EPIC Far-Forward Working Group Updates

Alex Jentsch, for the conveners

12/16/2022

Electron Ion Collider

BROOKHAVEN NATIONAL LABORATORY

U.S. DEPARTMENT OF ENERGY | Office of Science

Collaboration Meeting Talks

- 4 total talks – 12’ +3’ each
  - Overview and update on RP/OMD/B0 Tracking – Alex Jentsch
  - Geometry Implementation of B0 EMCAL – Sakib Rahman
  - Photon studies with B0 EMCAL – Michael Pitt
  - ZDC Imaging with AI/ML – PNNL Group (speaker TBD)
- Two of of us will be there in-person, AFAIK.
  - Hopefully everyone can make it in-person.
- Asked speakers to have slides sent to mailing list prior to our meeting on Jan. 3rd.
  - Conveners will review and sign-off.

Some General Updates

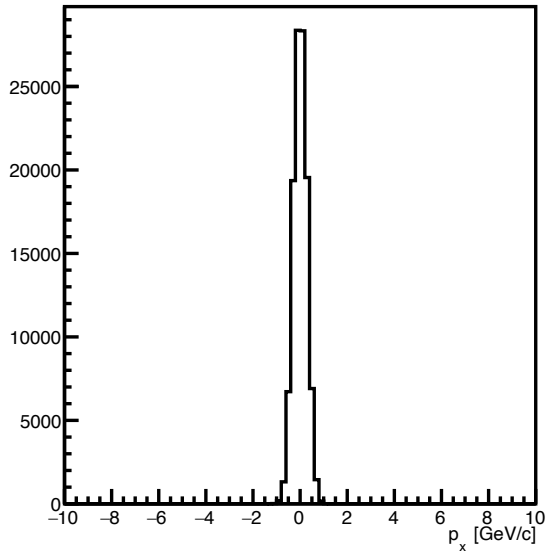
- Alex investigated possibility of placing B0 EMCAL *before* tracking system to save space.
  - Indico: https://indico.bnl.gov/event/17905/
  - Summary: definitely a no-go – drastically impacts tracking resolution.
  - Will provide enormous multiplicity of secondaries to tracking system.
- We have new B0 magnet design.
  - ~20cm of space available for B0 EMCAL.
  - Given results of study above, need to look at potential backgrounds for tracking system from secondary production (back-scattering).
- Looking at impedances for RP and OMD.
  - Huge source of beam impedance.
  - Working with engineers on some solutions to the problem: https://indico.bnl.gov/event/17728/
- Our R&D proposal for Roman Pots reconstruction software was approved.
  - Looking for a partial postdoc to help.
  - Contact either me or Michael Murray for more information.

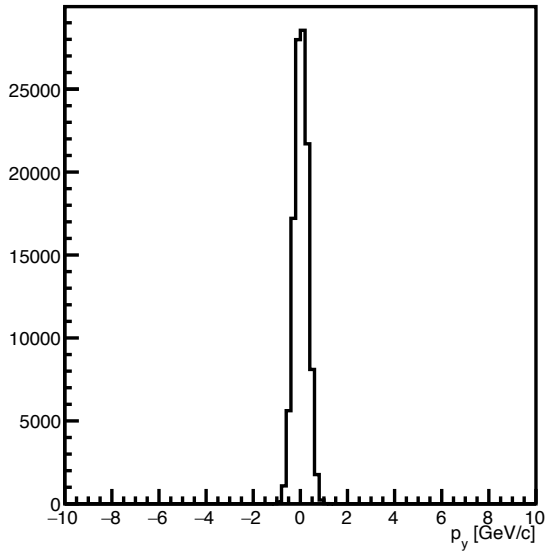
Simulation Campaign

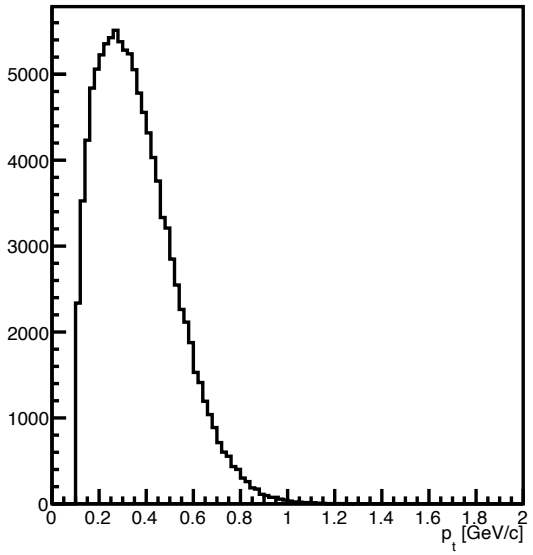
- Samples relevant to far-forward only showed up on S3 on Thursday (maybe late Wednesday?).
  - Already found several issues.
  - Not getting momenta from matrix reconstruction in EICRecon!
- Alex was able to use stored hit information to perform reconstruction at the analysis stage (see next slide).
- Fast smearing plugin seems to work fine.
- Basic analysis code now tested, just needs a bit of cleanup and I will make it available for anyone who wants to use it.

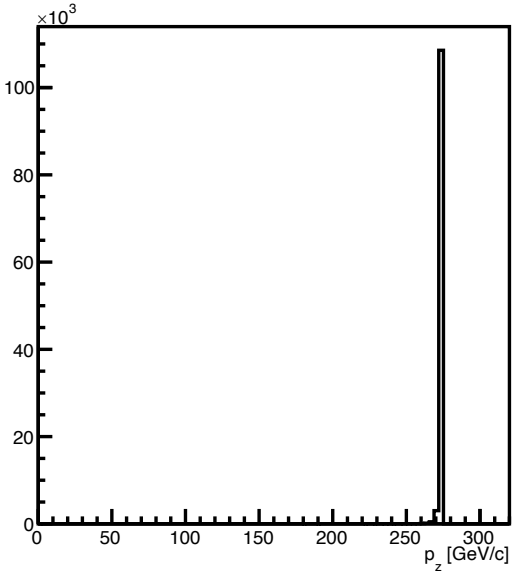
Simulation Campaign Results - DVCS

MC Only





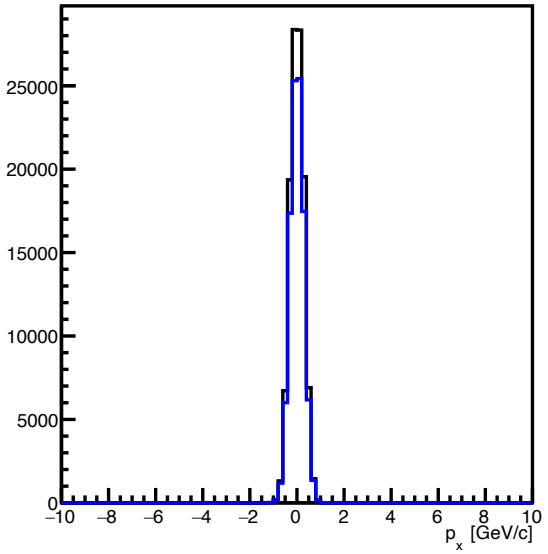


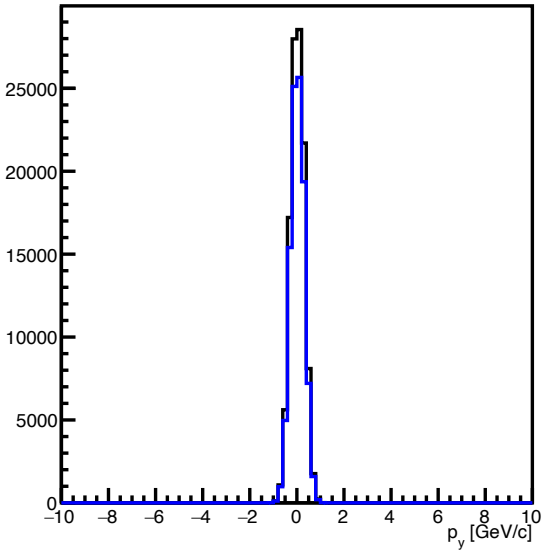


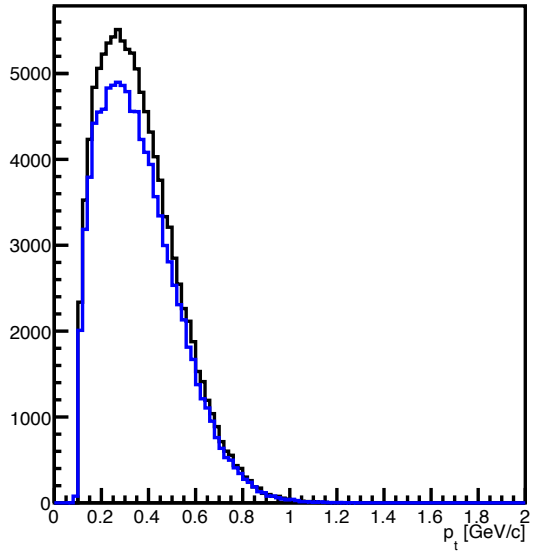
- 18x275 GeV
- Pt > 0.1 (not sure what t-min was, but had lots of entries at pt ~ 0)
- Crossing angle removed (affects px)
- ~110k events processed
  - The analysis runs super fast (<15 seconds) – just grabbed 51 files locally to my laptop for testing.

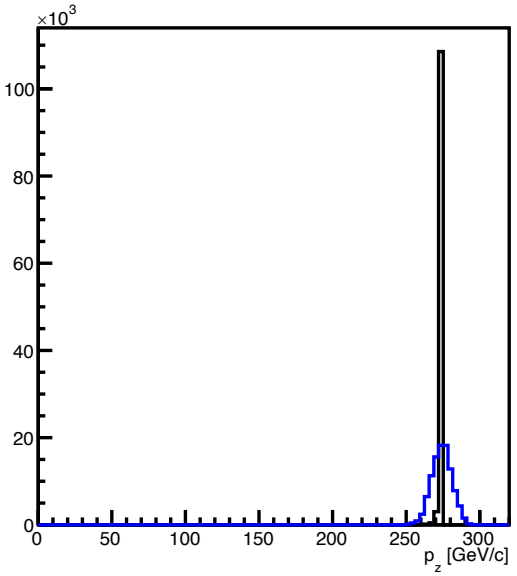
Simulation Campaign Results - DVCS

MC + "**smeared FF**"





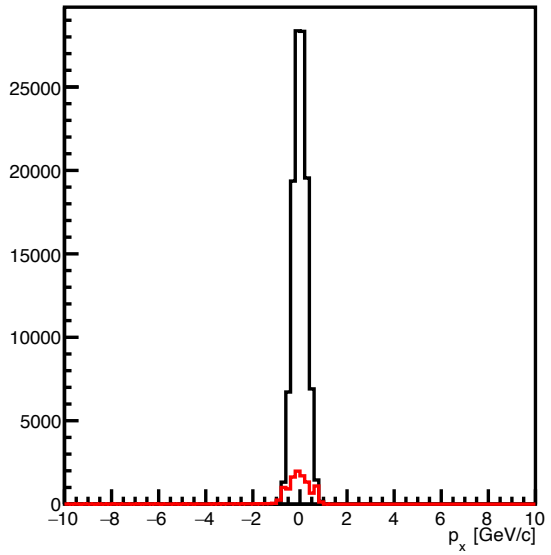


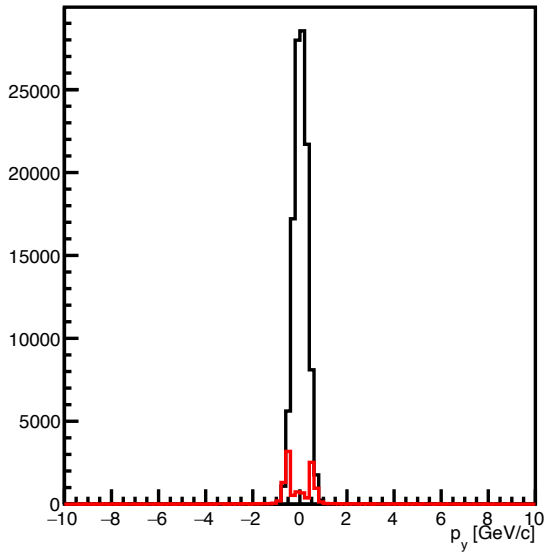


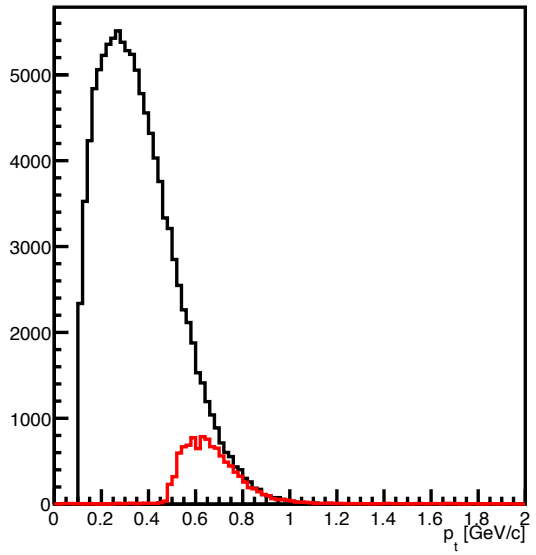
- Fast smearing plugin seems to work fine.
- Acceptances from previous simulations, smearing a rough average (not parametrized).
- Useful for main detector studies where a FF proton needs to be tagged/reconstructed.
- Crossing angle removed.

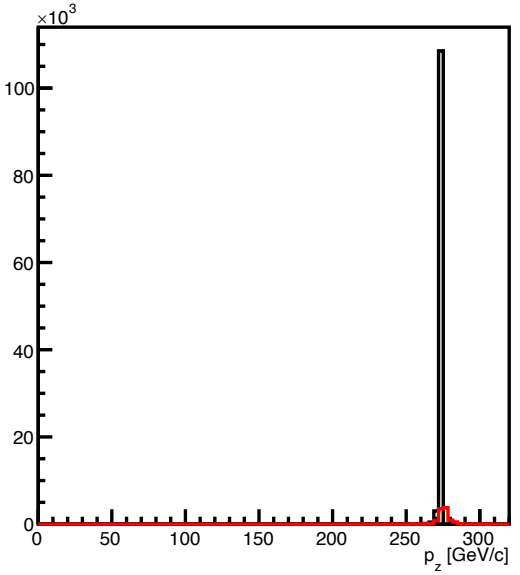
Simulation Campaign Results - DVCS

MC + "**Roman Pots Reco**"



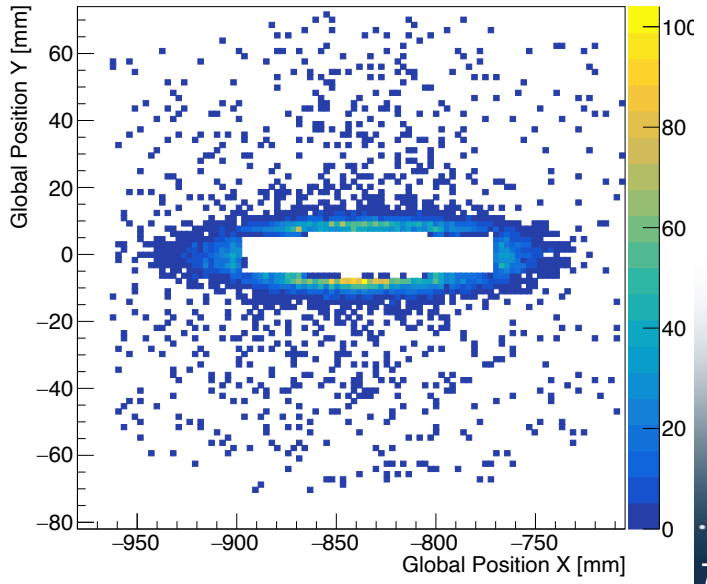






- Reconstruction is ***not working*** in EICRecon – px and py = 0.0, pz = exactly beam momentum.
  - **Obviously will investigate.**
- I have written an afterburner into my analysis code (will make it available today) which performs the reconstruction with the ***real hits*** (it literally does exactly what the EICRecon code is supposed to do).
  - This is what you see above – real reconstruction with the real hits, done at the analysis stage.
- Acceptance is about 10%, which indicates that something is not working properly with the settings for the 10σ position.
- Need to look at other beam energies - will do soon.

Roman_pots_occupancy_map



Summary and Takeaways

- Things are moving along reasonably for the design of the FF detectors.
- We have some simulation results (as of yesterday) which allow to us to work on the FF detectors.
  - Lots of work to do, but we are putting together common tools so people can contribute with a minimal learning curve.