SIDIS-EIC and Latest Productions

https://github.com/eic/sidis-eic

Christopher Dilks
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Duke
UNIVERSITY

Production 22.11.2

```
jug_xl> dilks@arcturus:~/e/sidis-eic$ mc tree S3/eictest/EPIC/RECO/22.11.2/epic_arches/DIS/NC/
S3/eictest/EPIC/RECO/22.11.2/epic_arches/DIS/NC/
├─ 10x100
│  ├─ minQ2=1
│  ├─ minQ2=10
│  ├─ minQ2=100
│  └─ minQ2=1000
├─ 18x275
│  ├─ minQ2=1
│  ├─ minQ2=10
│  ├─ minQ2=100
│  └─ minQ2=1000
└─ 5x41
   ├─ minQ2=1
   ├─ minQ2=10
   └─ minQ2=100
jug_xl> dilks@arcturus:~/e/sidis-eic$ mc tree S3/eictest/EPIC/RECO/22.11.2/epic_brycecanyon/DIS/NC/
S3/eictest/EPIC/RECO/22.11.2/epic_brycecanyon/DIS/NC/
├─ 10x100
│  ├─ minQ2=1
│  └─ minQ2=10
├─ 18x275
│  ├─ minQ2=1
│  ├─ minQ2=10
│  ├─ minQ2=100
│  └─ minQ2=1000
└─ 5x41
   ├─ minQ2=1
   ├─ minQ2=10
   └─ minQ2=100
```

- Pythia 8 (from ATHENA EVGEN?)
- Supported by SIDIS-EIC “s3tools/”
  - Automates downloading, streaming, config files

Production 22.11.3

```
jug_xl> dilks@arcturus:~$ mc tree S3/eictest/EPIC/RECO/22.11.3/epic_arches/SIDIS/
S3/eictest/EPIC/RECO/22.11.3/epic_arches/SIDIS/
├─ Lambda_ABCONV
└─ pythia6
   ├─ ep_18x275
   │  └─ hepmc_ip6
   │     └─ radcor
   └─ ep_5x41
      └─ hepmc_ip6
         ├─ noradcor
         └─ radcor
jug_xl> dilks@arcturus:~$ mc tree S3/eictest/EPIC/RECO/22.11.3/epic_brycecanyon/SIDIS/
S3/eictest/EPIC/RECO/22.11.3/epic_brycecanyon/SIDIS/
├─ Lambda_ABCONV
└─ pythia6
   ├─ ep_18x275
   │  └─ hepmc_ip6
   │     └─ radcor
   └─ ep_5x41
      └─ hepmc_ip6
         ├─ noradcor
         └─ radcor
jug_xl> dilks@arcturus:~$
```

- Pythia 6, with and without radiative corrections
- Support in SIDIS-EIC “s3tools/” coming soon…
  - Inconsistencies in file tree:
  - similar inconsistency in EVGEN file tree...

Detector Configurations

- **Version A “Arches”:**
  - Standard silicon tracker
  - **2 MPGD barrel planes** (second behind DIRC)
  - **No MPGD plane behind dRICH**
  - Standard dRICH & DIRC
  - **mRICH**
  - Standard forward/backward calorimetry and barrel HCal
  - **SciGlass bECal**
  - Standard FF and FB
  - Standard TOF?
  - **No calorimeter insert**

- **Version B “BryceCanyon”:**
  - Standard silicon tracker
  - **1 MPGD barrel plane** (no plane behind DIRC)
  - **+ MPGD plane behind dRICH**
  - Standard dRICH & DIRC
  - **pfRICH**
  - Standard forward/backward calorimetry and barrel HCal
  - **Imaging bECal**
  - Standard FF and FB
  - Standard TOF? Or no TOF?
  - **+Calorimeter insert?**

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Test Productions

- **EPIC 22.11.***
  - S3/eictest/EPIC/RECO/22.11.2/epic_{arches,brycecanyon}/DIS/NC
  - S3/eictest/EPIC/RECO/22.11.3/epic_{arches,brycecanyon}/SIDIS/pythia6
- **ECCE 22.1**
  - S3/eictest/EPIC/Campaigns/22.1/SIDIS/pythia6
- **ATHENA DeathValley 1.0**
  - S3/eictest/ATHENA/RECO/deathvalley-v1.0/DIS/NC
- **Delphes**
  - HEPMC files from S3/eictest/ATHENA/EVGEN/DIS/NC
    - to be updated: ATHENA → EPIC
  - Run through Delphes (CI job)
  - Using ATHENA card from `delphes_EIC` [update needed]

SIDIS-EIC Updates

- AnalysisEpic support https://github.com/eic/sidis-eic/pull/208
  - Merged → Release 0.5.0
  - New AnalysisEpic class
  - New output tree: ParticleTree
  - New S3 support script s3tools/make-epic-config.sh
  - New tutorial/analysis_epic.C

- Kinematics Reconstruction with ML – in progress: https://github.com/eic/sidis-eic/pull/214
  - Open PR from Connor
  - Roadblocks to adding to CI benchmarks?

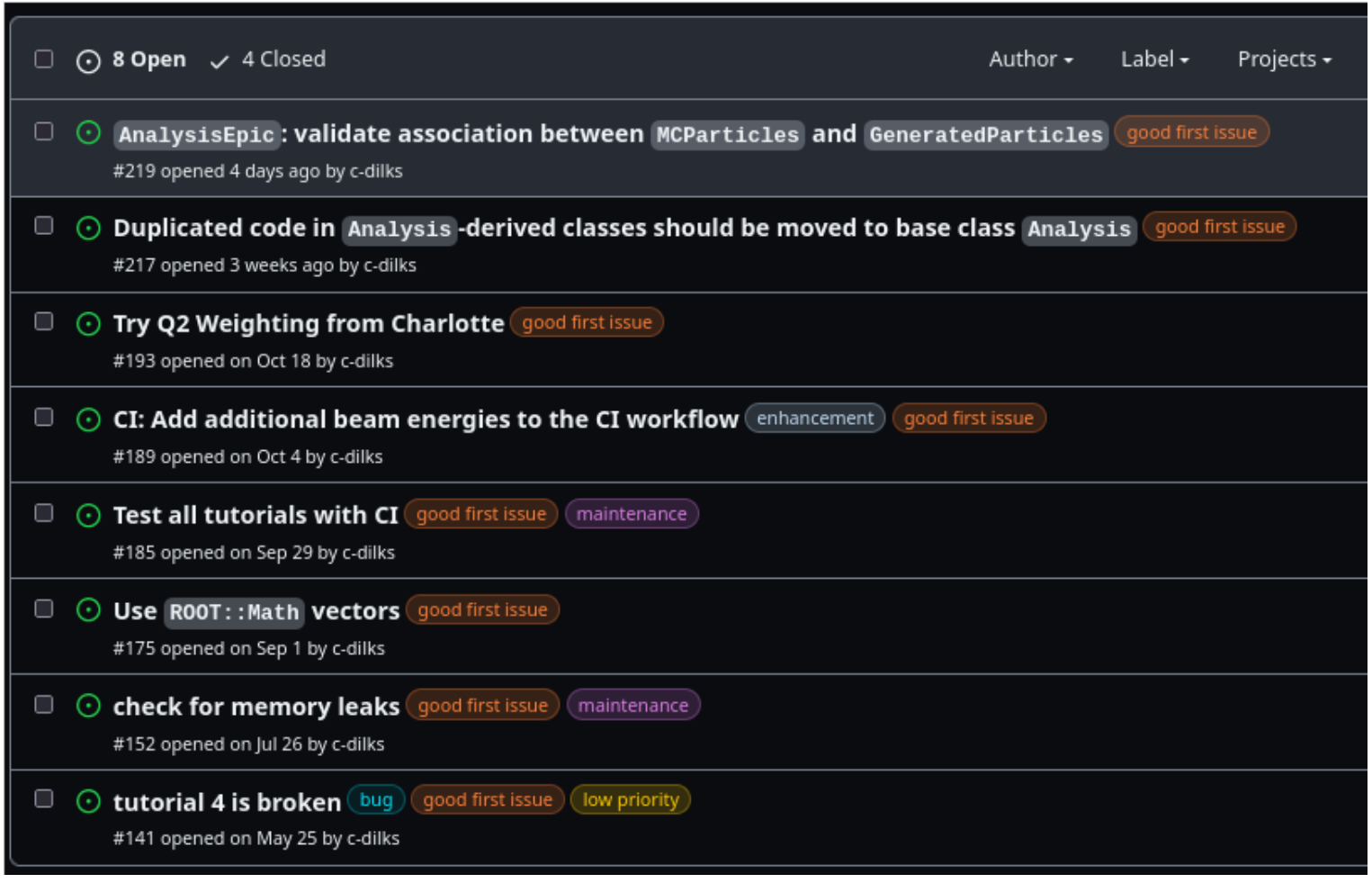
- New S3 endpoint
  - Updated in CI, but users need to update locally:

```
mc config host rm S3
mc config host add S3 https://eics3.sdcc.bnl.gov:9000 $S3_ACCESS_KEY $S3_SECRET_KEY
```

- Licensing under LGPLv3
  - Same as `epic` (DD4hep geometry repo)
  - Copyright headers added to all files (check your name!)
  - Future: follow whatever open source licensing EPIC decides…

Software Tasks…

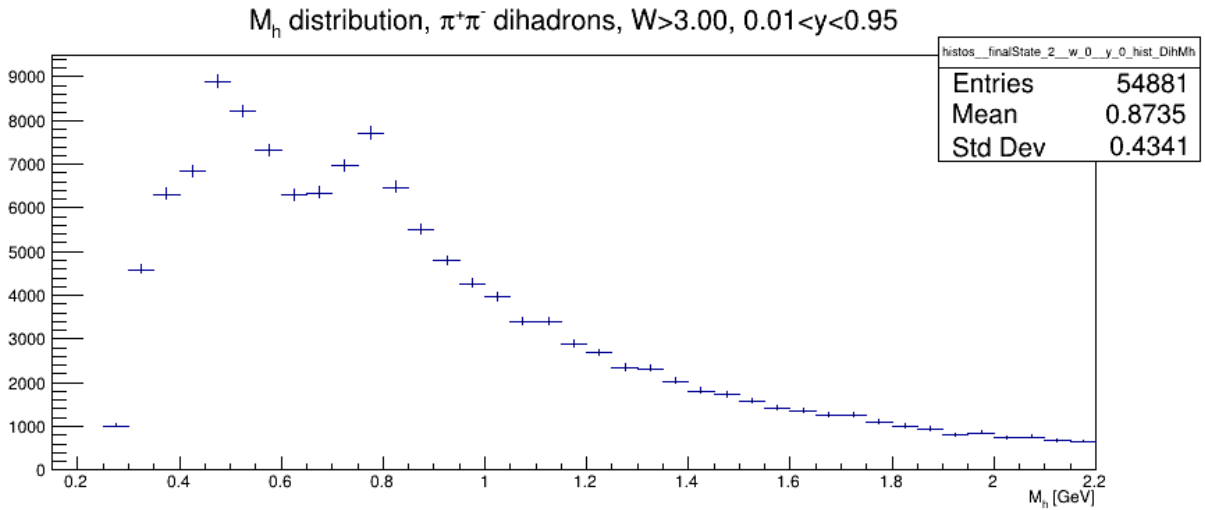
- Rename to “**epic-analysis**”
- “Good first issues”

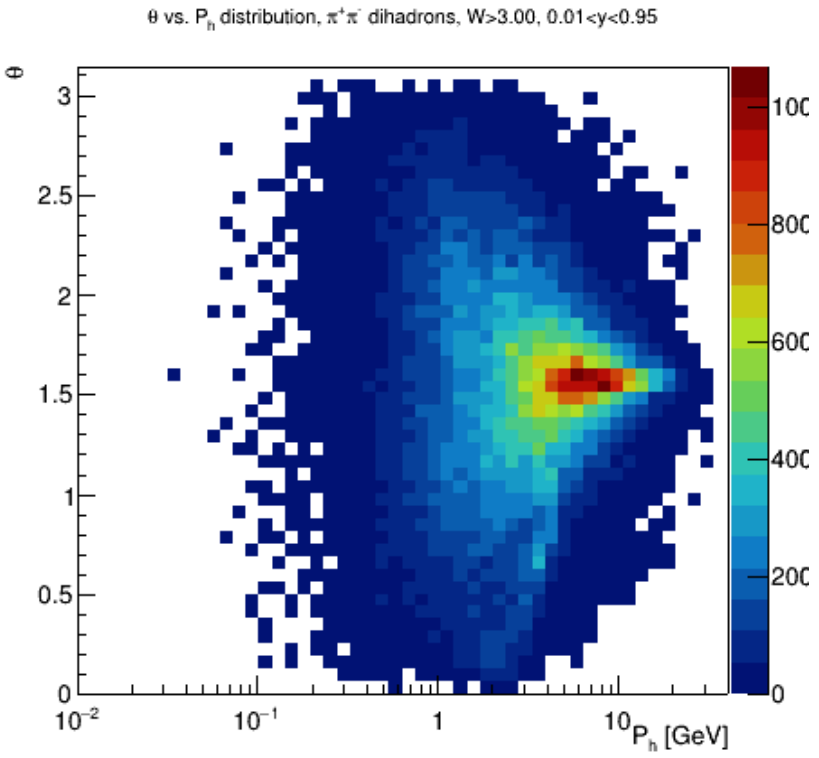


Dihadrons

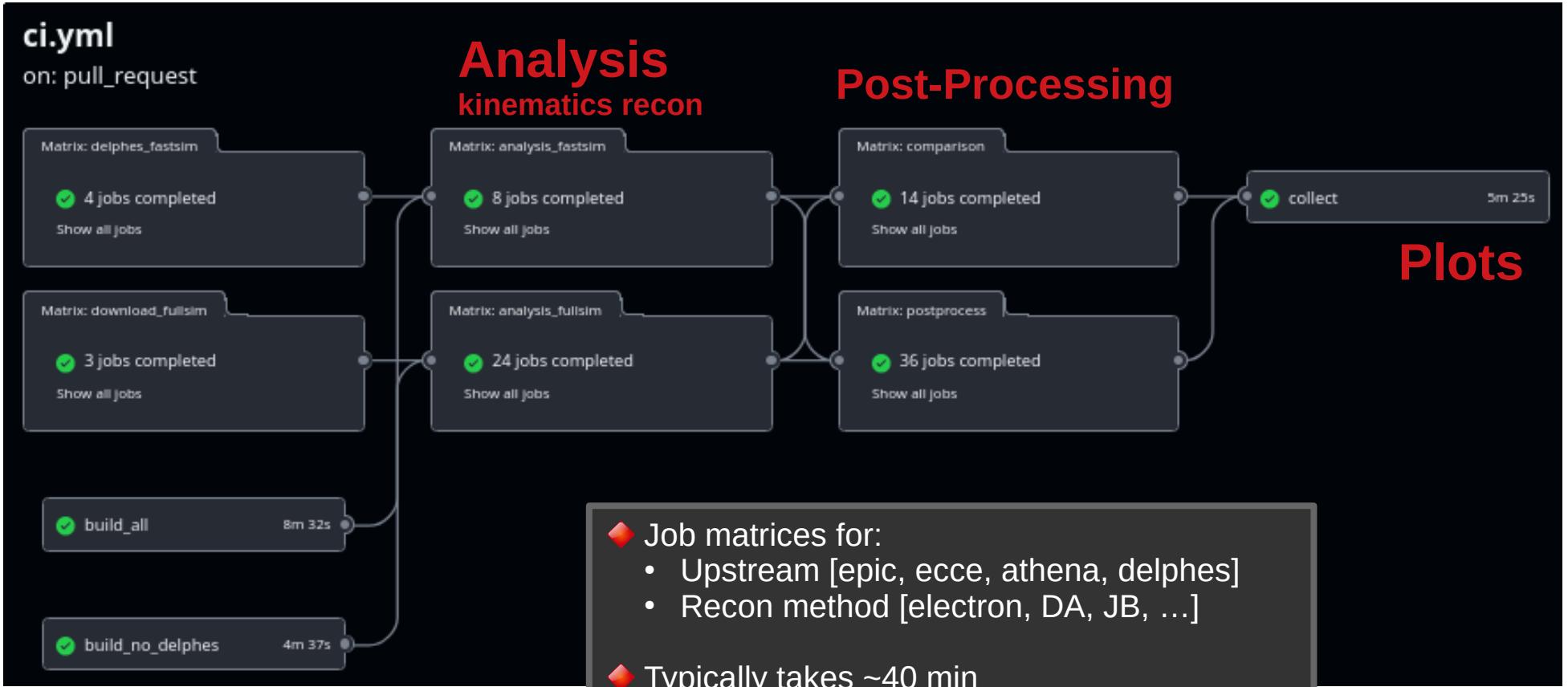
- Work in Progress: https://github.com/eic/sidis-eic/pull/192
  - Kinematics – done, but needs validation / cross check
  - Inclusive Pairing – done, but needs validation
  - Integrated as an additional “finalState”

- **Any volunteers to take over?**





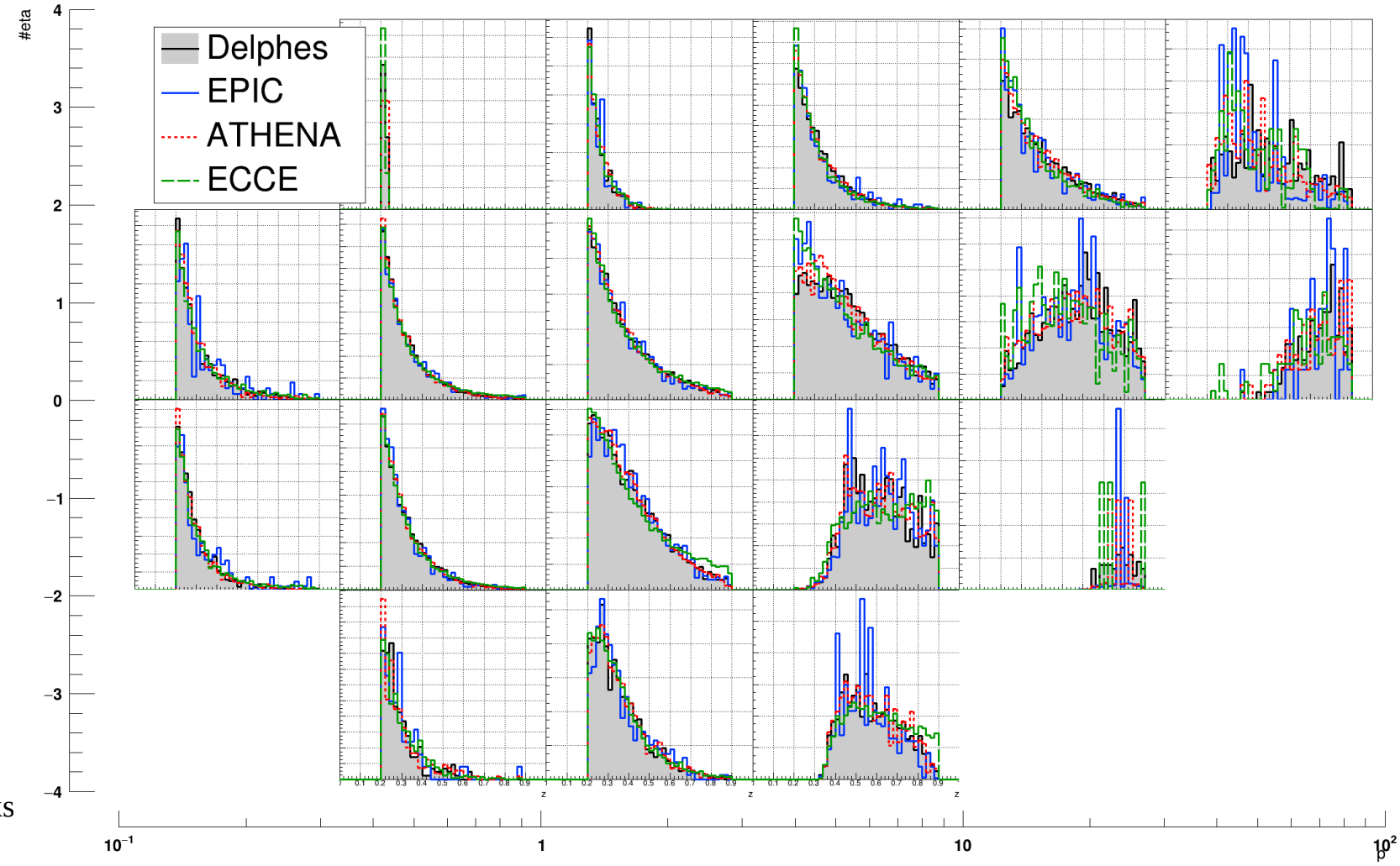
Analysis Benchmarks



- Job matrices for:
  - Upstream [epic, ecce, athena, delphes]
  - Recon method [electron, DA, JB, …]
- Typically takes ~40 min
  - Separate “no delphes” build to start full simulation jobs sooner
  - Alternatively, add Delphes to eic-shell
  - Slowest step: reading from S3

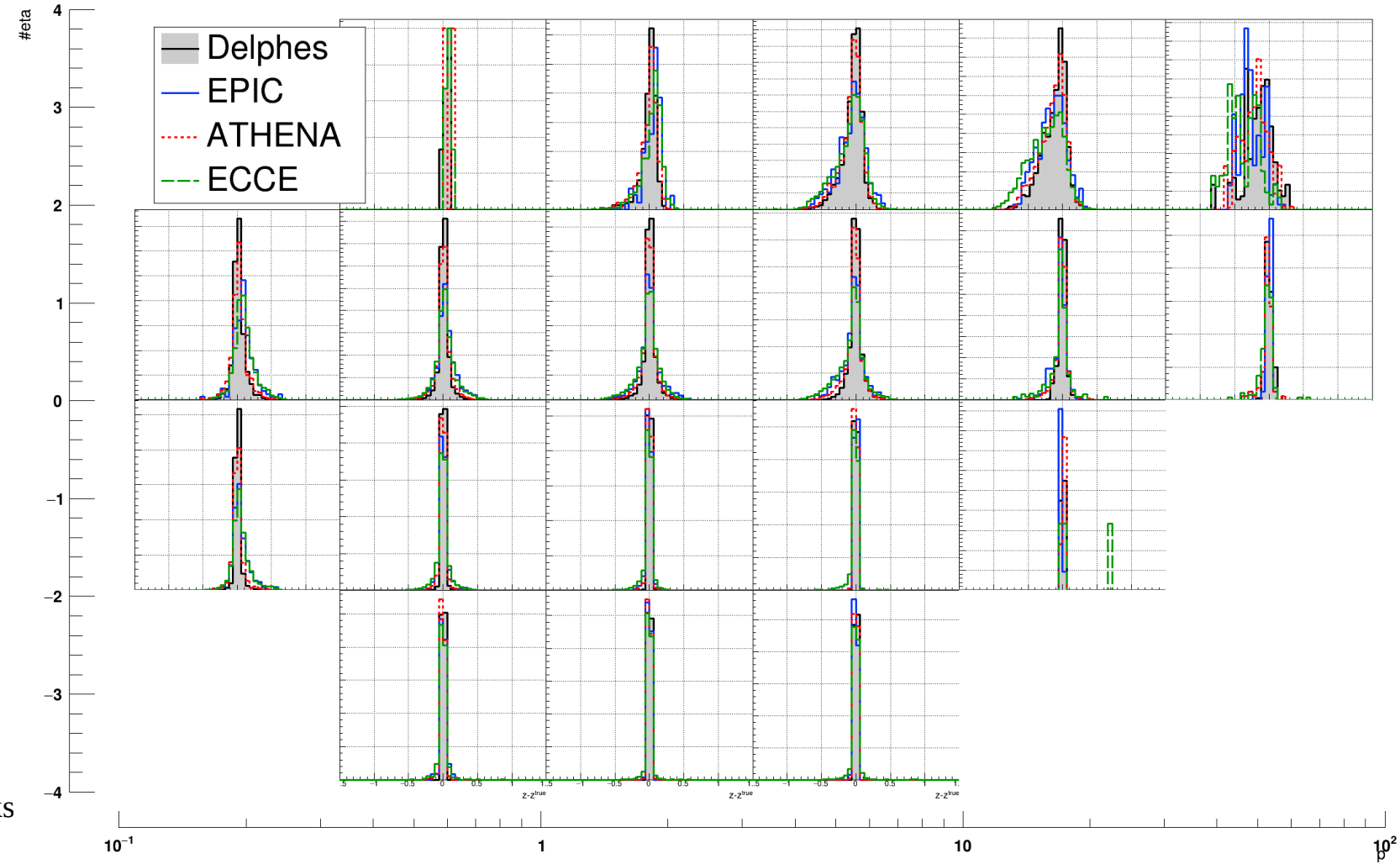
Sample plots: z in (η,p)

Electron method



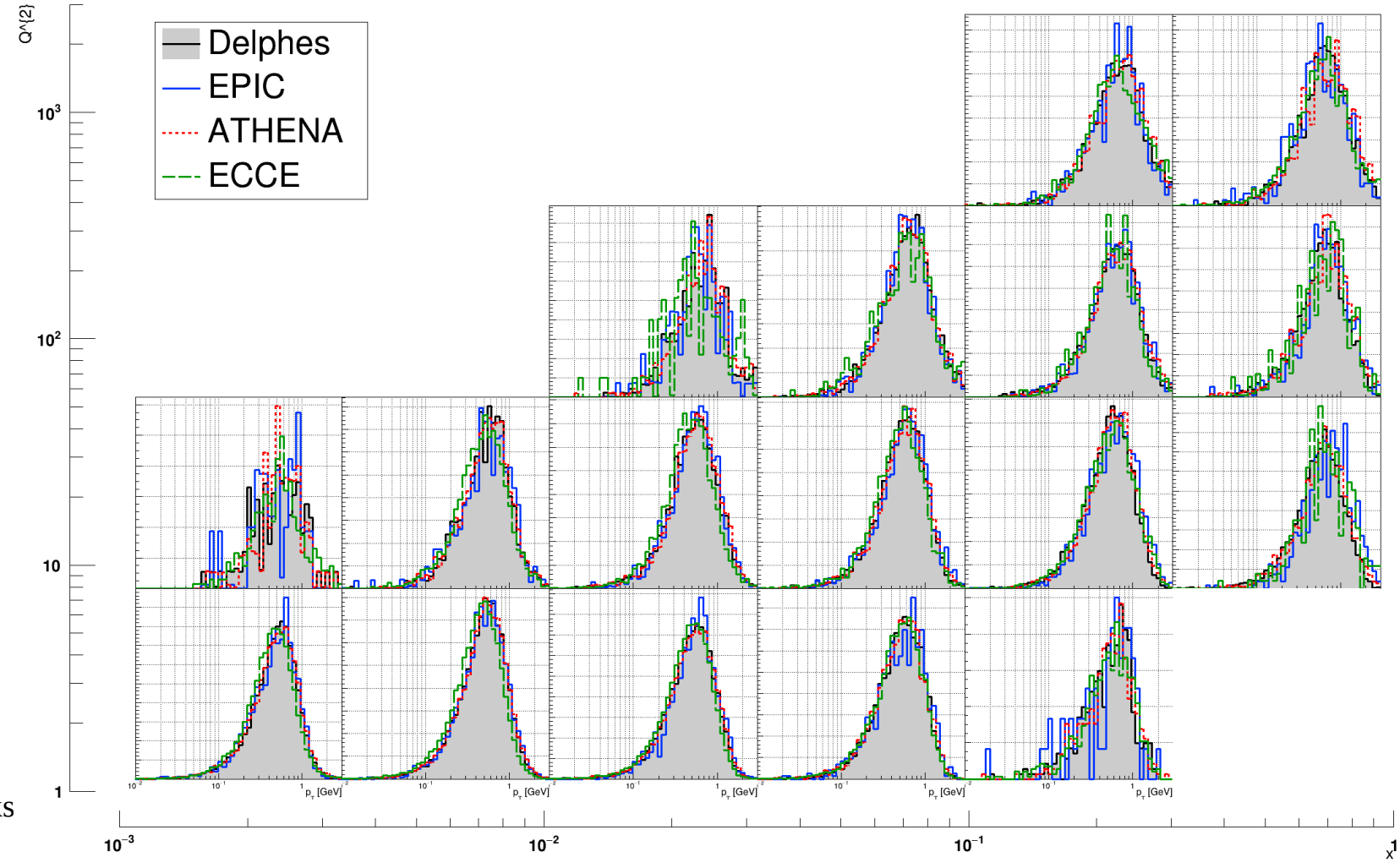
Sample plots: z resolution in (η,p)

Electron method



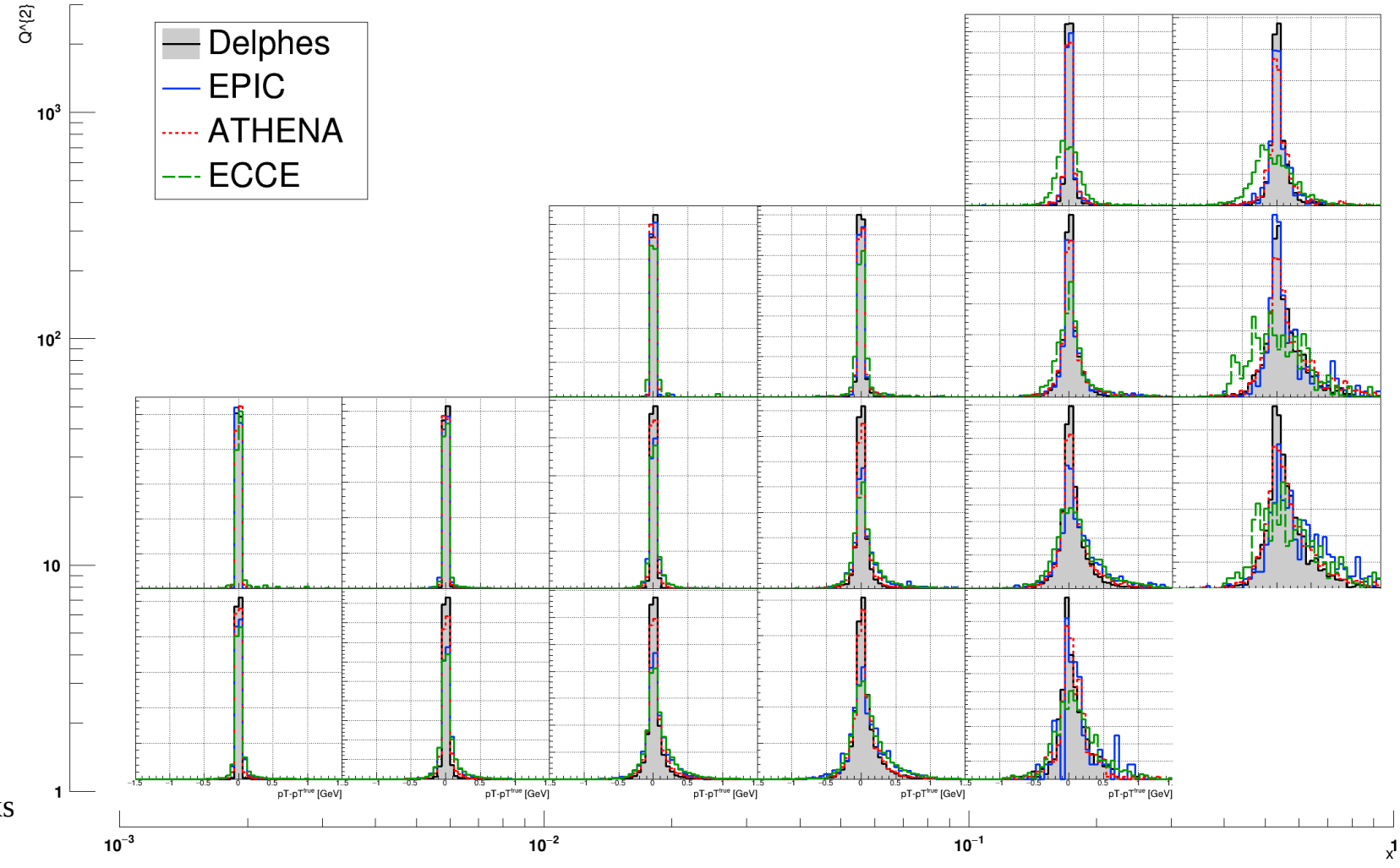
Sample plots: p_T in (x,Q2)

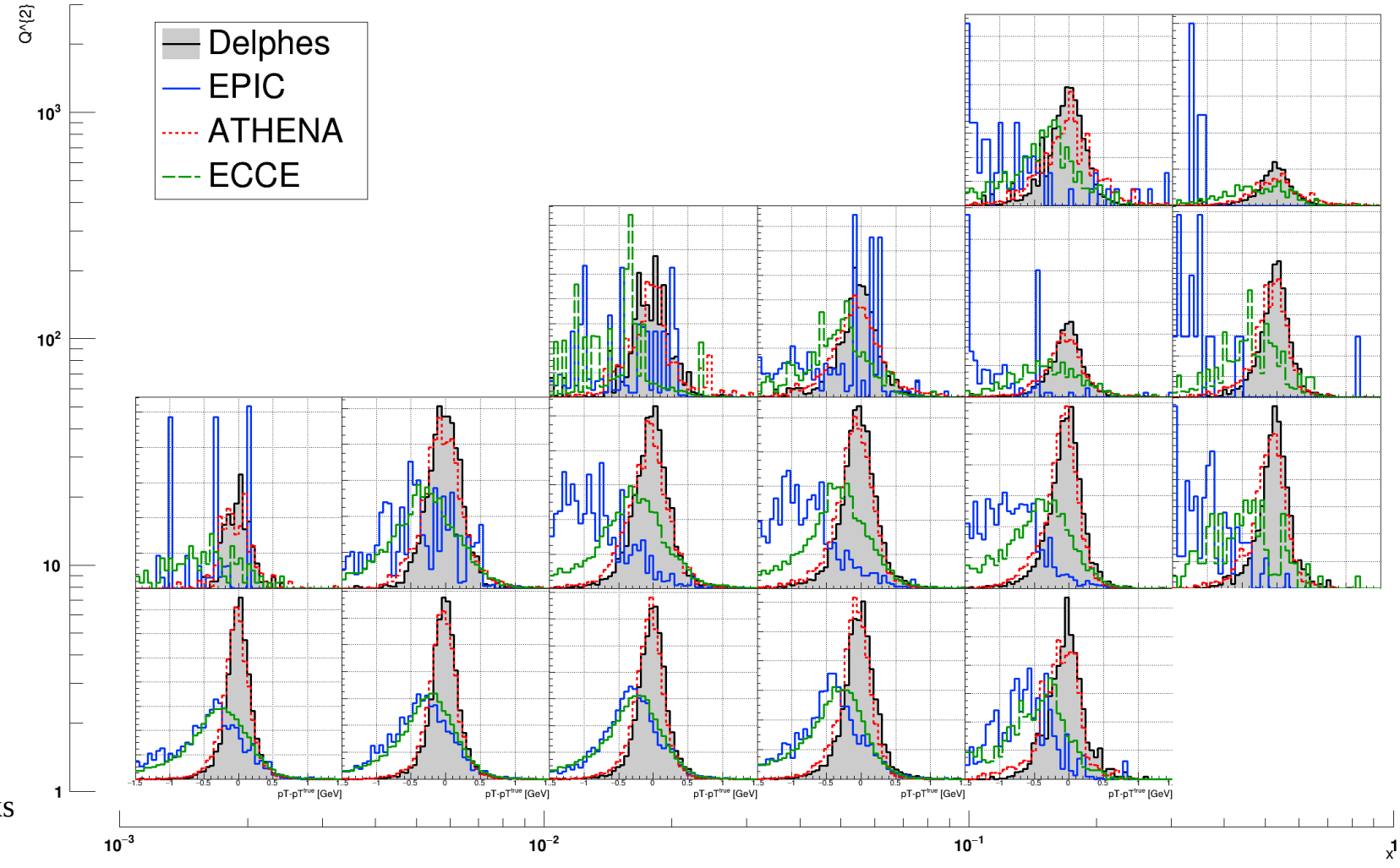
Electron method



Sample plots: p_T resolution in (x,Q2)

Electron method



Sample plots: p_T resolution in (x,Q2)

JB method