



CARDIS, a new European effort targeting mobile early-stage cardio vascular disease detection

Leuven, Belgium – February 2, 2015 – Imec, Medtronic, Ghent University and their project partners today announced the launch of the CARDIS project. Together they will develop and validate an early-stage cardio vascular disease detection platform using integrated silicon photonics. The project is supported by the recently launched European Union's Horizon 2020 Framework Programme for Industrial leadership in Information and Communication Technologies (H2020). The project's overarching goal is the investigation and demonstration of a mobile, low-cost device based on a silicon photonics integrated laser Doppler vibrometer. The concept will be validated for the screening of arterial stiffness, detection of stenosis and heart failure in a clinical setting.

Early identification of individuals at risk for cardio vascular disease (CVD) allows early intervention for halting or reversing the pathological process. This drives the CARDIS project team to develop a mobile, low-cost, non-invasive, point-of-care screening device for CVD. Assessment of arterial stiffness by measurement of the aortic pulse wave velocity (aPWV) is included in the latest ESC/ESH¹ guidelines for CVD risk prediction. Besides aPWV, early identification of arterial stenosis and cardiac contraction abnormalities can be used to improve CVD risk classification. To date, there are no tools available to screen a large population set at primary care level on these parameters, and individuals that are considered to be at low or moderate risk too often go undiagnosed.

The CARDIS research activities include:

- The investigation, design and fabrication of the optical subsystems and components.
- The integration of the subsystems and building of a multi-array laser interferometer system.
- The development of a process flow scalable to high volumes for all subsystems and their integration steps.
- The investigation and development of the biomechanical model for translating optical signals related to skin-level vibrations into underlying CVD physiological events.
- The validation of the system in a clinical setting.

¹ European Society of Cardiology / European Society of Hypertension



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Over the next three and a half years, CARDIS will be managed by imec, through imec's associated laboratory located at Ghent University (Photonics Research Group in the Department of Information Technology). Medtronic Bakken Research Center (Netherlands) will be responsible for the scientific and technical coordination of the project. Other industrial, academic and clinical partners will bring their expertise to the project: SIOS Messtechnik (Germany), University College Cork Tyndall (Ireland), INSERM (France), Queen Mary University of London (United Kingdom), Universiteit Maastricht (Netherlands), Ghent University and Fundico (Belgium).

Interested to learn more about the potential of silicon photonics? Imec is exhibiting at next week's SPIE Photonics West in San Francisco (booth 4635) and organizing a workshop and demonstration session on Silicon Photonics together with MOSIS (February 10-11). More information <http://www.imec.be/SPIE2015>

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This press release can be downloaded at http://www2.imec.be/be_en/press/imec-news/imecCARDIS.html

About imec

Imec performs world-leading research in nanoelectronics. Imec leverages its scientific knowledge with the innovative power of its global partnerships in ICT, healthcare and energy. Imec delivers industry-relevant technology solutions. In a unique high-tech environment, its international top talent is committed to providing the building blocks for a better life in a sustainable society. Imec is headquartered in Leuven, Belgium, and has offices in the Netherlands, Taiwan, US, China, India and Japan. Its staff of over 2,080 people includes more than 670 industrial residents and guest researchers. In 2013, imec's revenue (P&L) totaled 332 million euro. Further information on imec can be found at www.imec.be. Stay up to date about what's happening at imec with the monthly imec magazine, available for tablets and smartphones (as an app for [iOS](#) and [Android](#)), or via the website www.imec.be/imecmagazine. The Photonics Research Group in the Department of Information Technology of Ghent University is an associated lab of imec and performs research in the field of photonic integration – more specifically silicon photonics – and its applications in information and communication technology, in sensing and in life sciences. With its 80 researchers the group has a leading international role in the field and is also very active in graduate education in photonics and in industrial spin-off resulting from its research. More information can be found at www.photonics.intec.ugent.be.

Imec is a registered trademark for the activities of IMEC International (a legal entity set up under Belgian law as a "stichting van openbaar nut"), imec Belgium (IMEC vzw supported by the Flemish Government), imec the Netherlands (Stichting IMEC Nederland, part of Holst Centre

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which is supported by the Dutch Government), imec Taiwan (IMEC Taiwan Co.) and imec China (IMEC Microelectronics (Shanghai) Co. Ltd.) and imec India (Imec India Private Limited).

About Medtronic

Medtronic is the world's largest medical technology company, offering a large breadth and depth of innovative therapies. In 2013 more than 9 million people benefited from Medtronic medical therapies, which treat cardiac and vascular diseases, diabetes, and neurological and musculoskeletal conditions.

With a global reach that extends to more than 140 countries, we have a deep understanding of many universal healthcare challenges. We're using our experience, extensive partnerships, and the passion of 46,000+ employees to help transform healthcare worldwide by improving outcomes, expanding access, and enhancing value. To support this paradigm Medtronic founded the Bakken Research Center (BRC) in Maastricht in 1987 as a research facility (250 employees). BRC has extensive and long standing experience in contributing to human welfare by application of biomedical engineering in the research, design, manufacture, and sale of instruments or appliances that improve patients diagnosis and therapies. The BRC played a major role in the creation and realization of several world class therapies, like Deep Brain Stimulation and Cardiac Resynchronization Therapy. Along the years clinical research study activities have grown substantially, now ranging from small exploratory studies with one physician-investigator and just a few patients to multinational, randomized trials intended to demonstrate superior clinical and economical outcomes with new device therapies in hundreds, sometimes thousands of patients.

About 40 scientists, engineers and technicians are working closely with medical innovators in mainly European hospitals and universities to develop, build and study new devices or methods to "alleviate pain, restore health, and extend life".

About SIOS

SIOS Meßtechnik GmbH as an SME specializes in the development and manufacture of precision metrological instrumentation. The company was founded in 1991. Its close collaboration with the Institute of Process Measurement and Sensor Technology of the Technical University of Ilmenau and other high-technology companies in the Technology Area of Ilmenau on scientific and engineering matters forms the basis for its lines of innovative, top-quality, ultraprecision products.

The SIOS Meßtechnik GmbH manufactures laser-interferometric and other types of precision instrumentation for measuring lengths, angles, vibratory motions and derived quantities such as weights, forces, and pressures. All of the metrological techniques employed in its instrumentation provide ultrahigh resolutions and ultra precision results, along with other features of benefit to users. The systems' work is mostly based on using of miniaturized laser interferometers. These fibre-coupled lengths measurement devices with the remarkable resolution of 0.02 nm work very stable and precisely because of using a frequency-stabilized He-Ne laser as light source combined with environment's influence compensation for air pressure and temperature being



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relevant for lasers' wavelength. The company's flexible organizational structure allows it to tailor instrumentations to suit both customers' needs and the demands.

SIOS Meßtechnik GmbH has a high expertise in developing R&D projects, at both European and national level. About 25 % of SIOS staff is working in the R&D department. The ongoing national level projects are focused on the developments in the field of precision laser interferometric based instrumentation for length metrology, life sciences, nano-positioning and vibration analysis of micro parts.

About UCC-Tyndall National Institute

Established with a mission to support industry and academia in driving research to market, Tyndall National Institute is one of Europe's leading research centres in Information and Communications Technology (ICT) research and development and the largest facility of its type in Ireland. Established in 2004 as a successor to the National Microelectronics Research Centre (NMRC founded in 1982) at University College Cork, the Institute employs over 460 researchers, engineers and support staff, with a full-time graduate cohort of 135 students generating over 200 peer-reviewed publications each year.

With a network of 200 industry partners and customers worldwide, Tyndall generates around €30M income each year, 85% from competitively won contracts nationally and internationally. Tyndall is also a lead partner in European research partnerships in its core areas of ICT, communications, energy, health and the environment worth €48M, including €10M accruing to industry in Ireland (from Framework 7). Hosting the only full CMOS (*metal oxide semiconductor*) integrated circuit construction, Micro Electronic Mechanical systems (MEMS) and III-V Wafer Semiconductor fabrication facilities and services in Ireland, Tyndall is capable of prototyping new product opportunities for its target industries – electronics, medical devices, energy and communication. Tyndall is a globally leading Institute in its four core research areas of Photonics, Microsystems, Micro/Nanoelectronics and Theory, Modeling and Design. Tyndall is the lead institution for the Science Foundation Ireland funded Irish Photonics Integration Centre. IPIC brings together Irish research capabilities in photonics, electronics and biomedical science together with 18 industrial partners, to develop integrated photonic solutions for advanced medical diagnostics and surgical procedures, and to enable continued growth of communications systems and the internet. For more information go to www.tyndall.ie.

About Ghent University

Ghent University (UGent) consists of 117 departments across 11 faculties and offers high-quality research-based educational programs in virtually every scientific discipline. UGent distinguishes itself as a socially committed and pluralistic university in a broad international perspective. The motto of the university is 'Dare to Think'. The university's appeal is growing every year, with about 41,000 students in 2014, of whom 11% (students) and 35% (PhD students) are international. Numerous research groups, centres and institutes have been founded over the years, becoming world-renowned in disciplines such as biotechnology, aquaculture and micro-electronics.

Ghent University is the only Belgian university in the top 100 of both the Shanghai (70) and Times ranking (85). The University has participated in more than 200 research projects in the EU's Sixth



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Framework Programme (2002-2006) and in 260 projects in the Seventh Framework Programme, of which 26 ERC grants and 26 Marie Curie Fellowships. Ghent University coordinated 42 collaborative projects in FP7. The university provides excellent training opportunities to both young and experienced researchers, and is one of the fastest growing European universities in terms of research capacity and productivity. Besides the Photonics Research Group from the Department of Information Technology of Ghent University, a second research team involved is IBiTech-bioMMeda (Biofluid, Tissue and Solid Mechanics for Medical Applications) from the Department of Electronics and Information Systems. The team has expertise in the study of (fluid) mechanical aspects of and transport processes in a native organ or system, in artificial organs and prosthetic devices. We combine basic engineering with applied biomedical and clinical research for better understanding of patho-physiological problems, a better quantification (and diagnosis) of the function of an (artificial) organ or system, or design of new or improved medical devices for a better patient treatment.

About INSERM

Founded in 1964, the French National Institute of Health and Medical Research (Inserm) is a public scientific and technological institute which operates under the joint authority of the French Ministry of Health and French Ministry of Research. As the only French public research institute to focus entirely on human health, in 2008 Inserm took on the responsibility for the strategic, scientific and operational coordination of biomedical research. This key role as coordinator comes naturally to Inserm thanks to the scientific quality of its teams and its ability to conduct translational research, from the laboratory to the patient's bed. The decree adopted in March 2009 will enable Inserm to perform its research missions in the face of the new scientific, health and economic challenges of the 21st century. Scientific monitoring and expertise are now part of the Institute's official missions. In early 2008, 10 thematic institutes were created in the light of this new coordination role, in association with Inserm. The aforementioned decree secures a long-term future for them and clearly defines their remit, an inventory of French research in their field, how this research is to be managed and their objectives. From the outset, Institute has forged close partnerships with the other public and private research establishments as well as hospitals to fulfil its missions. 80% of Inserm's 318 research units are currently set up in university hospitals or cancer research centers. The research campuses of the French National Center for Scientific Research (CNRS), along with the Pasteur and Curie Institutes, also house Inserm research divisions. With the law on the independence of universities placing them at the heart of the research policy, they will also be a key partner of Inserm. In April 2009, national coordination was strengthened by the Alliance nationale pour les sciences de la vie et de la santé (French National Alliance for Life and Health Sciences), which Inserm co-founded with other research institutes and the Conférence des présidents d'université (Association of University Presidents). To extend the strategic and programmatic coordination of research to all life and health sciences, the Alliance relies on 10 multi-body thematic institutes jointly overseen by two research institutes (Inserm, CNRS, French Atomic Energy Commission/CEA or French National Institute for Agricultural Research/Inra), depending on the research field.

INSERM PARCC team 7 project concerns arterial disease and their pharmacological treatments. It is enclosed in the general framework of a multidisciplinary research, and is focused on the pathogenesis and pharmacology of arterial diseases. These studies imply a clinical approach of arterial function (arterial stiffness, endothelial dysfunction) and remodeling (arterial wall thickness and enlargement), which supposes to measure in vivo with high precision the geometric and functional properties of large arteries, at different levels of the arterial tree, in humans. Team 7 is



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among the best publishers in the field, having 3 papers cumulating more than 1500 quotations each, and more than 450 cumulated references on the field.

About Queen Mary University of London

Queen Mary University of London, hosts 18,000 students and employs 4000 academic staff. It was ranked 10th nationally in the latest research assessment exercise. In the same assessment its medical school Barts & The London School of Medicine & Dentistry, was ranked 5th in the country and 1st in London. It has also shown the largest increase in research funding in the last five years in the UK. The School's translational research strength has been recognised by, amongst others, the award of a NIHR Biomedical Research Unit in Cardiovascular Disease.

The cardiovascular biomechanics group in The Blizard Institute in the School of Medicine & Dentistry adopts a wide-ranging approach towards the study of the structure-function relationships of soft tissues, from cell and developmental biology, biomechanics to pathology. This includes studies on the biocompatibility and durability of vascular prostheses and stents, a challenging area due to the complex hierarchical structure of soft tissue. Group members have gained an international reputation in developing in vitro and in vivo methodologies for dynamic testing of tissues such as articular cartilage, blood vessels, skin, ligaments/tendons under both compression and tension, as well as structural proteins, such as collagen and elastin. The group has also considerable and internationally recognized experience in developing novel techniques for the non-invasive estimation of arterial compliance and endothelial function, properties which are now known to be among the strongest independent prognostic indicators for cardiovascular morbidity and mortality. Our collaborators in the Clinical Physics Laboratory of The Royal London Hospital provide high level expertise in ultrasound imaging and extensive experience in the design, fabrication and characterisation of soft tissue phantoms.

About Universiteit Maastricht

Within the 40 year-young Maastricht University the Cardiovascular Research Institute Maastricht (CARIM) integrates all research in the cardiovascular field. CARIM has an annual budget of ~20 M€, employs ~200 fte of researchers and 70 fte of technical and supporting staff, divided over 13 departments/disciplines. Together they produce more than 500 scientific papers annually. Within CARIM Prof. Frits Prinzen is a well-known investigator in the field of pacemaker therapies for heart failure, using pre-clinical and clinical research for these purposes. Within CARDIS he will evaluate the use of the newly developed products in patients with cardiac resynchronization therapy (CRT). Goal is to demonstrate the clinical feasibility of using the new product and to validate the technical concept for optimizing the application of CRT.

About Fundico

Fundico bvba, located in Zwijnaarde, Belgium, is a consultancy company with the objective to assist industrial companies and research organisations with the submission of financing proposals for research and development, mainly in the field of information and communication technologies. These financing proposals are submitted to regional public authorities or to the European Commission. In the latter case these proposals are submitted in response to an official call for proposals issued by the European Commission. In case of project proposals for which financing is granted, Fundico will also, in many cases be involved in the management and coordination of the research and development project.

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