

LabCourse: Experiments in Molecular Physics

Chirped-pulse spectroscopy of methyl cyanide

FAQs / Tasks:

A. Static measurement of methyl cyanide (CH_3CN)

- 1) Starting the instrument:
 - I. Which component should be switched on first?
 - II. And in which order the others?
- 2) Chirp range: The frequency range of interest is between 73.54-73.60 GHz and 91.95-92.00 GHz.
 - I. Which local oscillator frequency and which chirp span is needed?
- 3) Fill in the sample: Start at $1\text{e-}2\text{mbar}$ and increase it stepwise to $2\text{e-}2\text{mbar}$.
 - I. Which pressure gives the best results?
- 4) Start the measurement:
 - I. Is the intensity reasonable or is some optical alignment necessary?
- 5) Perform the Fourier transform with the given software.
- 6) Create a symmetric top molecule in PGOPHER program using the parameters of methyl cyanide from the CDMS database.
- 7) Load the spectra into PGOPHER. (Perform a fit)
 - I. Which J transitions were measured?
 - II. Why are there so many lines?

B. Jet measurement of methyl cyanide (CH_3CN)

- 1) Use the other pump system.
- 2) Conduct measurements as in A but using the supersonic jet expansion.
- 3) Perform the Fourier transform.
- 4) Load the new spectra into your PGOPHER file.
 - I. What differences do you notice compared to static measurements?