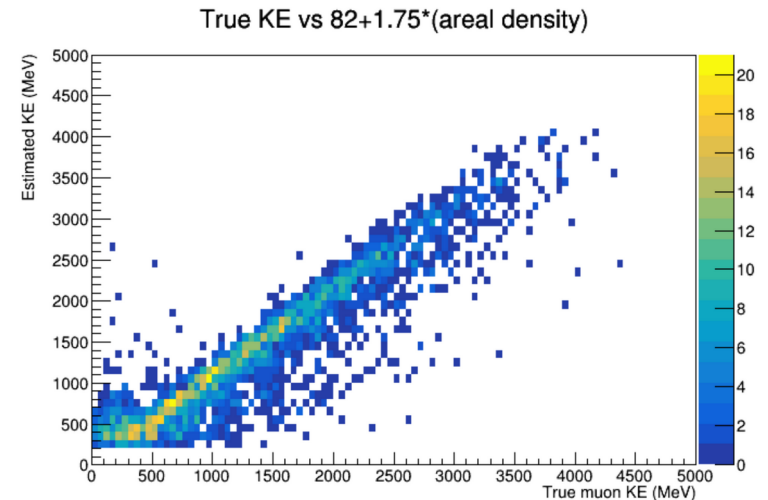# Status of TMS studies

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Introduction

- Areal density fix is in

  - Thank you reviewing the PR, Liam

- After last meeting, I posted reference plots using geom v3 with the areal density fix here

  - Something to compare with

  - Includes info about how files were generated in case of questions

- Code, Wiki

  - How to make plots, datasets

  - Please add info as needed

This is true muon KE vs KE estimate for all muons that start in TMS

My Schedule

- Traveling back from Cern Dec 14th – Need chair

- Do we want to meet Dec 21st? Last Thursday before break

Things I'm working on

- Fix spill simulation for production
  - Explained next slide

- Add per-reco-track truth information
  - Explained in 2 slides

- Finish det simulation
  - Fiber simulation needs to be a bit more complex

- Make samples with variations of det sim
  - At least make configs for production to use

- TMS framework and core software workshop next week

- TMS calibration

Fix spill simulation for production

- edep sim and prod spill builder handled pileup differently

  - Pileup = multiple possibly overlapping events in the same spill

- Spill builder way can load portions only of hits at a time for LAr sim

  - Full spill < 1GB in TMS

- TMS code needs to understand spill builder way

Edep sim way

ttree entry 1:
- interaction 1, spill 1, t=0ns
- interaction 2, spill 1, t=10ns
- interaction 3, spill 1, t=30ns
- …

ttree entry 2:
- interaction n+1, spill 2, t=0ns
- interaction n+2, spill 2, t=10ns
- interaction n+3, spill 2, t=30ns
- …

Spill Builder way

- interaction 1, ttree entry 1, spill 1, t=0ns
- interaction 2, ttree entry 2, spill 1, t=10ns
- interaction 3, ttree entry 3, spill 1, t=30ns
- …
- interaction n+1, ttree entry n+1, spill 2, t=0ns
- interaction n+2, ttree entry n+2, spill 2, t=10ns
- interaction n+3, ttree entry n+3, spill 2, t=30ns
- …

Add per-reco-track truth information

- Time slicer and muon truth info don't play well together
  - See issue 42

- Time slicer splits spill with multiple interactions into "slices"
  - Tries its best to split into single events but you're going to have pileup

- Study scripts use Muon_TrueKE branch and some others
  - Only filled when the time slicer is not run
  - With pileup, you can have 2 or more muons

- Save truth information per reco track instead
  - Also fill Muon_TrueKE with most energetic true muon in slice to keep some backward compatibility

TMS Projects I'm aware of

- Asa Nehm

  – per-view track reconstruction → 3D track reconstruction

- Lukas Koch

  – ND geometry

- Liam O'Sullivan

  – dune-tms git owner and caf integration

- Sushil Shivakoti

  – Muon energy resolution

- Xiaoyan Huang

  – Muon reco efficiency and detector simulation comparisons

- Michael Dolce

  – Possible B-field studies

Style Guides

- We should start following the style guides
  - https://github.com/DUNE/dune_plot_style/tree/main
  - https://github.com/DUNE/dune_plot_style/blob/main/guidelines.md
- Make our plots from make_hist.py follow them
  - Ideally make a separate plotting script that plots from root file
- Nice small project
  - Learn more about root

Conclusion

- Lots of work to do

- Goals
  - help with design decisions, PDR, TDR
  - make code that works long-term for actual detector
  - develop skills of the graduate students

- I'm going to be gone super soon
  - We made a lot of progress in short time
  - Hoping to get things fully on track before I go