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From Boltzmann equations to steady wall velocities

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By means of a relativistic microscopic approach we calculate the expansion velocity of bubbles generated during a first-order electroweak phase transition. In particular, we use the gradient expansion of the Kadanoff-Baym equations to set up the fluid system. This turns out to be equivalent to the one found in the semi-classical approach in the non-relativistic limit. Finally, by including hydrodynamic deflagration effects and solving the Higgs equations of motion in the fluid, we determine velocity and thickness of the bubble walls. Our findings are compared with phenomenological models of wall velocities. As illustrative examples, we apply these results to three theories providing first-order phase transitions with a particle content in the thermal plasma that resembles the Standard Model.

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