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Benefits of high spectral resolution and complementary target materials for spectroscopic diagnostics[1] S.B. HANSEN, LLNL, A. FAENOV, T. PIKUZ, VNIIFTRI and IHED, RAS, S. STAGIRA, F. CALEGARI, M. NISOLI, INFM-Politecnico di Milano, L. POLETTO, P. VILLORESI, INFM-Universita di Padova — Spectra of H- and He-like ions and their satellites are rich in information about the emitting plasma and have long been used as plasma diagnostics. However, since line intensities can have a complex interdependence on density, temperature, non-thermal electrons, and plasma size, it can be difficult to infer a unique set of plasma conditions from line intensities alone. This challenge can be overcome by supplementing intensity data with density- and opacity-sensitive line widths (requiring high spectral resolution) and by measuring emission from elements which respond in distinctive ways to changes in the electron energy distribution. We illustrate these diagnostic benefits through an analysis of K-shell emission spectra with $E/\Delta E=5000$ from Al and F plasmas created at the ULTRAS 2TW laser facility. Robust diagnostics derived from multifaceted measurements are used to investigate changes in plasma conditions under variations in laser intensities, energies, and prepulses.

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Stephanie Hansen
Lawrence Livermore National Laboratory

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