

# NASA TECH BRIEF

## Langley Research Center



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### Microstrip Antennas

It is now possible to design and construct a simple, efficient microwave antenna, either linearly or circularly polarized, which should be very useful in phased arrays. It is mounted on a thin dielectric substrate and extends only slightly above the ground plane. Space behind the ground plane is not required except for the feed line and mounting hardware.

To build an antenna with the design center frequency very near the measured center frequency, it is necessary to first measure the antenna input impedance at the desired frequency and then design the matching network. The matching network determines the antenna bandwidth and the actual resonant frequency (within a larger band, determined by the antenna size).

To obtain a linearly polarized element, construct the antenna  $\lambda_d/2$  square at the end of a 50-ohm microstrip feed line ( $\lambda_d$  is the wavelength in the dielectric). Measure the impedance of the antenna in the frequency range of interest and design a matching network to transform the antenna impedance to 50 ohms. Reconstruct the antenna with the matching network on the same dielectric substrate. It may be necessary to adjust the lengths of the transmission lines slightly to shift the center frequency to the desired point.

A circularly polarized wave will result if the antenna is made square and driven from two adjacent sides with signals  $90^\circ$  out of phase. This may be done by incorporating a  $90^\circ$  hybrid on the same dielectric substrate as the antenna element and inserting the appropriate matching network between the antenna and the hybrid.

It is also possible to build an antenna with two resonant frequencies by making it rectangular and driving it from adjacent sides.

#### Note:

Requests for further information may be directed to:  
Technology Utilization Officer  
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Mail Stop 139A  
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Reference: B73-10179

#### Patent status:

NASA has decided not to apply for a patent.

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