S E M I N A R

LABORATORIJA ZA FIZIKU ATOMSKIH SUDARNIH PROCESA

"PULSED LASER INDUCED MATERIAL MOTION AND FLUORESCENCE"

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Good understanding of light-matter interaction is important in view of basic science and for a number of laser applications in industry and medicine. In this lecture emphasis will be given to dynamic aspects of laser-beam surface interaction in which the absorption of laser pulses results in different kinds of macroscopic material motion.

These phenomena have been widely studied in order to understand the interaction processes and to develop novel applications in several disciplines, such as non-destructive testing, spectroscopy, monitoring deexcitation processes and probing physical properties of materials. Within the various detection techniques we shall also describe a new and innovative method for high-speed two-frame shadowgraphy, which enables one to capture two temporally and spatially resolved images of laser induced plasma. It is used to measure the velocity of the ignition of the laser-induced plasma and the development of the shock wave within the nanosecond excitation-pulse as well as the velocities of the shock wave propagation and its decay into an acoustic wave motion.

In addition we shall also describe some recent results of laser induced fluorescence on variety of nanocrystals produced by flame spray pyrolysis and combustion related to the development of noncontact temperature measurements.

SEMINAR NA PMF UNIVERZITETA U NOVOM SADU

Optodynamics - a new interdisciplinary research field

The lecture will be devoted to the description of optodynamics as a new interdisciplinary research area dealing with mechanical aspects of the interaction between light and matter. In accordance with this definition a wide spectrum of phenomena can be treated associated with optodynamics:

- high intensity optoacoustics
- laser-induced shock waves
- laser ultrasonics
- pulsed laser materials processing
- pulsed laser medicine
- laser propulsion
- etc…

In view of optodynamics a laser beam is not only considered as a tool but also as a generator of information about the material processes. The information is retained and conveyed by different kinds of optically induced mechanical waves and in some cases also by macroscopic motion of the illuminated object. Several generation/detection schemes will be described how to extract this information to monitor some pulsed laser manufacturing processes. Attention will be also be given to one dimensional model, optical-to-mechanical energy conversion efficiency, linear momentum flow associated with laser ablation and to on-line observation of the workpiece deformation during laser processing using rapid 3D laser profilometry.