Small Size 2.4 GHz PCB ANTENNA

technical data sheet

PCB antenna-2.4GHz

Model	PCB antenna-2.4GHz
Antenna Size	15.2 X 5.7mm
LOS range	240 m
Gain	4.0dBi
Frequency	2400-2505MHz

1 INTRODUCTION

The PCB antenna used on the USB dongle reference design is described in this application note. Even if the antenna presented is for a USB dongle design it can be used in all 2.4 GHz designs, especially where small space is required for the antenna.

This application note describes the antenna dimensions, the RF performance and considerations for complying with regulatory limits when using this design.

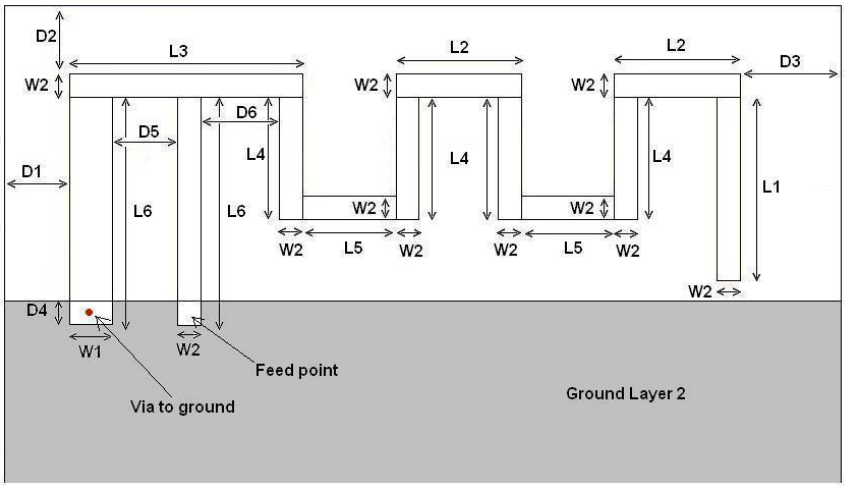
The suggested antenna design requires no more than 15.2 x 5.7 mm of space and ensures a VSWR ratio of less than 2 across the 2.4 GHz ISM band when connected to a 50 ohm source.

2 ANTENNA DESIGN

The PCB antenna on the USB dongle reference design is a meandered Inverted F Antenna (IFA). The IFA was designed to match an impedance of 50 ohm at 2.45 GHz. Thus no additional matching components are necessary.

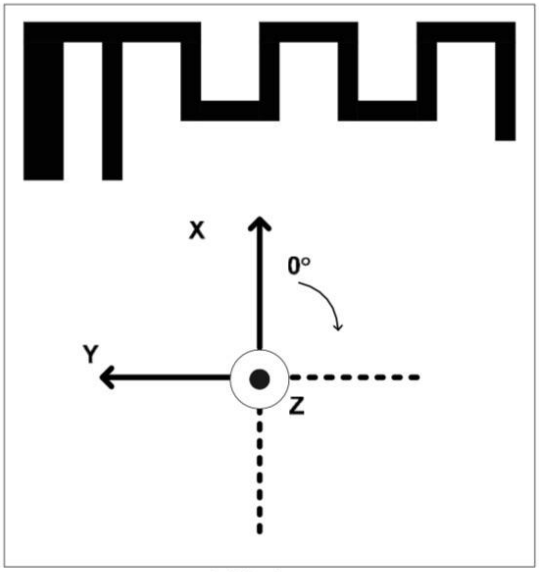
The reflection at the feed point of the antenna determines how much of the applied power is delivered to the antenna. A reflection of less than -10 dB across the 2.4 GHz ISM band, when connected to a 50 ohm source, was a design goal. Reflection of less than -10 dB, or VSWR less than 2, ensures that more than 90% of the available power is delivered to the antenna. Bandwidth is in this document defined as the frequency band where more than 90% of the available power is delivered to the antenna. Another design goal was to fit the size of the PCB antenna on a USB dongle and to obtain good performance also when the dongle is connected to a computer.

3 MECHANICAL DRAWING

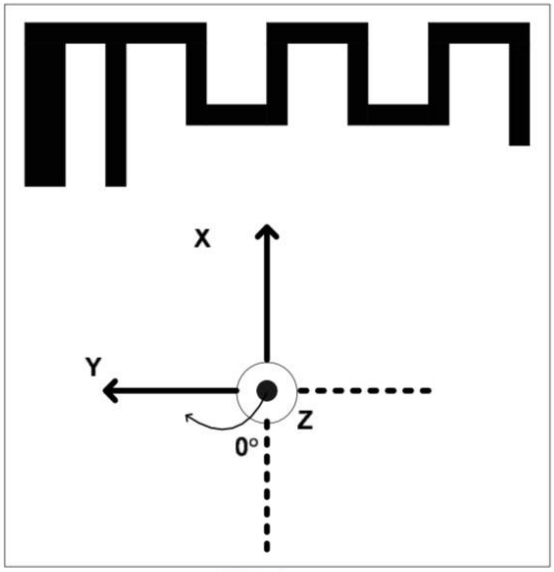


L1	3.94mm	L2	2.70mm
L3	5.00mm	L4	2.64mm
L5	2.00mm	L6	4.90mm
W1	0.90mm	W2	0.50mm
D1	0.50mm	D2	0.30mm
D3	0.30mm	D4	0.50mm
D5	1.40mm	D6	1.70mm

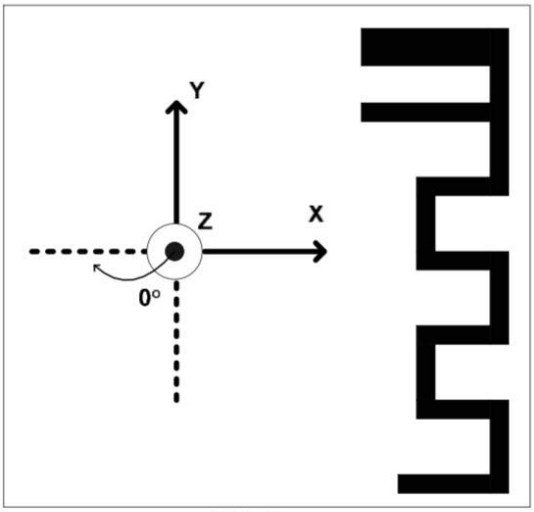
4 TEST RESULTS



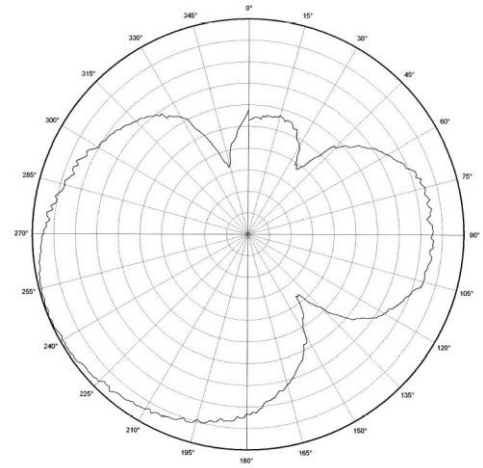
XY plane



YZ plane

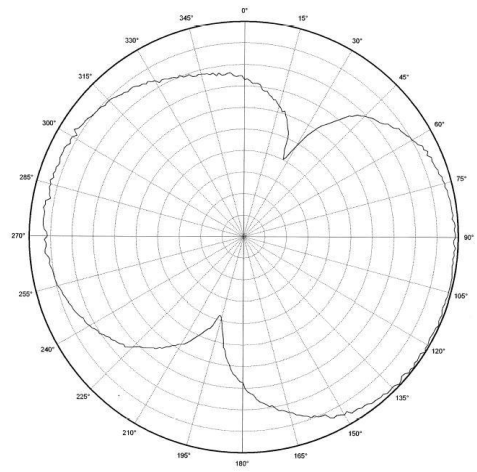


XZ plane



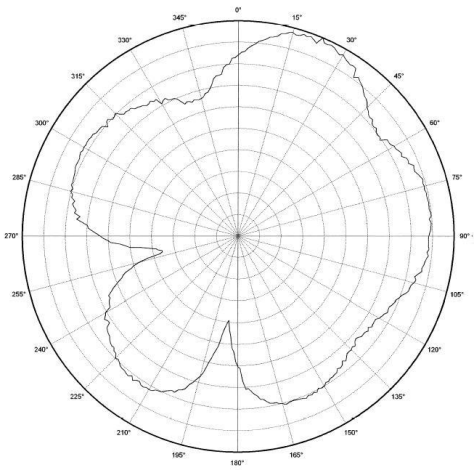
Vertical Polarization
usb XY

CF 2450.000 MHz
4 dB/ div
Ref Lev: -2.5 dBm



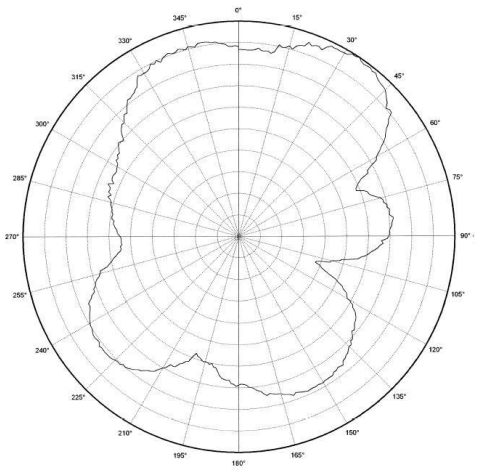
Horisontal Polarization
usb XY

CF 2450.000 MHz
5 dB/ div
Ref Lev: 4.5 dBm



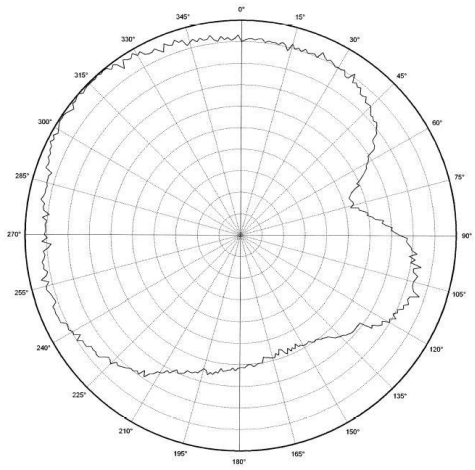
Vertical Polarization
usb XZ

CF 2450.000 MHz
4 dB/ div
Ref Lev: 2.2 dBm



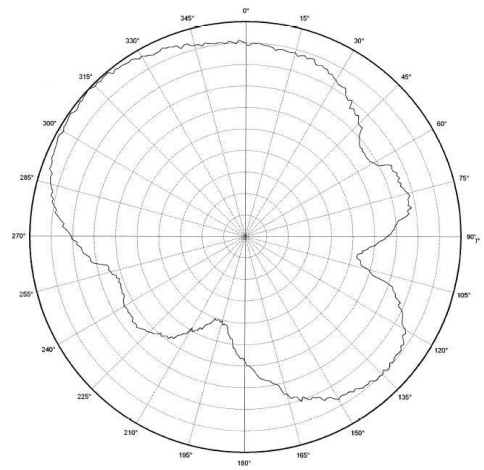
Horisontal Polarization
usb XZ

CF 2450.000 MHz
4 dB/ div
Ref Lev: 5.3 dBm



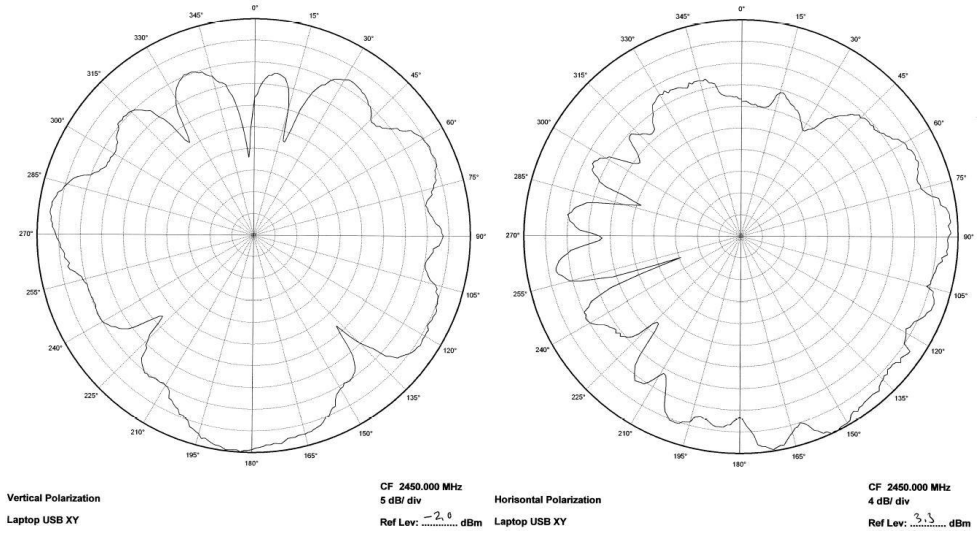
Vertical Polarization
usb YZ

CF 2450.000 MHz
2 dB/ div
Ref Lev: +5.3 dBm



Horisontal Polarization
usb YZ

CF 2450.000 MHz
3 dB/ div
Ref Lev: -1.2 dBm



EFFICENCY/GAIN TEST

No.	Frequency(MHz)	Efficiency(%)	Gain(dBi)
01	2400	65.02	4.00
02	2415	53.94	3.11
03	2430	57.52	3.62
04	2445	59.16	3.83
05	2460	57.59	3.64
06	2475	61.52	3.96
07	2490	56.57	3.52
08	2505	54.80	3.27

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