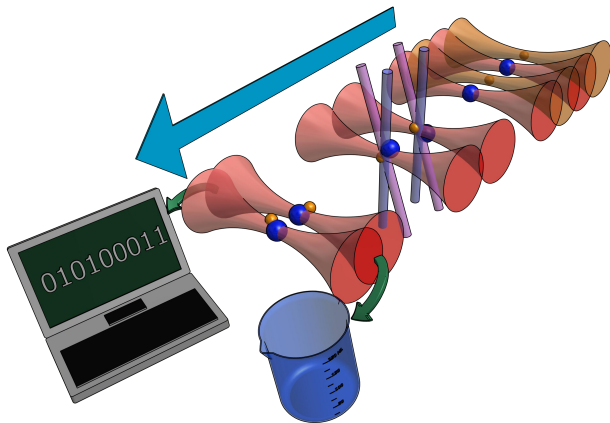


Trapping and imaging of single atoms in the presence of light shift

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May 26, 2016

Ni Group/Harvard



Group members

Nicholas Hutzler

Lee Liu

Jessie Zhang

PI

Kang-Kuen Ni



BECKMAN
FOUNDATION

Procedure

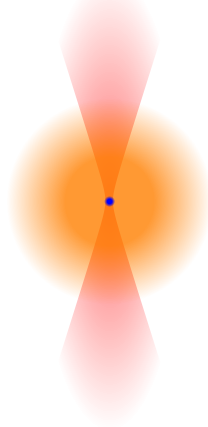
- MOT Loading
- Trapping
- Imaging
- Works for Cs
- Doesn't work for Na



Procedure

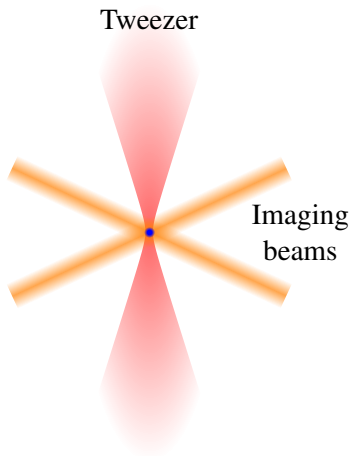
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Tweezer



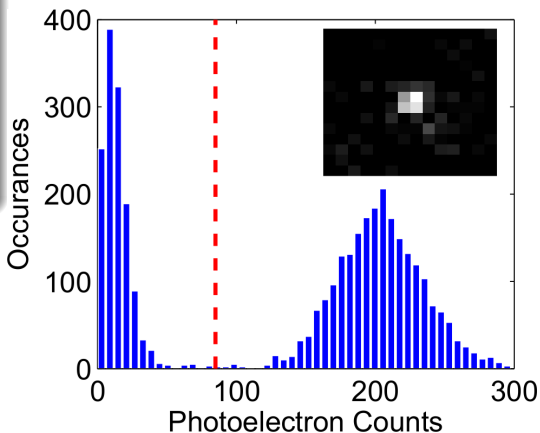
Procedure

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Procedure

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Procedure

- MOT Loading
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Light shift

- Inefficient cooling;
Heating
- Shift imaging light out of
resonance



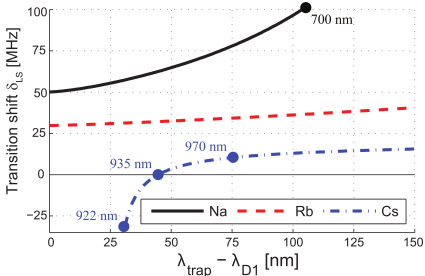
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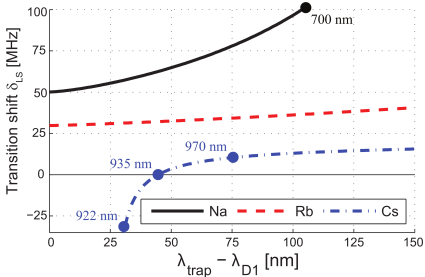
Light shift

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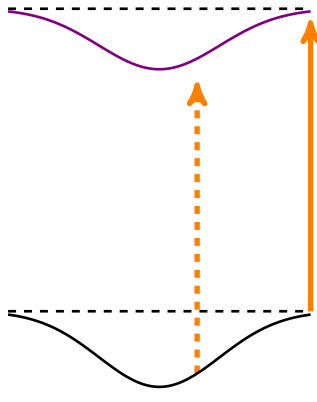
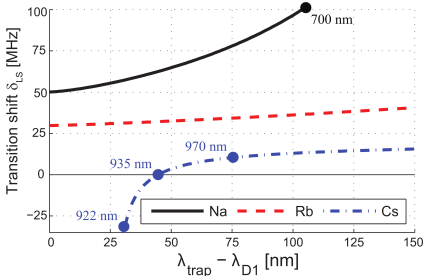
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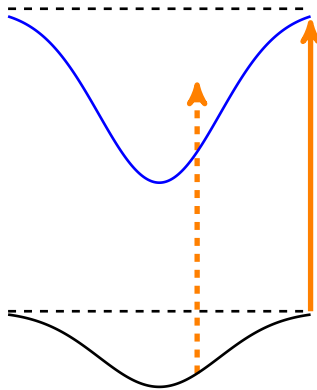
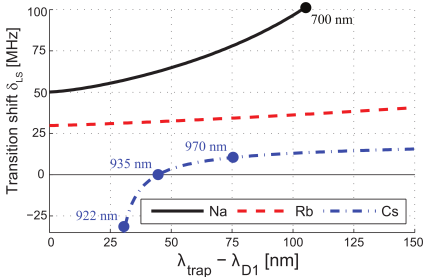
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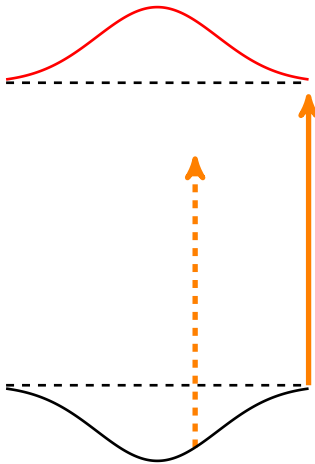
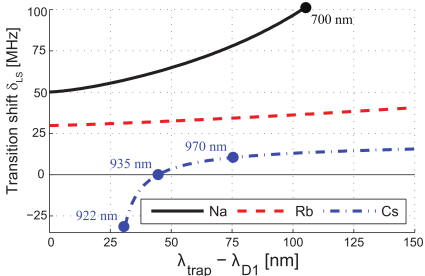
Light shift

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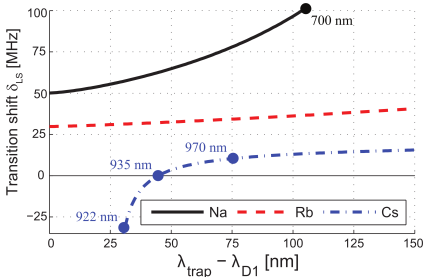
Light shift

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Light shift

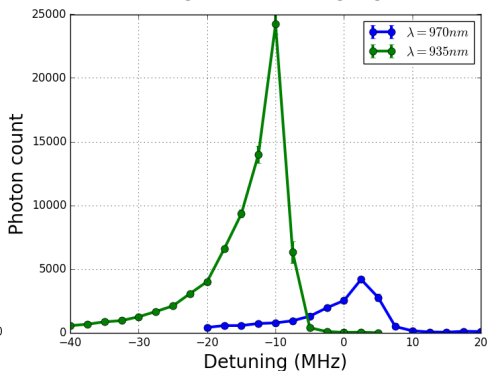
- Inefficient cooling;
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Cs single atom loading

$\lambda_{trap}(nm)$	922	935	970
Loading (%)	0	≈ 50	≈ 50

Cs single atom imaging

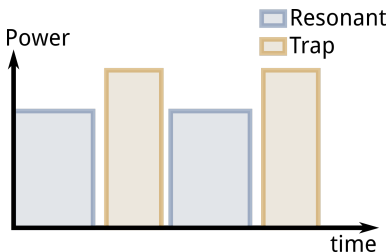


Trap modulation

Alternate between trap and
resonant (cooling and imaging)
light at 1 ~ 3 MHz

$$f_{\text{trap}} = 10 \sim 400 \text{ kHz}$$

$$\Gamma = 2\pi \times (5 \sim 10) \text{ MHz}$$



Trap modulation

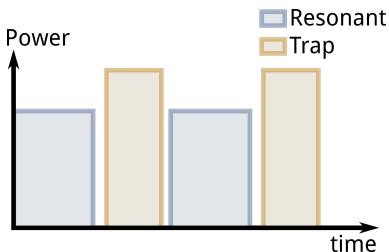
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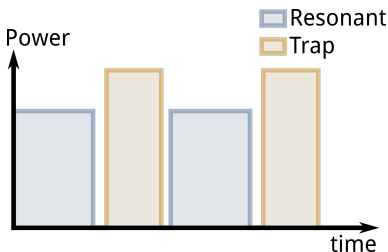


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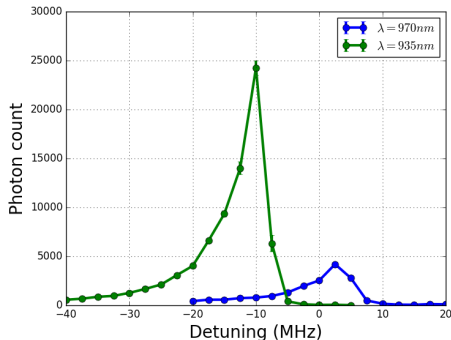
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Cs single atom imaging

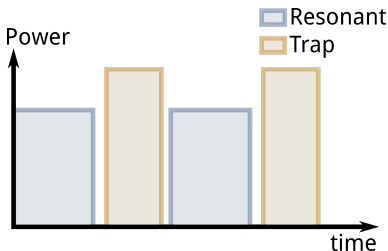


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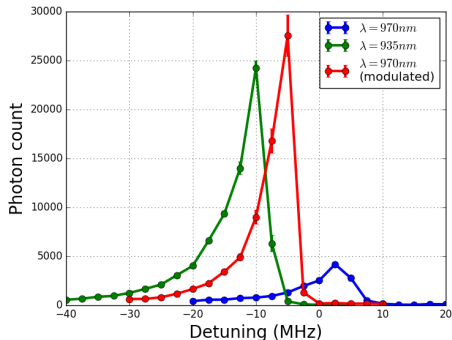
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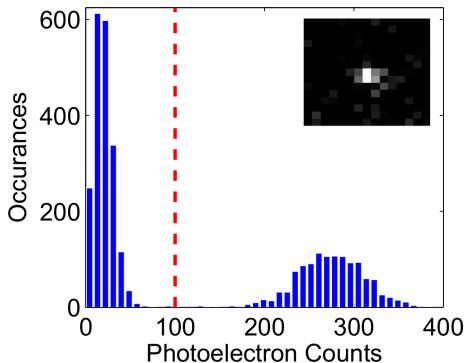
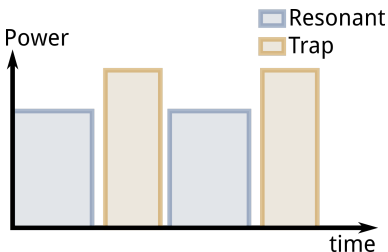


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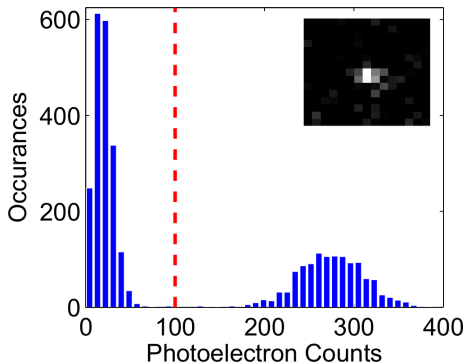
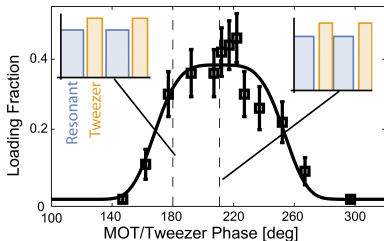
Na Single Atom Loaded!!

Trap modulation

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Na Single Atom Loaded!!

Conclusion

- Measured the effect of light shift on loading and imaging of single atom
- Overcome the light shift by alternating trapping and resonant light to achieve loading of single Na atom.
- Generalizable to other species

