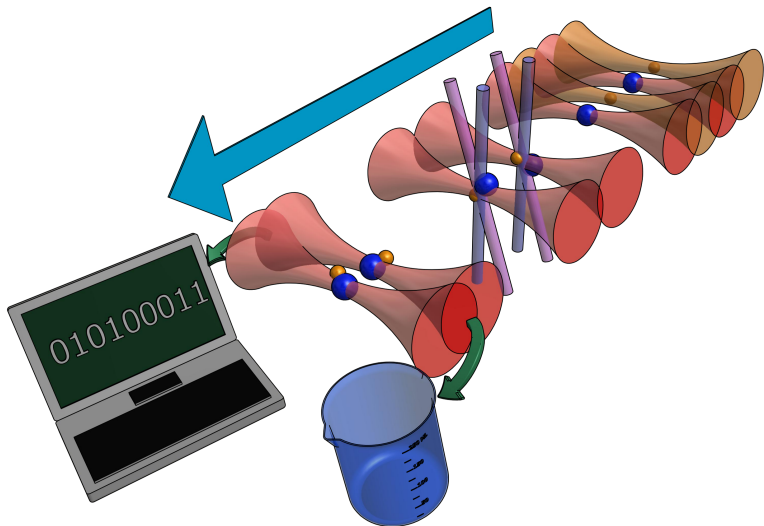


NaCs lab update

Yichao Yu

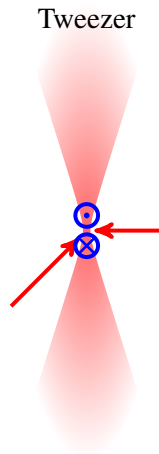
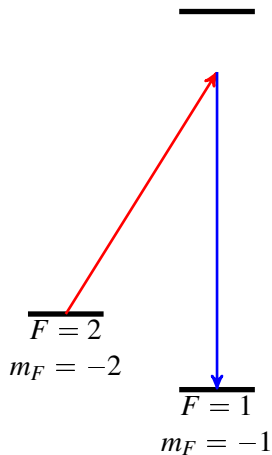
Ni Group/Harvard

March 24, 2017



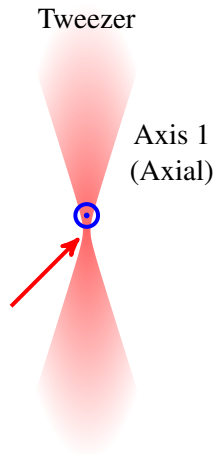
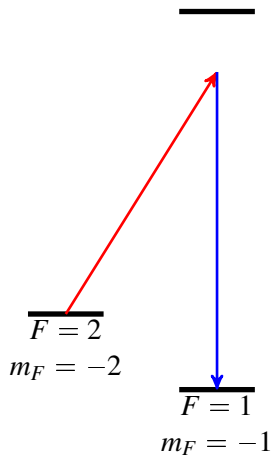
Raman sideband cooling of Sodium

• Setup



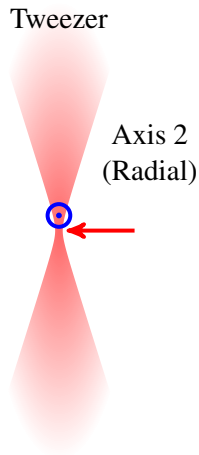
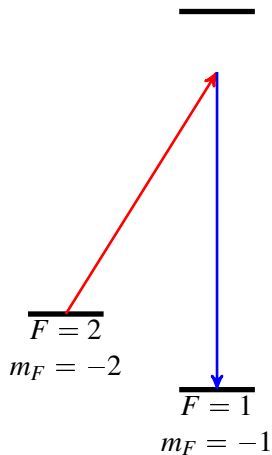
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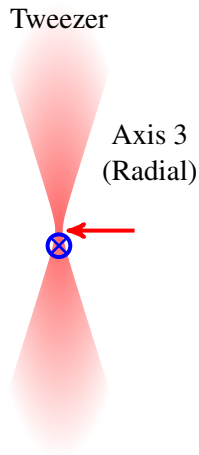
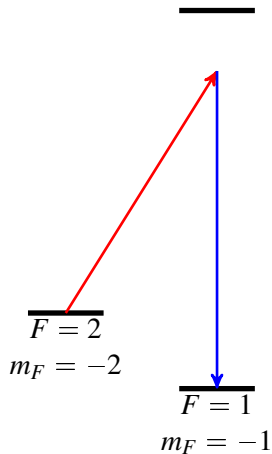
Raman sideband cooling of Sodium

• Setup



Raman sideband cooling of Sodium

• Setup



Raman sideband cooling of Sodium

Trap parameters

Axis	ν/kHz	η
1 (axial)	67	0.43
2 (radial)	420	0.35
3 (radial)	580	0.29

Raman sideband cooling of Sodium

Difficulties

- High initial temperature ($40\mu K$)
- High Lamb-Dicke parameter
- Trap anharmonicity

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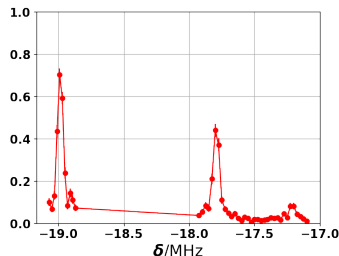
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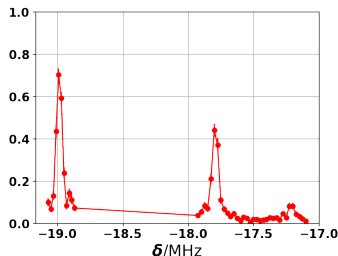
- High initial temperature ($40\mu K$)
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Improvements

- Stabilize trap power
- Add Raman beam for axis 3
- Increase Rabi frequency
- Simulation

Trap parameters

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Difficulties

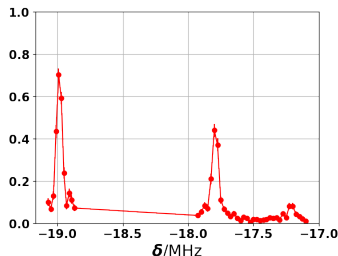
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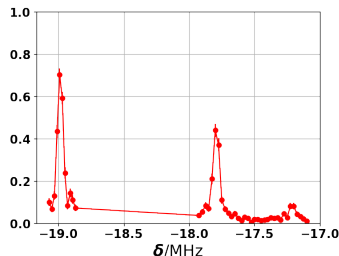
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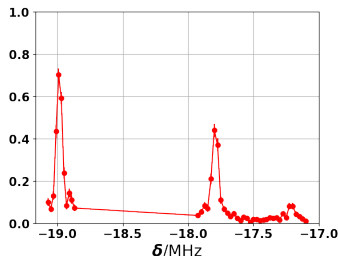
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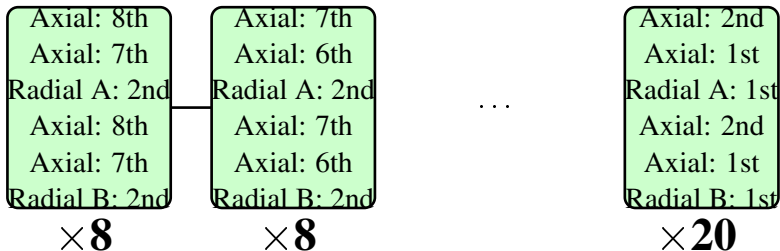
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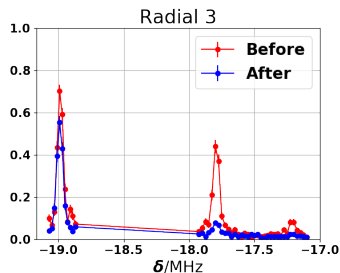
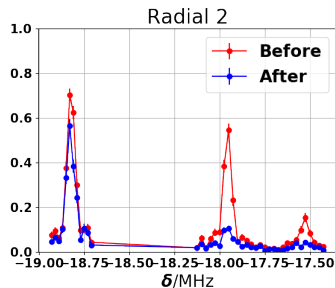
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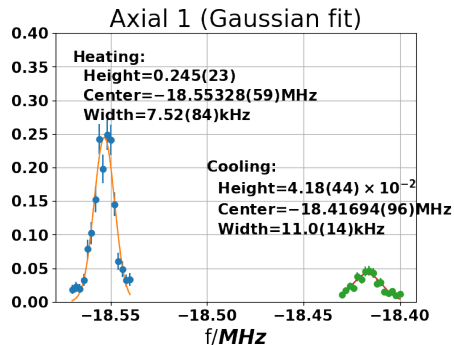
Cooling sequence



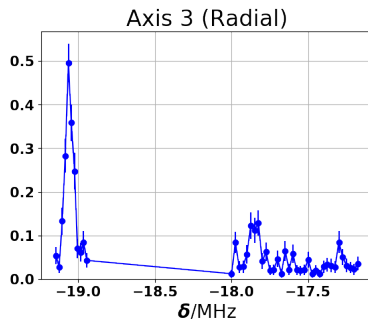
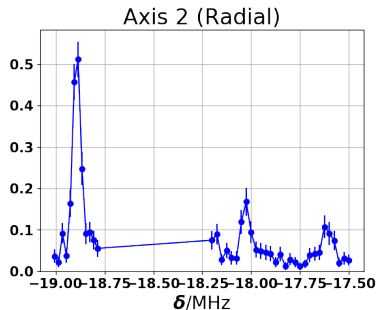
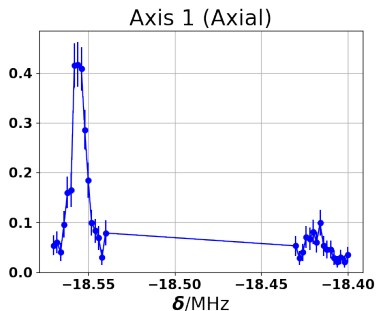
- Radial-only cooling
- Axial-only cooling
- 3D cooling
(Survival: $\approx 89\%$)



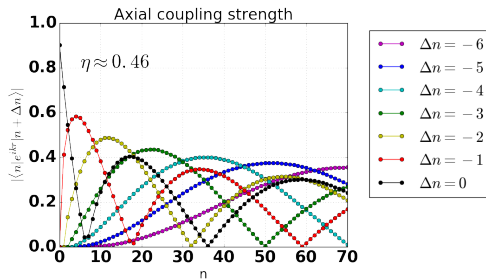
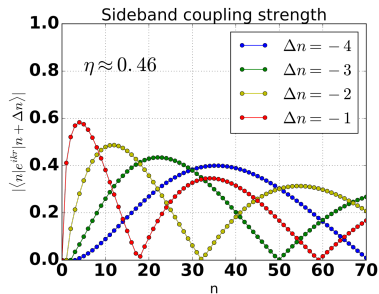
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- Axial-only cooling
- 3D cooling
(Survival: $\approx 89\%$)



Axial matrix element



Radial matrix element

