Filtered dark matter in a first order phase transition

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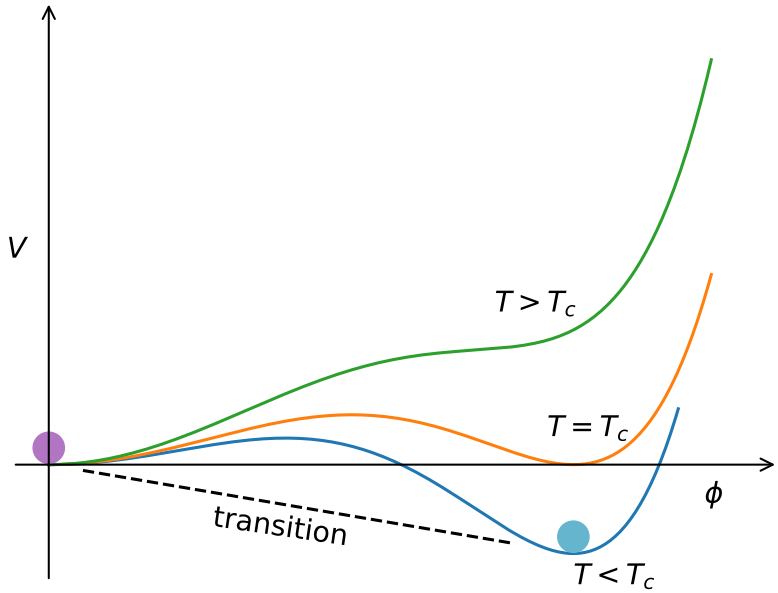
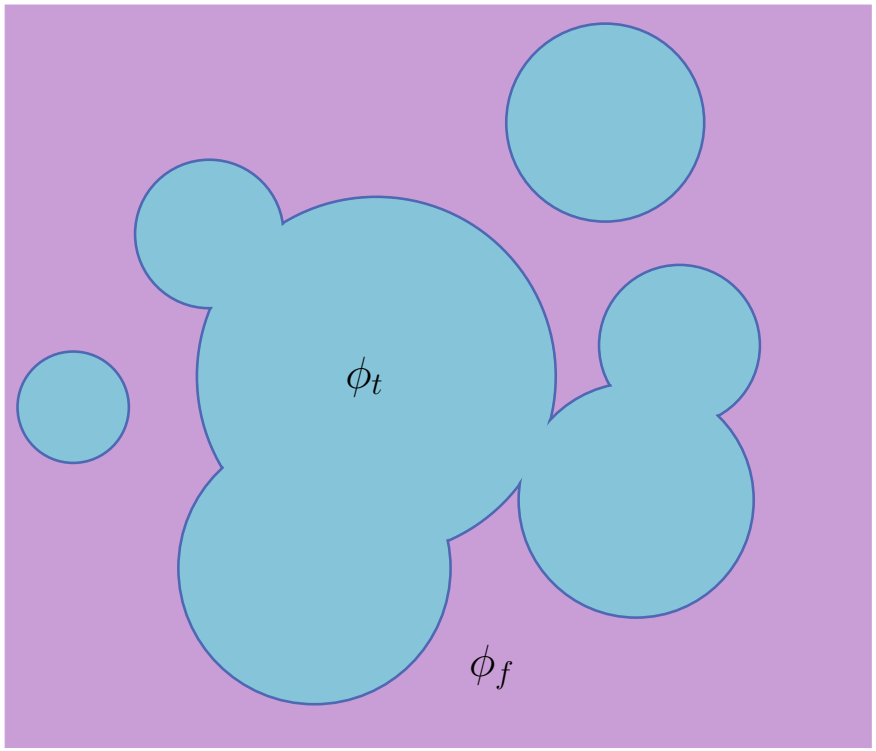
Cargese 2025: BSM Odyssey

1st order phase transition

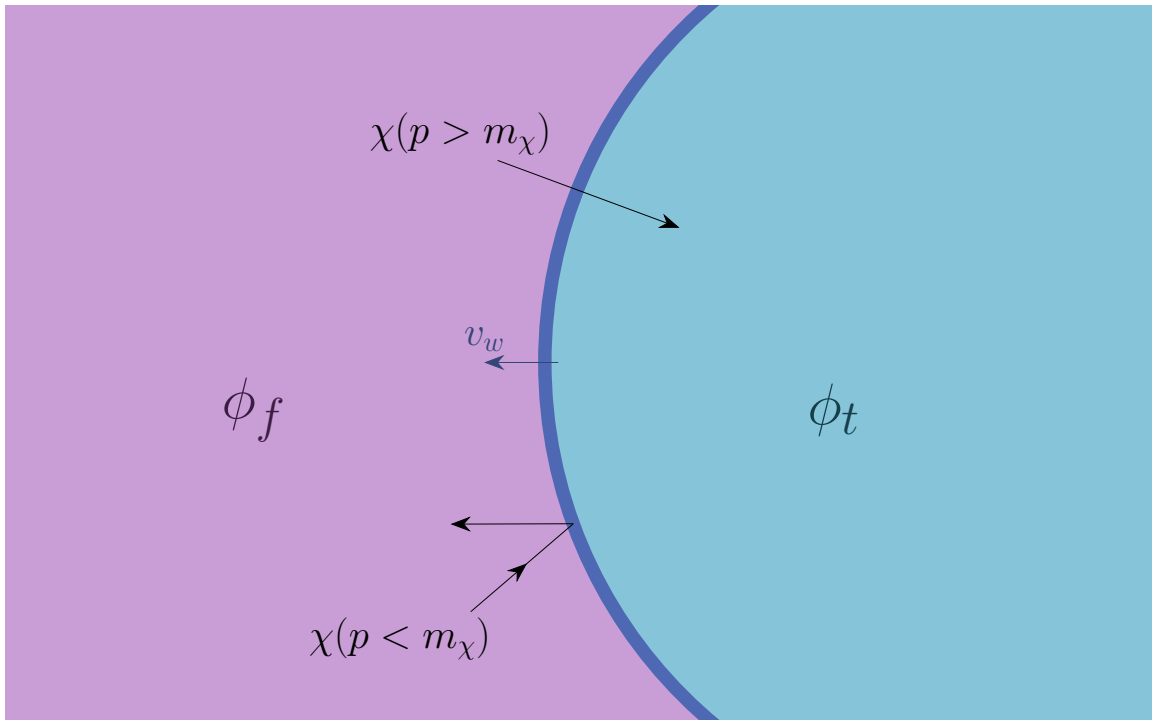




Filtered dark matter

ref. Baker, Kopp & Long, 2020

- Simple model: Add to the SM a scalar field ϕ and Dirac fermion χ, which is the dark matter (χ couples to ϕ and ϕ to SM)
- DM particles become massive when entering a bubble
- Freeze-out in the broken phase
- GWs from 1st order phase transitions as indirect probes for DM



Dependence on wall velocity

- Bubbles in plasma
- Friction from fluid slows the expansion
  $\Rightarrow$ terminal wall velocity

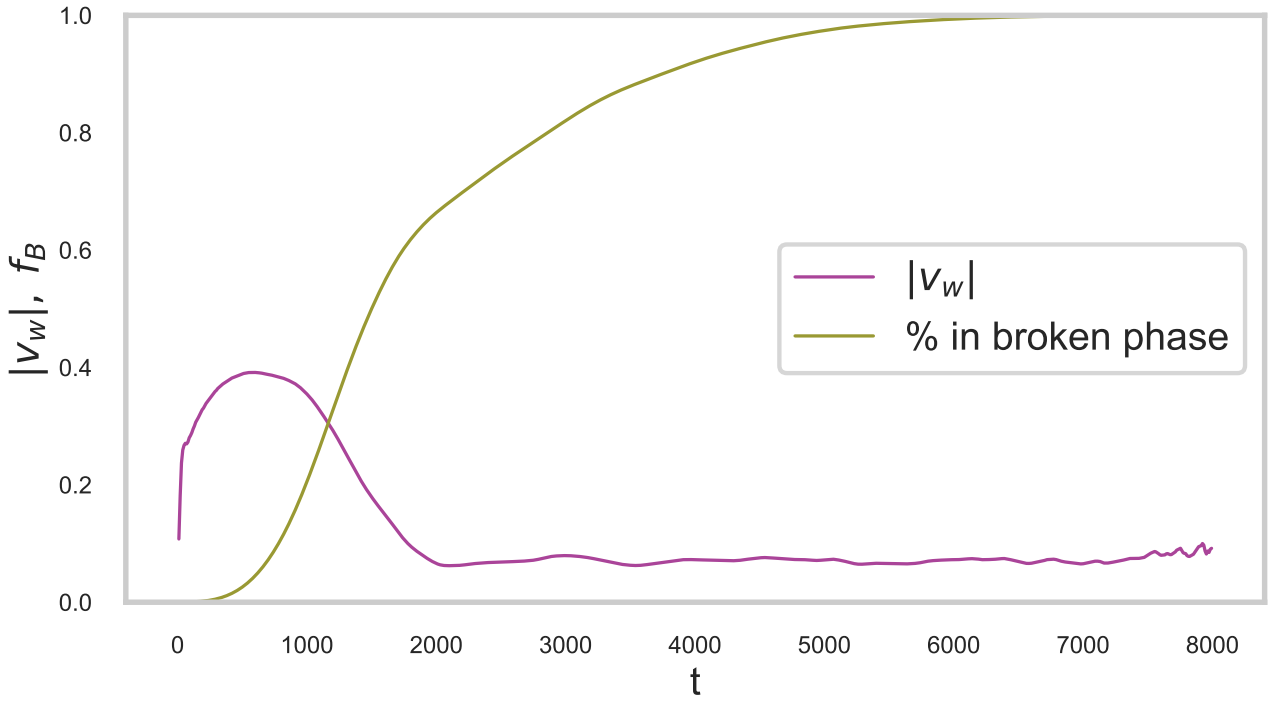


Figure: Correia, Hindmarsh, Rummukainen, Weir (arxiv:2505.17824)

Dependence on wall velocity

- Different sections of space experience a different wall velocity $\Rightarrow$ DM density may vary as well