IEEE Circuits and Systems Society Activity:

Developing Inter-disciplinary Education in Circuits and Systems Community

23rd May 2014, 10.00am

Dipartimento di Elettronica, Informazione e Bioingegneria

Aula Beta, Edificio 24, Via Golgi 40, Milano

- 10.00-11.00: Ephraim Suhir, Portland State University**:**

"Probabilistic Design-for-Reliability (PDfR) of Photovoltaic (PV) Products: Role and Significance of Predictive Modeling"

- 11.15-12.00: Vito Giannini, imec:

"Sensing The World With Millimeter-Waves"

Probabilistic Design-for-Reliability (PDfR) of Photovoltaic (PV) Products: Role and Significance of Predictive Modeling

Prof. Ephraim Suhir,
Portland State University, Portland, OR and ERS Co., Los Altos, CA, USA

e-mail: suhire@aol.com

Solar energy is abundant worldwide, and photovoltaic (PV) technologies are an attractive and promising direction in the renewable energy world. The major bottleneck of these technologies today is the assurance of the long-term reliability of the PV systems: it is still a long way to go until viable and promising PV devices, modules and systems will become reliable and cost-effective products. Accelerated qualification testing (QT) is the major means for making a viable PV device into a reliable and marketable product. It is well known, however, that the today's PV modules that passed the existing QT often exhibit premature field failures. Could the existing QT specifications and procedures be improved to an extent that if a PV product underwent highly accelerated life testing, passed the QT and survived burn-in testing, there is a quantifiable and consistent way to assure its failure-free operation in the field? The application of the probabilistic-design-for-reliability (PDfR) concept enables one to provide an affirmative answer to this question. The attributes and challenges of this concept and the roles of its major constituents –highly focused and highly cost-effective failure oriented accelerated testing and simple, physically meaningful, and easy-to-use predictive modeling are addressed and discussed in detail. It is suggested that the multi-parametric Boltzmann-Arrhenius-Zhurkov (BAZ) equation is used as a suitable predictive model in the effort in question.

Ephraim Suhir is Foreign Full Member (Academician), National Academy of Engineering, Ukraine; Fulbright Scholar, Information Technologies, US State Department; Fellow of seven leading professional societies: the Institute of Electrical and Electronics Engineers (IEEE); the American Physical Society (APS); the Institute of Physics (IoP, UK); the American Society of Mechanical Engineers (ASME); the International Microelectronics and Packaging Society (IMAPS); the Society of Optical Engineers (SPIE); and the Society of Plastics Engineers (SPE); author and co-author over 300 technical publications (patents, papers, book chapters, books) and recipient of numerous professional awards, including the 2004 ASME Worcester Read Warner Medal "for outstanding contributions to the permanent literature of engineering and for laying a foundation of a new discipline - Structural Analysis of Electronic and Photonic Systems". He is the third Russian American, after Steven Timoshenko and Igor Sikorsky, who received this prestigious award. Ephraim received also the 1996 Bell Laboratories Distinguished Member of Technical Staff (DMTS) Award "for developing methods for predicting the reliability of structures used in manufacturing of AT&T and Lucent Technologies products".

Sensing The World With Millimeter-Waves

Dr. Vito Giannini, imec, Belgium

e-mail: Vito.Giannini@imec.be

Historically, millimeter wave (mm-wave) sensing, which is capable of detecting the position, direction and relative speed of an object, has been synonymous with military use, high cost, and low volume deployment. But if we could integrate mm-wave sensors in a fraction of the area, then a whole range of new applications could take advantage of their unique properties: robustness against bad weather conditions and harsh environments, their nonintrusive nature in detecting motion without identifying people, as well as the capability to penetrate some materials thereby rendering them invisible. Fortunately, there is already a big driving force behind these developments: 77/79GHz radar will soon enable active safety in every car. In the future, smart homes will use mm-wave sensors to detect people's ongoing activities and self-adapt to provide extra comfort while protecting privacy. In robotic vehicles, mm-wave sensors will complement image sensors allowing further robustness and accuracy to autonomously perform challenging and inconvenient tasks for humans. At imec, we accelerate this deployment by developing fully integrated mm-wave sensors, that fit on a fingertip, and include integrated RFICs, antennas, packaging and basic algorithms. We leverage close multidisciplinary collaboration with industry and academia. Thanks to this, the full potential of mm-wave sensing is becoming ever more apparent. This talk will give some technology insights explaining benefits, challenges and our current state-of-the-art.

Vito Giannini holds a Master and a PhD degree in electronic engineering and has a background in CMOS IC design and communication. His research applies to Cognitive-Radios, heterogeneous Radio Access Networks, and wireless sensor networks. Vito is passionate about innovation and believes that disruptive technology breakthroughs happen often at the intersection of several disciplines. He is a principal scientist with imec, Belgium where he is currently exploring the world of remote motion sensing. He is a senior member of IEEE and (co)authored more than 40 articles published in peer reviewed IEEE conferences and journals.