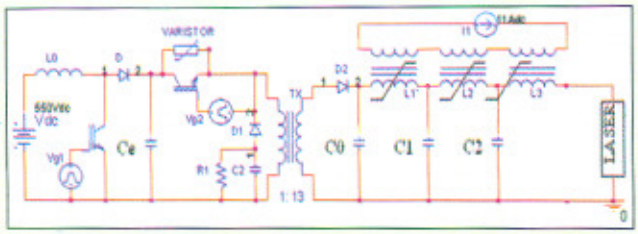

Fig. L.9.1 Circuit diagram of power supply

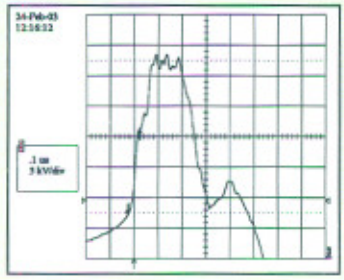

Fig. L.9.2 Voltage waveform

Max Peak Power	150MW
Output Voltage	35kV
Peak Current	3-4kA
Rise time	<80nSec
Pulse width(FWHM)	275nSec
Pulse Energy	15J
Max Repetition Rate	500Hz
Efficiency	~75%

Table 1

The electrical circuits of power supply and voltage waveform at laser head are shown in figures L.9.1 and L.9.2 respectively. The semiconductor switch produces a pulse with a rise time of 10μs and the three MPC stages compress the pulse to 75ns. Thus, a total compression gain of 125 is achieved. The input energy is regulated using a high voltage DC-DC boost converter and this stabilizes the laser output energy. The specification of ASSE is given in Table 1. The TEA CO_2 laser has been operated using ASSE at 35kV peak voltage in the range of 1 to 500Hz pulse repetition rate. It gives maximum 500W average power at 500Hz repetition rate with an electro-optic efficiency of about 8%.

(Contributed by: Dr. AK Nath; aknath@cat.ernet.in)

L.10 Diffusion cooled V-fold CW CO_2 laser

A diffusion-cooled continuous wave V-fold CO_2 laser has been developed for material processing applications, which require good quality laser beam in 100-250W power range, like zero-width glass cutting. The laser with a total discharge length of 6 meters, in 4 limbs each having two discharge sections of 75cm length each, yielded a maximum output power of 260W with 12% electro-optic efficiency. This is excited by high voltage dc discharge which is superimposed on high frequency (5kHz) pulses of ~10kV peak voltage. The high frequency pulses facilitate uniform and stable discharge in 8 sections(fig. L.10.1). Because of the large resonator length (7.5meter) and small discharge tube diameter (9mm) the diffraction loss of plano-concave resonator, which is commonly used, is very large.

Fig. L.10.1 V-fold CW CO_2 Laser

In order to circumvent this problem a symmetric optical resonator (confocal type) has been used which is formed with all mirrors i.e. rear reflector, v-folding mirrors and zinc selenide output coupler, having 5meter radius of curvature. In this resonator, the diffraction loss is relatively less as the same laser beam propagation profile repeats in all limbs. Since the v-folding angle is within 5 degree, curved mirrors do not introduce significant astigmatism. The output beam is of 6mm diameter and its intensity distribution is near Gaussian.

(Contributed by: Dr. AK Nath; aknath@cat.ernet.in)

L.11 Diode laser pumped high power Nd: YAG laser in side-pumping geometry

The development of high-power diode arrays allows the use of highly efficient diode lasers for pumping solid-state lasers. In one set up, using 5mm diameter, 100mm long Nd:YAG rod pumped by fifteen laser diode bars of 50W in an axially multiplexing scheme, we have achieved more than 215W of CW power at a diode pump power of 700W.

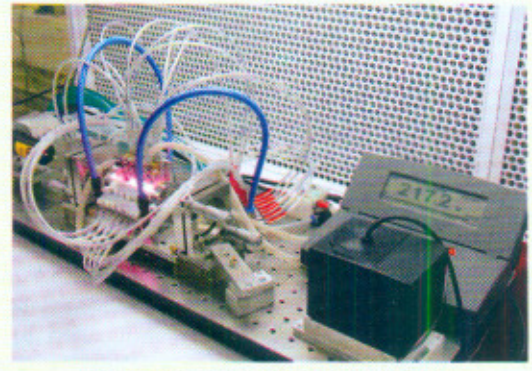

Fig. L.11. 1 The DP Nd:YAG laser