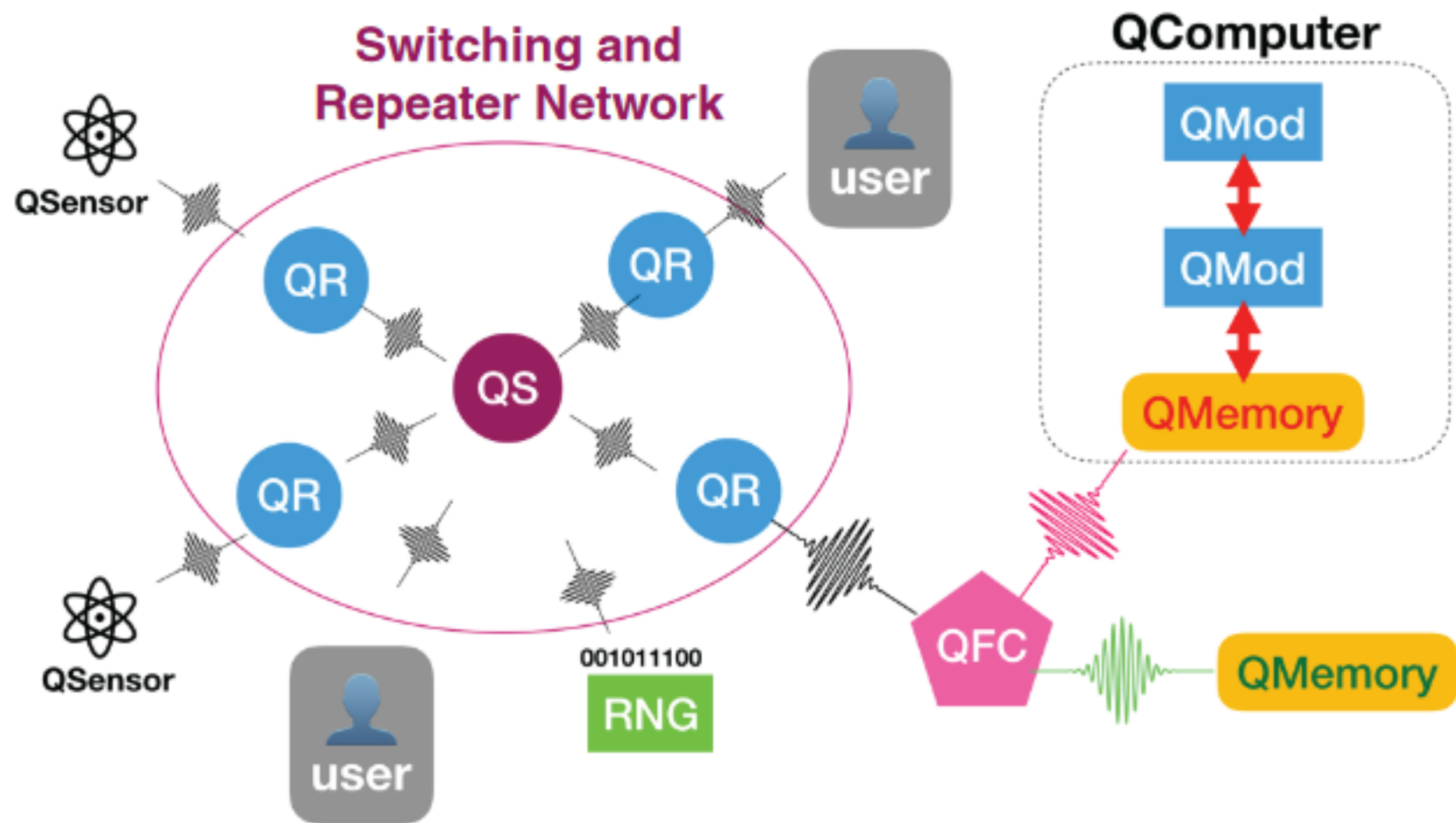
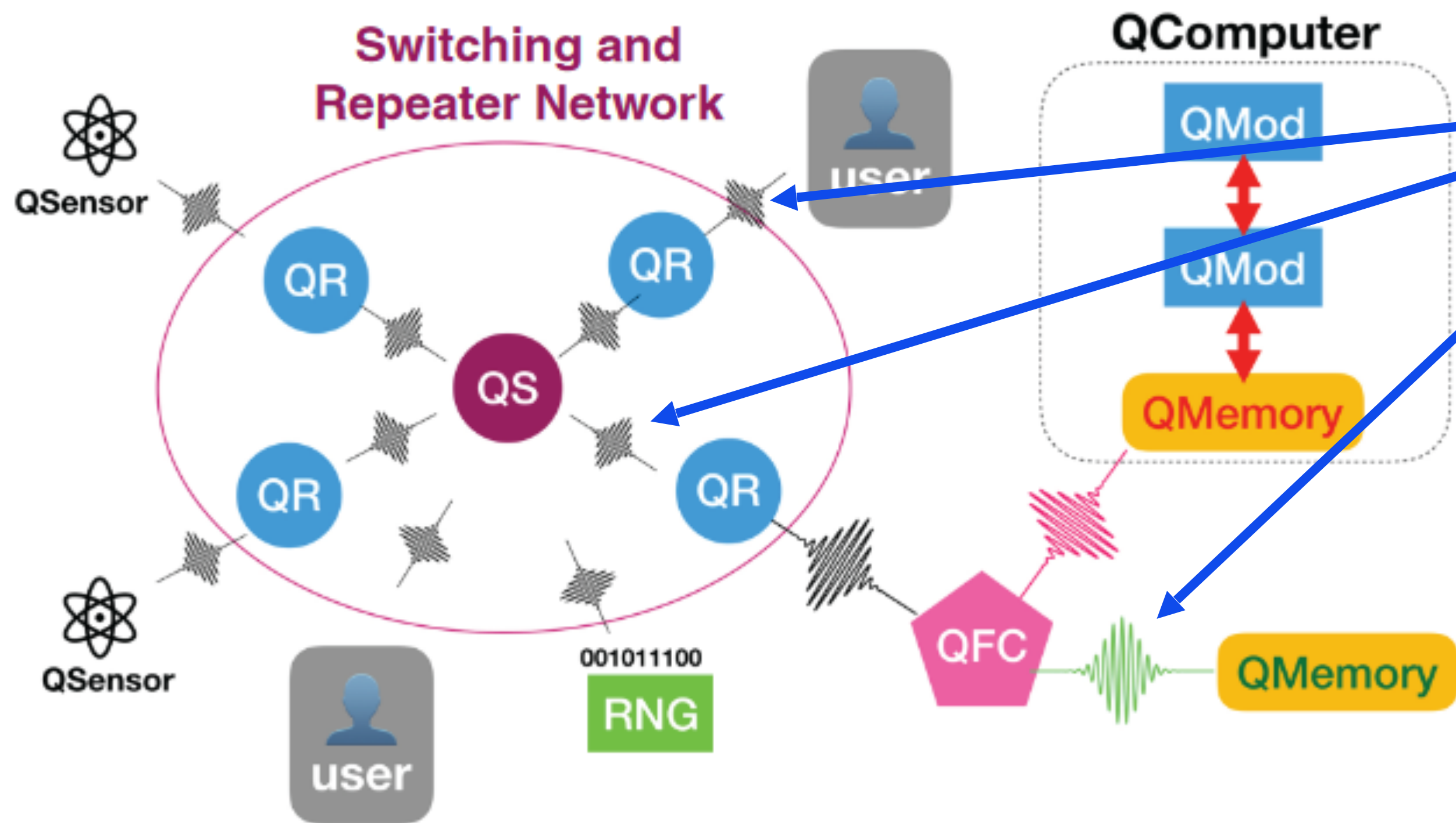


Resonant Spectroscopy of Blue Quantum Emitters in hexagonal Boron Nitride

Jake Horder
13/12/22

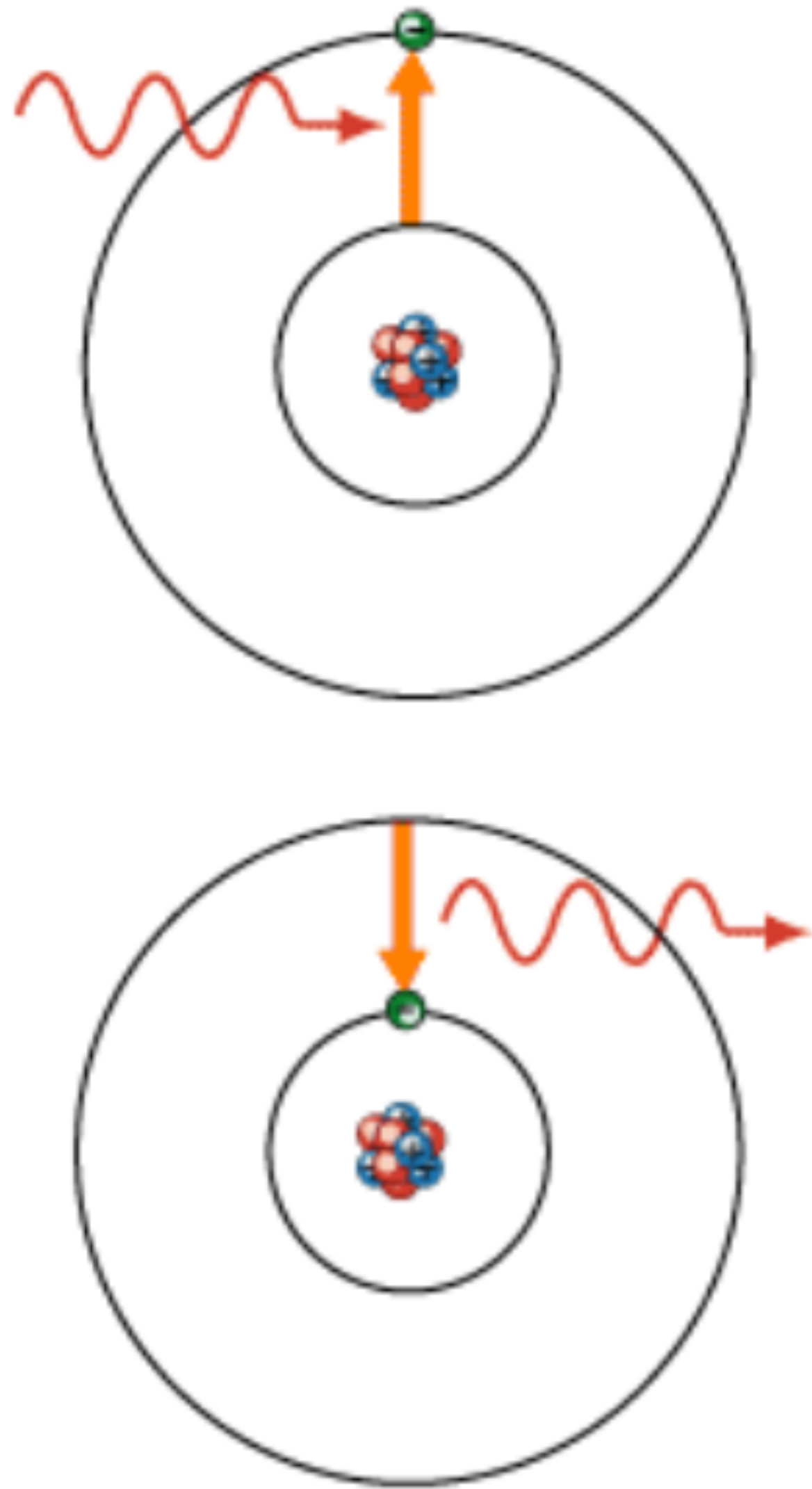


Awschalom et al, 2021

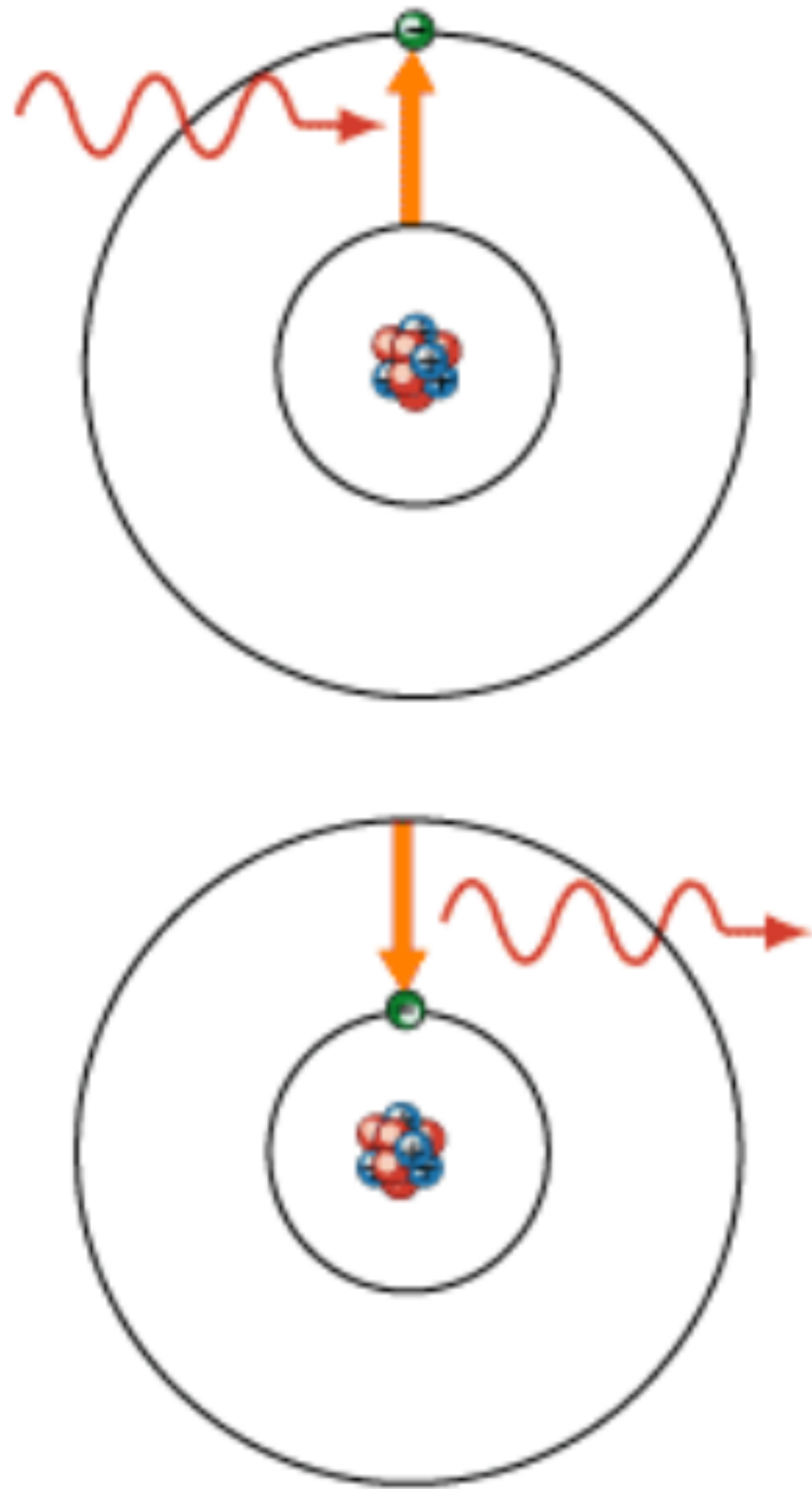


How can we make these single photons?

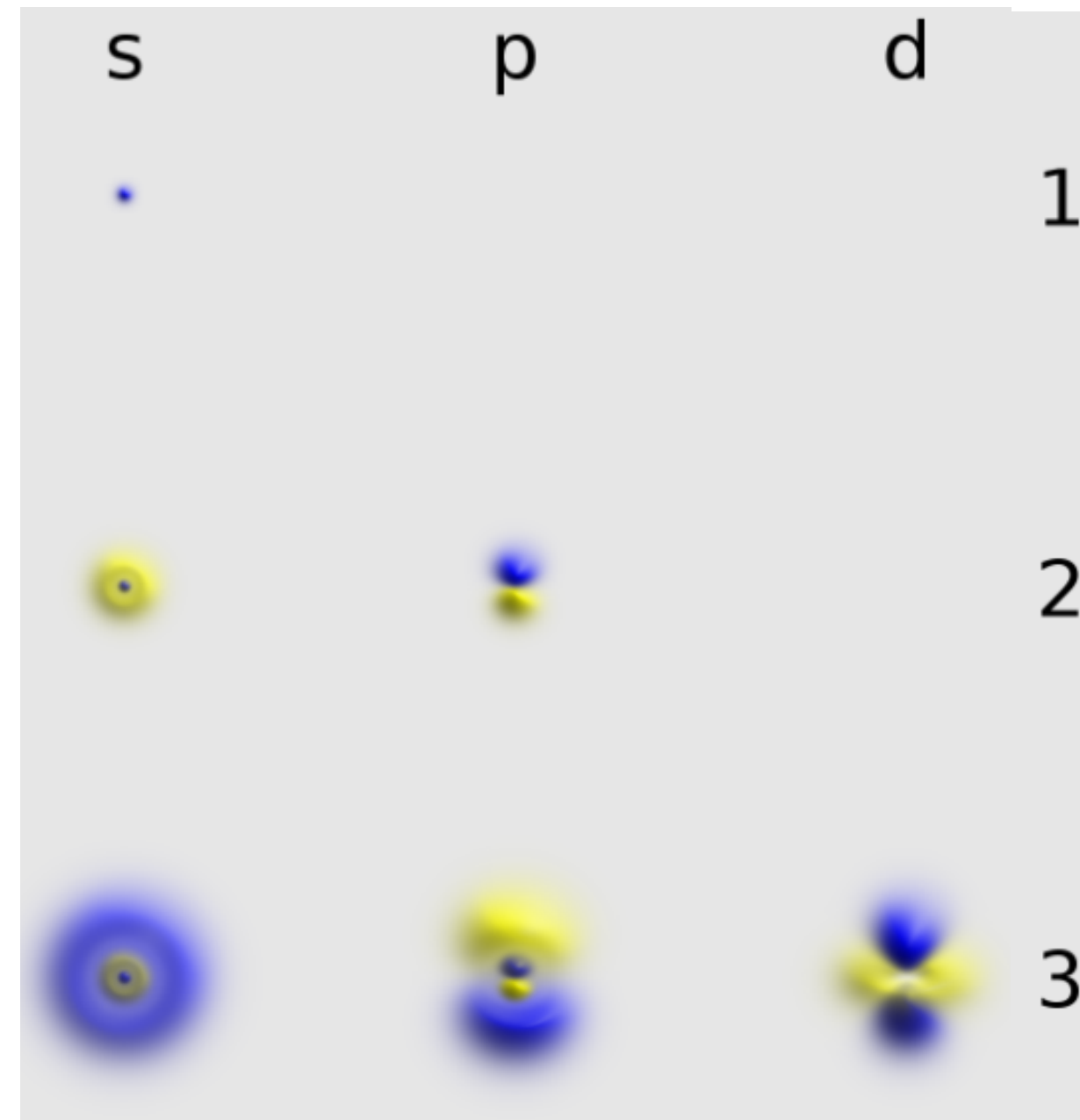
Awschalom et al, 2021



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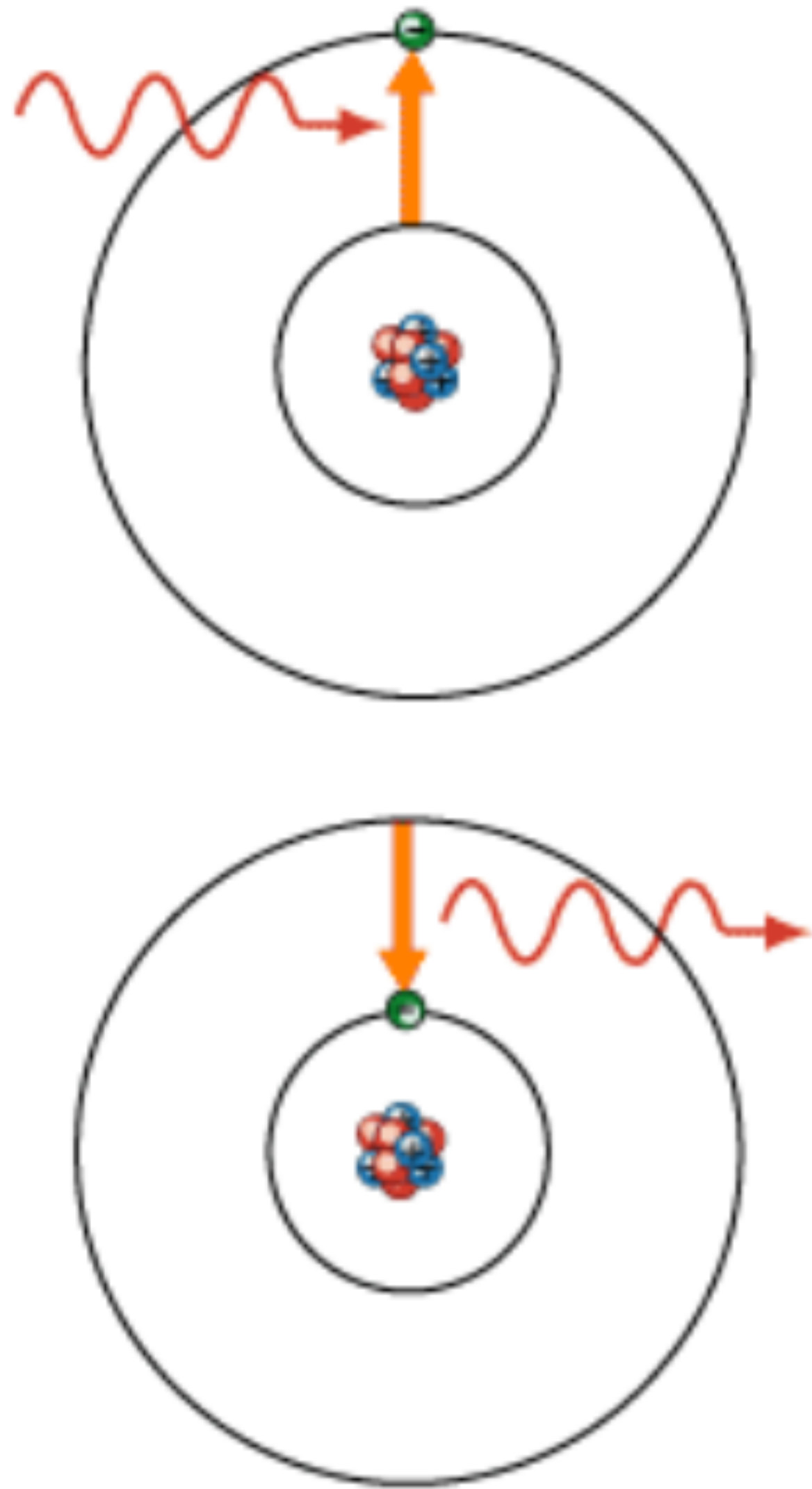


Single atom QEs

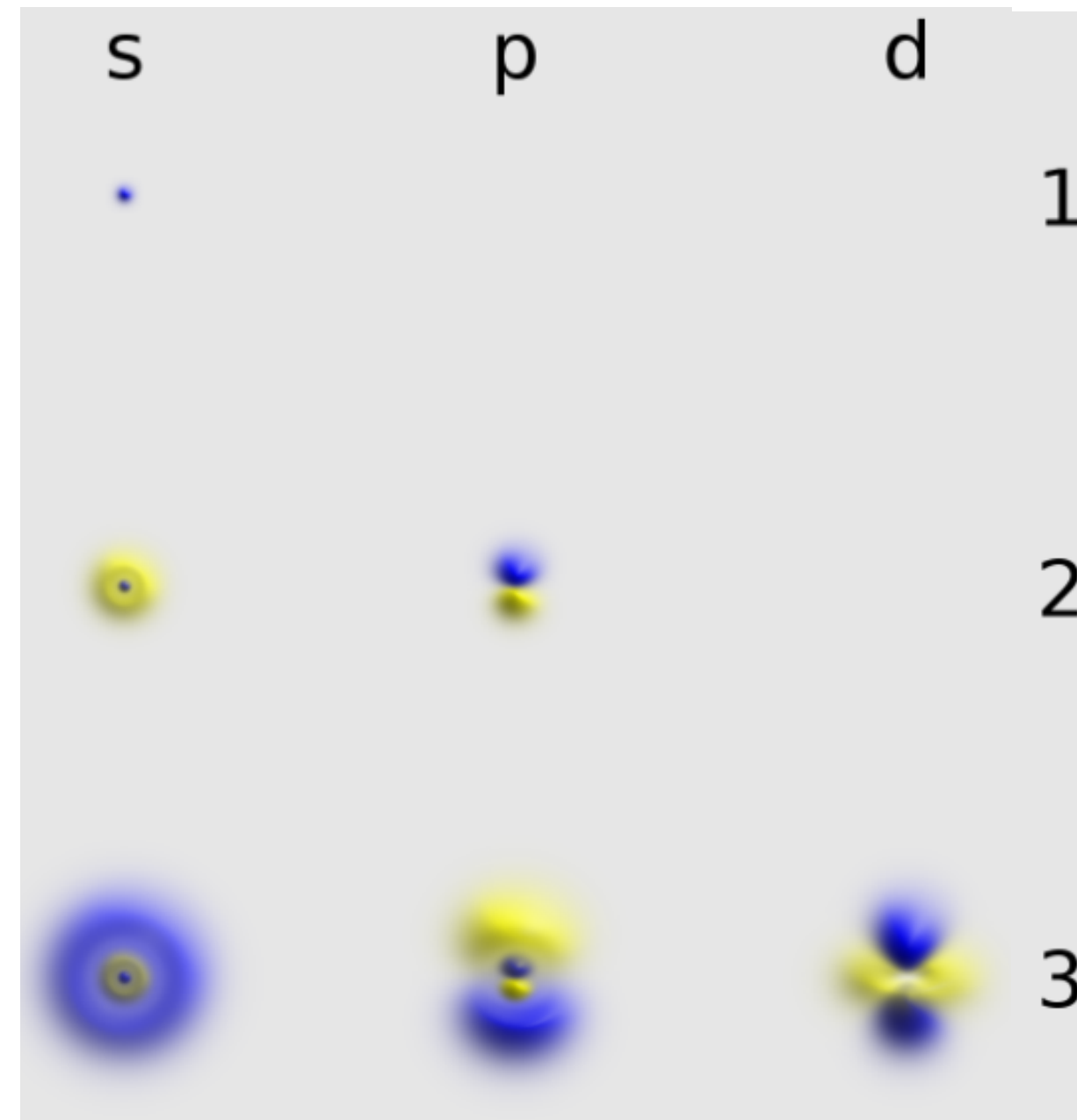


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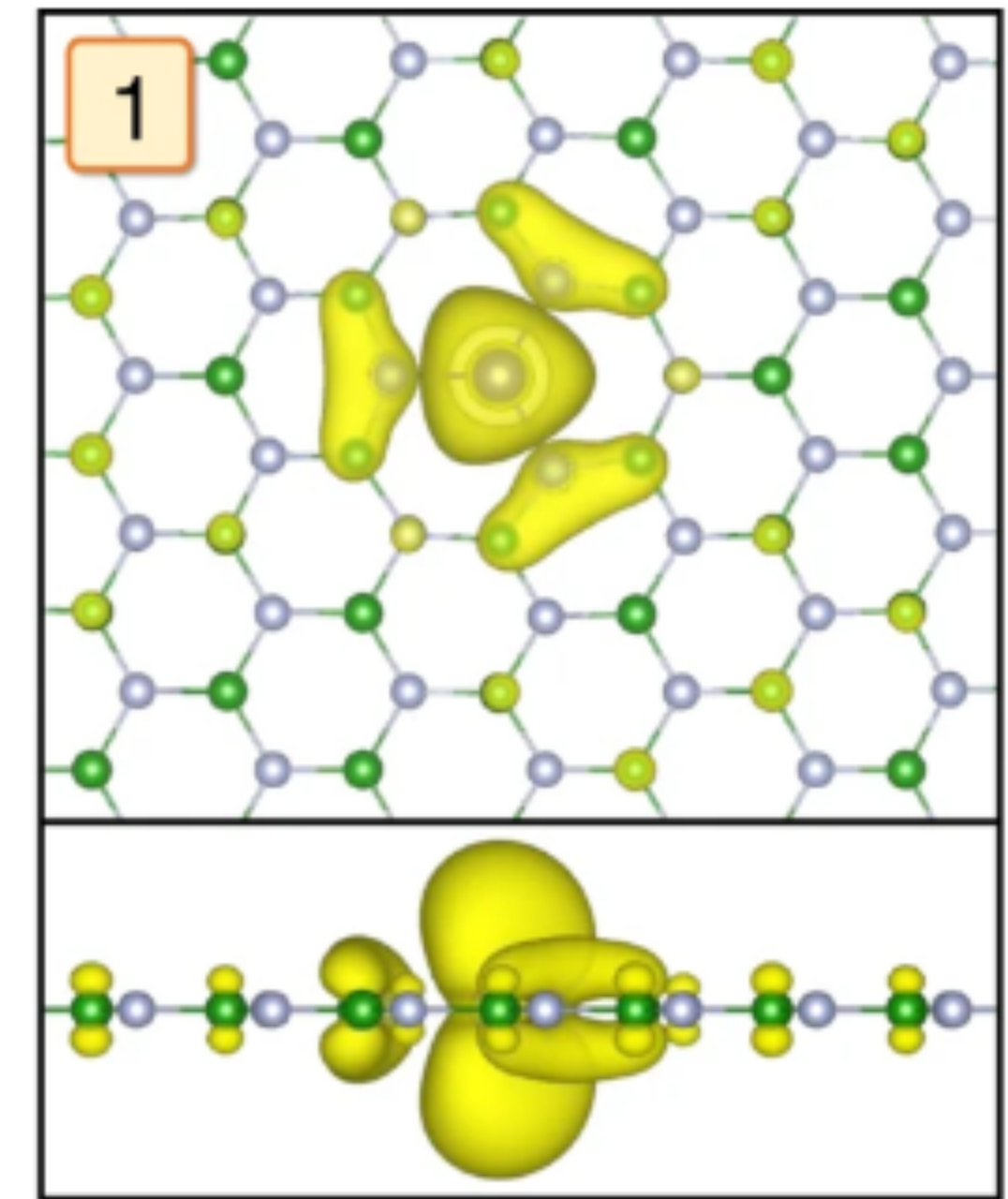


Single atom QEs



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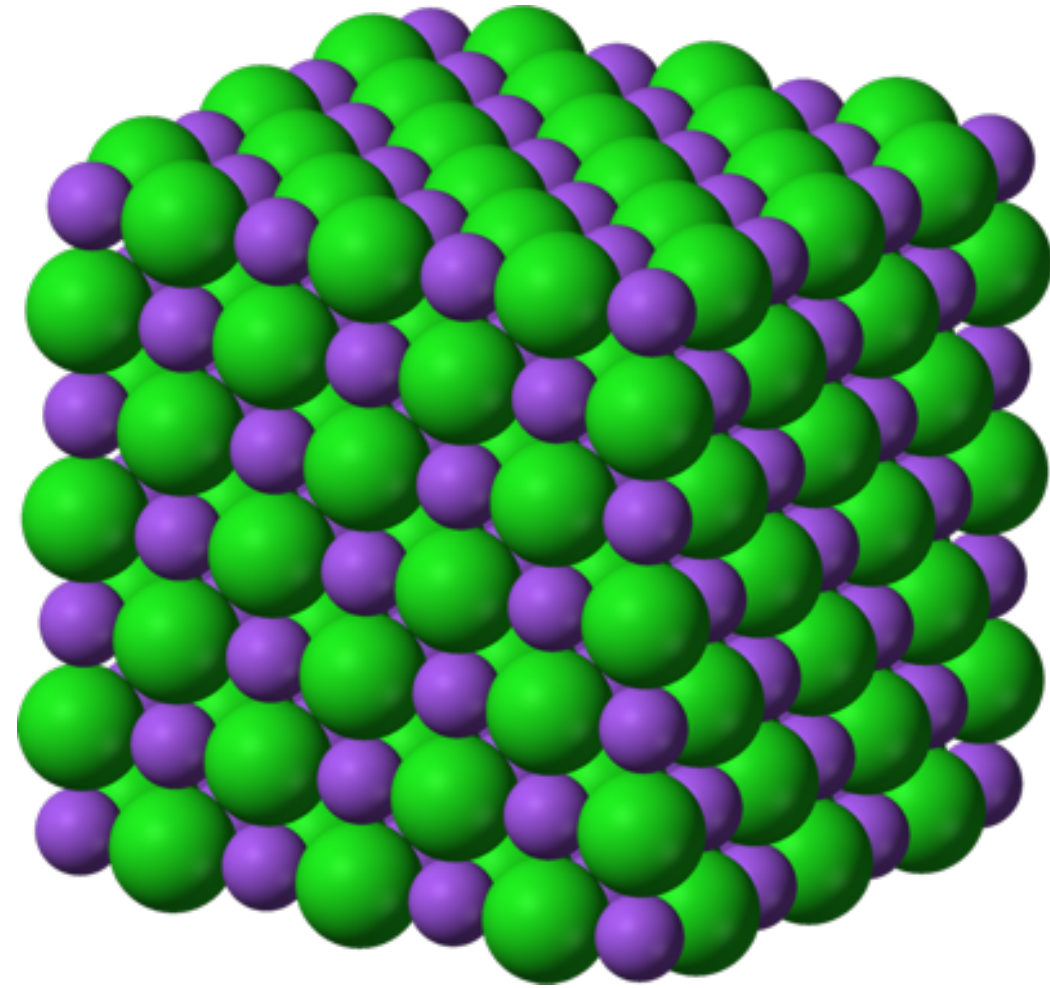
Solid state QEs



Lu et al, 2022

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3D materials

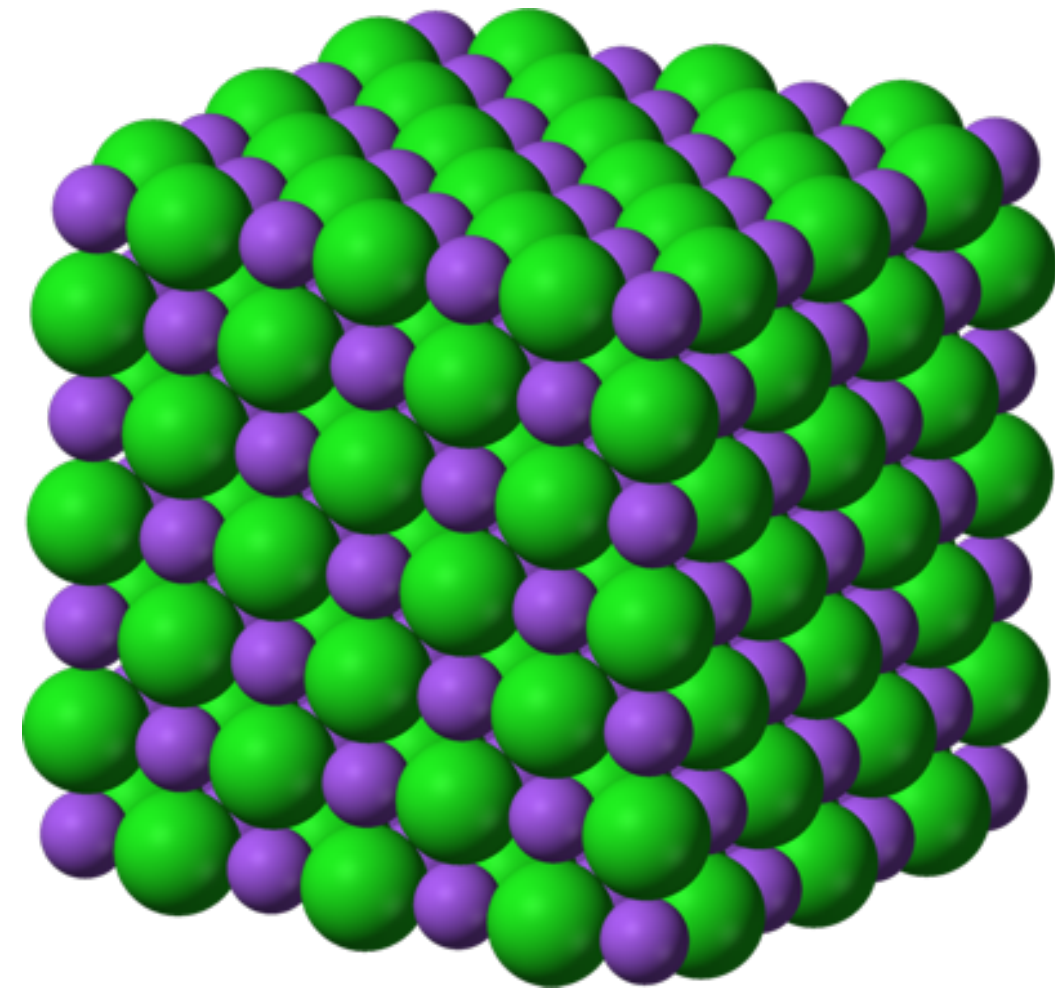


https://en.wikipedia.org/wiki/Crystal_structure



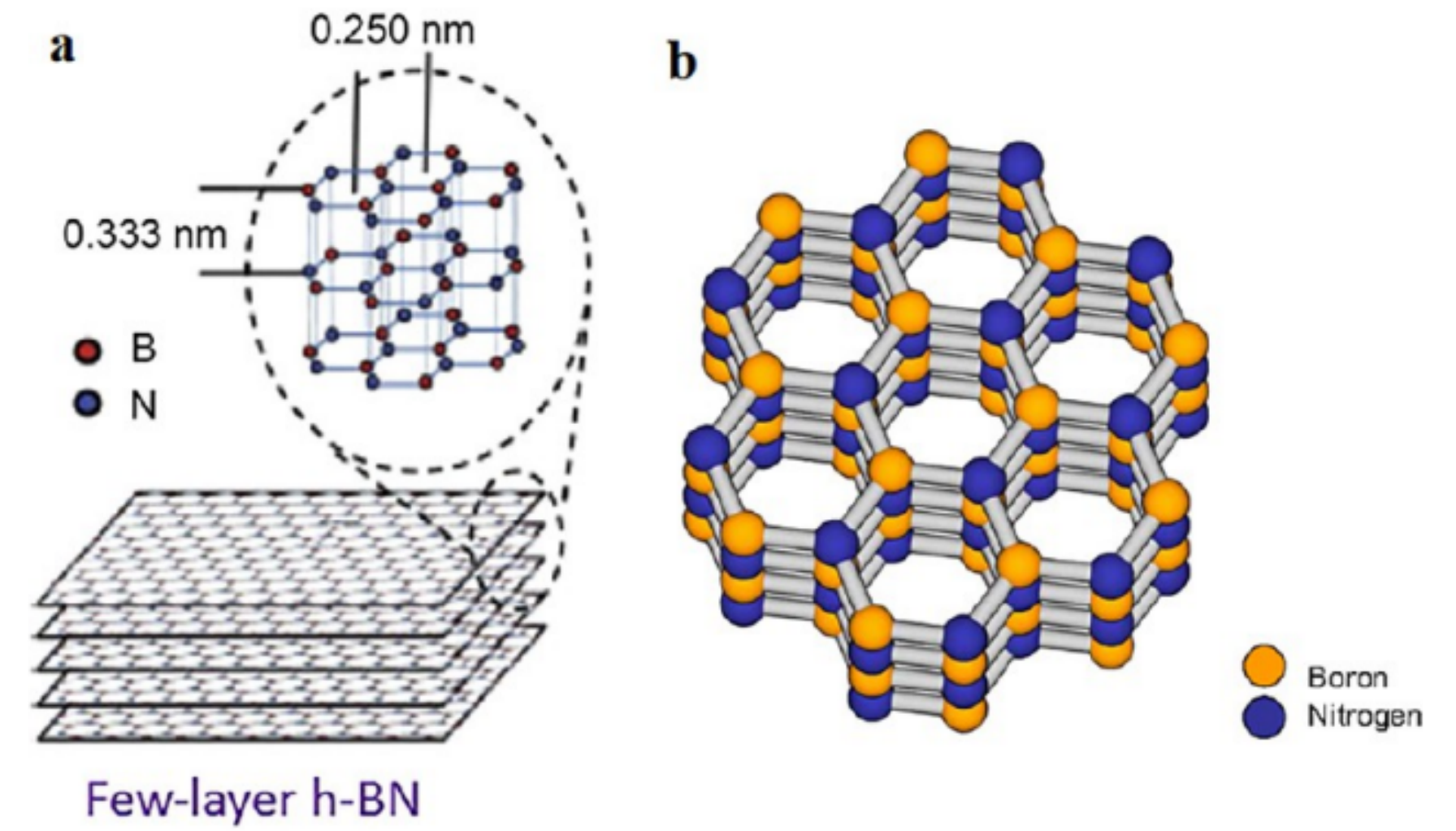
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3D materials



https://en.wikipedia.org/wiki/Crystal_structure

2D materials



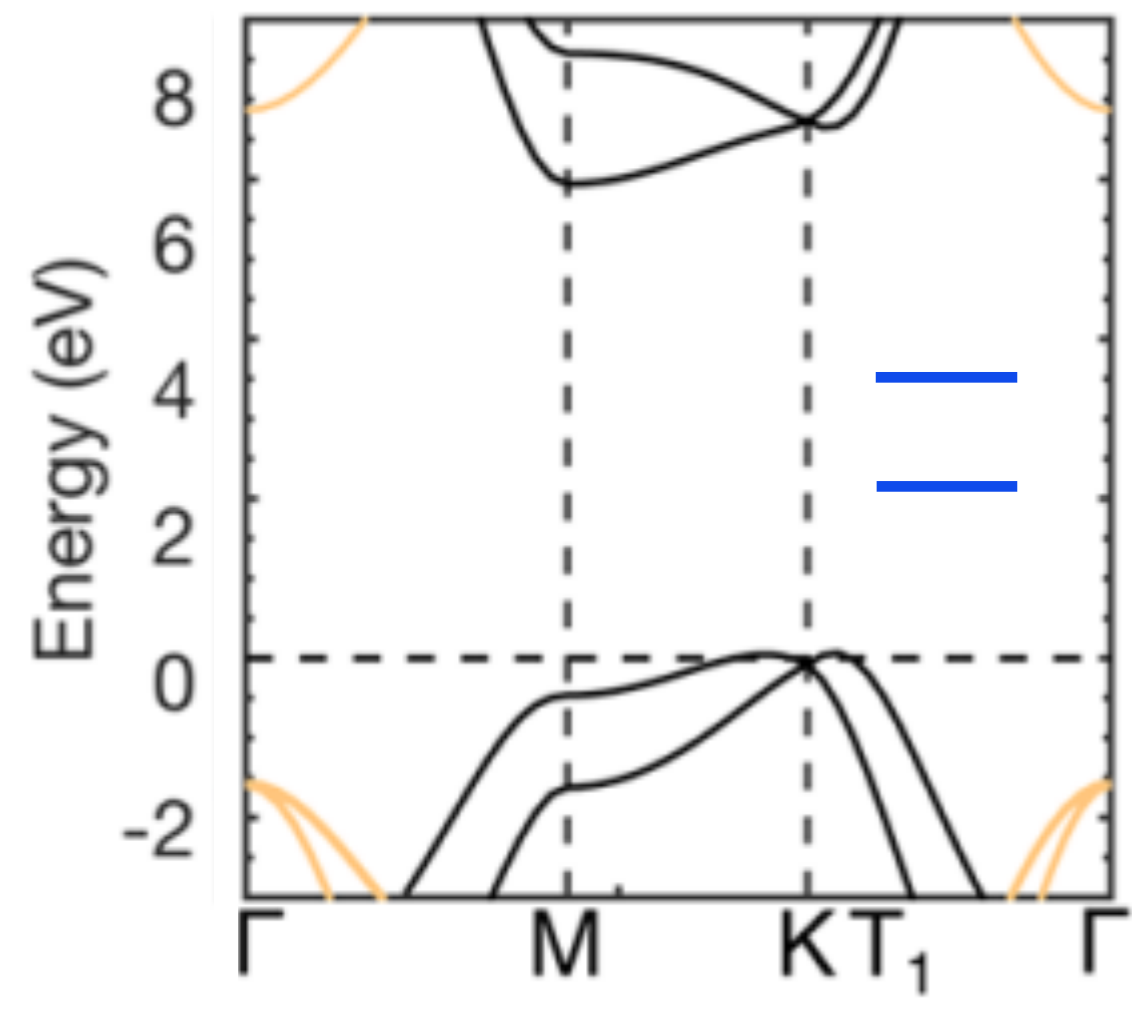
Molaei et al, 2021



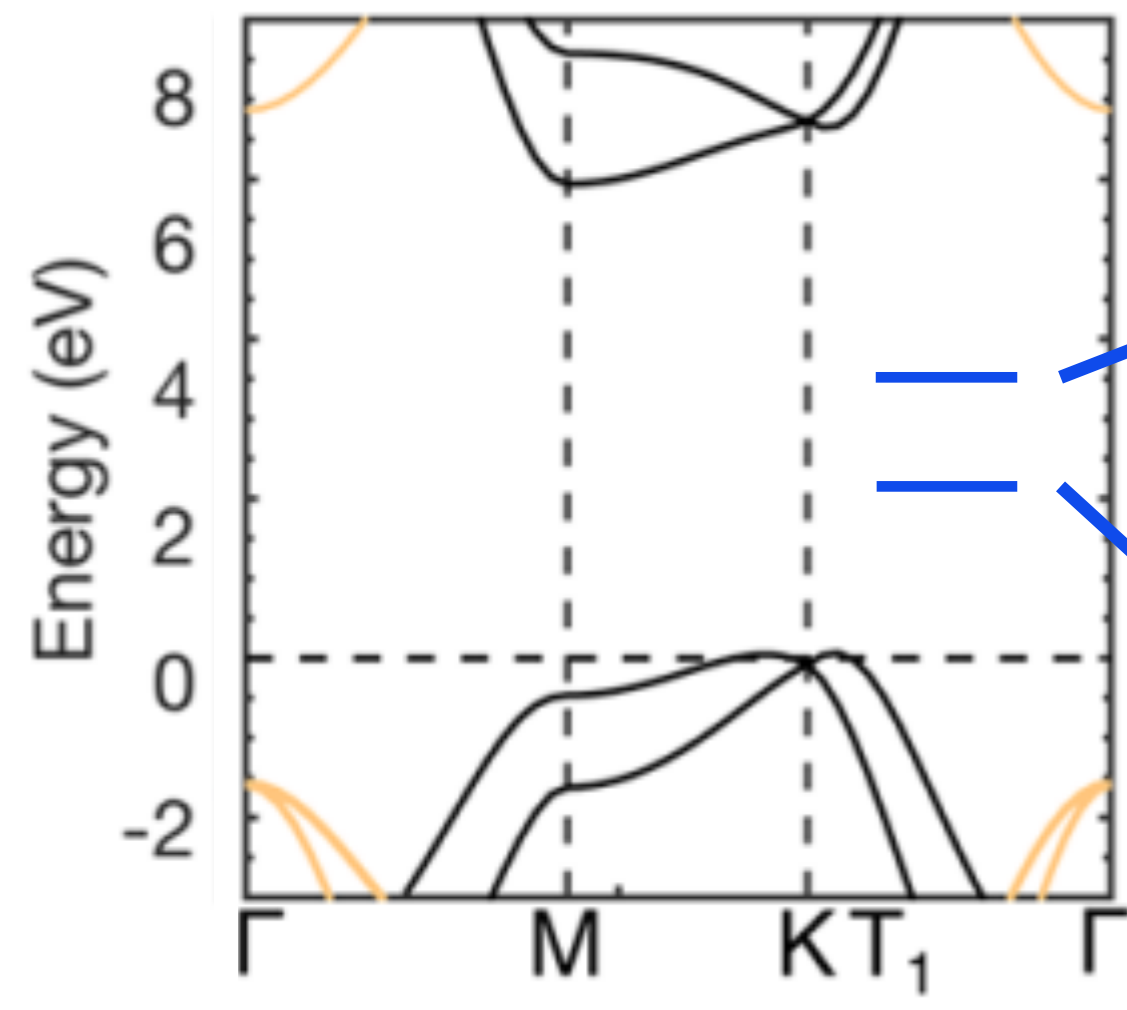
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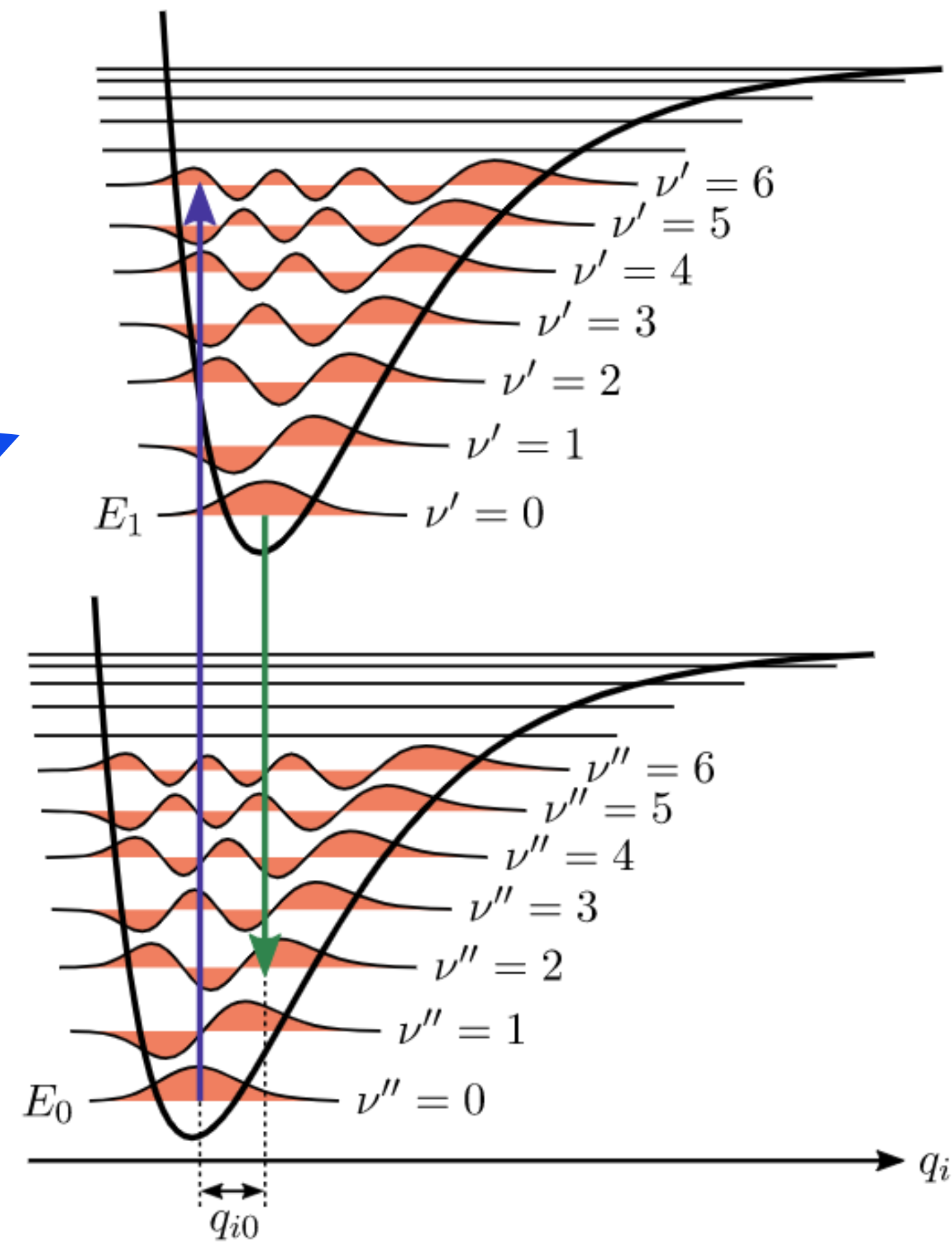
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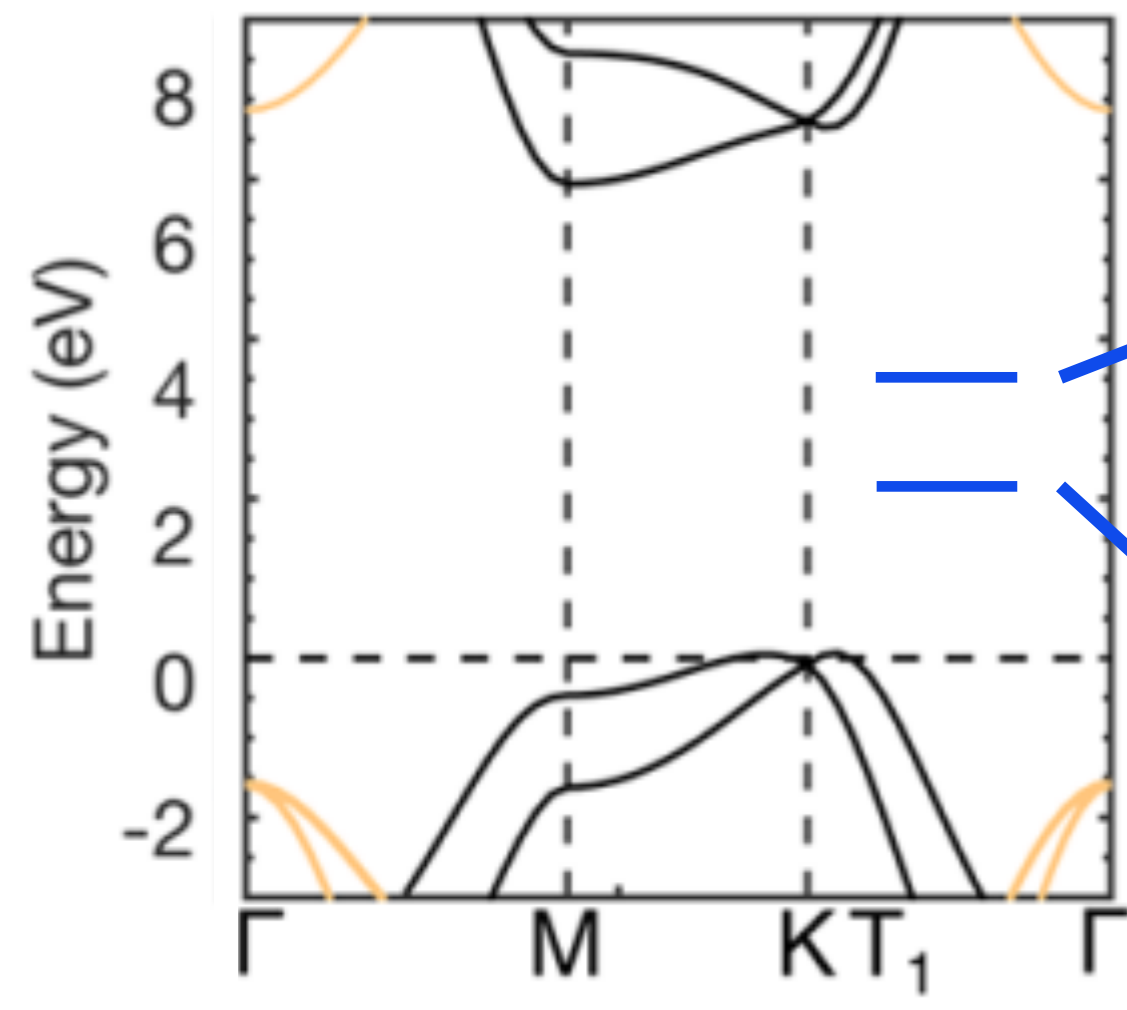
Wickramaratne et al, 2018



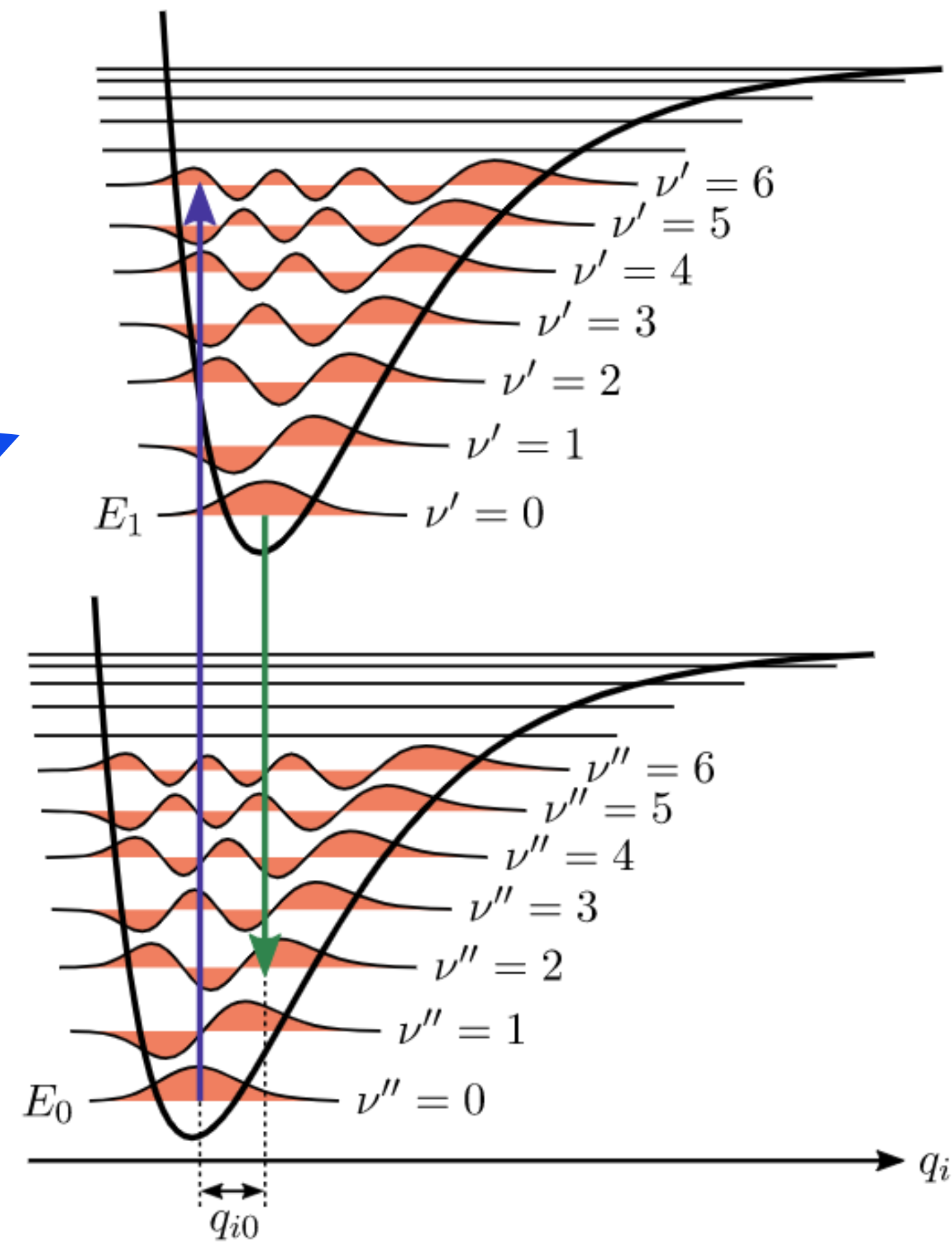
Wickramaratne et al, 2018



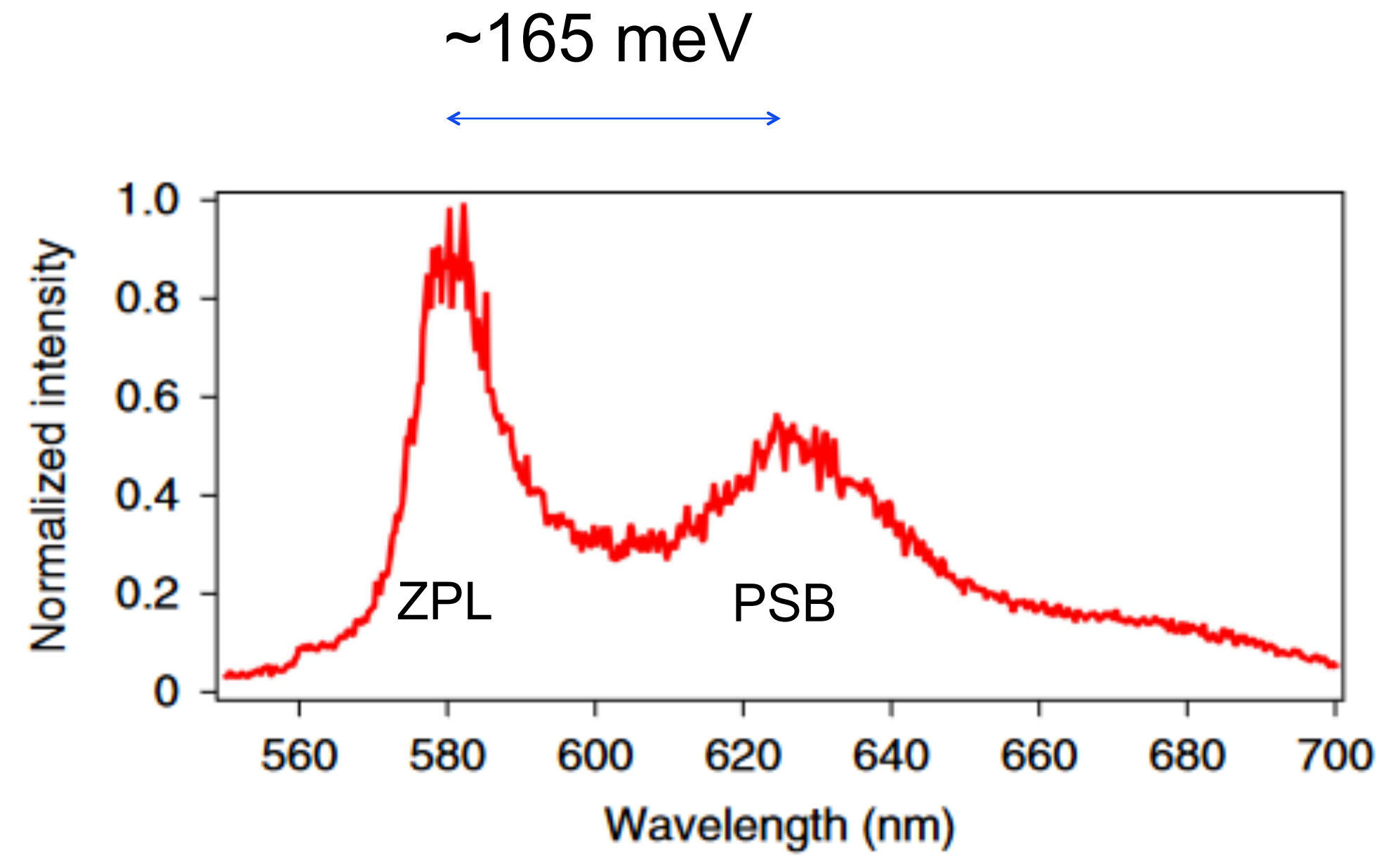
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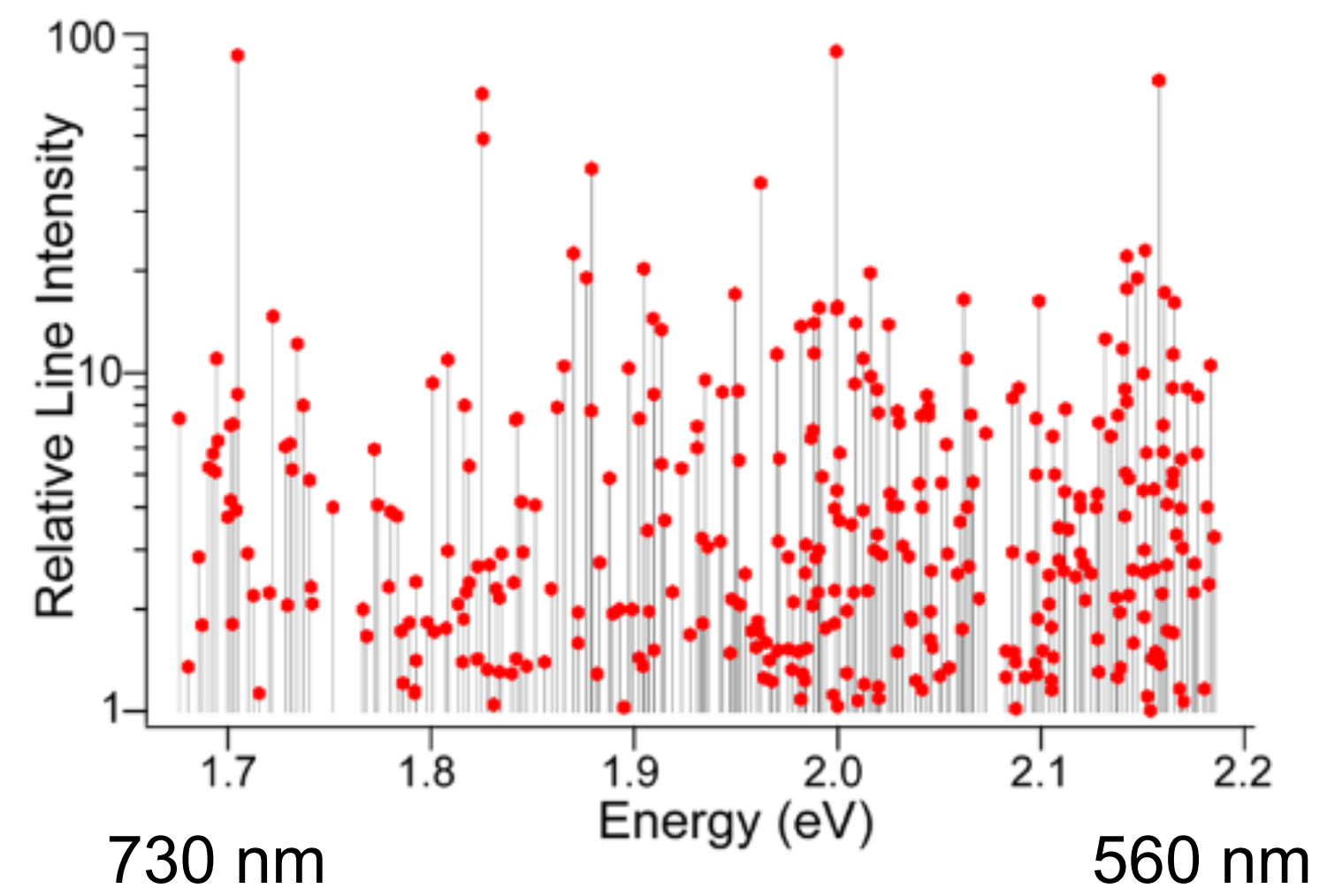
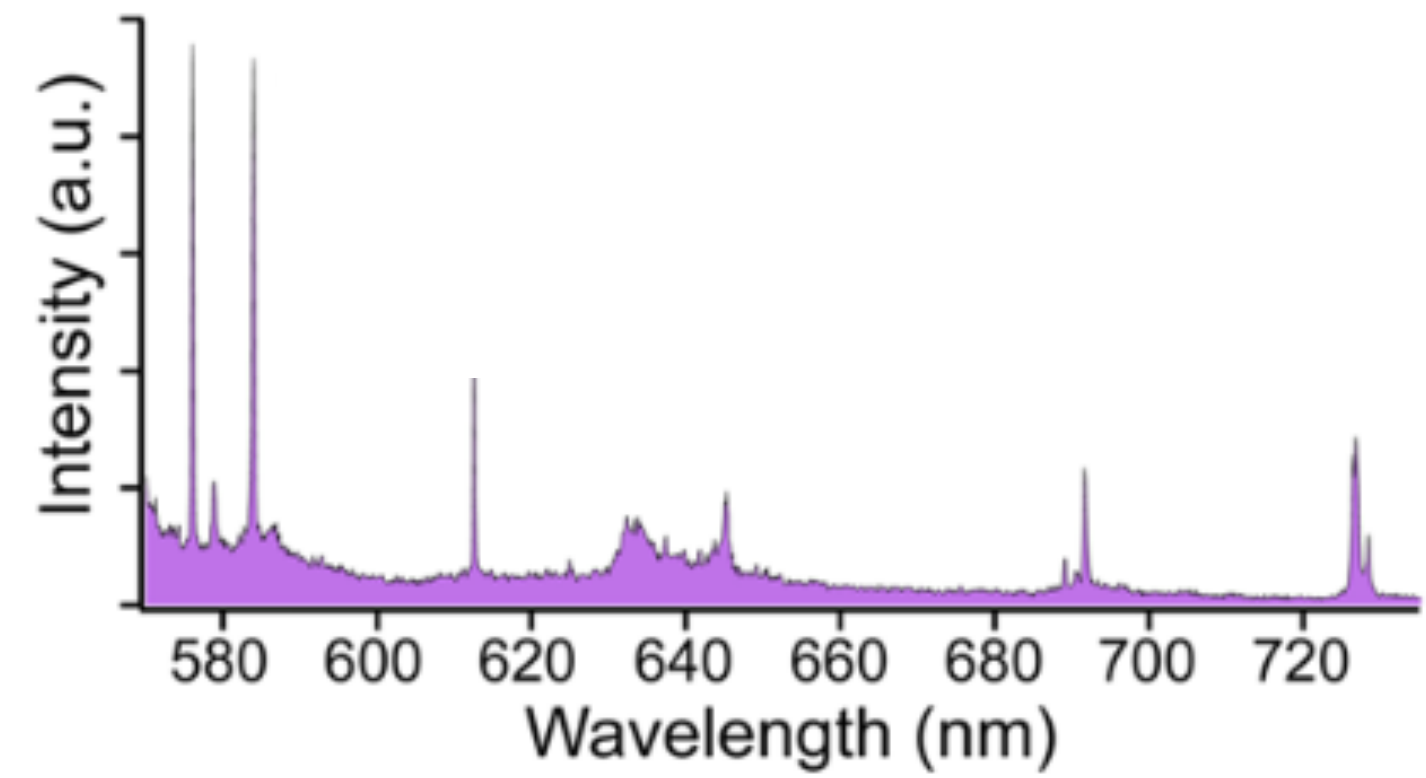
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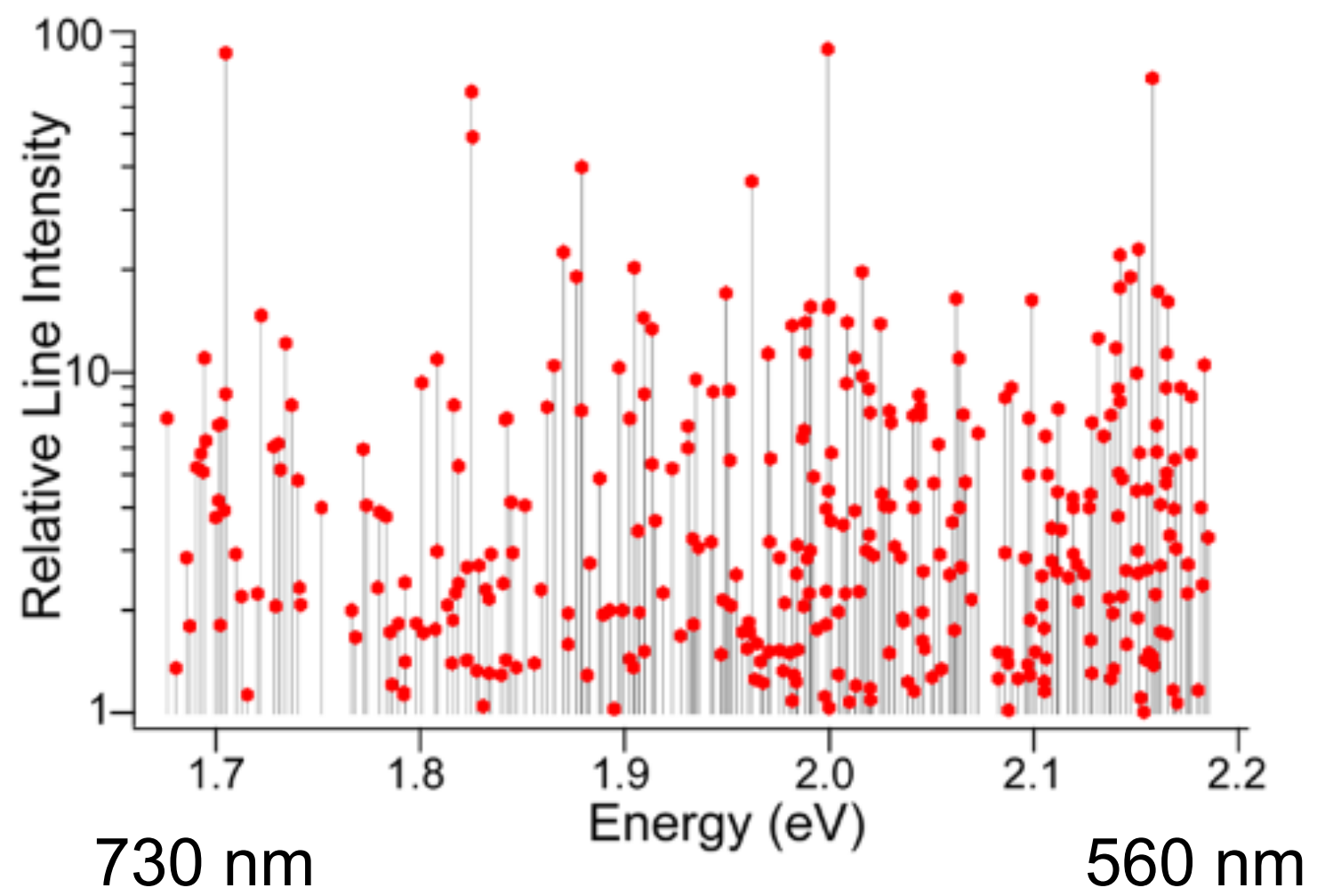
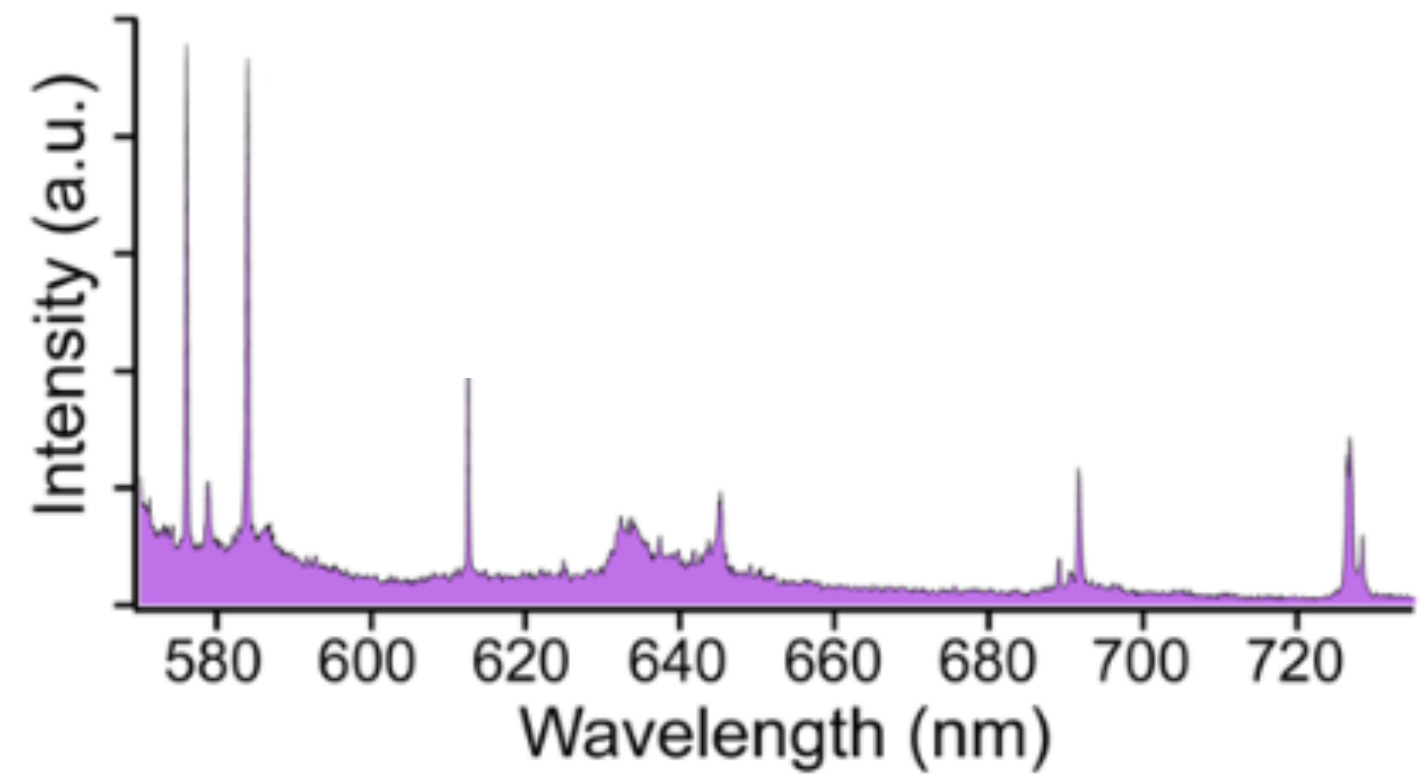
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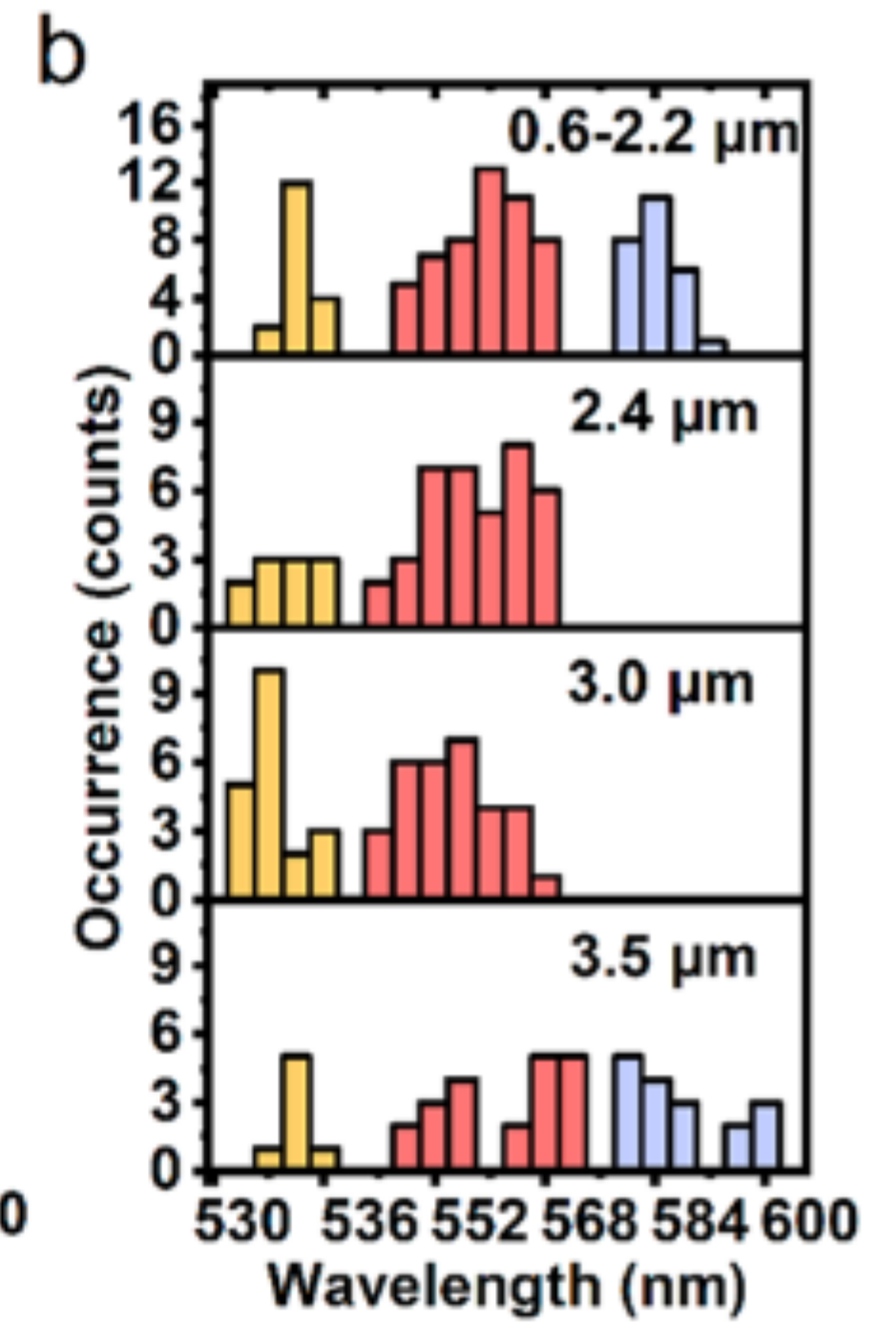
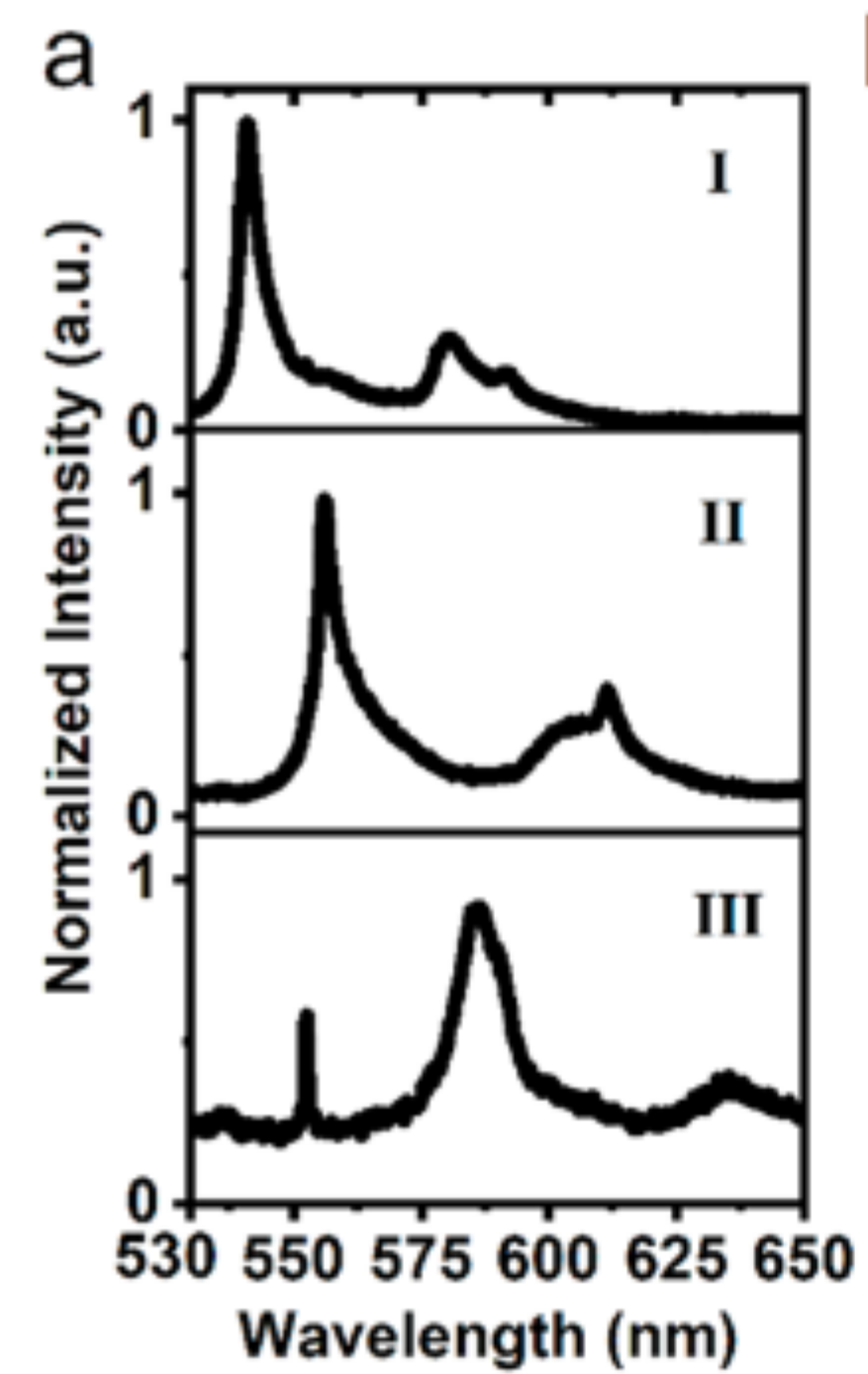
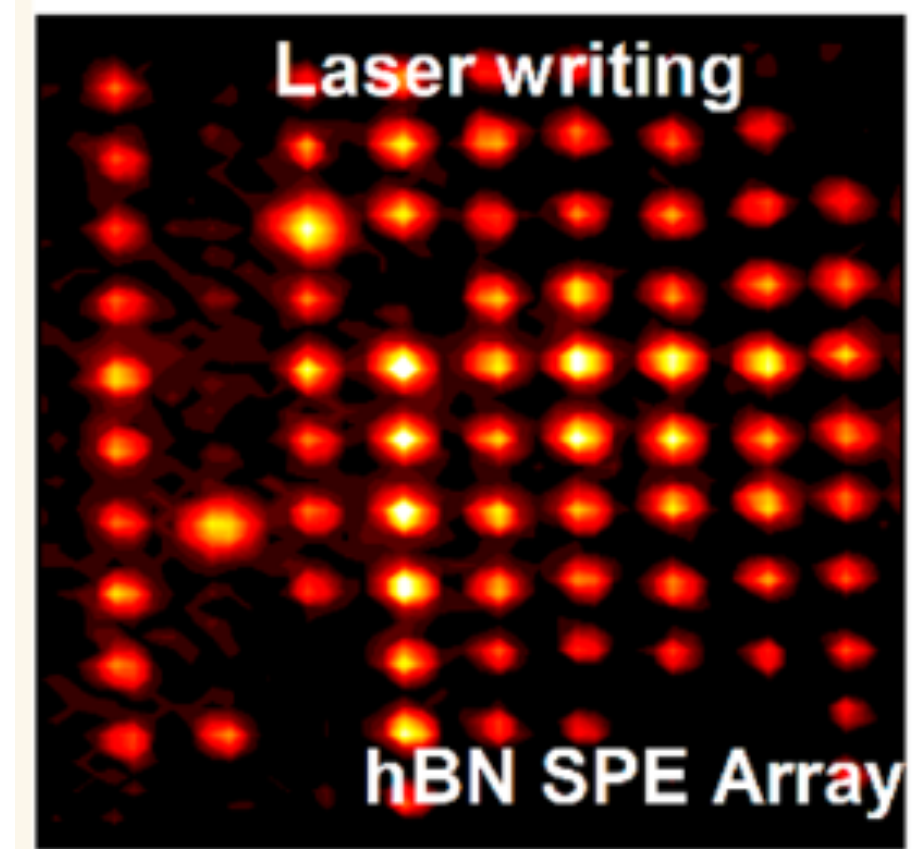
Mendelson et al, 2021



Jungwirth et al, 2016

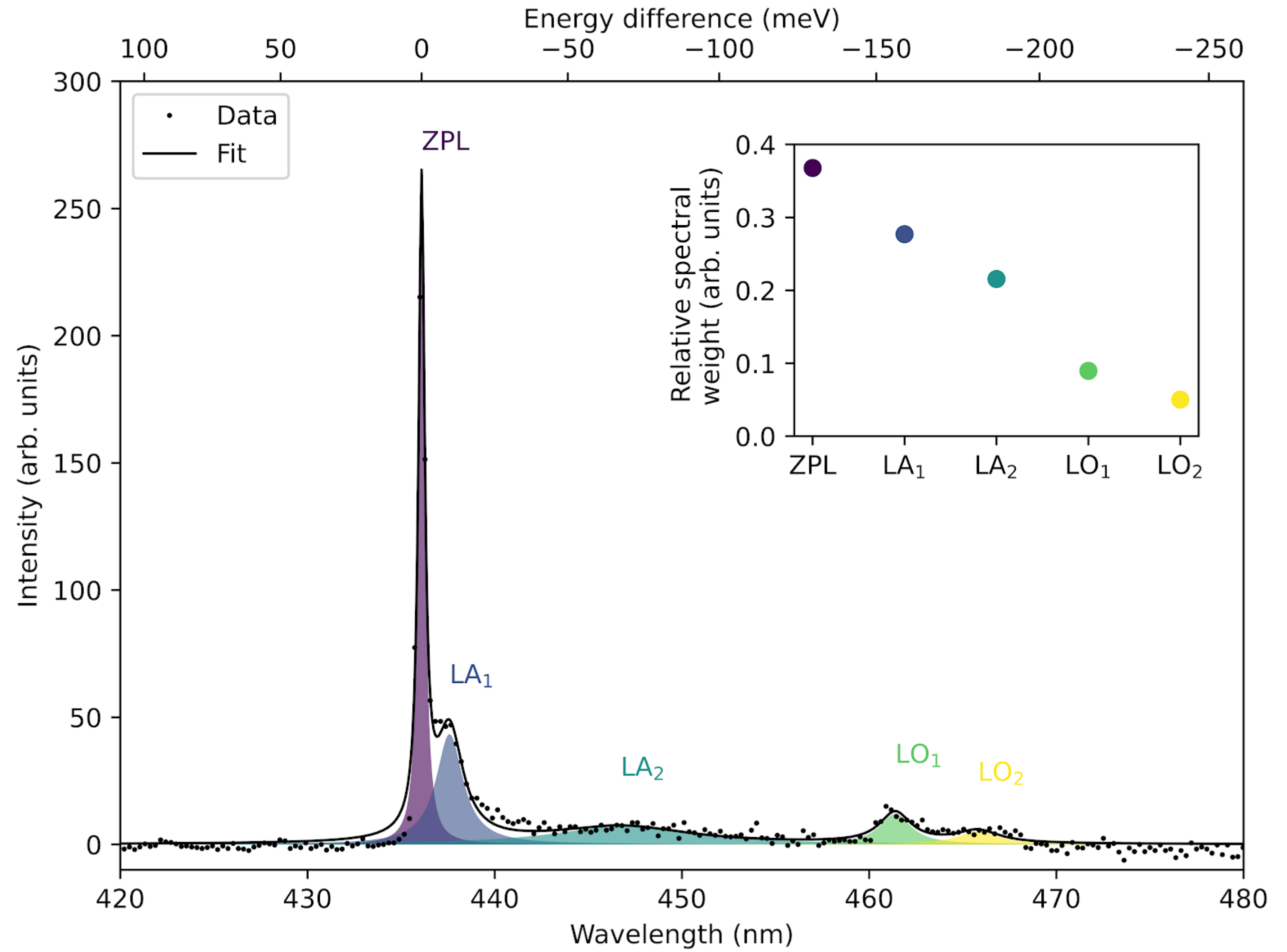
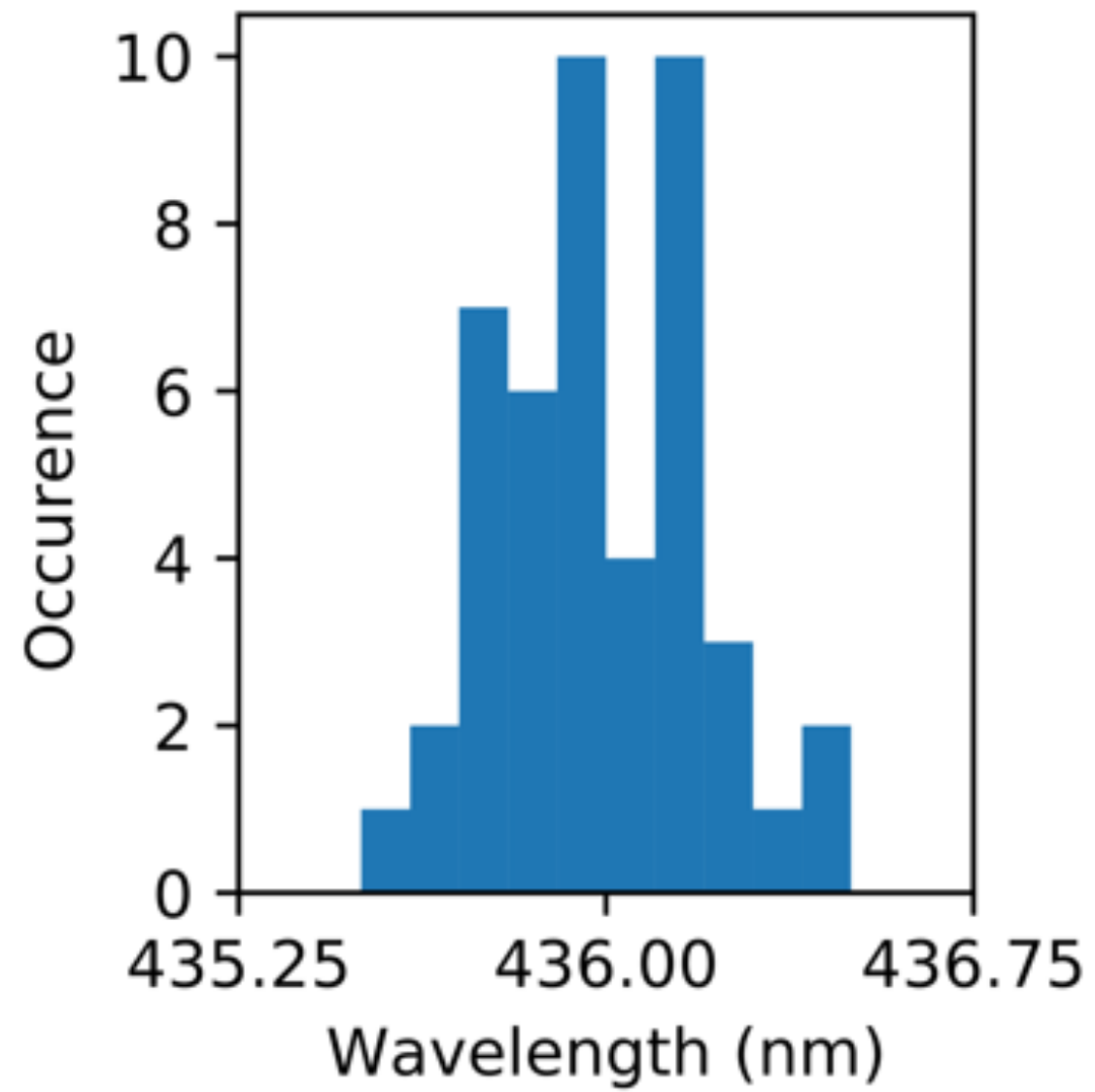
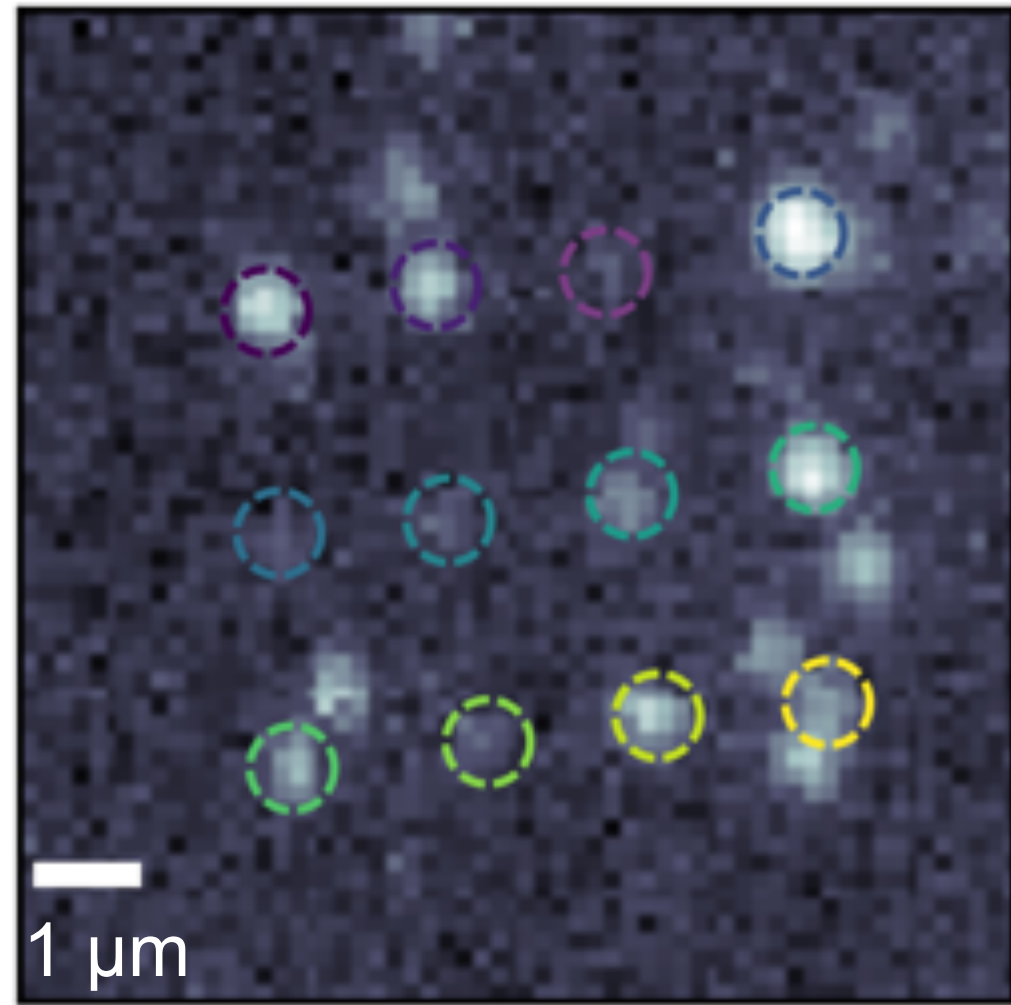


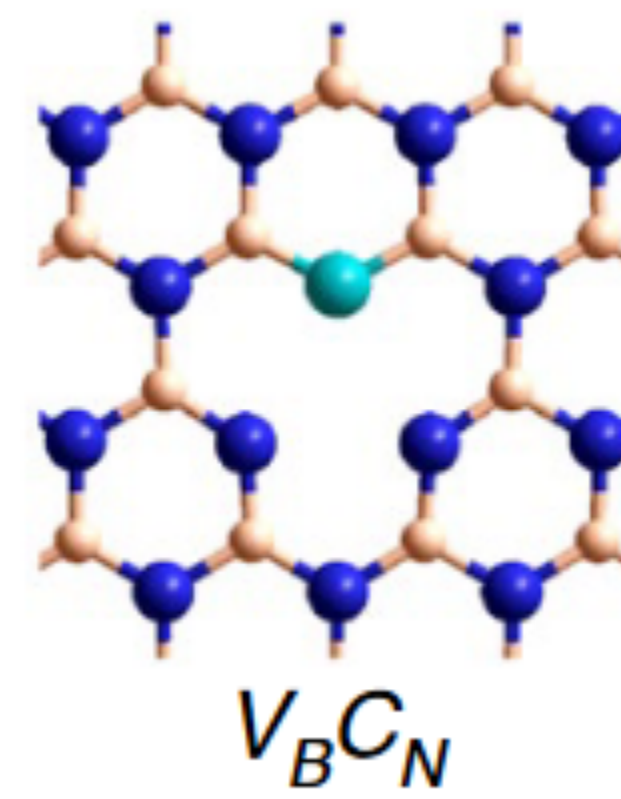
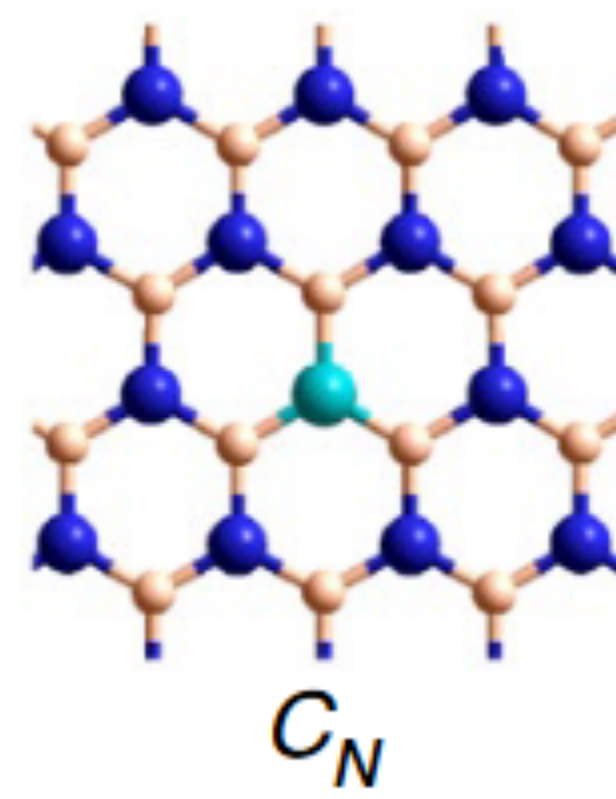
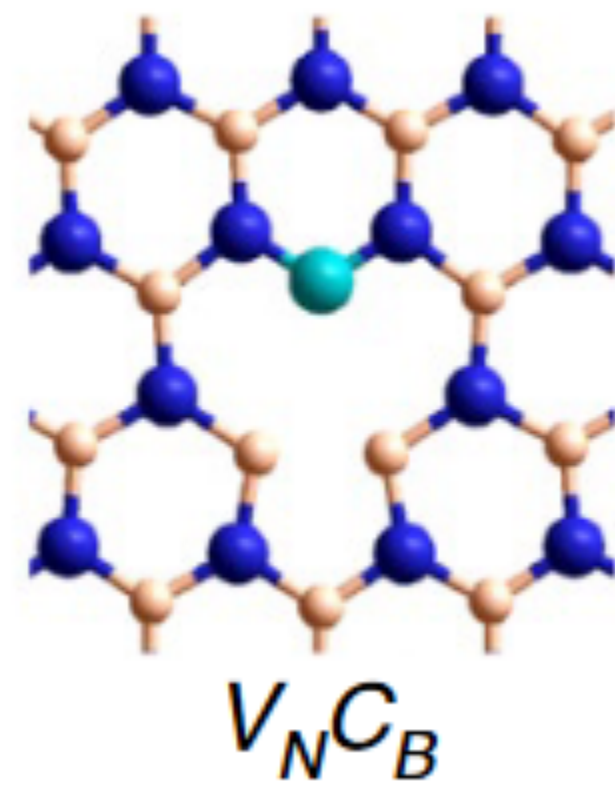
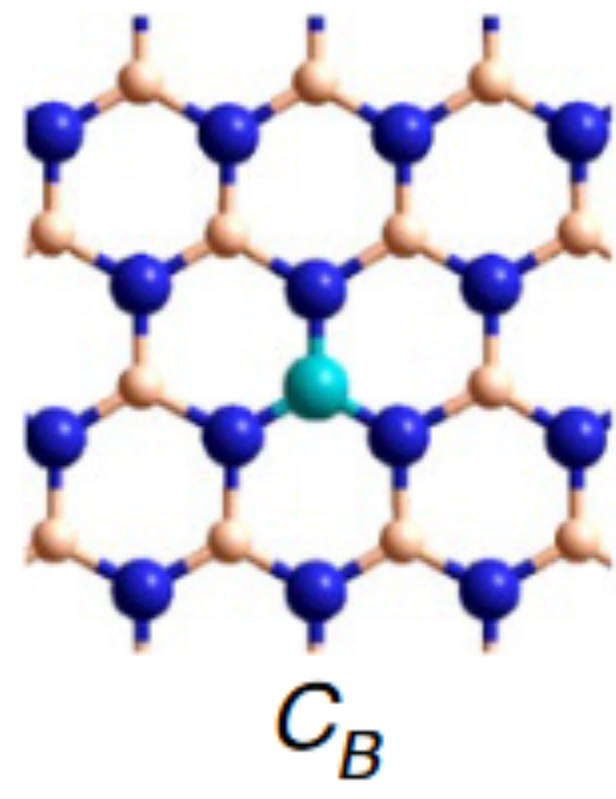
Jungwirth et al, 2016



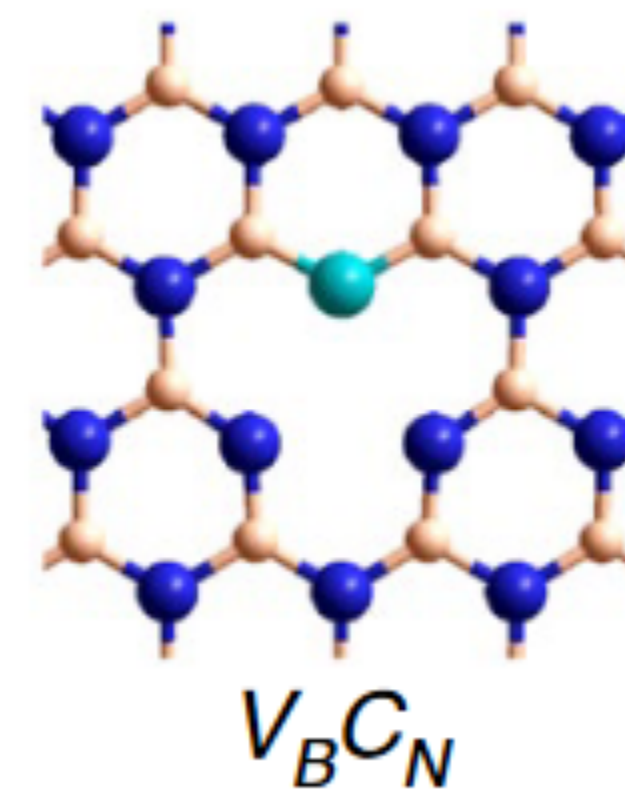
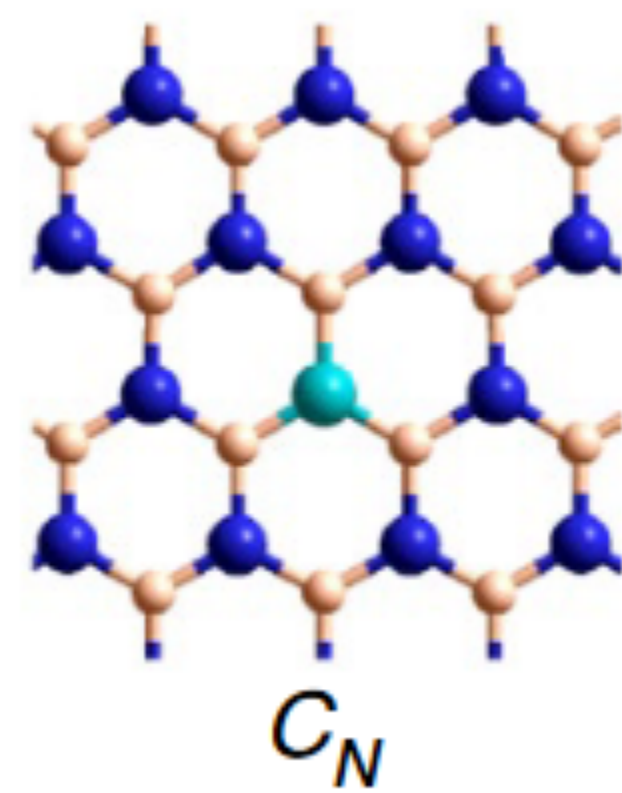
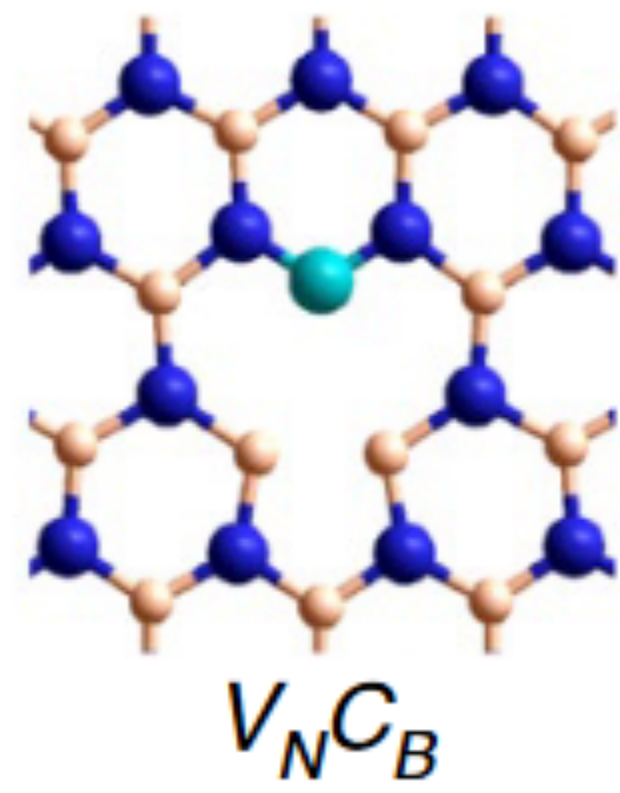
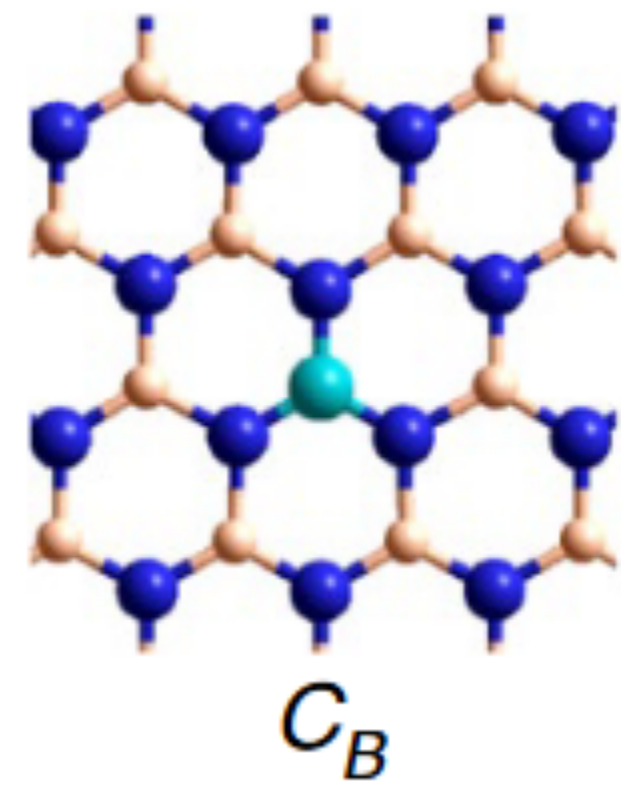
Gan et al, 2022

Non-resonant spectroscopy @ 5 K

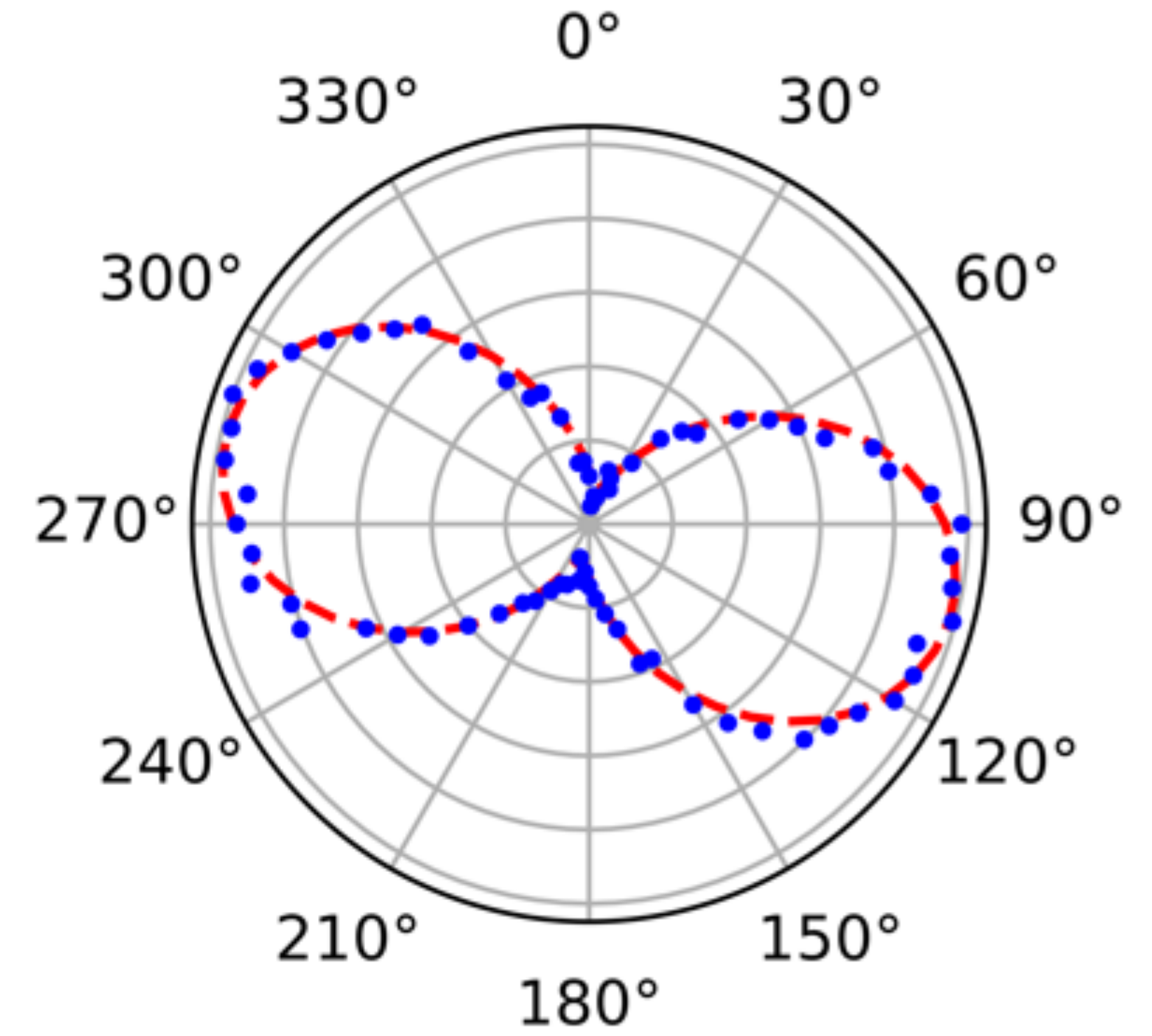
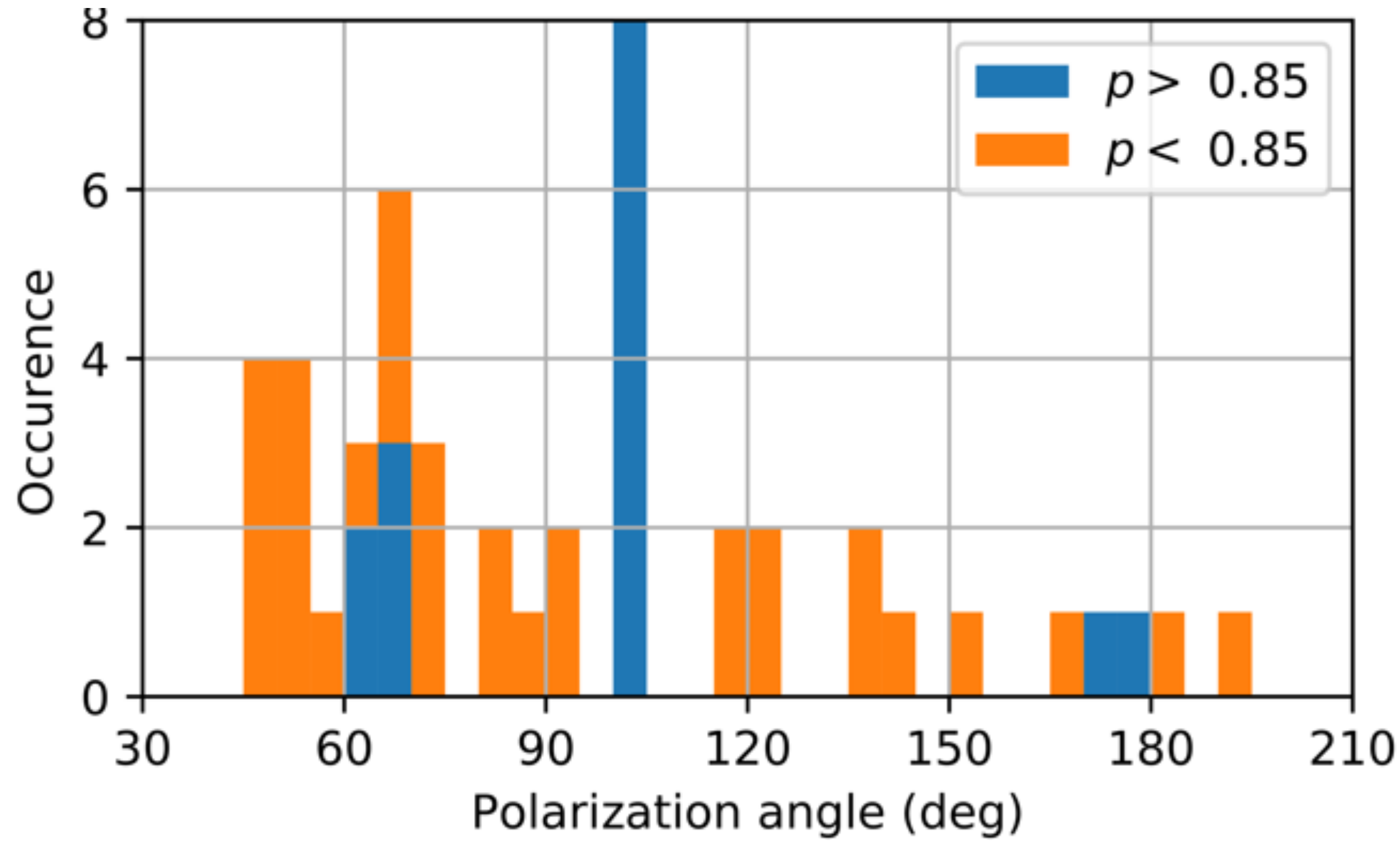


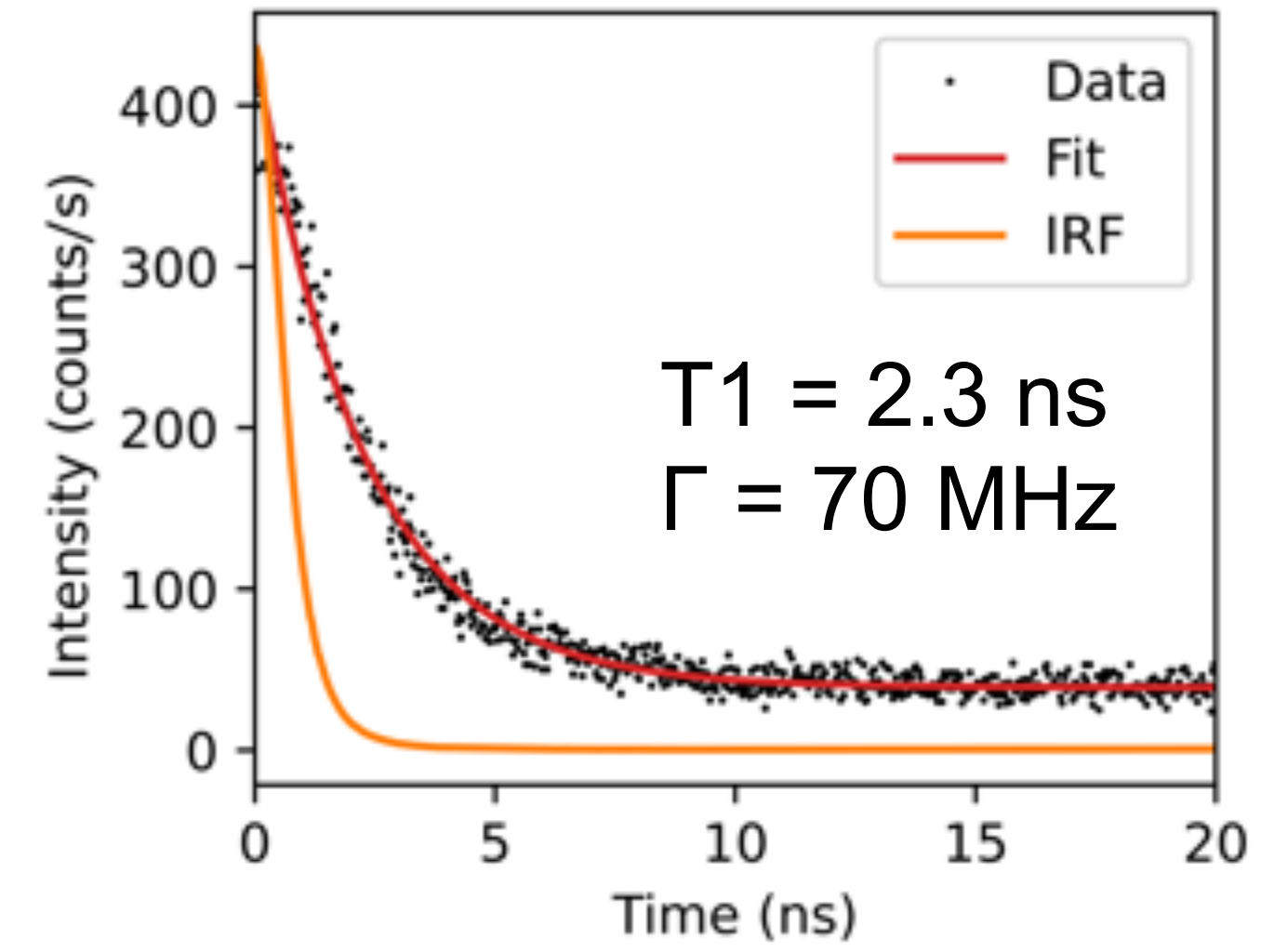


Mendelson et al, 2021

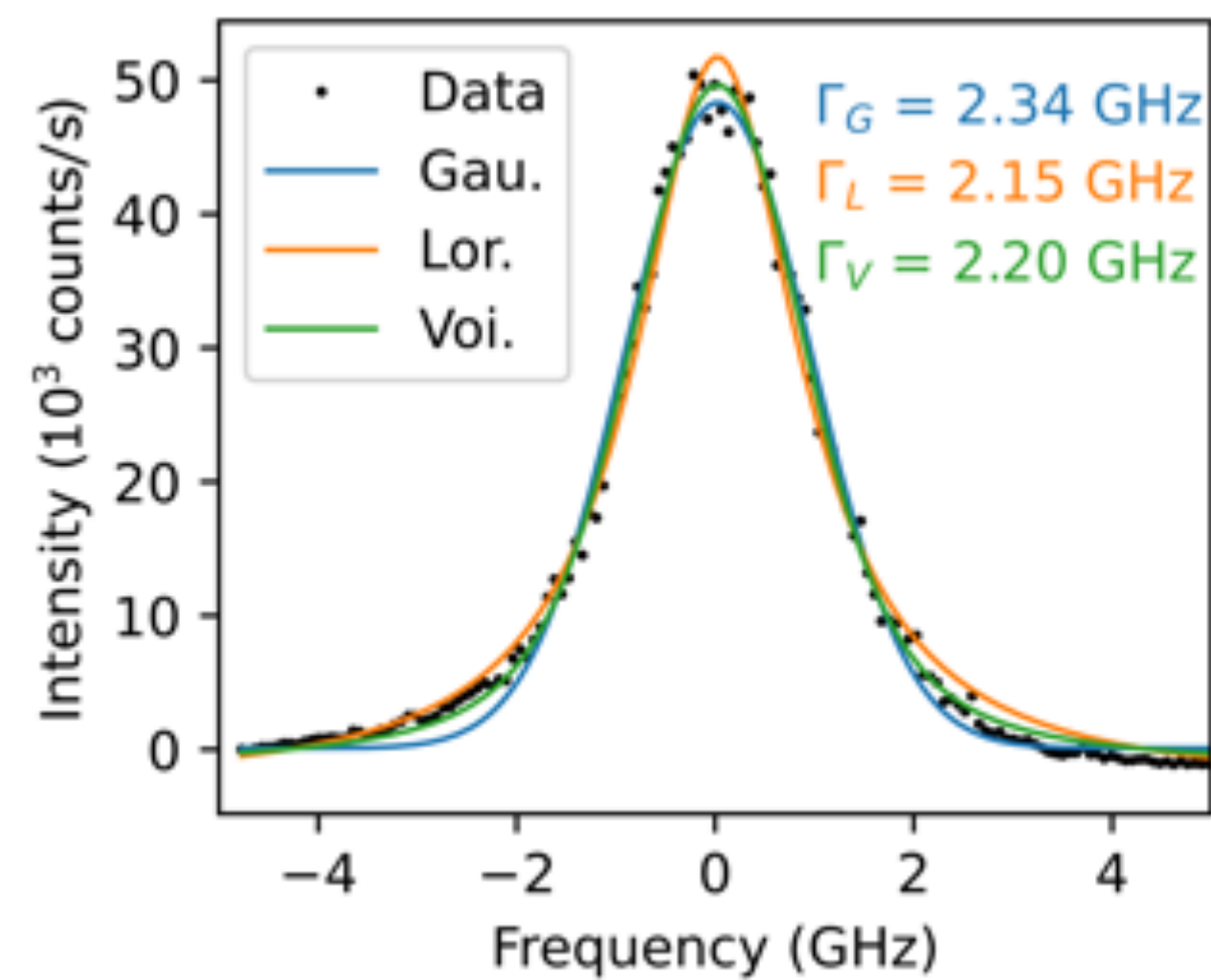
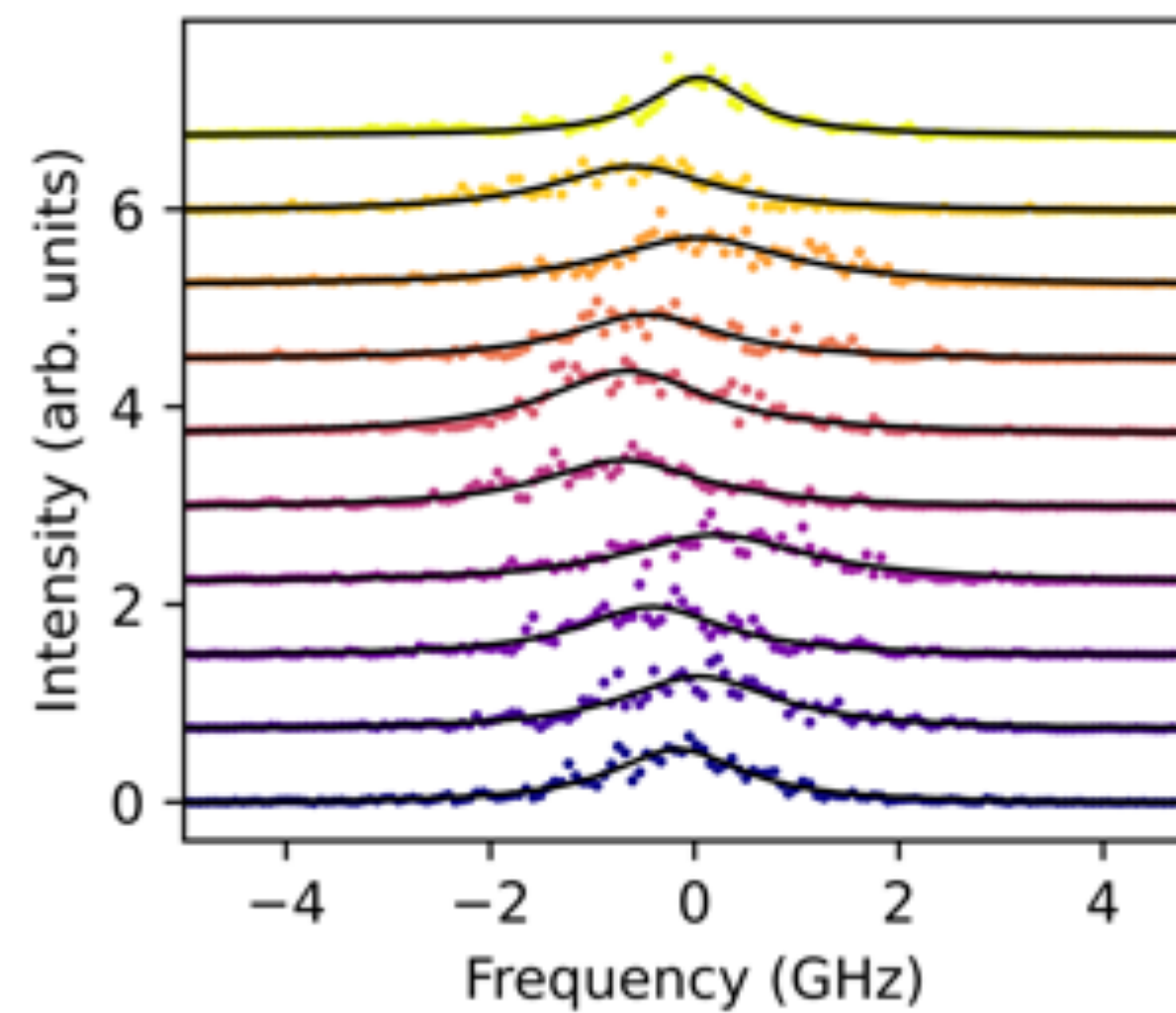
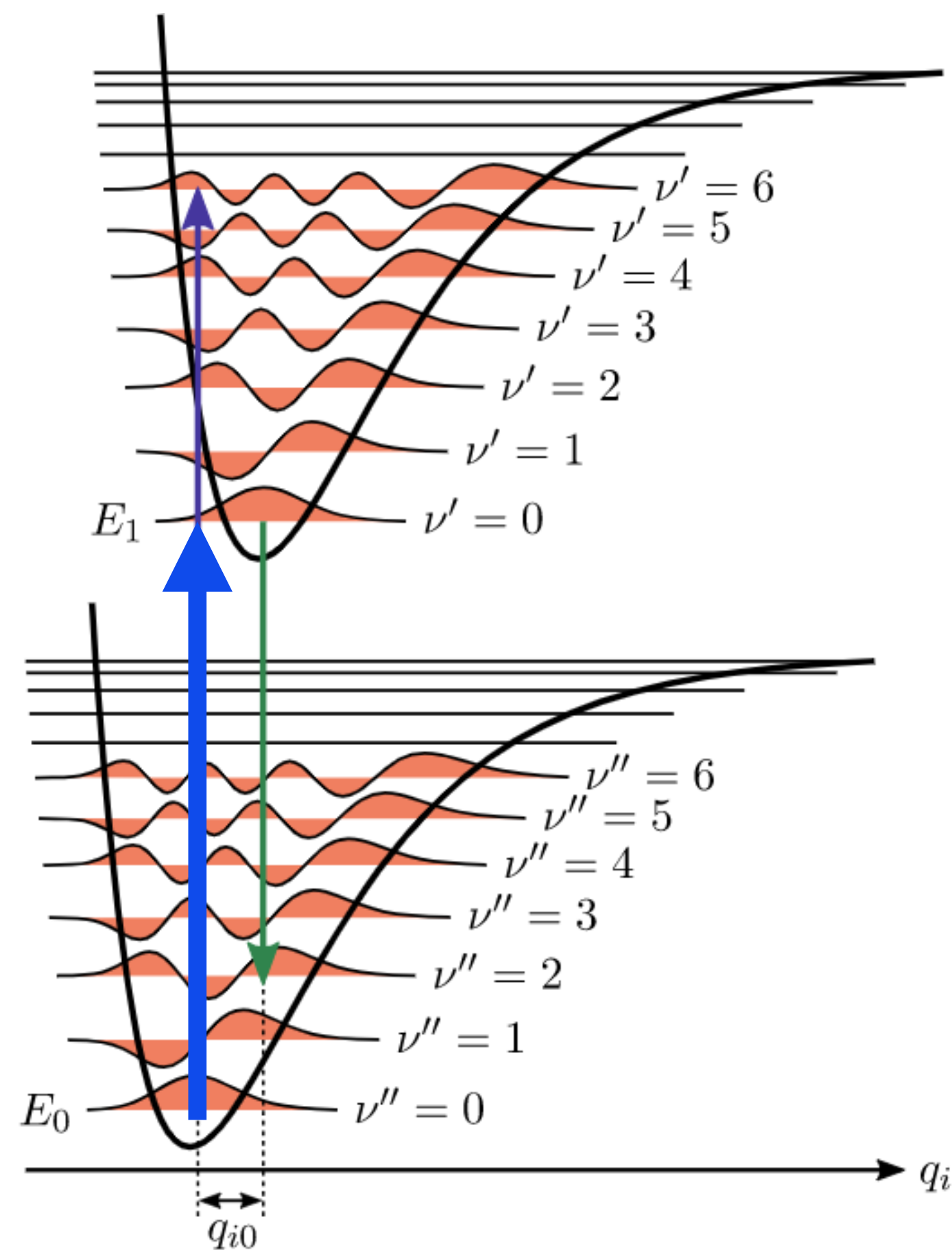
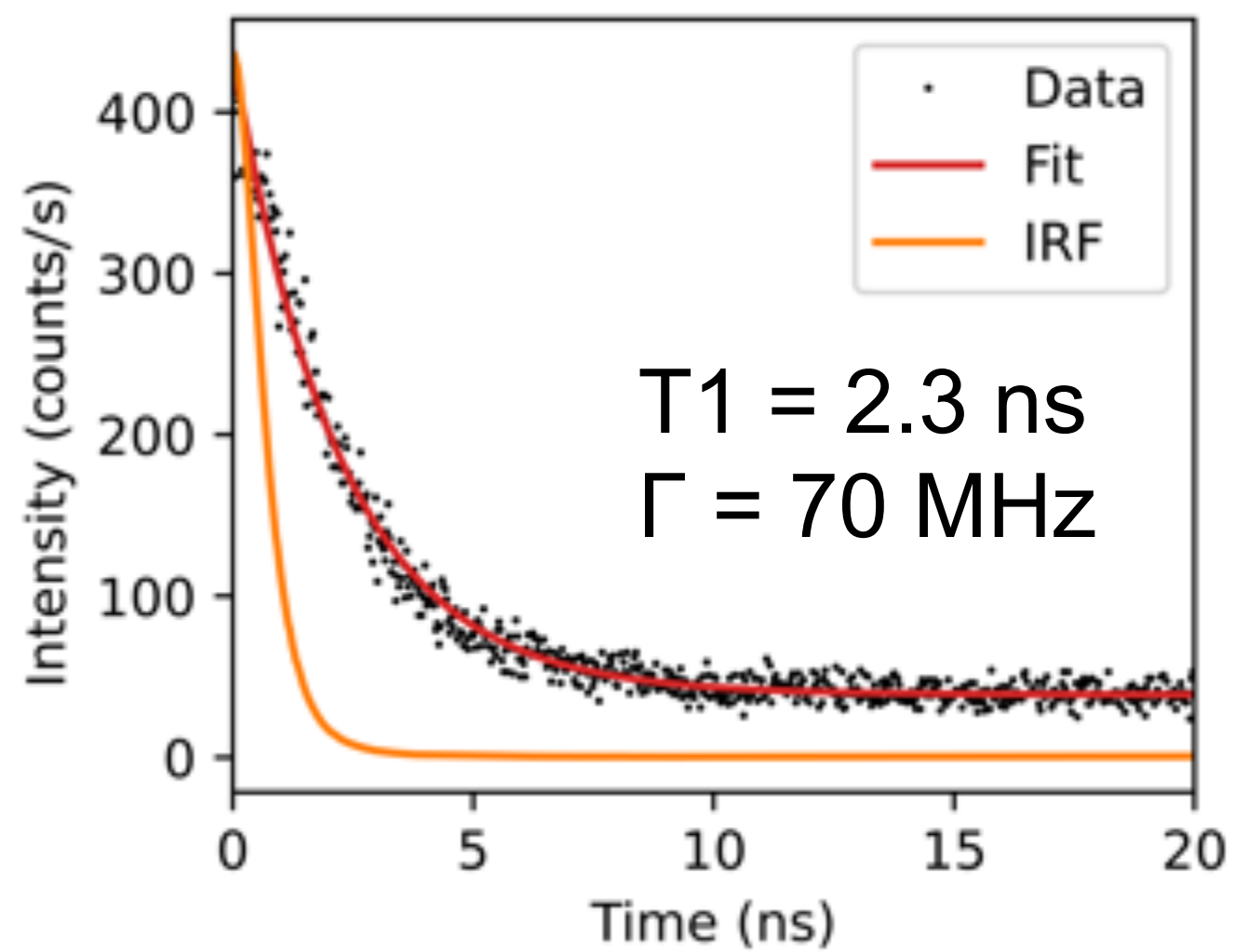


Mendelson et al, 2021





Resonant spectroscopy @ 5 K



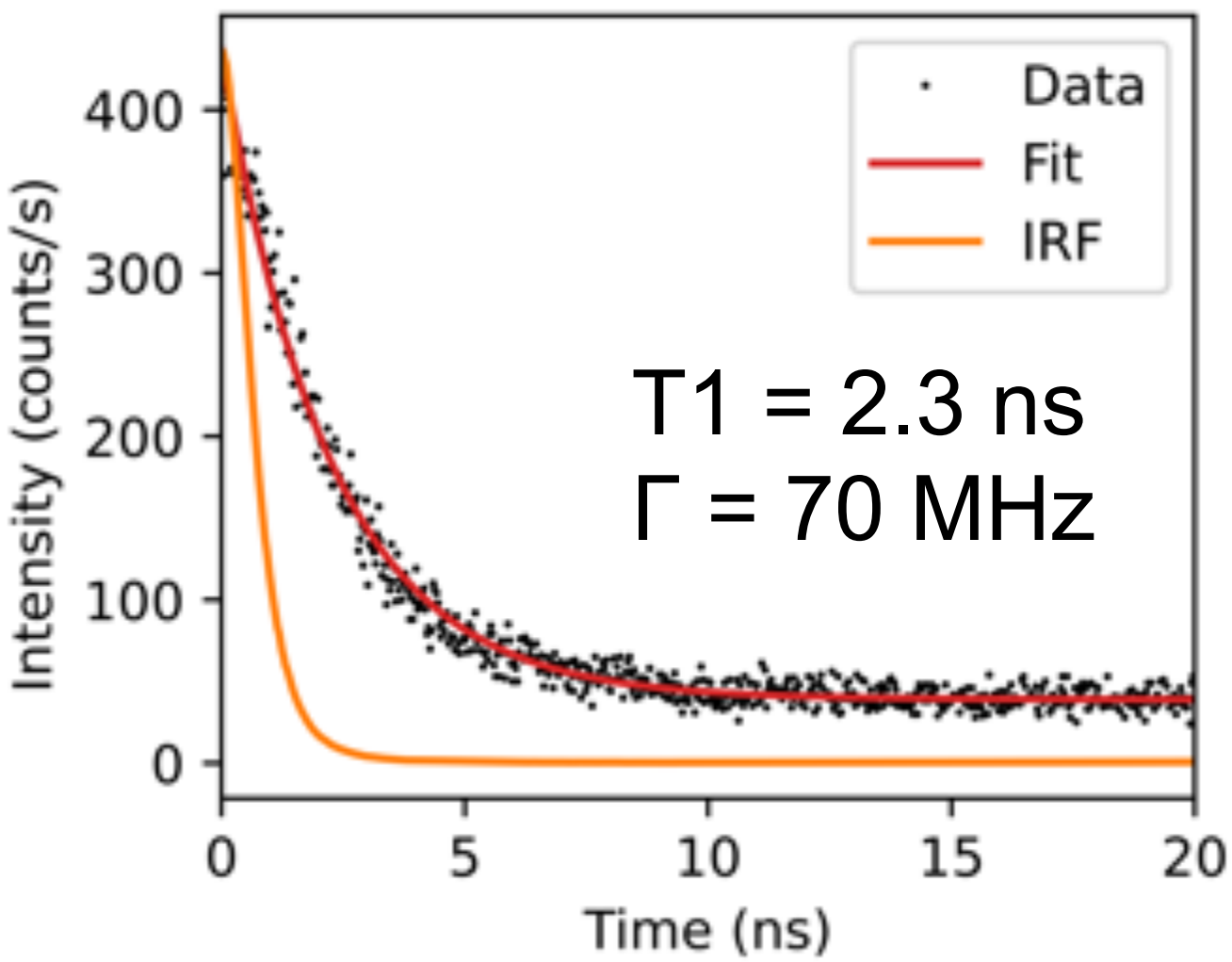
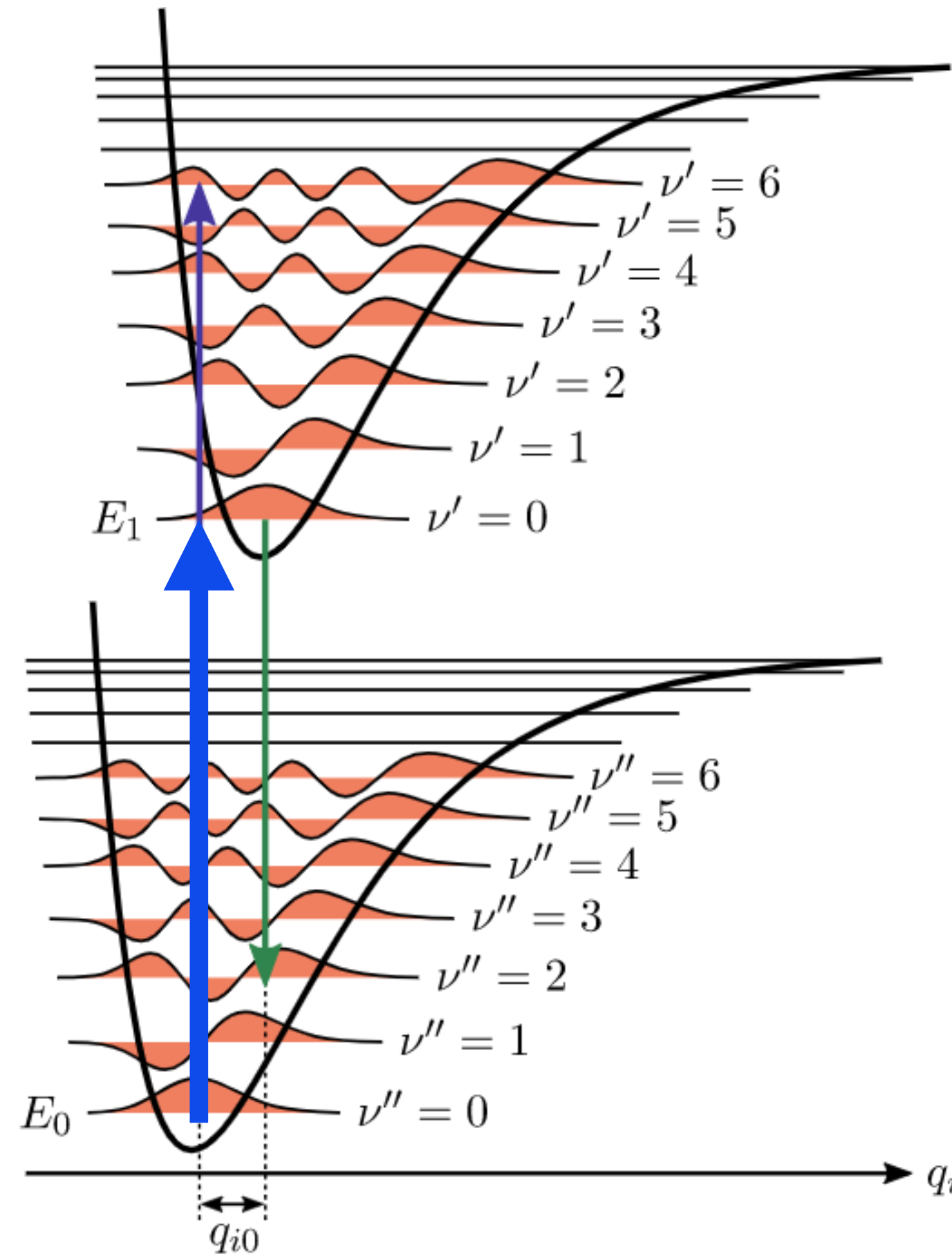
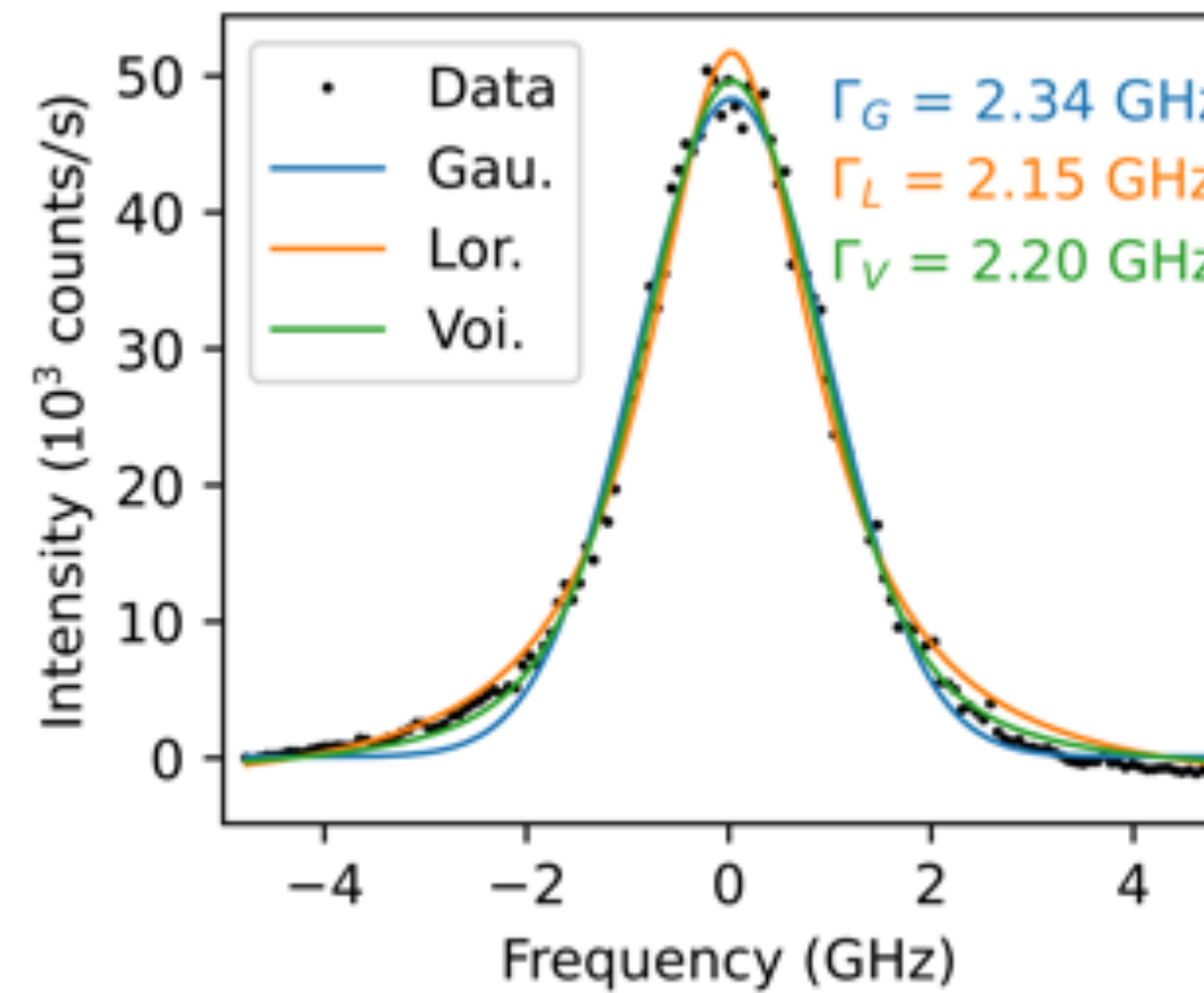
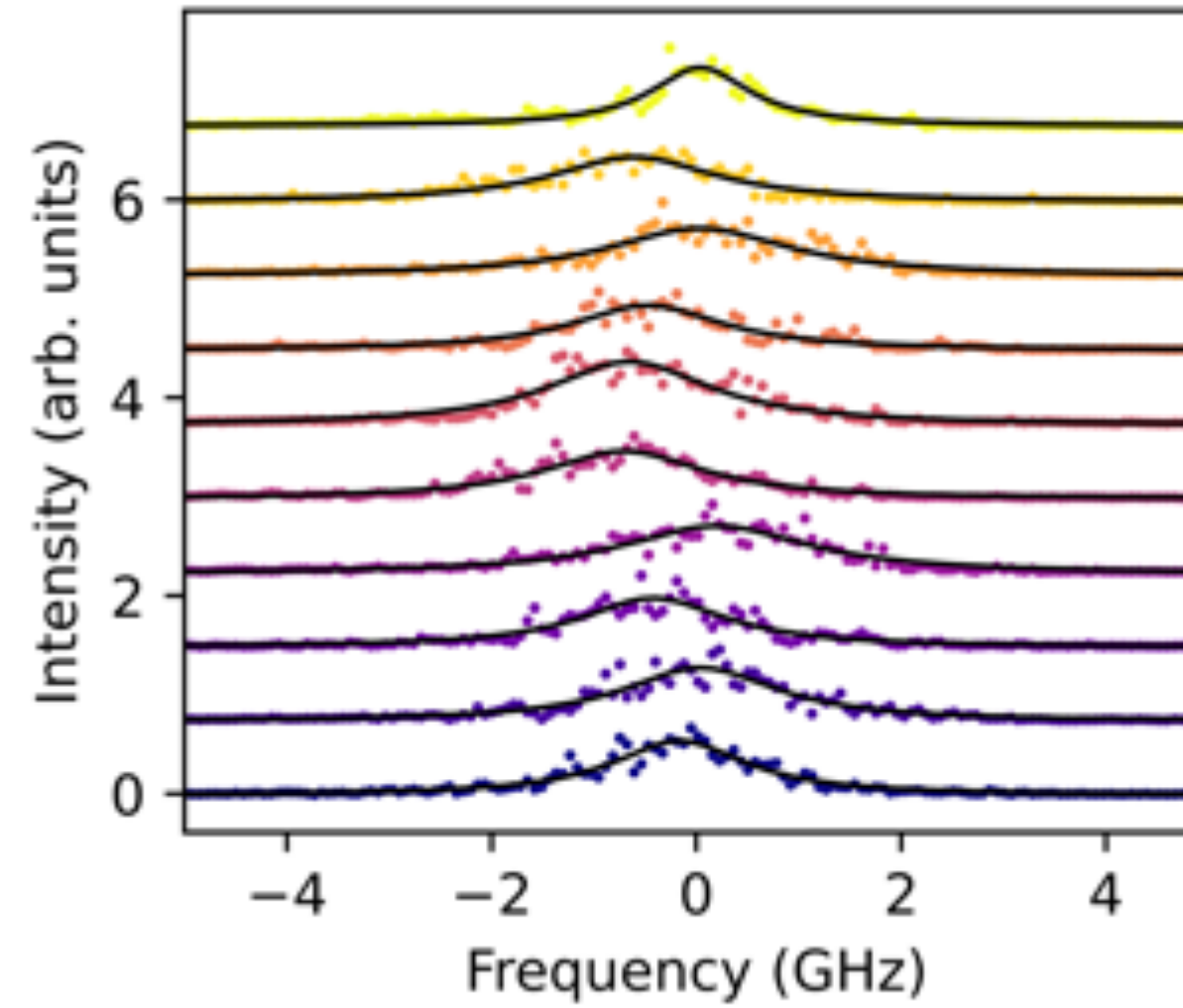
Resonant spectroscopy @ 5 K

What determines linewidth?

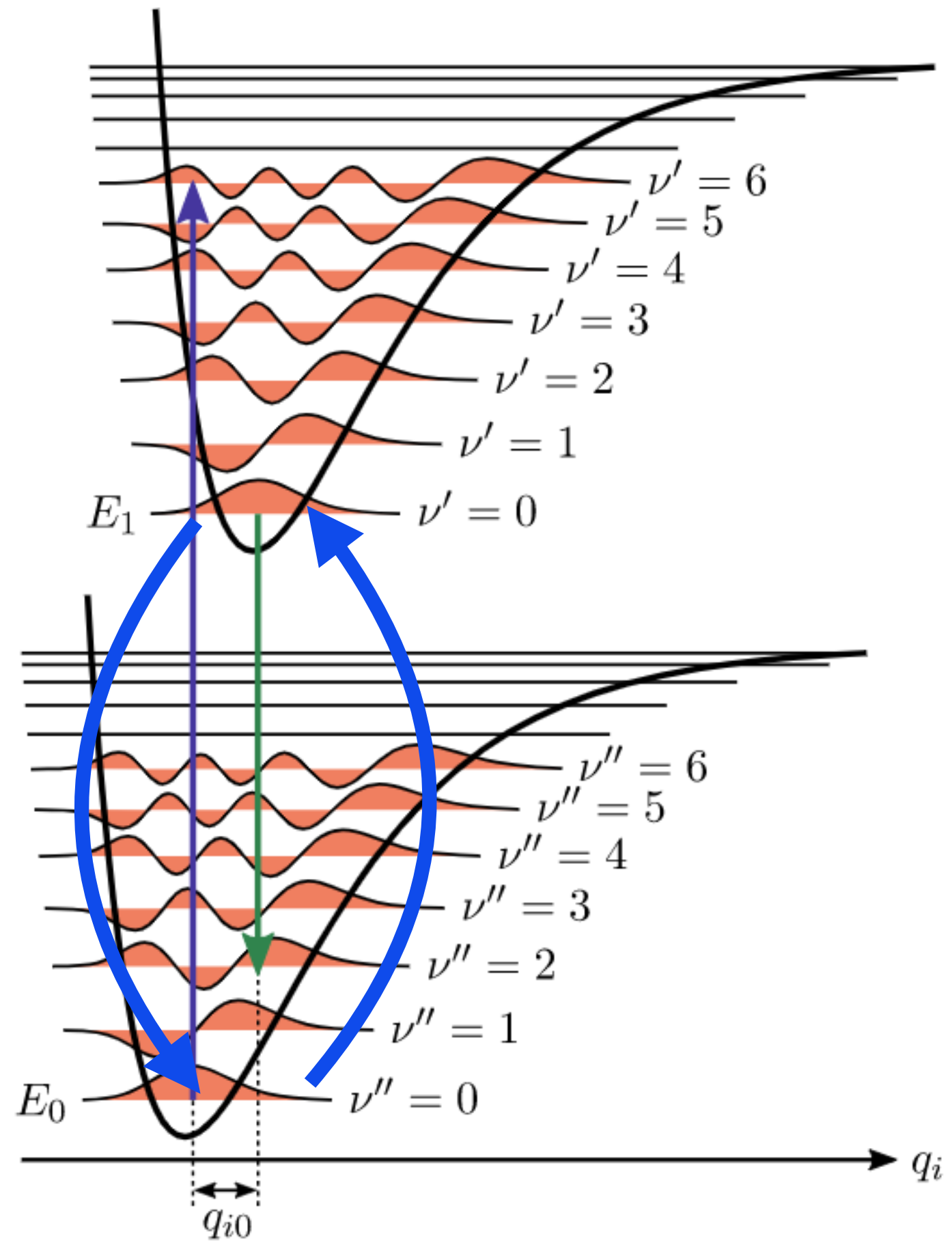
Natural LW
↓
Lorentzian

Phonon-broadened
↓
Lorentzian

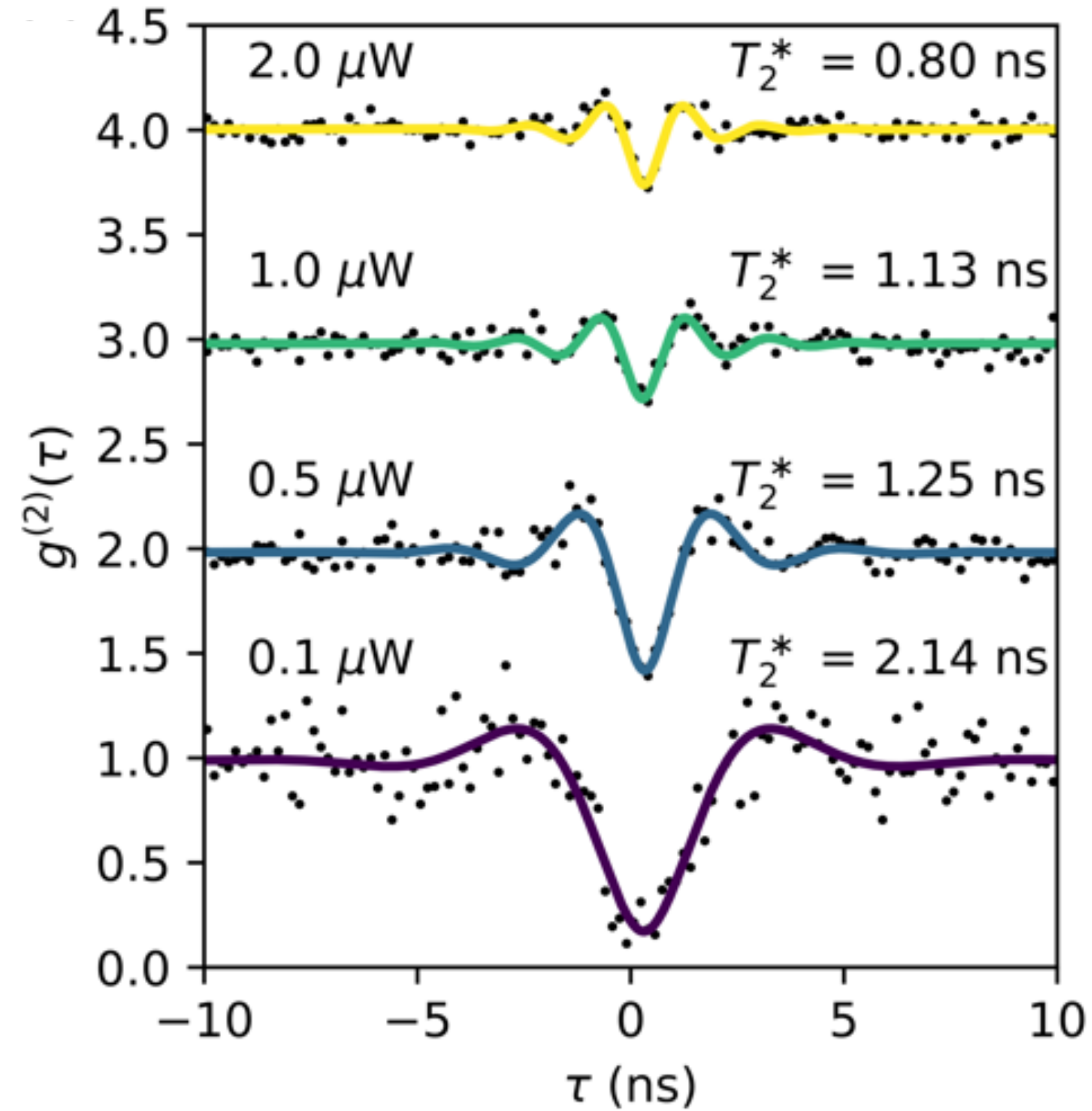
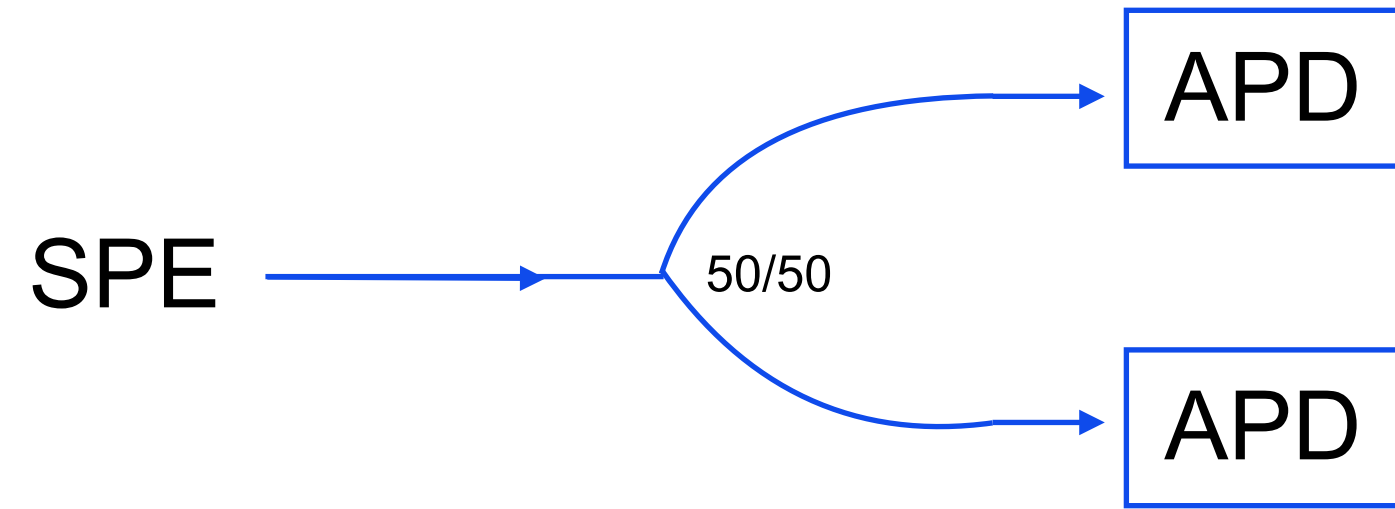
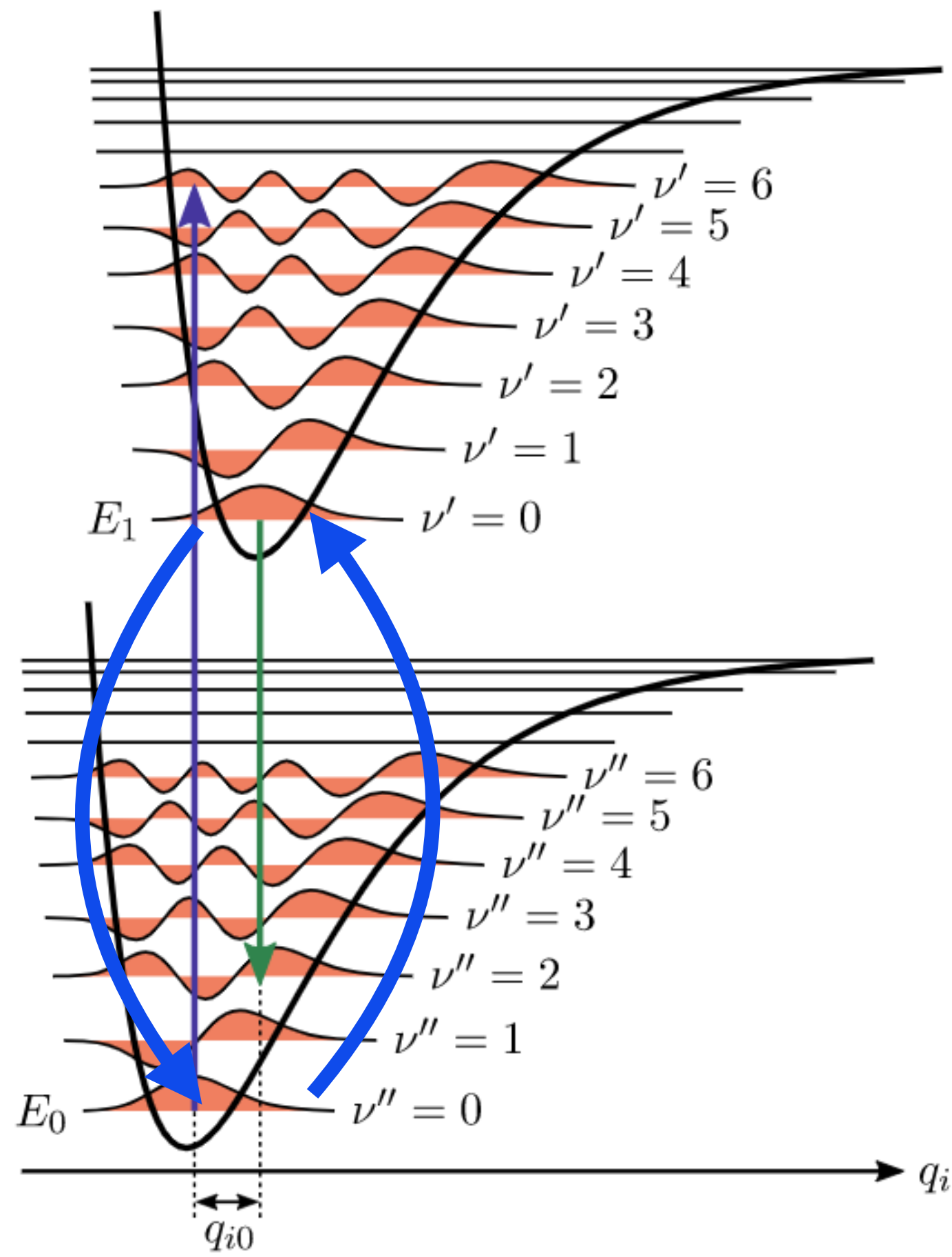
Spectral diffusion
↓
Gaussian



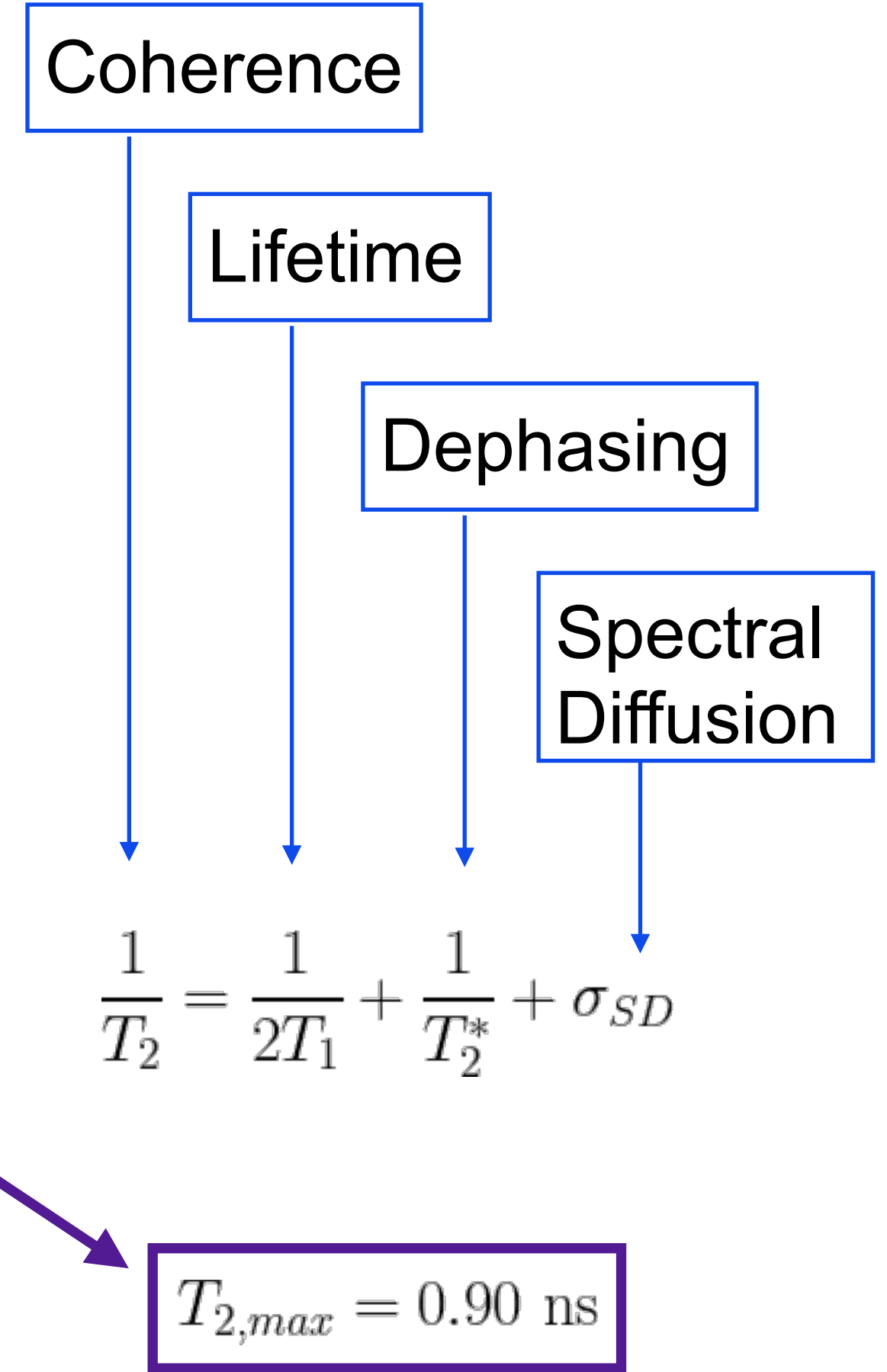
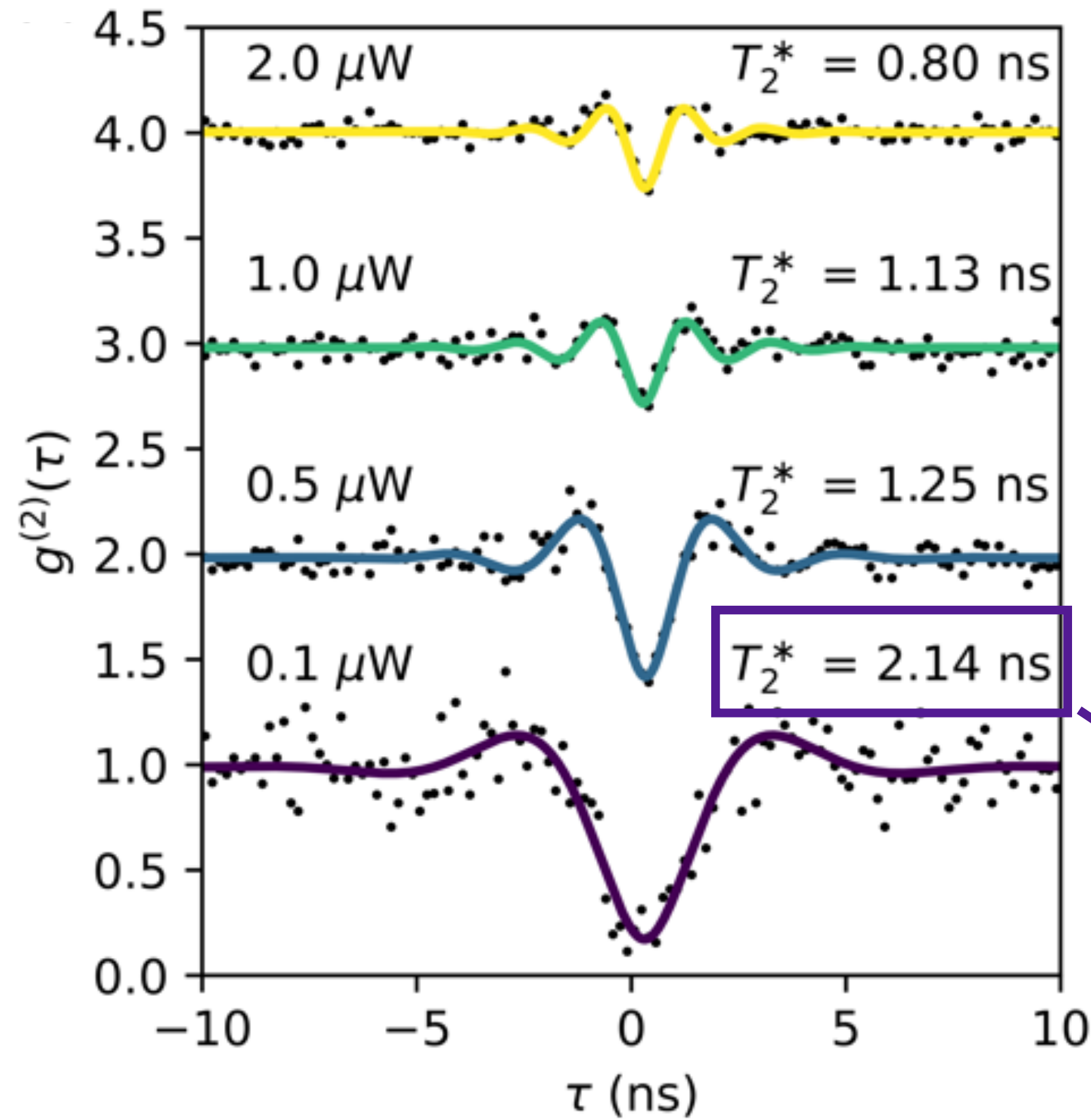
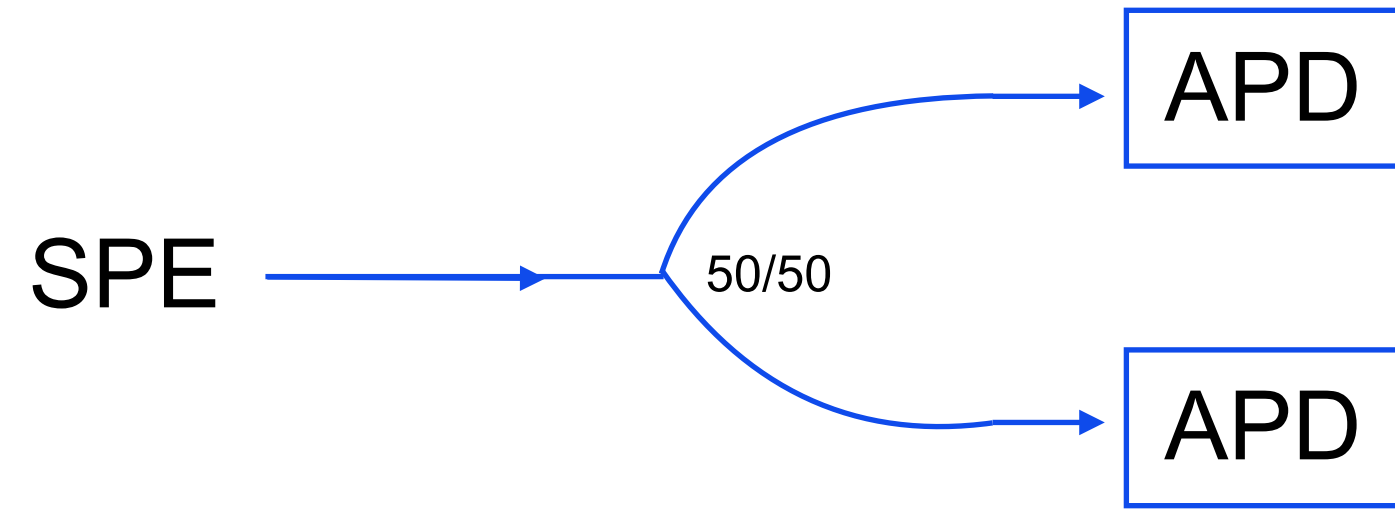
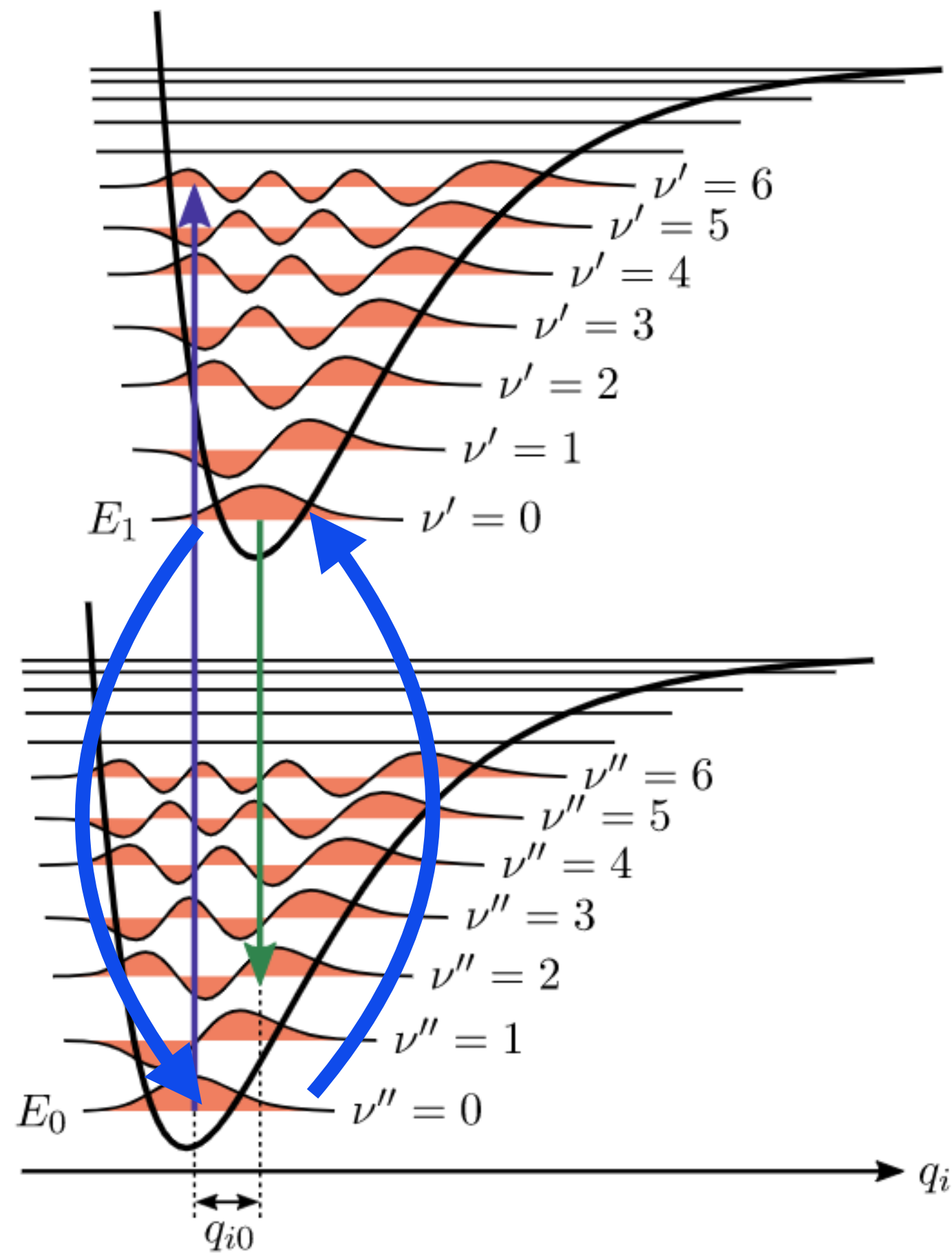
Strong-field limit



Strong-field limit



Strong-field limit



Editors' Suggestion

Coherence Properties of Electron-Beam-Activated Emitters in Hexagonal Boron Nitride Under Resonant Excitation

Jake Horder, Simon J.U. White, Angus Gale, Chi Li, Kenji Watanabe, Takashi Taniguchi, Mehran Kianinia, Igor Aharonovich, and Milos Toth

Phys. Rev. Applied **18**, 064021 – Published 8 December 2022

Next Steps:

- Reduce linewidth broadening mechanisms
- Couple to cavity for Purcell enhancement
- Improve coherence and perform one/two photon interference

UTS Quantum Materials Group



- Blue emitter EBI creation: Angus Gale, R7 @ 5 pm TUE
- Stark shift of Blue ZPL: Ivan Zhigulin, R7 @ 3 pm WED
- Electrical control: Simon White, Hall C @ 4.30 pm THU
- hBN spin defects: Mehran Kianinia, R7 @ 4 pm TUE

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