ID contributo: **50**

Tipo: **Poster**

Towards acceleration of high-quality electron beams: Manipulation and characterization of ultra-short laser pulses

Abstract: The state-of-art generation of high-intensity laser pulses enables the construction of a particle accelerator with accelerating gradients on the order of hundreds of GV/m. Through laser-plasma interaction and the charge dynamics within the resultant plasma wave structure, high-amplitude accelerating and focusing electric fields are formed [1]. These enable electron beams to be accelerated to relativistic energies. In order to establish a solid infrastructure for commercial applications of such an acceleration method, the generation of high-quality electron bunches is essential. One of the reasons for the deteriorated quality of the electron beam is the quality of the interacting laser pulse itself, which can generally be affected by dispersive and nonlinear effects that occur in refractive optics. For this reason, Off-Axis Parabolic (OAP) mirrors have become vital in many high-power laser facilities. One of them is the Intense Laser Irradiation Laboratory at CNR-INO in Pisa, Italy, with peak power up to 220 TW generating <25 fs laser pulses of energy >5 J [2]. Their frequent use is caused by their achromaticity and the possibility of attaining extremely high intensity, as they do not exhibit the inherent Fresnel losses or absorption of the bulk material. However, when dealing with ultra-short and ultra-intense laser pulses, knowledge of the temporal and spatial structure of the electric fields in the focal region of OAPs is fundamental. Furthermore, a broad spectrum of fs-laser pulses should also be considered. Therefore, a preliminary study on the spatial and temporal profiles of non-monochromatic laser pulses based on the full Stratton-Chu vector diffraction theory [3,4] is presented.

Keywords: Laser Wakefield Acceleration, Off-axis parabolic mirrors, Full Stratton–Chu vector diffraction theory, Non-monochromatic laser pulse

[1] T. Tajima and J. M. Dawson, "Laser Electron Accelerator,"Phys. Rev. Lett. 43, 267 (1979).
[2] L. A. Gizzi, L. Labate, F. Baffigi, et al. "Overview and specifications of laser and target areas at the Intense Laser Irradiation Laboratory,"High Power Laser Sci. and Eng. 9, e10 (2021).
[3] L. A. Stratton and L. J. Chu, "Diffraction Theory of Electromagnetic Waves," Phys.Rev. 56, 99 (1939).
[4] L. Labate, P. Ferrara, L. Fulgentini, and L. A. Gizzi, "Effects of small misalignments on the intensity and Strehl ratio for a laser beam focused by an off-axis parabola," Appl. Opt. 55, 6506-6515 (2016).

Autore principale: GREGOCKI, David (Consiglio Nazionale delle Ricerche - Istituto Nazionale di Ottica)

Coautore: Dr. LABATE, Luca (Consiglio Nazionale delle Ricerche - Istituto Nazionale di Ottica); Dr. GIZZI, Leonida Antonio (Consiglio Nazionale delle Ricerche - Istituto Nazionale di Ottica)

Relatore: GREGOCKI, David (Consiglio Nazionale delle Ricerche - Istituto Nazionale di Ottica)

Classifica Sessioni: Poster Session & Industry Display