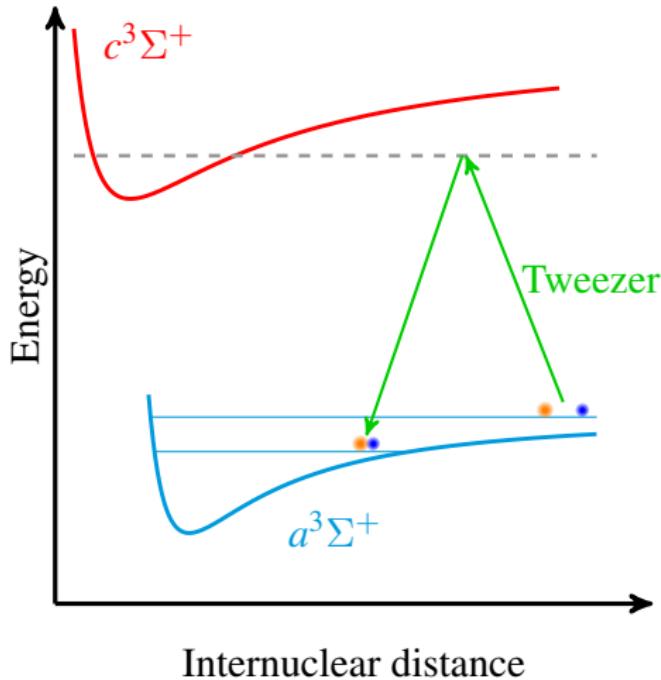


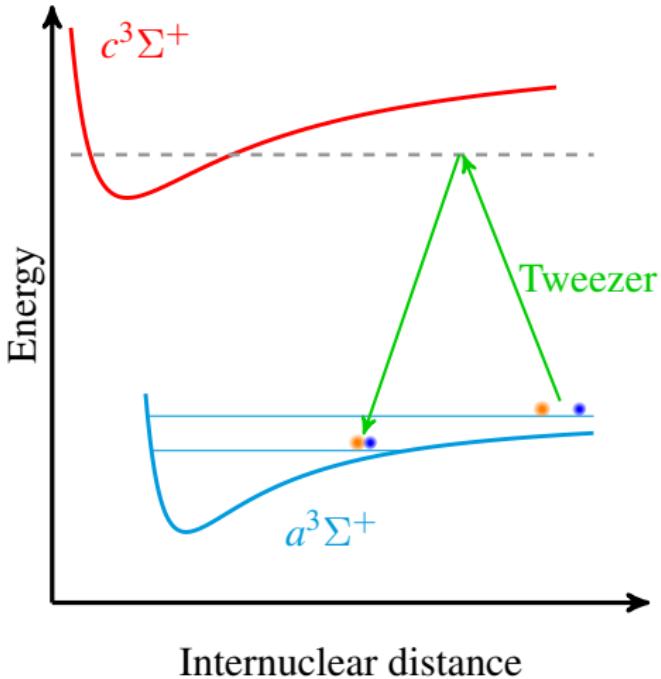
NaCs lab update

Yichao Yu

Ni Group

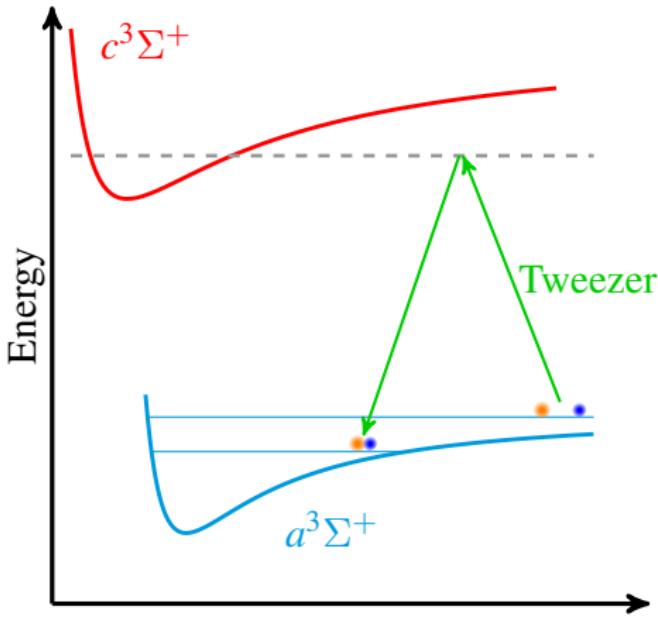
Feb. 21, 2020





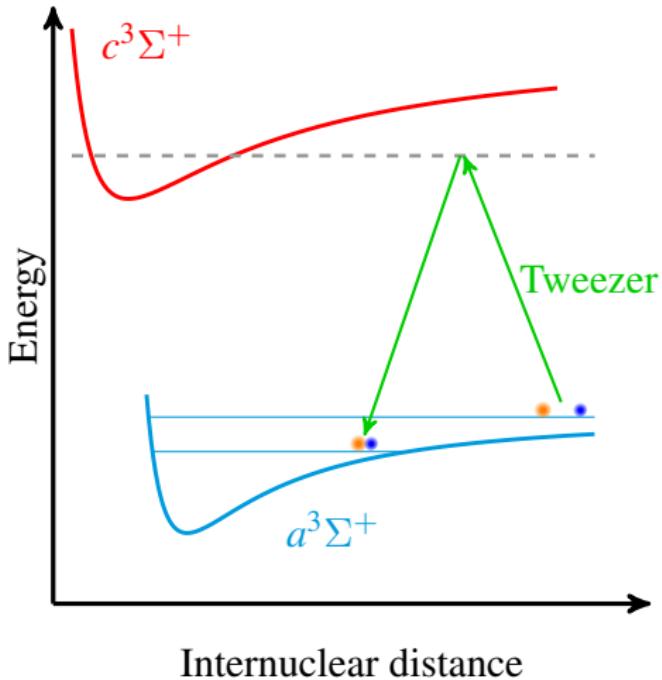
No Rabi oscillation





Still
No Rabi oscillation



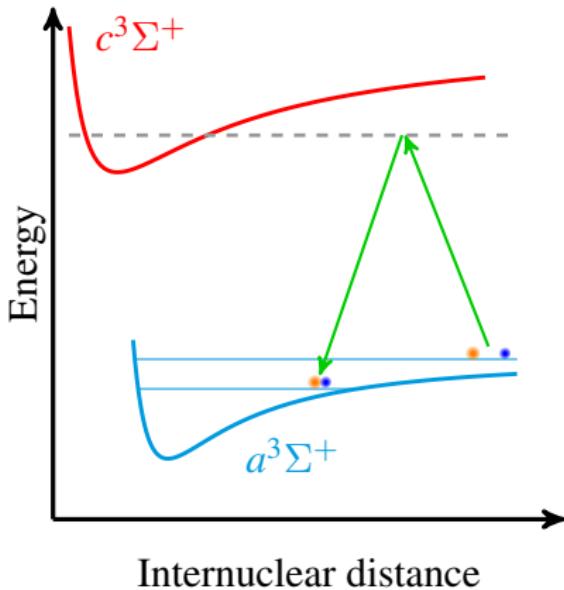


Still
No Rabi oscillation



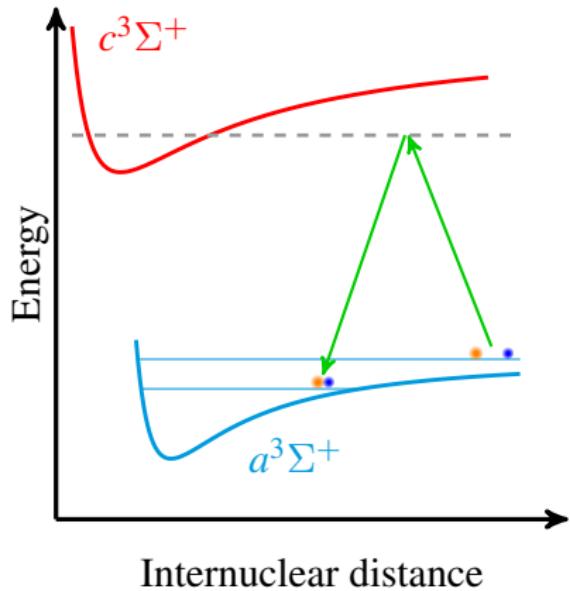
- Understand the issue
 - Find a better approach

What can go wrong?



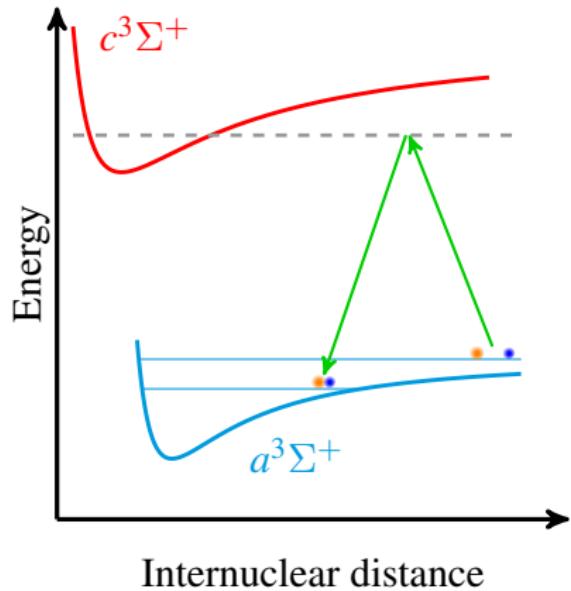
What can go wrong?

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



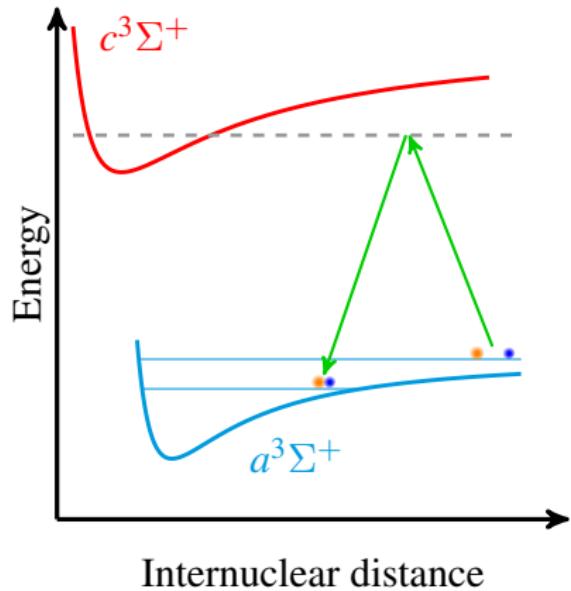
What can go wrong?

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



What can go wrong?

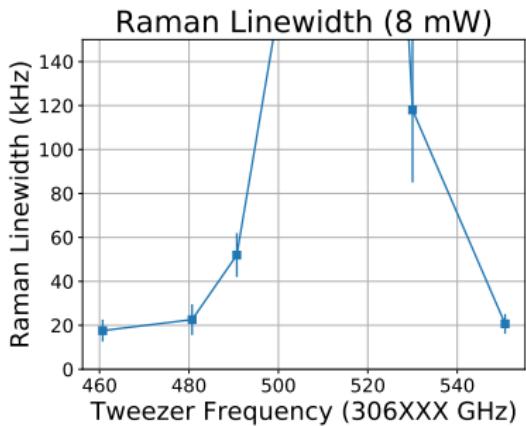
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What can go wrong?

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

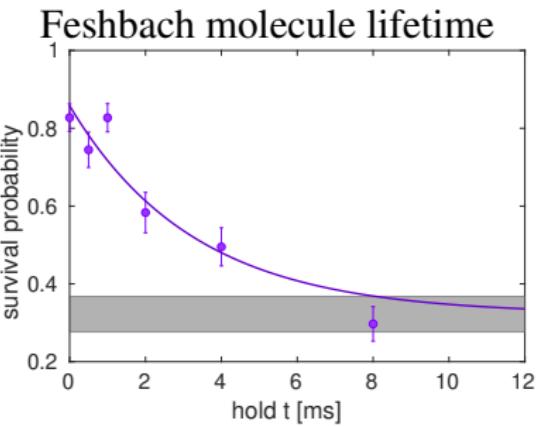
- Single PA line effect
- Fluctuation
- Scattering



What can go wrong?

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

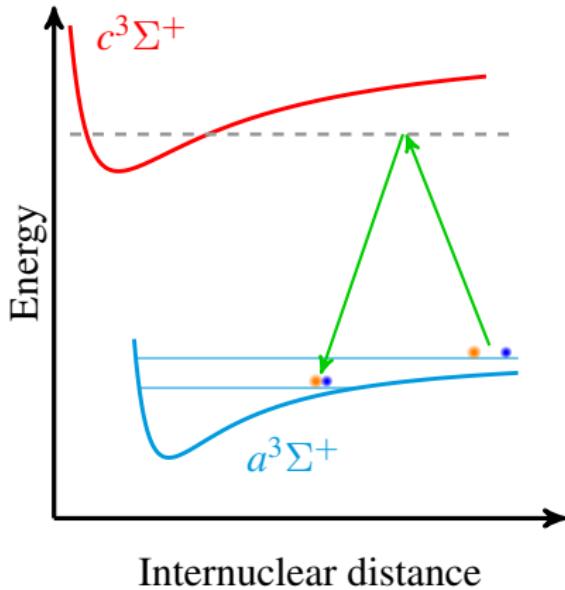
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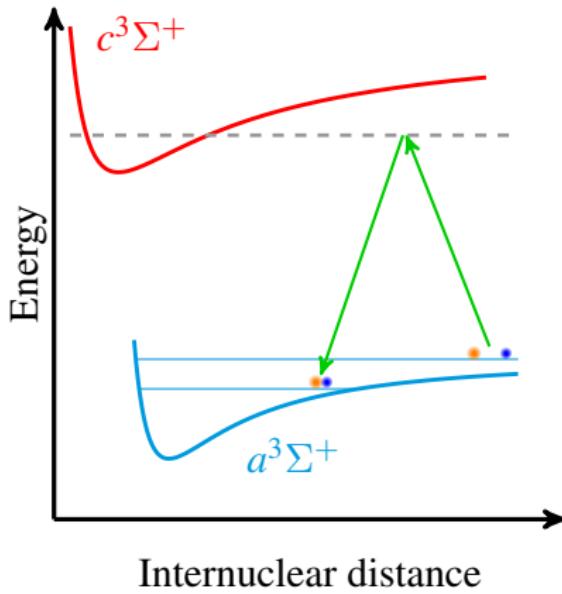
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What can go wrong?

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

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How many photons?

Two photon scattering

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

Two photon scattering

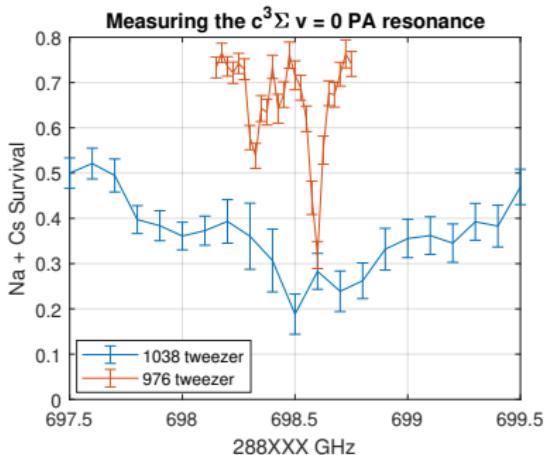
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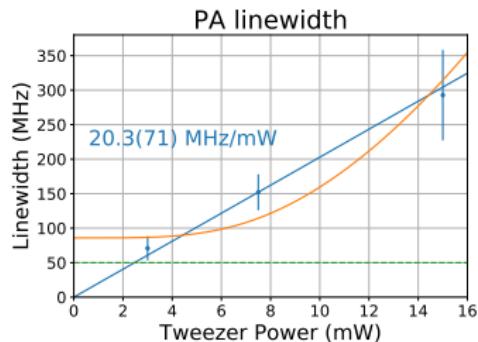
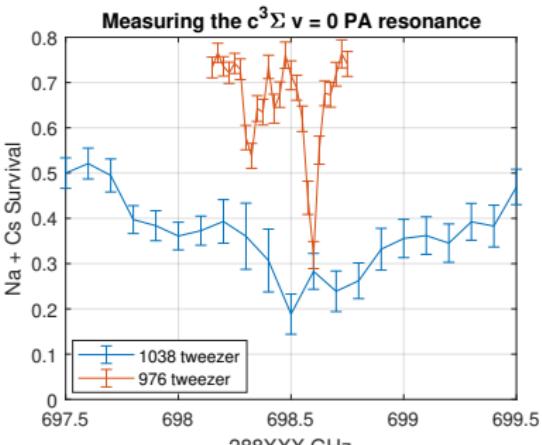
Two photon scattering

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Two photon scattering

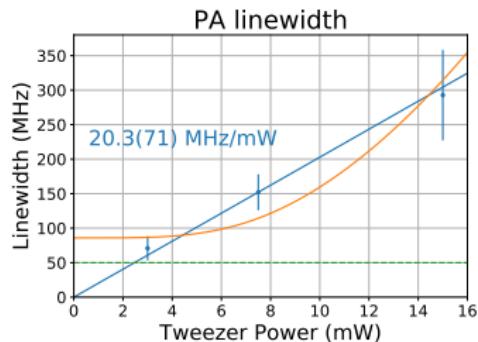
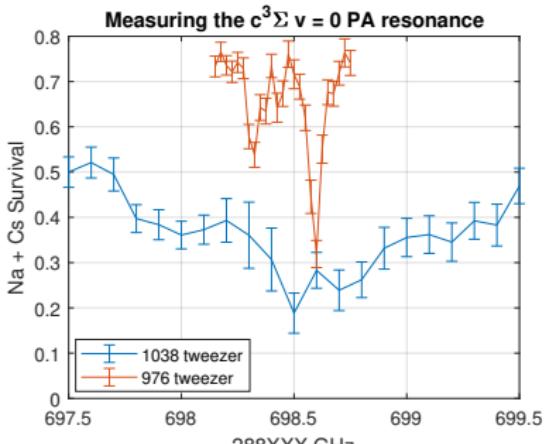
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Two photon scattering

Until ...

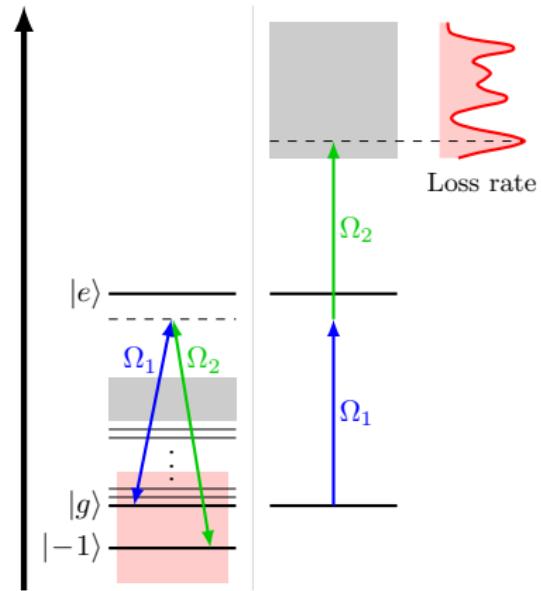
- Two photon up vs down
- One beam vs two beams
- Linear dependency on power for Raman line width



Two photon scattering

Until ...

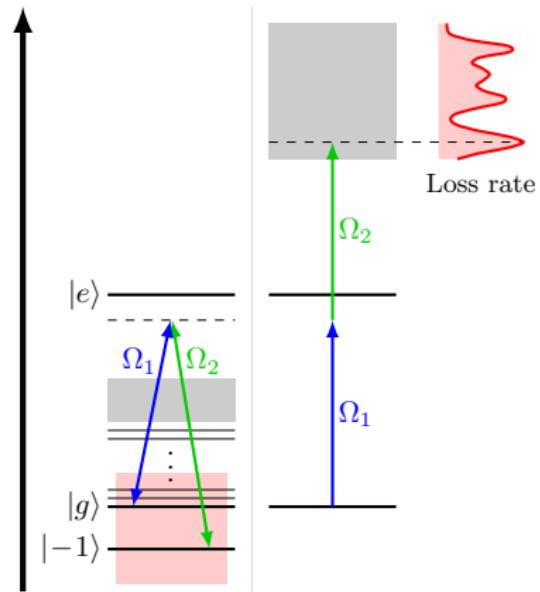
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Two photon scattering

Until ...

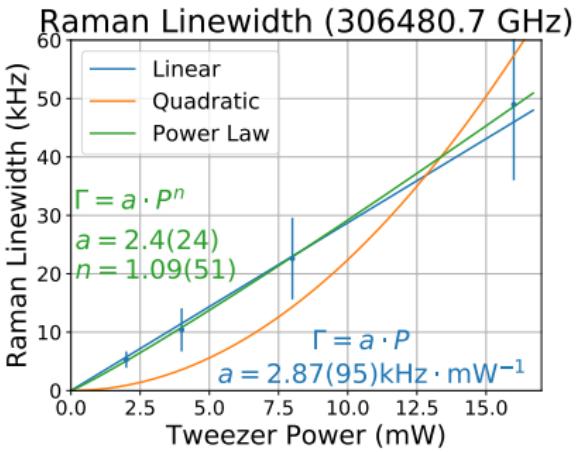
- Two photon up vs down
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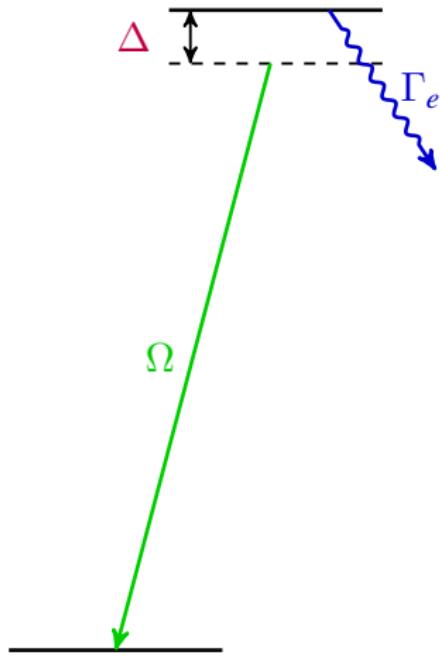
Two photon scattering

Until ...

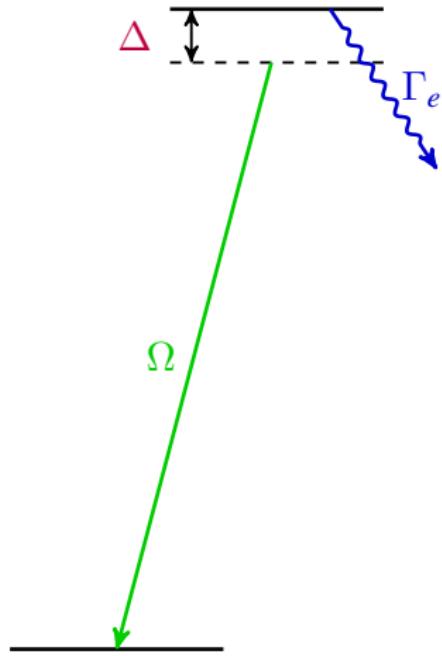
- Two photon up vs down
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One photon scattering (i.e. the easy kind)

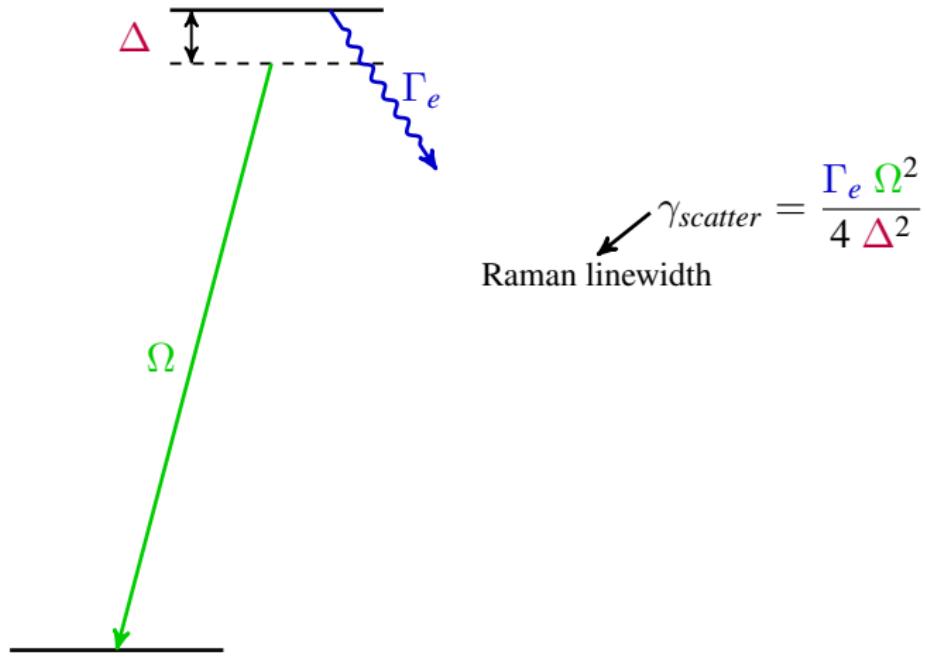


One photon scattering (i.e. the easy kind)

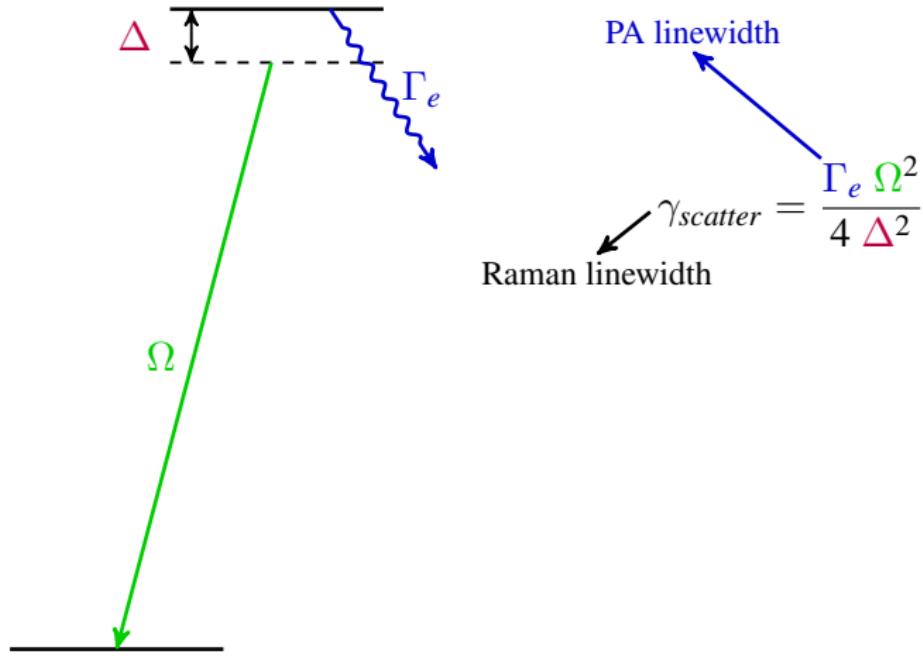


$$\gamma_{scatter} = \frac{\Gamma_e \Omega^2}{4 \Delta^2}$$

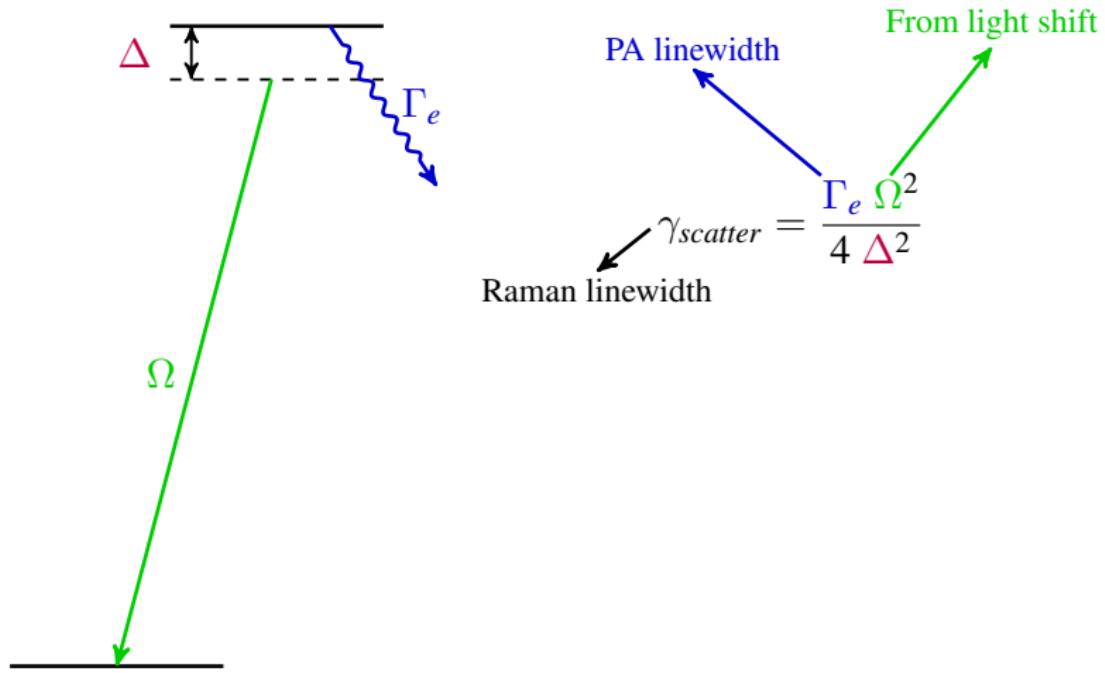
One photon scattering (i.e. the easy kind)



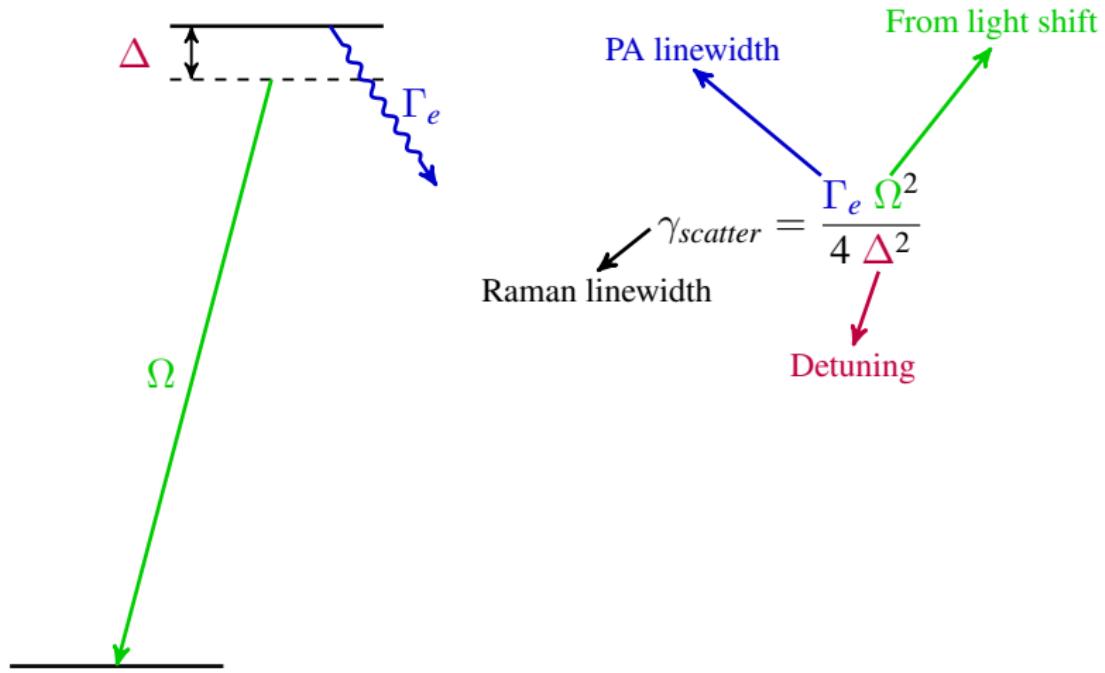
One photon scattering (i.e. the easy kind)



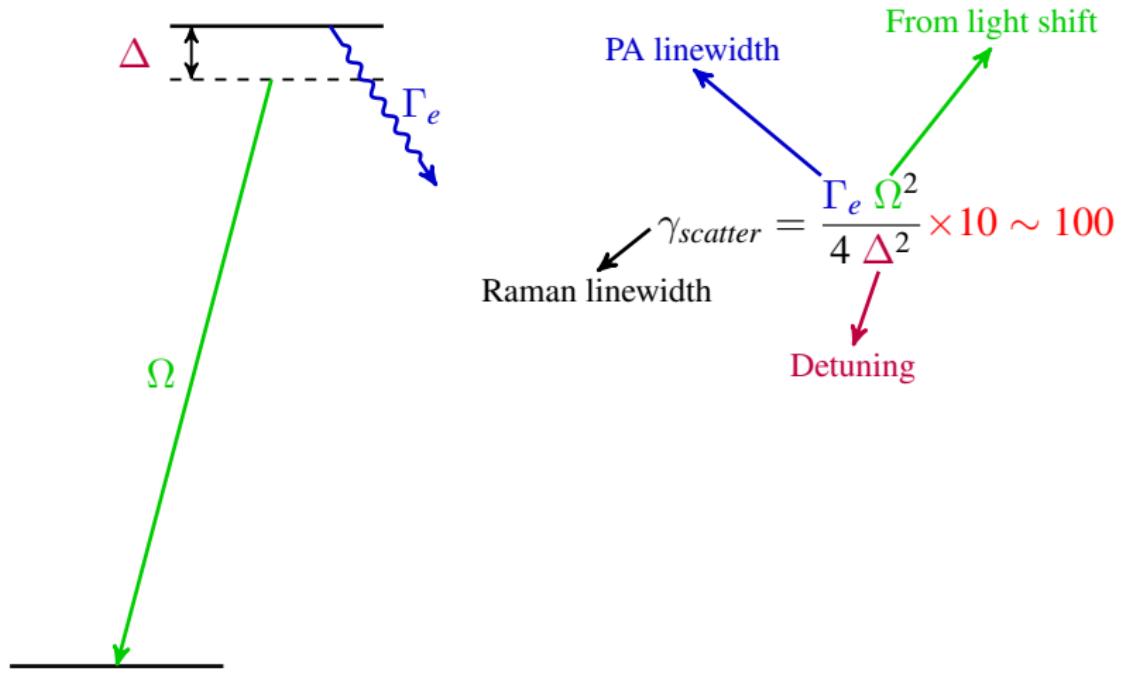
One photon scattering (i.e. the easy kind)



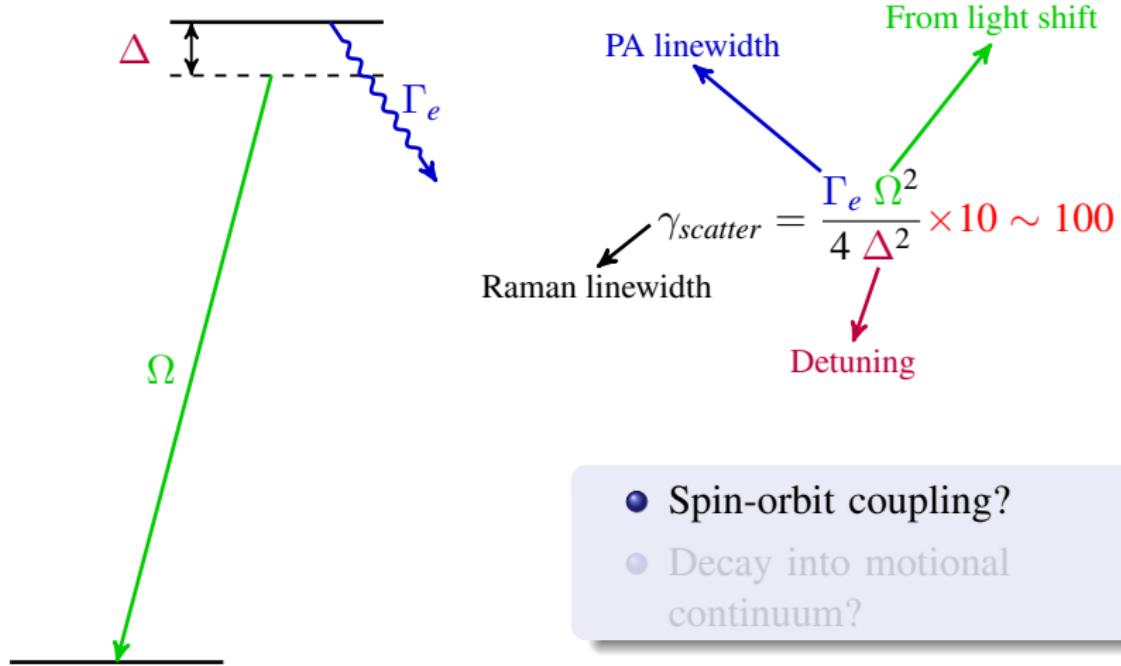
One photon scattering (i.e. the easy kind)



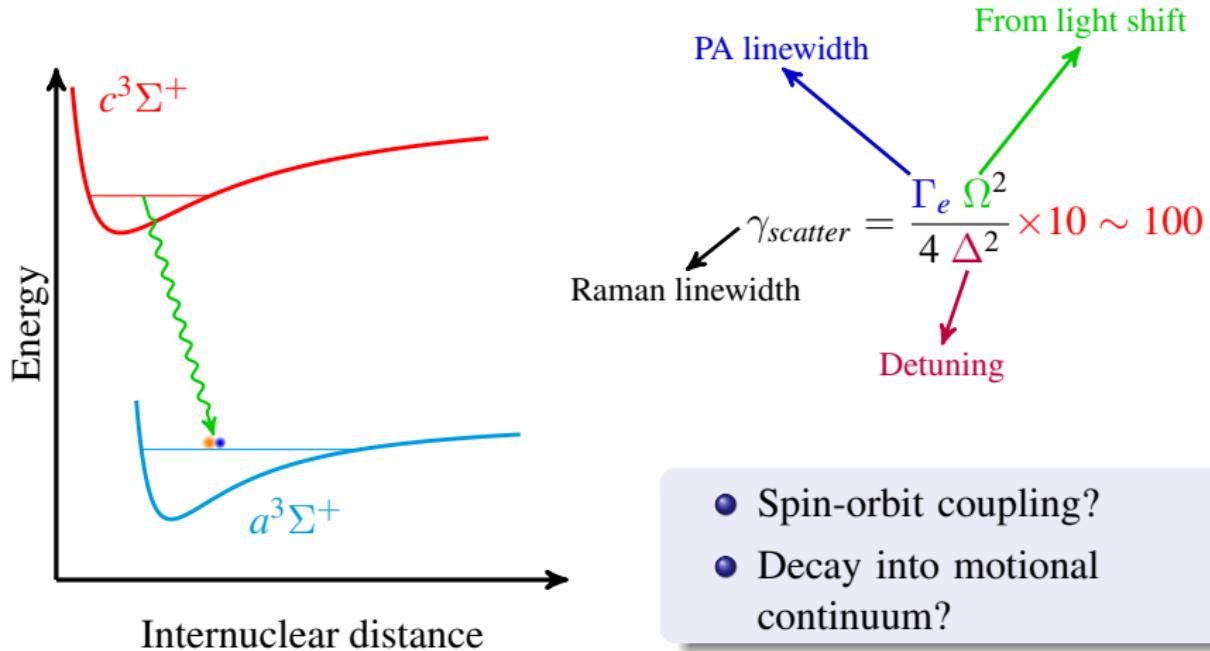
One photon scattering (i.e. the easy kind)



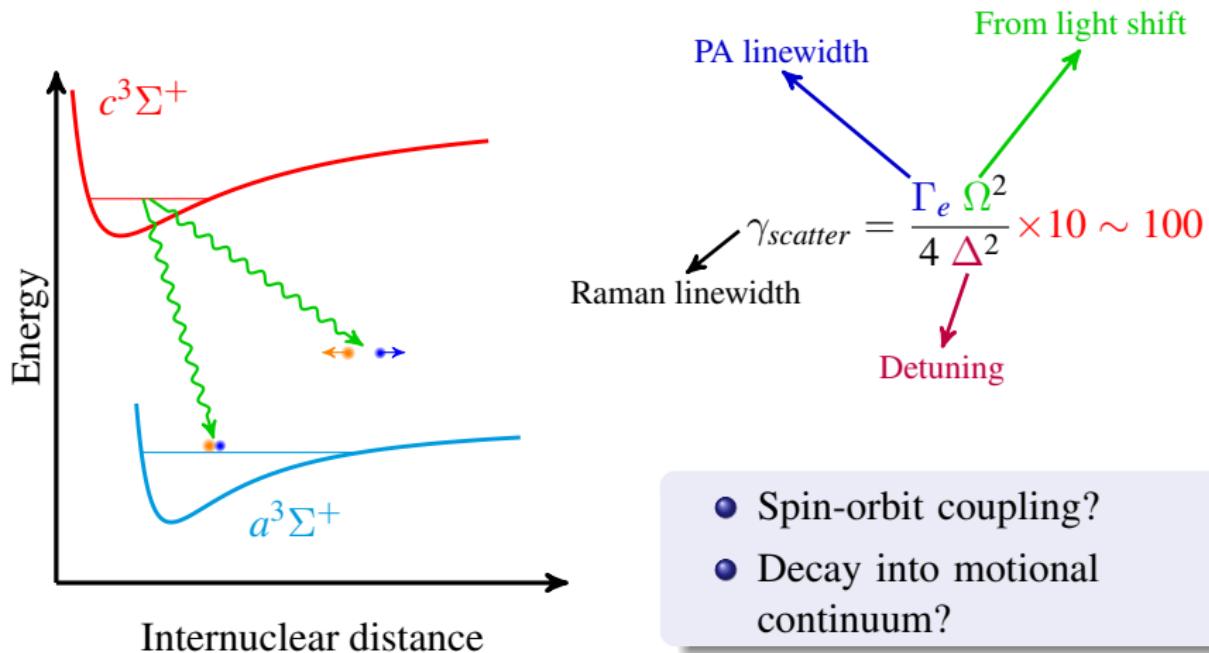
One photon scattering (i.e. the easy kind)



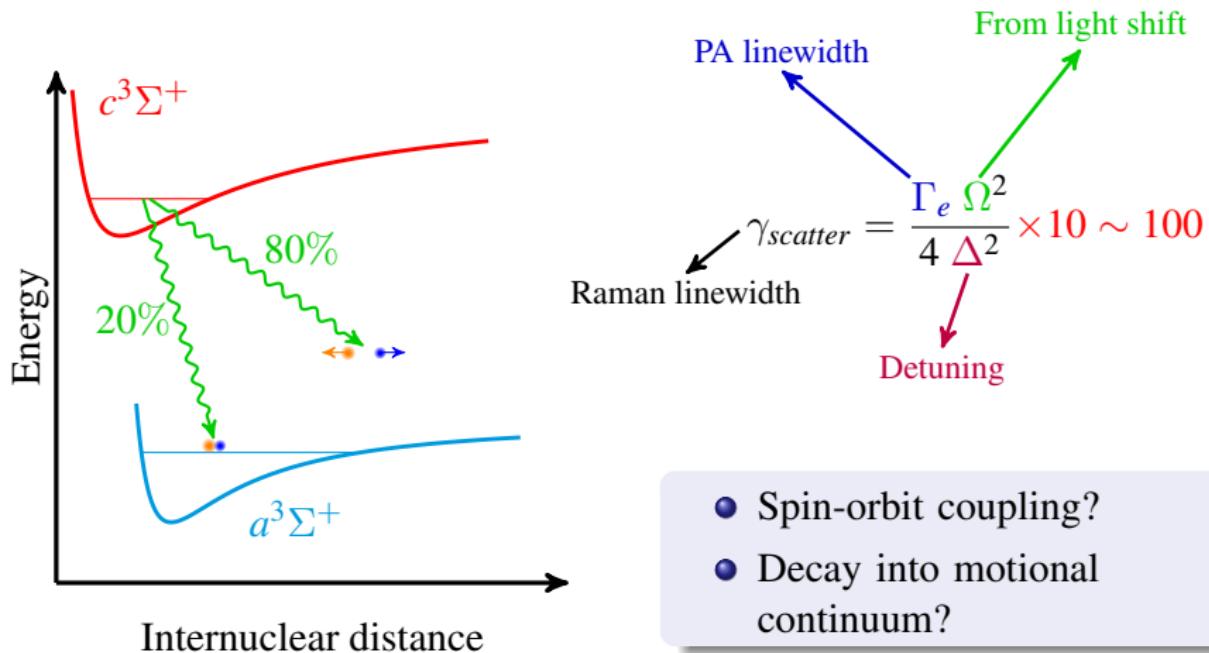
One photon scattering (i.e. the easy kind)



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



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



- Understand the issue

Calculating decay rate due to different effects.

- Find a better approach

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

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Thanks Ben & ACME.