update on geant4 – test beam data comparison for pions and protons

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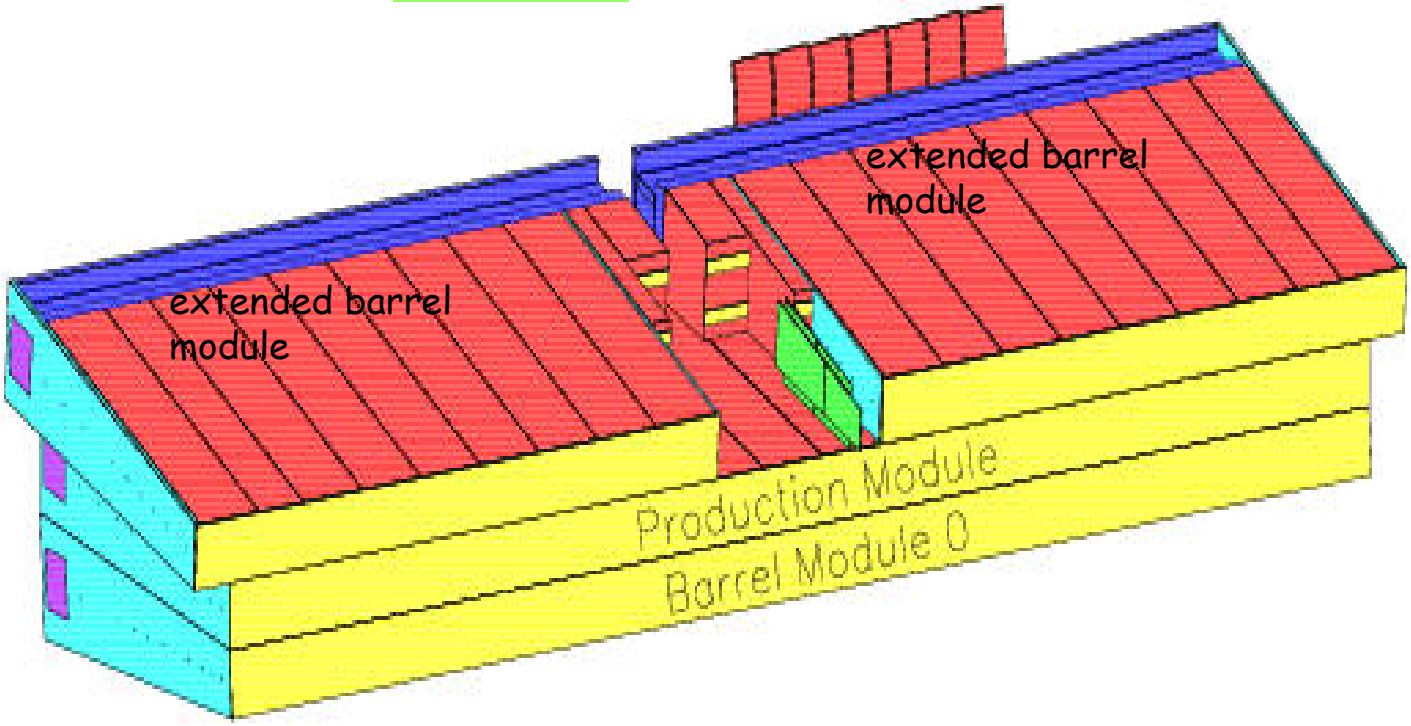
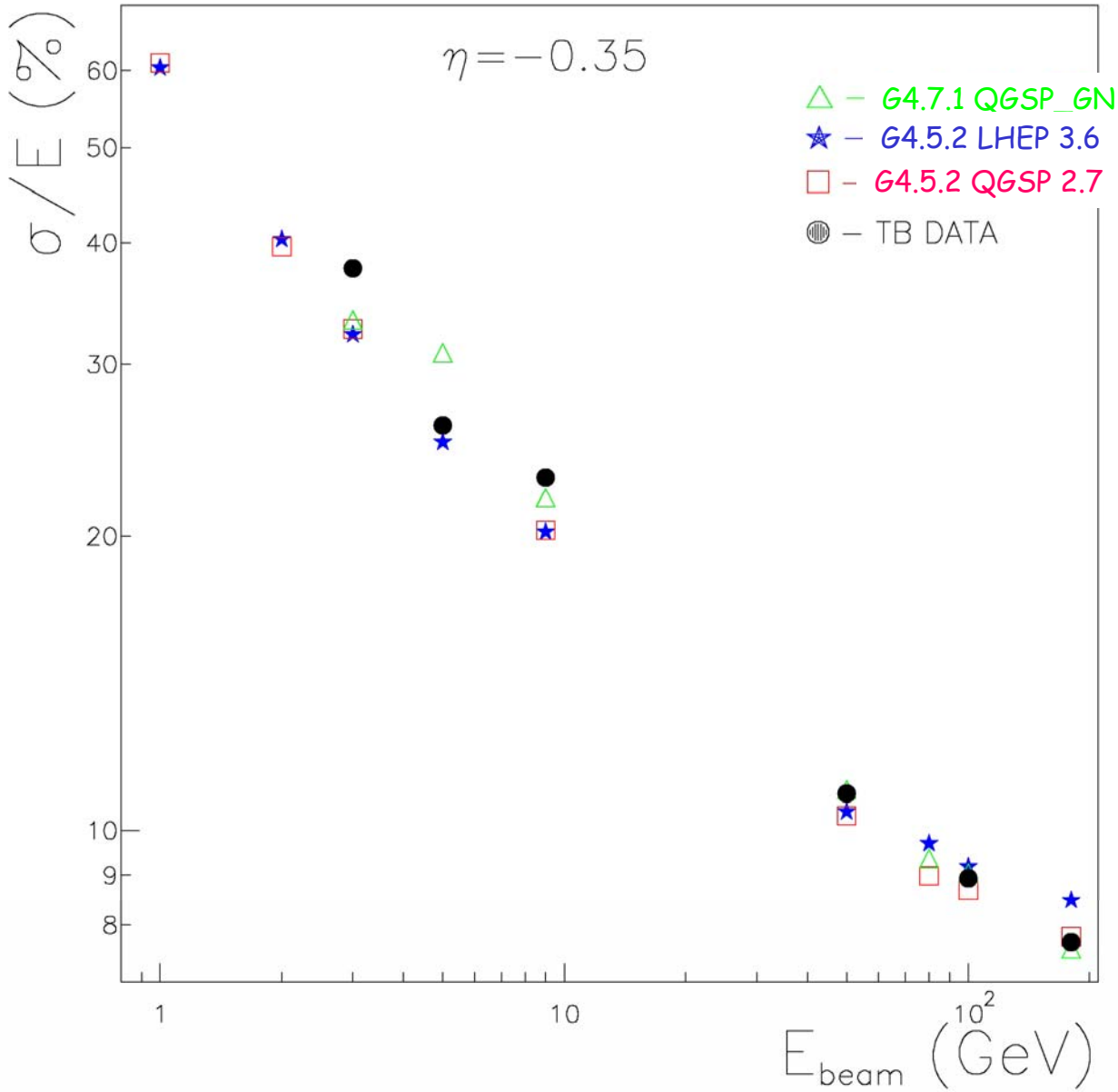
- 2002 test-beam data (old ntuples: flat filter)
- ATHENA 11.0.1
- GEANT 4.7.1 -> QGSP_GN
- GEANT 4.5.2 -> LHEP 3.6, QGSP 2.3 and QGSP2.7

test-beam setup

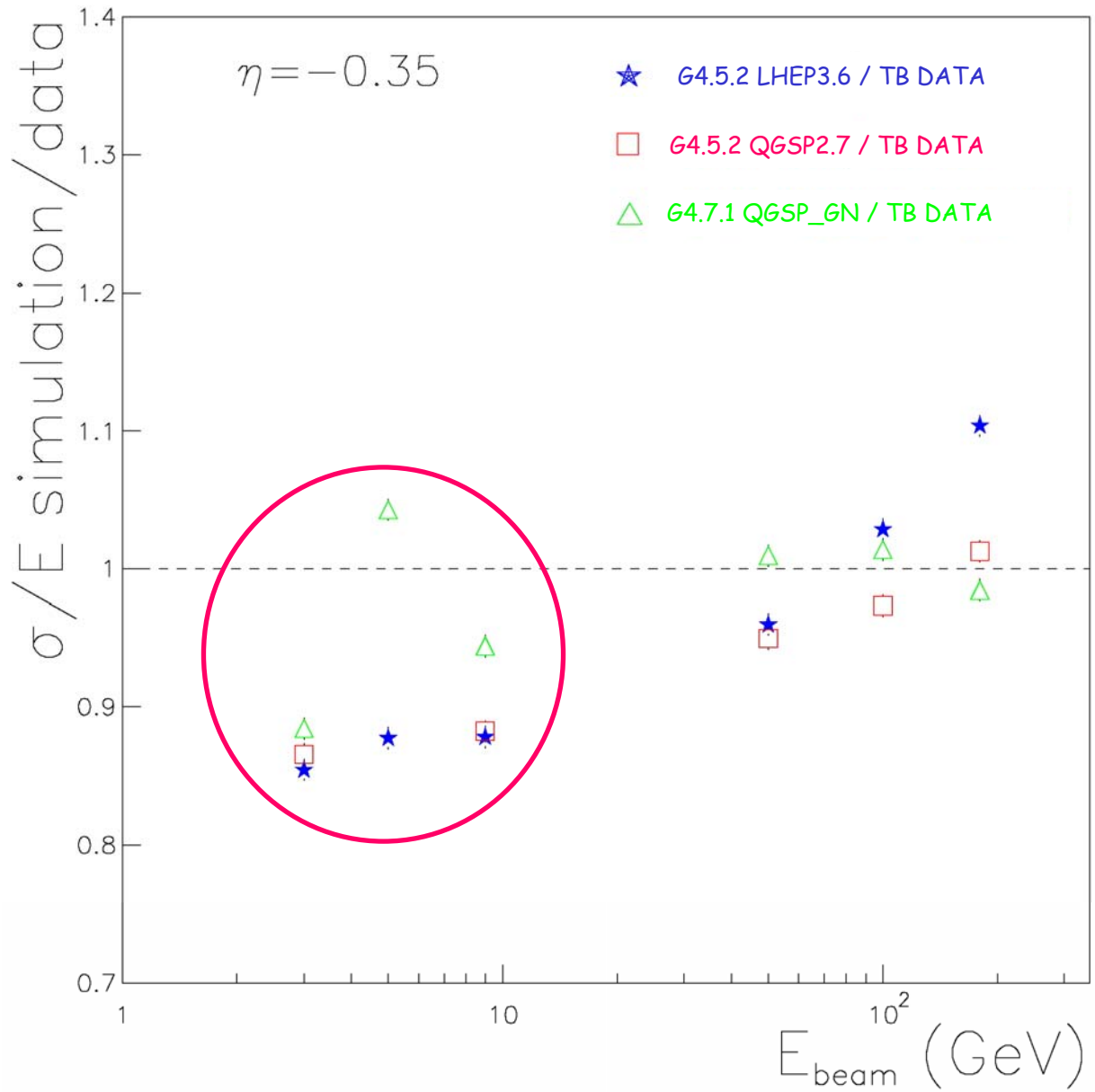
2002-2003



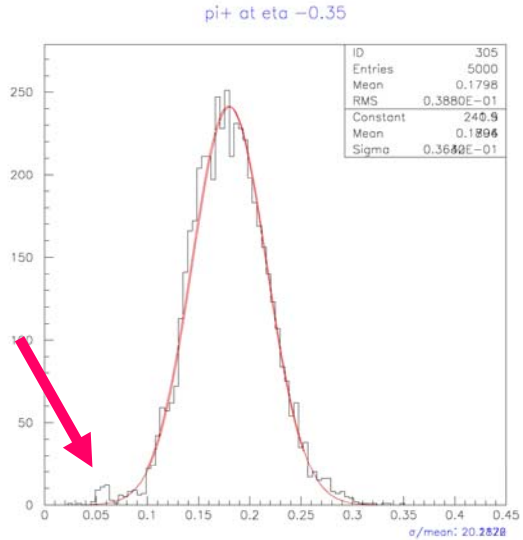
pion energy resolution

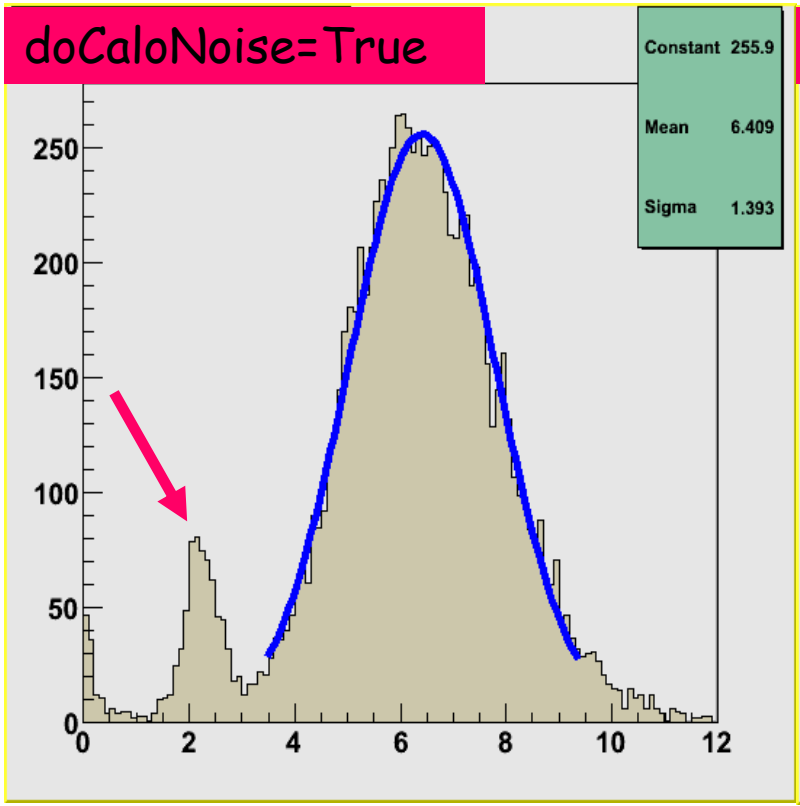


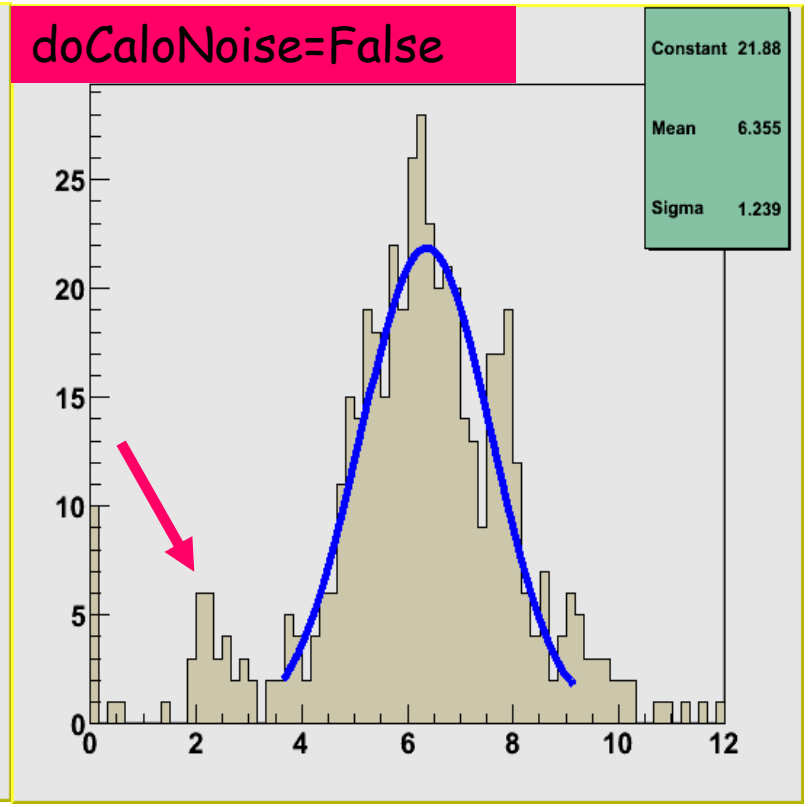
pion energy resolution



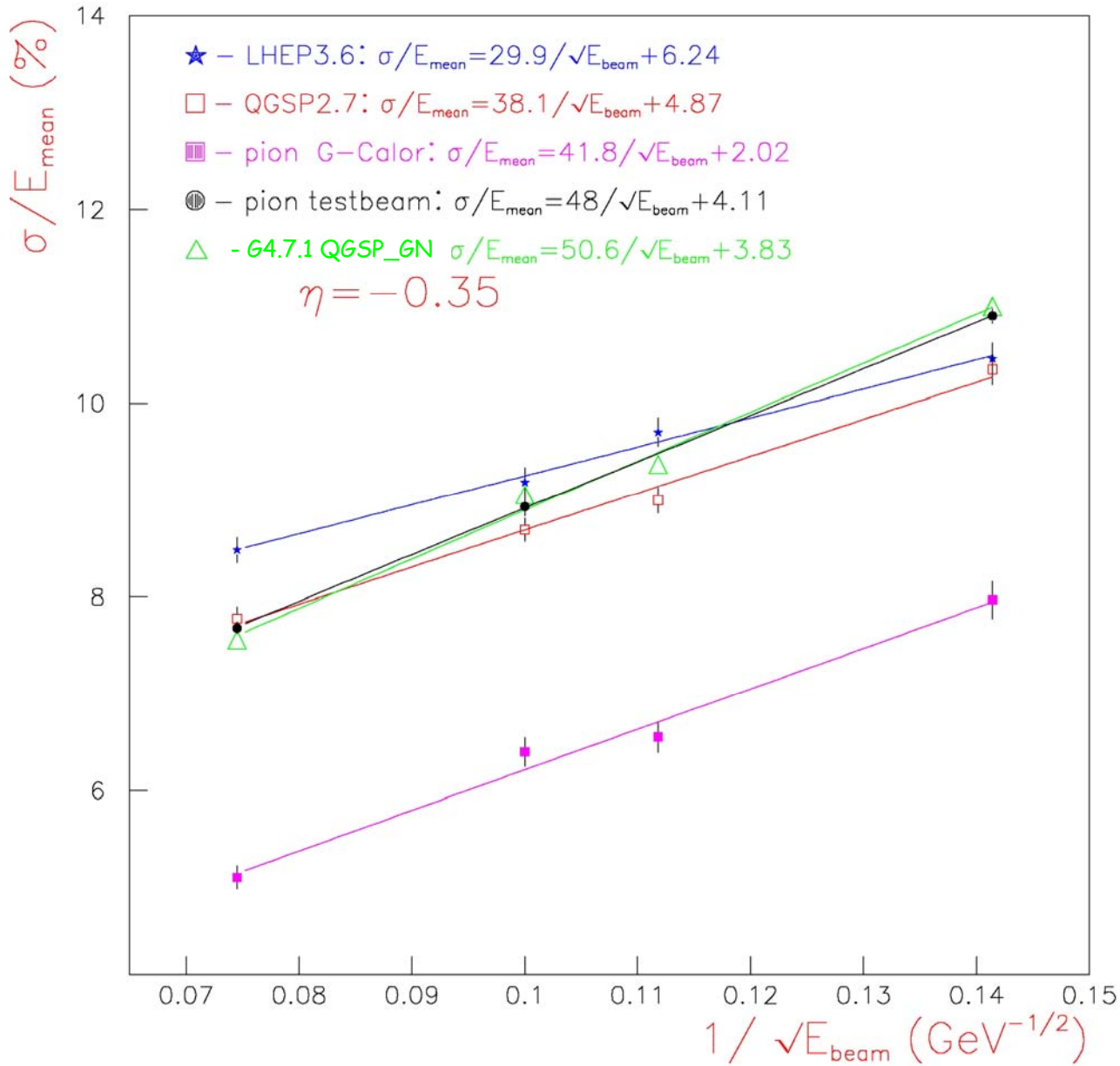
9 GeV pion energy distribution



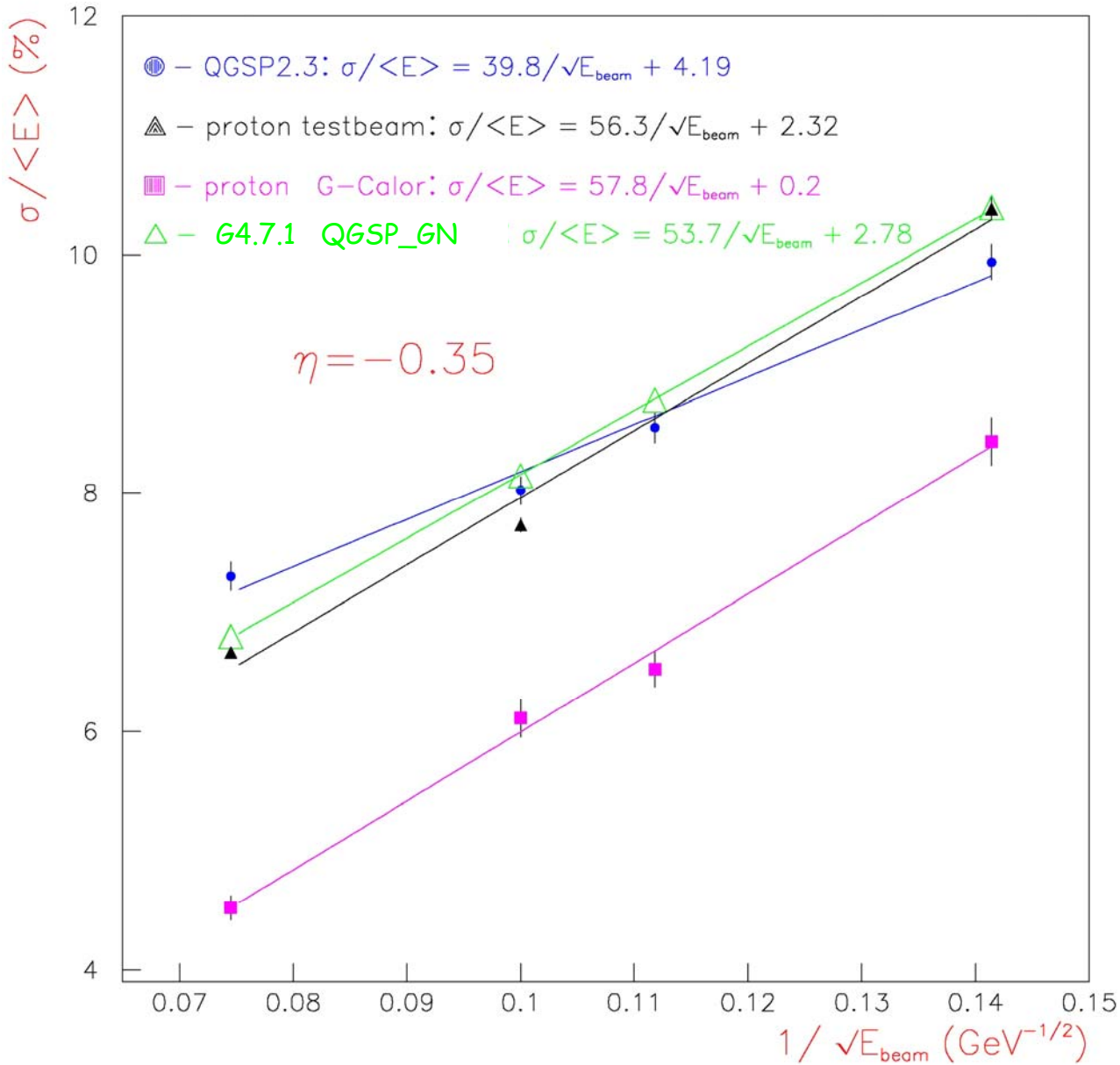




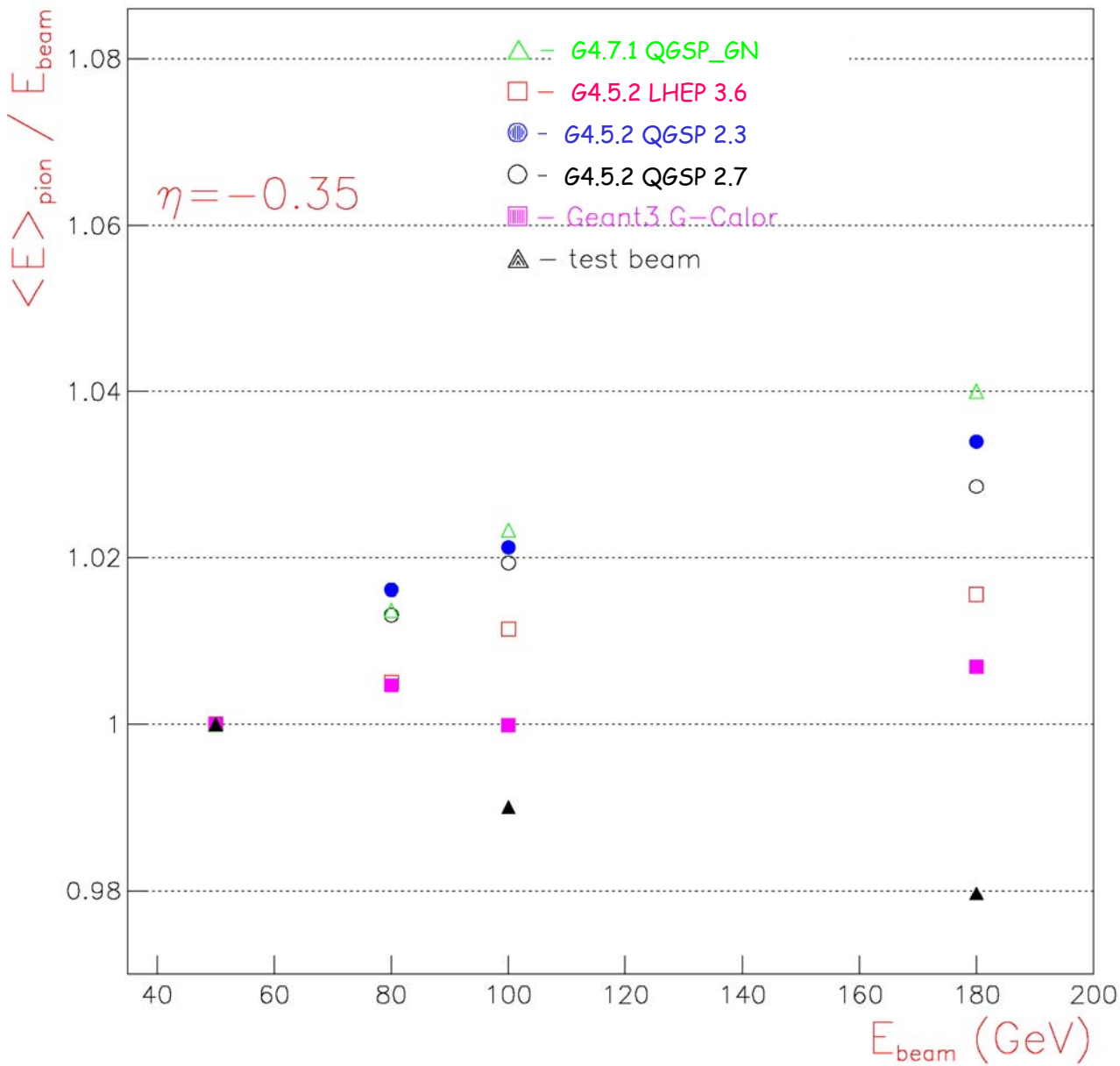
pion energy resolution



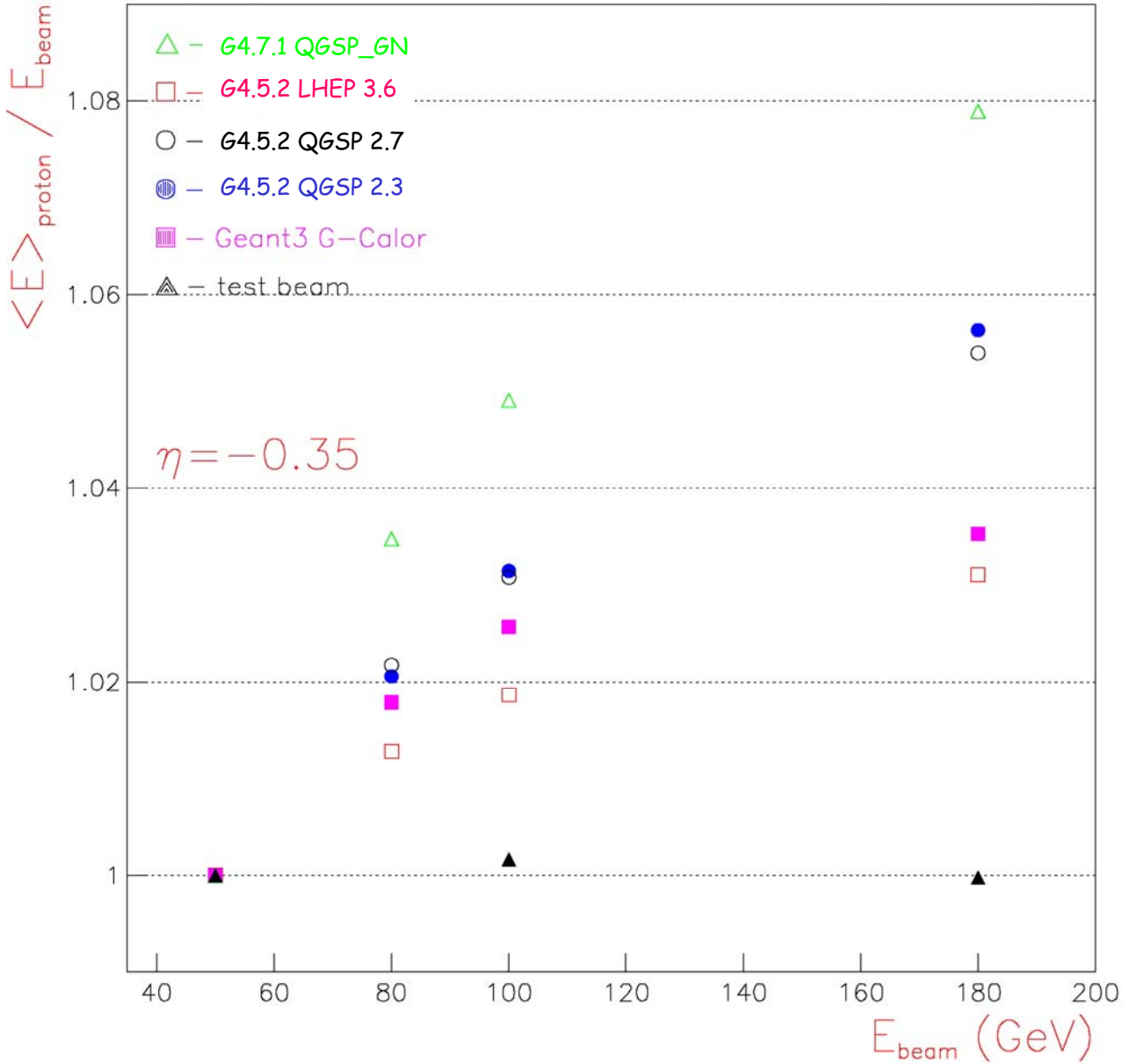
proton energy resolution



pion linearity



proton linearity



$$\frac{e}{\pi} = \frac{e/h}{1+(e/h-1)F_{\pi^0}^{\pi}} = \frac{e/h}{e/h-(e/h-1)F_h^{\pi}}$$

$$\frac{e}{p} = \frac{e/h}{1+(e/h-1)F_{\pi^0}^{p}} = \frac{eh}{e/h-(e/h-1)F_h^{p}}$$

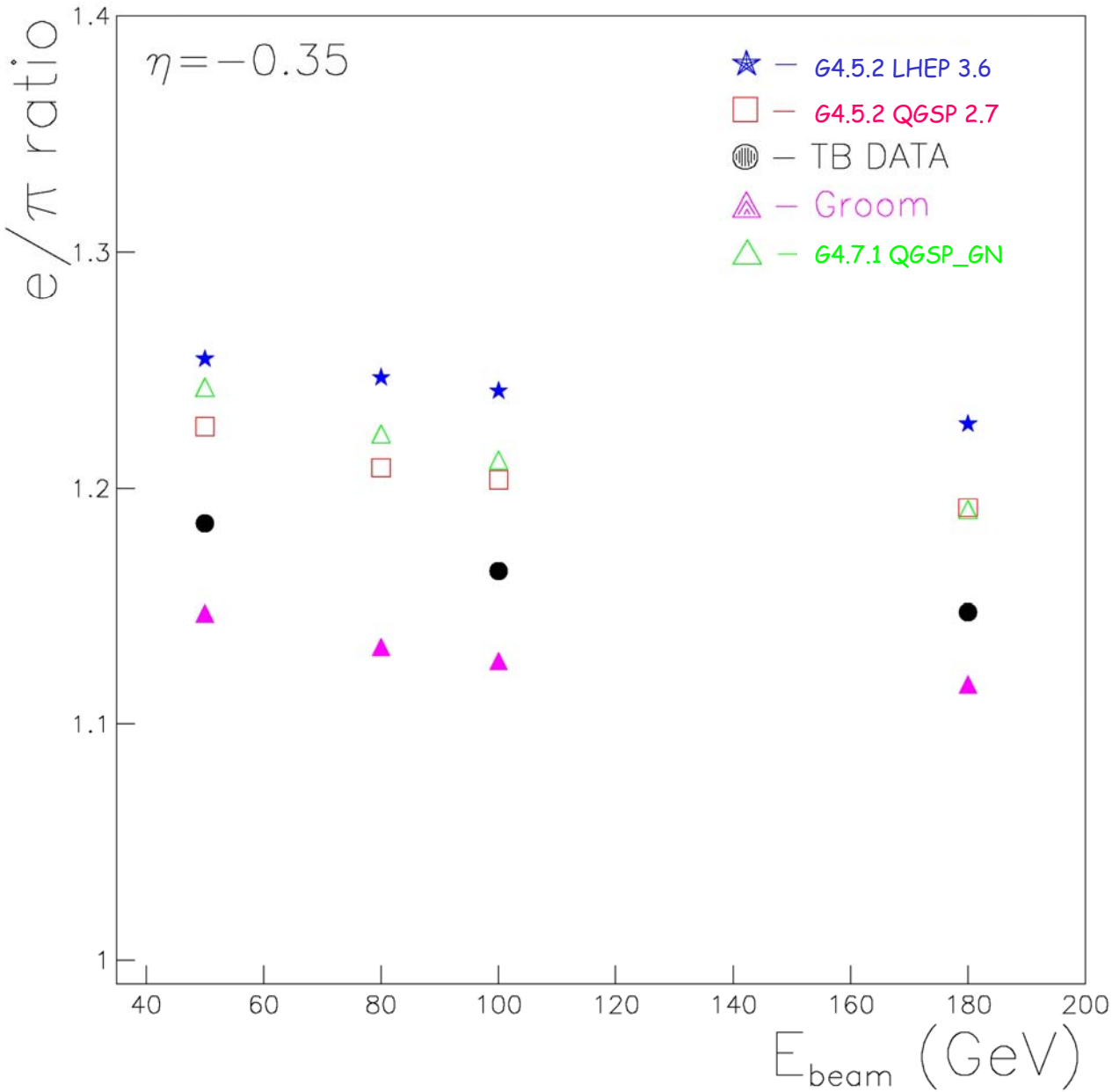
$$F_h = (E/E_0)^{m-1}$$

- for iron absorbant and scintillator **Groom** predictions are:
  - E_0=0.96 for pions and E_0=2.62 for protons
  - m=0.816 for pions and m=0.814 for protons

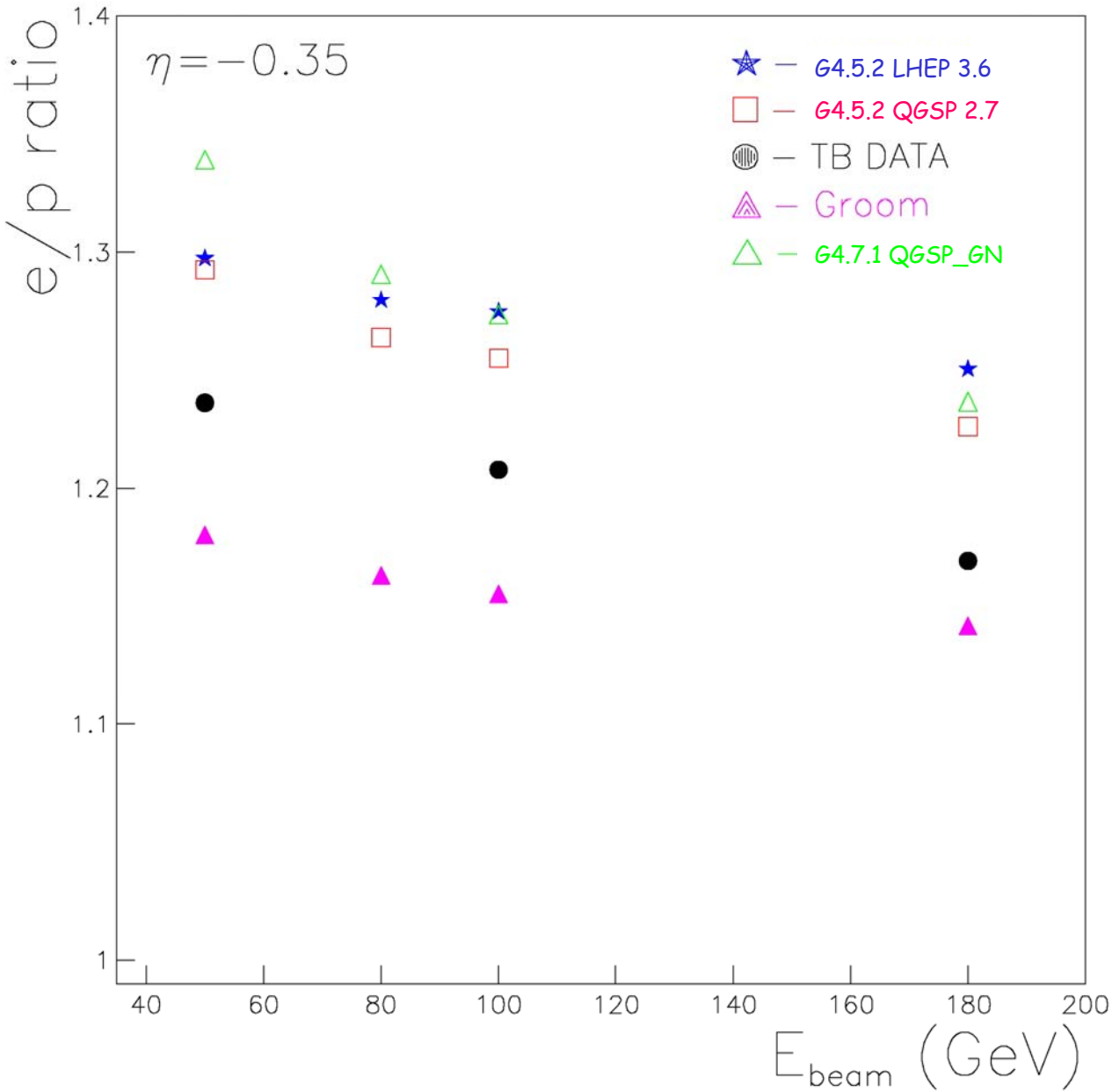
- e/h = 1.36 ± 0.11 was determined in ATLAS Tilecal (CERN/LHCC 95-44)

- e/π, e/p and π/p obtained using the above formula and the experimental e/h value will be shown as Groom predictions

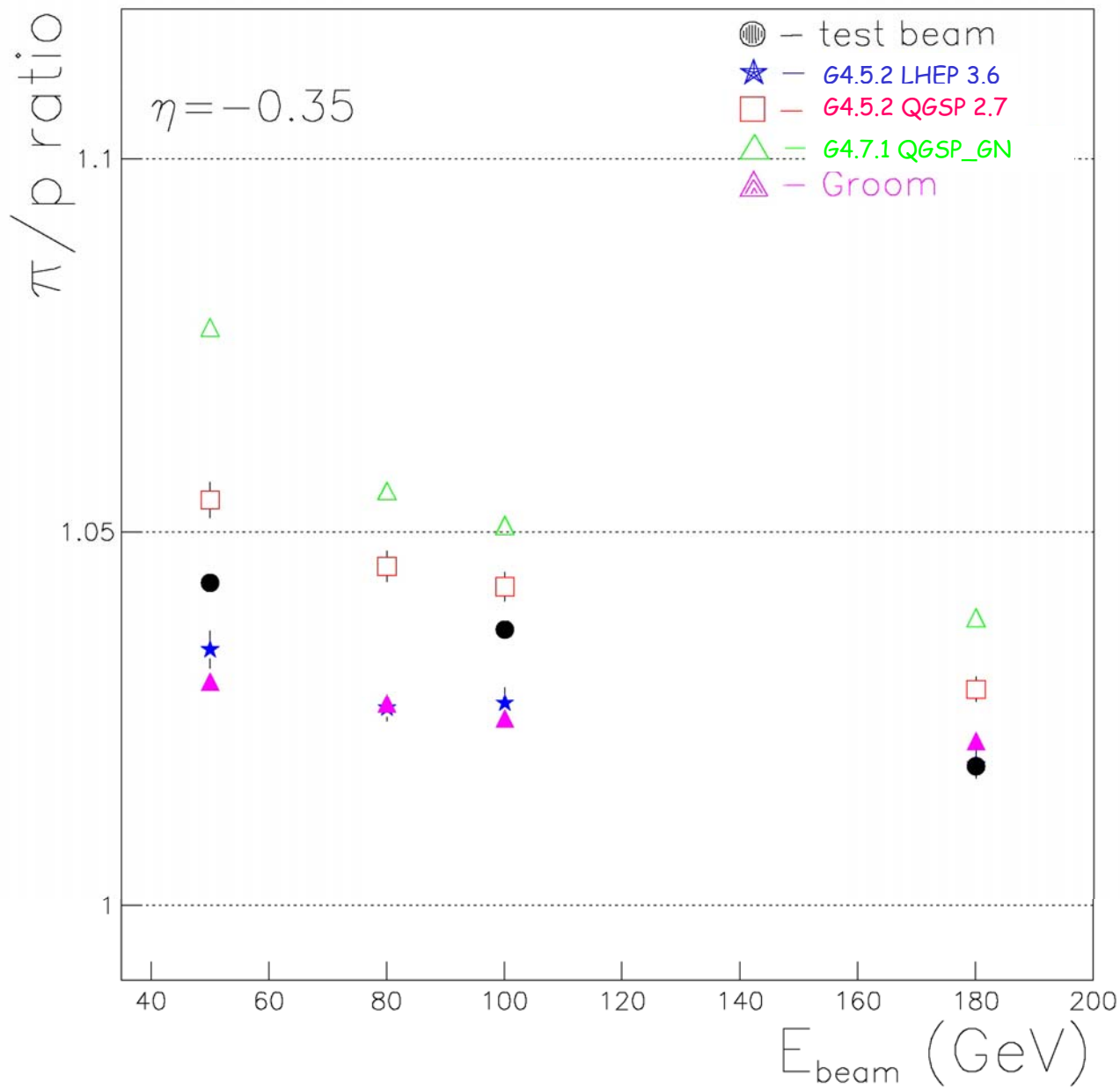
electron/pion



electron/proton



pion/proton


π/p ratio
η=−0.35
– test beam
– G4.5.2 LHEP 3.6
– G4.5.2 QGSP 2.7
– G4.7.1 QGSP_GN
– Groom
1.1
1.05
1
40
60
80
100
120
140
160
180
200
E beam (GeV)

conclusions:

pion:

- energy resolution: geant4.7.1 and clhep1.9 -> better description of the test-beam data
- worse linearity and e/π

proton:

- energy resolution: geant4.7.1 and clhep1.9 -> better description of the test-beam data
- worse linearity and e/p

further analysis with ATHENA11.0.1 and GEANT4.7.1:

- latest test-beam data will be considered
- leakage corrections will be studied
- e/p, e/π, π/p, shower shape, etc.