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Electron trapping condition of transverse ellipsoidal bubble in laser wakefield accelerator MYUNGHOON CHO, YOUNGKUK KIM, MIN-SUP HUR, Ulsan Natl Inst of Sci & Tech — We present the condition of electron trapping in an ellipsoidal bubble in the LWFA, which is not well explained by the spherical bubble model. The formation of an ellipsoidal bubble, which is elongated transversely, frequently occurs when the spot size of the laser pulse is large compared to the plasma wavelength. First we introduce the relation between the bubble size and the field slope inside the bubble in longitudinal and transverse directions. Then we provide an ellipsoidal model of the bubble potential and investigate the electron trapping condition by numerical integration of the equations of motion. If the field slop in longitudinal direction reaches the maximum earlier than that in the transverse direction, the trapping condition is determined only by a transverse bubble radius. This gives a significantly less restrictive trapping condition than the spherical bubble model. The trapping condition is compared with three-dimensional particle-in-cell simulations and the electron trajectory in test potential simulation, from which we confirm the simulation result is consistent with the theoretical expectations.

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