

CENTER FOR BEAM PHYSICS SEMINAR

“Laser acceleration of electrons in vacuum: accuracy principle of nonlinearity”

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Friday, March 30, 2001, 10:30 AM
Albert Ghiorso Conference Room, Bldg. 71 LBNL

Summary: The acceleration of electrons by lasers in vacuum has been clarified on the basis of trapping electrons in intensity minima or by free motion within the laser beam. The expression used for the laser field has to be exact, including the longitudinal components. The electron energy and the conical emission as measured by Umstadter et al have been completely reproduced by the theory. The recent result that the trace of the electron in a laser beam can be bent nearly parallel to the beam axis (capture and acceleration scenario, X.C. Yuan, Y.K. Ho et al, Dec.2000) is examined using exact calculations under the accuracy principle of nonlinearity. We show how TeV electrons may be produced by a micrometer wavelength laser pulse of 10 wave lengths and 20 wavelenghs focus diameter with a pulse energy of 4.3 Exawatt. These laser pulses are considered possible based on the material strength of alexandrite of 2 PW/cm².

Biographical data and R&D interests: Heinrich Hora was Professor of Theoretical Physics and Head of Department at UNSW from 1975 until 1992, when he became an Emeritus Professor. His distinguished career includes faculty and research positions in Germany, CERN and Osaka. He has authored 9 books and 400 papers on laser-plasma interaction, inertial nuclear fusion, ponderomotive and relativistic self-focusing, laser acceleration of particles, correspondence principle of electromagnetic interaction, and the accuracy principle of nonlinearity. He has earned the Ritter-von-Gerstner medal (1985) and the Edward Teller medal (1991). He holds numerous patents on chemical vapor deposition of diamond (IBM) and other applications of plasmas. He founded in 1982 and was Editor-in-Chief of the Journal Laser and Particle Beams until 1992. He also founded in 1968 the series of 13 conferences until 1997 Laser Interaction and Related Plasma Phenomena of which he was co-director until 1991.

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