A Miniaturized On-Body Antenna for Body Area Sensor Networks

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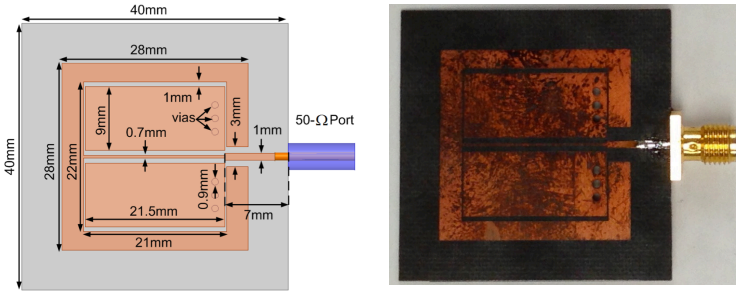
In this paper, an antenna fulfilling the requirements of body-centric communications is presented. Figure 1 shows the schematic depicting the proposed antenna that operates at the Industrial, Scientific and Medical (ISM) band. As shown in the figure, the antenna consists of two radiating microstrip parts (PIFA-like), that each part is grounded by three vias at one edge and left open-circuited at the other edge. The excitation mechanism is based on the proximity coupling phenomenon. To implement this, a 50-Ω microstrip transmission line is used to transfer the input power to the radiating parts. The antenna was fabricated on a Rogers RT/Duroid 5880 substrate with a relative permittivity of 2.2±10% and a loss-tangent near 0.004 and the thickness of 0.508 mm (Figure 1b). The physical dimensions of the antenna are provided in Figure 1a. The proposed antenna is nearly 5 times smaller than the conventional microstrip antennas operating at the same resonance frequency. The



(a) (b)

Figure 1: The proposed on-body antenna, (a) Schematic and (b) Fabricated.

antenna characterization's results (simulated), including reflection coefficient and radiation pattern prediction, were investigated and are briefly discussed as follows. The reflection coefficient of the antenna was obtained from simulation in a frequency band ranging from 1 to 4 GHz. The antenna can operate at the resonance frequency of ∼2.45 GHz, where the reflection coefficient is around -30 dB. The antenna gain (realized) is better than 5 dBi, while showing a front-to-back ratio (FTBR) as high as 12 dB at the resonance frequency. This level of the FTBR guarantees desired operation of the antenna in the proximity of the human body. The radiation characteristics of the presented antenna and also its miniaturized structure make it a suitable candidate for many on-body wireless sensors used in modern healthcare systems such as Body Area Sensor Networks (BASNs) (M. Kim and J.H. Takada, *IEEE Trans. Antennas and Propagation*, 60, 5364-5372, 2012).