The Impact of Magnetic Fields on the Melting Curves of Warm Dense Matter

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We propose an experimental setup to study the melting curves of a warm dense matter sample under magnetization and demonstrate that such a setup is possible based on PERSEUS simulations. The setup proposed involves a $1/2$ hohlraum (halfraum) illuminated by OMEGA beams in a polar drive arrangement. While the material is expanding, the ablated plasma moves inwards due to the rocket effect compressing the initial magnetic field of $50\,T$ generated by MIFEDS to up to $1\,kT$ based on our simulations. This field strength is needed in order to magnetize the valence electrons of warm dense matter. We further show that the density of the plasma between the sample and the compression beam is sub-critical allowing the compression beam to reach the target. For the diagnostics, PXRDIP will be used to study how and when the state transition occurs with MIFEDS off (no magnetization) and MIFEDS on (magnetization). Our simulations promise successful experiments to study the melting curves of warm dense matter under magnetization, which are of critical importance to understanding the inner structure of astrophysical objects like white dwarfs and are of help to ongoing research on fusion science.