DUNE Calibration WG Update on Activities

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DUNE Calibration Working Group Meeting

January 24th, 2020

News

- Multiple Calibration WG members are being left out of discussion in bi-weekly meetings due to time being bad
  - In particular, current time is **too late for non-US members**
  - Will send out a second Doodle poll to see if we can rotate between two times: current afternoon time (Fridays, 2pm-3pm CT) and a morning time – one per month each (so still bi-weekly meetings overall)
- WG mailing list: **dune-physics-calibration@fnal.gov**
  - Please sign up via FNAL LISTSERV if you haven't already
  - **Currently 67 members!**
- Today: present update on first studies being planned for May collaboration meeting
  - No dedicated meetings for January collaboration meeting given that we've only started WG activities

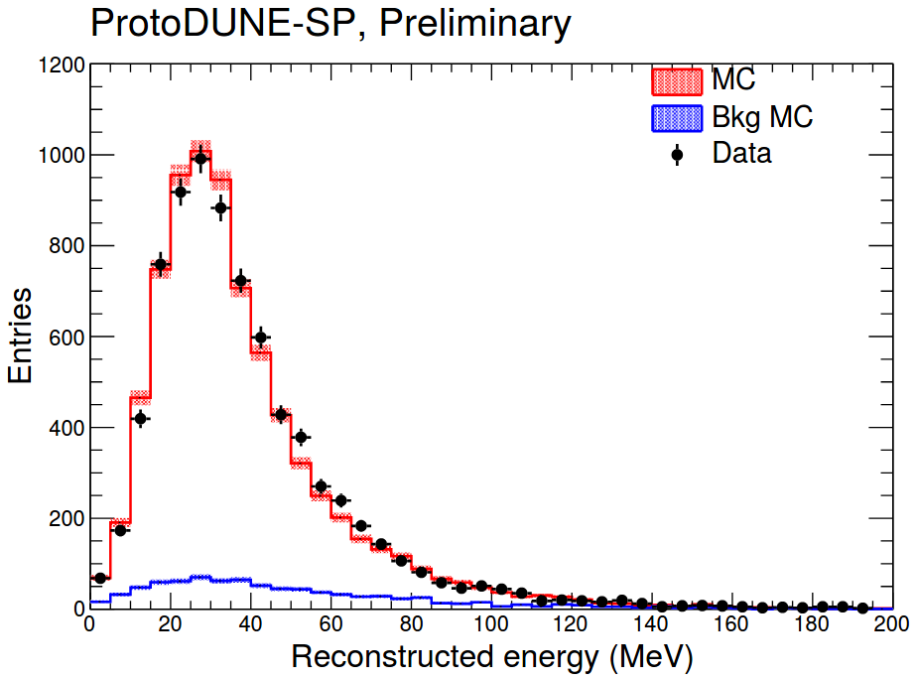
WG Goals and First Studies

- Reminder of goals of DUNE Calibration WG:
  - (1) Develop strategy for low-level calibrations at DUNE
  - (2) Develop strategy for high-level calibrations, making use of "standard candles" to probe particle-level detector systematics
  - (3) Evaluate impact on DUNE physics measurements/sensitivities
- Discussed in last meeting that it would be useful to have better feeling of statistics for various standard candles, and power toward constraining low-level/high-level parameters
- Toward that end, three studies being planned:
  - Electron lifetime studies in DUNE FD using cosmic muons
  - Low-energy electron energy constraint w/ Michels in DUNE FD
  - High-energy elec./photon energy constraint w/ π^0s in DUNE FD
- In all cases, use ProtoDUNE-SP studies as starting point

Elec. Lifetime w/ Cosmics

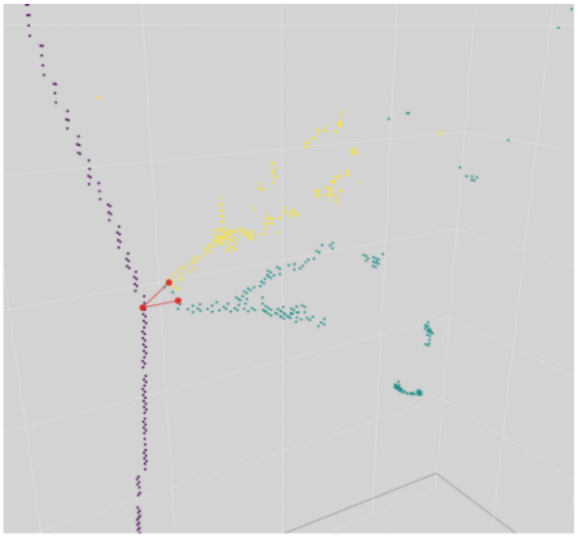
- Contributors: Sheffield (Praveen Kumar, GS; Viktor Pec, PD; Vitaly Kudryavtsev, PI)
- Major concern about our capability of using cosmic muons in measuring electron lifetime in DUNE FD
  - Very low cosmic rate at FD compared to ProtoDUNEs
  - Can we handle expected spatial/temporal variations with limited statistics?
  - Cosmic muons at DUNE FD are much higher energy… will this complicate the measurement? Different reco. than ProtoDUNEs?
- Has implications for broader strategy involving hardware calibration systems (UV laser, pulsed neutron source)
  - How often to perform dedicated hardware calibration runs?
- First study will be updating expected cosmic muon rate, including that for Michels, stopping muons, neutral pions

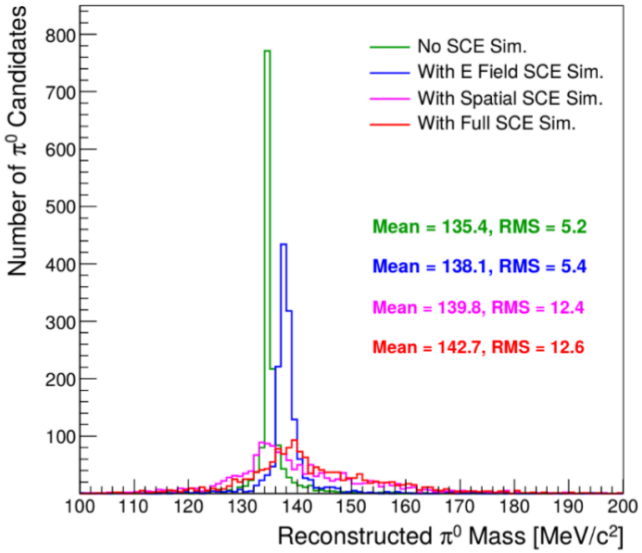
Michel Electron Studies



- Contributors: ANL (Aleena Rafique, PD; Zelimir Djurcic, PI)
- Use Michel electrons to constrain low-energy electron energy scale (and resolution) with data at DUNE FD
- First studies will be carried out by Aleena, repeating what she did for ProtoDUNE-SP; can we increase efficiency?

Neutral Pion Studies





- Contributors: CSU (Lane Kashur, GS; Justin Mueller, GS; Mike Mooney, PI), BNL (Jacob Larkin, GS; Elizabeth Worcester, PI)
- Use neutrino induced (and cosmogenic?) netural pions to constrain “high-energy” electron/photon energy scale (and resolution) with data at DUNE FD
- Building off of large ProtoDUNE-SP effort (CSU/LBNL/SLAC)
- Do we need to rely on ProtoDUNE-SP data for this constraint?

Discussion

- Clearly this is just a start… what are we missing?
- Please let the conveners (David C., Mike M.) know if you are interested in studying something different in the near (or long) term
  - We are expecting to expand our list of items to be studied over the next few weeks

BACKUP SLIDES