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NARROW LINEWIDTH GAS JET SOURCES FOR INSTANTANEOUS MAGNETIC FIELD MEASUREMENTS

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Fast ignition in Inertial Confinement fusion (ICF) is an important technique to enhance the coupling efficiency of the laser to the core [1]. One of the primary challenges faced in fast ignition is the electron divergence, leading to reduced laser-core coupling [2]. A key solution to this problem is the generation of intense Mega-gauss magnetic fields to guide the ignition electrons, which results in an improvement in the energy coupling efficiency of the laser with the compressed fuel. Capacitor coils present themselves as excellent candidates for producing magnetic pulses of approximately 0.1-0.5 kT and a duration of around 5 ns, driven by high-energy, high-intensity (on the order of a few 10^15 W/cm2) nanosecond laser pulses [3-4]. At the University of Alberta, we have characterized gas jet nozzle targets to investigate the instantaneous magnetic fields produced by capacitor coils, based on measurements of high resolution Zeeman splitting. For optimum Zeeman splitting, the plasma conditions such as plasma temperature and density should be controlled to minimize broadening and maximize brightness of the spectral lines. We explore the response of the UV spectral line CIII 229.78 nm (1s22s2p-1s22p2) via modelling and experiments under various spatiotemporal plasma conditions. The aim is to investigate optimum plasma conditions to avoid large line broadening due to the high plasma density and temperature which can exceed the Zeeman splitting.

Keyword-1

laser plasma

Keyword-2

plasma spectroscopy

Keyword-3

Primary author: KAUR, Channprit

Co-authors: Mr GJEVRE, J. Matthew (University of Alberta); Dr MALKO, Sophia (Princeton University); Prof. FEDOSEJEVS, Robert (University of Alberta)

Presenter: KAUR, Channprit

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