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Proton acceleration using doped Argon plasma density gradient interacting with relativistic CO2-laser pulse AAKASH SAHAI, OLIVER ETTLINGER, GEORGE HICKS, EMMA-JANE DITTER, ZULFIKAR NAJMUDIN, Imperial College London — We investigate proton and light-ion acceleration driven by the interaction of relativistic CO_2 laser pulses with overdense Argon or other heavy-ion gas targets doped with lighter-ion species. Optically shaping the gas targets allows tuning of the pre-plasma scale-length from a few to several laser wavelengths, allowing the laser to efficiently drive a propagating snowplow through the bunching in the electron density. Preliminary PIC-based modeling shows that the lighter-ion species is accelerated even without any significant motion of the heavier ions which is a signature of the Relativistically Induced Transparency Acceleration mechanism. Some outlines of possible experiments at the TW CO_2 laser at the Accelerator Test Facility at Brookhaven National Laboratory are presented.

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