OPTIMIZATION OF WAVEGUIDE INTERDIGITAL FILTER USING PSO AND ANN

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ABSTRACT

In this paper theoretical design and optimization of VSWR BW of a waveguide based Inter-digital filter using PSO-ANN algorithm is highlighted. The objective of this paper is to focus on use of the trained ANN model coupled with the particle swarm optimization (PSO) algorithm to synthesize and optimize an waveguide based inter-digital filter using resonating bars alternatively short circuited. Design, synthesis and optimization process is compared with the results obtained from EM simulation which is also compared from the same obtained experimentally. The design of a waveguide based Inter-digital filter using rectangular bars as its resonator elements is done using traditional synthesis process. Capacitance values of the resonators are evaluated using an Artificial Neural Network (ANN) model of the same with the geometry parameters of resonators as its inputs. Particle swarm optimization (PSO) algorithm is utilized to optimize the dimensional parameters of the resonators in order to obtain inter-resonator coupling coefficient values that can be used for the design of the broadband filter. The aim of the present research work is to design and optimize waveguide based inter-digital filter having rectangular bars as resonators for broadband VSWR BW. Electro-Magnetic simulations are performed using the theoretical design of the waveguide Inter-digital filter structure and compared for accuracy of the design and optimization process adopted here. The simulation results are in good agreement with those obtained using the ANN/PSO algorithm. The optimized design of the filter is developed by practical implementation in hardware and further characterized. Simulation and measurement results are compared to validate the design approach.

KEYWORDS: Rectangular Bar, Broadband, Filter, ANN/PSO, Inter-Digital, Capacitance