
Foreword

Marlin H. Mickle

University of Pittsburgh,
432 Benedum Hall,
Pittsburgh, PA 15261, USA
E-mail: mickle@ee.pitt.edu

Biographical notes: Marlin H. Mickle received his PhD from the University of Pittsburgh in 1967. He is currently Nickolas A. DeCecco Professor and is the Executive Director of the Swanson Centre for Product Innovation. He is currently active in the areas of energy harvesting and high technology applications, co-author and co-editor of over 20 books and over 125 refereed publications. He has held engineering positions with the IBM and Westinghouse, and has also served as Program Director of the Systems Theory and Applications Program of the National Science Foundation. He is a Life Fellow of the IEEE and 1988 Recipient of the Systems Research and Cybernetics Award of the International Institute for Advanced Studies in Systems Research and Cybernetics.

1 Introduction

The inaugural issue of any publication is important as it sets the tone for at least the first years in the minds of the readers. In this point of view, I am pleased to present our first set of accepted papers that we, the Editorial Board, feel truly to cover the T&A of *IJRFITA* in bringing to persons focused on radio frequency identification, the aspects of the discipline that otherwise must be found by sorting through numerous highly focused technical publications in narrowly focused technical areas.

In addition, it is important to note that the first aim of *IJRFITA* is also covered in that we have three continents covered in seven papers. In addition, one of the papers is co-authored by persons on two different continents, and the US papers are from the West Coast, the Midwest and the East Coast. Authors' home countries include Finland, Italy, Mexico, India, Russia, China and the USA. Backgrounds include a former Director of the MIT Auto-ID Center, a person who has been a member of most of RFID standards groups and a former President of the IEEE. Authors include both females and males, thus covering most areas of diversification.

The topics covered are also diverse but focused on RFID. These topics include technology and applications, including a contribution with the mixing of a paper industry application and antenna technology. Antennas that function in three dimensions as well as inside huge rolls of paper provide insight into avenues not typically covered elsewhere. We have a paper on testing, including the characterisation of the environment of functionality for a set of RFID tests that actually formed the basis for the establishment of the 915 MHz UHF standard frequency.

The view presented here provides the reader with a focus on the reader and the tag, including the object on which the tag is attached, typically referred to other technical industry areas as the 'last mile'.

Although bar codes have evolved in two dimensions over time, it has become quite clear that RFID requires a third dimension. The paper by Delichatsios et al. provides novel designs of two three-dimensional tag antennas, including evaluation of their performance in static and dynamic environments, specifically orientation and material sensitivity.

A rapidly developing field such as RFID is bound to lead to shortcomings in standards development when the world requires to adopt this new and exciting technology. The paper by Harmon considers several factors that led to omissions in the EPCglobal Gen 2 specification/standard. In particular, the specification has failed to provide for a means to reasonably access User Memory, which is considered in this paper.

At the cutting edge of RFID technology, Jones et al. present a new concept, termed the Passive Active Radio Frequency Tag (PART), enabled by a burst switch allowing the active transceiver and controller to sleep when the tag is not being queried. An RF query supplied by the reader 'wakes up' the active components of the tag to interrogate the query. This paper includes a technique to automate the generation of a customised RFID tag controller based on a high-level description of the desired RFID primitives and is capable of targeting a microprocessor-based or custom hardware-based RFID tag controller.

A standing problem at the physical layer is Tx/Rx isolation for an RFID reader that is addressed by the use of

- 1 separate transmission and receiving antennas
- 2 a circulator and
- 3 a directional coupler.

Penttilä et al. demonstrate that for portable readers a directional coupler offers the most suitable performance due to its size and cost.

Advancements in wireless technology and increasing frequency reuse increase RF interference and decrease a system's service quality. A test protocol for the characterisation of the performance of RFID systems under active interference is presented in the paper by Porter et al. The effectiveness of the test protocol has been verified by fully characterising eight RFID systems operating at frequencies ranging from 120 kHz to 2.45 GHz, with the results having been validated by experts in the field of RFID. These tests were central to the establishment of the 915 MHz UHF standard frequency.

A successful RFID application has been the classification of animals, in particular the bovine meat market. An experimental analysis of the steps in the bovine meat process, described by Alù et al. is accomplished by localising possible sources of electromagnetic noise in the standardised frequency range of RFID. The analysis of the system includes a portable reader and passive glass tags working in half-duplex at the frequencies of 123.2 kHz and 134.2 kHz.

Applications in the paper industry include a non-obvious placement of the RFID tag. Such a placement requires novel tag antenna designs for identification of paper and cardboard reels. An evolutionary tag antenna design for passive UHF RFID illustrating a little known characteristic of embedded tags is reported by Ukkonen et al.

As the Journal Editor, I am truly grateful to those persons who wrote, reviewed, rewrote and re-reviewed the manuscripts for this Journal whose ideals were conveyed by a mutual understanding that a forum for fundamental research, technology and application is a necessity. It is my hope that we can continue these efforts for growth in this most exciting and topical area.