FONDAZIONE BRUNO KESSLER
MAGAZINE

The European MiSS project has kicked off

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Coordinated by FBK in Trento, Italy, it will aim to develop quantum devices beyond the state-of-the-art.

Developing innovative superconducting circuits capable of operating in the field of microwaves and generating quantum light.

That, in a nutshell, is the goal of the **MiSS** scientific project, “Microwave Squeezing with Superconducting (meta)materials,” funded by the **European Union** through the **Horizon Europe** program and coordinated by **Fondazione Bruno Kessler**.

The project consortium, to be started with a kick-off meeting on July 3 and 4 at the FBK hub in Povo (Trento, Italy) and lasting three years, includes two other Italian institutions of excellence, the **University of Milano-Bicocca** and the **National Institute of Metrological Research (INRiM),** and four international ones, the **Néel Institute (France), Aalto University (Finland),** the **NIST research center (USA)** and the company Silent-Waves **(France).**

The quantum nature of these technologies will allow to lay the foundations for making increasingly accurate sensors and for increasing security in telecommunications.

“With the MiSS project,” **FBK** researcher **Federica Mantegazzini**, coordinator of the European project, pointed out *“we aim to develop a robust and scalable technology based on* ***superconducting quantum circuits*** *that amplify light in the microwave regime and change its properties. By operating these devices at temperatures close to absolute zero we will be able to create* ***squeezed quantum light*** *in the microwave regime. The technological development fostered by the MiSS project will open* ***new horizons in the areas of Quantum Sensing and Quantum Key Distribution.***
“Throughout the project, we will investigate the possibility of exploiting quantum correlations between different sensors to increase measurement sensitivity, which will allow to improve the understanding of some microscopic properties of superconducting materials. The MiSS project is part of an expanding line of research at FBK dedicated to quantum technologies based on the superconducting platform.

With recent investments for a new cryogenic laboratory dedicated to these activities, our research team aims to accelerate the development of different types of planar superconducting quantum devices and exploit them for Quantum Sensing applications and fundamental physics experiments."

"Our research group will be responsible for the design and simulations of these devices," said **Associate Professor of Experimental Physics at the University of Milano-Bicocca Andrea Giachero**, *"their characterization and squeezing measurements, also using the* ***Cryogenics laboratory*** *present in our Physics Department. Ours is a cutting-edge university, one of the first in Italy to have developed quantum devices, thanks to the previous DARTWARS project, which I coordinated, that aimed to improve the read-out of data produced by quantum devices and to study their application to quantum computers, and that received double competitive funding, from INFN and the European Union. The MiSS project continues that line of research, which is gaining more and more importance in the international scientific community, both in academia and industry, so much so that the United Nations has proclaimed 2025 as the International Year of Quantum Science and Technology, to celebrate past successes and plan for a future in which everyone can benefit from these state-of-the-art technologies."*

"INRiM plays a key role within the project," **INRiM** researcher **Emanuele Enrico** said, *"contributing with its advanced expertise in the field of microwave metrology. In the MiSS project, INRiM is committed to developing and validating innovative metrology protocols for the evaluation of nonclassical radiation sources, made in the consortium's micro- and nanofabrication laboratories, and to studying the environmental effects in which these devices operate, thus paving the way for their standardization. Our goal is to ensure accurate and repeatable measurements on the performance of the devices developed during the project, which are critical to transforming laboratory technologies into scalable and reliable solutions for real-world applications."*

For more information: https://miss.fbk.eu

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