Abstracts

A Hybrid Dielectric Slab-Beam Waveguide for the Sub-Millimeter Wave Region

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A hybrid dielectric slab-beam waveguide is suggested which should be well suited as transmission medium for the design of planar quasi-optical integrated circuits and devices operating in the mm and sub-mm wave regions. The new guide consists of a grounded dielectric slab into which a sequence of equally spaced cylindrical lenses is fabricated. (The center line of the slab guide is the axis of the lenses). The structure uses two distinct wave guiding principles in conjunction with each other to guide electromagnetic waves. In the direction normal to the slab surface, the guided fields behave as surface waves of the slab guide; their energy is largely confined to the interior of the dielectric and they are guided by total reflection at the slab surface. In the lateral direction the waves behave as Gauss-Hermite beammodes that are guided by the lenses which periodically reconstitute their cross sectional phase distribution, resulting in a wave beam that is iterated with the lens spacing. The guided fields are in effect TE and TM modes. The analysis of the new guiding structure is presented: The mode spectrum is calculated and the iteration loss due to the finite size of the lenses is estimated.

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