

Customization of 433 MHz Antenna for an ISM Application using Meanderline Structure

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Abstract – Innovation on ISM devices has been an interensting trend in robotics application. Antenna as a wireless interfacing part in communication between the device and another requires a specific design to fit an available space in the device. This paper explores a customized design of 433MHz antenna for an application of ISM devices. Antenna is designed by using meandeline structure theory. An antenna for the frequency has been simulated and fabricated. The design is implemented in 38mm x 110mm FR-4 PCB with thickness 1.6mm. The antenna has a maximum gain 1.1 dB and SWR 1.83 at the frequency.

Keywords: antenna, ISM, meander line, wireless communication

I. Introduction

The introduction of the 433 MHz ISM band has been a significant milestone in the development of wireless communication systems. This band is used for a variety of applications, including remote controls, garage door openers, and wireless sensors. The design of an antenna for this band is crucial for ensuring reliable communication. This paper presents a customized design of a 433 MHz antenna using a meanderline structure. The antenna is designed to fit within a 38mm x 110mm FR-4 PCB with a thickness of 1.6mm. The design is implemented and simulated, showing a maximum gain of 1.1 dB and a SWR of 1.83 at the frequency. The meanderline structure allows for a compact design while maintaining the required electrical properties.

The meanderline structure is a type of planar antenna that consists of a series of connected line segments. This structure allows for a compact design while maintaining the required electrical properties. The antenna is designed to fit within a 38mm x 110mm FR-4 PCB with a thickness of 1.6mm. The design is implemented and simulated, showing a maximum gain of 1.1 dB and a SWR of 1.83 at the frequency. The meanderline structure allows for a compact design while maintaining the required electrical properties.

II. Relevant Theories

The relevant theories for the design of the 433 MHz antenna are discussed in this section. The meanderline structure is a type of planar antenna that consists of a series of connected line segments. This structure allows for a compact design while maintaining the required electrical properties.

II.1. Antenna 433MHz

The antenna is designed for the 433 MHz frequency. The meanderline structure is used to achieve the required electrical properties. The antenna is designed to fit within a 38mm x 110mm FR-4 PCB with a thickness of 1.6mm. The design is implemented and simulated, showing a maximum gain of 1.1 dB and a SWR of 1.83 at the frequency.

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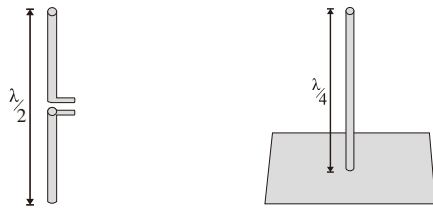


Fig 1

II.2. Meanderline Antenna

The meanderline antenna is a type of antenna that is designed to have a small physical size and a large bandwidth. It is typically used in applications where space is limited and a wide bandwidth is required. The meanderline antenna is designed to have a small physical size and a large bandwidth. It is typically used in applications where space is limited and a wide bandwidth is required. The meanderline antenna is designed to have a small physical size and a large bandwidth. It is typically used in applications where space is limited and a wide bandwidth is required.

II.3. Electrically Small Antenna

The electrically small antenna is a type of antenna that is designed to have a small physical size and a large bandwidth. It is typically used in applications where space is limited and a wide bandwidth is required. The electrically small antenna is designed to have a small physical size and a large bandwidth. It is typically used in applications where space is limited and a wide bandwidth is required. The electrically small antenna is designed to have a small physical size and a large bandwidth. It is typically used in applications where space is limited and a wide bandwidth is required.

$$ka < 1 \quad (1)$$

$$Q = \frac{1 + (ka)^2}{(ka)^3} \quad (2)$$

$$G = (ka)^2 + 2(ka) \quad (3)$$

$$BW = \frac{s-1}{Q\sqrt{s}} \quad (4)$$

The meanderline antenna is a type of antenna that is designed to have a small physical size and a large bandwidth. It is typically used in applications where space is limited and a wide bandwidth is required. The meanderline antenna is designed to have a small physical size and a large bandwidth. It is typically used in applications where space is limited and a wide bandwidth is required. The meanderline antenna is designed to have a small physical size and a large bandwidth. It is typically used in applications where space is limited and a wide bandwidth is required.

$$Z_0 = \frac{120\pi}{\sqrt{\epsilon_{eff}}} \times \frac{K(k)}{K(k')} \quad (5)$$

$$\frac{K(k)}{K(k')} \approx \begin{cases} \pi / \ln \left[2 \frac{(1 + \sqrt{k'})}{(1 - \sqrt{k'})} \right] & \text{for } 1 \leq \frac{K}{K'} \leq \infty \\ \text{and } 0 \leq k \leq \frac{1}{\sqrt{2}} \\ \frac{1}{\pi} \ln \left[2 \frac{(1 + \sqrt{k'})}{(1 - \sqrt{k'})} \right] & \text{for } 0 \leq \frac{K}{K'} \leq 1 \\ \text{and } \frac{1}{\sqrt{2}} \leq k \leq 1 \end{cases} \quad (6)$$

II.4. Standing Wave Ratio

The standing wave ratio (SWR) is a measure of the impedance mismatch between a load and a transmission line. It is typically used in applications where space is limited and a wide bandwidth is required. The standing wave ratio (SWR) is a measure of the impedance mismatch between a load and a transmission line. It is typically used in applications where space is limited and a wide bandwidth is required. The standing wave ratio (SWR) is a measure of the impedance mismatch between a load and a transmission line. It is typically used in applications where space is limited and a wide bandwidth is required.

$$\Gamma = \frac{Z_L - Z_0}{Z_L + Z_0} \quad (7)$$

$$SWR = \frac{1 + \Gamma}{1 - \Gamma} \quad (8)$$

III. Proposed Antenna Design and Research Methodology

The proposed antenna design is a meanderline antenna that is designed to have a small physical size and a large bandwidth. It is typically used in applications where space is limited and a wide bandwidth is required. The proposed antenna design is a meanderline antenna that is designed to have a small physical size and a large bandwidth. It is typically used in applications where space is limited and a wide bandwidth is required.

III.1. Antenna Design

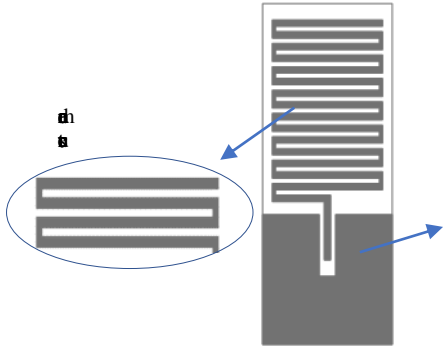


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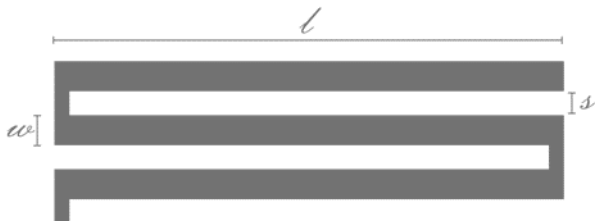


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Figs 463-4

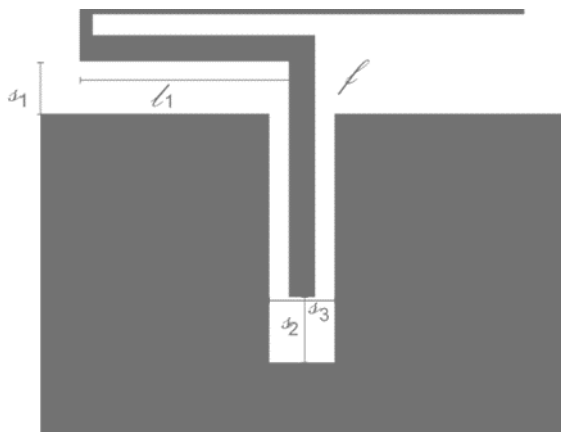


Fig. 4. β and δ and α and γ

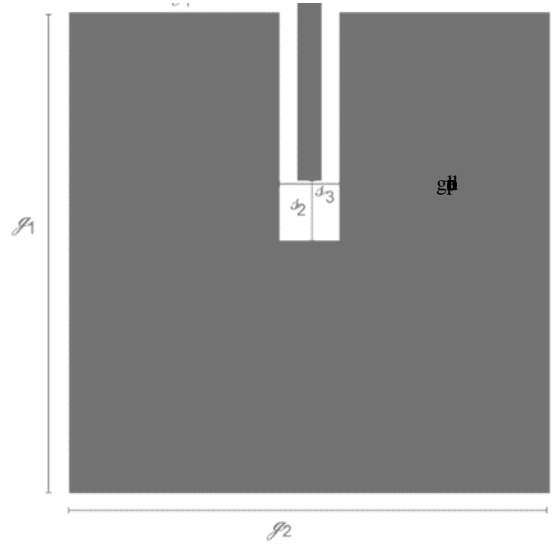
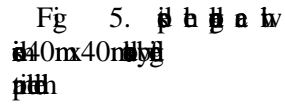
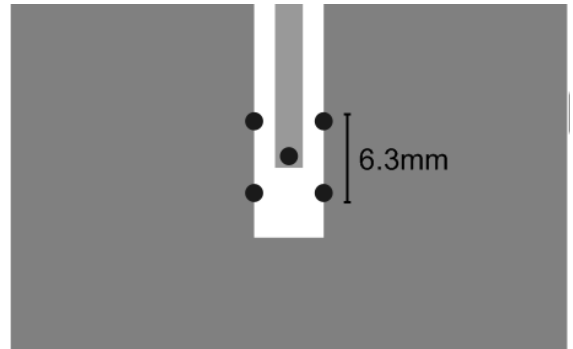


Fig. 5. ρ $\frac{d\rho}{d\tau}$ $\frac{d^2\rho}{d\tau^2}$

III.2. Antenna Port Design

Fig. 6. The effect of the concentration of the reagent on the rate of the reaction. The reaction was carried out in the presence of 0.01 M of the reagent. The reaction was carried out in the presence of 0.01 M of the reagent. The reaction was carried out in the presence of 0.01 M of the reagent.

Fig 6. ~~10~~

III.3. Simulation Setup

This 3D FEM
 (FEM) model
 is a good
 guide for
 design

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2. Hb h n
3. Hb h

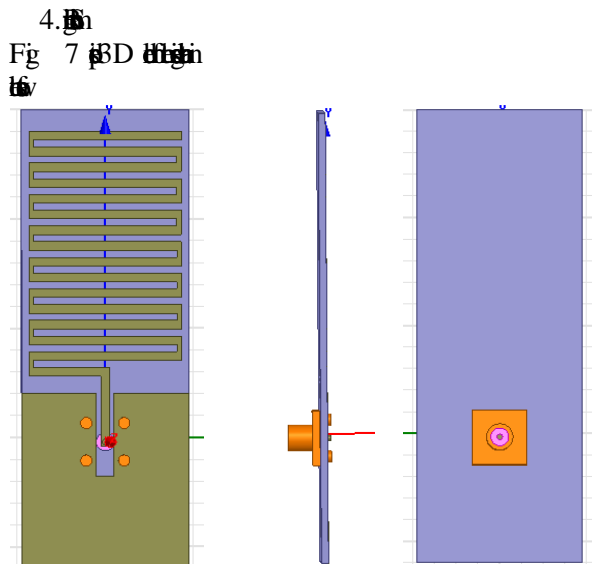


Fig 7 3D FEM

III.4. Hardware Implementation and Measurement

The antenna was fabricated on a FR-4 PCB. The dimensions of the antenna are 100 mm x 100 mm. The antenna was tested using a Vector Network Analyzer (VNA) and the results are shown in Figure 8.

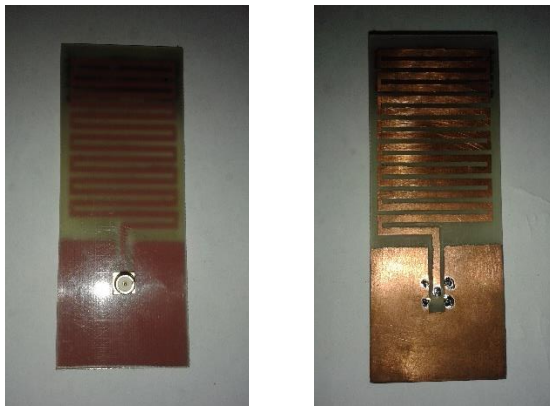


Fig 8. Ant

The antenna was tested using a Vector Network Analyzer (VNA) and the results are shown in Figure 8. The antenna was tested at a frequency of 0.43 GHz and the results are shown in Figure 9.

IV. Result and Discussion

The antenna was tested using a Vector Network Analyzer (VNA) and the results are shown in Figure 8. The antenna was tested at a frequency of 0.43 GHz and the results are shown in Figure 9.

IV.1. Antenna Gain and Radiation Pattern

The antenna gain and radiation pattern were measured using a Vector Network Analyzer (VNA) and the results are shown in Figure 9. The antenna gain was measured at a frequency of 0.43 GHz and the results are shown in Figure 9. The radiation pattern was measured at a frequency of 0.43 GHz and the results are shown in Figure 9.

Fig9 Ant

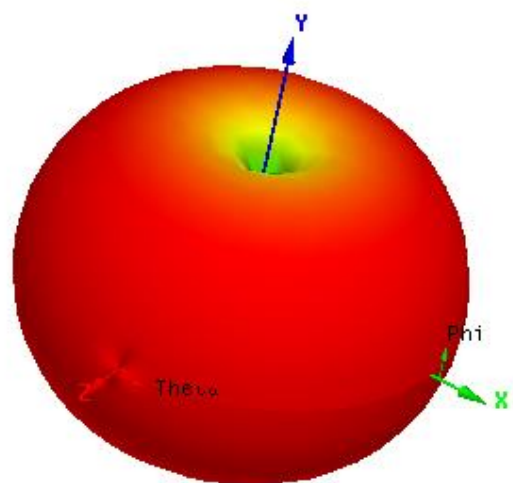
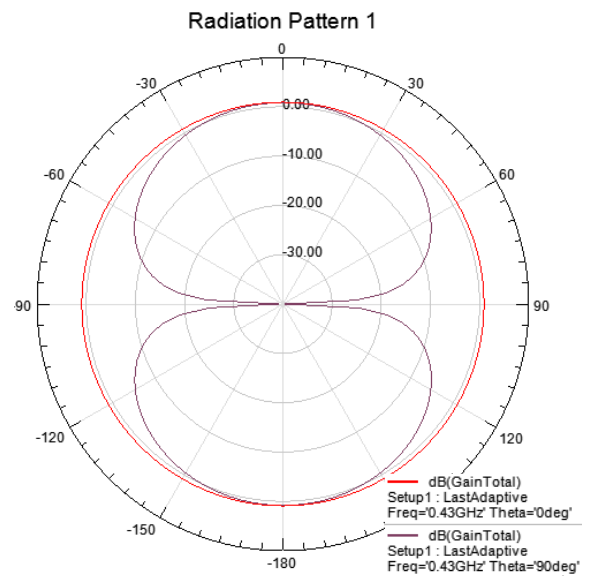


Fig . 9. Ant

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