## Self-diplexed patch antennas based on metamaterials for active RFID systems

## F.J. Herraiz-Martínez, E. Ugarte-Muñoz, V. González-Posadas, L.E. García-Muñoz, D. Segovia-Vargas

Abstract— This paper presents a full duplex active RF identification system with arbitrary values for any of the two frequencies in the different radio links. First, the antennas proposed in this paper are based on linearly polarized self-diplexed patch antennas working in a full-duplex way at 2.45 GHz for the reader-transponder (or tag) link and at a lower variable frequency (1.7 GHz) for the transponder-reader link reducing the propagation losses for the most critical link. Secondly, in order to reduce the multipath losses, antennas with circular polarizations for the reader and linear polarization for the transponder have been designed for the corresponding radio links. Patch antennas partially filled with metamaterial cells have offered the possibility of achieving multifrequency performance with two dipolar radiation modes, one due to the patch and the other to the metamaterial cells. This fact makes it possible to obtain high isolation levels between different ports. In addition, the inclusion of coupled or slot lines to feed the antenna has increased this isolation level. Finally, the diplexing level has been increased by including some filtering lines with metamaterial particles at the input of the feeding line. This approach avoids using an external filter or diplexer.

Index Terms— Left-handed (LH) metamaterials, microstrip antennas, RF identification (RFID) antennas, self-diplexed multifrequency antennas.

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