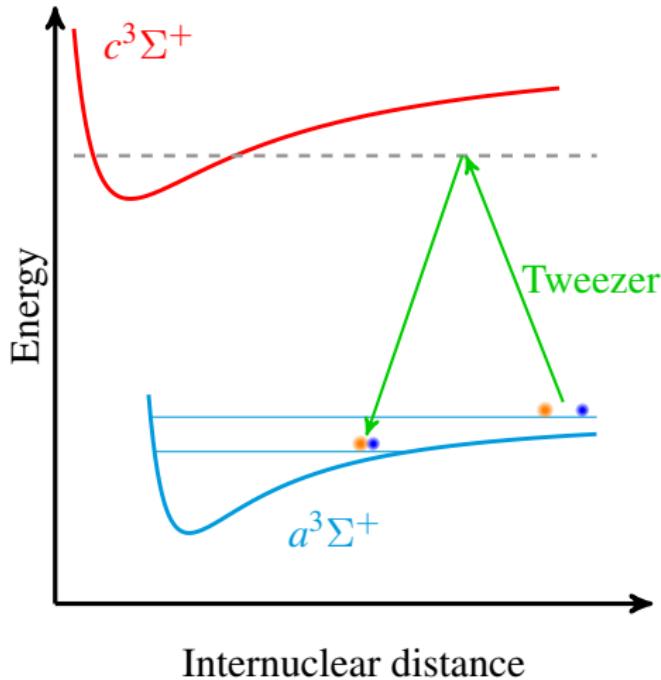


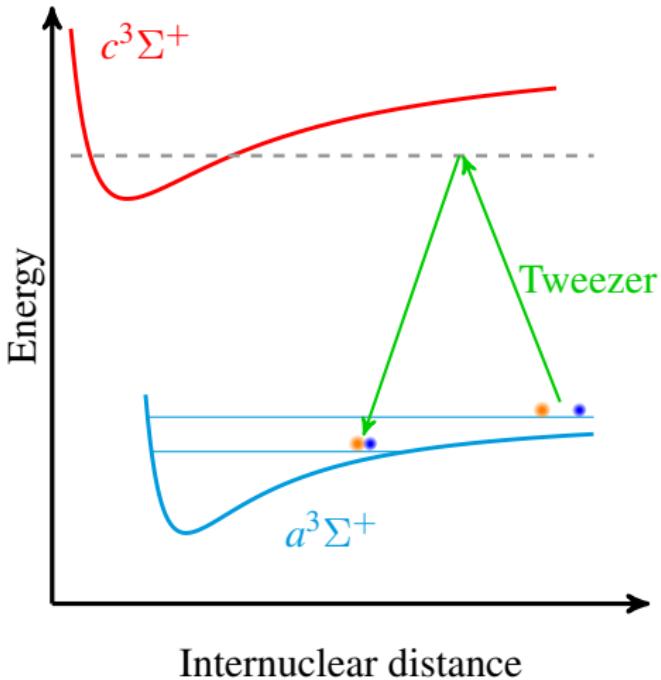
NaCs lab update

Yichao Yu

Ni Group

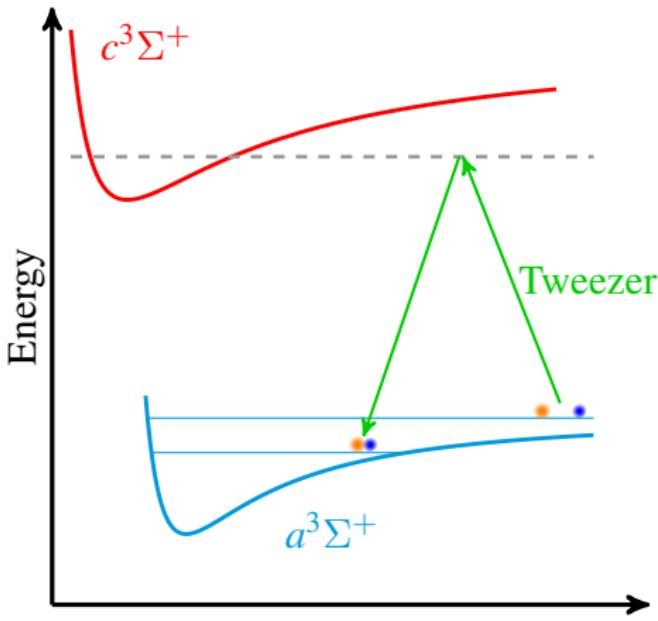
Feb. 21, 2020





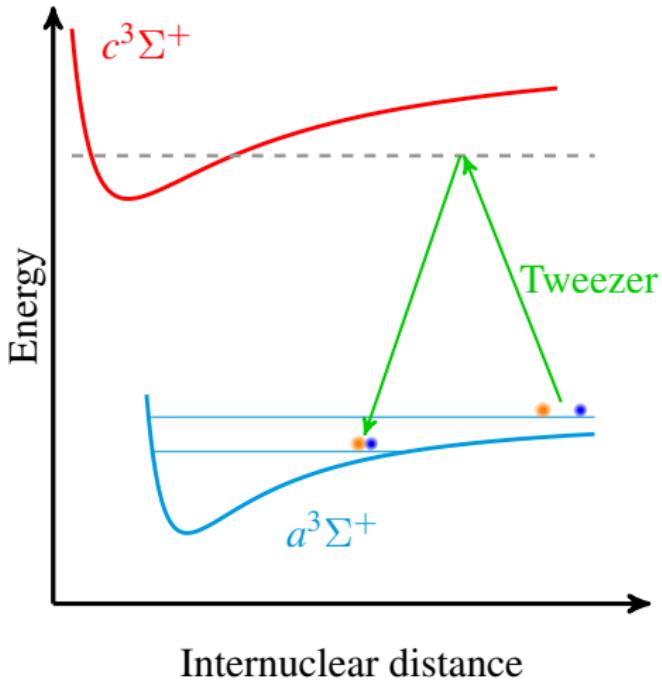
No Rabi oscillation





Still
No Rabi oscillation



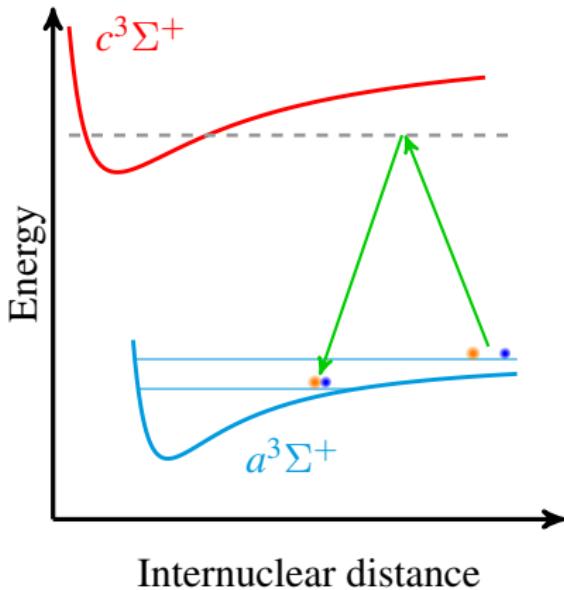


Still
No Rabi oscillation



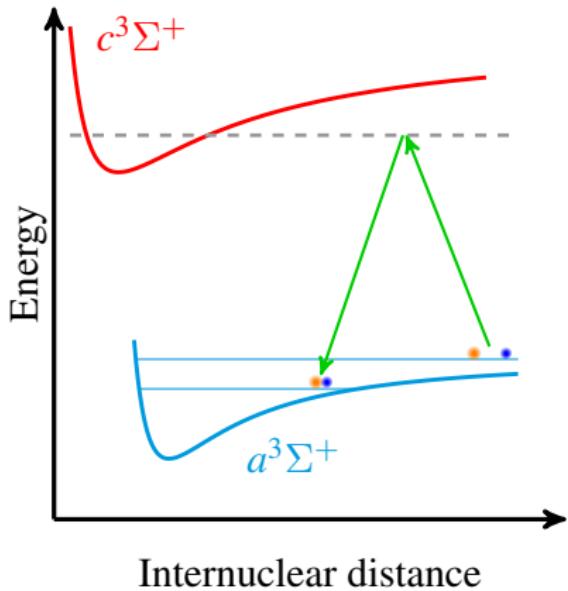
- Understand the issue
 - Find a better approach

What can go wrong?



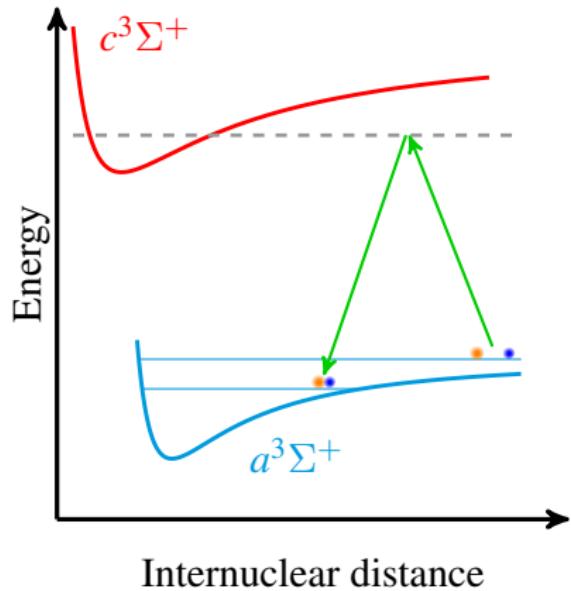
What can go wrong?

Condition	Rabi Oscillation
b	No
r	No
K	No
No	No
...	Still No
...	...



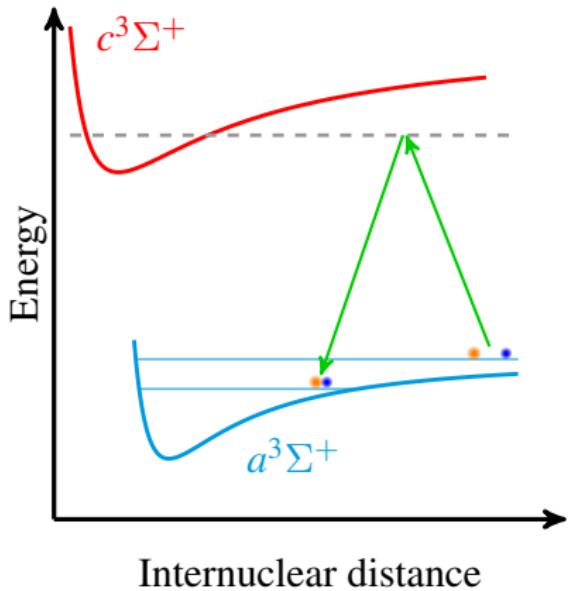
What can go wrong?

$$\frac{\Gamma_{\text{(Line width)}}}{\Omega_{\text{(Rabi frequency)}}}$$



What can go wrong?

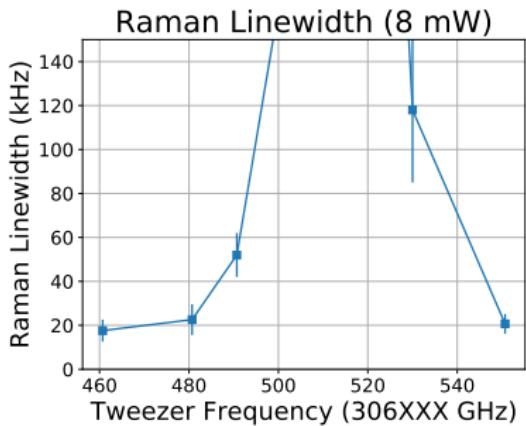
$$\frac{\Gamma_{\text{Line width}}}{\Omega_{\text{Rabi frequency}}}$$



What can go wrong?

$$\frac{\Gamma_{\text{(Line width)}}}{\Omega_{\text{(Rabi frequency)}}}$$

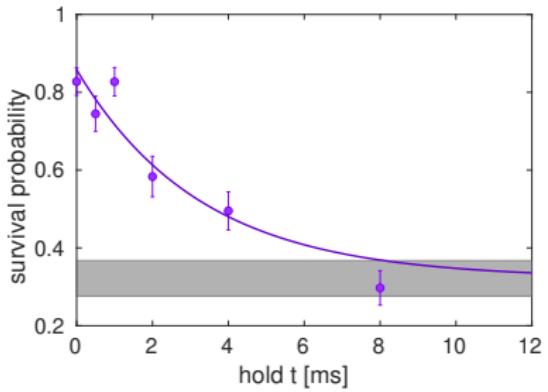
- Single PA line effect
- Fluctuation
- Scattering



What can go wrong?

$$\frac{\Gamma_{\text{(Line width)}}}{\Omega_{\text{(Rabi frequency)}}}$$

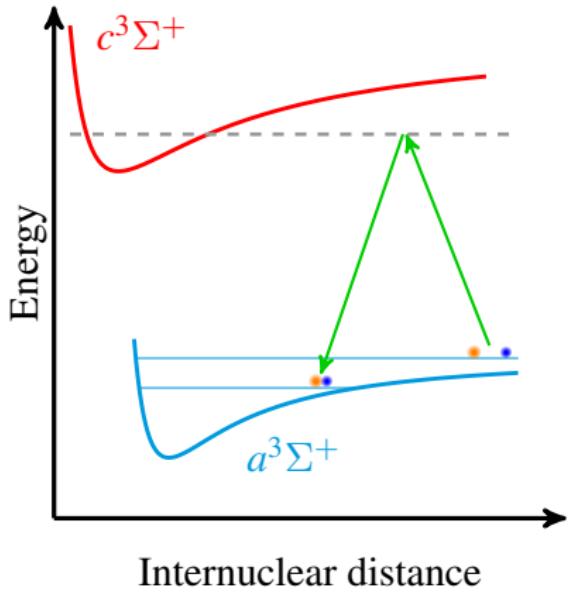
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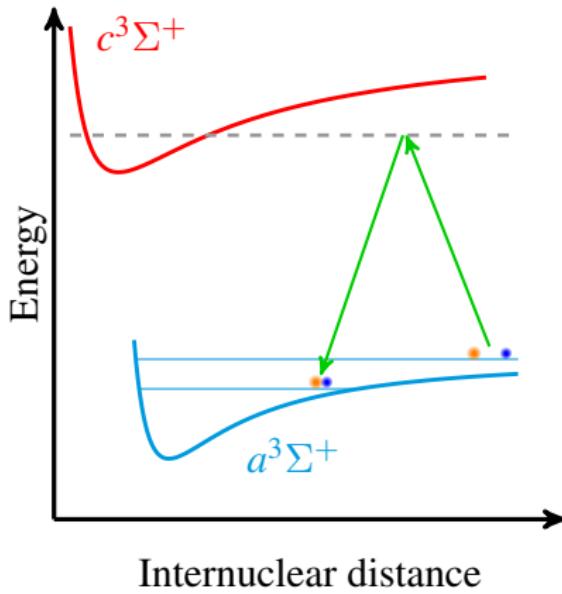
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What can go wrong?

$$\frac{\Gamma_{\text{(Line width)}}}{\Omega_{\text{(Rabi frequency)}}}$$

- Single PA line effect
- Fluctuation
- Scattering



How many photons?

Two photon scattering

- Stronger intensity than bulk gas
- Less accurate/no prediction
- Evidence from other group

Two photon scattering

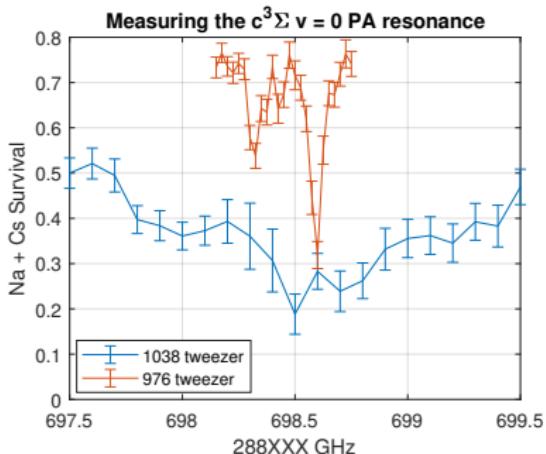
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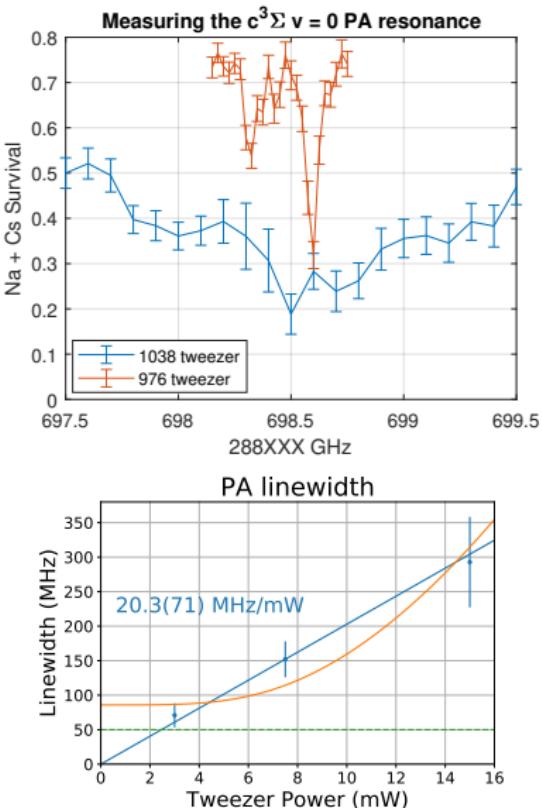
Two photon scattering

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Two photon scattering

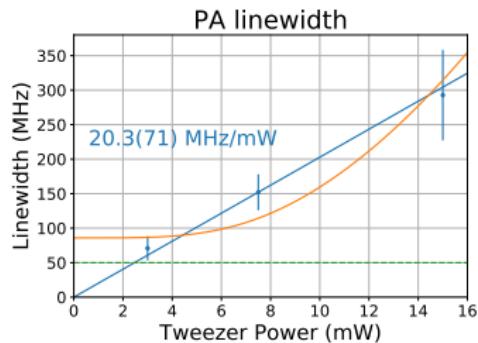
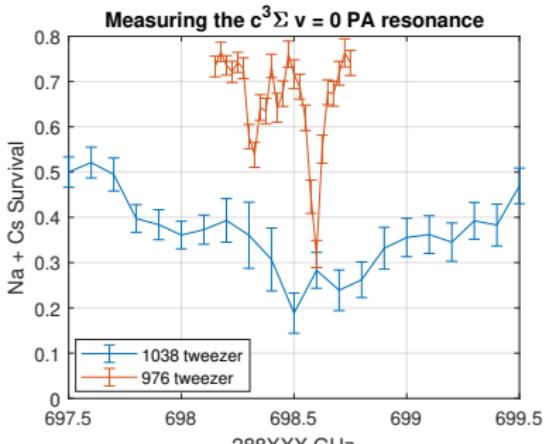
- Stronger intensity than bulk gas
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Two photon scattering

Until ...

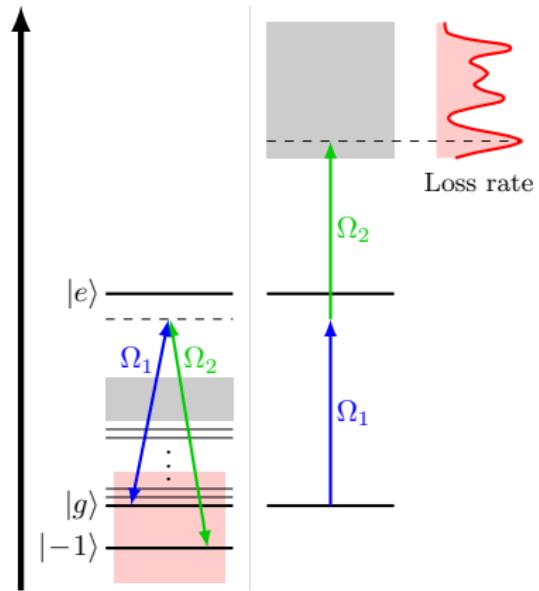
- Two photon up vs down
- One beam vs two beams
- Linear dependency on power for Raman line width



Two photon scattering

Until ...

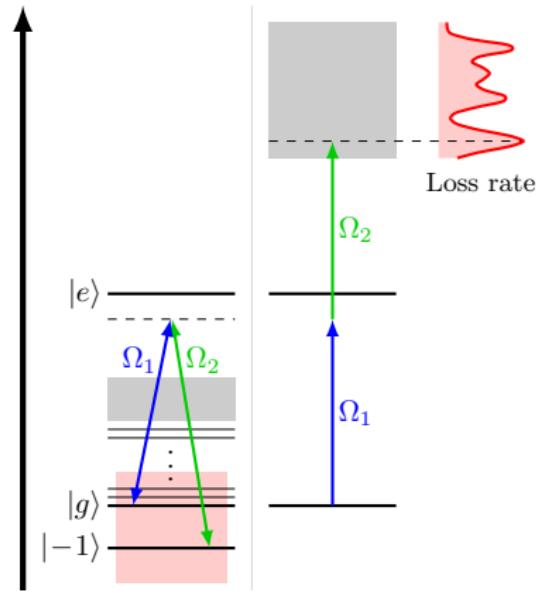
- Two photon up vs down
 - One beam vs two beams
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Two photon scattering

Until ...

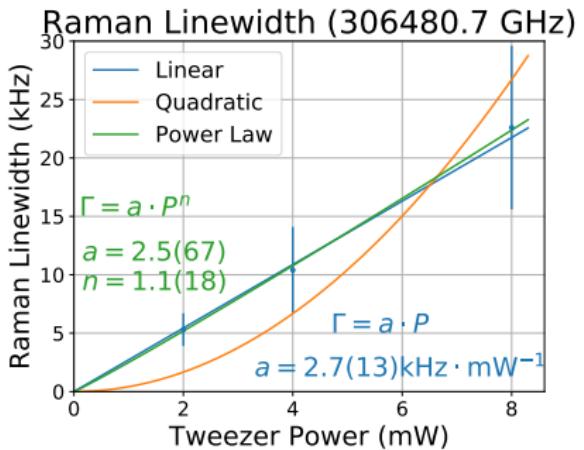
- Two photon up vs down
- One beam vs two beams
- Linear dependency on power for Raman line width



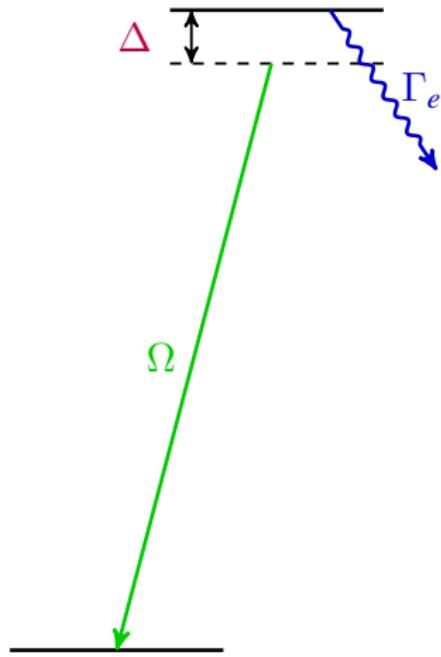
Two photon scattering

Until ...

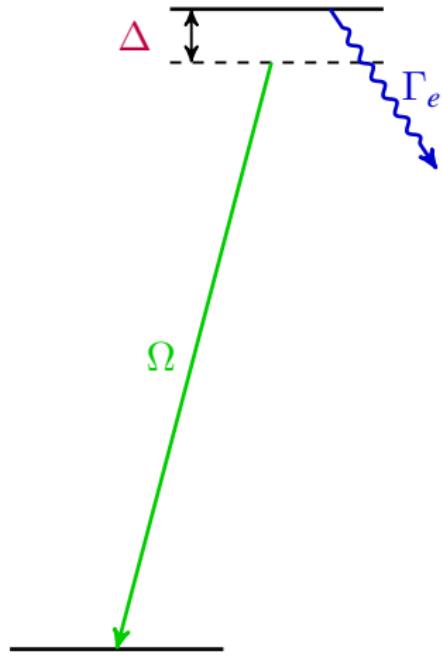
- Two photon up vs down
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One photon scattering (i.e. the easy kind)

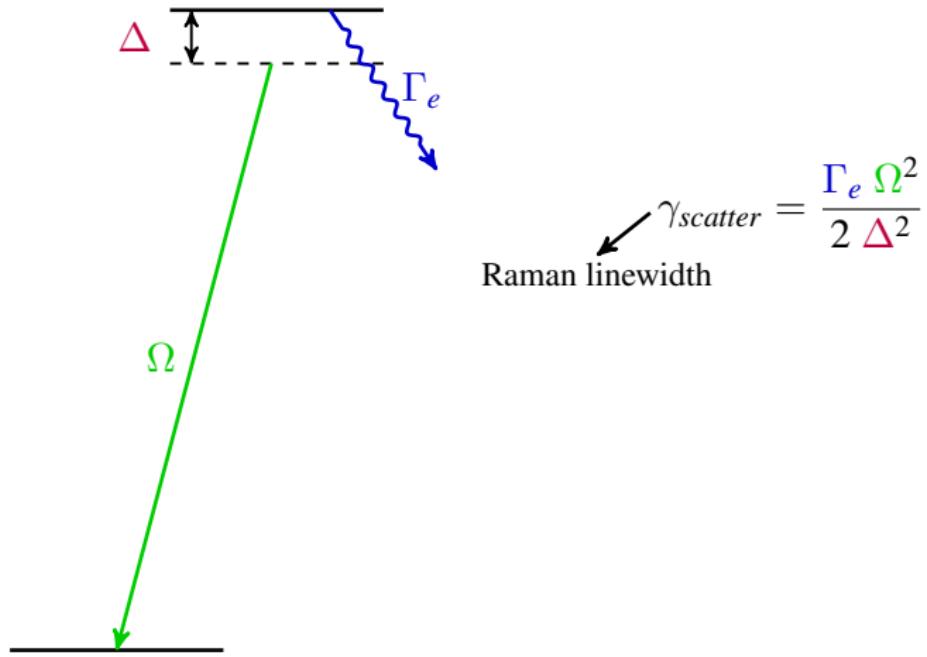


One photon scattering (i.e. the easy kind)

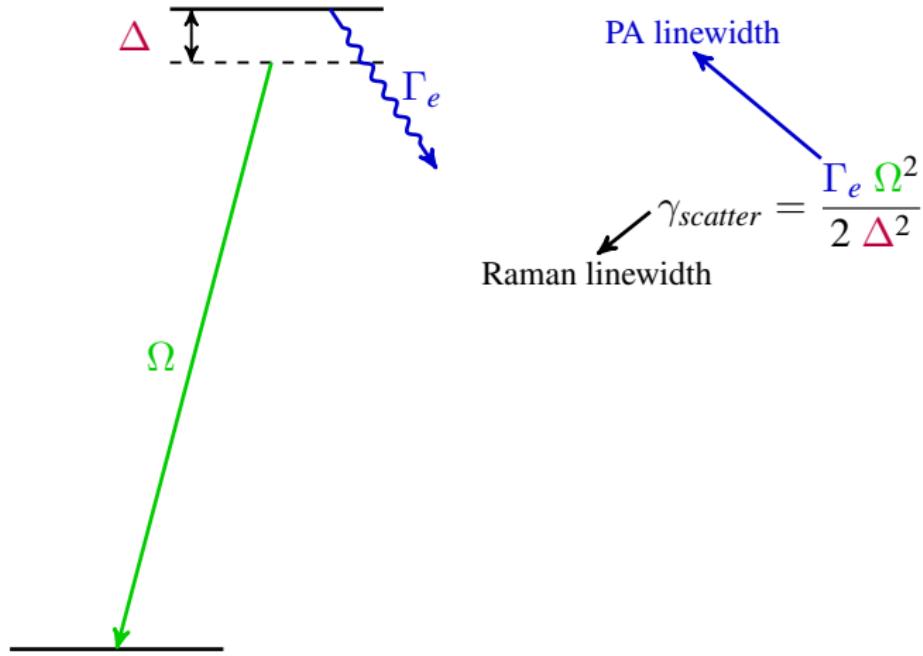


$$\gamma_{scatter} = \frac{\Gamma_e \Omega^2}{2 \Delta^2}$$

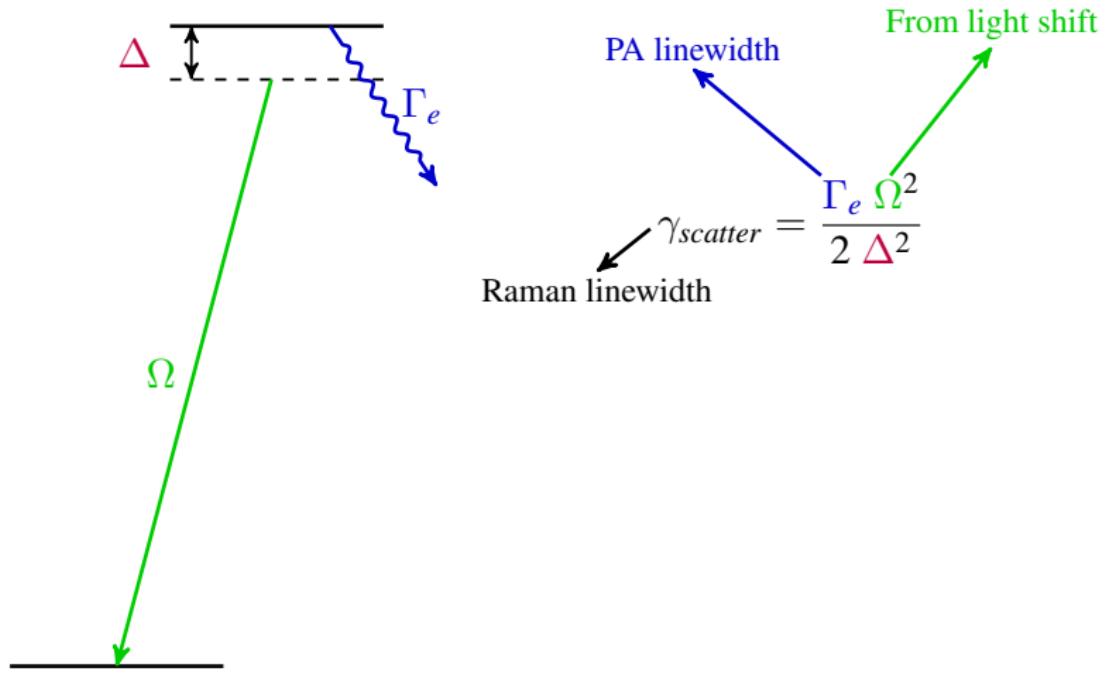
One photon scattering (i.e. the easy kind)



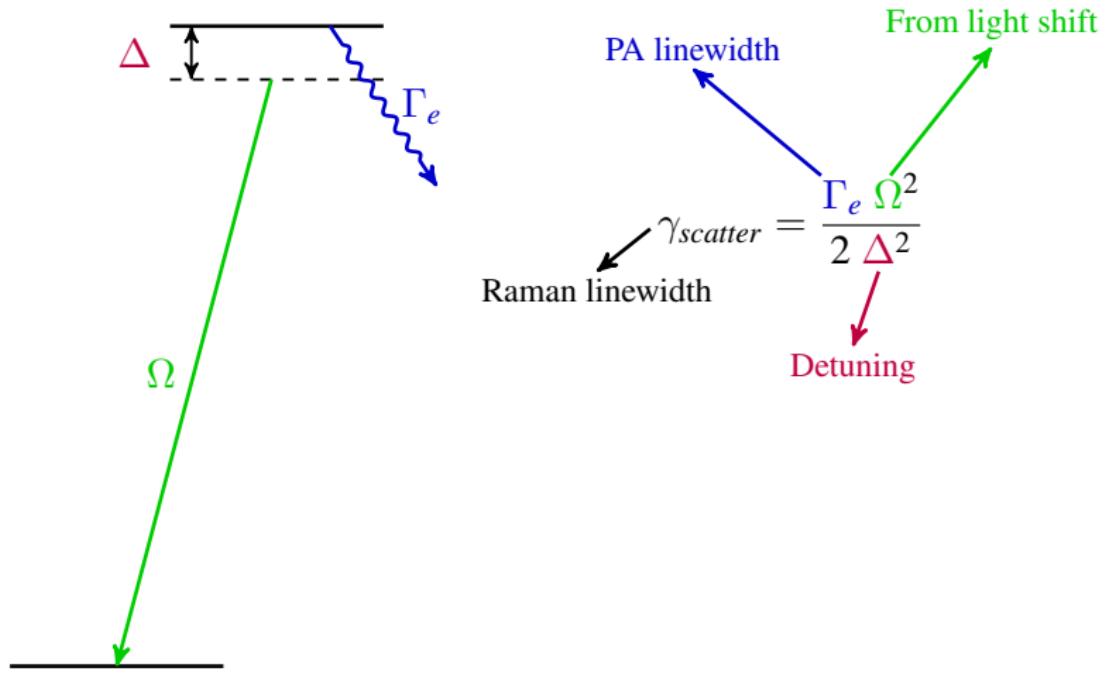
One photon scattering (i.e. the easy kind)



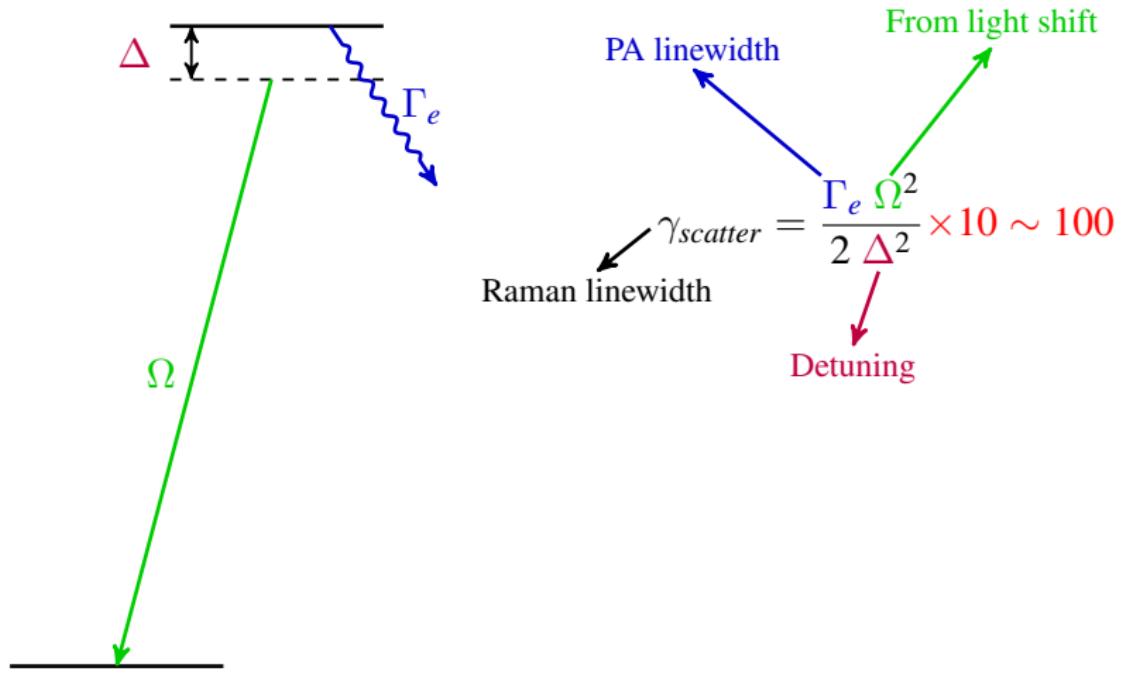
One photon scattering (i.e. the easy kind)



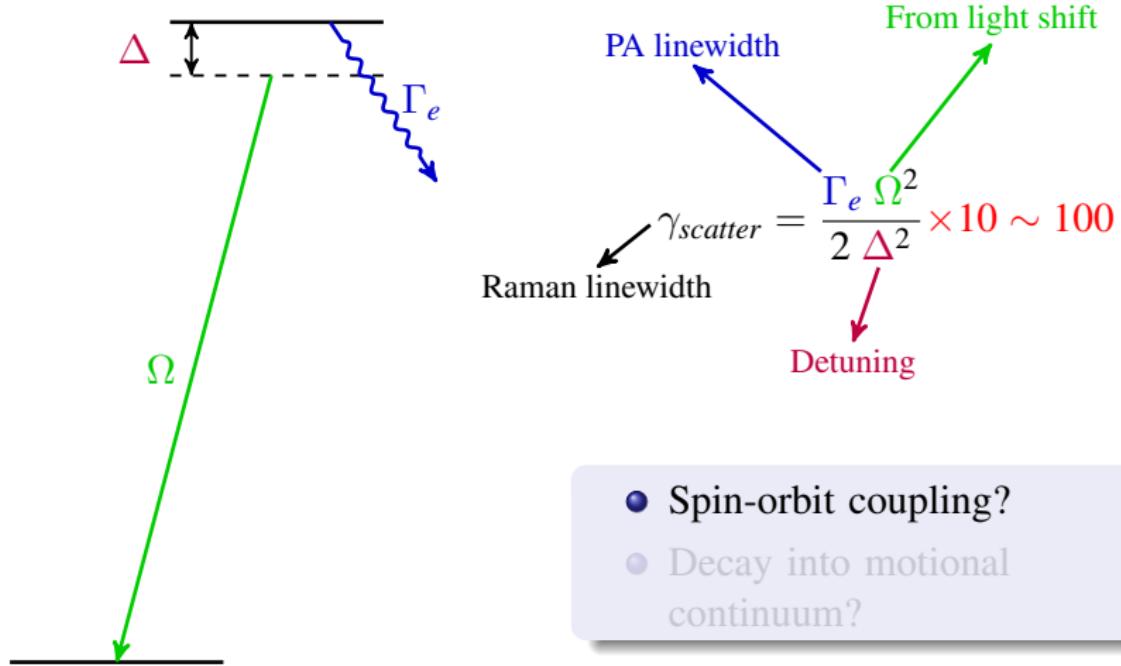
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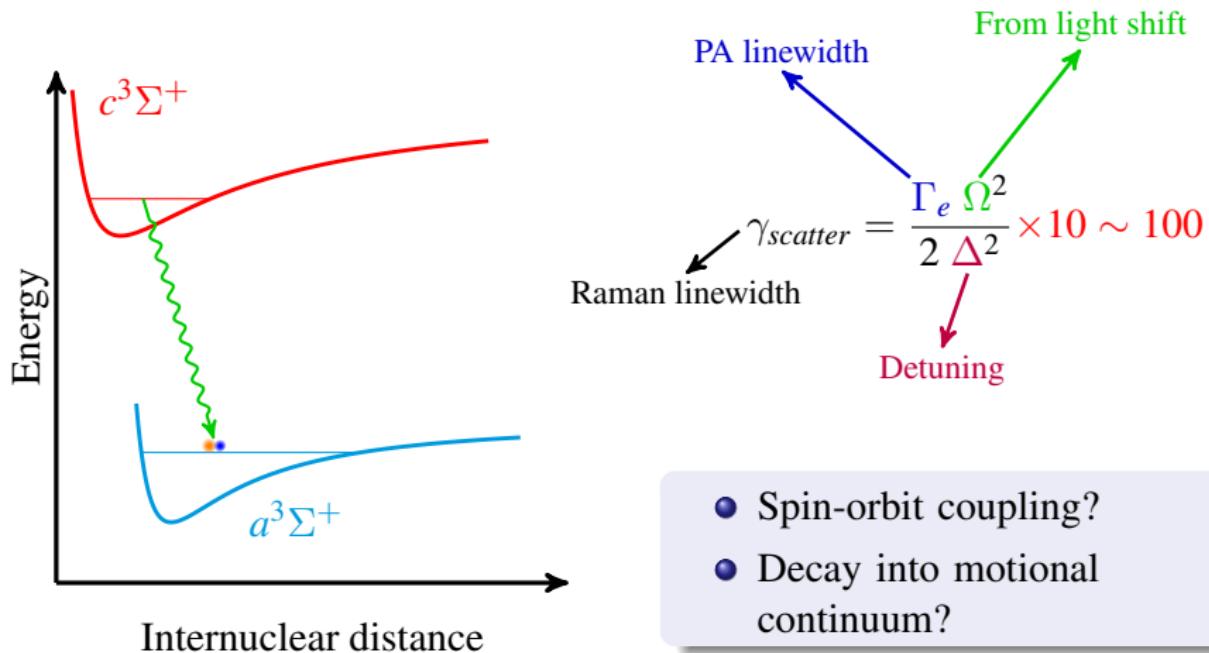


One photon scattering (i.e. the easy kind)

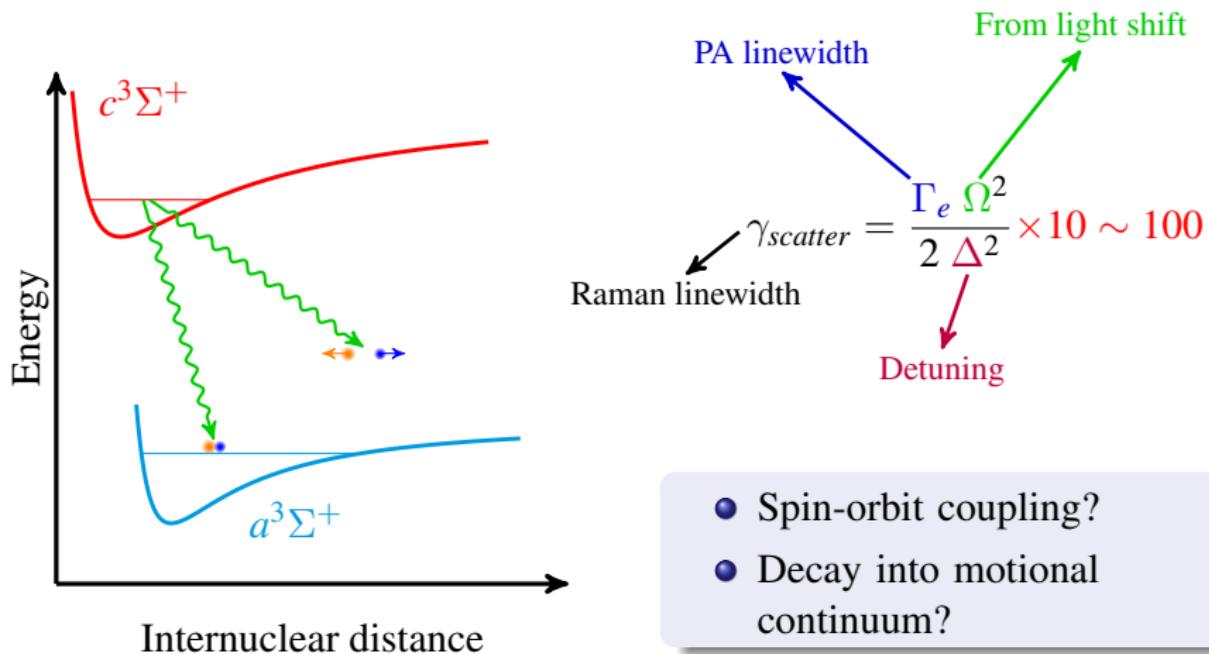


- Spin-orbit coupling?
- Decay into motional continuum?

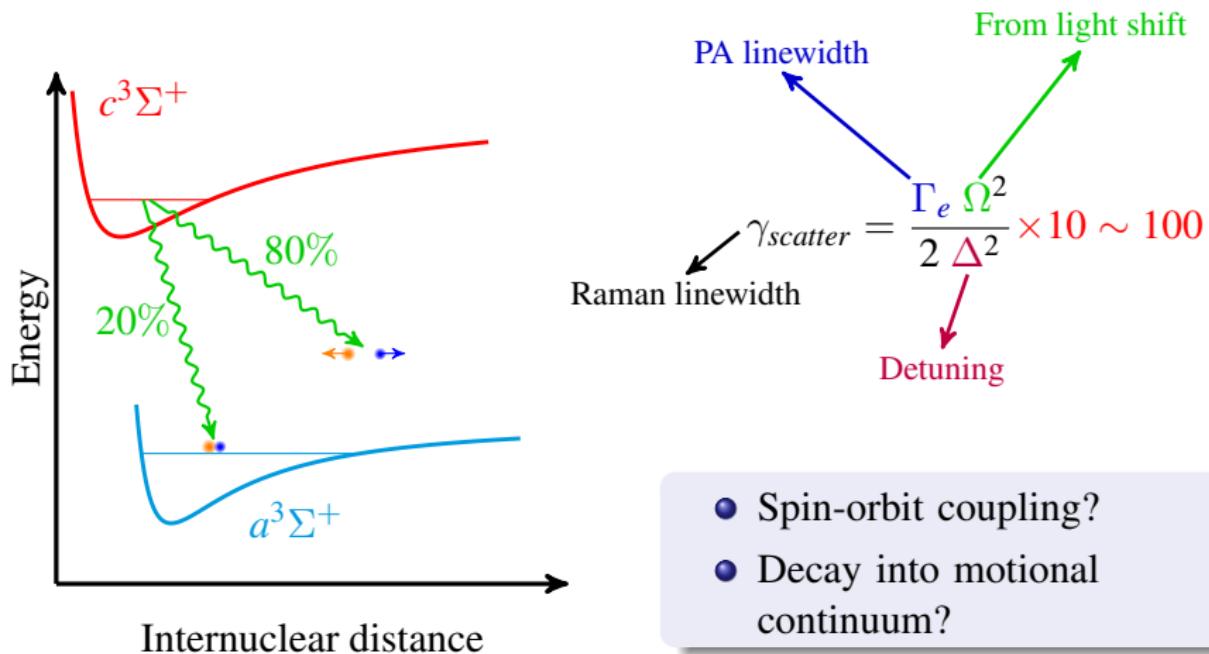
One photon scattering (i.e. the easy kind)



One photon scattering (i.e. the easy kind)



One photon scattering (i.e. the easy kind)



- Spin-orbit coupling?
- Decay into motional continuum?

- Understand the issue

Calculating decay rate due to different effects.

- Find a better approach

New initial state: $F^{Cs} = 3, m_F^{Cs} = 3; F^{Na} = 2, m_F^{Na} = 2$

- Understand the issue
- Find a better approach

Calculating decay rate due to different effects.
New initial state: $F^{Cs} = 3, m_F^{Cs} = 3; F^{Na} = 2, m_F^{Na} = 2$

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Calculating decay rate due to different effects.

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New initial state: $F^{Cs} = 3, m_F^{Cs} = 3; F^{Na} = 2, m_F^{Na} = 2$