(GMR) $La_{1-x}Sr_xCoO_3$ and in the detailed linear and non-linear susceptibility study in a series of $CeFe_2$ based samples showing double magnetic transition.

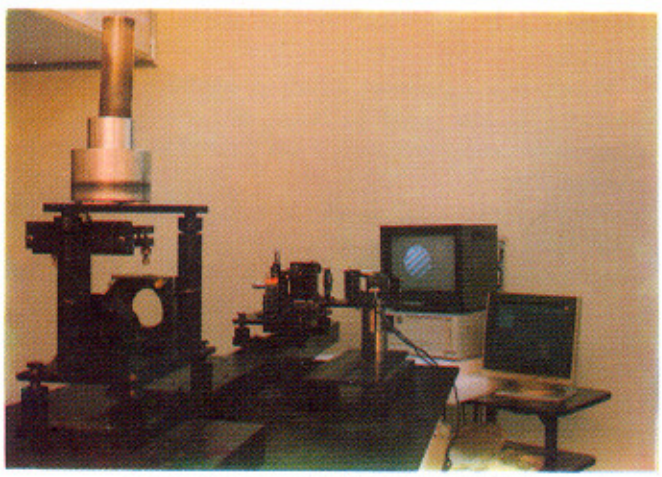
Fizeau Interferometer

A Fizeau interferometer has been developed for non contact testing of surface figure, parallelism etc of optical components. Light from a 2.0 mw He-Ne laser (6328 Å) is first spatially filtered by microscope objective pin hole combination and then made parallel by a corrected telescope objective. A reference plate, mounted on a precision tilt-able mount, is placed in front of the objective and the optical component (also mounted on a tilt-able mount) which is to be tested is placed after the reference plate. Interference occurs between light reflected from the front surface of the reference and from the job surface. A semi-aluminized beam splitter (B.S) is used to reflect the beams coming from reference and object surfaces through the opening of an iris diaphragm used for blocking unwanted reflection. Fringes are captured by means of a CCD Camera frame grabber connected to PC. The interferometer is placed on a home made vibration isolation table.

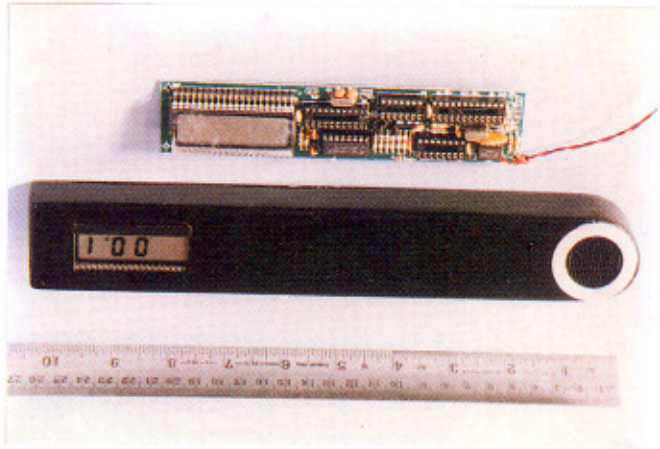
A vertical testing set up has been developed for using with this interferometer. In this set up a high surface quality mirror is used at 45° for turning the horizontal beam in vertical direction. This attachment is very useful for non contact surface testing of laser rods, block etc. Job is placed on a table with a central hole, for passing the laser beam, and three tilting screws for adjustments of its orientation.

Reference plate is mounted on a separate mirror mount below this job table. The job table needs to be aligned once with respect to the reference surface and does not require frequent alignment for different jobs. So it is very useful for testing jobs in production environment.

Liquid reference testing has been carried out using this set up by replacing the reference plate with a disk shaped liquid container with a central window for passing the laser beam. The experiment being extremely sensitive to vibration, air flow etc, controlled condition are required for obtaining stable interference fringe pattern.



Fizeau Interferometer developed at CAT



Hand held laser power meter developed at CAT

Development of hand held laser power meter

A hand held laser power meter for measurement of laser power from 1 watt to 100 watts has been developed at CAT. Compared to conventional laser power meters this instrument is light weight and compact. The unit runs on a 9V cell and consists of a sensor substrate having an active area diameter ~22 mm on which a temperature sensor is mounted. The sensor is designed in such a way that the rate of rise in temperature is linked to actual power. The electronics of the unit is divided into three parts namely - power management system, computation unit and analog to digital conversion unit. The processor takes care of various corrections such as sensor heating due to pervious measurements, time of placement error etc. The unit has dimensions as 27cm x 4cm x 2.5cm and weighs about 400 gm.

Unstable super gaussian ND:YAG laser

An unstable Q-switched Nd:YAG laser using variable reflectivity mirror (VRM) has been developed. The system consists of high reflectivity concave rear mirror of 5 meter curvature and a convex variable reflecting mirror (Super

Salient Features of Hand Held Laser Power Meter

Power range	1 - 100 Watt
Active area diameter	22 mm
Resolution	0.1 Watt
Spectral range	0.3 - 11μm
Accuracy	±5%
Measurement time	6 seconds
Auto shut off time	15 seconds
Max. Average power density	200W/cm²
Max. Target temp	110°C
Typical temperature rise per reading	0.5°C/W
Battery	9V, Square type
Size	27 cm x 4 cm x 2.5 cm
Weight	400 gm

Salient Features of Unstable Super Gaussian Nd:YAG Laser	
Output energy	360mj @ 1064nm 150mj @ 532nm 45mj @ 355nm
Pulse width	5 - 6 nsec (FWHM)
Spot size	5mm (FWHM)
Rep rate.	10 pps
Divergence	0.8 mrad
Energy stability	± 3% (Peak to Peak)

Gaussian order = 5) of 4 meter curvature separated by a distance of 0.4 metre. The peak reflectivity and spot diameter on the mirror are 30% and 2.2 mm respectively. Parameters of the laser output are shown in the table above.

The main features of the laser are higher output energy and shorter pulse width hence high peak power, compact laser head, and smooth temporal pulse.

Near field spatial profile from VRM resonator configuration for Nd:YAG laser developed at CAT.

INFRASTRUCTURAL DEVELOPMENT

Energy recovery unit in air-conditioning system

In normal air-conditioning system, the heat load contribution because of fresh air induction is quite significant. This contribution becomes major if the requirement is for once-through system. The fresh air is most important factor to control & represents a major load factor which is 20 to 22% of the total heat load in normal A/C system. American Society for Heating Refrigerating and Air-conditioning Engineers in respect of Indoor Air Quality has categorically revised (upwardly) the fresh air induction quantity to control sick building syndrome & Building related illness of any air-conditioned area. With this upward revision in fresh-air induction quantity, the higher energy penalty, because of more cooling, has become inevitable.

An "Energy Recovery Unit" has been developed at CAT, which extracts cooling from the waste exhaust air of the air-conditioned laboratory. Waste exhaust air which is at low temperature and with low relative humidity is made to pass through the evaporative section of this unit. Cooling medium (water in this case) in the evaporator section is cooled evaporatively with this waste exhaust air and is then made to flow through the heat exchanger. Fresh air which is at comparatively high temperature is passed over this heat exchanger, where it gets cooled by transferring its heat to cooling medium flowing through the heat exchanger. This way pre-cooling of fresh air before its induction in A/C apparatus is carried out with help of this energy recovery unit.

Precooling of fresh air with the help of energy recovery unit reduces load on system, which helps in down sizing (by 15%) the chiller unit along with its auxiliary system. Further, power consumption in operation of energy recovery unit is approx. one fourth of that of an A/C system required to produce same cooling effect. Thus overall operating cost also gets reduced. Advantages of ERU so developed are; that it helps in reducing the overall power consumption of an A/C system; and helps in down sizing the chiller units along with its auxiliaries.

Energy Recovery Unit Developed at CAT