CRETIN SIMULATIONS OF HOT-SPOT MIX SPECTROSCOPY IN NIF IMPLOSIONS[1].

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In a NIF implosion, hydrodynamic instabilities may cause cold material from the imploding shell to be injected into the hot-spot, enhancing the radiative and conductive losses, which may lead to a quenching of the ignition process.

The K-shell line spectroscopy of the high-Z dopants in the ablator material that gets mixed into the hot-spot can be used to infer the total amount of mixed mass [1]. We present here a 4-layer 1D model of the imploding capsule, based on the CRETIN code, which can be used to retrieve information on the amount of hot-spot mixed mass by comparison with both the line and continuum emission from the imploded capsule.

In particular using both emission and absorption features arising from the colder external layer of the capsule may allow us to better constrain the effect of the opacity of the doped-plastic shell, affecting the absolute value for the emitted energy, and thus the inferred mixed mass.

The performance of the model is investigated by comparing with previously published experimental data (see figure), and its ability to diagnose both mixed mass and plasma conditions is tested by fitting synthetic spectra from postprocessed 2D Hydra simulations.

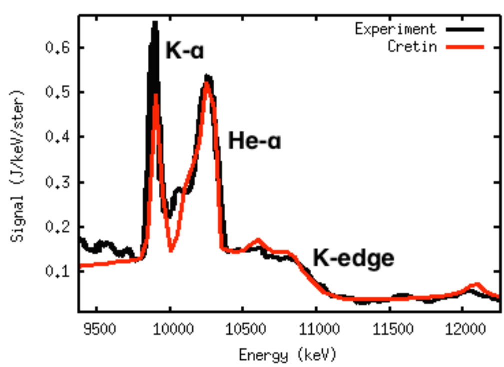

Figure: Cretin fit to Ge spectra from imploded tri-doped targets [1]. The K-alpha line and K-edge absorption feature arise from the imploded plastic shell, simulated by the external layer of the 1D model, whilst the He-alpha lines and its satellites originate from different regions of the hot-spot, modelled by the two inner-most layers of the 1D model.

[1] S.P Regan et al., PRL 111, 045001.

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