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Staged Laser driven Electron Acceleration THOMAS SOKOLLIK, SATOMI SHIRAISHI, ANTHONY GONSALVES, KEI NAKAMURA, JEROEN VAN TILBORG, BRIAN SHAW, ERIC ESAREY, CARL SCHROEDER, CARLO BENEDETTI, CSABA TOTH, WIM LEEMANS, Lawrence Berkeley National Laboratory, LOASIS PROGRAM TEAM — Laser plasma accelerators have made tremendous progress over the last decade. Currently electron energies around 1 GeV [W. Leemans et al., Nature Physics 2, 696 (2006)] and above can be achieved. In the acceleration process, laser energy is transferred, via generation of a plasma wakefield by the laser pulse, to the electrons. The acceleration of electrons stops, when the laser energy is depleted. To increase the electron energy in current LPA schemes, laser systems with more pulse energy are needed, thus current laser plasma accelerators are limited by laser technology. Today, several projects are using or planning to use PW class laser systems to achieve electron energies up to 10 GeV [W. P. Leemans et al., AAC proceedings (2012)]. These laser systems represent the latest development in laser technology and are able to deliver the highest achievable laser intensities today. To overcome the electron energy limitation a staged acceleration concept is necessary. In this scheme multiple acceleration stages are placed in series, each driven by a separate laser pulse. Now the final electron energy is limited by the number of stages only. In a concept study a 1TeV electron-positron collider based on staged acceleration was envisioned in reference [W. P. Leemans and E. Esarey, Physics Today, 62, 44 (2009)]. We will present the latest results on a staged laser plasma experiment in which two stages and two laser pulses are used.

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