

9th Summer School

# Plasmas in super-intense laser fields



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## X-rays for Diagnostic of Laser-Matter Interaction

*Lectures are devoted to X-ray radiation arising from the interaction of a laser with matter, and how it is used to diagnose plasma parameters. X-rays have many advantages over radiation in the optical and VUV-photon ranges. These are the fs-scale of relaxation of excited states upon irradiation with X-ray photons (compare with the ns-scale for optical and tens of ps- for VUV photons), low plasma absorption, and simple interpretation of the measured spectra.*

*At the beginning, we will discuss elementary processes in plasma, which lead to the formation of the charge state distribution and the population of the excited states of the ions. Radiative relaxation of the ion excited states causes the characteristic plasma self-radiation, which can be measured and used for plasma diagnostics.*

*Plasma generated in short-pulse laser interaction with matter has transient (time-dependent) features. It will be shown that the laser-produced plasmas are far from the thermodynamic equilibrium and have strong deviations from the Saha-Boltzmann distribution of bound electrons and from the Maxwell distribution of free electrons. All this must be taken into account in order not to be mistaken in the interpretation of experimental data.*

*In the lectures, particular attention is paid to the discussion of the formation and application of K-alpha and He alpha lines widely used for diagnostics of short pulse laser-matter interaction.*