U-shaped RFID Tag Antenna for Isotropic Radiation Pattern

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Abstract— Recently, radio frequency identification (RFID) in the ultra high frequency (UHF) band has been gaining popularity in many applications. It offers a broad detectable range, fast read speed, and the ability to read multiple objects. To maximize system performance, RFID requires a tag antenna that can provide adequate readability with restricted system power. The antennas of dipole structure are widely used as a RFID tag antenna owing to their simple structure and adequate performance in recognizing objects. However, the antenna of dipole structure has a problem where a readable range of the reader system is remarkably reduced due to the null of doughnut-shaped radiation pattern. Therefore, the tag antenna design is needed to have equally recognizable zone in every direction to ensure reliability of the tag. This requires the tag to have a radiation pattern close to an isotropic pattern. In this paper, we proposed a simple U-shaped RFID tag antenna with an isotropic radiation characteristic for the stable operation of RFID system. The proposed antenna is composed of a U-shaped half-wavelength dipole and a rectangular-shaped feed as shown in Fig. 1. The rectangular-shaped feed is connected at the bottom of a U-shaped dipole for conjugate impedance matching with the commercial tag chip. On the condition of VSWR < 2, the tag antenna has the measured bandwidth in the range 900 to 919 MHz that satisfies the Korea UHF RFID specifications, and showed the efficiency of greater than 90% and the gain deviation of less than 1.62 dB in all directions within the bandwidth.

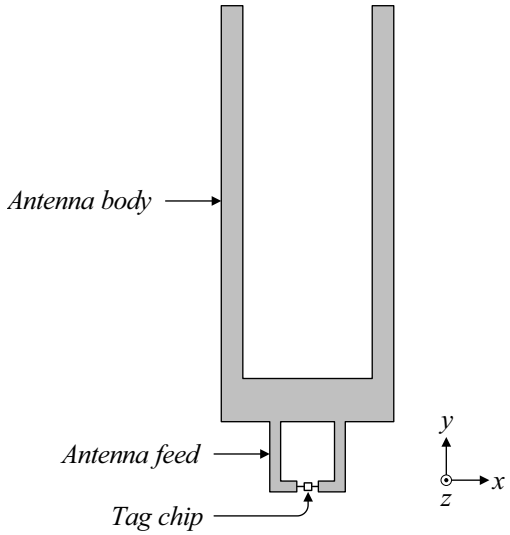

Figure 1: Structure of the U-shaped RFID tag antenna.