PRESS RELEASE

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Politecnico di Milano Wins Two ERC Starting Grants

Researchers Claudio Conci and Emanuele Riva were awarded a total of 3 million EUR to fund their ALFRED and LUMEN projects

Milan, 04 September 2025 - Improving living conditions for Parkinson's patients, and diagnoses for patients suffering from inflammatory processes. The medical field is the common factor in these **Politecnico di Milano** research projects, which have been awarded **two ERC (European Research Council) Starting Grants with a funding of 1.5 million each**, for a duration of five years. The prestigious awards were won by researchers **Emanuele Riva** from the Department of Mechanical Engineering with the **LUMEN** project and **Claudio Conci** from the Department of Chemistry, Materials, and Chemical Engineering "Giulio Natta" with the **ALFRED** project. A total of **55** Italian researchers are among the **478** selected by the European Research Council for 2025, with a total of **761 million EUR** going to support the proposed ideas.

The **LUMEN** *(Leaky-wave focused Ultrasound through Metamaterial Engineering*) project proposes **a new approach for brain stimulation using transcranial focused ultrasound** (tFUS), a non-invasive technology used to treat movement disorders such as essential tremor and Parkinson's associated tremor. Currently, its effectiveness is limited by the formation of so-called "*leaky-Lamb* waves", waves that–due to the skull bones acting as a barrier–radiate energy into the brain at arbitrary angles, thus reducing the accuracy of stimulation. **However, the LUMEN project aims to control the radiation of these waves at source, and potentially exploit them,** through the development of acoustic metasurfaces and biocompatible implants, which are engineered structures capable of manipulating wave propagation, **to make ultrasound targeting more effective**. "***The intention is for ultrasound stimulation to become more accessible and less expensive****, while also making it more effective even in peripheral regions of the brain that are difficult to reach, and ensuring good targeting for different types of patients*, explained **Emanuele Riva**. "*The expected results could revolutionise treatments for millions of people with tremors, neuropathic pain, and pain caused by cancer.*"

Emanuele Riva received his PhD with honours in Mechanical Engineering from the Politecnico di Milano in 2020. Since 2021, he has been a researcher (RTDA) at the university's Department of Mechanical Engineering, where he conducts research in the field of structural dynamics and elastic wave propagation. His main interests include metamaterials and metastructures, with applications to vibration control, energy harvesting, and structural monitoring. To date, he has co-authored more than 40 scientific publications, including articles in international journals and conference papers. He also holds two patents and is the co-founder of Phononic Vibes, a company specialising in the control of vibrations and acoustics using metamaterials.

Inflammation is a contributing factor in the development of various diseases, including cancer and cardiovascular and neurodegenerative diseases. However, the first signs of inflammation are difficult to detect early because, at present, there are no tools for non-invasive localised diagnosis. To overcome this limitation, the **ALFRED** *(Positron Annihilation Lifetime Spectroscopy for Revealing and Quantifying Inflammation and Endothelial Diseases)* project **proposes the study of a revolutionary solution: the use of Positron Annihilation Spectroscopy (PAS).** This is a particle physics technique that, thanks to its extremely high resolution, can potentially **detect tiny biological changes in a timely and non-invasive manner**. "*By combining the expertise of bioengineering, physics and nuclear medicine, the project aims to provide a powerful new prevention tool that could one day help intercept the onset of deadly diseases,*" explained **Claudio Conci**.

Claudio Conci is currently Assistant Professor in Bioengineering at the Department of Chemistry, Materials, and Chemical Engineering "Giulio Natta" of the Politecnico di Milano. He obtained his Laurea Magistrale (equivalent to Bachelor of Science) in Biomedical Engineering in 2017 and his PhD in Bioengineering in 2022 at the same university, with top marks. His research focuses on the development of advanced imaging platforms with reduced ethical impact, and miniaturised medical devices to revolutionise medical diagnostics and the rapid development of drugs and vaccines. He gained his experience through multidisciplinary collaborations, such as those with the CNR's Institute of Photonics and Nanotechnology IFN, the University of Milan Bicocca Department of Physics, and the Italian Institute of Technology (iiT), and through his constant involvement in projects funded by organisations such as the European Space Agency (ESA), the European Research Council (ERC) and the Ministry of Universities and Research (MUR).

Within the **Horizon Europe 2021-2027** programme, Politecnico di Milano remains **the leading Italian university** with **362 projects funded** for a total of **over €175 million**, and has so far been awarded **39 ERC projects for over €41 million.**

ERC Starting Grants are designed for researchers who have held a PhD degree for at least 2 years, up to a maximum of 7 years. The aim is to enhance the creativity and excellence of European basic or frontier research and to invest in the best ideas by stimulating the quality and ambition of individual Researchers.

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FOR INFORMATION:

Raffaella Turati, +39 3402652568, relazionimedia@polimi.it