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Laser-plasma electron acceleration and X-ray production in capillary tubes[1] H. FERRARI, A. LIFSCHITZ, B. CROS, K. CASSOU, F. WOJDA, LPGP - Unv. Paris-Sud, Orsay, France, G. GENOUD, M. BURZA, C. KAMPERIDIS, A. PERSSON, C.-G. WAHLSTRÅOM, Dep. of Phys., Lund Univ., Sweden, S. KNEIP, S.P.D. MANGLES, Blackett Laboratory, Imp. Coll.London, UK
— The dynamics of electron acceleration and X-rays production in capillary tubes are investigated numerically. An ultra-intense (0.77×10^{18} W/cm^2) and ultra-short (35 fs) laser pulse can be guided in cm long plasmas with electron densities of the order of 5×10^{18}cm^{-3}. Self-injected electrons are accelerated in the plasma wake, and undergo betatron oscillations giving rise to X-rays emission. We performed cm-long quasi-3D PIC simulations with CALDER-CIRC. The capillary tube was implemented through a non-uniform dielectric function. X-ray production was calculated a posteriori from electron trajectories by classical formulas. We compare numerical results with experimental ones. For cm long propagation, multiple electrons injection and acceleration are observed. The X-ray emission at the output of the tube is calculated in the conditions of the experiment. The effects of the plasma density and of the capillary edge on the X-ray beam divergence are discussed.

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