

Abstract Submitted
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**Controlling Interaction of Pair-plasmas with Laser-plasmas:
Laser Positron Accelerator**¹ AAKASH A. SAHAI, University of Colorado,
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ACCELERATOR COLLABORATION — Laser electron accelerators [1], utiliz-
ing CPA laser driven collective plasma modes are now recognized as a means for
centimeter-scale acceleration of multi-GeV electron beams with various applications.
Unfortunately, even with the rapid development of laser electron accelerators, laser
acceleration of exotic particles like positrons remains unexplored. We propose to
pioneer the first-ever prototype of a Laser Positron Accelerator that will pave the
way for centimeter-scale acceleration of tunable positron beams at numerous laser
facilities worldwide with new applications such as crystal channeling [2] and accel-
eration [3]. This work uses an innovative two-laser two-stage model [4] where a
laser-driven plasma (stage 2) is used to post-process e^+e^- pair-plasmas produced
(stage 1) in a target by laser accelerated electrons. It is timely due to the success of
two recent experiments: (a) all-optical shower production [5]; (b) multistage laser
electron acceleration [6]. The goal is to tune the pair-plasma characteristics in order
to match them with the chosen post-processing stage properties, specifically to trap
and accelerate a spectrally peaked positron beam through controlled interaction [4]
between pair-plasma and laser-driven plasma waves.

¹[1]PRL 43 (1979) [2]Fermilab-TM-2568 (2013) [3]Phys. Plasmas 25, 023112 (2018)
[4]PRAB 21,081301(2018) [5]PRL 110,255002(2013) [6]Nature 530,p.190(2016)

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