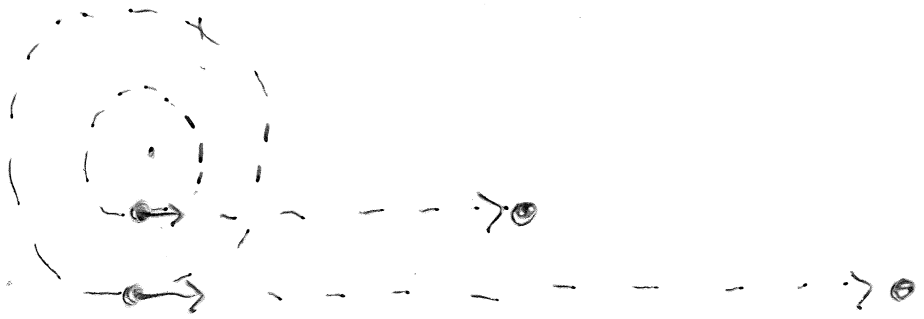
How to look for these ?

N.R. + N. Cooper 2003

Free expansion: remove trap potential at $t=0$
snapshot at time t

LLL states $\leftrightarrow$ lowest energy for each m

$\leftrightarrow$ circular orbits, classically



After time $t \gg 1/\omega_0$, positions rescaled by $\omega_0 t$, rotated by $\pi/2$

$\Rightarrow$ a real-space image of $t=0$ configuration

Justified to neglect interactions? $\bar{n}(t) \sim \frac{1}{(\omega_0 t)^3}$

Interaction corrections negligible if $g\bar{n}(0)\frac{1}{\omega_0} \lesssim t$

- same as for LLL approx in presence of potential
- ints are crucial in presence of potential

Even from a single snapshot, it is possible to obtain density-density correlation of $t=0$ state (if N large, not too much noise etc.)

- Get $g(\underline{r})$ as histogram, $\underline{r} = \underline{r}_i - \underline{r}_j$, over all pairs $i \neq j$
- Compare with g.u. average

$$g(\underline{r}) = \langle \psi^\dagger(\underline{r}) \psi^\dagger(0) \psi(0) \psi(\underline{r}) \rangle / \bar{n}^2$$

of a candidate state

- incompressible states appear uniform