Dottorato di Ricerca in Fisica dell'Università degli Studi di Messina
5 Luglio 2012, ore 15.00, Aula E. Majorana del Dipartimento di Fisica
V.le F. Stagno d'Alcontres 31, S. Agata, Messina

Seminar title:

Fast diagnostic techniques for ion emission from high intensities laser-generated plasmas

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Abstract

Laser-generated plasmas have been obtained in high vacuum by irradiating thin and thick films at intensities between 10^{10} and 10^{16} W/cm^2. Plasmas, generated in backward and in forward direction, are monitored with different techniques in order to measure the mean parameters responsible of the ion acceleration along the normal to the target surface.

Plasma density, temperature, ion energy distribution, charge state distributions, expansion velocity and electric field developed in plasma, represent some of the parameters that can be measured.

At the higher laser intensities ion accelerations above 0.5 MeV/charge state can be produced and the use of peculiar laser-matter interactions permit to generate proton streams with a kinetic energy above 2 MeV and gold ion beams with charge states up to about 60^+.

Ion collectors, semiconductor SiC detectors and electrostatic ion energy analyzer have been employed in time-of-flight configuration technique in order to measure the ion velocities as a function of the angular distribution around the normal direction to the target surface. Thomson spectrometer, using multi-channel-plate detector coupled to phosphorous screen and CCD, has been employed in order to separate, in single laser shots, the different ion contributions to the charge emission, to have information on the ion charge states, energy and proton acceleration.

Thomson spectrometry spectra have been studied in detail thank to the comparison with accurate TOSCA parabola simulations.

Measurements, in collaboration with many research groups, are performed at Messina University, INFN-LNS of Catania and PALS Laboratories of Prague thank to national and international financial supports.