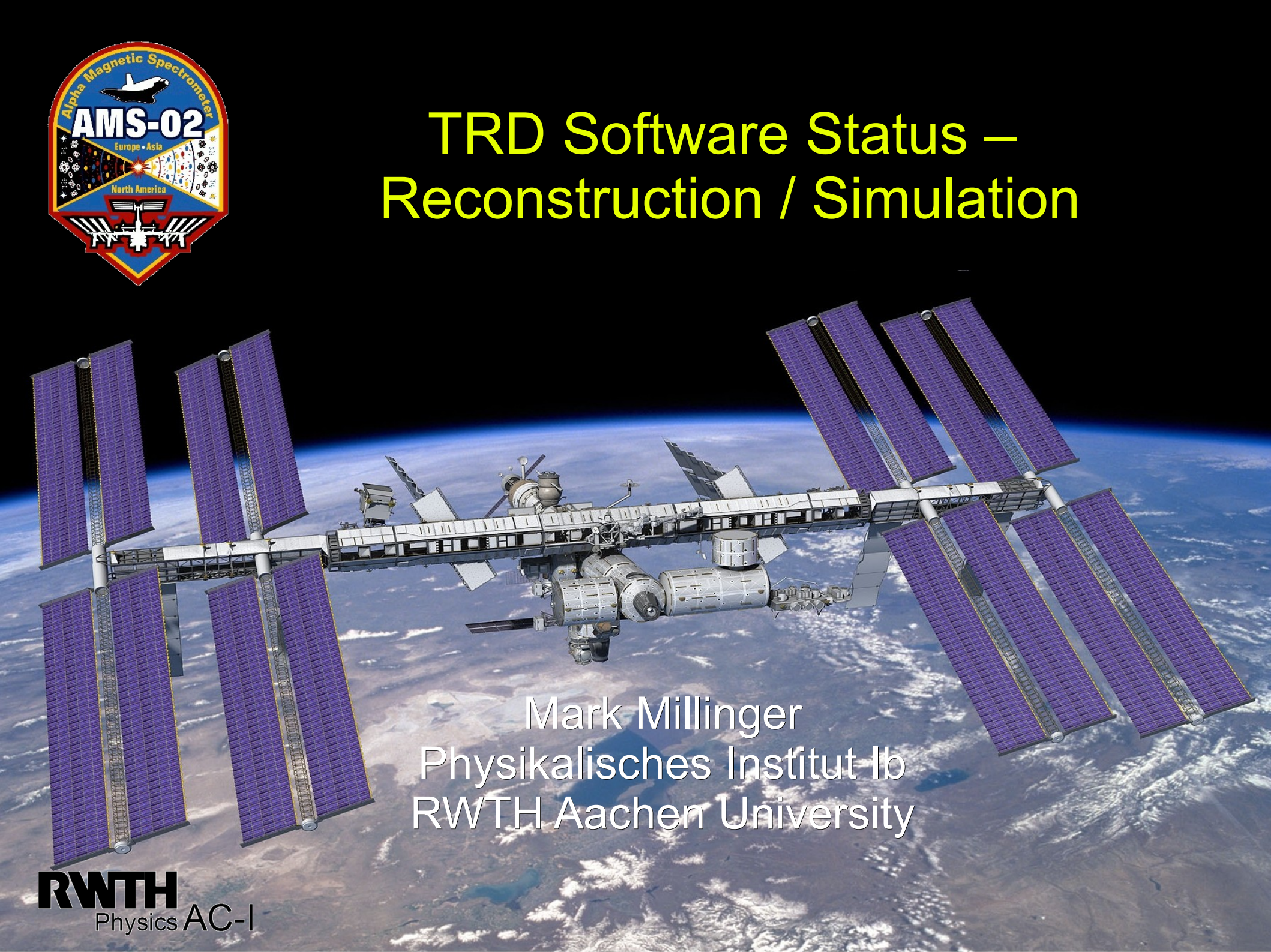
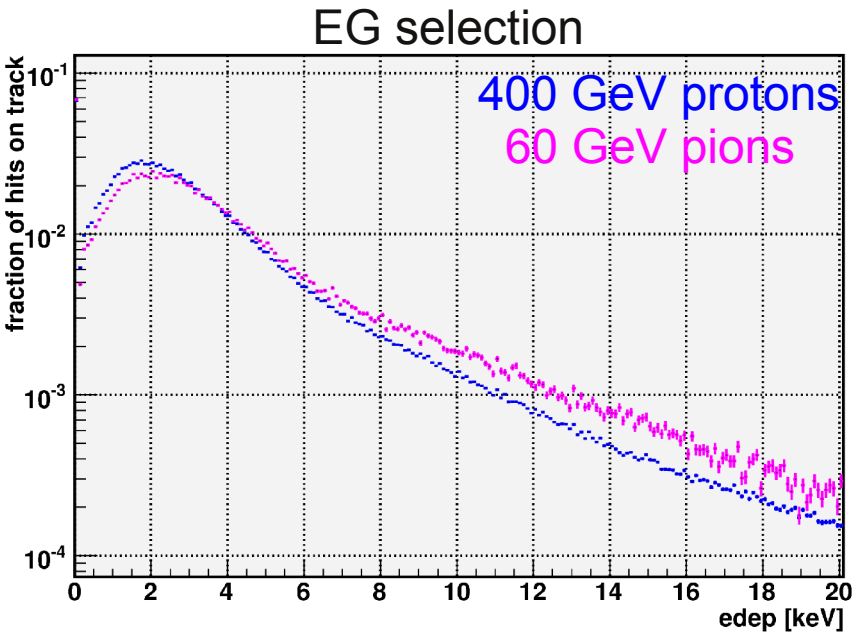


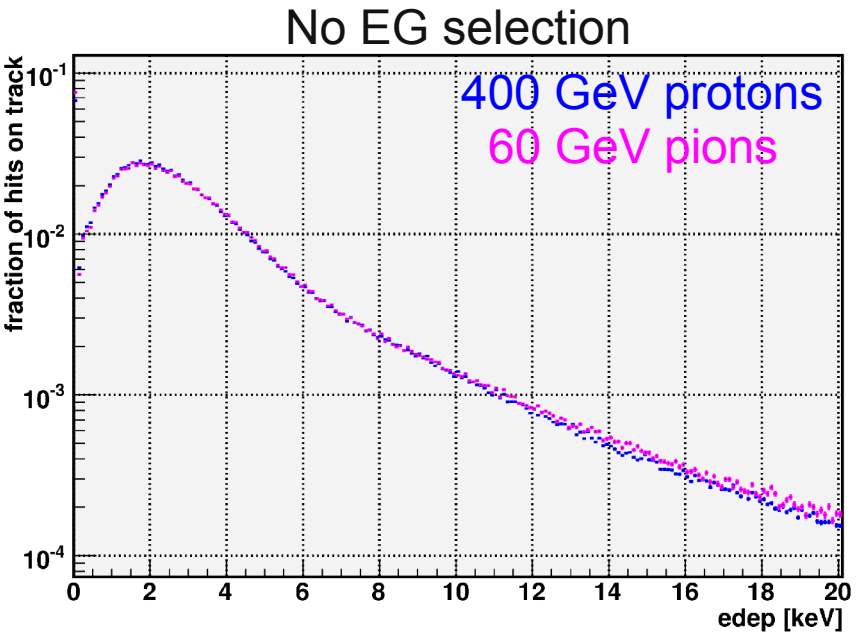
TRD Software Status – Reconstruction / Simulation

Mark Millinger
Physikalisches Institut Ib
RWTH Aachen University

RWTH Physics AC-I

Testbeam data spectra



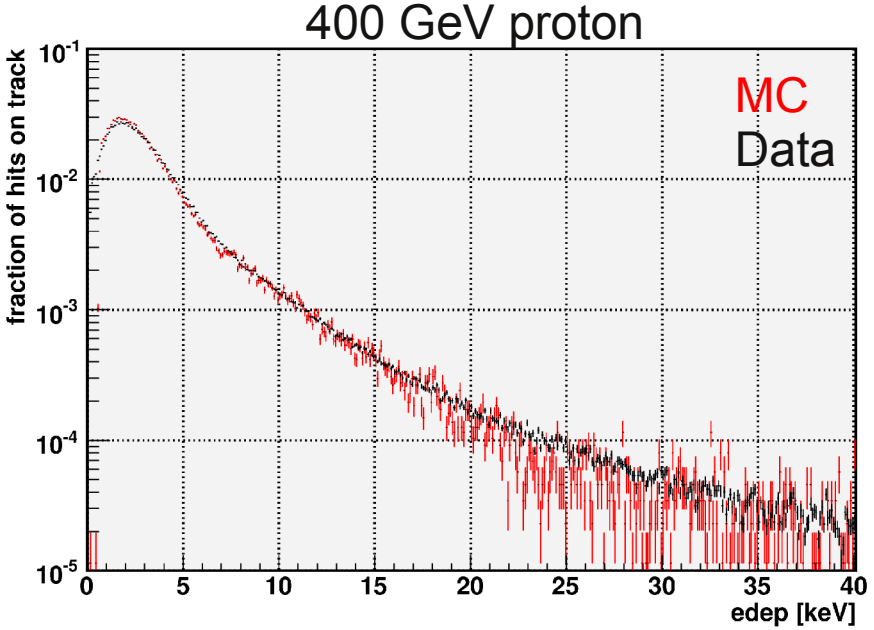


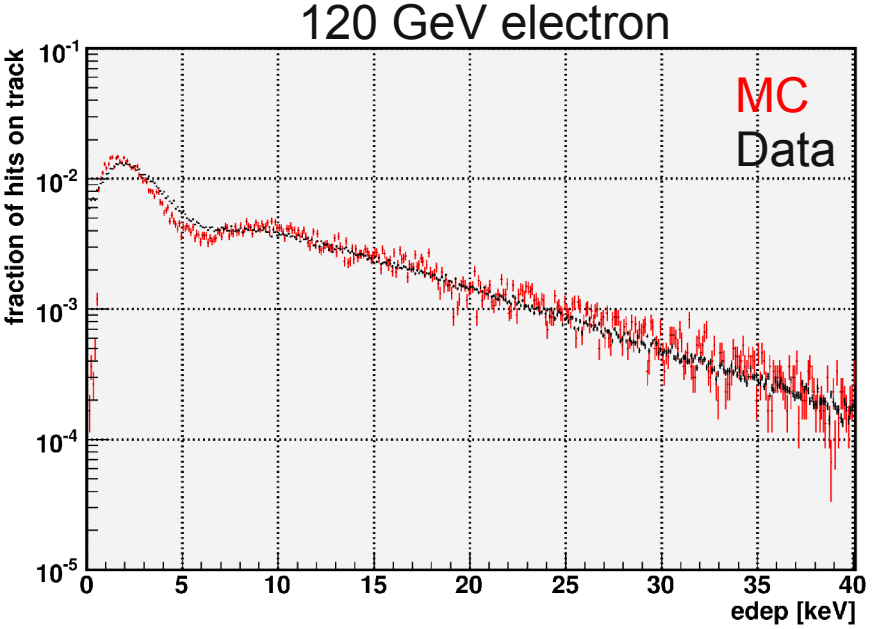
- Cherenkov signals added to AMS trigger as ExtGate1/2
- Disregarding EG selection (pion = EG0&&EG1) improves agreement on proton / pion spectra (same gamma factor)

Gbatch Software Updates

- **ParticleR class:**
  - Simple / Robust Cluster Counting algorithm
  - Updated PDFs – independent of other subdetectors (rigidity)
  - “Single” likelihoods for events being proton- / electron-like
- **Geant3 Simulation**
  - Introduced factors to tune TR Generation / Absorption & Ionization
- **Geant4 Simulation**
  - Updated Makefile (source g4i – make -f Moptg4)
  - Workaround for bug in TRD geometry

Testbeam / MC spectra





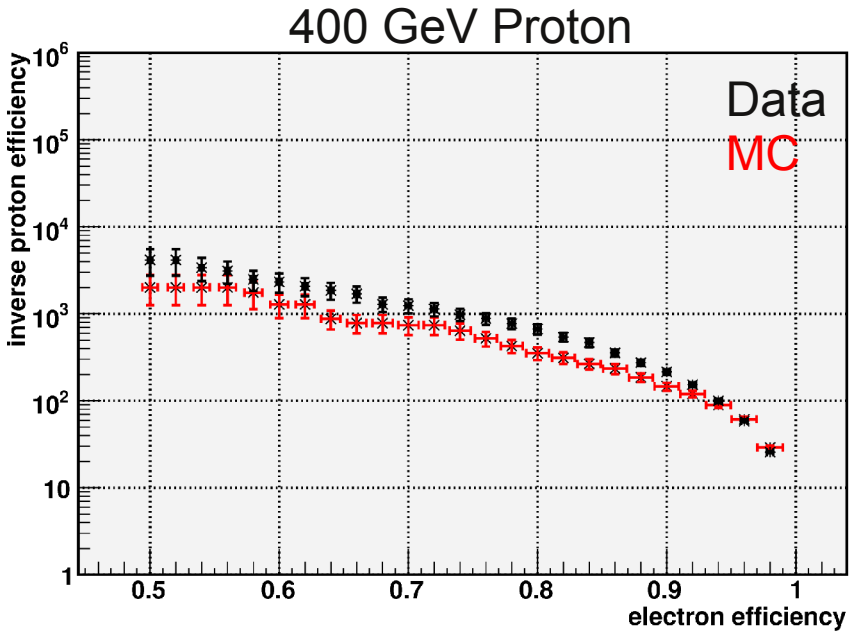
- Energy deposition fairly described by AMS Geant3 MC
- Better performance expected from Geant4

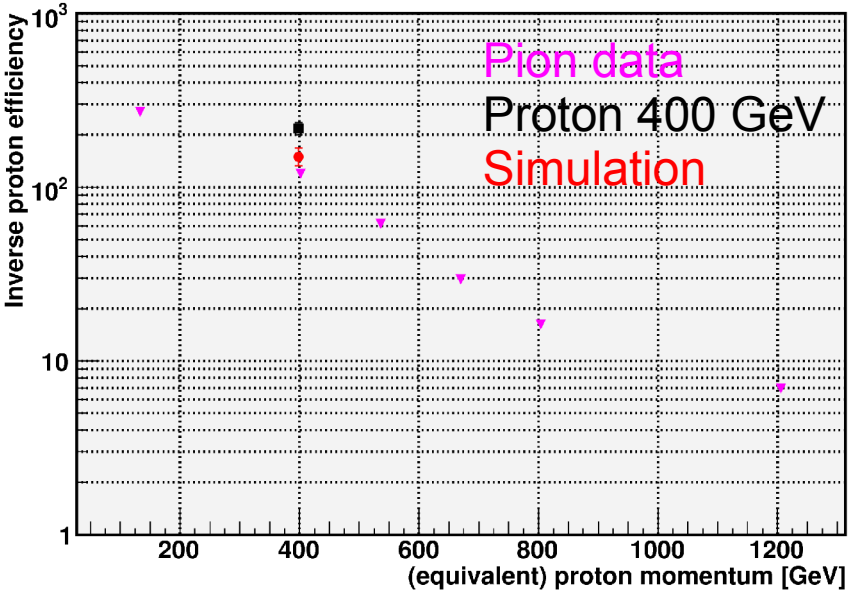
Geant4 advantages

- Maintained / Up-to-date Detector Simulation package
- Modular Physics Processes (Various models)

- **For TRD:**
  - TR photon physics is calculated for materials rather than added by hand / parametrized in physics tables
  - Ionization processes in thin layers are calculated for tube gas
  - Calculation above based on material parameters
    (e.g. density, temperature, pressure, composition of TRD gas)

TRD identification performance





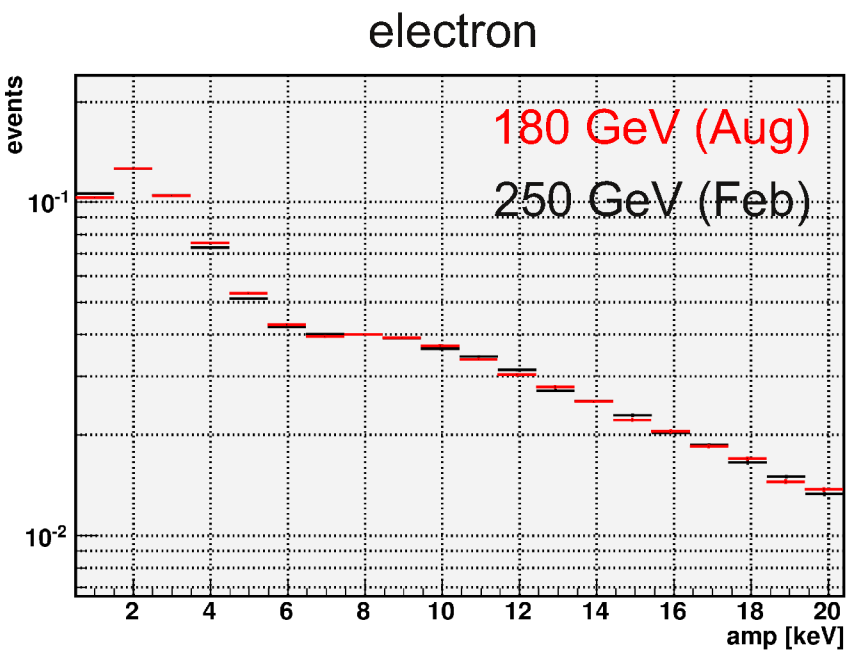
- Inverse proton efficiency above 100 up to at least 400 GeV
- MC reasonably matches testbeam results
  - Deviation could arise from 400 GeV “Microbeam”

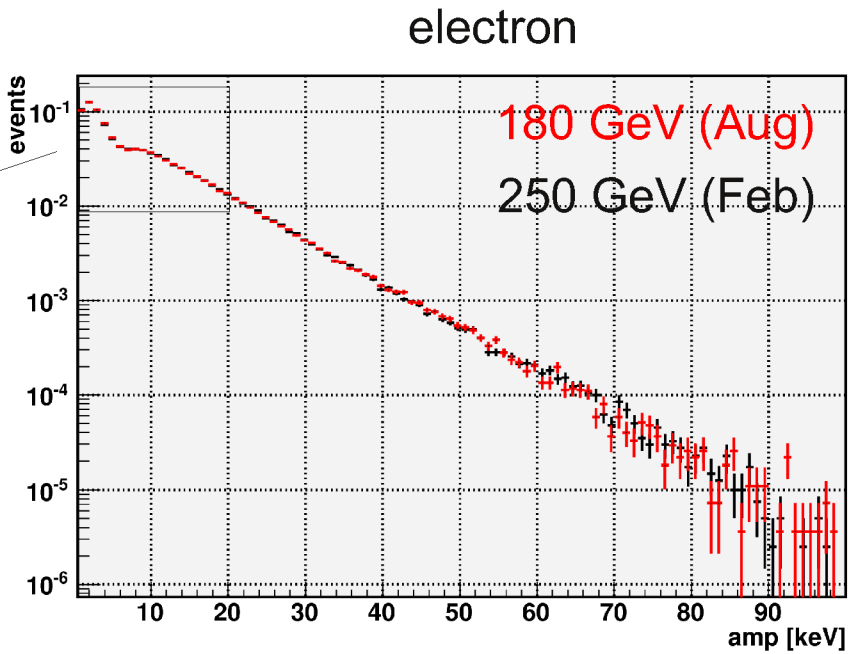
Things to be done

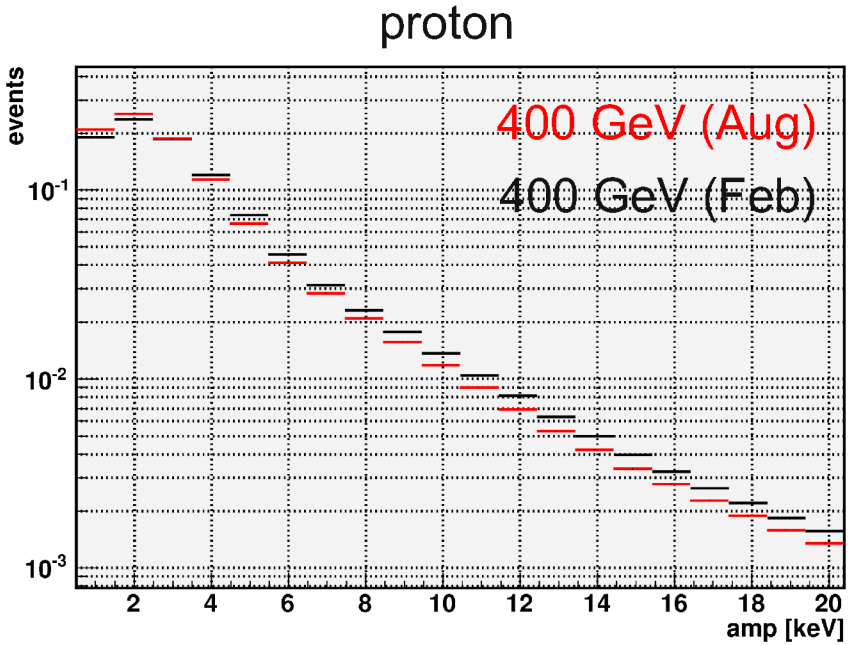
- **Reconstruction / Analysis**
  - Verification of updated particle identification (ParticleR)
  - Calibration of TRD
  - Angular scan of tube spectra and particle efficiencies (Testbeam)
  - Charge reconstruction in TRD

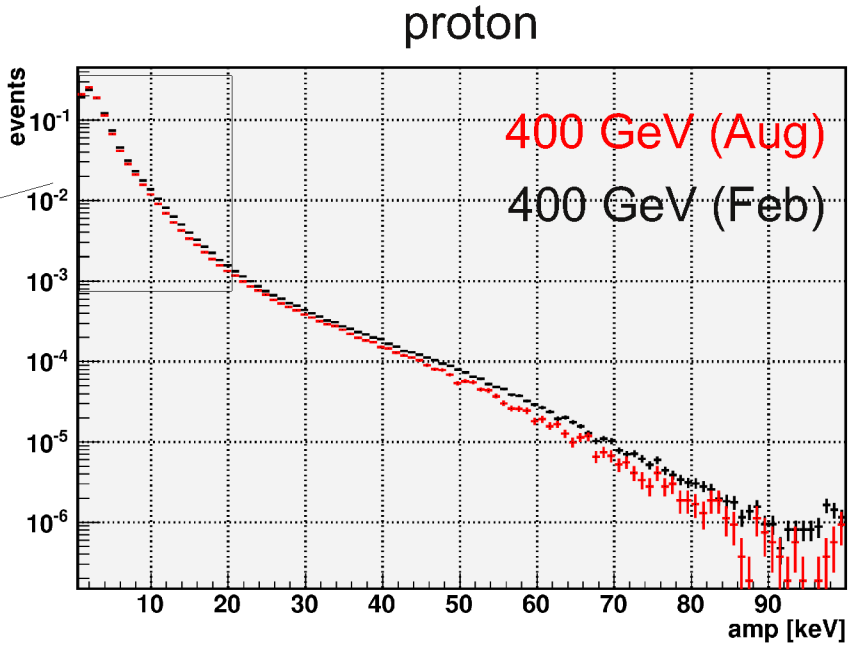
- **Simulation code**
  - Verification of Geant3 MC
  - Code update and verification for Geant4 MC

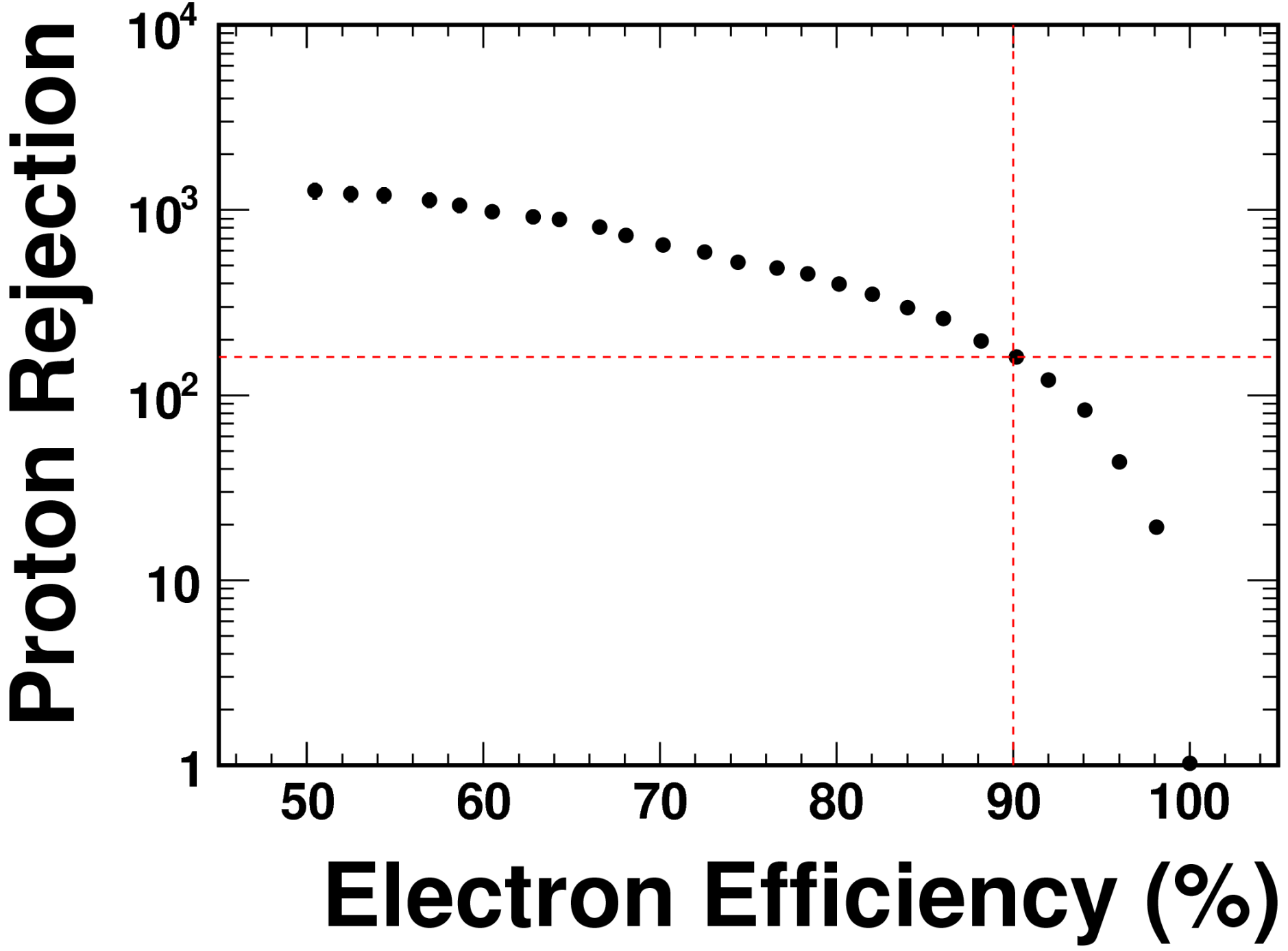
- **...?**


electron
180 GeV (Aug)
250 GeV (Feb)
events
amp [keV]


electron
180 GeV (Aug)
250 GeV (Feb)
events
amp [keV]


proton
400 GeV (Aug)
400 GeV (Feb)
events
amp [keV]


proton
400 GeV (Aug)
400 GeV (Feb)
events
amp [keV]


Proton Rejection
10^4
10^3
10^2
10
1
50
60
70
80
90
100
Electron Efficiency (%)