



Contribution ID: 53

Type: **Early Career (Eligible for Oral or Poster)**

Liquid Xenon Positron Target

Wednesday, 17 May 2023 14:50 (10 minutes)

Positron targets are a critical component of future Linear Colliders. Traditional targets are composed of high-Z metals that become brittle over time due to constant bombardment by high-power electron beams. We explore the possibility of a liquid xenon target which is continuously refreshed and therefore not susceptible to the damage mechanisms of traditional solid targets. Using the GEANT4 simulation code, we examine the performance of the liquid xenon target and show that the positron yield is comparable to solid targets when normalized by radiation length. Additionally, we observe that the peak energy deposition density (PEDD) threshold for liquid xenon is higher than for commonly employed metal targets, which makes it an attractive, non-toxic positron target alternative. We develop parameter sets for demonstration applications at FACET-II and future Linear Colliders.

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Session Classification: Accelerator: Particle Sources

Track Classification: Accelerator: Particle Sources