Level: PhD

Course title: Coherent radiation sources and applications

Status: elective

ECTS: 15

Requirements: none

Learning objectives

To familiarize students with the coherent radiation sources, i.e. Lasers and their application in plasma physics.

Learning outcomes

Students are expected to have:

- General skills: general knowledge about the types and principles of operation of certain types of lasers.
- Specific skills: knowledge about the possibilities of application of certain types of lasers in plasma diagnostics.

Syllabus

Theoretical instruction

The processes of emission and absorption of radiation. Stimulated emission. The population of the energy levels of atoms and molecules. Inverse population. Quantum amplifier and a quantum generator.

The processes of pumping, gas discharges, light absorption, chemical reactions, flow of current through the pn-junction.

Optical resonators, passive and active.

Characteristics of laser radiation. The interaction of laser radiation and matter. Damage of optical elements. Characteristics of laser materials.

Types of lasers. Helium-neon laser, Ruby laser. Neodymium laser. Argon laser. Nitrogen laser. CO_2 laser. Chemical lasers. Liquid lasers. Semiconductor lasers.

The application of lasers. The elements of nonlinear optics.

Practical instruction

Helium-neon laser, Neodymium laser.

Weekly teaching load				Other:
Lectures: 6	Exercises: 4	Other forms of teaching: seminars	Student research:	