Design and Synthesis of Two Tunable Bandpass Filters Based on Varactors and Defected Ground Structure

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Abstract : This paper presents a new ultra wideband (UWB) microstrip bandpass filter (BPF) at microwave frequencies. The first one is based on multiple-mode resonator (MMR) and rectangular-shaped defected ground structure (DGS). This filter, which is compact size of 25.2 x 3.8 mm2, provides in the pass band an insertion loss of 0.57 dB and a return loss greater than 12 dB. The second structure is a tunable bandpass filters using planar patch resonators based on diode varactor. This filter is formed by a triple mode circular patch resonator with two pairs of slots, in which the varactors are connected. Indeed, this filter is initially centered at 2.4 GHz, the center frequency of the tunable patch filter could be tuned up to 1.8 GHz simultaneously with the bandwidth, reaching high tuning ranges. Lossless simulations were compared to those considering the substrate dielectric, conductor losses, and the equivalent electrical circuit model of the tuning element in order to assess their effects. Within these variations, simulation results showed insertion loss better than 2 dB and return loss better than 10 dB over the passband. The proposed filters presents good performances and the simulation results are in satisfactory agreement with the experimentation ones reported elsewhere.

Keywords : defected ground structure, diode varactor, microstrip bandpass filter, multiple-mode resonator

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