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Dynamics of electric fields driving the laser acceleration of multi-MeV protons LORENZO ROMAGNANI, JULIEN FUCHS, PATRICK AUDEBERT, PATRIZIO ANTICI, Laboratoire pour lUtilisation des Lasers Intenses, CNRS-CEA-Ecole Polytecnique-Univ., France, MARCO BORGHESI, SATYABRATA KAR, School of Mathematics and Physics, The Queen's Univ. of Belfast, UK, OSWALD WILLI, GEORG PRETZLER, TOMA TONCIAN, Institut fur Laser-und Plasmaphysik, Heinrich-Heine-Universitat, Germany, FRANCESCO CECCHERINI, ANDREA MACCHI, Istituto Nazionale per la Fisica della Materia and Dipartimento di Fisica "Enrico Fermi", Universita di Pisa, Italy, PATRICK MORA, TOMA GRISMAYER, Centre de Physique Theorique, CNRS-Ecole Polytechnique, France, ANGELO SCHIAVI, Dipartimento di Energetica, Univ. di Roma 1 "La Sapienza", Roma, Italy, TOM COWAN, Physics Dept., MS-220, Univ. of Nevada — We present the first direct experimental measurement of the electric fields driving the acceleration of high energy protons from a thin foil irradiated by an intense ($I \sim 3.5 \times 10^{18}$ W/cm^2) and short ($t_l \sim 1.5$ ps) laser pulse. The measurement was performed employing an auxiliary laser-accelerated proton beam as a transverse charged particle probe. The initial sheath field at the target-vacuum interface and the predicted late time peak of the accelerating field at the expanding ion front are observed. The experimental results are in good agreement with Particle In Cell and fluid simulations of the expansion of a thin plasma into a vacuum.

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