

“QUANTUM” : a public engagement initiative and beyond

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Abstract: We report on the development and outcomes of the exhibition QUANTUM, which successfully concluded the International Year of Quantum Science and Technology. This serves as a case study for future outreach activities in quantum physics.

On the occasion of the International Year of Quantum Science and Technology (IYQ), for which the National Quantum Science and Technology Institute (NQSTI) has been a distinguished partner, several public engagement and outreach initiatives were organized worldwide [1]. The exhibition *QUANTUM – la fisica quantistica è per tutti* was set up within the facilities of our university. The exhibition was based on materials and panels developed during the nationwide initiative *Italian Quantum Weeks* [2]. We primarily addressed high school students and teachers. Our aim was to introduce key topics in quantum physics, ranging from the crisis of classical physics and early foundational experiments to core concepts such as state, measurement, entanglement, and correlation, as well as contemporary applications in quantum computing and quantum cryptography. We adopted a modern approach to public engagement [3], emphasizing active audience participation. The exhibition featured interactive educational tools, and complementary inquiry-based and game-based activities, designed to make quantum science engaging, accessible, and explorable [4]. To this end, five people at different stages of their careers in physics - from undergraduate students to postdoctoral researchers - were selected and trained to guide visits and facilitate interactive activities. They also actively contributed to the development of the exhibition’s narrative. Moreover, during the exhibition period, three public events featuring invited speakers on quantum physics were organized, and ten in-house researchers delivered outreach seminars for the visitors. The aim of this extensive public engagement initiative was to help young students develop a new image of quantum science: a field to be explored and investigated through direct experience and experimentation, a domain closely connected to everyday reality and rich with possibilities and inspiration for a future they could contribute to shape. At the same time, the initiative represented an opportunity for physicists at different career stages to share their passion and their work with a public that, thanks to the exhibition, developed new interest and new tools for engaging with the concepts presented. The initiative yielded highly positive outcomes in both quantitative and qualitative terms: a total of approximately 900 visits were recorded, and student feedback highlighted the effectiveness of the exhibition in fostering engagement and stimulating curiosity. Among the most meaningful words emerging from the responses to the open-ended feedback questionnaire there were *fascination, awareness, and concreteness*.

References

- [1] International Year of Quantum Science and Technology - Events: <https://quantum2025.org/events/>
- [2] Italian Quantum Week <https://quantumweeks.it/>
- [3] C. Fracchiolla, A. C. Lau, N. Schrode "Fostering connection: Principles and practices for well-designed public engagement in physics", *Phys. Plasmas* **31(5)**, 050602 (2024).
- [4] Quantum Mechanics Street:: <https://quantummechanicsstreet.com/quantum-explorers/quantum-education-outreach/>