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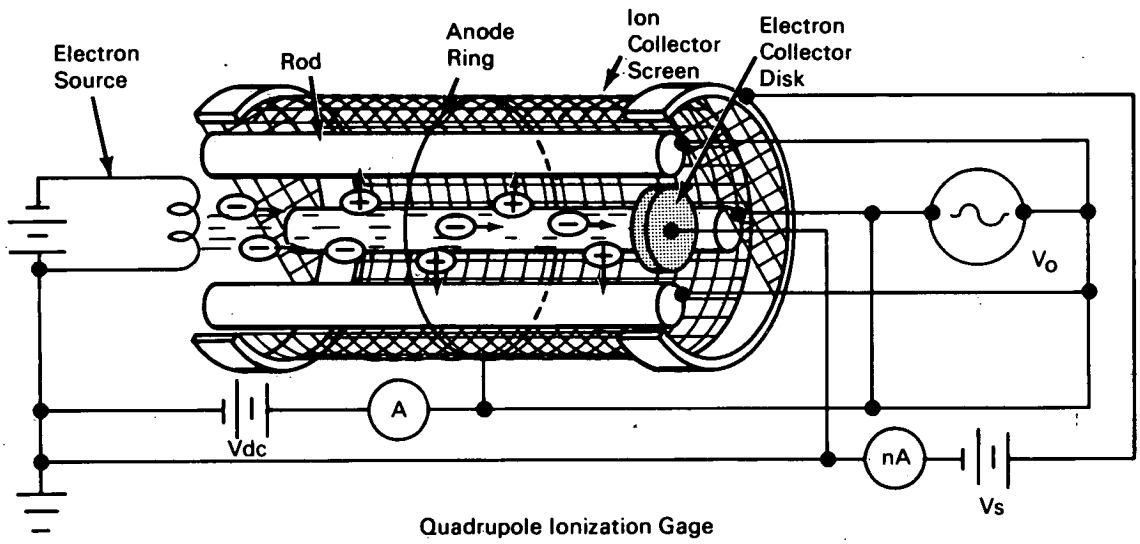
NASA TECH BRIEF

Quadrupole Ionization Gage Measures Ultrahigh Vacuum



Quadrupole Ionization Gage

The problem:

To develop an ionization gage for measuring residual gases in an ultrahigh vacuum. The X-ray background must be reduced and the pathlength of the ionizing electrons increased without the aid of an external magnetic field.

The solution:

A quadrupole system, energized with a 200-MHz electric field, restrains the ionizing electrons within the center of the gage shown in the figure. The oscillatory trajectory of the electrons increases the probability of ionizing the gas molecules, lowers the background X-ray level and increases the signal-to-noise ratio.

How it's done:

Electrons emitted from the hot cathode filament are accelerated in the tube by a dc potential superimposed on the rf field. The same dc potential is applied to a disk-shaped electrode located at the opposite end. The presence of the rf field forces the electrons to oscillate between the two electrodes until the electrons collide with the residual molecules. Ions produced from the collisions are collected by a closed screen surrounding the entire structure.

Notes:

1. An interesting anomaly associated with this experimental gage is the increase of ion current as the pressure decreases within the range of 10^{-5} to 10^{-10} torr.
2. Requests for further information may be directed to:

   Technology Utilization Officer
   Langley Research Center
   Hampton, Virginia 23365
   Reference: B70-10620

(continued overleaf)

Patent status:

No patent action is contemplated by NASA.

Source: H. J. Schwarz of
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