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Phillip F. Schewe

Ben Stein

Donald P. Umstadter
University of Nebraska-Lincoln, donald.umstadter@unl.edu

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At next week's meeting of the American Physical Society Division of Plasma Physics in Seattle, three groups will independently announce their ability to generate powerful, intense streams of ions by shining ultrashort laser pulses on tiny spots of solid material. Potentially, this approach offers an alternative to bulky, expensive ion accelerators for producing high-velocity ions useful for cancer therapy and electronics manufacturing. Using a single pulse of light from Livermore's Petawatt laser, the most powerful in the world, researchers at that laboratory (Scott Wilks, 925-422-2974, wilks@icf.llnl.gov) have reported generating 30 trillion protons with energies up to 50 MeV, from a tiny spot approximately 400 microns in size. Using a tabletop terawatt laser one-thousandth the power of the Petawatt, University of Michigan researchers (Donald Umstadter, 734-764-2284, dpu@umich.edu) produce 10 billion protons with about a tenth the energy of those reported at Livermore. In addition, the Michigan team has announced that they can produce a confined beam of ions pointing roughly in the direction of the laser beam. Employing the VULCAN laser at the Rutherford Appleton Laboratory, researchers there (Karl Krushelnick, Imperial College, kmkr@ic.ac.uk, 011-44-594-76-35), generated lead ions with energies up to 420 MeV (and protons up to 17 MeV). The mechanism behind each demonstration is similar. A single laser pulse strikes a thin target, ejecting electrons which form a cloud of negative charge around the back of the target. The cloud pulls positively charged ions from the back of this target and rapidly accelerates the ions to high energies. All of this occurs over a very short distance--almost 1 MeV/micron for protons in the Livermore case, which is orders of magnitude higher than conventional ion accelerators. (Papers FI2.04, O1.11, QO1.12, QO1.13, JP1.74 at meeting; Meeting program at http://www.aps.org/meet/DPP99/baps/; Figures at Physics News Graphics.)

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