LabCourse: Experiments in Molecular Physics

Millimeter-wave spectroscopy of carbonyl sulfide, OCS

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Basic tasks:

1) Start a broadband scan (roughly $4B$) of OCS in the 3mm range
2) Calculate the structural parameters of the simple diatomic molecules CO and CS from their rotational constants of $B_{CO} = 57635.968$ MHz and $B_{CS} = 24495.560$ MHz.
3) Estimate the rotational constant of OCS assuming that the structural parameters of CO and CS also apply in this molecule.
4) Plot and print your total spectrum of OCS
5) What are the most abundant isotopic species of OCS?
6) Estimate the rotational constants of those species
7) Identify and assign the transitions visible in the spectrum
8) Rescan the lines identified at high spectral resolution and fit those lines using the PGOPHER program
9) Try to do a Lamb-Dip Spectrum
10) If time is left: Determination of empirical (r_0) structural parameters of OCS