MOEDAL SIMULATION UPDATE

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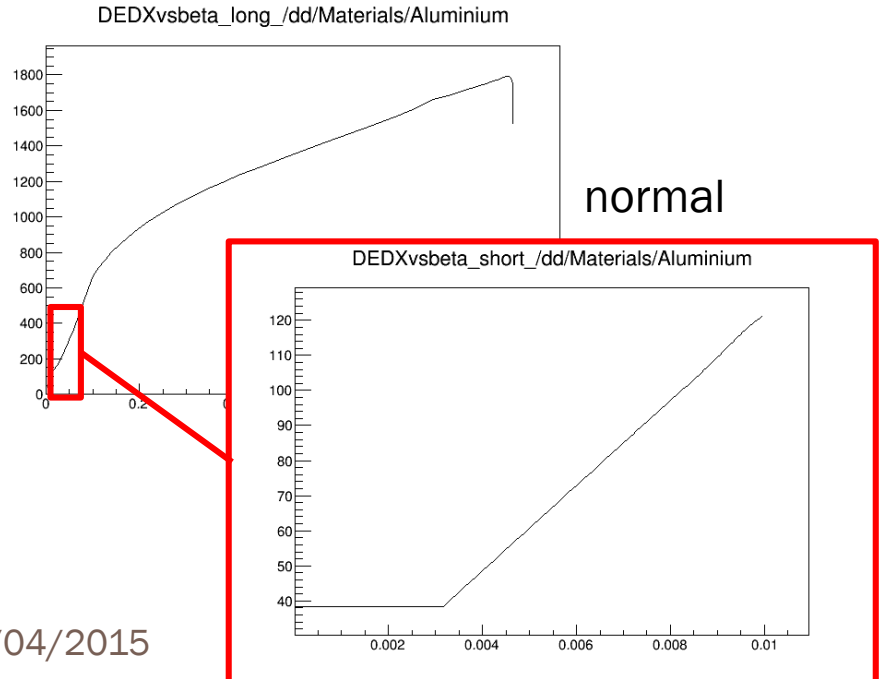
MMT uncertainty due to dE/dx model

- Philippe opened a JIRA item for:
  - Determining the MMT acceptance uncertainty due to the approximation of dE/dx at low beta.

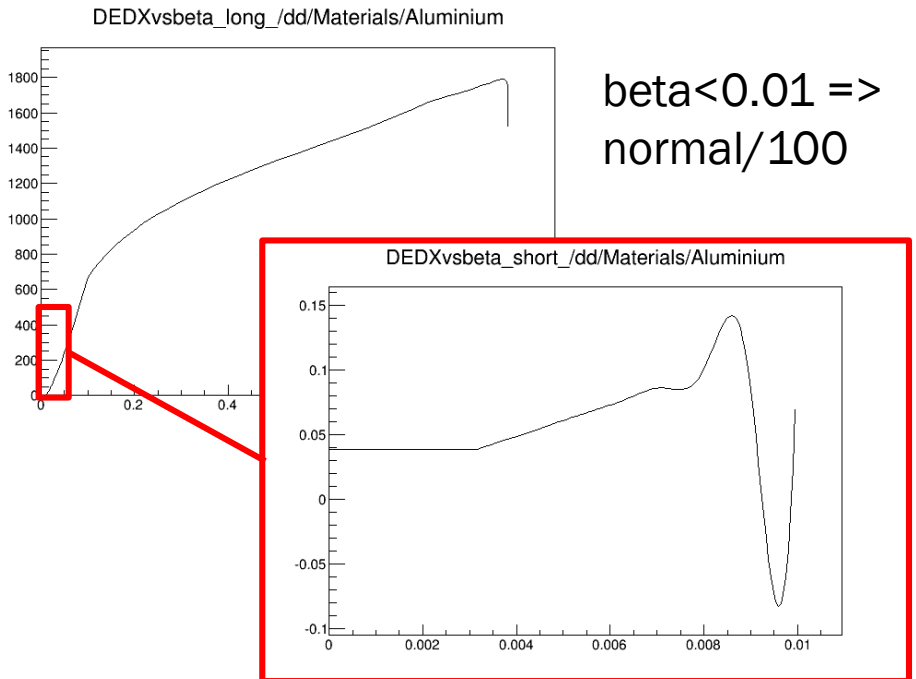
- The easiest case to implement is where the dE/dx is fixed below a certain beta value
  - Problems occur if the curve is non-continuous
  - => have to fix dE/dx value to below a beta cut to the curve value at that beta cut
  - Could also add other continuous functions and mesh them into the curve
    - => next job is to try a large positive function (kx^2?) and manage meshing into normal curve
    - functions for smaller dE/dx values than normal are more difficult

Problems with non-continuous curves

- The dE/dx model is not queried directly during a run
  - It is used at the start of a run to generate a look-up table against logarithmic KE
  - dE/dx values are obtained by interpolating between values in the table
  - The interpolation is done using a spline function
    - => discrete changes introduce “waves” that can go negative…



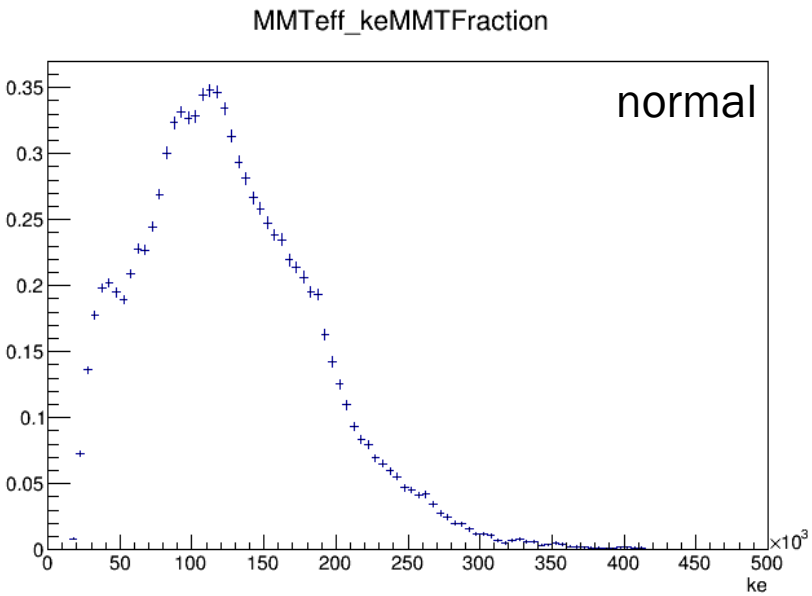
normal

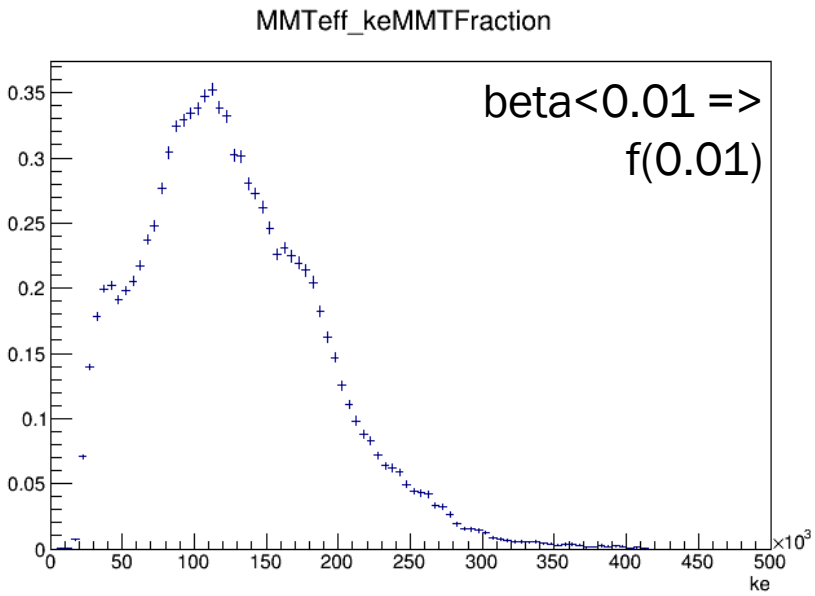


beta<0.01 => normal/100

Effect on MMT acceptance

- Not much effect
  - Pretty much what was expected

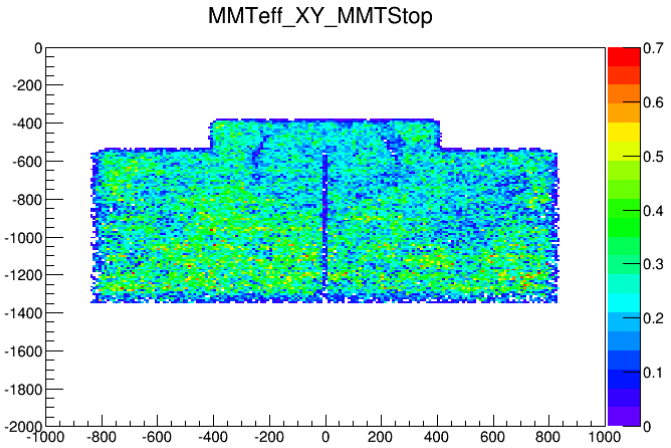




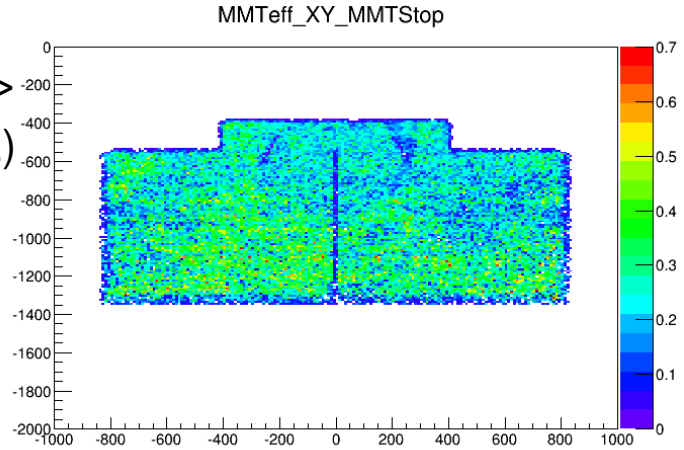
Other effects

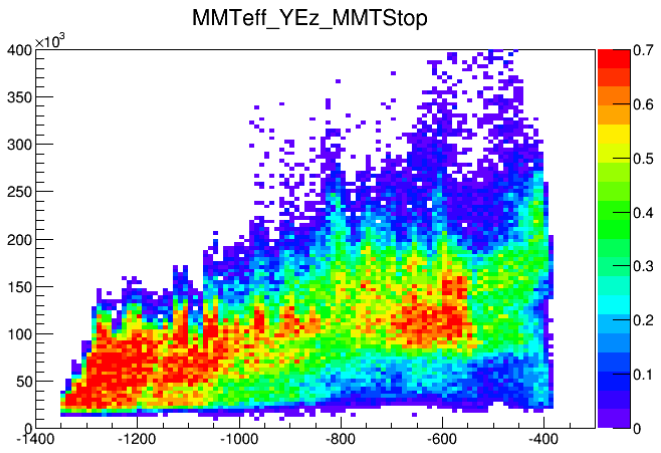
- Very small changes to the high Ez distribution are visible
  - Not sure to what extent they might just be statistics

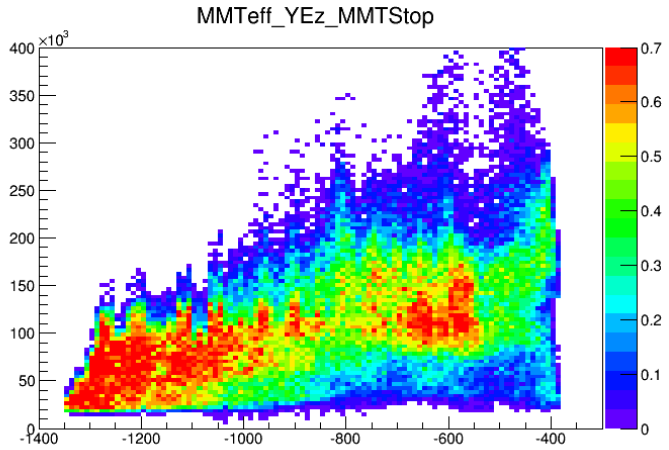
normal



beta<0.01 => f(0.01)







Other effects

- One noticeable effect is the apparent phase-change of the stopping pattern in air (i.e. after the MMT)
  - This is largely a “feature” of the way that Geant4 deals with low energy stopping, shouldn’t be a major concern.