

|          |                                 |             |         |
|----------|---------------------------------|-------------|---------|
| WITHINGS | BCM9Fractal 2.4 GHz PCB Antenna |             |         |
|          | Antenna Specification           |             |         |
|          | CD:20220928                     | MD:20240625 | Ver: 05 |

# BCM9Fractal Antenna Specification

|            |                                                          |
|------------|----------------------------------------------------------|
| Subject    | Broadcom BCM9Fractal 2.4 GHz PCB Antenna for Withings    |
| Type       | Specification                                            |
| Written by | Victor Ting                                              |
| Diffusion  | Withings, Manufacturing Subcontractor, Certification Lab |

## I Revision History

- V05 - 20240625
- Added manufacturer address to table on page 2.
  - Added construction information on page 2.
  - Corrected page headers.
- V04
- Added more dimensions on Figure 1, antenna feed line length and width on page 3.
- V03
- Removed "Confidential" note on page footer.
  - Added "MAY BE MADE PUBLIC FOR THE PURPOSES OF CERTIFICATION" on page 3.
- v02
- Added "Manufacturer" column on page 2 and added "Withings"
- v01

|                                                             |                                                                                    |
|-------------------------------------------------------------|------------------------------------------------------------------------------------|
| 2 rue Maurice Hartmann -- 92130 Issy-les-Moulineaux, FRANCE | No communication, reproduction or use without prior written approval from Withings |
| Withings                                                    |                                                                                    |

|          |                                 |             |         |
|----------|---------------------------------|-------------|---------|
| WITHINGS | BCM9Fractal 2.4 GHz PCB Antenna |             |         |
|          | Antenna Specification           |             |         |
|          | CD:20220928                     | MD:20240625 | Ver: 05 |

- Initial version

## II Purpose

This document describes the design and gain characteristics of the BCM9Fractal 2.4 GHz PCB antenna provided to Withings by Broadcom.

## III Confidentiality

The gain information contained in this document may be made public for purposes of certification.

## IV Features

- Compact design
- 2.4 to 2.5 GHz operation
- 802.11b/g/n and Bluetooth applications
- VSWR better than 2:1
- Efficiency > 72%

## V General Description

This compact high efficiency PCB antenna has been optimized for use on small form factor boards and modules using Broadcom 802.11b/g/n WLAN chipsets. It offers a good radiation pattern in all 3 planes, together with high efficiency. This design is provided to Withings under NDA and can be easily incorporated into the layouts of various types of PCB design.

## VI Antenna Gain Details

| Type | Brand    | Manufacturer | Address                                                       | Model       | Max Antenna Gain (dBi) | Connector |
|------|----------|--------------|---------------------------------------------------------------|-------------|------------------------|-----------|
| PCB  | Broadcom | Withings     | 2 rue Maurice Hartmann<br>92130 Issy-les-Moulineaux<br>FRANCE | BCM9Fractal | 2.8                    | N/A       |

## VII Construction

The construction of the PCB antenna is based on the following parameters:

**Dielectric constant:** 3.99  
**Impedance:** 50 ohm  
**Thickness:** 35 um

The following figure shows the design of the antenna to be implemented on the PCB.

|                                                                             |                                                                                    |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| 2 rue Maurice Hartmann -- 92130 Issy-les-Moulineaux, FRANCE<br><br>Withings | No communication, reproduction or use without prior written approval from Withings |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------|

|          |                                 |             |         |
|----------|---------------------------------|-------------|---------|
| WITHINGS | BCM9Fractal 2.4 GHz PCB Antenna |             |         |
|          | Antenna Specification           |             |         |
|          | CD:20220928                     | MD:20240625 | Ver: 05 |

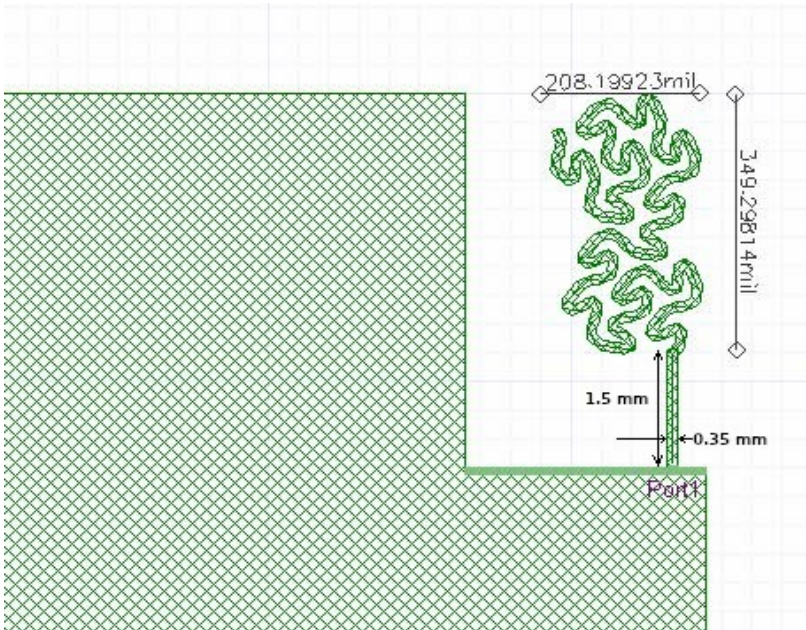


Figure 1: PCB layout design

THE FOLLOWING INFORMATION IS UNDER NDA AND MAY BE MADE PUBLIC FOR THE PURPOSES OF CERTIFICATION

VIII Measurements

The following diagram shows the orientation of the probes corresponding to the measurements made on the antenna.

|                                                             |                                                                                    |
|-------------------------------------------------------------|------------------------------------------------------------------------------------|
| 2 rue Maurice Hartmann -- 92130 Issy-les-Moulineaux, FRANCE | No communication, reproduction or use without prior written approval from Withings |
| Withings                                                    |                                                                                    |

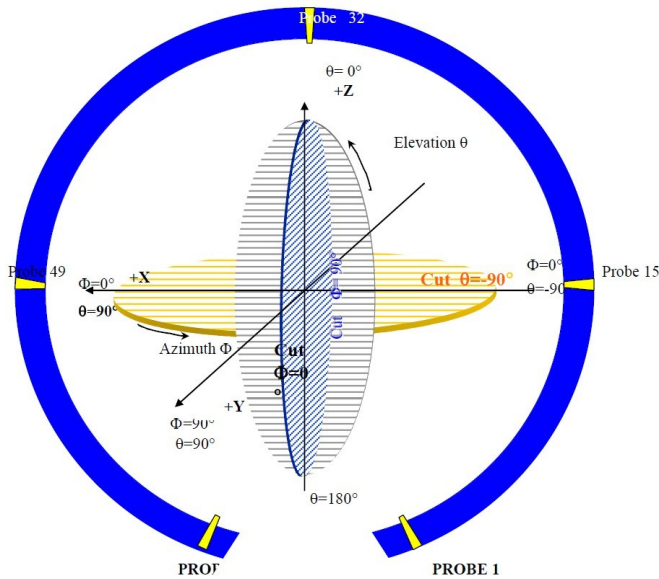


Figure 2: Measurement probe orientation

The subsequent graphs show the measurement results of the two cut planes:

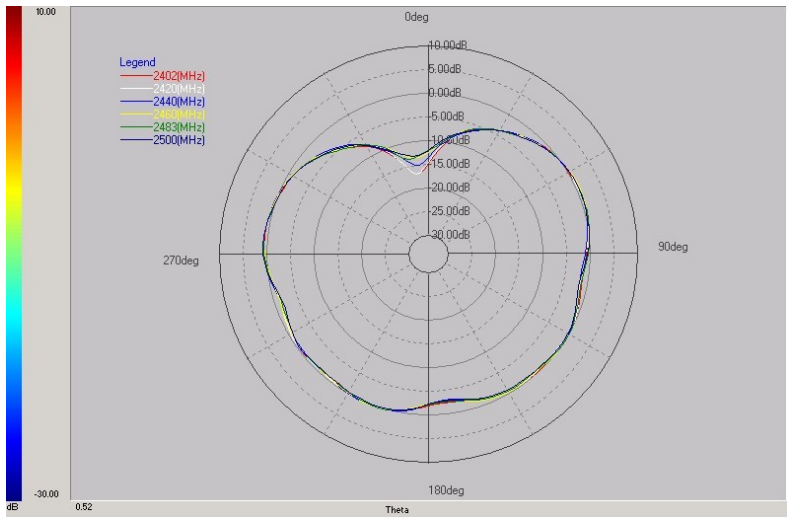


Figure 3: Plane A: Phi 0

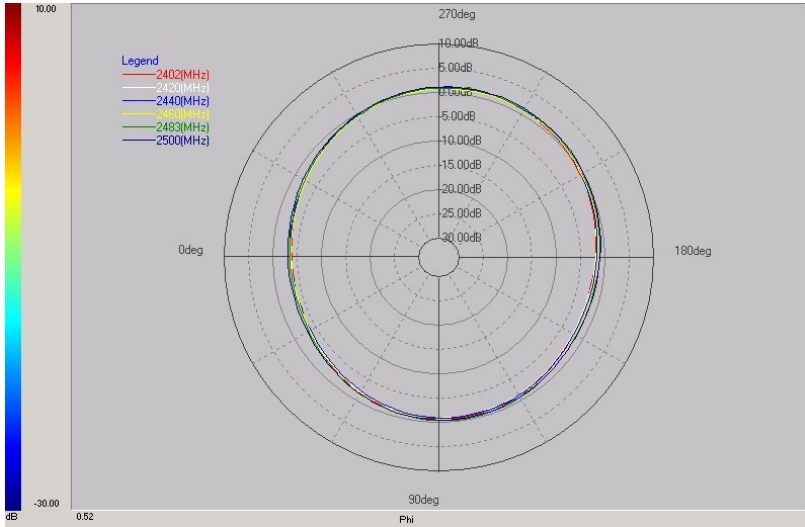


Figure 4: Plane A: Phi 90

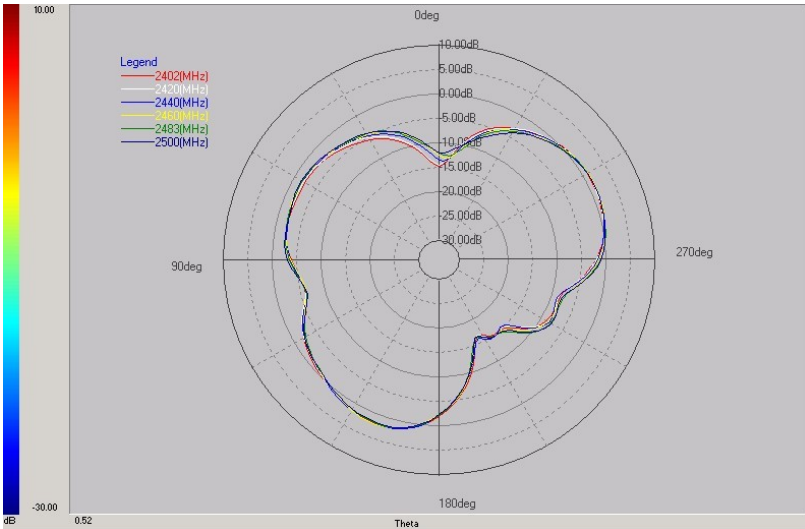


Figure 5: Plane A: Theta 90

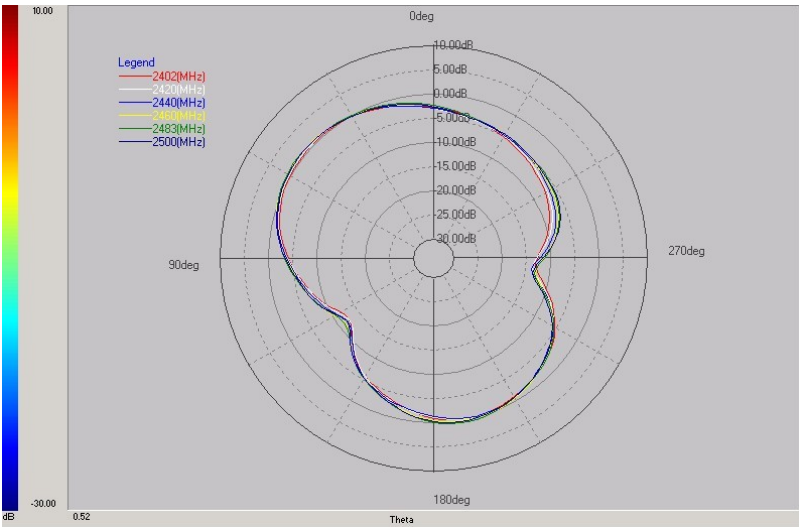


Figure 6: Plane B: Phi 0

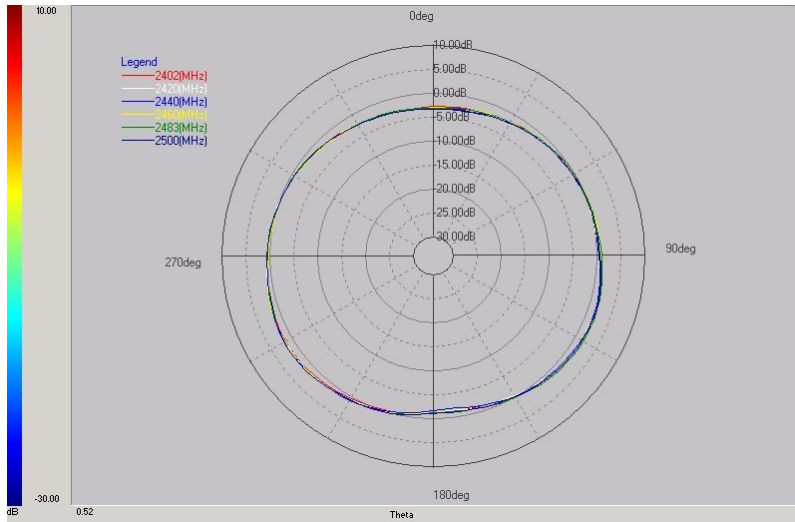


Figure 7: Plane B: Phi 90

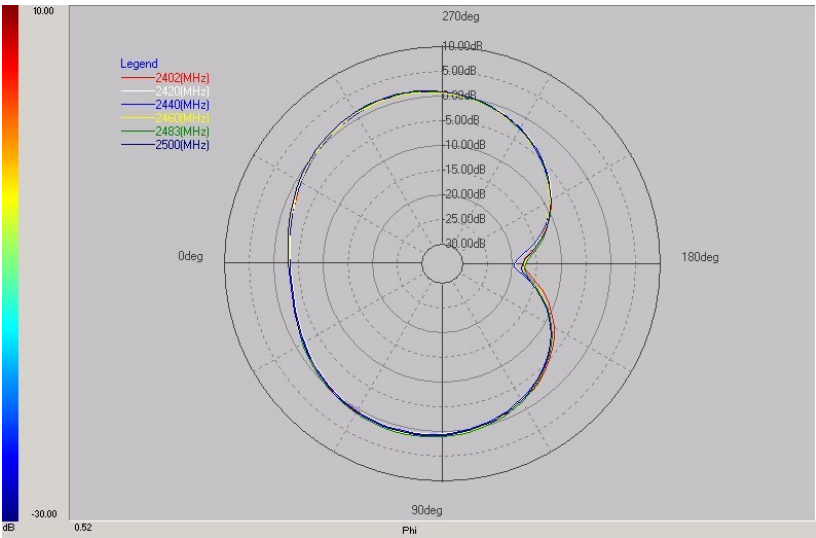


Figure 8: Plane B: Theta 90