MÉCANIQUE QUANTIQUE ET APPLICATIONS

QUANTUM MECHANICS AND APPLICATIONS

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| Lecturers : 18.0 | TC : 18.0 | PW : 0.0 | Autonomy : 12.0 | Study : 0.0 | Project : 0.0 | Language : FR

Objectives

Quantum mechanics is one of the most predictive and widespread physical theories we know. It allows us to describe the atoms and constituents of matter, but it also allows to understand the assemblies of molecules, the nature of light and the structure of solids. Quantum mechanics, as a fundamental science, is also at the origin of great applications upon which are based our modern society: most high-tech products are directly derived from quantum concepts (computer, laser, GPS, MRI ...). The objective of this course is to offer an introduction to quantum mechanics and its general principles using the Dirac formalism.

Keywords : Schrödinger Equation, quantum state, Quantum mechanics principles, superposition, Dirac formalism, Hamiltonian,Hilbert space, spin, fermion, boson, indistinguishable particles

Programme

- Back to wave / particle duality - Construction of quantum theory.
- Measurement / Time evolution of systems.
- The postulates of quantum mechanics.
- Two-state systems.
- The angular momentum.
- ½ spin.
- NMR.
- The identical particles.
- The fermions, the bosons.

Learning outcomes

- Identify the field of application of quantum mechanics and the quantum / classical limit.
- Apply the principles of quantum mechanics.
- Use Dirac formalism to solve a problem of quantum mechanics.
- Describe the state of several particles and their spin.

Independent study

Objectifs : Understand and assimilate the course.

Méhodes : Questions and answers sessions, corrections of former exams in session, exercises to be treated in autonomy.

Core texts

J-L Basdevant, J. Dalibard., *MÉCANIQUE QUANTIQUE*, Ed. de l'Ecole Polytechnique, 2002
C. Cohen-Tannoudj i. et al. *MÉCANIQUE QUANTIQUE I*, Hermann, 1973
C. Cohen-Tannoudj i. et al.*MÉCANIQUE QUANTIQUE II*, Hermann, 1973

Assessment