Generation of low energy electron beams suitable for WDM diagnostics

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One of possible approaches to the diagnostics of Warm Dense Matter is to use a low energy (~<1 MeV) electron beam as a backlighter. From the nature of WDM experiment it is suitable to have this beam produced by laser and to have sufficient brightness to obtain a single shot diagnostic image for, e.g., electron diffraction, which could show the ionic structure of the matter.

Downramp gradient laser wakefield acceleration has the capabilities to produce such beams. This approach relies on focusing the fs laser onto a decreasing density gradient in a gas jet. We have investigated this approach on the PALS Ti:Saph laser system (Prague) with different types of gas nozzles producing various density profiles and gradients. We present the transition between standard and downramp acceleration regimes and compare this to the result of relevant PIC simulations. We propose a scheme of magnetic beampath aimed at improving the beam quality, especially decreasing the beam bandwidth and divergence.