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Self-Modulated Laser Wakefield Acceleration for OMEGA EP

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Self-modulated laser wakefield accelerators (SM-LWFA'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 SM-LWFA platform for the OMEGA EP Laser System at LLE. To provide the underdense plasma targets required for SM-LWFA, a new gas-jet system for OMEGA and OMEGA EP has been fielded and characterized. The focal length of OMEGA EP has been extended to larger f numbers to generate laser focal geometries well suited to SM-LWFA. Initial experiments demonstrated electron beams with electron energies exceeding 200 MeV, divergences as low as 40 mrad, and charge exceeding 100 nC. This material is based upon work supported by the Department of Energy National Nuclear Security Administration under Award Number DE-NA0003856, the Department of Energy under Award Number DE-SC0017950, and the National Science Foundation under Award Number PHY1705224. *In collaboration with F. Albert, N. Lemos, P. M. King, M. A. Romo-Gonzalez, J. P. Palastro, and D. H. Froula.