465
Accession number:WOS:000306342000017
Title:Dielectric Wakefield Acceleration of a Relativistic Electron Beam in a Slab-Symmetric Dielectric Lined Waveguide
Authors:Andonian, G. (1); Stratakis, D. (1); Babzien, M. (2); Barber, S. (1); Fedurin, M. (2); Hemsing, E. (3); Kusche, K. (2); Muggli, P. (4); O'Shea, B. (1); Wei, X. (1); Williams, O. (1); Yakimenko, V. (2); Rosenzweig, J. B. (1)
Author affiliation: (1) Univ Calif Los Angeles, Dept Phys & Astron, Los Angeles, CA 90095 USA; (2) Brookhaven Natl Lab, Accelerator Test Facil, Upton, NY 11973 USA; (3)SLAC Natl Accelerator Lab, Menlo Pk, CA 94025 USA; (4) Max Planck Inst Phys & Astrophys, Munich, Germany
Source title:PHYSICAL REVIEW LETTERS
Abbreviated source title:PHYS REV LETT
Volume:108
Issue:24
Issue date:JUN 15 2012
Pages:244801
Language:English
ISSN:0031-9007
Document type:Article
Publisher:AMER PHYSICAL SOC, ONE PHYSICS ELLIPSE, COLLEGE PK, MD 20740-3844 USA
Abstract:We report first evidence of wakefield acceleration of a relativistic electron beam in a dielectric-lined slab-symmetric structure. The high energy tail of a similar to 60 MeV electron beam was accelerated by similar to 150 keV in a 2 cm-long, slab-symmetric SiO2 waveguide, with the acceleration or deceleration clearly visible due to the use of a beam with a bifurcated longitudinal distribution that serves to approximate a driver-witness beam pair. This split-bunch distribution is verified by longitudinal reconstruction analysis of the emitted coherent transition radiation. The dielectric waveguide structure is further characterized by spectral analysis of the emitted coherent Cherenkov radiation at THz frequencies, from a single electron bunch, and from a relativistic bunch train with spacing selectively tuned to the second longitudinal mode (TM02). Start-to-end simulation results reproduce aspects of the electron beam bifurcation dynamics, emitted THz radiation properties, and the observation of acceleration in the dielectric-lined, slab-symmetric waveguide.
Number of references:18
Main heading:Physics
DOI:10.1103/PhysRevLett.108.244801