

A New ANFIS-Based Hybrid Method in the Design and Fabrication of a High-Performance Novel Microstrip Diplexer for Wireless Applications

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< Previous

Next >

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Abstract

In this work, we have used a novel adaptive neuro-fuzzy inference system (ANFIS) method to design and fabricate a high-performance microstrip diplexer. For developing the proposed ANFIS model, the hybrid learning method consisting of least square estimation and back-propagation (BP) techniques is utilized. To achieve a compact diplexer, a designing process written in MATLAB 7.4 software is introduced based on the proposed ANFIS model. The basic microstrip resonator used in this study is mathematically analyzed. The designed microstrip diplexer operates at 2.2 GHz and 5.1 GHz for wideband wireless applications. Compared to the previous works, it has the minimum insertion losses and the smallest area of $0.007 \lambda_g^2$ (72.2 mm^2). It has flat channels with very low group delays (GDs) and wide fractional bandwidths (FBWs). The GDs at its lower and upper channels are only 0.48 ns and 0.76 ns, respectively. Another advantage of this work is its suppressed harmonics up to 12.9 GHz (5th harmonic). To design the proposed diplexer, an LC model of the presented resonator is introduced and analyzed. To verify the simulation results and the presented ANFIS method, we fabricated and measured the proposed diplexer. The results show that both simulations and measurements data are in good agreement, which give reliability to the proposed ANFIS method.