

ABSTRACT**WAVEGUIDE FOR MICROWAVE EXCITATION OF PLASMA IN AN ION
BEAM GUIDE**

An apparatus and method for providing a low energy, high current ion beam for ion implantation applications are disclosed. The apparatus includes a mass analysis magnet (114) mounted in a passageway (139, 202) along the path (129) of an ion beam, a power source (174) adapted to provide an electric field in the passageway (139, 202), and a magnetic device (170) adapted to provide a multi-cusped magnetic field in the passageway (139, 202), which may include a plurality of magnets (220) mounted along at least a portion of the passageway (139, 202). The power source (174) and the magnets (220) may cooperatively interact to provide an electron cyclotron resonance (ECR) condition along at least a portion of the passageway (139, 202). The multi-cusped magnetic field may be superimposed on the dipole field at a specified field strength in a region of the mass analyzer passageway to interact with an electric field of a known RF or microwave frequency for a given low energy ion beam. The invention further comprises a mass analyzer waveguide (250) adapted to couple the electric field to the beam plasma consistently along the length of the mass analyzer passageway (202) to thereby improve the creation of the ECR condition. The invention thus provides enhancement of beam plasma within a mass analyzer dipole magnetic field for low energy ion beams without the introduction of externally generated plasma. The invention further includes a method (300) of providing ion beam containment in a low energy ion implantation system, as well as an ion implantation system.

Figure 1B