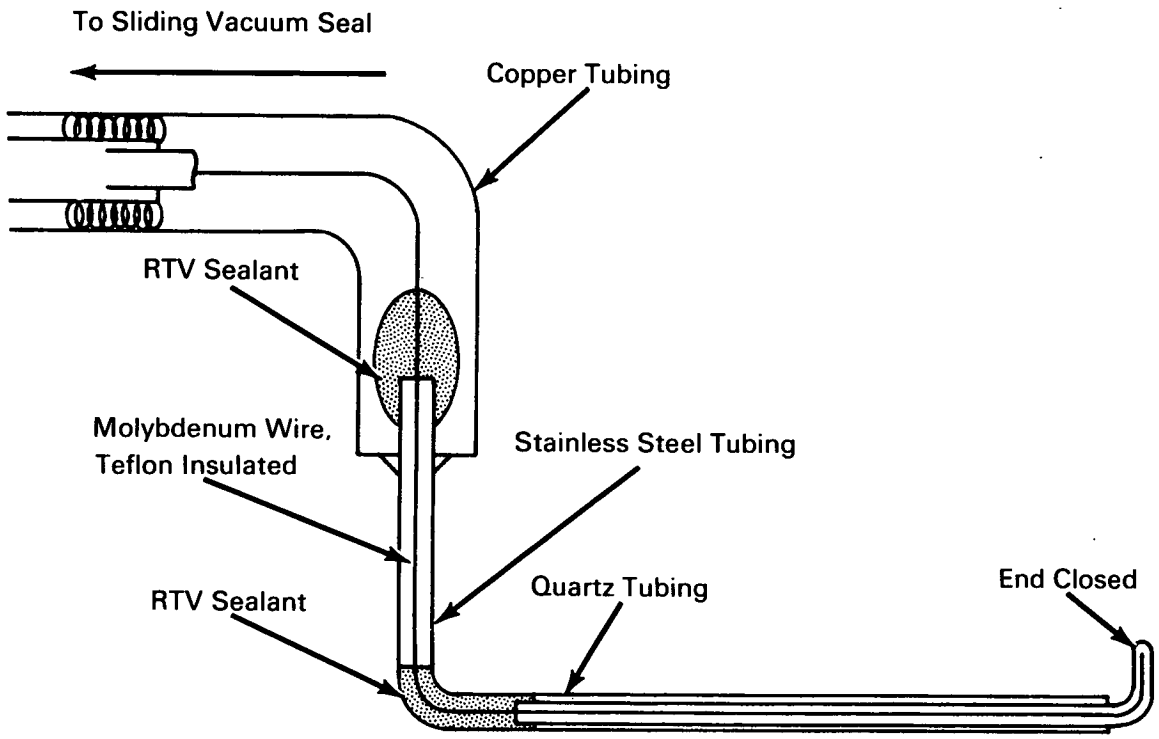
October 1967

Brief 67-10362

NASA TECH BRIEF

Movable RF Probe Eliminates Need for Calibration in Plasma Accelerators



The problem:

To evaluate the basic processes in some plasma accelerators, it is necessary to know the absorption and propagation characteristics of the driving electromagnetic field throughout the interaction region. It is also necessary to know the rf field level within and in front of the calorimeter to determine the extent to which the calorimeter heating is due to power absorbed from the rf wave directly within the calorimeter.

Previous techniques to map the rf wave profile utilized antennas fixed in the accelerator walls. These fixed probes were antenna wires separated from the plasma by quartz covers and responded to the rf electric field in the vicinity of the probe. The induced signal was rectified through a crystal detector and then recorded on a chart recorder. Although attempts were made to make all probes identical, they did not have identical sensitivities and had to be calibrated before they could be used on a comparative basis.

The solution:

A movable rf antenna probe that can continuously map the rf field both within and beyond the accelerator.

(continued overleaf)

How it's done:

The rf probe is basically a short wire antenna. To give the probe mobility, it is mounted on a motor actuated arm and is shielded from the plasma by a dielectric cover. The probe can be moved through the plasma along the system axis for continuous measurement through *and beyond* the plasma diameter. The high temperature molybdenum wire allows continuous use in high energy plasmas.

Since this is a single probe, there is no problem of probe dissimilarity.

Notes:

1. The use of this rf probe in plasma accelerators should eliminate the need for installing probes in the accelerator walls.
2. The moving rf probe can be used to map the rf electrical field under various accelerator conditions. The data from the moving probe can be interpreted more accurately than the fixed rf probes and their associated calibration problems. This type of probe can be useful in rf plasma interaction studies.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B67-10362

Patent status:

No patent action is contemplated by NASA.

Source: D. B. Miller
of General Electric Co.
under contract to
Lewis Research Center
(LEW-10127)