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	:	S83-AWK-1200-AC
Product Name	:	Outdoor Wireless AP Client
Model Name	:	AWK-1200-AC-XX (X=A~Z)
Frequency Range	:	2.400GHz ~ 2.4835GHz
Channel Spacing	:	5MHz
Support Channel	:	11 Channels
Modulation Skill	:	DBPSK, DQPSK, CCK, OFDM
Power Type	:	Powered by PoE

PoE Power Type as below:

(1).Manufacture: MEAN WELL

Model: ES18U48-480

I/P: 100-240VAC 50/60Hz 0.5A MAX.

O/P: 48VDC--- 0.375A , 18W MAX.

Power Cable : 188cm length, non-shielded, incorporating a ferrite core

(2).Manufacture: UMEC

Model: UP0181B-48PA

I/P: 100-240VAC 50/60Hz 0.4A MAX.

O/P: + 48VDC--- 0.38A, 18W MAX.

Power Cable : 180cm length, non-shielded, non-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: $S = \dfrac{PG}{4\pi R^2} = \dfrac{158.78 \times 7.94}{4\pi(20)^2} = 0.251 mW/cm^2$

Estimated safe separation: $R = \sqrt{\dfrac{PG}{4\pi}} = \sqrt{\dfrac{158.78 \times 7.94}{4\pi}} = 10.016 cm$

<u>*Note: "The safe estimated separation that the user must maintain from the antenna is at least 6.5cm"*</u>

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)
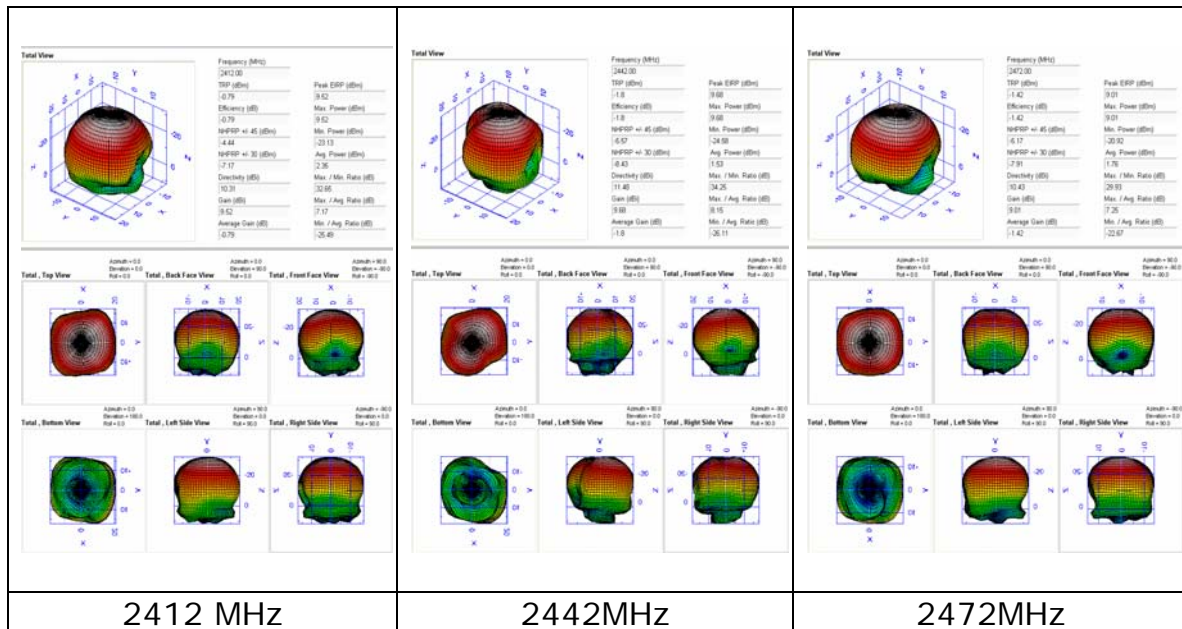
G = Log $^{-1}$ (9.0 / 10) = 7.94
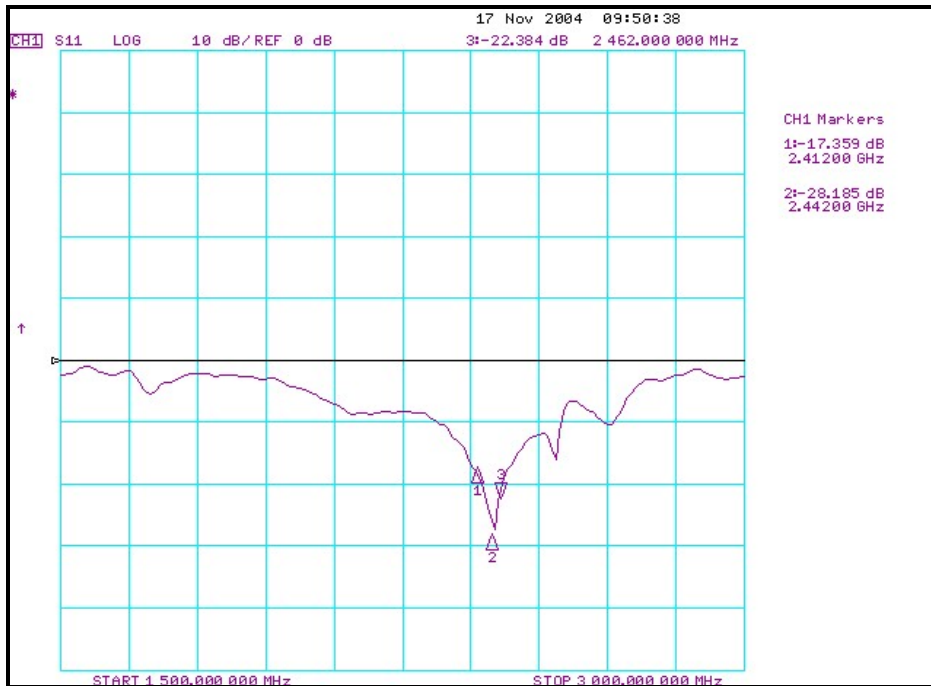
Appendix

Antenna Specification

Electrical Characteristics

➢ Operating Frequency　: 2.4~2.5GHz
➢ Polarization Type　: Linear
➢ Type of Radiation　: Directional
➢ Antenna Gain　: 9 dBi Typical
➢ Impedance　: 50 Ohm nominal
➢ V.S.W.R.　: 1.5:1 Max

3D Pattern

| 2412 MHz | 2442MHz | 2472MHz |

Return Loss


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                                    17 Nov 2004   09:50:38
CH1  S11    LOG    10 dB/REF 0 dB        3:-22.384 dB   2 462.000 000 MHz

                                                    CH1 Markers

                                                    1:-17.359 dB
                                                     2.41200 GHz

                                                    2:-28.185 dB
                                                     2.44200 GHz

     START 1 500.000 000 MHz              STOP 3 000.000 000 MHz
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V.S.W.R


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                                    17 Nov 2004   10:17:08
CH1  S11    SWR     2  /REF 1           3:1.1419      2 462.000 000 MHz

                                                    CH1 Markers

                                                    1: 1.3930
                                                     2.41200 GHz

                                                    2: 1.1696
                                                     2.44200 GHz

     START 1 500.000 000 MHz              STOP 3 000.000 000 MHz
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