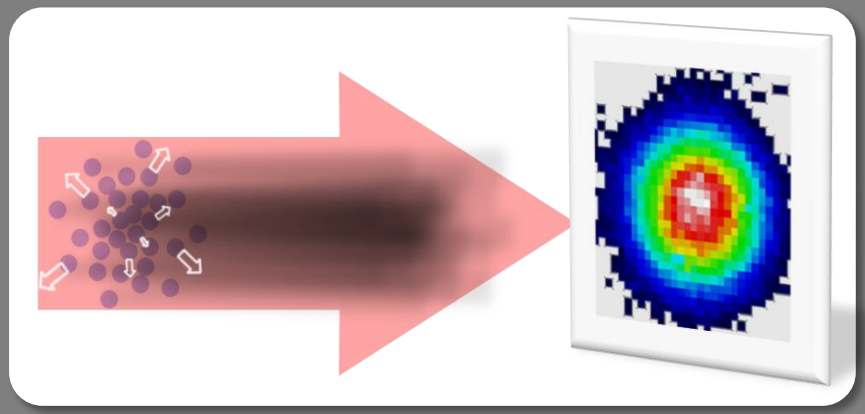
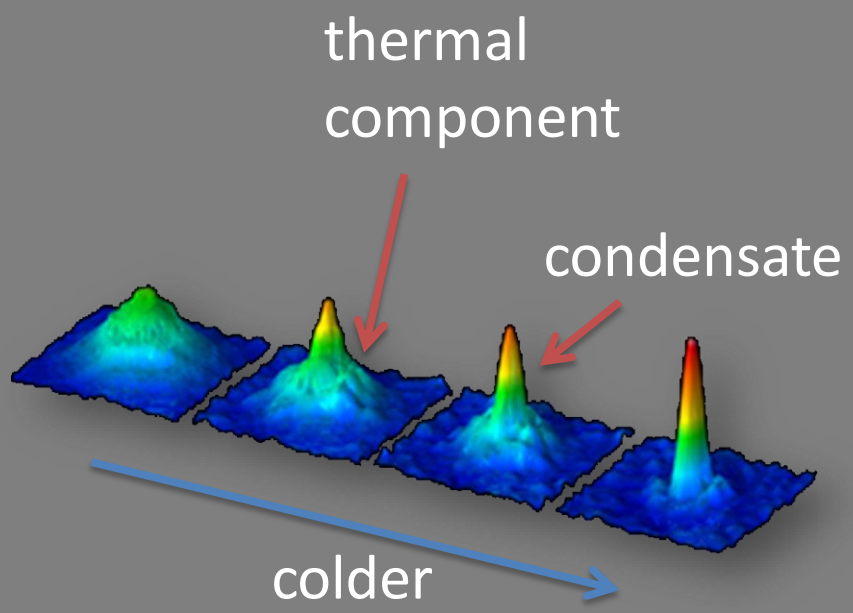
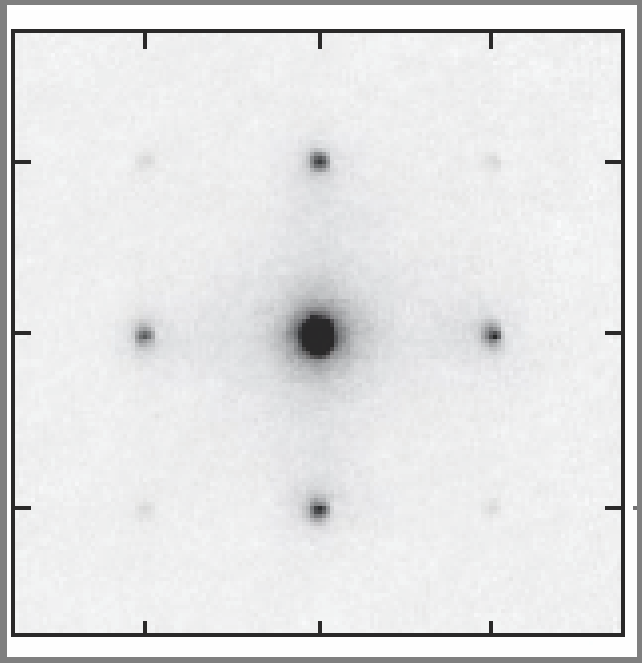
TOF imaging: projection onto plane waves

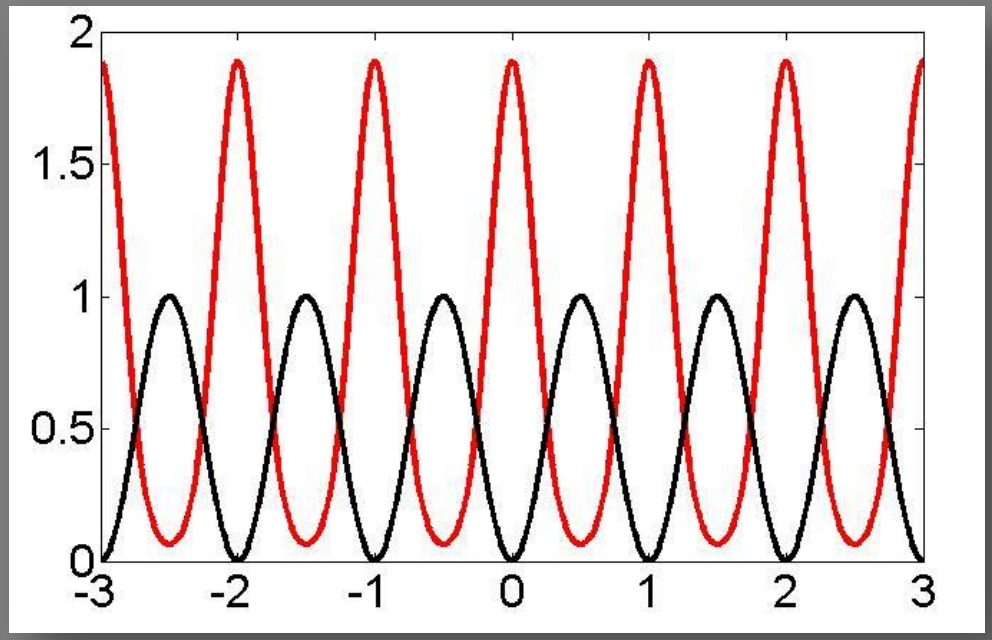
TOF imaging: momentum distribution (can be hard to achieve this regime with bosons)





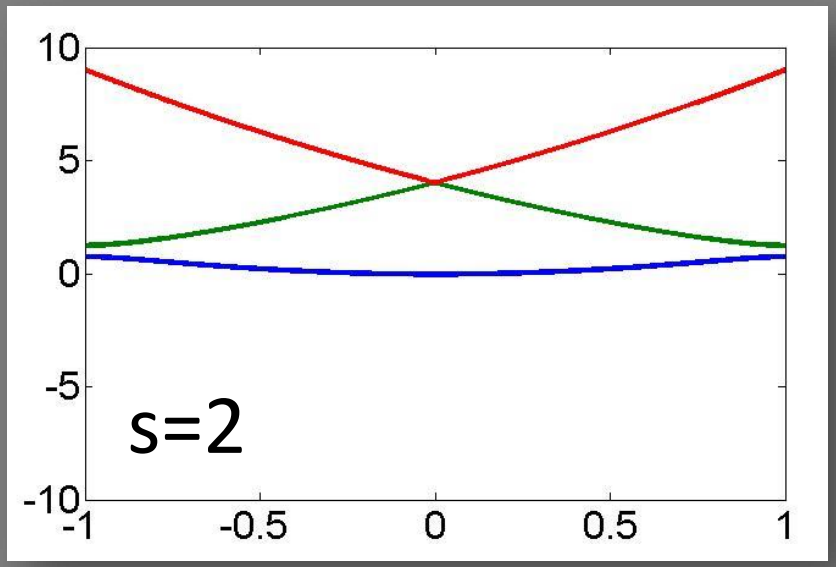


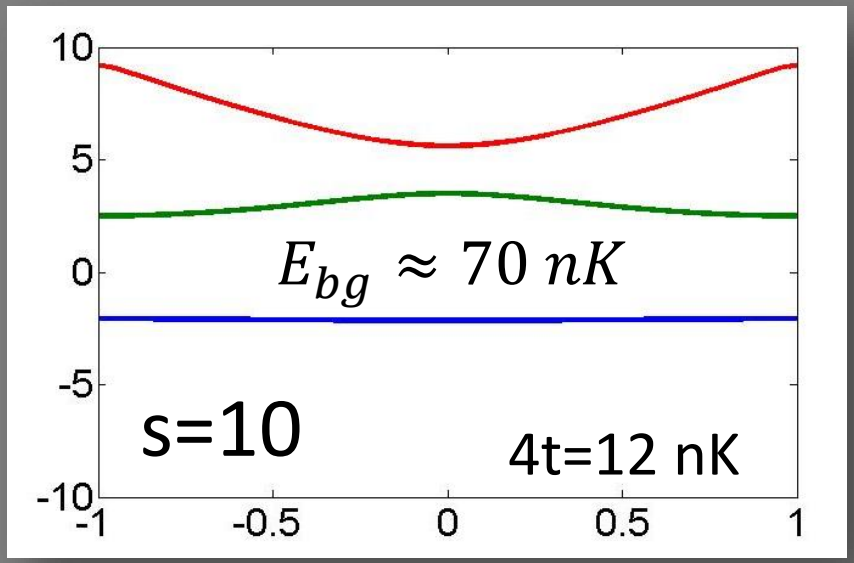
$|\Phi_{l=0,q=0}|$



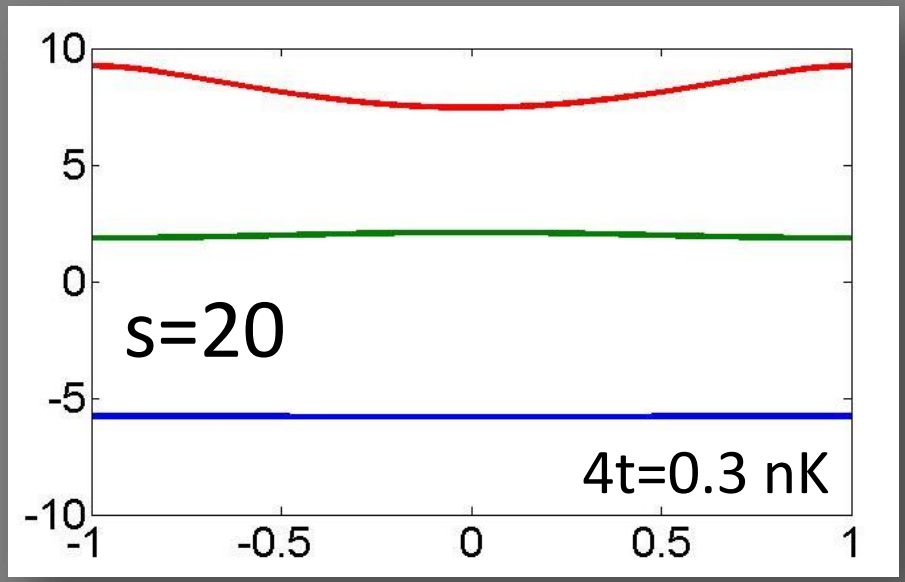
$x[\pi/k]$

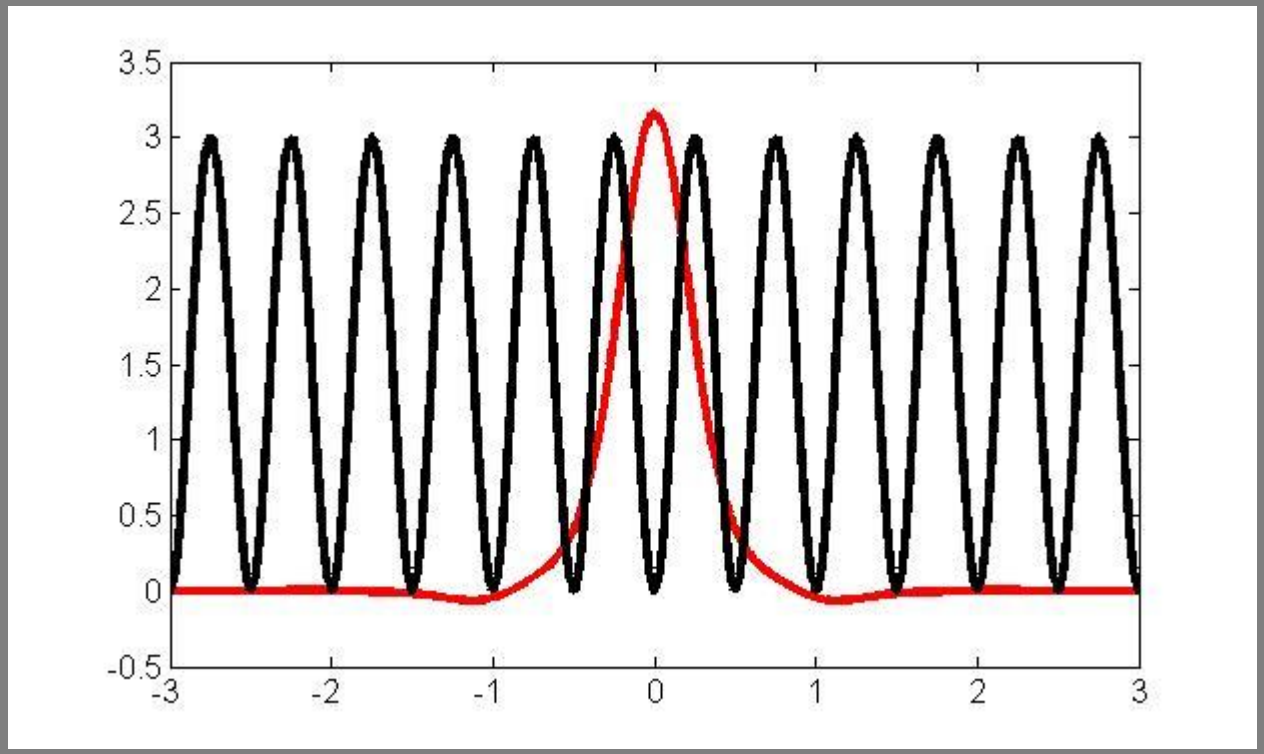
$E(E_R)$


10
5
0
-5
-10
-1
-0.5
0
0.5
1
s=2


10
5
0
-5
-10
-1
-0.5
0
0.5
1
$E_{bg} \approx 70\ nK$
s=10
4t=12 nK

q/q_B


10
5
0
-5
-10
-1
-0.5
0
0.5
1
s=20
4t=0.3 nK



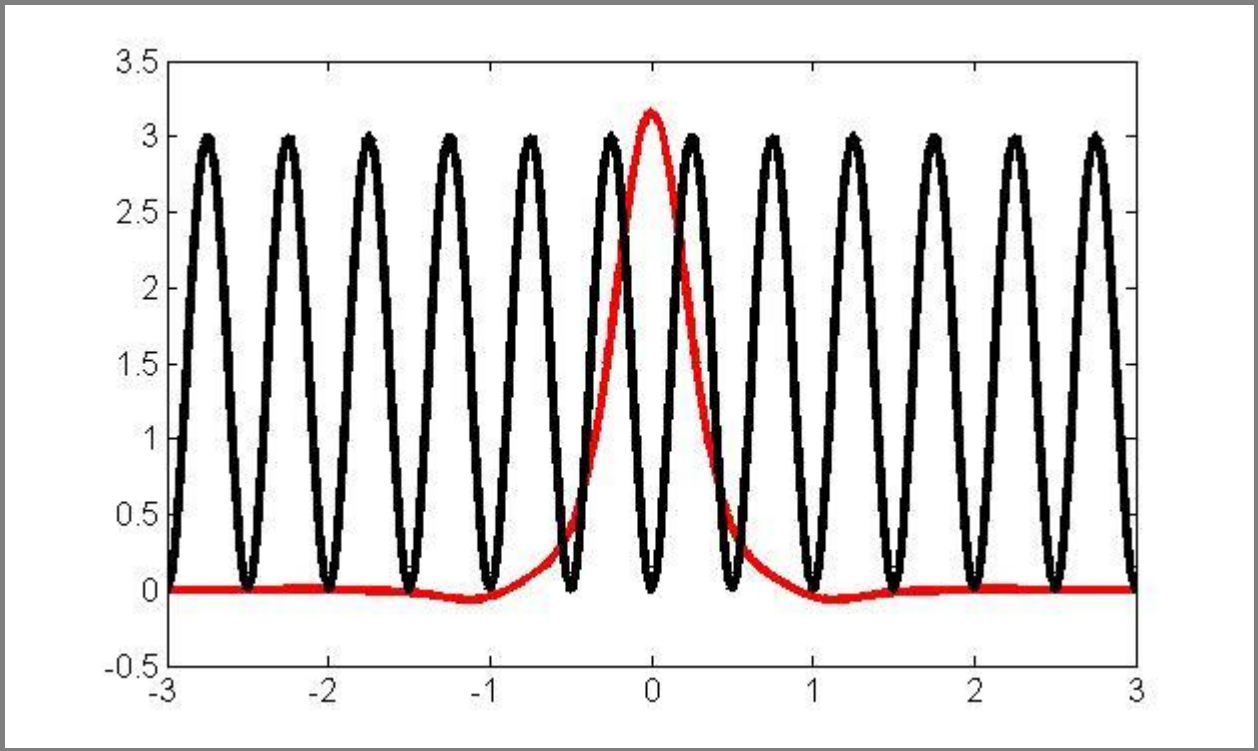
$|w(x)|$

$x[\pi/k]$

Wannier states

Another way of looking at the problem

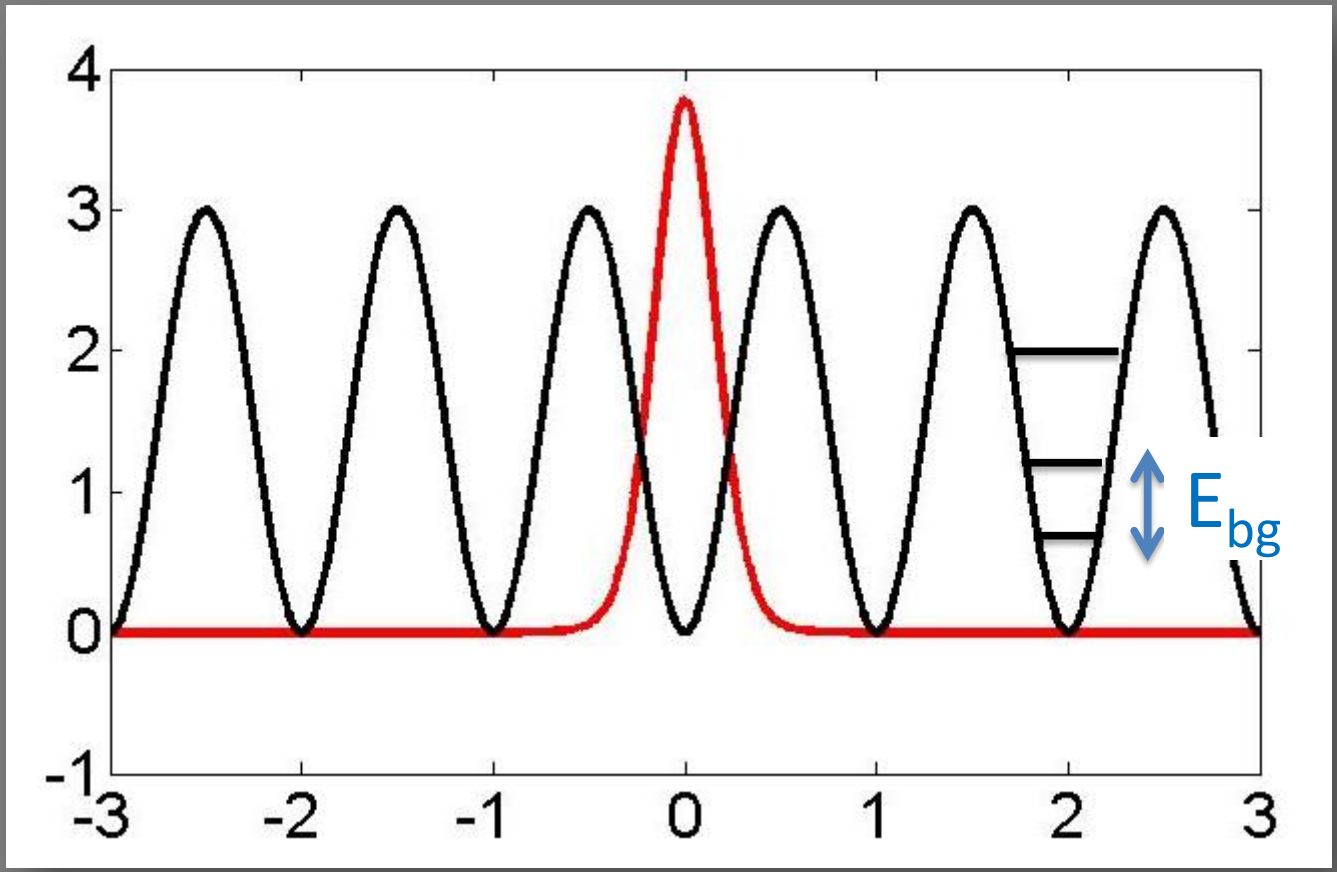
$$w_i(x) = \int_{-\infty}^{\infty} e^{iq(x-x_i)/\hbar} \Phi_q(x) dq \qquad \Phi_q(x) = \sum_j e^{iqx/\hbar} w_i(x - x_i)$$



$|w(x)|$

$x[\pi/k]$

$|w(x)|$



$x[\pi/k]$

Fermionic Atoms in a Three Dimensional Optical Lattice: Observing Fermi Surfaces, Dynamics, and Interactions

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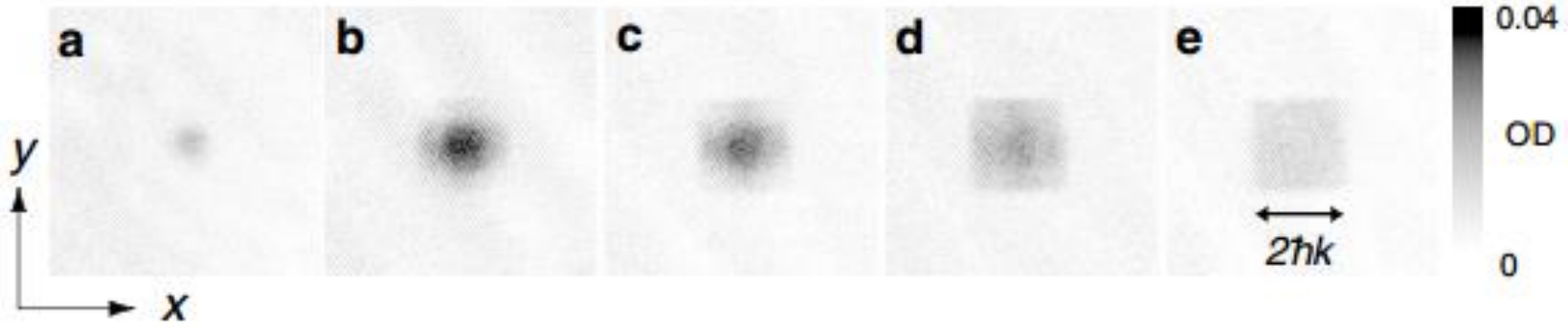

A Mott insulator of fermionic atoms in an optical lattice

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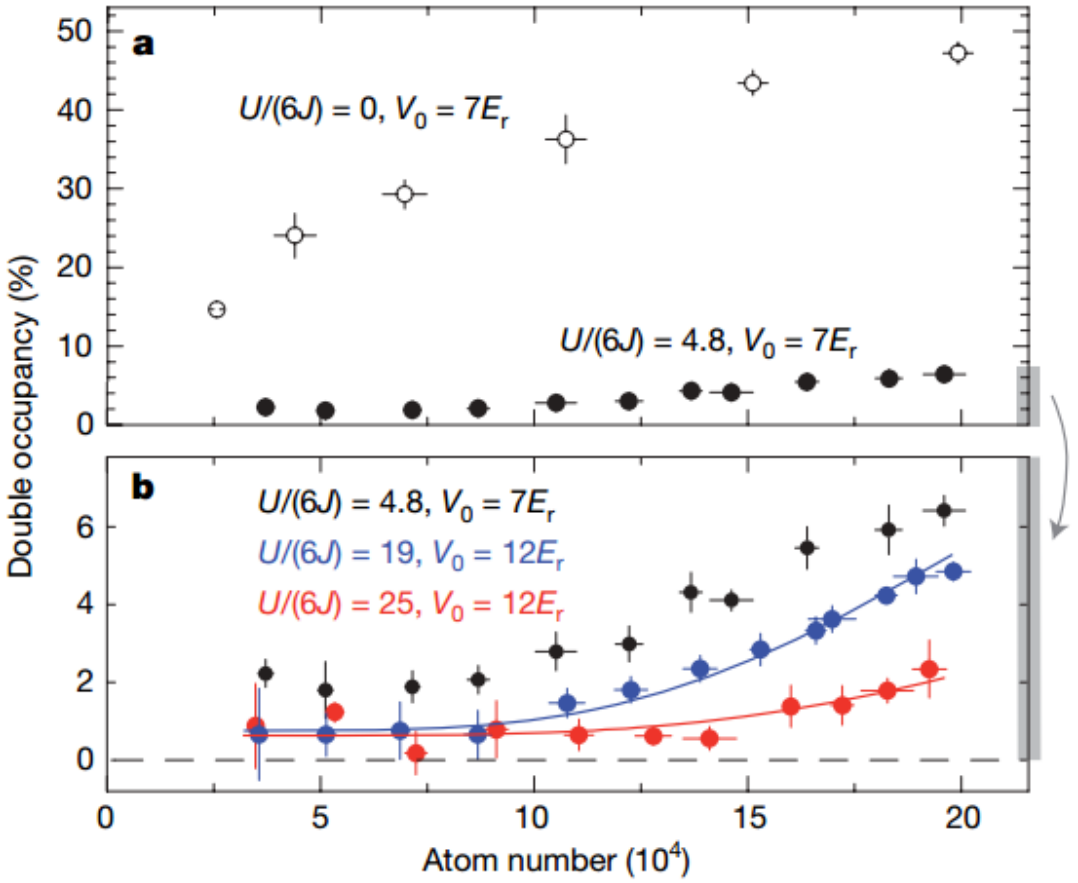

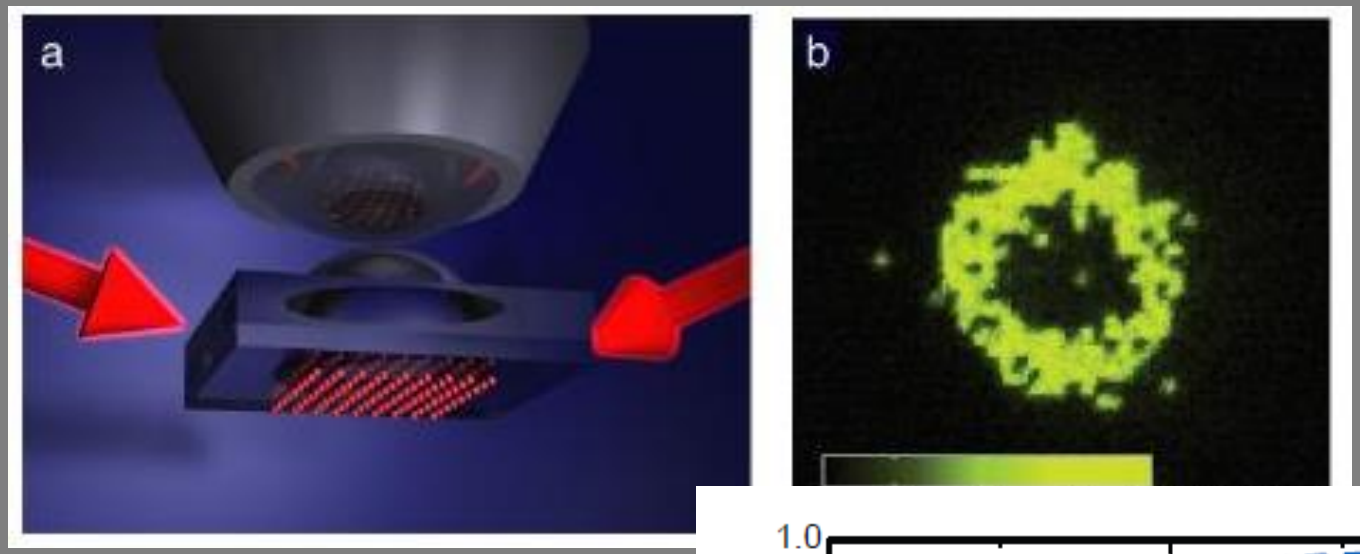

Greiner

Bosons only!