

Lab diagnostics primer for astronomers

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Abstract

In the laboratory, high energy density conditions are created by depositing energy over durations shorter than it takes the sample to disintegrate. The systems thus produced are highly inhomogeneous, often anisotropic, short lived, evolving so rapidly that sometimes they do not reach equilibrium during the experiment. These extreme conditions have stimulated experimentalists and diagnosticians to create potent diagnostics techniques capable to characterize the experimental systems in detail and to glean accurate data necessary for understanding astrophysical objects and phenomena. This talk will briefly review elegant and successful techniques most commonly used in the laboratory. As the passive diagnostics are familiar to astronomers, the focus will be placed on active techniques, which employ external, well controlled radiation or particle beams to probe a high energy density sample. The review will include the physical principles and the applicability conditions for these diagnostics, as well as examples of implementation and illustrating results.