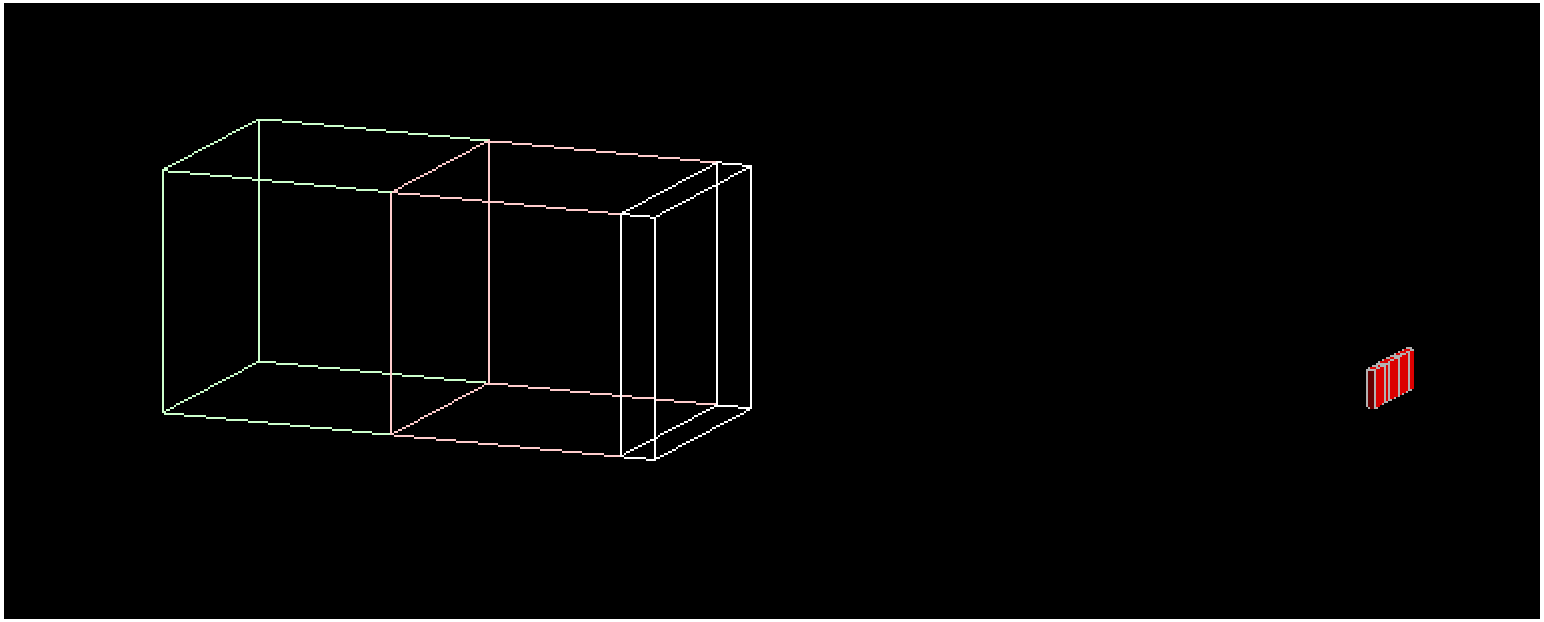
Generic vs. Conventional Importance Biasing

1. Simple set-up
2. Results
3. Features of generic biasing
4. Next steps
5. Mu3e use of GB (bhabha cross-section) ☺

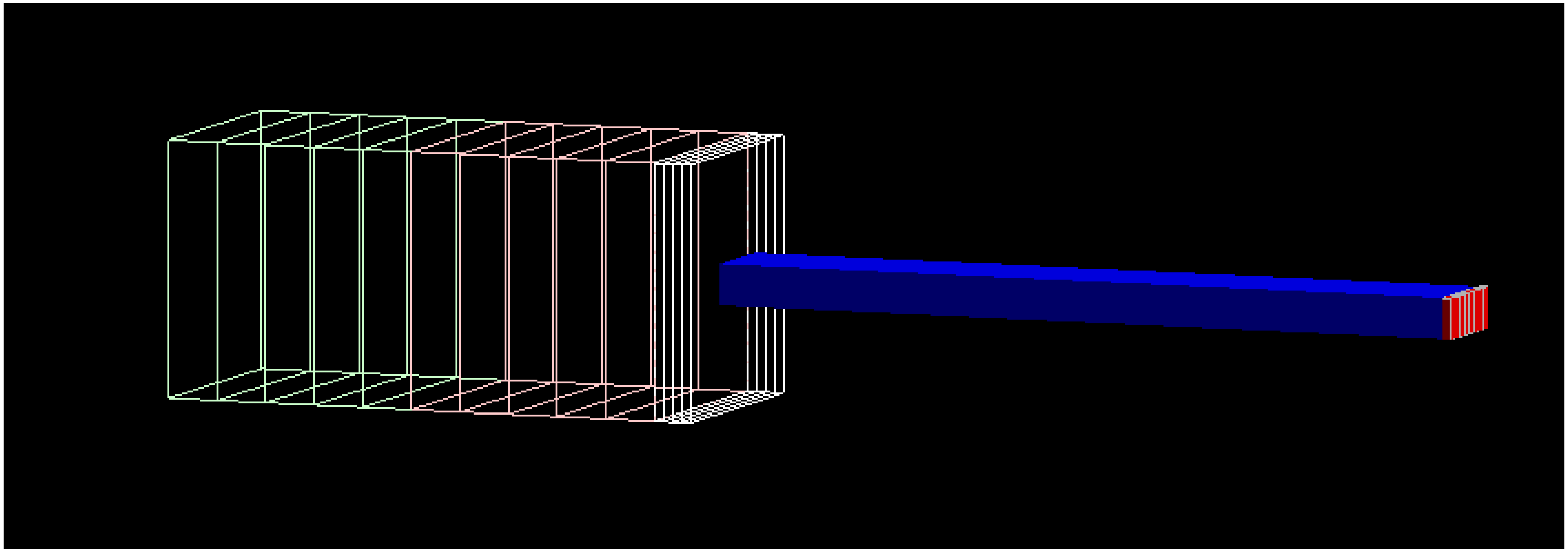
Setup

- **Muscle (10cm x 10cm x 10cm)**
- **Tissue (10cm x 10cm x 10cm)**
- **Bone (10cm x 10cm x 1.5cm)**
- **Air gap (to sensor) 30cm-0.5 x sensor**
- **CZT sensors (3mm thickeness)**



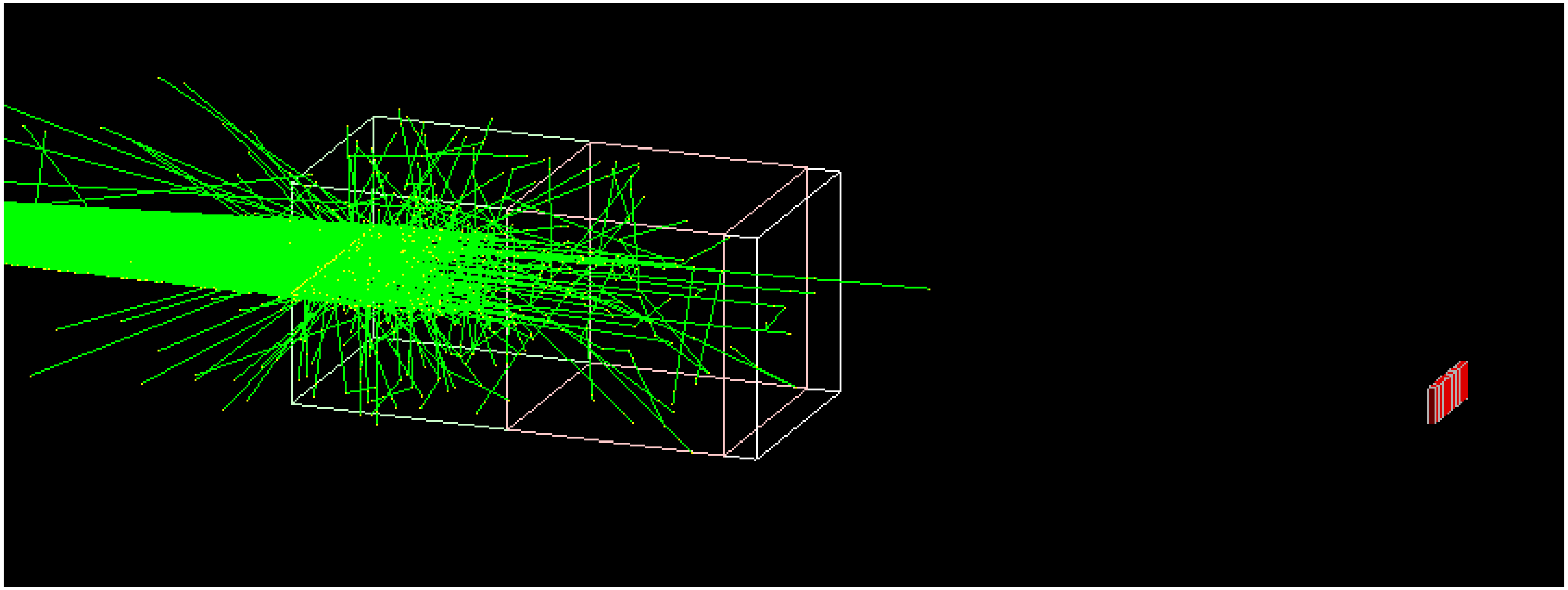
Setup with biasing sub-divison

- **Air column also introduced (otherwise killed on exit)**

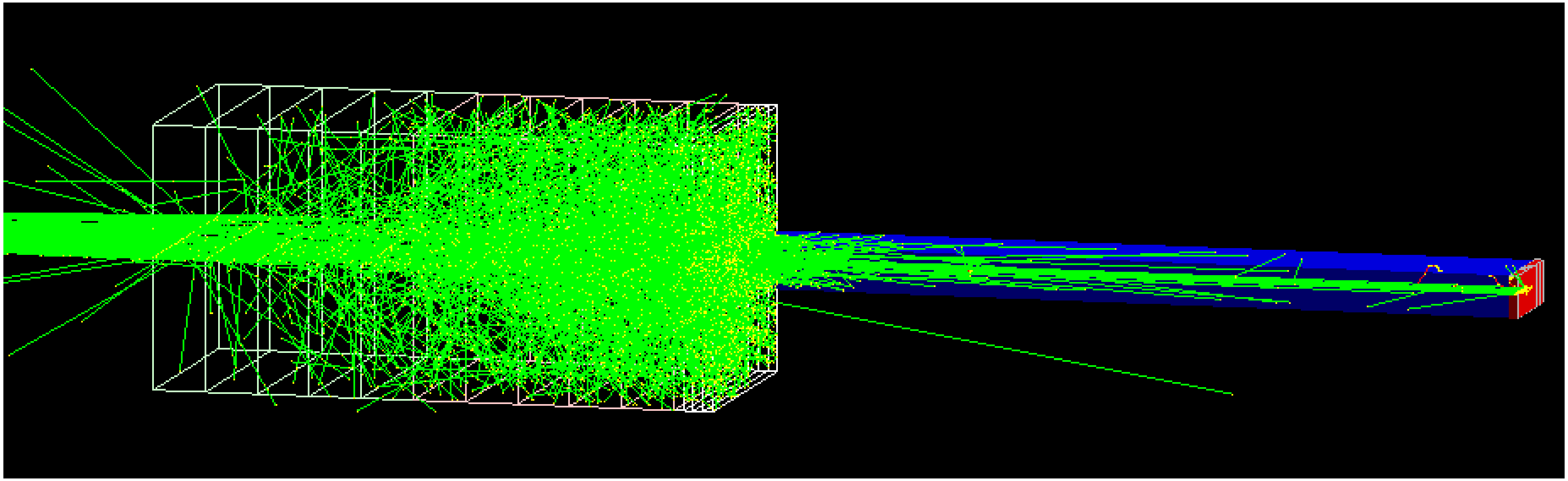


60keV x-ray fan beam

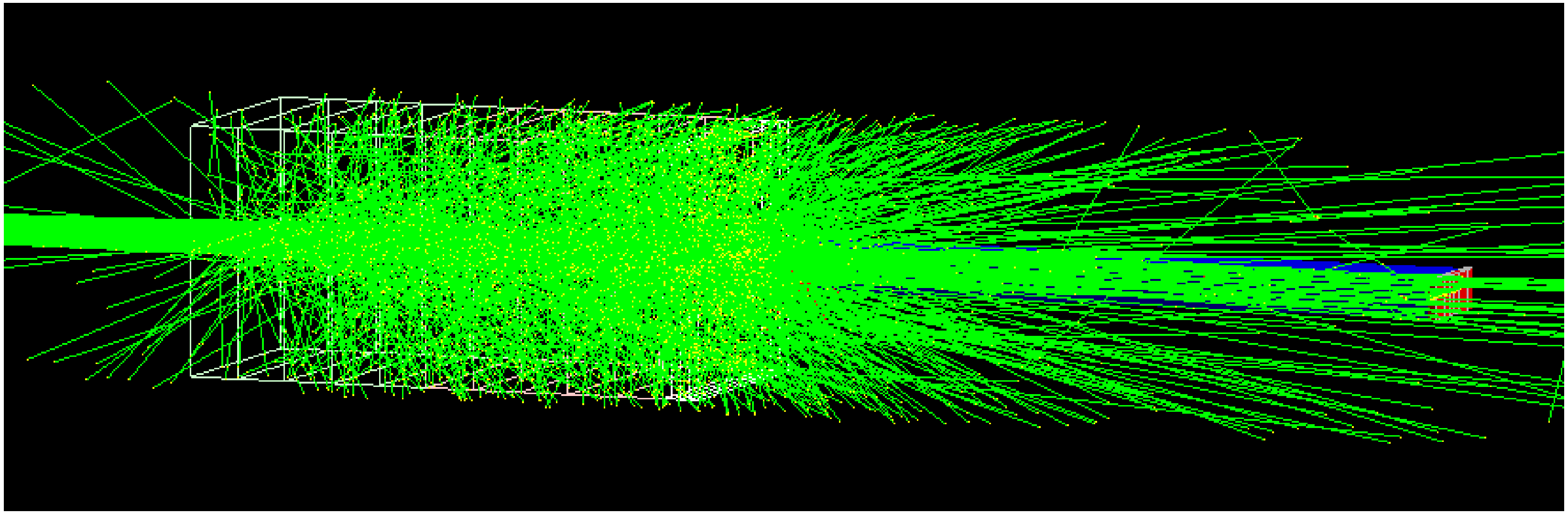
- **No biasing – strong attenuation**



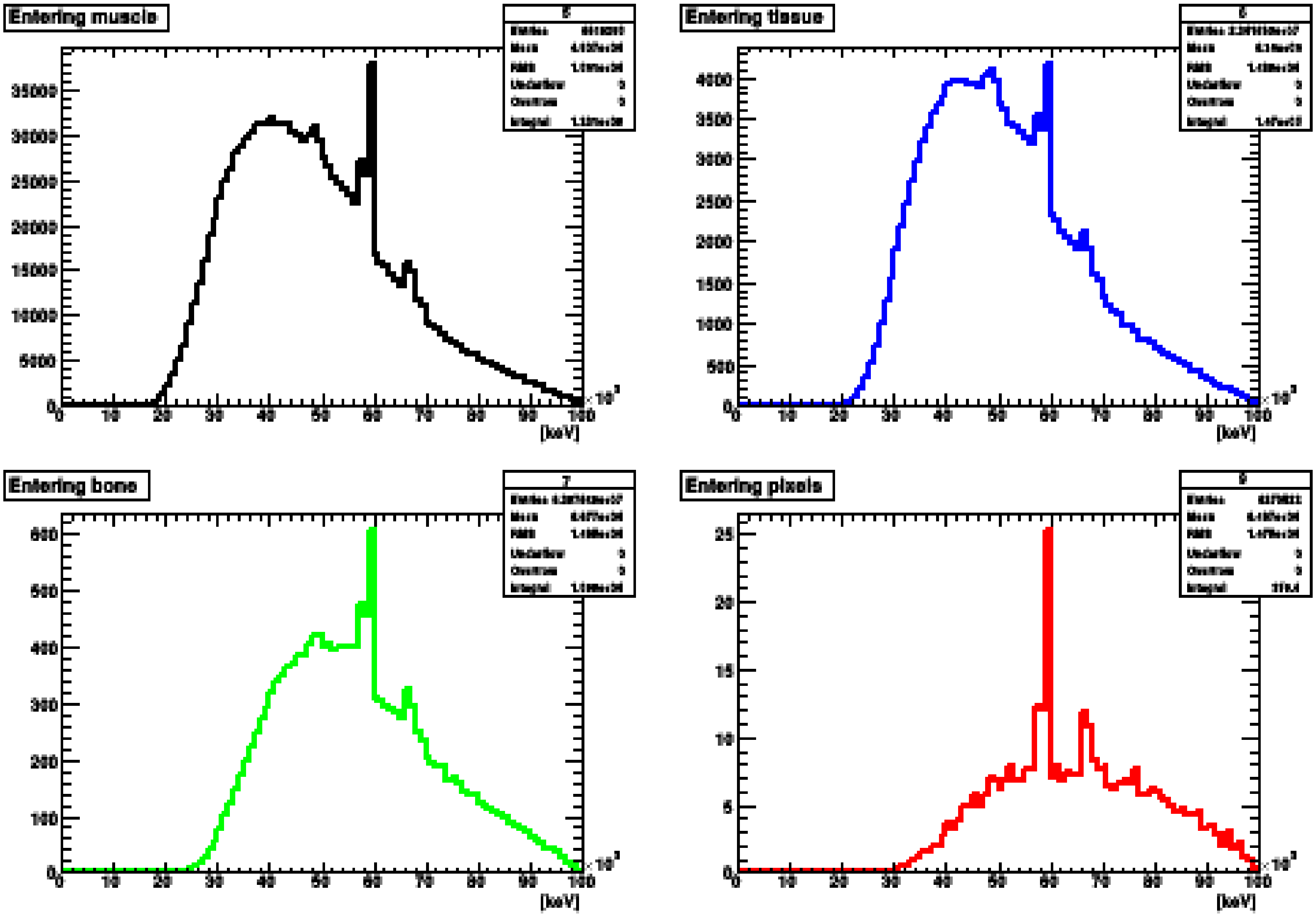
“Normal” importance biasing



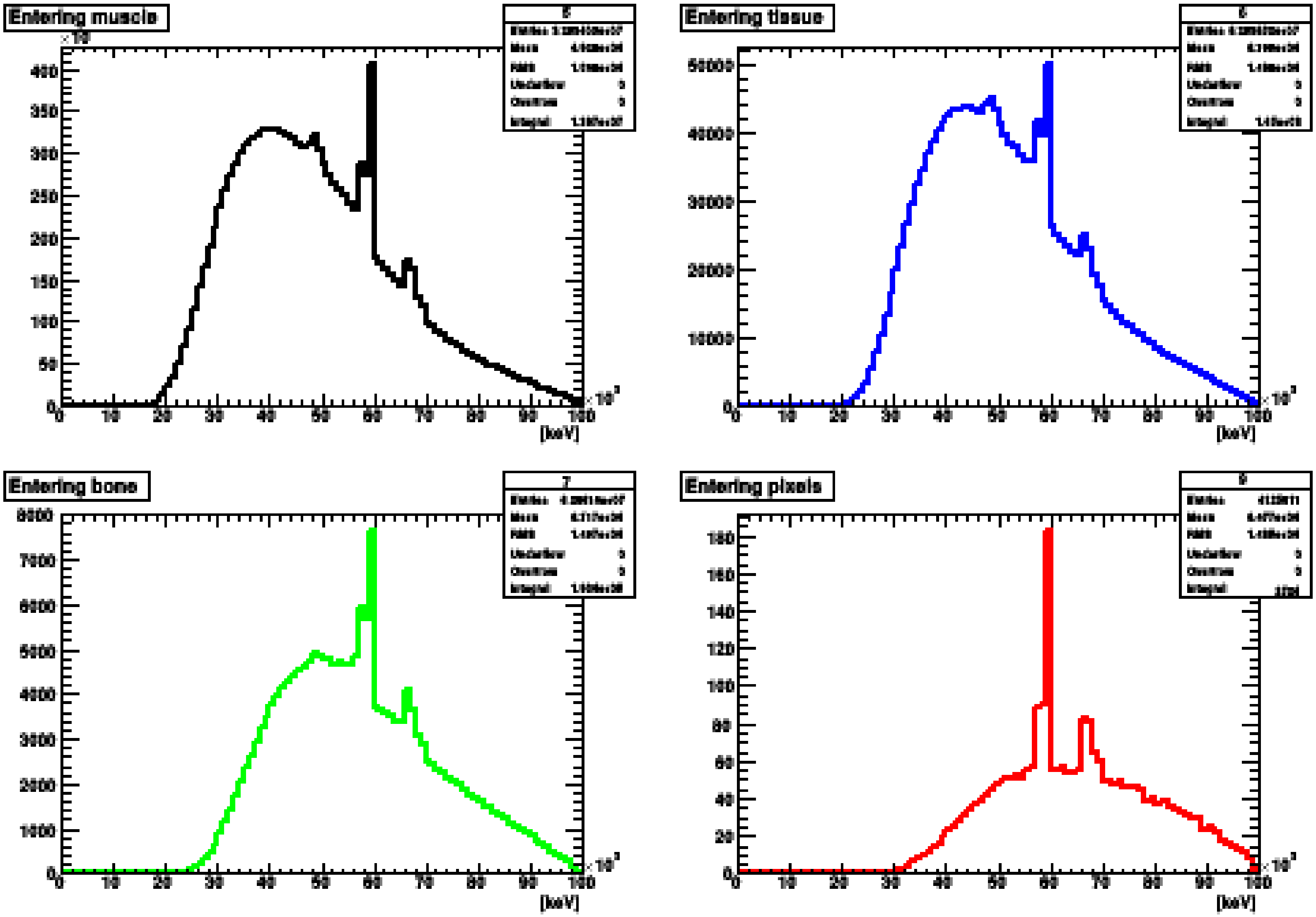
Generic Biasing



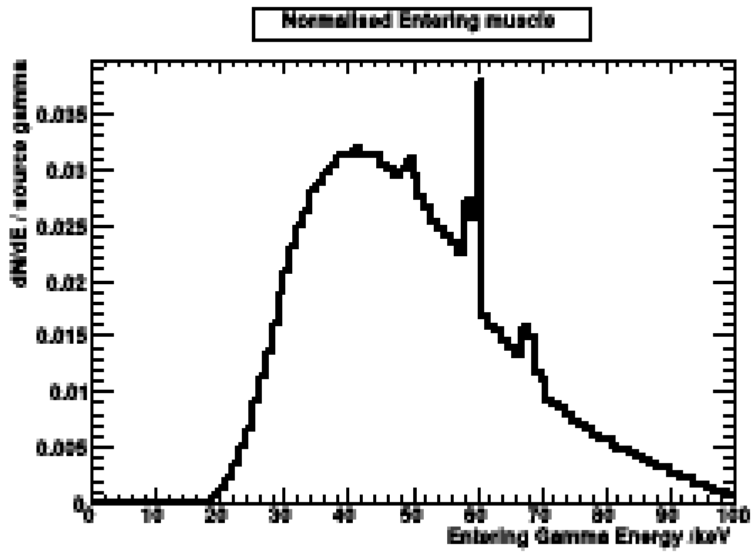
Conventional Biasing 1 million events

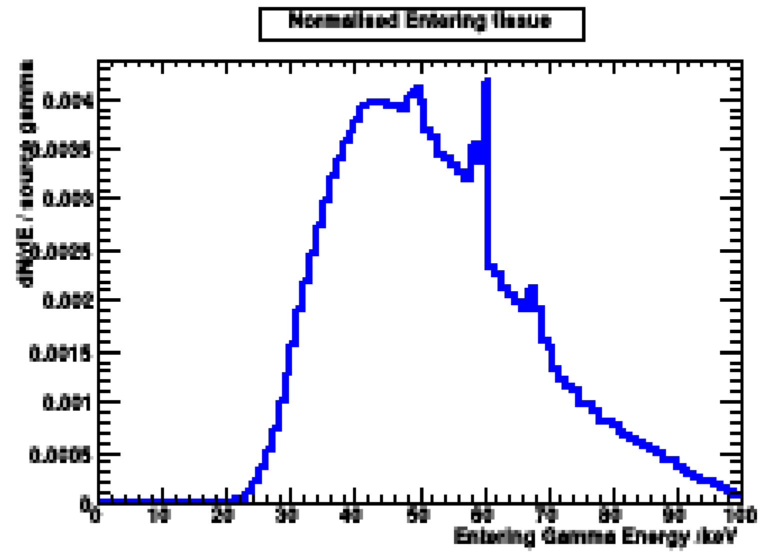


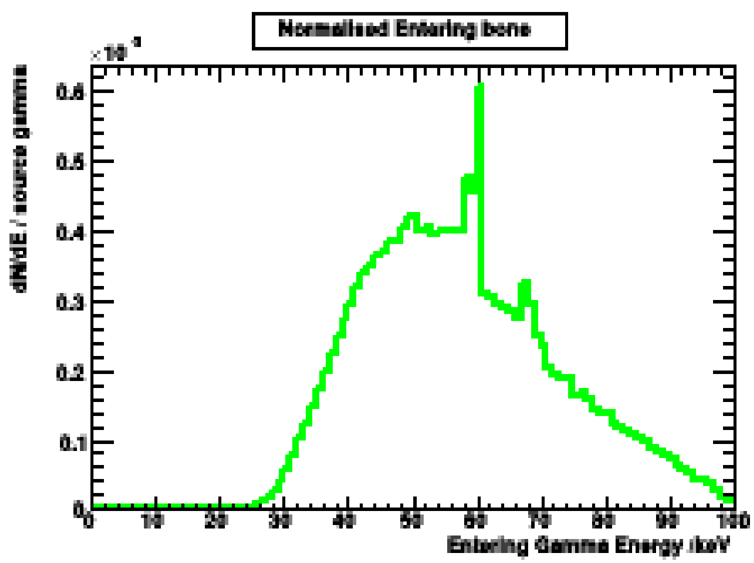
Generic Biasing 10 million events

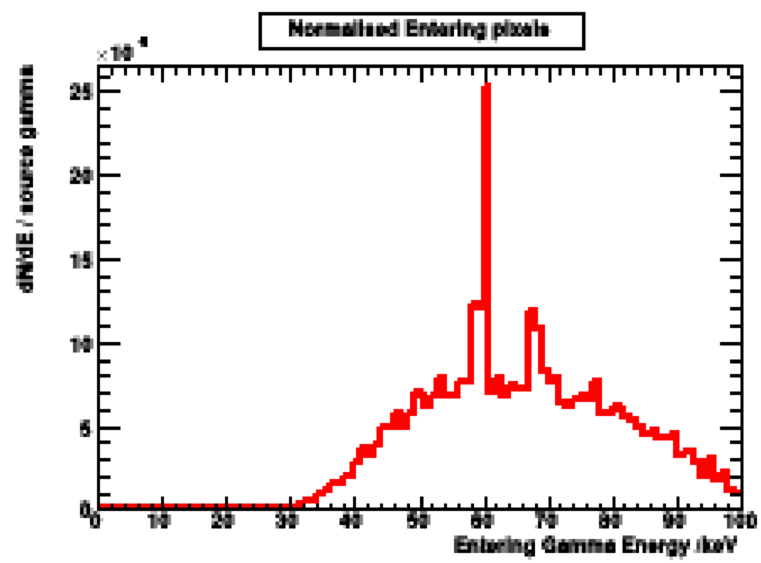


Normalised Flux - conventional

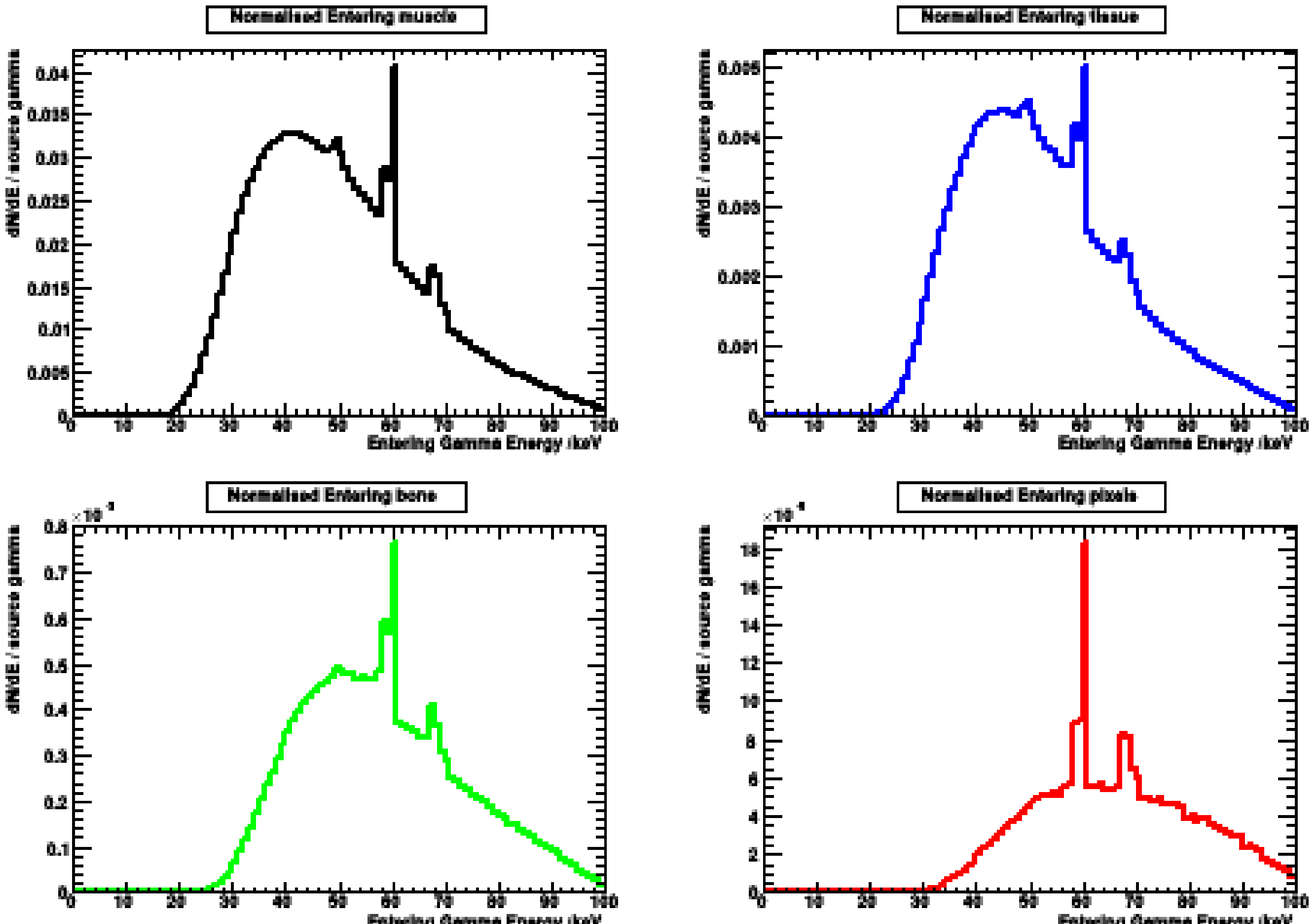








Normalised Flux - Generic Biasing Different numbers…

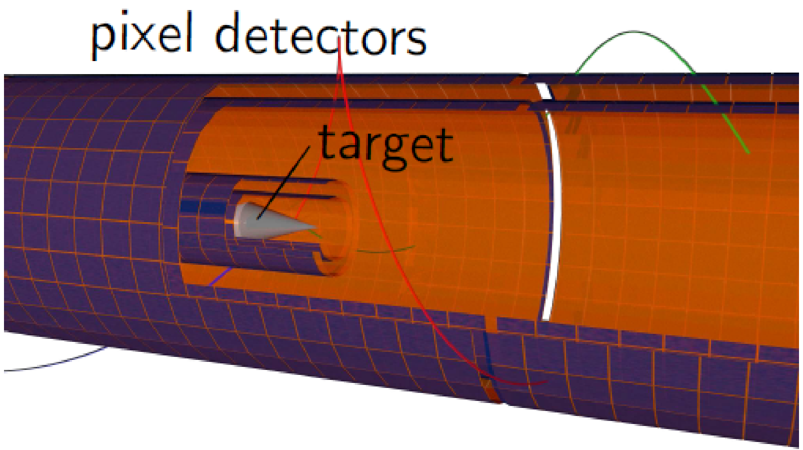


Features of Generic Biasing

- Almost my "smart" biasing option (thanks Marc!)
- Integer weights
- Directionality
  - How to handle nested shells?
- In general – how is direction handled – flat importance or always split?
- How to get the flux into a displaced detector without splitting at the detector entrance?

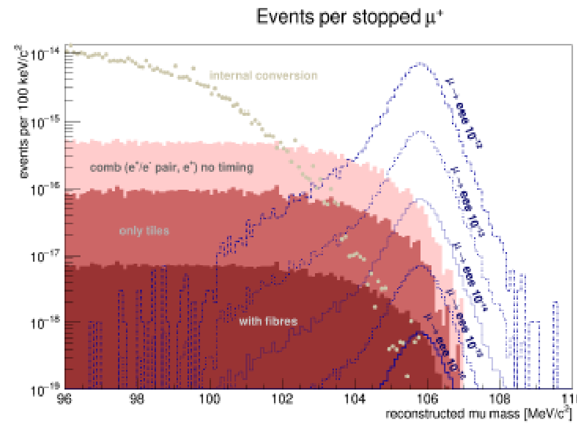
Physics Based Biasing in Mu3e

The Experiment: $\mu^+ \rightarrow e^+e^-e^+$



$p_e < 53\,\text{MeV}$
$\rightarrow$ resolution ($\sim$0.5 MeV) is multiple scattering dominated

The Goal: Background estimate



Work in progress, example plot to illustrate bg sources.

e^+ scattering in target dominates combinatorical BG (e^+ *Target* $\rightarrow e^+e^-$)

Implementation *(Work in progress)*
Biasing e^+ scattering (Bhabha) only in target to generate large sample, but to retain momentum resolution properties of reconstruction (given by the scattering in all the other parts, e.g. pixels).