Linearity and resolution with and without weight

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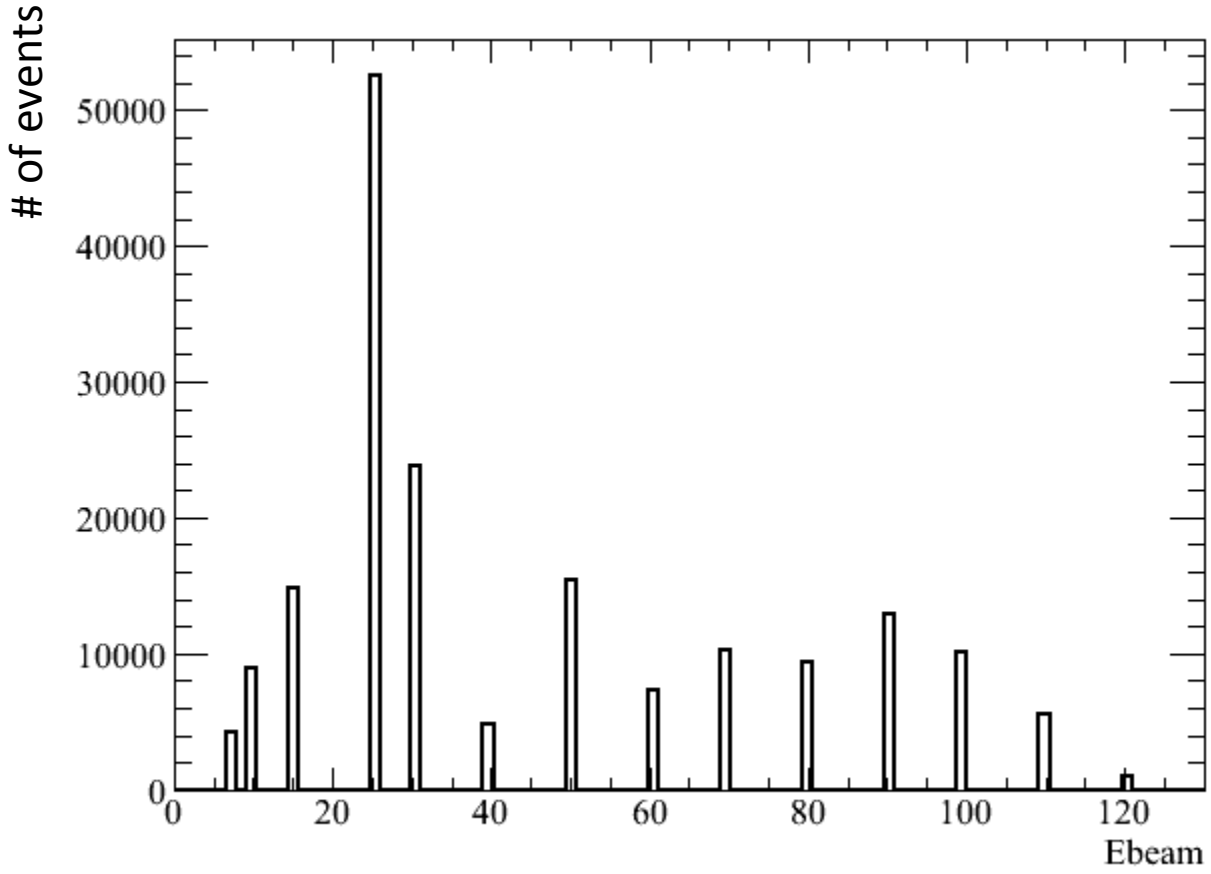
Group meeting, LAPP, 24/10/2012

Data I use: Augoust TB



Event selection and E computation

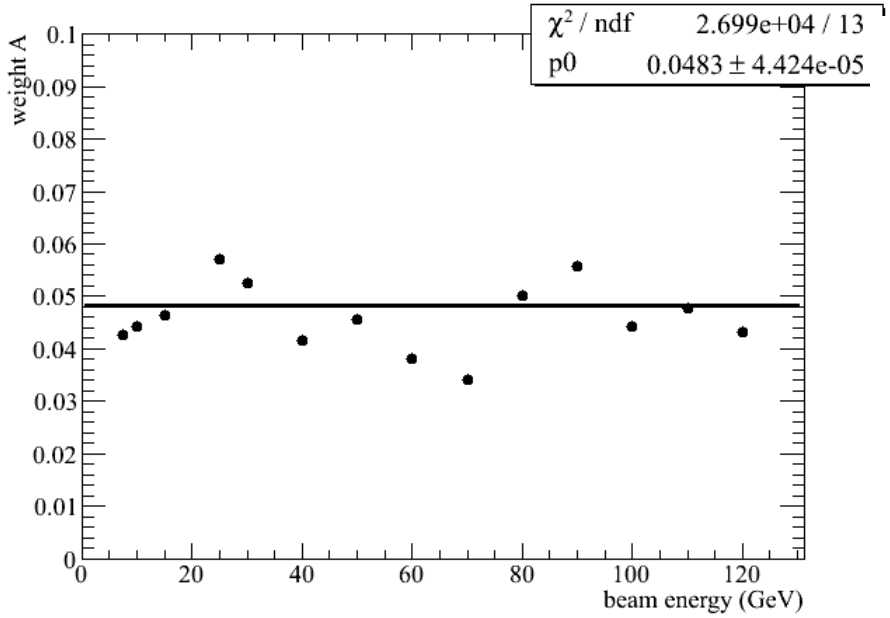
- The energy is computed:
  - $E \sim N_{hits}$ (digital)
  - E = a*Nhits1+b*Nhits2+c*Nhits3

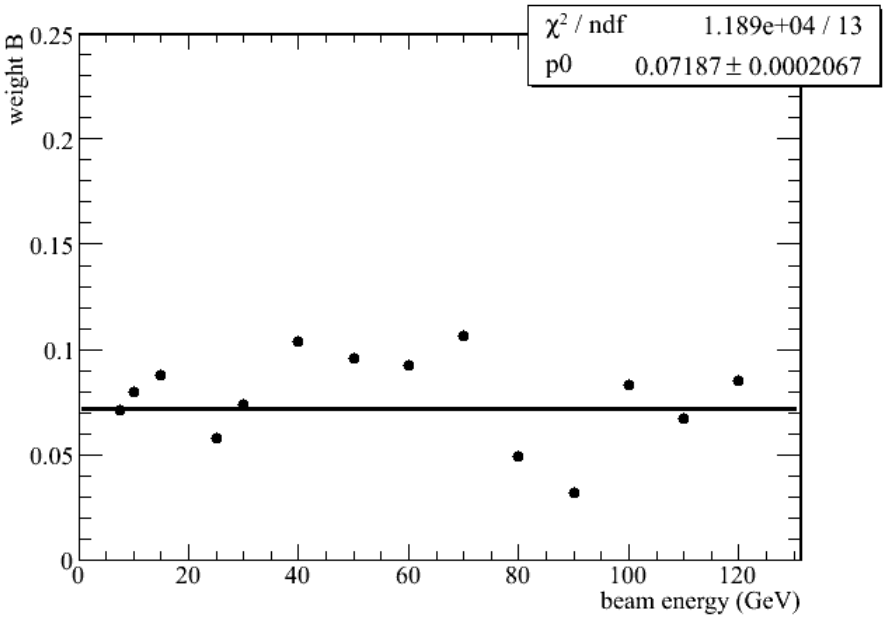
  Where a, b and c are computed by minimizing:

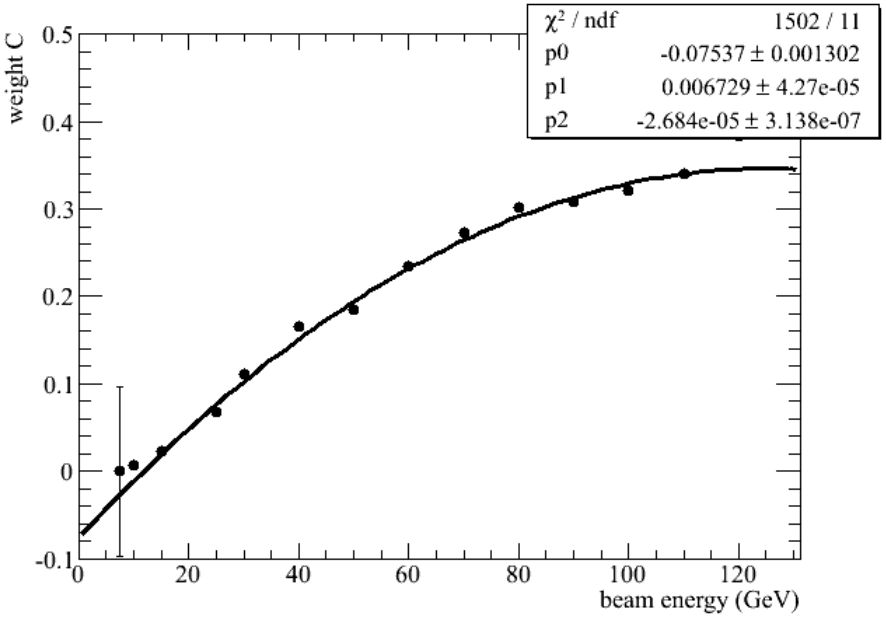
  dE = Ebeam – a*Nhits1+b*Nhits2+c*Nhits3 (TMinuit)

- Event selection:
  - standard pion selection
  - AND shower containment selection

  Nhits(planes 42 to 47)/Nhits(planes 0 to 30) < 0.1

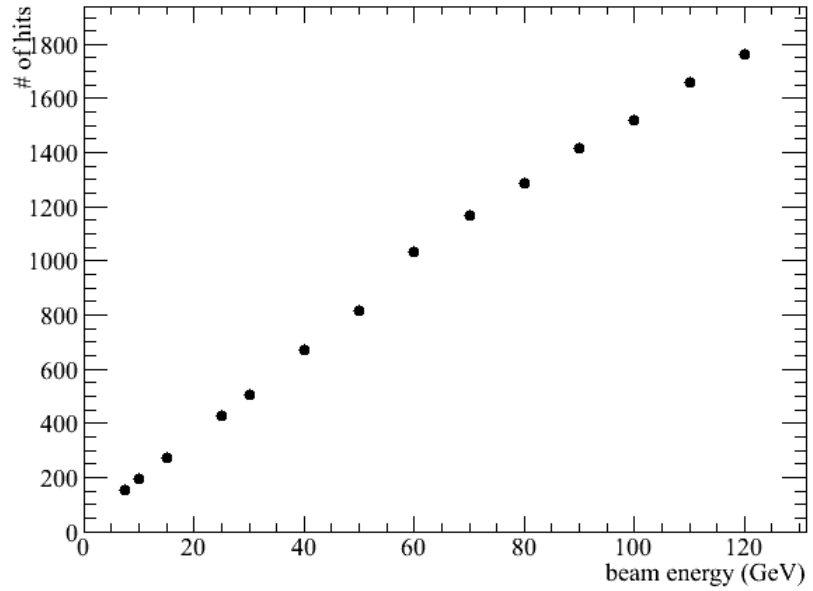






Note:

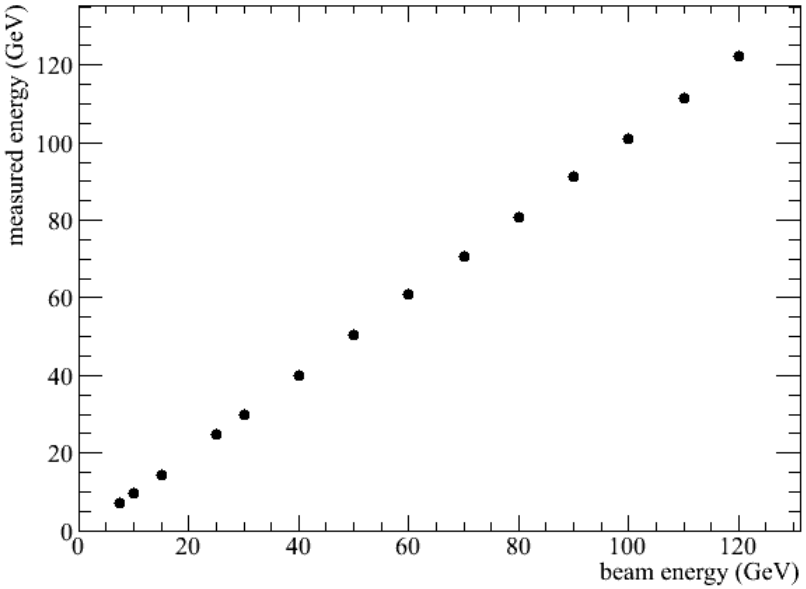
1) Those weights are compute WITHOUT the shower containment cuts
2) I have to parameterize the third one as a function of Ntot



Linearity - digital

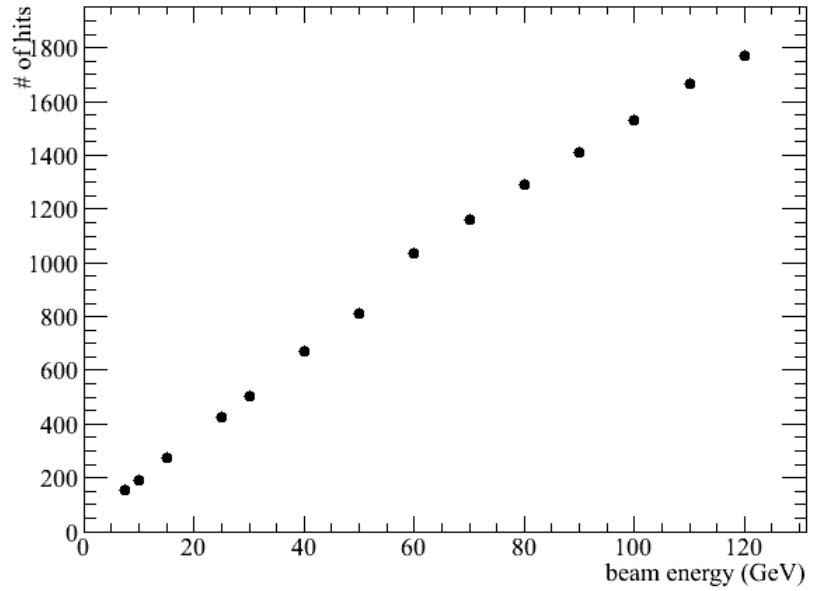
Without any shower containment cut

Much better linearity
BUT
this is by construction…



Linearity - semidigital

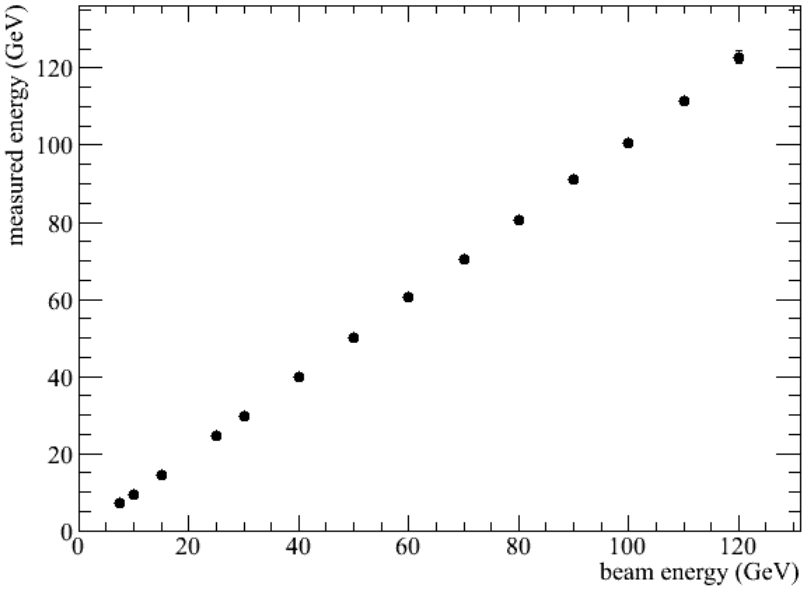
Without any shower containment cut



Linearity - digital

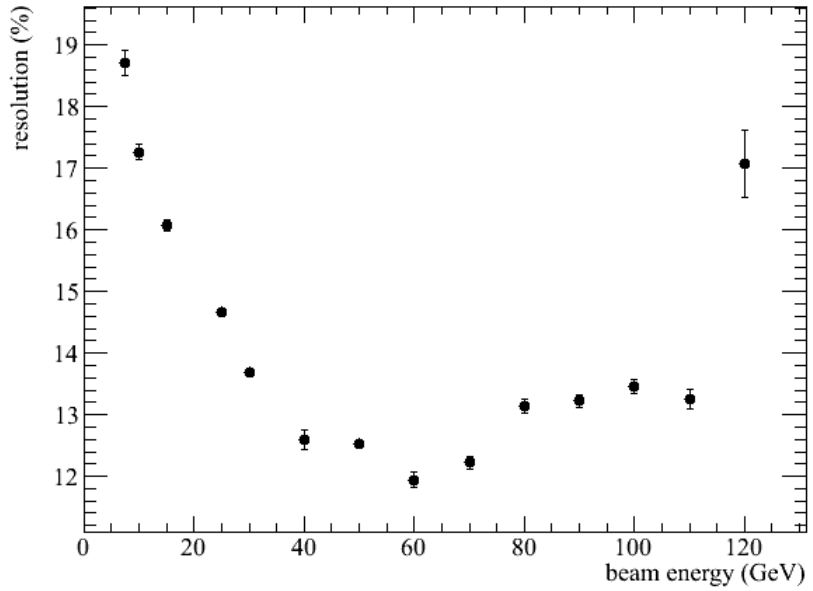
With the shower containment cut

Much better linearity
BUT
this is by construction…



Linearity - semidigital

With the shower containment cut



Resolution - digital

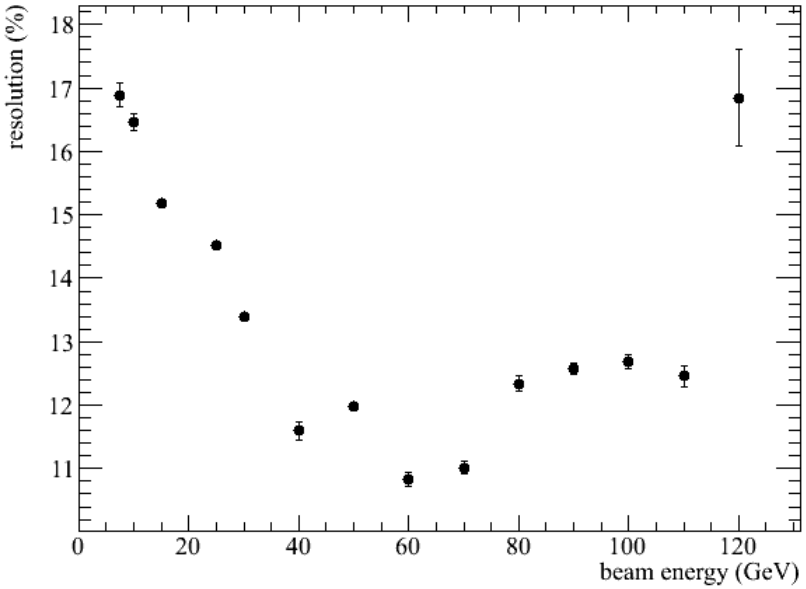
Without any shower containment cut

Improvement of at least 1% in the whole range

BUT

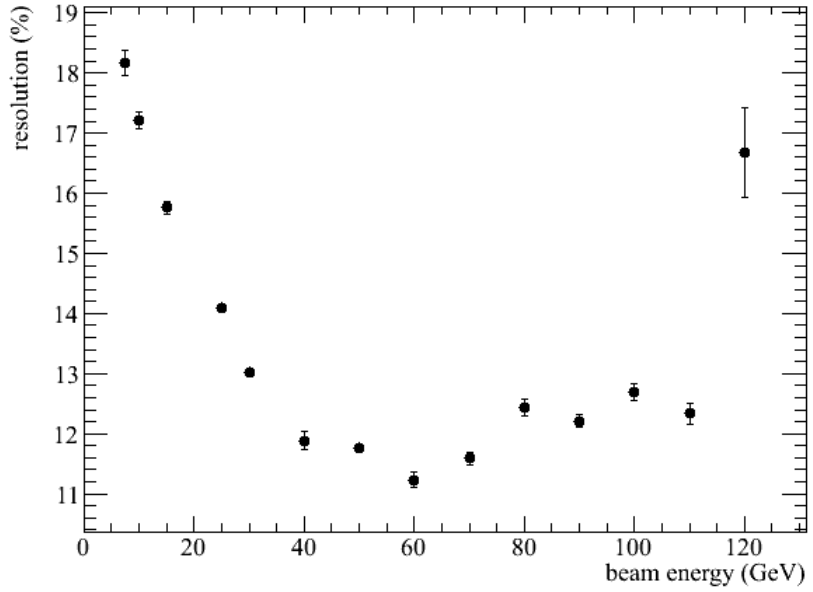
Again too easy:

1) same data to optimize the weights and to compute the performance
2) one set of weight for every energy cannot work in collision data taking



Resolution - semidigital

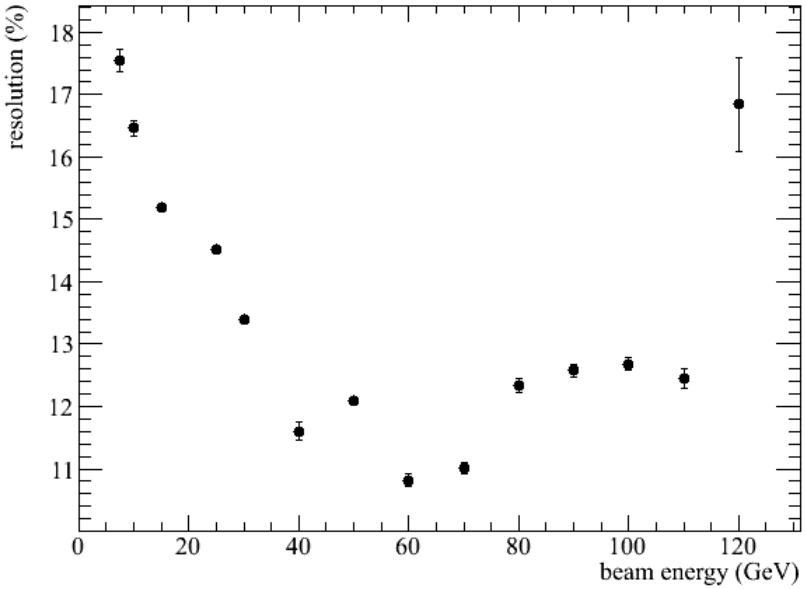
Without any shower containment cut



Resolution - digital

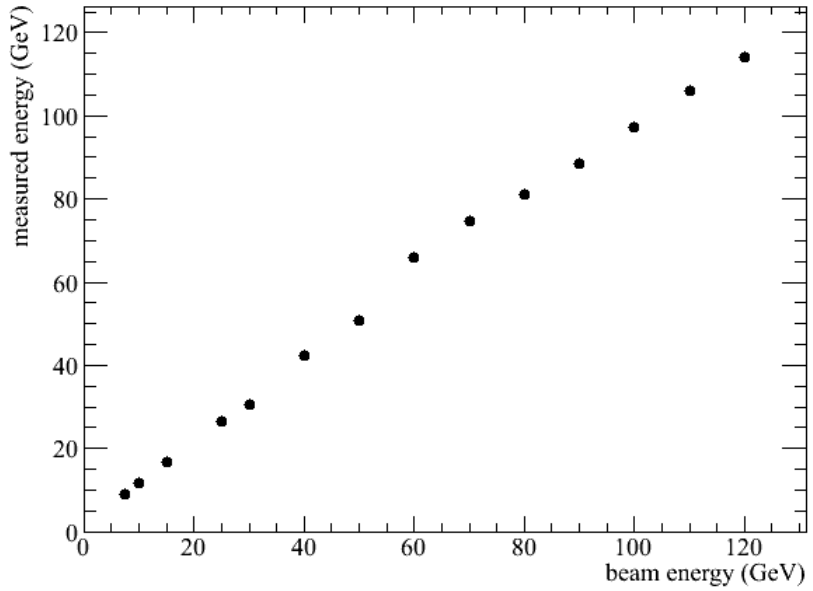
With the shower containment cut

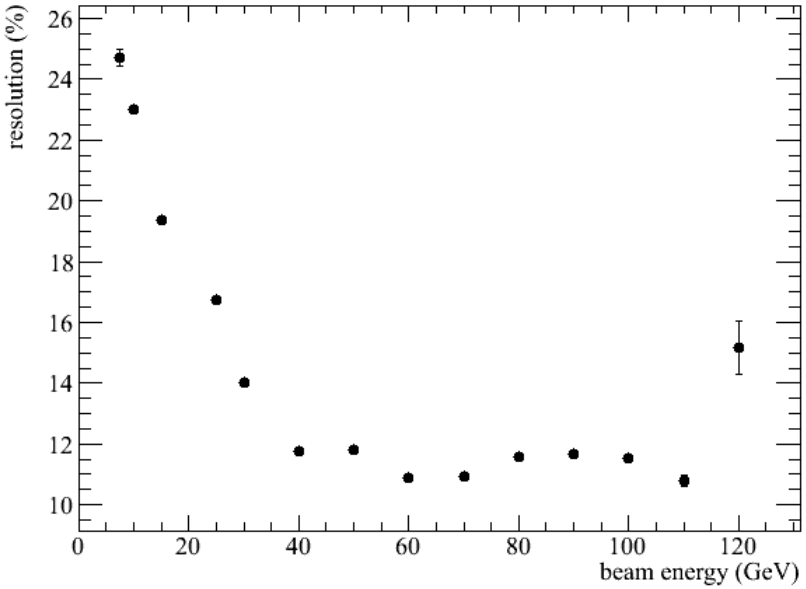
Not the improvement is less obvious:
This can be due to the fact that the weights are optimized without the SC selection



Resolution - semidigital

With the shower containment cut





First attempt to parametrize the weights:

Run over all the energies in the same time and make a global fit with 5 parameters:

a = ct
b = ct
c = c0 + c1*Nhits + c2*Nhits^2

For the moment this doesn't work…

Problem: this fit is extremely unstable, with values that depend very strongly on the initialization

Conclusions

- With a “perfect” use of the semidigital energy parametrization we can gain 1% on the energy resolution and have a much better linearity
- For this to work on real conditions we have to parametrize as a function of a value that we can measure: Nhits
- We could also use only a fraction of the events not to have 100% correlated samples
- For the moment all this is on going…