Section 8

RF Exposure Information

8.1 Radio Frequency Radiation Exposure Evaluation

FCC Rules: 1.1307, 1.1310, 2.1091, 27.52

FCC Requirement: < 1mW/cm^2 General Population / Uncontrolled Exposure

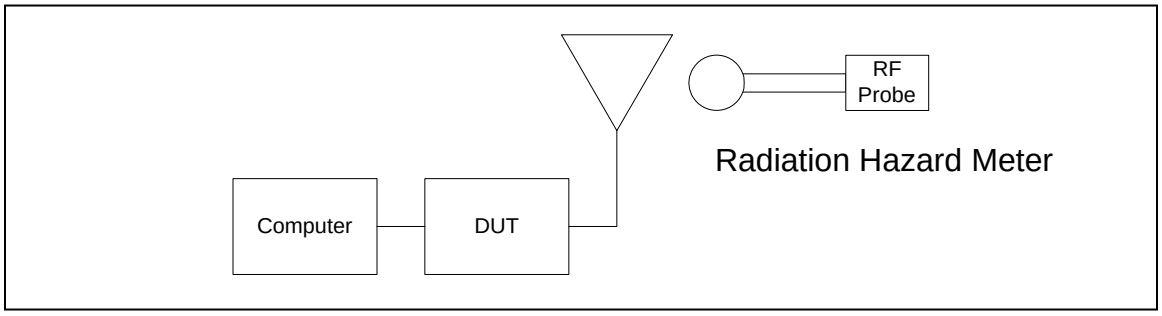
Standard: IEEE Std C95.3 – 2002
FCC OET Bulletin 65

Procedure:

The Motorola, Inc. WiMax device operates as a Time Division Duplex (TDD) product with a Time Division Multiple Access (TDMA) frame structure. The CPEi25100 product is able to transmit a time division duplex (TDD) signal up to a maximum 49.37 % transmit duty cycle. To measure the RF Exposure, the WiMax transmitter is enabled in test mode and set to the maximum power level with all sub-channels enabled. Measurements are performed at the low, mid, and high channels of each channel bandwidth, using the maximum transmitter duty cycle and all sub-channels. Modulation was set to 16 QAM ¾ rate.

Conditions: Frequency = 2499, 2593, 2687 MHz
Temperature = 22ºC
Supply Voltage = 120 VAC / 60 Hz nominal to DUT power supply

Set-Up:



Radiation Hazard Test Setup Diagram

8.2 Test Equipment

Radiation Hazard Meter: General Microwave Corporation RAHAM Model 3
Calibrated: 10-20-2005 Due: 10-20-2007

Voltmeter: Fluke 87 V True RMS Multimeter
S/N: 87180024
Measurement level verified with meter listed below.
HP 34401A
S/N: MY45001201
Calibrated: 5-4-2007 / Calibration due: 5-4-2009

The General Microwave RAHAM Model 3 isotropic broadband electromagnetic radiation hazard meter consists of a model 83A probe and model 481B meter. The model 83A probe employs three orthogonally-oriented thin-film thermoelectric arrays. This type of probe exhibits extremely good adherence to square-law characteristics such that the DC output from the thermocouple is proportional to the square of the electric field strength. The recorder output from the RAHAM meter is applied to the Fluke DVM. The DC level of the Recorder Output is recorded and then converted to the corresponding maximum permissible exposure value. The recorder output at a full scale reading is 124 mV. The measurements performed for this report utilize the 2 mW/cm^2 setting of the RAHAM instrument.

8.3 General Information

The Motorola, Inc. CPEi25100 WiMax transmitter can apply 0.5 watts of RF power, within a channel, to the integral antenna in the 2496-2690 MHz band. The CPEi25100 has a maximum transmit duty cycle of 49.37 % per the 802.16e protocol and is based on a TDMA frame.

The vertically polarized antenna has 13 dBi of gain. Therefore, the maximum radiated transmit power with all sub-channels enabled is as follows:

49.37% Transmit Duty Cycle:
Pmax = Ptx(dBm) + G(antenna(dBi)) - 10*log(duty cycle)(dB)
Pmax = 27 + 13 - 10*log(0.4937) = 27 + 13 – 3.0654
Pmax = 36.9346 dBm EIRP = 4.937 Watts EIRP

Calculations:

The following calculations can be used to determine the distance from the transmitting antenna that must be maintained to ensure that the exposure limit as defined in Table 1 of part 1.1310 (B) Limits for General Population / Uncontrolled Exposure. The formula for the following calculations are found

in the OET Bulletin 65, edition 97-01 August 1997, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields".

The maximum power level from the previous calculations will be used.

$S = EIRP/4\pi R^2$
or
$R = (EIRP/4\pi S)^{0.5}$

2496-2690 MHz Band:

$S=1\ mW/cm^2$	R=20 cm
EIRP = 4.937 W	EIRP = 4.937 W
EIRP = 4937 mW	EIRP = 4937 mW
$S = 1\ mW/cm^2$	R = 20 cm
$R = (4937/(4*\pi*1))^{0.5}$	$S = 4937/(4*pi*20^2)$
R = 19.82 cm	$S = 0.9822\ mW/cm^2$

The calculated safe distance from the transmitting antenna is 19.82 cm for a point source radiation element, or the maximum field strength for a point source radiation element at 20 cm would be 0.9822 mW/cm^2. The Motorola CPEi25100 uses a four element patch array antenna. The RF power supplied to each patch is one quarter the total power that would be supplied to a single radiating antenna as described in Bulletin 65. Because the transmitted power is distributed over a larger area, the actual signal at 20 cm will be less than the calculated value. A measurement of the signal strength at 20 cm is detailed below. The measured values of "S" have been adjusted to include the current calibration factor of the radiation hazard meter.

Measurement calculations:

DC voltage recorded	= 31 mV
Convert dc level to	Sdc = (31 mV * 2 mW/cm^2) / 124 mV
	= 62 mVmW/cm^2 / 124 mV
	= 0.5 mW/cm^2
Apply the calibration factor	S = Sdc*CF
	= 0.5 mW/cm^2 * 1.33
S (MPE level)	= 0.665 mW/cm^2

Test Results:

Vertically Polarized Antenna				
20 cm From Antenna Surface (16 QAM 3/4)				
Channel	Bandwidth	Max Meter Voltage	Max S (mw/cm^2)	Corrected Max S (mw/cm^2)
2499	5.0 MHz	31	0.50	0.67
2593	5.0 MHz	27	0.44	0.58
2687	5.0 MHz	22	0.35	0.47
2499	10 MHz	26	0.42	0.56
2593	10 MHz	30	0.48	0.64
2687	10 MHz	19	0.31	0.41

Test Conclusion:

The Motorola, Inc. CPEi25100 product is below the limit for RF Exposure as detailed in the FCC 47CFR1.1310 requirement for General Population / Uncontrolled Exposure.

The following information is located on a label on the CPEi25100 product:

To comply with FCC radio frequency exposure rules, 47CFR1.1307 and 1.1310, a minimum separation of 20 cm (8 inches) is required between this device and all persons.