BROOKHAVEN
NATIONAL LABORATORY

EicRoot recycling for the Yellow Report needs

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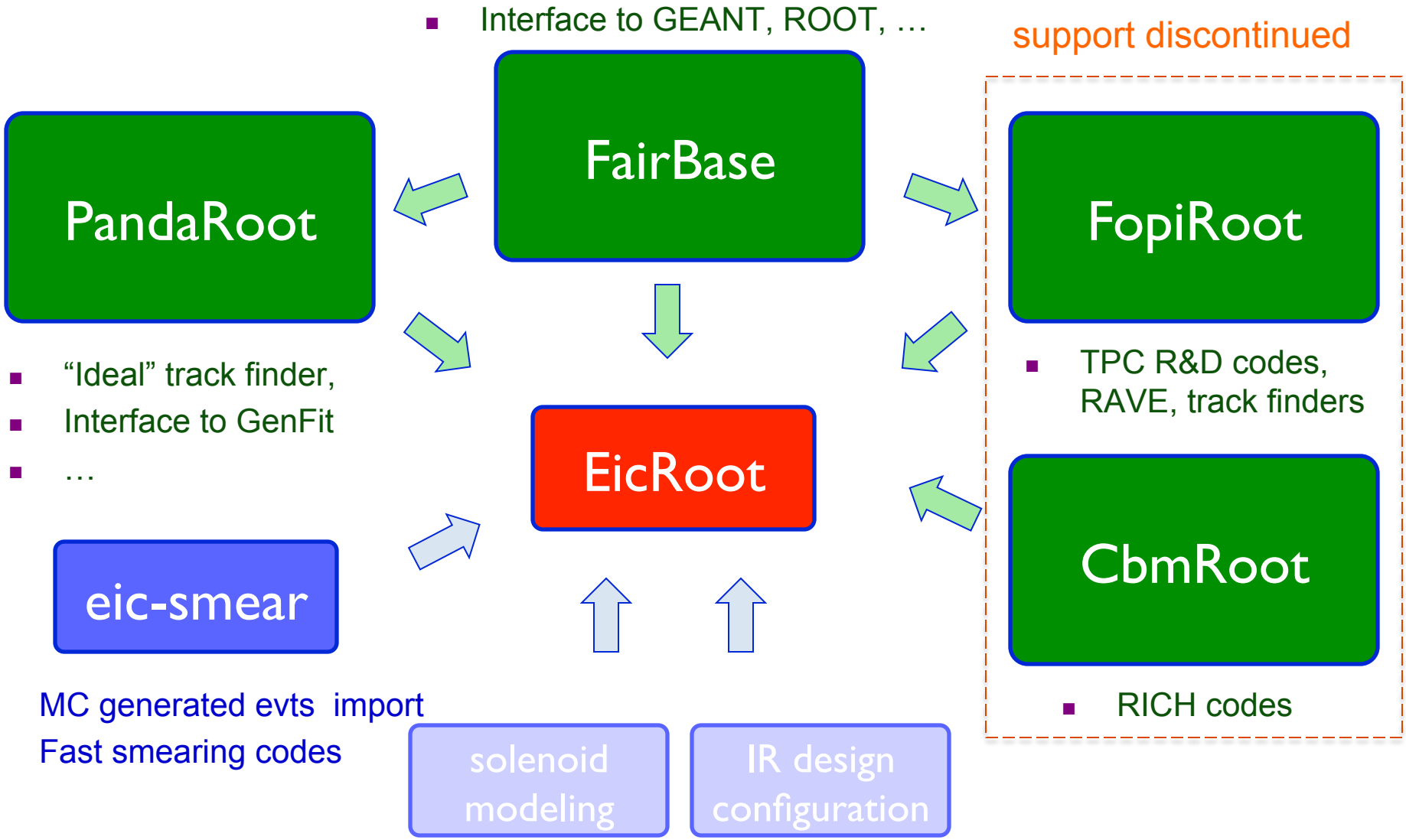
YR Tracking WG Meeting April 23 2020

EicRoot framework building blocks



- ROOT-based I/O, VGM, VMC (e.g. easy switch between G3 & G4)

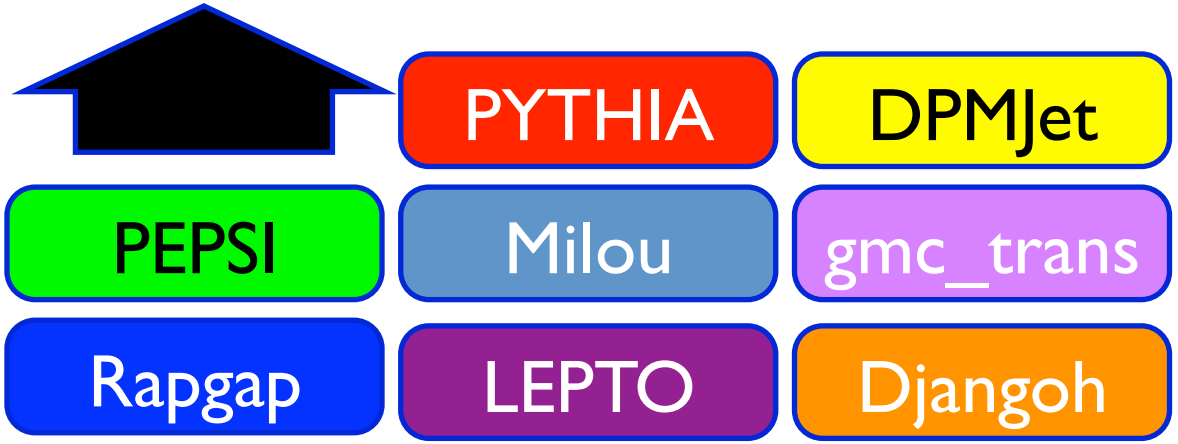
Simulation work flow

- Execution control through the ROOT macros
- ROOT files for analysis available after each step
- C++ class structure is well defined at each I/O stage

- It is a “full” GEANT3 (GEANT4) simulation framework
- It is a collection of shared libraries (no executable); a *toolkit* in some sense
- Digitization is fast (parametric) rather than microscopic; yet pretty versatile
- No track finder *in the main event processing chain* (use Monte-Carlo truth)
- Genfit-based Kalman filter for track fitting
- No vertex code *in the main event processing chain*

applied to the eRD6/16/18 studies to date: these were NOT just “fast simulations”

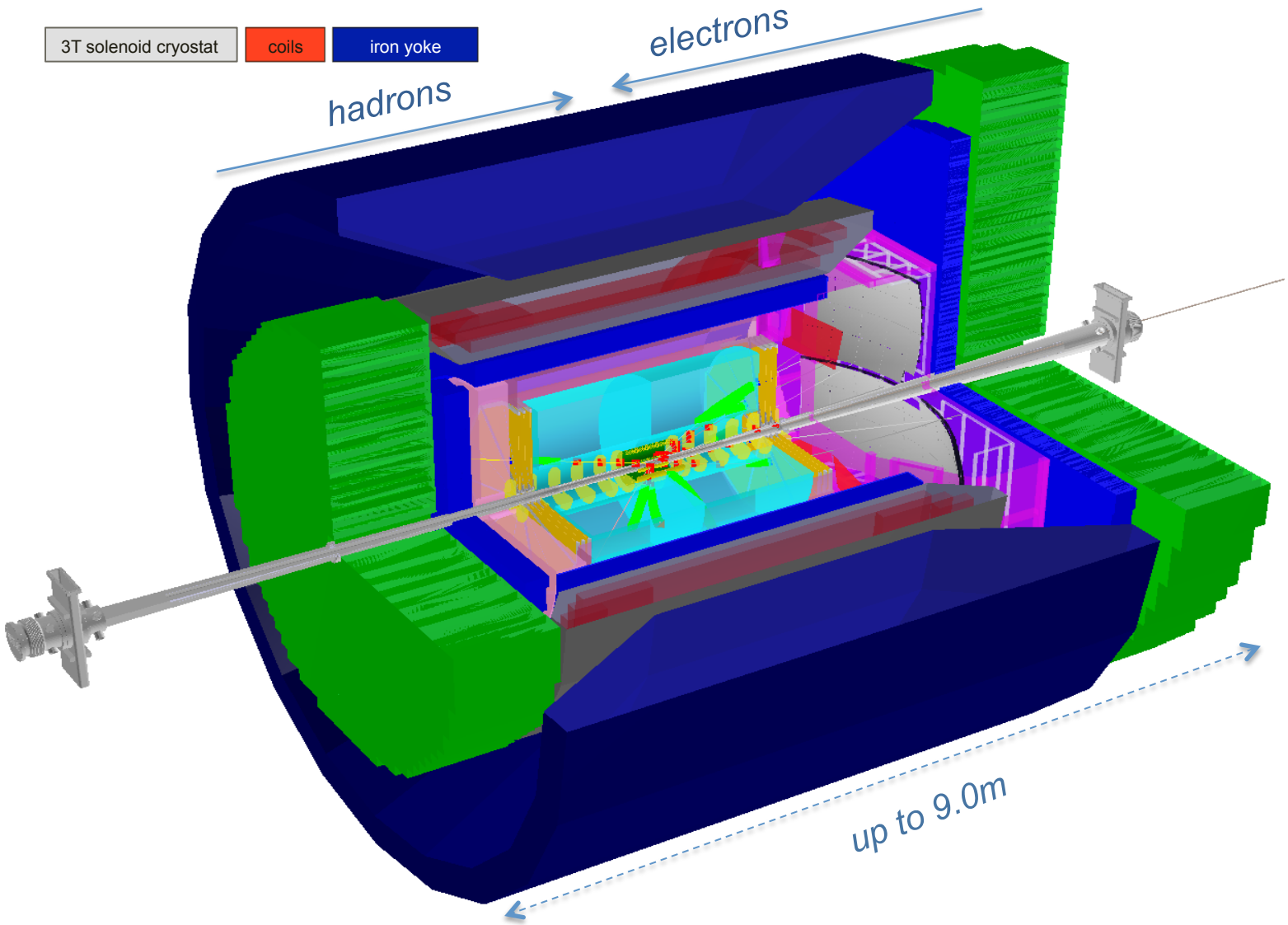
EIC smearing generator interface



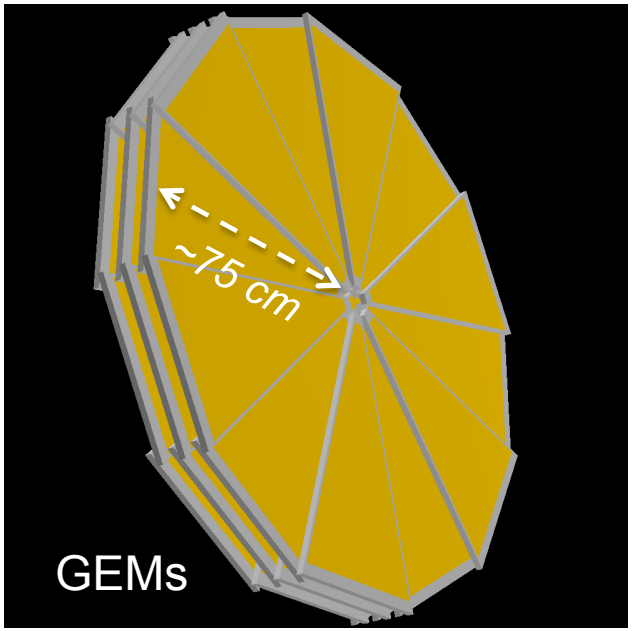
Large number of EIC Monte Carlo generators with standard ASCII format

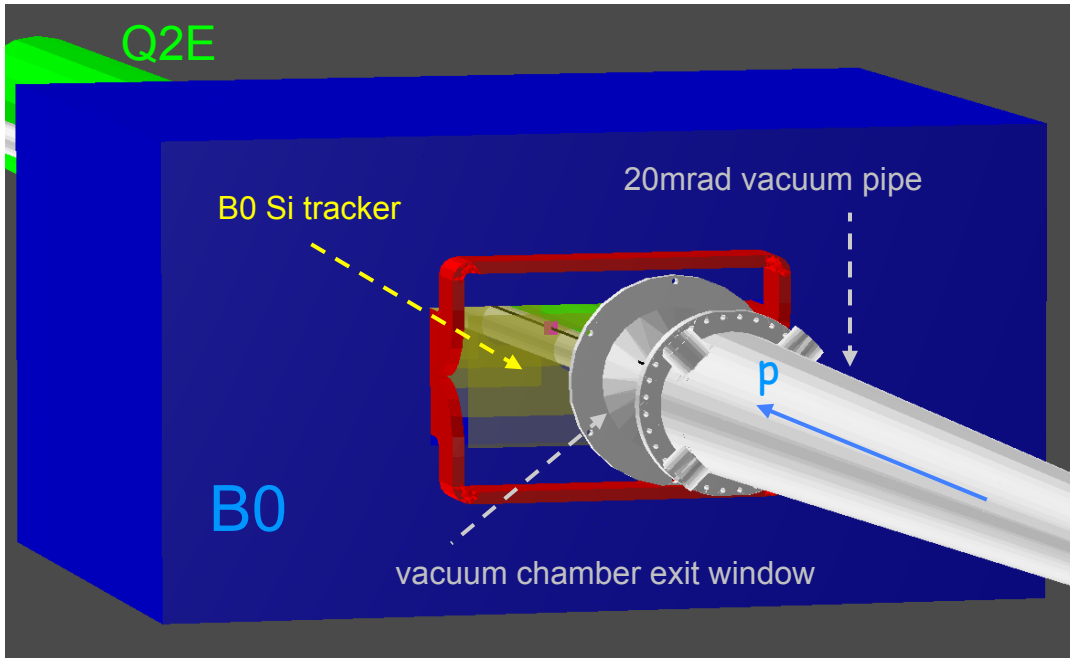
- Both event import and smearing functionality is supported in EicRoot

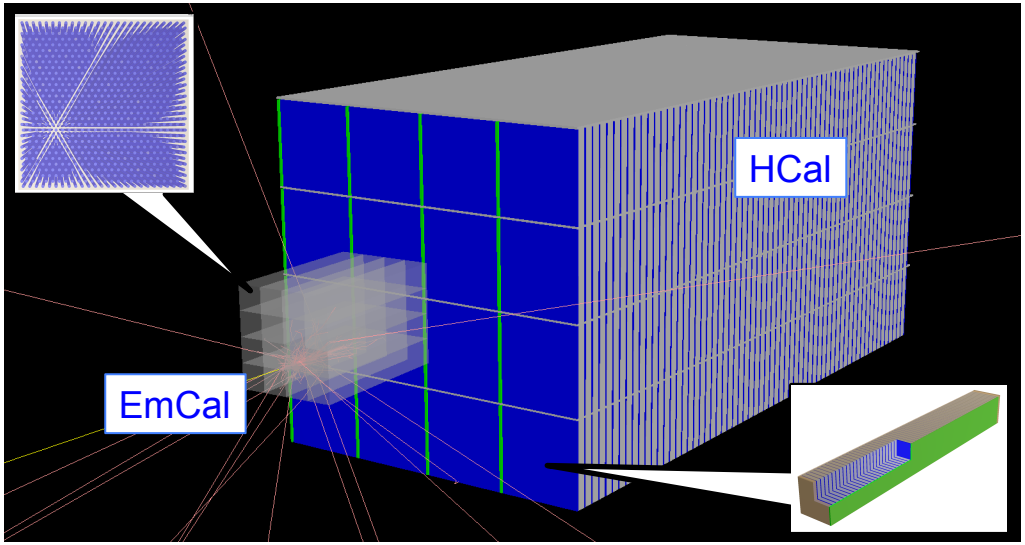
EIC model detector layout (2018)

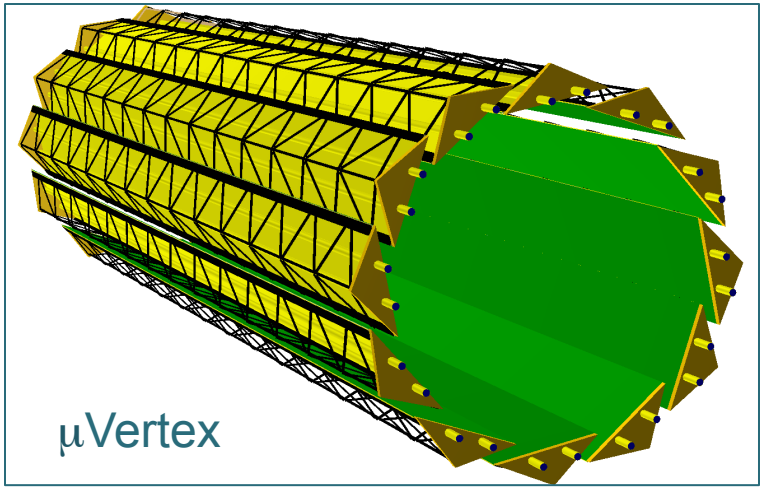


Examples of geometry building blocks



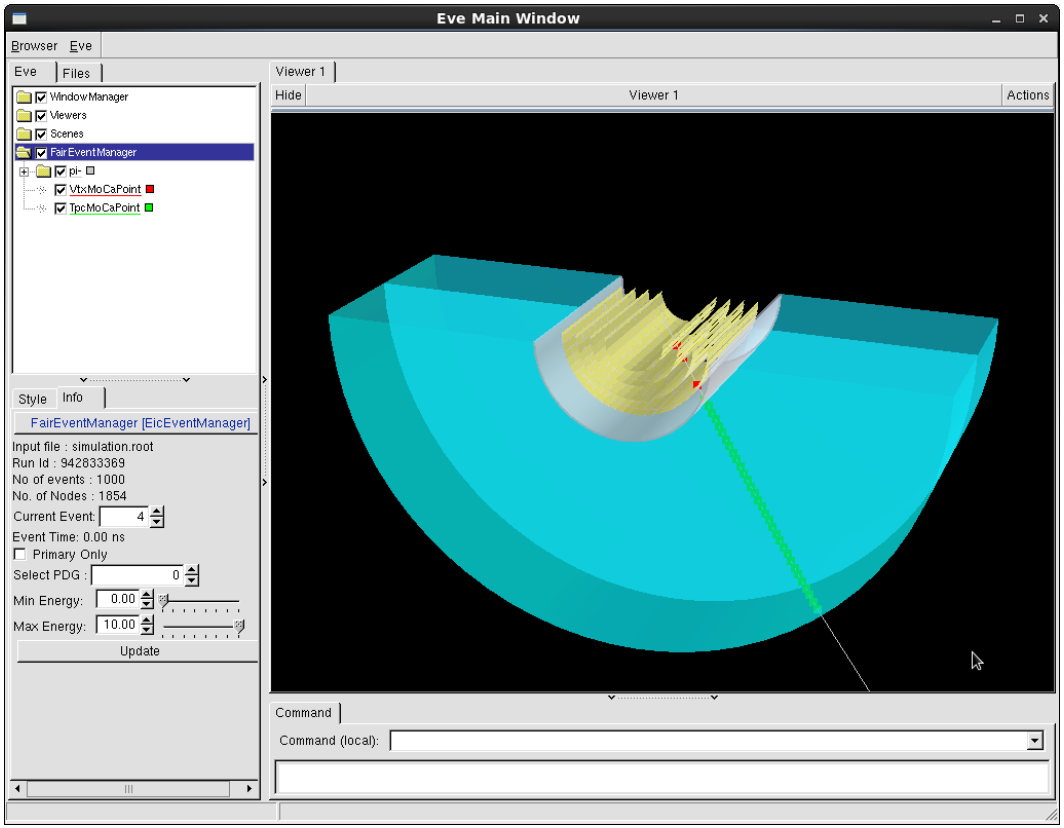


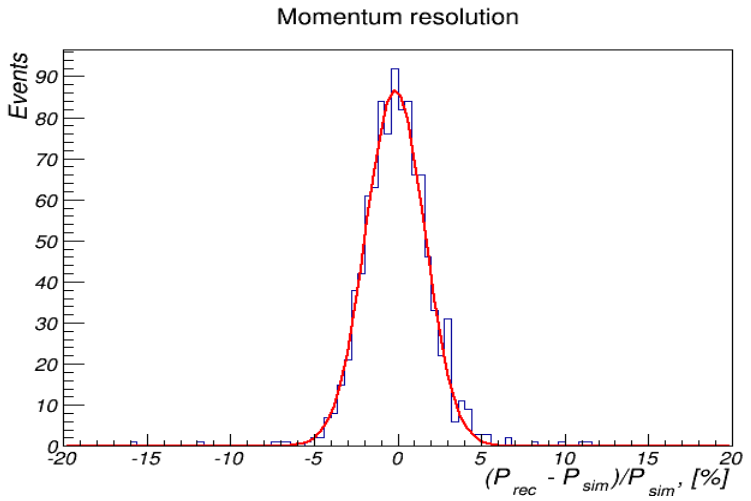


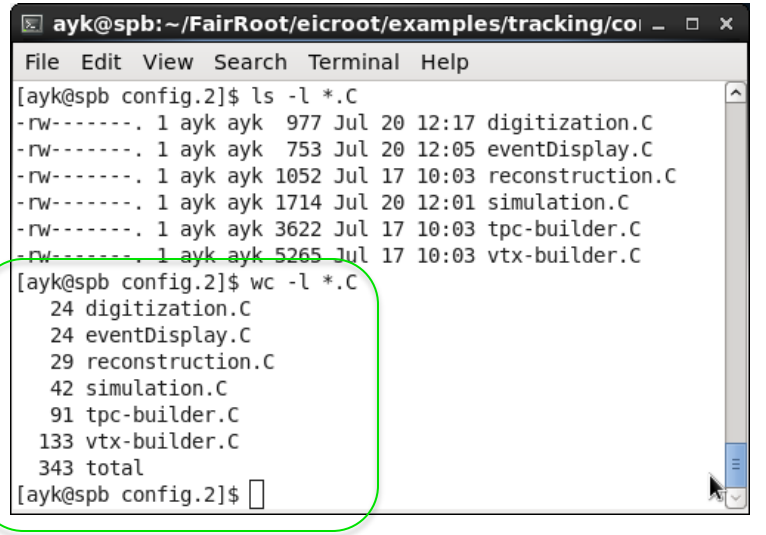


Example R&D study: vertex+barrel tracker

Consider vertex tracker + TPC in 3T field; shoot 10 GeV/c pions at θ=75^{o}



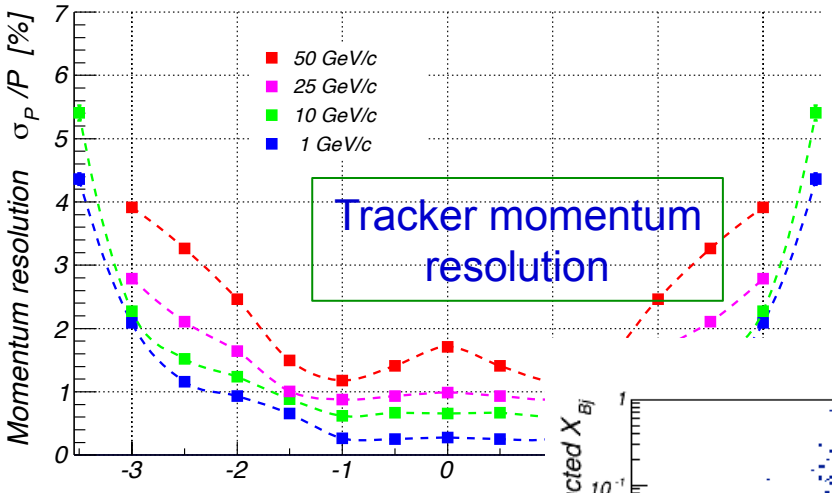


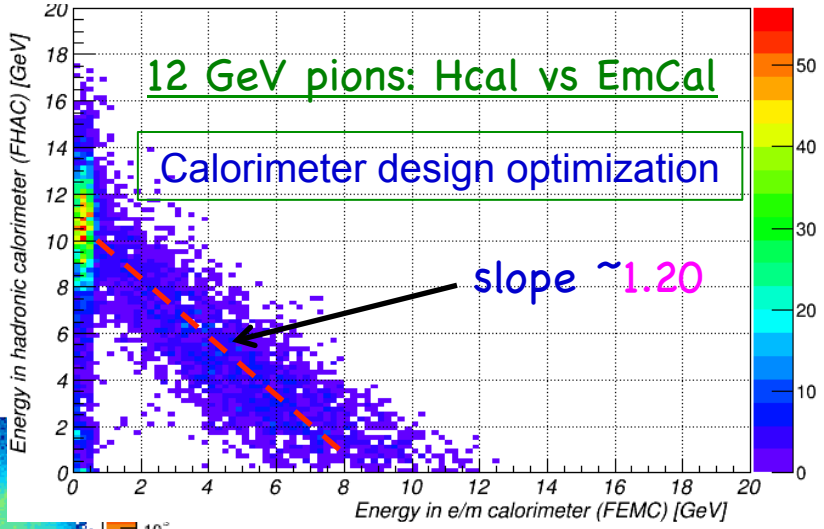


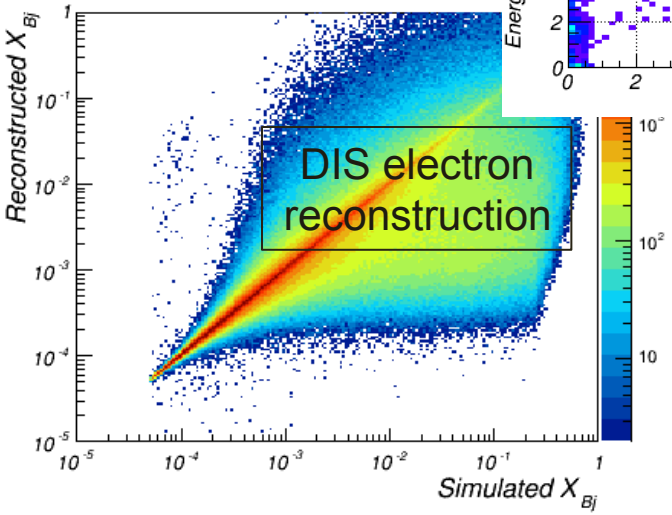
-> see examples/tracking/config.2 directory for details

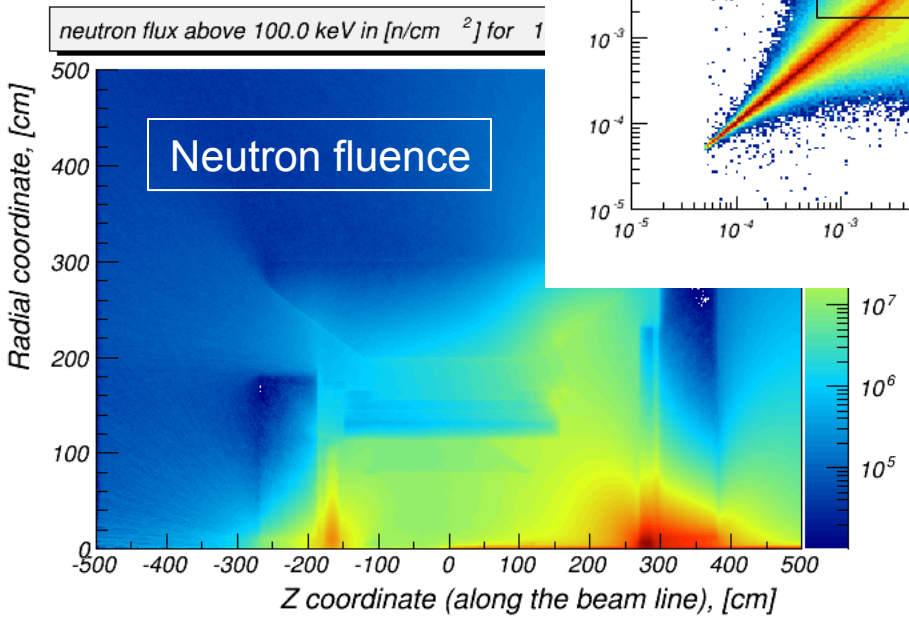
- Once Docker image is downloaded it takes <5 minutes to generate this dp/p plot

More advanced applications

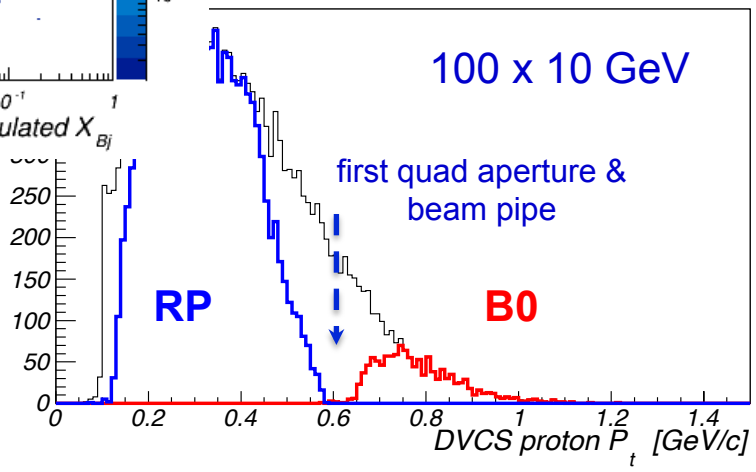




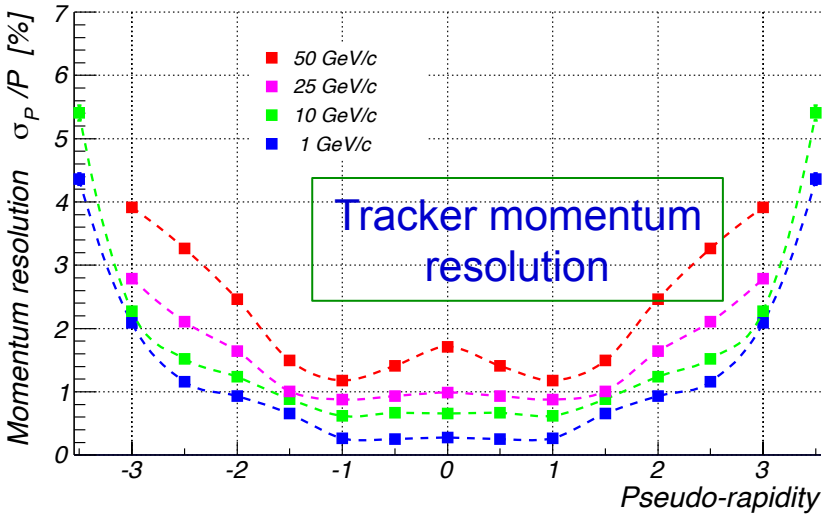


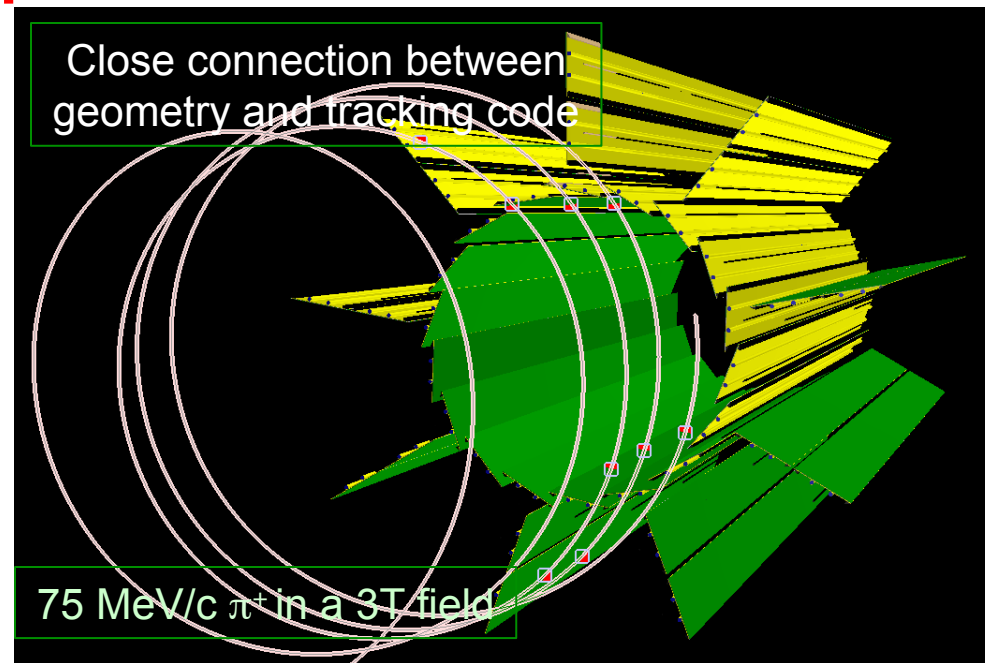


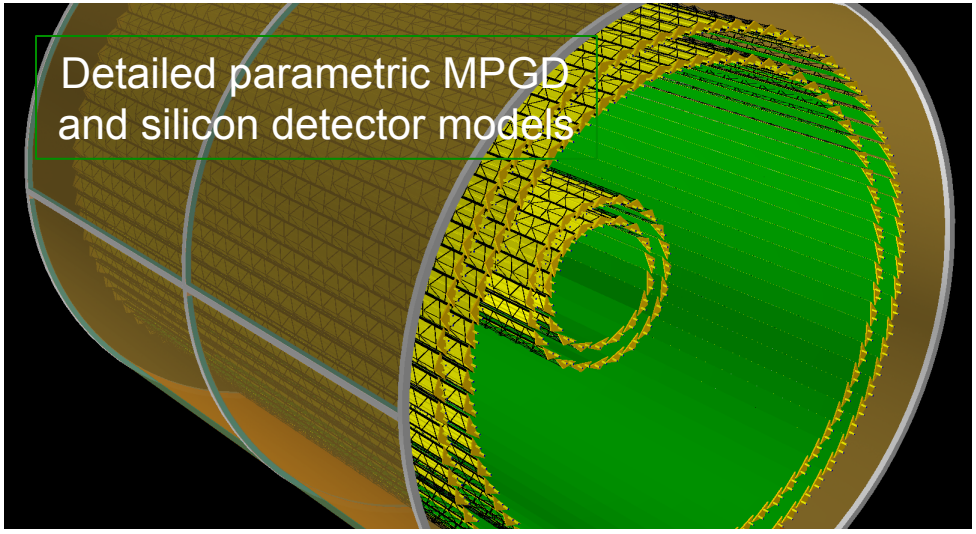
Roman Pot acceptance



Yellow Report application candidates







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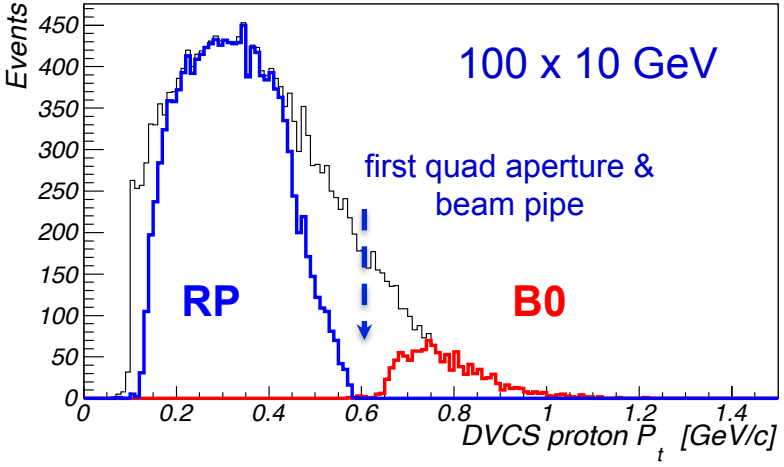

Recent updates and next steps

- Re-packaged completely (no “software bundle dependency”)
- Switched to ROOT6; ROOT5 support discontinued
- GLX library bug *potentially* fixed (ROOT event display issue)

- Software dependencies, current state:
  - GEANT3 v3.21
  - Latest versions of G3 and G4 VMC

  - GEANT4 v10.05.p01 *(not the latest)*
  - ROOT 6.14.0 *(not the latest)*

- Will be uploaded to github.com/eic *some time soon*
- Will afterwards be installed on RACF, *...*
- *...* and distributed via a Docker container (to start with)

What can be available for the YR work

- Track fitting codes, required for eic-smear parameterizations:
  - Momentum and angular resolutions at the IP
  - Tracking resolutions at the PID detector locations
- (Tracker) geometry modeling tools + export to GDML
- Other parametric detector modeling tools (e.g. calorimetry)

- Friendly support of the IR / forward WG efforts ...
- ... , as well as the *current tracking eRD** ***expert-level*** *users*

- Until Pavia meeting: dead material & services creation interface
- If requested: RAVE vertexing interface

The IR vacuum system description in ROOT
will be hard to provide on a *short* time scale