

# NASA TECH BRIEF

## Langley Research Center



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

### Dual-Band Ridged Waveguide

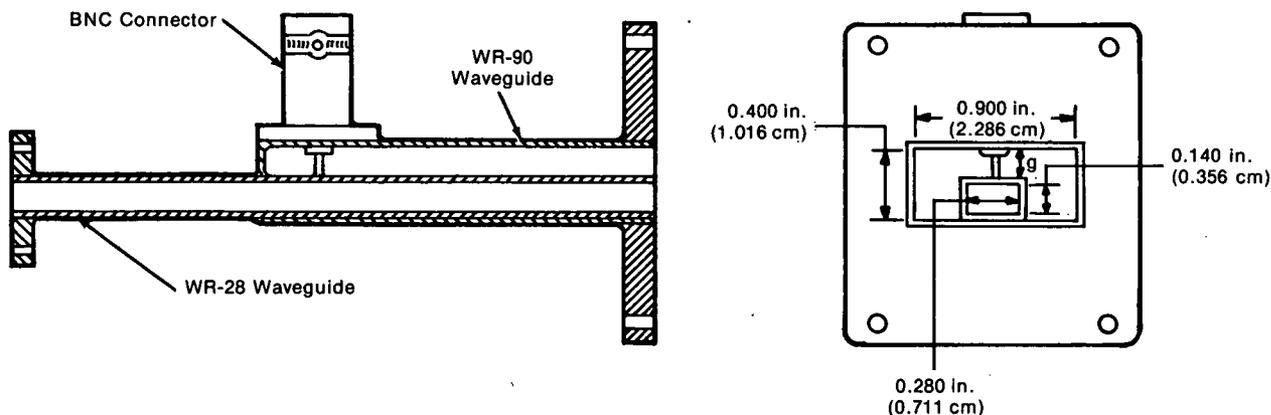
A ridged waveguide is often considered in a design when extremely wide bandwidths are required and a system cannot tolerate the losses inherent in a coaxial cable or a microstrip. Such a waveguide is expensive to machine and generates considerable material waste in manufacture, but a new "waveguide-in-waveguide" technique overcomes such drawbacks and also provides the needed results. It involves the routing of two waveguides through the same passageway. A smaller waveguide, such as a WR-28 millimeter waveguide, can be soft or silver soldered inside an X-band waveguide (WR-90) to form a single ridged guide and to propagate frequencies at the C-band.

The ridged waveguide may have a central ridge added to the top or the bottom, or both, of a rectangular section. This lowers the cutoff frequency of the guide due to the capacitive effect at the center.

In principle, the cutoff frequency may be made as low as desired by decreasing the gap width ( $g$  in the illustration) sufficiently. Impedance decreases, however.

For example, by inserting the WR-28 waveguide (which covers 26.5 to 40 GHz) into the WR-90 waveguide (8.2 to 12.4 GHz), the cutoff frequencies of the outer guide then become approximately 4.5 GHz and 11.2 GHz. It can be used for frequencies from 7 through 10 GHz and should be usable well down into the C-band before attenuation effects become severe. The characteristics of the inner guide are unaltered.

A method to decouple the guides is shown in the illustration. The smaller WR-28 guide continues through the end wall of the larger guide, and a coaxial-to-waveguide adapter is used to couple energy from the outside guide.



Dual-Band Ridged Waveguide

(continued overleaf)

**Note:**

No further documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer  
Langley Research Center  
Mail Stop 139-A  
Hampton, Virginia 23665  
Reference: B75-10091

**Patent status:**

Inquiries concerning rights for the commercial use of this invention should be addressed to:

Patent Counsel  
Langley Research Center  
Mail Stop 313  
Hampton, Virginia 23665

Source: John M. Franke  
Langley Research Center  
(LAR-11781)