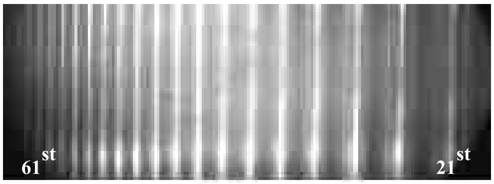

Fig. L.3.1 *Harmonics from silver plasma: 9^{th} to 63^{rd} harmonics have been recorded.*

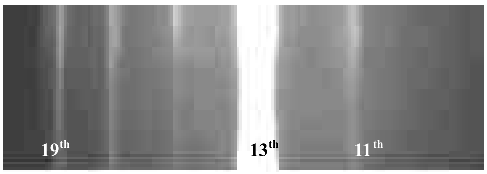

Fig. L.3.2 *Bright 13^{th} harmonic in indium plasma: intensity 200X that of nearby harmonics.*

Spectral tuning of the higher order harmonics was attempted through chirp control of the high intensity laser pulses. Chirp variation of the laser pulse propagating through a GaAs plasma showed a considerable enhancement of the intensity of the 27^{th} harmonic compared to that of the neighboring harmonics [*J. Opt .Soc. Am B (2006) In Press*]. Next, a detailed experimental study of harmonic intensity enhancement in various indium-containing plasma plumes of In, InSb, InGaP and InP by controlling the chirp of the driving laser radiation was carried out. It was found that the chirp control allows optimization of the 13^{th} harmonic (61nm) intensity to reach a 200-fold enhancement with respect to the neighboring harmonics (fig.L.3.2). Further, a 10-fold enhancement of the intensity of the 21^{st} harmonic radiation (37.8nm) in the case of InSb plume was observed using positively chirped laser pulses.

These studies have demonstrated the capability of the generation of an almost monochromatic harmonic radiation through interaction of laser with the ablated plasma. Such an approach may pave the way for efficient single harmonic enhancement in the XUV range using plasma plumes of different materials.

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L.4 Twin point x-ray sources for radiograph

Laser Plasma Laboratory has developed a novel technique of simultaneous generation of mutli-keV monochromatic twin point x-ray sources in a vacuum diode with laser plasma cathode. The diode consists of a planar aluminium slab target as the cathode and two identical point-tip anodes of titanium. The separation between anode-cathode and that between the two anodes were 3 mm each. An Nd:YAG laser beam (energy ~ 2 - 40mJ, FWHM pulse duration ~ 20ns, repetition rate of 1Hz) was focussed symmetrically with respect to the two anodes on the aluminium target to produce plasma. Electrons from the sheath region of the expanding laser-produced plasma were accelerated in an externally applied electric field and bombarded the anode tips to generate characteristic K-shell x-ray radiation. Approximately 10^9 photons / pulse (Ti Kα at $h\nu \approx 4.51$keV) were generated in a pulse of 20-25ns duration, from each source of ~ 300m diameter. Brightness of each source was estimated to be 4 x 10^{18} photons / cm^2-sec-sr. Single shot twin radiographs of physical objects were recorded on phosphor-coated fibre-optic-plate coupled with intensified CCD camera kept at a distance of ~ 15cm from the twin x-ray sources [For more details, please see: *A. Moorti, P.A. Naik and P.D. Gupta, Rev. Sci. Instrum. 76, 106101, 2005*]. Such a source can also be attractive for single shot differential imaging by using different materials for the two anodes and for pump-probe type experiments, involving a laser as an excitation source, as the x-ray pulse can be temporally synchronized with respect to the laser pulse.

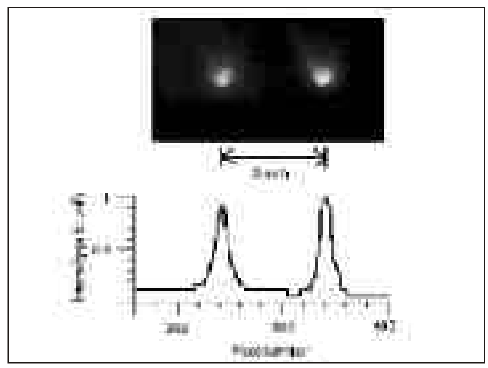

Fig. L.4.1a *The x-ray images of the two sources. The lineout shows their intensity profiles.*

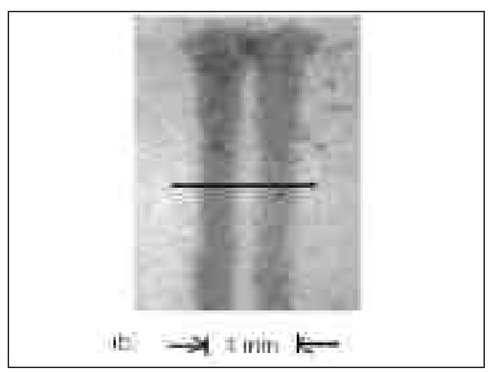

Fig. L.4.1b *X-ray radiograph of a metal taken using the twin x-ray source.*

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