1.7 DEVELOPMENT OF HIGH CURRENT PROTON ECR SOURCE

APPD/BARC has initiated a program of designing & developing a 50 kV, 50 mA, DC ECR based proton ion source shown schematically in Fig. It consists of 1) Microwave generator, 2) Microwave transmission components, 3) Plasma chamber, 4) Solenoids, 5) Ion extraction assembly, 6) Vacuum systems, 7) Gas injection assembly, 8) Beam diagnostics, 9) Einzel lenses and 10) Power supplies for operating the source. The plasma is initiated by a microwave discharge in the presence of a magnetic field created through a pair of solenoids. The microwave power is generated by a 2.45 GHz, 2 kW cw Magnetron. This power to the ion source is fed via an RF plumbing line consisting of a circulator, dual directional coupler, four-stub auto-tuner, waveguide break, ridge waveguide and a microwave window.

The ion source rms normalized emittance has been theoretically estimated to be \( \sim 0.1 \text{ p mm-mrad} \), which corresponds to an ion temperature of \( kT_i = 1.5 \text{ eV} \). The minimum value of the emittance has been estimated at a puller voltage of 40 kV. The ECR discharge will be attained at an axial magnetic field of \( B_{ECR} \sim 875 \text{ G} \) using two independently controlled and water-cooled solenoids.

A turbo pump is used to evacuate the source and the flow of hydrogen/deuteron gas is monitored through a flow meter. The plasma chamber has been made and tested. The microwave generator comprising of a magnetron and a plumb line is shown in Fig. This has been tested up to 1.8 kW. The generator will be operated through a remotely controlled micro-controller, managed through a PC. The ECR ion source will be commissioned by 2007.