7.3.1 THE GRID ARRAY ANTENNA

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The purpose of this note is to call attention to the grid array as a possible useful antenna design for UHF clear-air radars. This type of antenna integrates radiating elements and the feed network into a single structure so that a fairly large array can be driven from a single feed point. TIURI et al. (1974) described the chain antenna and parallel strings of chain antennas that they called grid antennas. Their designs were fed at one end and terminated at the other so that the beam was scanned along the chain as the frequency was varied. They built and tested a 635-MHz grid array using this traveling wave design. A more extensive analysis of the grid antenna is given by CONTI et al. (1981). They used the array as a resonant (broadside) radiating structure at fixed frequency. In addition, they devised a way to taper the array illumination for sidelobe reduction.

Figure 1 has been adapted from CONTI et al. (1981) to demonstrate the basic principle of the grid array. Conductors are arranged above a ground plane in a repeating, staggered array of connected rectangles. Each rectangular element is approximately one by one-half wavelength in size. The arrows in Figure 1 show the currents on the conductors at resonance. Note that the vertical elements are all in phase, and that the currents on the horizontal conductors reverse at one-half wavelength intervals. This causes the vertical field components to add and the horizontal components to cancel, forming a vertically polarized beam in the far field. The grid array shown in Figure 1 can be expanded in both vertical and horizontal directions about the feed point by adding additional rectangular conductors. The array illumination can be tapered by making the central conductors larger (lower impedance) than those near the edges.

The grid array antenna would seem to be useful for UHF clear-air radar applications where a single broadside beam is required. The design eliminates the feed network and would provide a thin, panel-like antenna that could be easily built and transported.

REFERENCES

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