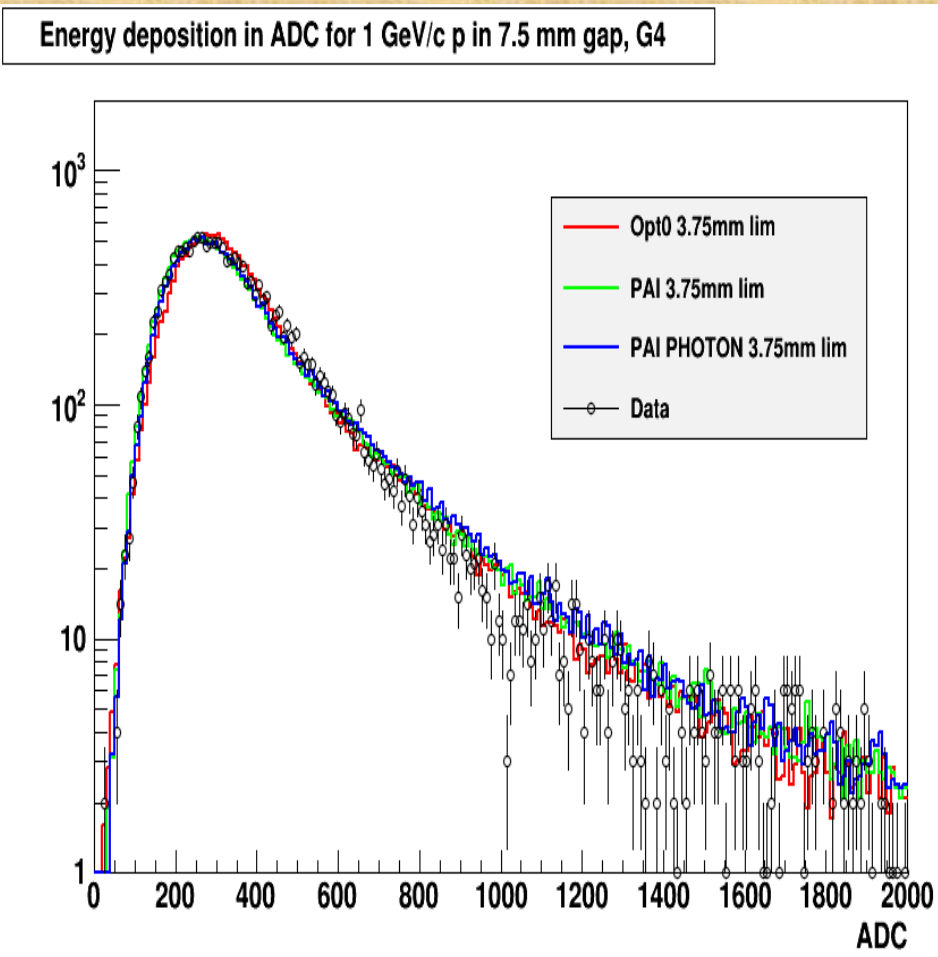
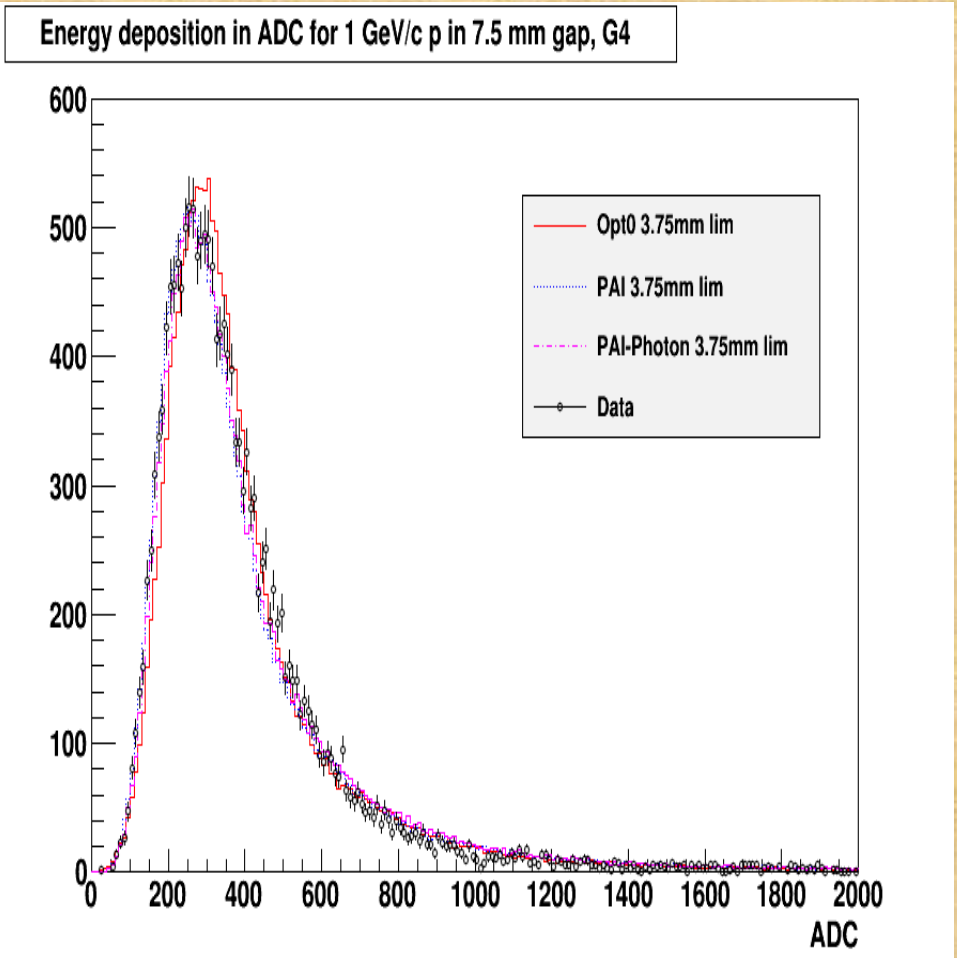
Validation of 10.0-cand01 for EM and hadronic cascades

V.Ivanchenko

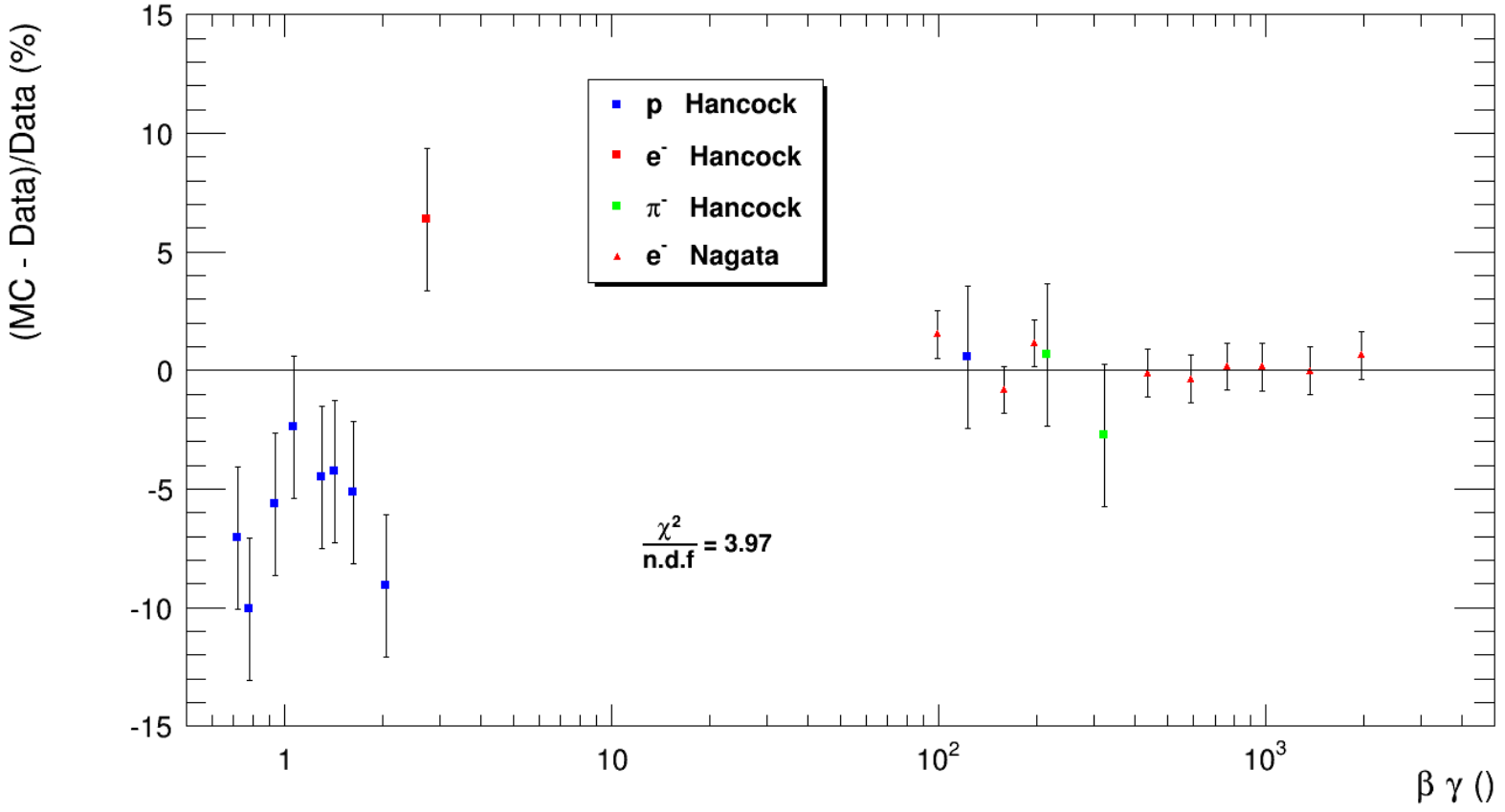
02 December 2013

ALICE TPC test-beam

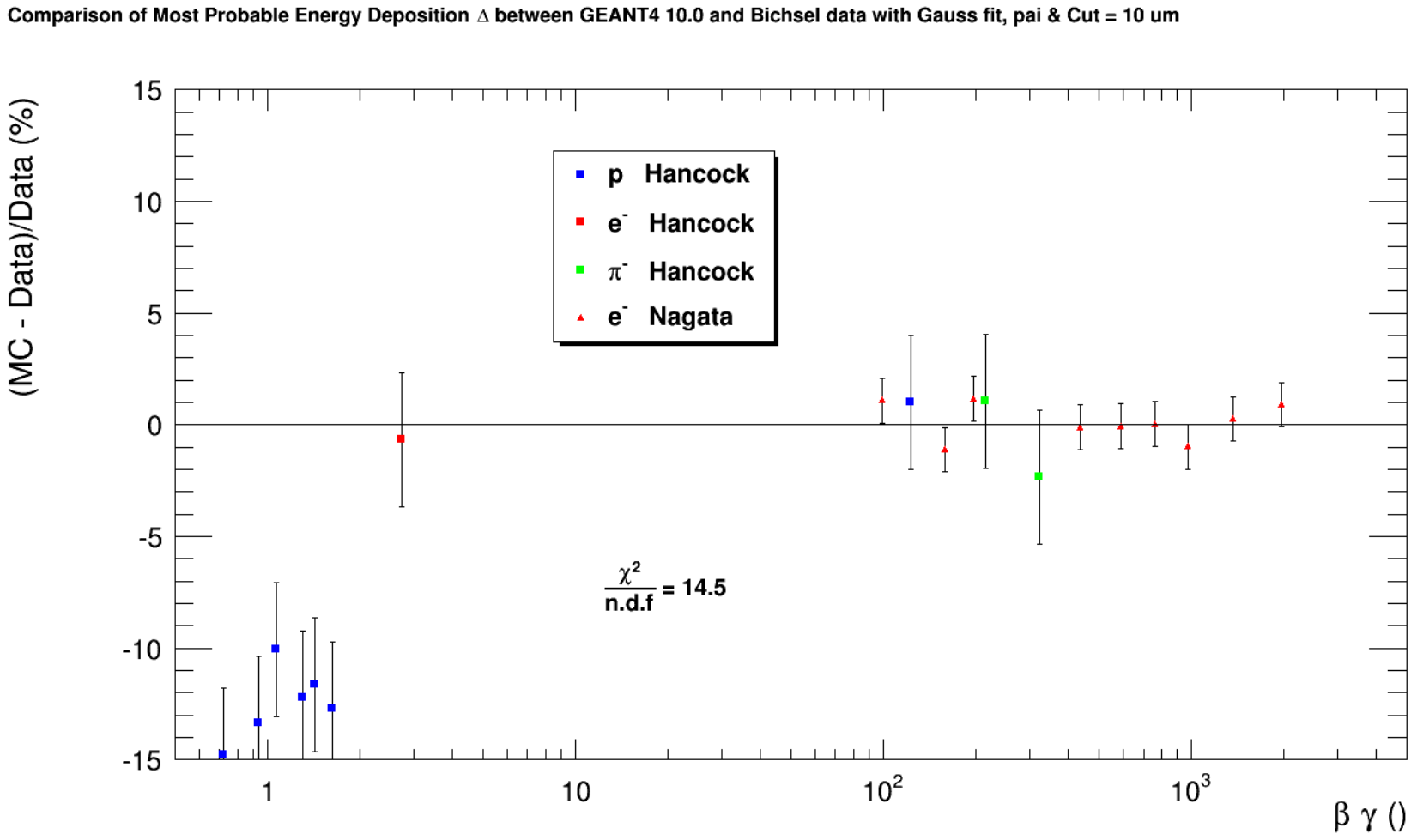




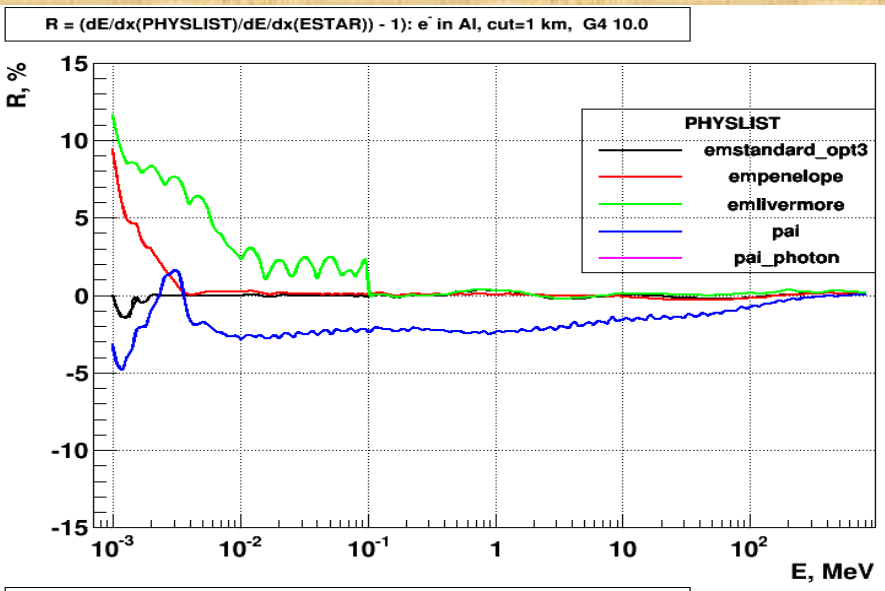
Bichsel test on dedx (defaults)

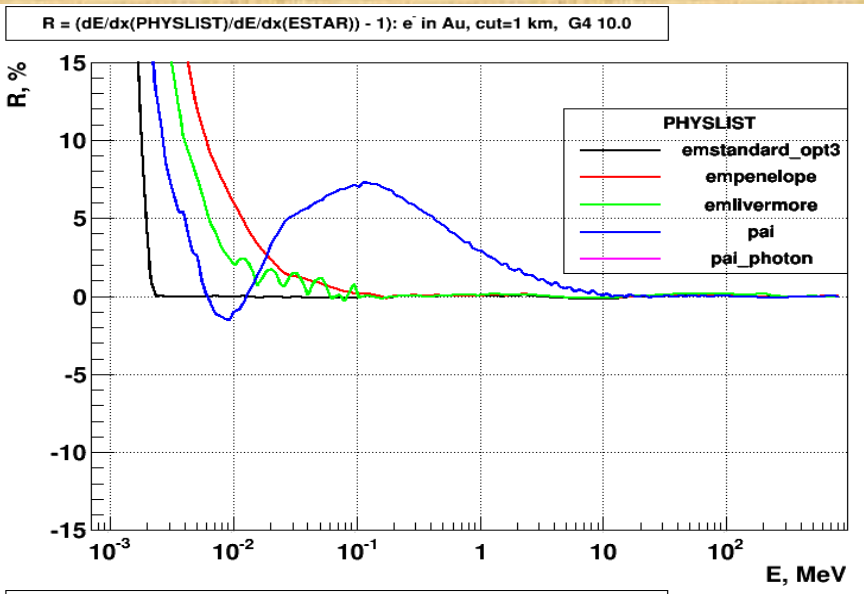


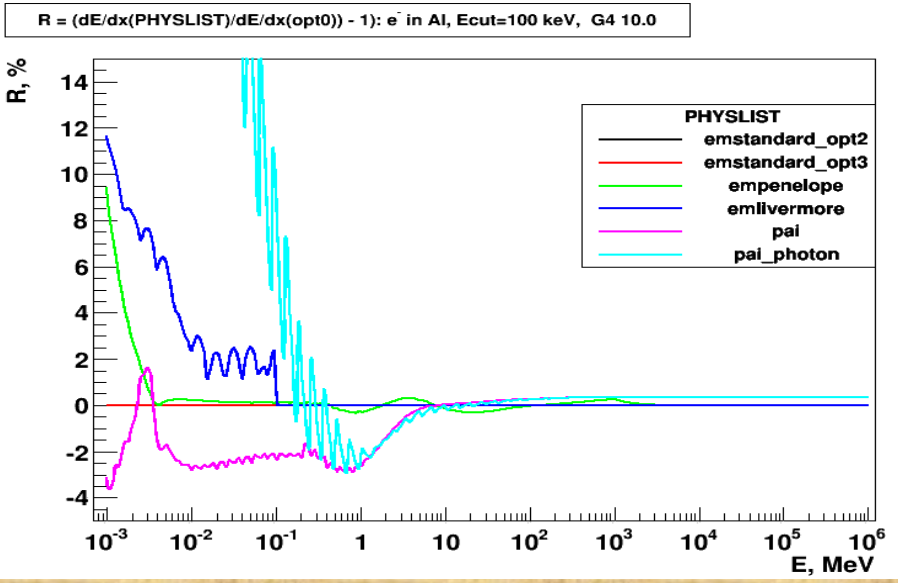
Bichsel test on dedx (PAI)

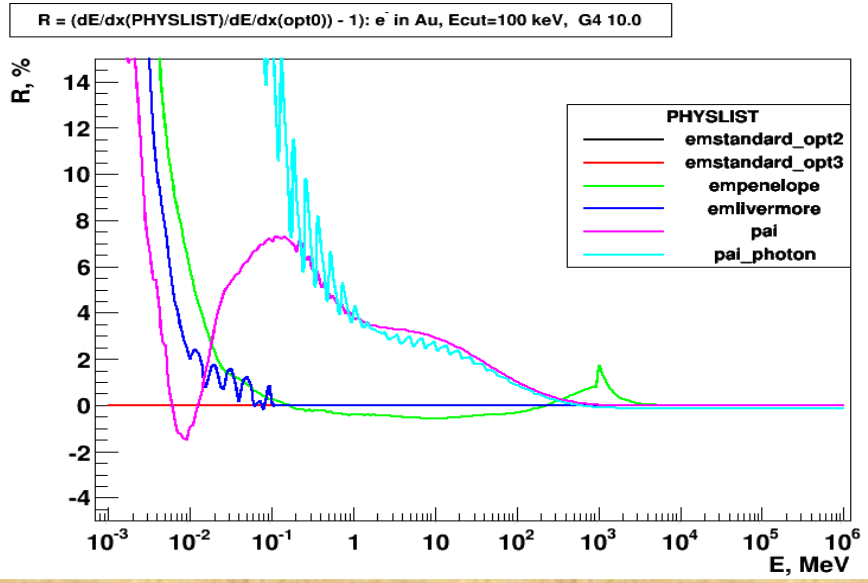


Test on stopping power for electrons

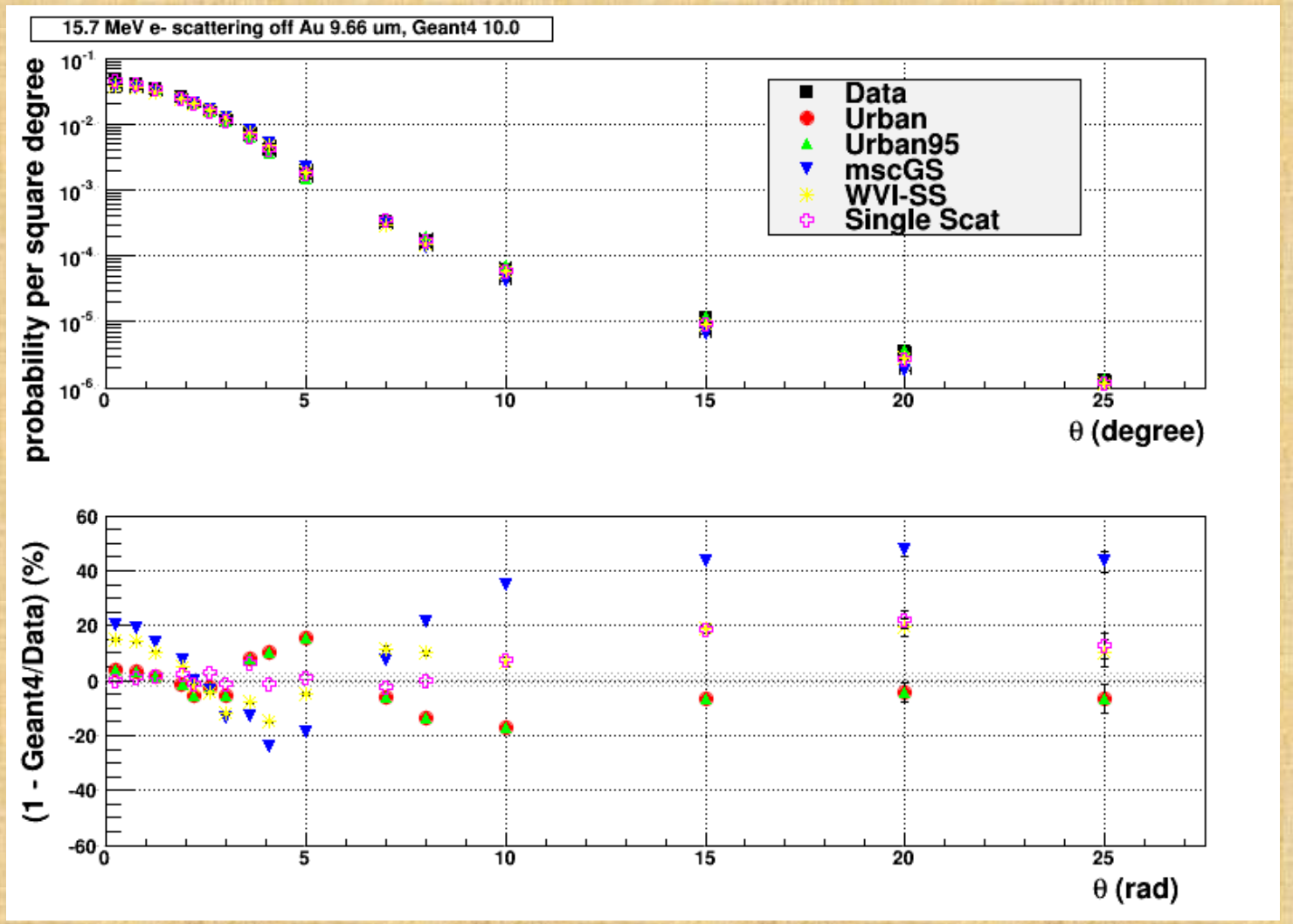




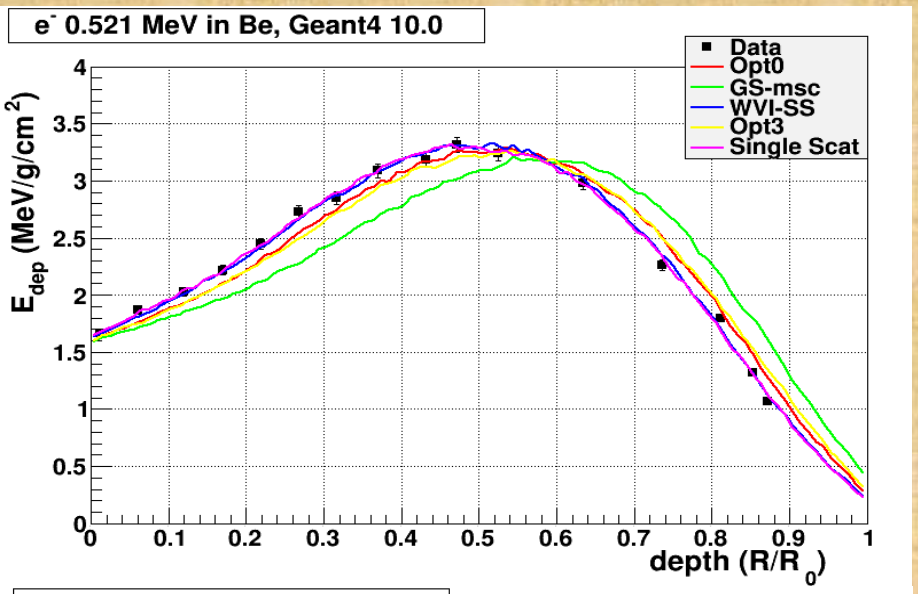


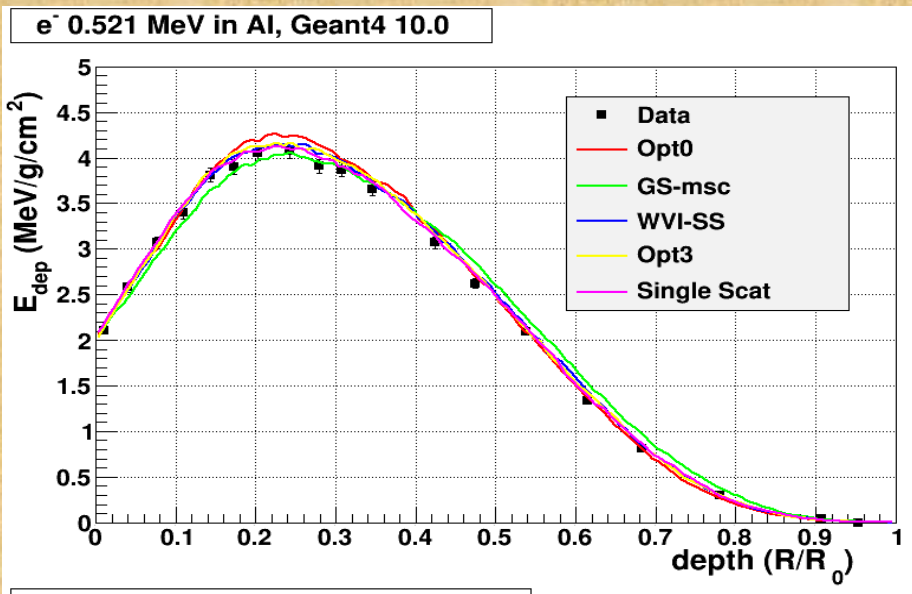


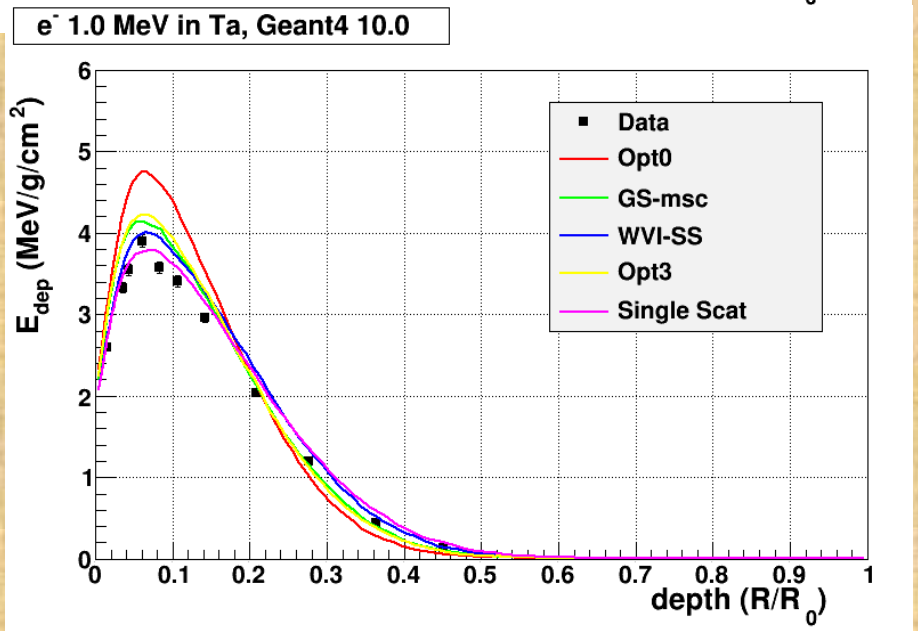
Hanson data for e- scattering

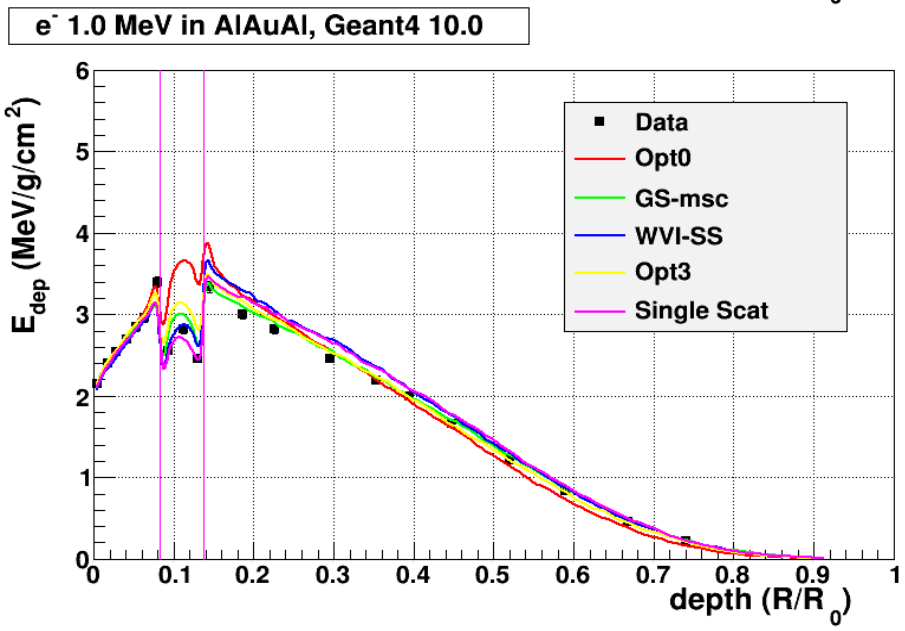


Sandia data

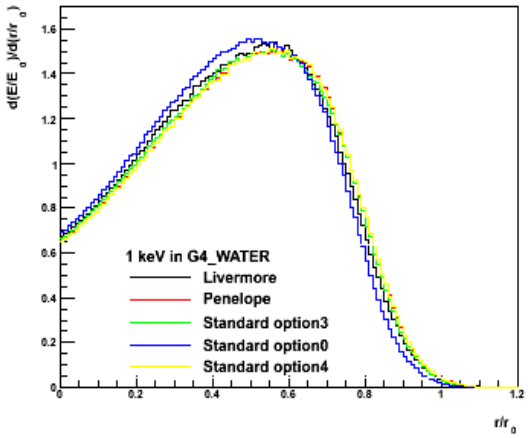

e⁻ 0.521 MeV in Be, Geant4 10.0
Data
Opt0
GS-msc
WVI-SS
Opt3
Single Scat
E_dep (MeV/g/cm²)
depth (R/R₀)

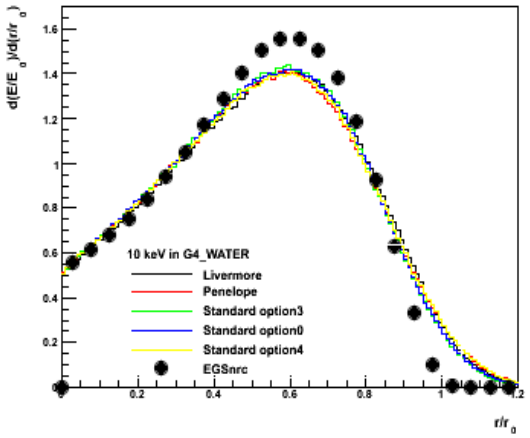

e⁻ 0.521 MeV in Al, Geant4 10.0
Data
Opt0
GS-msc
WVI-SS
Opt3
Single Scat
E_dep (MeV/g/cm²)
depth (R/R₀)

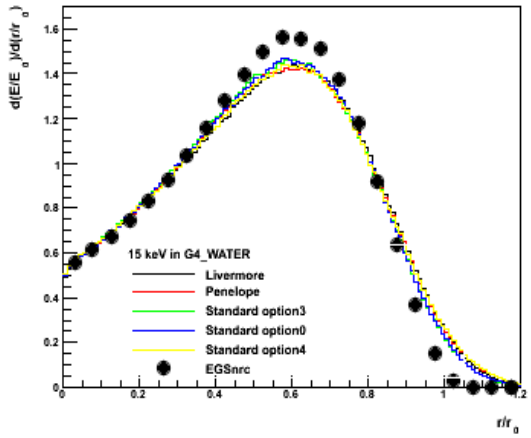

e⁻ 1.0 MeV in Ta, Geant4 10.0
Data
Opt0
GS-msc
WVI-SS
Opt3
Single Scat
E_dep (MeV/g/cm²)
depth (R/R₀)

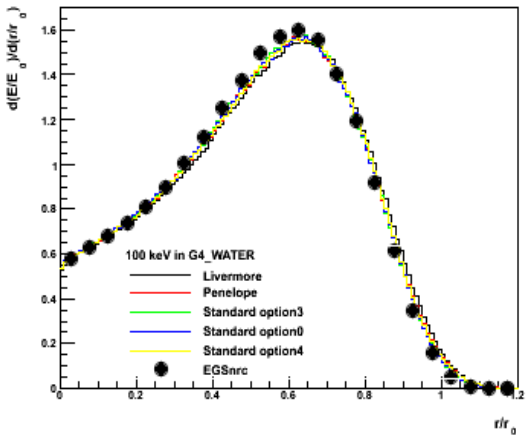

e⁻ 1.0 MeV in AlAuAl, Geant4 10.0
Data
Opt0
GS-msc
WVI-SS
Opt3
Single Scat
E_dep (MeV/g/cm²)
depth (R/R₀)

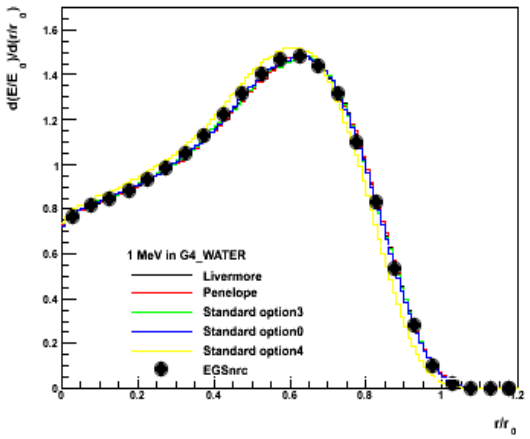
Dose point kernel in water (S.Incerti)



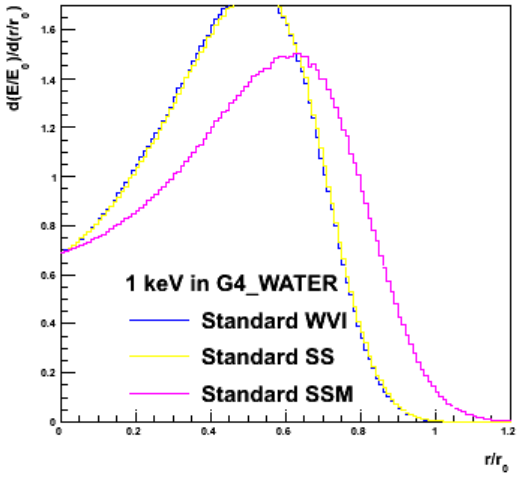


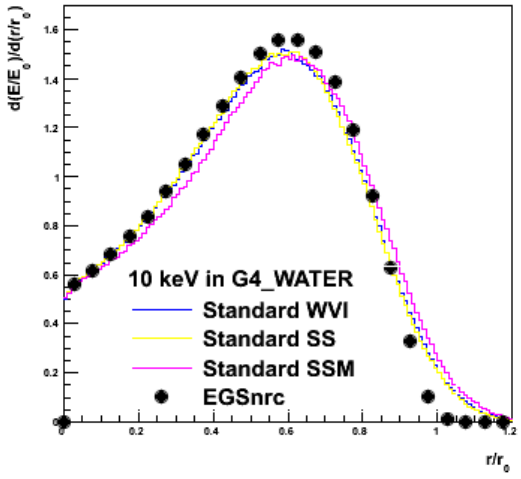


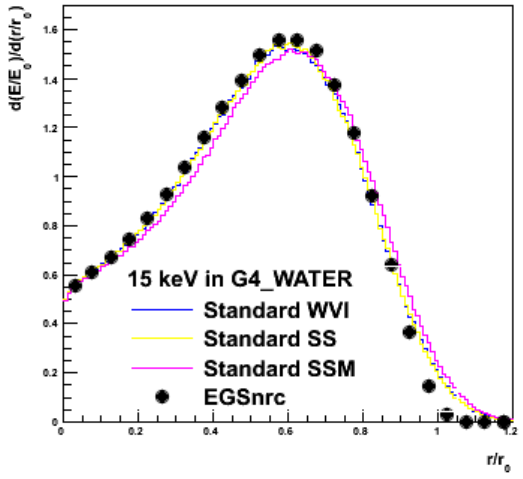


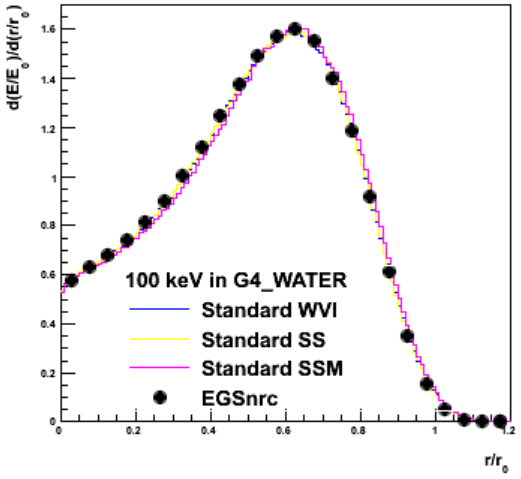


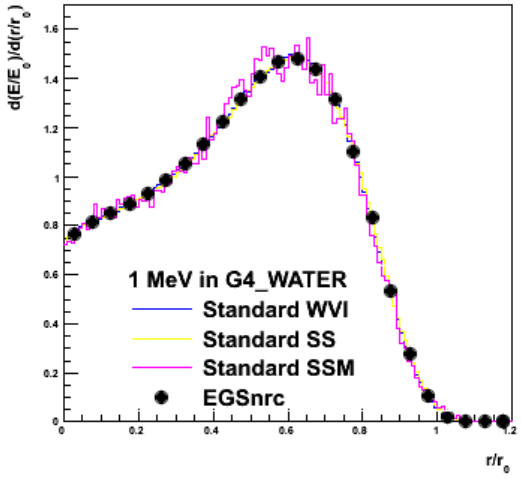
Dose point kernel in water (S.Incerti)



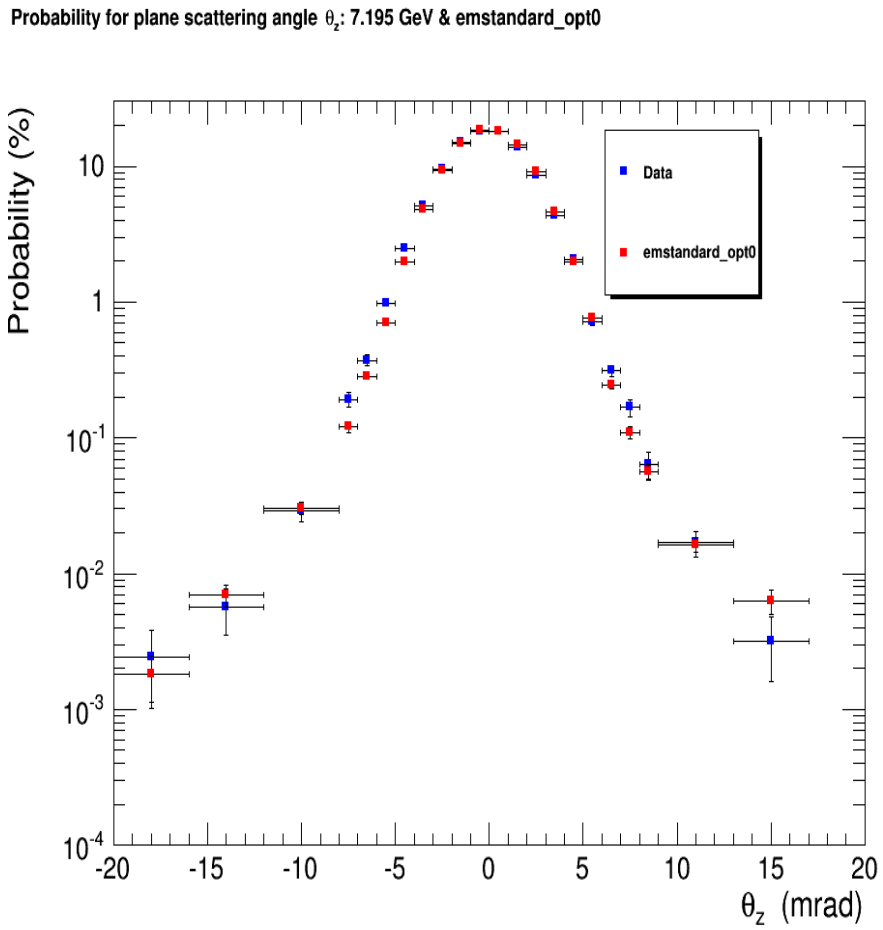


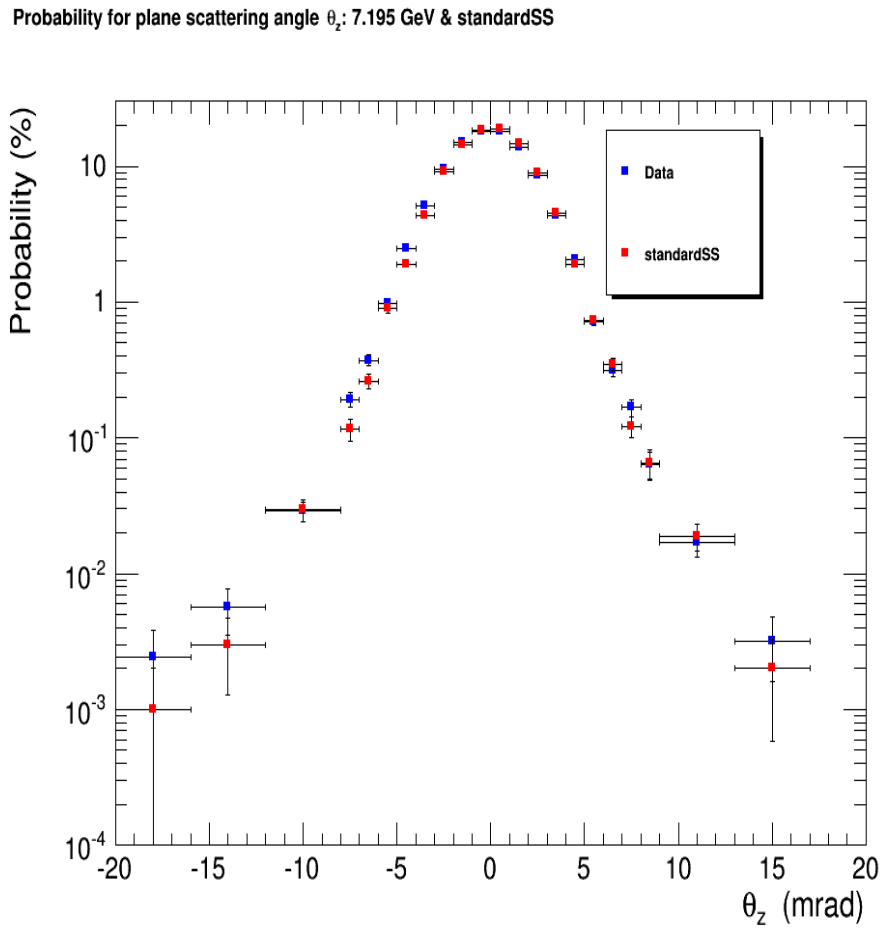




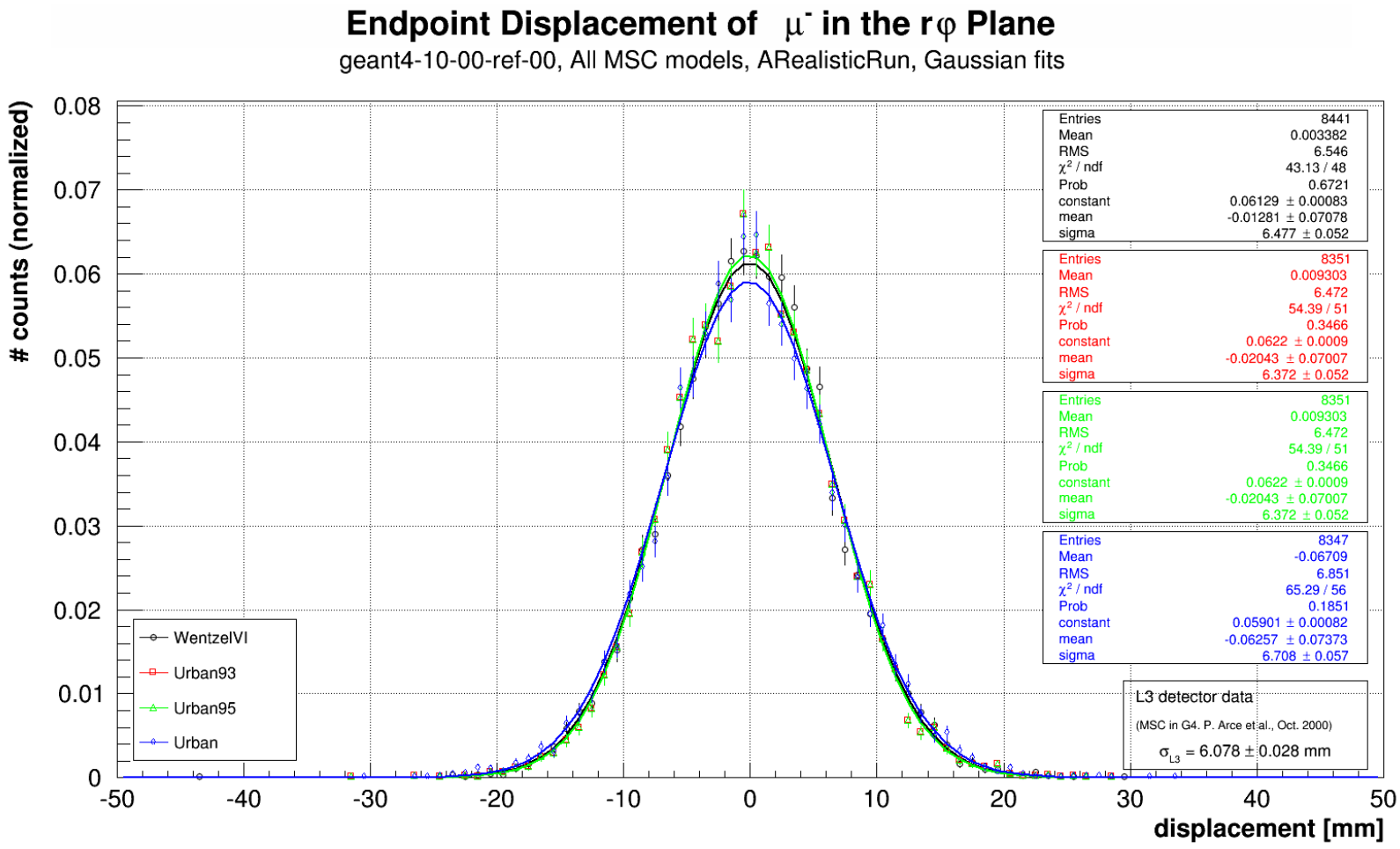


7.195 GeV muons in Copper

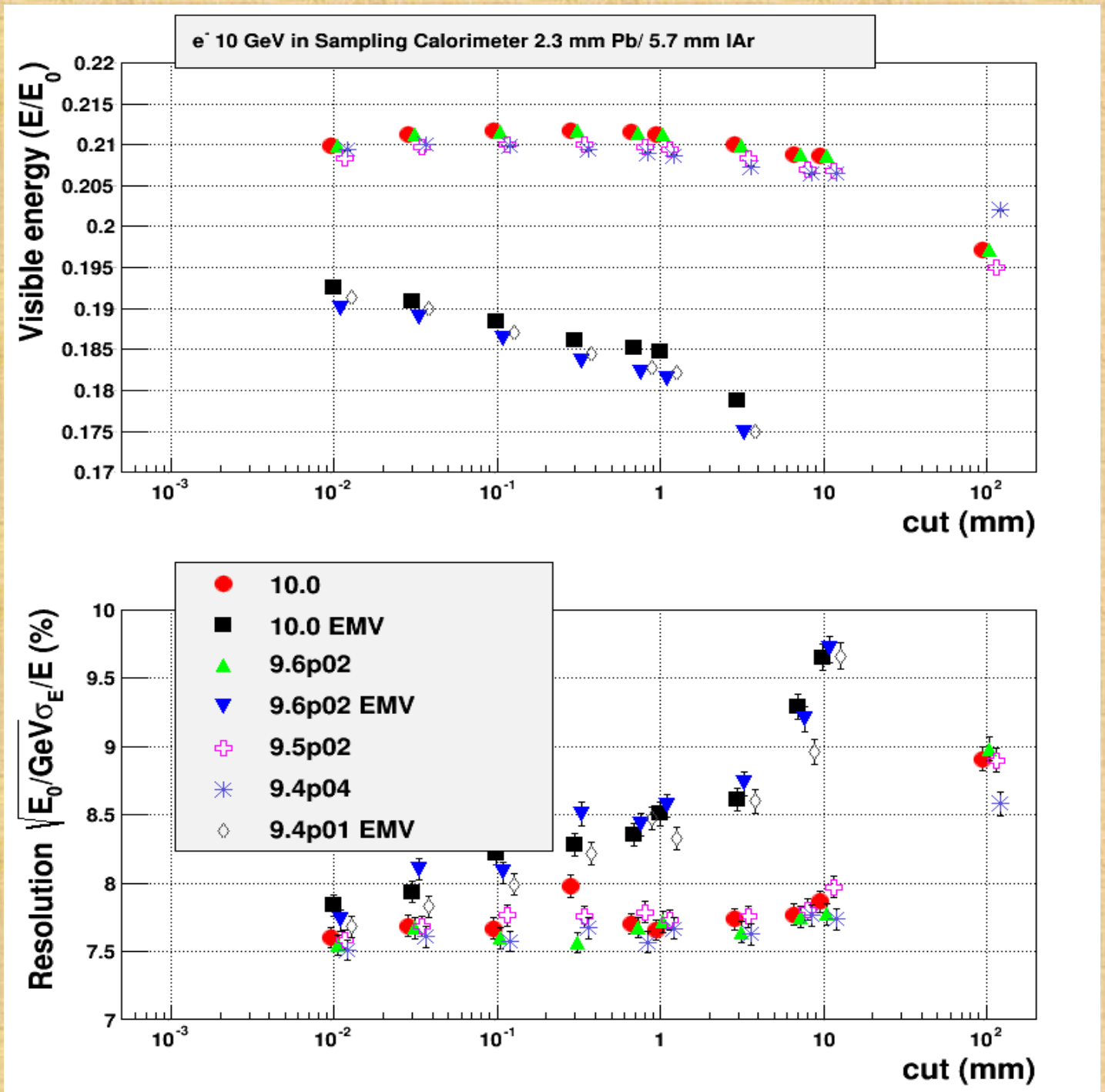




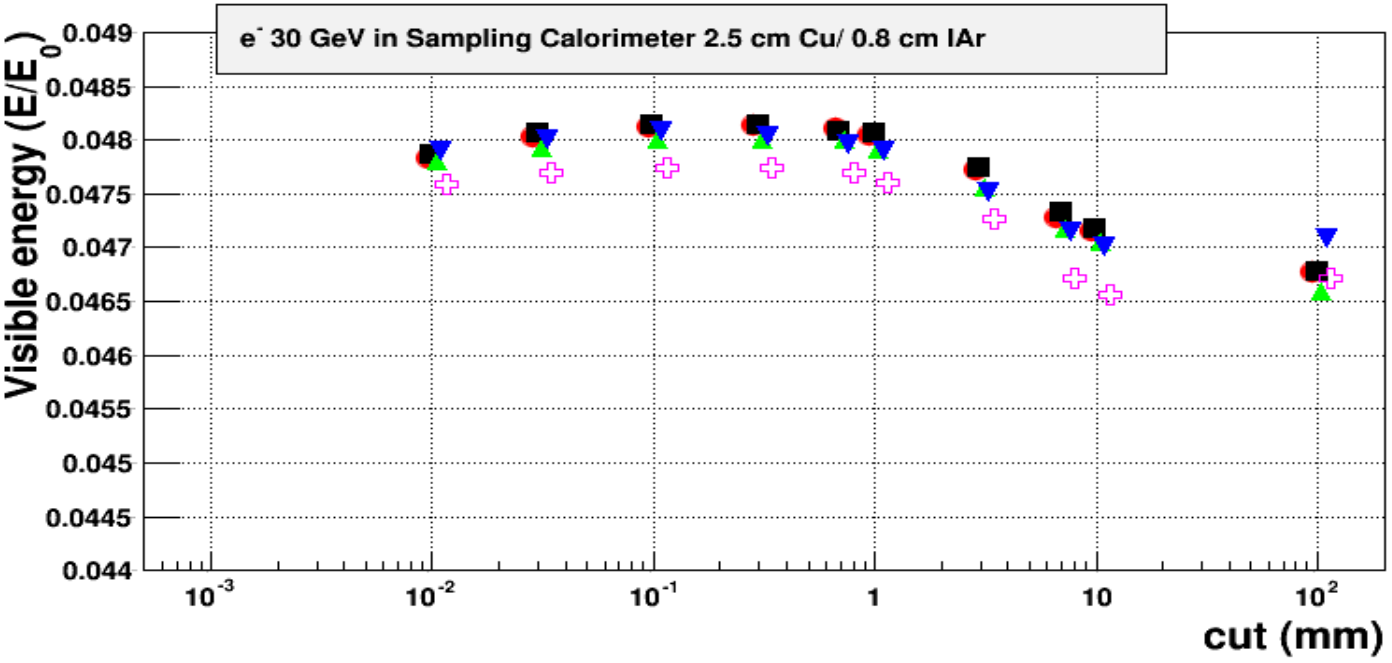
L3 muons

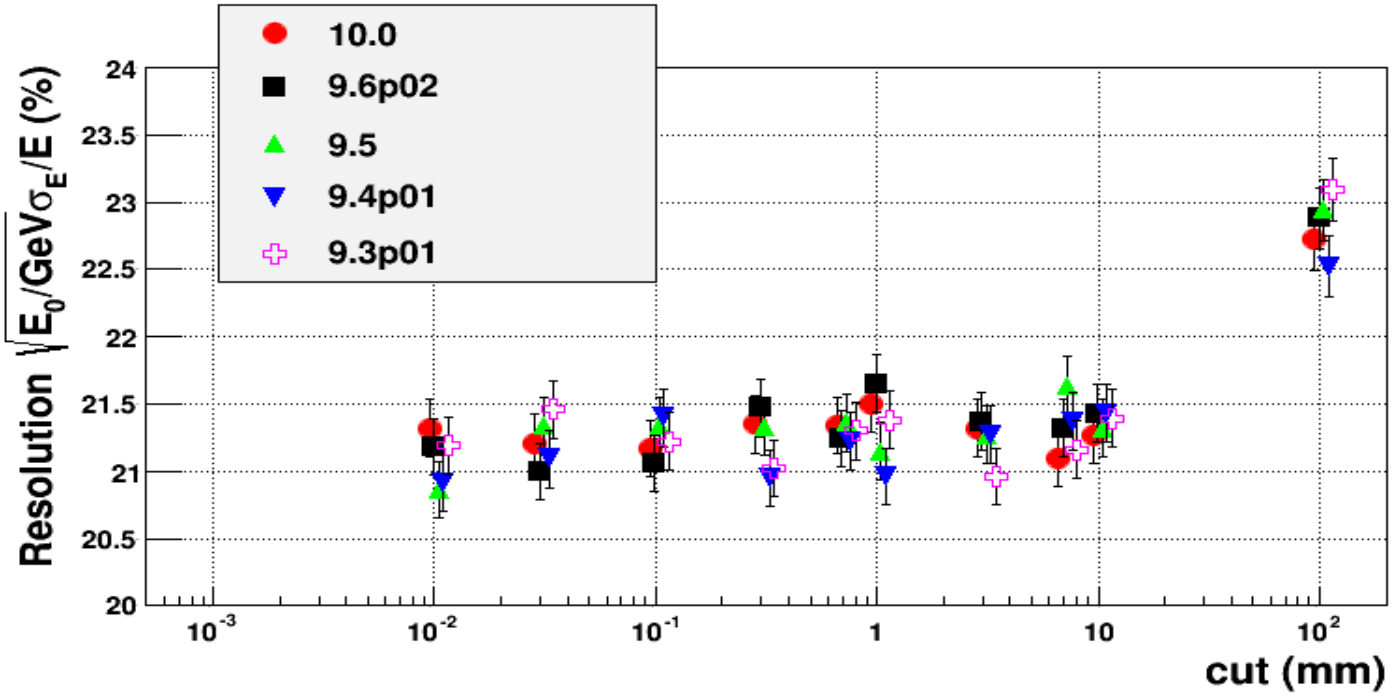

Endpoint Displacement of μ⁻ in the rφ Plane
geant4-10-00-ref-00, All MSC models, ARealisticRun, Gaussian fits
counts (normalized)
displacement [mm]
WentzelVI
Urban93
Urban95
Urban
Entries 8441
Mean 0.003382
RMS 6.546
χ² / ndf 43.13 / 48
Prob 0.6721
constant 0.06129 ± 0.00083
mean -0.01281 ± 0.07078
sigma 6.477 ± 0.052
Entries 8351
Mean 0.009303
RMS 6.472
χ² / ndf 54.39 / 51
Prob 0.3466
constant 0.0622 ± 0.0009
mean -0.02043 ± 0.07007
sigma 6.372 ± 0.052
Entries 8351
Mean 0.009303
RMS 6.472
χ² / ndf 54.39 / 51
Prob 0.3466
constant 0.0622 ± 0.0009
mean -0.02043 ± 0.07007
sigma 6.372 ± 0.052
Entries 8347
Mean -0.06709
RMS 6.851
χ² / ndf 65.29 / 56
Prob 0.1851
constant 0.05901 ± 0.00082
mean -0.06257 ± 0.07373
sigma 6.708 ± 0.057
L3 detector data
(MSC in G4. P. Arce et al., Oct. 2000)
σ_L3 = 6.078 ± 0.028 mm

ATLAS-barrel type calorimeter

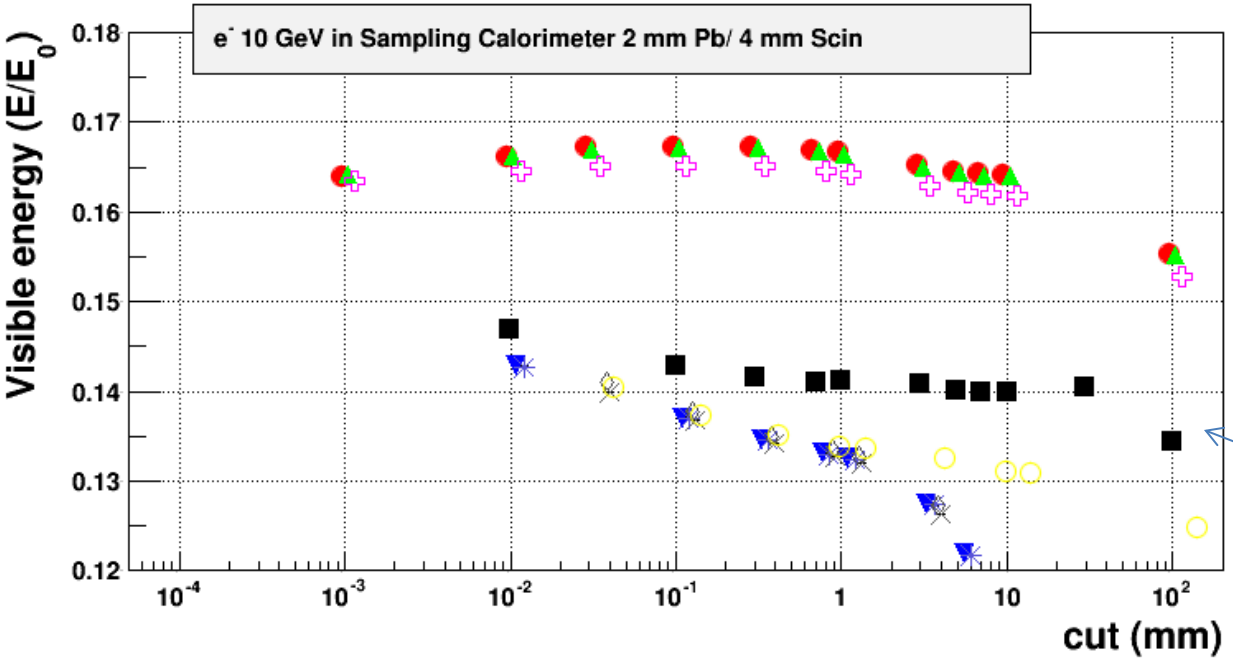


ATLAS-hec type calorimeter

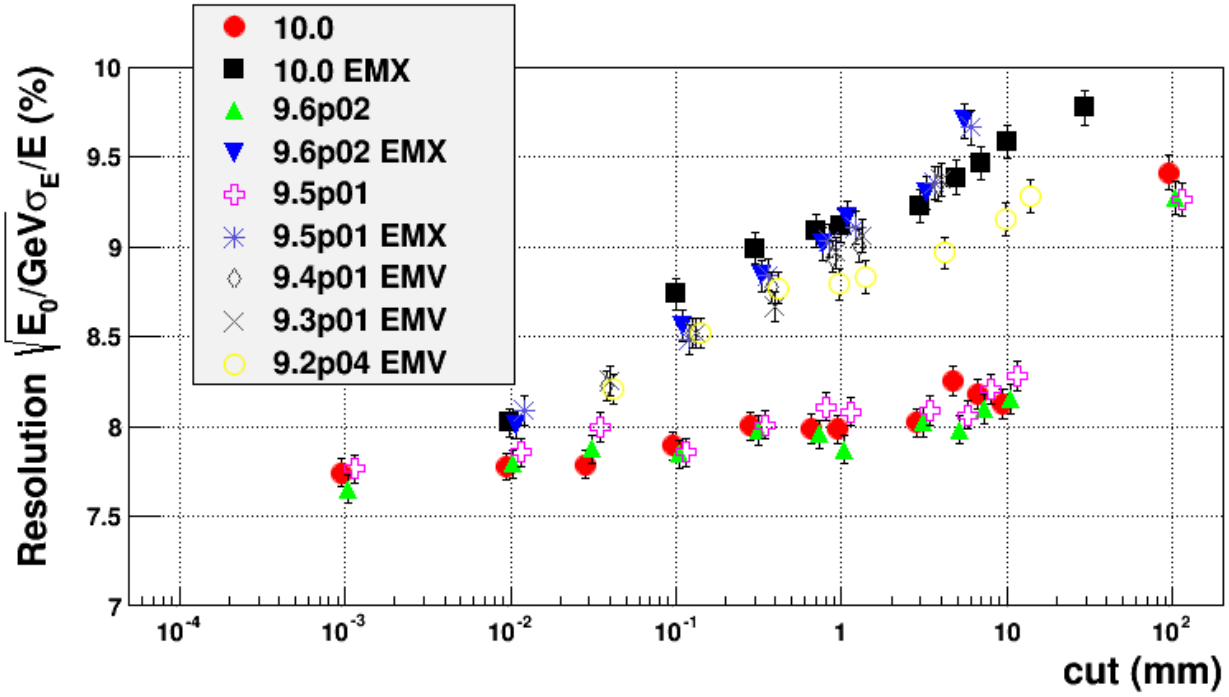




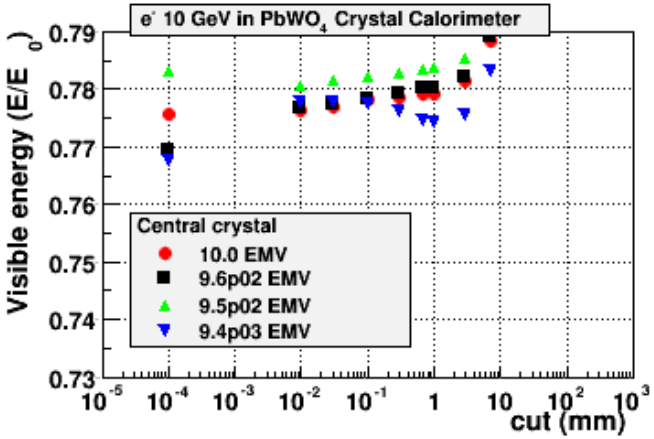
LHCb-hec type calorimeter

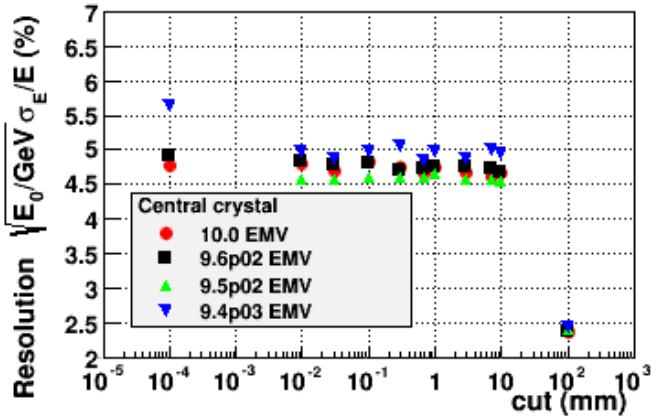


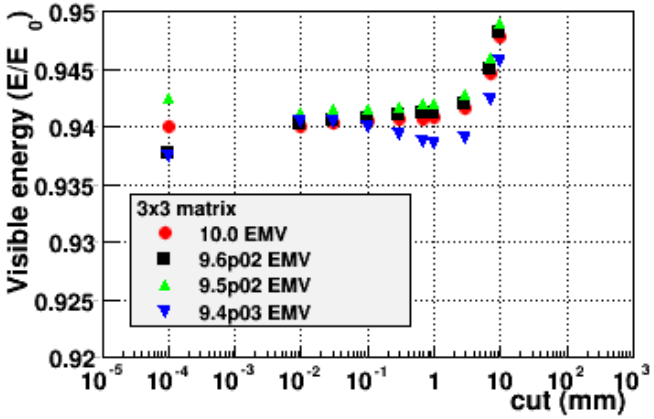
ApplyCuts is disabled

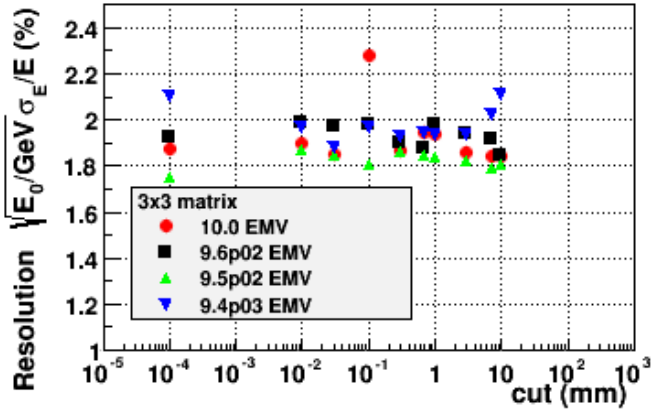


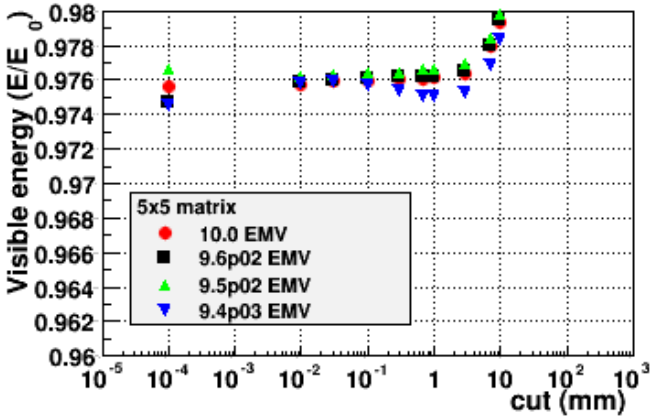
CMS-ECAL type calorimeter

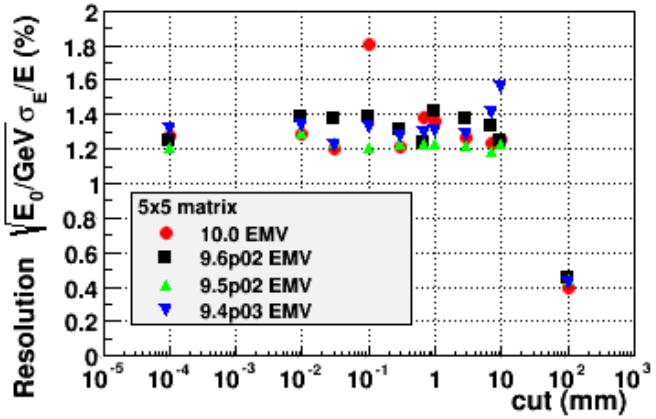








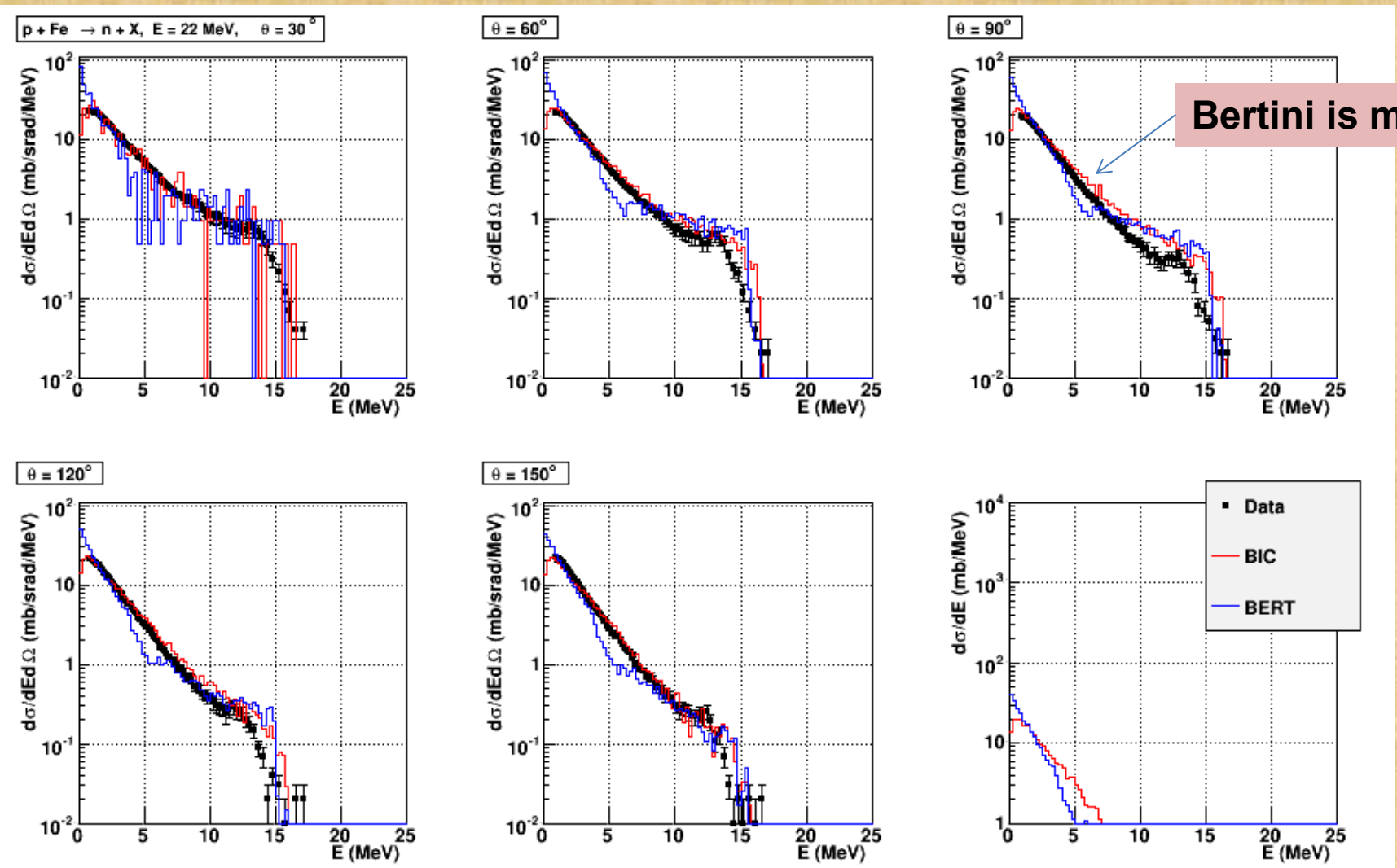




EM summary

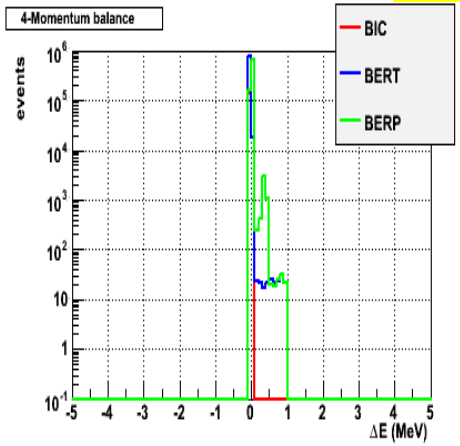
- Results obtained with 10.0-cand01
- EM results are generally stable
- PAI energy loss is improved
- LHCb type of calorimeter is tested with Opt2 (EMX) Phys List «ApplyCuts» disabled

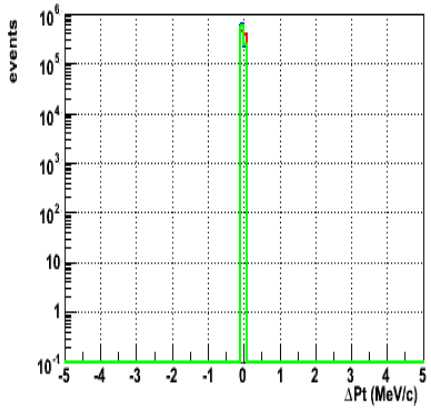
P + Fe 22 MeV

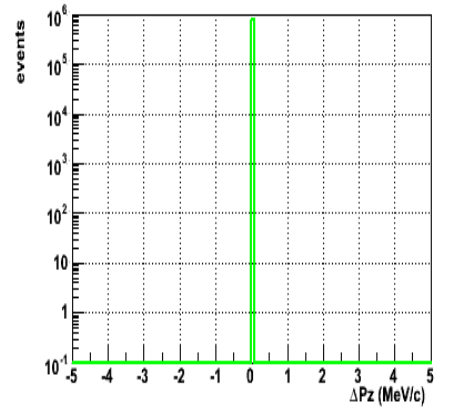

p + Fe → n + X, E = 22 MeV, θ = 30°
θ = 60°
θ = 90°
θ = 120°
θ = 150°
dσ/dEdΩ (mb/srad/MeV)
dσ/dE (mb/MeV)
E (MeV)
Data
BIC
BERT
Bertini is modified

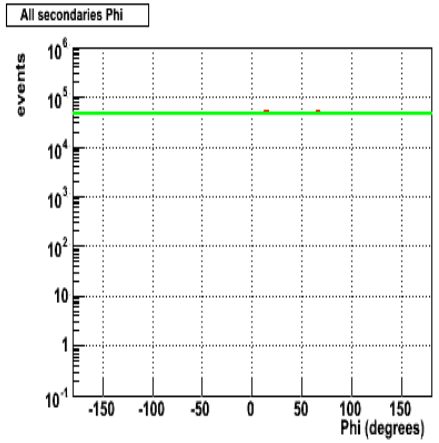
P + Fe 22 MeV – Bertini modified

9.6

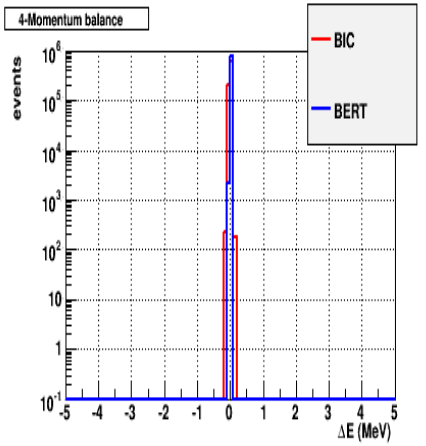


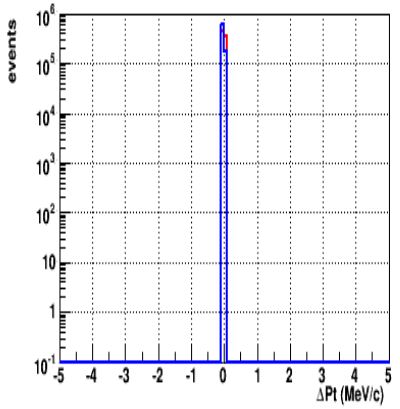


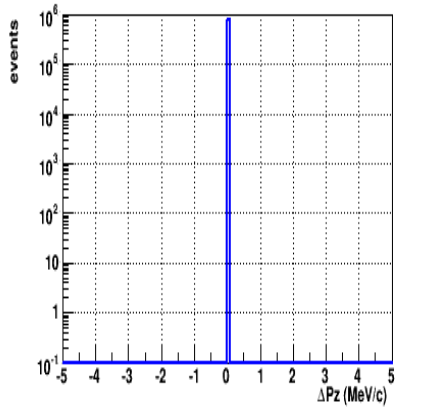


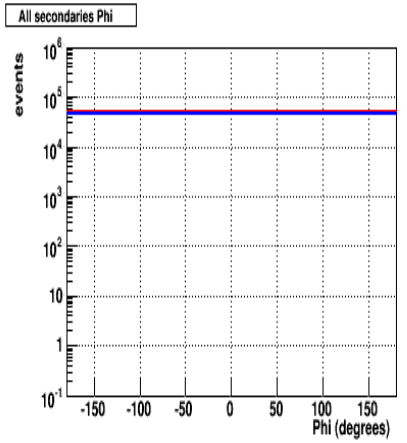


10.0

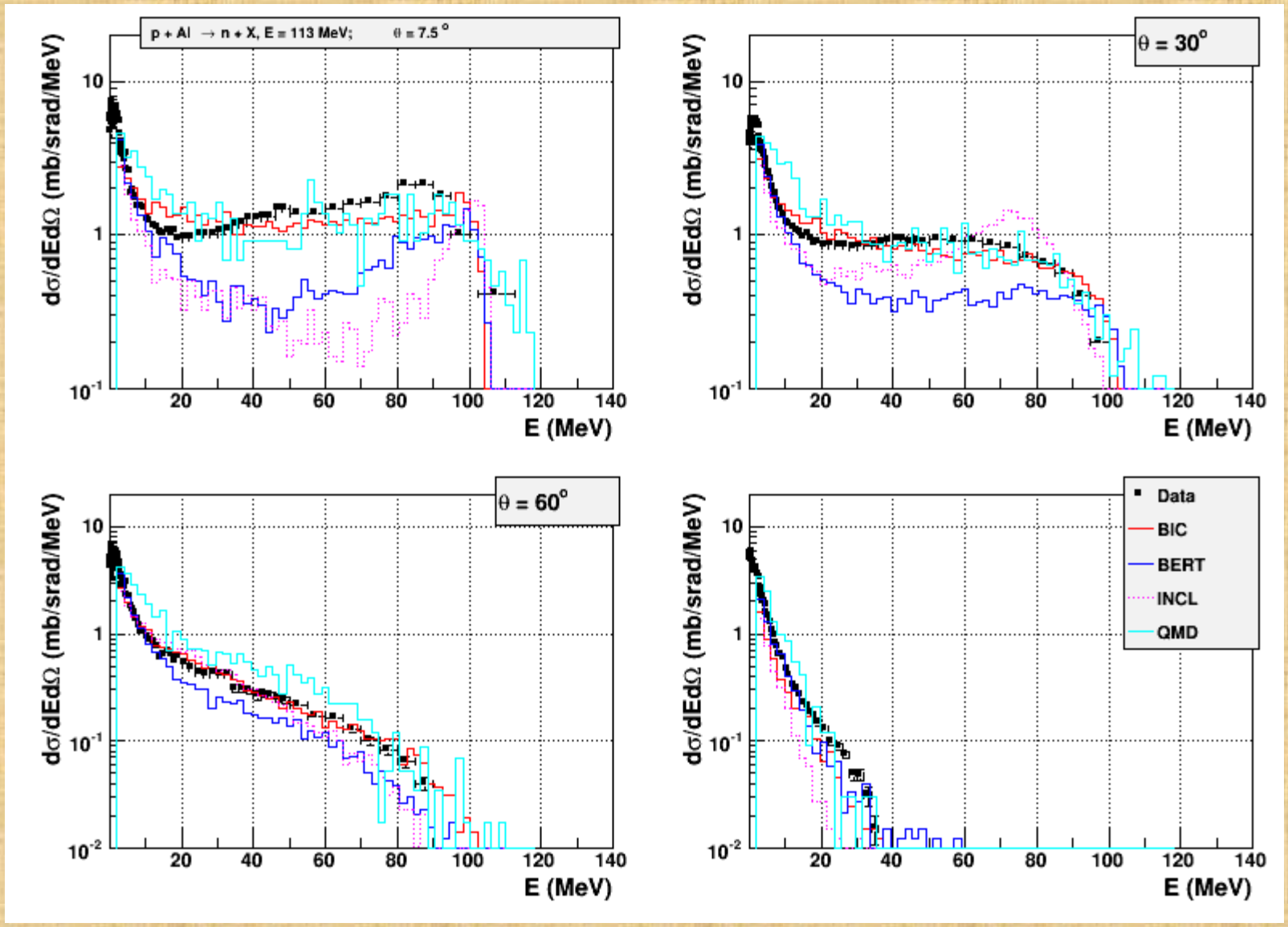




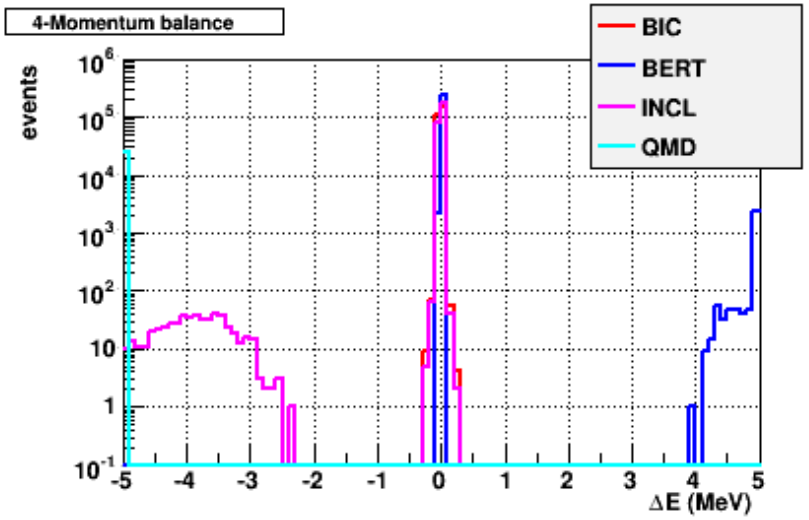


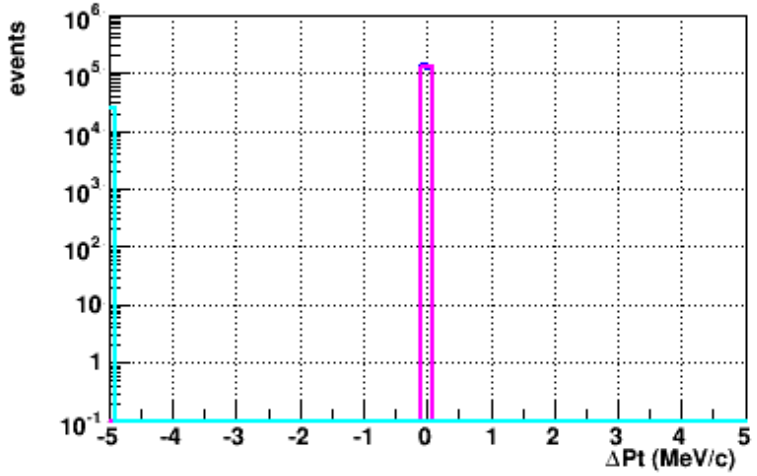


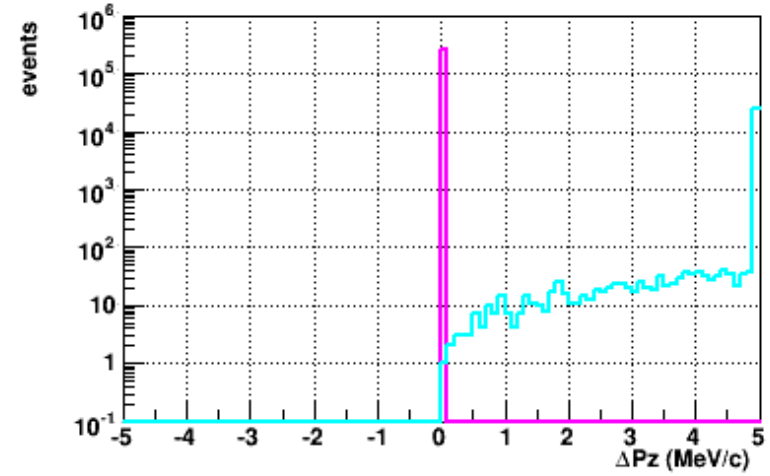
P + Al 113 MeV

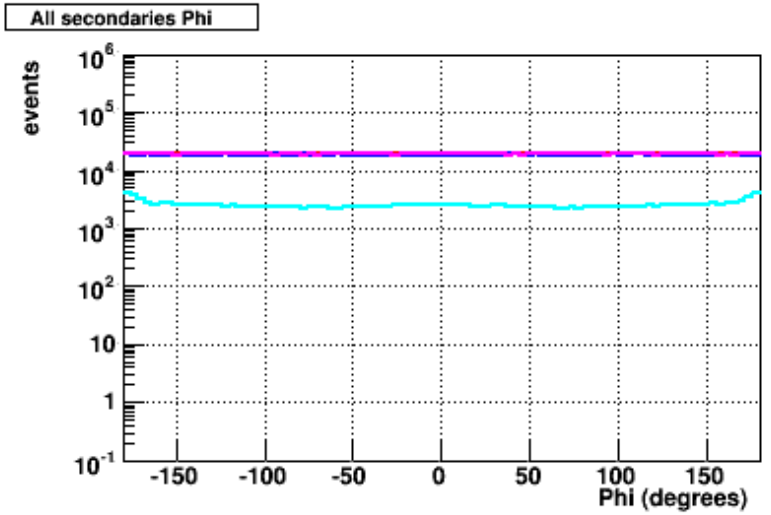

p + Al → n + X, E = 113 MeV; θ = 7.5°
θ = 30°
θ = 60°
Data
BIC
BERT
INCL
QMD
dσ/dEdΩ (mb/srad/MeV)
E (MeV)

P + Al 113 MeV 4-momentum balance

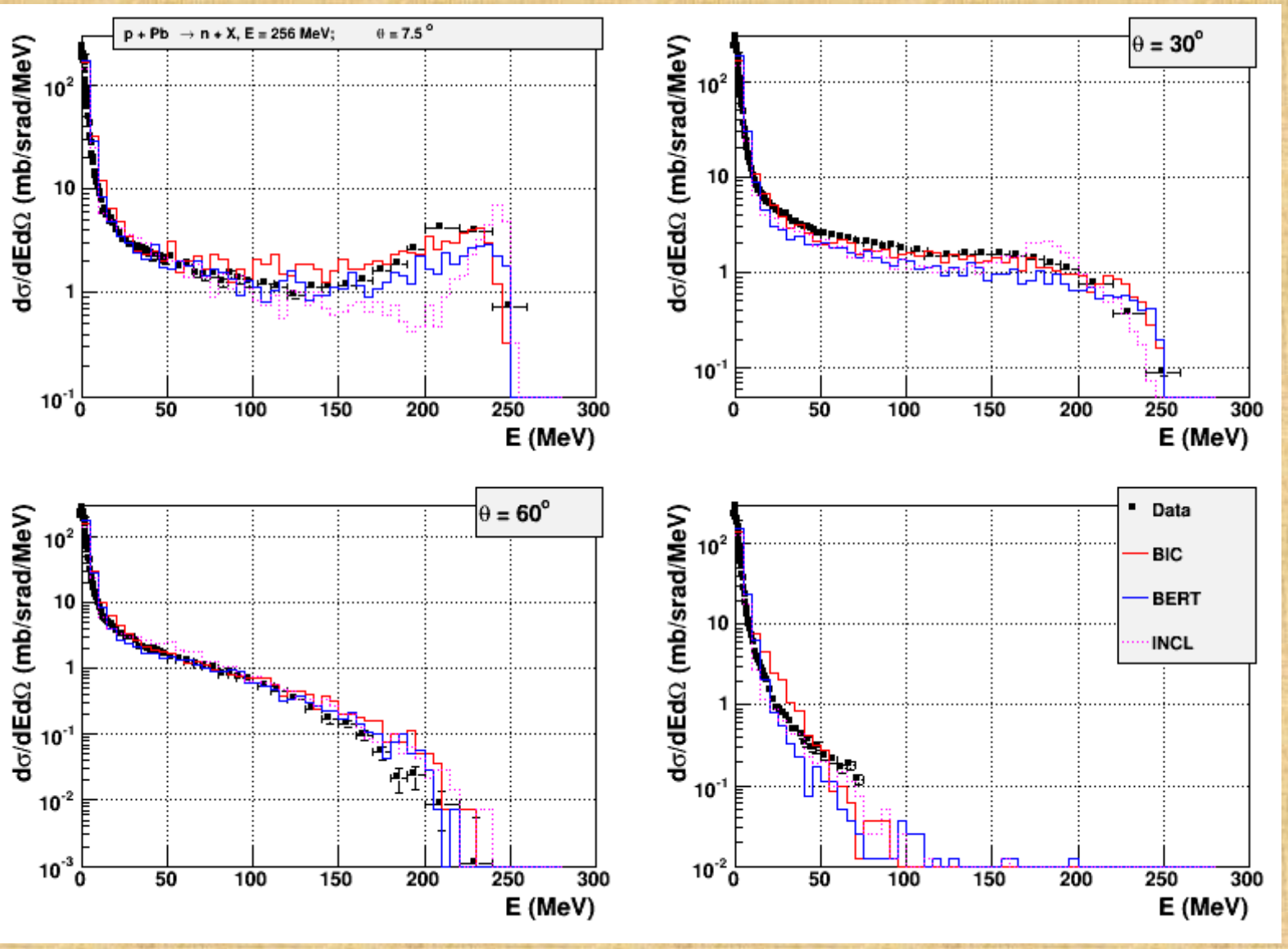






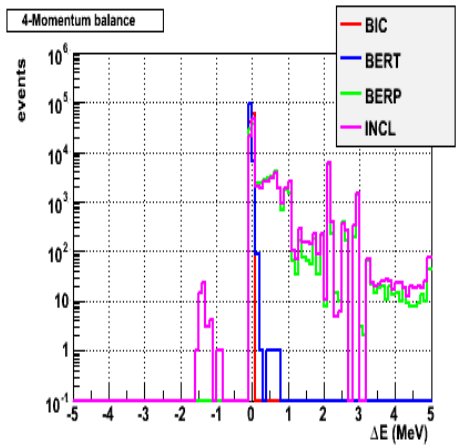


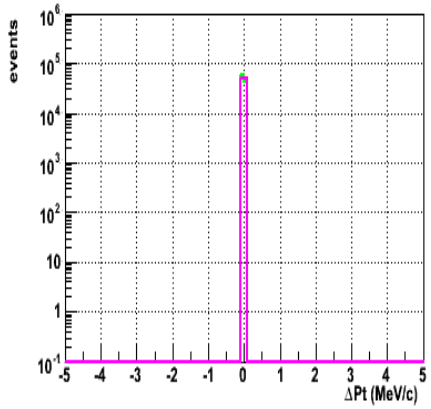
P + Pb 256 MeV

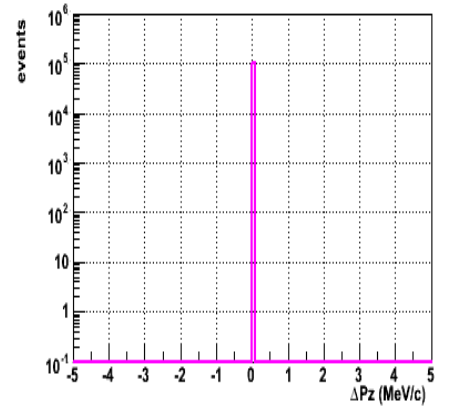

p + Pb → n + X, E = 256 MeV; θ = 7.5°
θ = 30°
θ = 60°
Data
BIC
BERT
INCL
dσ/dEdΩ (mb/srad/MeV)
E (MeV)

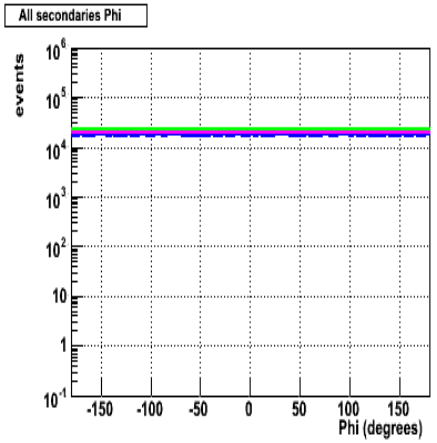
P + Pb 256 MeV 4-momentum balance

9.6









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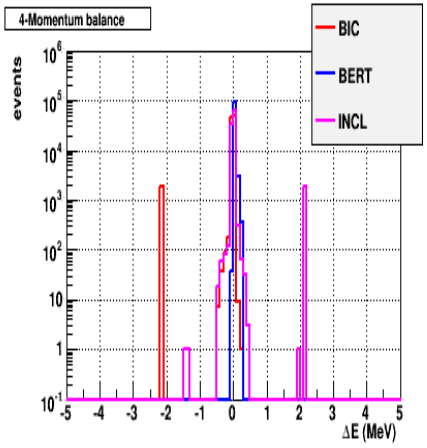
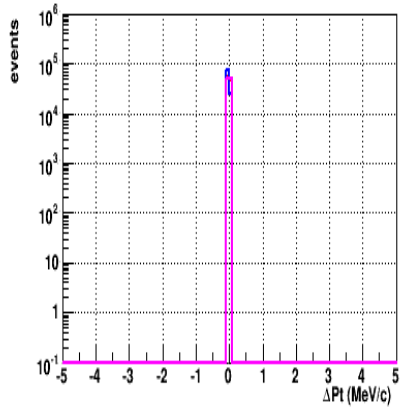
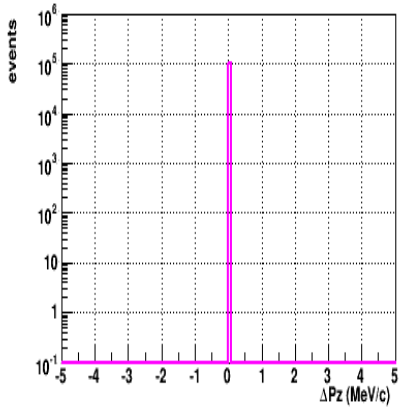
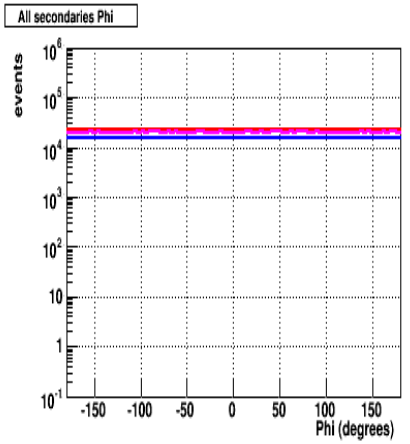
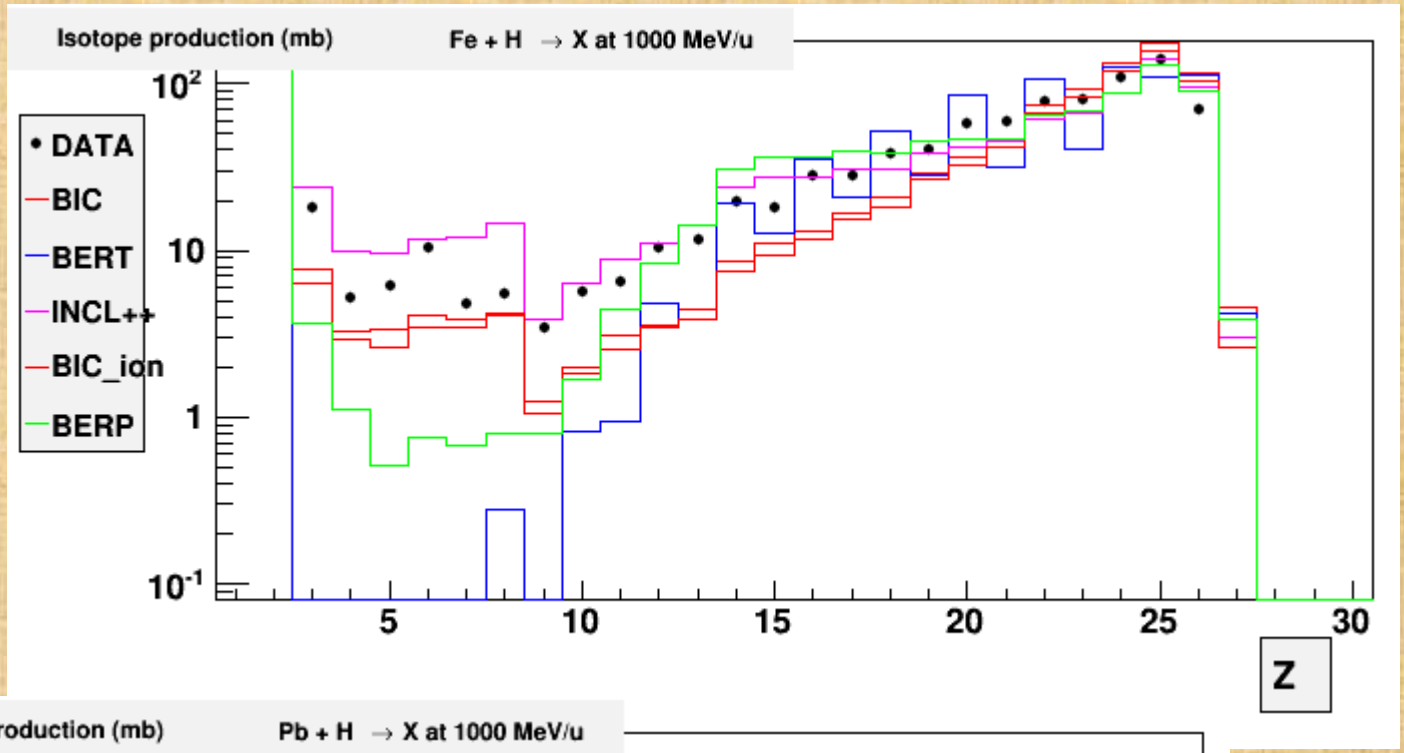


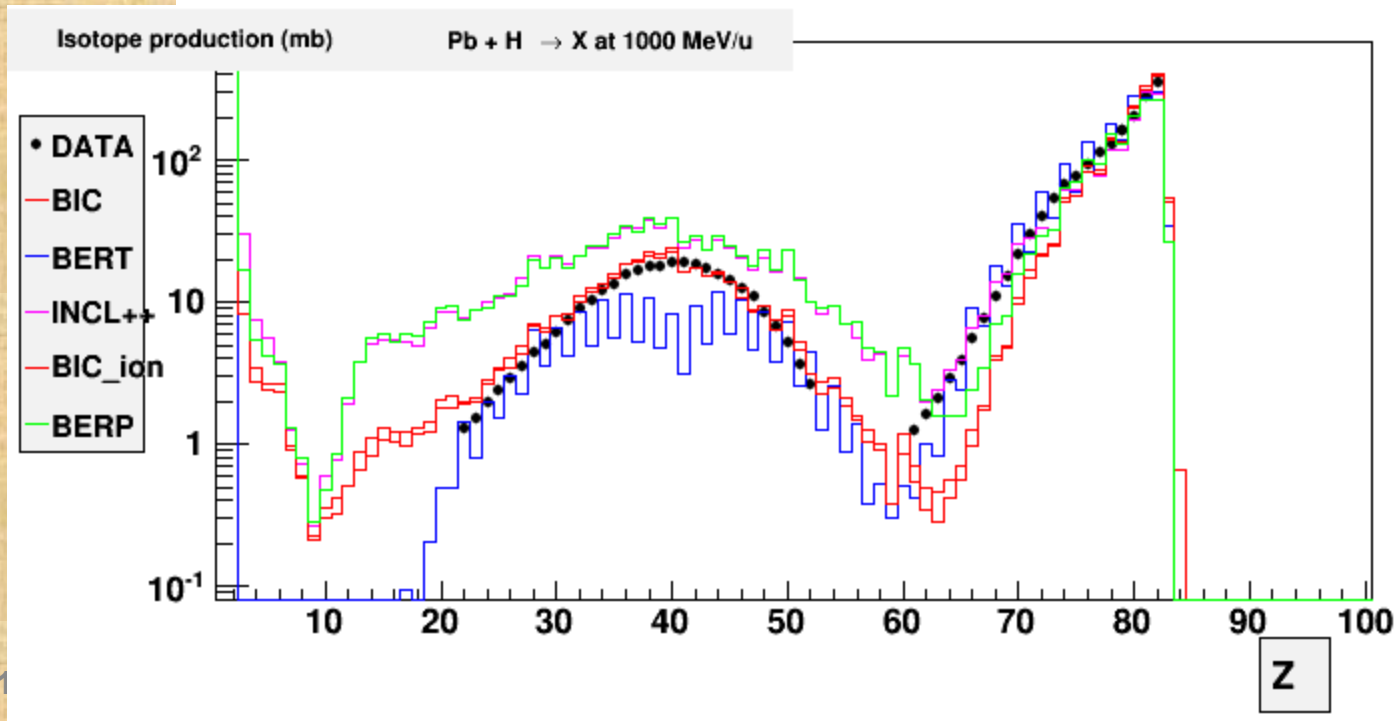




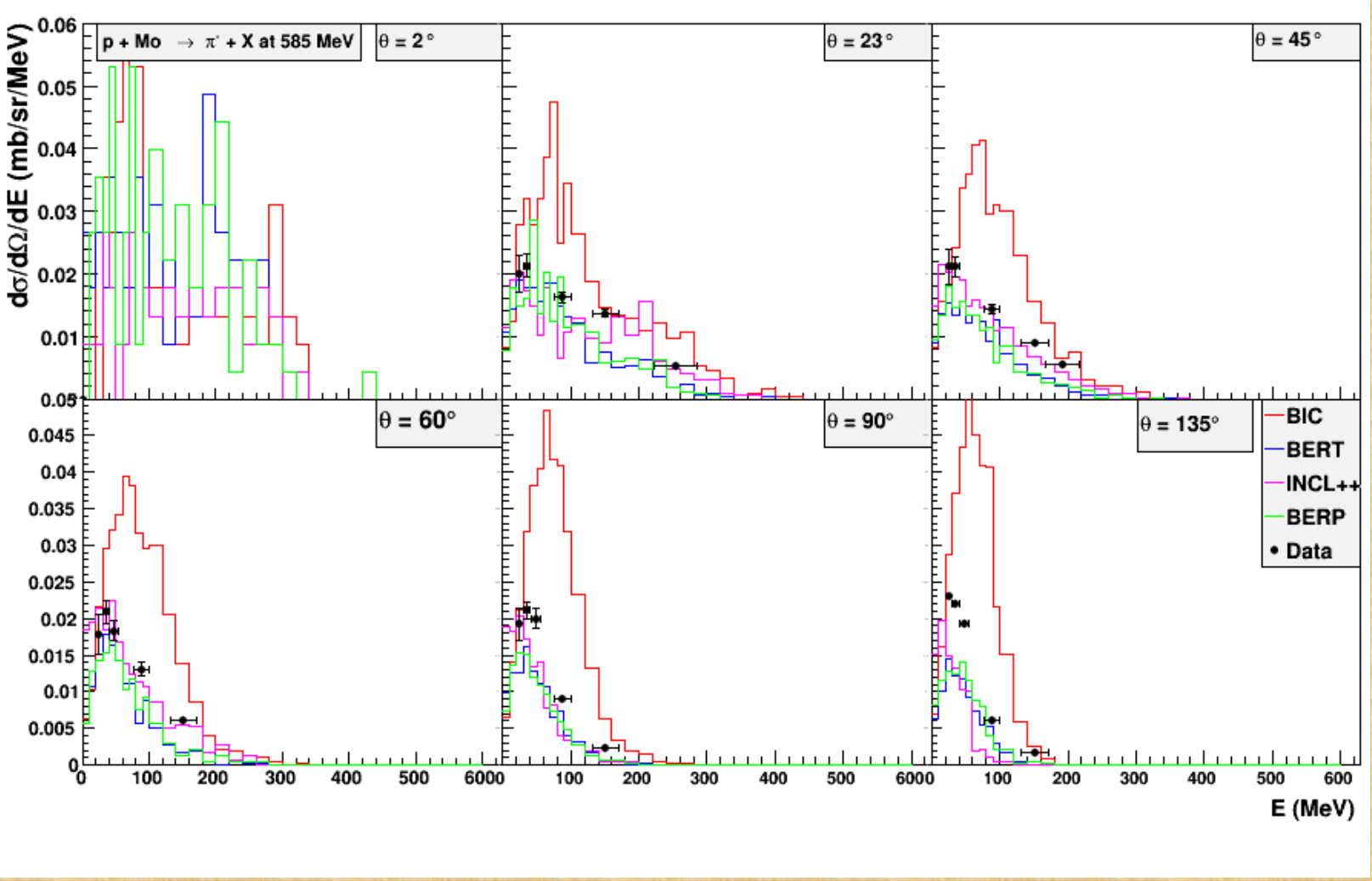


Isotope production





Pion production by protons at 585 MeV



Hadronic Summary

- Bertini cascade with cand01 provides improved 4-momentum balance and a bit modified de-excitation part
- New 4-momentum problem in Binary