

Millimeter-Wave Identification for Future Low Cost Identification, Sensing and Tracking Systems

Abstract: The emerging millimeter-wave identification (MMID) technology is set out to exploit the smaller size of components and antenna and larger available bandwidths in order to alleviate the limitations of low-frequency RFID. The successful development of MMID into markets is strategically critical for future smart living and better life in terms of green environment, efficient energy and secure information.

In this work, the state-of-art of innovative techniques, which allow propelling the MMID technology in the front line of future innovative wireless systems will be presented. Two recent developments in our group will be highlighted with simulations and experiments, namely (1) extremely miniaturized and highly-secure chipless tag techniques for short- and mid-ranges; and (2) a new generation of high data-rate fully integrated, battery-free, yet active MMID tag on a single CMOS die with no external components.

In addition to the well-known functions of identification, the MMID concept is fully compatible with upcoming and future applications of millimeter-wave technology in wireless communications such as 5G technologies, especially information sharing of surrounding environment sensor networks. The sensor functions would be combined with printable tags and antennas for building a complete integrated sensing system. The great potentials and exciting prospects of MMID sensing systems as well as their technological challenges in terms of security, networking, mass production, and deployment will be discussed.

Key words: Millimeter-wave technologies, Radiofrequency identification (RFID), Wireless sensing & tracking systems, Wireless reader and tag technologies, Machine to Machine (M2M), Internet of Things (IoT), ICT devices, Chipless tags and MIST, CMOS technologies, Smart antenna technique.