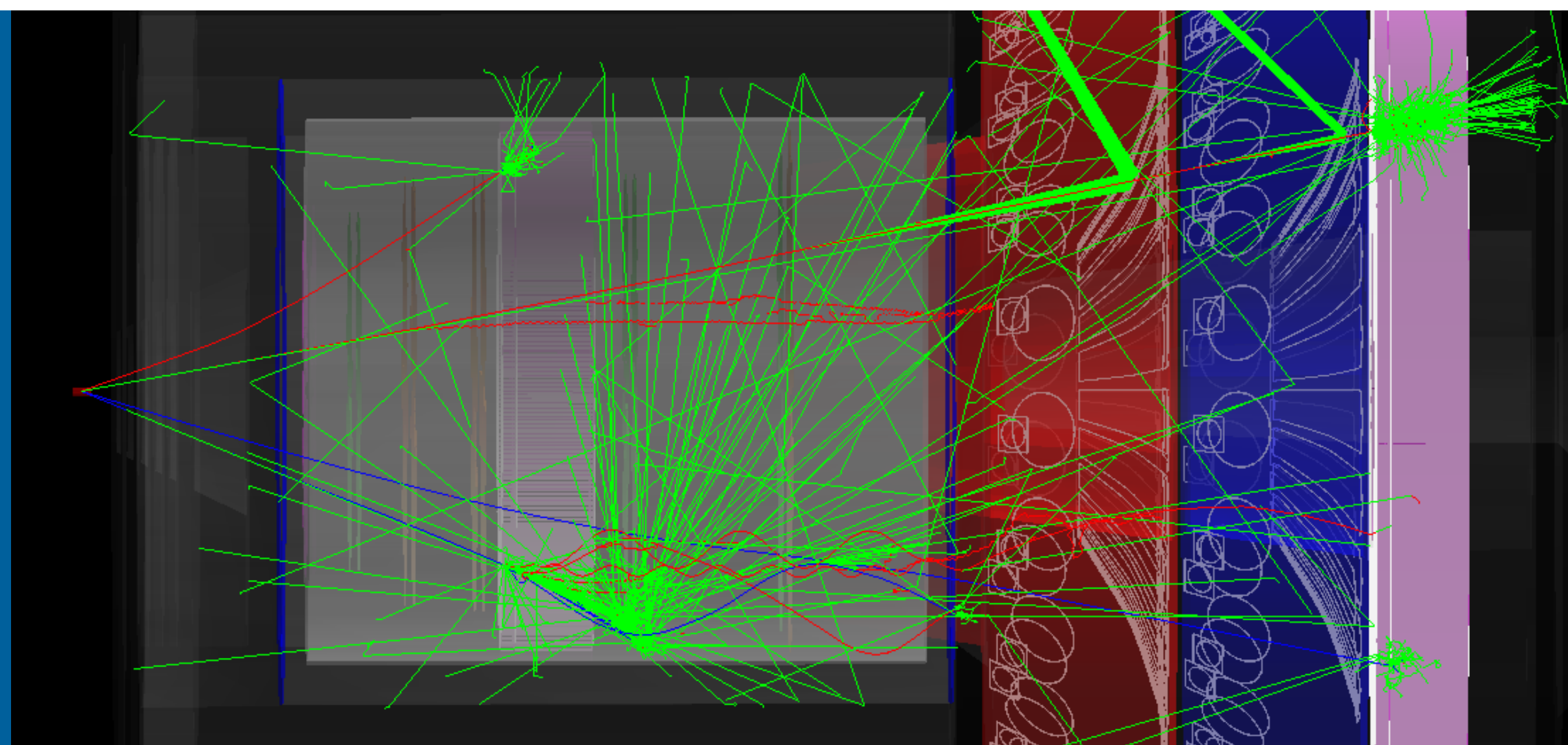


TOWARDS AN END-TO-END SIMULATION

AN EXAMPLE: SOLID J/PSI CASE



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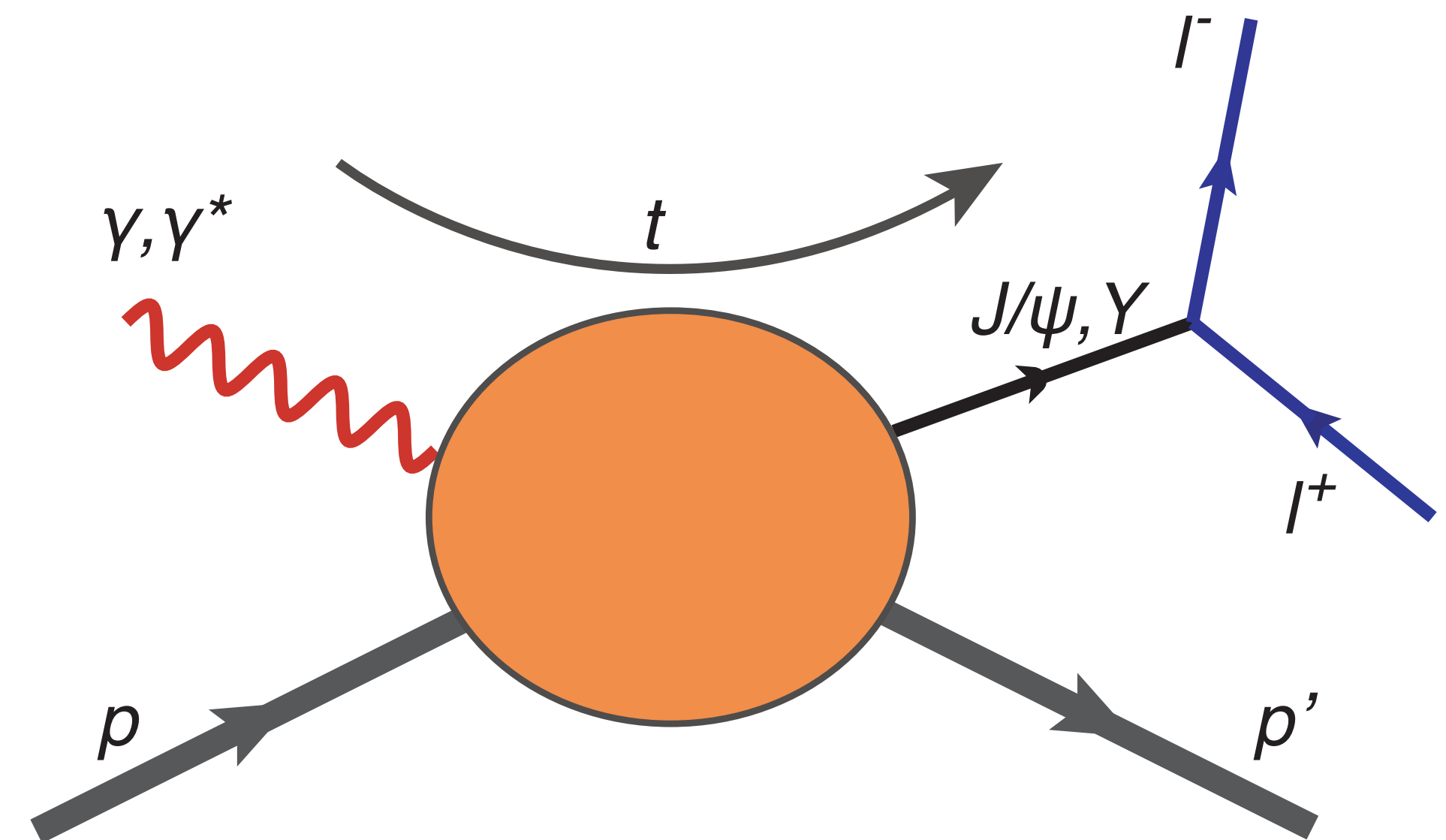
CHAO PENG
TOM POLAKOVIC
JUNQI XIE

SIMULATING J/PSI PRODUCTION

Use J/psi electro-production (“3-fold coincidence”) as example

- Electro-production
 - Measure **scattered electron and decay leptons**
 - t-channel J/ψ rate: $\sim 90/\text{day}$
 - Clean signal (less background)
 - Closer to threshold

- Photo-production
 - Measure **decay leptons and recoil proton**
 - t-channel J/ψ rate: > 1600 per day
 - Ultra-high rate



MONTE-CARLO GENERATOR

lAger I/A event generator

- Meant to be a general purpose generator
- Currently implements various models for J/ψ and Y production
- Available to the public
- Standard HepMC3 output works perfectly with DD4hep

I/A-event Generator

This is the Argonne generic I/A-event generator (**lAger**), a flexible MC generator system to simulate electro- and photo-production off nucleons and nuclei.

Below you can find an overview of the release versions, as well as a short tutorial and copyright notice. If you use lAger to generate data used in a presentation or an article in a scientific publication, please cite:

S. Joosten, Argonne I/A-event Generator (2020), GitLab repository,
https://eicweb.phy.anl.gov/monte_carlo/lager

Versions

- v3.1.0 First stable release version of **lAger**.

Tutorial

Setup of the lager singularity container on your system:

The default mode to run the generator is through singularity. To setup the generator on your system, first ensure singularity is installed. Then follow these instructions:

1. Clone this repository and checkout the desired stable release (e.g. v3.1.0)

```
git clone https://eicweb.phy.anl.gov/monte_carlo/lager.git
cd lager && git checkout v3.1.0
```

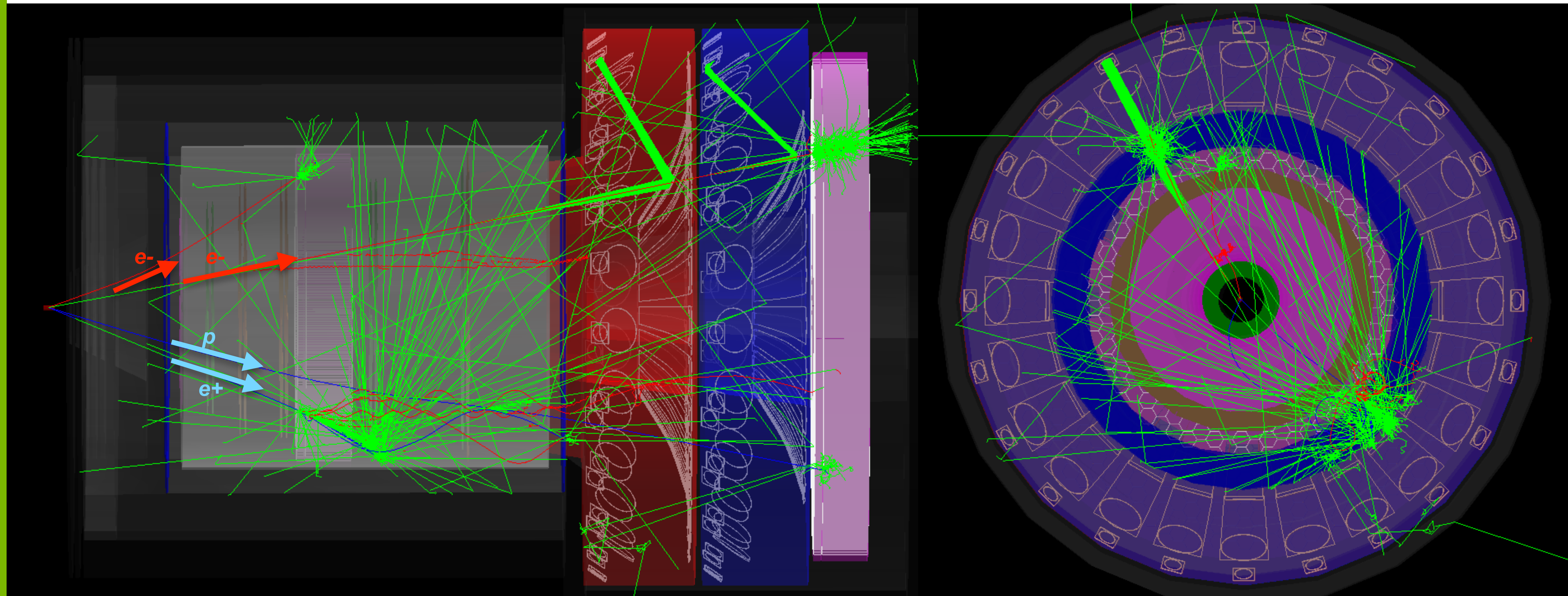
2. Run the **deploy.py** script to install the container to a prefix of your choice, e.g.
\$HOME/local/opt/lager.

```
./deploy.py $HOME/local/opt/lager
```

https://eicweb.phy.anl.gov/monte_carlo/lager

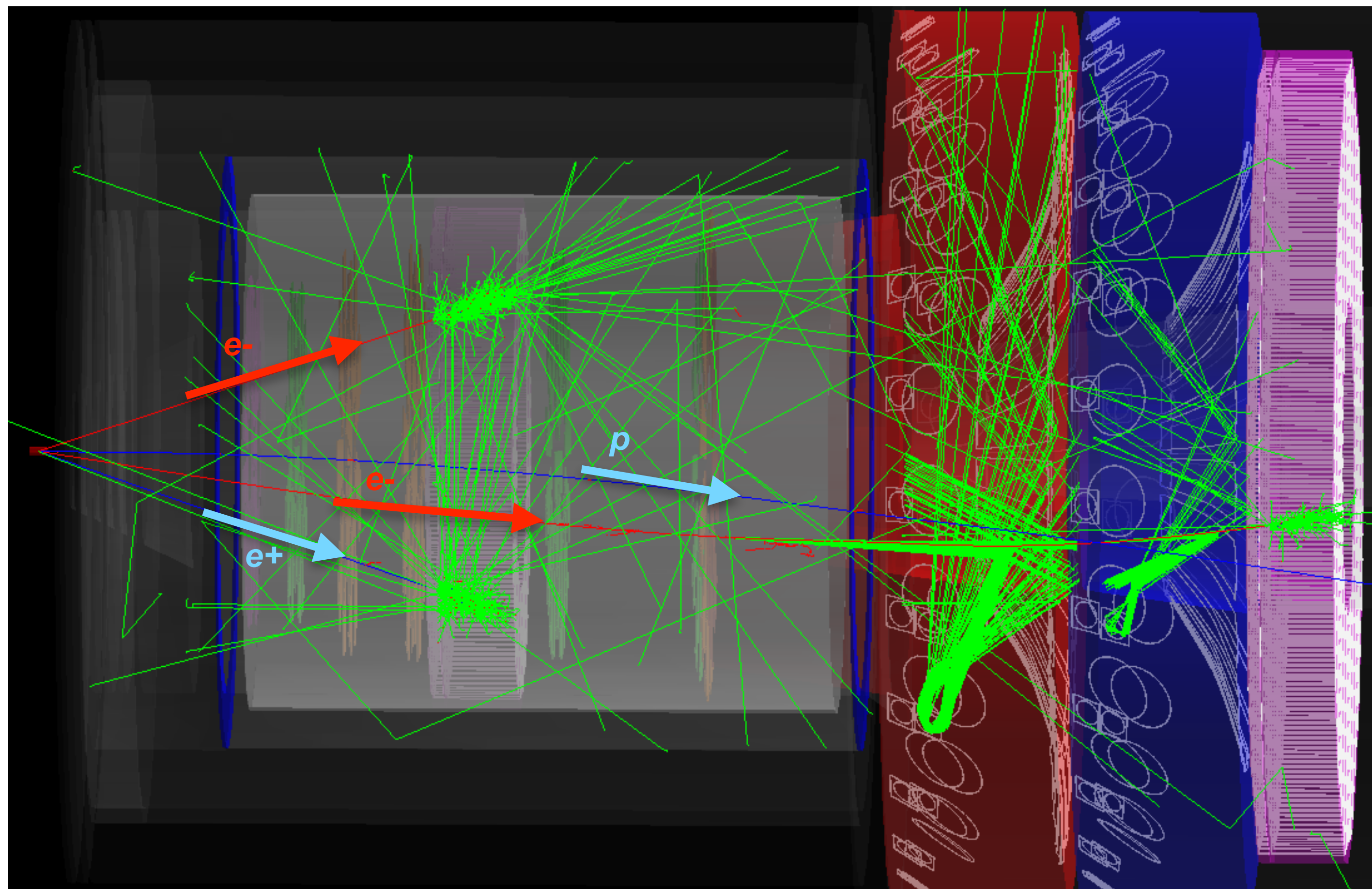
4-FOLD COINCIDENCE J/PSI EVENT

From new DD4hep software



3-FOLD COINCIDENCE J/PSI EVENT

From new DD4hep software

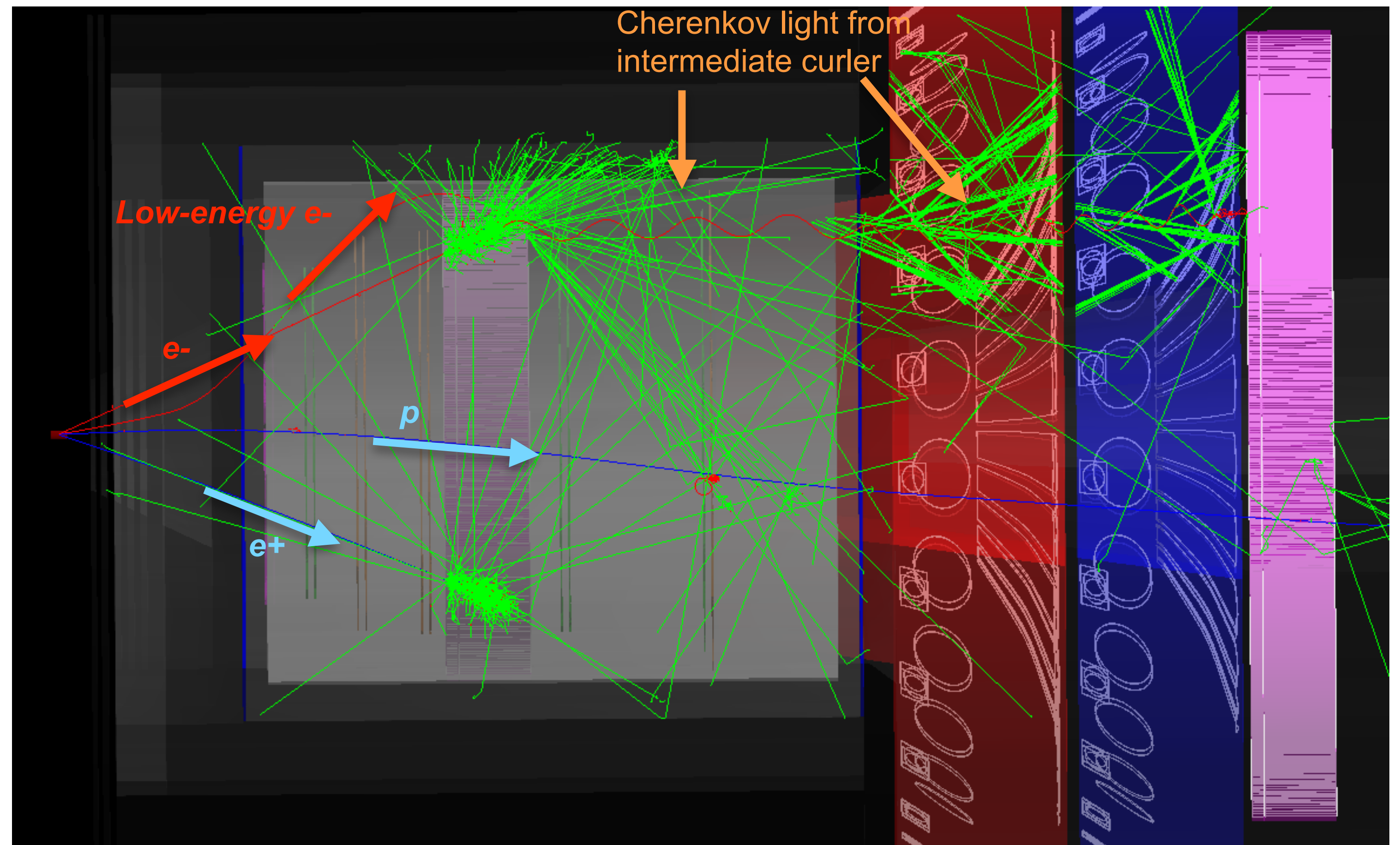


- Recoil proton barely misses detection
- J/psi decay products in at large angle
- Scattered electron in forward detector.

UNDETECTED J/PSI EVENT

From new DD4hep software

- J/psi decay products in at large angle
- Low-energy scattered electron not detected
- Recoil proton again barely misses detection



NEXT STEPS

A full showcase of the new software

1. **Cross-validate** old gemc implementation with new DD4hep implementation:
 - Start from EC background rate using Wiser generator
 - Will be simple example of better workflow through DD4hep
2. Use closed-loop **simulation + reconstruction** to ensure **optimization** for *J/psi*
3. Update *J/psi* **trigger** for science review (high-priority!)
4. Leverage our experience to be **comprehensive example** of new software
 - Will naturally highlight pro's and con's to collaboration
 - Full implementation for SoLID-Jpsi will be a good guide for other configurations!



BEBOP

MORE TO COME SOON!

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