GS_Quantum_UE_Quantum Optics

Level
Baccalaureate +5

ECTS
3 credits

Component
UFR PhITEM (physique, ingénierie, terre, environnement, mécanique)

Semester
Automne

- **Teaching language(s):** English
- **Open to exchange students:** Yes
- **Code d'export Apogée:** PAX9QIAA

Presentation

Description

Teachers : Julien Claudon (CEA) and Cyril Branciard (CNRS)

Objectives :
These lectures are aimed to provide building blocks to understand and model the elementary components of light (photons), light matter-interaction at the single photon level, and elements of quantum communication and information processing with single photons.

Program :

Chapter 1: Julien Claudon (16h)
1. Quantification of the free radiation field - Photons
2. Representation of quantum states in phase space
Tutorial: Coherent states
3. Interference in quantum optics, single-photon states and wave-particle duality
4. Light-matter interaction in free space, optical Bloch equations
5. Cavity quantum electrodynamics

Chapter 2: Cyril Branciard (8h)
Entanglement, Bell’s inequalities.

Quantum cryptography (BB84, Ekert protocol), quantum teleportation.
Quantum repeaters, entanglement distribution, quantum networks.

Course parts

UE Quantum Optics - CMTD	Lectures (CM) & Teaching Unit (UE)	24h

Period : Semester 9

Useful info

Campus

Grenoble - University campus