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Comparison of the spherical and ellipsoidal bubble models in laser wakefield accelerator MYUNGHOO CHO, YOUNGKUK KIM, MINSUB HUR, Ulsan Natl Inst of Sci & Tech — The bubble in the laser wakefield electron accelerator generally takes an ellipsoidal shape. However, the electron trapping condition in such a general shape has not been fully investigated yet. In this presentation, we describe our improved theory of electron trapping in an ellipsoidal bubble; especially we focus on the trapping condition for a transversely elongated one, which is not well explained by the spherical bubble model. First we introduce and compare the spherical and ellipsoidal bubble formation derived from Maxwell's equation. Specifically we introduce the relation between the bubble size and the field slope in longitudinal and transverse directions. Then we investigate the electron trapping condition by numerically integrating the equations of motion. From a series of numerical calculations, we found that the trapping is dominantly determined by the transverse bubble size, which makes the trapping condition much less restrictive than in the completely spherical bubble. To confirm our theoretical prediction, we carried out 3D PIC simulations, which exhibited good agreement with the theory.

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