

# **Design and Optimization of Micro-Machined Sierpinski Carpet Fractal Antenna Using Ant Lion Optimization**

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## **Abstract**

This study investigates the optimized Sierpinski carpet fractal patch antenna and also explores the possibility of the integration of the proposed design with monolithic microwave integrated circuits. The optimization process has been performed using an ant lion optimization algorithm to achieve the required operating frequency and impedance matching. Further, due to surface waves excitation in the high index substrates used for the antenna design, the performance of the antenna degrades. Therefore, a process of micro-machining has been adopted to overcome this limitation. The micro-machining process creates an air cavity underneath the patch which further creates the low index environment in the patch antenna causing drastic improvement in the performance parameters along with the compatibility with monolithic microwave integrated circuits. The design shows multiple resonance frequencies in X-band and Ku-band. The proposed micro-machined design shows the resonance at 7.9 GHz, 9.6 GHz, 13.6 GHz, and 19 GHz with a maximum gain of 6 dBi.

**Keywords:** ant lion optimization, gain, bandwidth, micro-machining, fractal, high index substrate

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