

“Highly-directive planar leaky-wave antennas: a comparison between metamaterial-based and conventional designs”, pp.12-21

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Abstract – A comparative study is made of two types of planar leaky-wave antennas. The first type is a “conventional” planar leaky-wave antenna composed of a grounded slab that is covered with a metallic or dielectric partially-reflecting surface, which acts as a leaky parallel-plate waveguide. The second type is a leaky-wave antenna consisting of a grounded metamaterial layer, having either a very low permittivity or permeability. For either type of structure, directive pencil beams at broadside may be produced when the structure is excited with a simple source such as a horizontal electric or magnetic dipole. A high directivity is obtained by the excitation of weakly-attenuated cylindrical leaky waves that propagate radially outward from the source on the planar structure. The comparison is made for the fundamental antenna properties such as broadside directivity, radiated broadside power density, pattern bandwidth, and the attenuation constants of the relevant leaky modes.