CONSIGLIO NAZIONALE DELLE RICERCHE
ISTITUTO NAZIONALE DI OTTICA

Avviso di Seminario

Il giorno giovedì 3 marzo 2011 alle ore 15,30 presso l'area della ricerca del CNR di Pisa,
Aula 44, primo piano, Edificio "A"

Il Dr. Anatoly Ya. Faenov

Joint Institute for High Temperature, Russian Academy of Science, Moscow, Russia

terrà un seminario dal titolo:

Low-threshold ablation of dielectrics and metals irradiated by ultrashort pulses of soft X-ray transient-collisional and free electron lasers.

Recent results of experimental and theoretical studies of ablation of condensed matter by soft X-ray transient-collisional and free electron lasers will be presented. A very low ablation threshold of LiF crystals ~ 10 mJ/cm^2 was determined for both types of lasers irradiation. This is substantially below the ablation thresholds obtained with other lasers having longer pulse duration and/or longer wavelength. Such low ablation threshold was explained in the frame of photo-thermo mechanical theory consideration. It was also experimentally shown that ablated mass of dielectric with strong growth of laser fluency in the case of XRL has slow growth. A theory is presented which explains this result as the transition from spallative ablation near threshold to evaporative ablation at high fluencies. It was also demonstrated that when aluminum surface of solid target was irradiated by the fluencies of up to 27 mJ/cm2 thhe surface modifications caused by the SXRL pulses were clearly seen, and it was found that the conical structures having about 70–150 nm in diameters were formed under a single pulse shot. The conical structures were formed in the features with the average depth of about 40 nm, and this value was in accordance with the attenuation length of the SXRL beam for Al. Thermo-mechanical modeling of SXRL laser interaction with Al surface, which explains nanostructure surface modification, will be provided. All obtained results clear demonstrated that ultrashort soft X-ray laser irradiation of different materials could be used for micromachining of different materials.

Antonio Giulietti