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INO Annual Symposium 2020

Quantum for Renaissance

23 – 25 November 2020

The 2020 Virtual Conference

CNR National Institute of Optics

Summary. The INO Annual Symposium 2020 was a unique occasion for discussing the role of the Institute in the emerging fields of quantum simulation/computing, photonics, sensing and communication, which represent some of the fundamental pillars of the recently launched European Quantum Flagship.

Keywords. Quantum technologies, photonics, sensing, lasers, optics, light.

The future is Quantum. With this motto the 2020 INO Annual Symposium got underway on 23 November 2020 with the introductory speech by Director Paolo De Natale. Given the pandemic, the Symposium was run completely online, joining together an average of hundreds of people per session and reaching scientists throughout the world.

The scientific program consisted of six scientific sessions, two each day of the Symposium, with presentations given by world leading scientists and CNR-INO researchers. The sessions covered Quantum Optics, Information and Metrology, Cold Matter and Quantum Simulation, Extreme Light and Matter, Sensors, Spectroscopy and Communications, Heritage Science, Vision Science, Solar Energy and Optical Design and Biophotonics, reflecting the different thematic research areas of the Institute.

The beginning of the new quantum revolution was celebrated with contributions given by internationally renowned scientists. In particular, Prof. Massimo Inguscio, President of the National Research Council (CNR), and Prof. Tommaso Calarco, Director of the Institute for Quantum Control of the Peter Grünberg Institute in Germany and promoter of the Quantum Manifesto, illustrated the road map of Quantum Flagship and the potential of the quantum approach with important examples. They also discussed the impact which this second quantum revolution is expected to have even on everyday life. Nobel Laureate Prof. Wolfgang Ketterle (MIT-Harvard Center for Ultracold Atoms, USA) and Prof. Antoine Browaeys (Institut d'Optique Graduate School, France) illustrated the potentialities of ultracold atomic systems as versatile and powerful quantum simulators.

Prof. A.G. White (University of Queensland, Australia) and A. Alù (City University of New York, USA) discussed the perspectives of light and metamaterial-based platforms in developing new and advanced technologies (Fig. 1 provides a pictorial example).

During the meeting, the INO Technology Transfer team made an off-topic presentation of the Institute's spin-off activity, while Dr. Angelo Volpi (CNR Science and Technology Officer in Brussels) gave a detailed description of opportunities for advanced R&D in light of new European funding schemes, which will eventually involve the Quantum Flagship initiative.

The Symposium also touched on two other thematic areas of CNR INO, Heritage Science and Biophotonics. These fields are of fundamental importance for the Institution, given their impact on society. Prof. Vincent Detalle (Centre de recherche et de restauration des musées de France, C2RME, France) talked about the role of laser-based techniques for cultural heritage conservation and preservation, providing direct examples of such protocols. Prof. D. Dombek (Northwestern University, USA) spoke about optical observations of neuronal circuits.

Two additional off-topic contributions were presented during the Symposium. The first was given by Oliver Graydon, Chief Editor of *Nature Photonics*, who discussed scientific publishing. The second, by CNR INO members Oliver Morsch, Alessandro Farini and Alessandra Rocco, was dedicated to science outreach perspectives.

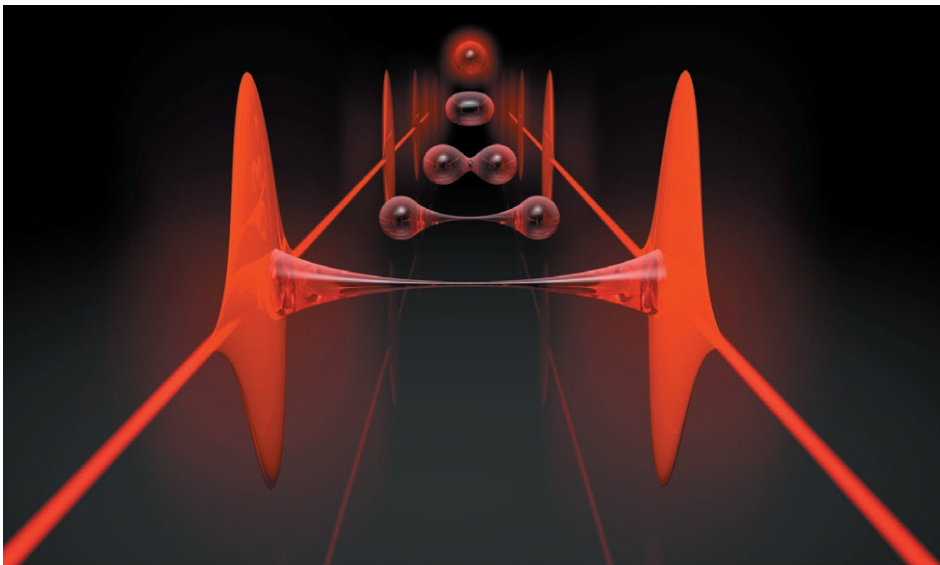


Figure 1. Sharing a single photon entangles two distinct pulses of laser light. Quantum entanglement is at the basis of quantum (secure) communication and cryptography protocols.