Comparative Analysis of RFID Tag(UHF) using Aluminum Etching Technology

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Abstract : In this paper, RFID antenna is designed and realized for UHF (860 ~ 960 MHz) application. Aluminium is used for patterning on polythelene terephalate (PET) substrate using etching process. The thickness of the substrates is 50 μm and for copper and aluminium, the thickness is typically 18 μm or 35 μm and 10 μm respectively. As a result of simulation, maximum return loss is indicated 0.04 dB at 960 MHz and 0.08 dB at 900 MHz.

Key Words : RFID antenna, UHF, Tag, Aluminum etching

1. Introduction

In recent years, radio frequency identification (RFID) technology has moved from obscurity into mainstream applications that helps speed the handling of manufactured goods and materials. RFID enables identification from a distance, and unlike earlier bar code technology, it does so without requiring line-of-sight. Functional passive UHF (ultra high frequency) RFID systems with a range of several meters appeared in early 1970"s. Since then, RFID has experienced a tremendous growth. RFID UHF bands vary in different countries and include frequencies between 860 MHz and 960 MHz (EPCglobal standard).

2. Design and Simulation

This RFID antenna was designed by using the tool, Sonnet which showed excellent of EM simulation results. The antennas were designed in such a way that both designs have one port with symmetric manner. Design A showed a maximum input return loss of 0.04 dB at 960 MHz (Fig. 1) and designed B showed maximum input return loss of 0.08 dB at 960 MHz (Fig. 2). Sizes of the antenna A and antenna B are 2.27 mm × 0.2 mm and 2.3 mm × 0.5 mm respectively.

3. Realization of RFID Antenna

While realizing antennas, a thin aluminum foil on a substrate material was etched into the form of the designed antenna pattern. The substrate material must tolerate the chemicals used in the etching process, and this restricts the choice of substrate material. Polyethelene Terephthalate (PET) is commonly used as an antenna substrate material. The thickness of the foils is typically 18 μm or 35 μm for copper and 10 μm for aluminum. A typical etchant is Ferricloride, which corrodes both copper and aluminum. The thickness of the conductor metal has an influence on the etching process, tag antenna performance, and also on the manufacturing costs

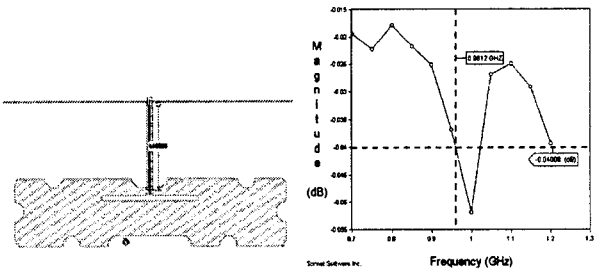

Fig.1. RFID Tag Pattern (A)

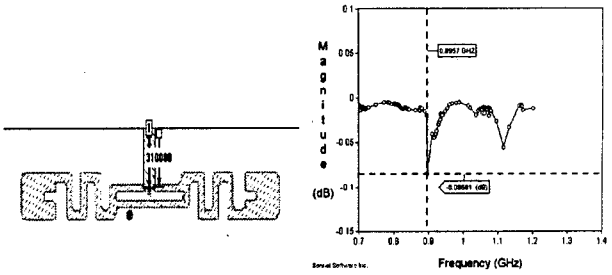

Fig.2. RFID Tag Pattern B

4. Conclusion

In this work, RFID antennas were designed and realized for UHF application. The simulation results of both antennas showed good input return loss characteristics. But when comparing the two designs, the design B has a good characteristics and compact in size. Both designs are applicable in RFID tag.

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