Abstracts

Electronic Phase Shifter for Millimeter-Wave Semiconductor Dielectric Integrated Circuits

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A new system is proposed for millimeter-wave integrated circuits. It is suggested that high-resistivity silicon be used as a medium for a dielectric waveguide. With the advent of high-resistivity silicon, propagation can occur with relatively low Ioss. Furthermore, since the medium is a semiconductor compatible with active devices, it is proposed that active devices can be constructed directly in the semiconductor dielectric guide or appendaged directly on the surface. The basic approach is similar to that used in integrated optics, except that the medium for millimeter-wave guidance is a semiconductor and the control devices rely on conductivity modulation rather than on electrooptical effects. Some particular devices suggested are oscillator, mechanical and electronic phase shifters, amplitude modulators (switches), and detectors. The first of such devices investigated has been the electronic phase shifter. Related theory and experiments are reported here. In addition, preliminary results on oscillators imbedded in a dielectric resonator are presented.

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