डा. आर. चिदम्बरम्
Dr R. Chidambaram
सचिव
SECRETARY
&
अध्यक्ष, परमाणु ऊर्जा आयोग
CHAIRMAN, ATOMIC ENERGY COMMISSION

भारत सरकार
परमाणु ऊर्जा विभाग
GOVERNMENT OF INDIA
DEPARTMENT OF ATOMIC ENERGY

May 31, 1993

M E S S A G E

The Centre for Advanced Technology (CAT), in the last nine years has been spearheading successfully the national effort in Research and Development in the frontier technology areas of accelerators and lasers and also related areas. I congratulate all the employees of CAT for their valuable contributions which has made this possible.

I am sure CAT would continue to function with the same vigour and scale even greater heights of achievements in the years to come.

One of our important mandates is to make scientific information available to the public in lucid language. I am happy to note that the News Letter of CAT has been fulfilling this task commendably.

My felicitations to the editorial staff and best wishes for their continued success.

R. Chidambaram

(R. Chidambaram)
Chairman, AEC &
Secretary, DAE

control room. Due to low repetition rate (1-2 Hz) of the microtron beam bunches it is difficult to view the real time image. This problem has been overcome by using a video frame grabber discussed later in this newsletter.

The Faraday cup is used for absolute measurement of the extracted beam current. It consists of a graphite absorber which captures the electrons. The abosrber has a re-entrant geometry followed by a lead backing and is surrounded by a vacuum envelope.

The monitors have been tested under simulated beam conditions and have been installed in the experimental setup for the beam extraction trials. The photograph shows this experimental setup with a beam profile monitor and a Faraday cup in the path of the external beam of the 20 MeV microtron. The internal probe, being inside the chamber, is not seen in the photograph. After beam extraction at 20 MeV, a transfer line with a provision to measure the beam emittance and energy spread will be set up.

Video Frame Grabber

A video frame grabber has been made at CAT with the help of the technology developed at BARC. As mentioned above, this is used with the beam profile monitor for capturing the image of the microtron beam repeating at 1-2 Hz. The image thus captured can be seen on a TV monitor and can also be sent to a computer for analysis.

The video frame grabber is a stand alone instrument capable of digitizing CCIR standard composite video signal. A picture frame is digitized into 512x512 pixels with a resolution of 8 bits. This requires 256 Kbytes of RAM; hence two picture frames can be stored at a time. A picture frame can be captured in response to an external trigger. The beam image is captured using a trigger pulse derived from the microtron control system. An important feature of this instrument is that the incoming picture frame can be subtracted point by point from the stored frame so as to display the on-line difference image, which can be stored and digitized. This can be transferred to a PC XT/AT for further processing.

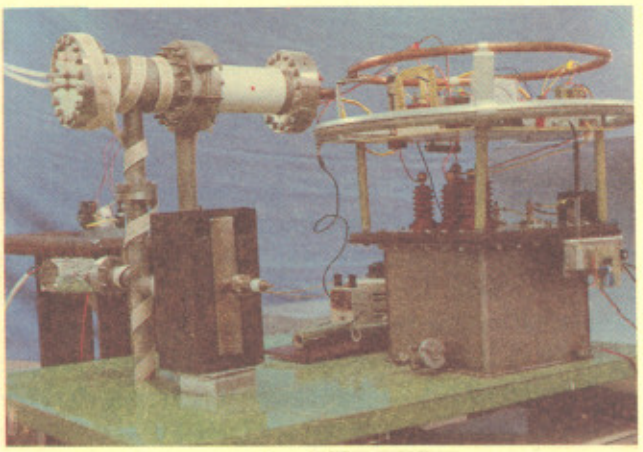
Beam monitors installed on microtron

Electron Gun for LINACs

An electron gun for injection into LINACs has been designed and developed. It has been tested to provide a 120 mA pulsed electron beam at 40 kV, with 2.8 μs duration. In contrast to the conventional design which is cathode pulsed, this is grid pulsed and offers many advantages viz. a simple electronic circuit, a good leverage in controls since they are at lower voltage, and no distortion in the cathode field focusing. Further, both a direct emitting cathode, and indirect emission under electron bombardment, have been used. The axially symmetric electron optical design, and the gun parameters, were optimised using a computer program. The integrated electronic power supply includes a 45 kV isolation transformer, a 6 kV - 50 mA supply for electron bombardment, and a pulse transformer for grid pulsing. The gun and water-cooled Faraday cup operate at 5×10^{-6} torr, and the materials have been chosen to enable baking at 400°C.

EDXRF Spectrometer

A table top EDXRF (Energy Dispersive X-ray Fluorescence) spectrometer has been set up for non-destructive multielement analysis. The spectrometer comprises of an excitation source, a high resolution solid state detector, and data acquisition and processing systems.



A view of Electron Gun

The excitation system is a low power transmission anode X-ray tube to give a stable X-ray flux from molybdenum material. A liquid nitrogen cooled Si(Li) detector (ORTEC) is being used to detect and disperse X-ray photons of different energies. The resolution achieved is 160 eV for 5.9 KeV X-rays.

The data acquisition system consists of ORTEC's 92X Spectrum Master integrated spectroscopy system which is controlled by a PC/AT computer. For quantitative estimation of the concentration of the elements present in the specimen sophisticated data processing procedures have been developed. An analytical sensitivity of the order of few tens of ppm for most of the elements having Z>18 has been achieved.

The set up has recently been used for analysis of a greenish colour coating observed in the low conductivity water supply tubing of Klystron. The coating can cause change in the heat removal and thus affect the frequency of the Klystron. The analysis has shown that the coating primarily contained two elements namely copper (5%) and Pb (0.1%). This will help in identifying the probable cause of coating in the Klystron, and is an illustrative example of the various uses of this instrument.

COVER: *Copper Vapour Laser, developed at CAT, pumping a dye laser.*

A **School on Physics and Engineering for Particle Accelerators** will be organised jointly by CERN and CAT during November 7-16, 1993 at CAT. Topics to be covered include general accelerator physics, design of magnets and RF cavities, vacuum systems and control systems. The School Directors are Dr E J N Wilson, CERN and Shri S S Ramamurthi, CAT. The faculty include distinguished scientists from major accelerator centres worldwide. For further details contact Accelerator Programme Office, CAT.