

Chapter 9

Printing Techniques and Performance of Chipless Tag Design on Flexible Low-Cost Thin-Film Substrates

Rubayet-E-Azim Anee
Monash University, Australia

Nemai Chandra Karmakar
Monash University, Australia

Sushim Mukul Roy
Monash University, Australia

Ramprakash Yerramilli
Securency International Pty Ltd, Australia

Gerhard F. Swiegers
University of Wollongong, Australia

ABSTRACT

Radio Frequency Identification (RFID) is an emerging technology playing a vital role in modern automatic identification system. Chipless RFID is a new dimension in the field of radio-frequency application systems with immense potential to manufacture low-cost, multi-bit RFID tags for potential barcode replacement on polymer, paper, and other flexible substrates. In this chapter, the authors present a detailed overview of the printing methods, substrates, and materials used for printing chipless RFID tags. Based on the available literature, an attempt is made to review the printing and performance related issues of printed RF devices that are currently published. The basic aspects of printing of chipless tags with conductive inks are discussed in brief.

1. INTRODUCTION

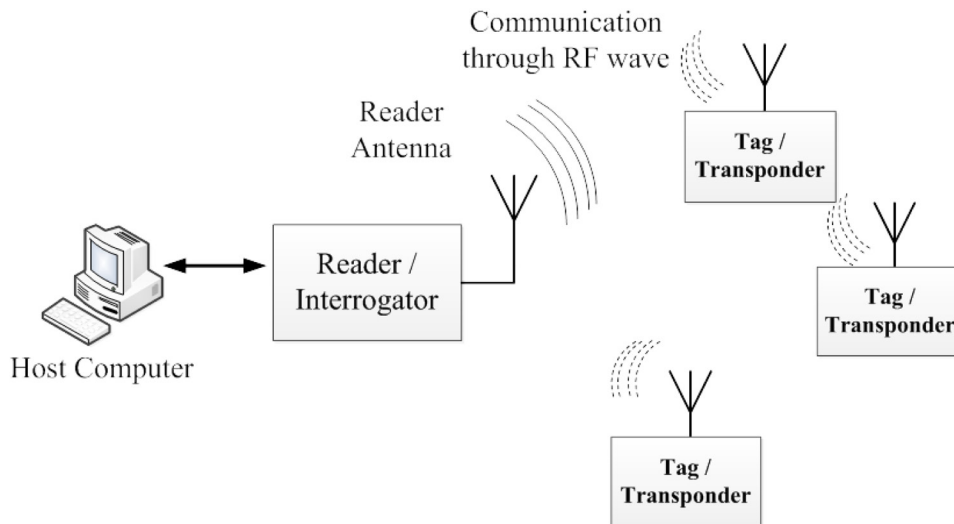
RFID stands for Radio Frequency Identification which uses the radio frequency for communication between tags and reader through free space. A typical RFID system consists of a Reader, transponder

(RFID tags) and processing unit for processing the data from the transponder as shown in Figure 1.

Automatic identification procedure has become popular in this age of modern technology and is playing a vital role in recent business activities of global economy. In coping up with the fast

DOI: 10.4018/978-1-4666-1616-5.ch009

Figure 1. Schematic of a generalized radio frequency identification system



paced lifestyle of this Century, the demand for automation is on the increase day by day. In this respect, Radio Frequency Identification (RFID) finds an ever increasing application and has only been emerging recently as a powerful alternative to conventional security technology for product authentication. RFID systems have been gaining more and more popularity in areas such as supply chain management, inventory control, automated identification systems, and any place requiring identifications of products or people. RFID technology is better than barcode in many ways (Non Line of Sight Communication, longer operating range, quick reading of tags etc.)(Preradovic & Karmakar, 2010)), and may totally replace the older 'barcode identification system' all together in the future, if the printing of tags on flexible low-cost substrates hits commercial success. A typical RFID (Radio Frequency Identification) system (Figure1) includes RFID tag (Transponders), reader (Interrogation Unit) and Data Processing Unit (Host Computer for necessary processing on received data to decode the Tag ID). Tags are attached to objects/persons, and readers communicate with tags in their transmission ranges via radio signals. Yang Xiao et al (Xiao et

al., 2007) discussed in depth about the technologies, applications and research issues of RFID. Here it can be concluded that issues relating to the cost efficiency of RFID equipment, other issues such as energy efficiency, interference from multiple readers and security issues need further investigation.

The main hindrance to commercialization of RFID technology comes from the price of the tag which is much higher compared to the traditional barcode feature. The bulk of the cost of RFID tag comes from the silicon chip that is used to store data. Significant research and development investments are in place worldwide to replace the silicon chip with printed circuitry (printed transistors / resonating circuits) on the same substrate. The antenna is either printed together with the circuitry or separately which is then attached to the circuit with some low-cost technique (Subramanian et al., 2010). Chip-less tag does not require any chip/IC hence there is no need of a battery to turn on the chip. Such tags can be printed on low cost substrates using conventional printing technology with conductive ink for use in item level tagging and other applications. As chipless tags do not require any power supply to turn on

19 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/printing-techniques-performance-chipless-tag/65981

Related Content

A logistic-Map-Based PN Sequence for Stochastic Wireless Channels

Deb Sunder Swamiand Kandarpa Kumar Sarma (2017). *Routing Protocols and Architectural Solutions for Optimal Wireless Networks and Security* (pp. 155-181).

www.irma-international.org/chapter/a-logistic-map-based-pn-sequence-for-stochastic-wireless-channels/181171

Evaluation of Sixth Generation 6G Wireless Networks: The Vision of Future Wireless Communication

Senthil Kumar S., Leelavathi M., Manoj Kumar P. K.and Periasamy Palanisamy (2022). *Handbook of Research on Design, Deployment, Automation, and Testing Strategies for 6G Mobile Core Network* (pp. 1-26).

www.irma-international.org/chapter/evaluation-of-sixth-generation-6g-wireless-networks/302176

Contemporary Music Students and Mobile Technology

Thomas Cochrane (2012). *Wireless Technologies: Concepts, Methodologies, Tools and Applications* (pp. 1390-1414).

www.irma-international.org/chapter/contemporary-music-students-mobile-technology/58848

A Signal Adaptation Mechanism for Power Optimization of Wireless Adapters

Christos Bouras, Vaggelis Kapoulas, Georgios Kioumourtzis, Kostas Stamos, Nikos Stahopoulosand Nikos Tavoularis (2015). *International Journal of Wireless Networks and Broadband Technologies* (pp. 48-72).

www.irma-international.org/article/a-signal-adaptation-mechanism-for-power-optimization-of-wireless-adapters/154481

Sensing Coverage and Connectivity in Cognitive Radio Sensor Networks

Ecehan Berk Pehlivanolu, Mustafa Özgerand Özgür Bar Akan (2016). *Mobile Computing and Wireless Networks: Concepts, Methodologies, Tools, and Applications* (pp. 608-633).

www.irma-international.org/chapter/sensing-coverage-and-connectivity-in-cognitive-radio-sensor-networks/138201