Effect of amplitude tapering and frequency-dependent phase errors on radiation characteristics of radial waveguide fed non-resonant array antenna

L. Pazin and Y. Leviatan

Abstract: A high-gain low sidelobe level array antenna that is fed by a radial waveguide and designed to operate over a frequency range is considered. Assuming azimuthally symmetric excitation, the radiation pattern of the circular array is approximated by the space factor for the equivalent circular aperture and a simple and efficient tool is introduced for analysis of the array radiation pattern. The effect of the tapering, for both paraboloidal and bell-shaped aperture amplitude distributions, and the consequences of the phase errors, caused by the variation with frequency of the electrical lengths in the radial waveguide feed structure, on the gain and sidelobe level are studied in detail. Results obtained based on the proposed analysis are validated with respect to experimental data available in the literature. They are applicable to designs of arrays as well as aperture antennas.