Fig. L.3. 2 20 kW CW CO_2 Laser

(Reported by: A.K. Nath ; aknath@cat.ernet.in)

L.4 Laser based machine for Brachytherapy capsule welding

A laser based welding machine has been developed for welding of irradiation capsules (source), in a hot cell. At present these capsules are being welded by pulsed TIG welding machine that is not preferred any more for ensuring enhanced safety and reliability of source integrity over prolonged duration of use. TIG welding is not suitable for welding of small capsules (thin walled), in particular that of Cs-137 Brachytherapy sources. When these capsules are welded with TIG, due to over heating Cs-137 comes out of the capsules in the form of vapor during welding. The laser welding is the solution for such critical welding because with laser one can control and impart precise amount of thermal energy over a small area, which is just suitable for melting desired volume in a very small duration of time (few ms). Therefore total heat input to the job is minimum and bulk heating of job, to a high temperature, is avoided.

The machine consists of an Nd-YAG laser with fiber beam delivery system and a semi-automated laser welding workstation (see fig. L.4.1). The workstation consists of a job holding rotary fixture, driven by stepper motor, and a welding head. The jobholders (fixtures) are provided with precision sliding fit, with gearbox shaft and with the capsules. This is designed for ease of mounting and dismounting with the help of master slave manipulator (MSM) of hot cell. Two holders are designed for two different size capsules in such a way that welding plane is maintained with respect to cutting head (focus plane of the lens). Specially designed spring catches are provided, at both the locations, to avoid slip or movement between job and holder and also between holder and the shaft

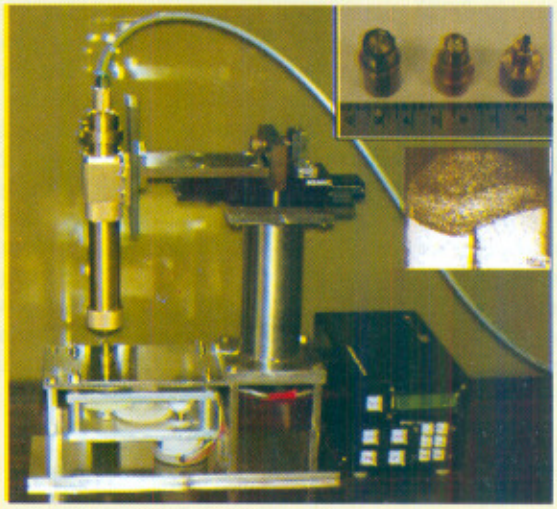

Fig. L.4.1 Capsule welding work station
(Inset- welded capsules & cross section of weld-ment).

The welding head is mounted on a precision slide. When the slide is at one extreme the welding head is just above the seam and is kept in the precise position by mechanical stopper cum magnetic catch. The welding head can be moved to other extreme of the slide to replace the new capsule assembly using MSM. One such machine is installed at BRIT, Mumbai, where regular production of capsules is being done.

(Reported by: T P S Nathan; nathan@cat.ernet.in)

L.5 Development of multirod CW Nd: YAG laser

The output power of a solid-state laser can be scaled to higher levels by using multirod systems. We have developed a CW dual cavity Nd:YAG laser capable of producing output power more than 570Watts. The gain module consists of 8mm dia. x 150mm long Nd:YAG crystal pumped by a single krypton arc lamp in a close coupled gold-plated elliptical reflectors geometry. The laser cavity and lamp is cooled by chilled de-ionized water using closed loop water chiller unit. The arc lamps are powered by