DESY SRF R&D Seminar

and

Joint DESY and University of Hamburg Accelerator Physics Seminar

Wednesday, 16.12.2020 13:30

ZOOM video seminar (needs version 5.0+)

Current Status of the Optimization of the SRF Photo Injector for the CW European XFEL

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Abstract

An upgrade of the European XFEL towards the operational regime with continuous wave (CW) or long pulse mode brings significant benefits to users of the free-electron laser (FEL) X-Rays. This includes more flexible time structure, higher average brilliance, improved stability and more. The quality of the electron beam produced at the injector has a major impact on the overall performance of the FEL. Moreover, the accelerating gradient of the linac in the CW mode will be lower in comparison to the pulsed regime. Hence, a higher brightness of the electron beams is needed in order to fulfil the requirements for the FEL operated with short wavelength. In this framework, we report the current status of the multi-objective optimization of the CW SRF photo-injector based on the DESY L-band CW SRF gun. At this stage, we consider various scenarios (cathode laser profiles, gun gradients etc.) and describe the performance of the SRF photo injector in terms of beam dynamics simulations. The optimized electron bunches from the injector are further tracked in OCELOT and IMPACT-Z through a whole conceptional CW XFEL accelerator beamline till the undulator entrance. Longitudinal beam dynamics case studies are carried out in presence of collective effects (space charge, wake, CSR) to justify the beam qualities in front of the undulators. First simulations have shown promising results: a reasonably good emittance of the produced electron bunch with a slice energy spread of a couple of MeVs while being compressed to a few kA's peak current.

NOTE THE UNUSUAL DATE AND TIME

D.Reschke, (DESY), M.Wenskat (Univ. HH), W.Hillert, (Univ. HH), I.Agapov (MPY) and M.Vogt (MFL).

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