

Updated sampling fraction

Removed flux return overlap bug

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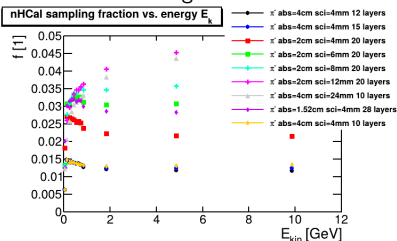
THE OHIO STATE UNIVERSITY

## 1 Updates

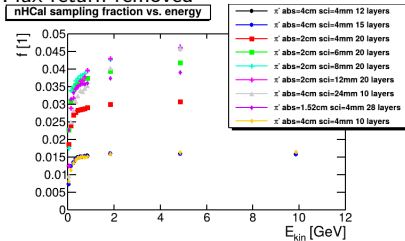
$$f_s = \frac{\sum E_{scint}}{E_k}$$

- Sampling fraction calculated by filling a TProfile with a ratio of sum of energy deposits in scintillator tiles  $E_{scint}$  over kinetic energy of incoming particle
- calculates correct  $e/h$  response ratios
  - same method as used in beam tests (kinetic energy as a reference)
  - this is not the case when using sum of energy deposits in steel and plastic in the denominator (LFHCAL method)
    - missing energy for pions
- made all geometry versions  $5\times$  thicker ( $\lambda/\lambda_0 > 10$ )
  - This minimizes leakage and relates to the real energy deposits
- Previous calculations included flux return steel which overlapped with extended nHCal
  - Not detected by the overlap check, now fixed
  - It effectively added extra material

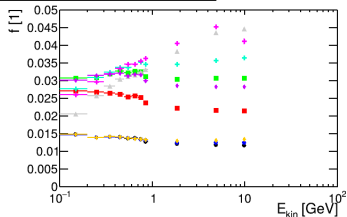
With flux return bug



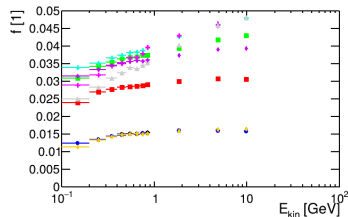
Flux return removed



nHCal sampling fraction vs. energy  $E_k$

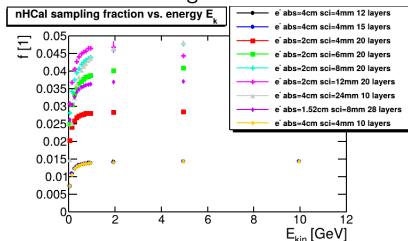


nHCal sampling fraction vs. energy

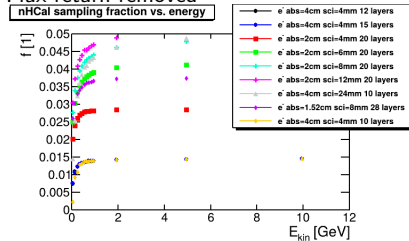


- Bug artificially increased sampling fraction at low energy - now fixed!

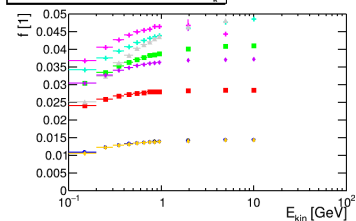
With flux return bug



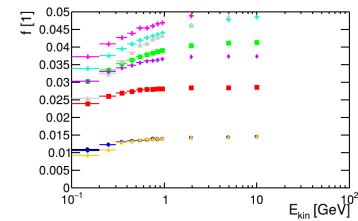
Flux return removed



nHCal sampling fraction vs. energy  $E_k$



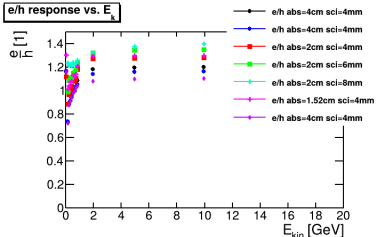
nHCal sampling fraction vs. energy



- Bug artificially increased sampling fraction at low energy - now fixed!

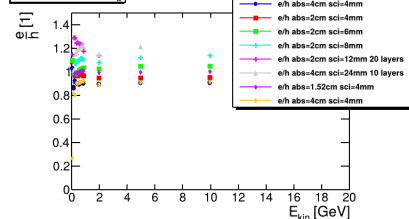
## With flux return bug

e/h response vs.  $E_k$

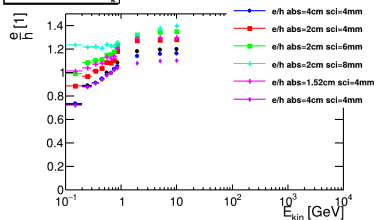


## Flux return removed

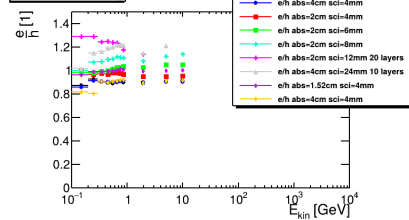
e/h response vs.  $E_k$



e/h response vs.  $E_k$



e/h response vs.  $E_k$



- Bug artificially increased e/h response
- Now fixed, closer to 1

- Fixed the bug with sampling fraction calculation
- It effectively added extra material, which is now removed
- This artificially increased sampling fraction at low energy

**BACKUP**