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The photo-detection system and double calorimetry in DUNE

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The Deep Underground Neutrino Experiment (DUNE), the next generation long-baseline neutrino experiment, comprises a suite of Near Detectors and four Far Detectors based on the Liquid Argon TPC technology which is enhanced by a powerful Photon Detection System (PDS) that records the scintillation light emitted in Argon. Besides providing the timing information for an event, which is necessary for reconstructing the drift coordinate of ionizing particle tracks, photon detectors can be effectively used for other purposes including calorimetric energy estimation.
The two observables generated from energy deposition by particles in liquid Argon are charge and light. Therefore, a calorimetric measurement to determine the energy of neutrino beam events can be performed by exploiting the complementarity of the two.
The visible energy can also be estimated by using charge information alone, however, only electrons escaping recombination and reaching the wire planes can be used so corrections must be applied for this loss. As charge and light are anti-correlated and their sum is directly proportional to the total energy deposited the advantage of using both and is that the correction for recombination is no more necessary. When using the light information we profit as well from a detailed end-to-end simulation of our photodetection system.
I will present an overview of DUNE PDS and the results obtained for calorimetric measurements in the DUNE horizontal-drift Far Detector by combining charge and light in pure liquid Argon.

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