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Design and fabrication of a high-performance microstrip multiplexer using computational intelligence for multi-band RF wireless communications systems

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Highlights

- An accurate ANN model is used to design a microstrip multiplexer.
- A novel design process based on the ANN model is proposed to obtain four BPFs.
- S-parameters of the fabricated multiplexer are measured to validate the ANN method.
- Our multiplexer has the smallest size and the lowest losses in comparison with the previous works.

Abstract

In this paper, a mathematical model based on artificial neural network (ANN) is used to design, fabricate and measure a quad-channel microstrip multiplexer. Multi-layer perceptron (MLP) neural network trained with back-propagation algorithm is adopted to model a new microstrip bandpass filter (BPF) based on a novel stub-loaded open-loop resonator. Then, a design process is proposed to obtain four BPFs. Finally, using the obtained BPFs a high-performance microstrip multiplexer is designed. The designed multiplexer has the smallest size and the best insertion and return losses in comparison with the previous multiplexers. It operates at 2.2GHz, 2.8GHz, 3.5GHz and 4GHz, which are appropriate for multi-band RF wireless communications systems. To validate the ANN model and the simulation results, the proposed quad-channel microstrip multiplexer is fabricated and measured where a good agreement is achieved.