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ProtoDUNE PDS Sim/Reco meeting - 30/10/2023

ProtoDUNE PDS characterisation/performance

- Calibration and monitoring
 - Multiple PEs plot, charge and max amplitude
 - Gain vs applied bias voltage, SNR, calibration factor
 - Crosstalk & afterpulses
 - Time resolution
 - Response stability overtime

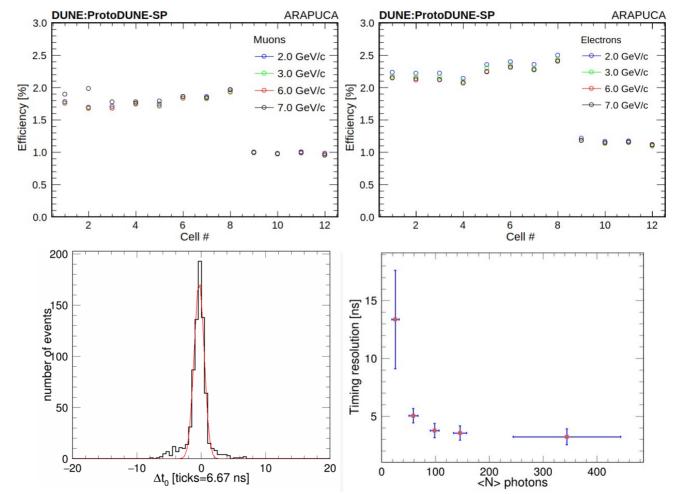
- Cosmics
 - Signal characteristics:
 - Baseline, noise
 - SPE: amplitude, rise, fall, etc
 - Sensor efficiency (track, MC light estimate)
 - Time resolution (distance, track)

• Beam

- Beam characteristics, particle types
- Optical properties (MC tunning)
- Sensors efficiency (MC light estimate)
- Time resolution (distance, track)

List not updated: Pulsed neutron source, rad. sources, Ion. laser.

Examples from pDUNE-SP



Beam

Sensors efficiency (MC light estimate)

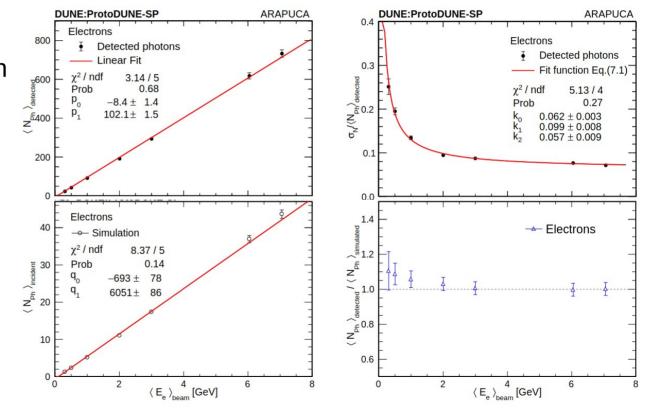
Time resolution (distance, track)

https://arxiv.org/pdf/2007.06722.pdf

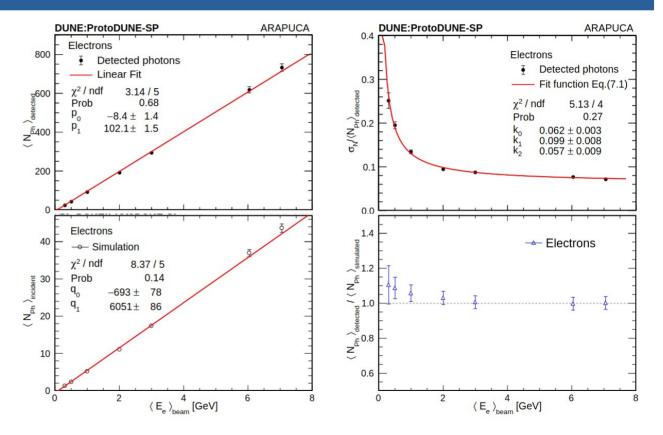
https://indico.fnal.gov/event/53004/contributions/245849/attachments/158471/207932/NuFACT2022_presentation_AjibPaudel.pdf

- PDS calorimetric energy reconstruction
- Combined charge+light calorimetry
- Michel electrons (LE calorimetry)

- PDS energy reconstruction
 - Independent measurement

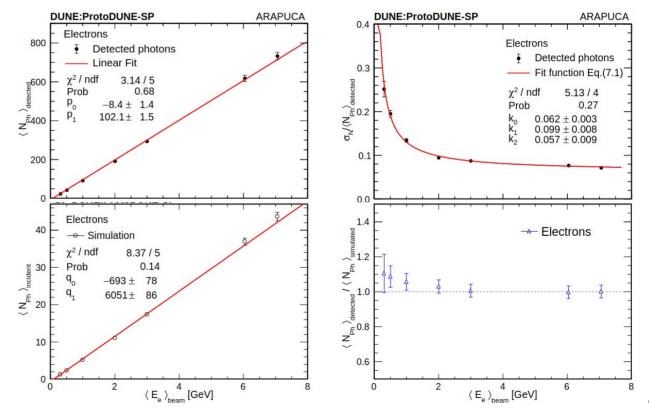


- PDS energy reconstruction
 - Independent measurement
- Light + charge calorimetry
 - Anti-correlation understanding
 - Resolution improvement
 - No recombination correction



https://indico.physics.ucsd.edu/event/1/contributions/97/attachments/12/31/Djurcic_LIDINE_2021_vs.pdf https://agenda.infn.it/event/33107/contributions/205130/attachments/112095/160096/NeutrinoTelescope23_brunetti.pdf

- PDS energy reconstruction
 - Independent measurement
- Light + charge calorimetry
 - Anti-correlation understanding
 - Resolution improvement
 - No recombination correction
- Michel electrons
 - Physics (Oscillation and SNB)
 - Low energy range (<60MeV)
 - Energy & time information?



 $https://indico.fnal.gov/event/57487/contributions/267740/attachments/167296/223184/20230523_vpec_dune_cm_ql_combined_calo.pdf$

- PDS calorimetric energy reconstruction
- Combined charge+light calorimetry
 - Michel electrons (LE calorimetry)
- Areas/opportunities where PDS info can help improve Physics?
 - Neutron interaction studies?
 - Inelastic (n-p interactions, y de-excitation), elastic (LE p), capture (y)
 - Low energy point-like deposits?