

激光篇

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流体力学中的激光 计量技术

Laser Metrology in Fluid Mechanics



Laser Metrology in Fluid Mechanics

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Laser Metrology in Fluid Mechanics

*Granulometry, Temperature
and Concentration Measurements*

Edited by
Alain Boutier

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Optical Experiment and Basic Teaching

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Table of Contents

Preface	xi
Introduction	xiii
Alain BOUTIER	
Chapter 1. Basics on Light Scattering by Particles	1
Fabrice ONOFRI and Séverine BARBOSA	
1.1. Introduction.	1
1.2. A brief synopsis of electromagnetic theory	2
1.2.1. Maxwell's equations	2
1.2.2. Harmonic electromagnetic plane waves.	4
1.2.3. Optical constants	9
1.2.4. Light scattering by a single particle	11
1.3. Methods using separation of variables	16
1.3.1. Lorenz–Mie (or Mie) theory	16
1.3.2. Debye and complex angular momentum theories	26
1.4. Rayleigh theory and the discrete dipole approximation	29
1.4.1. Rayleigh theory	29
1.4.2. Discrete dipole approximation	31
1.5. The T-matrix method	32
1.6. Physical (or wave) optics models	34
1.6.1. Huygens–Fresnel integral	35
1.6.2. Fraunhofer diffraction theory for a particle with a circular cross section.	37
1.6.3. Airy theory of the rainbow	40
1.6.4. Marston's physical-optics approximation.	44
1.7. Geometrical optics.	47
1.7.1. Calculation of the scattering angle	48

1.7.2. Calculation of the intensity of rays	48
1.7.3. Calculation of the phase and amplitude of rays	49
1.8. Multiple scattering and Monte Carlo models	50
1.8.1. Scattering by an optically diluted particle system	50
1.8.2. Multiple scattering	51
1.8.3. Monte Carlo method	52
1.9. Conclusion	57
1.10. Bibliography	57
Chapter 2. Optical Particle Characterization	67
Fabrice ONOFRI and Séverine BARBOSA	
2.1. Introduction.	67
2.2. Particles in flows.	69
2.2.1. Diameter, shape and concentration	69
2.2.2. Statistical representation of particle size data	70
2.2.3. Concentrations and fluxes	74
2.3. An attempt to classify OPC techniques	75
2.3.1. Physical principles and measured quantities	75
2.3.2. Nature and procedure to achieve statistics	76
2.4. Phase Doppler interferometry (or anemometry)	77
2.4.1. Principle	77
2.4.2. Modeling the phase–diameter relationship	81
2.4.3. Experimental setup and typical results	87
2.4.4. Conclusion.	90
2.5. Ellipsometry	91
2.6. Forward (or “laser”) diffraction	93
2.6.1. Principle	93
2.6.2. Modeling and inversion of diffraction patterns	95
2.6.3. Typical experimental setup and results	98
2.6.4. Conclusion.	100
2.7. Rainbow and near-critical-angle diffractometry techniques	101
2.7.1. Similarities to forward diffraction	101
2.7.2. Rainbow diffractometry	102
2.7.3. Near-critical-angle diffractometry	107
2.8. Classical shadowgraph imaging.	112
2.8.1. Principle and classical setup	112
2.8.2. One-dimensional shadow Doppler technique	114
2.8.3. Calculation of particle images using the point spread function	115
2.8.4. Conclusion.	118
2.9. Out-of-focus interferometric imaging	119
2.9.1. Principle	119

2.9.2. Modeling the diameter–angular frequency relationship	120
2.9.3. Conclusion	126
2.10. Holography of particles	128
2.10.1. Gabor holography for holographic films	128
2.10.2. Inline digital holography	129
2.10.3. Conclusion	131
2.11. Light extinction spectrometry	132
2.11.1. Principle	132
2.11.2. Algebraic inverse method	134
2.11.3. Experimental setup and conclusion	136
2.12. Photon correlation spectroscopy	139
2.13. Laser-induced fluorescence and elastic-scattering imaging ratio	141
2.13.1. Principle	142
2.13.2. Experimental setup and results	143
2.13.3. Conclusion	144
2.14. Laser-induced incandescence	144
2.15. General conclusions	145
2.16. Bibliography	146
Chapter 3. Laser-Induced Fluorescence	159
Fabrice LEMOINE and Frédéric GRISCH	
3.1. Recall on energy quantification of molecules	159
3.1.1. Radiative transitions	162
3.1.2. Energy level thermo-statistics	164
3.1.3. Franck–Condon principle	164
3.1.4. Non-radiative transitions	164
3.1.5. Line width	165
3.2. Laser-induced fluorescence principles	168
3.2.1. Absorption kinetics	169
3.2.2. Fluorescence signal	170
3.2.3. Fluorescence detection	173
3.2.4. Absorption along optical path	174
3.2.5. Fluorescence measurement device	175
3.3. Applications of laser-induced fluorescence in gases	177
3.3.1. Generalities	177
3.3.2. Diatomic molecules	178
3.3.3. Poly-Atomic molecular tracers	186
3.4. Laser-induced fluorescence in liquids	202
3.4.1. Principles and modeling	202
3.4.2. Fluorescence reabsorption	205
3.4.3. Applications to concentration measurement	205

3.4.4. Application to temperature measurement	210
3.5. Bibliography	218
Chapter 4. Diode Laser Absorption Spectroscopy Techniques	223
Ajmal MOHAMED	
4.1. High spectral resolution absorption spectroscopy in fluid mechanics	223
4.2. Recap on molecular absorption	226
4.2.1. Line profile	226
4.2.2. Line strength.	228
4.3. Absorption spectroscopy bench	229
4.3.1. Emitting optics	230
4.3.2. Optical detection	234
4.3.3. Spectra processing	237
4.4. Applications in hypersonic.	245
4.4.1. F4 characteristics	246
4.4.2. Setup installed at F4	248
4.4.3. Results obtained at F4 and HEG	249
4.5. Other applications of diode laser absorption spectroscopy	250
4.5.1. Combustion applications	250
4.5.2. Applications to atmospheric probing	253
4.6. Other devices for diode laser absorption spectroscopy	254
4.6.1. Multipass spectrometry	254
4.6.2. Spectrometry in a resonant cavity	257
4.7. Perspectives and conclusion on diode laser absorption spectroscopy	261
4.7.1. Laser source: use of non-cryogenic diodes	262
4.7.2. Spatial resolution: use of probe in flow	262
4.7.3. Use of frequency combs	264
4.8. Bibliography	264
Chapter 5. Nonlinear Optical Sources and Techniques for Optical Diagnostic	271
Michel LEFEBVRE	
5.1. Introduction to nonlinear optics	271
5.2. Main processes in nonlinear optics	272
5.2.1. Propagation effects	273
5.2.2. Second- and third-order nonlinearities	276
5.2.3. Phase matching notion	280
5.3. Nonlinear sources for optical metrology	282
5.3.1. Sum frequency generation and frequency doubling	283
5.3.2. Raman converters.	285

5.3.3. Optical parametric generators and oscillators	289
5.4. Nonlinear techniques for optical diagnostic	296
5.4.1. Introduction to four-wave mixing techniques	296
5.4.2. Temperature and concentration measurements in four-wave mixing.	299
5.4.3. Velocity measurements in four-wave mixing	301
5.5. Bibliography	305
Chapter 6. Laser Safety	307
Jean-Michel MOST	
6.1. Generalities on laser safety.	307
6.2. Laser type and classification.	308
6.3. Laser risks: nature and effects	310
6.3.1. Biological risks	310
6.3.2. Risks to the eye	312
6.3.3. Risks to the skin.	314
6.3.4. Risk to hearing	315
6.3.5. Other biological risks	315
6.4. Protections	316
6.4.1. Accident prevention	316
6.4.2. Collective protection	316
6.4.3. Individual protection	318
6.5. Safety advice	319
6.6. Human behavior	320
Conclusion	321
Alain BOUTIER	
Nomenclature	323
List of Authors	329
Index	331

Preface

This book has been elaborated from lectures given in the framework of autumn schools organized since 1997 by AFVL – *Association Francophone de Vélocimétrie Laser* (French-speaking Association of Laser Velocimetry).

AFVL activities are especially dedicated to foster and facilitate transfer of knowledge in laser velocimetry and all techniques making use of lasers employed for metrology in fluid mechanics. Among the main objectives, a good use of laser techniques is looked at to fulfill requirements of potential applications in research and industry.

The authors of this book have thus shared their expertise within AFVL, which led them to write the various chapters within a teaching environment, which allows the reader to learn and perfect perspective both for his/her theoretical and practical knowledge.



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Introduction

In fluid mechanics, non-intrusive measurements are fundamental to improve knowledge about flow behavior. Flow maps of velocity, temperature and concentration, as well as particle granulometry in two-phase flows, uniquely help in understanding the physical phenomena inside flows, which in turn enables code validation.

Different techniques are required for velocity measurements using spectroscopic principles, based on light scattering by molecules: laser-induced fluorescence, coherent anti-Stokes Raman scattering and tuneable laser diode. They are generally better suited for characterization of high-velocity flows. These devices also very often allow access to temperatures and concentrations of species present in reactive flows. Chapter 2 is especially dedicated to the determination of particle granulometry by optical means, measurement techniques being more adapted to two-phase flows studies; whereas Chapter 1 describes light scattering principles. For each technique, basic principles are described, as well as optical setups and signal processors.

The last chapter (Chapter 6) is dedicated to laser safety; it sums up the main precautions that must be taken for any device using an intense laser source.

Another book by the same authors, titled “Laser Velocimetry in Fluid Mechanics”, describes the various techniques of velocity measurement based on particle scattering. These velocity measurement techniques give access to the mean velocity field, as well as to detailed turbulence knowledge.

Introduction is written by Alain BOUTIER.



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