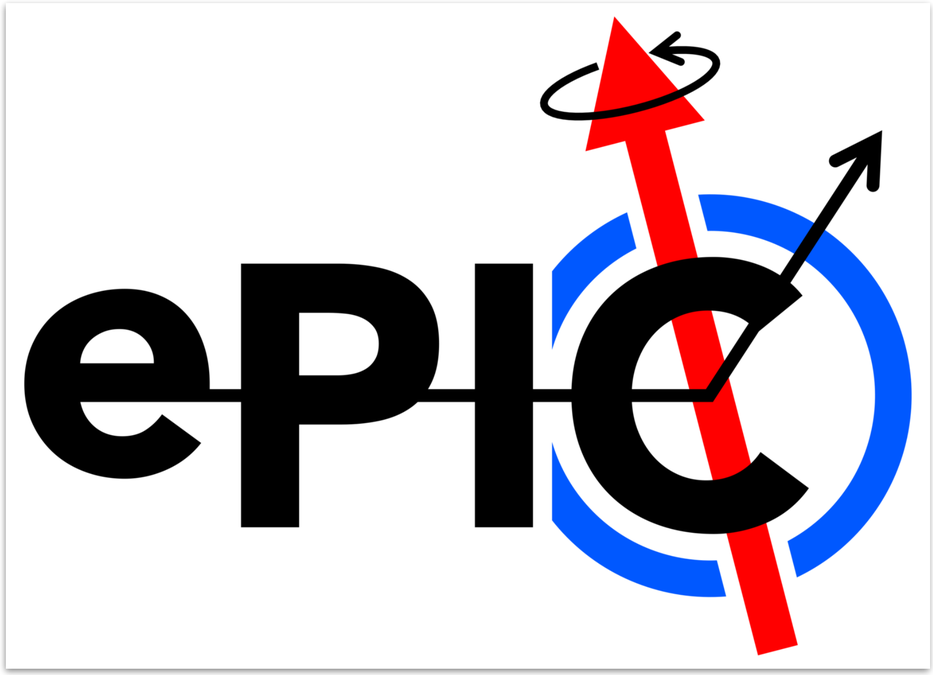

Update - exclusive VMs in the nHCal

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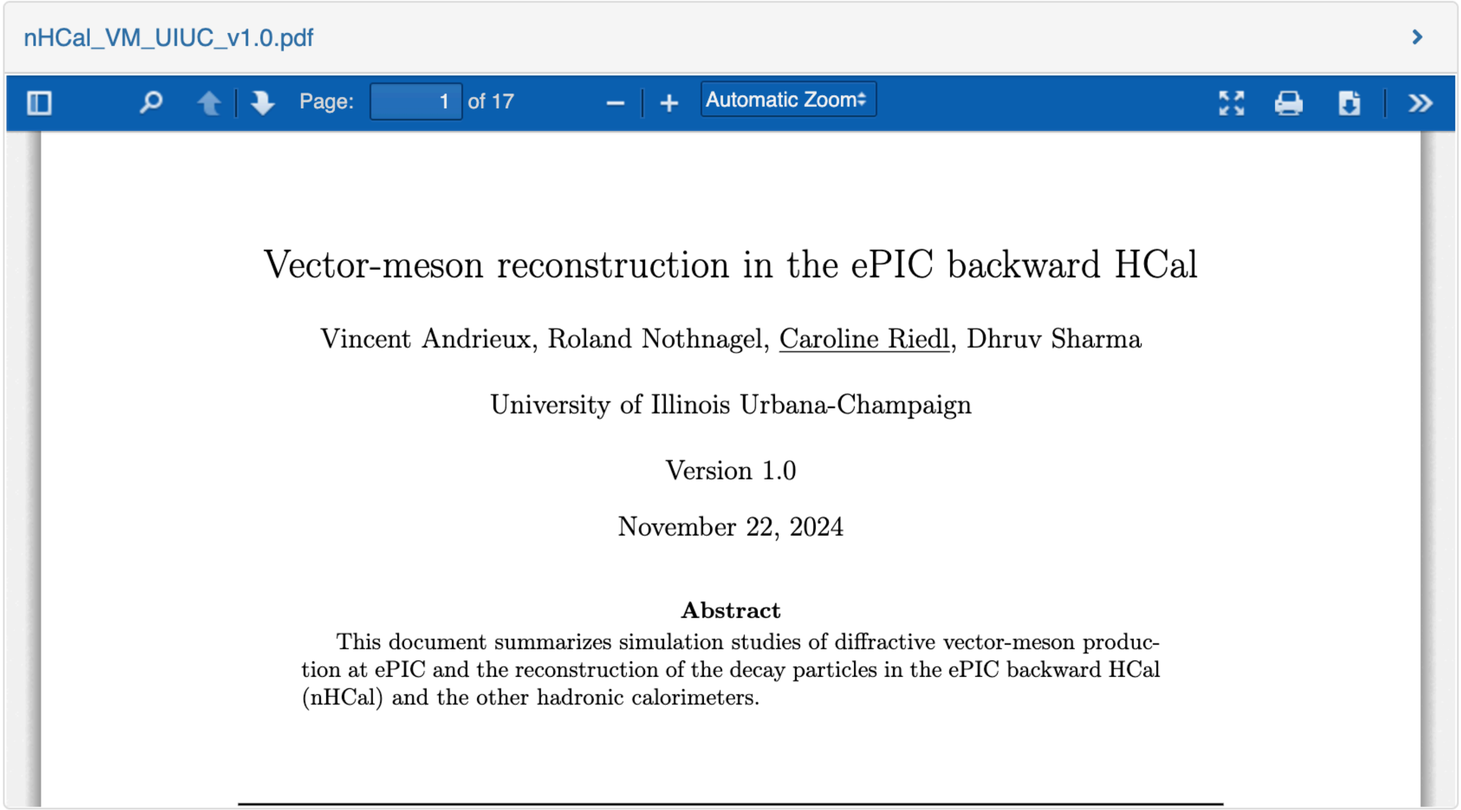
December 4, 2024

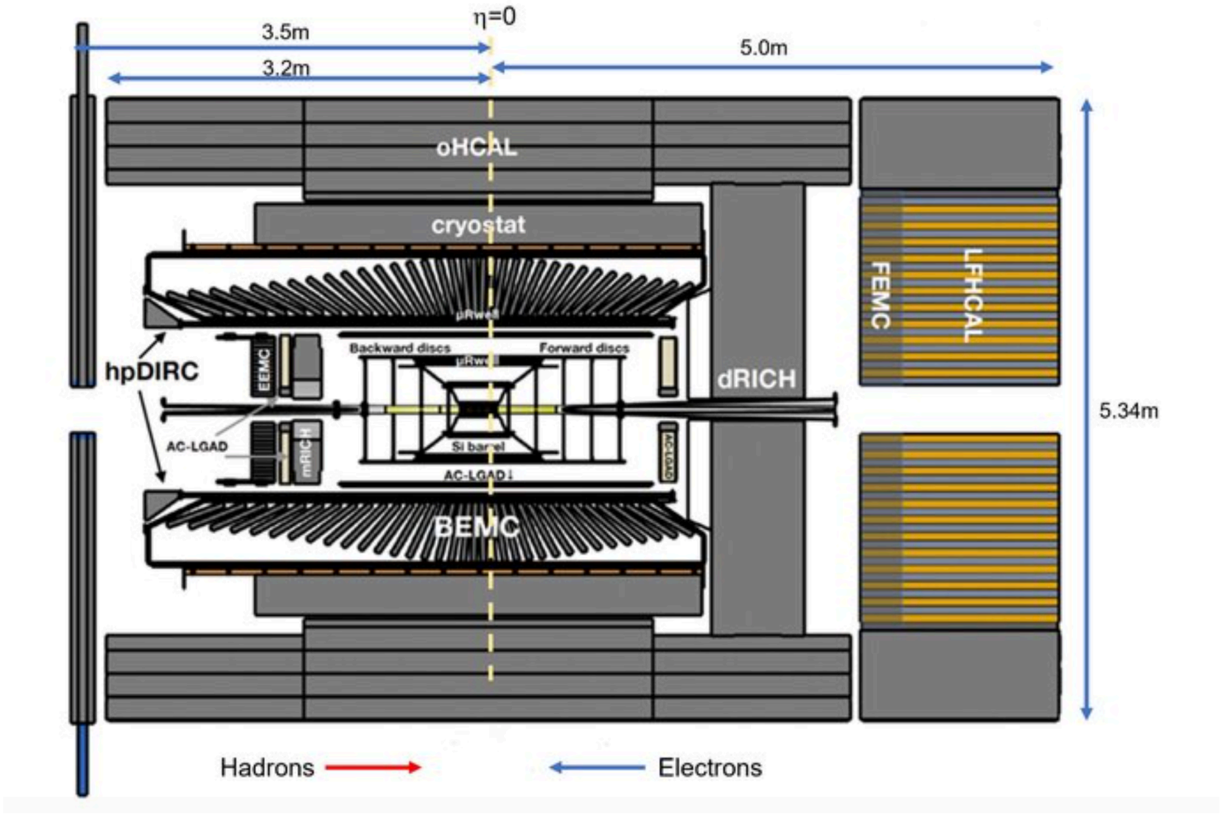
Summary of Illinois studies so far

- Internal note https://doi.org/10.5281/zenodo.14200155
- Reference for preTDR etc.
- Work in progress



Kaon decays… a closer look

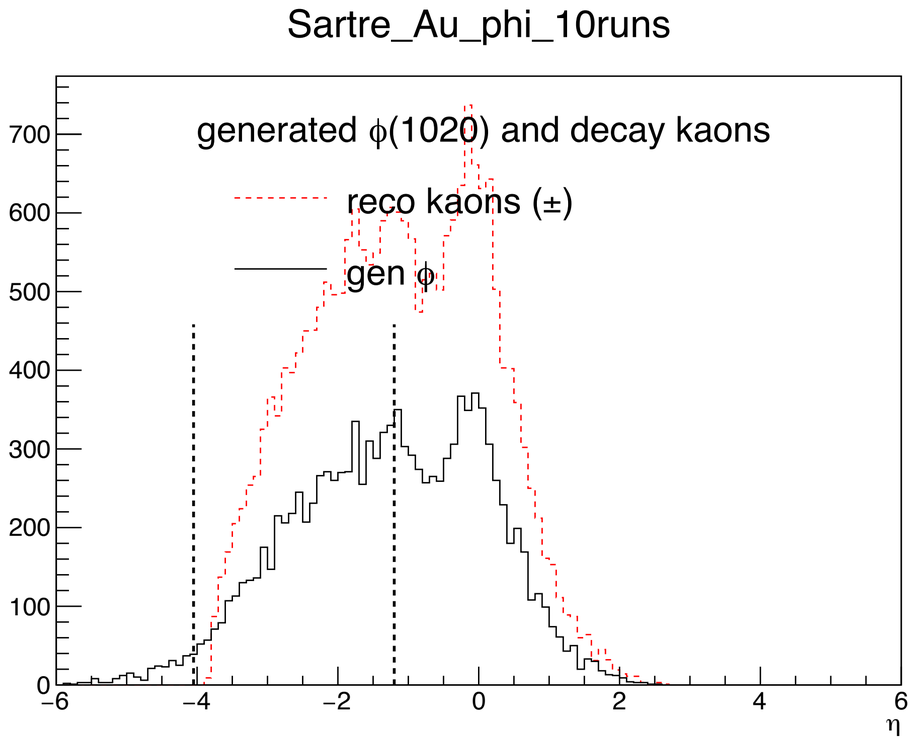
- Is it correct / realistic that the kaons are not decayed in the simulation?
- $\phi \rightarrow K^+K^-$ via strong interaction
  (life time ~ 10^{-22} sec) ~ instant
- $K^{\pm} \rightarrow \mu^{\pm}\nu$ via weak interaction
  (mean life time 1.238*10^{-8} s)
  => 3.7m travel before decay
- Will most kaons have decayed before reaching the nHCal??
- But: relativistic corrections (gamma factor)
- Decay length L = $\underbrace{\text{gamma} * \text{tau}}_{\text{time dilation}} * v$



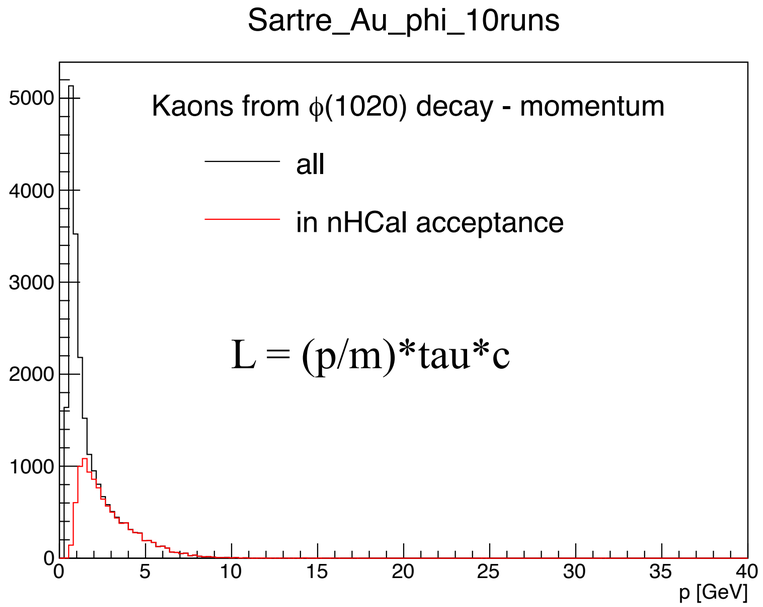
Calculate decay length for kaons from phi-meson decay. The decay length goes linearly with the momentum p (in GeV), as (p/m)*tau*c, where m is the kaon+- rest mass (in GeV), tau its lifetime (in s), and c the speed of light (in m/s).

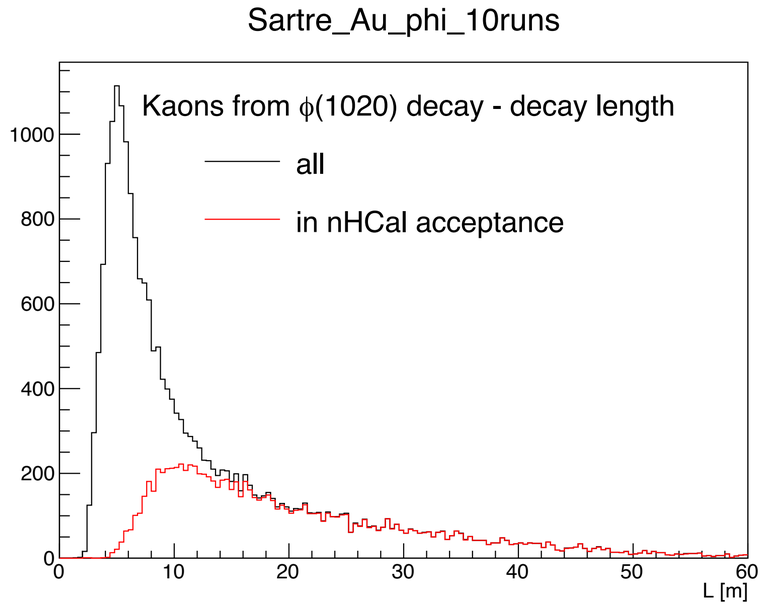
Sartre simulation of diffractive phi to KK (as before)

event generators tailored for this purpose. Diffractively produced VMs were studied as generated by the **sartre** event generator in coherent production: eAu→eAuϕ ($\rightarrow K^+K^-$) from `EPIC/RECO/24.07.0/epic_craterlake/EXCLUSIVE/DIFFRACTIVE_PHI_ABCONV/Sartre/Coherent`. The beam energies are (18x110), the used dipole model is **bNonSat**, the dipole model parameter set KMW, the kinematic limits are $t = [0.5, \sim 0]$; $Q^2 = [1, 20]$; $W = [1.95772, 88.9985]$, and the **sartre** release is 1.39. The sample consists of one generated and decaying ϕ-meson



Does the nHCal see kaons (K^{+-}) or muons?





- Answer: mostly kaons. A few kaons start decaying right at the front face of the nHCal, but most (would) decay well downstream of the nHCal.