

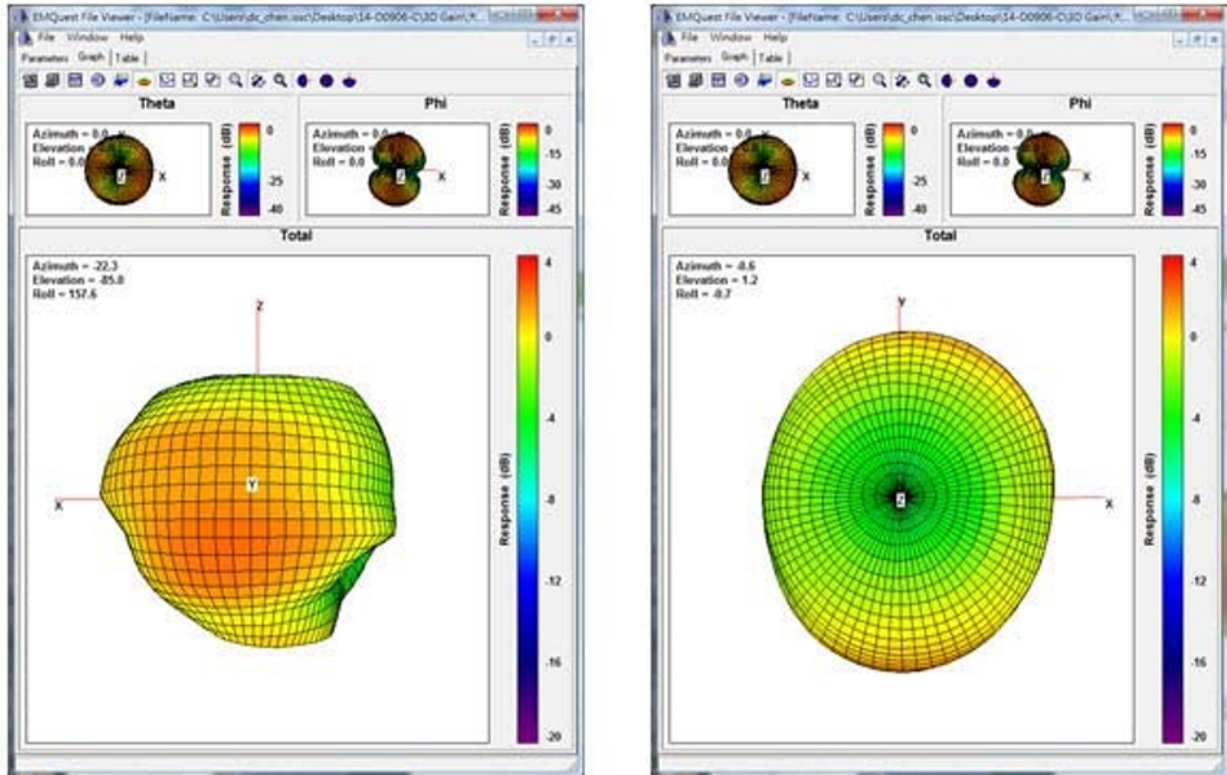
## 7. PCB Antenna Information

The BM83 module is integrated with a PCB antenna. This chapter provides the radiation pattern, its orientation, and characteristics.

### 7.1 Antenna Radiation Pattern

The following figure illustrates the 3D radiation pattern of the PCB antenna at 2438 MHz.

Figure 7-1. PCB Antenna 3D Radiation Pattern At 2438 MHz<sup>(1)</sup>



1. The preceding figure illustrates the typical radiation pattern with BM83 module on the 45 mm x 45 mm BM83 Carrier Board.

The following figure illustrates the module orientation for antenna radiation pattern.

**Figure 7-2. Module Orientation for Radiation Pattern**

**Elevation Cut (Phi Axis = 90°)**

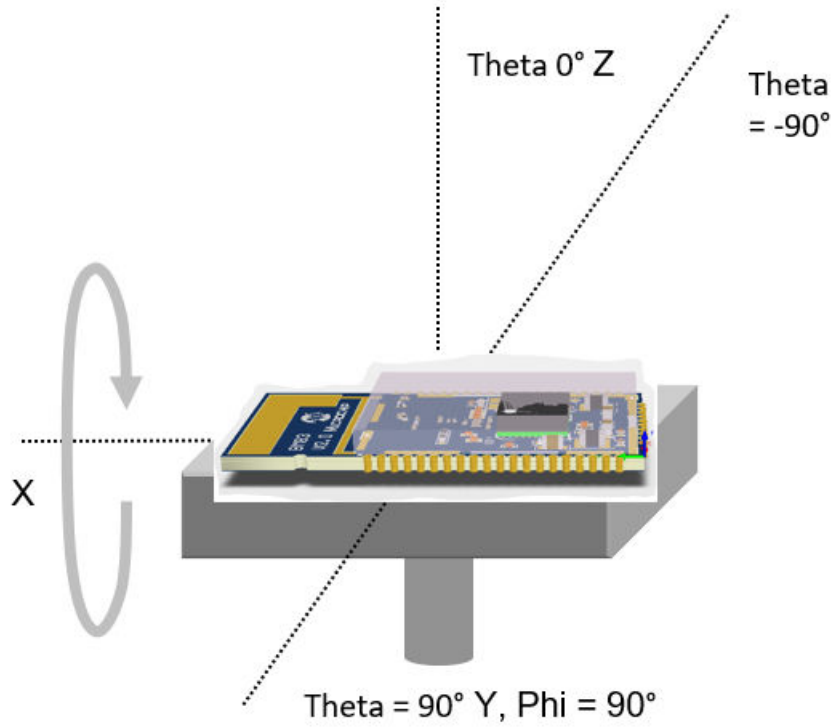
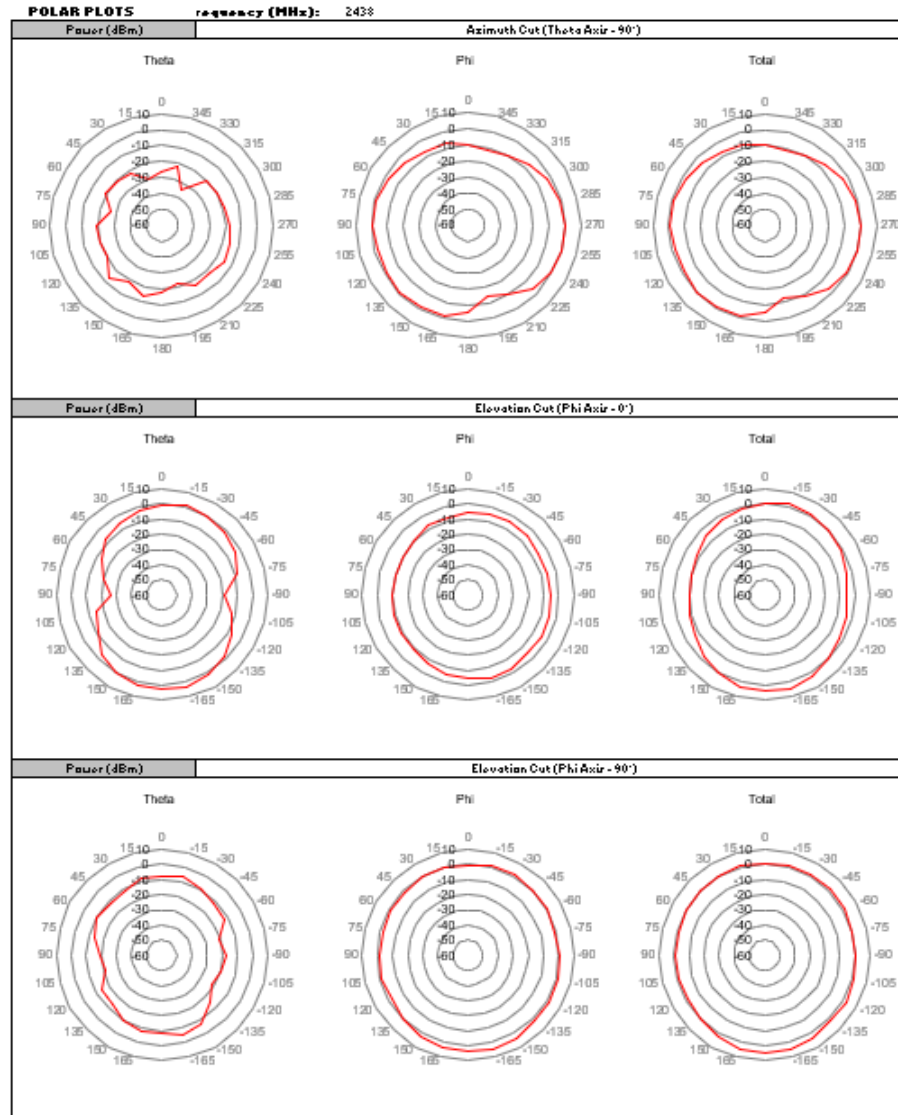


Figure 7-3. Polar Plots<sup>(1)</sup>



1. The preceding figure illustrates the typical radiation pattern with BM83 module on the 45 mm x 45 mm BM83 Carrier Board.

The following table provides the characteristics of PCB antenna with BM83 Module mounted on BM83 Carrier Board, plugged into BM83 EVB.

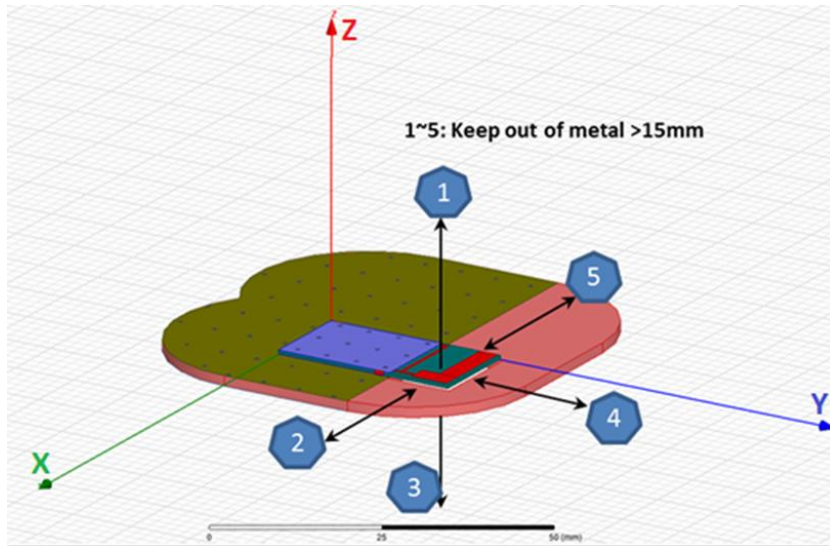
**Table 7-1. BM83 PCB Antenna Characteristics**

Parameter	Value
Frequency	2400 MHz to 2480 MHz
Peak Gain	3.5 dBi
Efficiency	80%

## 7.2 Module Placement Guidelines

For a Bluetooth-enabled product, the antenna placement affects the overall performance of the system. The antenna requires free space to radiate RF signals and it must not be surrounded by the ground plane. It is recommended that the areas underneath the antenna on the host PCB must not contain copper on the top, inner, or bottom layers, as illustrated in the following figure.

Figure 7-4. Recommended Keep-out Area for PCB Antenna



A low-impedance ground plane ensures the best radio performance (best range, lowest noise). The ground plane can be extended beyond the minimum recommendation as required for the main Printed Circuit Board (PCB) Electromagnetic Compatibility (EMC) noise reduction. For the best range performance, keep all external metal at least 15 mm away from the on-board PCB trace antenna.

The following figure illustrates the example of recommended placement of the BM83 module on a host board for the best RF performance.

Figure 7-5. Recommended Module Placement



The application board provides a continuous ground plane equal to or greater than the module dimension below the module PCB. Trace routing is not recommended on the application board top layer underneath the module. Bigger ground plane is recommended for better antenna range performance. The reference radiation pattern data provided above uses a BM83 Carrier Board with a dimension of 45 mm x 45 mm. The following figure illustrates the ground plane placement of BM83 module on the host board. The BM83 FCC/ISED certification requires the host board to provide a continuous ground plane with minimum size equal to the BM83 module dimension directly beneath the

module (16mmx19mm ). Provide ground plane with distributed via stitching. Avoid trace routing directly under the module. A small cut out can be provided on the host PCB below the module RF test point in order to solder pig tail SMA cable and perform conducted RF measurements.

**Figure 7-6. Ground Plane on Host Application Board**

