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Microcoulomb-Class Self-Modulated Laser Wakefield Accelerator on OMEGA EP[1] JESSICA SHAW, GERRIT BRUHAUG, MANFRED AMBAT, MAX MCKIE, JOHN PALASTRO, DUSTIN FROULA, Laboratory for Laser Energetics University of Rochester, MARCO ROMO-GONZALEZ, Laboratory for Laser Energetics University of Rochester and California State U. Stanislaus, NUNO LEMOS, FELICIE ALBERT, LLNL, PAUL KING, LLNL and U. Texas Austin — Self-modulated laser wakefield accelerators (SMLWFA's) driven by picosecond-scale, kilojoule-class lasers enable particle beams and x-ray sources that could be coupled to experiments driven by large-scale, high-energy lasers such as the OMEGA laser at the Laboratory for Laser Energetics (LLE) or the National Ignition Facility at Lawrence Livermore National Laboratory. We report on the development of a SMLWFA platform for the OMEGA EP Laser System at LLE. This platform is the first laser-plasma accelerator driven by a short-pulse, kilojoule-class laser (OMEGA EP) connected to a high-energy-density-science (HEDS) driver (OMEGA). Initial experiments demonstrated electron beams with electron energies exceeding 200 MeV, divergences as low as 32 mrad, charge exceeding 700 nC, and laser-to-electron conversion efficiencies up to 11%. The total charge in the electron beam is found to scale with both a_0 and plasma density. These electron beams are, to our knowledge, the highest-charge electron beams produced from a laser-plasma accelerator and show promise as a path to MeV-class radiography sources and improved flux for broadband sources of interest at HEDS facilities.

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