



**EZ Connect™**  
**Zigbee™, RFID, ISM868/900**  
**Chip antenna**

**Application Note:**  
**900 MHz Automatic Meter Readers**



**Antenna Part Number:**  
**FR05-S1-R-0-105**





## TABLE OF CONTENTS

QUICK REFERENCE GUIDE	3
FEATURES AND BENEFITS	4
RECOMMENDED PCB LAYOUT	5
ACHIEVED PERFORMANCE	5
VSWR	5
ANTENNA EFFICIENCY AND GAIN	6
RADIATION PATTERNS	7

Fractus is an ISO 9001:2002 certified company  
All our antennas are lead-free and RoHS compliant

## NOTES

The products described in this document are protected worldwide by at least one of the following Patents and Patent Applications owned by Fractus: PCT/EP2005/054297; PAT. US7148850.

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### QUICK REFERENCE GUIDE


Technical features (1)	
Frequency range <sup>(2)</sup>	902-928 MHz
Radiation Efficiency	> 40%
Peak Gain	> 0 dBi
VSWR	< 2:1
Polarization	Linear
Weight	0.2 g
Temperature	-40 to + 85°C
Impedance	50Ω unbalanced
Dimensions	18x7.3x1 mm

**Notes:**

- (1) Results measured in a reference evaluation board of 121x65 mm described in the following section.
- (2) Contact your sales representative at [wireless@fractus.com](mailto:wireless@fractus.com) to obtain specific PCB configurations for the 868 MHz band



Front view



Bottom view

**18 x 7,3 x 1 mm**

For further information related to the standard features of the EZConnect™ Chip Antenna please refer to the *User Manual*. (UM\_FR05-S1-R-0-105)



## FEATURES AND BENEFITS

**Automatic Meter Readers (AMR)** are widely used devices in single family homes and buildings that provide measurements for individual consumption for water, gas and electricity. Traditionally, the reading of such metering devices has been performed by workers who take on-site readings. However, by incorporating wireless functionality into the meters allows for automatic wireless readings; eliminating the need for workers to travel from place to place physically performing meter readings. The benefits of such technical advancement are time and cost savings.

In order to improve wireless AMR in the market place, manufacturers have the following requirements:

- 1) Increase coverage areas to reduce the reading time
- 2) Increase battery life
- 3) Provide a stable link in all directions, thus minimizing potential dead spots
- 4) Reduce BoM costs
- 5) Reduce device dimensions and visual impact to avoid theft

The antenna is a critical element to enable the successful market entry for wireless AMR. Fractus' expertise in antenna design, development and manufacturing understands the challenges involved in integrating and optimising the antenna to reach the manufactures target requirements.

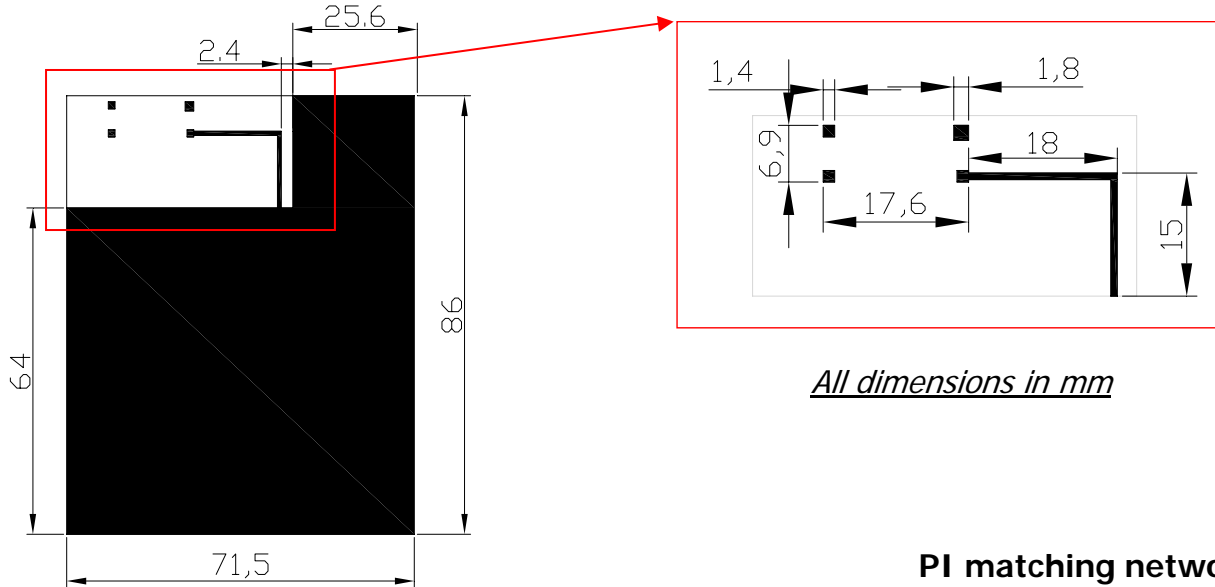
This document provides an optimal antenna configuration based on the Fractus EZConnect™ Chip Antenna FR05-S1-R-0-105. If you follow the guidelines that we explain, you will obtain:

- a) Greater radiation efficiencies and average gain which increases the range and signal quality
- b) Broadened bandwidth and improved antenna matching level, which increases battery life
- c) An omnidirectional radiation pattern that will increase signal reliability in all directions
- d) A reduction in BoM costs

In this Application Note, Fractus provides an optimum antenna configuration for **900 MHz wireless AMR**, as well as details all the steps recommended to customize the presented configuration for your specific device. In case you need the configuration to cover **868 MHz band**, please contact your sales representative at [wireless@fractus.com](mailto:wireless@fractus.com).



# RECOMMENDED PCB LAYOUT



It is recommended to place a 3-element matching network in a PI configuration in the final PCB design (please, see picture besides). This may provide more flexibility to tune the antenna in the real PCB, thus obtaining an optimal performance in the final device. Fractus can assist you to provide the network values for the final device version. Please, contact us at wireless@fractus.com.

### PI matching network

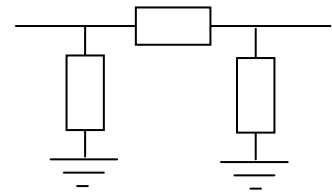
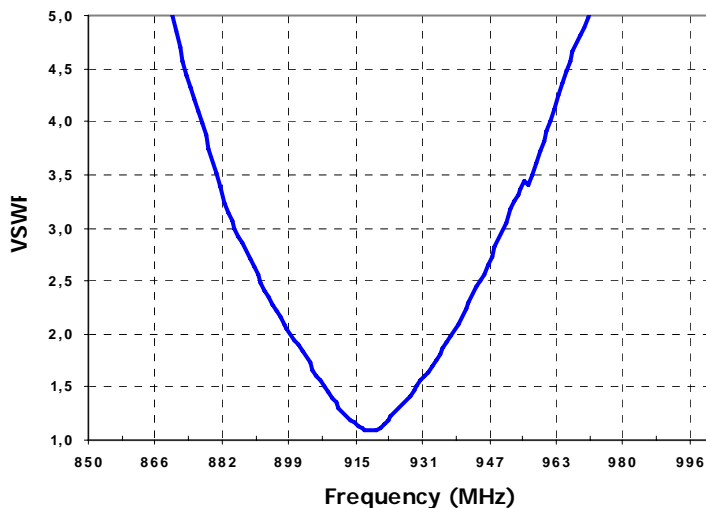


Figure 1. Recommended Layout and footprint details

# ACHIEVED PERFORMANCE

## VSWR



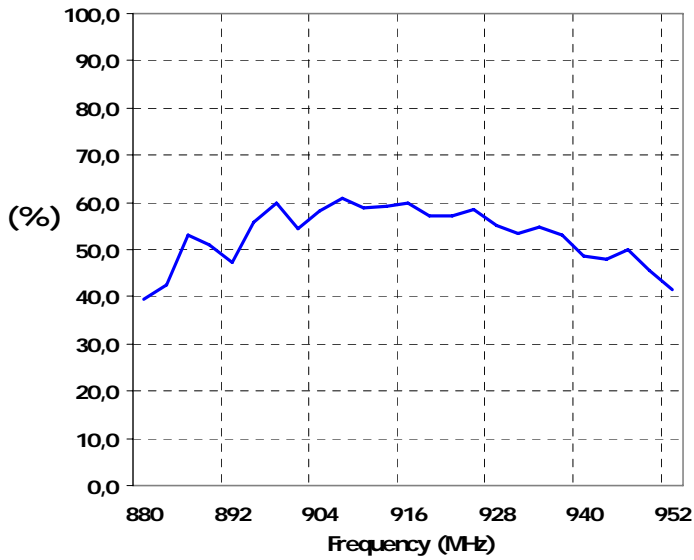
Measurement conditions:

- ABS Plastic housing
- 3 element matching network

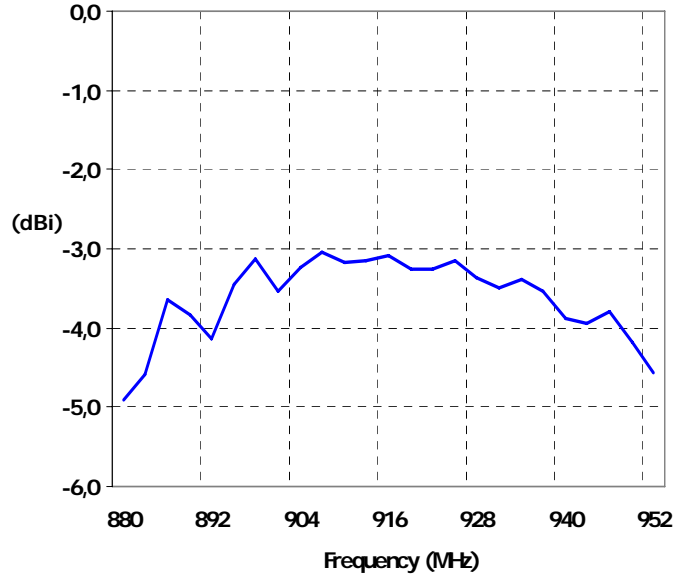


## ANTENNA EFFICIENCY AND GAIN

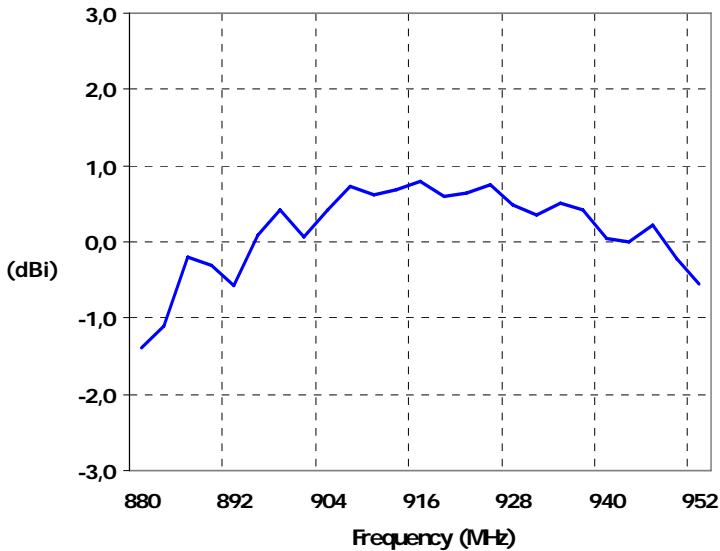
### EFFICIENCY



### AVERAGE GAIN



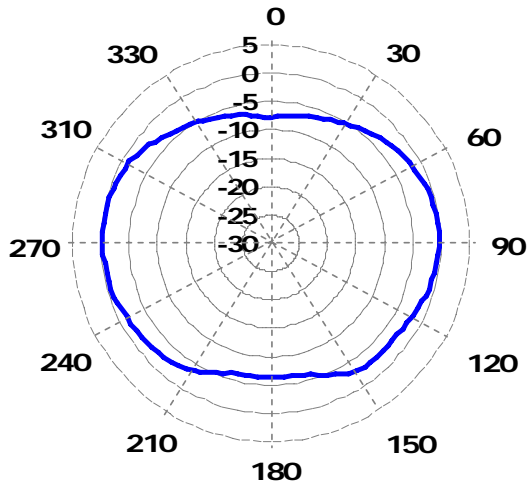
### PEAK GAIN



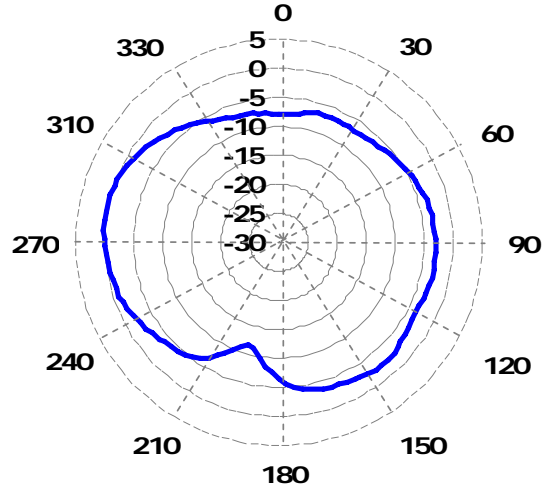
Gain	Peak Gain	0.5 dBi
	Average Gain	-3.2 dBi
Efficiency	Peak Efficiency	61 %
	Average Efficiency	58 %



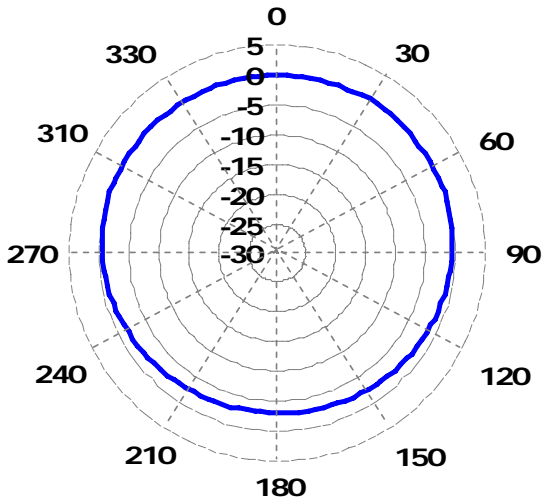
**RADIATION PATTERNS**



Azimuth Cut



cut  $\phi = 0^\circ$



cut  $\phi = 90^\circ$

