Accelerator Technology Development (mechanical) Section

Accelerator Technology Development (mechanical) Section is engaged in the design and development of critical accelerator components based on the inputs provided by the experts. It has developed beam line and its magnets, injection, extraction and beam diagnostic components for both the cyclotrons at VEC Centre. It has also developed cryogenic components for the accelerator program at VEC Centre.
The section is presently involved in the fabrication of large bending magnets for the external beam line of superconducting cyclotron, design and fabrication of beam diagnostics, design of cryostat for superconducting radio frequency cavity, design of large aperture superconducting quadrupole and sextupole magnet and its cryostat.

High Current Ion Source
Mechanical design and fabrication of the high current ion source for accelerator driven sub-critical system and its low energy beam transport system comprising water cooled plasma chamber, solenoid magnet, drive system for solenoid magnet and beam line was carried out (Fig. 1). At the end of the beam transport system the beam is injected in a magnet to study injection of high current beam in a cyclotron.

Fig. 1: High Current Ion Source Assembly

A microwave power generator supplies microwave power to the microwave generator. Initially, the wave guide was stepped (Fig. 2). During operation the wave guide was getting heated up. In order to have proper matching of the microwave power, a tapered wave guide (Fig. 3) was fabricated. A ridged wave guide with water cooling (Fig. 4) was also fabricated. This wave guide reported to give the best results.

Fig. 2: Stepped wave guide

Fig. 3: Tapered wave guide

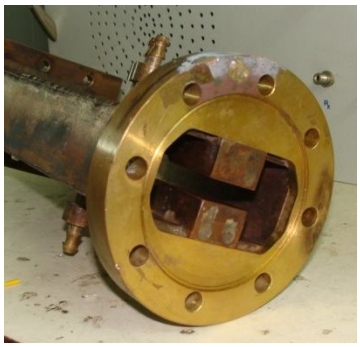

Fig. 4: Water cooled ridged wave guide

At the end of the low energy beam transport system, the beam enters an inflector (Fig. 5) placed at the center of a magnet and exits at the median plane of the magnet. An electrostatic field of 20kV/cm is applied between two electrodes of spiral inflector. The surfaces of electrodes facing each other form a spiral helix. The gap between the electrode surfaces reduces from 14 mm at entry to 11.3 mm at exit. The contoured electrodes were machined from aluminum 6061 plates using a 3+1 axis CNC machine. The profile accuracy below 50 micron and surface roughness was achieved in final component. The inflector was designed and fabricated in the departmental workshop.

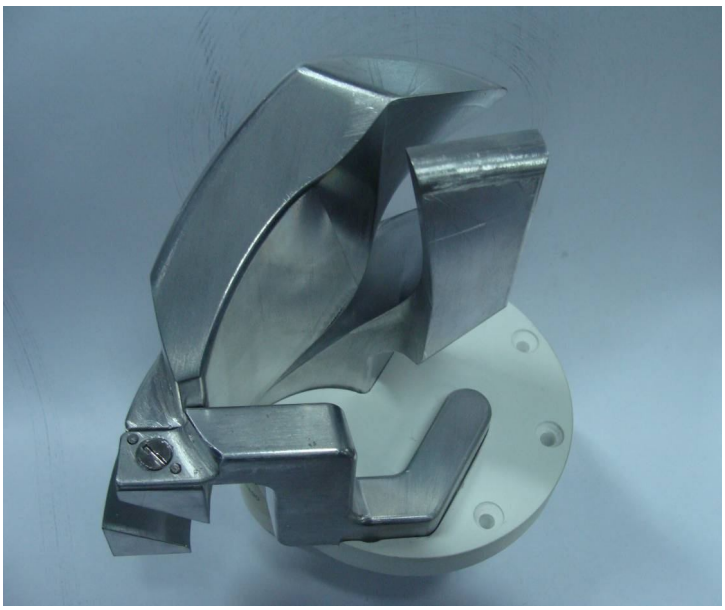

Fig. 5: Spiral inflector for high current ion source