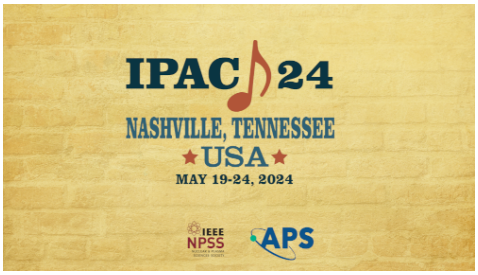

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A compact source of positron beams with small thermal emittance

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

In this contribution, we investigate electrostatic traps as a novel source of positron beams for accelerator physics applications. Penning-Malmberg (PM) traps are commonly employed in low-energy antimatter experiments. Positrons contained in the trap are cooled to room temperature or below. We calculate the thermal emittance of the positrons in the trap and show that it is comparable to or better than the performance of state-of-the-art photocathode guns. We propose a compact positron source comprised of a PM trap, electrostatic compressor, and RF accelerator that can be built and operated at a fraction of the cost and size of traditional target-based positron sources, albeit at reduced repetition rate and with intrinsic angular momentum. We model the acceleration of a positron bunch up to an energy of 17.6 MeV with a final thermal emittance of 0.60 micron-rad and bunch length of 190 microns. This system may be useful for accelerator physics studies, such as investigations of flat-beam sources for linear colliders and positron plasma wakefield acceleration.

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