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Edinburgh International Conference Centre, Edinburgh – United Kingdom

Integrating CMOS with other Technologies

The evolution of silicon microelectronics has seen a recent diversification into new device types and associated novel application areas. Examples of this diversification include smart power, RF systems, microsystems, microdisplays, bioelectronics and silicon photonics. These technologies have in common, the use of silicon as a platform for system integration with the added value being the innovation associated with post-processing of, in many cases, standard foundry technology. These so-called Silicon⁺ technologies will most likely become the mainstream silicon research direction when scaling has run its course and hits a combination of technological and economic barriers.

In this tutorial, experts in academia, start-up technology companies, and international semiconductor manufacturers will examine the challenges involved in this exciting field. Existing and potential solutions will be presented and future difficulties discussed. A number of case studies from industry at the forefront of this stimulating area will provide invaluable firsthand experience. The tutorial will appeal to graduate students and young engineers as well as to more experienced engineers and managers who are looking for an informal and informative introduction to this important field.

Programme

13:30 Introduction to Integrating CMOS with other Technologies
Anthony Walton (University of Edinburgh, UK)

14:10 Design for Manufacture Challenges in MEMS enabled Micro & Nano Systems
Andrew Richardson (Lancaster University, UK)

14:50 Post-processing Microdisplays on CMOS
Ian Underwood (Microemissive Displays, UK)

15:30 Coffee

15:50 Post-processing Image Sensors on CMOS
Lindsay Grant (ST Microelectronics, UK)

16:30 CMOS Integration with Biotechnology
Roland Thewes (Qimonda, Germany)

17:10 Gas multiplication grid integrated on CMOS
Jurriaan Schmitz (University of Twente, Netherlands)

17:50 Close

Biographies of speakers

Anthony Walton is professor of Microelectronic Manufacturing in the School of Engineering and Electronics at the University of Edinburgh. He leads the technology research activities in the Institute for Integrated Micro and Nano Systems (IMNS) and was instrumental in setting up the Scottish Microelectronics Centre (SMC). This is a purpose built facility for R&D and company incubation consisting of approximately 350m² of class 10 cleanrooms. His research interests include the design and fabrication of microsystem technology and its integration with

CMOS, which has been a feature of many of the companies that have been spun out of the IMNS. He has published over 200 papers and is an associate editor of the IEEE Transactions on Semiconductor Manufacturing and a member of the IEEE.

Andrew Richardson currently holds a personal chair in Microsystems Engineering within the Department of Engineering at Lancaster University. He is the Director of the Centre for Microsystems Engineering, Scientific Director of Dolphin Integration, Grenoble. He has published 140 journal, conference and workshop papers together with two books that cover work in the fields of mixed signal and analogue design-for-test, defect, fault and degradation modelling, MEMS modelling and test and design for micro and nano-manufacture. More recently Prof. Richardson has been carrying out work on System-in-Package Technology, Multi-Sensor Microsystems for Health Monitoring applications and both Bio-MEMS and Microfluidics. Prof. Richardson has contributed to funded projects in all European IST programs since 1994 that includes the coordination of the FP6 PATENT-DfMM Network of Excellence that involves 24 partners and over 140 researchers across 10 European countries. He is also a partner in the QinetiQ led Integrated project "Integrated MNT Platforms & Services" (INTEGRAMplus) and is a co-investigator and member of the management team for the EPSRC Innovative Electronics Manufacturing Centre. Prof. Richardson is also a steering committee member for the NEXUS Association that represents European universities and industry working in the field of integrated MEMS.

Ian Underwood is a co-founder of MED and co-inventor of its P-OLED microdisplay technology. Prior to 1999 he was at The University of Edinburgh where he carried out pioneering research and development in the field of liquid crystal microdisplays between 1983 and 1999. He is a Fulbright Fellow (1991), Photonics Spectra Circle of Excellence designer (1994), British Telecom Fellow (1997), Ben Sturgeon Award winner (1999), Ernst & Young Entrepreneur of the Year (2003), Fellow of the Royal Society of Edinburgh (2004), Gannochy Medal winner (2004), Fellow of the Royal Academy of Engineering (2008), and Fellow of the Institute of Physics (2008). As Chief Scientific Advisor, he is responsible for putting in place projects and programs to ensure that MED's future products will continue to meet the challenge of fast moving markets and innovative customers. He is recognized worldwide as an authority on microdisplay technology, systems and applications. In 2005, Ian was named Professor of Electronic Displays at The University of Edinburgh. In addition to his full-time post at MED, he sits on the Council of the Scottish Optoelectronics Association and the Steering Committee of ADRIA (Europe's Network in Advanced Displays). He is co-author of a recently released book entitled Introduction to Microdisplays.

Lindsay Grant was born in Glasgow, Scotland in 1961. He received the B.Sc. in Physics from St. Andrews University in 1984 and embarked on a career in the semiconductor industry. He has more than 20 years of experience in semiconductor device physics and process development. Initially he worked near Bristol, UK for equipment manufacturer Electrotech on plasma etch processing. Then having moved to Harlow, UK and he spent 3 years in device engineering with STC working on BiCMOS process development. Returning to Scotland in 1988 he spent 11 years with Seagate Microelectronics, Livingston, Scotland. In Seagate he worked on Bipolar, CMOS, DMOS and BiCMOS technologies and he held positions in product, device and process engineering. In 1999 he joined ST Microelectronics, Edinburgh. ST Microelectronics acquired VLSI Vision in 1999 and since then Lindsay Grant has played a key role in the development and introduction of CMOS Image Sensor process technology inside ST. He has worked on the development of 7 generations of pixel technology with ST progressing from 5.6µm pitch in 1999 to 1.4µm in 2008. He currently holds the position of Imaging Process Development Manager inside the Imaging Division. He has co-authored several papers on imaging technology and been an invited speaker at imaging conferences.

Roland Thewes was born in Marl, Germany, in 1962. He received his Ph.D. degree in Electrical Engineering from the University of Dortmund, Germany, in 1995. In 1994, he joined the Research Laboratories of Siemens AG, where he was active in the field of reliability and yield of analog CMOS circuits and in the design of non-volatile memories. From 1997-1999, he managed projects in the areas of design for manufacturability, reliability, analog device performance, and analog CMOS circuit design. From 2000-2005, he was responsible for the Lab on Mixed-Signal Circuits of Corporate Research of Infineon Technologies focusing on

CMOS-based bio-sensors, analog CMOS circuit design, and device-circuit interaction. Since 2006, he is responsible for DRAM Core Circuitry Development at Qimonda. Moreover, he serves as a consultant of the Max-Planck Society in the area of CMOS-based neural tissue imaging. He has authored or co-authored some 130 technical publications including book chapters, tutorials, and invited papers, and he also has authored or co-authored a similar number of granted patents and patent applications. He has been serving as a member of the Technical Program Committees of various conferences. Currently, he is a member of the Technical Program Committees of the International Solid-State Circuits Conference (ISSCC) and of the European Solid State Device Research Conference (ESSDERC), of the Executive Committee the International Electron Device Meeting (IEDM), and of the Joint Steering Committee of the European Solid State Device Research Conference (ESSDERC) and European Solid State Circuits Conference (ESSCIRC).

Jurriaan Schmitz (1967) obtained his M.Sc. (1990) and Ph.D. (1994) at the University of Amsterdam in the field of experimental high-energy physics carried out at NIKHEF. His Ph.D thesis, supervised by Prof. Jos Engelen, dealt with the research and development of the microstrip gas counter, with the intent to apply it in the ATLAS inner detector. After his Ph.D. he joined Philips Research (in Eindhoven, NL) to work on CMOS transistor downscaling, and characterization and reliability of MOS devices. Since 2002, he is a full Professor at the University of Twente. At present he heads a group of 25 people devoted mainly to scientific research on the components inside integrated circuits. His current research programme focuses on CMOS post-processing techniques, and can be found at <http://sc.el.utwente.nl/research>. He holds 14 US patents and authored or co-authored over 80 scientific papers. He is member of the IEEE and the Dutch and European Physical Societies.