Pion and Kaon Form Factors at the EIC

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ePIC simulations for exclusive reactions

- Feasibility studies of exclusive pion and kaon electroproduction reactions through ePIC simulations.

- Major updates have been made to the Deep Exclusive Meson Production event generator (DEMPgen) to enhance the reliability of feasibility studies.

- DEMPgen v.1.2.0 will be released shortly on https://github.com/JeffersonLab/DEMPgen/releases.

- DEMPgen paper can be found at https://arxiv.org/abs/2403.06000.

- Updated DEMPgen is used to generate new files for both reactions, which will then undergo the latest ePIC simulations.

- Latest files can be found at https://dtn01.sdcc.bnl.gov:9001/buckets.

Upcoming plans for the TDR

- For π^+ electroproduction reaction : $e + p \rightarrow e' + \pi^+ + n$

- Reconstruct neutron track from ZDC hits and e'/π tracks.

- Reconstruct all final state particles (relatively straightforward) to determine $F_\pi(Q^2)$ projections.

- Will determine how high in $F_\pi(Q^2)$ can be reached with new detector configuration and the updated generator.

- Will compare the results with the previously generated ECCE simulation plots.

Upcoming plans for the TDR

- For K$^+$ electroproduction reaction : $e + p \rightarrow e' + K^+ + \Lambda$

$$\Lambda \rightarrow n + \pi^0, \pi^0 \rightarrow \gamma\gamma$$

- Reconstruct photons and neutrons from Λ in the ZDC – EMCAL & HCAL and e'/K$^+$ tracks.
  - Will help to investigate ZDC – EMCAL thickness.
  - Impact on the Λ reconstruction from photons and neutrons.

- Reconstruction is considerably challenging, uncertain about the achievable extent at present.

- Will perform tests on Λ reconstruction, focusing on efficiency, acceptance and resolution.

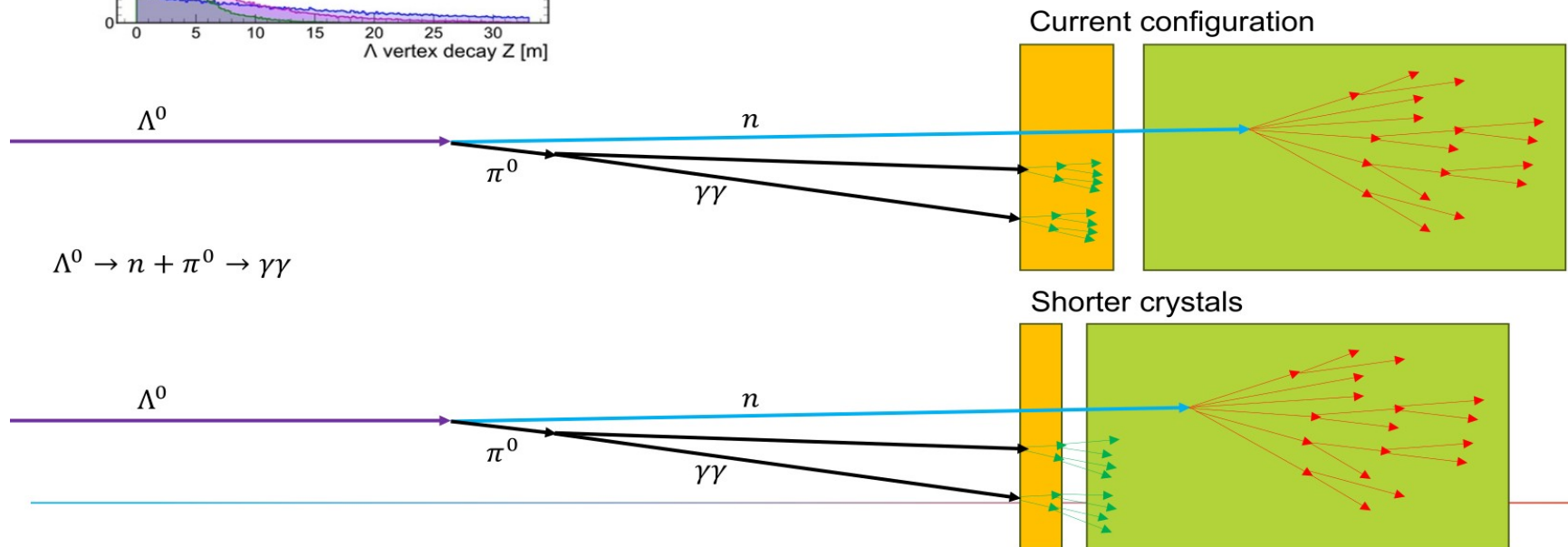- Aim to determine the $F_K(Q^2)$ projections in the long term.

Pictorial view of neutral decay into ZDC
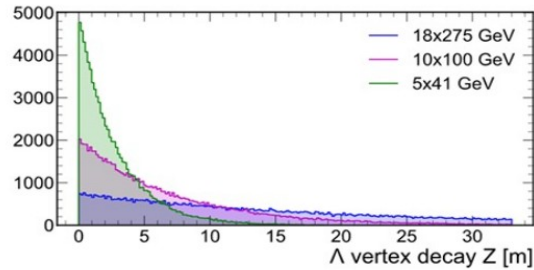
From: J Arrington *et al* 2021 *J. Phys. G: Nucl. Part. Phys.* **48** 075106

Yellow: crystal EMCAL
Blue: SiPM-on-Tile

Current configuration

Shorter crystals

Λ^0

n

π^0

$\gamma\gamma$

$\Lambda^0 \to n + \pi^0 \to \gamma\gamma$

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Thank you !

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