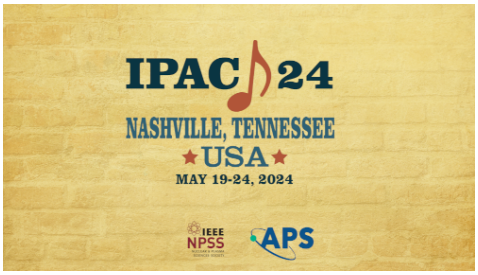

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Optimizing plasma-downramp profiles and beam transport for emittance preservation in multi-stage plasma accelerators

Monday, 20 May 2024 16:00 (2 hours)

Plasma-based particle accelerators maintain accelerating fields that are several orders of magnitude higher than conventional accelerators. This allows for more compact accelerator footprints that can deliver particle beams of very high charge (> 100 pC) and large current (> kA) for various applications. Plasma-wakefield accelerators are promising candidates for next-generation TeV-class electron-positron colliders for high-energy physics and secondary light sources. However, to reach the desired TeV energy regime, a staging approach of independent laser-driven plasma accelerators that each preserve low energy spread and beam emittance is required. Maintaining beam emittance over tens and hundreds of stages is a serious challenge but is crucial to achieve a high luminosity in future collider experiments. We present results for the optimization of plasma-stage downramp profiles and inter-stage beam transport in simulations of multi-stage plasma accelerators, carried out with codes from the Beam pLasma & Accelerator Simulation Toolkit (BLAST) and steered by optimas, a Python library for optimization at scale, powered by libEnsemble.

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