

Università degli Studi di Trieste

Dipartimento di Fisica

Seminario

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Tuesday, June 12, 2.30 PM – Room 204, Leonardo Building, Dip. di Fisica – Strada Costiera, 11 – Trieste

Quantum theory in real or quaternionic Hilbert spaces: how the complex Hilbert space structure emerges from Poincaré symmetry



In principle, the lattice of elementary propositions of a generic quantum system admits a representation in real, complex or quaternionic Hilbert spaces as established by Solèr's theorem (1995) closing a long-standing problem that can be traced back to the von Neumann's mathematical formulation of quantum mechanics. Some remarkable attempts have been made in the years to justify such a privileged role of the complex numbers, even though a mathematically rigorous analysis in the more general case of relativistic systems is still absent to our knowledge. The strategy has always been the same: construct some suitable complex structure which commutes with all the observables. Such an object allows for a complexification of the Hilbert space. Adopting a similar strategy, we show that elementary relativistic systems cannot be described in real or

quaternionic Hilbert spaces as a consequence of some peculiarity of the continuous unitary representations of the (universal covering of the) proper orthochronous Poincaré group related with the theory of polar decomposition of operators. Indeed any such attempt leads necessarily to an equivalent formulation in terms of a suitable complex Hilbert space.

Organizzazione a cura di: A. Bassi

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Everyone interested in the topic is welcome to attend

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