

MEMS REPORT

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Prof. Dr. Hubert Lakner
Director of Institute

Dear Customers, Partners and Friends
of Fraunhofer IPMS,

On July 14, 2015, Chancellor Merkel joined Minister Wanka and Saxony's Prime Minister Tillich in Dresden for an informational visit to learn about the prospects and strategic importance of microelectronics. In a strategy discussion at the Fraunhofer IPMS, we along with representatives from both industry and research were able to demonstrate the lighthouse function of Saxony in the semiconductor industry and provide an outlook as to which areas require action in, for example, successfully implementing Industry 4.0.

The local significance of the semiconductor industry, which was mentioned during the discussion with Chancellor Merkel, was underscored by two further significant events of the last quarter. In May, the kick-off for the ECSEL project "ADMONT" happened at the Fraunhofer IPMS and only a few weeks later, we were happy to host the opening of the new "Functional Integration for Micro-/Nanoelectronics" performance center. Both cases involve the close integration of technology suppliers to tap new products and markets in order to be able to provide the industry offers of which single actors are not capable. All three of these events made long-lasting contributions to the protection and further development of Dresden and the state of Saxony as a location for industry. I wish you all an informative reading of the current MEMS report.

Prof. Dr. Hubert Lakner

OFFICIAL LAUNCH OF THE ECSEL-FUNDED ADMONT PROJECT



Funded under the ECSEL Joint Technology Initiative, the "Advanced Distributed Pilot Line for More-than-Moore Technologies" (ADMONT) aims to establish a high-capacity and flexible More-

than-Moore (MtM) pilot line for Europe at the Dresden location. The official project start took place in Dresden on May, 12 and 13.

The ADMONT project is funded by the EU Commission, involved Member States and the Free State of Saxony in the context of the Joint Undertaking ECSEL (Electronic Components and Systems for European Leadership). The project aims to achieve the further diversification of CMOS process technologies essential to innovative components and systems in a wide range of application fields. As proof of manufacturability, a More-than-Moore (MtM) pilot line will be realized in ADMONT.

Through the combination of the existing expertise, technological capabilities and production capacities of partners from both industry and research institutes, a completely new eco-system is being formed within the largest European silicon technology cluster known as "Silicon Saxony". Spatially distributed yet seamlessly integrated to a continuous MtM platform, the pilot line combines basic CMOS processes of our partner X-FAB with Fraunhofer IPMS technology for sensors and MEMS components, the OLED-on-CMOS-integration of the Fraunhofer FEP-COMEDD and options of 2,5D- and 3D-integration provided by the Fraunhofer IZM-ASSID. Individual technology modules are not located in a common clean room, rather distributed among the partners in Dresden.

ADMONT (Project ID: 661796 – ECSEL-2014-2) is a financially supported ECSEL Innovative Action receiving fifty percent of its funding from the European Commission with Member States providing the other half. National funding for project partners in Saxony is equally shared between the federal government and the Free State of Saxony. The duration of the project is four years.

www.admont-project.eu

BASF AND FRAUNHOFER IPMS-CNT JOINTLY DEVELOP ELECTRONIC MATERIALS

BASF and Fraunhofer IPMS-CNT have joined forces to develop innovative solutions for the semiconductor industry. BASF has installed a modern tool for electrochemical metal deposition at the Fraunhofer IPMS Center for Nanoelectronic Technologies CNT in Dresden.

In pilot tests at the CNT, the latest technologies and innovative chemicals are further developed and tailored for BASF customers. BASF and Fraunhofer are using the same tool and technology used by customers, enabling customers to significantly reduce qualification effort. This saves customers development time, reduces their costs, and allows them to work more efficiently. When the pilot tests at the CNT are completed, customers will have direct access to ready-to-use processes for the production of advanced electronic materials.

“The collaboration with Fraunhofer IPMS-CNT in Dresden is further proof of BASF’s commitment to meet the growing demands of the semiconductor industry. It allows our global customers to evaluate

our innovative solutions for advanced microchip technologies under production conditions”, says Dr. Lothar Laupichler, Senior Vice President, Electronic Materials at BASF. “In our global R&D network, which now includes the Fraunhofer IPMS-CNT, we will be collaborating with customers to develop products for the semiconductor industry that surpass current standards.”

Dr. Romy Liske, CNT business unit manager, adds, “The further development of materials and processes together with BASF is an important step toward achieving the ever-growing requirements that microchips have to fulfill in terms of functionality, speed, and energy efficiency.”

Microchips are widely used in the electronics industry, for example in computers, mobile phones, and electronic components for automobiles. They are manufactured on monocrystalline silicon wafers typically 300 mm in diameter in extremely clean environments known as clean rooms. The network of conductor paths in a microchip is created by means of electrochemical deposition.



CLEAN ROOM AT FRAUNHOFER IPMS-CNT DRESDEN

CHANCELLOR ANGELA MERKEL VISITED FRAUNHOFER IPMS

On July 14, 2015, Chancellor Angela Merkel, Federal Research Minister Johanna Wanka and Saxony's Prime Minister Stanislaw Tillich visited Dresden to gather information about the current developments and strategic importance of microelectronics in Germany and Europe. After appointments on site at Globalfoundries and Infineon Technologies Dresden, a strategy meeting addressing market trends, future research topics and the innovation landscape took place at the Fraunhofer IPMS with representatives from both industry and science. Behind closed doors, the small circle of invited discussion participants were able to illustrate the lighthouse function of Saxony in the semiconductor industry and provide an outlook as to which technological developments can be implemented in the future and what new business models, especially in terms of Industry 4.0, can be realized.

In her closing statement, Chancellor Merkel recognized the interconnectedness of the various activities as a particular strength of Saxony as a location for industry and once again underscored the importance of the region as a high-tech location for Germany and Europe to be further promoted largely through national and European initiatives. Along the same line, Minister Wanka announced the launch of a new federal framework program to promote research and innovation in microelectronics. Designed by the Federal Ministry of Education and Research (BMBF), the

program will be developed in cooperation with other ministries by the end of this year and will be funded with a volume of 400 million Euro until 2020.

Prof. Hubert Lakner, Director of the Fraunhofer IPMS gave his thoughts on the meeting, "The Chancellor's visit to the Fraunhofer IPMS is a great honor for our institute. As hosts of this strategic discussion, we were able to join our partners from industry and the TU Dresden to stress the importance of microelectronics for Germany as a location for business to Mrs. Merkel."



5TH INDUSTRY PARTNER DAY AT FRAUNHOFER IPMS-CNT

One of five business units of the Fraunhofer IPMS, the Center Nanoelectronic Technologies CNT once again welcomed around 100 guests from industry and science at the Königsbrücker Straße location in Dresden for the Industry Partner Day on June 11, 2015. The fifth Industry Partner Day to be hosted by Fraunhofer IPMS featured representatives from Globalfoundries, Entegris, Bubbles & Beyond, X-FAB and Anvo-Systems who presented joint projects and current development trends in the semiconductor industry. BASF gave an exemplary presentation on the "Plating Lab" cooperation, in which pilot tests for new technologies can be carried out and innovative, tailor-made chemicals can be further developed. The CNT provides the link between suppliers and the chip industry production lines in that it tests production conditions and prepares for risk-free integration.

The Center Nanoelectronic Technologies – part of Fraunhofer IPMS since 2013 – celebrated its tenth anniversary during the 2015

Industry Partner Day and ended the day with an exclusive tour through CNT clean rooms and the infrastructure on the Infineon Technologies AG premises. The next Industry Partner Day is scheduled to take place in June 2016.



LAUNCH EVENT PERFORMANCE CENTER FOR MICRO / NANO

The Fraunhofer IPMS, ENAS, IIS and IZM have joined the Technical Universities of Dresden and Chemnitz in the "Function Integration for Micro- / Nanoelectronics" high-performance center. In close cooperation with local companies, the partners set out to deepen research expertise and speed up innovation implementation in applications and products in order to strengthen the region. The



pilot project plans to combine the regional strengths of research and industry – in addition to technical project work, the center should create the basis for marketing results effectively and efficiently as well as act as a central point of contact for new cooperation partners. The effectiveness of the high-performance center shall be demonstrated by an intensive industry involvement. With this involvement, companies receive the opportunity to help determine the thematic focus of the pilot project via an industrial advisory board. To date, over twenty companies have expressed a basic interest to participate in and contribute to the project. The high-performance center will be financed over a two-year pilot phase with funds coming from the Free State of Saxony, the Fraunhofer Association and the industrial partners. The technical work of the high-performance center mainly focuses on micro-electromechanical systems (MEMS) such as sensors and actuators as well as the implementation of systems in industrial automation. Through the close cooperation and networking of the universities, Fraunhofer and the regional industry, the pilot phase will end with the establishment of a virtual innovation center.

MUT 2015 – 14TH INTERNATIONAL WORKSHOP FOR MICROMACHINED ULTRASONIC TRANSDUCERS IN DRESDEN



Introduced in Rome in 2001, the MUT (Micromachined Ultrasonic Transducers) Workshop has taken place almost every year in various European cities. From May 19-20, 2015 scientists and engineers from around the world gathered in Dresden to exchange knowledge,

ideas, results and prospects surrounding micromachined ultrasonic transducers which offer promising new applications for the medical, industrial and consumer sectors. Hosted for the first time by the Fraunhofer IPMS, this year's event established a new record level of attendance and contribution accommodating 65 participants and supporting 21 presentations.

www.mut2015.org



FRAUNHOFER IPMS DEVELOPS SOLUTIONS FOR INDOOR NAVIGATION



Large public building complexes such as convention centers, airports, shopping malls or museums as well as medical and governmental institutions frequently resemble a maze. It is often difficult for visitors to quickly and easily find a desired product or the fastest route to a particular destination. An electronic navigation system accessible on smartphones and tablets could ensure both employees and guests a more comfortable stay while working or visiting such a complex.

Positioning on WLAN-Basis

In response, the Fraunhofer IPMS has developed an indoor navigation system for Android devices which directs users quickly and safely to destinations of choice. Users may choose to borrow a tablet at the complex entrance or download an app to a private smartphone. A platform-independent solution is also in planning. While outdoor position tracking usually relies on satellites, for example in support of a GPS system, indoor navigation can use WLAN infrastructure. In comparison to special technologies that can be used only for position tracking, WLAN is a globally common, cost-effective standard capable of numerous applications. Good WLAN coverage can provide positioning in a radius of under two meters. The implementation of additional technologies can improve positioning to accuracies of up to a few centimeters. The main advantages of this technology are that WLAN coverage is often already available because of existing IT infrastructure and the adjustments needed to optimize the infrastructure for position tracking are manageable.

Indoor navigation in medical facilities

With numerous rooms, corridors, floors and buildings, large medical facilities such as hospitals and rehabilitation centers can often be confusing. First-time visitors get lost easily and may arrive at their destination only after a long search and many requests for directions.

As in standard navigation systems used in automobiles, the app graphically displays the user position and the calculated route to the selected destination. The medical facility defines all points of interest and important places in the complex to include information booths, emergency exits, treatment or examination rooms as well as patient rooms, canteens and toilets. It is also possible to combine the final destination route with other information.

All destination and navigation data can be customized and upgraded on a central server at any time and the layout can be flexibly extended according to customer requirements. The app is automatically updated with navigation destinations and additional information each time it is started. When moving through the building, the current position, the overall route and appropriate navigational instructions are dynamically updated. The calculated route is the shortest route from the current location to the destination. Depending on the application, positions are determined either on a server in the network or directly on the handheld device. The recommended route is then calculated directly on the smartphone. If the user should leave the suggested route, a new route is automatically calculated and displayed.

The system can be flexibly tailored for any application and enhanced with new functions. Depending on the application, users can, for example, receive suggested routes calculated to include nearby points of interest. The app can significantly improve the visitor experience by providing an interactive navigation system with text and audio messages. WLAN and GPS are connected for navigation outdoors between buildings. The developed Android app can be used on 99.7% of all Android devices using at least Version 2.3.

Localization of mobile inventory and people

In the times of the Internet of Things and Industry 4.0, the ability to locate electronic objects and movable assets within large buildings, warehouses and production facilities is becoming increasingly important. Organizing business processes in manufacturing plants, warehouses, hospitals or rehabilitation centers using mobile equipment and personnel often becomes a great challenge. In particular, the search for inventory frequently takes a long time. Through simple localization, work processes in technical operations, production and storage facilities, medical centers and public institutions can be considerably streamlined and optimized.

The navigation system developed by Fraunhofer IPMS offers not only the possibility to navigate the user through the building, but rather can also be used to locate objects within the complex: If technical equipment such as production lots and movable machinery as well as mobile inventory such as infusion pumps, wheelchairs or hospital beds are equipped with a WLAN module, the exact location of these assets can be determined. Not only are tools and machines easily located through this system – staff and patients can also be found faster by way of electronic bracelets or watches. Category and description filters now make it possible to conduct and easily implement quick and targeted searches for both stationary and mobile objects.

A WLAN infrastructure is again used here as the technical basis and can be further enhanced with Bluetooth Bacon to increase accuracy levels within buildings. All methods work on a similar principle: The actual position is determined through the evaluation of signal strengths. Server-based position tracking analyzes client-transmitted values to determine position and sends the information back to the client. At Fraunhofer IPMS, an algorithm to track position without a network connection has also been developed. In this case, localization is exclusively performed on the handheld device.

The development of this app has been carried out together with LPS Services, a Swiss company. The demo system is available for viewing and testing at the Fraunhofer IPMS.

UPCOMING EVENTS

ECOC

Valencia, Spain September 28 - 30, 2015
Feria Valencia, Booth 812

Semicon Europa

Dresden, Germany October 6 - 8, 2015
Dresden Exhibition Center, Booth 2092

MikroSystemTechnik Congress

Karlsruhe, Germany October 26 - 28, 2015
Townhall Karlsruhe

MEDICA

Düsseldorf, Germany November 16 - 19, 2015
Düsseldorf Exhibition Center, Hall 3, Booth E74A

SPIE Photonics West

San Francisco, USA February 16 - 18, 2015
Moscone Center, Booth 4636

www.ipms.fraunhofer.de/en/events.html

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