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流体力学中的激光计量技术

Laser Metrology in Fluid Mechanics

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Laser Metrology in Fluid Mechanics

Granulometry, Temperature and Concentration Measurements

Edited by
Alain Boutier

ISTE WILEY

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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.

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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