SOFTWARE-DEFINED CONTROL OF PATTERN AND POLARIZATION RECONFIGURABLE ANTENNAS IN EDGE NETWORKS

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Software Defined Radio (SDR) provides a platform for a reconfigurable communication system which is solely controlled by a software program with access to certain hardware modules. SDRs are typically connected to very minimalistic, and often, manually controlled reconfigurable antenna(s) with no software control over radiation parameters. Hence, on a wave propagation front, the radiator does not capitalize on the software infrastructure it is connected to. This work presents a software controlled pattern and polarization reconfigurable microstrip patch antenna, with reconfigurable parasitic elements, for reconfigurable wireless networks and applications. The antenna is designed to operate in from 2.4 GHz to 2.5 GHz, covering all channels (channels 1 through 14) of the 2.4 GHz ISM band. This broadband behavior is achieved with a two-layer stacked annular ring patch antenna, separated by a layer of foam. This antenna is dual probe-fed to achieve vertical and horizontal linear polarizations as well as right-hand and left-hand circular polarizations. Pattern reconfiguration is achieved with a third layer comprised of microstrip patch elements acting as parasitic radiators, either reflecting or directing a beam in a direction, which are controlled by RF PIN diodes. Elements are placed such that pattern reconfiguration is possible across all polarization modes. The electromagnetic design and software-defined control of the antenna will be presented along with preliminary results demonstrating the use of polarization reconfigurable antenna systems in a market-mediated paradigm for edge networks. This includes the full implementation of the antenna system using RF PIN diodes and the software interface used to automate the control of antenna states.