

BELL

- Trieste
- Milano
- Pavia
- Trento
- Cosenza
- Genova



- Fondamenti della MQ
- Test di MQ
- Gravità Quantistica
- Informazione Quantistica
- Sistemi aperti
- MQ Statistica

Genova

Zanghì, (Cassinelli) Pinamonti, Truini, Drago (Marian)

- Fondamenti MQ
- Gravità Quantistica
- MQ Statistica
- Esperimenti

Gravità

1) Teorie di campo quantistiche interagenti su spazi curvi nell'approccio perturbativo

- nell'approccio funzionale tipo delle teorie algebriche:

- Analisi di metodi efficienti per la rinormalizzazione necessaria a definire i prodotti tempo ordinati presenti nell'espansione perturbativa.

- Stabilità degli stati quantistici costruiti con la teoria perturbativa

2) Equazione di Einstein semiclassica: Influenza della materia quantistica sulla curvatura

- Abbiamo provato un teorema di esistenza e unicità globale per queste teorie in ambito cosmologico

- Vogliamo studiare questo problema in presenza della sola simmetria sferica, ovvero nel caso in cui nello spaziotempo sia presente un buco nero sferico.

Il nostro scopo è quello di costruire un modello microscopico (basato su equazioni locali) in cui si possa studiare l'evaporazione dei buchi neri dovuta alla radiazione di Hawking (nessun modello di questo tipo è presente in letteratura).

3) Psiquadro per sistemi invarianti per diffeomorfismi (tesi dottorato Matematica, Monaco)

- [1] Gere, Hack, Pinamonti "An analytic regularisation scheme on curved spacetimes with applications to cosmological spacetimes" arxiv:1505.00286
- [2] Drago, Hack, Pinamonti "The generalised principle of perturbative agreement and the thermal mass" arxiv:1502.02705
- [3] Pinamonti, Siemssen "Global Existence of Solutions of the Semiclassical Einstein Equation in Cosmological Spacetime" Comm. Math. Phys. 334 (2015) 171 arxiv:1309.6303

Altri lavori apparsi su arxiv o pubblicati nell'ultimo anno inerenti questo progetto

- [4] Drago, Pinamonti "Influence of quantum matter fluctuations on geodesic deviation" j.phys. A 47 (2014) 375202 arxiv:1402.4265
- [5] Dappiaggi, Drago " A new deformation argument for Hadamard states via an extended Møller operator" arxiv:1506.09122
- [6] Dappiaggi, Nosari, Pinamonti "The Casimir effect from the point of view of algebraic quantum field theory" arxiv:1412.1409
- [7] Pinamonti, Siemssen "Scale-Invariant Curvature Fluctuations from an Extended Semiclassical Gravity" J. Math. Phys 56 (2015) 022303 arxiv:1303.3241

MS Quantistica

Estensione analisi Boltzmann per l'approccio all'equilibrio di sistemi macroscopici quantistici

Collaborazione con Lebowitz, Goldstein Tumulka (Rutgers University)

Universal Probability Distribution for the Wave Function of an Open Quantum System
with Sheldon Goldstein, Joel L. Lebowitz, Christian Mastrodonato, and Roderich Tumulka
(sottoposto al Communications on Mathematical Physics)

Any Orthonormal Basis in High Dimension is Uniformly Distributed over the Sphere
with Sheldon Goldstein, Joel L. Lebowitz, and Roderich Tumulka

Fondamenti MQ (Applicazioni e Esperimenti)

Weak Values from Displacement Currents in Multiterminal Electron Devices

D. Marian,^{1,2} N. Zanghì,¹ and X. Oriols^{2,*}

¹*Dipartimento di Fisica dell'Università di Genova and INFN sezione di Genova, Via Dodecaneso 33, 16146 Genova, Italy*

²*Departament d'Enginyeria Electrònica, Universitat Autònoma de Barcelona, 08193-Bellaterra (Barcelona), Spain*

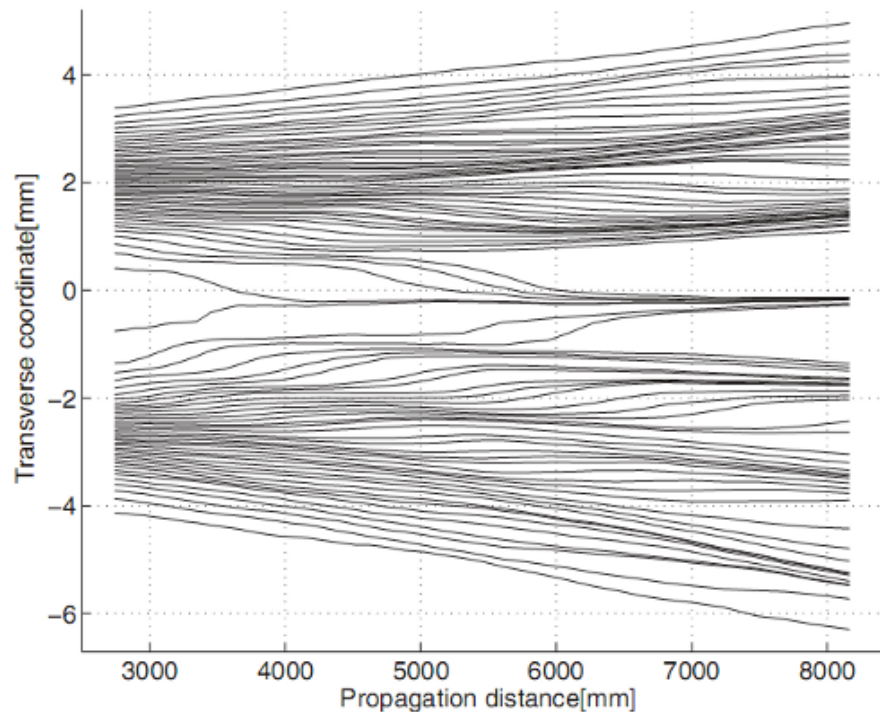
Weak values allow the measurement of observables associated to non-commuting operators. Up to now, position-momentum weak values have been mainly developed for (relativistic) photons. In this work, a proposal for the measurement of such weak values in typical electronic devices is presented. Inspired by the Ramo-Shockley-Pellegrini theorem that provides a relation between total current and electron velocity, it is shown (through many-particle system-plus-apparatus simulations) that the displacement current measured in multiterminal configurations can provide either a *weak* measurement of the momentum or *strong* measurement of position. This proposal opens a large number of new opportunities for implementing quantum engineering or fundamental experiments with state-of-the-art electronic technology. As an example, a setup for the measurement of the Bohmian velocity of (non-relativistic) electrons is presented by a weak measurement of momentum post-selected with a strong measurement of position.

Science 3 June 2011:
Vol. 332 no. 6034 pp. 1170–1173
DOI: 10.1126/science.1202218

- REPORT

Observing the Average Trajectories of Single Photons in a Two-Slit Interferometer

1. [Sacha Kocsis^{1,2,*}](#), [Boris Braverman^{1,*}](#), [Sylvain Ravets^{3,*}](#), [Martin J. Stevens⁴](#), [Richard P. Mirin⁴](#), [L. Krister Shalm^{1,5}](#), [Aephraim M. Steinberg^{1,†}](#)



From: S. Kocsis, *et al.*, Science, 332 (2011).

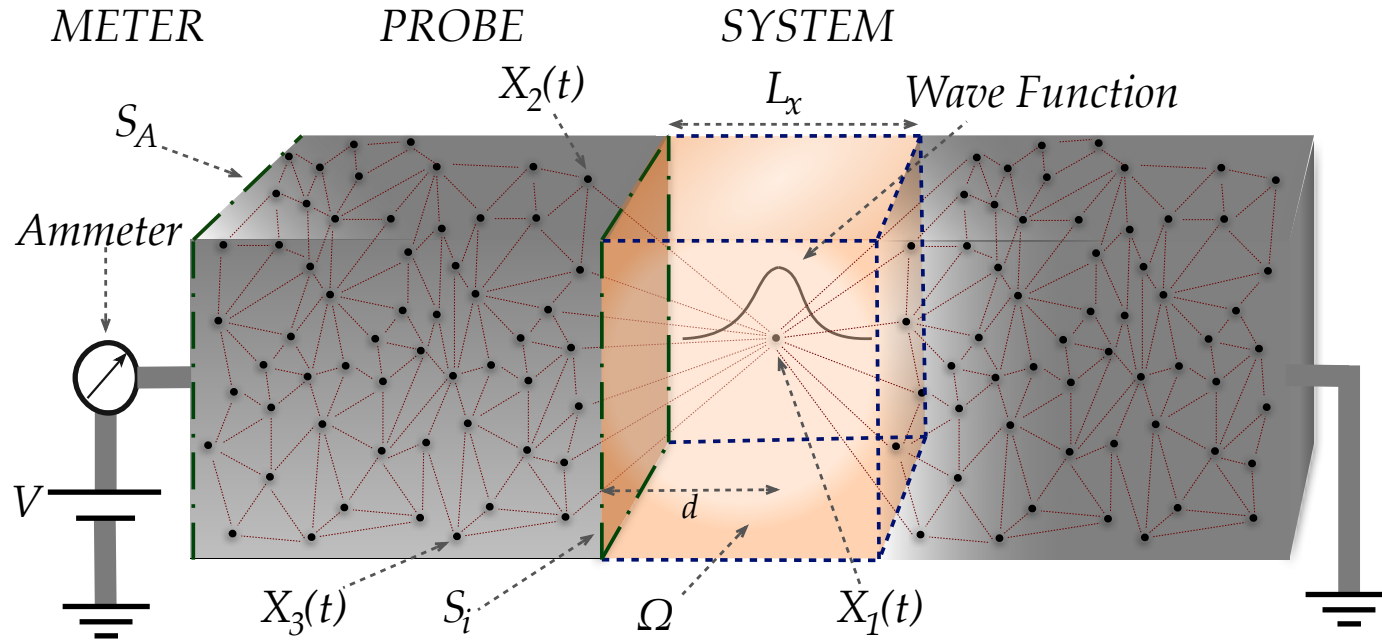
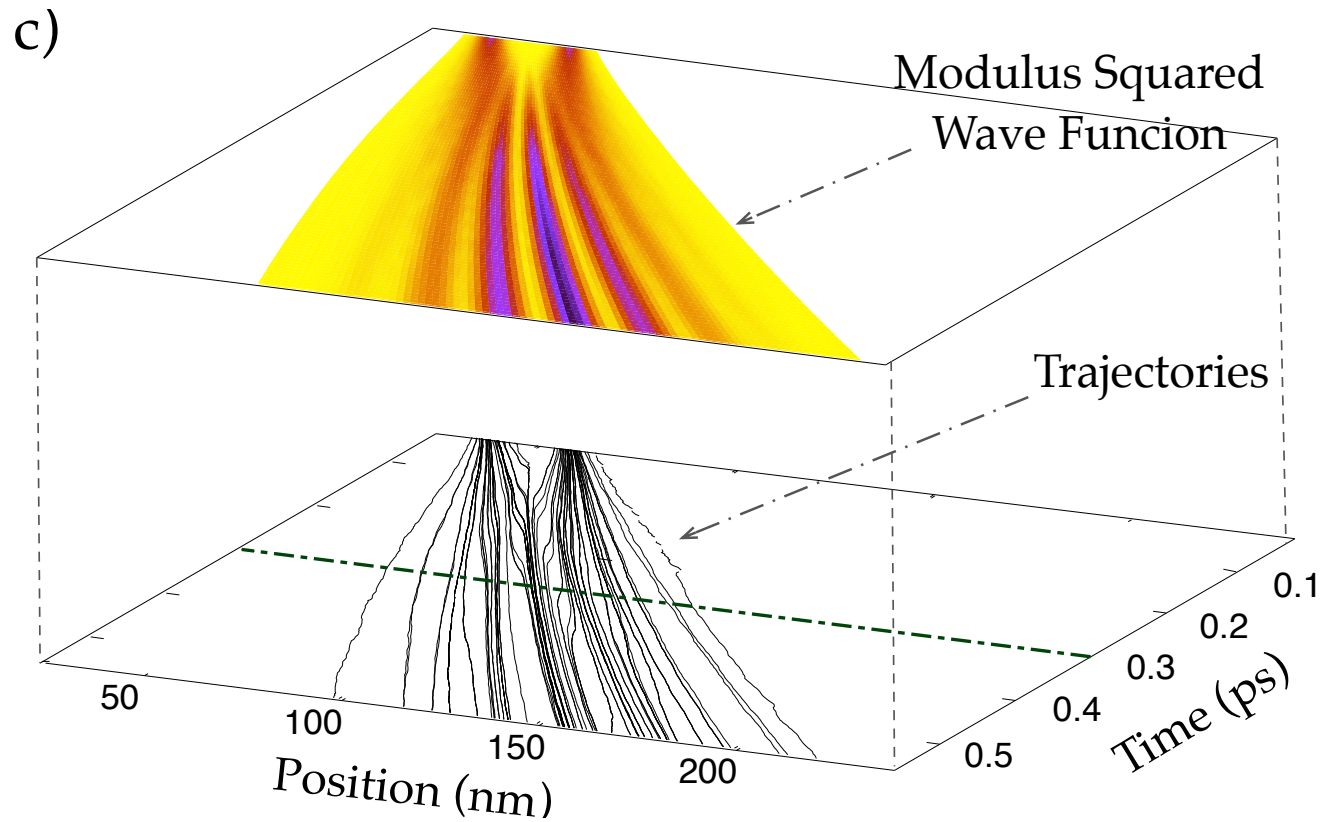


FIG. 1. Schematic representation of the system studied. We have divided the all problem in three parts, in the middle there is the system we are interested in (*system*) which interact through Coulomb interaction (red dashed line) with N_P electrons in the metal surface (*probe*). Finally the probe interacts with the ammeter (*meter*) which gives the final result of the measurement. The surfaces S_i and S_A (green dashed dotted line) and the volume Ω (blue dashed line) used in the text are indicated.



Time-resolved electron transport with quantum trajectories

with G. Albareda, D. Marian, A. Benali, and X. Oriols

[Journal of Computational Electronics 12 405-419 \(2013\)](#)

Fondamenti MQ (Matematica e Concettuale)

Fermionic Wave Functions on Unordered Configurations

Sheldon Goldstein*, James Taylor[†],
Roderich Tumulka[‡] and Nino Zanghì[§]

March 11, 2014

Abstract

Quantum mechanical wave functions of N identical fermions are usually represented as anti-symmetric functions of *ordered* configurations. Leinaas and Myrheim [14] proposed how a fermionic wave function can be represented as a function of *unordered* configurations, which is desirable as the ordering is artificial and unphysical. In this approach, the wave function is a cross-section of a particular Hermitian vector bundle over the configuration space, which we call the fermionic line bundle. Here, we provide a justification for Leinaas and Myrheim's proposal, that is, a justification for regarding cross-sections of the fermionic line bundle as equivalent to anti-symmetric functions of ordered configurations. In fact, we propose a general notion of equivalence of two quantum theories on the same configuration space; it is based on specifying a quantum theory as a triple (\mathcal{H}, H, Q) (“quantum triple”) consisting of a Hilbert space \mathcal{H} , a Hamiltonian H , and a family of position operators (technically, a projection-valued measure on configuration space acting on \mathcal{H}).

PACS. 03.65.Vf; 03.65.Ta. Key words: bosons and fermions, symmetrization postulate, topological phases, Hermitian vector bundles, holonomy.

Collaborazioni con filosofi

Predictions and Primitive Ontology in Quantum Foundations: A Study of Examples
with Valia Allori, Sheldon Goldstein and Roderich Tumulka.

[*British Journal for the Philosophy of Science* **65**: 323-352 \(2014\)](#)

[arXiv:1206.0019](#)