

Maximum Permissible Exposure (MPE) Evaluation Report

Report No. : EME-031079

Model No. : 11-133

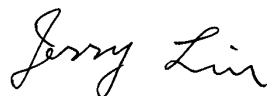
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Project Engineer



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Reviewed By



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Table of Contents

Summary of Tests 3

1. Introduction 4

2. RF Exposure Limit 4

3. RF Exposure calculations..... 5

4. Test results 5

Summary of Tests

MPE Evaluation meet FCC OET No. 65: 1997/ IEEE C95.1-1999

11Mbps Wireless LAN Card-Model: 11-133

FCC ID: MFM-11-133

Test	Reference	Results
MPE Evaluation	FCC Guidelines for Human Exposure IEEE C95.1	Complies

1. Introduction

The EUT operates in the 2.4GHz ISM band. Due to the EUT (include antenna) at its normal operation distance is at least 20 cm from the human body, the EUT was defined as a Mobile Device.

The reason to do the MPE Evaluation is to avoid the RF hazard to human body. The maximum output power and gain of the antenna were used to calculate the limited Power density (S) at 20cm distance away from the product. The limit for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 is followed.

2. RF Exposure Limit

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
(A) Limits for Occupational / Control Exposures				
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				
30-300	27.5	0.073	0.2	30
300-1500	-	-	F/1500	30
1500-100,000	-	-	1.0	30

F= Frequency in MHz

3. RF Exposure calculations

From §FCC 1.1310 table 1, the maximum permissible RF exposure for an uncontrolled environment is $1\text{mW}/(\text{cm}^2)$

Power density (S) is calculated by the following formula:

$$S = (P * G)/4\pi R^2$$

where, S = Power density (mW/cm^2)

P = Output power to antenna (mW)

R = Distance between radiating structure and observation point (cm)

G = Gain of antenna in numeric

$\pi = 3.1416$

Example:

Assume a mobile device operates at 2412MHz and its maximum output power is 50mW, and the maximum gain of antenna is 1 (numeric) /0dBi.

then the power density (S) = $(50 * 1)/4*\pi*20^2 = 0.00995 (\text{mW}/\text{cm}^2)$

4. Test results

The test result of Rubber Ducky antenna:

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm^2)	Limit of power density (mW/cm^2)
1	2412	1.78	73.11	0.02586	1.0
6	2437	1.78	67.92	0.02403	1.0
11	2462	1.78	77.09	0.02727	1.0

The test result of Omni antenna:

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm^2)	Limit of power density (mW/cm^2)
1	2412	3.16	73.11	0.04599	1.0
6	2437	3.16	67.92	0.04273	1.0
11	2462	3.16	77.09	0.04850	1.0

The Notice in Installation Manual has been stated as below:

While installing and operating this transmitter, the radio frequency exposure limit of $1\text{mW}/(\text{cm}^2)$ may be exceeded at distances close to the transmitter. Hence, the user must keep minimum distance of 20 cm away from the device.

The test result of Grid antenna:

Channel	Channel Frequency (MHz)	Maximum antenna gain (numeric)	Output power to antenna (mW)	Power density (mW/cm ²)	Limit of power density (mW/cm ²)
1	2412	251.19	73.11	3.654	5.0
6	2437	251.19	67.92	3.394	5.0
11	2462	251.19	77.09	3.852	5.0

The Notice in Installation Manual has been stated as below:

The Grid antenna of EUT is fixed exclusively, point-to-point operation and is professionally installed.

While installing and operating this transmitter, the radio frequency exposure limit of 5mW/(cm*cm) may be exceeded if the user is close to the transmitter. Hence, the user must keep minimum distance of 20 cm away from the device.