

June 1975

# NASA TECH BRIEF

## NASA Pasadena Office



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.

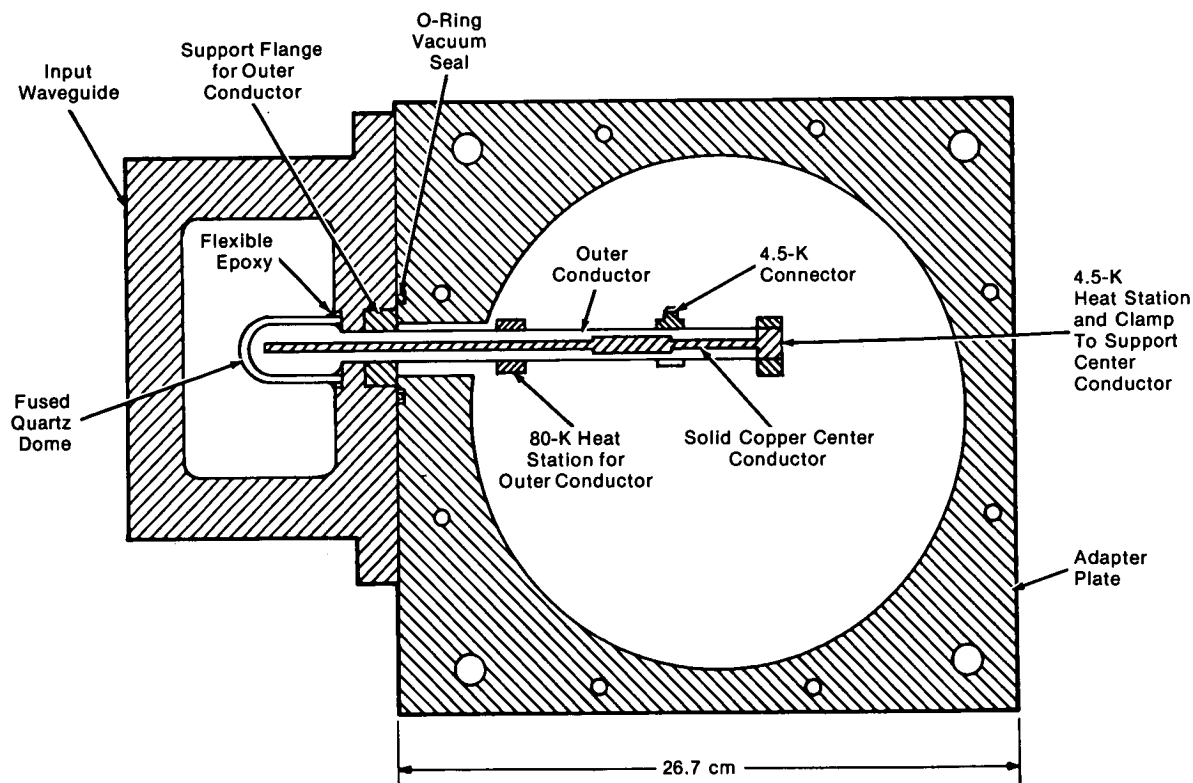
### Transmission Line for S-Band Masers

A new shortened transmission line has been developed for S-band masers. The result is reduced noise temperature at the maser input.

The transmission-line assembly is shown in the illustration. The line is coaxial. Its outer conductor is made of a thin-wall (0.25-mm wall) stainless-steel tube; the inside is plated with 0.0025 mm copper and 0.0003 mm gold. This combination gives little microwave loss and adequate thermal isolation. The transmission line is mechanically supported by clamping a flange at the room-temperature end of the

outer conductor, between the adapter plate and the waveguide. Thermal connections to the 80-K and 4.5-K, closed-cycle, helium-refrigeration (CCR) stations are made with flexible copper straps.

The transmission-line center conductor contacts the outer conductor at the 4.5-K temperature connector and at the support clamp (which is thermally connected to the 4.5-K CCR station). It is made of gold-plated, polished copper. A vacuum, common to the CCR vacuum jacket, provides thermal insulation between the coaxial-line center conductor and its surrounding outer conductor and the quartz dome.



Input Transmission-Line Assembly

A fused quartz dome serves as part of the vacuum seal. The quartz dome is attached and sealed to the input waveguide with flexible epoxy. An O-ring seal is used between the waveguide and the adapter plate. The waveguide and fused quartz dome assembly can be replaced without disturbing other input-line components.

Refrigeration capacity measurements show that the total heat transferred to the 4.5-K CCR station (by radiation to the center conductor and by conduction through the outer conductor) is approximately 100 mW. The VSWR (voltage standing-wave ratio) of the transmission-line and waveguide assembly is less than 1.15 to 1 for frequencies from 2,050 to 2,650 MHz. The overall system operating temperature is 8.3 K.

**Notes:**

1. A 2.1-K maser equivalent-input noise temperature was achieved through the use of the new input transmission line. At Goldstone, California, and at Canberra, Australia, 2.1-K masers were installed on 64-m antennas. The improved systems (each with an overall system temperature of 13 K with the antenna at zenith) enabled the reception of high data-rate television pictures from Mercury (by Mariner spacecraft) in 1974.

2. Requests for further information may be directed to:

Technology Utilization Officer  
NASA Pasadena Office  
4800 Oak Grove Drive  
Pasadena, California 91103  
Reference: TSP75-10126

**Patent status:**

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non-exclusive or exclusive license for its commercial development should be addressed to:

Patent Counsel  
NASA Pasadena Office  
4800 Oak Grove Drive  
Pasadena, California 91103

Source: Robert C. Clauss and Ervin R. Wiebe of  
Caltech/JPL  
under contract to  
NASA Pasadena Office  
(NPO-13504)