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Characterizing relativistic petawatt-laser-generated particle beams on Orion MATTHEW HILL, PETER ALLAN, COLIN BROWN, RAY EDWARDS, EDWARD GUMBRELL, DAVID HOARTY, LAUREN HOBBS, STEVEN JAMES, Plasma Physics, AWE, Aldermaston, UK, HUI CHEN, ANDY HAZI, EDWARD MARLEY, RONNIE SHEPHERD, JACKSON WILLIAMS, Physics Division, Lawrence Livermore National Laboratory, CA, USA — The Orion laser facility at AWE has been used to irradiate a variety of metal and plastic targets with up to 600 J of 1.054μm laser light at pulse lengths ranging from 0.5 ps to 8 ps and intensities above 10^{21} W/cm^2. The particle beams produced from these targets include considerable numbers of relativistic electrons (up to 250 MeV) as well as positrons, protons and heavy ions (up to 60 MeV). Magnetic spectrometers, radiochromic film stacks and a Thomson parabola suggest strong sheath field acceleration of both positrons and ions, as well as very hot electron distributions (T_{hot} >18 MeV) indicating efficient laser-plasma coupling at high intensities. Simultaneous proton radiography and heating have been accomplished on metal foils and foams, showing promise for diagnosing short-pulse laser-plasma interactions as well as fields within extended target objects. We report on the latest progress in charged particle diagnostics systems and experimental platforms on the Orion facility. Supporting work performed at LLNL under the auspices of the U.S. DoE under contract DE-AC52-07NA27344.

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