

False Vacuum, Hot Bubbles and other ferromagnetic stories

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Ultracold atoms are among the most versatile tools for exploring quantum phenomena on macroscopic scales. Their ability to simulate a wide range of quantum effects extends from ferromagnetism to cosmology, and from single-atom chains to continuous field models.

In our experiments, we work with one-dimensional coherently-coupled hyperfine mixtures of sodium. Owing to the specific combination of intra- and inter-state collisional properties, the mixture can be tuned into a ferromagnetic state, allowing us to study both first- and second-order phase transitions.

In particular, we observe the formation of bubbles following the decay of a metastable state—a yet-unverified prediction of quantum field theory known as False Vacuum Decay. More recently, we have investigated how temperature affects this decay process and extended our study to the dynamics and interactions of bubbles in flat potentials.

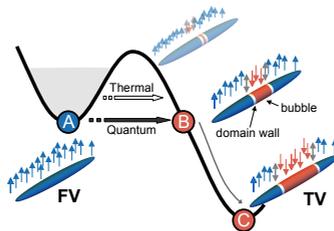


Fig. 1: Metastable states and bubble formation in False vacuum decay

References

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