Quantum Information and Computing

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Quantum state preparation of a single molecular ion

1. Study the protocol reported in the reference to probabilistically prepare a pure initial state of the molecular ion via optical pumping.
2. Once understood the atomic structure of $^{40}CaH^{+}$ reproduce the Raman spectra with and without optical pumping (Fig.3).
3. Characterize the atomic structure CaOH molecule and provide the Raman spectra.
4. *(optional) Estimate the probability to prepare a certain state using Bayesian estimation.*

Reference: Preparation and coherent manipulation of pure quantum states of a single molecular ion (https://www.nature.com/articles/nature22338).

By the due date please submit the presentation and the code. The final presentation will be 20 minutes long and you have to present the problem, methods and results. A final question on the program of the Quantum Information and Computing course will conclude the exam.