dinates, gas flow ON/OFF status and also the shutter position. This unit also controls the laser power supply. In case of emergency, the laser supply can be switched off from the control panel. The pulse repetition rate of laser is controlled both by hardware as well as software.

One such machine has been commissioned at Shree Pacetronics Ltd., Pithampur, and is working satisfactorily. This company was earlier getting pacemakers welded abroad, and has now started using our machine in its production line.

CW Nd:YAG laser

An intra cavity frequency doubled CW Nd:YAG laser system has been developed. The laser is also acousto-optically Q-switched for high repetition rate pulsed operation. $LiIO_3$ and KTP crystals were used for frequency doubling experiments. With $LiIO_3$ crystal operating in type I phase matching condition, 2 W average power, 5 KHz repetition rate laser pulses at 532nm are obtained. In the same resonator configuration and operating conditions, with a KTP crystal operating at type II phase matching condition, 5 W average power laser pulses at 532 nm are obtained.

Development of laser workstation

The application of high power lasers in laser material processing requires a fast work handling equipment. CNC based co-ordinate tables, with specific design features to meet such applications, have therefore been developed.

A small workstation of 800 x 600 mm traverse has been designed. This system works on stationary beam, moving workpiece principle and has two axes contouring control. This machine has been designed for R&D work on laser material processing using CO_2 lasers and all aspects for such an application have been considered during the design and fabrication.

This machine has been fabricated at CAT and has an overall accuracy of 20 microns in movement along either axis. The drive components, motors etc. have been procured indigenously, while ball screws and linear motion guides have been procured from M/s THK Ltd., Japan. The system has two axes CNC traverse as specified above and speed range available in either axis is upto 10 m/min. The third axis movement is manually adjustable upto 250 mm traverse for mounting the beam handling system.

Laser workstation fabricated at CAT.

A laser workstation with two axes CNC control, on composite movement of beam in one axis and workpiece in second axis, has been procured from M/s HMT Ltd., Bangalore. It has a traverse of 3 metres and of 1.2 metres along the two axis respectivly. Design work for 5 axis laser workstation has also been undertaken with 3 co-ordinate axes x, y & z and rotation and revolution of the work pieces.

Alignment jig for range finder

Alignment jigs for axes alignment to within 10 secs of arc in laser range finder transmitter, receiver and collimator were designed and got fabricated. This jig was commissioned at 509 Army Base Workshop, Agra Cantt.

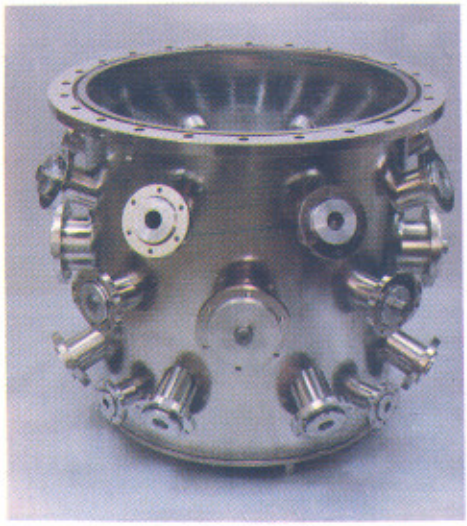
INFRASTRUCTURAL DEVELOPMENT

Computer facility

One mini computer system based on the latest microprocessor chip 'Pentium' has been installed in the computer centre. This machine will be used for scientific computations and also as a server for the e-mail.

One parallel computer system "ANUPAM" has been bought and commissioned at CAT. This machine developed at BARC, is based on i860, and has four nodes. "ANUPAM" is the fastest parallel machine available in India.

Two electronic telephone exchanges (one in the lab area and one in the residential area), with interconnectivity, have been commissioned. These exchanges have the latest technical features and the facility of 'DID' (Direct Inward Dialing), enabling every extension to have a separate number for access from outside CAT. This will obviate the need for telephone operators. These exchanges are also capable of handling voice and data simultaneously on the same pair of wires.



Target chamber for laser- plasma interaction studies.

The new canteen building.

Chamber for laser-plasma interaction studies

The workshop has designed and fabricated a target chamber for carrying out experiments to study laser produced plasma as well as laser plasma interaction, when a multibeam high power laser irradiates a microballoon target uniformly. The high vacuum chamber with an inner diameter of 600 mm and length 630 mm is made of SS304. It has 31 ports of different sizes for mounting various diagnostics and high power lasers. Twentyeight of these ports are positioned in such a way that their axes meet at a point (within a sphere of dia 0.1mm), where the microballoon target will be positioned. The chamber is leak tight to 1×10^{-8} std. cc/sec (helium) and an ultimate vacuum of 5×10^{-6} torr has been obtained during vacuum testing.

Construction activity

The Laser R & D building - Blocks 'A', 'B' & 'C' and the Accelerator Support Technology building have now been handed over. In these buildings, a separate return air duct was eliminated and the false ceiling itself served the purpose of return air duct.

The canteen is now functional in its new building. Construction of the buildings for Library, Computer centre, and Administration has commenced. Construction of the building for Medical Centre and the extension of School building is also in progress.

The construction group has taken up construction of all the houses of 8th plan except 2 'E' type houses. During 2 years of plan period, out of 188 sanctioned houses 78 houses (18 Type 'A', 54 nos. Type 'B', 6 Type 'C') have been handed over.

CAT was also entrusted with the job of construction of one dormitory and four flatlets at TIFR, Pachmarhi. It is noteworthy that despite the site being at a long distance and high altitude, the work has been completed in scheduled time.

Optical Nonlinearities in Quantum-confined Systems

Nonlinear optics deals with interaction of light with light in a medium. For example, when two or more monochromatic waves interact in an optically nonlinear medium energy can be transfered from one to the other. Although every material is in principle nonlinear, to make a device one needs materials which have relatively large nonlinearities.

In the early days of nonlinear optics, the search for new materials was mainly aimed at frequency conversion devices based on second order effects. In recent years, however, this search is increasingly driven by the need to develop photonic computing devices based on third order nonlinear effects particularly optical bistability and optical phase conjugation by degenerate four wave mixing. In degenerate four wave mixing (DFWM) there are 3 input beams — two oppositely directed pumps and third, a probe beam incident at an angle to one of the two pump beams. The signal beam is a beam which retraces the path of the probe beam irrespective of the angle. Thus, a phase conjugate mirror acts as if every ray is incident normally on it. The DFWM process can also be seen as real time holography. The interference of one pump with the probe creates an intensity pattern — which is converted into a refractive index pattern by the intensity depdendence of the