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Shock driven acceleration of impurity free ion beam using low density targets OLIVIER TRESCA, Brookhaven National Laboratory, Upton, NY, USA, NICHOLAS DOVER, Imperial College, London, UK, NATHAN COOK, CHAKRA MAHARJAN, Stony Brook University, Stony Brook, NY, USA, ZULFIKAR NAJMUDIN, Imperial College, London, UK, MIKHAIL POLYANSKIY, Brookhaven National Laboratory, Upton, NY, USA, PETER SHKOLNIKOV, Stony Brook University, Stony Brook, NY, USA, IGOR POGORELSKY, Brookhaven National Laboratory, Upton, NY, USA, ATF TEAM, BLACKETT LABORATORY TEAM, STONY BROOK UNIVERSITY TEAM — Recent progress in COlaser technology has allowed for the creation of intense, 10Wcm^{-2}, pulses at lambda $\sim$10 μm. The longer wavelength of these pulses, compare to solid state lasers, allow for the use of low density targets, $\sim$10cm^{-3}. In these conditions ion beams can be accelerated by a laser generated shock-wave to multi MeV energies with a narrow energy spread smaller than 10%. The CO laser at the Accelerator Test Facility has the unique capability of producing single, picoseconds-scale, pulses with 1TW peak power, enabling us to study this acceleration regime in detail. The spatial density profile of the gas target has been found to be critical to the successful acceleration of ion beams. We report on recent PIC and fluid simulations results exploring the propagation of shock-wave and resulting ion acceleration for various plasma density profiles. Recent experimental results will also be discussed.

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