Sampling fraction vs. nHCal geometry versions

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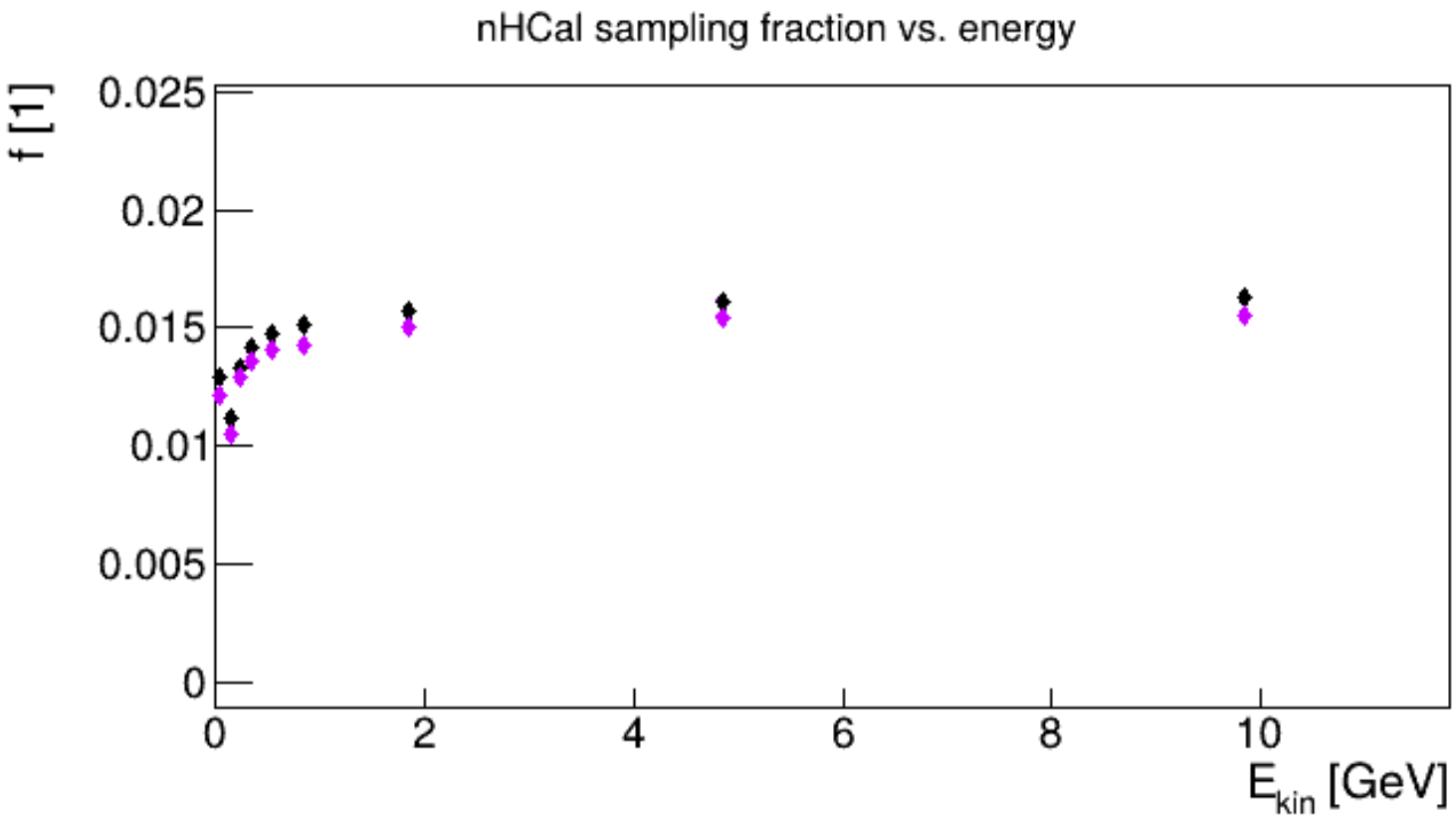
Outline

Sampling fraction calculation method

$$f_s = \frac{\sum E_{scint}}{\sum E_{all}}$$

- Sampling fraction calculated by filling a TProfile with a ration of sum of energy deposits in scintillator tiles E_{scint} over a sum of energy deposits in all nHCal materials E_{all}
- Uses only actual energy deposits
- Missing energy for pions

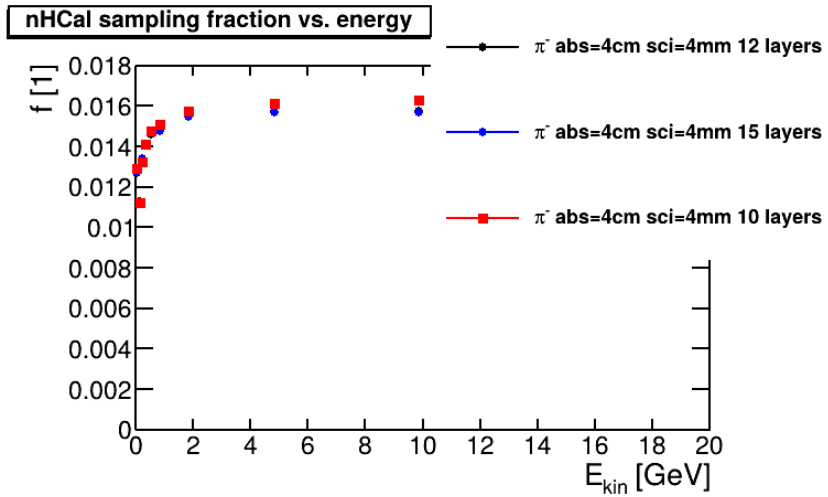
Update from old StainlessSteel to SAE304



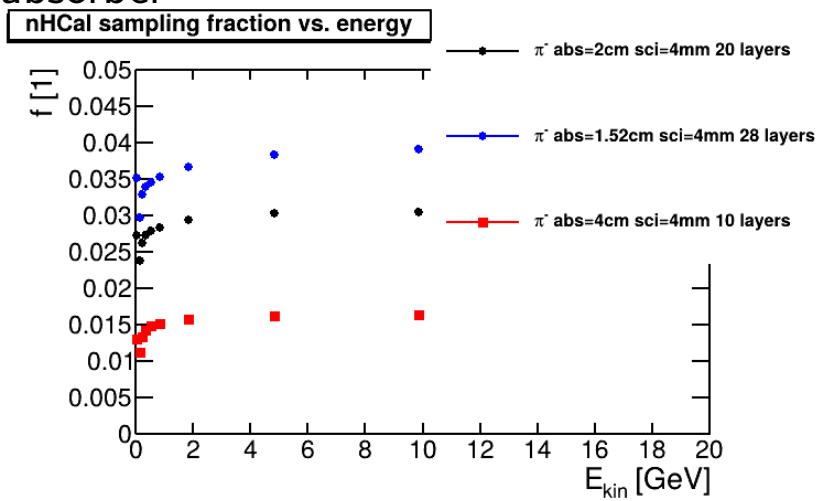
- Density updated from old StainlessSteel 8.3 $\mathrm{g/cm^3}$ to SAE 304 7.9 $\mathrm{g/cm^3}$ (5% change)
- Merged into main epic repository: `https://github.com/eic/epic/pull/885`
- Increases sampling fraction for default by 4.5% to 6% (low energy)

Sampling fraction vs. geometry - pions

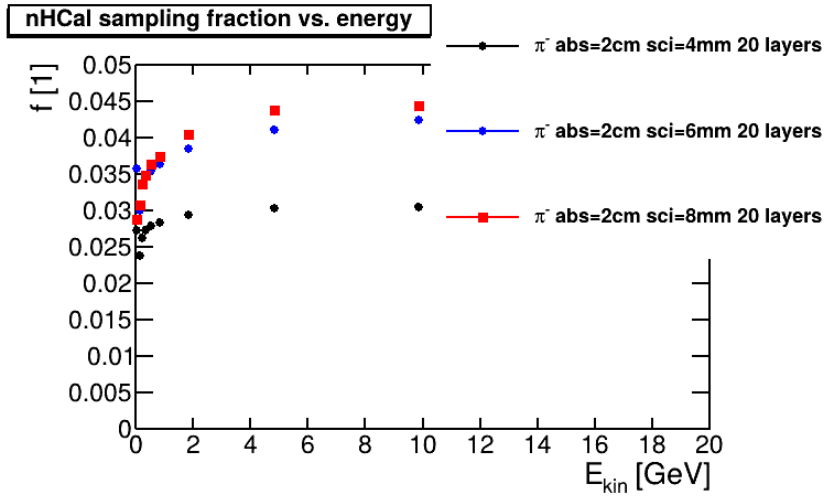
layers



absorber



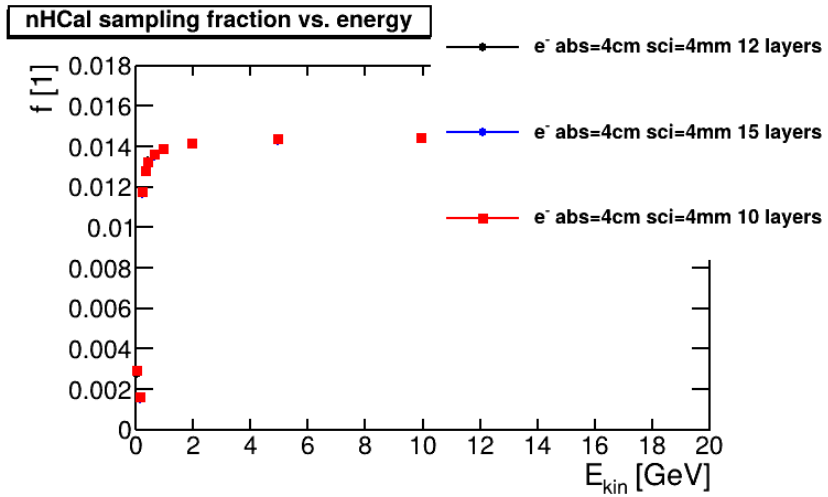
scintillator



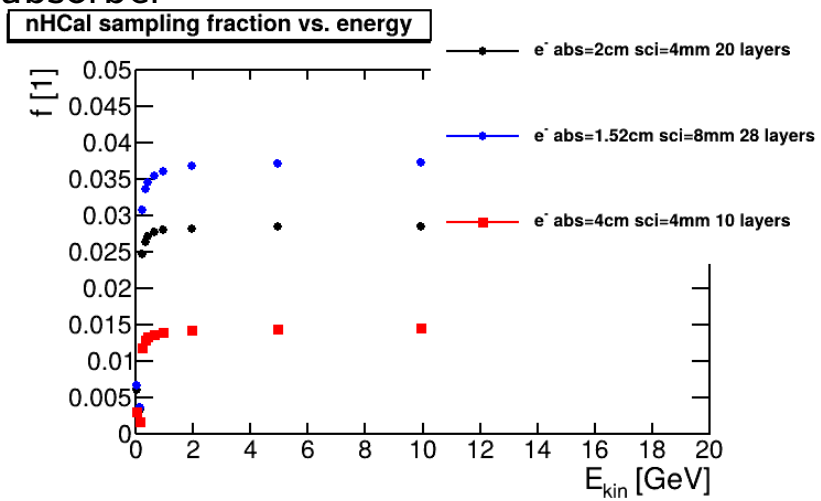
- Results behave as expected eg.: doubling scintillator doubles sampling fraction
- The higher, the better in principle, but we need to look at the energy resolution too
- Higher sampling fraction can make e/h response off, but this can be compensated with ML software

Sampling fraction vs. geometry - electrons

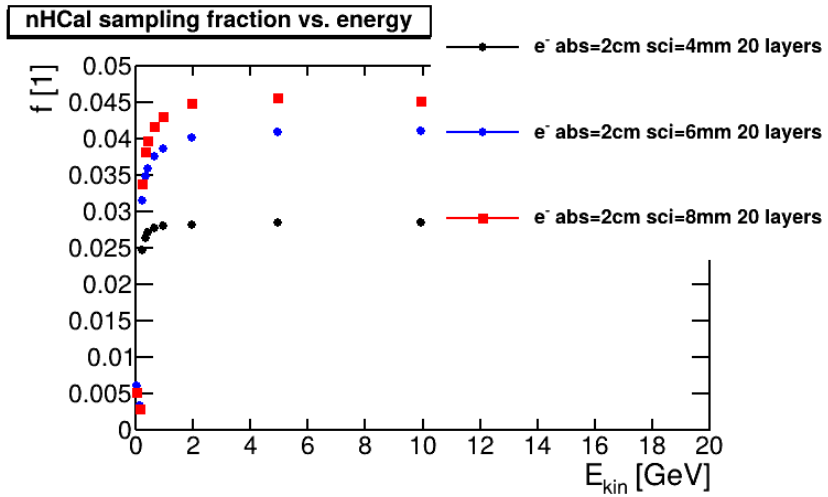
layers



absorber



scintillator



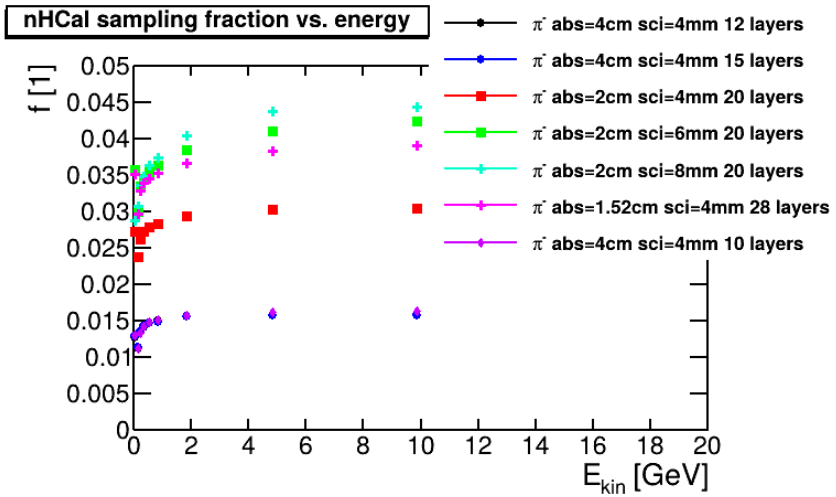
- Smaller than pion in most cases - this is strange
- Missing energy not taken into account (need correction for pions!)
- Can refer to the original pion energy, but leakage!

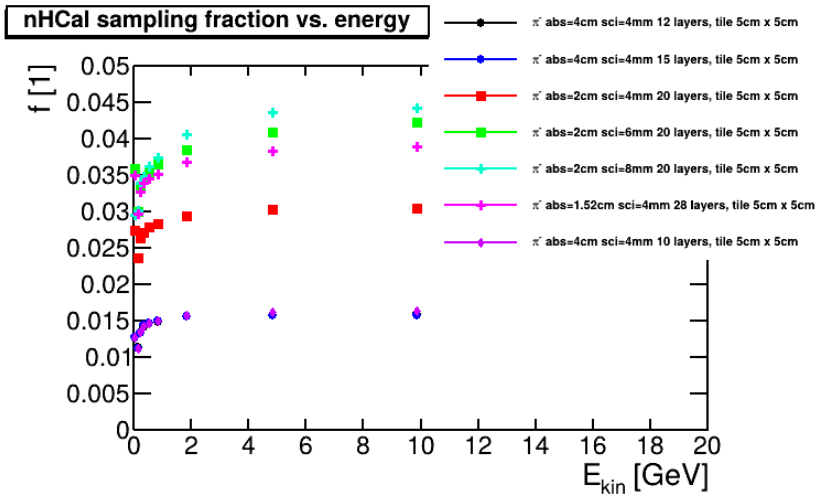
Summary

- Investigated sampling fraction for different geometry versions
- Steel density changes have small effect 4.5% to 6% (low energy)
- As expected, but larger effect at lower energy
- Next: calculate e/h response

BACKUP

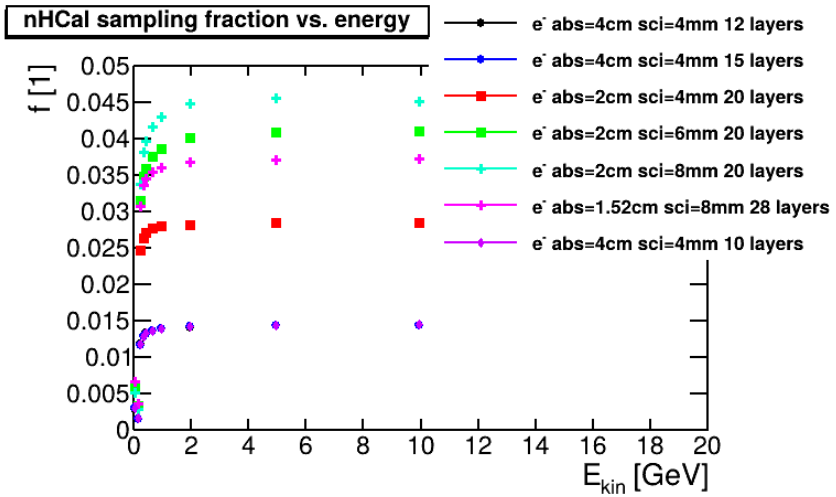
Sampling fraction vs. geometry - pions

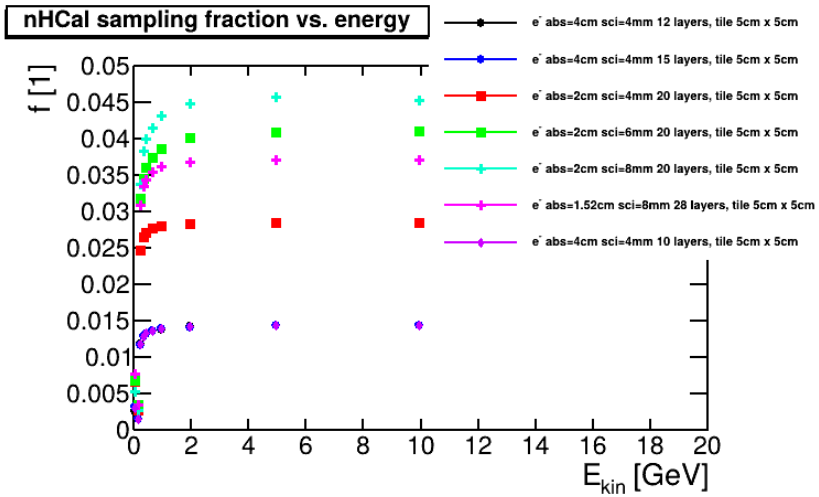




- Results behave as expected eg.: doubling scintillator doubles sampling fraction
- The higher, the better in principle, but we need to look at the energy resolution too
- Higher sampling fraction can make e/h response off, but this can be compensated with ML software
- Sampling fraction is energy dependent, but we can assume only a single value in the reconstruction

Sampling fraction vs. geometry - electrons





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