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Hydrodynamical obstructions to bubble growth

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Terminal velocity reached by bubble walls in first order phase
transitions is an important parameter determining both primordial gravitational-wave spectrum and production of baryon asymmetry in models of electroweak baryogenesis. We developed a numerical code to study real-time evolution of expanding bubbles and investigated how
their walls reach stationary states. Our results agree with the profiles obtained within the so-called bag model with very good accuracy, however, not all such solutions are stable and
are realized in dynamical systems. Depending on the exact shape of the potential there is always a range of wall velocities where no steady state solutions exist. This behavior in deflagrations is explained by hydrodynamical obstruction where solutions that would heat the plasma outside the wall above the critical temperature and cause local symmetry restoration are forbidden. For even more affected hybrid solutions the causes are less straight forward, however, we provide a simple numerical fit allowing one to verify if a solution with a given velocity is allowed simply by computing the ratio of the nucleation temperature to the critical one for the potential in question.

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