Researcher from the University of Puerto Rico’s Mayagüez Campus receives million-dollar grant for a project with potential in quantum information science [1]

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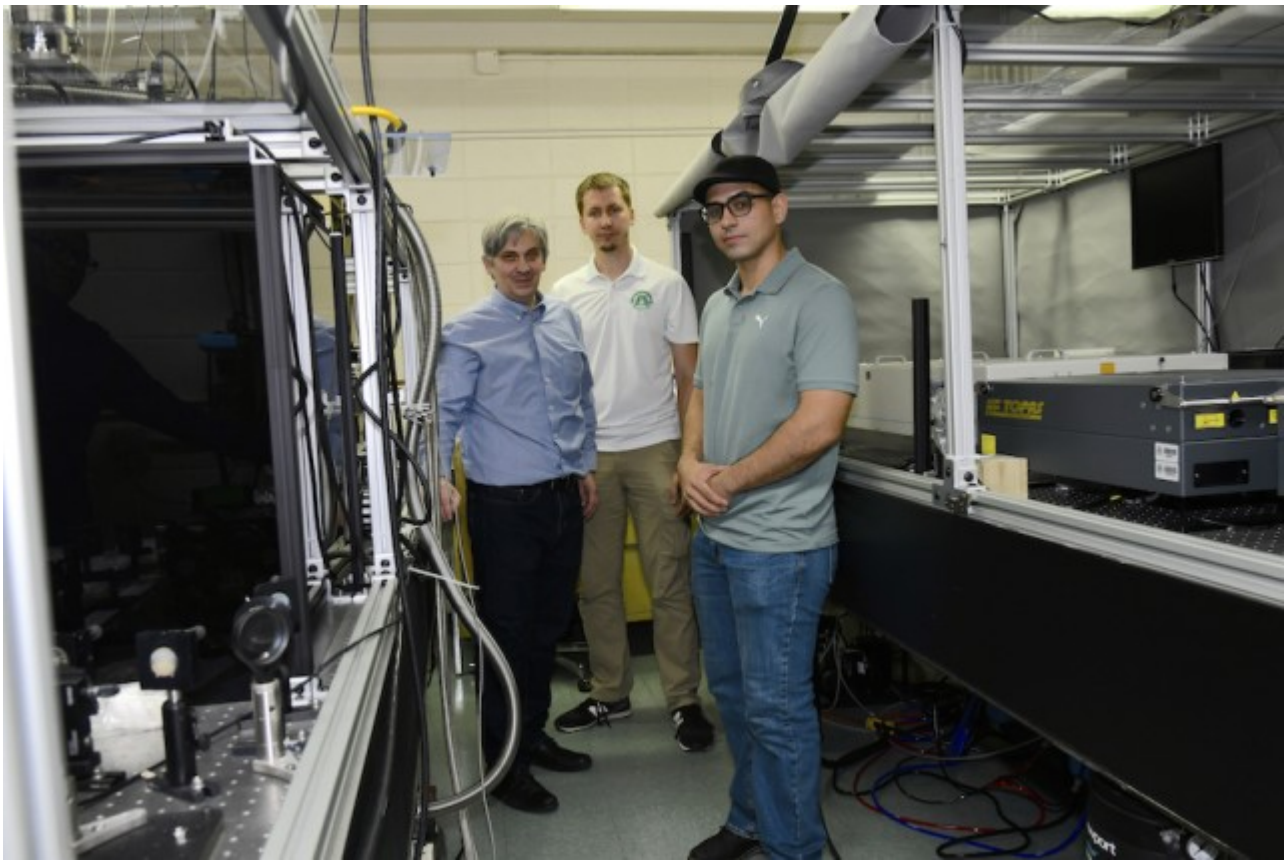


Dr. Sergiy Lysenko, Professor in the Department of Physics at the University of Puerto Rico's Mayagüez Campus (RUM), together with his Quantum Materials Dynamics team, received a $1-million grant from the **Army Research Office (ARO)** to investigate the ultrafast control of quantum phases in iron-based superconductors. The results of this project are expected to contribute to the development of promising technologies and applications in **Quantum Information Science and Engineering**. The work will also position the campus as a cutting-edge educational institution in this field and benefit students by preparing them as the future workforce for this area.

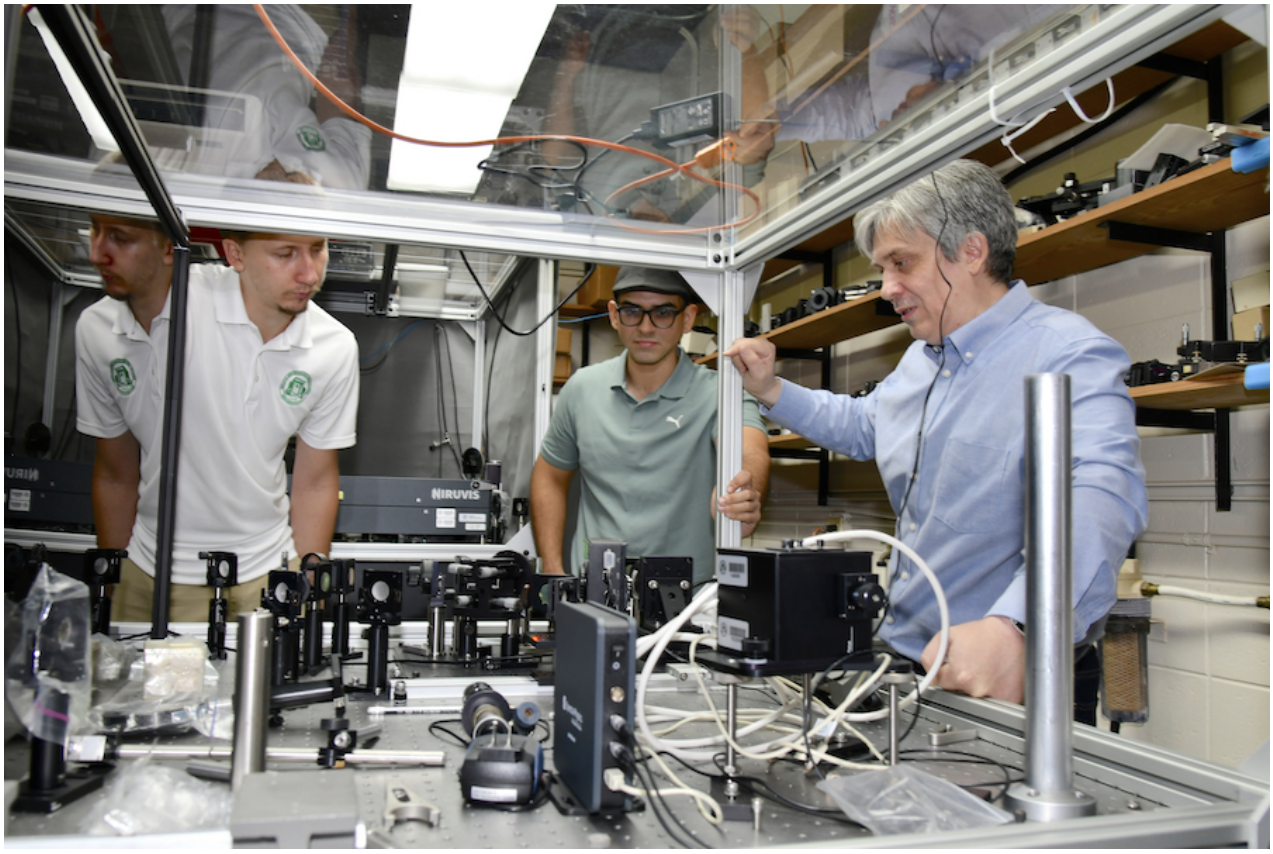
This was announced by the principal investigator, who explained that he has been developing this line of study for years together with his students and Dr. Armando Rúa de la Asunción, colleague in the Department of Physics, with support from similar grants from the **National Science Foundation (NSF)** and another specific grant from ARO, which allowed the acquisition of state-of-the-art technology unique in Puerto Rico to support their laboratory work. According to Lysenko, iron-based superconductors are a recently discovered family of unconventional high-temperature superconducting materials that combine several intertwined quantum states, including superconducting, magnetic, electronic, and structural phases.

> "The nature of superconductivity in these materials is quite new because they were discovered in 2006. The physics behind the mechanisms that produce

superconductivity is very different from what was previously known. This is a magnetic material, so it is now very important to understand how the different phases the material exhibits as a function of temperature interact with one another. The work is experimental and seeks to develop new ultrafast spectroscopy techniques to map the dynamics of the different phases present in the material. We expect these innovative measurements to help theoretical physicists explain the nature of superconductivity in these materials, which are important for quantum information science. It is a great opportunity to conduct cutting-edge research at this University," Lysenko stated.

He also noted that he eventually hopes to have between five and ten undergraduate and graduate students on his research team, who will benefit from experiments that integrate quantum physics, optics, and materials science, giving them an invaluable opportunity to gain hands-on experience with high-tech equipment as they prepare to work in this scientific discipline. They will also be trained as competent professionals with the potential to create start-ups, contribute innovative output, and offer consulting services, helping to build an innovative ecosystem in Puerto Rico capable of competing globally.

The project, titled **Ultrafast control of intertwined quantum phases in layered iron-based superconductors**, received funding for the next four years, and its results are expected to lead to applications and new technologies in ultrafast electronics and quantum computing.



Dr. Sergiy Lysenko, on the right; together with his students Esteban E. Montalvo (center) and Alexander Bartenev, on the left, showcase part of the innovative technology of the Quantum Materials Dynamics Laboratory.

Dr. Lysenko has a 20-year trajectory as a professor and researcher at RUM, during which he has dedicated himself to advancing this line of work. He is also responsible for the construction of the **Quantum Materials Dynamics Laboratory**, which features high-tech equipment such as laser systems, high-vacuum and cryogenic systems, and specialized laboratory electronics. Meanwhile, the President of the UPR, Dr. Zayira Jordán Conde, and the Chancellor of RUM, Dr. Agustín Rullán Toro, congratulated the researcher for this significant achievement that positions the institution at the forefront of quantum science with great potential in the discipline.

> “We are immensely proud that the work of Dr. Lysenko and his research group has earned such distinguished recognition within the scientific community. Without a doubt, his effort is a product of the extraordinary commitment and discipline that characterize the faculty and scholars at the University of Puerto Rico. We have no doubt that the results of this work will lead to important global advances and to the training of a generation of highly skilled professionals in this field, with impact on society and the country’s economy,” reiterated Dr. Jordán Conde.

> “Definitely, with projects and grants of such relevance, we are moving forward on the path from our current Carnegie R2 high-research classification toward an R1 designation. We are seeing here the fruit of many years of Dr. Lysenko’s work, and now, with this new funding awarded by the **Army Research Office**, we are entering an area in which we believe the Mayagüez Campus can cultivate a niche—quantum science and technologies, a topic of great relevance for humanity at this moment,” stated Rullán Toro.
