http://ssd19.org/marko-moscovitch-school/

7th Marko Moscovitch School

SSD Summer School

in conjuction with

19th International Conference on Solid State Dosimetry

HIROSHIMA, JAPAN

11-14 SEPTEMBER 2019

7th Marko Moscovitch School (SSD Summer School)

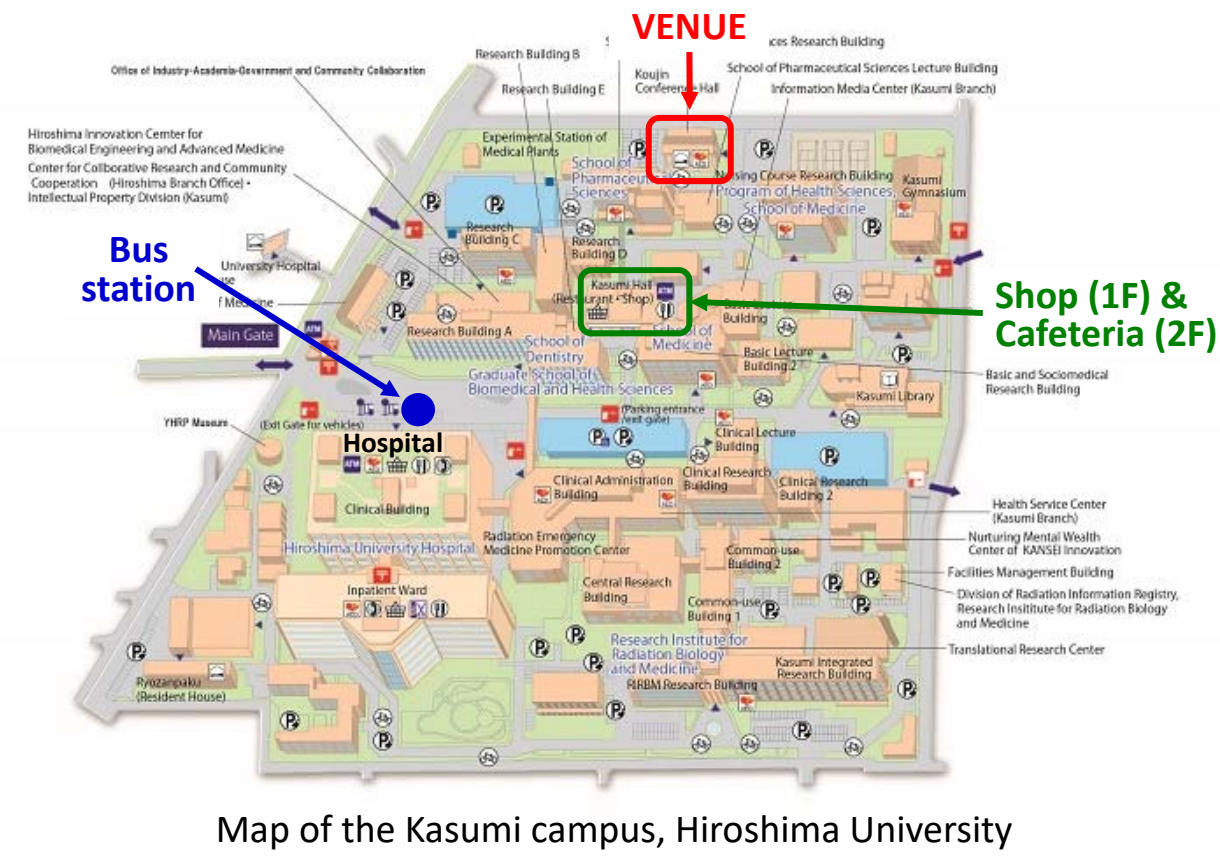
in conjunction with SSD19

Time: Wednesday 11 to Saturday 14, September, 2019

Venue: Kojin-kaikan Conference Hall,
Kasumi Campus, Hiroshima University,
1-2 Kasumi, Minami-ku, Hiroshima City

Access: Take **No.5** bus from the JR Hiroshima station to the University Hospital (about 15 min). Then walk 5 min in the campus (see the map below).

Host: International Solid State Dosimetry Organization (ISSDO) and Hiroshima University



Map of the Kasumi campus, Hiroshima University

School Program

Time	Date in 2019			
	Wed 11 Sep	Thu 12 Sep.	Fri 13 Sep.	Sat 14 Sep.
9:00-10:00		3. Luminescence dosimetry	8. Dosimetry in space and aviation	13. Neutron dosimetry and spectrometers
		Coffee break	Coffee break	Coffee break
10:20-11:20		4. Retrospective dosimetry	9. 3D polymer gel dosimetry	14. Personal and Environmental Dosimetry
		Coffee break	Coffee break	Coffee break
11:40-12:40		5. Dosimetry using EPR	10. Micro-dosimetry for radiation therapy	Wrap-up: Which dosimeter is the most promising?
	13:30~ Registration	Lunch	Lunch	Closing & Group photo
14:00-14:10	Opening			Excursion[2]
14:10-15:10	1.Fundamentals of dosimetry	6. Particle dosimetry and track detectors	11. Advanced semiconductor detectors	
	Coffee break	Coffee break	Coffee break	
15:30-16:30	2. Dosimetry for radiological emergency	7. Computational dosimetry	12. Medical radiation dosimetry	
	Coffee break	Coffee break	Coffee break	
16:50-17:50	Reception	Exercise[1]: Practical Exercises on TL	Special Lecture: How to write a scientific paper	

[1] Note PC will be needed for this exercise session.

[2] It is planned to visit the Hiroshima Peace Memorial Museum.

Dear Colleagues,

The first Marko Moscovitch School (formerly called Summer School) was held in conjunction with Solid State Dosimetry Conference in Athens on 2001. Since then the School is held each time preceding the SSD Conference under supervision of the ISSDO.

The aim of this School is to teach the skills and knowledge needed to understand the principles and application of dosimetry based on solid state detectors. Its program includes the basics of dosimetry, advanced applications of the SSD techniques for emergency dosimetry, dose reconstruction & dating, real-time monitoring, medical dosimetry, etc.

In this School, selected world-class experts will provide lectures on state-of-the-art methods and theories for radiation dosimetry, and then discuss future needs that will be investigated by young professionals including graduate-course students.

We are very excited and look forward to seeing you enjoy those lectures and discussions in this School. Please use this precious opportunity to deepen and widen your knowledge on radiation dosimetry and expand your scientific activities.

Let us express our sincere appreciation to all the lecturers who accepted giving lectures for this School from their busy schedules. We also thank all institutions and sponsors as well as our colleagues in Hiroshima who kindly supported organization and operation of this School.

All the best,

Organizing Committee of SSD19 Summer School:

Adrie J.J. Bos (The Netherlands)
Anatoly Rosenfeld (Australia)
Eduardo Yukihara (Switzerland)
Francesco d'Errico (Italy/USA)
Stephen W.S. McKeever (USA)
Hiroshi Yasuda (Japan)

School Lectures

Wednesday, 11 September 2019

Opening: Welcome address from Hiroshima University [Shin-ichi Tate, Japan]

History of Marko Moscovitch School [Stephen McKeever, USA]

Lecture 1: Fundamentals of dosimetry [Adrie Bos, The Netherlands]

Lecture 2: Dosimetry for nuclear/radiological emergencies [Hiroshi Yasuda, Japan]

Thursday, 12 September 2019

Lecture 3: Luminescence dosimetry [Eduardo Yukihara, Switzerland]

Lecture 4: Retrospective dosimetry [Ian Bailiff, UK]

Lecture 5: Dosimetry using electron paramagnetic resonance [François Trompier, France]

Lecture 6: Particle dosimetry and track detectors [Mark Akselrod, USA]

Lecture 7: Computational dosimetry [Steffen Greilich, Germany]

Exercise session: Practical exercises in luminescence dosimetry: from experimental data to models [Vasilis Pagonis, USA]

Friday, 13 September 2019

Lecture 8: Space and ion beam dosimetry [Satoshi Kodaira, Japan]

Lecture 9: Three-dimensional polymer gel dosimetry [Francesco d'Errico, Italy]

Lecture 10: Microdosimetry and its applications in BNCT and hadron therapy [Paolo Colautti, Italy]

Lecture 11: Advanced semiconductor detectors [Anatoly Rosenfeld, Australia]

Lecture 12: Medical radiation dosimetry [Tomas Kron, Australia]

Special lecture: How to write a scientific paper [Adrie Bos, The Netherlands]

Saturday, 14 September 2019

Lecture 13: Neutron dosimetry and spectrometers [Takashi Nakamura, Japan]

Lecture 14: Personal and Environmental Dosimetry [Filip Vanhavere, Belgium]

Wrap-up session: Which dosimeter is the most promising? [moderated by Stephen McKeever, USA]

Lecture 1

Wed 11 Sep, 14:10 – 15:10

Fundamentals of dosimetry

Prof. Adrie J.J. Bos

Delft University of Technology,
The Netherlands

Biography

1979 Graduated Faculty of Mathematics and Physics, Free University Amsterdam (The Netherlands)

1985 Researcher, InterUniversity Reactor Institute (Delft, The Netherlands)

1990 Senior Scientist and Lecturer, Delft University of Technology (The Netherlands)

2012- Co-Editor-in-Chief, Radiation Measurements

Abstract

The basic concepts of radiation dosimetry are reviewed. The dosimetric quantities, kerma, absorbed dose and exposure together with the relations between them are discussed in depth. Finally it is indicated how the absorbed dose can be measured with a calorimeter by measuring the temperature increase and with an ionisation chamber measuring the charge produced by the ionizing radiation and making use of the Bragg-Gray relation.

Lecture 2

Wed 11 Sep, 15:30 – 16:30

Dosimetry for radiological emergency

Prof. Hiroshi Yasuda

Hiroshima University, Japan

Biography

1988 Graduated Faculty of Sanitary and Environmental Engineering, Kyoto University (Japan)

1992 Researcher, National Institute of Radiological Sciences (Japan)

2011 Project Manager, Secretariat for UNSCEAR (Austria)

2015- Professor, Hiroshima University (Japan)

Abstract

When you encounter an accident/incident/anomaly associated with radiation exposure, it is crucial to immediately identify the individuals who received significant exposure levels, estimate their doses quickly (even roughly) and make it possible to provide the best medical treatment on a case-by-case basis. The lecture will present a practical guide to achieve the most appropriate dosimetry in such emergency situations.

Lecture 3

Thu 12 Sep, 9:00 – 10:00

Luminescence Dosimetry

Dr. Eduardo Yukihara

Paul Scherrer Institut, Switzerland

Biography

2004 – 2009 Assistant Professor, Physics Department, Oklahoma State University

2009 – 2016 Associate Professor, Physics Department, Oklahoma State University

2016 – 2018 Professor, Physics Department, Oklahoma State University

2018 Associate Professor, Physics Department, Oklahoma State University

2016 Head of the Dosimetry Group, Department of Radiation Safety and Security, Paul Scherrer Institute

2018- Head of the Radiation Metrology Section, Department of Radiation Safety and Security, Paul Scherrer Institute

Abstract

Luminescence remains one of the most widely used phenomenon in passive radiation dosimetry. The related techniques, thermoluminescence (TL), optically stimulated luminescence (OSL) and radiophotoluminescence (RPL), are the basis of successful commercial dosimetry systems. In this lecture we will explore the unifying principles behind these techniques, explore advantages and disadvantages of each one of them, and discuss the state of the art. The topic will also provide the fundamentals for other lectures in the School.

Lecture 4

Thu 12 Sep, 10:20 – 11:20

Retrospective dosimetry

Prof. Ian Bailiff

University of Durham, UK

Biography

1986 Science and Engineering Research Council Advanced Fellow

1991 Lecturer, University of Durham

2003 Professor, University of Durham

2009 - Co-Editor-in-Chief, Radiation Measurements

Abstract

Luminescent minerals within ceramic building materials have been successfully applied as surrogate dosimetry materials to important dose reconstruction studies, in particular at Hiroshima and Nagasaki, and more recently in areas affected by radioactive fallout (e.g. the Nevada Test Site, the Chernobyl accident, the Semipalatinsk Nuclear Test Site, Chelyabinsk, etc.). These retrospective studies aimed to reconstruct the cumulative gamma dose years after the onset of the contamination event. Recent concerns regarding future radiological emergencies has led to widening the search for other surrogate dosimetry materials that can be used on a much shorter timescale. In this lecture we examine the range of materials and techniques that are potentially available for dosimetry investigations on long and short timescales and include practical aspects of their application.

Lecture 5

Thu 12 Sep, 11:40 – 12:40

Dosimetry using EPR

Dr. François Trompier

IRSN, France

Biography

1997-2004 Research assistant at Atomic Energy Commission (CEA, France)

2004 Graduate in Engineering in Nuclear Sciences and Technology

2011 PhD in material sciences, Pierre et Marie Curie University

2004- Research Scientist at The Institute of Radiological Protection and Nuclear Safety (IRSN, France)

Abstract

The lecture will provide an overview of the various applications of EPR spectroscopy in dosimetry (Emergency dosimetry, criticality dosimetry, support in epidemiology studies, fossil dating, irradiated food identification, metrology and radiotherapy, wildlife studies,..). Basic principles EPR spectroscopy and practical aspect of EPR quantification will be covered as well as new emerging approaches/techniques in EPR dosimetry.

Lecture 6

Thu 12 Sep, 14:10 – 15:10

Particle dosimetry and track detectors

Dr. Mark Akselrod

Landauer, USA

Biography

1983 PhD in Solid State Physics, Urals Federal University (Russia)

1984-1994 Head of Dosimetry Laboratory, Urals Federal University (Russia)

1994-1998 Visiting and Research Professor, Oklahoma State University (USA)

1998- Chief Scientist, Executive Manager, Landauer (USA)

Abstract

Heavy charged particle dosimetry and especially dosimetry of neutrons present multiple challenges and are the most difficult tasks in radiation detection. The first challenge is associated with strong dependence of most detectors on particles energy and LET. The second big challenge is caused by presence of photons in most radiation fields. The lecture will cover several particle detection techniques and will focus mostly on technologies capable of detection, visualization and spectroscopy of individual particle tracks. Fluorescent Nuclear Track Detectors (FNTD)are the latest advancement in this growing field.

Lecture 7

Thu 12 Sep, 15:30 – 16:30

Computational dosimetry

Dr. Steffen Greilich

Berthold Technologies, Germany

Biography

1999 Graduated Faculty of Physics and Astronomy, Heidelberg University (Germany)

2004 Post-doctoral fellow, Max-Planck-Institute for Nuclear Physics (Germany)

2006 Post-doctoral fellow, Risø National Laboratory (Denmark)

2009 Senior Scientist, Head of Research Group 'Ion-Beam Therapy' (from 2015), Germany Cancer Research Center (DKFZ, Germany)

2019- Berthold Technologies GmbH (Germany)

Abstract

The computational determination of absorbed dose and related quantities is of great importance for complementing experimental studies. This session will introduce the basics concepts of Monte Carlo radiation transport modelling, its application in dosimetry and show hand-on examples for detector design and calibration.

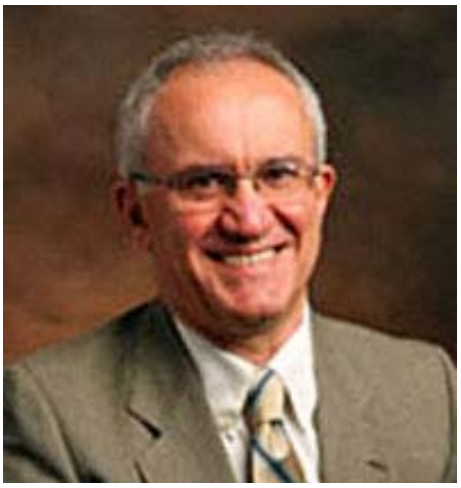
Exercise Session

Thu 12 Sep, 16:50 – 17:50

Practical exercises in luminescence dosimetry: from experimental data to model

Prof. Vasilis Pagonis

McDaniel College, USA



Biography

1982 PhD in Solid State Physics, Northeastern University (USA)

1982-1986 Faculty, Allegheny College (USA)

1986- Professor of Physics, McDaniel College (USA)

Abstract

In this session, a variety of exercises will be presented dealing with practical aspects of luminescence dosimetry. Specific examples will be given of experimental data from several luminescent dosimetric materials, and the methods of analyzing the data will be summarized. Emphasis will be given on how to choose specific models for the experimental data, and how to extract the important parameters using the model. The purpose of this session is to provide a practical guide and an overview for both established and new researchers entering the field of luminescence dosimetry and its many applications. Several examples will be given of available open access software for analyzing luminescence dosimetry data, as well as examples of using specific models that have been applied for different types of materials. The exercises will cover applications using both thermoluminescence (TL) and optically stimulated luminescence (OSL) signals.

Lecture 8

Fri 13 Sep, 9:00 – 10:00

Dosimetry in space and aviation

Dr. Satoshi Kodaira

QST, Japan

Biography

2007 Ph.D., Graduate school of Science and Engineering, Waseda University (Japan)

2011 Research Scientist, National Institute of Radiological Sciences (Japan)

2014 Senior Research Scientist, National Institute of Radiological Sciences (Japan)

2017 Principal Research Scientist, National Institutes for Quantum and Radiological Science and Technology (Japan)

2018- Group Leader, Group of Space Quantum Research, QST advanced study laboratory, National Institutes for Quantum and Radiological Science and Technology (Japan)

Abstract

Space is much complicated radiation field due to the mixture of various high energetic charged particles. These primary particles additionally produce various secondary particles via nuclear interactions with materials. The measurement of linear energy transfer of charged particles is essential to assess the dose equivalent in space. The lecture will present about the space radiation environment and its dosimetry.

Lecture 9

Fri 13 Sep, 10:20 – 11:20

3D polymer gel dosimetry

Dr. Francesco d'Errico

The University of Pisa, Italy
Yale University, USA

Biography

1995-2001 Assistant Professor, Yale University School of Medicine, New Haven CT.

1997- Fellow, Timothy Dwight College, Yale University

2001-2004 Research Scientist, Faculty of Engineering, University of Pisa

2005-2017 Associate Professor, School of Engineering, University of Pisa

2018- President, R&D Board, International Master's Degree course on Protection from CBRNe events, University of Rome II

2018- Full Professor, School of Engineering, University of Pisa

Abstract

Fricke gel radiochemical sensors based on various matrices have been investigated for decades as 3D dosimeters for radiotherapy. Despite their many appealing features, progressive aging and blurring of the signal have prevented the widespread use of these dosimeters, so far. This lecture illustrates how these shortcomings have been addressed and presents the development and detailed manufacturing recipe of a Fricke gel based on a chemically cross-linked PVA matrix. The influence is discussed of several parameters of the polymeric matrix on sensitivity, diffusion coefficient and spontaneous oxidation. Our best gel formulation is presented, combining transparency, high sensitivity and simple production method, typical of gels based on natural polymers, with low diffusion coefficient and slow spontaneous oxidation typical of PVA gels made by freezing-thawing.

Lecture 10

Fri 13 Sep, 11:40 – 12:40

Microdosimetry for radiation therapy

Dr. Paolo Colautti

LNL-INFN, Italy

Biography

1972 Graduated in Nuclear Physics by the University of Padova

1975 Researcher of the Italian Institute of Nuclear Physics (INFN)

1984-2014 Microdosimetry group leader at the National Laboratories of Legnaro (LNL-INFN)

2015- Senior scientist at LNL-INFN

Abstract

Microdosimetry is a chapter of the radiation physics. It gives a full theoretical description of the energy absorbed in a finite site caused by single or multiple radiation events. When the site size is comparable with biological structures, microdosimetry physical quantities describe the first physical step of events that give eventually rise to the biological effect. Microdosimetry is nowadays the best heuristic tool to assess the biological effect of a mixed radiation field without direct biological measurements.

The lecture syllabus: i) scientific background; ii) microdosimetric quantities; iii) microdosimetric detectors; iv) neutron and BNCT microdosimetry; vi) therapeutic proton microdosimetry.

Lecture 11

Fri 13 Sep, 14:10 – 15:10

Advanced semiconductor detectors

Prof. Anatoly Rosenfeld

University of Wollongong, Australia

Biography

1977-1992 Engineering and research positions in Radiation Physics , Institute for Nuclear Research, Kiev, Ukraine

1993-1996 Lecturer, Department of Physics, University of Wollongong (UOW), Australia

1996-1998 Senior Lecturer, Head Radiation Physics Group, Department of Physics, UoW

1999-2001 Associate Professor, Head, Group of Medical Radiation Physics, UoW

2002-2013 Professor , Director of Centre for Medical Radiation Physics, School of Physics, UoW

2014-2015 Senior Professor, Director of Centre for Medical Radiation Physics, School of Physics UoW

2016– Distinguished Professor, Director of Centre for Medical Radiation Physics, School of Physics UoW

Abstract

Semiconductor detectors has many advantages in applications for passive and real time dosimetry of photon and mixed radiation fields. In this lecture we will explore fundamental principles behind operation of the different semiconductor radiation detectors, their advantages and disadvantages . We will discuss the state of the arts of semiconductor dosimetry with some example of their applications for electronic and medical dosimetry.

Lecture 12

Fri 13 Sep, 15:30 – 16:30

Medical radiation dosimetry

Dr. Tomas Kron

Peter Mac Callum Cancer Centre, Australia

Biography

1983 – 1985 Radiation Protection Officer, Department of Technical Radiation Protection, Gesellschaft für Strahlen und Umweltforschung, Munich, Germany

1990 – 1992 Medical Physicist in Radiation Oncology at Prince of Wales Hospital, Sydney and Illawarra Cancer Care Centre, Wollongong, Australia

1993 – 2001 Chief Medical Physicist, Newcastle Mater Misericordiae Hospital, Newcastle, Australia

2001 – 2004 Tomotherapy co-ordinator, London Regional Cancer Centre, London, Ontario, Canada

2005 – 2014 Principal Research Physicist, Peter Mac Callum Cancer Centre, Melbourne, Australia

2015- Director of Physical Sciences, Peter Mac Callum Cancer Centre, Melbourne, Australia

Abstract

The tremendous success of the use of ionizing radiation in medicine has resulted in medical exposures becoming one of the largest contributors to radiation exposure of humans. As such, dosimetry is essential to quantify exposure to patients, staff and the public. Solid-state dosimetry (SSD) has many advantages for this including the wide range of doses that can be detected as well as small detector size and potentially fast read-out. The lecture will include a broad introduction in the use of ionizing radiation in medicine focusing on advanced applications. Solid-state detectors and dosimeters will be contrasted with other dosimeters widely used in medical applications and an attempt made to predict the role of SSD in medicine over the next 10 years.

Special Lecture

Fri 13 Sep, 16:50 – 17:50

How to write a scientific paper

Prof. Adrie J.J. Bos

Delft University of Technology,
The Netherlands

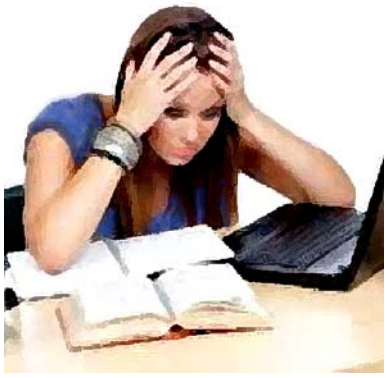
Biography

1979 Graduated Faculty of Mathematics and Physics, Free University Amsterdam (The Netherlands)

1985 Researcher, InterUniversity Reactor Institute (Delft, The Netherlands)

1990 Senior Scientist and Lecturer, Delft University of Technology (The Netherlands)

2012- Co-Editor-in-Chief, Radiation Measurements



Abstract

Prof. Bos will give you hints and tips on how to write high-quality scientific papers that must be positively accepted by reviewers and editors of well-known international journals.

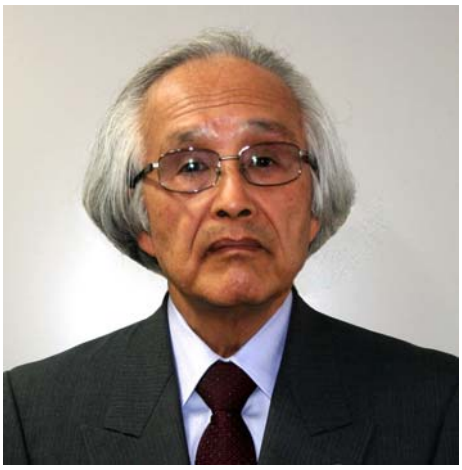
Lecture 13

Sat 14 Sep, 9:00 – 10:00

Neutron dosimetry and spectrometers

Prof. Takashi Nakamura

Tohoku University, Japan



Biography

1964 Graduated Master Course of Graduate School of Engineering, Kyoto University

1964 Research Associate of Faculty of Engineering, Kyoto University

1973-1974 Guest Researcher of Atomic Energy Research Institute of Sweden

1975 Associate Professor of Institute for Nuclear Study, University of Tokyo

1986 Professor of Cyclotron and Radioisotope Center, Tohoku University

2003- Professor Emeritus of Tohoku University

Abstract

Several neutron spectrometers and dosemeters which we have developed are described, such as Phoswich-type spectrometer, Bonner sphere spectrometer and two-type dosemeters of high-efficiency type and lightweight type, and silicon semiconductor personal dosemeter. They are used to measure neutrons in the environment around the nuclear facilities and personal dose working there. They are also used to measure cosmic-ray neutrons on board the aircraft and in space at International Space Station.

Lecture 14

Sat 14 Sep, 10:20 – 11:20

Personal and environmental dosimetry

Dr. Filip Vanhavere

SCK•CEN, Belgium

Biography

1999 Ph.D in applied sciences at Ghent University, Belgium

1998-present Head of Radiation Protection Dosimetry and Calibration Group at the Belgian Nuclear Research Centre SCK•CEN

2016- Deputy Director of the Environment, Health and Safety Institute at the Belgian Nuclear Research Centre SCK•CEN

Abstract

Occupational exposed workers are subject to dosimetric control. In most countries, passive dosimetry systems are used to verify compliance with regulatory dose limits. Active personal dosemeters (APD) are frequently used as alarm dosemeters in potential high dose areas, and help in the application of the ALARA principle. The basic objective of a personal dosemeter is to provide a reliable measurement of the operational quantities Hp(0.07), Hp(3) and Hp(10) for all practical situations, independent of the type, energy and direction of the radiation, and with a prescribed overall accuracy. For some installations, passive environmental dosimetry is also needed, e.g. to control exposures at boundaries of installations, where the quantity H*(10) needs to be measured. In this lecture, different types of personal and environmental dosemeters will be reviewed..

Wrap-up session

Sat 14 Sep, 11:40 – 12:40

Which dosimeter is the most promising?

Prof. Stephen W.S. McKeever

Oklahoma State University, USA

Biography

1975 PhD, University of Bangor, UK.

2015 DSc, University of Bangor, UK.

1983-2016 Professor of Physics, Oklahoma State University, USA

1995-1999 Head of the Department of Physics, Oklahoma State University, USA

2000-2003 Associate Dean for Research, College of Arts & Sciences, Oklahoma State University, USA

2003-2013 Vice President for Research, Oklahoma State University, USA

2011-2017 Secretary of Science & Technology, State of Oklahoma, USA

2016- Emeritus Regents Professor, Oklahoma State University, USA

Abstract

Prof. McKeever will lead an overview and discussion of various aspects of the course material presented by the Summer School instructors. The open, interactive discussion will include both students and instructors and will include a Question-and-Answer session, with opinions and projections for future research.