Metasurfaces Inspired Pattern Shaping of Higher Order Modes of Circular Microstrip Radiator

Prateek Juyal
Dept. Electrical & Computer Engineering
University of Manitoba
juyalp@myumanitoba.ca

Microstrip antennas [1] are attractive candidates for many applications due to their low profile structure. One of the basic geometrical shapes available in microstrip is circular type. Resonances in circular microstrip antenna are well described by TMmn modes. A large amount of the literature is dedicated towards fundamental mode of operation i.e. TM11. All the modes for which \( m \neq 1 \) radiates conically and have null in broadside direction. Modes which radiates in broadside direction contained in a set of TM 1n modes. Besides TM11, the pattern for all the modes in this family is not useful for applications due to very high levels of side lobes in one plane.

An attempt has been done here to shape the pattern of these higher order modes and to make them useful for various applications. The motivation behind, comes from the fact that these higher order modes has very narrow beamwidth which decreases as mode number increases. Shaping the radiation pattern of these modes can lead to highly directive printed antennas. Pattern shaping of TM13 mode has been achieved which ultimately leads to a novel antenna configuration. The technique used is inspired by the concept of metasurfaces, the 2D equivalent of metamaterials [2]. A complementary octopus type element [3] has been used to design metasurface.

REFERENCES