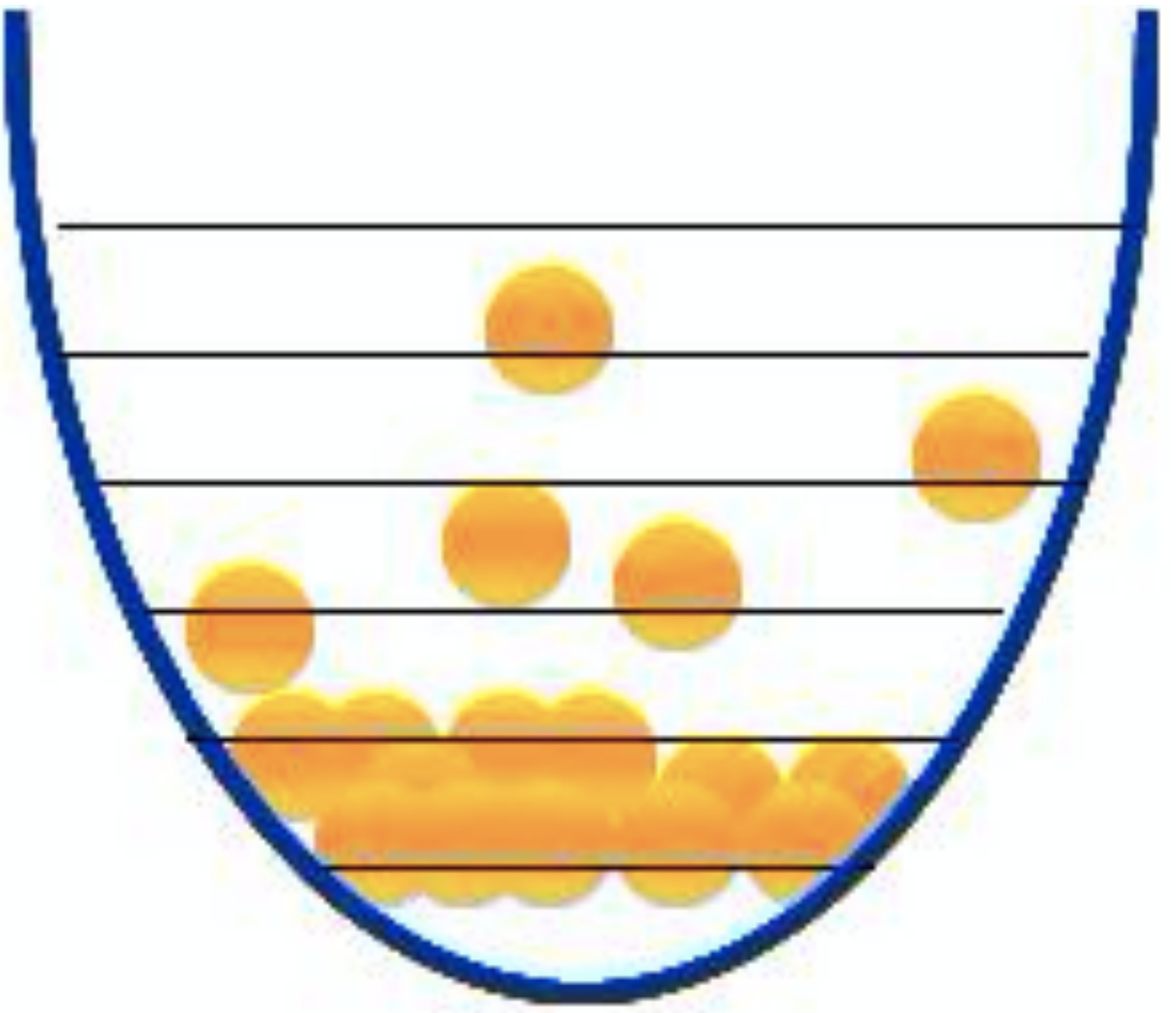
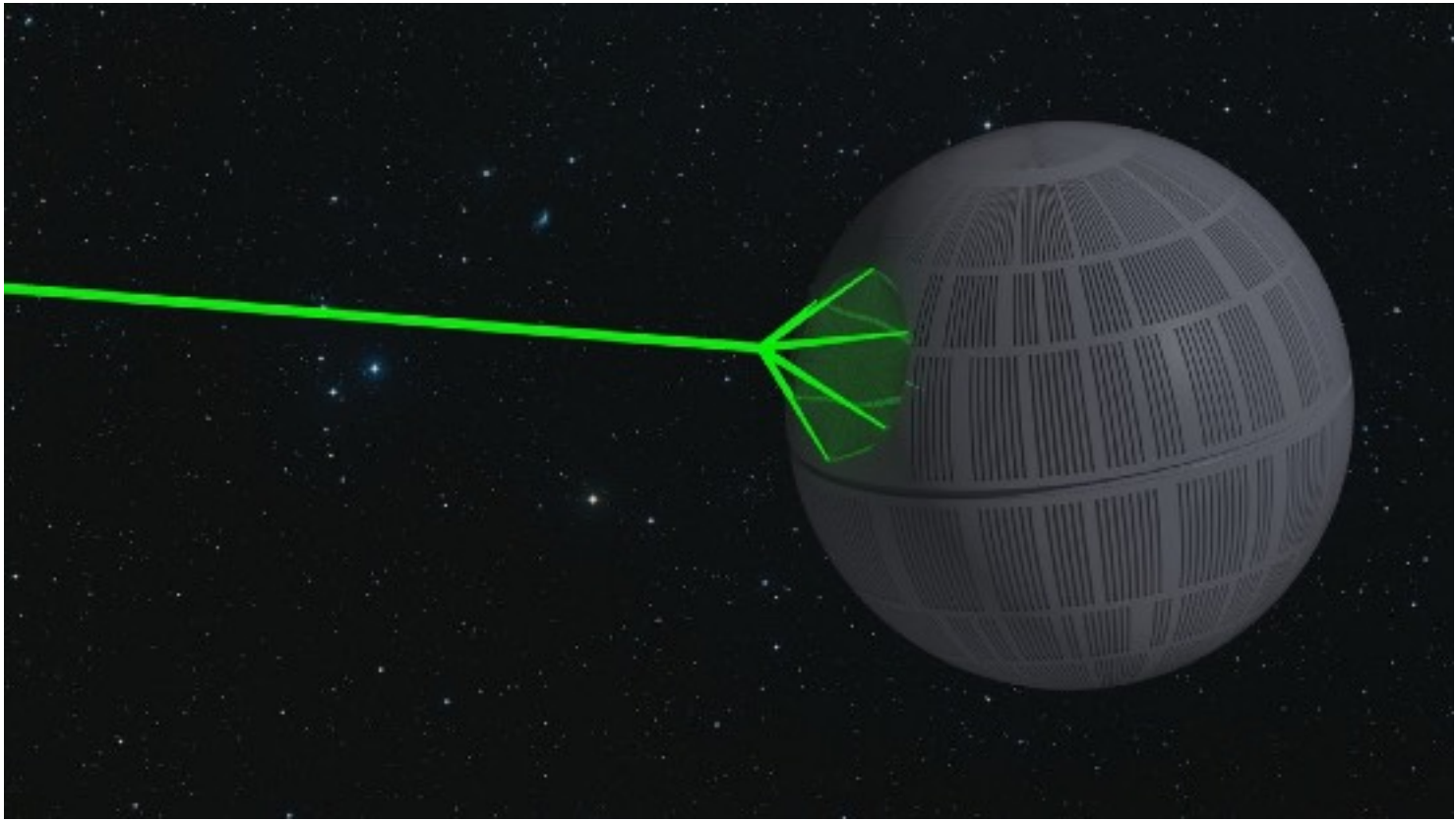
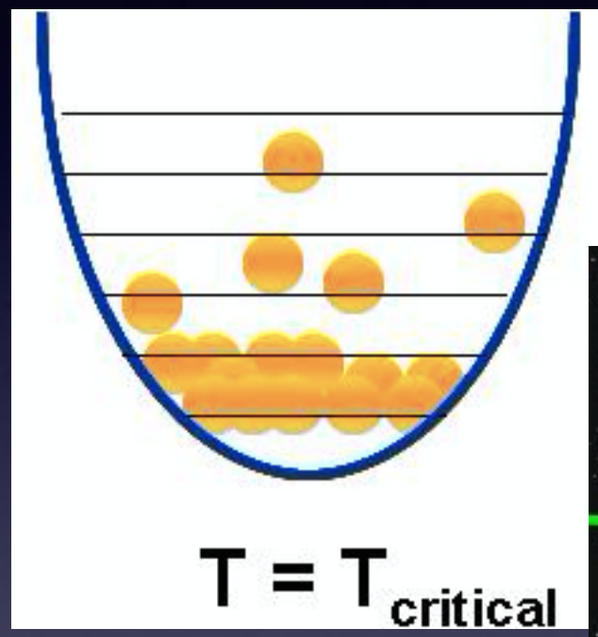


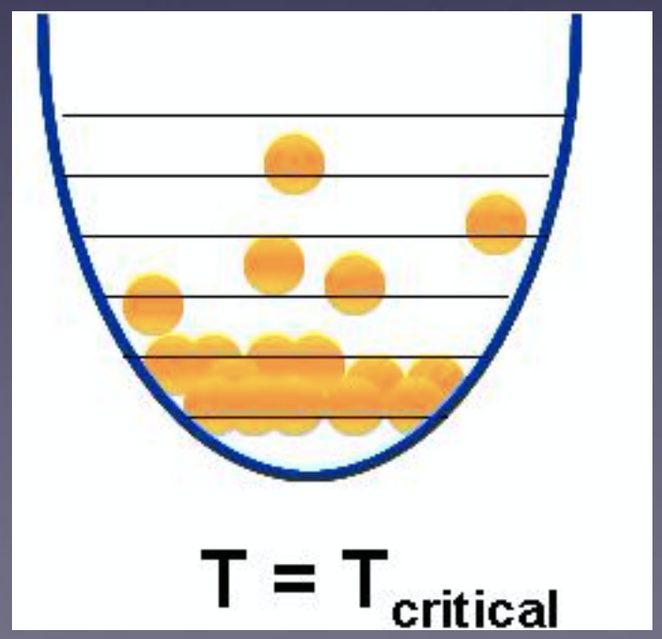
$T = T_{critical}$

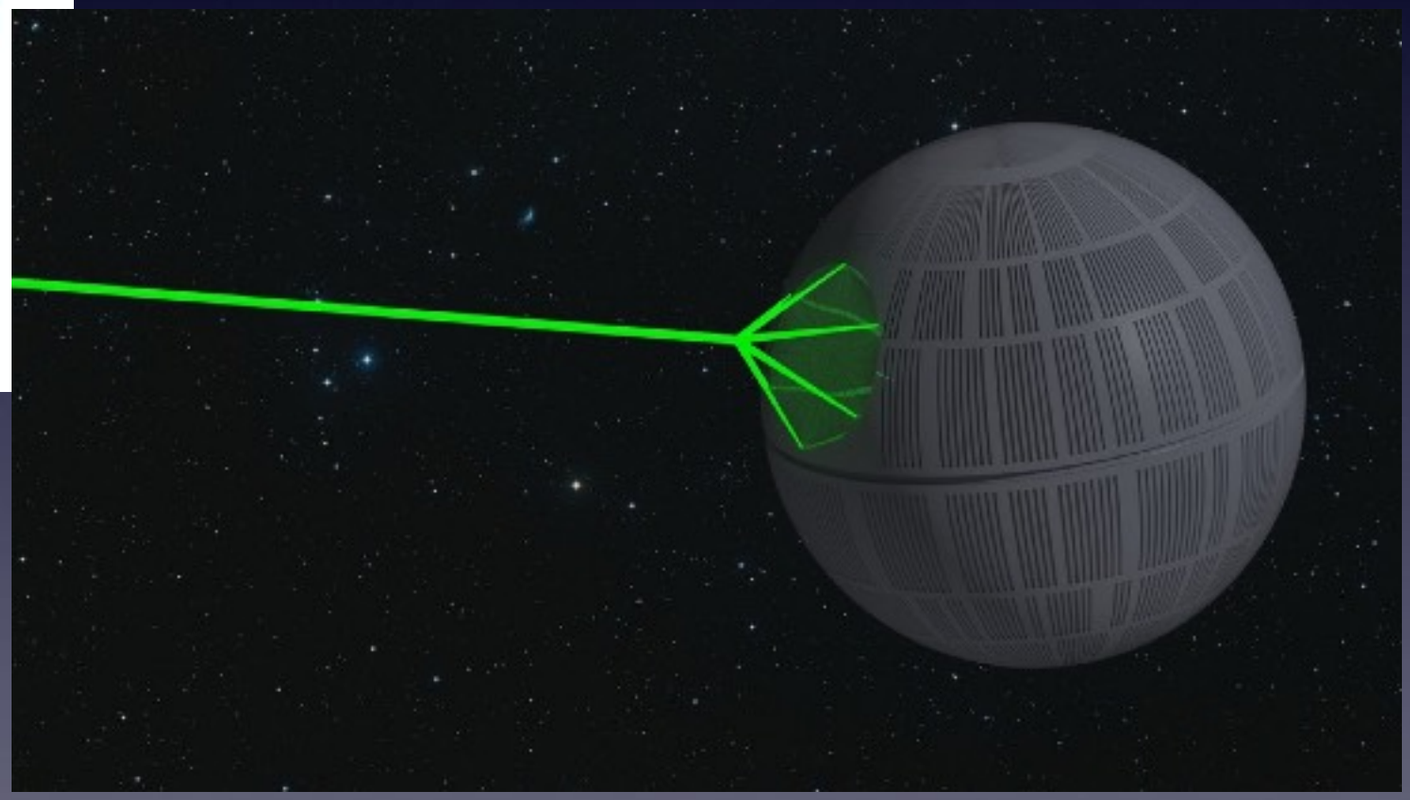


Building an Analogue System

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







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

Modelling BEC Dynamics

$$\hat{\Psi}_i = \psi_i + \Delta\hat{\psi}_i$$

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

KE PE S-wave Conversion

$$\mathcal{H} = \frac{\hbar^2}{2m_i}|\nabla\psi_i|^2 + V(x)|\psi_i|^2 + \frac{g_{ij}}{2}|\psi_i|^2|\psi_j|^2 + \frac{\nu_{ij}}{2}\left(\psi_i\psi_j^* + \psi_j\psi_i^*\right)$$