Innovation in Breast Cancer Diagnosis
The SOLUS Project, coordinated by the Politecnico di Milano, proposes multimodal tomography

Milan, 28 February 2017 – The Politecnico di Milano is developing an innovative multimodal tomography system to improve diagnosis of breast cancer.
The aim of the **SOLUS (Smart OpticaL and UltraSound diagnostics of breast cancer) Project**'s multimodal imaging system is non-invasive classification of mammary lesions detected through mammography screening in order to differentiate benign lesions from malignant ones (cancer), thus avoiding invasive investigations (biopsies, often neither useful nor reliable).

"*SOLUS uses new and revolutionary concepts in photonics and electronics to develop new components",* says the project's Coordinator, **Paola Taroni**, "*and, in particular, the smart optode, a small, low-cost device for optical tomography. This multimodal approach to breast imaging*", Taroni continues, *"will give us global multiparametric classification of breast lesions. Thanks to our method, all parameters correlated to the level of malignancy of breast lesions will be evaluated simultaneously".*

Indeed, ultrasound imaging will provide anatomical information (already currently used in clinical diagnosis) while elastography will estimate the rigidity of the tissue, which tends to be greater in malignant tumours, and optical tomography will evaluate the tissue's composition in terms of water, lipids and collagen, the functional blood parameters (volume of blood and oxygenation level) and the parameters of light diffusion in the tissue, which provide information on its microscopic structure.

The system developed by SOLUS will have potential applications in other fields as well: from wearable devices for measuring muscle oxygenation and the threshold for lactate formation during sports training to medical rehabilitation and non-destructive monitoring of the quality of fruit and vegetables.

SOLUS, coordinated by the Politecnico di Milano and funded with €3.8m from the European Community as part of the H2020 framework programme, is a four-year project.

Paola Taroni, of the Politecnico di Milano's Department of Physics, has over 20 years' experience in optical diagnostic techniques, particularly in the medical field. Together with her colleagues, she has already, among other things, developed and tested on clinical data a statistical method for differentiating between malignant and benign lesions, based on tissue composition estimated using optical measurements and known risk factor information from the patient's medical history. The study was recently published in *Scientific Reports* under the title "Non-invasive optical estimate of tissue composition to differentiate malignant from benign breast lesions: A pilot study": http://www.nature.com/articles/srep40683

The project is supported by a multi-disciplinary consortium comprising CEA-LETI, the Commissariat à l'Energie Atomique et aux Energies Alternatives of Grenoble, University College London and the San Raffaele hospital in Milan plus four industrial partners: iC-Haus of Bodenheim, Micro Photon Devices of Bolzano, Vermon of Tours and Supersonic Imagine of Aix-en-Provence, with the addition of EIBIR, Vienna.

For further information: www.solus-project.eu e www.photonics21.org