Abstract

This thesis presents a stacked stepped impedance resonator (SSIR) structure for designing compact multi-band bandpass filters (BPFs). The multilayer resonator structure is used to reduce the filter size. Moreover, based on the theory of coupled resonators, the desired characteristics of its multiple passbands can be obtained by determining the coupling coefficients and external quality factors. Furthermore, a novel technique has been developed to create controllable transmission zeros (TZs) in the stopbands.

The first BPF design was designed with the center frequency of 3.5 GHz and the FBW of 7.2%. The TZ can be controlled and adjusted by controlling either magnetic or electric coupling. The overall size of the proposed design filter is 4.2mm x 5.2mm without considering the feeding lines. The second design proposed new approach to tune the transmission zeros. By adding the via holes and ring slots in ground plane, the transmission zero can be controlled effectively.

The third design is about tri-band bandpass filter (BPF) using stacked stepped impedance resonator (SSIR). It was designed on a 0.568 mm thick three-layer RT/Duroid 6010 substrate with a dielectric constant of 10.2 and it occupies an area of 2.8 mm x 2.5 mm. The fourth design proposes a stacked stepped impedance resonator (SSIR) structure for designing compact quad-band bandpass filters (BPFs). The shape of the first and third passbands and the second and fourth passbands can be well adjusted by changing the gap width between two SSIRs on the second and first layer, respectively

Keywords: *Bandpass filter; Multi Layer; Multi band; Transmission Zeros.*