Joint DESY and University of Hamburg Accelerator Physics Seminar

Tuesday, 23.07.2024 16:00

Hybrid Seminar:

Seminar Room 30b/459 & zoom Video Access

Time Characterization of the Electron Bunch at ARES: from the Commissioning Phase to Advanced Diagnostics Development

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Abstract

The ARES (Accelerator Research Experiment at Sinbad) linear electron accelerator at DESY, which generated its first beam in October 2019, aims to deliver ultrashort electron bunches (fs to sub-fs) with excellent momentum and arrival time stability (10 fs rms or below) for the purpose of applications linked to accelerator research and development (compact and advanced time profile diagnostics and accelerating structures development, medical applications studies, test of new accelerator components, machine learning, etc.). The targeted bunch duration and arrival time stability are close to the resolution limit of state-of-the-art diagnostics, their measurement thus representing a challenge on its own. During the commissioning phase of ARES, self-embedded diagnostics, namely diagnostics using only elements present for other purposes on the accelerator beamline, were used for their characterization due to the absence of dedicated diagnostics. A bunch duration of 20 fs rms (resolution-limited) and an arrival time jitter between 50 fs and 20 fs rms were demonstrated, representing major steps towards ARES ultimate goals. During these campaigns, the photocathode response time and the phase velocities of the ARES travelling wave accelerating structures were also determined leading to an improved understanding of ARES and a significantly better overlap between the experimentally measured bunch duration and the simulated one. ARES is now used, among other applications, as test platform for compact and advanced bunch duration diagnostics in the femtosecond range. The most recent experimental campaign for the EIC-funded TWAC (Terahertz Wave Accelerating Cavity) project, aiming to demonstrate the applicability of passive streaking to low-charge (around 10 pC) and low-momentum (20 MeV) short electron bunches, falls within this framework.

Access to seminar room 30b/459 only for a limited no. of participants! Please consider our zoom link

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