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The effects of the pre-pulse on capillary discharge XUV laser

AMIT BEN-KISH, MOSHE SHUKER, RON NEMIROVSKY, AMNON FISHER, AMIRAM RON, Dept. of Phys., Technion, Haifa, Israel — In the past few years collisionally pumped XUV lasers utilizing a capillary discharge were demonstrated [1-4]. An intense current pulse is applied to a gas-filled capillary, inducing magnetic collapse (Z pinch) and formation of a highly ionized plasma column. Usually, a small current pulse (pre-pulse) is applied to the gas in order to pre-ionize it. In this paper we investigate the effects of the pre-pulse on a capillary discharge Ne-like Ar XUV laser (46.9 nm). The importance of the pre-pulse in achieving suitable initial conditions of the gas column and preventing instabilities during the collapse is demonstrated. Furthermore, measurements of the amplified spontaneous emission (ASE) properties (intensity and duration) in different pre-pulse currents revealed unexpected sensitivity. Increasing the pre-pulse current by a factor of 2 caused the ASE intensity to decrease by an order of magnitude and to nearly disappear. This effect is accompanied by a slight increase in the lasing duration. We attribute this effect to axial flow in the gas during the pre-pulse.

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