

Radiation Ionization And Detection In Nuclear Medicine

Selected Topics in Image Science
Detectors for Particle Radiation
Radiation Effects in Materials
Handbook of Measurement in Science and Engineering
Radiation, Ionization, and Detection in Nuclear Medicine
An Evaluation of Radiation Exposure Guidance for Military Operations
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Physics and Engineering of Radiation Detection
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Fundamentals of Ionizing Radiation Dosimetry
Principles of Radiation Interaction in Matter and Detection
Evolution of Ionizing Radiation Research
Handbook of Drug Metabolism, Third Edition
Signal Processing for Radiation Detectors
Ionizing Radiation Effects and Applications
Semiconductor Radiation Detection Systems
Sourcebook on Atomic Energy
Fundamentals of Radiation and Chemical Safety
Radiation Detection and Measurement
Nuclear Energy
Engineering of Scintillation Materials and Radiation Technologies
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Seeing

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Photons Radiation, Ionization, and Detection in Nuclear Medicine
Silicon Solid State Devices and Radiation Detection
Radiation

Selected Topics in Image Science

The Department of Defense recently highlighted intelligence, surveillance, and reconnaissance (ISR) capabilities as a top priority for U.S. warfighters. Contributions provided by ISR assets in the operational theaters in Iraq and Afghanistan have been widely documented in press reporting. While the United States continues to increase investments in ISR capabilities, other nations not friendly to the United States will continue to seek countermeasures to U.S. capabilities. The Technology Warning Division of the Defense Intelligence Agency's (DIA) Defense Warning Office (DWO) has the critical responsibility, in collaborations with other components of the intelligence community (IC), for providing U.S. policymakers insight into technological developments that may impact future U.S. warfighting capabilities. To this end, the IC requested that the National Research Council (NRC) investigate and report on key visible and infrared detector technologies, with potential military utility, that are likely to be developed in the next 10-15 years. This study is the eighth in a series sponsored by the DWO and executed under the auspices of the NRC TIGER (Technology Insight-Gauge, Evaluate, and Review) Standing Committee.

Detectors for Particle Radiation

There is a growing need to understand and combat potential radiation damage problems in semiconductor devices and circuits. Assessing the billion-dollar market for detection equipment in the context of medical imaging using ionizing radiation, *Electronics for Radiation Detection* presents valuable information that will help integrated circuit (IC) designers and other electronics professionals take full advantage of the tremendous developments and opportunities associated with this burgeoning field. Assembling contributions from industrial and academic experts, this book— Addresses the state of the art in the design of semiconductor detectors, integrated circuits, and other electronics used in radiation detection Analyzes the main effects of radiation in semiconductor devices and circuits, paying special attention to degradation observed in MOS devices and circuits when they are irradiated Explains how circuits are built to deal with radiation, focusing on practical information about how they are being used, rather than mathematical details Radiation detection is critical in space applications, nuclear physics, semiconductor processing, and medical imaging, as well as security, drug development, and modern silicon processing techniques. The authors discuss new opportunities in these fields and address emerging detector technologies, circuit design techniques, new materials, and innovative system approaches. Aimed at postgraduate researchers and practicing engineers, this book is a must for those serious about improving

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their understanding of electronics used in radiation detection. The information presented here can help you make optimal use of electronic detection equipment and stimulate further interest in its development, use, and benefits.

Radiation Effects in Materials

The authors have addressed the basic need for internationally consistent standards and methods demanded by the new and increasing use of radioactive materials, radiopharmaceuticals and labelled compounds. Particular emphasis is given to the basic and practical problems that may be encountered in measuring radioactivity. The text provides information and recommendations in the areas of radiation protection, focusing on quality control and the precautions necessary for the preparation and handling of radioactive substances. New information is also presented on the applications of both traditional and innovative instruments in the fields of diagnostic and clinical radiology, radiation protection, biomedical research, industrial and agricultural applications, power production and waste control.

Handbook of Measurement in Science and Engineering

Integrating aspects of engineering, application physics, and medical science, *Solid-State Radiation Detectors: Technology and Applications* offers a comprehensive review of new and emerging solid-

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state materials-based technologies for radiation detection. Each chapter is structured to address the current advantages and challenges of each material and technology presented, as well as to discuss novel research and applications. Featuring contributions from leading experts in industry and academia, this authoritative text: Covers modern semiconductors used for radiation monitoring Examines CdZnTe and CdTe technology for imaging applications including three-dimensional capability detectors Highlights interconnect technology for current pixel detectors Describes hybrid pixel detectors and their characterizations Tackles the integrated analog signal processing read-out front ends for particle detectors Considers new organic materials with direct bandgap for direct energy detection Summarizes recent developments involving lanthanum halide and cerium bromide scintillators Analyzes the potential of recent progress in the field of crystallogenes, quantum dots, and photonics crystals toward a new concept of x- and gamma-ray detectors based on metamaterials Explores position-sensitivity photomultipliers and silicon photomultipliers for scintillation crystals Solid-State Radiation Detectors: Technology and Applications provides a valuable reference for engineers and scientists looking to enhance the performance of radiation detector technology for medical imaging and other applications.

Radiation, Ionization, and Detection in Nuclear Medicine

The author is ready to assert that practically none of

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the readers of this book will ever happen to deal with large doses of radiation. But the author, without a shadow of a doubt, claims that any readers of this book, regardless of gender, age, financial situation, type of professional activity, and habits, are actually exposed to low doses of radiation throughout their life. This book is devoted to the effect of small doses on the body. To understand the basic effects of radiation on humans, the book contains the necessary information from an atomic, molecular and nuclear physics, as well as from biochemistry and biology. Special attention is paid to the issues that are either not considered or discussed very briefly in existing literature. Examples include the ionization of inner atomic shells that play an essential role in radiological processes, and the questions of transformation of the energy of ionizing radiation in matter. The benefits of ionizing radiation to mankind is reflected in a wide range of radiation technologies used in science, industry, agriculture, culture, art, forensics, and, what is the most important application, medicine. Radiation: Fundamentals, Applications, Risks and Safety provides information on the use of radiation in modern life, its usefulness and indispensability. Experiments on the effects of small doses on bacteria, fungi, algae, insects, plants and animals are described. Human medical experiments are inhuman and ethically flawed. However, during the familiarity of mankind with ionizing radiation, a large number of population groups were subject to accumulation, exposed to radiation at doses of small but exceeding the natural background radiation. This book analyzes existing, real-life radiation results from survivors of Hiroshima and Nagasaki, Chernobyl and Fukushima,

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and examines studies of radiation effect on patients, radiologists, crews of long-distant flights and astronauts, on miners of uranium mines, on workers of nuclear industry and on militaries, exposed to ionizing radiation on a professional basis, and on the population of the various countries receiving environmental exposure. The author hopes that this book can mitigate the impact of radiation phobia, which prevails in the public consciousness over the last half century. Explores the science of radiation and the effects of radiation technologies and biological processes Analyzes the elementary processes of ionization and excitation Summarizes information about inner shells ionization and its impact on matter and biological structures Discusses quantum concepts in biology and clarifies the importance of epigenetics in radiological processes Includes case studies focusing on humans irradiated by low doses of radiation and its effects

An Evaluation of Radiation Exposure Guidance for Military Operations

Methods of proteomics have been shown to be powerful tools in search of target proteins – proteins that respond in cells to an internal or an external stimulus. Proteomics is widely used in biomedical research. However, in radiation biology research, following exposures of living matter to low doses of either ionizing or non-ionizing radiation, proteomics approach is only very slowly gaining support. This book, by presenting the current status of the use of proteomics in radiation biology, will help to attract

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attention to the field of radiation proteomics.

Gaseous Radiation Detectors

Describes the fundamentals and applications of gaseous radiation detection, ideal for researchers and experimentalists in nuclear and particle physics.

Electronics for Radiation Detection

Presents the fundamental concepts of signal processing for all application areas of ionizing radiation This book provides a clear understanding of the principles of signal processing of radiation detectors. It puts great emphasis on the characteristics of pulses from various types of detectors and offers a full overview on the basic concepts required to understand detector signal processing systems and pulse processing techniques. Signal Processing for Radiation Detectors covers all of the important aspects of signal processing, including energy spectroscopy, timing measurements, position-sensing, pulse-shape discrimination, and radiation intensity measurement. The book encompasses a wide range of applications so that readers from different disciplines can benefit from all of the information. In addition, this resource: Describes both analog and digital techniques of signal processing Presents a complete compilation of digital pulse processing algorithms Extrapolates content from more than 700 references covering classic papers as well as those of today Demonstrates concepts with more than 340 original illustrations Signal Processing

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for Radiation Detectors provides researchers, engineers, and graduate students working in disciplines such as nuclear physics and engineering, environmental and biomedical engineering, and medical physics and radiological science, the knowledge to design their own systems, optimize available systems or to set up new experiments.

Radiation Detection and Measurement

Fundamentals of Radiation and Chemical Safety covers the effects and mechanisms involved in radiation and chemical exposure on humans. The mechanisms and effects of these damaging factors have many aspects in common, as do their research methodology and the methods used for data processing. In many cases of these types of exposures the same final effect can also be noted: Cancer. Low doses of radiation and small doses of chemical exposure are continuously active and they could influence the entire population. The analysis of these two main source hazards on the lives of the human population is covered here for the first time in a single volume determining and demonstrating their common basis. Fundamentals of Radiation and Chemical Safety includes the necessary knowledge from nuclear physics, chemistry and biology, as well the methods of processing the experimental results. This title focuses on the effects of low radiation dosage and chemical hormesis as well as the hazards associated with, and safety precautions in radiation and chemicals, rather than the more commonly noted safety issues high level emergencies and disasters of

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this type. Brings together, for the first time, the problems of radiation and chemical safety on a common biophysical basis. Relates hazards caused by ionizing radiation and chemicals and discusses the common effective mechanisms Outlines common methodology and data processing between radiation and regular chemical hazards Concerns primarily with low levels of radiation and chemical exposure

Advanced Radiation Protection Dosimetry

Semiconductor sensors patterned at the micron scale combined with custom-designed integrated circuits have revolutionized semiconductor radiation detector systems. Designs covering many square meters with millions of signal channels are now commonplace in high-energy physics and the technology is finding its way into many other fields, ranging from astrophysics to experiments at synchrotron light sources and medical imaging. This book is the first to present a comprehensive discussion of the many facets of highly integrated semiconductor detector systems, covering sensors, signal processing, transistors and circuits, low-noise electronics, and radiation effects. The diversity of design approaches is illustrated in a chapter describing systems in high-energy physics, astronomy, and astrophysics. Finally a chapter "Why things don't work" discusses common pitfalls. Profusely illustrated, this book provides a unique reference in a key area of modern science.

Health Risks from Exposure to Low

Levels of Ionizing Radiation

The second edition of a bestseller, this book presents the latest innovative research methods that help break new ground by applying patterns, reuse, and design science to research. The book relies on familiar patterns to provide the solid fundamentals of various research philosophies and techniques as touchstones that demonstrate how to innovate research methods. Filled with practical examples of applying patterns to IT research with an emphasis on reusing research activities to save time and money, this book describes design science research in relation to other information systems research paradigms such as positivist and interpretivist research.

Radioactivity and Radiation

A multidisciplinary reference of engineering measurement tools, techniques, and applications
"When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely in your thoughts advanced to the stage of science." — Lord Kelvin
Measurement is at the heart of any engineering and scientific discipline and job function. Whether engineers and scientists are attempting to state requirements quantitatively and demonstrate compliance; to track progress and predict results; or to analyze costs and benefits, they

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must use the right tools and techniques to produce meaningful data. The Handbook of Measurement in Science and Engineering is the most comprehensive, up-to-date reference set on engineering and scientific measurements—beyond anything on the market today. Encyclopedic in scope, Volume 3 covers measurements in physics, electrical engineering and chemistry: Laser Measurement Techniques Magnetic Force Images using Capacitive Coupling Effect Scanning Tunneling Microscopy Measurement of Light and Color The Detection and Measurement of Ionizing Radiation Measuring Time and Comparing Clocks Laboratory-Based Gravity Measurement Cryogenic Measurements Temperature-Dependent Fluorescence Measurements Voltage and Current Transducers for Power Systems Electric Power and Energy Measurement Chemometrics for the Engineering and Measurement Sciences Liquid Chromatography Mass Spectroscopy Measurements of Nitrotyrosine-Containing Proteins Fluorescence Spectroscopy X-Ray Absorption Spectroscopy Nuclear Magnetic Resonance (NMR) Spectroscopy Near Infrared (NIR) Spectroscopy Nanomaterials Properties Chemical Sensing Vital for engineers, scientists, and technical managers in industry and government, Handbook of Measurement in Science and Engineering will also prove ideal for academics and researchers at universities and laboratories.

Semiconductor Detector Systems

This book presents an overview of the physics of radiation detection and its applications. It covers the

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origins and properties of different kinds of ionizing radiation, their detection and measurement, and the procedures used to protect people and the environment from their potentially harmful effects. It details the experimental techniques and instrumentation used in different detection systems in a very practical way without sacrificing the physics content. It provides useful formulae and explains methodologies to solve problems related to radiation measurements. With abundance of worked-out examples and end-of-chapter problems, this book enables the reader to understand the underlying physical principles and their applications. Detailed discussions on different detection media, such as gases, liquids, liquefied gases, semiconductors, and scintillators make this book an excellent source of information for students as well as professionals working in related fields. Chapters on statistics, data analysis techniques, software for data analysis, and data acquisition systems provide the reader with necessary skills to design and build practical systems and perform data analysis. * Covers the modern techniques involved in detection and measurement of radiation and the underlying physical principles * Illustrates theoretical and practical details with an abundance of practical, worked-out examples * Provides practice problems at the end of each chapter

Nuclear Radiation Detectors

An Introduction to the Physics of Nuclear Medicine

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This book will serve as the definitive source of detailed information on radiation, ionization, and detection in nuclear medicine. It opens by considering fundamental aspects of nuclear radiation, including dose and energy, sources, and shielding. Subsequent chapters cover the full range of relevant topics, including the detection and measurement of radiation exposure (with detailed information on mathematical modelling); medical imaging; the different types of radiation detector and their working principles; basic principles of and experimental techniques for deposition of scintillating materials; device fabrication; the optical and electrical behaviors of radiation detectors; and the instrumentation used in nuclear medicine and its application. The book will be an invaluable source of information for academia, industry, practitioners, and researchers.

Radiation Detection

This book addresses the fundamental principles of interaction between radiation and matter, the principles of working and the operation of particle detectors based on silicon solid state devices. It covers a broad scope with respect to the fields of application of radiation detectors based on silicon solid state devices from low to high energy physics experiments including in outer space and in the medical environment. This book covers state-of-the-art detection techniques in the use of radiation detectors based on silicon solid state devices and their readout electronics, including the latest developments on pixelated silicon radiation detector

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and their application. The content and coverage of the book benefit from the extensive experience of the two authors who have made significant contributions as researchers as well as in teaching physics students in various universities.

Radiation

Fosters a thorough understand of radiation dosimetry concepts: detailed solutions to the exercises in the textbook "Fundamentals of Ionizing Radiation Dosimetry"!

Exercises with Solutions in Radiation Physics

The author is ready to assert that practically none of the readers of this book will ever happen to deal with large doses of radiation. But the author, without a shadow of a doubt, claims that any readers of this book, regardless of gender, age, financial situation, type of professional activity, and habits, are actually exposed to low doses of radiation throughout their life. This book is devoted to the effect of small doses on the body. To understand the basic effects of radiation on humans, the book contains the necessary information from an atomic, molecular and nuclear physics, as well as from biochemistry and biology. Special attention is paid to the issues that are either not considered or discussed very briefly in existing literature. Examples include the ionization of inner atomic shells that play an essential role in radiological processes, and the questions of transformation of the

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energy of ionizing radiation in matter. The benefits of ionizing radiation to mankind is reflected in a wide range of radiation technologies used in science, industry, agriculture, culture, art, forensics, and, what is the most important application, medicine.

Radiation: Fundamentals, Applications, Risks and Safety provides information on the use of radiation in modern life, its usefulness and indispensability.

Experiments on the effects of small doses on bacteria, fungi, algae, insects, plants and animals are described. Human medical experiments are inhuman and ethically flawed. However, during the familiarity of mankind with ionizing radiation, a large number of population groups were subject to accumulation, exposed to radiation at doses of small but exceeding the natural background radiation. This book analyzes existing, real-life radiation results from survivors of Hiroshima and Nagasaki, Chernobyl and Fukushima, and examines studies of radiation effect on patients, radiologists, crews of long-distant flights and astronauts, on miners of uranium mines, on workers of nuclear industry and on militaries, exposed to ionizing radiation on a professional basis, and on the population of the various countries receiving environmental exposure. The author hopes that this book can mitigate the impact of radiation phobia, which prevails in the public consciousness over the last half century. Explores the science of radiation and the effects of radiation technologies and biological processes Analyzes the elementary processes of ionization and excitation Summarizes information about inner shells ionization and its impact on matter and biological structures Discusses quantum concepts in biology and clarifies the importance of epigenetics

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in radiological processes Includes case studies focusing on humans irradiated by low doses of radiation and its effects

Radioactivity Measurements

The study of radiation effects has developed as a major field of materials science from the beginning, approximately 70 years ago. Its rapid development has been driven by two strong influences. The properties of the crystal defects and the materials containing them may then be studied. The types of radiation that can alter structural materials consist of neutrons, ions, electrons, gamma rays or other electromagnetic waves with different wavelengths. All of these forms of radiation have the capability to displace atoms/molecules from their lattice sites, which is the fundamental process that drives the changes in all materials. The effect of irradiation on materials is fixed in the initial event in which an energetic projectile strikes a target. The book is distributed in four sections: Ionic Materials; Biomaterials; Polymeric Materials and Metallic Materials.

Physics and Engineering of Radiation Detection

Nuclear Energy provides an authoritative reference on all aspects of the nuclear industry from fundamental reactor physics calculations to reactor design, nuclear fuel resources, nuclear fuel cycle, radiation detection and protection, and nuclear power economics.

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Featuring 19 peer-reviewed entries by recognized authorities in the field, this book provides comprehensive, streamlined coverage of fundamentals, current areas of research, and goals for the future. The chapters will appeal to undergraduate and graduate students, researchers, and energy industry experts.

Solid-State Radiation Detectors

Semiconductor Radiation Detection Systems addresses the state-of-the-art in the design of semiconductor detectors and integrated circuit design, in the context of medical imaging using ionizing radiation. It addresses exciting new opportunities in X-ray detection, Computer Tomography (CT), bone dosimetry, and nuclear medicine (PET, SPECT). In addition to medical imaging, the book explores other applications of semiconductor radiation detection systems in security applications such as luggage scanning, dirty bomb detection, and border control. Features a chapter written by well-known Gamma-Ray Imaging authority Tadayuki Takahashi Assembled by a combination of top industrial experts and academic professors, this book is more than just a product manual. It is practical enough to provide a solid explanation of presented technologies, incorporating material that offers an optimal balance of scientific and academic theory. With less of a focus on math and physical details, the author concentrates more on exploring exactly how technologies are being used. With its combined coverage of new materials and innovative

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new system approaches, as well as a succinct overview of recent developments, this book is an invaluable tool for any engineer, professional, or student working in electronics or an associated field.

Physics and Engineering of Radiation Detection

The industrial and medical applications of radiation have been augmented and scientific insight into mechanisms for radiation action notably progressed. In addition, the public concern about radiation risk has also grown extensively. Today the importance of risk communication among stakeholders involved in radiation-related issues is emphasized much more than any time in the past. Thus, the circumstances of radiation research have drastically changed, and the demand for a novel approach to radiation-related issues is increasing. It is thought that the publication of the book *Evolution of Ionizing Radiation Research* at this time would have enormous impacts on the society. The editor believes that technical experts would find a variety of new ideas and hints in this book that would be helpful to them to tackle ionizing radiation.

Ionizing Radiation Detectors for Medical Imaging

Radiation Detection: Concepts, Methods, and Devices provides a modern overview of radiation detection devices and radiation measurement methods. The book topics have been selected on the basis of the

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authors' many years of experience designing radiation detectors and teaching radiation detection and measurement in a classroom environment. This book is designed to give the reader more than a glimpse at radiation detection devices and a few packaged equations. Rather it seeks to provide an understanding that allows the reader to choose the appropriate detection technology for a particular application, to design detectors, and to competently perform radiation measurements. The authors describe assumptions used to derive frequently encountered equations used in radiation detection and measurement, thereby providing insight when and when not to apply the many approaches used in different aspects of radiation detection. Detailed in many of the chapters are specific aspects of radiation detectors, including comprehensive reviews of the historical development and current state of each topic. Such a review necessarily entails citations to many of the important discoveries, providing a resource to find quickly additional and more detailed information. This book generally has five main themes: Physics and Electrostatics needed to Design Radiation Detectors Properties and Design of Common Radiation Detectors Description and Modeling of the Different Types of Radiation Detectors Radiation Measurements and Subsequent Analysis Introductory Electronics Used for Radiation Detectors Topics covered include atomic and nuclear physics, radiation interactions, sources of radiation, and background radiation. Detector operation is addressed with chapters on radiation counting statistics, radiation source and detector effects, electrostatics for signal generation, solid-state and

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semiconductor physics, background radiations, and radiation counting and spectroscopy. Detectors for gamma-rays, charged-particles, and neutrons are detailed in chapters on gas-filled, scintillator, semiconductor, thermoluminescence and optically stimulated luminescence, photographic film, and a variety of other detection devices.

Fundamentals of Ionizing Radiation Dosimetry

This volume provides a broad overview of the latest achievements in scintillator development, from theory to applications, and aiming for a deeper understanding of fundamental processes, as well as the discovery and availability of components for the production of new generations of scintillation materials. It includes papers on the microtheory of scintillation and the initial phase of luminescence development, applications of the various materials, and development and characterization of ionizing radiation detection equipment. The book also touches upon the increased demand for cryogenic scintillators, the renaissance of garnet materials for scintillator applications, nano-structuring in scintillator development, development and applications for security, and exploration of hydrocarbons and ecological monitoring.

Principles of Radiation Interaction in Matter and Detection

The continuing growth of computed tomography (CT)

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and other imaging techniques motivated us to bring together a comprehensive review of the state of the art in diagnostic imaging. Twelve years after the first appearance of x-ray CT, computerized diagnostic imaging has grown so rapidly in sophistication that it is difficult to follow current developments in this diversified field. In this book, we have attempted to cover the basic developments in several areas. The first part includes some of the fundamental aspects of computerized diagnostic imaging such as algorithms and detectors. Specific applications in emission tomography, digital radiography, ultrasound and nuclear magnetic resonance imaging are dealt with in the second part. The contributed papers are by experts currently in the field, whom we feel would certainly enlighten the subject matter and possibly suggest directions for future development. We would like to express our sincere thanks to those who have contributed to this volume. We are sure that their original papers will be beneficial for readers and will also remain as an important reference for researchers in the years to come. We would also like to thank Betty Trent for her expert and patient typing of the entire book. Finally, special thanks are due to Mrs. Ingeborg Mayer of Springer-Verlag for her encouragements, support and patience throughout the preparation of this book.

Evolution of Ionizing Radiation Research

This book lays the foundations for you to understand all that you always wanted to know about radioactivity. It begins by setting out essential

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information about the structure of matter, how radiation occurs and how it can be measured. It goes on to explore the substantial benefits of radioactivity through its many applications, and also the possible risks associated with its use. The field of radioactivity is explained in layman's terms, so that everybody who is interested can improve their understanding of issues such as nuclear power, radiation accidents, medical applications of radiation and radioactivity from the environment. Everything is radioactive. There is natural radioactivity in the homes that we live in, the food that we eat and the air that we breath. For over 100 years, people have recognised the potential for radioactivity to help solve problems and improve our standard of living. This has led to the creation of radioactivity levels in some places that are much higher than naturally-occurring background levels. Such high levels of radiation can be harmful to people and the environment, so there is a clear need to manage this potential harm and to make the risk worth the benefits mankind can achieve from radioactive materials.

Handbook of Drug Metabolism, Third Edition

Signal Processing for Radiation Detectors

This is the resource that engineers turn to in the study of radiation detection. The fourth edition takes into account the technical developments that

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continue to enhance the instruments and techniques available for the detection and spectroscopy of ionizing radiation. New coverage is presented on ROC curves, micropattern gas detectors, new sensors for scintillation light, and the excess noise factor. Revised discussions are also included on TLDs and cryogenic spectrometers, radiation backgrounds, and the VME standard. Engineers will gain a strong understanding of the field with this updated book.

Ionizing Radiation Effects and Applications

Ionizing Radiation Detectors for Medical Imaging contains tentechanical chapters, half of which are devoted to radiology and theother half to nuclear medicine. The last chapter describes thedetectors for radiotherapy and portal imaging. Each chapter addressescompletely a specific application. The emphasis is always on detectorfundamentals and detector properties. Where necessary, software andspecific applications are described in depth. This book is intended for graduate and undergraduate students inphysics and engineering who want to study medical imaging. Inaddition, scientists who are working in a specific sub-field ofmedical imaging can acquire from the book an up-to-date description ofthe state of the art in related sub-fields, within the scope ofionizing radiation detectors. Other scientists, as well as physicians, can use the book as a reference for medical imaging

Semiconductor Radiation Detection

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Systems

This book, like the first and second editions, addresses the fundamental principles of interaction between radiation and matter and the principles of particle detection and detectors in a wide scope of fields, from low to high energy, including space physics and medical environment. It provides abundant information about the processes of electromagnetic and hadronic energy deposition in matter, detecting systems, performance of detectors and their optimization. The third edition includes additional material covering, for instance: mechanisms of energy loss like the inverse Compton scattering, corrections due to the Landau-Pomeranchuk-Migdal effect, an extended relativistic treatment of nucleus-nucleus screened Coulomb scattering, and transport of charged particles inside the heliosphere. Furthermore, the displacement damage (NIEL) in semiconductors has been revisited to account for recent experimental data and more comprehensive comparisons with results previously obtained. This book will be of great use to graduate students and final-year undergraduates as a reference and supplement for courses in particle, astroparticle, space physics and instrumentation. A part of the book is directed toward courses in medical physics. The book can also be used by researchers in experimental particle physics at low, medium, and high energy who are dealing with instrumentation. Errata(s) Errata Contents: Electromagnetic Interaction of Radiation in Matter Nuclear Interactions in Matter Radiation

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Environments and Damage in Silicon
Semiconductors
Scintillating Media and Scintillator
Detectors
Solid State Detectors
Displacement Damage and Particle Interactions in Silicon Devices
Gas Filled Chambers
Principles of Particle Energy
Determination
Superheated Droplet (Bubble) Detectors and CDM Search
Medical Physics Applications
Readership: Researchers, academics, graduate students and professionals in accelerator, particle, astroparticle, space, applied and medical physics. Keywords: Interactions Between Radiation/Particles and Matter; High; Intermediate and Low Energy Particle Physics; Medical Physics; Radiation/Particle Detection; Space Physics; Detectors; Semiconductors; Calorimeters; Chambers; Scintillators; Silicon Pixels; Radiation Damage; Single Event Effects; Solar Cells
Key Features: Covers state-of-the-art detection techniques and underlying theories
Addresses topics of considerable use for professionals in medical physics, nuclear engineering, and environmental studies
Contains an updated reference table set of physical properties

Sourcebook on Atomic Energy

This book will serve as the definitive source of detailed information on radiation, ionization, and detection in nuclear medicine. It opens by considering fundamental aspects of nuclear radiation, including dose and energy, sources, and shielding. Subsequent chapters cover the full range of relevant topics, including the detection and measurement of radiation exposure (with detailed information on mathematical

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modelling); medical imaging; the different types of radiation detector and their working principles; basic principles of and experimental techniques for deposition of scintillating materials; device fabrication; the optical and electrical behaviors of radiation detectors; and the instrumentation used in nuclear medicine and its application. The book will be an invaluable source of information for academia, industry, practitioners, and researchers.

Fundamentals of Radiation and Chemical Safety

The complexity and vulnerability of the human body has driven the development of a diverse range of diagnostic and therapeutic techniques in modern medicine. The Nuclear Medicine procedures of Positron Emission Tomography (PET), Single Photon Emission Computed Tomography (SPECT) and Radionuclide Therapy are well-established in clinical practice and are founded upon the principles of radiation physics. This book will offer an insight into the physics of nuclear medicine by explaining the principles of radioactivity, how radionuclides are produced and administered as radiopharmaceuticals to the body and how radiation can be detected and used to produce images for diagnosis. The treatment of diseases such as thyroid cancer, hyperthyroidism and lymphoma by radionuclide therapy will also be explored.

Radiation Detection and Measurement

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This new edition of the methods and instrumentation used in the detection of ionizing radiation has been revised and updated to reflect recent advances. It covers modern engineering practice, provides useful design information and contains an up-to-date review of the literature.

Nuclear Energy

Although many radiation protection scientists and engineers use dose coefficients, few know the origin of those dose coefficients. This is the first book in over 40 years to address the topic of radiation protection dosimetry in intimate detail. *Advanced Radiation Protection Dosimetry* covers all methods used in radiation protection dosimetry, including advanced external and internal radiation dosimetry concepts and regulatory applications. This book is an ideal reference for both scientists and practitioners in radiation protection and students in graduate health physics and medical physics courses. Features: A much-needed book filling a gap in the market in a rapidly expanding area Contains the history, evolution, and the most up-to-date computational dosimetry models Authored and edited by internationally recognized authorities and subject area specialists Interrogates both the origins and methodologies of dose coefficient calculation Incorporates the latest international guidance for radiation dosimetry and protection

Engineering of Scintillation Materials and Radiation Technologies

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Physics and Engineering of Radiation Detection presents an overview of the physics of radiation detection and its applications. It covers the origins and properties of different kinds of ionizing radiation, their detection and measurement, and the procedures used to protect people and the environment from their potentially harmful effects. The second edition is fully revised and provides the latest developments in detector technology and analyses software. Also, more material related to measurements in particle physics and a complete solutions manual have been added. Discusses the experimental techniques and instrumentation used in different detection systems in a very practical way without sacrificing the physics content Provides useful formulae and explains methodologies to solve problems related to radiation measurements Contains many worked-out examples and end-of-chapter problems Detailed discussions on different detection media, such as gases, liquids, liquefied gases, semiconductors, and scintillators Chapters on statistics, data analysis techniques, software for data analysis, and data acquisition systems

Radiation Proteomics

A clear, concise, comprehensive review of detectors of high-energy particles and radiation; thoroughly revised and updated.

Seeing Photons

The benefits of ionizing radiations have been largely

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demonstrated through many achievements of human life. Understanding the fundamental elementary interactions of ionizing radiations with material has allowed the development of various applications needed by different industries. This book draws some facets of their applications, such as hardening process for semiconductor devices, biomedical imaging by radiation luminescent quantum dots, hydrogen gas detection by Raman lidar sensor for explosion risk assessment, water and wastewater purification by radiation treatment for environment, doping by the neutron transmutation doping for the semiconductor industry, and polymerization by irradiation, which is useful for industries requiring resistant and protective coating. I wish the chapters of this book can provide some helpful information on ionizing radiation applications.

Radiation, Ionization, and Detection in Nuclear Medicine

Silicon Solid State Devices and Radiation Detection

This book is the seventh in a series of titles from the National Research Council that addresses the effects of exposure to low dose LET (Linear Energy Transfer) ionizing radiation and human health. Updating information previously presented in the 1990 publication, Health Effects of Exposure to Low Levels of Ionizing Radiation: BEIR V, this book draws upon new data in both epidemiologic and experimental

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research. Ionizing radiation arises from both natural and man-made sources and at very high doses can produce damaging effects in human tissue that can be evident within days after exposure. However, it is the low-dose exposures that are the focus of this book. So-called “late” effects, such as cancer, are produced many years after the initial exposure. This book is among the first of its kind to include detailed risk estimates for cancer incidence in addition to cancer mortality. BEIR VII offers a full review of the available biological, biophysical, and epidemiological literature since the last BEIR report on the subject and develops the most up-to-date and comprehensive risk estimates for cancer and other health effects from exposure to low-level ionizing radiation.

Radiation

The textbook begins with exercises related to radioactive sources and decay schemes. The problems covered include series decay and how to determine the frequency and energy of emitted particles in disintegrations. The next chapter deals with the interaction of ionizing radiation, including the treatment of photons and charged particles. The main focus is on applications based on the knowledge of interaction, to be used in subsequent work and courses. The textbook then examines detectors and measurements, including both counting statistics and properties of pulse detectors. The chapter that follows is dedicated to dosimetry, which is a major subject in medical radiation physics. It covers theoretical applications, such as different equilibrium situations

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and cavity theories, as well as experimental dosimetry, including ionization chambers and solid state and liquid dosimeters. A shorter chapter deals with radiobiology, where different cell survival models are considered. The last chapter concerns radiation protection and health physics. Both radioecology and radiation shielding calculations are covered. The textbook includes tables to simplify the solutions of the exercises, but the reader is mainly referred to important websites for importing necessary data.

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