

## Design and Analysis of Printed Waveguide Slot Antennas

Rohit Sammeta\* and Ahmed A. Kishk

Department of Electrical Engineering and Center of Applied Electromagnetic System  
Research, University of Mississippi

[rsammeta@olemiss.edu](mailto:rsammeta@olemiss.edu) and [ahmed@olemiss.edu](mailto:ahmed@olemiss.edu)

Waveguide Slot Antennas have always had the problems of being voluminous and expensive to manufacture. The advent of a new concept called 'Substrate Integrated Circuits' (SICs) that allows the integration of planar and non-planar structures within the same substrate has led to the development of the Substrate Integrated Waveguide (SIW). The SIW is analogous to a rectangular waveguide filled with dielectric material, but the sidewalls of the rectangular waveguide are simulated using via holes or metallized grooves in the substrate. Etching slots on the top metallic surface of the SIW results in a slot waveguide antenna [Li Yan, et. al.. "Simulation and Experiment on SIW Slot Array Antenna" *IEEE Microwave and Wireless Components Letters, Vol 14, No. 9, September 2004*]. Although the gain and efficiency of these slot antennas have a little reduction due to the dielectric losses, there is a reduction in the size, weight and cost of the waveguide slot antenna array.

Integrated slot antenna array is modeled using the commercial software 'EMPiCASSO' [EMPiCASSO, Version 3.30, 2004 EMAG Technologies, Inc]. The waveguide is simulated using a substrate with a material of  $\epsilon_r = 2.4$  and thickness  $t = 1.5$  mm and bounded by ground plane on either sides. The sidewalls of the waveguide are simulated using via-holes and a coaxial probe excites the traveling wave array. Arrays giving a reasonably good performance (broadside beam) have been made using longitudinal shunt slots, inclined slots and spiral slots. The parameters of each kind of slot have been empirically tuned by observing the radiation pattern and with an aim of exciting the entire array. Further investigations are being carried out in order to improve the performance of the above slot configurations in terms of the radiation pattern and the input impedance.