DESIGN AND OPTIMIZATION OF PSI (Ψ) SLOTTED FRACTAL ANTENNA USING ANN AND GA FOR MULTIBAND APPLICATIONS

Name of Student : Gagandeep Kaur (1452675)
Deptt. : ECE
Guide : Munish Rattan & C. Jain
Mode of Study : F. Time

ABSTRACT

Antenna with the minimum return loss is the vital requirement of any wireless communication system. Microstrip antennas suffer from the problem of narrow impedance bandwidth and not always able to used for multiband operation. Fractal antennas have unique property to show wide and multiband response. Thus the problem of narrow bandwidth of microstrip antennas can be evicted by the use of fractal antenna. Koch Snowflake, Hilbert Curve, Sierpinski Gasket, Sierpinski Carpet, Minkowski Island and the hybrid combination of Koch and Sierpinski etc. are the fundamental geometries of fractal antennas. The optimization of the antenna is to be done so that best solution can be found which has less return loss and better output parameters with minimum errors. Light weight, low cost and metal reduction are other important requirements for a system in the wireless communication. The novel design of PSI (Ψ) Slotted Fractal Antenna (PSFA) that exhibits multiband operation has been used for optimization which enhanced its utilities for distinct bands. The empirical fact is that return loss is optimized after applying Artificial Neural Networks (ANN) and Genetic Algorithm (GA). The proposed fractal antenna has been designed using substrate material of RT/duroid having height of substrate 1.5 mm, dielectric constant 2.2 and loss tangent 0.0009 for the stage of iteration up to one. The simulated, optimized and experimental results are obtained by the use of Zeland IE3D software, MATLAB Software and Rohde and Schwarz ZVL Vector Network Analyzer respectively. The measured values of return loss which obtained after fabrication are -13.81 dB, -19.88 dB, -20.86 dB, and -27.33 dB for the resonant frequencies 1.89 GHz, 2.78 GHz, 4.40 GHz, and 5.72 GHz and the values of their respective VSWR are 1.52, 1.25, 1.21 and 1.12. Hence, it has applications for L-band, S-band and C-band. The output values obtained after simulation and fabrication have minute variations due to fabrication imperfection and environmental conditions but are found to be a good candidate for multiband applications.