Sessão: Física Matemática

Overview of Canonical Quantization in finite and infinite dimensions

José Velhinho[1],

[1] Universidade da Beira Interior

Quantization is the process of obtaining the quantum correspondent of a classical physical theory. In principle, Canonical Quantization is a map from the Poisson algebra of observables in a symplectic manifold to operators in some Hilbert space, preserving as much as possible the given classical structure. In its minimal and prototypical version, it is a Lie-algebra morphism from the Heisenberg algebra to (essentially) self-adjoint operators, or better still, a unitary representation of the Weyl group. However, notable obstructions and ambiguities affect the quantization process, when one tries to go outside the minimal set of observables, or in nonlinear cases, or most remarkably, even when linear but infinite dimensional symplectic spaces are involved, as happens in field theories. We present an overview of the canonical quantization process, in finite and infinite dimensions, commenting on the most important results and difficulties. Occasionally, a measure theory perspective is adopted, concerning the construction of the Hilbert space and the required quantum representations.