A Compact Multiband Reconfigurable Quasi-Isotropic Antenna with Planar Structure

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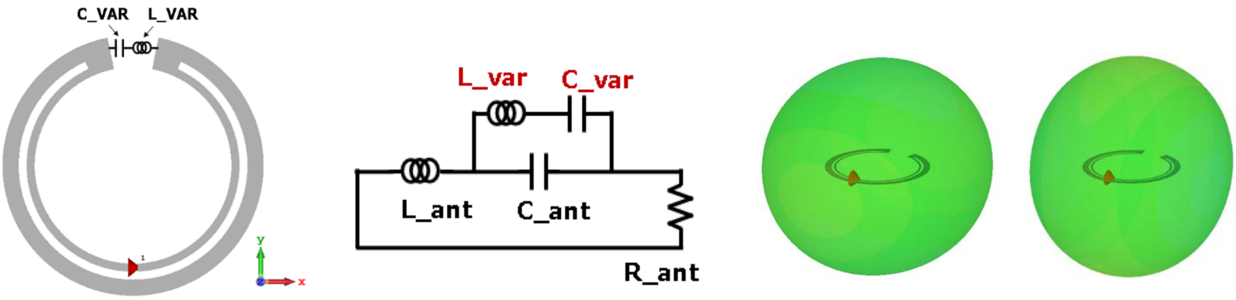
Isotropic antennas which can radiate a power into all direction and provide full spatial coverage have drag attention for modern wireless applications such as wireless power transfer, wearable antennas, wireless access point and radio frequency energy harvesting. Since an isotropic antenna which radiate with polarization of all direction is impossible to implement in practice, many researchers have designed quasi-isotropic antenna by implementing electric dipoles and magnetic dipoles [1, 2]. The isotropic antennas, especially for mobile applications, need to be compact and provide multiband operation. However, previous works have rarely suggested multiband operations with isotropic patterns. In addition, the antenna for mobile application needs to be planar to integrate with circuit board and provide reconfigurable operation to be able to cover broader bands.

In this abstract, we propose a compact dual band isotropic antenna with reconfigurable operation in planar structure. It is based on the Folded Split-Ring Resonator (FSRR), as proposed in [1, 2]. The FSRR can be modeled as an equivalent electric dipole and orthogonal magnetic dipole. Since each dipoles are simultaneously excited, the resulting radiated fields can propagate as quasi-isotropic pattern. The width and radius of the FSRR are critical factors to determine input resistance and resonance frequency, respectively [1-3]. Instead of using orthogonal FSRRs, which is 3-dimensional structure as described in [2], a planar FSRR with a series resonators between the gaps of a FSRR is proposed as shown in Fig.1 (a). The equivalent circuit model is described in Fig.1 (b). There is an additional resonance so that give a chance to form dual band operations. The operation frequency and matching characteristics can be optimized by tuning the radius, L_var and C_var, width of the antenna. The simulated radiation pattern is described in Fig.1 (c), which shows quasi-isotropic pattern at dual band as expected. Therefore, the proposed structure can be used as compact, multiband, and reconfigurable quasi-isotropic antenna with planar structure.



(a) (b) (c)

Figure 1. (a) Configuration of proposed dual band planar Quasi-isotropic antenna, (b) Equivalent circuit model of the proposed antenna, (c) Radiataion pattern of the proposed antenna at low-band and high-band resonance, respectively.

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