

NEWSLETTER N.6, September 2019



Speaker at the TEQ Workshop "Redefining the foundations of physics in the quantum technology era", Trieste (IT) 16-19 September 2019

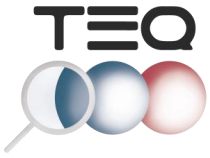


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UPDATES OF WORK DONE

TEQ Workshop

Within the framework of TEQ, the workshop “Redefining the foundations of physics in the quantum technology era” was organized from 16 to 19 September in Trieste.

The works explored the state of the art – both theoretically and experimentally – of our understanding of quantum theory and discuss the new directions of research.

Speakers included leading senior experts in quantum mechanics as well as junior members of the TEQ consortium for a total of 45 participants.

The Workshop included also a Q&A session with Editor at Nature Dr Gaia Donati on scientific policies, editorial criteria and peer-review process.

Trieste Junior Quantum Days

The workshop gathered young researchers working in quantum mechanics and its applications. PhD students and PostDocs have been the opportunity to present their research activity and interact with their colleagues, share motivations, techniques and perspectives, in a friendly and informal environment. In the morning, blackboard lectures by senior experts provided a perspective on relevant problems in quantum theory.

Topics included: quantum information, entanglement, open quantum systems, quantum foundations, many-body physics, quantum thermodynamics, equilibrium & non-equilibrium physics, mathematical methods for quantum mechanics.

The workshop was attended by around 50 participants and was successful. The event was rated by the participant in an online questionnaire with good reviews for the organization, the venue and the program schedule.

WG Meetings

An internal TEQ experiment meeting has been organized to continue the discussion on the technical details needed to build the TEQ experiment, following the Frascati meeting held on May 31. This meeting was on July 24 at UCL (London) and was attended by a group of 9 TEQ members from 6 different partners. Agenda items discussed included updates on electronics, particle trapping and detection, trap blades and parametric heating for detection, update on CSL tests with mechanical resonators, particle launching, cryostat.

An additional follow up meeting has been organized on September 19 in Trieste, following the TEQ Workshop, to update on developments of setting up the TEQ experiments and its components. 8 TEQ members were present, representing 5 partner organizations.

PUBLICATIONS

(for more info, please go to www.tequantum.eu → ‘Publications’)

In the last months there has been a significant amount of papers published, doubling the publications for the same period in 2018.

Here below, the new publications:

Authors	Title	Journal	Volume	Pages	Year
Guarnieri, G., N. H. Y. Ng, K. Modi, J. Eisert, M. Paternostro, and J. Goold	Quantum work statistics and resource theories: Bridging the gap through Rényi divergences	Phys. Rev. E	99	050101(R)	2019
Malouf, William T. B., Jader P. Santos, Luis A. Correa, Mauro Paternostro, and Gabriel T. Landi	Wigner entropy production and heat transport in linear quantum lattices	Physical Review A.	99	052104	2019
Campbell, Steve, Barış Çakmak, Özgür E. Müstecaplıoğlu, Mauro Paternostro, and Bassano Vacchini	Collisional unfolding of quantum Darwinism	Physical Review A.	99	042103	2019
Ottaviani, Carlo, Cosmo Lupo, Alessandro Ferraro, Mauro Paternostro, and Stefano Pirandola	Multipartite entanglement swapping and mechanical cluster states	Phys. Rev. A	99	030301(R)	2019
R. Puebla, J. Casanova, O. Houhou, E. Solano, and M. Paternostro	Quantum simulation of multiphoton and nonlinear dissipative spin-boson models	Phys. Rev. A	99	032303	2019
Abah, Obinna, and Mauro Paternostro	Shortcut-to-adiabaticity Otto engine: A twist to finite-time thermodynamics	Phys. Rev. E	99	022110	2019
Çakmak, Barış, Steve Campbell, Bassano Vacchini, Özgür E. Müstecaplıoğlu, and Mauro Paternostro	Robust multipartite entanglement generation via a collision model	Phys. Rev. A	99	012319	2019

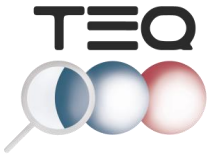
Belenchia, A, D Benincasa, F Marin, F Marino, A Ortolan, M Paternoastro, and S Liberati	Tests of quantum gravity-induced non- locality: Hamiltonian formulation of a non- local harmonic oscillator	Classical and Quantum Gravity	36.15		2019
Belenchia, Alessio, Robert M. Wald, Flaminia Giacomini, Esteban Castro-Ruiz, Časlav Brukner, and Markus Aspelmeyer	Information content of the gravitational field of a quantum superposition	International Journal of Modern Physics D			2019
A. Vinante, A. Pontin, M. Rashid, M. Toroš, P. F. Barker, and H. Ulbricht	Testing collapse models with levitated nanoparticles: Detection challenge	Physical Review A	100.1	012119	2019
Ferialdi, Luca, Ashley Setter, Marko Toroš, Chris Timberlake, and Hendrik Ulbricht	Optimal control for feedback cooling in cavityless levitated optomechanics	New Journal of Physics	21.7		2019
Giacomini, Flaminia, Esteban Castro-Ruiz, and Časlav Brukner	Relativistic Quantum Reference Frames: The Operational Meaning of Spin	Physical Review Letters	123.9	090404	2019
Kull, Ilya, Philippe Allard Guérin, and Časlav Brukner	A spacetime area law bound on quantum correlations	npj Quantum Information	5.1		2019

DISSEMINATION ACTIVITIES

(for more info, please go to www.tequantum.eu → 'Dissemination')

Since the beginning of 2019, the dissemination activities held were a total of 62, addressing more than 5.000 people. 36 talks were given to academic audiences, 16 lectures were given to high-school and school students and teachers while 10 presentations were delivered to the general public.

A detailed list of all talks can be found on the TEQ Website.



ANY OTHER RELEVANT INFORMATION

TEQ experiment paper in PRA with editor's suggestion and in Featured in Physics with a news story

The motion of hovering nanoparticles might reveal that quantum wave functions collapse spontaneously, but three common measurement methods are not ready for prime time as reported by TEQ experimentalists in the latest issue of Physical Review A with Editors suggestion and a Synopsis in Featured in Physics by the American Physical Society. The identification of an appropriate detection method - a major challenge for the realization of the TEQ experiment - is going on.

More information at <https://physics.aps.org/synopsis-for/10.1103/PhysRevA.100.012119>

UPCOMING ACTIVITIES

Quantum Café

After the success of the first editions in the fall 2018 and spring 2019, UniTs organizes a new round of dissemination events in the frame of the TEQ project to communicate to the general public the beauty and the importance of quantum mechanics.

In Trieste, for its third edition, the Quantum Café proposes the topic of Matter with the following program (*see poster below*):

- October 15, 2019: the alphabet of matter
- October 29, 2019: microscopic architectures
- November 12, 2019: the future in 2D

With the aim of offering an interdisciplinary dissemination event that could bring other forms of experimentation closer to science and to the general public, the Quantum Café offers moments of theater readings of contemporary classics by the students of the University Theater Center (CUT) and live music performed by the students of the Trieste Tartini Conservatory.



UNIVERSITÀ
DEGLI STUDI DI TRIESTE
Dipartimento di Fisica

CAFFÈ DEI QUANTI

scienza, musica, teatro: avvicinarsi alla meccanica quantistica
Il grande mondo del piccolo

ottobre_novembre 2019, ore 18.30

Caffè libreria Knulp
via Madonna del Mare 7/a, Trieste

per info e prenotazioni:
T. +39 040 300021



martedì 15 ottobre
L'alfabeto della materia

martedì 29 ottobre
Architetture microscopiche

martedì 12 novembre
Il futuro in 2D

Il sistema periodico di Primo Levi
Lettura a cura del
Centro Universitario Teatrale CUT Trieste

**La materia
e i suoi mattoni**

Intervento scientifico di
MARIA PERESSI
docente di Fisica della materia
Università di Trieste

Musica
a cura degli studenti
del Conservatorio di Musica "G. Tartini" di Trieste

Il libro dei Mostri di J. Rodolfo Willcock
Lettura a cura del
Centro Universitario Teatrale CUT Trieste

**Materiali nanostrutturati
e nanotecnologie**

Intervento scientifico di
GIOVANNI COMELLI
docente di Fisica della materia
Università di Trieste

Musica
a cura degli studenti
del Conservatorio di Musica "G. Tartini" di Trieste

Flatlandia di Edward Abbot
Lettura a cura del
Centro Universitario Teatrale CUT Trieste

**Materiali bidimensionali
innovativi**

Intervento scientifico di
MARTINA DELL'ANGELA
ricercatrice, Istituto Officina dei Materiali
IOM-CNR, Trieste

Musica
a cura degli studenti
del Conservatorio di Musica "G. Tartini" di Trieste



Il Caffè dei Quanti è un'iniziativa
sviluppata nell'ambito del progetto di ricerca
**TEQ Testing the large-scale limit
of quantum mechanics**
finanziato dalla **Commissione Europea**
www.tequantum.eu

Ideato e organizzato da
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