

# Raman transition on single Cesium Atom

Yichao Yu

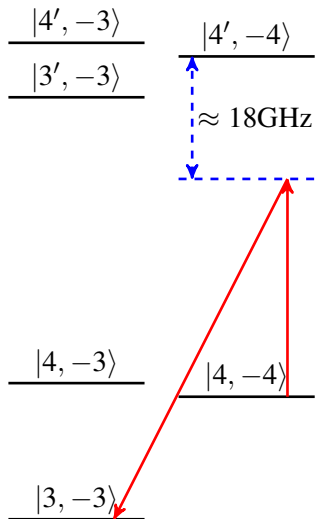
Ni Group/Harvard

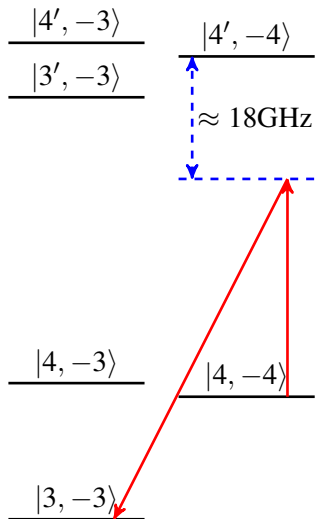
March 2, 2015

$$\frac{|4', -3\rangle}{|3', -3\rangle} \quad \frac{|4', -4\rangle}{|3', -4\rangle}$$

$$\frac{|4, -3\rangle}{|3, -3\rangle} \quad \frac{|4, -4\rangle}{|3, -4\rangle}$$

$$\frac{|3, -3\rangle}{|2, -3\rangle}$$





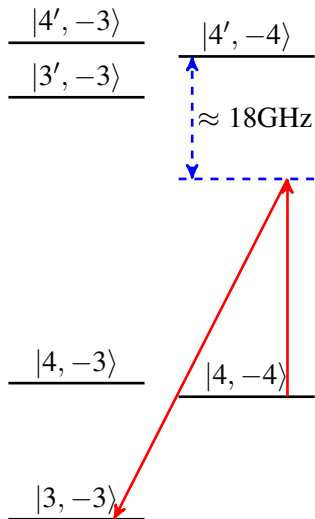
- Use single atom

- Light

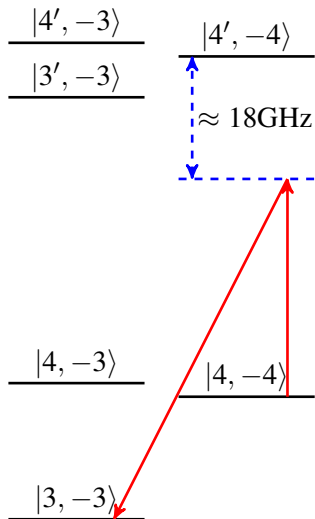
Power

Frequency

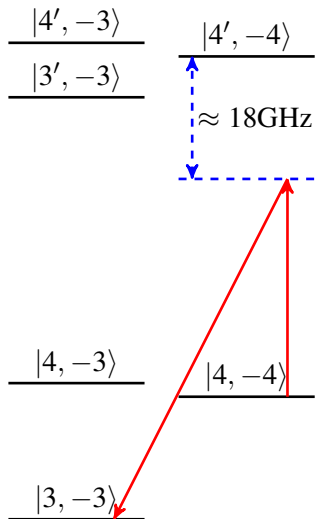
- State



- Use single atom
- Light
  - Power
  - Frequency
- State



- Use single atom
- Light
  - ▶ Power
  - ▶ Frequency
- State



- Use single atom

- Light

- ▶ Power

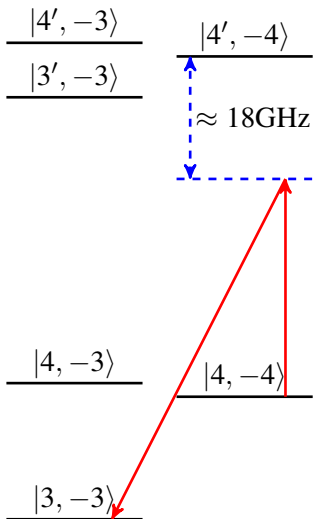
- ▶ Frequency

- State

- Shrink size

- Alignment

- Scattering measurement



- Use single atom

- Light

- ▶ Power

- ▶ Frequency

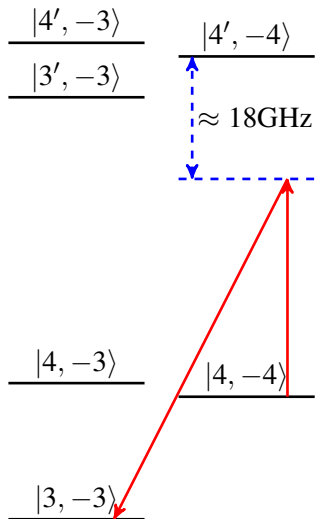
- State

- Shrink size

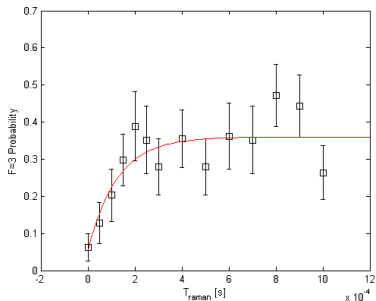
- Alignment

- Scattering measurement





- Use single atom
- Light
  - ▶ Power
  - ▶ Frequency
- State
- Shrink size
- Alignment
- Scattering measurement



- Use single atom

- Light

- ▶ Power

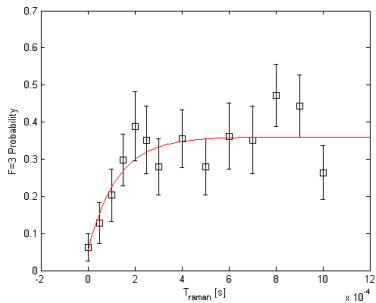
- ▶ Frequency

- State

- Shrink size

- Alignment

- Scattering measurement



- Use single atom

- Light

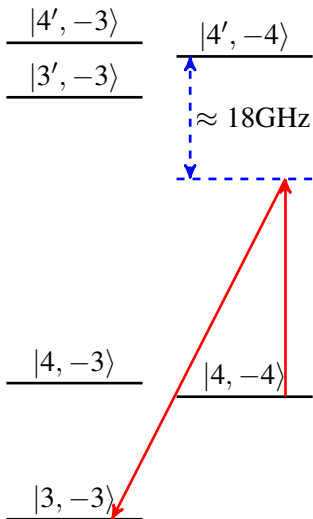
- ▶ Power ✓

- ▶ Frequency

- State

- Use co-propagating beams

- Measure beat note



- Use single atom

- Light

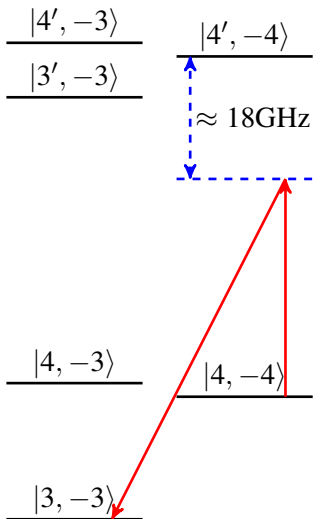
- ▶ Power ✓

- ▶ Frequency

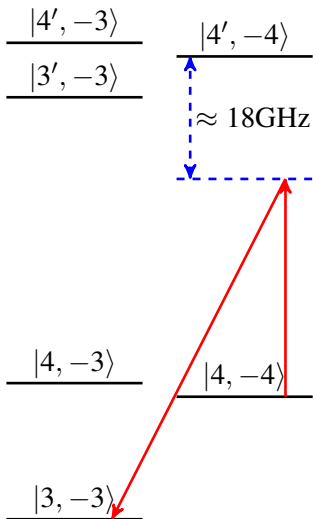
- State

- Use co-propagating beams

- Measure beat note



- Use single atom
- Light
  - ▶ Power ✓
  - ▶ Frequency ✓
- State



- Use single atom

- Light

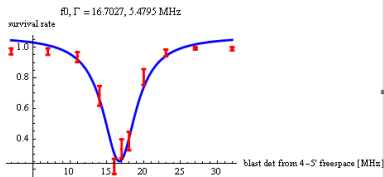
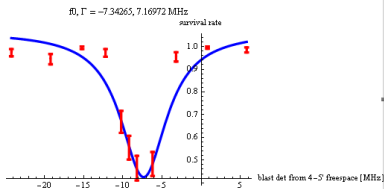
- ▶ Power ✓

- ▶ Frequency ✓

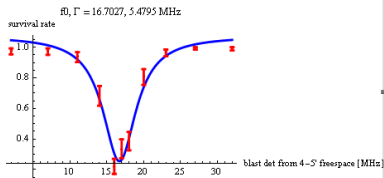
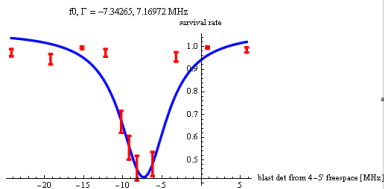
- State

- Dark state pumping

- Cycling transition Zeeman shift

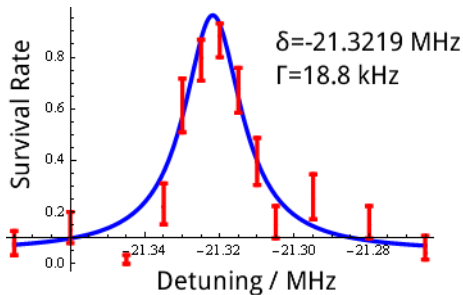
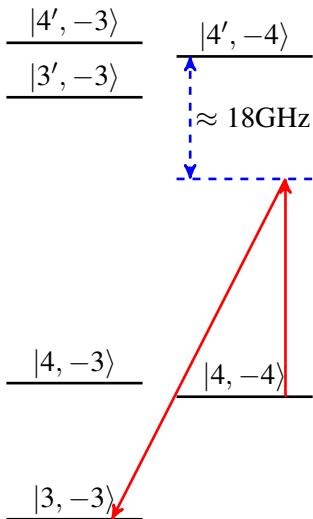


- Use single atom
  - Light
    - ▶ Power ✓
    - ▶ Frequency ✓
  - State
- 
- Dark state pumping
  - Cycling transition Zeeman shift

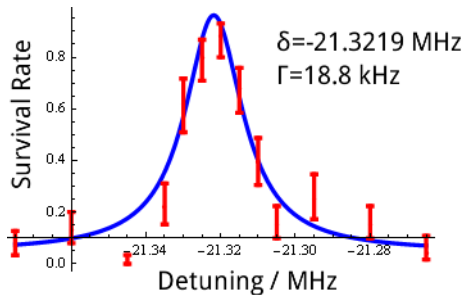
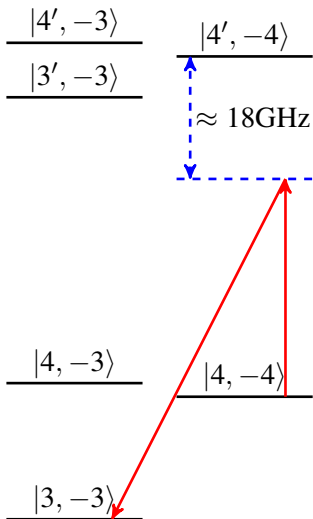


- Use single atom
- Light
  - ▶ Power ✓
  - ▶ Frequency ✓
- State ✓

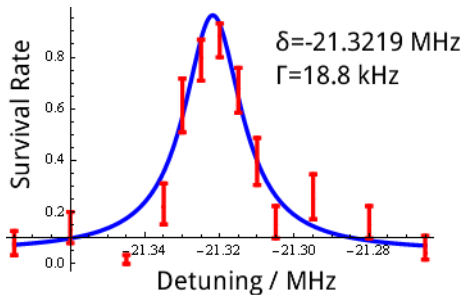
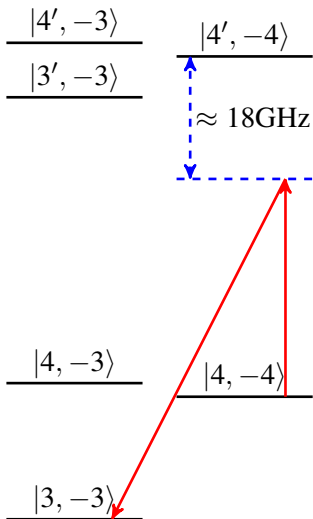




- Zeeman shift  $\approx 21\text{MHz}$
- Red shifted (and wider) with higher Raman intensity

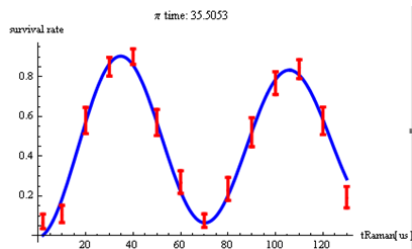


- Zeeman shift  $\approx 21\text{MHz}$
- Red shifted (and wider) with higher Raman intensity

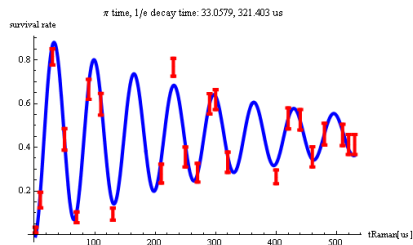
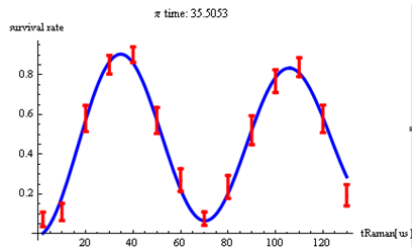


- Zeeman shift  $\approx 21\text{MHz}$
- Red shifted (and wider) with higher Raman intensity

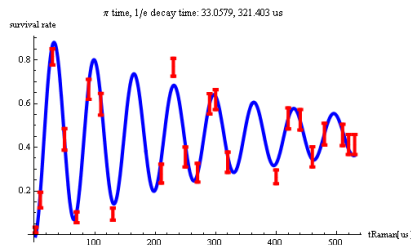
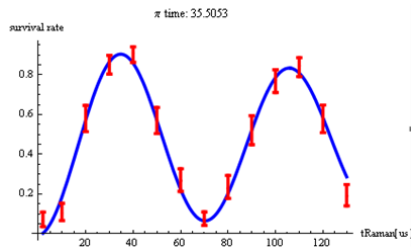
# Rabi flopping



# Rabi flopping



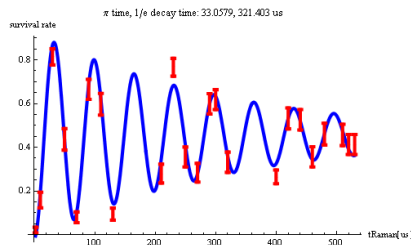
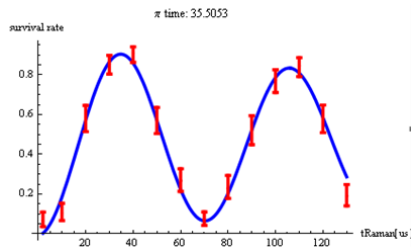
# Rabi flopping



## Next

- More characterization (Power, heating, decoherence)
- Drive sideband

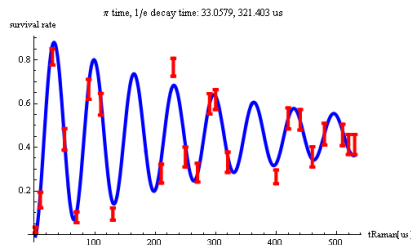
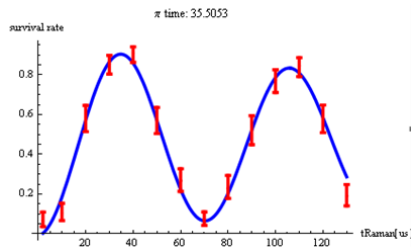
# Rabi flopping



## Next

- More characterization (Power, heating, decoherence)
- Drive sideband

# Rabi flopping



## Next

- More characterization (Power, heating, decoherence)
- Drive sideband





