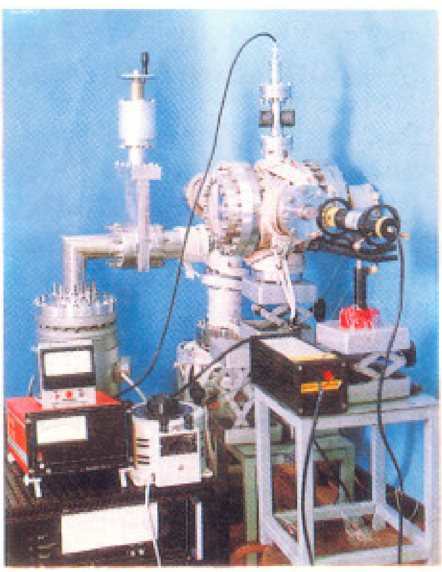
power was varied from 5 to 160 Watts. The maximum current obtained for argon and helium ions was 2.5 mA at 4 kV and 1.5 mA at 1 kV respectively. The axial magnetic field was varied from 0 to 100 Gauss. Such an ion source will also be used for injection into the proton linac using hydrogen gas plasma.

Synchrotron radiation beam viewer

In a synchrotron radiation (SR) beam line, a beam viewer is an important module to carry out beam alignment after every optical element. A beam viewer comprising a novel electromagnetically operated flipping mechanism has been designed and developed for operation in an ultrahigh vacuum chamber. The flipping mechanism rotates a fluorescent screen by 45° to bring it in the path of the synchrotron radiation beam. The beam position is then monitored using a closed circuit TV camera placed at right angle to the SR beam path.

The flipping mechanism, driven by an electromagnetic actuator, consists of a stainless steel cantilever rod which is rotated by a plunger made of a soft magnetic material. This plunger moves in a stainless steel cylinder because of the electromagnetic force induced by an induction coil placed concentric with the stainless steel cylinder. The magnetic force pulls the plunger in such a way that the fluorescent screen makes an angle of 45° through mechanical limiting of its motion. The actuator along with the screen is mounted on a standard conflat flange which is fixed on to the beam viewer chamber. The beam viewer has been tested down to a vacuum of 8×10^{-9} mbar.



Synchrotron radiation beam-viewer with electromagnetic actuator.

Compact Faraday cups

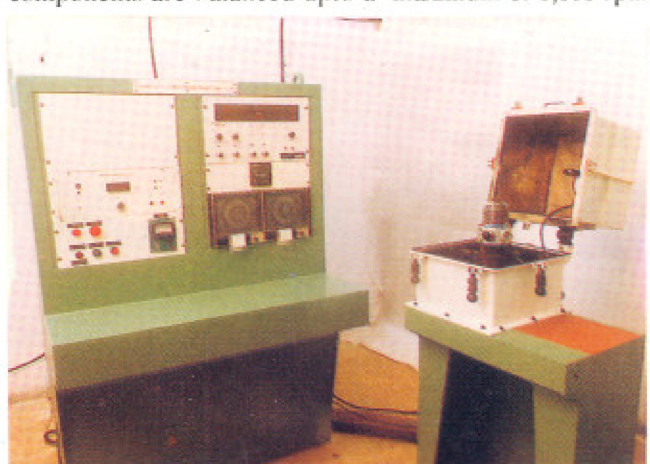
The most widely used device for measuring electron or ion beam currents is the Faraday cup, which stops the beam completely. Compact water-cooled Faraday cups have been fabricated to measure the pulsed electron beam currents from a linac electron gun. A 40kV, 100 mA, 2.6 μsec pulsed beam at 1 Hz corresponds to a power dissipation of a few milliwatts only. Pulsed currents were measured using a toroidal current transformer. The number of turns and the load resistance were matched to get a 1 mV signal for 1 mA beam current without affecting the time structure of the beam. In addition, high power water cooled Faraday cups have also been developed, and tested with a continuous beam of 2kW power from a high voltage, high current electron gun (60kV, 30 mA). Effects arising from sputtering, space charge, secondary particles and contact potentials have been taken into account during the design. A batch of three Faraday cups have been designed, fabricated and tested for electron beams in both pulsed and continuous modes.

Dynamic balancing machine setup for turbo-molecular pumps

A turbo-molecular pump is an efficient device for creating ultrahigh vacuum of the order of 10^{-9} mbar. CAT has taken up the development of a 150 litre/sec capacity turbo-molecular pumps.

The critical areas of the development of a turbo-molecular pump are mainly the fabrication of a complex geometry multistage finned rotor, stator, a three phase electric motor, a variable frequency power supply and the precision dynamic balancing of all the rotating components upto the operating speed of 50,000 rpm. A dynamic balancing machine satisfying our specifications has been developed for the first time in India by a private balancing machine manufacturer. The machine has been accepted and commissioned at CAT.

The set-up consists of two balancing machine modules. The first is a hard bearing type of balancing machine which will be utilized for low speed component balancing of various components such as motor rotor and the pump rotor separately. At low speed balancing the gross unbalance which is usually introduced by the size variation and machining tolerances, is minimised. The components are balanced upto a maximum of 6,000 rpm



High-speed-assembly balancing machine for turbomolecular pump.