Dottorato di Ricerca in Fisica dell'Università degli Studi di Messina
29 Marzo 2012, ore 15.00, Aula E. Majorana, Dip.to di Fisica,
V.le F. Stagno d'Alcontres 31, S. Agata, Messina

Seminar title:
Quantum Dynamics in the Partial Wigner Picture

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Abstract

The Wigner formalism provides a representation of quantum dynamics in terms of dynamics in a classical-like phase space.
Systems which lack a classical analogue cannot be fully studied by means of the Wigner approach.
In such cases, one can resort to a partial-Wigner representation.
The quantum propagator in the partial Wigner representation is, in general, a very complicated mathematical object but, using a linear approximation, is taken as a basis for describing the dynamics of hybrid quantum-classical systems. It turns out that the dynamics of quantum-classical systems, with a harmonic potential and a linear coupling to the quantum subsystem, is exactly equivalent to full quantum dynamics.
For more general polynomial potentials, such as the quartic (double-well) potential, quantum-classical dynamics is only an approximation.
With the above motivation, we have derived an analytical expression for the quantum propagator, in the case of linear coupling and a general polynomial potential, and we have studied, numerically, the resulting quantum dynamics in a few relevant cases.