

Molecular Physics

Module No.: MN-P-SP-Astro, MN-P-SP-Mol, MN-P-PN-Astro, MN-P-PN-Mol

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Course: Measurement Techniques in Molecular Physics

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Category	Type	Language	Teaching Hours	CP	Semester
Specialized Course	Lecture	English	2	3	WiSe

Requirements for participation:

Atomic Physics, Molecular Physics and Quantum Mechanics at the level of the bachelor courses in physics

Type of module examinations:

One oral examination at the end of the module

Duration of the course:

1 semester

Aims of the course:

Understanding the way molecular properties are used for detection and quantification of molecules including an understanding of data accuracy, precision and time resolution achievable with different methodological approaches.

Contents of the course:

The lecture introduces to measurement techniques used to detect and quantify molecules with examples used from observations in the Earth atmosphere. The lecture specifically covers the following topics:

- Vacuum Technology
- Mass Spectrometry (Quadrupole mass spectrometers, ion traps, time of flight mass spectrometry, sector field mass spectrometers)
- Stable isotope mass spectrometry and its application in kinetic isotope effect detection
- Chemi-luminescence methods
- Optical methods (Differential optical absorption spectroscopy, Laser Interferometry Detection and Ranging, Laser induced fluorescence)

Recommended literature:

- "Analytical Techniques for Atmospheric Measurement", ed. D. Heard, Wiley-Blackwell, First Edition
- D.M. Hata, "Introduction to Vacuum Technology", Prentice Hall, First Edition
- E. de Hoffmann, V. Stroobant, "Mass Spectrometry: Principles and Applications", Wiley-Interscience, Third Edition
- J. Throck Watson, O. David Sparkman, "Introduction to Mass Spectrometry: Instrumentation, Applications, and Strategies for Data Interpretation", Wiley, Fourth Edition
- F.W. McLafferty, F. Tureek, "Interpretation of Mass Spectra", University Science Books, Fourth Edition