Updates on HiDRa simulation analysis

Andrea Pareti – 9/11/2022

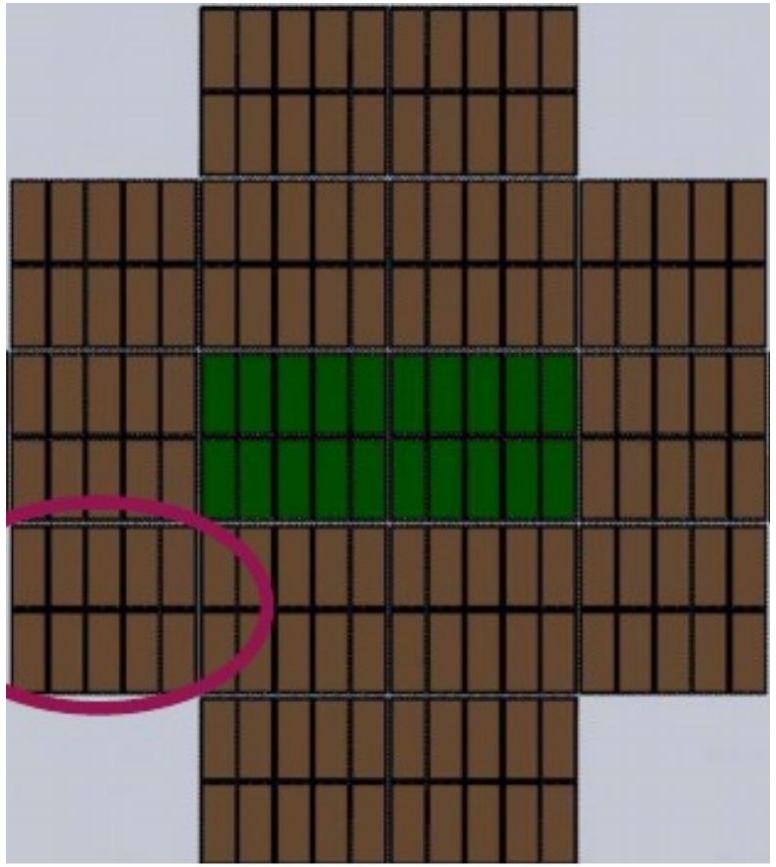
Simulation

- Calorimeter depth: 2500mm ✓
- Geometry: 80 miniM ✓
- Material: Steel/Brass ?

48x10 minimodules geometry has also been used in the extraction of the χ factor

Details on simulation:

- Beam tilted by 2.5° in X and Y directions
- Datasets: [10, 20, 30, 40, 60, 80, 100] GeV
- 10k events per set
- Beam diameter: 1cm
- Fiber diameter: 1mm

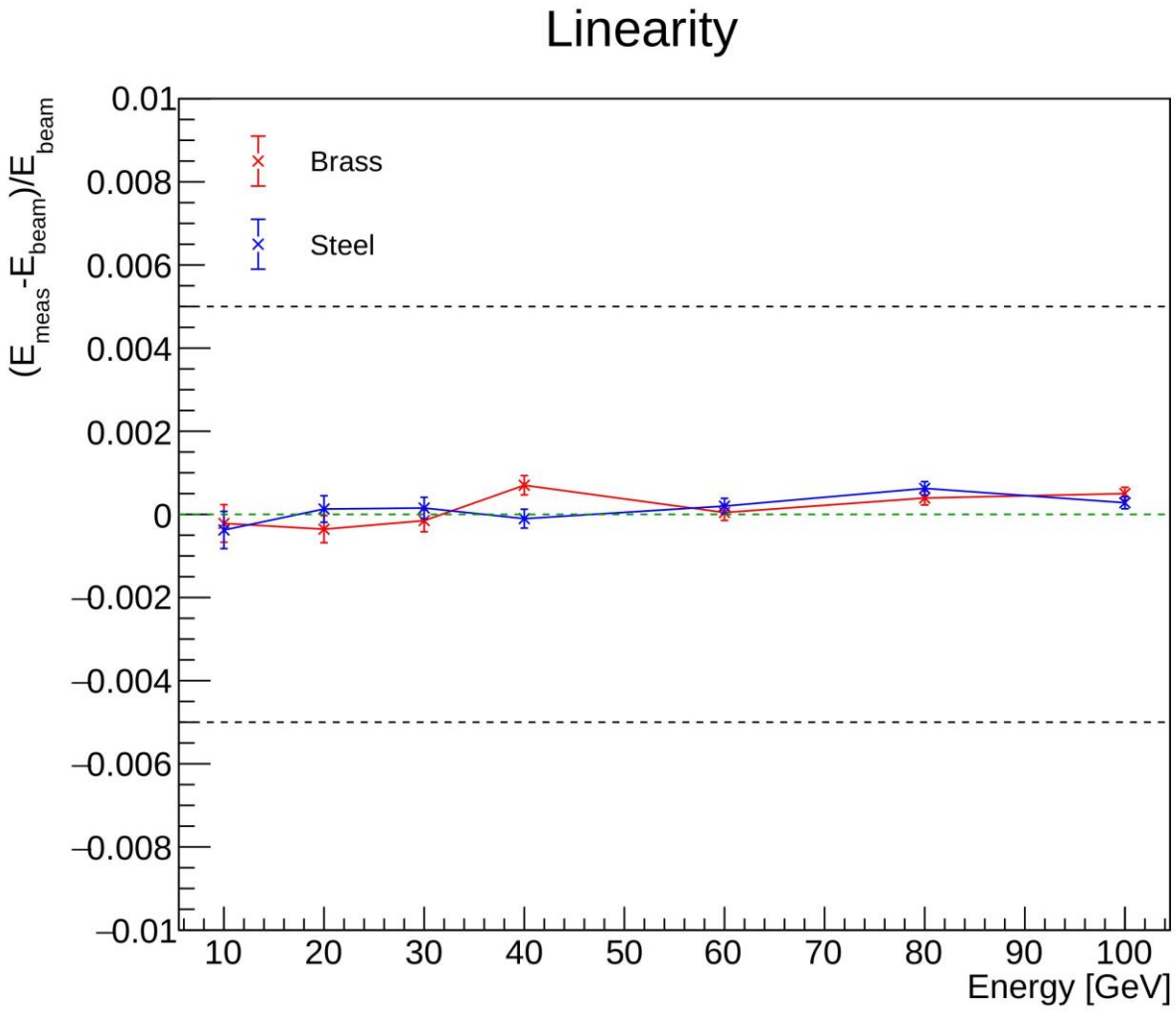


Steel Vs Brass: electrons

phe/GeV ratio obtained from the mean of the sets between [10, 100] GeV

Steel:
- sci: 225.97+-0.18
- cer: 55.21 +-0.03

Brass:
- sci: 218.00+-0.12
- cer: 53.49+-0.02



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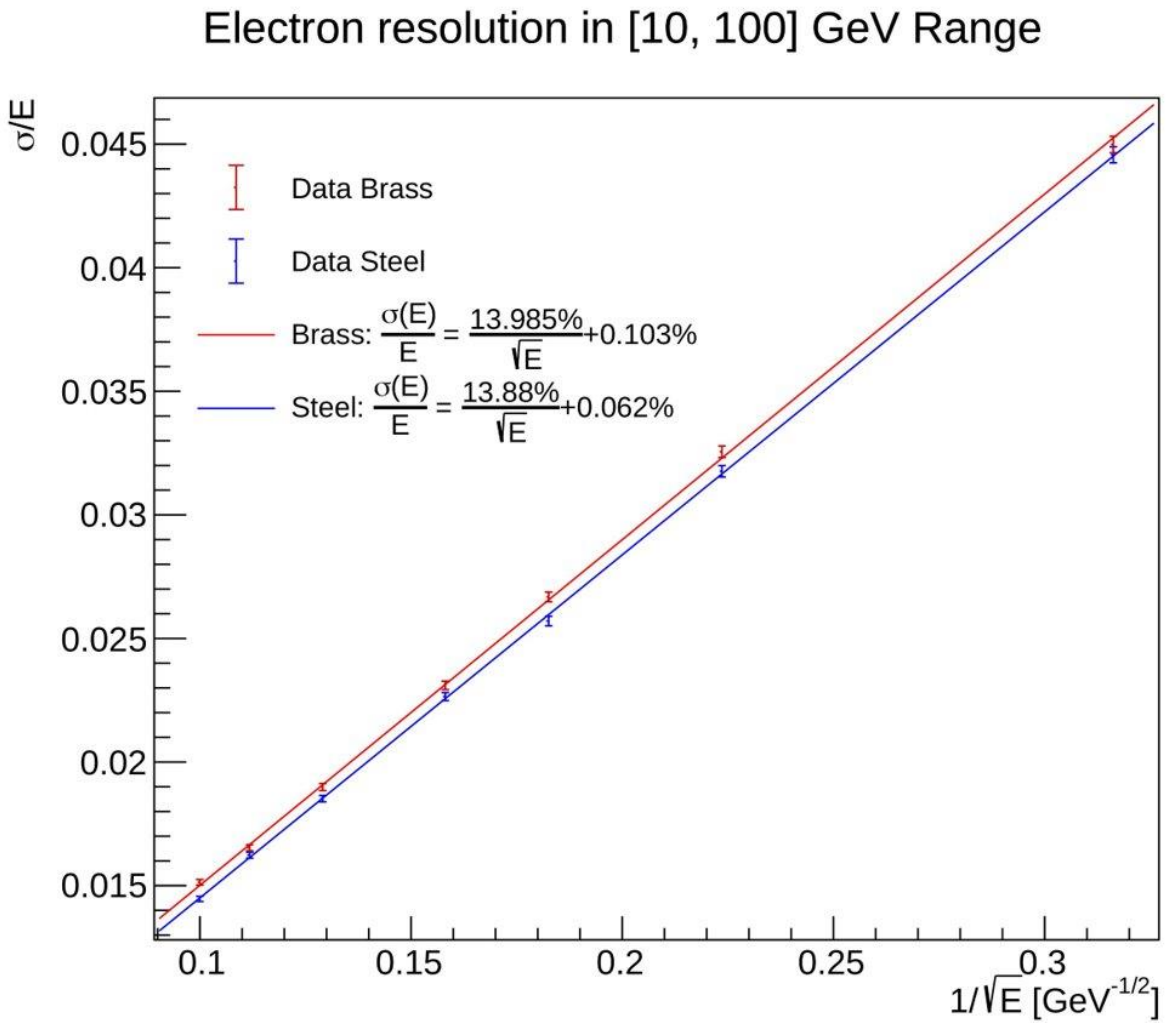
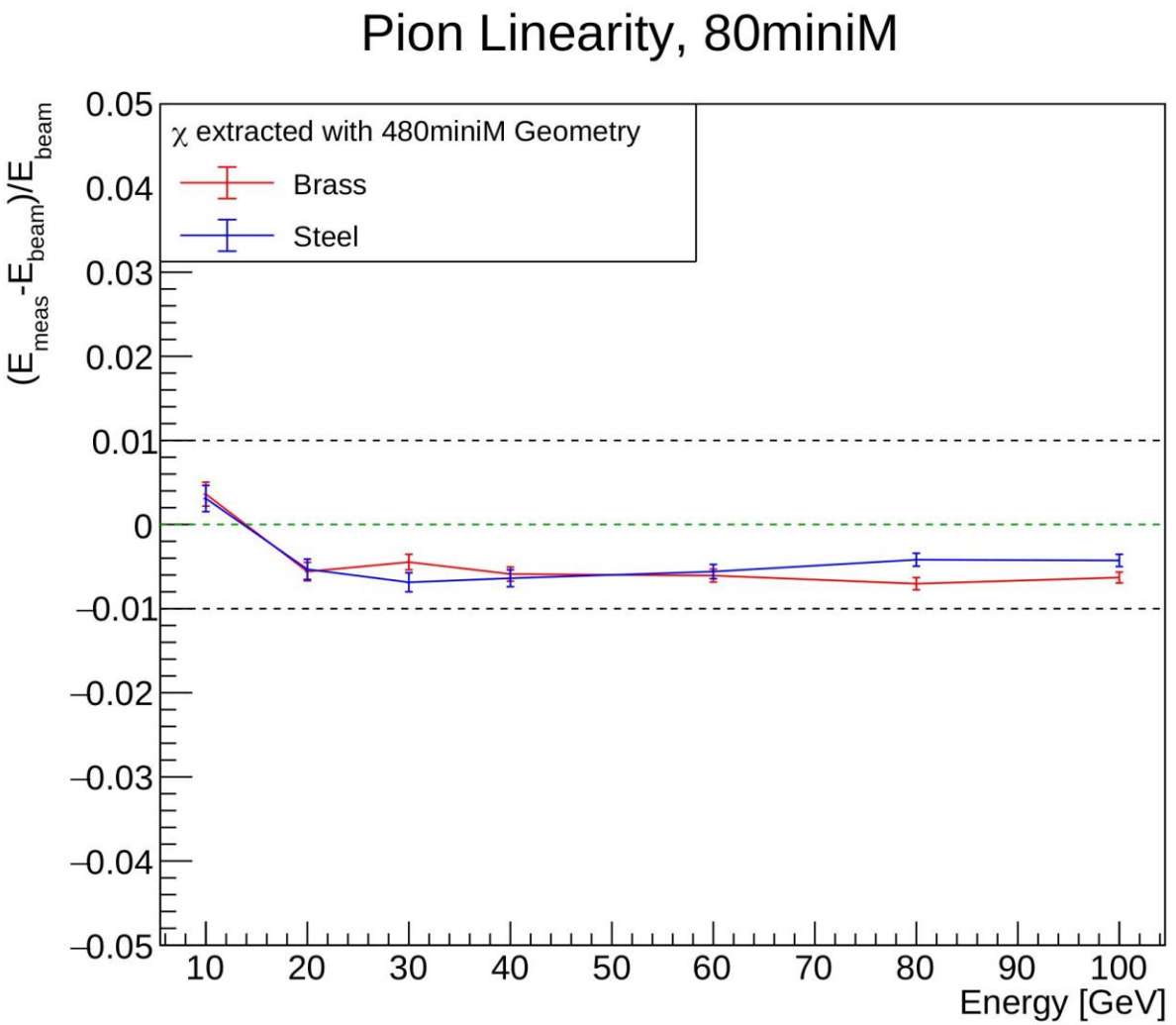


Steel Vs Brass: pions

Attempt n°1:
Extract χ from 480 miniM simulation and use it to obtain resolution with 80 miniM geometry
(find χ such that the 480miniM calo is perfectly linear at 40 GeV)

- Steel: $\chi = 0.3394$
- Brass: $\chi = 0.2960$



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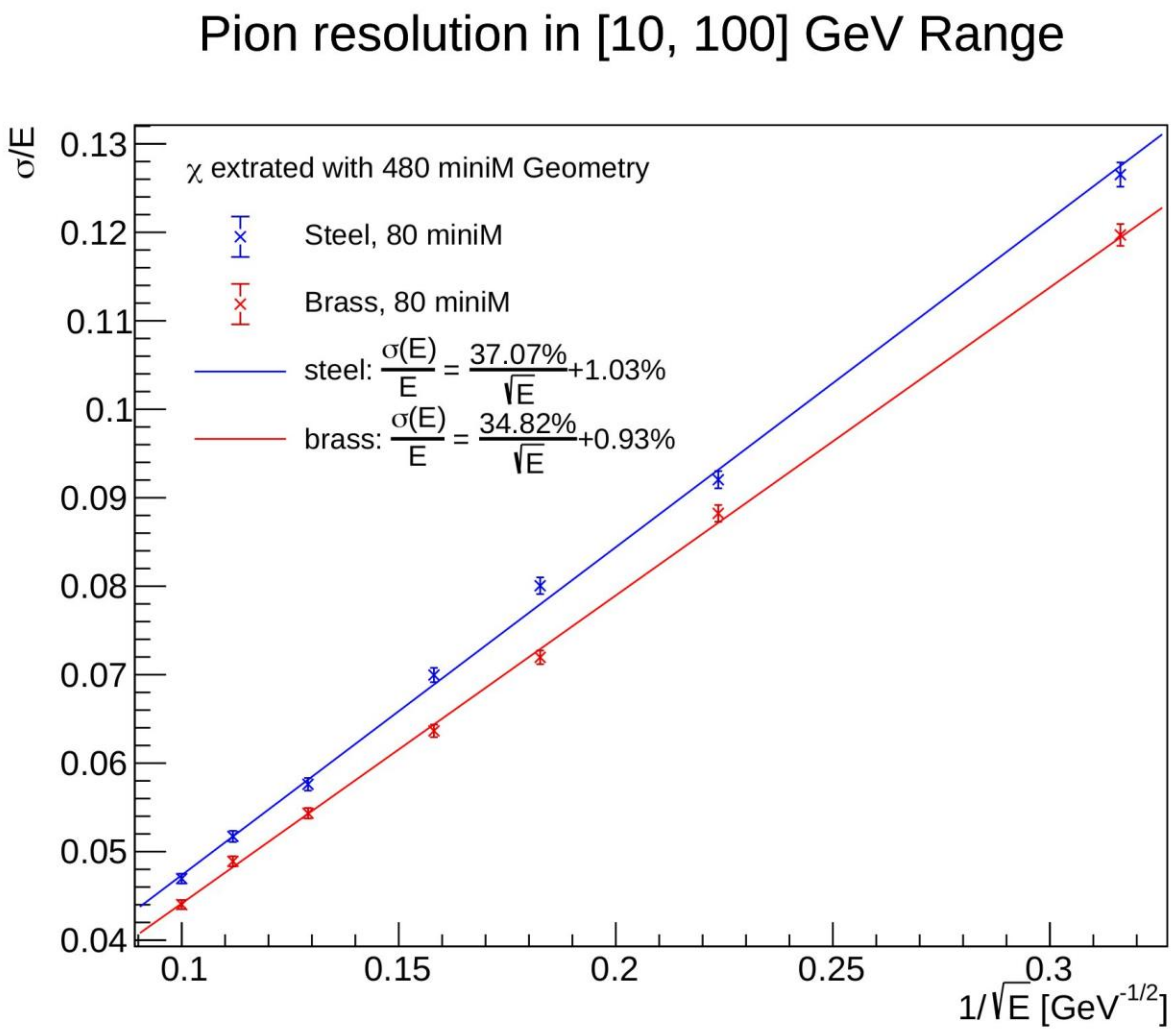

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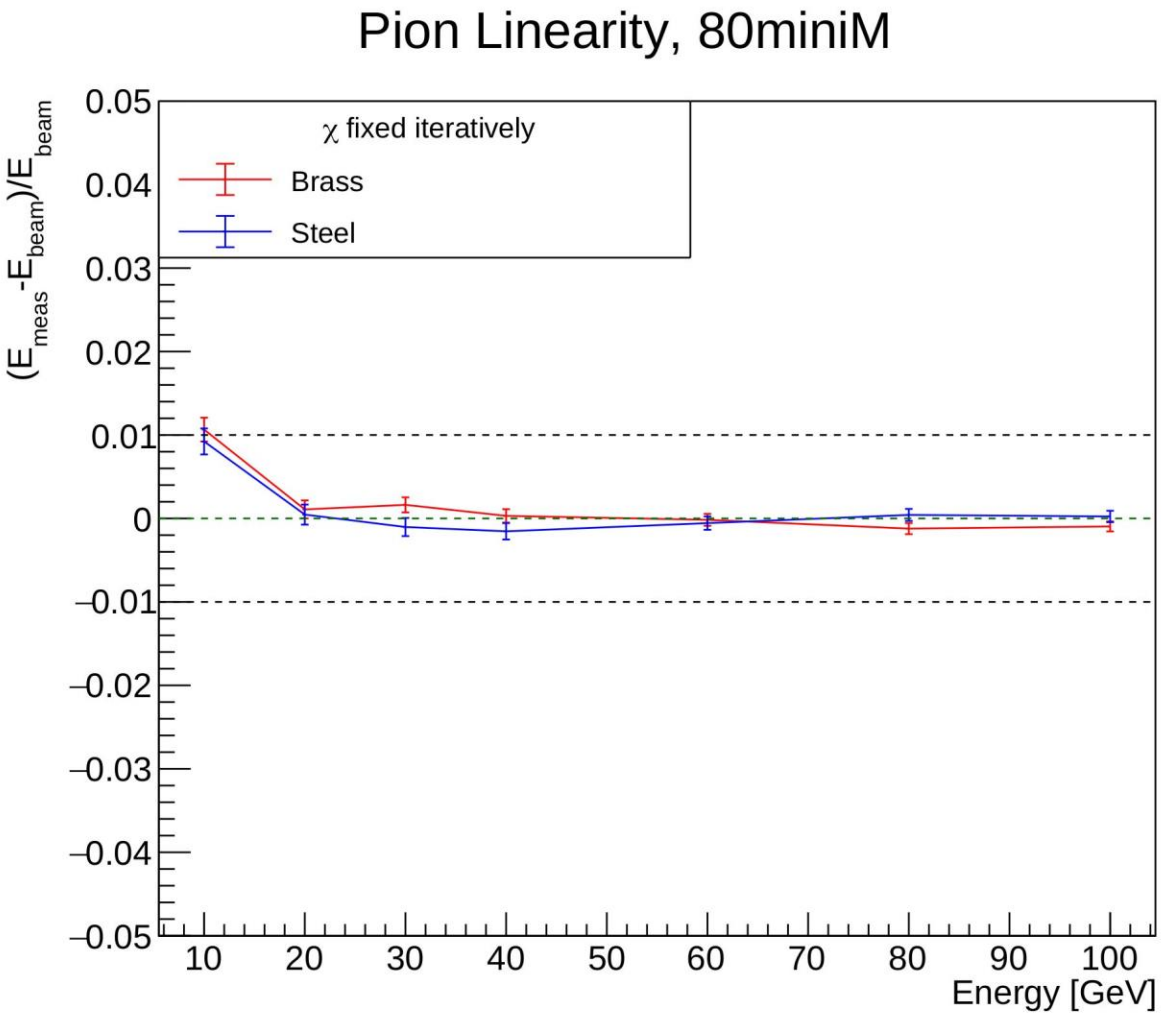
Attempt n°2:
Using only the 80 miniM simulated set, iterate over χ to minimize

$$\sum_{E_k=[10,..,100]} \frac{(E_{beam} - Ereco)^2}{\sigma^2}$$

- Steel: χ = 0.3517
- Brass: χ = 0.3109



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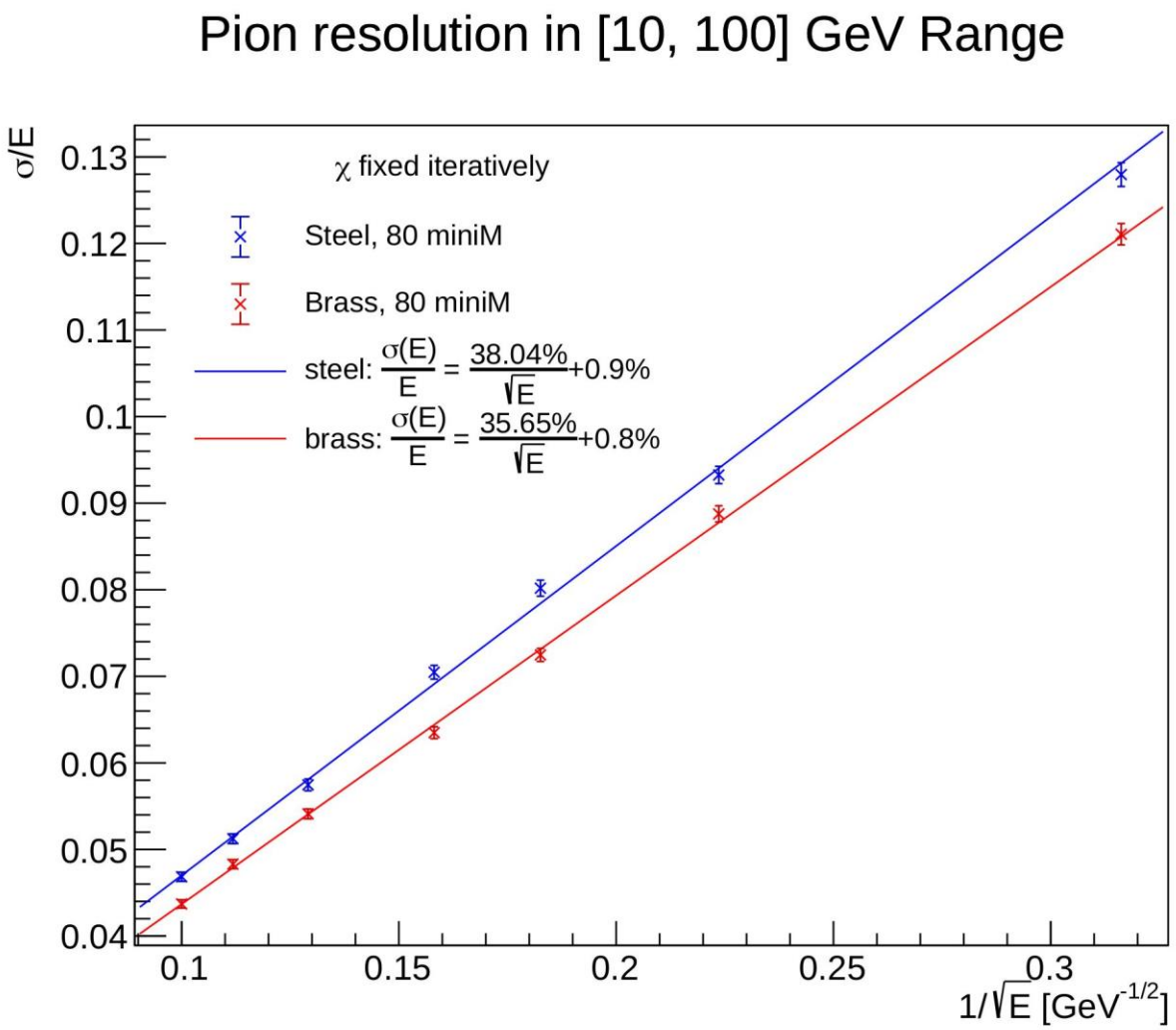
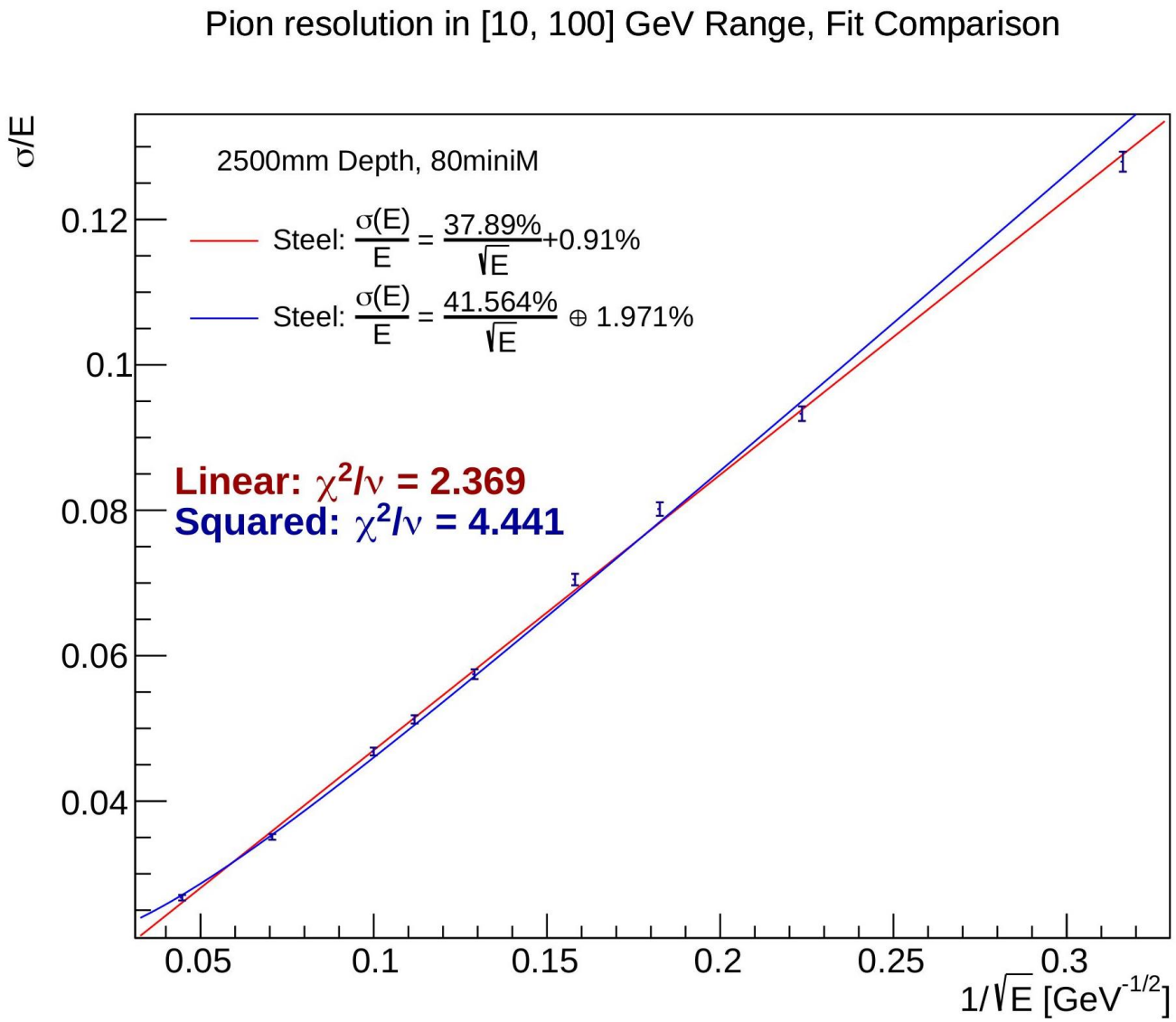


Comparing Fits

Compare goodness of fit, with errors added linearly or in quadrature

Added two new sets at higher energies, 200 and 500 GeV

Chi extracted with the iterative procedure



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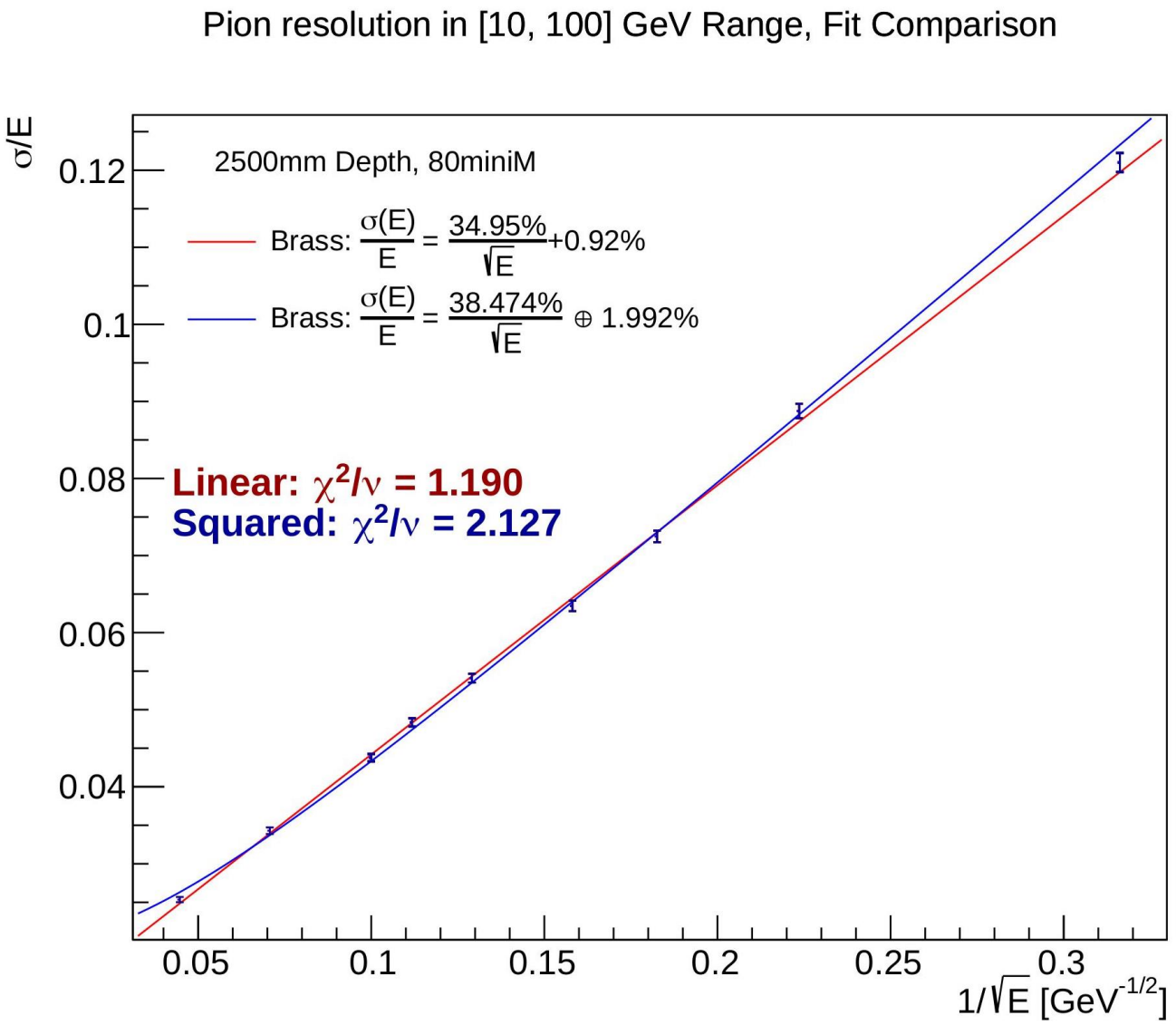

Backup

Comparing Fits

$$E_{reco} = \frac{S-\chi C}{1-\chi}$$