



# Cours de physique théorique

agrée par l'École doctorale "Physique en Ile de France"

## *Quantum measurement theory*      *Roger Balian*

Les vendredis 19/09/2014, 3/10, 10/10, 17/10 à 10h00.

IPhT

Whereas quantum measurement theory has given rise to many studies and controversies, due to its implications on the interpretation of quantum mechanics, it is hardly mentioned in courses.

We shall first present the measurement problem, an apparent contradiction between the expected properties of individual runs of a repeated measurement and the quantum theory, which only deals with statistical ensembles.

We shall then analyse the dynamics of ideal measurement processes, which involve a coupling between the tested system and the apparatus. The macroscopic size of the latter plays a major role, and we must rely on quantum statistical mechanics. We shall illustrate this approach with a rather realistic solvable model, and shall exhibit the needed properties of the Hamiltonian.

This use of quantum equations being still purely formal, should be supplemented with interpretative principles. We shall exhibit the weakest possible such principles required to solve the measurement problem and shall discuss the status of Born's rule and of von Neumann's reduction.

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**Lieu :** IPhT, CEA Saclay, Orme des Merisiers, Bât. 774, p. 1A Salle C. Itzykson.

**Accès :** navettes CEA du RER B Le Guichet vers CEA Ormes, toutes les 15 minutes de 8h00 à 9h45  
ou bus publics Mobicaps 9 et 10, Albatrans 91.06 et 91.10.

**Renseignements :** <http://ipht.cea.fr> ou [ipht-lectures@cea.fr](mailto:ipht-lectures@cea.fr)