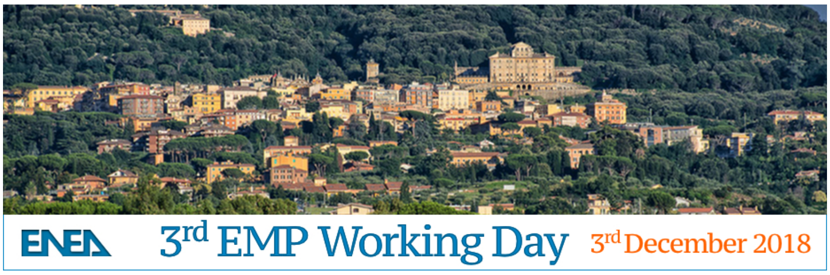

Contribution ID: **6**

Type: **Oral Presentation**

Generation of strong magnetic fields with lasers: from nano- to picoseconds

Recent experiments with high intensity lasers are showing possibilities to generate strong magnetic fields exceeding a kiloTesla level. They are promising new studies of laser matter interaction in unexplored domain. However, the physical processes leading to generation of strong quasi-stationary currents exceeding hundreds of kiloAmperes are not sufficiently understood. In this talk we present theoretical models and target setups that can be used for generation of strong magnetic fields on nanosecond and picosecond time scale and several examples of their application in experiments.

Magnetic fields of nanosecond duration are generated in a coil connected to a laser-driven diode, which supplies a quasi-stationary electric current. We present a self-consistent model explaining generation of a strong magnetic field in such a system, which accounts for three major effects controlling the current: space charge neutralization in the diode, plasma magnetization and heating of the coil wire. The model provides the necessary conditions for transporting strongly super-Alfvenic currents in the system. Its validity is confirmed by a comparison with experimental data.

Magnetic fields induced by sub-picosecond laser pulses may exist much longer time than the laser pulse duration. Their origin is in supra-thermal electron ejection from the target or in generation of hot electron vortices. Without confinement, these magnetic fields are emitted in a form of high amplitude electromagnetic pulses presenting danger for diagnostics operation and electronic devices in the experimental chamber. In contrast, while confined within the target structure, these magnetic fields could be used for controlling electron and ion acceleration and guiding. We present a theoretical model of target charging and electromagnetic field generation followed with several examples of its application in experiments.

Primary author: Prof. TIKHONCHUK, Vladimir (CELIA, University of Bordeaux and ELI-Beamlines, Pregue)

Presenter: Prof. TIKHONCHUK, Vladimir (CELIA, University of Bordeaux and ELI-Beamlines, Pregue)