Title: Development of equivalent circuit model for UHF RFID IC and its validation with self-healing elastomer RFID tags

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Abstract
Ultra-high-frequency (UHF) radio-frequency identification (RFID) systems are increasingly used in healthcare, logistics, and wearable technologies. Accurate characterization of an RFID IC's input impedance at its wake-up power level is essential for IC-specific antenna impedance matching, enabling a performance-optimized tag with high read range.
In this work, we fabricate and test a set of fully assembled dipole-type UHF RFID tags and compare full-wave electromagnetic simulations with measurements to determine the IC effect on antenna gain. Using the known antenna impedance, we back-calculate the IC input impedance at wake-up power and repeat the procedure across the frequency range of 840-960 MHz for multiple tag designs, yielding an estimated IC-impedance range within a reasonable error margin. We further validated our RFID IC input-impedance characterization by comparing simulated and measured read ranges of tag fabricated on self-healing elastomer substrates. Ongoing work develops a reliable equivalent circuit model to enable an accurate antenna-IC co-design and to assess the suitability of novel self-healing elastomers for next-generation flexible RFID systems.