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Tunable laser Doppler spectroscopy of LANSCE H-ion source plasma

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Plasma temperature dynamics provide significant insight when evaluating ion source performance. Quantities such as beam emittance, or mean transverse energy, are strongly correlated with the source plasma temperature. At LANSCE there is currently no method implemented for measuring initial source emittance or implementing tunability of mean transverse energy through ion source control parameters. In this work we will discuss our demonstration of a new laser diagnostic tool for measuring H- beam emittance on the LANSCE H- ion source laser diagnostic stand. Our investigated method will be an extension of systems outlined for NIFS, and will be optimized for rapid response times, scanning the Doppler broadened Hydrogen-alpha emission line at a rate 10x faster than the plasma ignition time window (800 microseconds). We will show that our real-time, non-intrusive measurement approach will enable characterization and study of source control parameter effects on source plasma temperature for future emittance optimization.

Footnotes

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