Abstract:

The gyromagnetic properties of magnetized ferrites are widely used in many novel rf and microwave devices. According to the Drude model, similar principles should also be applicable to magnetized semiconductors due to its gyroelectric properties. In this study, an axially magnetized semiconductor resonator is characterized in terms of bias field and signal frequency. The resonance and loss regions are identified at 77K. The affect of changing material and geometrical properties of the resonator on the splitting and tuning behavior of normal modes are illustrated. Green's Function approach is used to derive the S-parameters of a two port semiconductor network. The network response and the material properties can be used to calibrate the semiconductor material before measuring the millimeter-wave properties of the resonator. This theoretical analysis may prove to be vital in realizing miniaturized and broadband semiconductor junction circulators and filters for high-Tc superconductive circuits.