

## Designing Printed Antennas for Bluetooth® Low Energy

### 5.1 Full Size Printed IFA, 1 mm Substrate

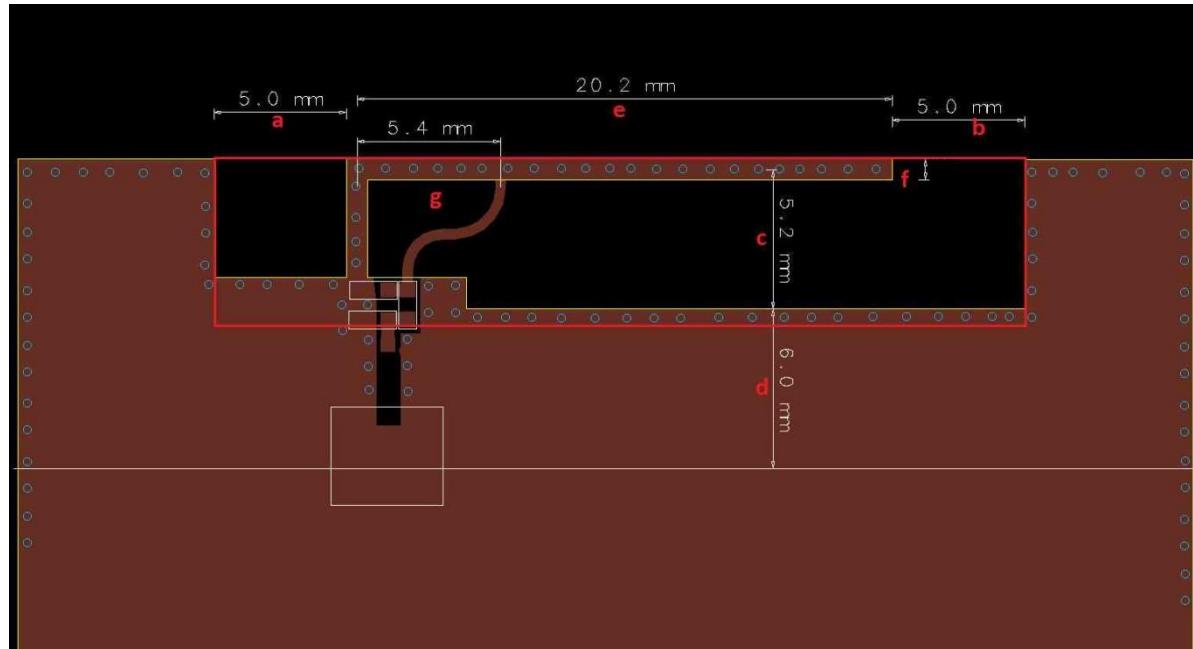


Figure 3: Full Size IFA with Dimensions

The red outline indicates the antenna footprint, i.e. required allocation of PCB space. The antenna footprint is available on request in DXF format.

Legend (see Figure 3):

- a. Clearance between antenna arm and GND plane left.
- b. Clearance between antenna arm and GND plane right.
  - i. For narrow PCBs (a) and (b) will coincide with board edges.
  - ii. The two GND pieces left and right of the antenna are NOT required for correct antenna operation.
- c. Clearance between antenna arm and GND plane below.
- d. Minimum GND plane size required for correct operation of the antenna.
- e. Antenna width.
  - i. The antenna is implemented on top and bottom layers and stitched together using vias.
  - ii. The feeding line (from indicated matching components) is implemented on top layer only.
- f. Antenna trace width (0.6 mm).
- g. Feed point position.

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### 5.1.1 Matching Network

The matching is subject to change depending on substrate type or thickness and enclosure material (type and proximity to PCB).

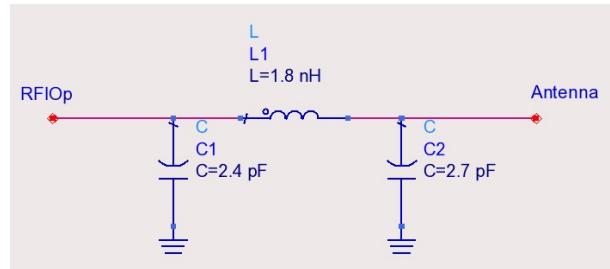


Figure 4: Matching Components, Full Size IFA

- C1: 2.4 pF, 0402, GRM15 series, Murata
- L1: 1.8 nH, 0402, LQP series, Murata
- C2: 2.7 pF, 0402, GRM15 series, Murata
- *In addition to the matching network, a 3.3 nH or 3.9 nH coil (depending on the DA1458x package) is required close to the RFIOp pin.*

### 5.1.2 Measured Return Loss

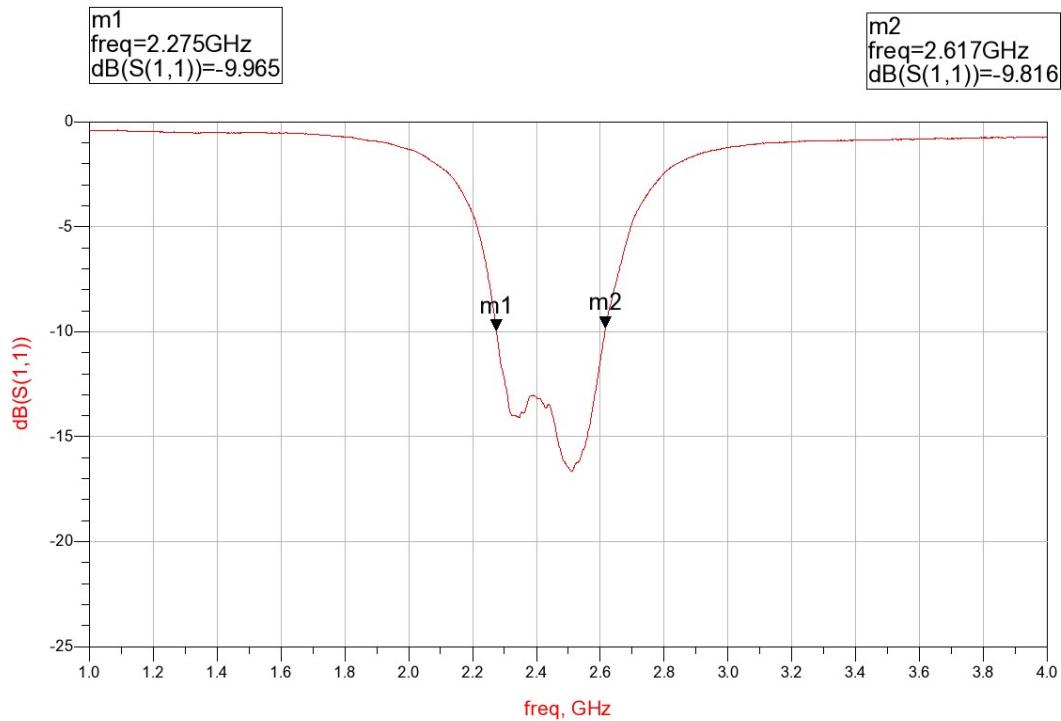


Figure 5: Measured S11, Full Size IFA

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### 5.1.3 Measured Radiation Pattern

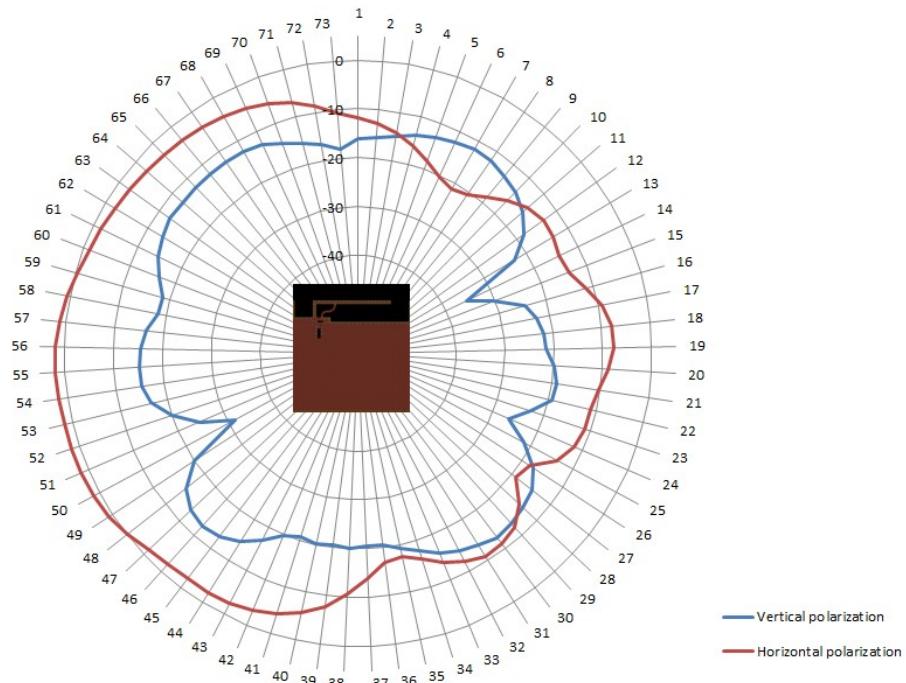


Figure 6: Radiation Pattern, PCB Horizontal, Full Size IFA

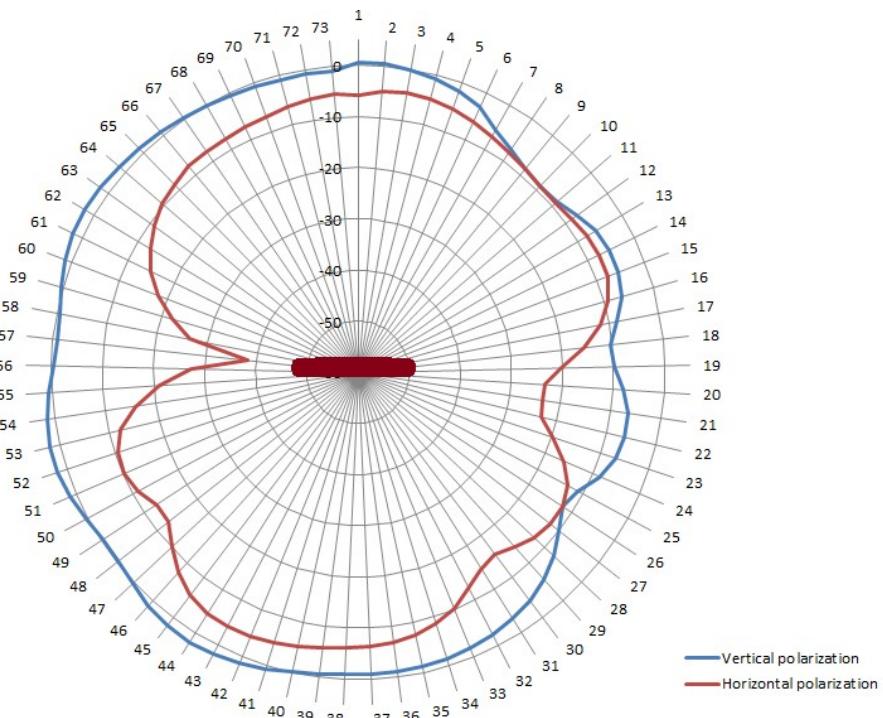


Figure 7: Radiation Pattern, PCB Vertical, Full Size IFA