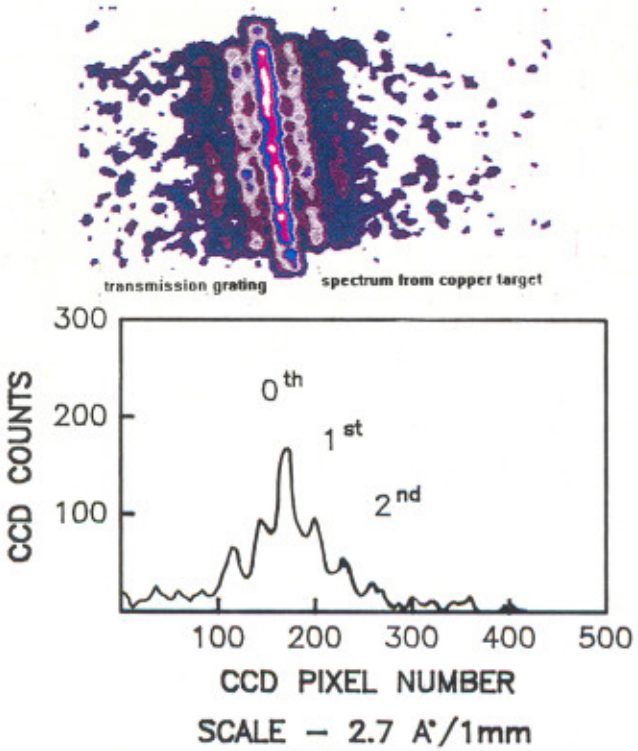


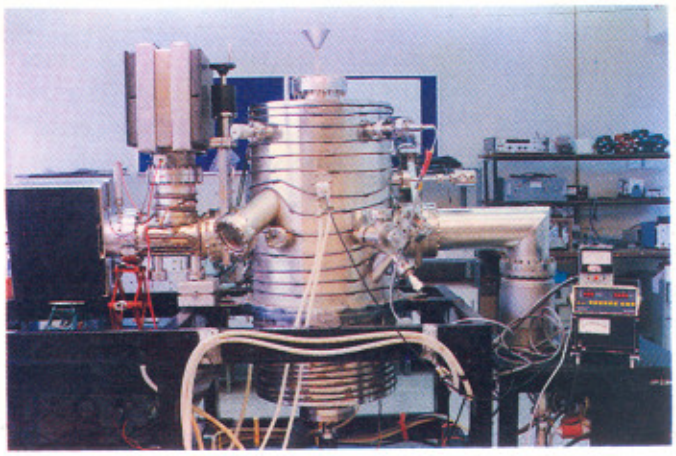
Fig. 3 Image and intensity profile of x-ray spectrum from copper plasma.

PROMISE Software. The spectrum shows clearly 1st and 2nd orders on both sides of the 0th order.

ACCELERATOR PROGRAMME

Commissioning of booster synchrotron

An accelerated current of 9 mA at 450 MeV energy has now been achieved in the booster synchrotron. This increase in current from 1.8 mA (CAT Newsletter, July - December, 1995) was achieved by optimisation of RF parameters and steering of the beam orbit. The beam is steered in both horizontal and vertical planes using six horizontal steering magnets located on the six dipole magnets and five vertical steering magnets, installed separately. Now these steering magnets were operated in ramp mode. The RF parameters were optimised by detuning of cavity frequency with respect to revolution frequency and ramping of the RF voltage linearly from 1.5 kV (at injection energy) to 5 kV (at peak energy). Lower voltage at the injection energy reduces the losses due to synchrotron oscillations. Whereas at higher energy, high voltage is required to compensate for the synchrotron radiation losses. Earlier a constant voltage was applied throughout the ramping. Besides this, injection magnet parameters and other magnet parameters were further optimised. Beam extraction trials will start very soon.



Setup for electron beam deposition for X-ray multilayer mirrors

Electron beam deposition system for x-ray multilayer mirrors

Optical elements with multilayer coatings for XUV optics have wide application in many fields including synchrotron radiation instrumentation, plasma diagnostics, soft x-ray spectrometers and x-ray astronomy. These elements consist of stacks of thin film which are composed of materials with alternate high and low scattering power, and have periodicity in the range of 10 to 100 Å. These can be operated at higher angles of incidence. For developing such films an electron beam (e-b) evaporation system has been developed. In this, three e-b evaporation sources have been incorporated in an ultra high vacuum deposition chamber. This is evacuated by a turbomolecular pump and two sputter ion pumps. The film thickness and deposition rate is monitored using two quartz crystal monitors and a quadrupole mass analyzer. A substrate holder which can be cooled to liquid nitrogen temperature is also installed. A movable masking system has been mounted just below the substrate to deposit several kind of multilayers without venting the system.

Radiological safety in Indus-1 building

With the increase in beam current and energy during commissioning stage of booster synchrotron, radiation fields inside booster synchrotron hall have increased significantly. In view of the potential radiation hazards (Bremsstrahlung X-rays and neutrons) in Indus-1 building during operation of microtron and booster synchrotron, several steps have been taken for ensuring radiological safety of working personnel. The Indus-1 building has been divided into three zones based on their hazard potential:

(1) Normal areas, such as the entry lobby, main corridor etc. where persons have free access.

(2) Restricted entry areas (synchrotron radiation source hall, microtron control room) where monitoring

devices like TLD or DRD are to be worn by working personnel.

(3) Inaccessible areas which are kept locked during operation. The doors to these areas have door interlock switches so that if they are opened, the accelerator goes off automatically. This area houses the microtron block and the booster synchrotron.

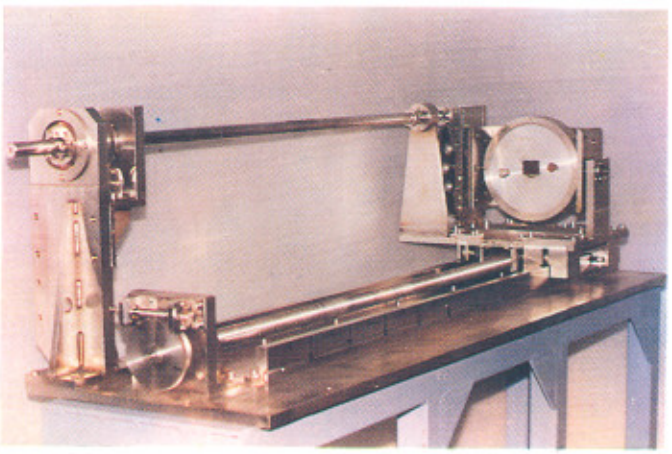
Various audio-visual warning systems like display panels, red flashing lamps, PA system, siren etc. are used to inform working personnel about the machine operation and existing hazards. Safety checks before starting microtron are followed every time. The operator goes inside synchrotron hall and searches for any working person. A series of relay operated search switches are installed within the accelerator hall to complete the interlock circuits besides the physical search. After ensuring no occupancy inside, the operator locks the door. The machine can be started only after all the interlocks positively confirm the locking criterion. Scram (emergency off) switches are installed at various locations within the accelerator hall. This allows a person to turn off the accelerator, if he is trapped inadvertently in Zone-3.

Bulk radiation shielding using ordinary concrete (upto 2m thick) is provided around microtron and booster synchrotron to reduce the radiation dose to permissible levels. In addition to this, local shielding is also provided wherever necessary. Only authorised persons are permitted to enter Indus-1 building. For entry to restricted entry areas, working personnel are issued personnel monitoring devices (TLD-Thermoluminiscent Dosimeter or DRD-Direct Reading Dosimeter). Periodic radiation survey of various areas of the building is done by a health physicist. Alarm type area radiation monitors are kept in the area to indicate the ambient radiation field on continuous basis. Working personnel are trained in radiation safety practices and the safety procedure to be followed. The responsibility to enforce safety practices is entrusted to the shift-in-charge and a health physicist.

INFRASTRUCTURAL DEVELOPMENT

Fabrication of grating mount and drive mechanism for beam line

A grating mount and its precision drive mechanism for a 6.65 m long eagle mount spectrometer has been fabricated at CAT workshops. It is a part of 23 m long VUV beam line for Indus-1 being built by spectroscopy division, BARC. The system was designed by central workshops, BARC. It is operating in high vacuum and will enable focusing of the synchrotron radiation beam to exit slit and PM tube assembly for scanning purpose.



Grating mount and drive mechanism for beam line.

Computer facility

Laser R & D block 'D' has been brought now on Ethernet. Two new networks have joined the CATnet, viz. one at Palace and the other at purchase dept. These networks are connected to the main network using PPP protocol over dedicated lines. IP masquerading technique is used to overcome the problem of limited IP addresses available to CAT, without restricting the internet access. A new protocol POP (Post Office Protocol) has also been fully implemented on CAT machine. This allows end user to send and receive mails directly from his own PC connected to CATnet. A software package named 'Auto Attendant' has been developed and implemented at CAT to automatically redirect incoming calls to CAT EPABX. In this, the extension number is taken from the DTMF sequences from the caller.

Cover photograph shows the laser micrometer developed at CAT.