

Robust meta-stable qutrit and mid-circuit cooling of barium ions

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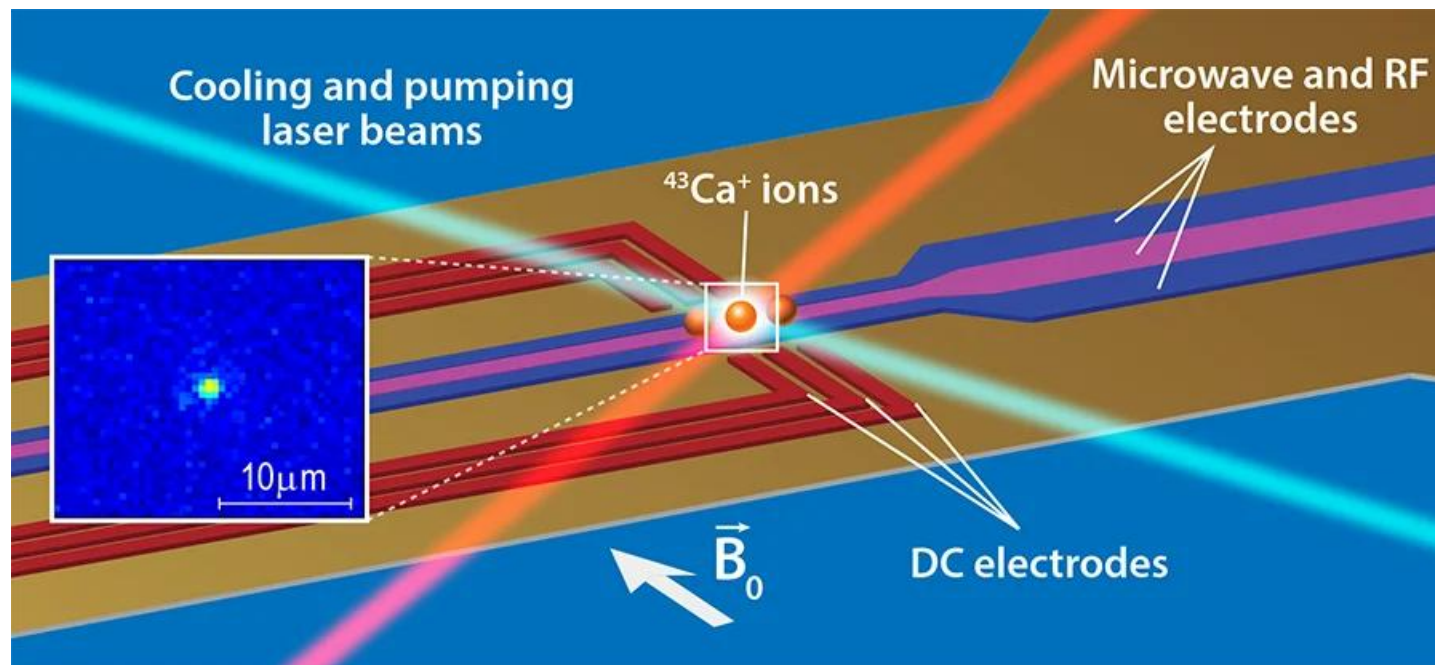
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09/15/2026

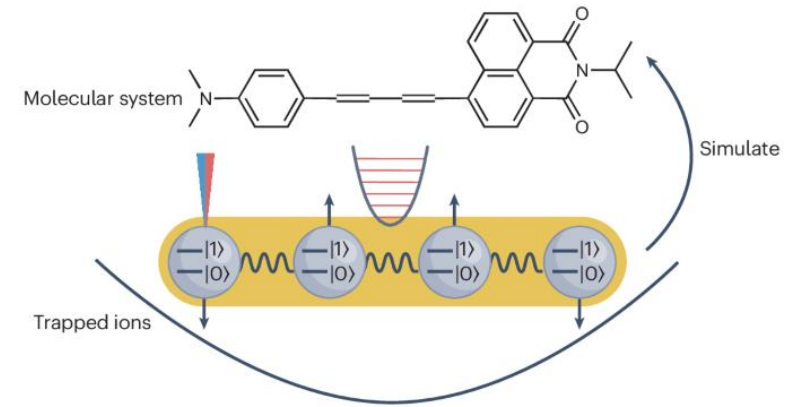
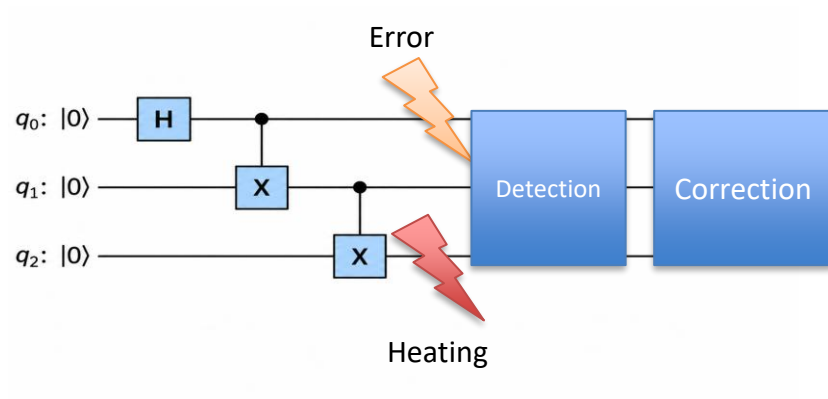
The 20th US-Korea Forum on Nanotechnology

Trapped Ion Quantum Computer

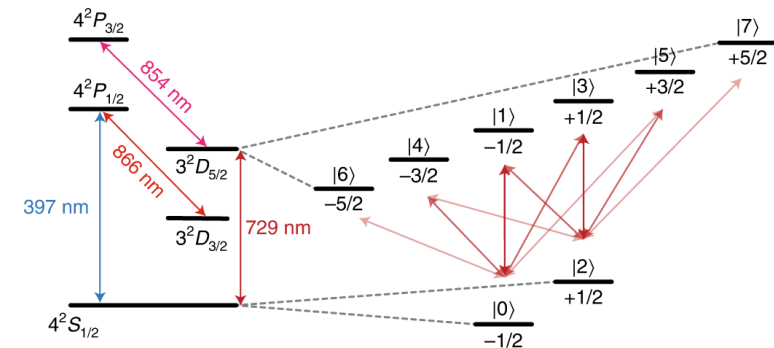
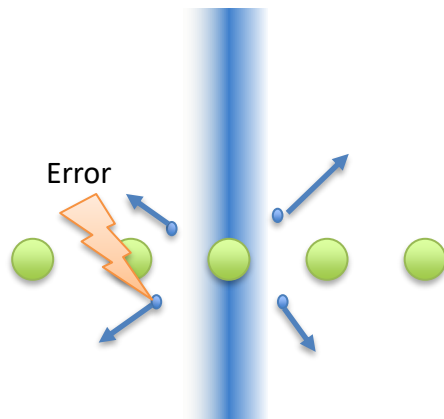


- Trap $\longrightarrow$ Electric field
- Qubit $\longrightarrow$ Spin in levitated atomic ion
- Quantum Gate $\longrightarrow$ Laser or Microwave
- Entanglement Bus $\longrightarrow$ Collective Motion
- State Detection $\longrightarrow$ State-dependent Photon Scattering

J. Kim, *Physics* 7, 119 (2014). Illustration: APS/Alan Stonebraker.



M. Kang et al. Nat.Rev.Chem. 8, 340-358 (2024)

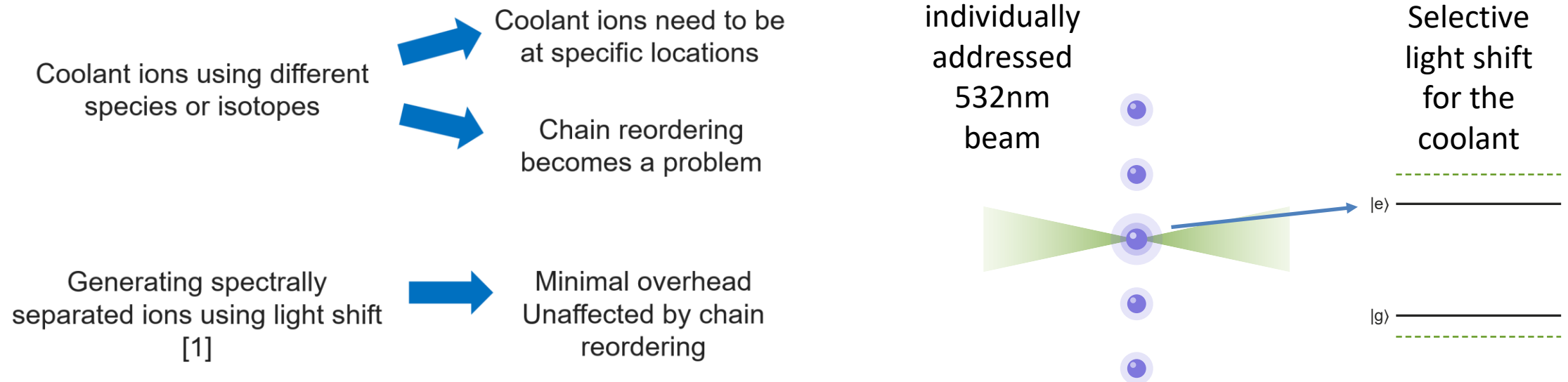


M. Ringbauer et al. Nat.Phys 586, 538-542 (2020)

Midcircuit Error correction and temperature control while preserving quantum information

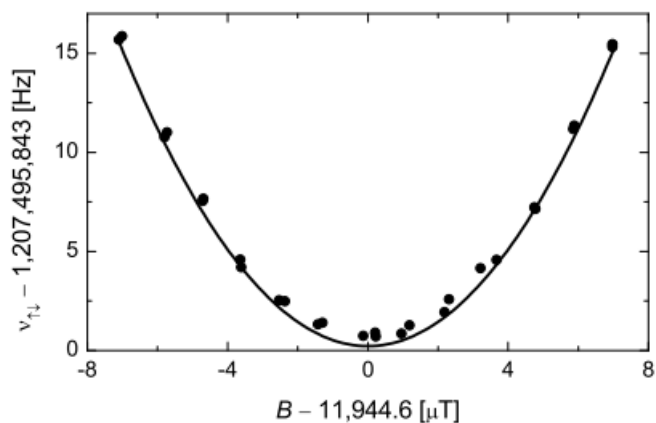
Can we get more out of the same?

Mid-circuit Cooling with Light-shifted Ions



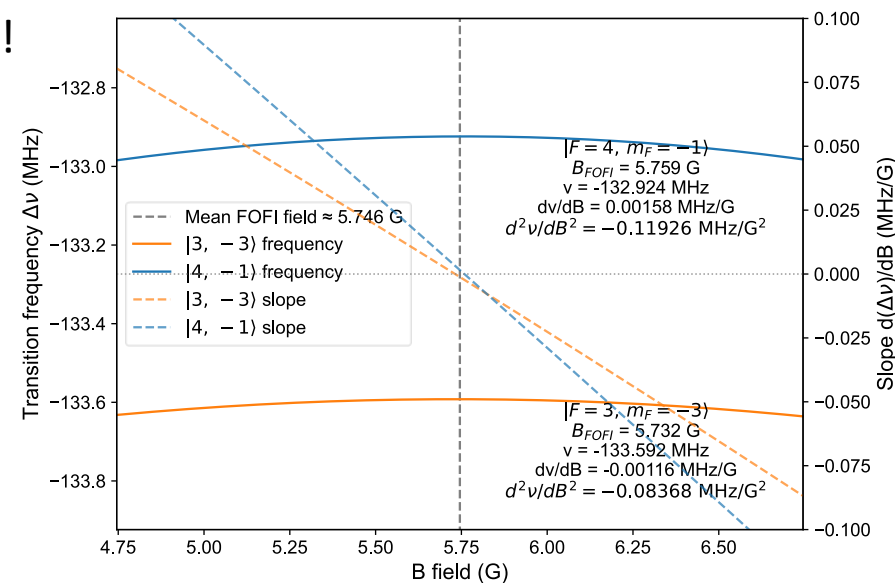
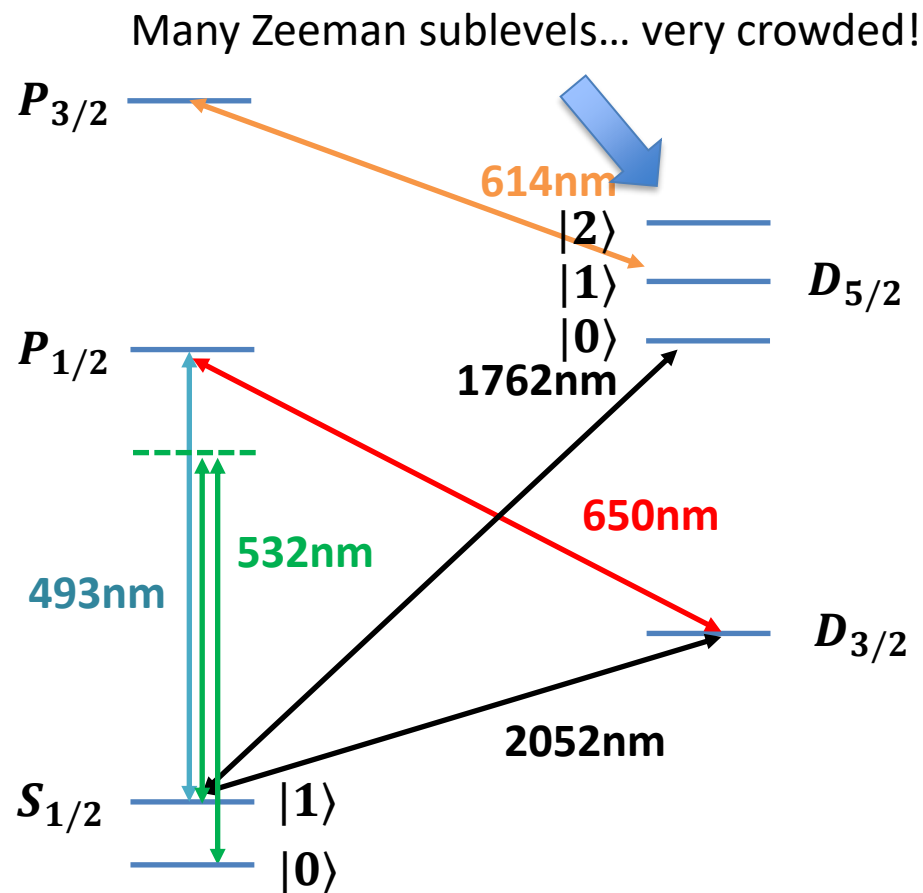
[1] Z.-Y. Chen et al., *Phys. Rev. A* **113**, 012606 (2026).

Robust meta-stable qutrit



C. Langer et al., Phys. Rev. Lett. 95, 060502 (2005)

$\frac{dE}{dB} = 0 \rightarrow$ robust to b field noise



A 3-level system with X1000 reduction in magnetic field sensitivity

Thank you!