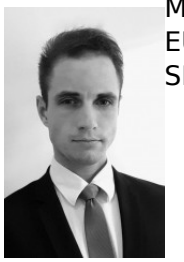
MADEin4 Session



M. Kysela
EU Policy and Project Coordinator
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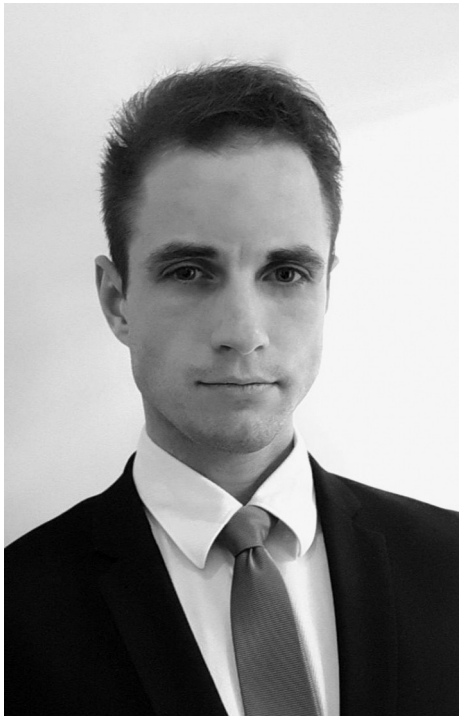


Biography
Works for SEMI Europe as EU Policy and Project Coordinator, coordinating SEMI's R&D projects and technology policy program. Prior to SEMI, he obtained experience in ICT project management with EU institutions and gained experience of (cyber)security policy. Marek obtained his master's degree in International Relations from Sogang University in Seoul, Republic of Korea and specialized education in Chinese Foreign Affairs from Peking University in Beijing.

Metrology Advances for Digitized ECS Industry 4.0 (MADEin4 Overall Concept

N. S. Malik
Deputy Director
Applied Materials India Pvt Ltd, IPC PDC,
Bangalore, India

Abstract
The metrology is a key enabler for productivity enhancements in many industries across the electronic components and system (ECS) value chain and is an integral part of any advanced production process. Connected metrology equipment, virtual metrology or Industrial internet of things (IIoT) sensors must be combined with, advanced, smart data processing technologies and intrinsic knowledge of the design and production process to enable optimization of production processes.
The metrology role in the ECS integrated circuit (IC) fabs is of the most challenging, as it measures on silicon

wafers down to an atomic scale 2D and 3D features with deep sub-nm levels of precision and accuracy. Also in back-end and packaging challenges are increasing because of smaller dimensions, complex (3D) geometries and difficult materials. In addition, the metrology role is continuously increasing for other highly complex industrial sectors as automotive. Metrology can be used to mature a production process so that it is not anymore in a reactive mode but more in a predictive mode, where disruptions are either prevented or, at the least, predicted. However, for any metrology technology, it is a real challenge to achieve not only the required sensitivity, precision and accuracy but also to enhance its productivity in terms of sample rates, cycle times and economic sustainability. To really improve throughput and predictability in the production process, both aspects need to be covered at the same time. This talk will address these challenges by concentrating on developing next generation metrology tools for both ECS's Semiconductor and Automotive industries which will focus on higher productivity and connectedness to its environment (Cyber Physical Systems (CPS).

Biography

Dr. Nitin Singh Malik (m) is Deputy Director of Application Engineering at PDC group of Applied Material (AMAT) India. He joined AMAT in 2012 and worked on varieties of semiconductor e-beam metrology and Defect review solution dedicated from planar device to advance FinFET device. He is an expert of e-beam technology and semiconductor customer technology and contributed significantly to e-beam technology development of Applied Materials as per customer roadmap. He received his Master of Technology (Solid State Electronics) degree in 2007 from Indian Institute of Technology Delhi, India and PhD (Physics) in 2011 from University of Grenoble, France . His PhD thesis focused on fabrication of high efficiency III-V semiconductor quantum dot based single photon source. He authored and co-authored more than 30 peer reviewed publications in conferences and refereed journals.

Metrology platforms developments for enhanced productivity

A. F. de Jong
Director, Strategic Programs
ThermoFisher Scientific, MSD, Eindhoven, Netherlands

Abstract
In the present semiconductor industry, the importance of metrology is increasing as the demands on production are higher both from a complexity perspective, as well as from a cost-perspective.

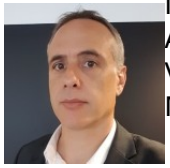
The complexity of novel generations of memory and logic devices is higher, both because dimensions are getting smaller and because device architectures are more complex, with 3D GAA transistors as an example. Some years ago metrology companies together with several academic institutes as well as the semiconductor RTO's started the ECSEL project "3D Advanced Metrology" to explore especially the demands of the 3D architectures. This project, a predecessor to MADEin4, focused on new (platform) technology developments also combining several techniques to get better results faster. The project has recently been completed, and some of the results will be discussed.

From a cost perspective, improved metrology functionality is absolutely necessary to decrease time-to-market of new generations of semiconductor devices and to increase the yield in mature processes. Relevant metrology results have to become available more quickly, and ready for further analysis to enable fast feed-back into production. In the MADEin4 project, the main challenge for the metrology platforms is formulated as follows:
Develop new metrology platforms which can handle the higher complexity and smaller dimensions while at the same time enhance the productivity*. The platforms have to be "Industry 4 ready" so that larger amounts of data can be acquired, processed and be available for further analysis.*

In this presentation, some examples will be discussed of what this means in terms of platform development. WP3 contains developments of in-line as well as off-line platforms, including metrology for front-end and back-end and advanced packaging. Apart from physical improvements, new data science techniques such as AI and ML are used to enhance the productivity of the platforms.

Biography
Frank de Jong received a PhD in physics from TU Delft. After working as scientist at the Philips Research Labs in Eindhoven, The Netherlands, he transferred to the Electron Optics division. He held various positions in R&D and then became responsible for the world-wide Research activities of FEI as director Research and Technology. In 2012, he became director of Technology Partnerships for FEI. Since FEI was acquired by Thermo Fisher Scientific in 2016, he is responsible for Strategic Partnerships in their Materials and Structural Analysis Division (MSD). Frank de Jong has a large experience in leading public-private partnerships, both internationally and in the Netherlands. Most of these projects are positioned at the transition point between academic research and industrial developments. He is the coordinator of the EU-ECSEL project 3DAM, and Work-package leader in the new EU-ECSEL project MADEin4. Frank de Jong serves in various public (national) functions, such as industrial leader for roadmap Nanotechnology, executive board of foundation NanoNextNL and advisory roles for Dutch science institutes Amolf and ARC-NL.

Digitized Electronics & Industry 4.0: Electronic Design perspective



M. Chomat
Application Engineer Manager Europe - Physical Verification and Manufacturing
Mentor a Siemens business, Montbonnot, France

Abstract
Due to the complexity in the manufacture and design of electronic components, and the very low defectivity rate required for proper operation of electronic devices, traditional machine learning methods were never able to achieve the level of accuracy and reliability required to replace or enhance existing design and manufacturing flows. However, social media and online marketing are driving research in machine learning, allowing them to reach a point in which some semiconductor manufacturing operations benefit from their implementation and provide means to enhance current design and manufacturing flows. In this talk we will cover some of these techniques, and how they provide a real opportunity to improve the efficiency of manufacturing electronic components.

Biography
Mr **Michael Chomat** is Application Engineer manager for physical verification and manufacturing tools in Mentor a Siemens business. Before joining Mentor in 2015 he held multiple management positions in mask data preparation flow, planning and production control in STMicroelectronics France and Singapore main manufacturing plants. Michael holds an engineering diploma in electronics from ISEN, Institut Superieur de l'Electronique et du Numérique.

Industry 4.0 Digitization of Manufacturing for Enhanced Productivity

Y. Hirsch
Project manager
TowerJazz, SENSORS business unit, Migdal HaEmek, Israel

Abstract
The vision of Industry 4.0 is achieving significantly higher productivity, efficiency, and self-managing production processes. This, by letting people, machines, equipment, logistics systems, and work-in-process components communicate and cooperate with each other directly. Digitizing the manufacturing floor will boost the endless strive to reduce machinery downtime, reduce the cost of quality and increase production efficiency.

Many trends show that by 2020, 80% of large manufacturers will update their operations and operating models with IoT and analytic-based situational awareness to mitigate risk and speed time to market Digitization of Manufacturing will increase the production efficiency of a complex manufacturing line by acting on different levels, from the initial study of the process (Virtual Commission) to the global control of the line (Virtual Metrology, Predictive Maintenance and Prediction of Final Yield). It enables machines to interact socially within groups, with other machines (and/or humans), and to apply social skills to each robot in such a way that it will be able to interact with other robots, patriciate in a group, and collaborate to achieve joint tasks/goals without preprogramming.
Digitization of Manufacturing enhances the ***Digital Twin*** concept, which provides a virtualized product that lets you analyze how a product performs under various conditions and make adjustments in the virtual world to ensure that the new physical product will perform exactly as planned in the field.
Advanced image sensors are central players in both sides of this equation. Manufacturing of large format sensors is enabled by excellent and well monitored production line, while on the other end new capabilities of image sensor technology like 3D imaging (TOF), wider wavelength (from UV to NIR and SWIR), embedded processing within the sensors and large format sensors become key components in advanced production lines.

Biography
Mr. Yoav Hirsch serves as a leading project manager at TowerJazz CMOS Sensor business unit. As part of his role he is in charge of various image sensor technology projects, supporting the sensor's business unit development roadmap. Mr. Hirsch has extensive experience in the semiconductors industry, specializing in the field of CMOS image sensor. Throughout his career, he held various positions in SCD, ECI-Telecom and AFCON-industries where he managed a variety of multi-disciplinary technology projects, which required, amongst others, expertise in the fields of industrial control, system engineering, manufacturing, and design electronics.

Mr. Hirsch holds a B.Eng Electrical Engineering from Coventry University, England, M.Sc. in Electrical engineering from Tel-Aviv University and an MBA from Haifa University, Israel.