Parichart Sritanavut 2010: Affordable Printing Technology for Ubiquitous Short-range Communication Applications. Master of Engineering (Electrical Engineering), Major Field: Electrical Engineering, Department of Electrical Engineering. Thesis Advisor: Ms. Suneat Pranonsatit, Ph.D. 82 pages.

The conventional industrial fabrication process of electronic circuits is considered complicated and time-consuming. Therefore, there are interests in developing alternative technologies with simplicity, environmental friendliness and cost effectiveness. One of promising technologies is the adaptation of the ordinary inkjet printing. This technology employs a direct-write method, in which the circuits are made on substrates in a single step. This research project is focused on the adaptation of commercially available inkjet printers for electronic device fabrication. In particular, the technology is demonstrated through UHF Radio Frequency IDentification (RFID) tags. The proposed technology is verified through the performance of the fabricated devices.

Nano-particle silver ink and paper were chosen as conductive material and substrate, respectively. The high frequency model simulator was employed in designing several types of printed antennas. Specifically, the impedances of the antennas and RFID chip should be matched, at the allocated frequency in Thailand, i.e. at 922.5 MHz center frequency. All antennas were printed 5 times and cured at 150^{o}C for 30 minutes in a vacuum oven. Then, the RFID tags were produced by attaching antennas to RFID chips. The tag's reading distance is the indicated performance and was translated from measured power in the fixed distance method between 840-950 MHz. It is shown that number of prints, curing time and temperature had effects on the tag performances.

The measured reading distances of meander and dipole with tuning stub antennas are maximum at almost 13 m at 922.5 MHz. At other frequencies, the reading ranges are comparable to simulation results. It is also found that dipole and patch antennas are suitable for international frequency ranges. And their performances are similar to commercially available UHF RFID tags. In conclusions, this research project has been successfully developed an alternative inkjet printing technique and demonstrated through antennas of RFID tags. More importantly, the technology will help expand the applications of ubiquitous short-range communications. In addition, universities and research institutions can be benefited from this research project as the developed process can be simply employed in fabricating various designed electronic devices.

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