Contribution ID: **80** Type: **not specified**

Production and detection of muons using electron beams from a Laser Plasma Accelerator

Monday, 22 July 2024 17:12 (24 minutes)

Muons and their applications in tomography of large objects have recently gained significant interest within the accelerator physics community. However, the lack of portable muon sources has limited muon tomography to relying on cosmic rays, which have a typical flux of $F\ 1s^{-}1cm^{-}2$ at ground level for muon energies above 1 GeV. This low flux restricts muon tomography to objects that remain immobile for extended periods. Laser-Plasma Accelerators (LPAs) have demonstrated production of multi-GeV-class electron beams over compact accelerating lengths. When a converter target is placed in front of the generated electron beam, a substantial number of muon pairs are produced via the Bethe-Heitler process. Therefore, an LPA can serve as a viable, compact, and transportable high-flux muon source. In this talk, we present recent experimental results at the BELLA Center, where muon production from LPA-produced, multi-GeV electron beams was demonstrated. Simulations show that the interaction of the beam with the layers of lead contained in the electron beam dump produce a collimated cone of muon pairs, which were detected on the other side of the wall using scintillating paddles and pixelated silicon detectors.

This work was supported by DARPA. This work was also supported by the Director, Office of Science, Office of High Energy Physics, of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231, and used the computational facilities at the National Energy Research Scientific Computing Center (NERSC).

Working group

WG5 : Beam sources, monitoring and control

Primary author: TERZANI, Davide (Lawrence Berkeley National Laboratory)

Co-authors: Dr KISYOV, Stanimir (Lawrence Berkeley National Laboratory); GREENBERG, Stephen (Lawrence Berkeley National Laboratory); LE POTTIER, Luc (Lawrence Berkeley National Laboratory; University of California); Dr MIRONOVA, Maria (Lawrence Berkeley National Laboratory); LI, Raymond (Lawrence Berkeley National Laboratory; University of California); PICKSLEY, Alex (Lawrence Berkeley National Lab); STACKHOUSE, Joshua (Lawrence Berkeley National Laboratory; University of California); Dr TSAI, Hai-En (Lawrence Berkeley National Laboratory); ROCKAFELLOW, Ela (University of Maryland); Dr HEIM, Timon (Lawrence Berkeley National Laboratory); Dr GARCIA-SCIVERES, Maurice (Lawrence Berkeley National Laboratory); BENEDETTI, carlo (LBNL); VALENTINE, John (Lawrence Berkeley National Laboratory); Prof. MILCHBERG, Howard (University of Maryland); NAKAMURA, Kei (Lawrence Berkeley National Laboratory); GONSALVES, Anthony J. (Lawrence Berkeley National Laboratory); SCHROEDER, Carl (Lawrence Berkeley National Laboratory); VAN TILBORG, Jeroen (LBNL); ESAREY, Eric (LBNL); GEDDES, Cameron (LBNL)

Presenter: TERZANI, Davide (Lawrence Berkeley National Laboratory)

Session Classification: WG5