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NASA TECH BRIEF

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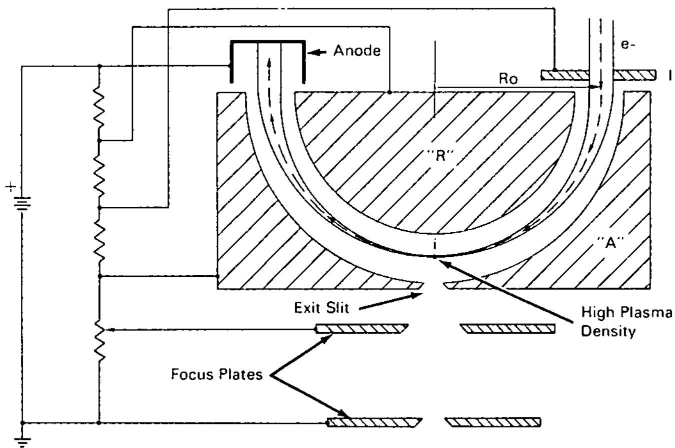
Spherical Ion Source



SPHERICAL ION SOURCE

A method of radial focusing electrons in an ion source produces greater ion densities than have previously been available. The increased ion density allows for higher resolution and focus capability for a given source volume. Applications of this principle can readily be transferred to sources used in mass spectrometers, particle accelerators, leak detectors and related instrumentation.

The problem:

Conventional ion sources have a plasma density which is spatially uniform. The extraction efficiency at the exit slit is thus limited by lack of concentrated ion density. Compromises must be made between a small aperture (low current and high resolution) or a large aperture (high current, poor focusing and low resolution).

The solution:

The electron beam is focused near the exit aperture by use of spherical fields; the fact that the ions are created at high density allows focusing the ion beam to high density at the exit slit, thereby allowing high current through a small aperture.

How it's done:

Electrons on parallel paths and having equal energies are injected through the plane at "I", pass between the inner hemisphere "R" and outer hemisphere "A" and are finally collected at the anode. A high convergence is produced at "i" as a result of the central force field established between the two concentric spheres when a potential exists between them. If a gas is present at low pressure in the region near "i", the ions formed by electron collision are also at high density at "i". The positive ions created are forced through the exit aperture and into the electrostatic lens system because the potential at "R" is more positive than "A".

Notes:

No further documentation is available. Inquiries may be directed to:

(continued overleaf)

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
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Patent status:

No patent action is contemplated by NASA.

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