

PhD GRANTS 2024

PhD project title: Design of a new type of compact accelerator for the generation of ultra-short electron bunches

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PhD project summary (max. 20 lines):

The thesis concerns an important part of the European project EIC “TWAC” (Terahertz Waveguide Accelerating Cavity) and will be carried out in collaboration with IJCLab (Orsay, France).

Particle accelerators, and in particular electron accelerators, are central devices in a wide range of applications in both fundamental and medical physics. However, there is an urgent and growing need to reduce the footprint of these facilities to make them unique tools for a multitude of applications in industry, laboratories and universities.

Over the past decades, **new acceleration techniques such as laser-plasma acceleration (LPA) and laser-dielectric acceleration (DLA) are emerging as concrete alternatives for the next generation of accelerators.** However, despite accelerating over extremely short distances, the electron beam properties of these new sources remain a major limitation as an alternative to conventional accelerators, despite constantly improving levels of performance and reliability. More recently, dielectric terahertz acceleration (DTA) has also emerged as a very promising area for the acceleration and manipulation of electrons. The research work will consist of studying a new so-called hybrid acceleration strategy combining different types of acceleration (conventional, DTA, LPA) which would allow **a significant reduction in the infrastructure footprint while maintaining good electron beam properties.** We propose to study theoretically and numerically a hybrid accelerator system and will focus on the IJCLab accelerator complex (Orsay). The internship will involve the development of original codes as well as the use of existing codes for the integration and/or analysis of electron beam dynamics.