Bandwidth and Beamsteering Reconfigurable Antenna

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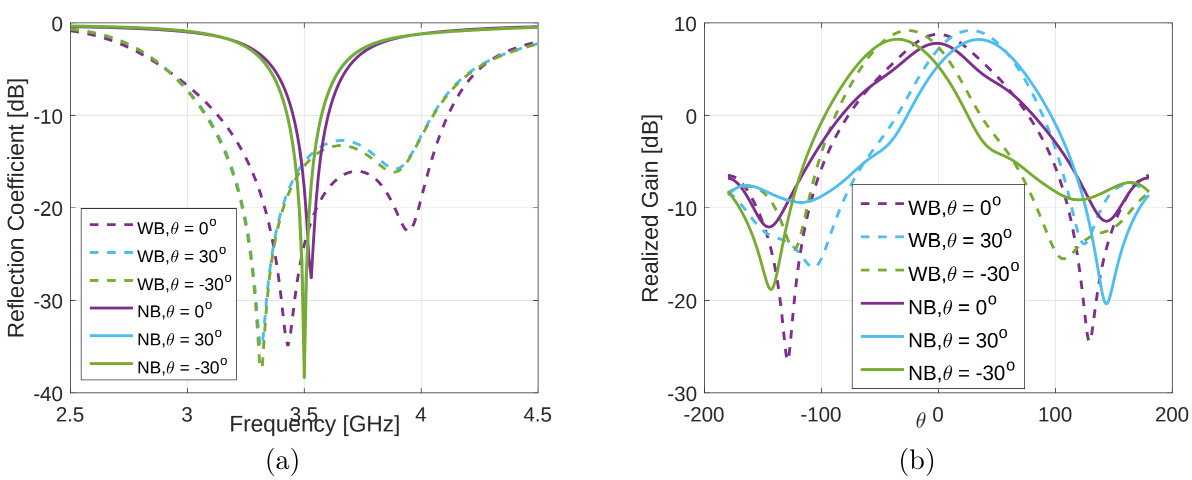
A single-element reconfigurable antenna of which frequency bandwidth can be changed between narrow- ($3.4 - 3.6$ GHz) and broad- ($3.1 - 4.2$ GHz) bands is presented. This antenna is capable of steering its main beam into various directions for each band of operation. The reconfiguration mechanism is based on parasitic layer approach, which is an effective technique to enable the reconfigurability of antennas. In this technique, multiple electrically small metallic pixels interconnected by means of on-off switching is placed within the near-field of the driven antenna layer. Different parasitic surface geometries create different current distributions resulting in various antenna properties in frequency, polarization and radiation pattern. In this work, the driven antenna is chosen to be a microstrip patch. The average obtained realized gains are ~8 and ~9 dB for narrow- and broad-band operations, respectively, and their variations over the frequency band of operation for each steered beam direction stays relatively constant. This antenna is designed to meet the requirements of enhanced spectral- and energy-efficiency of next generation wireless systems which are to operate over a wide range of frequencies with different bandwidth requirements.

This antenna is designed by using full-wave electromagnetic simulation tool (HFSS). Figure 1 illustrates the reflection coefficients and the radiation patterns attained by the proposed MRA with 2-layer reconfigurable parasitic surface. As seen from Figure 1.a, there is a common impedance bandwidth for each mode of operation and associated beamsteering modes corresponding to $\theta \in \{-30^o, 0^o, 30^o\}$ tilts.

This design is optimized to support reconfigurability over the Citizens Broadband Radio Service (CBRS) band (3.5-3.7 GHz) recently relieved for spectrum sharing. This MRA can effectively be utilized for both spectrum sensing and spectrum access purposes.



(a) (b)

Figure 1: (a) The reflection coefficients, (b) radiation patterns for various modes of operation of the proposed 2-layer reconfigurable parasitic surface MRA.