SOLUS | SMART OPTICAL AND ULTRASOUND DIAGNOSTICS OF BREAST CANCER

Innovation in the diagnosis of breast cancer – the SOLUS project

The new EU-funded SOLUS project (www.solus-project.eu) will develop a new device for multimodal tomography using ultrasound and optical tomography to improve breast cancer diagnosis.

February 28, 2017 – Together with several partners, project coordinator Politecnico di Milano is developing an innovative, multimodal tomographic system to improve the diagnosis of breast cancer as part of the SOLUS project (Smart OpticaL and UltraSound diagnostics of breast cancer). The system combines optical methods, a *smart optode* performing diffuse optical tomography, and conventional ultrasound imaging but also advanced quantitative elastography.

The project aims to develop a multimodal imaging system which can classify breast lesions detected by mammography screening in a non-invasive manner, and significantly improve the ability to differentiate between benign and malignant lesions. Invasive investigations such as biopsies, are currently carried out in an unnecessarily high number of cases. Many of which can be avoided by improved characterisation of lesions.

New and revolutionary concepts in photonics and electronics will be exploited to develop novel components for the SOLUS system, and in particular an innovative *smart optode*, a small and low-cost device for optical tomography.

The multimodal approach of SOLUS for breast imaging will produce a global multi-parametric classification of breast lesions, where all parameters related to the degree of malignancy of breast lesions will be evaluated simultaneously:

- Ultrasound imaging, currently used for clinical diagnosis, will provide anatomical information.
- Elastography will estimate the stiffness of the tissue, which tends to be higher in malignant tumors.
- Optical tomography will assess tissue composition. It measures water, lipid and collagen content, as well as functional blood parameters such as blood volume and oxygenation levels. Additionally, characteristic quantities of the light diffusion in tissue, provide information on its microscopic structure.

Several components developed by the project for the SOLUS system will also have potential applications in other fields, ranging from wearable devices to monitor muscular oxygenation or the threshold for the formation of lactate during sports training and medical rehabilitation to non-destructive assessment of the quality of fruit and vegetables.

SOLUS is coordinated by Politecnico di Milano (Prof. Paola Taroni, Department of Physics) and relies on a multidisciplinary consortium bringing together engineers, physicists and radiologists from 9 partners from industry, academia and the clinical field. The European Institute for Biomedical Imaging Research, EIBIR, supports the management of the projects and leads the dissemination activities. The project started in late 2016, receives €3,8M funding from the European Commission under the Horizon 2020 Framework Programme and will run for 4 year, until October 2020.

The SOLUS consortium consists of:

Politecnico di Milano in Milan, Italy
CEA-LETI, Commissariat à l'Energie Atomique et aux Energies Alternatives in Grenoble, France
Supersonic Imagine in Aix-en-Provence, France
Vermon in Tours, France
University College London, United Kingdom
Micro Photon Devices in Bolzano, Italy
San Raffaele Hospital in Milan, Italy
The European Institute for Biomedical Imaging Research (EIBIR) in Vienna, Austria
iC-Haus in Bodenheim, Germany

The SOLUS project is an initiative of the Photonics Public Private Partnership. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731877. www.photonics21.org. More information about the project can be found on www.SOLUS-project.eu.

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