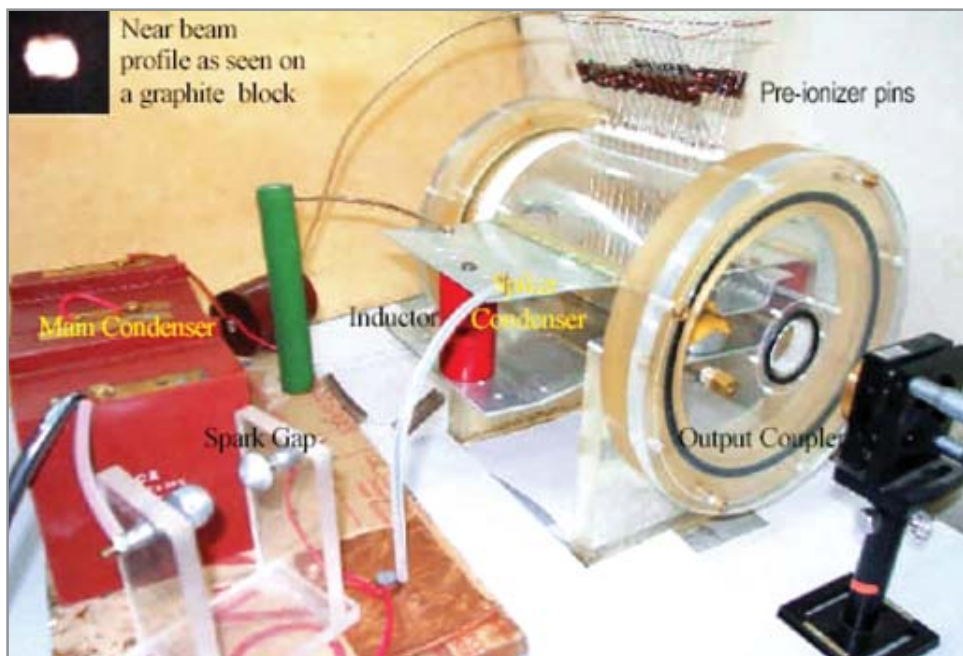


4.24 OPERATION OF A HELIUM-FREE TEA CO₂ LASER

The major role of the expensive and scarce helium gas that constitutes majority of the gas mixture in a pulsed Transversely Excited Atmospheric pressure (TEA) CO₂ laser, is to stabilise and facilitate the occurrence of an arc free discharge. We have, in our laboratory, achieved helium-free operation of a conventional TEA-CO₂ laser under a wide range of operating conditions. This was rendered possible by integrating the spiker and sustainer-like actions in to a single pulser network by making use of a coupling inductance. This, in addition to delaying the spiker with respect to the preionisation, also decided the rate of rise of voltage across the electrodes and therefore, tailored the sustainer pulse such that arc-free operation at atmospheric pressure in a helium-less gas mixture became possible. The fact that expensive and scarce helium is not a constituent of the laser gas mixture makes it an ideal system for high repetition rate operation as the gas re-circulatory loop consisting of the heat exchanger and the catalytic re-converter can be readily dispensed with here.

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Laser head and the pulser system. Inset shows the laser beam