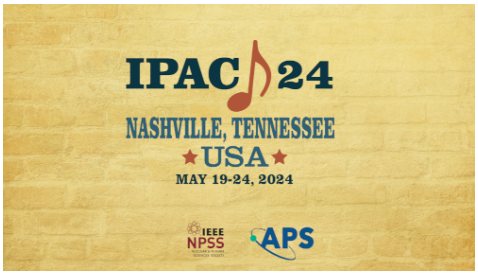

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Simulation optimization of electrom beams from the ELBE superconducting RF gun for ultrafast electron diffraction

Wednesday, 22 May 2024 16:00 (2 hours)

Moving towards beam energies around 2-6 MeV in ultrafast electron diffraction (UED) experiments allows achievement of larger coherence length for better *k*-space resolution, while the temporal resolution is improved when shorter electron bunches are generated and the velocity mismatch between the optical pump and UED probe is reduced.
At Helmholtz-Zentrum Dresden-Rossendorf (HZDR), a series of superconducting cw RF (SRF) guns has been designed, build, and tested, with the latest version currently in routine operation as one of the electron sources for the ELBE Center for High Power Radiation. This SRF photoinjector produces bunches with a few-MeV energies at up to MHz repetition rates, making it a suitable electron source also for MeV-UED experiments. The high repetition rate provides a significant advantage for the characterization of samples with low scattering cross-sections such as liquids and gases.
In this paper, we outline the conceptual MeV-UED instrument program under development at HZDR. We also showcase the beam quality achieved in first simulations of the ELBE SRF gun operating at low bunch charge as an electron source for diffraction experiments.

Footnotes

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