

# Astrophysics and Molecular Physics

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

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## Course: Methods of Molecular Astrophysics

Lecturers: S. Schlemmer, K. Jacobs

Email: schlemmer@ph1.uni-koeln.de, jacobs@ph1.uni-koeln.de

| Category           | Type              | Language | Teaching Hours | CP  | Semester |
|--------------------|-------------------|----------|----------------|-----|----------|
| Specialized Course | Lecture           | English  | 2              | 3   | SuSe     |
| Specialized Course | Lecture & Seminar | English  | 2+1            | 4.5 | SuSe     |

### Requirements for participation:

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

### Type of module examinations:

One oral examination at the end of the module

### Duration of the course:

1 semester

### Aims of the course:

The lecture introduces into various detection techniques used in current laboratory astrophysics and astronomy. In particular the sensitive detection of infrared and THz radiation is described. Also mass spectrometric detection techniques are introduced. This course prepares for the operation of state-of-the-art equipment in molecular astrophysics.

### Contents of the course:

- Concept of THz detectors: principle and operation
- Heterodyne detection
- Infrared detectors: principle and operation
- Fundamentals of Mass Spectrometry
- Concepts of Ion Trapping
- Free Jets and Molecular Beams

### Recommended literature:

O. Hachenber and B. Vowinkel, Technische Grundlagen der Radioastronomie, BI Verlag 1982

J.D. Vincent, Fundamentals of IR detector operation and testing, Wiley 1990

G. Scoles (ed.) Atomic and Molecular beam Methods, Oxford 1988

D. Gerlich "Inhomogeneous Electrical Radio Frequency Fields: A Versatile Tool for the Study of Processes with Slow Ions" in: State-Selected and State-to-State Ion-Molecule Reaction Dynamics, edited by C.Y.Ng and M. Baer. Advances in Chemical Physics Series, LXXXII, J. Wiley & Sons (1992)

Peter H. Dawson, Quadrupole Mass Spectrometry and its Applications, American Inst. of Physics, 1997