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Atomic Hydrogen Dynamics in High Power Helicon Plasma

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Neutral particles, such as atomic hydrogen, are an active species in low temperature plasmas and can greatly influence the plasma physics and chemistry, from fuel retention and radiative cooling in tokamak divertors to chemical agents in plasma processing and neutral depletion in high power helicon plasmas. A better understanding of the dynamics of neutral particles will provide greater control and optimisation in plasma systems and applications.

Two-photon absorbed laser induced fluorescence (TALIF) is one of the most sensitive techniques for measuring atomic and molecular species in the plasma. It can provide excellent spatial and temporal resolution of densities in the gas phase, temperatures, surface loss probabilities, erosion and deposition precursors. Different species can be selected by varying the absorption wavelength. A TALIF diagnostic is used at the Australian National University to investigate neutral atomic hydrogen in MAGPIE[1], a linear helicon plasma device.

In this contribution, the two-photon absorbed laser induced fluorescence (TALIF) diagnostic will be discussed. Densities and temperatures for atomic hydrogen in pure and mixed plasmas will be presented including at higher powers (20kW) than previously reported.

References

[1] B. Blackwell, et. al., Plasma Sources Sci. Techno. 2012, 21.