$$\mathcal{L}_{\text{eff}} \sim G(\phi)\frac{\dot{\phi}^2}{2} - c_s^2 \frac{(\nabla\phi)^2}{2} + \nu\Lambda\cos\phi + \dots$$

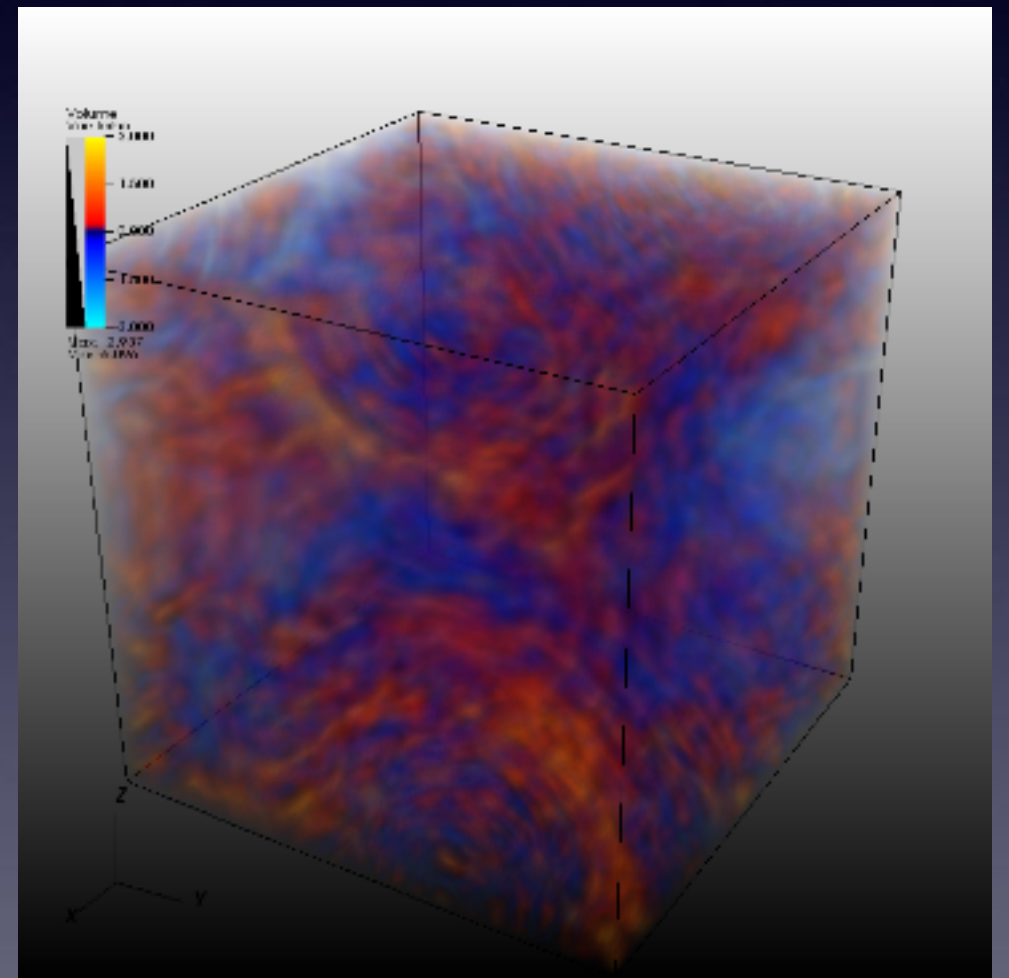Finite number effects

Trapping Potential

Finite Temperature

This Talk

$$i\hbar\dot{\psi}_i = \left(-\delta_{ij}\frac{\hbar^2}{2m_i}\nabla^2 + V(\mathbf{x}) + g_{ij}|\psi_j|^2\right)\psi_i - \nu_{ij}\psi_j$$
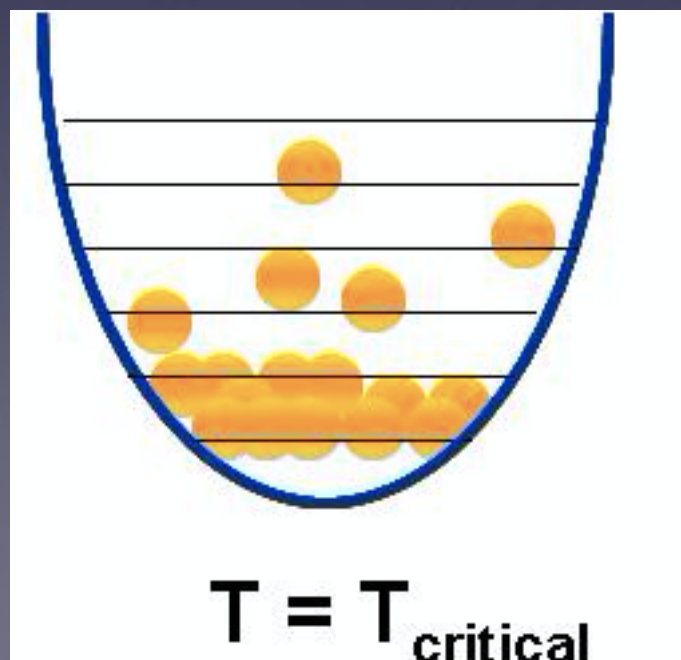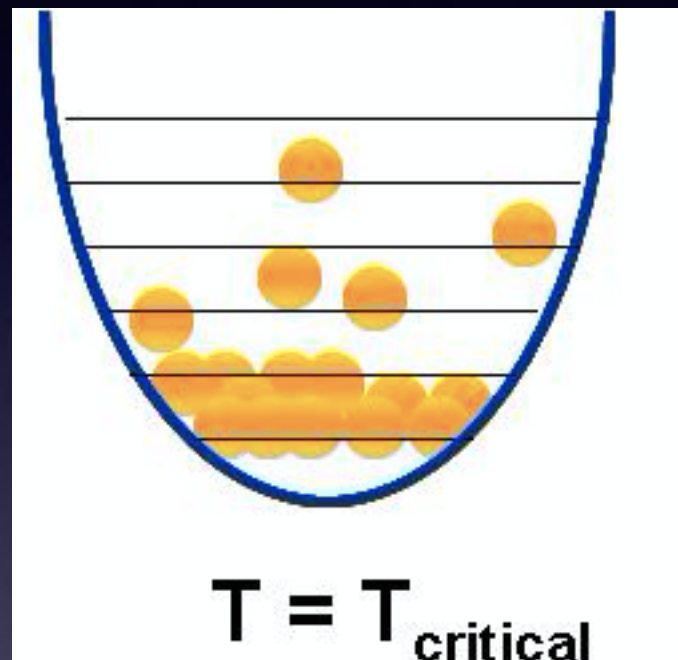
Building an Analogue System

[Fialko, Opanchuk, Sidorov, Drummond, and Brand]
[**JB**, Johnson, Peiris, Weinfurtner]
[Billam, Gregory, Michel, and Moss]

$T = T_{critical}$

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Important Scale : Healing Length
Crossover between wave and
particle dispersion relationship