ERC Advanced Grant

A prestigious ERC Advanced Grant has been awarded to Prof. at ICFO Adrian Bachtold for the pioneering research project QTube

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The European Research Council (ERC) recently announced the winners of its latest Advanced Grants call. The funding, worth in total ?721 million, will go to 281 leading researchers across Europe.

This year, the entity has awarded a prestigious Advanced Grant to Prof. at ICFO **Adrian Bachtold,** group leader of the Quantum Nanomechanics and Nanoelectronics research group at ICFO, to support his group's groundbreaking science research in exploring the limits of quantum mechanics through the quantum delocalization of carbon nanotubes.

The five-year project, titled **QTube**, will aim to extend quantum superposition states beyond the microscopic world by quantum delocalizing a nanotube mechanical resonator, an object composed of approximately one million atoms, to a length scale greater than its diameter.

QTube will tackle several key challenges with significant scientific impact. Firstly, it will develop a nanotube double quantum dot qubit with record-breaking coherence rate;

secondly, it will aim to detect the mechanical vibrations of the nanotube in the quantum ground state using a quantum nondemolition approach with a superconducting resonator. Thirdly, it will demonstrate a double-well potential for nanomechanical vibrations, to synthesize a macroscopic quantum superposition of a nanotube

The research tackles major scientific and technological challenges, including the development of a high-coherence nanotube double quantum dot qubit, engineering a double-well potential for nanomechanical vibrations, and ultimately verifying the superposition state using quantum tomography.

i¿½This grant is absolutely crucial for progressing toward such an ambitious goal,i ?½ comments Bachtold. i¿½It gives us stable, long-term funding and allows our team to fully focus on solving extremely complex and fundamental scientific proble s.i¿½ The new project marks a new scientific direction compared to the group's previo s work. Recent advances in engineering double-well potentials in nanotube resonators have aid the groundwork for this leap, inspiring the proposal behind the newly funded research i¿½The objective is to achieve quantum delocalization that exceeds the size of the nano ube using the double-well potential approach,i¿½ explains the lead researcher. i¿½If su cessful, this work could open the door to realizing quantum superposition states in eve more massive and compl

x systems.i¿½ With previous ERC grants-both a Starting Grant and an earlier Advanced Gr nt-the team has built up a solid foundation in nanomechanics and quantum electronics. i ?½This new grant builds directly on our prior work but takes us in a significantly more dar ng and unexplored direction,i¿½ the researcher adds. i¿½It's exactly the kind of leap hat ERC supp

rt makes possible.i¿½ Finally, Prof. Oriol Romero-Isart, Director of ICFO, concludes on t e importance of the ERC program for the pursuit of research excellence at ICFO, by menti ning that "At ICFO, our mission is twofold: to push the frontiers of both applied and fun amental research. We're thrilled that Prof. Bachtold and his team have received strong E C support to pursue the ambitious goal of preparing a carbon nanotube in a macroscopi quantum state. We look forward to the ground

The ERC program

The Advanced Grant competition is one of the most prestigious and competitive funding schemes in the EU. It gives senior researchers the opportunity to pursue ambitious, curiosity-driven projects that could lead to major scientific breakthroughs. The new grants are part of the EU's Horizon Europe programme. Unlike conventional funding schemes that often favor incremental advances, ERC programs are designed to empower independent researchers to pursue visionary ideas with potentially transformative outcomes.

i¿½Ekaterina Zaharieva, European Commissioner for Startups, Research, and Innovation, sai : ?These ERC grants are our commitment to making Europe the world's hub for excelle t research. By supporting projects that have the potential to redefine whole fields, we are n

t just investing in science but in the future prosperity and resilience of our continent. In t e next competition rounds, scientists moving to Europe will receive even greater support n setting up their labs and research teams here. This is part of our i¿½Choose Europe for Sciencei¿½ initiative, designed to attract and retain the world's top scientist