

## High-gain Step-profiled Integrated Diagonal Horn-Antennas

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*G.V. Eleftheriades and G.M. Rebeiz. "High-gain Step-profiled Integrated Diagonal Horn-Antennas." 1992 Transactions on Microwave Theory and Techniques 40.5 (May 1992 [T-MTT]): 801-805.*

Dipole excited integrated horn antennas are well established by now. Their main limitation stems from their large flare angle of  $70^\circ$  which is inherent in the anisotropic etching process of (100) silicon wafers. The large flare-angle does not allow for integrated horns with gains higher than 13 dB and for 10-dB beamwidths less than  $90^\circ$ . In this paper, a new step-profiled horn is proposed which reduces the effective flare angle of the horn and allows for gains in the region of 17 dB to 20 dB to be achieved. The symmetry of the horn's radiation pattern is enhanced by positioning the exciting dipole along the diagonal of the horn cavity. A specific design example is shown with a gain of 18.4 dB and a 10-dB beamwidth of  $37^\circ$  in the E, H and  $45^\circ$  planes. The coupling efficiency of this horn to a Gaussian beam is calculated to be 83%. An equivalent smooth envelope-horn (see text) was built at 12.1 GHz and the measured patterns agree well with theory. The integrated step-profiled horn is well suited for millimeter wave and Terahertz focal plane imaging arrays requiring a large number of elements.

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