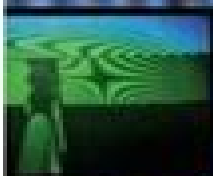


Basics of Interferometry

SECOND EDITION



P. Hariharan

Basics Of Interferometry

Pramod Rastogi



Basics Of Interferometry:

Basics of Interferometry P. Hariharan, 2012-12-02 This book is for those who have some knowledge of optics but little or no previous experience in interferometry Accordingly the carefully designed presentation helps readers easily find and assimilate the interferometric techniques they need for precision measurements Mathematics is held to a minimum and the topics covered are also summarized in capsule overviews at the beginning and end of each chapter Each chapter also contains a set of worked problems that give a feel for numbers The first five chapters present a clear tutorial review of fundamentals Chapters six and seven discuss the types of lasers and photodetectors used in interferometry The next eight chapters describe key applications of interferometry measurements of length optical testing studies of refractive index fields interference microscopy holographic and speckle interferometry interferometric sensors interference spectroscopy and Fourier transform spectroscopy The final chapter offers suggestions on choosing and setting up an interferometer *Basics of Interferometry* P. Hariharan, 2007 Optical interferometry is used in communications medical imaging astronomy and structural measurement With the use of an interferometer engineers and scientists are able to complete surface inspections of micromachined surfaces and semiconductors Medical technicians are able to give more concise diagnoses with the employ of interferometers in microscopy spectroscopy and coherent tomography Originating from a one day course this material was expanded to serve as an introduction to the topic for engineers and scientists that have little optical knowledge but a need for more in their daily work lives The need for interferometry knowledge has crossed the boundaries of engineering fields and Dr Hariharan has written a book that answers the questions that new practitioners to interferometry have and haven't even thought of yet This new edition includes complete updates of all material with an emphasis on applications It also has new chapters on white light microscopy and interference with single photons Outstanding introduction to the world of optical interferometry with summaries at the beginning and end of each chapter several appendices with essential information and worked numerical problems Practical details enrich understanding for readers new to this material New chapters on white light microscopy for medical imaging and interference with single photons quantum optics **Basics of Interferometry, 2nd Edition** P. Hariharan, 2006 Optical interferometry is used in communications medical imaging astronomy and structural measurement With the use of an interferometer engineers and scientists are able to complete surface inspections of micromachined surfaces and semiconductors Medical technicians are able to give more concise diagnoses with the employ of interferometers in microscopy spectroscopy and coherent tomography Originating from a one day course this material was expanded to serve as an introduction to the topic for engineers and scientists that have little optical knowledge but a need for more in their daily work lives The need for interferometry knowledge has crossed the boundaries of engineering fields and Dr Hariharan has written a book that answers the questions that new practitioners to interferometry have and haven't even thought of yet This new edition includes complete updates of all material with an emphasis on applications It also has new

chapters on white light microscopy and interference with single photons Outstanding introduction to the world of optical interferometry with summaries at the beginning and end of each chapter several appendices with essential information and worked numerical problems Practical details enrich understanding for readers new to this material New chapters on white light microscopy for medical imaging and interference with single photons quantum optics *Radar Interferometry* Ramon F. Hanssen, 2006-04-18 This book is the product of five and a half years of research dedicated to the understanding of radar interferometry a relatively new space geodetic technique for measuring the earth's topography and its deformation The main reason for undertaking this work early 1995 was the fact that this technique proved to be extremely useful for wide scale fine resolution deformation measurements Especially the interferometric products from the ERS 1 satellite provided beautiful first results several interferometric images appeared as highlights on the cover of journals such as Nature and Science Accuracies of a few millimeters in the radar line of sight were claimed in semi continuous image data acquired globally irrespective of cloud cover or solar illumination Unfortunately because of the relative lack of supportive observations at these resolutions and accuracies validation of the precision and reliability of the results remained an issue of concern From a geodetic point of view several survey techniques are commonly available to measure a specific geophysical phenomenon To make an optimal choice between these techniques it is important to have a uniform and quantitative approach for describing the errors and how these errors propagate to the estimated parameters In this context the research described in this book was initiated It describes issues involved with different types of errors induced by the sensor the data processing satellite positioning accuracy atmospheric propagation and scattering characteristics Nevertheless as the first item in the subtitle Data Interpretation and Error Analysis suggests data interpretation is not always straightforward *Fundamentals of Astrometry* Jean Kovalevsky, P. Kenneth Seidelmann, 2011-12-18 This text details the fundamentals of astrometry at milli and micro arcsecond accuracies **Optical Interferometry, 2e** P. Hariharan, 2003-10-20 When the first edition of Optical Interferometry was published interferometry was regarded as a rather esoteric method of making measurements largely confined to the laboratory Today however besides its use in several fields of research it has applications in fields as diverse as measurement of length and velocity sensors for rotation acceleration vibration and electrical and magnetic fields as well as in microscopy and nanotechnology Most topics are discussed first at a level accessible to anyone with a basic knowledge of physical optics then a more detailed treatment of the topic is undertaken and finally each topic is supplemented by a reference list of more than 1000 selected original publications in total Historical development of interferometry The laser as a light source Two beam interference Techniques for frequency stabilization Coherence Electronic phase measurements Multiple beam interference Quantum effects in optical interference Extensive coverage of the applications of interferometry such as measurements of length optical testing interference microscopy interference spectroscopy Fourier transform spectroscopy interferometric sensors nonlinear interferometers stellar interferometry and studies of space time and

gravitation **Laser Measurement Technology** Axel Donges, Reinhard Noll, 2014-10-14 Laser measurement technology has evolved in the last years in a versatile and reflationary way Today its methods are indispensable for research and development activities as well as for production technology Every physicist and engineer should therefore gain a working knowledge of laser measurement technology This book closes the gap of existing textbooks It introduces in a comprehensible presentation laser measurement technology in all its aspects Numerous figures graphs and tables allow for a fast access into the matter In the first part of the book the important physical and optical basics are described being necessary to understand laser measurement technology In the second part technically significant measuring methods are explained and application examples are presented Target groups of this textbook are students of natural and engineering sciences as well as working physicists and engineers who are interested to make themselves familiar with laser measurement technology and its fascinating potentials

Digital Optical Measurement Techniques and Applications Pramod Rastogi, 2015-05-01 This new resource explains the principles and applications of today's digital optical measurement techniques From start to finish each chapter provides a concise introduction to the concepts and principles of digital optical metrology followed by a detailed presentation of their applications The development of all these topics including their numerous methods principles and applications has been illustrated using a large number of easy to understand figures This book aims to not only help the reader identify the appropriate techniques in function of the measurement requirements but also assess modern digital measurement systems

The Very Large Telescope Interferometer Challenges for the Future Paulo J.V. Garcia, Andreas Glindemann, Thomas Henning, Fabien Malbet, 2013-11-11 A JENAM 2002 Workshop Porto Portugal 3-5 September 2002

Atomic and Molecular Spectroscopy Sune Svanberg, 2012-12-06 A wide ranging review of modern spectroscopic techniques such as X ray photoelectron optical and laser spectroscopy and radiofrequency and microwave techniques On the fundamental side the book focuses on physical principles and the impact of spectroscopy on our understanding of the building blocks of matter while in the area of applications particular attention is given to those in chemical analysis photochemistry surface characterisation environmental and medical diagnostics remote sensing and astrophysics The Fourth Edition also provides the reader with an update on laser cooling and trapping Bose Einstein condensation ultra fast spectroscopy high power laser matter interaction satellite based astronomy and spectroscopic aspects of laser medicine

Basics of Holography P. Hariharan, 2002-03-14 An excellent introduction to holography for students and researchers in science and engineering

Interferometry and Synthesis in Radio Astronomy A. Richard Thompson, James M. Moran, George W. Swenson Jr., 2017-02-22 This book is open access under a CC BY NC 4.0 license The third edition of this indispensable book in radio interferometry provides extensive updates to the second edition including results and technical advances from the past decade discussion of arrays that now span the full range of the radio part of the electromagnetic spectrum observable from the ground 10 MHz to 1 THz an analysis of factors that affect array speed and an expanded

discussion of digital signal processing techniques and of scintillation phenomena and the effects of atmospheric water vapor on image distortion among many other topics With its comprehensiveness and detailed exposition of all aspects of the theory and practice of radio interferometry and synthesis imaging this book has established itself as a standard reference in the field It begins with an overview of the basic principles of radio astronomy a short history of the development of radio interferometry and an elementary discussion of the operation of an interferometer From this foundation it delves into the underlying relationships of interferometry sets forth the coordinate systems and parameters to describe synthesis imaging and examines configurations of antennas for multielement synthesis arrays Various aspects of the design and response of receiving systems are discussed as well as the special requirements of very long baseline interferometry VLBI image reconstruction and recent developments in image enhancement techniques and astrometric observations Also discussed are propagation effects in the media between the source and the observer and radio interference factors that limit performance Related techniques are introduced including intensity interferometry optical interferometry lunar occultations tracking of satellites in Earth orbit interferometry for remote Earth sensing and holographic measurements of antenna surfaces This book will benefit anyone who is interested in radio interferometry techniques for astronomy astrometry geodesy or electrical engineering

Optical Interferometry Alexandr Banishev, Jue Wang, Mithun Bhowmick, 2017-02-15 Optical methods of measurements are the most sensitive techniques of noncontact investigations and at the same time they are fast as well as accurate which increases reproducibility of observed results In recent years the importance of optical interferometry methods for research has dramatically increased and applications range from precise surface testing to finding extrasolar planets This book covers various aspects of optical interferometry including descriptions of novel apparatuses and methods application interferometry for studying biological objects surface qualities materials characterization and optical testing The book includes a series of chapters in which experts share recent progress in interferometry through original research and literature reviews

Handbook of Optics: Fundamentals, techniques, and design Optical Society of America, 1995
Annotation A new volume in the field's bestselling optics reference an entirely new opus focusing on x ray nonlinear and vision optics Provides the same mix of tutorial writing with in depth reference material that distinguished Volumes I II

Literature 1992, Part 1 Astronomisches Recheninstitut, 2013-11-11 Astronomy and Astrophysics Abstracts appearing twice a year has become one of the fundamental publications in the fields of astronomy astrophysics and neighbouring sciences It is the most important English language abstracting journal in the mentioned branches The abstracts are classified under more than a hundred subject categories thus permitting a quick survey of the whole extended material The AAA is a valuable and important publication for all students and scientists working in the fields of astronomy and related sciences As such it represents a necessary ingredient of any astronomical library all over the world

Optoelectronic Gyroscopes Kamal Nain Chopra, 2020-09-19 The book presents the detailed study of optoelectronic gyroscopes especially Ring Laser

Gyroscopes RLGs and Fiber Optic Gyroscopes FOGs It discusses their design in detail to optimize their performance besides explaining the related concepts and the new developments Other topics covered in this book are double ion beam sputtering for fabricating RLG mirrors on the high quality optical substrates optical testing and thin films characterization techniques The book will be useful for the researchers professionals and engineers working in the areas of optical gyroscopes and the related technologies Coherent Optics Werner Lauterborn,Thomas Kurz,Martin Wiesenfeldt,2013-04-17 Coherent Optics presents in a concise and lively overview easy access to the fundamentals and modern aspects of this field From text based on coherence and its measurement the reader gains access to the fields of interferometry holography and Fourier optics while becoming acquainted with methods of coherent optical techniques of measurement From the multitude of nonlinear optical phenomena the following topics are particularly discussed the laser with its nonlinear dynamics tree wave interference the optical parametric amplifier and nonlinear fibre optics including solitons for signal transmission Many examples and exercises with complete solutions make this book a valuable study text **Interferometry and Synthesis in Radio Astronomy** A. Richard Thompson,James M. Moran,George W. Swenson, Jr.,2024-11-12 In this second edition of Interferometry and Synthesis in Radio Astronomy three leading figures in the development of large imaging arrays including very long baseline interferometry VLBI describe and explain the technology that provides images of the universe with an angular resolution as fine as 1 20 000 of an arcsecond This comprehensive volume begins with a historical review followed by detailed coverage of the theory of interferometry and synthesis imaging analysis of interferometer response geometrical relationships polarimetry antennas and arrays Discussion of the receiving system continues with analysis of the response to signals and noise analog design requirements and digital signal processing The authors detail special requirements of VLBI including atomic frequency standards broadband recording systems and antennas in orbit Further major topics include Calibration of data and synthesis of images Image enhancement using nonlinear algorithms Techniques for astrometry and geodesy Propagation in the neutral atmosphere and ionized media Radio interference Related techniques intensity interferometry moon occultations antenna holography and optical interferometry This edition meets current demands by providing a comprehensive account of the techniques used today La Doc STI The up to date edition of Thompson with its exhaustive bibliography becomes the indispensable source of background for those already in or considering radio astronomy The Observatory Optics in Astrophysics Renaud Foy,Françoise Claude Foy,2005-12-07 Astrophysics is facing challenging aims such as deep cosmology at redshift higher than 10 to constrain cosmology models or the detection of exoplanets and possibly terrestrial exoplanets and several others It requires unprecedented ambitious R D programs which have definitely to rely on a tight cooperation between astrophysics and optics communities The book addresses most of the most critical interdisciplinary domains where they interact or where they will do A first need is to collect more light i e telescopes still larger than the current 8 10 meter class ones Decametric and even hectometric optical from UV to IR wavelengths telescopes

are being studied Whereas up to now the light collecting surface of new telescopes was approximately 4 times that of the previous generation now this factor is growing to 10 to 100 This quantum leap urges to implement new methods or technologies developed in the optics community both in academic labs and in the industry Given the astrophysical goals and technological constraints new generation adaptive optics with a huge number of actuators and laser guide stars devices have to be developed from theoretical bases to experimental works Two other newcomers in observational astrophysics are interferometric arrays of optical telescopes and gravitational wave detectors Up to date reviews of detectors and of spectrographs are given as well as forefront R D in the field of optical coatings and of guided optics Possible new ways to handle photons are also addressed based on quantum physics More and more signal processing algorithms are a part and parcel of any modern instrumentation Thus finally the book gives two reviews about wavefront processing and about image restoration and deconvolution algorithms for ill conditioned cases

Optical Interferometry, 2e P. Hariharan, 2003-09-22

Nanotechnology sensor and measurement industries depend on these advances in optical interferometry for accuracy and profitability

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