LAser and Spectroscopy diagnostics in PlasMas platform (LASPM)

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The in-depth study of collisional non-thermal plasmas (NTPs) has attracted considerable attention over the past decades, driven by the continuous development of increasingly sophisticated diagnostic techniques. These diagnostics primarily rely on laser absorption spectroscopy and optical emission spectroscopy methods with exceptional sensitivity, spatial and temporal resolution. In particular, the challenge of applying fast (nanosecond – ns) and ultrafast (picosecond – ps or even femtosecond) laser spectroscopy in NTPs is strongly coupled with the intrinsic features of these plasmas, such as their enhanced reactivity, which demands highly precise measurements of key plasma parameters (effective lifetimes of reactive species, species densities, temperatures, etc.). The LAser and Spectroscopy diagnostics in PlasMas (LASPM) platform aims to address some of these challenges by offering advanced experimental tools such as ns and ps lasers capable of performing LIF (Laser Induced Fluorescence) and TALIF (Two-photon Absorption Laser Induced Fluorescence) measurements in ns and ps timescales to determine atomic and molecular densities, as well as other plasma parameters such as the gas temperature.

The platform is located at the LSPM laboratory (CNRS UPR3407) and welcomes applications from France and abroad for various plasma diagnostics. It has already hosted about a dozen different teams, each working with highly diverse plasmas (ranging from low to highly collisional environments) generated in various gases (He, Ar/N_2, O_2, Air, etc.) by pulsed, sinusoidal, radio frequency, and microwave power sources. LASPM platform has two available laser systems: a ns laser using a PMT as detector and a ps laser with a streak camera as detector. These are strongly complementary, enabling the optimization of TALIF measurements and ensuring maximum precision in measuring critical plasma properties. A team of researchers, academics, engineers, and support staff are on hand to accompany and guide research teams throughout their projects, from initial planning to data analysis/interpretation and, eventually, publication.

LASPM platform also contains other advanced diagnostics, including laser-based techniques for Raman, Rayleigh, and Thomson scattering, as well as incorporating existing optical emission spectroscopy tools at LSPM, such as spectrometers with focal lengths of 0.5, 1, and 2 meters. These enhancements will ultimately expand the LASPM platform, providing users with a broader range of measurable parameters in their plasma studies.

Research Engineer

Mots clés : LASPM platform, TALIF, collaboration, cold plasmas