(on the MCP screen) of the two peaks and the known time delay. The FWHM duration of the laser pulse is observed to be 21.3 psec as compared to a nominally expected value of ~ 20 psec.

Fig.1a shows streak pictures obtained from the S-1 camera for a train of 20 psec pulses (with inter-pulse separation of 233 psec) for the second fastest speed (20 mm/2.1 nsec). The intensity versus time trace shown in Fig.1b agrees well with the expected intensity reduction factor of 2 between successive pulses. A dynamic range of 20 is estimated from the data obtained from a large number of such pictures. Next, temporal resolution measurements were limited by the shortest laser pulse duration of 20 psec used in the present experiments. However, a resolution of ~3.6 psec is theoretically expected from the slit width of 100 μm and camera magnification of 2.1 for the fastest speed setting for the S-1 camera.

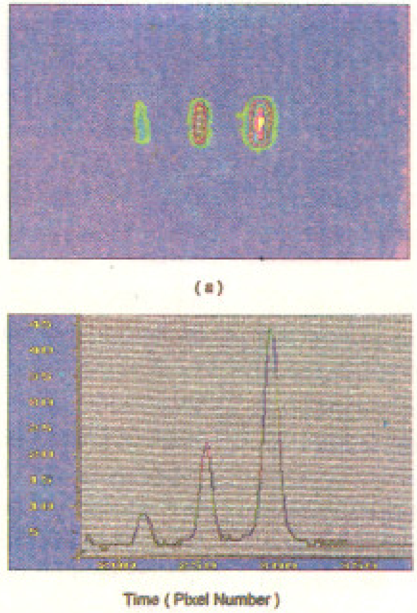


Fig.1 a) Streak pictures of a train of 20 psec laser pulses for dynamic range measurements of S-1 streak camera. b) corresponding intensity versus time profile.

The x-ray streak camera has also been tested by producing x-rays from copper and aluminium targets using 20 psec laser pulses of 50-70 mJ energy from Nd:glass laser chain. Fastest streak speed on this camera was measured to be 35 mm/1 nsec, with an expected temporal resolution of ~6psec. The camera has been used to record time profile of x-ray emission in different spectral regions by mounting various x-ray filters on the photocathode slit. Fig.2a shows a streak picture of x-rays transmitted through one and two numbers of aluminized polycarbonate foils (1 μm thickness) for emission from a copper plasma. The corresponding intensity profiles are shown in Fig. 2b and 2c respectively. It was seen that the relative intensity and duration of emission for the x-rays transmitted through two filters qualitatively agreed with the expected behaviour.

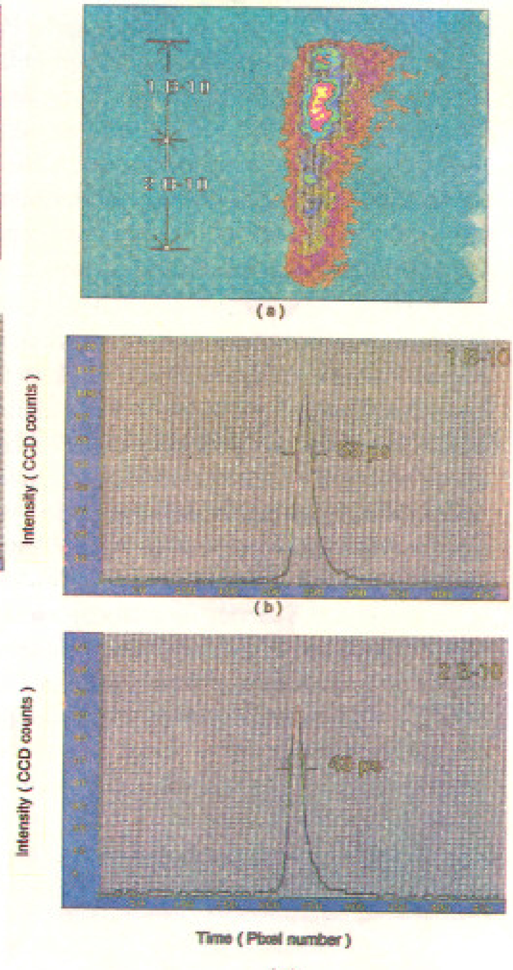
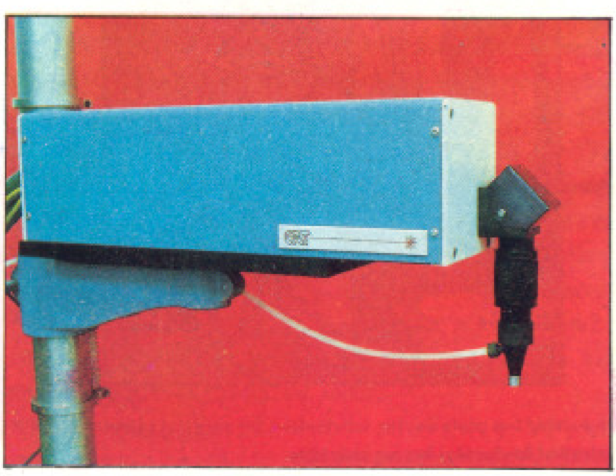


Fig.2 a) Streak picture of x-ray pulse transmitted through different filters for a laser produced copper plasma.
b,c) Intensity versus time profile for 1 B-10 and 2 B-10 x-ray filters respectively.

Development of a control system for 100 GW Nd:Glass picosecond laser chain.

A 100 GW Nd:Glass picosecond laser chain is being set up at CAT for studies of intense x-ray generation in laser plasma interaction. The laser chain consists of a picosecond oscillator-amplifier (supplied by Quantel, France) fol-



Cover: *Industrial YAG Laser Model IL YG - 150 during operation. This Laser has been delivered to Jadavpur University, Calcutta. The YAG Laser delivers a maximum of 150 W average power, pulse duration variable from 2 - 20 msec & has pulse shaping facility to cater to wide range of material processing procedures. Photograph on left side shows the Laser.*

lowed by four laser amplifier stages and a Faraday optical isolator. This approach of coupling amplifier stages to a commercial oscillator is advantageous since it is much cheaper to build up large aperture amplifier stages and their power supplies in the laboratory; it also provides easy maintanence of the laser chain, and flexibility of design. A microprocessor based control system for operation of this laser chain has been developed and tested.

Whereas the picosecond oscillator operates at a repetition rate of 1-10 Hz for a stable operation, large aperture amplifier stages are operated in a single shot or at a much lower frequency of one pulse in a few minutes. However, all the low peak power pulses from the oscillator, except the one to be amplified, should be blocked to avoid any damage or disturbance to the plasma target prior to the arrival of the amplified laser pulse. The control system generates charging and firing signals required for the picosecond oscillator, and also carries out charging and firing sequence of the various amplifier stages for single shot or repetitive modes of operation. It also controls a mechanical shutter to selectively pass a laser pulse from the oscillator stage into the amplifier chain.

The control system consists of 3 subsystems, viz a microcomputer, the control modules and the power supplies. The control modules contain the hardware logic required to control various operation of the power supplies, and they are mapped into the memory of the micro-computer. For operating the system, the data is entered through simple commands. The pico-second oscillator is operated at a frequency selectable between 1 to 10 Hz. For charging and firing other amplifiers, external switches are provided. A mechanical shutter, operated by a stepper motor is used to allow the beam to pass to the target when amplified laser pulse is being generated, and block all other oscillator pulses from reaching the target. After the laser shot is fired, data regarding leftover voltages, energy meter outputs etc. is displayed on the terminal. The system can be operated in single shot, or in repetitive mode with programmed number of shots and interval.

Operation of the above control system has been tested by firing the oscillator-amplifier system along with an amplifier stage of 15 mm aperture set up in the laboratory. Good synchronization is confirmed from the measurements of amplifier gain as a function of relative time delay in firing of different stages.

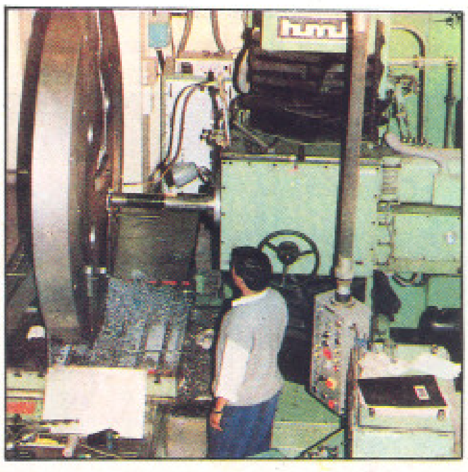
INFRASTRUCTURAL DEVELOPMENT

Computer facility

The computer network CATNET has been extended to Laser R&D Block - A, giving campus-wide connectivity between computers available at Palace, ADL, and A-Block. This facilitates availability of emails at individuals desk tops as well as provides access to the remote systems transparently to all users from their PCs. The network now has four segments in ADL with 22 nodes, 3 segments in A-Block with 7 nodes and single segment in palace with 15 nodes. The backbone (thick ethernet) has been commissioned between A-block and ADL with repeaters etc. The ADL network is connected to palace network through a serial line. The users can also access network by using DMKT phones distributed all over CAT. The email server has been shifted to ADL computer centre and is kept on round-the-clock.

Fabrication of large magnet for medical cyclotron

A large magnet assembly weighing nearly 27 tonnes was fabricated in the workshop for an 11 MeV Proton Cyclotron. The overall dimension of the assembly is 1868 mm dia and 1400 mm height. The major items of the magnet assembly fabricated, out of low carbon steel, in the workshop consist of four sectors and three supporting plates, each of diameter 1868 mm and thickness 173 mm. Each of these items weighs 3.7 tonnes. Further, four nos. of 54^{o} yoke blocks of height 587 mm with inner dia of 1420 mm and outer diameter of 1860 mm have also been fabricated. All the individual items have been machined within a tolerance $\pm$ 0.06 mm. This is the largest job fabricated in the workshop till now.



Supporting top plate during fabrication for medical cylcotron on CNC controlled horizental boring machine.