



**Maximum Permissible Exposure Evaluation**

**For**

**Motorola - Enterprise Mobility Solutions  
MC9090**

**FCC ID: H9PMC9090**

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## Maximum Permissible Exposure Test Report

for

**FCC ID: H9PMC9090**

### 1.0 Introduction

This report has been prepared on behalf of Motorola - Enterprise Mobility Solutions MC9090 802.11ABG Bluetooth and RFID Hand-Held Mobile Computing Terminal to show compliance with the RF exposure requirements as defined in FCC §1.1307.

Testing supporting this evaluation was performed at Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Washington Laboratories, Ltd. has been accepted as an EMC Conformity Assessment Body (CAB) under the United States/European Union Memorandum of Agreement. Washington Laboratories, Ltd. is accredited with the American Association for Laboratory Accreditation under Certificate 2675.01.

#### 1.1 Requirements

Three different categories of transmitters are defined by the FCC in OET Bulletin 65. These categories are fixed installation, mobile, and portable and are defined as follows:

- **Fixed Installations:** fixed location means that the device, including its antenna, is physically secured at a permanent location and is not able to be easily moved to another location. Additionally, distance to humans from the antenna is maintained to at least 2 meters.
- **Mobile Devices:** a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structures and the body of the user or nearby persons. Transmitters designed to be used by consumers or workers that can be easily re-located, such as a wireless modem operating in a laptop computer, are considered mobile devices if they meet the 20 centimeter separation requirement. The FCC rules for evaluating mobile devices for RF compliance are found in 47 CFR §2.1091.
- **Portable Devices:** a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. Portable device requirements are found in Section 2.1093 of the FCC's Rules (47 CFR§2.1093).

For this test report the Motorola - Enterprise Mobility Solutions MC9090 is considered a mobile device.

Antenna: 6dBi

Evaluation distance: 20cm test distance.

The FCC also categorizes the use of the device as based upon the user's awareness and ability to exercise control over his or her exposure. The two categories defined are Occupational/Controlled Exposure and General Population/Uncontrolled Exposure. These two categories are defined as follows:

- **Occupational/Controlled Exposure:** In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on methods to minimize such exposure risks.
- **General Population/Uncontrolled Exposure:** The general population / uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

Since there are no warnings or training associated with this unit and it can be used by anyone, the Motorola - Enterprise Mobility Solutions - UK 802.11ABG Bluetooth and RFID Hand-Held Mobile Computing Terminal is evaluated to the General Population/Uncontrolled Exposure limits.

## 1.2 Radio Frequency Radiation Exposure Evaluation

The highest RF output power of the unit was measured is recorded. According to §1.1310 of the FCC rules, the power density limit for General Population/Uncontrolled Exposure is  $1\text{mW}/\text{cm}^2$  for transmissions that fall in the 1.5 to 100GHz range and  $[\text{frequency}(\text{GHz})/1500] = x \text{mW}/\text{cm}^2$  for transmissions in the 300-1500 MHz range. The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at the Antenna Terminals

G = Gain of Transmit Antenna (linear gain-isotropic)

R = Distance from Transmitting Antenna

Table 1 presents the transmitter data incorporated in this device. Table 2 shows the RF exposure parameters of each transmitter condition along with the power density at 21.2 centimeters. This separation distance was requested by the manufacturer. For multiple transmitters the powers are summed proportionate to the percentage of power from each transmitter compared to their respective limits, the results are shown in table 3.

**Table 1: MC9090 Transmitters**

<b>Transmitter Frequency</b>	<b>Description</b>	<b>Power Output (dBm)</b>	<b>Antenna Gain</b>
<b>902.75 MHz</b>	<b>RFID</b>	<b>29.17</b>	<b>6</b>
<b>2402 MHz</b>	<b>Bluetooth</b>	<b>-0.17</b>	<b>2</b>
<b>2412MHz</b>	<b>802.11b/g</b>	<b>20.00</b>	<b>2</b>
<b>5260MHz</b>	<b>802.11a</b>	<b>19.29</b>	<b>3.1</b>

**Table 2. Transmitter MPE Calculation Summary**

<b>Transmitter #1 RFID</b>			
Frequency	902.75	MHz	
Limit	0.602	mW/cm <sup>2</sup>	
Distance (cm), R =	21.2	cm	
Power (dBm), P =	29.17	dBm	
TX Ant Gain (dBi), G =	6	dB	
<b>Power Density:</b>	0.58228	mW/cm <sup>2</sup>	@ 21.2cm
<b>Minimum Distance:</b>	<b>20.9</b>	cm	

<b>Transmitter #2 Bluetooth</b>			
Frequency	2402	MHz	
Limit	1.000	mW/cm <sup>2</sup>	
Distance (cm), R =	21.2	cm	
Power (dBm), P =	-0.17	dBm	
TX Ant Gain (dB), G =	2	dB	
<b>Power Density:</b>	0.00027	mW/cm <sup>2</sup>	@ 21.2cm
<b>Minimum Distance:</b>	<b>0.3</b>	cm	

<b>Transmitter #3a (802.11 b/g)</b>			
Frequency	2412	MHz	
Limit	1.000	mW/cm <sup>2</sup>	
Distance (cm), R =	21.2	cm	
Power (dBm), P =	20	dBm	
TX Ant Gain (dB), G =	2	dB	
<b>Power Density:</b>	0.02806	mW/cm <sup>2</sup>	@ 21.2cm
<b>Minimum Distance:</b>	<b>3.6</b>	cm	

<b>Transmitter #3b (802.11 a)</b>			
Frequency	5260	MHz	
Limit	1.000	mW/cm <sup>2</sup>	
Distance (cm), R =	21.2	cm	
Power (dBm), P =	19.29	dBm	
TX Ant Gain (dB), G =	3.1	dB	
<b>Power Density:</b>	0.03070	mW/cm <sup>2</sup>	@ 21.2cm
<b>Minimum Distance:</b>	<b>3.7</b>	cm	

**Table 3: Cumulative results for Multiple Transmitters @ 21.2cm separation from user**

<b>Transmitter</b>	<b>Power Density (mW/cm<sup>2</sup>)</b>	<b>Limit (mW/cm<sup>2</sup>)</b>	<b>Percent of MPE used (%)</b>
<b>#1 - RFID</b>	<b>0.58228</b>	<b>0.602</b>	<b>96.72</b>
<b>#2- Bluetooth</b>	<b>0.00027</b>	<b>1.000</b>	<b>0.027</b>
<b>#3- 802.11a</b>	<b>0.03070</b>	<b>1.000</b>	<b>3.070</b>
<b>Total</b>			<b>99.817</b>

Note: As the 802.11a mode is the worst case mode it was used for this calculation

From the above table the MC9090 meets the MPE requirements at a minimum of 21.2cm separation from the user for a mobile device. The user manual for this device must contain a statement requiring at least this separation distance.