HiDRa Simulation Updates

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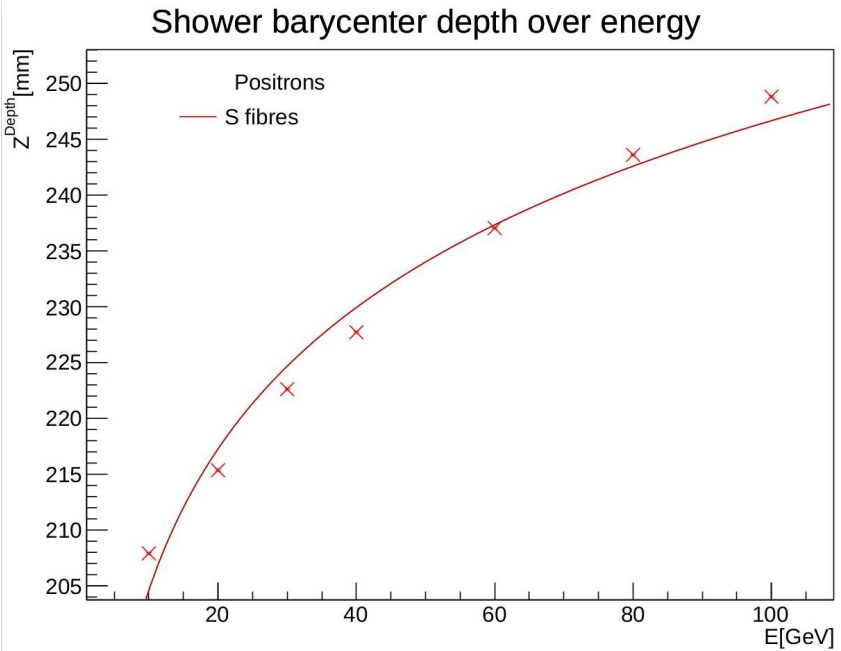
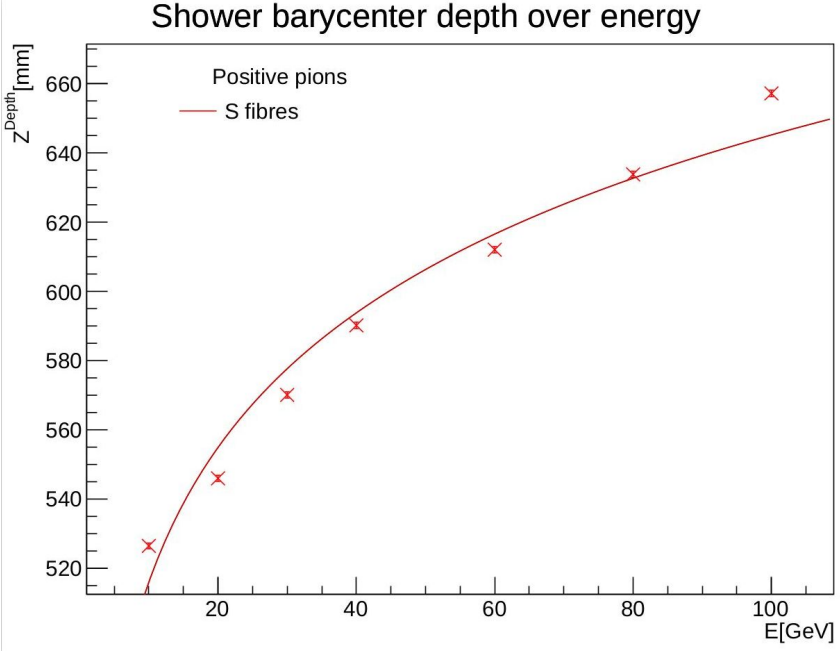
Shower barycenter depth

Errors are histogram RMS divided by sqrt(n_events) (here n_events = 10000)
Histogram is filled with shower barycenter Z information given by calorimeter hits
(kept 5cm gaussian smearing) → Logarithmic fit not great, should we worry?





Correction for light attenuation

Started with TB23 attenuation length parameters:

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SAttenuationLength = 191.6*CLHEP::cm;
CAttenuationLength = 388.9*CLHEP::cm;
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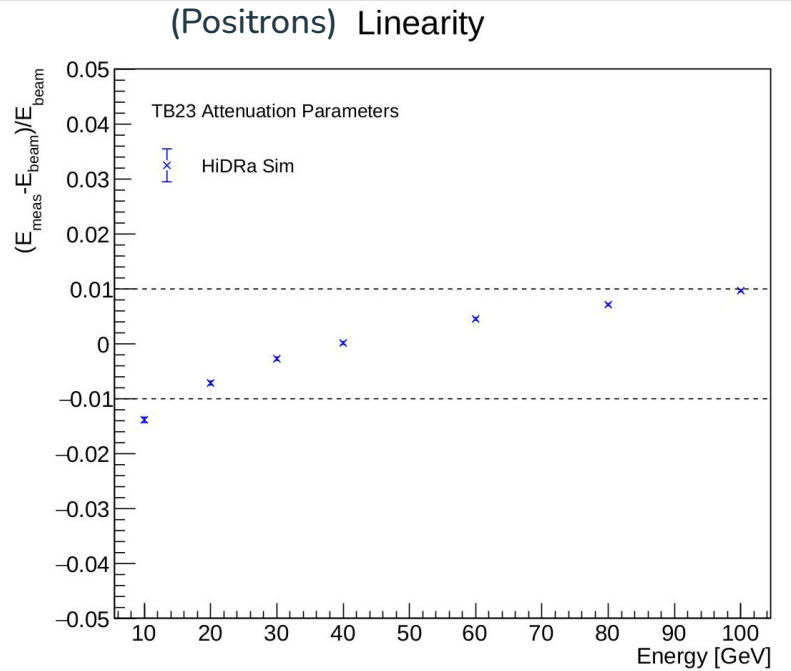
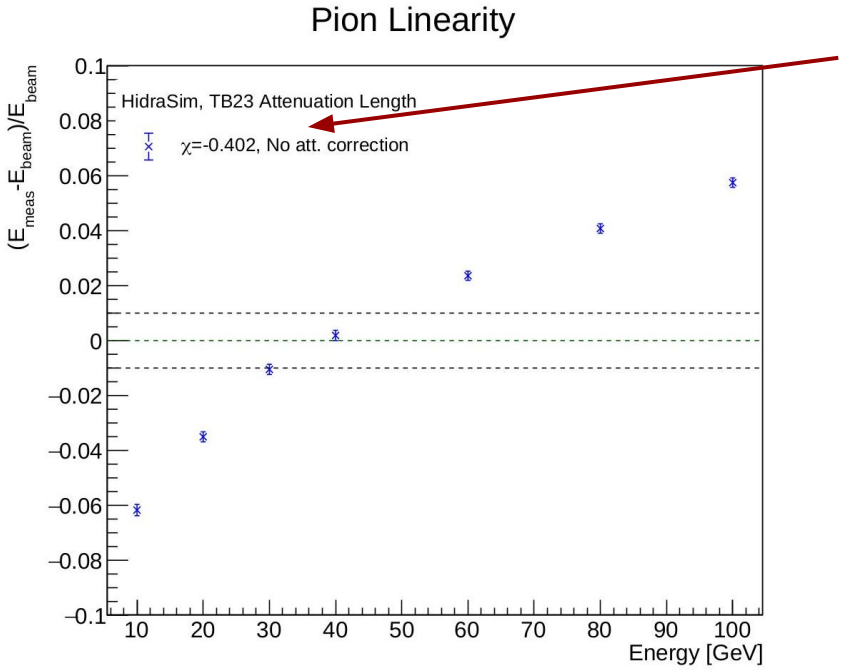


2% difference well motivated by taking mean shower barycenter depth for elm and had showers for 10 and 100 GeV

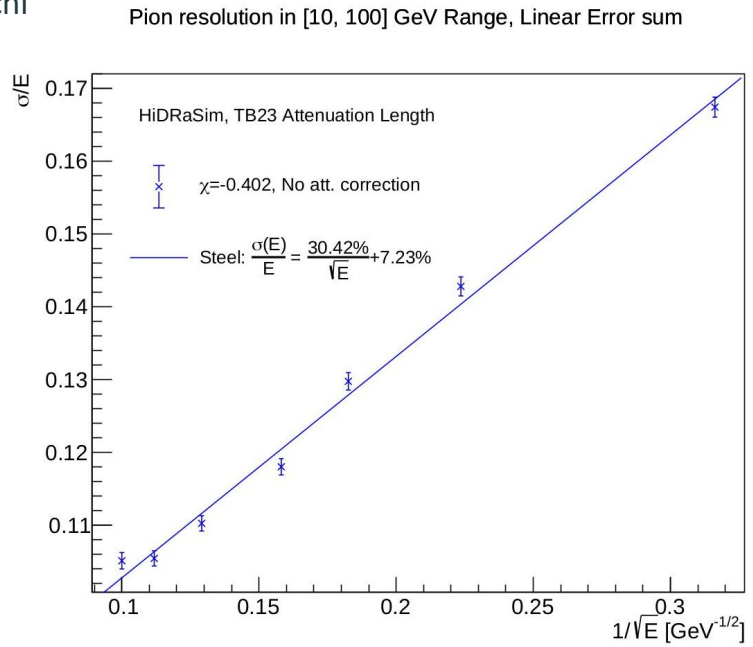
$$\frac{e^{-\frac{2500-Z(10GeV)_{el}}{\lambda_S}}}{e^{-\frac{2500-Z(100GeV)_{el}}{\lambda_S}}}$$

Correction for light attenuation

Started with TB23 attenuation length parameters:
Not correcting for hadron shower barycenter
Calibrate chi to reconstruct 40 GeV for a 40 GeV pion beam



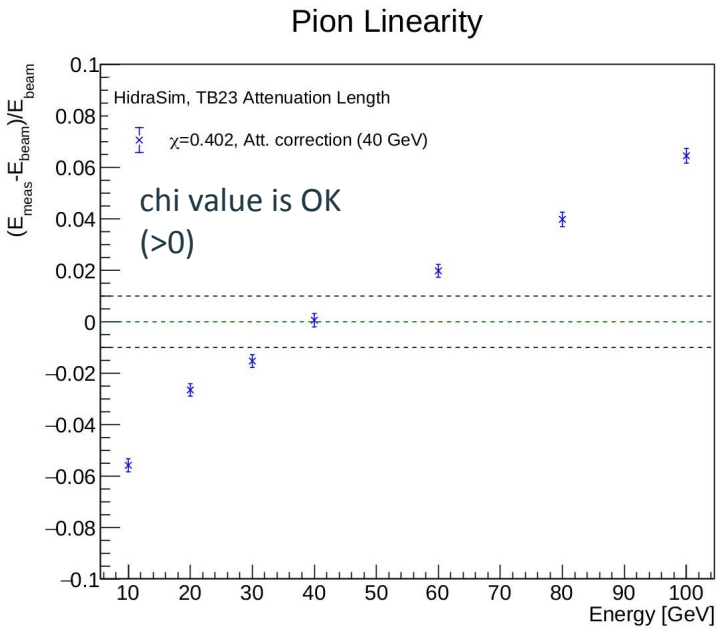
Negative chi

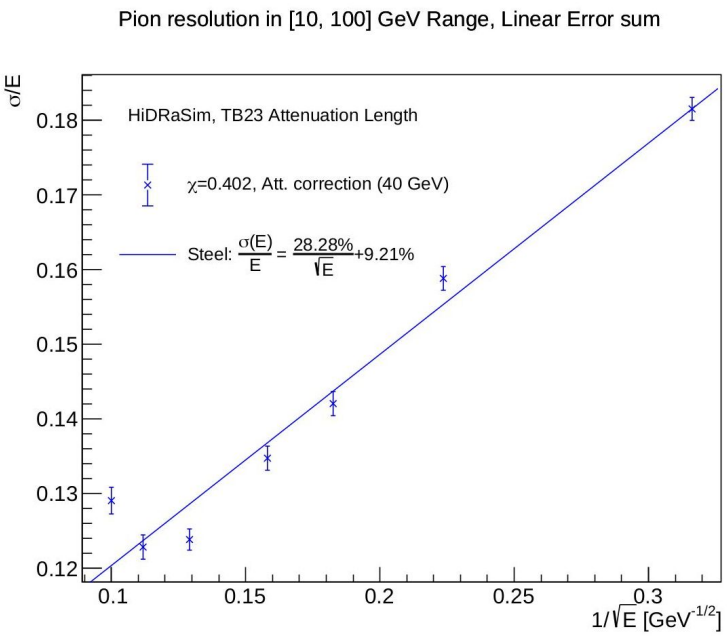


Correction for light attenuation

Started with TB23 attenuation length parameters:
Correcting for hadron shower barycenter (40 GeV only)
Take mean shower barycenter at 40 GeV for both positrons and pions
For hadron showers, correct S and C energies for:

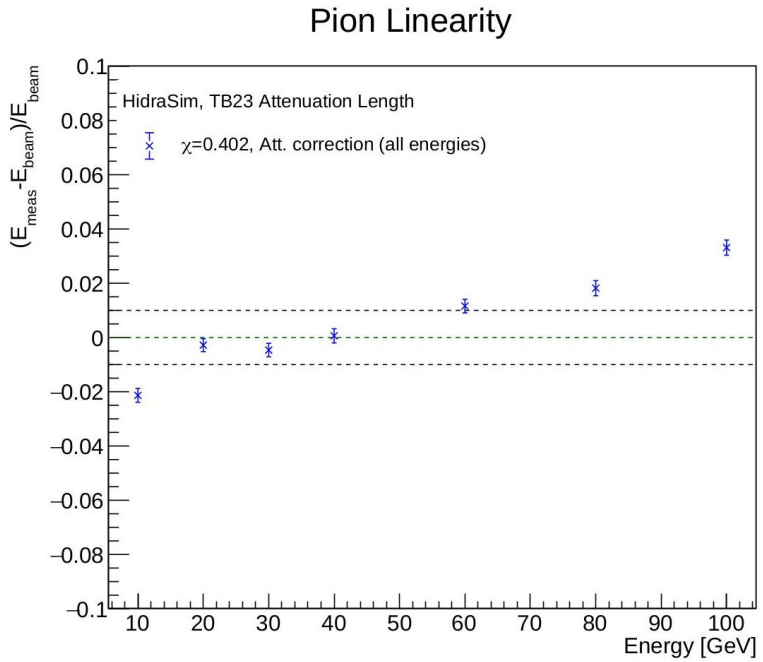
$$\frac{e^{-\frac{2500-Z_{bar}^{el}(40GeV)}{\lambda(S/C)}}}{e^{-\frac{2500-Z_{bar}^{had}(40GeV)}{\lambda(S/C)}}}$$

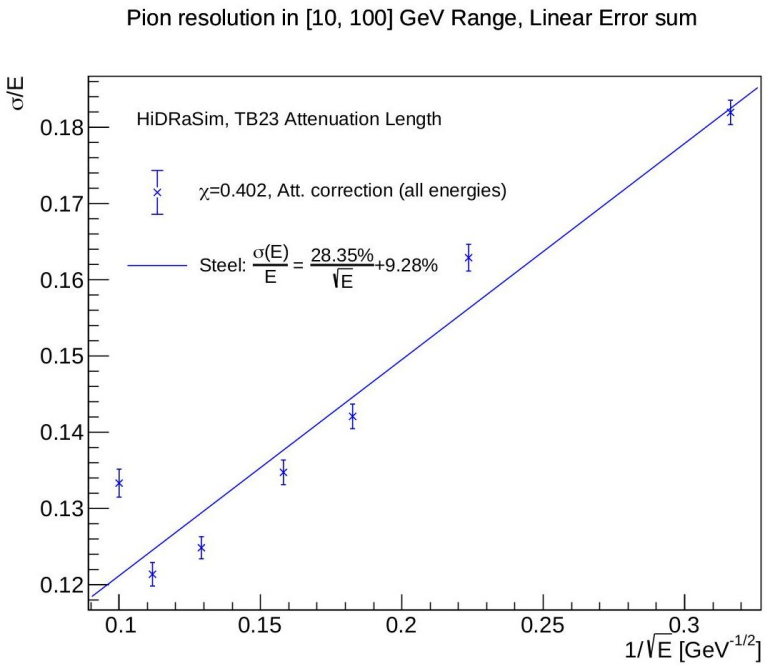




Correction for light attenuation

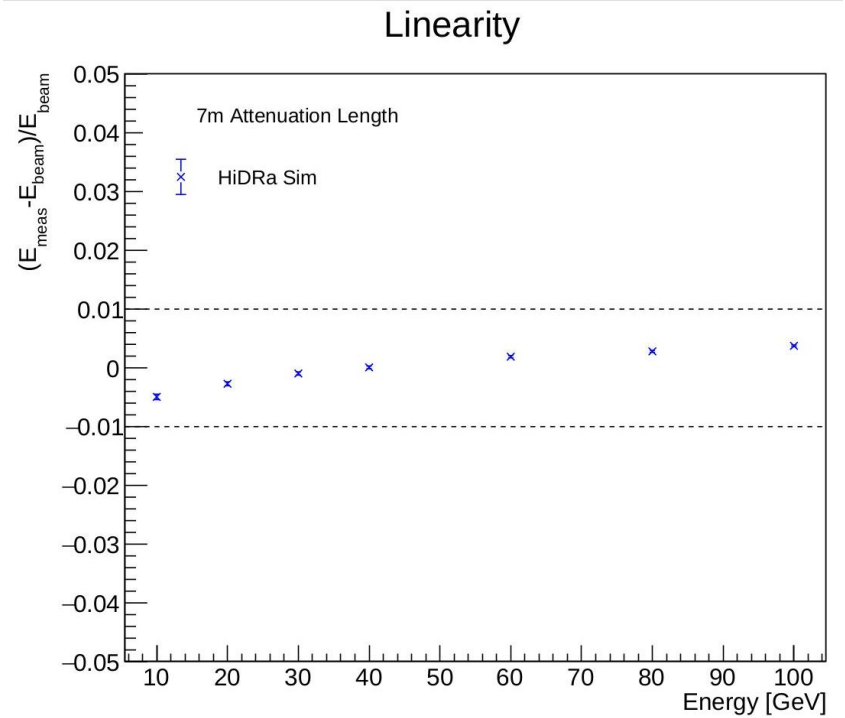
Started with TB23 attenuation length parameters:
Correcting for hadron shower barycenter at all energies
(repeat previous exercise for all energy points, assuming shower barycenter depth is known from MC)





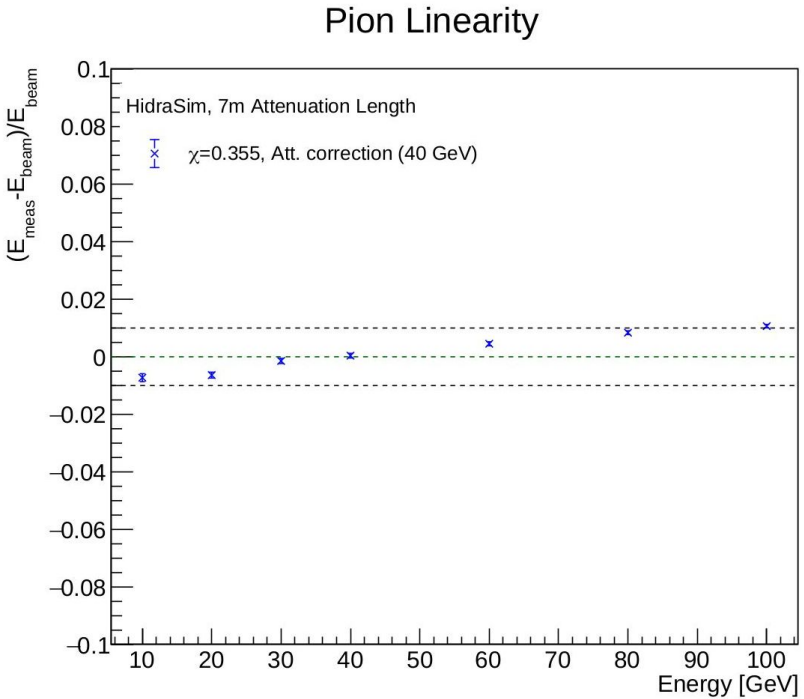
Correction for light attenuation

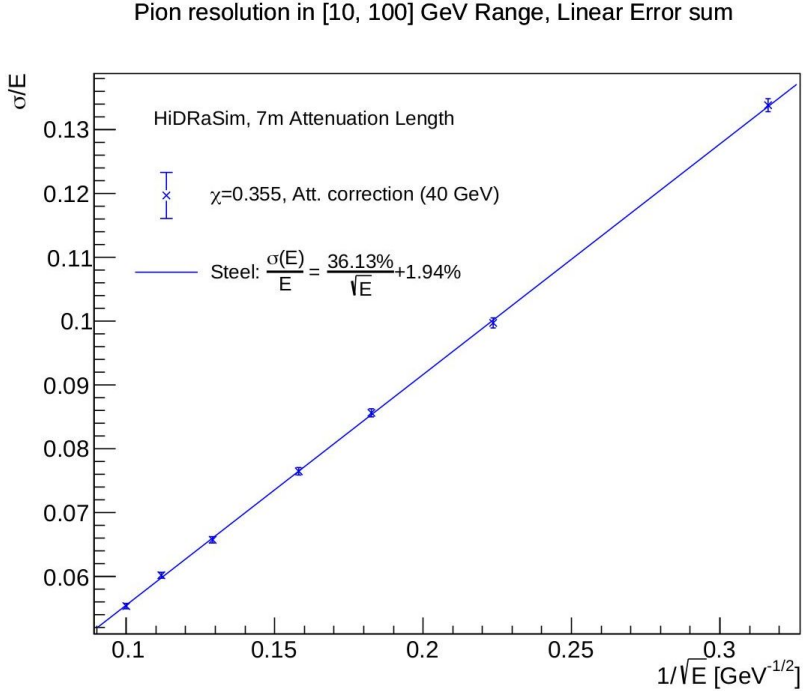
Trying with 7 metres attenuation length for both S and C fibres
Linearity with positron beam is again well motivated by different shower depth



Correction for light attenuation

Trying with 7 metres attenuation length for both S and C fibres
Repeat: here correction at 40 GeV only (first take mean shower barycenter for elm and had showers at 40 GeV, then optimise chi to reconstruct exactly 40 GeV)





Correction for light attenuation

Trying with 7 metres attenuation length for both S and C fibres
Repeat: here correction per energy point