Experimental Observation of Direct Particle Acceleration by Stimulated Emission of Radiation

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(Received 4 June 2006; published 28 September 2006)

We report the first experimental evidence for direct particle acceleration by stimulated emission of radiation. In the framework of this proof-of-principle experiment, a 45 MeV electron macrobunch was modulated by a high-power CO_2 laser and then injected into an excited CO_2 gas mixture. The emerging microbunches experienced a 0.15% relative change in the kinetic energy, in a less than 40 cm long interaction region. According to our experimental results, a fraction of these electrons have gained more than 200 keV each, implying that such an electron has undergone an order of magnitude of 2×10^6 collisions of the second kind.

DOI: 10.1103/PhysRevLett.97.134801 PACS numbers: 41.75.Jv, 41.60.Cr