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Ion response to laser plasma electron acceleration in the blow-out regime W. ROZMUS, University of ALberta, K.I. POPOV, L. RAMUNNO, University of Ottawa, V.YU. BYCHENKOV, Lebedev Physics Institute, N. NASERI, C.E. CAPJACK, University of Alberta — The ion response to relativistic electron bunches in the so called "bubble" or blow-out regime of a laser-plasma accelerator is modelled using numerical simulations. In response to the strong fields of the accelerated electrons the ions form a central filament along the laser axis that can be compressed to densities two orders of magnitude higher than the initial particle density. A theory and a simple model of the filament formation and its subsequent expansion are proposed. The long time ion evolution could provide a unique diagnostic of laser plasma electron accelerators. It is also shown that in the case of a sharp rear plasma-vacuum interface the ions can be accelerated by a combination of three basic mechanisms: charge separation field, longitudinal inductive field and electrostatic field at the tip of the ion filament.

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