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Launch of Q-networks

ICFO and Cellnex Telecom join forces under the project Q-networks to put into motion the first steps of the quantum internet

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In spring of 2021, ICFO scientists Dario Lago, Samuele Grandi, Jelena Rakonjac and ICFO Alum Alessandro Seri, led by ICREA Prof at ICFO, Hugues de Riedmatten, accomplished a landmark result in quantum communications. They were able to achieve scalable, telecom-heralded matter-matter entanglement between two remote, multimode and solid-state quantum memories. That is, they were able to store one single photon in two quantum memories placed 10m apart. The results were considered of such importance that the study was published in Nature and featured on the cover of the magazine.

But those results were just a mere first step in the long journey towards the ultimate goal of building the quantum internet. In doing so, the team has wanted to bring the experiment outside the lab, develop a real functional quantum repeater link and connect different links together to distribute entanglement along them. They aimed at bringing this 10m connection between quantum memories to longer distances and moving it out into the real world to see how the system might behave outside a controlled and stable environment such as the one inside the lab. ?

To be able to do this, the research groups of the ICREA Profs. at ICFO Hugues de Riedmatte and Valerio Pruneri have joined forces with Europe's leading operator of telecommunication infrastructures,Cellnex Telecom, owner of the biggest optical fiber network in Barcelona, an Catalunya, and who manages its services through the Xarxa Oberta de Catalunya (XOC) Together, they applied for funding from the Ministerio de Ciencia e Innovacion (MCIN) an were successfully selected as one of the two in all Spain to carry out projects related t quantum technologies

In a nutshell, the consortium will develop and deploy, for the first time, a quantum repeate node outside the lab, in the Barcelona area, and distribute entanglement between a repeate node at ICFO and the one in Barcelona, using the installed fiber optic network. It will als develop novel practical sources of photonic quantum entanglement and use them t implement cryptography protocols, such as Quantum Key Distribution (QKD), establishing completely secure quantum communication between the two sites to demonstrate quantum secure link and the effect of entanglement between both nodes. With this, it is als intended to demonstrate that quantum communication technologies can be easily integrate

into current classical telecom networks

During the first in-person meeting, Cellnex representatives from the Global Innovation an New Business Initiatives unit, together with researchers from de Riedmatten (coordinator o the project) and Pruneri's teams, as well as representatives from the KTT, Projects an Communications units, discussed the technicalities involved in such a deployment, as well a the various possibilities, opportunities, risks, etc., that the project could encounter during it 3-year lifespan

In the next few years, we hope to see many advances occurring in the world of quantu communications and this project is proof that we are ready and eager to take quantu technologies from the lab into the real world

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