

Design and Analysis of Circular Ring Wireless Microstrip Moisture Sensor

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Abstract— The circular ring wireless microstrip moisture sensor is designed for detecting the moisture content. The sensor is designed on CST software and used the dielectric substrate material FR-4 thickness. The circular ring wireless microstrip moisture sensor is operated at 7.5 GHz with better return loss are -30.99 dB and VSWR is 1.05. The circular ring wireless microstrip moisture sensor can be also used as a wireless sensor and detect the moisture content.

Keywords— Wireless moisture sensor, moisture content, CST, VNA

I. INTRODUCTION

Microstrip patch antenna (MPA) has become important role in many fields. In the last era, moisture is increasing in the grains and very typical to store the grains especially rice in the storage place [1]-[4]. Further it has also been used to detect the ripe fruits. Microwave sensors (MS) utilize electromagnetic field (EMF) and devices internally at operating frequencies starting from ~ 300 mega hertz (MHz) up to Tera hertz (THz) ranges. The microstrip patch antenna as a sensors are also using in the agricultural field. Microstrip patch antenna has important parameters such as real time, low cost, non-destructive, as well as detecting the moisture content continuously [5]-[6]. It can be detected the moisture content of foods, fruits, soil, wheat, rice as well as packaged packets also. Many techniques have used to detected the moisture content such as cavity technique, impedance bridge etc but due to high cost as well as large measurement setup did nor prefer by others [7]-[10].

In this paper, the circular ring antenna as a sensor will be operated on wireless moisture sensor with the help of backscatter characteristics of the microstrip antenna; it will be also operated on far field without the battery [11]-[14].

Microwaves play an ever increasing role in modern life. The electromagnetic spectrum from 300MHz to 300GHz is called the microwave spectrum [15].

II. CIRCULAR RING WIRELESS MICROSTRIP MOISTURE SENSOR

The proposed design circular ring microstrip moisture sensor analysed on CST software. The size of sensor is 12mm*12 mm as shown in given fig. 1.

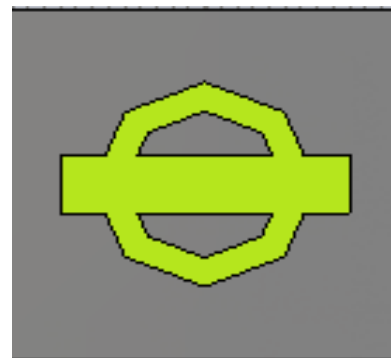


Fig. 1. Circular Ring Microstrip Moisture Sensor

It is operated at 7.5 GHz with better return loss are -30.99 dB, as shown in given fig. 2. The VSWR is 1.05 as shown in given fig. 3. For more accuracy, analysed the parameters such as smith chart, Magnitude, Phase, Axial Ratio as shown in given fig. 4 to fig. 7.

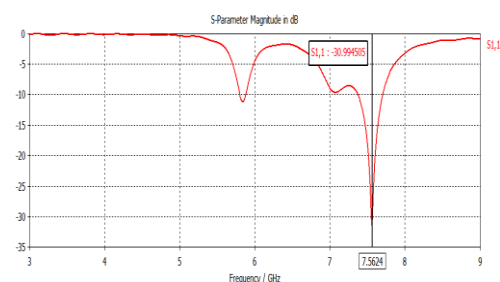


Fig. 2. Return Loss of Circular Ring Microstrip Moisture Sensor

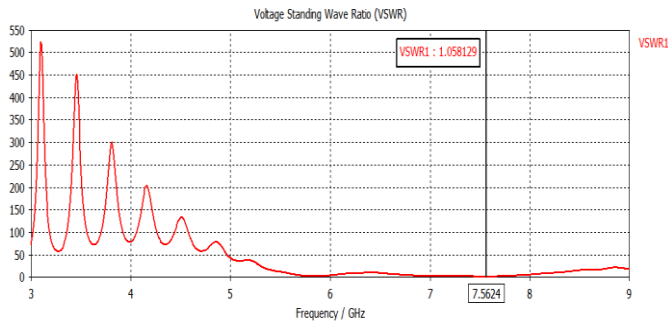


Fig. 3. VSWR of Circular Ring Microstrip Moisture Sensor

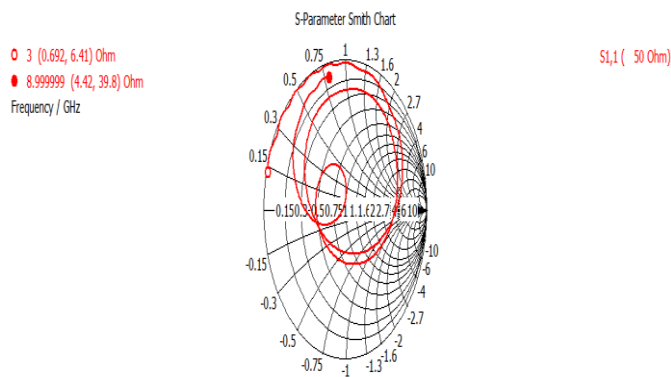


Fig. 4. Smith Chart of Circular Ring Microstrip Moisture Sensor

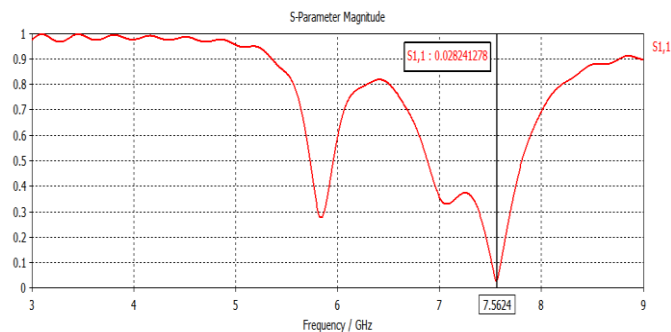


Fig. 5. Magnitude of Circular Ring Microstrip Moisture Sensor

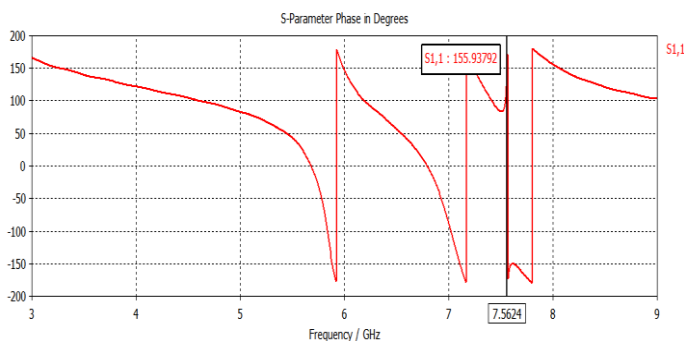


Fig. 6. Phase of Circular Ring Microstrip Moisture Sensor

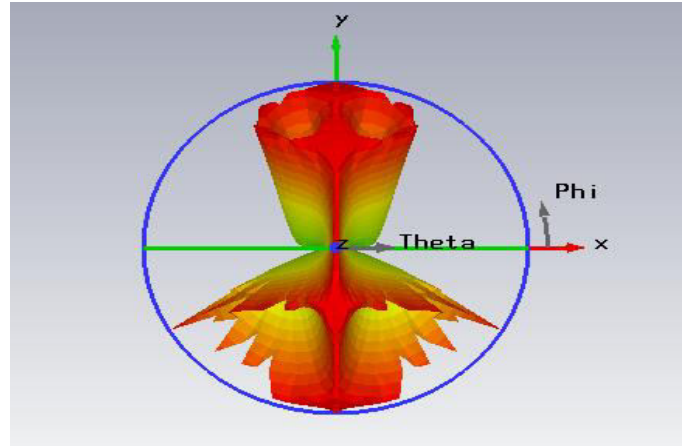


Fig. 7. Axial Ratio of Circular Ring Microstrip Moisture Sensor

III. CONCLUSION

The proposed design is analysed with all the parameters for detecting the moisture as well as can be used as a wireless moisture sensor based on backscatter characteristics and also can be detected distilled water with the help of backscatter characteristics. The sensor will be low cost due to FR-4 substrate.

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