

## IV-1. TRENDS IN PHASED ARRAYS

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The advent of the ballistic missile threat has promoted interest in a complex form of radar commonly called a "phased array." These radars, instead of using a single electrically large antenna such as a parabolic reflector, and mechanically moving it to point the beam, make use of many electrically small antennas (typically hundreds or thousands) and move the beam by varying the relative phasing of these antennas.

The current high level of interest in such configurations is now about ten years old. In this time, a significant amount of research and development has been done, primarily stimulated by and paid for under programs for defense against ballistic missiles and for observation and cataloging of objects in space. These early years have been quite fruitful. They have produced a thorough understanding of most of the physics of such devices, a great deal of exploration in techniques and system configurations and the invention of new kinds and forms of some of the components more or less unique to some systems such as electronic phase shifters.

Of significant import is the fact that the large expenditures of past years on very complex arrays to solve exceedingly complex problems have pointed the way to the necessary configuration and critical components required for "cheap" arrays to solve more mundane problems. For example, by this technology it appears that it will be possible to add the benefits of electronic scanning to a radar for a price differential of a fraction of the initial cost of a conventional radar and with negligible differential maintenance costs. It then becomes reasonable to consider the utility of simple electronic scan for applications for which the cost of arrays based on prior technology would have been prohibitive (e.g., air traffic control radars).

In this paper we will examine a typical configuration for very simple phased arrays and compare its utility and complexity with that of both conventional radar and more complex phased arrays. The most critical area of microwave technology required to realize such simple arrays are in the phasing devices. The current direction of effort in this area is briefly summarized and the current status of achievement outlined.

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