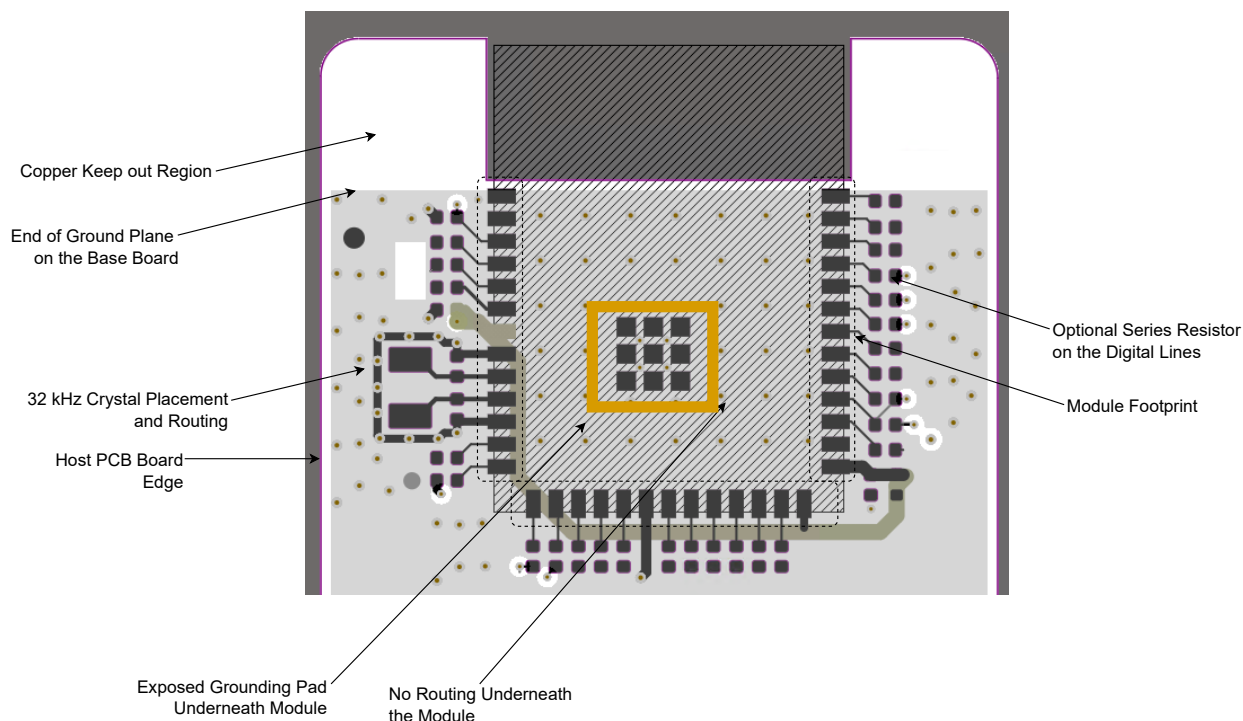


**Figure 4-12.** Example of Host Board on Top Layer



## 4.5 WBZ45 Module RF Considerations

The product design, environment and application significantly affect the overall performance of the system. The product designer must ensure system-level shielding (if required) and verify the performance of the product features and applications.

The following are the guidelines to consider for optimal RF performance:

- Position the WBZ45 module in a noise-free RF environment; keep it far away from high-frequency clock signals and any other sources of RF energy.
- Do not shield the antenna by any metal objects.
- The power supply must be clean and noise-free.
- Ensure that the width of the traces routed to GND, VDD rails are sufficiently large for handling peak TX current consumption.

**Note:** The WBZ45 module includes RF shielding on top of the board as a standard feature.

### WBZ451H RF Specifications

The 48-pin QFN LPA/MPA is combined with the external FEM design to achieve +20 dBm output power. The WBZ451H module has the matching network for doing a combined match of the LPA and MPA path along with a harmonic filter followed by an antenna-matching circuit and an antenna.

## 4.6 WBZ45 Module Antenna Considerations

### 4.6.1 PCB Antenna

For the WBZ45 module, the PCB antenna is fabricated on the top copper layer and covered in a solder mask. The layers below the antenna do not have copper trace. It is recommended to mount the module on the edge of the host board. Ensure there is no PCB material below the antenna structure of the module and no copper traces or planes on the host board in that area.

The following table lists the technical specification of the PCB antenna when tested with the WBZ45 module mounted on an evaluation board.

**Table 4-2.** PCB Antenna Specification for WBZ450 Module

| Parameter           | Specification        |
|---------------------|----------------------|
| Operating frequency | 2400 to 2480 MHz     |
| Peak gain           | 4.14 dBi at 2440 MHz |
| Efficiency          | 50%                  |

**Table 4-3.** PCB Antenna Specification for WBZ451 Module

| Parameter           | Specification        |
|---------------------|----------------------|
| Operating frequency | 2400 to 2480 MHz     |
| Peak gain           | 2.36 dBi at 2420 MHz |
| Efficiency          | 50%                  |

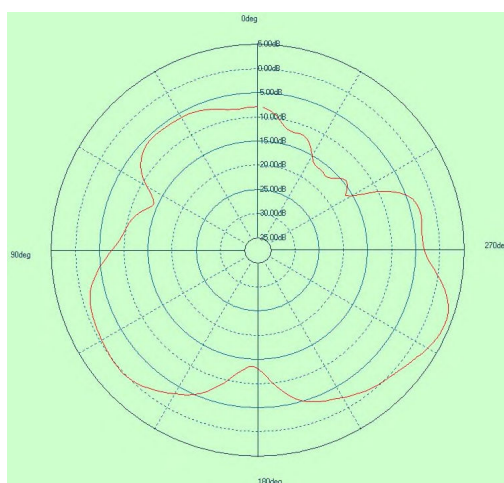
**Table 4-4.** PCB Antenna Specification for WBZ451H Module

| Parameter           | Specification        |
|---------------------|----------------------|
| Operating frequency | 2400 to 2480 MHz     |
| Peak gain           | 4.08 dBi at 2440 MHz |
| Efficiency          | 57%                  |

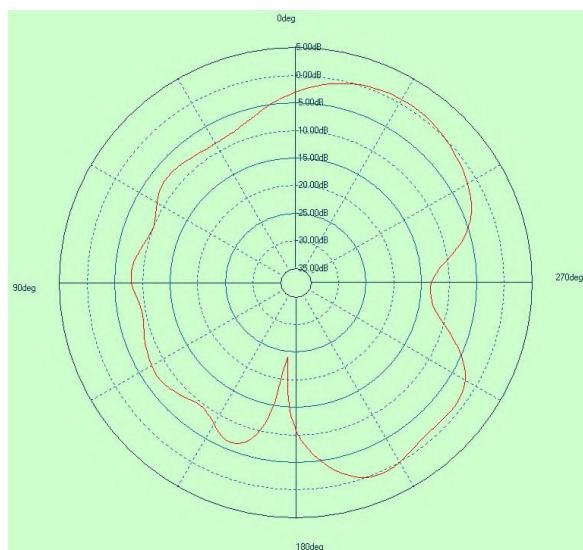
### PCB Antenna Radiation Pattern

The following figures illustrate the antenna radiation patterns for WBZ450 and WBZ451 modules.

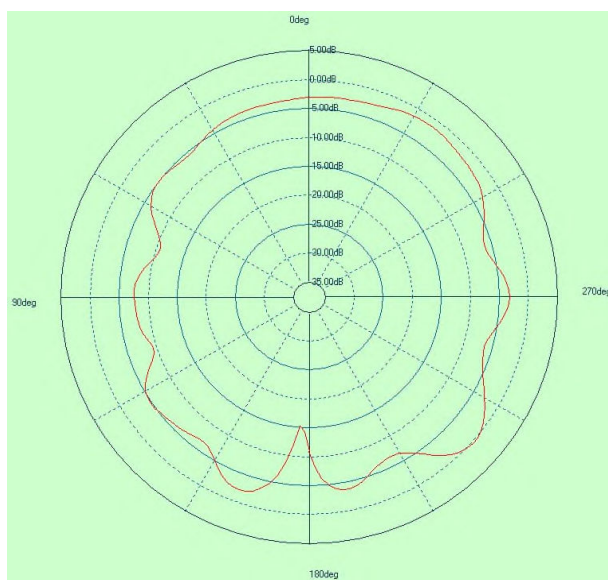
**Figure 4-13.** WBZ450 Antenna Radiation Pattern when  $\Phi = 0^\circ$



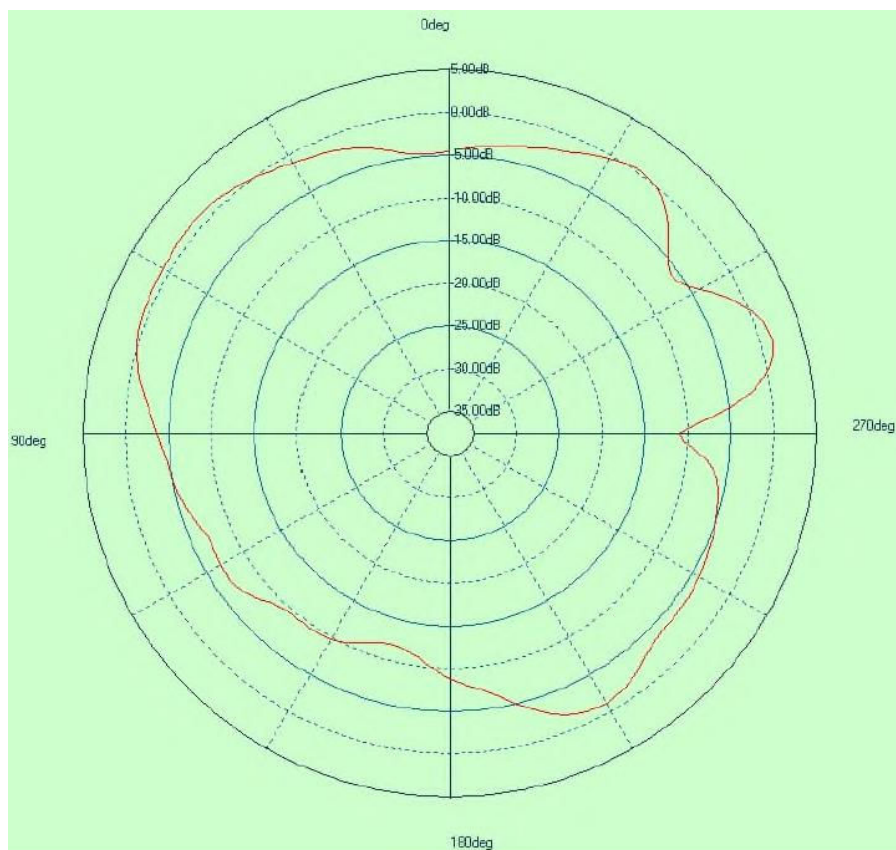
**Figure 4-14.** WBZ450 Antenna Radiation Pattern when  $\Phi = 90^\circ$



**Figure 4-15.** WBZ450 Antenna Radiation Pattern when  $\Theta = 90^\circ$



**Figure 4-16.** WBZ451 Antenna Radiation Pattern when  $\Phi = 0^\circ$



**Figure 4-17.** WBZ451 Antenna Radiation Pattern when  $\Phi = 90^\circ$

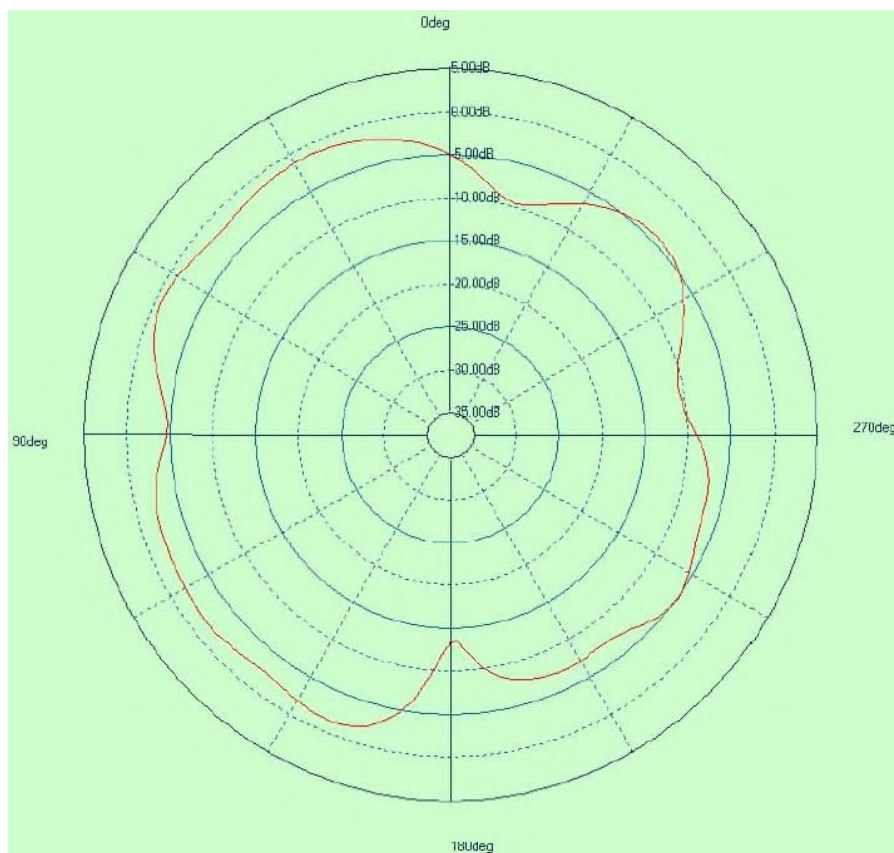


Figure 4-18. WBZ451 Antenna Radiation Pattern when Theta = 90°

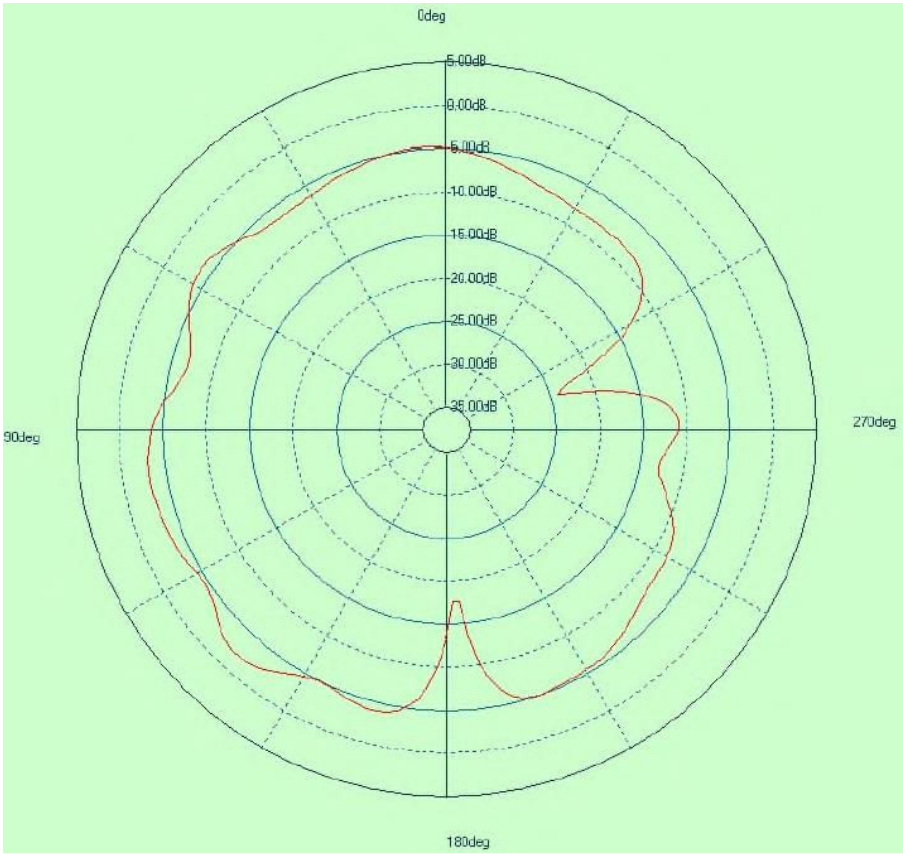


Figure 4-19. WBZ451H Antenna Radiation Pattern when Phi = 0°

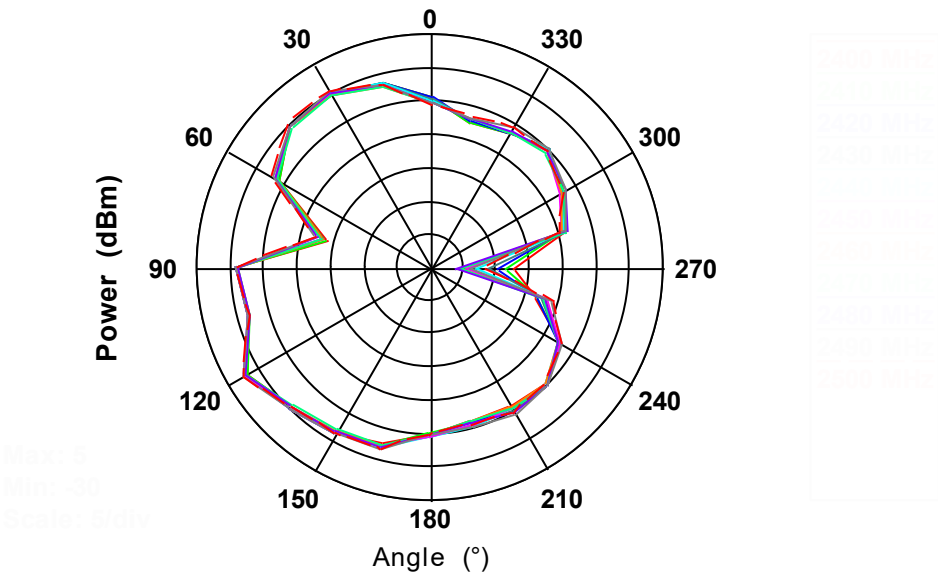




Figure 4-20. WBZ451H Antenna Radiation Pattern when  $\Phi = 90^\circ$

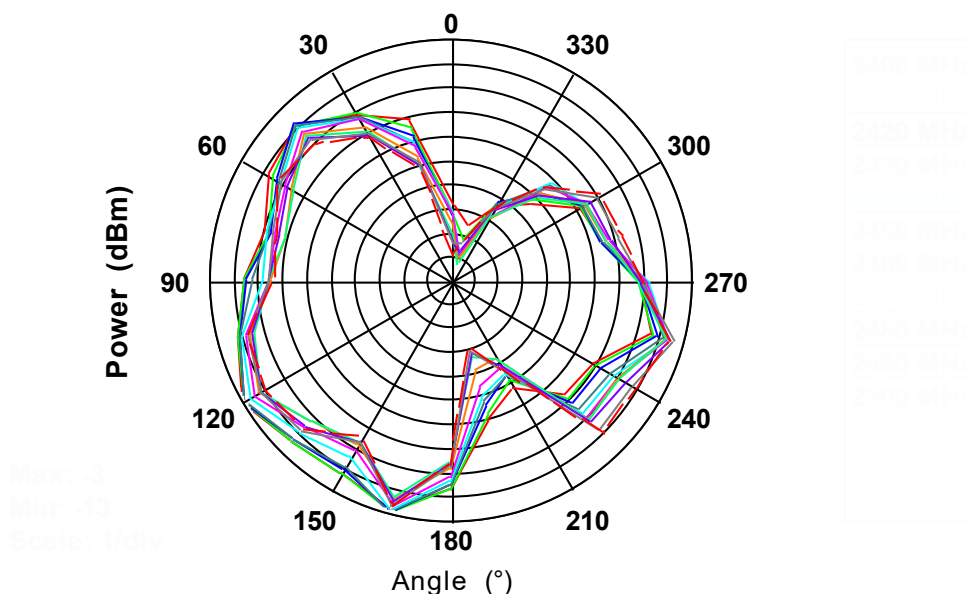
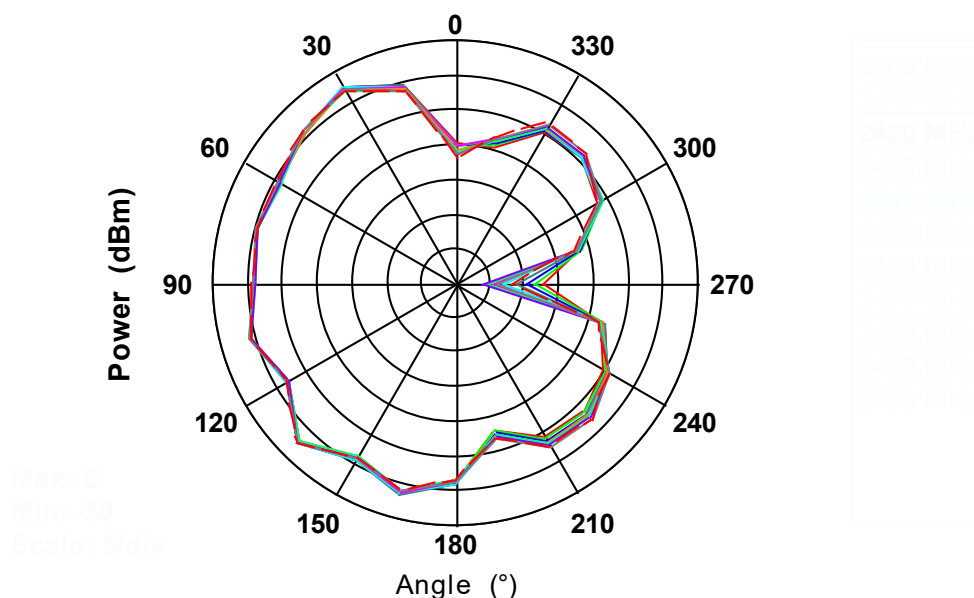


Figure 4-21. WBZ451H Antenna Radiation Pattern when  $\Theta = 90^\circ$



#### 4.6.2 External Antenna Placement Recommendations

The following recommendations must be applied for the placement of the antenna and its cable:

- The antenna cable must not be routed over circuits generating electrical noise on the host board or alongside or underneath the module. It is preferred that the cable is routed straight out of the module.
- The antenna must not be placed in direct contact or in close proximity of the plastic casing/objects (except when the selected antenna specifically recommends it).
- Do not enclose the antenna within a metal shield.