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Expanded Ensemble Method for Bubble Nucleation

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Many extensions of the Standard Model feature first-order phase transitions at the electroweak scale. These are particularly interesting since they may source gravitational waves, the spectrum of which is, in part, determined by the nucleation rate of bubbles. Computing this rate on the lattice requires us to determine the probability of the heavily suppressed critical bubble configurations.

While a standard application of the multicanonical method removes the obvious Boltzmann suppression, the condensation barrier is unaffected. This barrier appears at the condensation transition, which marks the point where the likely configuration changes from delocalised fluctuations of the metastable phase to a single localised bubble of the stable phase. The barrier increases with the system volume and causes exponential slowing down.

The ineffectiveness of the multicanonical method stems from the inability of the order parameter to distinguish fluctuations from small bubbles. In this talk, I will present an effective method for evading this deficiency, using expanded ensembles and non-homogeneous order parameters.

Special requests

Assuming acceptance, it would be preferable that the assigned timeslot would NOT be on Tuesday 2.12. before noon.

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