Highlights of recent patch releases physics part

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Outline

- Overview of fixes for physics
  - 10.1p03
  - 10.2p01
- EM physics fixes highlights
- Hadronic physics fixes highlights

Common fixes in 10.1p03 and 10.2p01

- Fixed problem #1820
  - Problem in kinematics happens when phase space decay is sampled with secondary dynamic masses of final short lived particles
  - There was no similar problem for the case of PDG masses
- Fixed process sub-types
  - G4VTransitionRadiation
  - G4VXTREnergyLoss
  - G4ParallelWorldProcess

Fixes in hadronic physics for 10.1p03

- Backport improvements implemented in 10.2:
  - G4NeutronInelasticXS, G4NeutronCaptureXS neutron cross sections classes:
    - Fixed isotope cross sections including retrieve, data management, isotope cross section, isotope selection
  - G4DiffuseElastic
    - Fixed BuildAngleTable to improve accuracy at high energy
- These modifications affect hadronic shower response
  - With these fixes FTFP_BERT and FTFP_BERT_HP results are similar

Summary of modifications in general processes, decay and particles for 10.2p01

- Fixed problem #1826 in G4DielectricLUT
- Fixed G4DecayTable::SelectADecayChannel for decay channels all kinematically forbidden
- In G4IonTable removed "tolerance" and replace it with call to G4NuclideTable, this recover missed levels when they are closer than 2 keV
  - The tolerance in G4NuclideTable is 1 eV
  - Rounding of excitation energy is turned out

Summary of modifications in EM physics libraries for 10.2p01

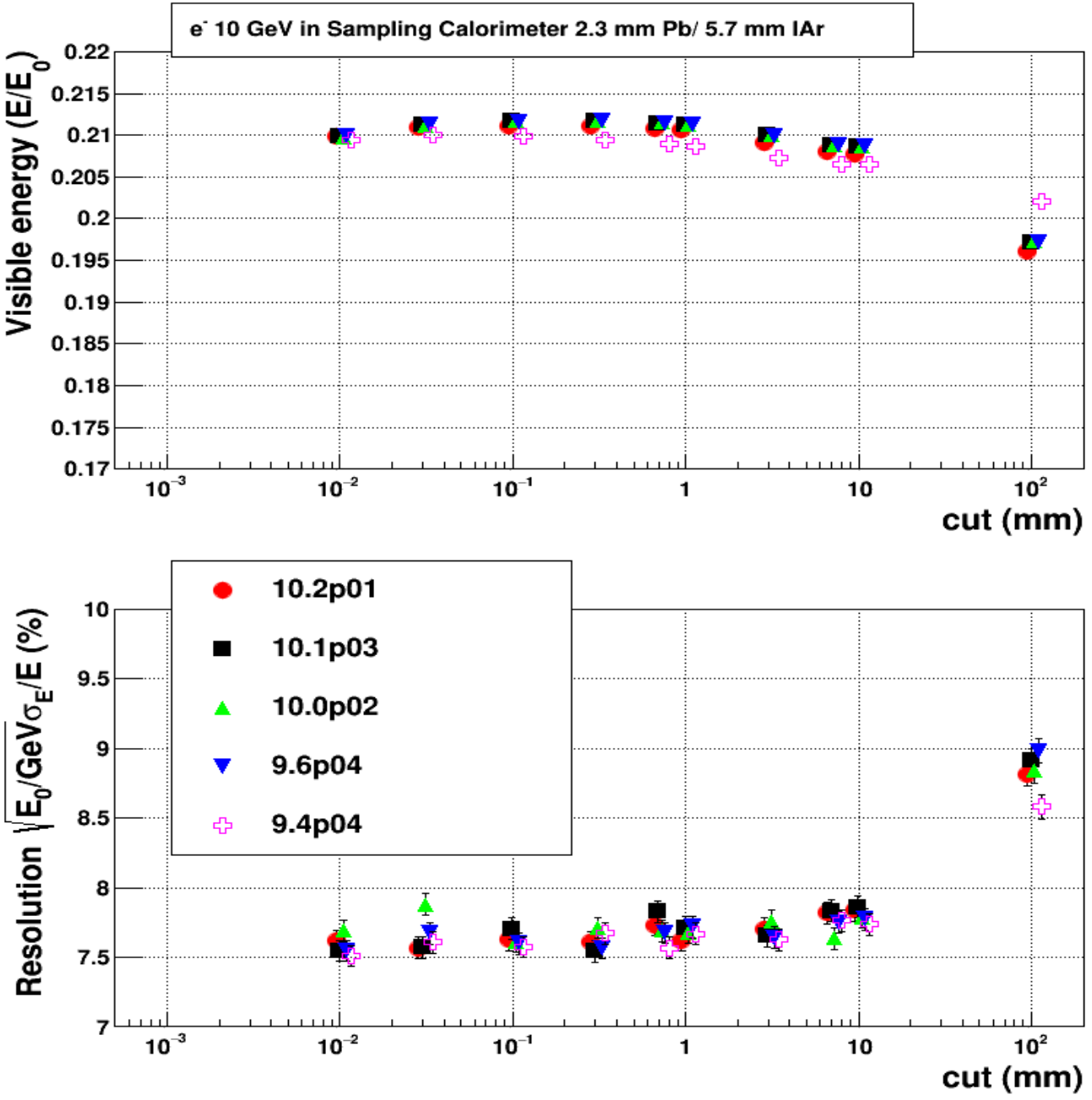
- Fixed technical problem #1807 in G4EmSaturation
  - User interface name is changed to avoid shadowing
- Fixed problem #1808 in G4EmCalculator
  - Computation of dEdx for He3 and He4 ions
  - Also fixed double computation of dEdx and range tables for He3 and He4 in G4LossTable Manager
- Fixed technical problem #1816 for G4LivermorePolarizedPhotoElectricModel
- Fixed problem #1823 in G4eSingleCoulombScatteringModel and G4EmStandardPhysicsSS
  - Floating point exception and sampling of scattering angle
  - Current version of the model become correct but very slow
- For DNA ionisation models added protection for interpolation problem

Summary of modifications in hadronic physics libraries for 10.2p01

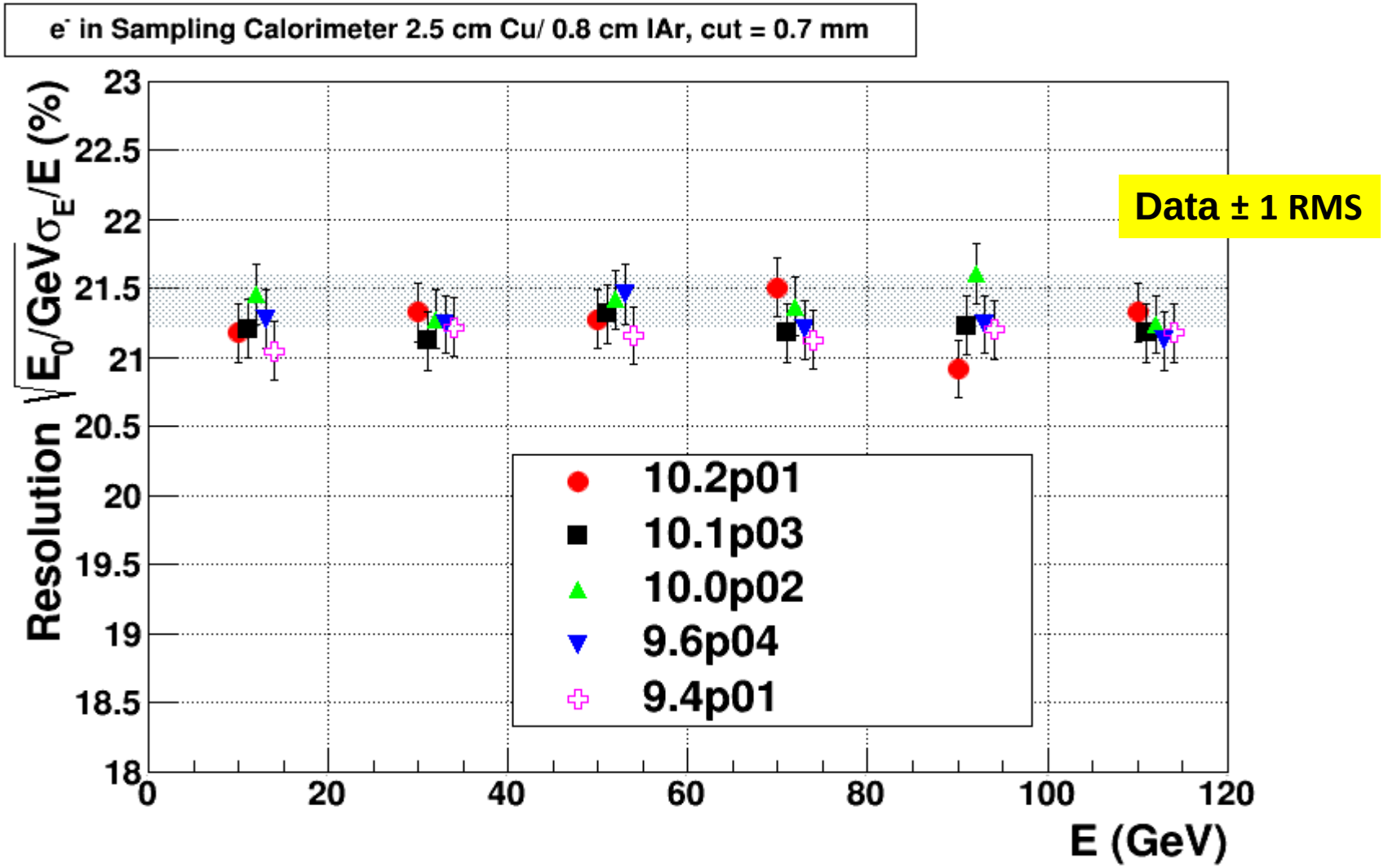
- Fixed bug in kinematics of the Abla de-excitation model
- Fixed problem #1806
  - G4GammaTransition – added protection for the case transition energy is lower than atomic level energy
  - G4PhotonEvaporation, G4LevelManager, G4LevelReader, G4NuclearLevelReader
    - fixed remaining cases interruption of nuclear cascade
    - remove creation of fake low-energy gamma
    - limit on gamma energy reduced fro 10 keV to 0.1 keV
- Fixed production of residual neutrons in LEND model
- ParticleHP fixed:
  - problem for materials hydrogen and helium
  - problem of initialisation of cached data in MT model
  - problem of deletion in MT mode
- Fixed bug in handling of forbidden decay in G4QMDCollision
- Fixed problem #1766 for beta decay
- G4HadronElasticPhysics – added elastic scattering of He3

Validation results

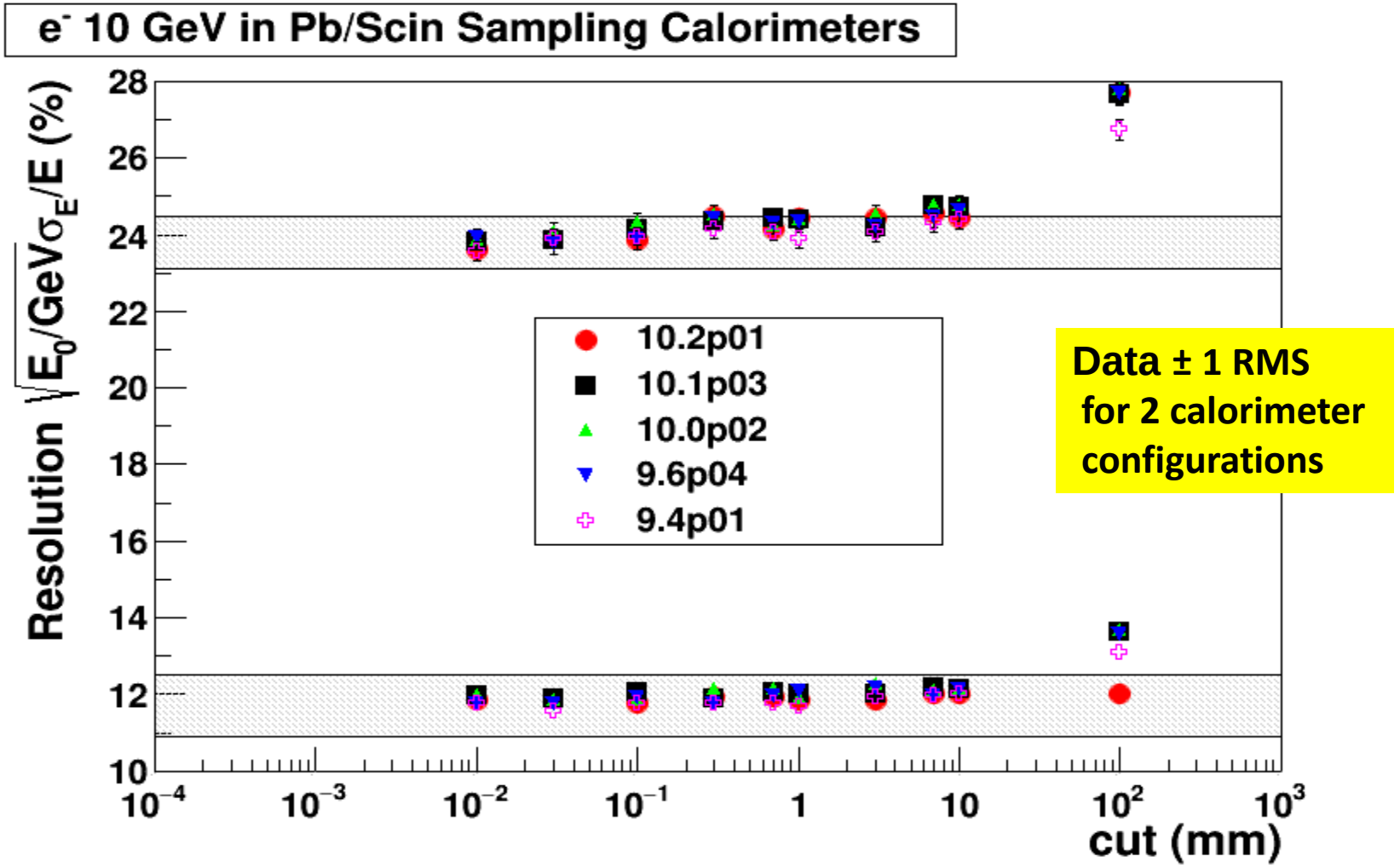
ATLAS barrel type simplified calorimeter results



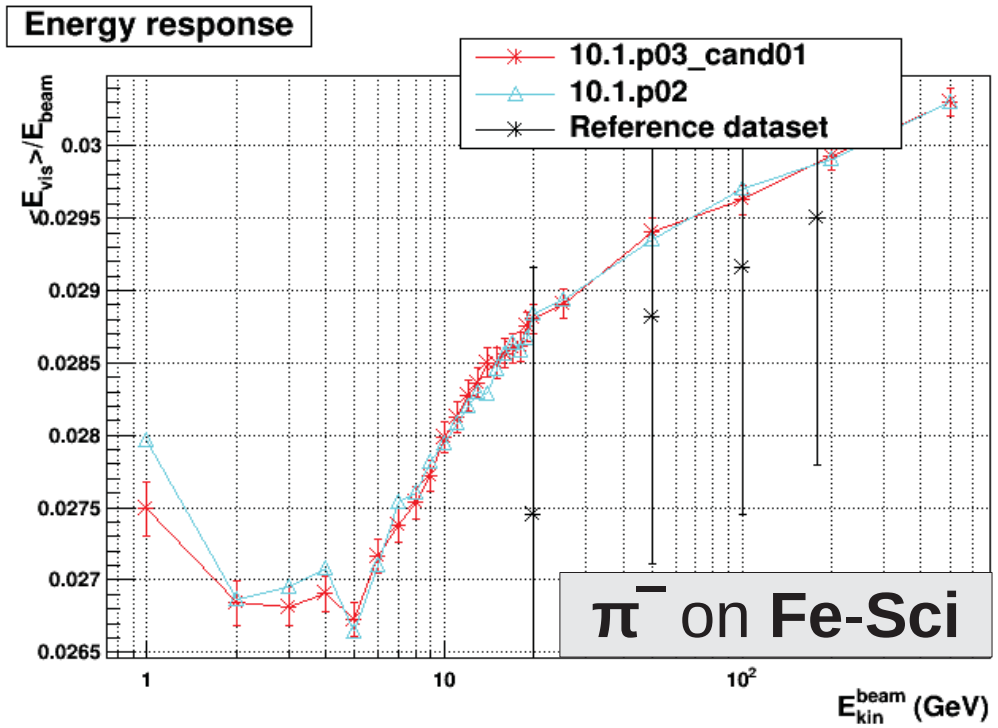
Resolution of simplified ATLAS HEC calorimeter versus test beam data

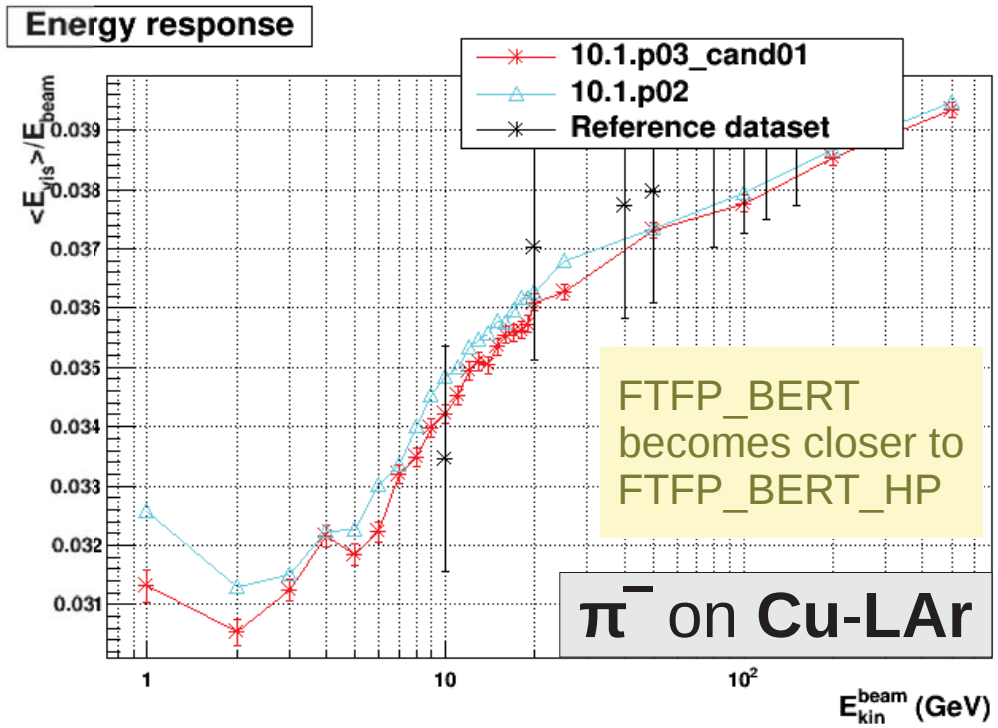


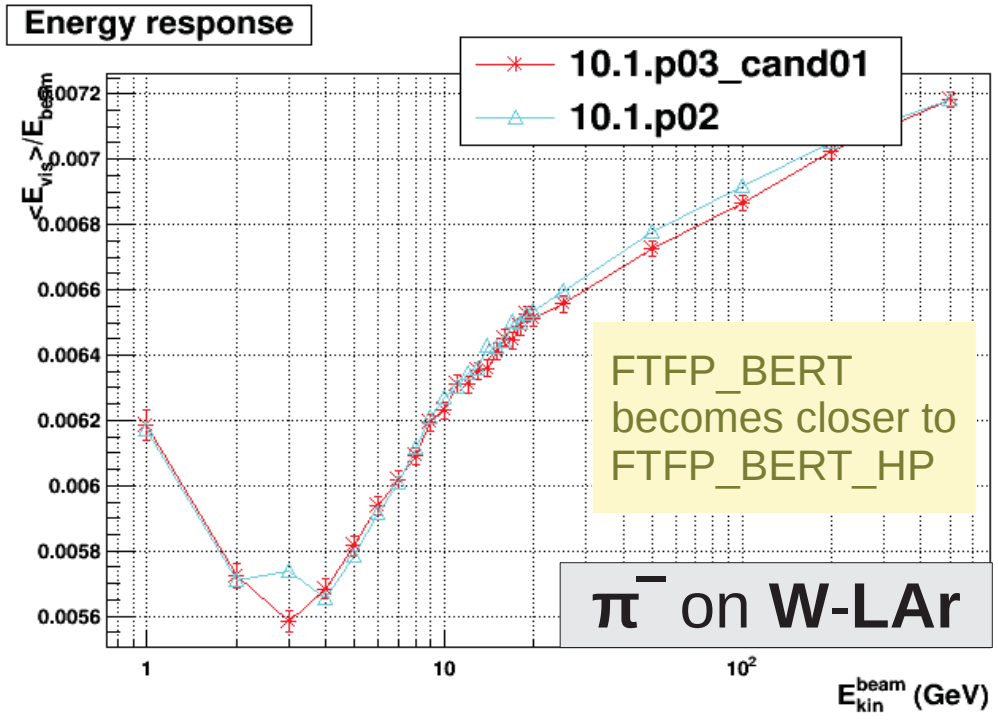
Resolution of ZEUS test beam calorimeters as function of cut in range

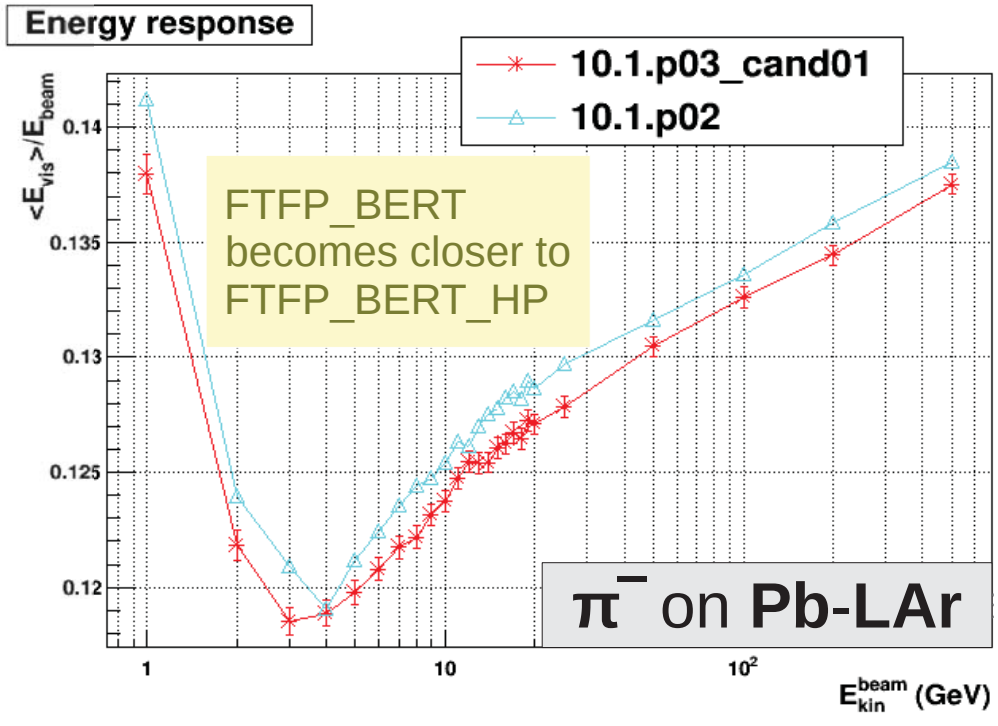
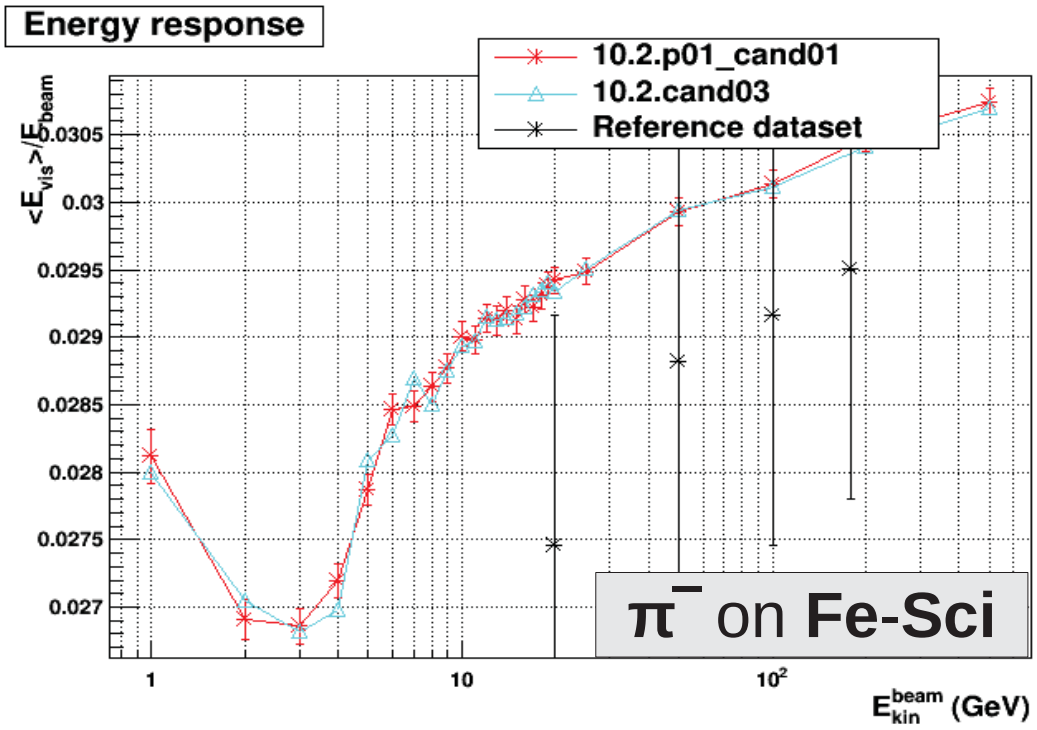
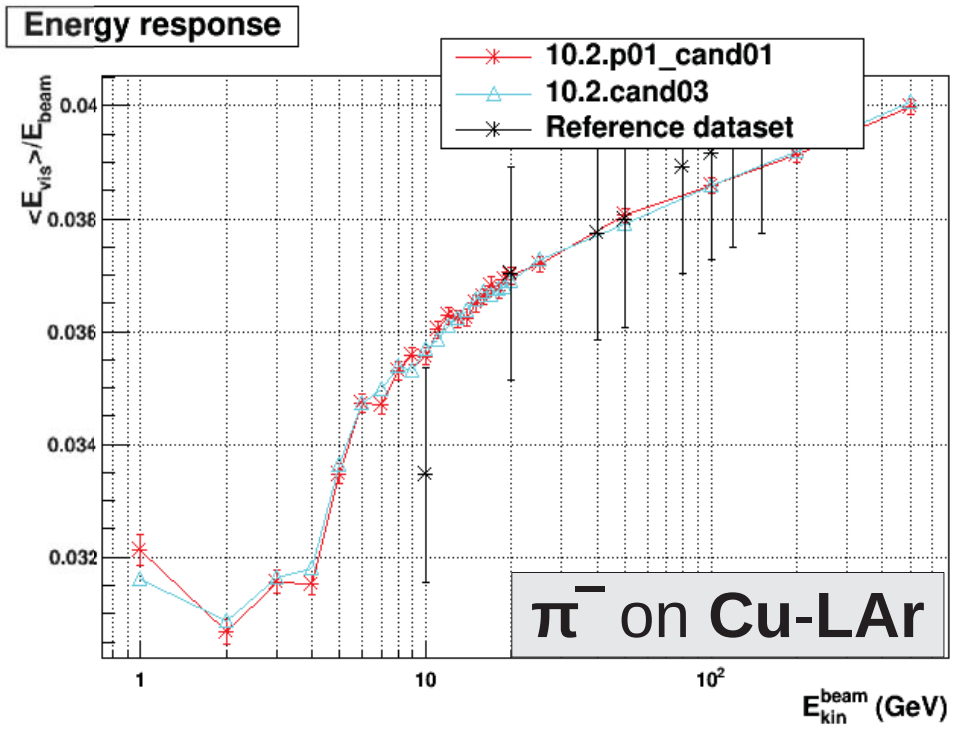
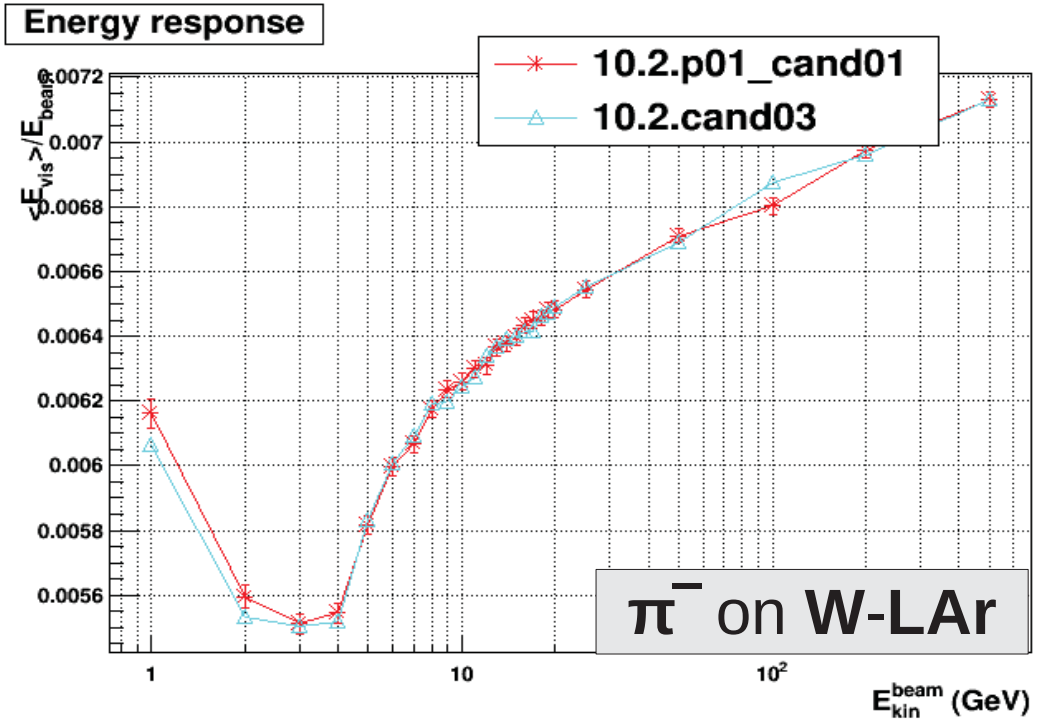
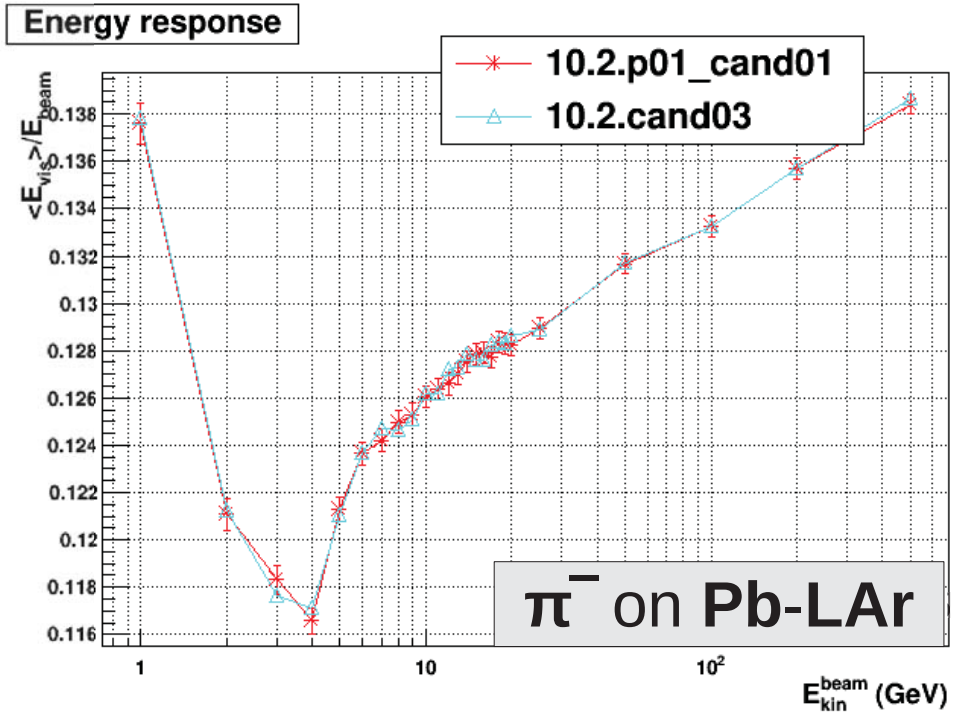


FTFP_BERT : Energy Response









FTFP_BERT : Energy Response