



PHYS2700 Experimental methods of laser-matter interactions

[45h] 6 credits

Teacher(s): Philippe Antoine, Pierre Defrance, Xavier Urbain
Language: French
Level: Second cycle

Aims

A: Experimental methods of laser-matter interactions (22.5-0)

Use of intense lasers and experimental methods for the study of laser-matter interactions.

B: Corpuscular optics (22.5-0)

Introduction to methods of production, transport and analysis of charged particle (non relativistic)

C: Experimental methods of atomic collisions (22.5-0)

Experimental study of collision processes, particularly those touching astrophysics and controlled thermonuclear fusion.

Main themes

A : Principles of high intensity lasers and ultra-short pulses

Diagnostics, transport and focalisation of rays, including the security issues

Coherent excitation of atoms

Multiphotonic ionization and dissociation

Harmonic generation, X rays and plasmas

B : Principles of production modes of charged particles (electrons, positrons, ions)

Basic principles of corpuscular optic, general equation of movement, paraxial equations and applications to electric and magnetic fields, notion of emittance, Liouville theorem and beam envelope simulation

Applications: beam production and simulation codes

C : Description of collision processes

Cross section, kinematics, detection and measurement methods, atomic traps

Collisions in presence of a laser field

Processes for astrophysics and thermonuclear fusion