

2023 IEEE NSREC Is Planning for Kansas City, Missouri



Nuclear and Space Radiation Effects Conference, 24th - 28th July 2023

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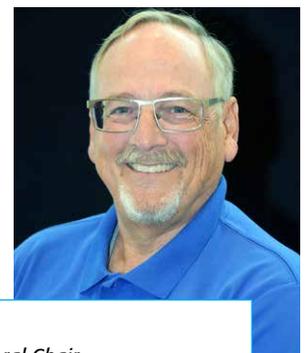
ARTICLES

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NSREC 2023 will be held at the Sheraton Kansas City Hotel at Crown Center, Kansas City, Missouri. The home of swing and bebop for some, "The City of Fountains" to others, Kansas City is different things to different people. Music enthusiasts are drawn to the jazz clubs and old haunts of famous musicians such as Charlie Parker and Count Basie. With more fountains than Rome, there are ample opportunities for scenic "strolling from fountain to fountain." Stop along the way to discover interesting neighborhoods and browse through eclectic shops.

Families are particularly attracted to the city because of its child-friendly events and venues. Science City features hands-on exhibits, while the zoo houses impressive African and Australian exhibits plus an IMAX Theater. The city's museums cover everything from the history of jazz music to a celebration of African-American baseball players and the National World War I Museum and Memorial. Kansas City spans across the Missouri and Kansas state lines and came to prominence as a port for the Missouri and Kansas Rivers. Today, Kansas City is a burgeoning metropolis with activities and attractions for visitors of all ages and interests.

Come and join us for NSREC 2023 and experience it for yourself. Please visit the NSREC <https://www.nsrec.com/> for 2023 conference details and travel planning tips.



Keith Avery
NSREC 2023 General Chair
Air Force Research Laboratory

"It is my distinct honor to invite you to attend NSREC 2023 in the heart of America, Kansas City, Missouri. My Conference Committee and I are excited to host all of you with some Midwest hospitality while providing an outstanding conference and time to enjoy all of the social opportunities. Kansas City is known as the City of Fountains and home to professional sports, world class art, museums, music, and some of the best barbeque in America. The NSREC website will provide extensive links to all that Kansas City has to offer starting in September. Start planning your adventure now! On behalf of the many who make NSREC possible, I welcome you to NSREC 2023. Kansas City here we come!"

NSREC Cont. from PAGE 1

TECHNICAL PROGRAM

The Technical Program Chair, Jonathan (Jonny) Pellish, NASA Goddard Space Flight Center, and his committee will be assembling the technical agenda from abstracts due February 3rd, 2023, and from Late News abstracts due mid-May 2023. They anticipate nine oral sessions and a poster session. Papers presented in the NSREC technical sessions are expected to be submitted for publication after the conference in the January 2024 issue of the *IEEE Transactions on Nuclear Science (TNS)*, subject to the standard TNS peer review process.

The Poster Session Chair is Jeff George, Los Alamos National Laboratory. The Data Workshop Chair is Andrea Coronetti, CERN.

The Technical Program Session Chairs are:

Basic Mechanisms of Radiation Effects

Chair: Ani Khachatryan, Naval Research Laboratory

Dosimetry

Chair: Richard Sharp, Radtest Ltd.

Hardness Assurance - Piece Parts to Systems and Testing Approaches

Chair: Courtney Matzkind, Missile Defense Agency

Hardening by Design

Chair: Paula Chen, AMD, Inc.

Radiation Effects in Devices and Integrated Circuits

Chair: Rudy Ferraro, CERN

Photonic Devices and Integrated Circuits

Chair: George Tzintzarov, The Aerospace Corporation

Single-Event Effects: Mechanisms and Modeling

Chair: Jason Osheroff, NASA GSFC

Single-Event Effects: Devices and Integrated Circuits

Chair: Françoise Bezerra, CNES

Space and Terrestrial Environments

Chair: Scott Messenger, Northrop Grumman Corporation

RADIATION EFFECTS DATA WORKSHOP

The Radiation Effects Data Workshop is a forum for papers addressing radiation effects data on electronic devices and systems. Workshop papers are intended to provide radiation response data to scientists and engineers who use electronic devices in radiation environments, and for designers of radiation-hardened or radiation-tolerant systems. Papers describing new simulation capabilities and facilities are also welcome.

INDUSTRIAL EXHIBIT

An Industrial Exhibit will be included as an integral part of the conference and will be chaired by Ken LaBel, SSAI, Inc./NASA GSFC. Exhibitors will include companies or agencies involved in manufacturing electronic devices or systems for applications in space or nuclear environments, modeling and analysis of radiation effects at the device and system level, and radiation testing. Exhibit sales are currently open, and information is available at www.nsrec.com.

For further information visit the NSREC web site or contact Teresa Farris, Vice Chair for Publicity at teresa.farris@archon-llc.com



Jonathan Pellish
Technical Program Chair



Ken LaBel
Industrial Exhibits Chair

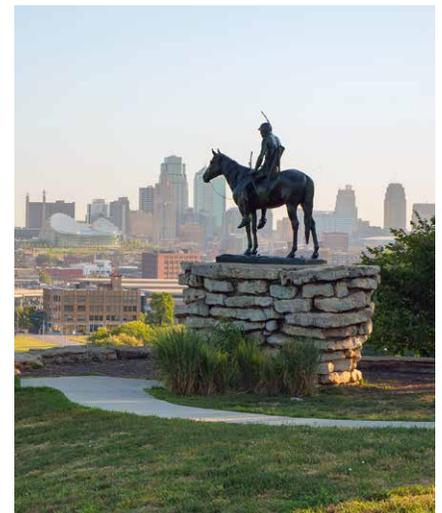


Teresa Farris
RE Vice Chair, Publicity



Left: "The City of Fountains", Kansas City boasts more fountains than Rome, with ample opportunities for scenic "strolling from fountain to fountain."

Right: The Scout, a famous statue by Cyrus E. Dallin, depicts a Sioux Indian on horseback surveying the landscape. It is installed in Penn Valley Park as a permanent memorial to local Indian tribes.



Nuclear Science Symposium, Medical Imaging Conference and International Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors

3rd - 11th November 2023, Vancouver, British Columbia, Canada

Dear Colleagues,

The 2023 IEEE Nuclear Science Symposium and Medical Imaging Conference, together with the International Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors will be held in Vancouver, B.C., Canada from November 3rd to November 11th in the beautiful Vancouver Convention Centre overlooking the Pacific Ocean and the North Shore Mountains.

This conference is the premier meeting on the use of instrumentation in the Nuclear and Medical fields, and we are anticipating a vibrant meeting with ample synergy and overlap between the three main areas of the conference, fostering discussions among world-leading scientists who work on similar problems, but possibly in different areas. We are endeavouring to maintain and extend the comprehensive content of state-of-the-art scientific and technological advances in subjects that include radiation detection, detector materials, electronics, image reconstruction algorithms, and complex radiation detector and imaging systems for research and applications in the fields of physics, medicine, biology, security and materials science. As in past years, the educational content of the conference will be enriched by special focus workshops, educational courses, WIE and Young Professional

events, plus outstanding plenary talks. We are actively following the IEEE WIE pledge (IEEE WIE pledges to work towards gender-diversified panels at all IEEE meetings, conferences, and events, including our own) in the conference organization and speaker selection. Following a long-standing tradition, an industrial exhibit area will be available to the attendees. We are also planning to add new sessions on scientific community-identified hot topics and a session presenting highlights from related topical meetings to enhance the breadth and excitement of attendees' experience – stay tuned!

Such an interdisciplinary flavor coupled with significant breadth and cutting-edge science offers an excellent milieu for students and postdoctoral fellows. Every effort will be made to provide as much student support as possible to make this unique scientific and educational experience more easily accessible.

At the moment the meeting is planned as an in-person event, and we do hope to see you all in person in this beautiful and culturally diverse city. We are striving to provide you with an exciting forum where outstanding science and innovation will be enhanced by interactions with old and new friends, favoring exchange of ideas and expertise – chats around coffee cannot be replaced by even the best zoom session! However, plans may need



Vesna Sossi
General Chair

to change if circumstances dictate it, and we'll make sure to post timely updates on the conference website.

For more detail and updates please check the conference website at <https://nssmic.ieee.org/2023/>. Importantly, the **abstract deadline is May 4th, 2023**.

On behalf of the entire organizing committee, I am very much looking forward to seeing you next autumn in Vancouver.

Vesna Sossi, General Chair, can be reached by E-mail at vesna@phas.ubc.ca or by phone at +1 604 822 7710

Vancouver, British Columbia



President's Report



Vesna Sossi
IEEE NPSS President

This is my first newsletter article in my new role as NPSS President. It is a great honour to lead this very diverse and successful society which includes eight technical areas: computer applications in nuclear and plasma science, fusion technology, radiation instrumentation, nuclear medical imaging, particle accelerator science and technology, pulsed power science and technology, plasma sciences and radiation effects. The diversity in the society's scientific endeavours is complemented by the geographical diversity of its members, which come from all ten IEEE regions.

My current professional background is in nuclear medical imaging having 'grown up' as a high-energy and nuclear physicist during my undergraduate and graduate years. I attended my first IEEE Nuclear Science Symposium and Medical Imaging Conference (IEEE NSS/MIC) in 1992 and was immediately impressed by the energy and collegiality of the participants and by the excitement generated by finding novel translational applications to the techniques developed in high energy physics as well as mathematics and computing to medical imaging. I am a firm believer that interactions between different fields catalyze scientific and personal enrichment; given its diversity, NPSS is very well placed to build on cross fertilization between its technical areas to promote and facilitate scientific advancements. I am particularly proud of being part of NPSS, not only for its scientific and technical excellence, but also for its outreach activities: its mission and strategic goals focus strongly on promotion of diversity and inclusion and broad education through the international schools program and promotion of student and young professionals, as well as humanitarian activities. Knowledge is being disseminated through conferences and publications, and emphasis is placed on ensuring that meetings provide a forum where experts interact not only with other experts in academia and industry, but also with students and young professionals thus fostering their growth and excitement – many a student has started their career by presenting their work at one of the NPSS meetings: a long time ago, I myself was one of them; over the years my NPSS colleagues

have become my most important and dear scientific family.

As I start in my role as a president, I am inheriting a society that runs extremely well: a testament not only to its leadership, but also to the dedication of its many volunteers, who dedicate time and effort to ensuring that our science has a direct positive impact worldwide on the scientific, social and environmental levels. I would like to sincerely thank all continuing AdCom members with particular gratitude to those whose term has ended in 2022: John Valentine and Sara Pozzi (RISC), Marion White and Evgenya Simakov (PAST), Jason Marshall (PSAC), Keith Avery (REC), Adam Alessio (NMISC). I extend a warm welcome to all newly elected and appointed members replacing the outgoing members: Srilalan Krishnamoorthy and Giulia Hull (RISC), Wolfram Fischer and John Lewellen (PAST), Brad Hoff (PSAC), Philippe Paillet (REC), Jae Sung Lee (NMISC) (in respective order). And while Sara Pozzi is leaving as RISC representative, I am delighted that she is joining AdCom as NPSS vice-president. I am also excited to introduce additional new members, Audrey Corbeil-Therrien as IEEE WIE co-liaison for 2023 together with Cinzia da Via, who will continue in that role for one more year, while representing NPSS in the TAB Climate Change Program. Mitra Safavi-Naeini will join us as liaison with IEEE Diversity & Inclusion working together with Jane Lehr. Alberto del Guerra is the new chair of the Fellows Search Committee, and Jane Lehr, the past chair, will be part of the committee providing expertise and continuity. Steve Meikle will now assume the role of past president and Chair of the Nominations committee, and Ron Schrimpf will be Awards Chair, following a long-standing NPSS tradition.

Steve Meikle, together with the committee, has done an outstanding job in steering NPSS through the pandemic: the society is in excellent shape and several changes have been implemented during his presidency. For example, there is a new Educational Committee (EduCom) chaired by Stefan Ritt, which oversees arrangement of international schools and there was the establishment of the NPSS Foundation Fund, chaired by Roger Fulton, which will provide more stable funding for initiatives, a primary mechanism to actualize the goals of our strategic plan (for a description of initiatives please refer to the NPSS Strategic Plan found on-line). Several conferences have transitioned successfully from in-person to virtual to hybrid overcoming many technical and logistical challenges and providing initial models for new conference formats.

Very significant progress has been made; challenges as well as opportunities however remain. In this first article

I would like to preferentially concentrate on some of the opportunities, which I would like to pursue in my term as president. I would like to increase involvement of young people and trainees in the NPSS organization as they are key to the NPSS overall vibrancy and continued success. They can become actively involved in various committees and conference organization through creation of specific positions; we can promote volunteering opportunities that will expose them to new scientific, educational and humanitarian experiences in line with the NPSS mission. Partially related to this is a strengthening our efforts in D&I. This is especially important in light of the still large gender and ethnic discrepancy in IEEE membership at the senior level, which can be deemed reflective of the status of the engineering field at large. Another important way in which our society can make significant contributions is by using our technical expertise to help address some of the serious problems currently facing the world: climate change and development of alternative energy sources. The NPSS initiatives program is designed to facilitate pursuit of such goals and I urge all of you to consider applying for initiative money to seek support for projects that align with NPSS priorities. And of course, we need to continue the high quality organization of our conferences: we keep striving to achieve optimal balance between in-person attendance and virtual delivery.

And finally, I believe that key to pursuing these goals is strong horizontal and vertical communication: between the NPSS technical areas themselves, between them and NPSS membership at large and between NPSS and IEEE. Other IEEE societies are exploring similar opportunities and facing similar challenges and have complementary technical expertise to ours. We can learn from each other and thus speed convergence towards solutions; we are particularly well placed given the strong involvement of NPSS members at higher IEEE levels. I will endeavour to increase such interactions and exchange of ideas and experiences; I hope to make good use of the Newsletter article space to disseminate relevant information.

As I start my term, I would like to thank in advance all my AdCom and NPSS colleagues, as I will be relying on them for support, guidance and wisdom. Several of them have been and still are my close mentors, from whom I have been receiving extremely valuable professional and life advice. I would also like use this opportunity to invite anyone interested in taking an active role in NPSS to please reach out to us: you will find yourself surrounded by great colleagues, mentors and friends.

Vesna Sossi

Vanessa Sossi

Vesna Sossi, IEEE NPSS President, can be reached by E-mail at vesna@phas.ubc.edu

Secretary's Report

AdCom held its second in-person meeting of 2022 in Milan, Italy following the NSS-MIC-RTSD Conference. There was about 65% in-person attendance, but we are continuing to offer a Zoom option for those unable to travel. Our 2023 and 2024 meeting schedule includes two in-person meetings and one fully virtual meeting for each of those years.

Our treasurer, Ralf Engels, reported that conferences were closing in a timely way and that our financial picture in 2022 was good. However, with big changes coming to the publications arena, with more Open Access (OA) requirements by funding agencies, it is likely that our publications income will be severely affected. In addition the cost of hybrid conferences, while having the advantage of increasing attendance especially by students and young professionals, is very high and in-person attendance has become harder to predict.

IEEE has also rolled out its new finance system, NexGen and has introduced policies that are making normal business harder to conduct such as reduced value of contracts needing legal and TAB FinCom scrutiny. Ralf's advice: leave lots of time to get approvals.

Overall technical committees and conferences are doing well but there is a lot of noise in the data. A new Education Committee has been formed with Stefan Ritt as Chair. It will focus on our international schools and expanding their scope to reflect more of our technical areas. The new Foundation Fund income will help support these and other programs not included

as approved initiatives or regular budget items. Every donation, regardless of size, helps promote NPSS activities worldwide.

ADCOM ACTIONS

- » RE moves that Article V, Section 1 of the C&BLs (Nomination and Election of Radiation Effects Steering Group Members) be modified. **From Current:** The Nominating Committee shall be made up of four members elected by the REC* at the REC Annual Open Meeting the year previous to the election and shall be chaired by the Past Chair who shall have the tie-breaking vote. **To Proposed:** The Nominating Committee shall be made up of the three elected Members-at-Large and the past Senior Member-at-Large of the RESG and shall be chaired by the Past Chair who shall have the tie-breaking vote. Passed 19 Y, 0 N, 0 A.
- » RISC moves that AdCom approve the revised Radiation Instrumentation Technical Committee Constitution & Bylaws. Passed: 18 Y, 0 N, 1 A.
- » FinCom moves that AdCom approve: the NPSS student membership fee shall be \$2.00. The first year free membership codes remain in place. Passed: 18 Y, 0 N, 1 A.
- » AdCom approves \$100k to support the Darway Coast Initiative, to be transferred to IEEE Smart Village before



Albe Larsen
IEEE NPSS Secretary and Newsletter Editor

the end of 2022. Passed: 18 Y, 0 N, 1 A.

- » AdCom Schedule for 2023 and 2024. The following schedule was approved: 19 Y, 0 N, 0 A.

2023 MEETINGS

March 2 – 4, Westin Gaslamp Quarter, San Diego, CA
June 23 - 24, Virtual
November 10 - 11, Vancouver, BC, Canada

2024 MEETINGS

March 7 - 9, La Fonda, Santa Fe, NM, USA
June 28 - 29, Virtual (to be confirmed)
November 1 - 2, Tampa, FL, USA

The meeting was concluded with the announcement that Vesna Sossi will be President and Sara Pozzi will be Vice President/President-elect beginning in January 2023.

Albe Larsen, IEEE NPSS Secretary and Newsletter Editor, can be reached by E-mail at amlarsen@slac.stanford.edu

New AdCom Officers, Elected AdCom Members and TC Chairs

President

Vesna Sossi

See President's report and brief bio under Awards: New Fellows

Vice President

Sara Pozzi

Professor Sara Pozzi is a University Diversity and Social Transformation Professor and professor of nuclear engineering and radiological sciences and physics (by courtesy) at the University of Michigan. Her research is on radiation detection, including the study of nuclear fission and radiation imaging for nuclear materials detection, identification, and characterization. In her fission work, she and her students study the neutron and

gamma ray emissions from induced and spontaneous fission, including their energy and angle correlations. In her imaging work, she leads the development of a neutron and gamma ray radiation imager to locate and characterize plutonium, including applications in mixed reality. She has led many experimental efforts for measurements of uranium and plutonium at the national laboratories. Professor Pozzi is the founding Director of the Consortium for Verification Technology (CVT) 2014-2019 and the Consortium for Monitoring, Technology, and Verification (MTV) 2019-2024, two large consortia of multiple universities and national laboratories working together to develop new technologies needed for nuclear treaty verification. Her publication record includes over 400 papers in journals and international



Sara Pozzi
IEEE NPSS Vice President/President-elect

conference proceedings. She has presented over 100 invited lectures, both nationally and internationally. She graduated 27 Ph. D. students who went on to develop successful careers at the national laboratories, academia, industry, and government.

SOCIETY GENERAL BUSINESS Continued on PAGE 6

Ad Com Officers

Cont. from PAGE 5

She is the recipient of many awards, including the 2006 Oak Ridge National Laboratory Early Career Award, 2006 Department of Energy, Office of Science, Outstanding Mentor Award, 2012 INMM Edway R. Johnson Meritorious Service Award, 2017 IEEE Distinguished Lecturer, 2018 Rackham Distinguished Graduate Mentoring Award, and 2021 American Nuclear Society Gail De Planque Award. She is a Fellow of the American Nuclear Society, the Institute of Nuclear Materials Management, and the IEEE.

Sara Pozzi, IEEE NPSS Vice President, can be reached by E-mail at pozzisa@umich.edu

ADCOM CLASS OF 2026

Radiation Instrumentation

Giulia Hull

Nuclear Medical and Imaging Science

Jae Sung Lee

Jae Sung Lee received his bachelor's degree in electrical engineering and Ph.D. in biomedical engineering from Seoul National University (SNU), Seoul, Korea in 1996 and 2001, respectively. He then worked as a postdoctoral fellow in radiology at Johns Hopkins University. In 2005, he joined SNU College of Medicine where he is currently a professor of nuclear medicine, biomedical engineering, and biomedical sciences. He was also a visiting professor at Stanford University (2015-6).

His early academic achievements are mainly related to the PET/SPECT imaging studies for understanding the energetics and hemodynamics in brain and heart. These studies include his pioneering work to solve blind source separation problems in dynamic PET data using unsupervised machine learning techniques, such as independent component analysis (ICA) and non-negative matrix factorization (NMF). The most notable achievement of Dr. Lee's group since the foundation of his own lab at SNU is the development of very early PET systems based on a novel photo-sensor, a silicon photomultiplier that is now widely used in clinical and preclinical PET systems. He is again focusing on machine learning techniques to answer challenging questions in various medical imaging modalities.

He is the editor-in-chief of *Biomedical Engineering Letters* (BMEL). He was the MIC chair in 2013 and 2021 for the IEEE NPSS NSS-MIC Conferences. He served as the chair of the Nuclear Medical and Imaging Sciences Council (NMISC) and as a member of AdCom in this



Giulia Hull
AdCom Class of 2026, RISC



Jae Sung Lee
AdCom Class of 2026, NMISC



John Lewellen
AdCom Class of 2026 PAST



Philippe Paillet
AdCom Class of 2026, RE

capacity as a TC chair. In 2016, he founded Brightonix Imaging Inc. that provides PET imaging instruments and AI software solutions for the medical and molecular imaging community. He has published 12 book chapters and over 300 papers in peer-reviewed journals and received multiple research awards from various scientific societies, including the 2022 IEEE NPSS Medical Imaging Technical Achievement Award.

Jae Sung Lee, AdCom Class of 2026 (NMISC) can be reached by E-mail at jaes@snu.ac.kr

Particle Accelerator Science and Technology

John Lewellen

John Lewellen is an accelerator physicist with the LCLS-II-HE project at SLAC National Accelerator Center, serving as System Manager for quarter-wave superconducting radiofrequency electron gun R&D. Over the course of his career John's work has encompassed several types of accelerators; his primary focus has been on electron machines, with emphasis on beam source development, and free-electron lasers. John is also interested in novel applications of accelerators and accelerator technology, and development of compact, high-average-power accelerators.

IEEE plays an important role throughout the career of most people engaged in accelerator-related research and development, arguably most notably in the form of conferences and workshops; but this often goes unrecognized, along with related resources and opportunities. Some of John's goals as a Member-at-Large are to work to increase awareness of the role IEEE plays in the career progression and enhancement of accelerator physicists and engineers; foster enhanced ties and cooperation between IEEE and various laboratory management teams; and help coordinate strategies for enhancing "pipelines" for workforce development.

John Lewellen, AdCom Class of 2026, PAST, can be reached by E-mail at lewellen@slac.stanford.edu

Radiation Effects

Philippe Paillet

Philippe Paillet (M'97-SM'04-F'18) received his Master's degree in Electrical Engineering from the Université Aix-Marseille I, France, in 1989 and his Ph.D. degree in Electrical Engineering from the Université Montpellier II, France, in 1995. He joined the Commissariat à l'Énergie Atomique (CEA) in Arpajon, France in 1995, and is a CEA International Expert. Philippe has been involved in numerous programs developing radiation-hardened electronic and optoelectronic technologies, characterizing the physical mechanisms responsible for radiation response of components and ICs, modeling the effects of radiation in

MOS technologies and the creation of radiation-induced defects, and developing hardness assurance approaches. Philippe has authored or co-authored more than 200 publications, articles, short courses and book chapters, including three Best Papers at RADECS, two Meritorious Paper Awards at NSREC, one Best Paper Award at HEART, and five Outstanding Paper Awards at NSREC. He is currently serving as Vice-president of the RADECS Association and RADECS Liaison to the IEEE Radiation Effects Steering Group.

Philippe Paillet, AdCom Class of 2026, RE, can be reached by E-mail at philippe.paillet@cea.fr

NEW TECHNICAL COMMITTEE CHAIRS

Particle Accelerator Science and Technology

Wolfram Fischer

Wolfram Fischer is the Deputy Associate Laboratory Director for Accelerators in Nuclear and Particle Physics, and Chair of the Collider-Accelerator Department at Brookhaven National Laboratory. The mission of the C-A Department is to develop, improve and operate the suite of particle/heavy ion accelerators used to carry out the program of accelerator-based experiments at BNL; to support the experimental program including design, construction, and operation of the beam transports to the experiments plus support of detector and research needs of the experiments; to design and construct new accelerator facilities in support of the BNL and national missions. The C-A Department supports an international user community of over 1,500 scientists. The Department performs all these functions in an environmentally responsible and safe manner under a rigorous conduct of operations approach.

Wolfram earned his Ph.D. from the University of Hamburg in 1995 with experimental accelerator physics work at CERN and DESY and joined Brookhaven in the same year. He moved through the ranks to his present position in 2021. His research interests are accelerator and particle-collider related.

Wolfram serves regularly on accelerator advisory committees in the U.S. and abroad. He is an Associate Editor of *Physical Review Accelerator and Beams*.

Wolfram is a Senior Member of IEEE and Fellow of the American Physical Society (APS). He received the APS Outstanding Referee Award in 2016 and the Brookhaven Science and Technology Award in 2017.

Wolfram Fischer, PAST Chair, can be reached by E-mail at wfischer@bnl.gov



Wolfram Fischer
PAST Chair



Brad Hoff
PSAC Chair



Srilalan Krishnamoorthy
RISC Chair

Plasma Science and Applications

Brad Hoff

Brad W. Hoff (S'04-M'10-SM'18) is the Senior Scientist for High Power Electromagnetics for the Air Force Research Laboratory (AFRL). His research background includes high power RF source technology, pulse power systems and diagnostics, PIC modeling, and electromagnetic interactions with high temperature materials. Current research interests involve beam-driven and solid-state high power microwave sources, microwave-driven plasmas, and electromagnetic properties of materials for extreme environments. Dr. Hoff holds degrees from the U.S. Naval Academy (B.S. in Physics), Old Dominion University (M.E.M. in Engineering Management), and the University of Michigan (M.S.E. in Nuclear Engineering, M.S.E. in Electrical Engineering,

and Ph.D. in Nuclear Engineering). Dr. Hoff is a Fellow of the Air Force Research Laboratory, a Fellow of the Directed Energy Professional Society, and an IEEE Senior Member. His previous service to PSAC ExCom includes Nominations Subcommittee chair in 2022 and Employment and Careers Subcommittee chair from 2018-2019. He has also been a guest editor and reviewer for *IEEE Transactions on Plasma Science* and a reviewer for *IEEE Transactions on Electron Devices*. In 2020, Dr. Hoff worked with PSAC ExCom voting members to initiate a successful motion to include student representative positions on the ExCom.

Brad Hoff, PSAC Chair, can be reached by E-mail at brad.hoff@ieee.org

Radiation Instrumentation

Srilalan Krishnamoorthy

Srilalan Krishnamoorthy is a Senior Research Investigator at the University of Pennsylvania, Philadelphia, USA and currently serves as the Chair of the Radiation Instrumentation Steering Committee (RISC). He has been a volunteer with the IEEE Nuclear Science Symposium and Medical Imaging (NSS/MIC) Conference in different roles for more than a decade: most recently as the Guest Editor for the 2022 NSS/MIC in Milan. He has attended NSS/MIC for nearly two decades and it continues to be one of the most comprehensive and important conferences for radiation instrumentation. Over the last couple of years though, there has been a large change in the approach to organize NSS/MIC. The changes, while largely positive, have an impact on both logistics and economy for both conference and attendee. RISC in conjunction with NMISC is working to build on these experiences while also evaluating its sustainability. In addition, over the past year RISC has initiated several new subcommittees (some jointly with NMISC) e.g., Fellows and Senior Member task force; Diversity, Inclusion and Next Generation; Conflict of Interest. We will continue to work on these while evaluating other areas. With NSS/MIC being among the larger NPSS conferences, we hope for some of these new initiatives to serve as a model for adoption across other conference(s) and technical areas.

Srilalan Krishnamoorthy can be reached by E-mail at srilalan@penmedicine.upenn.edu

Technical Committees

NUCLEAR MEDICAL AND IMAGING SCIENCES



Andrew Goertzen
NMISC Chair

November 2022 marked a new era for the NSS/MIC/RTSD with the first hybrid format version of the meeting. For those able to attend in person in Milano, Italy it was a welcome opportunity to see colleagues and once again enjoy the vibrant poster sessions that our conference is known for. For those attending virtually it was an opportunity to stay connected with the community and present their work despite travel limitations. Many thanks go to the organizing committee, particularly General Chair Chiara Guazzoni and Deputy General Chair Ralf Engels, for their efforts in putting together this successful event. We also want to acknowledge Peter Vahrenholt and his team at EventClass for their tremendous work in putting together the infrastructure to support the successful integration of virtual and in-person components at the meeting. The meeting had over 1250 abstracts submitted from more than 40 countries, with total attendance over 1700, with approximately 25% attending virtually. The lessons learned from this hybrid event will be carried forward to next year's event in Vancouver, Canada.

Four Christopher J. Thompson Student Paper Awards were presented at the conference for the most outstanding student presentations. The awards went to; First place: Bangyan Huang from the University of California Davis, USA, for the paper Statistical Image Reconstruction of Positron Lifetime via Time-Weighting (SIMPLE); Second place: Zipai Wang from Stony Brook University, USA, for the paper TOF-DOI Prism-PET brain scanner: first experimental phantom study of ultra-high resolution quantitative PET neuroimaging; Third place: Yihang Zhu from Tsinghua University, China for the paper Collimator-less Single-Slim-Detector SPECT; and Fourth place: Aicha Bourkadi Idrissi from Politecnico di Milano, Italy for the paper Prompt Gamma Imaging for Dose Monitoring in Carbon Ion Radiation Therapy: a Simulation Study. First and second place came with a \$500 prize

and certificate, while third and fourth place winners received certificates. Congratulations to the winners and all of the student paper presenters.

The start of the new year brings a number of changes to our committee membership. I want to welcome our newly elected NMISC members-at-large for terms from January 2023 to December 2025: Alexandre Bousse from INSERM U1101, France; Yong Du from Johns Hopkins University, USA; Georgios Konstantinou from Multiwave Metacrytal S.A., Switzerland; Sun Il Kwon from the University of California, Davis, USA; and Irene Polycarpou from European University, Cyprus. I want to thank our NMISC elected members whose term ended in 2022: Joyita Dutta, Antonio J. Gonzalez, Marie-Claude Gregoire, Craig Levin and Youngho Seo. Youngho will be staying on the committee as our Vice-Chair, assuming the Chair position in January 2024.

Jae Sung Lee from Seoul National University, Korea, has been elected as our new NMISC representative to AdCom for the 2023-2026 term, replacing Adam Alessio whose term ended in December. Dimitris Visvikis from INSERM, France was elected as our new NMISC member-at-large on the Joint Oversight Subcommittee (JOS), replacing Larry Zeng whose term ended. I want to thank all of our committee members for their work in support of our community and I also want to acknowledge and thank all of those who put their names forward as candidates for these elections. It is encouraging to see the significant interest in our committees from our community members.

I am very pleased to announce that two members from our NMISC community have been elevated to IEEE Fellow member grade with the Class of 2023 fellows. Our new Fellow members are Vesna Sossi from the University of British Columbia, Canada for contributions to quantitative and translational brain PET imaging and Margaret Daube-Witherspoon from the University of Pennsylvania, USA for contributions to 3D image reconstruction in PET and corrections for physics efforts. Vesna and Margaret are the first female members from NMISC areas that have been elevated to IEEE Fellow member status, making this a milestone in our committee efforts to ensure diversity and inclusion in our NMISC community. Congratulations to our new Fellow members! See their bios and citations under Functional Committees – Awards. I encourage all members to continue to put forward nominations for Fellow member grade. Our community has many worthy candidates for this honor and we are underrepresented in the list of Fellow grade members. For information on preparing nominations please contact our NMISC Awards and Fellows Subcommittee Chair Roger Fulton. Remember

that to be considered for elevation the nominee must already be a Senior Member of IEEE!

The NMISC Annual General Meeting was held in a hybrid format during the recent NSS/MIC/RTSD. We heard reports from our active subcommittees. The Initiatives Subcommittee, chaired by Robert Miyaoka, presented a proposal for an Instrumentation Hardware Library, that would seek to establish a library of components that can be loaned to research groups and NPSS Schools, lowering the barrier to entry to instrumentation research in our field. We are seeking interested participants for this proposed initiative with the aim of developing a full proposal to be submitted to NPSS for funding. The MIC Future Directions Subcommittee, chaired by Vesna Sossi, reported that their committee recommendations are being followed by the 2023 MIC Program Chairs. These recommendations include identifying Hot Topics to highlight at the meeting and moving former Hot Topics to dedicated Workshops if there is continued sustained interest. The Conference Record Subcommittee, chaired by Youngho Seo, is a joint subcommittee with RISC looking at the future of our conference record. This subcommittee is looking at an expanded publication format for the 2023 meeting that would allow the meeting abstracts to be published in IEEE Xplore. Reports were also presented by Nicolas Karakatsanis about opportunities for NMISC to participate in the SNMMI Initiative for the Standardization of PET Raw Data Formats and by Vesna Sossi about the IEEE Brain Technical Community. I encourage you to reach out to either Nicolas or Vesna if you are interested in participating in these initiatives.

It is never too early to consider nominating a colleague for our committee awards, the Edward J. Hoffman Medical Imaging Scientist Award, Medical Imaging Technical Achievement Award, and the Bruce Hasegawa Young Investigator Medical Imaging Science Award. Nominations are due July 15th. Soon we will also begin seeking nominations for the annual election of new members to NMISC. If you are interested in being nominated, please reach out to me.

Finally, I want to acknowledge the work of Merry Keyser, who for many years has coordinated our trainee awards program at the NSS/MIC/RTSD. As conference treasurer this year I saw first hand the amount of effort Merry puts into this job. This role is being handed off to Lorenzo Fabris, and he has very big shoes to fill.

More information on NMISC activities is available at <https://ieee-npsc.org/technical-committees/nuclear-medical-and-imaging-sciences/>

Andrew Goertzen, NMISC Chair, can be reached by E-mail at andrew.goertzen@umanitoba.ca

RADIATION INSTRUMENTATION



Srilalan Krishnamoorthy
RISC Chair

Let me start by thanking John Valentine, for serving as the RISC Chair these past two years. Over this period there has been a large change in how we organize and attend conferences. We hope to build upon these experiences to ensure that the IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC) continues to stay as the premier conference for the Radiation Instrumentation community.

By the time this newsletter is posted, it will be a few months since many of us met in-person for the first time in three years at the 2022 IEEE NSS/MIC in Milan. Even if you could not make it in-person, I hope you got to enjoy our first hybrid conference virtually. Thanks to Chiara Guazzoni (General Chair) and the entire organizing committee for their effort in putting this together. As with the 2020 and 2021 editions, the 2022 conference had its share of uncertainties to contend with, and we congratulate the organizing committee on the success of a first hybrid conference.

One of the highlights of each NSS/MIC conference is the presentation of the annual RISC awards. Awards presented 2022 awards included: -

- » The Radiation Instrumentation Early Career Award is given to a young investigator in recognition of significant and innovative technical contributions to the fields of radiation instrumentation and measurement techniques for ionizing radiation. The prize consists of \$1,500 and an engraved plaque. Davide Mezza from the Paul Scherrer Institute in Switzerland received this award. The citation reads "For contributions to the development of detectors for XFEL and specifically for their verification, characterization and calibration."
- » The IEEE Emilio Gatti Radiation Instrumentation Technical Achievement Award is given to an individual in recognition of midcareer significant and innovative technical contributions in the field of radiation detectors, radiation instrumentation, and/or nuclear electronics,

and/or measurement techniques for ionizing radiation. The award consists of US\$2,000 and an engraved plaque. Gabriella Carini from Brookhaven National Laboratory, USA received this award. The citation reads "For the development of new radiation detectors that operate at the fundamental limits of performance, enabling scientific discoveries and supporting homeland security."

- » The IEEE Glenn F. Knoll Radiation Instrumentation Outstanding Achievement Award is given to an individual in recognition of outstanding and enduring contributions to the field of radiation instrumentation. The prize, consisting of \$3,000 and an engraved plaque, went to Roger Lecomte of the Université de Sherbrooke in Canada who received the award with a citation reading "For the introduction of solid-state photodetectors to replace photomultiplier tubes in detectors for positron emission tomography and for contributions to the original use of radiation detectors in multimodal imaging."

- » NSS Student Paper award winners

First place

Kevin Deslandes from Université de Sherbrooke, Canada for the paper titled "Progress Report and Measurements of a Full-Scale 200 mm Interposer Technology as PCB Substitute in Cryogenic Particle Physics Experiments."

Second place

Gianmarco Torilla from Università di Pavia, Istituto Nazionale di Fisica Nucleare, Italy for the paper titled "Digital SiPMs in a 110 nm CMOS technology with fast parallel counter architecture."

Third place

Ricardo Lopez from University of Michigan, USA for the paper titled "Shielded Californium-252 Measurements Using an Organic Glass Dual Particle Imager,"

Fourth place

Adriana Simancas from DESY and the University of Bonn, Germany for the paper titled "Developing a Monolithic Silicon Sensor in 65 nm CMOS Imaging Technology for the Tangerine Project."

Congratulations to all the winners!

Also, a reminder for everyone to nominate a deserving colleague for these awards!

Congratulations also to Christer Frödjh from Mittuniversitetet, Sweden for being elected as the new Vice Chair of RISC. I look forward to working with Christer over the next four years.

More information on the Radiation Instrumentation Technical Committee, RISC Awards and its current member roster is available at <https://ieee-npss.org/technical-committees/radiation-instrumentation/>

Wishing everyone a healthy and productive 2023!

Srilalan Krishnamoorthy is with the University of Pennsylvania; Phone: +1 215 746-6892; Mobile +1 631 355-9958; E-mail: srilalan@penmedicine.upenn.edu

HIGHER EDUCATION

I sat in the balcony, but he talked right over my head anyway.

*A Princeton student
commenting on an Albert Einstein lecture*

UNQUESTIONABLE

Today in many fields, even at graduate level, education is simply data transmission and critical thinking is ignored or actively discouraged.

Hugh Roddis

HENCE TENURE

Much literary criticism comes from people from whom extreme specialization is a cover for either grave cerebral inadequacy or terminal laziness, the latter being a much cherished aspect of academic freedom.

John Kenneth Galbraith

AM NOW COMPLETELY SUPERFLUOUS

A teacher is one who makes himself progressively unnecessary.

Thomas Carruthers

TEACHER'S PROBLEM

I know what I have given you. I do not know what you have received.

Antonio Porchia

LIVING EXAMPLE

To those of you who received honors, awards and distinctions, I say well done. And to the C students, I say, you too can be president of the United States.

George W. Bush

Functional Committees

AWARDS



Ron Schrimpf
Awards Chair

The deadline for NPSS Awards nominations is January 31st, 2023 and it's also not too early to start thinking about the next awards cycle, for which the deadline will be January 31st, 2024. Ron Schrimpf of Vanderbilt University is the Awards Chair and nominations for the Merit, Shea, Early Achievement, Graduate Scholar, Birdsall, Barker, Kristiansen, and Jaszczak Awards should be sent to him, ron.schrimpf@vanderbilt.edu. Detailed information about each award, as well as about several grants, can be found at <https://ieee-npss.org/awards/npss-awards/>. Nomination forms are found with each award and grant description as well as a list of former award recipients. The NPSS community has many outstanding contributors and there are awards for all stages of careers, from graduate students to senior professionals. Please consider nominating someone!

Ron Schrimpf, NPSS Awards Chair, can be reached by E-mail at ron.schrimpf@vanderbilt.edu

CLASS OF 2023 FELLOWS

The IEEE offers Institute Awards, and most Societies and Society Technical Committees also offer awards. Elevation to IEEE Fellow is a prestigious honor awarded each year to no more than 0.1% of the full IEEE membership by the Institute's Board of Directors. Nominations are made from among Senior Members and nominees must be supported by at least six Fellows. After applications are reviewed and ranked by the appropriate IEEE Society, the nominations are forwarded to the Institute's Fellow Committee which then recommends a list of candidates to the IEEE Board of Directors for their consideration. The Nuclear and Plasma Sciences Society is justifiably proud of its Fellows. We present here the Class of 2023 Fellows and wish them each our heartfelt congratulations.



Margaret Daube-Witherspoon
Fellow, Class of 2023

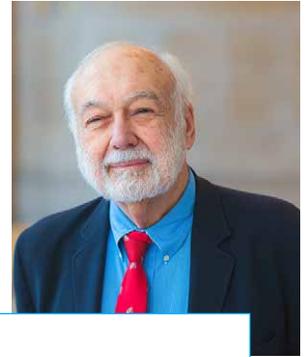
Margaret Daube-Witherspoon

Margaret Daube-Witherspoon is a Senior Research Investigator in the Department of Radiology at the University of Pennsylvania. She received her Ph.D. in Physics in 1983 from the University of Wisconsin – Madison, working to develop myocardial perfusion tracers for PET. She spent two years at the University of Pennsylvania, working on reconstruction approaches for fully 3D PET data. She developed a rebinning technique to convert 3D data to 2D slices for 2D reconstruction while also investigating image-based iterative reconstruction of 3D data without rebinning approximations. In 1986 she moved to the Department of Nuclear Medicine and later the Department of Positron Emission Tomography at the National Institutes of Health. While at NIH she worked on post-injection transmission imaging, as well as other aspects of quantitative PET corrections, including head motion measurement and correction and deadtime correction. She returned to the University of Pennsylvania in 1998 and has worked with the Physics and Instrumentation Group since then. She has worked on practical implementation and optimization of 3D reconstruction approaches for clinical PET imaging and studied the impact of time-of-flight for oncological PET studies. Her current research is focused on quantitative PET imaging for total-body PET systems to assess how to use the advantages of these high-sensitivity, long axial field-of-view systems for clinical and research applications where simultaneous imaging of multiple organs can be informative.

Citation

For Contributions to 3D Image Reconstruction in PET and Corrections for Physics Effects.

Margaret Daube-Witherspoon can be reached by E-mail at daubewit@pennmedicine.upenn.edu



Richard Lanza
Fellow, Class of 2023

Richard Lanza

Dr. Richard C. Lanza is a Senior Research Scientist in the MIT Department of Nuclear Science and Engineering. His interests are primarily in the area of application of nuclear techniques and development of instrumentation to problems in materials science, medicine and national security. He received an A.B. degree from Princeton University and S.M. and Ph.D. degrees from University of Pennsylvania, all in Physics.

His earliest work was in experimental high-energy physics with a special interest in radiation instrumentation and soon diversified toward more practical applications of new instrumentation, initially in biomedical imaging (X-ray crystallography) and later, with his colleagues at Harvard teaching hospitals, on one of the first fan-beam CT imagers. Subsequent research included PET imaging, bone-density absorptiometry and gas detectors for SPECT. One imaging approach was the use of coded apertures and coded sources for forming 3-D images with increased detection efficiency. This was applied not only to medical imaging, but later to solving problems in security involving such areas as aircraft and cargo screening as well as design of systems for long range detection of nuclear material. His most recent work was in using novel X-ray sources for 3-D imaging of integrated circuit chips at the 10 nm level. He is currently involved in new approaches to arms control and nonproliferation.

He has served on review panels for these areas for DNDO, DoE, FAA, NIH and the National Academy of Sciences and has been an Expert Advisor to the International Atomic Energy Agency (IAEA) for several of their programs. He served as Chairman of the NPSS Radiation Instrumentation Steering Committee (RISC) and was General Chair for the 2009 IEEE Nuclear Science and Medical Imaging Conference.

Citation

For developing novel imagers and radiation detectors applied to medicine and security problems.

Richard Lanza can be reached by E-mail at lanza@mit.edu



Uri Shumlak
Fellow, Class of 2023

Uri Shumlak

Uri Shumlak completed his undergraduate work at Texas A & M University and then obtained his Ph.D. from the University of California at Berkeley. After finishing his graduate degree, he was a National Research Council Fellow at the Air Force Phillips Laboratory (now AFRL) at Kirtland AFB, where he wrote MACH3, a 3-D time-dependent magneto-fluid code for nonideal plasmas in complex geometries. After the Phillips Lab, he joined the Aeronautics and Astronautics Department at the University of Washington where he is currently a Professor and serves as the department's Associate Chair for Academics. He is also an Adjunct Professor of Applied Mathematics. Recently, he co-founded Zap Energy - a spin-off company from the University of Washington aiming to develop commercial nuclear fusion energy.

Uri Shumlak's research areas are fundamental plasma physics, theoretical and computational plasma modeling, innovative magnetic plasma confinement for fusion energy, and advanced space propulsion. He develops plasma modeling algorithms that use high-order finite element methods for studying plasma dynamics. The algorithms are implemented in the WARPXM (Washington Approximate Riemann Plasma eXtended Modeling) code framework developed by his research group to solve MHD, 5N-moment multifluid, and multispecies continuum kinetic plasma models. His work includes theoretical and experimental investigations of the stabilizing effect of sheared flows in magnetically confined plasmas. A sheared-flow-stabilized Z pinch would have immediate applications as a compact fusion energy source and as a fusion space thruster. He has also developed the flow Z-pinch concept into an extreme ultraviolet (EUV) light source, which is applicable for next generation lithography.

Citation

For research of sheared flow stabilization of the Z pinch for fusion energy.

Uri Shumlak can be reached by E-mail at shumlak@uw.edu



Vesna Sossi
Fellow, Class of 2023, IEEE NPSS President

Vesna Sossi

Vesna Sossi received the Laurea degree from the University of Trieste, Italy, in High Energy Physics in 1986 and the Ph.D. degree from the University of British Columbia (UBC), Vancouver, B.C., Canada in Nuclear Physics in 1991. She is now a Professor in the UBC Physics and Astronomy Department and has been leading UBC PET and PET/MRI neuroimaging since 2009. She initially worked on detectors and data analysis as applied to measurements of nuclear reaction cross sections at the Canadian Nuclear Physics Laboratory TRIUMF and then transitioned to Nuclear-Medicine based imaging, specifically brain Positron Emission Tomography (PET). Since then, she has worked in many areas ranging from instrumentation-related topics such as development of data reconstruction and quantification algorithms, motion correction for high resolution PET data, design and development of a preclinical MR-compatible PET insert, to more applied areas such as development of novel kinetic modeling approaches for PET tracers and performance and interpretation of preclinical and clinical studies. In addition to contributing significantly to brain PET data quantification, she pioneered application and investigation of data-driven image-analysis metrics including texture-features in neurodegeneration-related PET imaging. Using PET imaging and her novel methodology, she was able to identify new Parkinson's disease related mechanisms as well as highlight the importance of neurochemical networks and distributed patterns. Her current research interests focus on enhancing the investigative power of multimodality imaging through improvement of data quantification and development of joint analysis methods. Her publication list includes more than 230 peer-reviewed papers and over 300 abstracts; she sits on several national and international review committees and is a reviewer for many journals and conferences.

Citation

For contributions to quantitative and translational brain PET imaging.

Vesna Sossi can be reached by E-mail at vesna@phas.ubc.edu

2022 IEEE NUCLEAR AND SPACE RADIATION EFFECTS CONFERENCE AWARDS

It is a longstanding tradition of the IEEE Nuclear and Space Radiation Effects Conference to recognize the Outstanding Conference Paper and the Outstanding Data Workshop Presentation from the previous conference. In recent years recognition has also been given to the best paper presented by an IEEE Student Member, who must also be the first author. The awards process recognizes high quality and important work and also encourages authors to produce presentations and manuscripts of high technical quality, clarity of presentation, and significance to the community.



Robert Reed
RE Chair



Teresa Farris
RE Vice Chair, Publicity

It is our pleasure to announce the award winners from the 2022 NSREC. Their awards will be presented at NSREC 2023 Conference in Kansas City, Missouri.

FUNCTIONAL COMMITTEES Continued on PAGE 12

FUNCTIONAL COMMITTEES

Cont. from PAGE 11

2022 OUTSTANDING PAPER AWARD

Radiation-Induced Faults Propagation in Quantum Bits and Quantum Circuits

D. Oliveria, E. Aduen, and P. Rech

2022 MERITORIOUS PAPER AWARD

Fragmented High-Energy Heavy Ion Beams for Electronics Testing

R. Garcia Alia, K. Bilko, F. Cerutti, A. Coronetti, L. Esposito, S. Francesc, W. Andreas, F. Saigne

2022 OUTSTANDING STUDENT PAPER AWARD

Scaling Trends for Single-Event Cross-Section for Conventional D-FF at Bulk FinFET Technology Nodes

Y. Xiong, N. Pieper, A. Feeley, B. Narasimham, D. Ball, B. Bhuvu

2022 OUTSTANDING DATA WORKSHOP PRESENTATION AWARD

A Heavy-Ion Single-Event Effects Test Facility at Michigan State University

S. Lidia, T. Glasmacher, S. Kim, G. Machicoane, P. Ostroumov, A. Stolz

Teresa Farris, RE Vice Chair for Publicity, can be reached by E-mail at teresa.farris@archon-llc.com

Robert Reed, RE Chair, can be reached by E-mail at robert.reed@vanderbilt.edu

EDUCATION AND TRANSNATIONAL COMMITTEES

THE DAKAR RADIATION INSTRUMENTATION SCHOOL

The IEEE NPSS School on Application of Radiation Instrumentation took place in Dakar, Senegal, November 14th – 26th, 2022. It was organized by the NPSS Transnational Committee under the umbrella of the new Educational Committee with support from Cheikh Anta Diop University and the Senegalese Physical Society. This school, originally planned for March 2020, had become one of the first victims of the pandemic, and we were really happy to finally make it happen in 2022.

Twenty-two students from Senegal, Benin, Burkina Faso, Cameroon, Morocco, and Togo participated in the school (12 male, 10 female). Two days of Zoom lectures the week before the school covered a broad range of topics on radiation instrumentation. Then, students and teachers met in person for five days at the university in Dakar. Students worked in small groups on four hands-on experiments (Time-of-Flight, cosmic ray detection, TimePix silicon detector and EasyPET imaging demonstration). Additional lectures on selected topics complemented the exercises. This “hybrid” format of Zoom-only lectures and in-person experiments allowed there to be contributions from many remote lecturers while only flying in those teachers who were involved



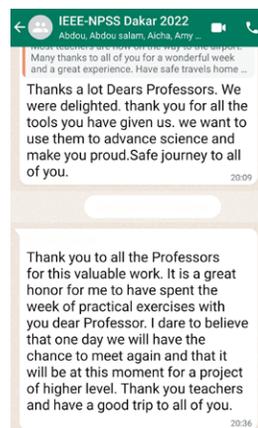
Martin Grossmann
TNC Chair



Stefan Ritt
EduCom Chair

in the experiments – saving money and CO₂. The full program is still available at <https://indico.cern.ch/e/Dakar2022>

One afternoon was dedicated to Women in Engineering. Pitch talks by several women who are running a successful career in STEM (from both Senegal and



Photos from Dakar

Clockwise from top left:
Using cosmic muons to determine the speed of light;
One of many thank-you messages posted by the students;
Fatou Gueye-Ndiaye from Dakar University leading the panel discussion at the WIE event;
Acquiring PET images using the EasyPET demonstration kit



abroad) opened a lively discussion among the participants (about 60 – mostly, but not exclusively, female) and the panel. Talks continued at an informal reception after the event.

The last day was dedicated to presentations by the students who had been asked to present a 15-minute talk on one of the experiments, followed by questions and feedback from the audience. All students participated with great enthusiasm, welcoming this opportunity as training in how to give scientific presentations in front of a larger audience.

Rounding off the school was a half-day excursion to Goré island, just off the coast of Dakar – a beautiful place with a grim history as one of the last slave trade hotspots.

We received very nice and positive feedback from the participants, with thanks for the opportunity to work hands-on with modern equipment and to interact with the teachers. You may read one student's (public) post on LinkedIn here: [tinurl.com/2p94458e](https://www.linkedin.com/posts/tinurlcom-2p94458e)

This was the first school organized under the NPSS Education Committee (EduCom). This committee was formed in 2022 with the goal to provide strategic advice to NPSS on educational activities, to effectively manage NPSS Schools as an ongoing sustainable educational activity and to act as the main point of contact for all educational activities inside NPSS. EduCom will continue

to support schools together with various NPSS Technical Committees in 2023 and beyond.

Martin Grossman, TNC Chair, can be reached by E-mail at martin.grossmann@psi.ch; Stefan Ritt, EduCom Chair, can be reached at stefan.ritt@psi.ch

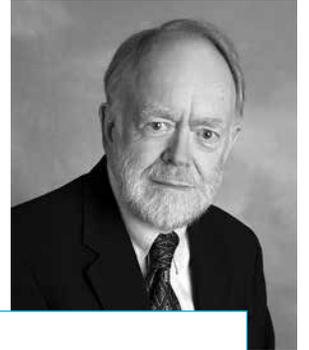
NPSS FOUNDATION FUND

MANY SMALL DONATIONS ARE ADDING UP

In just two months the fund has seen well over \$3,000 in individual donations! However, excellent as this is, many more are needed so that we can continue and expand the funding of the technical outreach programs that over recent years have been so successful and well-received!

Take a moment and make a small donation to the Nuclear and Plasma Sciences Society Fund at the IEEE Foundation. This gives us much greater flexibility and resources for mainly educational outreach at the graduate level. Both direct support of students as well as expanding the range and number of focused summer schools such as the Instrumentation Summer Schools, that have been such a great success in Asia and Africa over the last seven years, will benefit.

Current IEEE rules reasonably require us to change the funding support for these initiative activities after three years and that is when the Foundation Fund comes in.



Peter Clout
Communications Chair



Roger Fulton
NPSS Foundation Fund Chair

Because IEEE rules require external donations to justify the contributions made directly from Society funds, your donation, however small, will at least be doubled.

Please go to ieeefoundation.org/donate and select "Nuclear and Plasma Sciences Fund" from the drop-down designation box. Remember that the IEEE Foundation is a 501c3 organization so for U.S. tax-payers this donation is counted as a tax-deductible donation.

Peter Clout, Communications Chair, can be reached by E-mail at p.clout@ieee.org. Roger Fulton, NPSS Foundation Fund Chair can be reached by E-mail at roger.fulton@sydney.edu.au.



Article

Verification and Validation of ITER Interlock System Fast Architecture according to IEC 61508 standard

The ITER project, currently under construction in southern France, is a huge undertaking involving some 35 countries collaborating to build the largest tokamak in the world with the goals of demonstrating controlled burning plasmas and proving the feasibility of fusion as a large-scale viable energy source.

The ITER tokamak demands systems that protect the machine against serious damage caused by a failure in the plant systems or dangerous operation of the machine. The ITER system responsible for this function is the Interlock Control System (ICS) [1]. The ICS is the system in charge of protecting the machine operation from reaching absolute engineering limits, ensuring the needed integrity and availability. Figure 1 below shows the extent of the ICS within the massive ITER

Instrumentation and Control System. Due to the high importance of this system, it shall be developed and operated according to the highest quality standards. Therefore, ITER decided to use the IEC 61508 standard [1][2] as a reference for hard engineering best-practice.

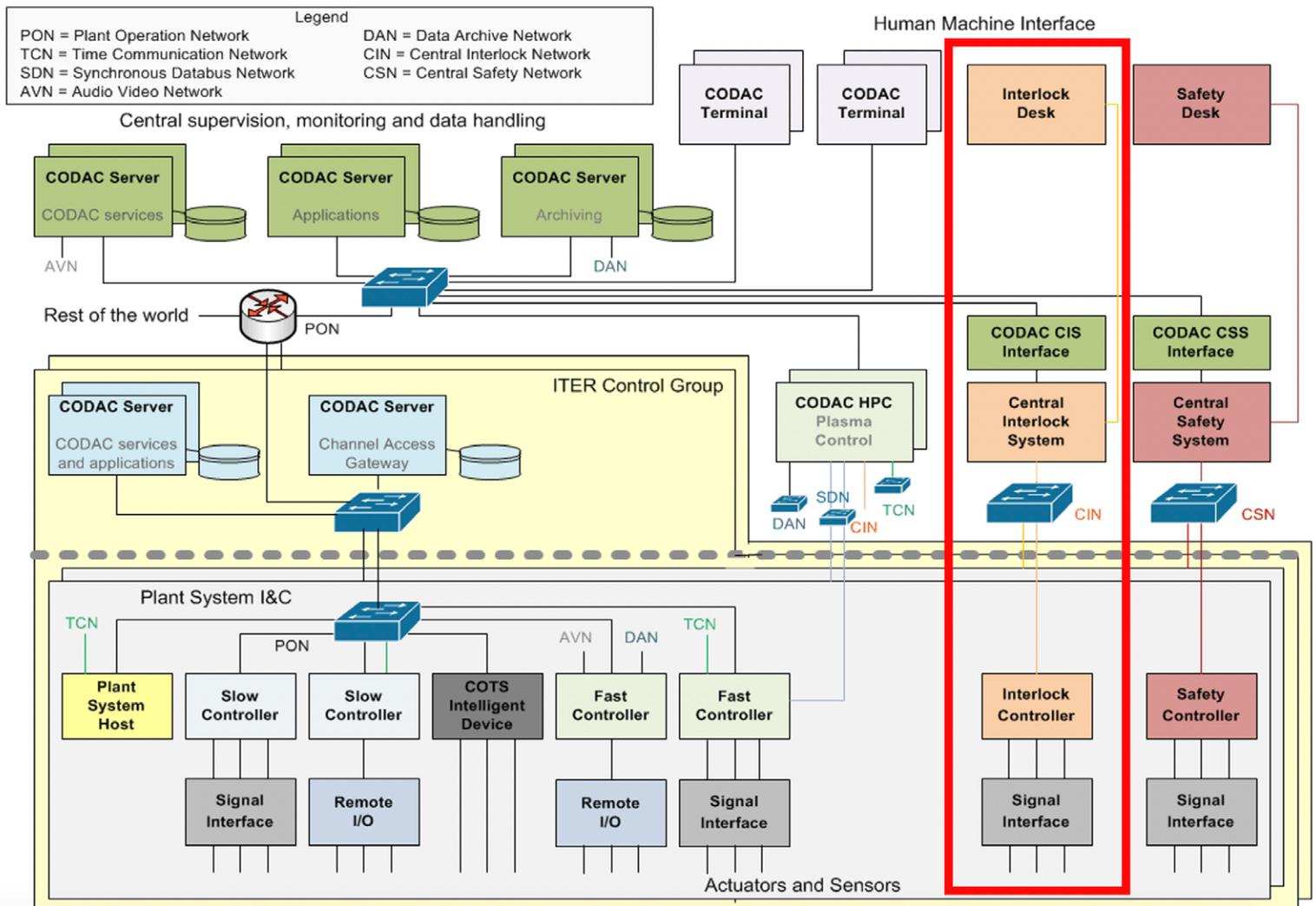
The ICS is divided into different hardware categories. This work focuses on controllers capable of delivering an interlock signal with submillisecond response times, requiring hard real-time control cycles in the order of 100 microseconds. Such requirements are assigned to Fast Architecture (FA). In 2016, ITER decided that the Fast Architecture would use Xilinx FPGA-based COTS CompactRIO NI 9159 provided by National Instruments in a redundant architecture [3]. It consists of a controller chassis containing a FPGA and a series of pluggable and

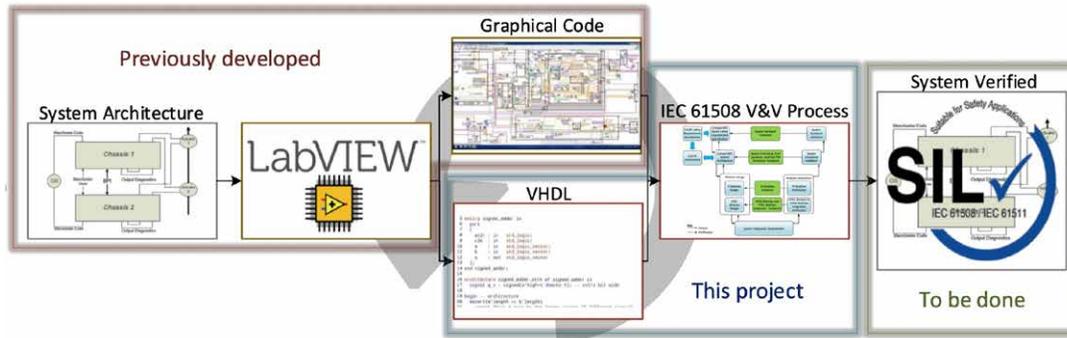


Ignacio Garcia-Siguero
CANPS Student Paper Award Recipient, 2022

configurable Input/Output modules. We developed all the system firmware using the available LabVIEW FPGA graphical programming tool.

The application of the IEC 61508 standard for this system must be done carefully. The first reason is that IEC 61508 is oriented to safety environments, and the concern is investment protection in this context. The second and most important reason is that the standard offers compliance directives for systems developed with Hardware Description Languages (HDL), not for high-





PG 14, Fig. 1.

The ICS into the complete ITER I&C system.

PG 15, Fig. 2.

V-model proposed as system development LabVIEW FPGA lifecycle

level synthesis languages or graphical languages, such as LabVIEW. The application of this standard for a similar system in the nuclear field has never been done before. Therefore, it provides a challenge for ITER.

As a result, The Interlock ITER team in collaboration with the Instrumentation and Acoustics Research Group (I2A2) of the Universidad Politécnica de Madrid (UPM) started a project to investigate in-depth the feasibility of applying the IEC 61508 standard to Fast ICS developed using the LabVIEW FPGA tool. The final objective was to create a Verification and Validation (V&V) process of the firmware developed through the LabVIEW tool for the CompactRIO. This process shall then be sufficient to guarantee the high availability and reliability of the developed systems.

The project was based on first applying the IEC 61508 standard to a previously developed system, obtaining results and conclusions useful for future developments. Specifically, the selected system corresponds to the Poloidal Field and Central Solenoid coil's power converter protection system [4]. The system was developed but not verified under any specific standard.

In order to apply the IEC 61508 standard to the target system, it was necessary to extract the auto-generated VHDL code by LabVIEW. Once the vast source code was available, we proceeded to perform the complete process that included all the V&V items of the IEC 61508. Without going into too much depth, the following activities were carried out:

» VERIFICATION

- o Tool analysis: detailed study of the steps run by LabVIEW FPGA to produce the firmware through the automatic compilation process.
- o Semi-formal methods: study of the VHDL code architecture generated the appropriateness of the constraints and other fundamental aspects of the

design as the management of clock and reset domains and the synchronization mechanism.

- o Formal methods: application of coding guidelines, design rule check and static timing analysis.
- o Unit simulations: a couple of simulations to check the correct implementation of the low-level functional requirements of the different modules. Therefore, unit-like tests focused on the set of inputs and outputs contained in the module to be verified. The test-benches were developed using the SystemVerilog language, and advanced testing techniques were incorporated, such as code and functional coverage and stimuli randomization. It was run with QuestaSim.

» VALIDATION

- o System simulations: a set of tests to validate the high-level function specifications using the complete system as a design under test. These tests validate the behavior by generating stimuli on the lines dedicated to the interface between the systems, reading the system results, and checking these results against the expected ones.
- o Real Test validation: tests performed on the real system with the final configuration bitstream. It was an FA system connected to an ad-hoc test system developed also using CompactRIO technology to assess the functional properties of the system. The validation report of the real system also includes the system performance, evaluated as the measurement of the system response time.
- o At the same time, different ways to improve the reliability were investigated, such as the control of the FPGA constraints by the user and the detection and mitigation of Single Event Upsets in the FPGA memory.

As a result of the research presented previously, we are proposing a new system development lifecycle. Figure 2 above shows a high-level summary of the project's current status. After performing the different activities, it can be concluded that the V&V of the system has been possible with some limitations. On the one hand, it has not been possible to cover all the items of the standard, leaving the standard partially applied. On the other hand, it must be considered the great cost, in knowledge, in effort, and in time, required for the application of this process. In particular, the effort required to understand, manage and implement this process for the first time is tremendously high. Even so, the subsequent number of times it is performed also requires a significant effort.

From the proposed methodology and the results obtained, ITER will define a design and V&V process that all investment protection systems using CompactRIO technology shall follow.

The author, Ignacio García-Siguero: Master student in Telecommunication Engineering at the Universidad Politécnica de Madrid, and member of the Instrumentation and Applied Acoustics Research Group (I2A2), expresses his thanks to the following:

Eduardo Barrera López de Turiso: Full Professor at Universidad Politecnica de Madrid, and leader of the Investment Protection research area with the Instrumentation and Applied Acoustics Research Group (I2A2).

Damien Karkinsky: Interlock Systems Integration Engineer and Responsible Officer at Advanced Protection System in the Facility Control System Section from ITER Organization.

Ignacio García-Siguero can be reached by E-mail at i.gsiguero@alumnos.upm.es

[1] J.L. Fernández-Hernando, D. Carrillo, G. Ciusa, Y. Liu, I. Prieto-Díaz, R. Pedica, S. Sayas, J. Soni, A. Vergara, "The ITER interlock system", Fusion Engineering and Design, Volume 129, 2018, Pages 104-108, ISSN 0920-3796,

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[3] E. Barrera et al., "Implementation of ITER Fast Plant Interlock System Using FPGAs With CompactRIO," IEEE Transactions on Nuclear Science, Volume 65, No. 2, Pages. 796-804, Feb. 2018, doi: 10.1109/TNS.2017.2783243.

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