Laser Doppler And Phase Doppler Measurement Techniques Experimental Fluid Mechanics

As recognized, adventure as without difficulty as experience roughly lesson, amusement, as without difficulty as pact can be gotten by just checking out a book **Laser Doppler And Phase Doppler Measurement Techniques Experimental Fluid Mechanics** as well as it is not directly done, you could acknowledge even more more or less this life, all but the world.

We manage to pay for you this proper as with ease as simple way to acquire those all. We give Laser Doppler And Phase Doppler Measurement Techniques Experimental Fluid Mechanics and numerous books collections from fictions to scientific research in any way. in the midst of them is this Laser Doppler And Phase Doppler Measurement Techniques Experimental Fluid Mechanics that can be your partner.

Application of a Laser-doppler Technique to the Measurement of Particle Velocity in Gas-particle Two-phase Flow Stanford University. Department of Aeronautics and Astronautics 1966 In chemical propulsion, the use of metallic fuel constituents burning to particulate refractory oxides in rocket engines has forced attention to the understanding of two-phase nozzle expansion processes. In this study light from a helium-neon laser was reflected both from a fixed target and from moving particles. A lens concentrated the laser light and the light back-scattered from the particles was picked up by the same lens and directed into a Fabry-Perot scanning plate interferometer. The interferometer limited observation at any moment to those particles whose Doppler shifted frequency coincided with the interferometer transmission frequency. The light from the fixed target provided a frequency reference system, and calibrated movement of the interferometer mirror spacing provided continuous examination of velocity. Data in the form of lightscattering and number count vs velocity has been obtained for water droplets in subsonic flow, for aluminum spheres and alumina abrasive in cold supersonic flow and for aluminum and magnesium oxide in hot supersonic flow. Number count-velocity data was found to be a complicated function of particle size distribution and vector velocity distribution as well as instrument characteristics.

Measurement of Velocity Distributions in Two-phase Suspension Flows by the Laser-doppler Technique S. EINAV 1973 THIS PAPER DESCRIBES THE APPLICATION OF LASER-DOPPLER ANEMOMETRY TO MEASUREMENT OF VELOCITY DISTRIBUTIONS IN TWO-PHASE SUSPENSIONS. IT IS SHOWN THAT TWO GROUPS OF SCATTERING PARTICLES, MEMBERS OF EACH OF WHICH ARE DIFFERENT IN SIZE AND MOVE WITH DISTINCT VELOCITIES, WILL PRODUCE SEPARATE SIGNALS IN THE FREQUENCY DOMAIN DIFFERENT IN BOTH AMPLITUDE AND FREQUENCY. BLOCK DIAGRAMS OF THE ELECTRONICS USED IN THE MEASUREMENT OF SUSPENSION FLOW ARE SHOWN.

Optical Measurement Techniques Kai-Erik Peiponen 2009-03-15 Devoted to novel optical measurement techniques that are applied both in industry and life sciences, this book contributes a fresh perspective on the development of modern optical sensors. These sensors are often essential in detecting and controlling parameters that are important for both industrial and biomedical applications. The book provides easy access for beginners wishing to gain familiarity with the innovations of modern optics.

Measurement of Velocities in Gas-liquid Two-phase Flow Using Laser Doppler Velocimetry 1992 Measurements of bubble and liquid velocities in two-phase flow have been made using a new forward/backward scattering Laser Doppler Velocimetry (LDV) technique. This work was performed in a 6.4 by 11.1 mm vertical duct using known air/water mixtures. A standard LDV fiber optic probe was used to measure the bubble velocity, using direct backscattered light. A novel retro-reflector and lens assembly permitted the same probe to measure the liquid velocity with direct forward-scattered light. The bubble velocity was confirmed by independent measurements with a high-speed video system. The liquid velocity was confirmed by demonstrating the dominance of the liquid seed data rate in the forward-scatter measurement. Experimental data are presented to demonstrate the accuracy of the technique for a wide range of flow conditions, from bubbles as small as 0.75-mm-diam to slugs as large as 10-mm wide by 30-mm long. In the slug regime, the LDV technique performed velocity measurements for both phases, for void fractions up to 50%, which was the upper limit of our experimental investigation.

Laser Doppler and Phase Doppler Measurement Techniques H.-E. Albrecht 2013-04-17 Providing the first comprehensive treatment, this book covers all aspects of the laser Doppler and phase Doppler measurement techniques, including light scattering from small particles, fundamental optics, system design, signal and data processing, tracer particle generation, and applications in single and two-phase flows. The book is intended as both a reference book for more experienced users as well as an instructional book for students. It provides ample material as a basis for a lecture course on the subject and represents one of the most comprehensive treatments of the phase Doppler technique to date. The book will serve as a valuable reference book in any fluid mechanics laboratory where the laser Doppler or phase Doppler techniques are used. This work reflects the authors' long practical experience in the development of the techniques and equipment, as the many examples confirm.

Experimental Investigation of a Fan Spray Using Laser Diffraction and Phase-Doppler Instruments M. Dannehl 1990 In the experimental work reported here, laser Doppler anemometry was used for "point" measurements of bivariate distributions of velocity and drop size (LDVS), and diffraction sizemetry (DSM) was used for line-of-sight measurements of drop size in sprays of water. Laser light sheet photographs were used to determine the spray geometry. The measurement positions were chosen so that the mean axes of the horizontal spray planes containing the LDVS measurement points coincided with the axis of the DSM laser beam. In this case, experimental results of DSM and LDVS are comparable, if one takes into account the laws of the conversion of drop flux (LDVS results) into a drop concentration (DSM results). Mean diameters as well as cumulative distributions obtained by LDVS at different measurement locations are compared with corresponding DSM results. Advantages and disadvantages of both methods with respect to spray analysis are discussed.

Size-Discriminated Velocity Cross-Correlation Measured by a Single Channel Phase Doppler Velocimeter Y. Hardalupas 1992 It would be nice to investigate droplet dispersion in sprays by measuring two velocity components and their time averaged cross-correlation as a function of droplet size with a single channel phase Doppler system by adapting Hoagland's method, commonly used in laser Doppler and hot wire velocimeter. This involves taking three non-orthogonal measurements of size and velocity, from which two velocity components and their cross correlation coefficient can be determined for each droplet size. This method requires simpler optics and electronics than a two channel phase Doppler system and removes uncertainties in the coincidence of the two colour probe volumes. The application of Hoagland's method to a phase Doppler velocimeter was examined theoretically by calculating the sizing response curves and the visibility of the Doppler signals using the geomerical optics sprays. The Gaussian intensity distribution of the incident laser beams did not introduce additional sizing uncertainties relative to the direct measurement with a two channel phase Doppler instrument, but the uncertainty of the velocity and flux measurements with the suggested method is larger than for a two channel system. (Author).

Laser Techniques for Fluid Mechanics R.J. Adrian 2013-06-29 This volume includes revised and extended versions of selected papers presented at the Tenth International Symposium on Applications of Laser Techniques to Fluid Mechanics held at the Calouste Gulbenkian Foundation in Lisbon, during the period of July 10 to 13, 2000. The papers describe instrumentation developments for Velocity, Scalar and Multi-Phase Flows and results of measurements of Turbulent Flows, and Combustion and Engines. The papers demonstrate the continuing and healthy interest in the development of understanding of new methodologies and implementation in terms of new instrumentation. The prime objective of the Tenth Symposium was to provide a forum for the presentation of the most advanced research on laser techniques for flow

measurements, and communicate significant results to fluid mechanics. The application of laser techniques to scientific and engineering fluid flow research was emphasized, but contributions to the theory and practice of laser methods were also considered where they facilitate new improved fluid mechanic research. Attention was placed on laser-Doppler anemometry, particle sizing and other methods for the measurement of velocity and scalars, such as particle image velocimetry and laser induced fluorescence.

The Laser Doppler Technique L. E. Drain 1980

The Accuracy of Flow Measurements by Laser Doppler Methods Preben Buchhave 1976

Liquid Particle Size Measurement Techniques, 2nd Volume E. Dan Hirleman 1990

Springer Handbook of Experimental Fluid Mechanics Cameron Tropea 2007-10-09 Accompanying DVD-ROM contains ... "all chapters of the Springer Handbook."--Page 3 of cover.

Fluid Mechanics Franz Durst 2008-09-01 Fluid mechanics embraces engineering, science, and medicine. This book's logical organization begins with an introductory chapter summarizing the history of fluid mechanics and then moves on to the essential mathematics and physics needed to understand and work in fluid mechanics. Analytical treatments are based on the Navier-Stokes equations. The book also fully addresses the numerical and experimental methods applied to flows. This text is specifically written to meet the needs of students in engineering and science. Overall, readers get a sound introduction to fluid mechanics.

Principles and Practice of Laser-Doppler Anemometry F. Durst 1981

Smart Sensors for Industrial Applications Krzysztof Iniewski 2017-12-19 Sensor technologies are a rapidly growing area of interest in science and product design, embracing developments in electronics, photonics, mechanics, chemistry, and biology. Their presence is widespread in everyday life, where they are used to sense sound, movement, and optical or magnetic signals. The demand for portable and lightweight sensors is relentless in several industries, from consumer electronics to biomedical engineering to the military. Smart Sensors for Industrial Applications brings together the latest research in smart sensors technology and exposes the reader to myriad applications that this technology has enabled. Organized into five parts, the book explores: Photonics and optoelectronics sensors, including developments in optical fibers, Brillouin detection, and Doppler effect analysis. Chapters also look at key applications such as oxygen detection, directional discrimination, and optical sensing. Infrared and thermal sensors, such as Bragg gratings, thin films, and microbolometers. Contributors also cover temperature measurements in industrial conditions, including sensing inside explosions. Magnetic and inductive sensors, including magnetometers, inductive coupling, and ferro-fluidics. The book also discusses magnetic field and inductive current measurements in various industrial conditions, such as on airplanes. Sound and ultrasound sensors, including underwater acoustic modem, vibrational spectroscopy, and photoacoustics. Piezoresistive, wireless, and electrical sensors, with applications in health monitoring, agrofood, and other industries. Featuring contributions by experts from around the world, this book offers a comprehensive review of the groundbreaking technologies and the latest applications and trends in the field of smart sensors.

Laser Doppler Measurements B. M. Watrasiewicz 1976

Development of a Laser Doppler Velocimeter Le-cong Phung 1976

Initial Discussion of the Application of a Laser-doppler Technique to the Measurement of Particle Velocity in Gas-particle Two-phase Flow Stanford University. Department of Aeronautics and Astronautics 1965

The Application of Eulerian Laser Doppler Vibrometry to the On-line Condition Monitoring of Axial-flow Turbomachinery Blades Abraham Johannes Oberholster 2013 The on-line condition monitoring of turbomachinery blades is of utmost importance to ensure the long term health and availability of such machines and as such has been an area of study since the late 1960s. As a result a number of on-line blade vibration measurement techniques are available, each with its own associated advantages and shortcomings. In general, on-blade sensor measurement techniques suffer from sensor lifespan, whereas non-contact techniques usually have measurement bandwidth limitations. One non-contact measurement technique that yields improvements in the area of measurement bandwidth is laser Doppler vibrometry. This thesis presents results and findings from utilizing laser Doppler vibrometry in an Eulerian fashion (i.e. a fixed reference frame) to measure on-line blade vibrations in axial-flow turbomachinery. With this measurement approach, the laser beam is focussed at a fixed point in space and measurements are available for the periods during which each blade sweeps through the beam. The characteristics of the measurement technique are studied analytically with an Euler-Bernoulli cantilever beam and experimental verification is performed. An approach for the numerical simulation of the measurement technique is then presented. Associated with the presented measurement technique are the short periods during which each blade is exposed to the laser beam. This characteristic yields traditional frequency domain signal processing techniques unsuitable for providing useful blade health indicators. To obtain frequency domain information from such short signals, it is necessary to employ non-standard signal processing techniques such as non-harmonic Fourier analysis. Results from experimental testing on a single-blade test rotor at a single rotor speed are presented in the form of phase angle trends obtained with non-harmonic Fourier analysis. Considering the maximum of absolute unwrapped phase angle trends around various reference frequencies, good indicators of blade health deterioration were obtained. These indicators were verified numerically. To extend the application of this condition monitoring approach, measurements were repeated on a five-blade test rotor at four different rotor speeds. Various damage cases were considered as well as different ELDV measurement positions. Using statistical parameters of the abovementioned indicators as well as time domain parameters, it is shown that with this condition monitoring approach, blade damage can successfully be identified and quantified with the aid of artificial neural networks.

Measurement, Instrumentation, and Sensors Handbook John G. Webster 2018-09-03 This new edition of the bestselling Measurement, Instrumentation, and Sensors Handbook brings together all aspects of the design and implementation of measurement, instrumentation, and sensors. Reflecting the current state of the art, it describes the use of instruments and techniques for performing practical measurements in engineering, physics, chemistry, and the life sciences; explains sensors and the associated hardware and software; and discusses processing systems, automatic data acquisition, reduction and analysis, operation characteristics, accuracy, errors, calibrations, and the incorporation of standards for control purposes. Organized according to measurement problem, the Second Edition: Consists of 2 volumes Features contributions from 240+ field experts Contains 53 new chapters, plus updates to all 194 existing chapters Addresses different ways of making measurements for given variables Emphasizes modern intelligent instruments and techniques, human factors, modern display methods, instrument networks, and virtual instruments Explains modern wireless techniques, sensors, measurements, and applications A concise and useful reference for engineers, scientists, academic faculty, students, designers, managers, and industry professionals involved in instrumentation and measurement research and development, Measurement, Instrumentation, and Sensors Handbook, Second Edition provides readers with a greater understanding of advanced applications.

Measurement, Instrumentation, and Sensors Handbook, Second Edition John G. Webster 2014-01-29 The Second Edition of the bestselling Measurement, Instrumentation, and Sensors Handbook brings together all aspects of the design and implementation of measurement, instrumentation, and sensors. Reflecting the current state of the art, it describes the use of instruments and techniques for performing practical measurements in engineering, physics, chemistry, and the life sciences and discusses processing systems, automatic data acquisition, reduction and analysis, operation characteristics, accuracy, errors, calibrations, and the incorporation of standards for control purposes. Organized according to measurement problem, the Spatial, Mechanical, Thermal, and Radiation Measurement volume of the Second Edition: Contains contributions from field experts, new chapters, and updates to all 96 existing chapters Covers instrumentation and measurement concepts, spatial and mechanical variables, displacement, acoustics, flow and spot velocity, radiation, wireless sensors and instrumentation, and control and human factors A concise and useful reference for engineers, scientists, academic faculty, students, designers, managers, and industry professionals involved in instrumentation and measurement research and development, Measurement, Instrumentation, and Sensors Handbook, Second Edition: Spatial, Mechanical, Thermal, and Radiation Measurement provides readers with a greater understanding of advanced applications.

Optical Measurements Oliver Feldmann 2012-12-06 Increasing possibilities of computer-aided data processing have caused a new revival of optical techniques in many areas of mechanical and chemical engi neering. Optical methods have a long tradition in heat and mass transfer and in fluid dynamics. Global experimental information is not sufficient for de veloping constitution equations to describe complicated phenomena in fluid dynamics or in transfer processes by a computer program. Furthermore, a detailed

insight with high local and temporal resolution into the thermo and fluiddynamic situations is necessary. Sets of equations for computer program in thermo dynamics and fluid dynamics usually consist of two types of formulations: a first one derived from the conservation laws for mass, energy and momentum, and a second one mathematically modelling transport processes like laminar or turbulent diffusion. For reliably predicting the heat transfer, for example, the velocity and temperature field in the boundary layer must be known, or a physically realistic and widely valid correlation describing the turbulence must be avail able. For a better understanding of combustion processes it is necessary to know the local concentration and temperature just ahead of the flame and in the ignition zone.

Experimental Analysis of Wall-Spray Structure by Laser-Doppler Techniques A. Coghe 1992 The wall spray generated by the normal impingement of a transient diesel spray on a flat well, under ambient air conditions was analyzed by Phase Doppler Anemometry. Proper data reduction of velocity and size data allowed to characterize the wall spray dynamics to identify the existence of a vortical structure moving along the wall to evaluate the momentum distribution close to the wall and the air entrainment into the wall spray (Author).

Instrumentation for Fluid Particle Flow S.L. Soo 2013-01-15 A focus on methods of measurement and options for engineers and scientists performing research and evaluation of particle-fluid flow systems. Improved instrumentation for measurement in this field is an essential element in the progress of research and engineering of multi-phase flow systems. Some of the most original and productive research specialists in the field of particle-fluid flow systems are assembled in this book, which is an important and current reference volume.--[Source inconnue].

Dual Cylindrical Wave Laser-doppler Method for Measurement of Skin Friction in Fluid Flow Amir Ahmad Naqwi 1987 The objective of the present work is to overcome the inadequacies of conventional skin friction measuring methods in terms of temporal and spatial resolution. An instrument has been developed for measurement of the instantaneous velocity gradient in a boundary layer at a solid surface, from which the instantaneous wall shear stress can be deduced. The principle of the device is akin to that of dual beam Laser Doppler Anemometer. Instead of crossing two laser beams to produce the measuring volume, the present technique uses interference between two closely spaced cylindrical waves emanating from the solid surface. The interference fringes which constitute the measuring volume appear to be radiating from a point on surface. Keywords: Skin friction; Fluid flow; Lasers; Boundary layers; Doppler method; Wall shear stress; Laser beams; Cylindrical waves.

Optical Measurement Techniques Kai-Erik Peiponen 2009-02-12 Devoted to new optical measurement techniques in industry as well as the life sciences, this book has a fresh perspective on the development of modern optical sensors, which are essential for the control of parameters in industrial and biomedical applications.

Development, Application, and Design Specifications of a Laser Doppler Particle Sensor for the Measurement of Particle Velocities in Two Phase Rocket Exhausts, Volume I. Stanford University. Department of Aeronautics and Astronautics 1968 In this report, the development of a prototype instrument to measure the velocity of particles in the exhaust of a solid rocket motor is described. The measurement technique is based upon the doppler-shifted scattering of a focused laser beam by the particle matter in a flow. The absolute value of frequency is converted into velocity information by a Fabry Perot interferometer, photomultiplier, electronic signal processing circuits and a suitable recording device. The recorded data is in the form of signal number count rate and maximum signal amplitude as a function of velocity at a specific point in the flow. This volume describes the development of the prototype instrument. (Author).

Laser Metrology in Fluid Mechanics Alain Boutier 2013-02-20 In fluid mechanics, non-intrusive measurements are fundamental in order to improve knowledge of the behavior and main physical phenomena of flows in order to further validate codes. The principles and characteristics of the different techniques available in laser metrology are described in detail in this book. Velocity, temperature and concentration measurements by spectroscopic techniques based on light scattered by molecules are achieved by different techniques: laser-induced fluorescence, coherent anti-Stokes Raman scattering using lasers and parametric sources, and absorption spectroscopy by tunable laser diodes, which are generally better suited for high velocity flows. The size determination of particles by optical means, a technique mainly applied in two-phase flows, is the subject of another chapter, along with a description of the principles of light scattering. For each technique the basic principles are given, as well as optical devices and data processing. A final chapter reminds the reader of the main safety precautions to be taken when using powerful lasers.

Optical Inspection of Microsystems Wolfgang Osten 2018-10-03 Where conventional testing and inspection techniques fail at the micro-scale, optical techniques provide a fast, robust, and relatively inexpensive alternative for investigating the properties and quality of microsystems. Speed, reliability, and cost are critical factors in the continued scale-up of microsystems technology across many industries, and optical techniques are in a unique position to satisfy modern commercial and industrial demands. Optical Inspection of Microsystems is the first comprehensive, up-to-date survey of the most important and widely used full-field optical metrology and inspection technologies. Under the guidance of accomplished researcher Wolfgang Osten, expert contributors from industrial and academic institutions around the world share their expertise and experience with techniques such as image correlation, light scattering, scanning probe microscopy, confocal microscopy, fringe projection, grid and moiré techniques, interference microscopy, laser Doppler vibrometry, holography, speckle metrology, and spectroscopy. They also examine modern approaches to data acquisition and processing. The book emphasizes the evaluation of various properties to increase reliability and promote a consistent approach to optical testing. Numerous practical examples and illustrations reinforce the concepts. Supplying advanced tools for microsystem manufacturing and characterization, Optical Inspection of Microsystems enables you to reach toward a higher level of quality and reliability in modern micro-scale applications.

Laser Droplet Interferometry Approach to Spray Drop Size Analysis JB. Kennedy 1986 With the advent of modeling computer programs which can handle in a timely fashion the elliptical Navier-Stokes equations and the growing demand for more knowledge about the design of injectors, a need has arisen for detailed or point measurements of the air velocity and droplet size and velocity downstream of injectors. The air velocity can be readily measured by seeding the airflow and using a standard nonintrusive laser doppler velocimetry (LDV) system. The laser droplet interferometry approach is a promising technique that is nonintrusive and has the potential of simultaneously measuring the droplet size and velocity from a single point measurement. Two laser droplet interferometry techniques are currently being developed. One of these techniques is the Imax system being developed at Spectron Development Laboratory, Inc., by Dr. Cecil Hess; the other system is the Phase-Doppler technique being developed at Aerometrics, Inc., by Dr. Will Bachalo. The principles behind these systems and some typical data are presented in this paper.

Handbook of Laser Technology and Applications: Applications Colin E. Webb 2004

Optical Measurements Franz Mayinger 2013-03-14 Increasing possibilities of computer-aided data processing have caused a new revival of optical techniques in many areas of mechanical and chemical en gineering. Optical methods have a long tradition in heat and mass transfer and in fluid dynamics. Global experimental information is not sufficient for developing constitution equations to describe complicated phenomena in fluid dynamics or in transfer processes by a computer program . Furthermore, a detailed insight with high local and temporal resolution into the thermo-and fluiddynamic situations is necessary. Sets of equations for computer program in thermo dynamics and fluid dynamics usually consist of two types of formulations: a first one derived from the conservation laws for mass, energy and momentum, and a second one mathematically modelling transport processes like laminar or turbulent diffusion. For reliably predicting the heat transfer, for example, the velocity and temperature field in the boundary layer must be known, or a physically realistic and widely valid correlation describing the turbulence must be avail able. For a better understanding of combustion processes it is necessary to know the local concentration and temperature just ahead of the flame and in the ignition zone.

Development of a Laser Doppler Anemometer Technique for the Measurement of Two Phase Dispersed Flow Jagannathan Srinivasan 1978

Particle Sizing Experiments with the Laser Doppler Velocimeter 1988 Measurement techniques for in-situ simultaneous measurements of particle size distributions and particle velocities using the dual beam laser Doppler velocimeter (LV) were analytically and experimentally investigated. This investigation examined the different signal characteristics of the LV for determination of particle size and particle velocity, simultaneously. The different size related signal components were evaluated not only singularly but also as

simultaneous measurements to determine which characteristic, or combination of characteristics, provided the best measure of particle size. The evaluation concentrated on the 0.5 to 5 .mu.m particle size range, in which the LV light scattering characteristics are complex often non-monotonic functions of the particle size as well as functions of index of refraction, the laser light wavelength, laser intensity and polarization, and the location and response characteristics of the detector. Different components of the LV signal were considered, but analysis concentrated on Doppler phase, visibility and scatter-intensity because they show the greatest promise. These signals characteristics were initially defined analytically for numerous optical configurations over the 0.5 to 5 .mu.m diameter range with 0.1 .mu.m segmentation, for refractive index values from 1.0 to 3.0 with absorptive (imaginary) components varied form 0 to 1.0. Collector orientation and effective f/No., as well as fringe spacing, beam polarization and wavelength, were varied in this analytical evaluation. 18 refs., 42 figs., 5 tabs.

Application of a Laser-doppler Technique to the Measure of Particle Velocity in Gas-particle Two-phase Flow Robert Nichols James 1966

Size and Velocity Measurements of Sodium Aerosols in Neutral Atmosphere by a Phase Laser Doppler Method J. Stefanini 1992 This report presents an utilization of laser measurement technique in the specific domain of sodium aerosols. More especially aerosols velocities and sizes were studied using Laser Doppler Velocimetry and Phase Doppler method. The difficulties encountered and synthesis of the experimental results obtained are detailed.

Measurement Technology and its Application Prasad Yarlagadda 2012-12-13 Volume is indexed by Thomson Reuters CPCI-S (WoS). This work covers topics such as: acoustics and ultrasonic measurement, light/radiation monitoring, electromagnetic measurement and resistance measurement, measurement of noise and vibration, remote sensing and telemetry, mechanical measurement, other measurement methods and their application, data acquisition, signal and data processing technology and systems, intelligence algorithms, optimization algorithms and their applications, materials properties and applications, engineering education.

Applied Optical Measurements Markus Lehner 1999-09-06 This book provides a compilation of important optical techniques applied to experiments in heat and mass transfer, multiphase flow and combustion. The emphasis of this book is on the application of these techniques to various engineering problems. The contributions are aiming to provide practicing engineers, both in industry and research, with the recent state of science in the application of advanced optical measurements. The book is written by selected specialists representing leading experts in this field who present new information for the possibilities of these techniques and give stimulation of new ideas for their application.

Development of Laser Doppler Anemometer Technique on the Measurement of Three-phase Suspension Flow Zhi-Hua Yang 1988

Laser Doppler and Phase Doppler Measurement Techniques H.-E. Albrecht 2014-03-12 Providing the first comprehensive treatment, this book covers all aspects of the laser Doppler and phase Doppler measurement techniques, including light scattering from small particles, fundamental optics, system design, signal and data processing, tracer particle generation, and applications in single and two-phase flows. The book is intended as both a reference book for more experienced users as well as an instructional book for students. It provides ample material as a basis for a lecture course on the subject and represents one of the most comprehensive treatments of the phase Doppler technique to date. The book will serve as a valuable reference book in any fluid mechanics laboratory where the laser Doppler or phase Doppler techniques are used. This work reflects the authors' long practical experience in the development of the techniques and equipment, as the many examples confirm.