# **Compact Positron Source**

## arXiv 2301.08368

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#### Low Energy Positron Source

**GBAR** Positron Source



Buffer Gas Trap Schematic



Low energy positron sources are commonly employed in antimatter and material science studies.

## **Combine Positron Source with Accelerator**

We are exploring the possibility of accelerating positron beams from the trap:

- <u>https://arxiv.org/abs/2301.08368</u>
- Advantages includes:
- Small thermal emittance
- Compact size/low cost
- Polarized positrons from <sup>22</sup>Na

**Disadvantages:** 

- Very-low positron rate X
- Low-energy/long bunch ×

The beam is magnetized.



A Compact Source of Positron Beams with Small Thermal Emittance, R. Hessami and S. Gessner, arXiv 2301.08368 (submitted to PRAB)

This novel, low-cost positron source can enable accelerator physics studies and ultrafast material science research.

### Positron Source for Linear Collider?

Linear colliders require  $10^{14} e^{+}/s$  at the IP.

This source only provides  $10^8 e^+/s$ . This seems like too large a gap!

However, this possibility is worth exploring in more detail because the cost of the sources and damping rings for a Linear Collider exceed **\$1B!** 

The concept of multiplexing the positron source already exists. Two research areas:

- 1. How to extrapolate from a 4-cell trap to a 1000-cell trap? Economy of scale?
- 2. How to accommodate stronger <sup>22</sup>Na sources?



Damping-ring-free electron injector proposal for future linear colliders, T. Xu et al. Phys. Rev. Acc. Beams (2023)



Confinement and manipulation of electron plasmas in a multicell trap, N. Hurst et al. Phys. Plasmas (2019)