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TechARENA: Semiconductor Nano-electronics - The Power of Collaboration

P. Connock
Chairman
memsstar Ltd, Livingston, United Kingdom

Biography
Peter Connock
PENTA Director, AENEAS
Board Chairman, memsstar Limited

Biography
Peter Connock has been working in the semiconductor industry for 40 years with a wide range of responsibilities in development, customer service, marketing and management. He has held long-term positions at Edwards, Applied Materials and memsstar in locations around the world. In his latest role, PENTA Director at AENEAS, he is responsible for the management of the EUREKA cluster PENTA – focussed on catalysing activity in the micro and nanoelectronics enabled systems and applications sector in Europe. PENTA will operate for 5 years, and launched its first call in January 2016.

This complements his Board Chairmanship of memsstar, Europe's premier semiconductor equipment remanufacturer and services provider. It also serves the global MEMS marketplace, offering etch and deposition expertise, experience, proprietary and remanufactured systems and know-how to deliver innovative products and services for research, commercial R&D and

production.

He has further augmented his operational activities by establishing a long-term relationship with industry representative bodies such as SEMI serving on SEMICON, ISS and now the Secondary Equipment committees in Europe for many years. These activities are complemented by his appointment to the nmi Board in the UK – representing the UK microelectronics industry .

Peter also specialises in working with SME's at Board level in strategic marketing and business development.

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Progression of Moore’s law

F. List
Senior Project Manager Strategic Technology Program
ASML, D&E - STP, Veldhoven, Netherlands

Abstract
In this session the cooperation between industry, SME’s, research institutes and academia in development of next generation semiconductor technologies will be covered. It provides an overview of the results and challenges in enabling 10nm, 7nm and 5nm technology nodes and thereby continuing Moore’s law. Technology areas addressed are Lithography, Metrology, Processing and Mask Infrastructure. The work is supported under the ECSEL Joint Undertaking, projects; E450LMDAP, SeNaTe, TAKE5 and TAKEMI5.

Biografie
Frans List works currently for ASML as Seniors Project Manager Strategic Technology Program. He received his Master degree in Electronic Engineering from the University of Twente, the Netherlands in 1984. Ever since he has been involved in semiconductor product development in roles varying from Integrated Circuit Design, Project-, Program- and R&D management with professional engagements in the Netherlands, England, Italy and Taiwan, leading product development projects, teams and development departments in Philips Research, STMicroelectronics and NXP. In the past he setup and coordinated industrial consortia collaborating on Non-Volatile Memory technology development in European context as part of Medea and Medea+ programs.

The power of collaboration in Europe

G. Delpu
Collaborative programs manager
RECIF Technologies, Blagnac, France

Abstract
Small and Medium sized Enterprises (SME) can sometime face problems to connect to the right stakeholders of the semiconductor industry and tackle the challenges they have to. Reasons such as protection of IP's (among others) make that dialog can be difficult to establish between several parties around a common goal.

We, in Europe, have multiple frameworks that simplify the set-up of basis for collaborative programs; this is a chance! Within such appropriate environments, all contributors of the value chain can find their interest around a common goal and major road blocks can be lifted.

From RECIF point of view, as an SME, this is the power of collaboration in Europe!

In its presentation, RECIF will provide insights of achievements obtained in its TSV-HANDY project, currently running under CATRENE framework. RECIF will also illustrate why such collaborative frameworks are key to maintain leadership of European stakeholders in a worldwide market.

Biografie
Guilhem Delpu works for RECIF Technologies as collaborative programs and product marketing manager.

RECIF is specialized in robotics wafer handling systems. He joined the company in 2004 and has held several positions in the company.

Throughout the past 7 years, he has managed the positioning of RECIF in 12 collaborative programs build under various frameworks (H2020 / ENIAC / CATRENE). He has also build and led 2 projects for RECIF under CATRENE framework. One is currently running.

Guilhem Delpu graduated in mechanical engineering as well as marketing, in Toulouse.

Graphene Flagship

J. Kinaret
Professor
Chalmers University of Technology, Physics,
Gothenburg, Sweden

Abstract
In this presentation I will describe the Graphene Flagship (www.graphene-flagship.eu), which is a large scale, ten year research initiative funded by the European Commission together with the EU member states and associated countries. The flagship brings together a very large research consortium of academic and industrial partners from over 20 countries, who work together to take graphene and related materials from academic laboratories to society as new products and employment opportunities. I will briefly describe the project, its goals, evolution and results, with a focus on the electronics domain.

Biografie
Jari Kinaret received his M.Sc. degrees in Theoretical Physics and Electrical Engineering at the University of Oulu, Finland, in 1986 and 1987, respectively, and in 1992 he graduated with Ph.D. in Physics from the Massachusetts Institute of Technology. After a brief stay in Copenhagen, he moved to Sweden in 1995 where he works as a Professor of Physics at the Chalmers University of Technology. His research is theoretical condensed matter physics, and his main interests in the last years have been nanoelectromechanical systems as well as optical properties of graphene. He has been the driving force behind the research initiative Graphene Flagship since 2010, and is the Director of this one billion euro endeavor since the project start in 2013.

Hyb-Man: Hybrid 3D Manufacturing of Smart Systems

R. van Asselt
Project leader
Philips Lighting, Research, Eindhoven,
Netherlands

Abstract
The current way of mass producing consumer electronics products poses challenges to industries like Philips Lighting. New flexible hybrid manufacturing methods and 3D integration of electronics enable faster product realization, product customization and new products with improved design and performance. Moreover, the integration of functions will result in less parts and easier assembly, which facilitates local and on-demand product manufacturing.

The successful implementation of hybrid manufacturing methods requires a wide range of competences and parallel development of technologies and markets for materials, processes, production equipment and products. Therefore we started the Hyb-Man project with the goal to develop hybrid 3D manufacturing methods to enable flexible first time right production of smart systems. Together with 11 partners from Germany and the Netherlands we will develop and integrate technologies for additive manufacturing, 3D electrical structures, assembly and interconnect. First time right manufacturing will be achieved by creating design rules based on understanding of product-process relationships and by developing in-line testing and quality monitoring as integral part of the complete production chain. In parallel we will develop two innovative product cases covering different applications and sectors (LED luminaires, automotive adaptive sensors) to demonstrate the hybrid 3D manufacturing approach.

Biografie
Dr. Rob van Asselt has a PhD in chemistry from the University of Amsterdam. In 1994 he joined Philips Research, where he has been involved in a variety of product and process development projects. Since 2011 he is project leader and system architect for LED lighting products. In this role he is also leading the Penta funded cooperation project Hyb-Man.

ECSEL OSIRIS Project : Development of a European isotopic SiC supply chain

S. PIOTROWICZ
Research Engineer
III-V LAB, Palaiseau, France

Abstract
OSIRIS project, a Research and Innovation Action (RIA), started on May 1st 2015. It aims at improving substantially the cost effectiveness and performance of gallium nitride (GaN) based millimetre wave devices. It proposes to elaborate innovative SiC materials using isotopic sources in order to offer thermal conductivity improvement of 30% which is important for SiC power electronics and microwave devices using GaN high electron mobility transistors (HEMT) grown on SiC semi-insulating substrates. The improved thermal SiC properties will be obtained by using single isotopic atoms for silicon and carbon, namely 28Si and 12C. The SiC wafer size will be targeted to 100mm (4-inches) which is today widely used in industry. For microwave GaN/SiC HEMT, this isotopic approach should create a complete shift in the currently used SiC substrate/GaN epi-wafer technology by growing the high thermal conductivity (+30%) semi-insulating SiC on top of lower cost semiconducting SiC substrates. The project is also evaluating HEMT microwave power performance improvement at 30GHz thanks to better thermal environment. For power electronics, this innovation will be essentially focused on thermal improvement not on price fall, i.e. better electron mobility at a given power dissipation as mobility and drift mobility decrease with temperature and also better carrier transport thanks to lower scattering rates. Schottky and p-i-n diodes will be tested using this material.

This project involves partners from France, Norway, Slovakia, and Sweden. This Consortium is very complementary and this work could not be realised without this collaborative work at European scale as no country would have on its own the different expertises required. The presentation will give an overview of the project outcomes including isotopic material, GaN epitaxy, processing, physical simulation, thermal assessment and device performances.

Biografie
Stéphane PIOTROWICZ received the PhD. Degree in Electronics from the University of Lille in 1999 at Institute for Electronics Microelectronics and Nanotechnology (IEMN). In 2000, he

joined the Thales Research Center and worked on the design of hybrid and MMIC power amplifiers on InGaP/GaAs HBT technology for Radar and Space Applications. He is currently in charge of the GaN HEMT for RF applications program at III-V Lab (a joint lab of Nokia Bell Labs France, Thales Research and Technology & CEA Leti). His background concerns design, modeling and RF characterization at transistor and circuit level as power switches, power amplifiers and low noise amplifiers for T/R modules.

The European Quantum Technologies Flagship Program

T. Calarco
Professor
University of Ulm, Ulm, Germany

Abstract
Technologies are currently being developed that explicitly address individual quantum states and make use of the “strange” quantum properties, such as superposition and entanglement – commonly referred to as Quantum Technologies (QT).
Europe has a well acknowledged world-class expertise, world leading in many areas of quantum science and technology. However, both commercialization of research results and the interest of large industrial players is less developed in Europe than it is in some other parts of the world. In the past, Europe has famously failed to capitalize on major technology trends and we should not miss the opportunity this time. The European Commission has therefore announced an ambitious, long-term (10 years) and large-scale (~1 billion EUR) Flagship initiative. The QT Flagship will be a coherent and well-aligned program consisting of research and innovation projects, which will be selected through peer-reviewed calls for proposals, based on the Flagship’s strategic research agenda. The calls will be part of the EU H2020 and FP9 funding programs; financing is expected also through national funding programs and investment by industrial partners.
The Flagship will be structured along four mission-driven application domains:
• Communication, to guarantee secure data transmission and long-term security for the information society by using quantum resources for communication protocols;
• Computation, to solve problems beyond the reach of current or conceivable classical processors by using programmable quantum machines;
• Simulation, to understand and solve important problems, e.g. chemical processes, the development of new materials, as well as fundamental physical theories, by mapping them onto controlled quantum systems in an analogue or digital way;
• Sensing and Metrology, to achieve unprecedented sensitivity, accuracy and resolution in measurement and diagnostics, by coherently manipulating quantum objects.

Biografie
Prof. Dr. Tommaso Calarco (Institute for Quantum Complex System, University of Ulm) has pioneered the application of quantum optimal control methods to quantum computation and to many-body quantum systems. He is the director of the centre IQST, which involves the University of Ulm, Stuttgart and the Max Planck Institute for Solid State Research. He is one of the author of the “Quantum Manifesto” and scientific member of the “High Level Steering Committee for the Quantum Technologies Flagship”.