

## Molecular Physics II - MolPhys II

Degree - M.Sc. in Physics (PO von 2014)

<i>Module</i>	<b>Specialization: Advanced Experimental Physics</b>
<i>Module No.</i>	physics62a

<i>Course</i>	<b>Molecular Physics II</b>
<i>Course No.</i>	MolPhys II

Category	Type	Language	Teaching hours	CP	Semester
Elective	Lecture with exercises	English	3+1	6	ST

### Requirements for Participation:

**Preparation:** Atomic Physics, Molecular Physics and Quantum Mechanics at the level of the bachelor courses in physics, Molecular Physics I

**Form of Testing and Examination:** Oral Examination

**Length of Course:** 1 semester

### Aims of the Course:

In the second part of the core courses more complex issues of molecular spectra are introduced. The students will be enabled to analyze spectra of complex molecules which are subject to couplings between electronic, vibrational and rotational motions.

In the special courses basic and advanced molecular physics are applied to atmospherical and astronomical environments.

This module prepares for topics of current research in molecular physics and provides the basis for the preparation of the master thesis.

### Contents of the Course:

- Vibrational modes of polyatomic molecules
- Fundamentals of point group symmetry
- Vibrational dipole moment and selection rules
- Characteristic ro-vibrational spectra of selected molecules
- Breakdown of Born-Oppenheimer Approximation
- Coupling of rotation and vibration
- Coupling of angular momenta in molecular physics

### Recommended Literature:

Bernath, "Spectra of Atoms and Molecules", Oxford University Press)

Townes Schawlow, "Microwave Spectroscopy" (Dover Publications)

Gordy & Cook, "Microwave Spectra" (Wiley)

Engelke, "Aufbau der Moleküle" (Teubner)

P. R. Bunker and Per Jensen: "Molecular Symmetry and Spectroscopy, 2nd Edition", ( NRC Research Press, Ottawa)