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ABSTRACT

In this paper, a new tunable bandpass filter with constant absolute bandwidth and ultra wide tuning range is proposed. First, the bandwidth of two conventional circuits is theoretically approximated in a new and simple way. Then one of these two is selected since it does not have any spurious bandwidth in a very wide range of frequencies and its bandwidth is half of the other, which causes a smaller capacitance and less circuit dimensions. Then a tuning lumped-based circuit is designed with bandwidth equal to 0.528 GHz, which covers all ultra wide band (UWB) of frequency tuning range, namely 3.1 to 10.6 GHz as an example. Finally, it is assembled by transmission line elements and HFSS software tools simulate it. The center frequency tuning range of the circuit is 137 % between 3.85 to 9 GHz with constant absolute bandwidth equal to 0.52±0.06 GHz. The compact size of the filter is 5 mm × 3 mm and its insertion loss is smaller than 3.5 dB across the whole tuning range. Simulations show that its behavior agrees well with the ideal equivalent lumped-based circuit over a very wide range of frequencies.

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