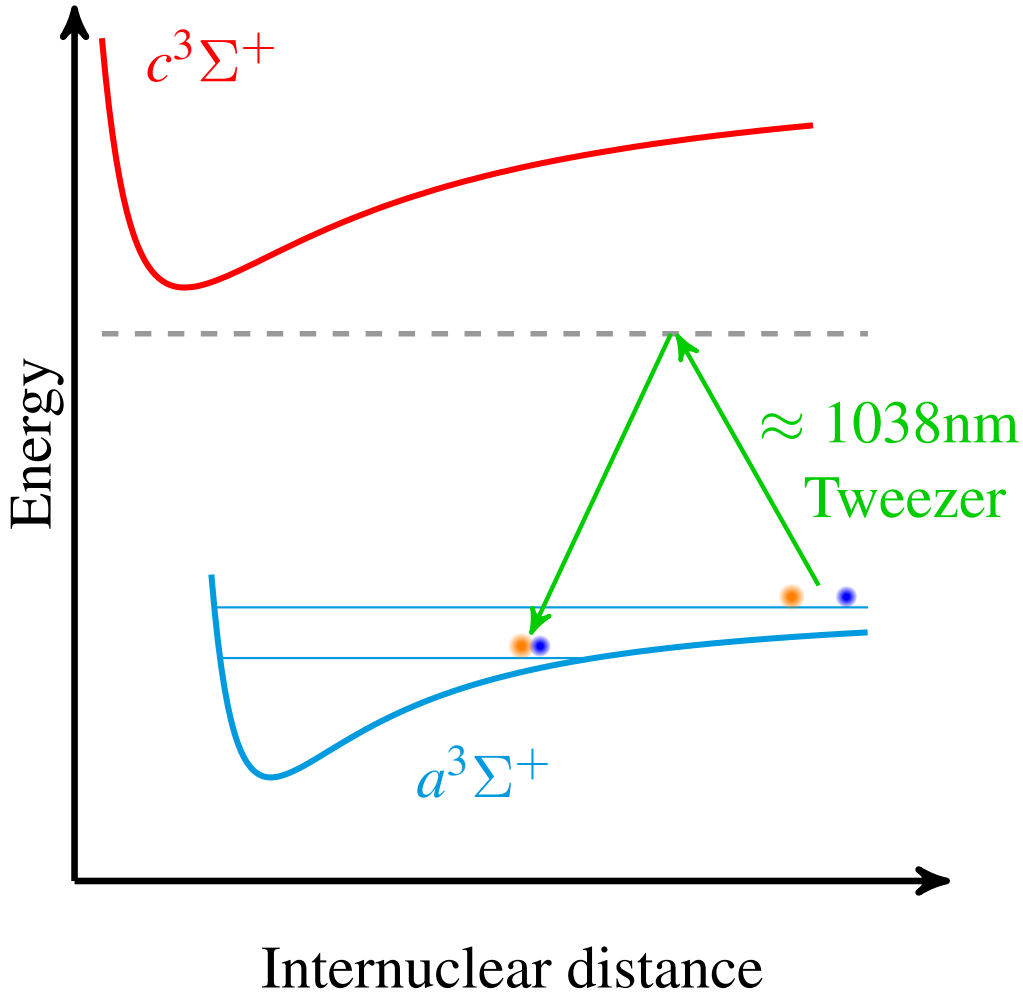
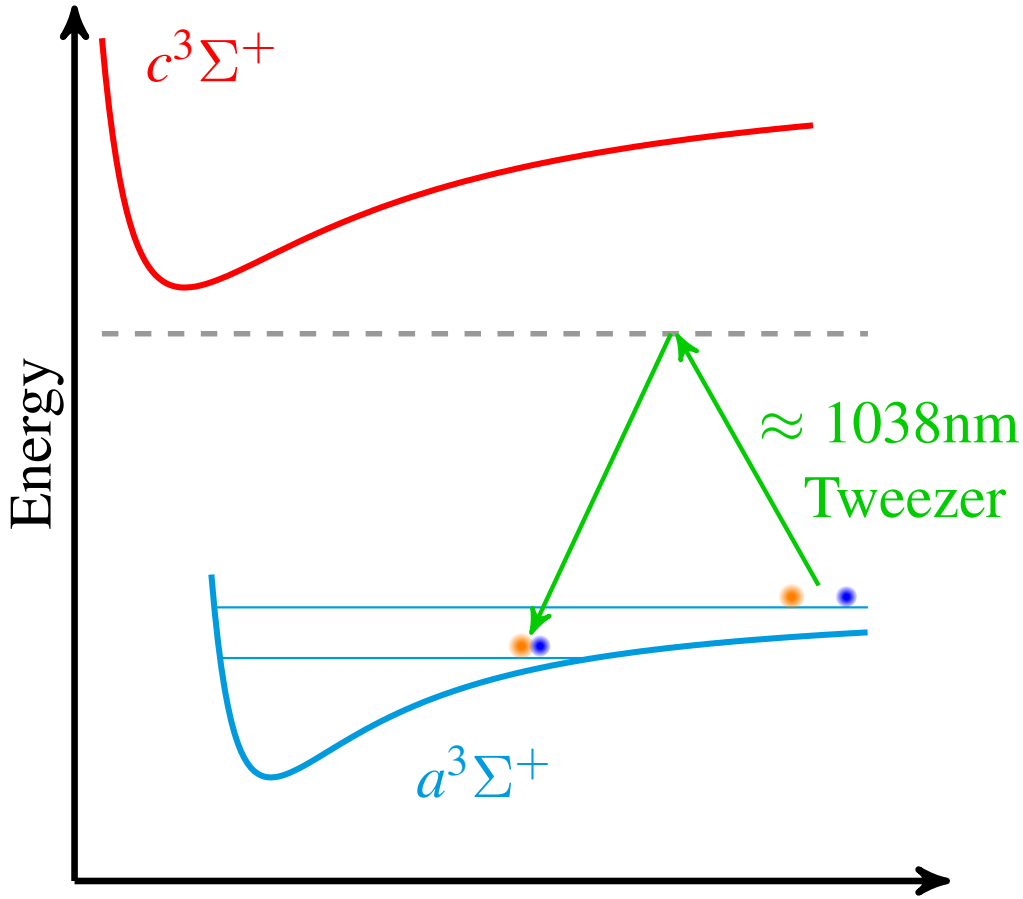
NaCs lab update

Yichao Yu

Ni Group

Apr. 26, 2019


$c^3\Sigma^+$
Energy
$\approx$ 1038nm
Tweezer
$a^3\Sigma^+$
Internuclear distance



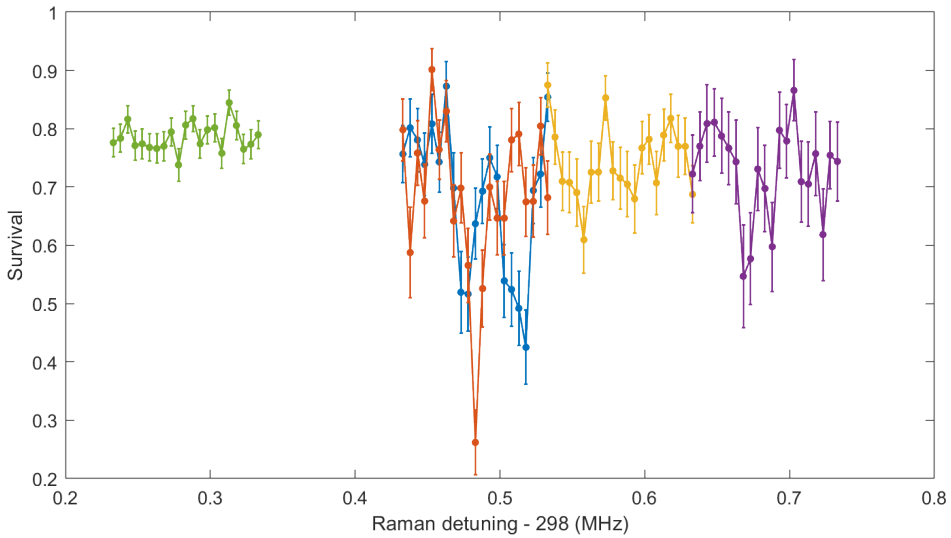
No Rabi oscillation

What can go wrong?

State

- Initial state (temperature)
- Final state

What can go wrong?



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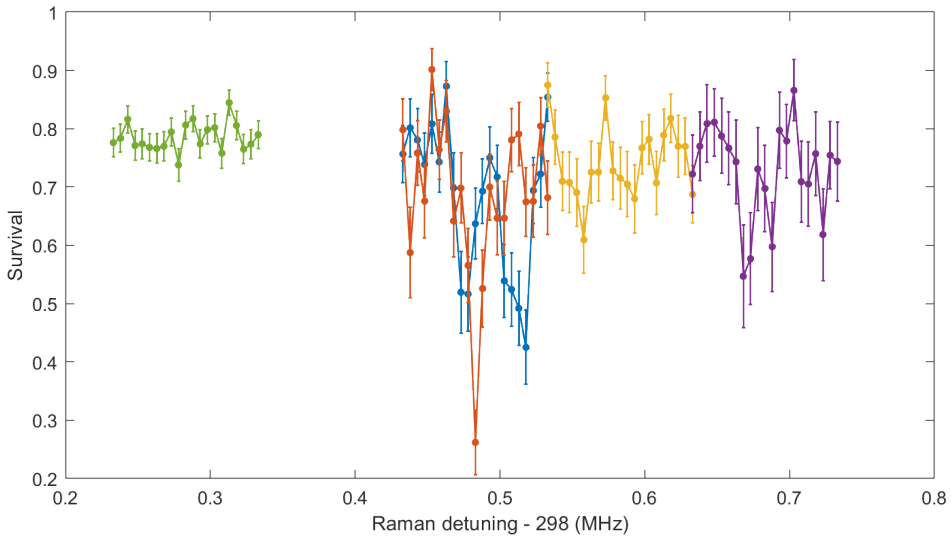

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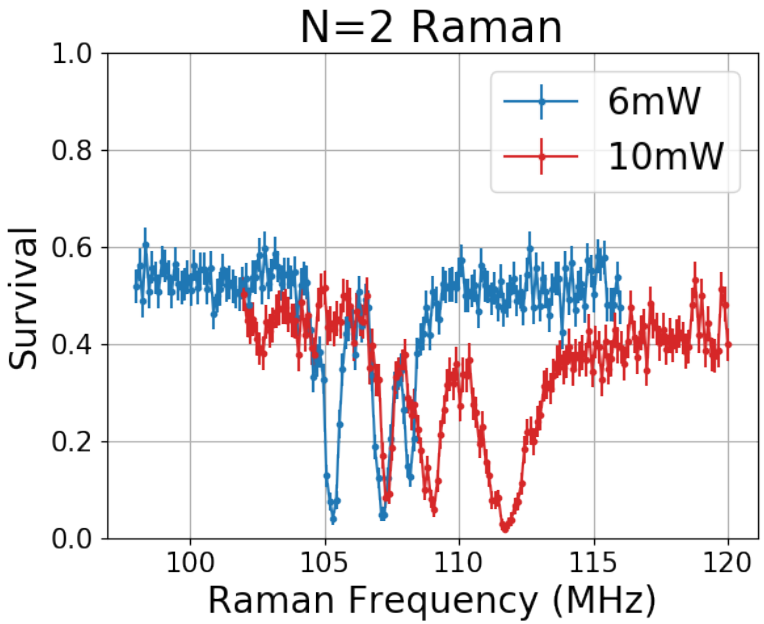
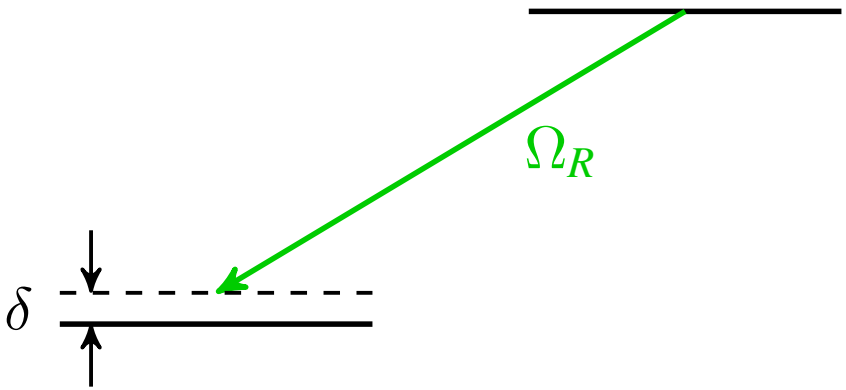
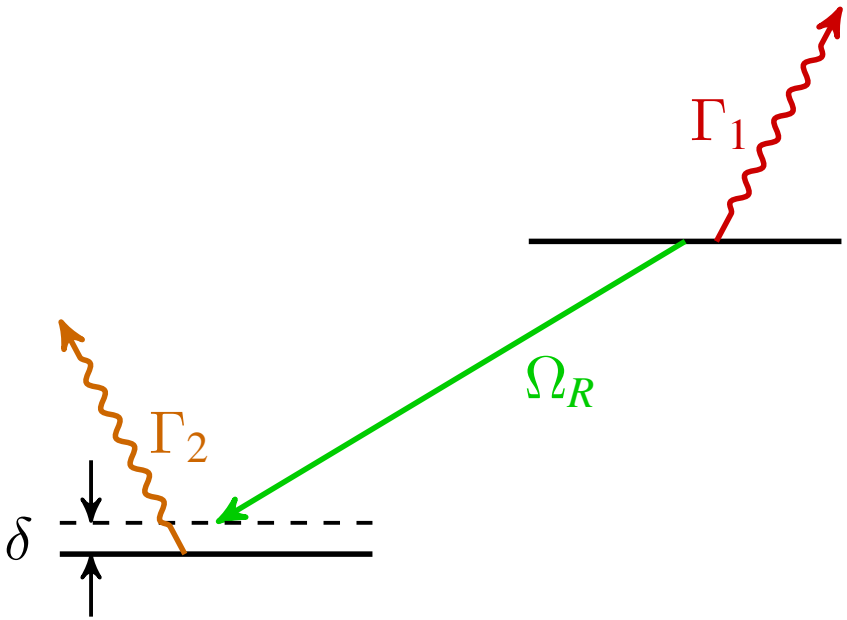
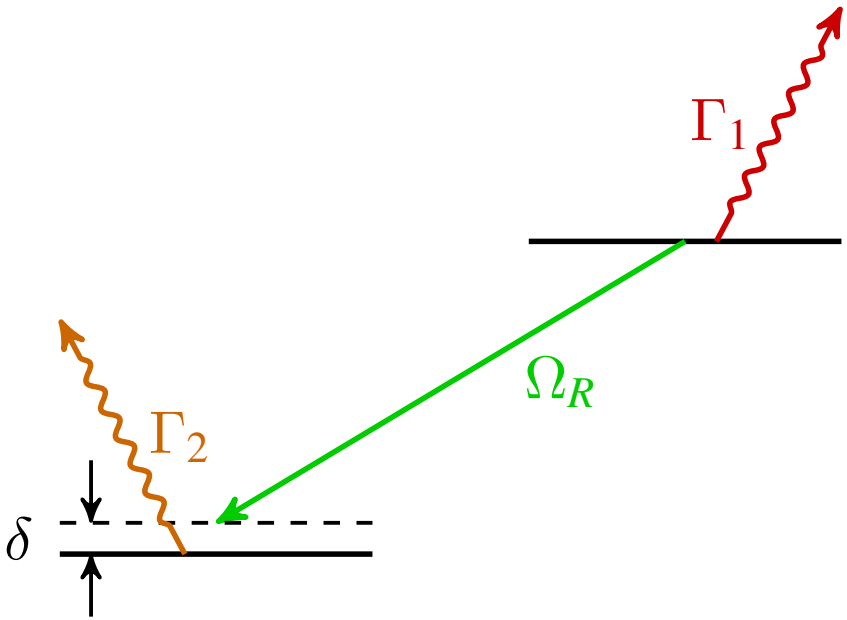



Ω_R
δ


Γ_1
Ω_R
Γ_2
δ

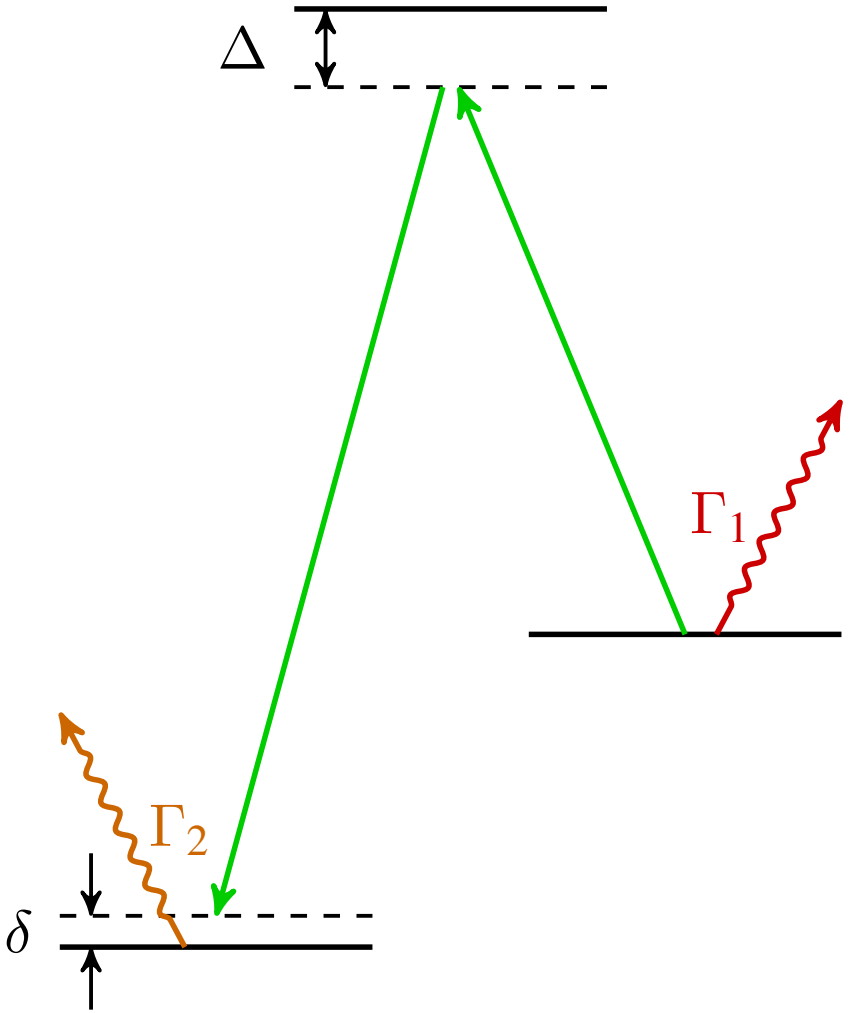


Γ_1: PA rate

Γ_2: Line width

Ω_R: Transfer/decay rate

δ: Resonance/line width



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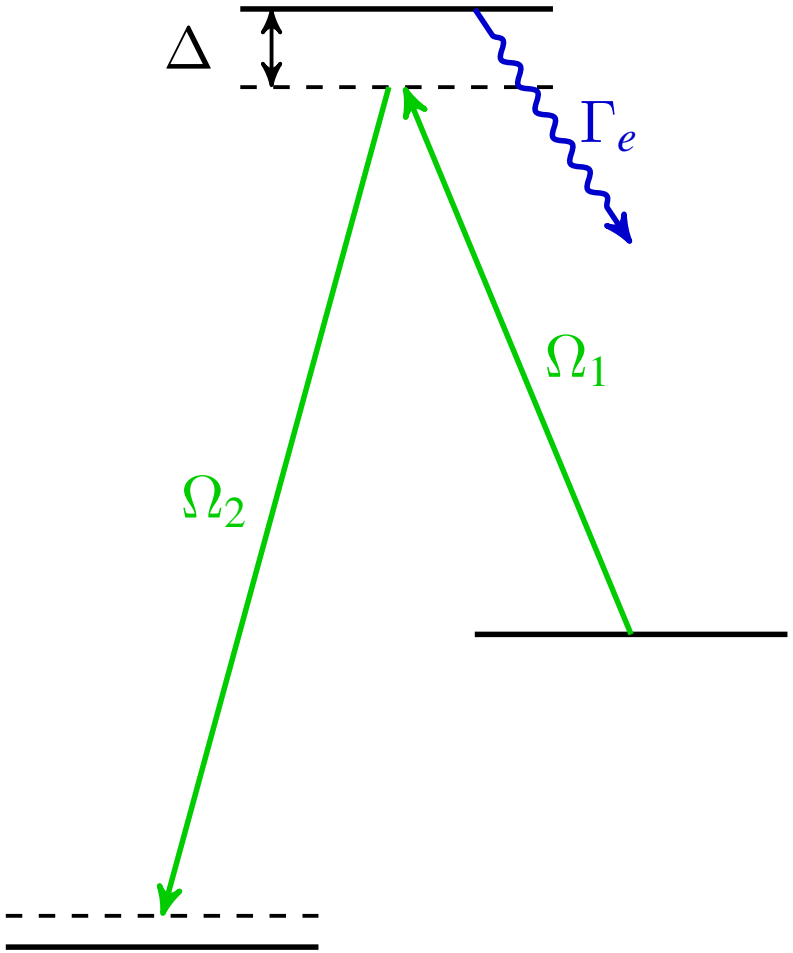

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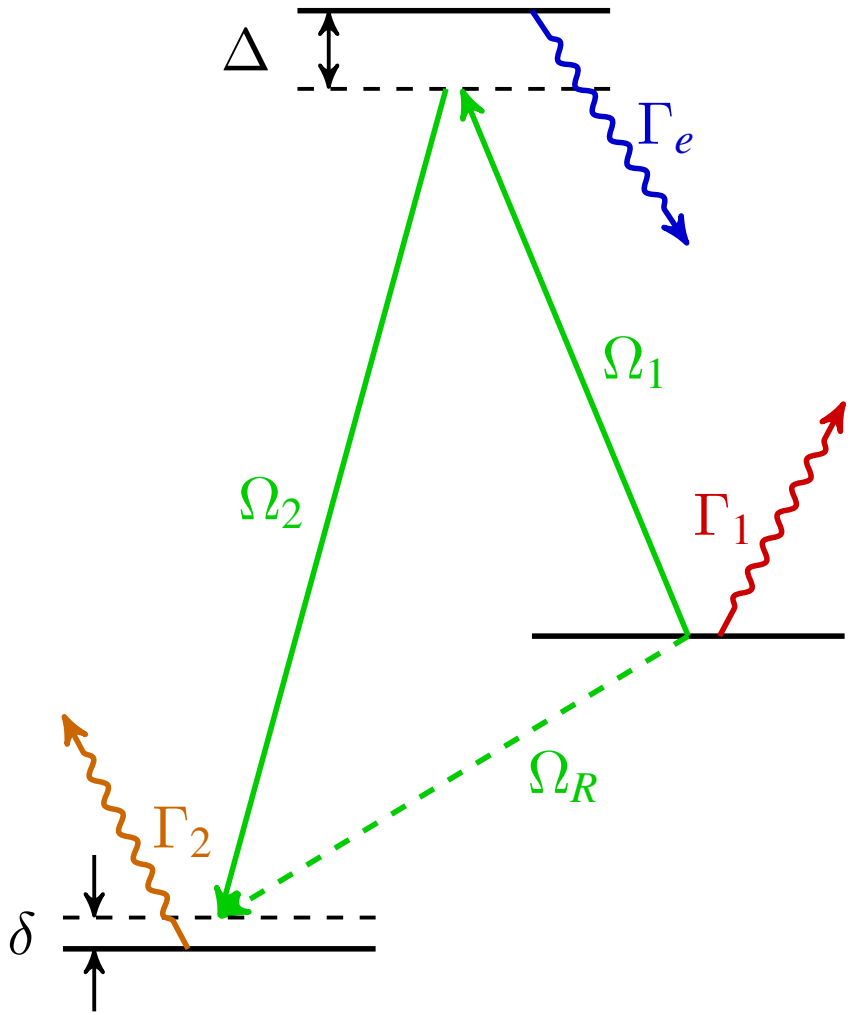
$$\Delta \rightarrow \Gamma_e \; \Omega_1 \; \Omega_2$$

Detuning fluctuation

- Raman Rabi rate $\Omega_R \propto \frac{\Omega_1 \Omega_2}{\Delta}$
- Light shift $\delta_L \propto \frac{\Omega_1^2 + \Omega_2^2}{\Delta}$
- For $\Omega_2 \gg \Omega_1$

  $$\frac{\delta_L}{\Omega_R} \approx \frac{\Omega_2}{\Omega_1} \gg 1$$
- Raman linewidth

  $$\Gamma_2 \propto \frac{1}{\Delta^2} \text{ or } \frac{\delta_L}{\Gamma_2} \propto \Delta$$



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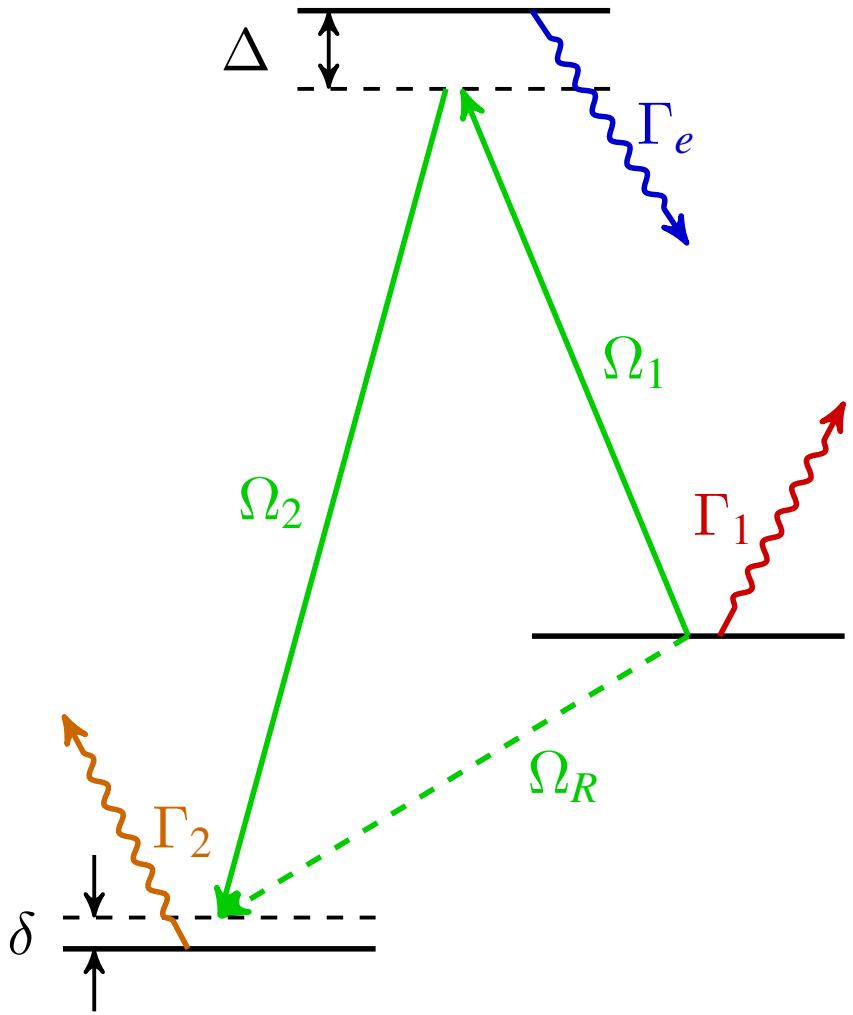

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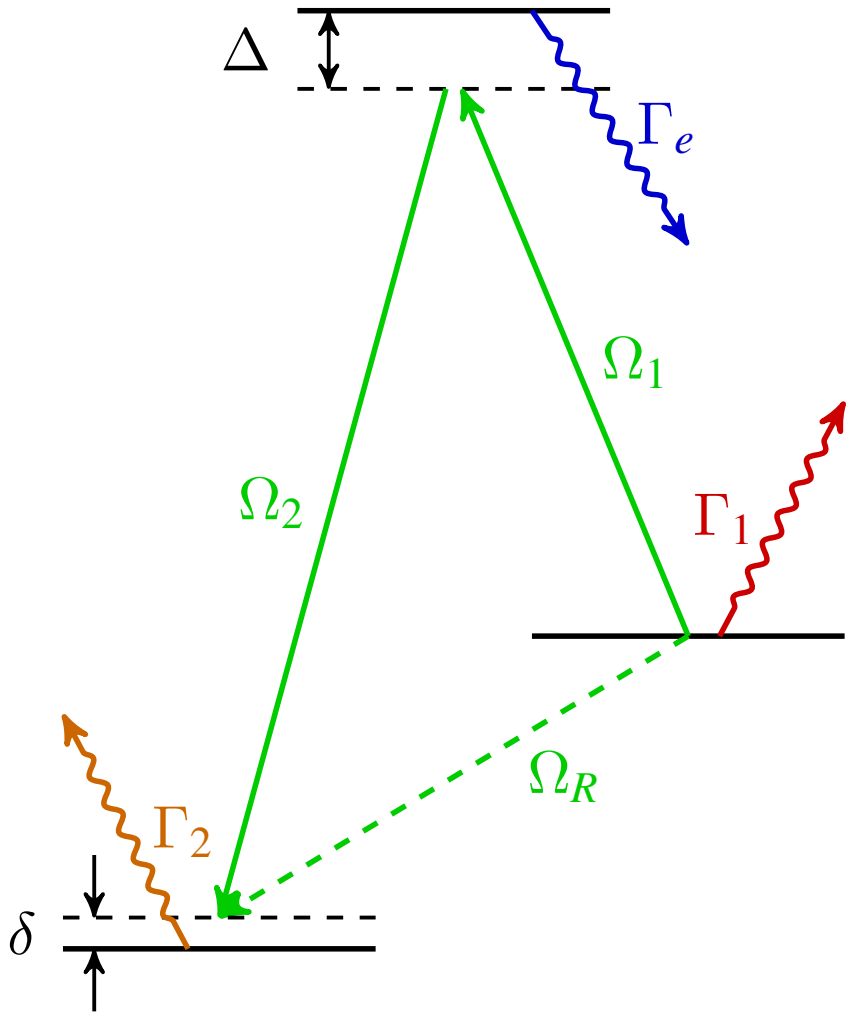

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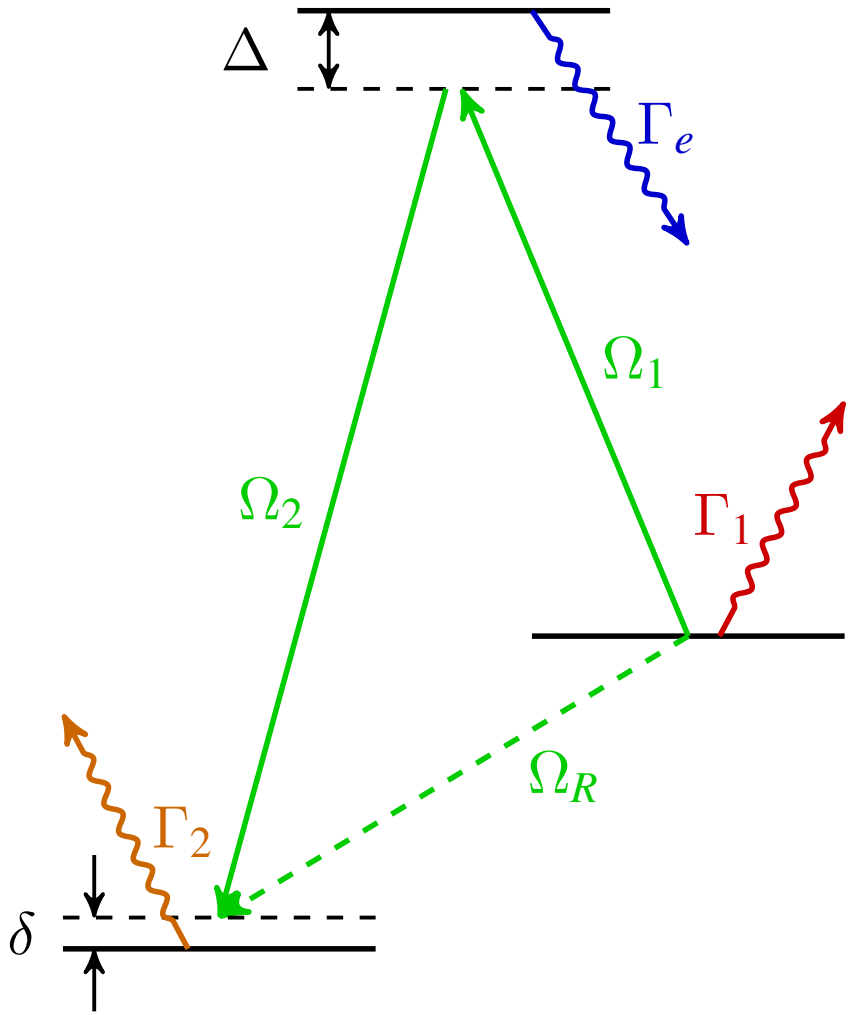

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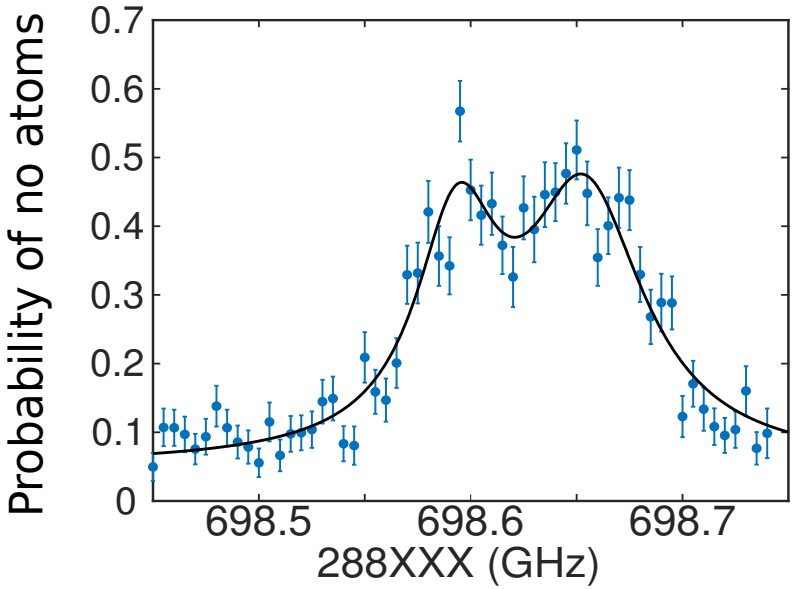

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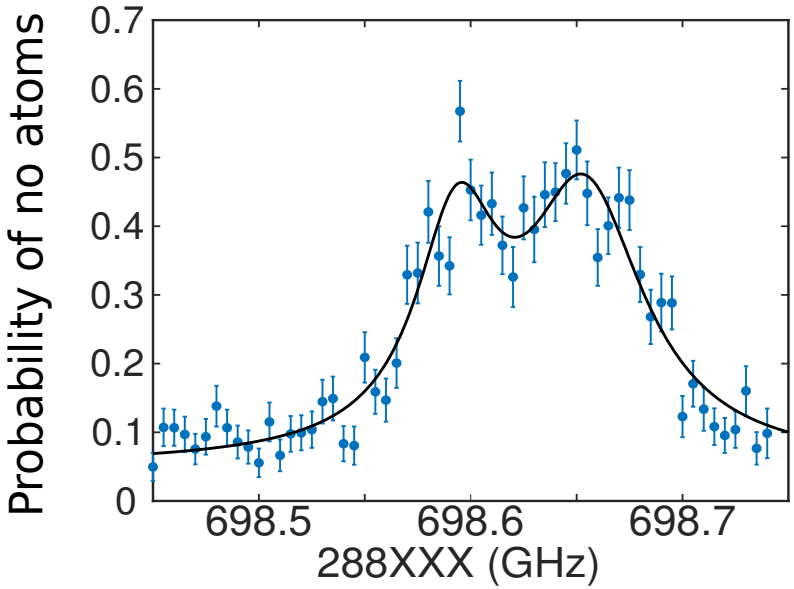

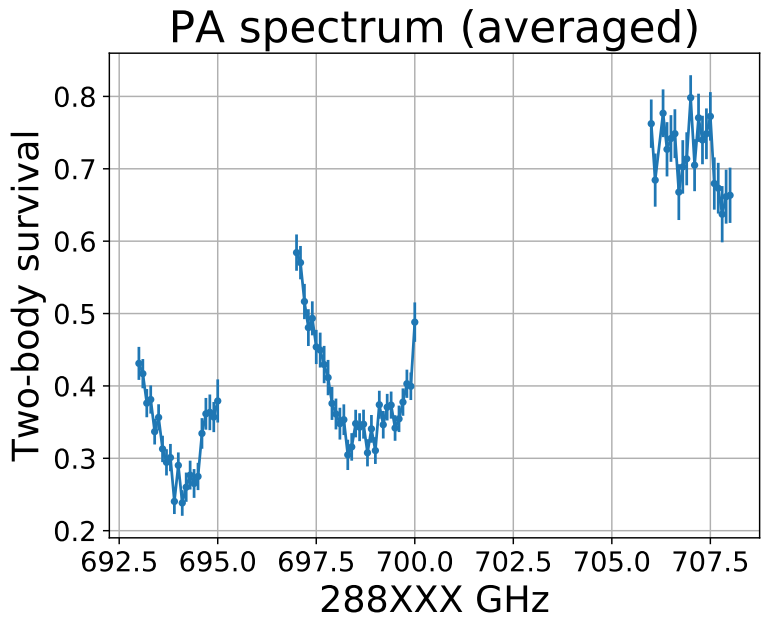

Next

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- Two photon process

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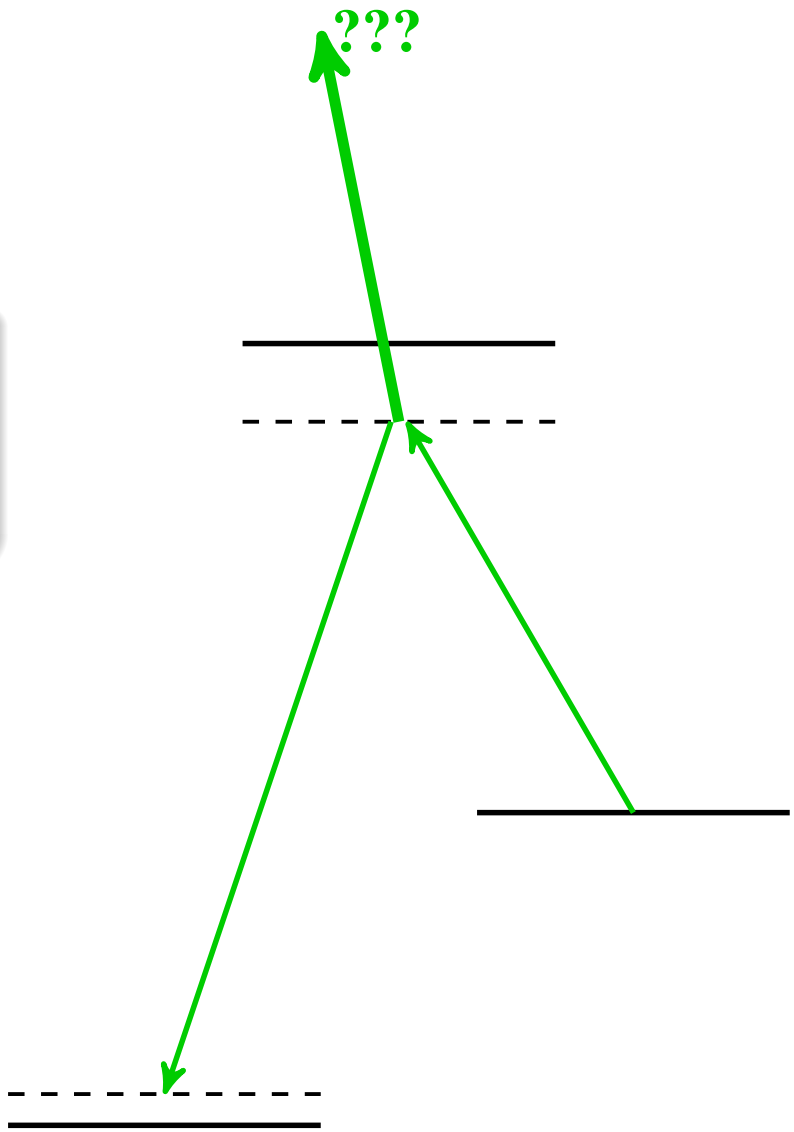

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