PREFACE

Radio frequency identification (RFID) is a wireless technology having real-time application in localization, identification, and tracking of objects using radio frequency signals. Of late, RFID system has turned out to be one of the most popular automatic identification techniques, replacing the omnipresent barcodes in an increasing number of cases. It has found widespread application in product tracking, asset management, transportation and logistics, supply chain management, health care, animal tracking, and security/access control. An RFID system consists of an electronic data-carrying device called the tag or transponder, an interrogator or reader, and a host computer with application software. An RFID system is a real-time processor that enables the information stored on a tag to be tracked and exchanged remotely with RFID reader. In this thesis, various miniaturized RFID antennas are designed and investigated for passive ultra high frequency (UHF) RFID applications. The present work has been addressed directly to reduce the size and increase the detection range and communication reliability of the RFID framework antennas, and the thesis consists of six chapters.

The first chapter of the thesis gives the motivation and structure of the thesis. Chapter two provides a brief introduction to RFID system. Thereafter, various operating frequency ranges of RFID systems and their working principles are discussed. Chapter two also explains various measurement techniques for read range and input impedance of tag antenna. This is followed by brief historical review on the topic.

In chapter three, the design and experimental evaluation of a circularly polarized tag antenna is presented. The circular polarization is realized by two orthogonal, unequal length linearly tapered meander line cross dipoles. The meander structure with

capacitive tip loading is used for size miniaturization of the antenna. A modified T-match network is employed to feed the cross dipole structure.

In chapter four, a novel dual antenna for RFID tags at dual ultra high frequency bands (f_1=866 MHz and f_2=915 MHz) is proposed. The designed structure consists of two dual band antennas, one acting as a receiving antenna and the other as a backscattering antenna. The receiving antenna is designed to have input impedance complex conjugate to the impedance of tag IC in order to maximize power transfer between the antenna and the microchip. The backscattered antenna is designed to have real-valued input impedance to obtain maximum differential radar cross section leading to read range enhancement.

In chapter five, a compact meandered cross-shaped slot circularly polarized antenna for UHF RFID reader applications is investigated. Circularly polarized radiation is realized by introducing a slot on the diagonal axis of a square patch. The overall size of the antenna is reduced by increasing the perimeter of a slot within one quadrant of the patch. Diagonally symmetric two- and four-slot antennas are also investigated for further size miniaturization.

Conclusions of the work are drawn as the last chapter of the thesis. Besides conclusion, the sixth chapter also includes some recommendations for future work.