Abstracts

Metal Walls in Close Proximity to a Dielectric Waveguide Antenna

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The effect of placing metal walls in close proximity to a dielectric antenna has been examined theoretically. When these walls are less than one millimeter away from a silicon dielectric waveguide operating nominally at 60 GHz, they affect the wavelength of the electromagnetic radiation within the guide. As the guide wavelength changes, the angle of radiated energy emanating from the metal stripe perturbations on the upper surface of the dielectric guide also changes. A line scanning antenna can be realized by varying the change in guide wavelength in a controlled manner. Theoretical calculations were made to determine the physical parameters such as waveguide size, spacing of metal stripe perturbations and location of metal walls with respect to the silicon waveguide which can produce a large angular scan. Design curves are presented which can be used to examine tradeoffs between the initial radiation angle and range of angular scan as a function of frequency and perturbation spacing. A means of electronically controlling the simulated absence or presence of metal walls by current biasing distributed p-i-n diodes attached to the side of the dielectric guide from a nonconducting state into a high conductivity state is discussed.

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