

Spectroscopy with Lasers

Prof. Dr. W. Demtröder

Universität Trier-Kaiserslautern, Fachbereich Physik, Kaiserslautern

Contents

I.	Introduction	3
II.	Characteristic Features of Lasers as Spectroscopic Light Sources	5
III.	Spectroscopic Applications of Lasers	12
	1. Absorption Spectroscopy	12
	2. Fluorescence Spectroscopy	17
	3. Measurements of Excited-State Lifetimes	21
	4. Spectroscopic Investigations of Collision Processes	25
	5. Photochemistry and Laser Photolysis	31
	6. Raman Spectroscopy	38
	7. Light Scattering Observations	44
	8. Plasma Spectroscopy	47
	9. Chemical Microanalysis and Spectrophotometry	52
	10. Nonlinear Optics and Solid-State Spectroscopy	53
IV.	High-Resolution Spectroscopy Based on Saturation Effects	56
	1. Different Kinds of Saturation Effects	56
	2. Lamb Dip Spectroscopy	60
	3. Frequency Stabilization by Saturated Absorption	64
	4. Investigation of Collision Processes from Line Shape Measurements	65
V.	Spectroscopy of Laser Media	67
	1. Infrared and Submillimeter Wave Spectroscopy	67
	2. Excitation Mechanisms and Collision Processes in Gas Discharges	69
	3. Solid-State and Semiconductor Lasers	71
	4. Chemical Lasers	73
VI.	Conclusion	78
VII.	Zusammenfassung	80
VIII.	References	82