Transition Radiation from a Self-Modulated Laser Wakefield Accelerator Generated Electron Beam*

C.B. Schroeder, E. Esarey, J. van Tilborg, D. Auerbach,
J. Faure, C.G.R. Geddes, Cs. Toth, W.P. Leemans
LBNL

The transition radiation from a relativistic electron beam generated by a self-modulated laser wakefield accelerator is studied analytically. The coherent and incoherent transition radiation spectrums are calculated for an electron beam with a multiple-temperature negative-exponential longitudinal momentum distribution, characteristic of laser-plasma produced electron beams. The effects of beam divergence on the coherent and Incoherent transition radiation are presented. The implications for use of the coherent transition radiation from the plasma-vacuum transition as a beam diagnostic and as a source of intense THz or mm-wave radiation are considered. The coherent transition radiation emitted from the plasma-vacuum interface is sub-ps in duration with energies per pulse orders of magnitude beyond that of conventional THz sources. The results are compared to recent experimental observations at LBNL.

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