

Ultrafast proton heating as a means of creating high energy density plasma states

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The interaction of an ultra-short high-intensity laser pulse with a solid target can result in the creation of highly energetic beams of protons. The proton beams are strongly directional, have a short temporal duration of order picoseconds, and have conversion efficiencies from the incident laser energy of several percent. We have found that the proton beams have sufficient flux to rapidly heat materials at solid density to temperatures on the order of 10-100 eV, creating unique states of high energy density matter. We present results of such proton heating experiments carried out on the 100TW JanUSP laser at LLNL, and the Vulcan Petawatt laser at RAL.