# LAYOUT DESIGN AND INSTALLATION OF LOW ENERGY ION BEAM FACILITY AT IUAC

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## INTRODUCTION

A new Low Energy Ion Beam Facility (LEIBF) is being installed in a newly built Low Energy Ion Beam building. The facility can deliver various beams with wide range of energies ranging from a few KeV to a few MeV. The detailed layout consists of different optical elements, diagnostics, vacuum systems, etc. This paper describes the detail design layout and installation of the facility.

## LAYOUT DESIGN

The entire facility can be divided into four different sections, which are:-

- High voltage(HV) deck with ECR source and Isolation transformer
- Accelerating section between deck and magnet.
- Analysing cum switching magnet.
- The three Beam lines.

The beam hall is L shaped. The ECR source sits on a 400 kV deck, placed at one end of the shorter leg. The multiply charged positive ion beams from the ECR source is to be transported to analyzing cum switching magnet, which sits at the joint of L and bends the ion beam towards the longer leg, into one of the three beam-lines at 75 degrees, 90 degrees and 105 degrees. The detail layout has been designed as per ion optics calculation and shown in figure 3.

## VACUUM SYSTEM

A combination of getter pump and ion pump has been installed in accelerating section and all the beamlines. ECR and deck components are provided with a combination of turbo pump and dry scroll to take care of high outgassing load. An electromagnetic scanner has been installed in the material science line, for scanning over an area of 50 mm x 50 mm. For this purpose intermediate section starting from end of the scanner magnet upto entrance of the target chamber has been widened to a diameter of 150 mm. So an additional turbo pumping system has been installed in this section to limit the gas loading from the chamber side into rest of the beamline. All monitoring and control equipments have been provided with necessary interlocks to prevent vacuum accidents.

## INSTALLATION

The floor of the beam hall has been strengthened by embedding of base plates on the floor at all the load bearing surfaces i.e. under the magnet, high voltage deck and under all the beamline stands and facilities. The beam axis height for this facility has been kept at 1.75 m from the floor. To install beamline components at this height, a complete support structure, consisting of beamline stands, channels, brackets and related accessories, were designed and fabricated. All these components were powder coated for better finish and life.

The magnet was placed and aligned properly using LEICA theodolite. The accelerating section, deck (high voltage deck) components and all the three beamlines were installed step by step and aligned with reference to the ports of the magnet. All vital components like ECR source and electrostatic accelerator column (GP tube), beam diagnostic components (BPM and Faraday cup), beam focussing/steering elements (quadrupoles, beam steerers and scanners) and beam slits have been installed precisely within an accuracy of ~ 0.5 mm. Reference points for beam height and beam axis have been transferred on the floor and on the walls at all the necessary points.

All the controllers for beamline valve and Faraday cup and their interfacing units are modular based and are designed and fabricated in-house. These are very compact, easy to operate and provided with status readback, which facilitate easy diagnosis of faulty points. To meet various requirements of the facility most of the components were indigenously designed and developed. Some of the critical components developed are:-

- High Voltage Deck: The high voltage deck is a stainless steel, two storey deck (Figure 1). The deck sits on three storeys of insulators and has been tested to hold 400 KV potential. All the power to deck is supplied through an indigenously designed and fabricated two stage Isolation transformer (400KV, 25 kVA capacity). A 400 KV high voltage Glassmann power supply is used to accelerate the beam from ECR through accelerating column.
- ECR source stand.
- All the beamline stand, brackets and accessories.
- Electrostatic quadrupole doublet and triplet.
- Control panel console, instrument racks and cable trays.

Figure 1: High voltage deck.

- Experimental chambers.
- Electrostatic steerer and scanner.
- Vacuum pumping crosses and all intermediate chambers.
- Modular based pneumatic valve controllers and Faraday cup controllers.

Figure 2: LEIBF Beamlines.

- Interfacing control units between Indigenous Measurement and Control System (I-MACS) and device controllers.

## STATUS

All the components except ECR source have been installed, Figure 2. Connection of components to control console is in progress. Water line connection for magnet cooling is going on. Facility is expected to be ready for testing by March, 2011

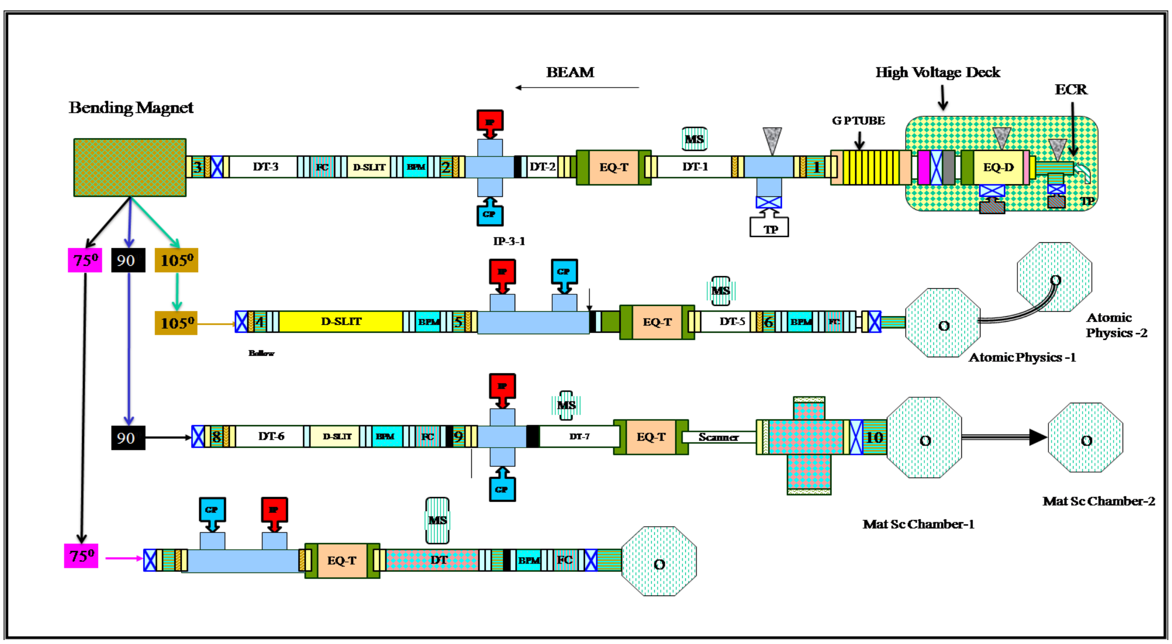


Figure 3: LEIBF Installation Layout.