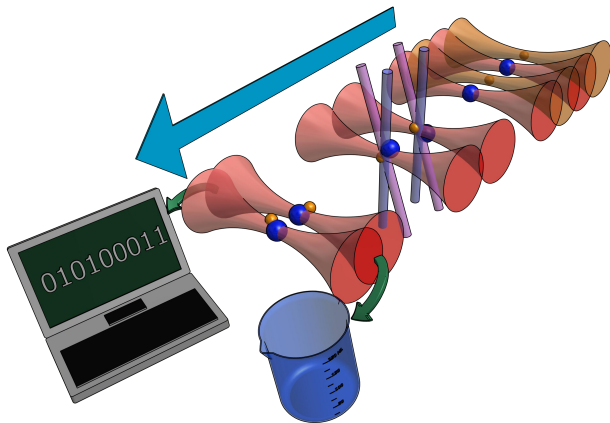


Trapping and imaging of single atoms in the presence of light shift

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May 26, 2016

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Nicholas Hutzler

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PI

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FOUNDATION

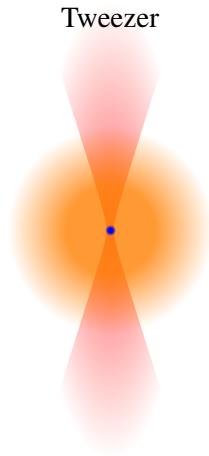
Procedure

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



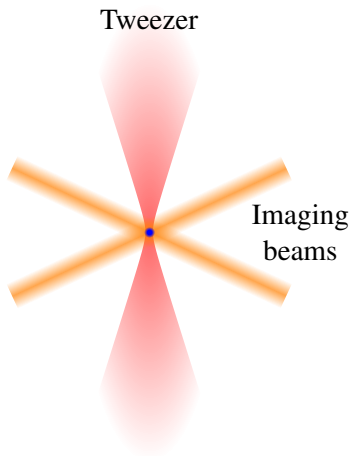
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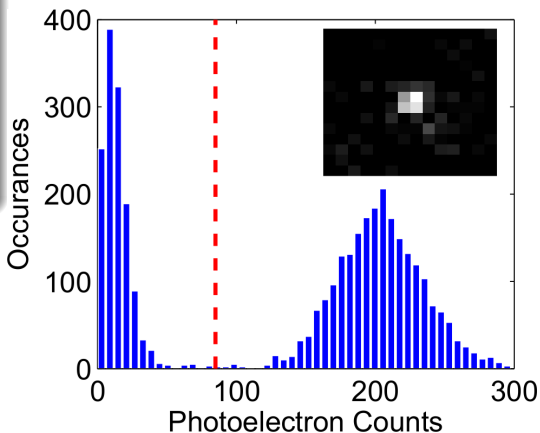
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Light shift

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



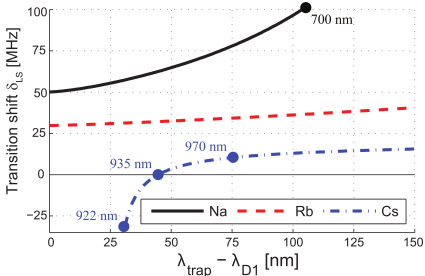
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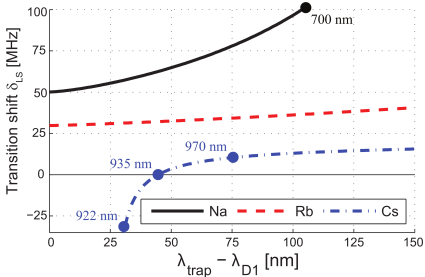
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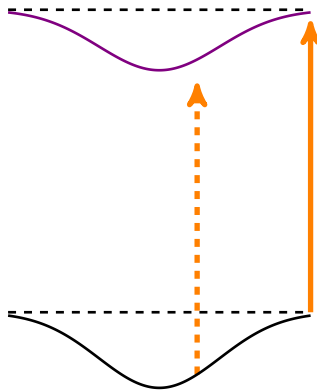
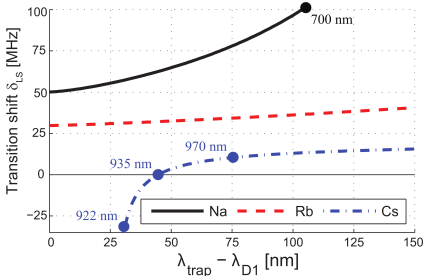
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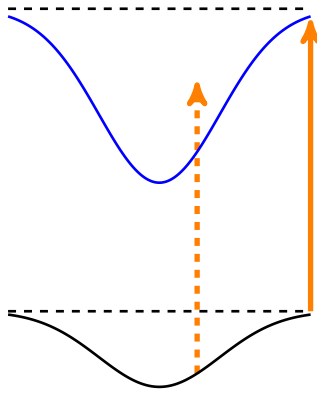
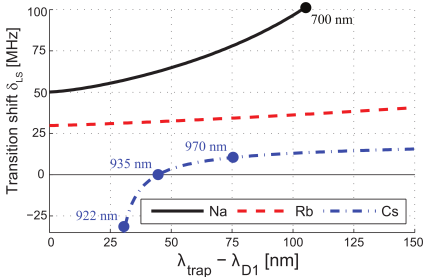
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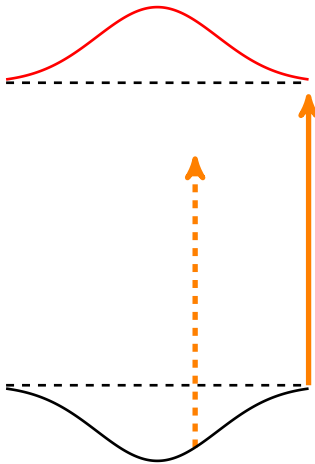
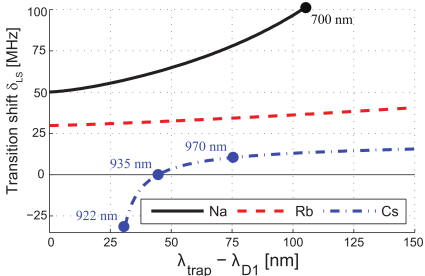
Light shift

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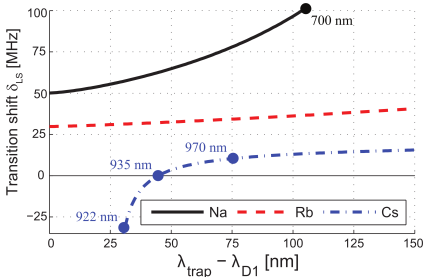
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Light shift

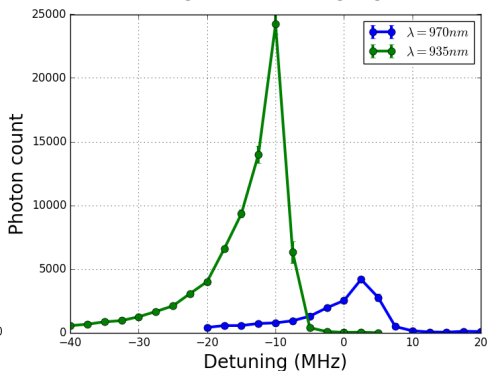
- Inefficient cooling; Heating
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Cs single atom loading

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

Cs single atom imaging

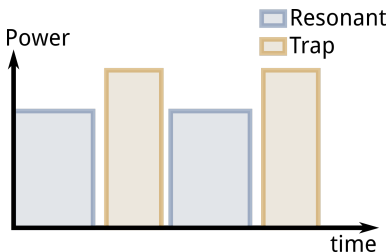


Trap modulation

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

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

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

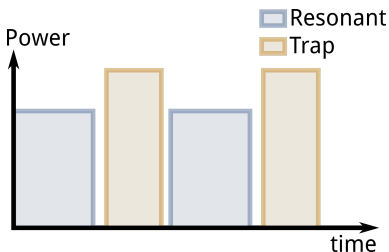


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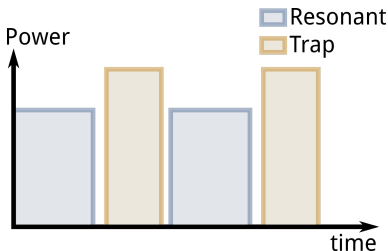
$\lambda_{\text{trap}}(\text{nm})$	922	935	970
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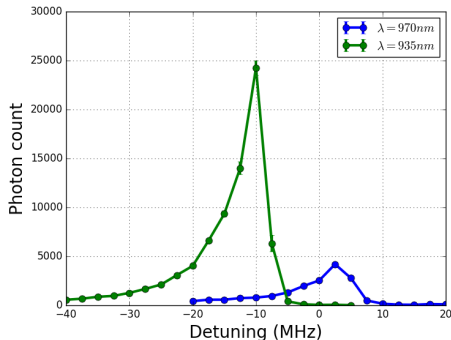
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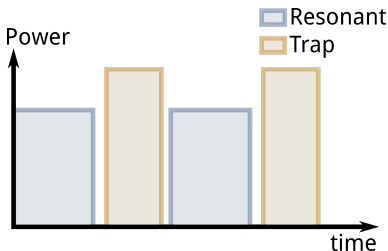


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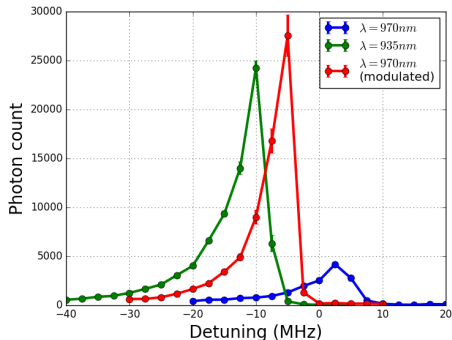
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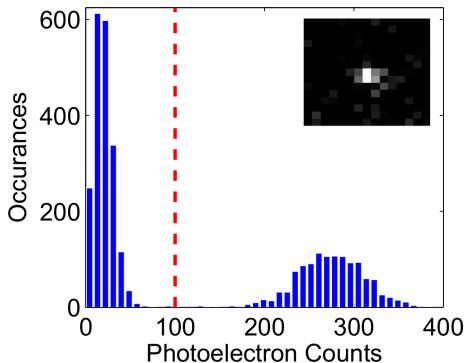
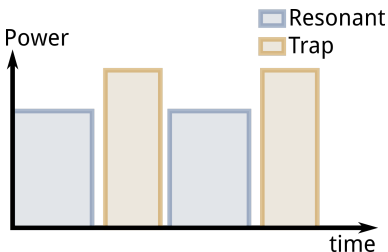


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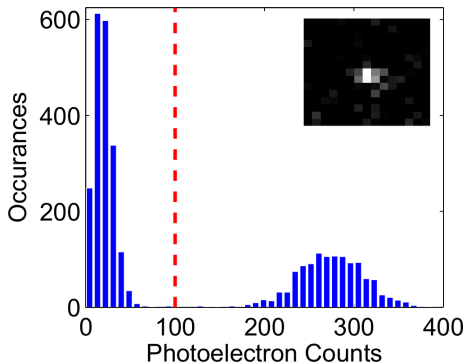
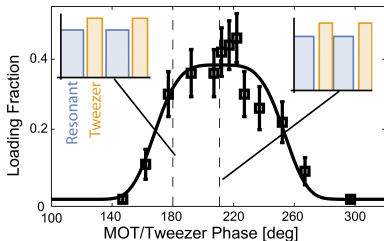
Na Single Atom Loaded!!

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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

