Department of Electrical Computer and Biomedical Engineering

Università degli Studi di Pavia

The award ceremony will take place on the Zoom platform.

Topic: Emilio Gatti and Franco Manfredi Best PhD Thesis Award in Radiation Instrumentation, 4th Edition
Time: Dec 17, 2020 02:30 PM Rome
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2020 IEEE Emilio Gatti and Franco Manfredi Best Ph.D. Thesis Award in Radiation Instrumentation

Award Ceremony
December 17th, 2020

IEEE NPSS
NUCLEAR & PLASMA SCIENCES SOCIETY
IEEE NPS Italy Chapter

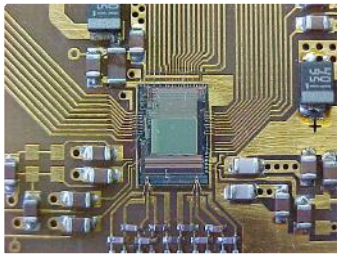
Department of Electrical Computer and Biomedical Engineering

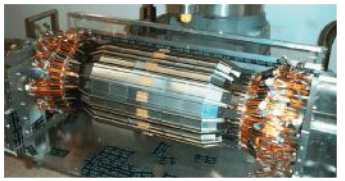
Università degli Studi di Pavia

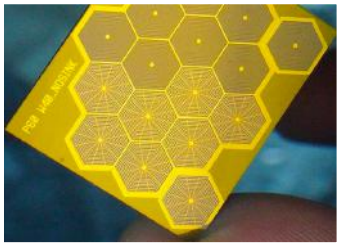
The IEEE NPS Italy Chapter is pleased to announce the fourth edition of the Award in memory of Emilio Gatti and Franco Manfredi. The award is presented to distinguished young scientists who have completed their Ph.D. thesis in the field of Radiation Instrumentation for fundamental and applied research.
The prize consists of 500 Euros and a certificate.

For more information about the award visit:

http://www.npss.polimi.it/GattiManfrediAward







Agenda

15:00 IEEE NPS Italy Chapter Chair Welcome
Gian-Franco Dalla Betta
Università degli Studi di Trento and INFN, Italy

15:10 Welcome of the Rector of the University of Pavia,
Prof. Francesco Svelto
Università degli Studi di Pavia, Italy

15:20 "High Electronic Density for High Spatial Resolution Positron Tomography Dedicated to Preclinical and Brain Imaging"
Réjean Fontaine
Université de Sherbrooke, Canada

15:50 "An Outlook into the Future of Spatial Resolution in PET"
Roger Lecomte
Université de Sherbrooke, Canada

16:20 Award Ceremony

16:30 "Total Ionizing Dose Degradation Mechanisms in Nanometer-scale Microelectronic Technologies"
Stefano Bonaldo – 2020 Awardee
Università degli Studi di Padova, Italy

17:00 Conclusion and Farewell

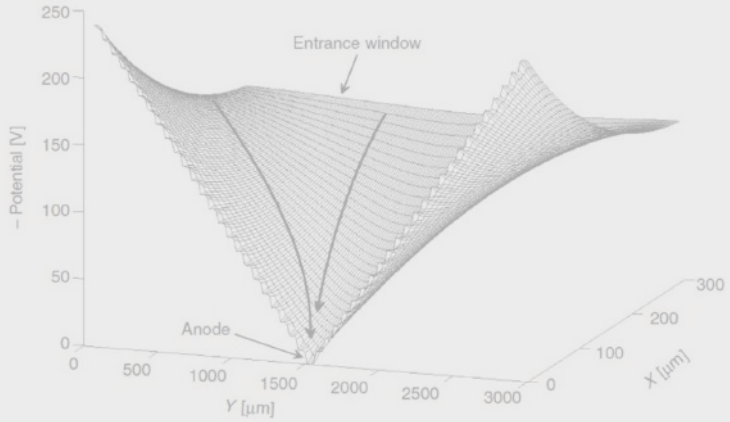
Réjean Fontaine received his bachelor and Ph.D. degrees at Université de Sherbrooke, Sherbrooke, Canada in 1991 and 1999. After spending a few years in the industry as an R&D manager, he got back to academia in 2001 at Université de Sherbrooke where he is currently holding a full professor position in electrical engineering and computer engineering department. He successfully engineered two positron emission tomography scanners dedicated to small and mid-sized animal imaging. These works conducted to innovations related to electronic integration in the field recognized by many awards. He is the first awardee of the IEEE Emilio Gatti Radiation Instrumentation Technical Achievement Award (2019). He manages a Canada research chair tier I dedicated to Time of flight positron emission tomography and authored more than 250 scientific contributions including international journals, book and conferences. In 2012, he founded the 3IT.micro which he still manages. The 3IT.micro is a technological platform for advanced PCB and 2.5D interposer assemblies. His current research interests include Time of flight PET and time of flight computed tomography (ToF-CT), a new research area his team introduced in 2018.

Roger Lecomte is Professor of Nuclear Medicine and Radiobiology at Université de Sherbrooke and Scientific Head of the Sherbrooke Molecular Imaging Center (SherbrookeImaging.ca). He received his PhD in Nuclear Physics from Université de Montréal in 1981. After postdoctoral training in Nuclear Medicine, he established the Laboratory of Positron Emission Tomography (LabPET) with the aim of designing, developing and exploiting multimodality imaging instrumentation and methods for preclinical studies in small animals. He developed the first PET scanner based on avalanche photodiodes (APD), achieving the world's best spatial resolution in 1995, and established the first animal PET imaging facility in Canada as part of the Sherbrooke Molecular Imaging Center. He was the co-founder in 2002 of Advanced Molecular Imaging (AMI) Inc., manufacturing the LabPET™, the first APD-based, fully digital, commercial PET scanner distributed worldwide by GE Healthcare from 2007 to 2011. More recently, he co-founded IR&T Inc. with the intent of introducing a second-generation LabPET technology in clinical brain imaging to achieve an order of magnitude improvement in volumetric spatial resolution with respect to the current state-of-the-art. He is an author of 260 refereed journal papers, 190 conference papers and over 700 abstracts, and a frequent invited speaker with over 170 lectures. Dr. Lecomte has received several awards for technological innovation and multidisciplinary achievements, including the Lionel-Boulet Scientific Award, the Quebec Government's highest distinction for scientific achievements (2013), and the Computer Applications in Nuclear and Plasma Sciences (CANPS) Award from the IEEE Society (2016). He was elected Fellow of the European Academy of Sciences in 2018.

“High Electronic Density for High Spatial Resolution Positron Tomography Dedicated to Preclinical and Brain Imaging”

Réjean Fontaine
Université de Sherbrooke, Canada

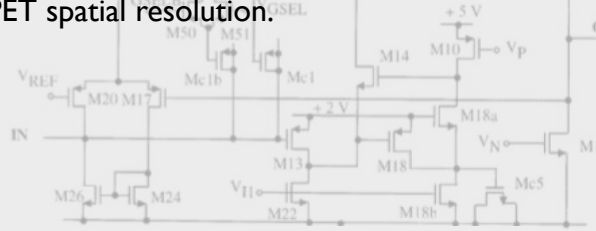
Abstract: Improvements in timing and spatial resolutions both contribute to high contrast to noise ratio in PET images. However, current timing performance is not yet sufficient to fully improve image quality of preclinical scanners where fewer than 30 ps must be reached for mice. Improving spatial resolution becomes then the best option but comes with challenges regarding the pixel and electronic density along with heat dissipation problems. This talk presents the evolution of two avalanche photodiode-based technologies that successfully improved the spatial resolution from 4 mm to 0.78 mm over almost two decades. Trade-offs between sensitivity, spatial resolution, electronic performance, image quality along with industrial manufacturability are presented. ASIC integration, cooling approaches, EMI susceptibility along with the capability to build an Ultra-High Resolution (UHR) brain PET scanner supporting 129 024 pixels on a 39 cm diameter scanner will close the presentation with an opening on next steps to include ultrafast time-of-flight PET measurements in preclinical and brain scanners.

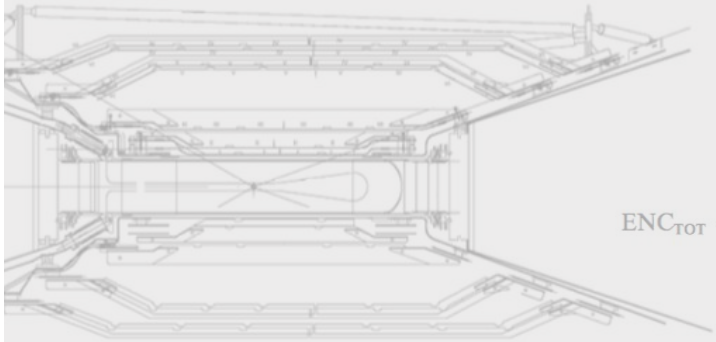


“An Outlook into the Future of Spatial Resolution in PET”

Roger Lecomte
Université de Sherbrooke, Canada

Abstract: Despite the steady improvement since its introduction, spatial resolution has remained the main weakness of positron emission tomography (PET) relative to the other whole-body medical imaging modalities, such as X-ray computed tomography (CT) and magnetic resonance imaging (MRI). With the most recent pixelated detector technology, spatial resolution is nearing what is considered nowadays as the physical limit of PET. While time-of-flight PET provides improvement of the contrast-to-noise ratio and further increases the unequaled picomolar sensitivity of PET, we postulate that ultra-fast (~10 ps) TOF-PET will provide an opportunity to break the physical barrier of spatial resolution, with the potential of making whole-body PET resolution comparable to that of its complementary medical imaging modalities. The talk will review the current state of the art and discuss the prospects and requirements for further progress in PET spatial resolution.





$$\mathrm{ENC_{TOT}} = \frac{\sigma_{\mathrm{TOT}}}{(\mathrm{dToT/d}Q)_{Q=Q_{in}}}$$