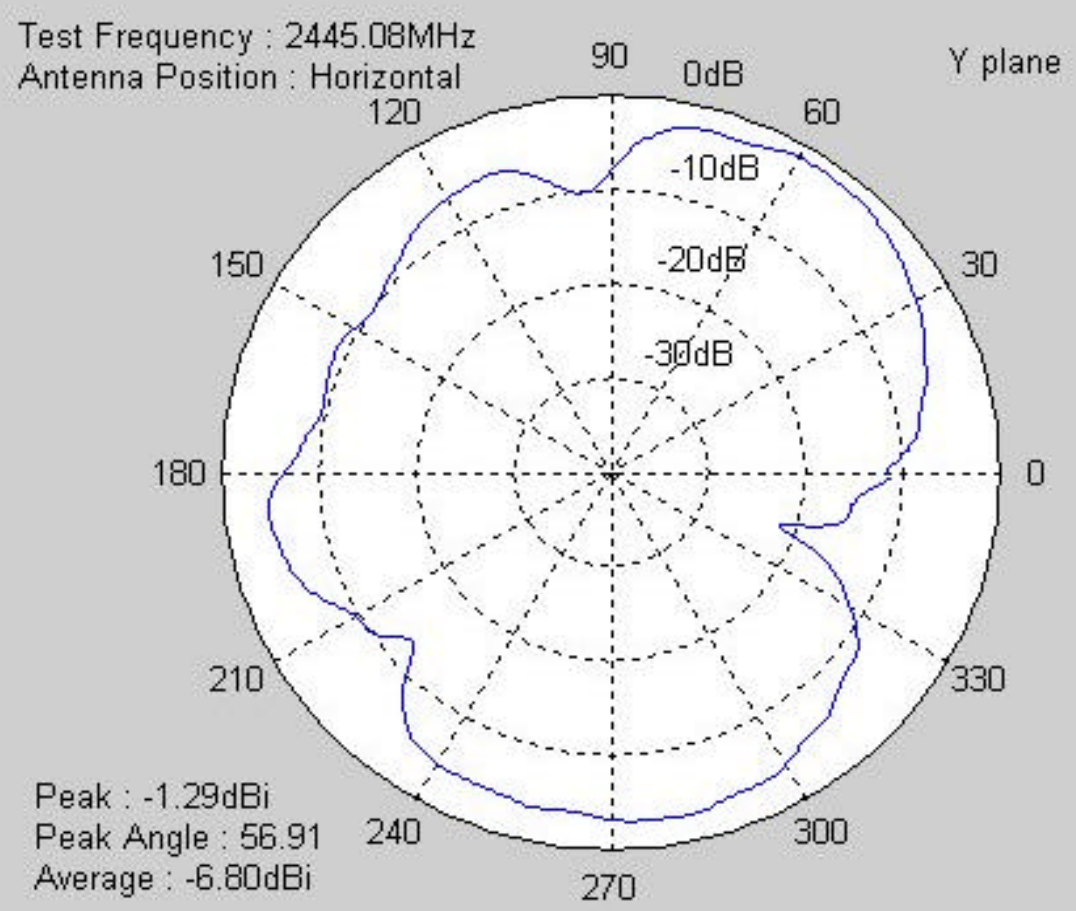
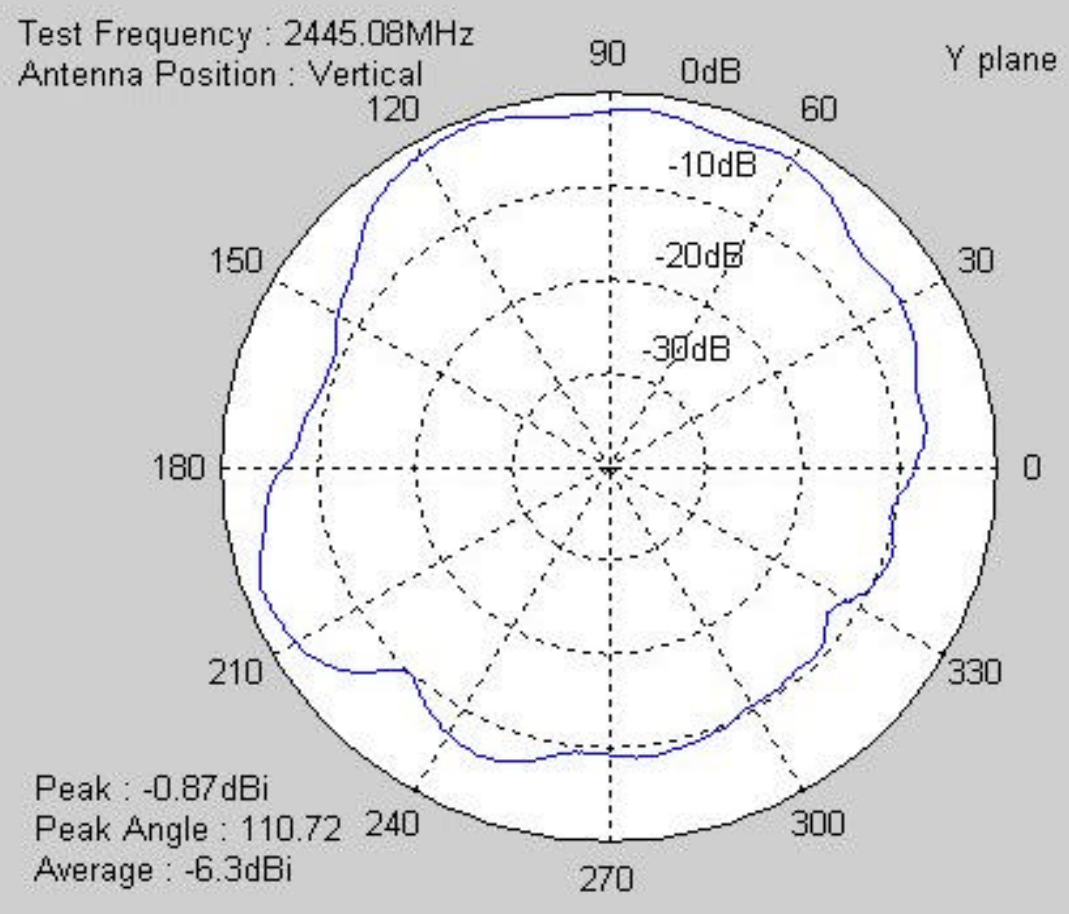
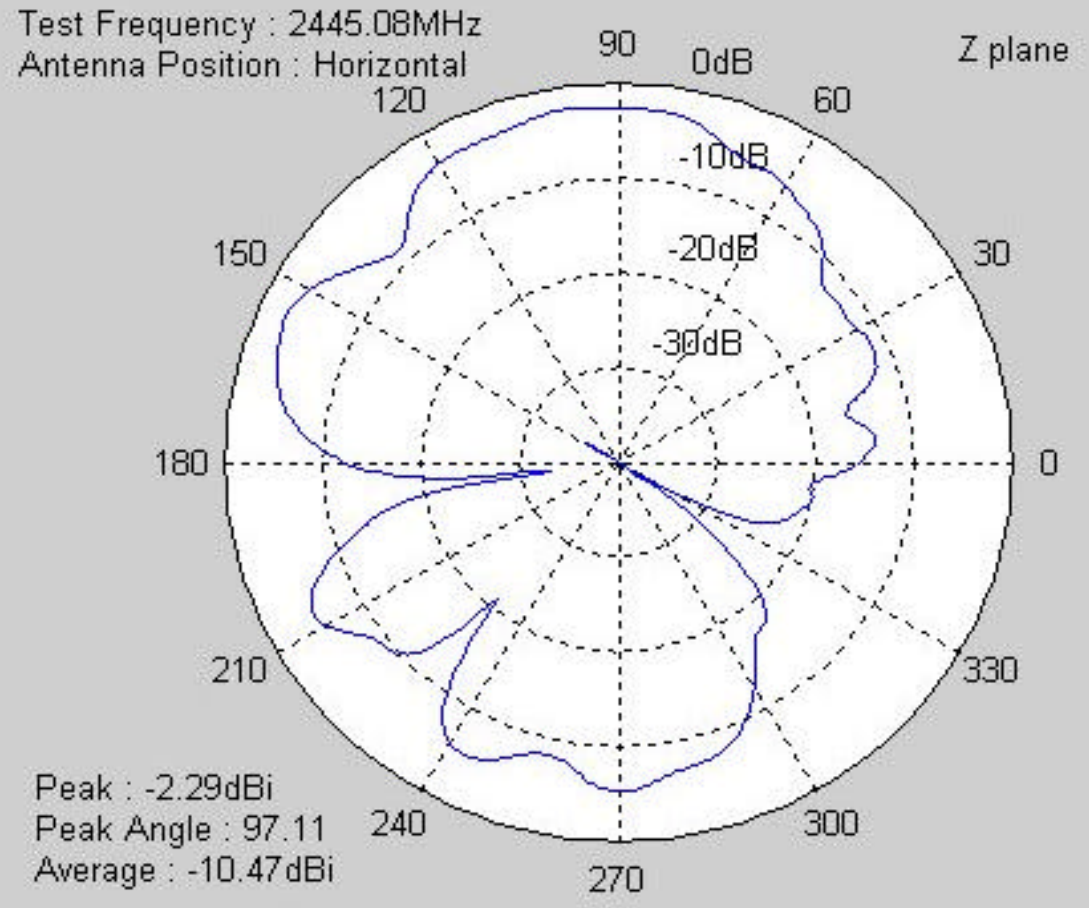
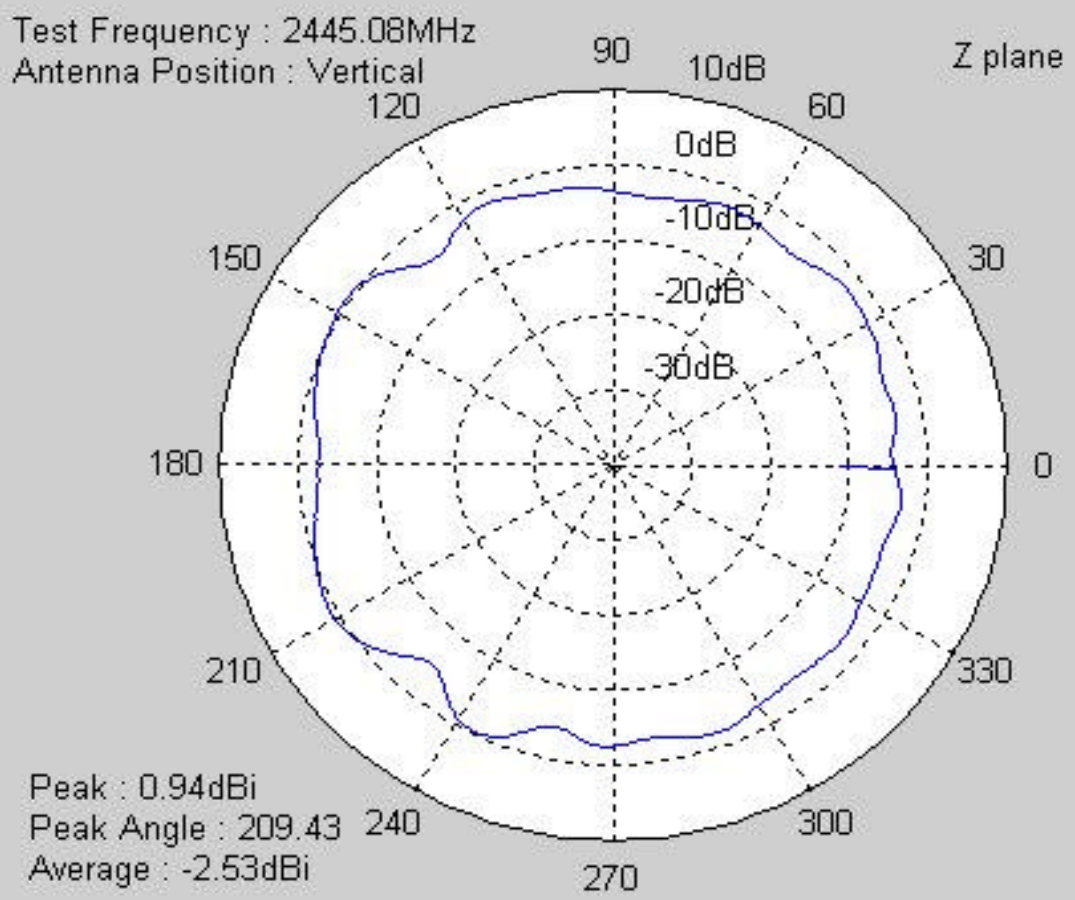
Antenna Position : Vertical
X plane
90
0dB
120
60
-10dB
150
30
-20dB
-30dB
180
0
210
330
Peak : -5.45dBi
Peak Angle : 187.42
Average : -12.03dBi
240
300
270


Test Frequency : 2445.08MHz
Antenna Position : Horizontal
Y plane
90
0dB
120
60
-10dB
150
-20dB
30
-30dB
180
0
210
330
240
300
270
Peak : -1.29dBi
Peak Angle : 56.91
Average : -6.80dBi


Test Frequency : 2445.08MHz
Antenna Position : Vertical
Y plane
90
0dB
120
60
-10dB
150
-20dB
30
-30dB
180
0
210
330
240
300
270
Peak : -0.87dBi
Peak Angle : 110.72
Average : -6.3dBi


Test Frequency : 2445.08MHz
Antenna Position : Horizontal
Z plane
90
0dB
120
60
-10dB
150
-20dB
30
-30dB
180
0
210
330
240
300
270
Peak : -2.29dBi
Peak Angle : 97.11
Average : -10.47dBi


Test Frequency : 2445.08MHz
Antenna Position : Vertical
Z plane
90
10dB
120
60
0dB
-10dB
150
30
-20dB
-30dB
180
0
210
330
240
300
270
Peak : 0.94dBi
Peak Angle : 209.43
Average : -2.53dBi