Fermilab

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LArG4 support project report

Hans Wenzel
LArSoft Coordination Meeting
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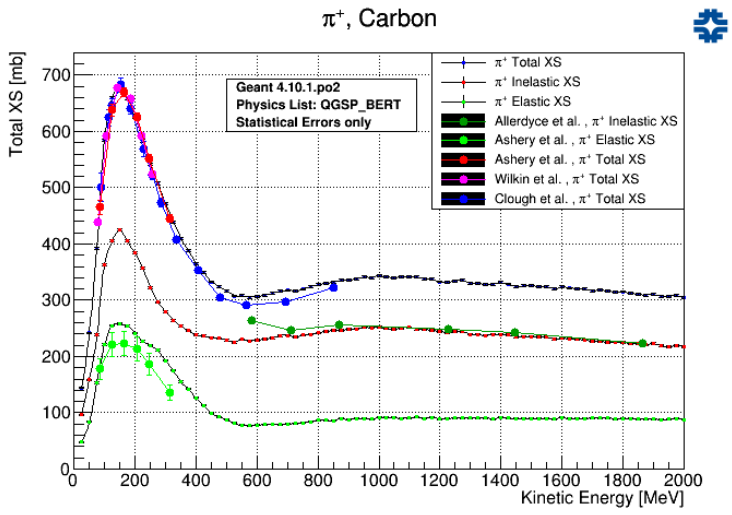
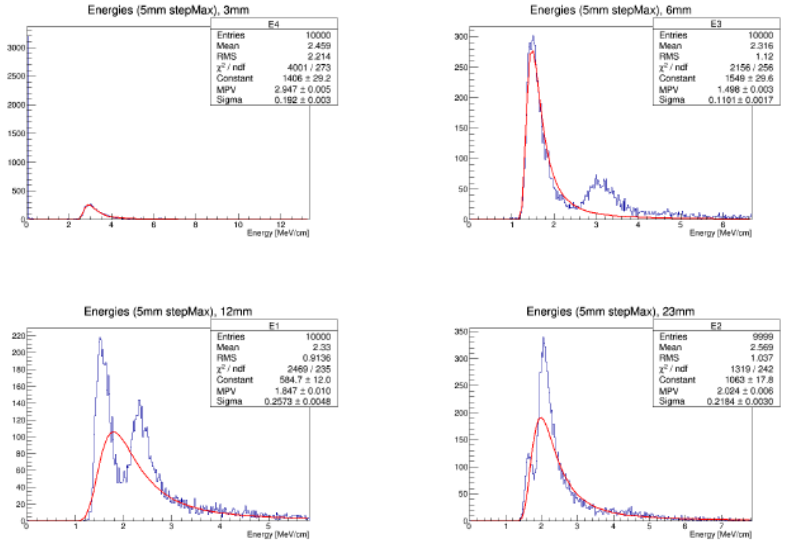
Status:

- Lynn got me set up → so can start developing. Made necessary changes (Saturation) so that LarSoft works with latest version of Geant4.
- Start looking into:
  - Step limiter vs. voxels to match to wire pitch. (CPU, memory...)
  - Use of reference physics lists.
  - New Geant4 interface to access optical photon processes (scintillation/Cerenkov)
  - Is the info written out sufficient to do all the physics studies of interest?
    - → no subprocesses which are available in Geant4.
    - → processes not resulting in new particles but available via stepping action.
  - Replace LarG4 by more general module (artg4tk) → liquid Argon would be just a special sensitive detector?

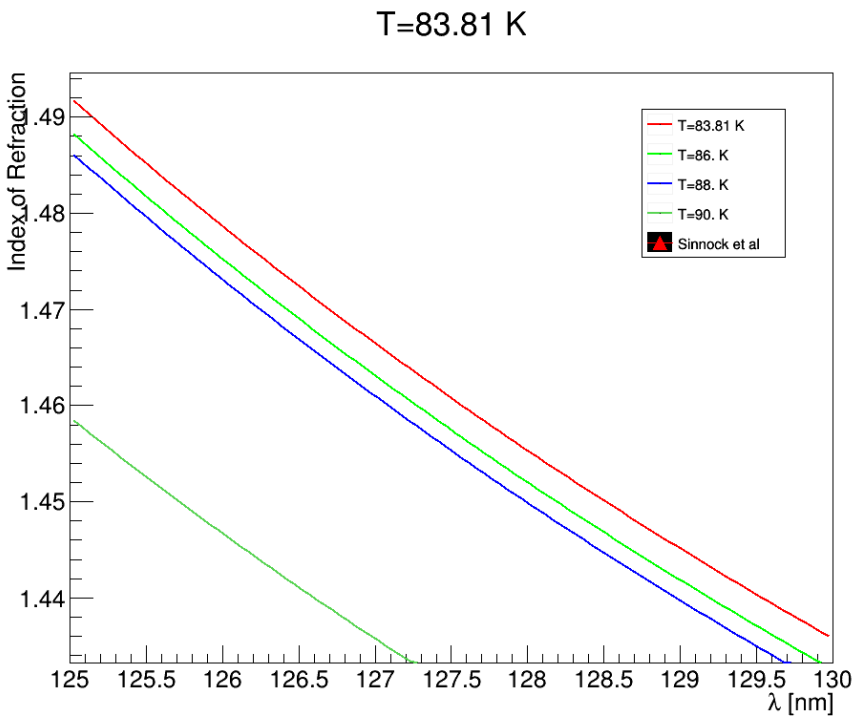
Validate physics relevant to liquid Ar TPC's (Isaac):

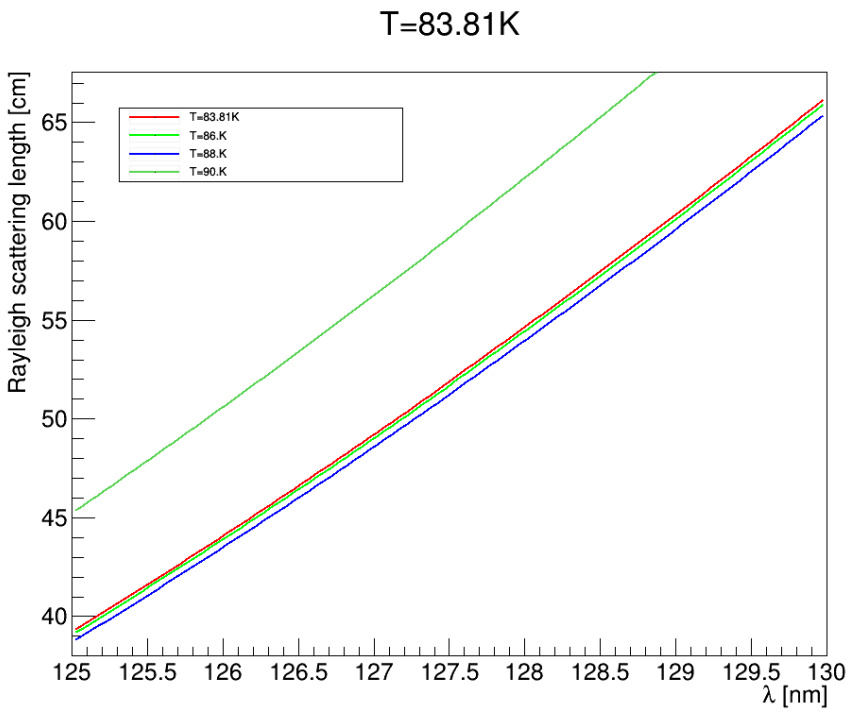
- dE/dx
- Cross sections ($K^{+/-}$,$\pi^{+/-}$, p ..).
- em shower shapes, e γ separation, energy resolution (combine dE/dx and scintillation).
- μ^+ μ^- separation.
- π interactions, $\pi^+\pi^-$ separation hadronic energy resolution.





Optical properties of liquid Argon: LAr.C root macro





Formulas and numbers are based on: arXiv:1502.04213 and private communication with one of the authors Emily Grace: emilygrace.k@gmail.com

Geant4: optical properties input the user has to provide in form of histograms

→Functions to get smoother response?