Caracterisation of spatio −temporal couplings of UHI100 laser beam at the focal point

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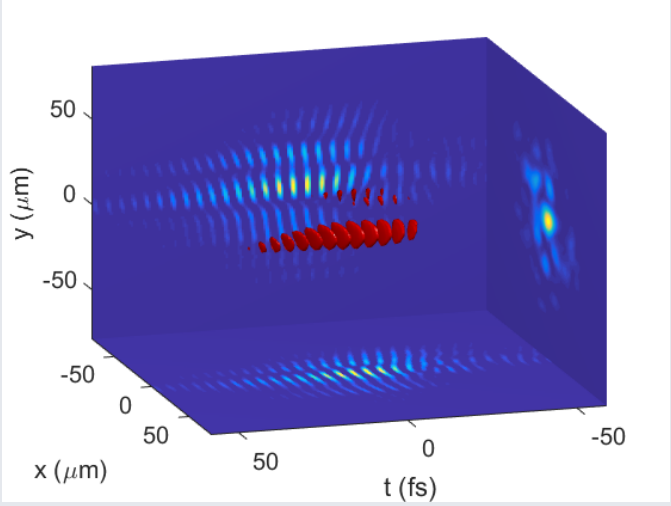
The knowledge of the real properties of the laser beam close at the interaction point is crucial to understand the physical processes involved in laser-plasma coupling. A new technique of spatio-temporal metrology, named INSIGHT, has been developed by A. Borot and F. Quéré, from CEA-LIDYL. It enables to measure the full intense laser pulse electric field at the focus, which means where the laser-plasma interaction takes place. This has been successfully set-up on UHI100 laser facility, in the experimental room dedicated to electron acceleration. The measurements have led to the identification of spatio-temporal couplings, and in particular a linear variation of the spatial phase frequency before focusing, which presents as, at focus, a wave front direction change with time. This effect is visible on figure 1, which shows the laser pulse reconstruction with space and time, and specifically the projection on the (x=0,y) plane. Higher order effects have also been observed.

The next step is to introduce this real measurement of the laser properties at focus, inside a quasi-3D simulation code, WARP, to model the laser-plasma interaction, and to compare the simulation results to the experimental ones for the relativistic electron beam.



3D reconstruction of the E-field amplitude of the UHI100 laser, measured at the focal point, by INSIGHT technique. On each side, the field projection on each coordinate is reported.

Résultats obtenus dans le cadre du projet ECOLE-ALP financé par le thème 3 du LabEx PALM et porté par Sandrine Dobosz (LIDYL, CEA) et Gilles Maynard (LPGP, CNRS).