Maximum Permissible Exposure (MPE) Evaluation Report

Report No. : EME-071149
Model No. : MAX-200M1
Issued Date : Nov. 06, 2007

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Test By : Intertek Testing Services Taiwan Ltd.
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Summary of Tests

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

WiMAX IEEE802.16e Indoor Basic CPE-2.5GHz -Model: MAX-200M1
FCC ID: I88MAX200M1

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

1. Introduction

The EUT operates in the 2.5GHz band about WiMAX IEEE 802.16e. 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.

According to 1.1307 (b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

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 1mW/(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) = $(50 * 1)/4*\pi*20^2 = 0.00995$ (mW/cm^2)

4. Test results

Input Power	Environmental Conditions	Antenna Type	Modulation	Coding Rate
120Vac, 60Hz	26℃, 65%	Dipole antenna	QPSK	1/2

Frequency (MHz)	Maximum antenna gain (numeric	Output power to antenna (mW)	Power density (mW/cm^2)	Limit of power density (mW/cm^2)	Band Width (MHz)
2500	1.41	116.1449	0.03264	1.0	5
2590	1.41	119.6741	0.03363	1.0	5
2685	1.41	77.2681	0.02171	1.0	5
2500	1.41	115.6112	0.03249	1.0	10
2590	1.41	113.2400	0.03182	1.0	10
2685	1.41	74.1310	0.02083	1.0	10

The Notice in Installation Manual has been stated as below:
While installing and operating this transmitter, the radio frequency exposure limit of 1mW/(cm*cm) may be exceeded at distances close to the transmitter. therefore, the user must maintain a minimum distance of 20 cm from the device at all time.

Input Power	Environmental Conditions	Antenna Type	Modulation	Coding Rate
120Vac, 60Hz	26℃, 65%	Dipole antenna	QPSK	3/4

Frequency (MHz)	Maximum antenna gain (numeric	Output power to antenna (mW)	Power density (mW/cm^2)	Limit of power density (mW/cm^2)	Band Width (MHz)
2500	1.41	111.6863	0.03139	1.0	5
2590	1.41	116.1449	0.03264	1.0	5
2685	1.41	75.3356	0.02117	1.0	5
2500	1.41	112.4605	0.03160	1.0	10
2590	1.41	109.9006	0.03088	1.0	10
2685	1.41	72.7780	0.02045	1.0	10

Input Power	Environmental Conditions	Antenna Type	Modulation	Coding Rate
120Vac, 60Hz	26℃, 65%	Dipole antenna	16QAM	1/2

Frequency (MHz)	Maximum antenna gain (numeric	Output power to antenna (mW)	Power density (mW/cm^2)	Limit of power density (mW/cm^2)	Band Width (MHz)
2500	1.41	109.3956	0.03074	1.0	5
2590	1.41	112.4605	0.03160	1.0	5
2685	1.41	73.6207	0.02069	1.0	5
2500	1.41	110.6624	0.03110	1.0	10
2590	1.41	107.8947	0.03032	1.0	10
2685	1.41	71.2853	0.02003	1.0	10

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2500	1.41	107.8947	0.03032	1.0	5
2590	1.41	111.6863	0.03139	1.0	5
2685	1.41	72.2770	0.02031	1.0	5
2500	1.41	108.1434	0.03039	1.0	10
2590	1.41	105.9254	0.02977	1.0	10
2685	1.41	69.3426	0.01947	1.0	10

Input Power	Environmental Conditions	Antenna Type	Modulation	Coding Rate
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