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## Charge and energy calibration of the ProtoDUNE-SP detector using cosmic ray muons

ProtoDUNE-SP is a Liquid LArTPC built at the CERN neutrino platform. In a LArTPC many factors, including Space Charge Effect, attenuation due to electronegative impurities, diffusion, and inactive wires, lead to non-uniformity in the charge deposition in various parts of the detector. We use the detector response for the through-going cosmic muons as a data-driven correction to remove any non-uniformities in the charge deposition throughout the TPC. We then perform the energy scale calibration using a sample of stopping cosmic muons such that we have a portion of a track for which  $dE/dx$  is theoretically known to better than 1%. In this method, we calculate the correction factors to remove non-uniformity in  $dQ/dx$  in each part of the detector and in time. We then find the absolute calibration constant to convert  $dQ/dx$  to  $dE/dx$  comparing observed values with theoretical predictions.

### Mini-abstract

Cosmic muons as a calibration source for charge and energy calibration of the ProtoDUNE-SP LArTPC.

### Experiment/Collaboration

ProtoDUNE-SP/DUNE

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