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Radiation cooling of dense laboratory plasma jets studied using soft x-ray laser interferometry and simulations MICHAEL PURVIS, JONATHAN GRAVA, JORGE FILEVICH, DUNCAN RYAN, MARIO MARCONI, VYACHESLAV SHLYAPTSEV, JORGE ROCCA, Colorado State University, STEPHEN MOON, JAMES DUNN, Lawrence Livermore National Laboratory — The physical mechanisms responsible for the collimation of laboratory plasma jets created with short laser pulses of ~0.5-1 J energy were studied using soft x-ray interferometry and hydrodynamic code simulations. Plasma jets with peak densities of $\sim 10^{20}$cm^{-3} were created by irradiation of C, Al, Cu, and Mo 90° triangular grooved targets with I = 1 x 10^{12} Wcm^{-2}, 120 ps duration laser pulses. Also, plasma jets with a much higher electron density, $>10^{21}$cm^{-3}, were created by irradiation of Cu cone shaped targets with I = 3 x 10^{13} Wcm^{-2}. The results were compared with simulations conducted with the code HYDRA. Plasma radiation cooling was found to play a significant role in increasing the collimation of the higher Z jets. In addition, at any instance in the evolution the higher Z jets appear to be more collimated due to their slower plasma expansion velocity associated with their higher mass. Work supported by the NNSA SSAA program through DOE Grant # DE-FG52-060NA26152 and the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

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