Čerenkov Detectors for Electron Detection in LUXE

Status Update

Ruth Jacobs

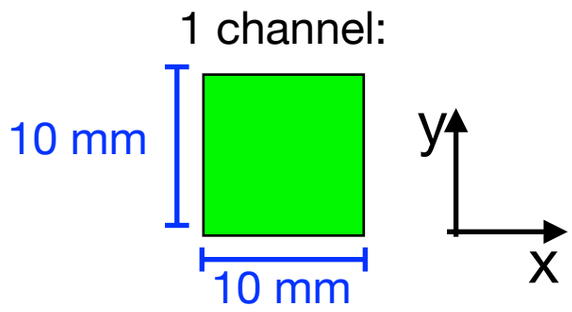
Luxe Technical Meeting, 23rd January 2020

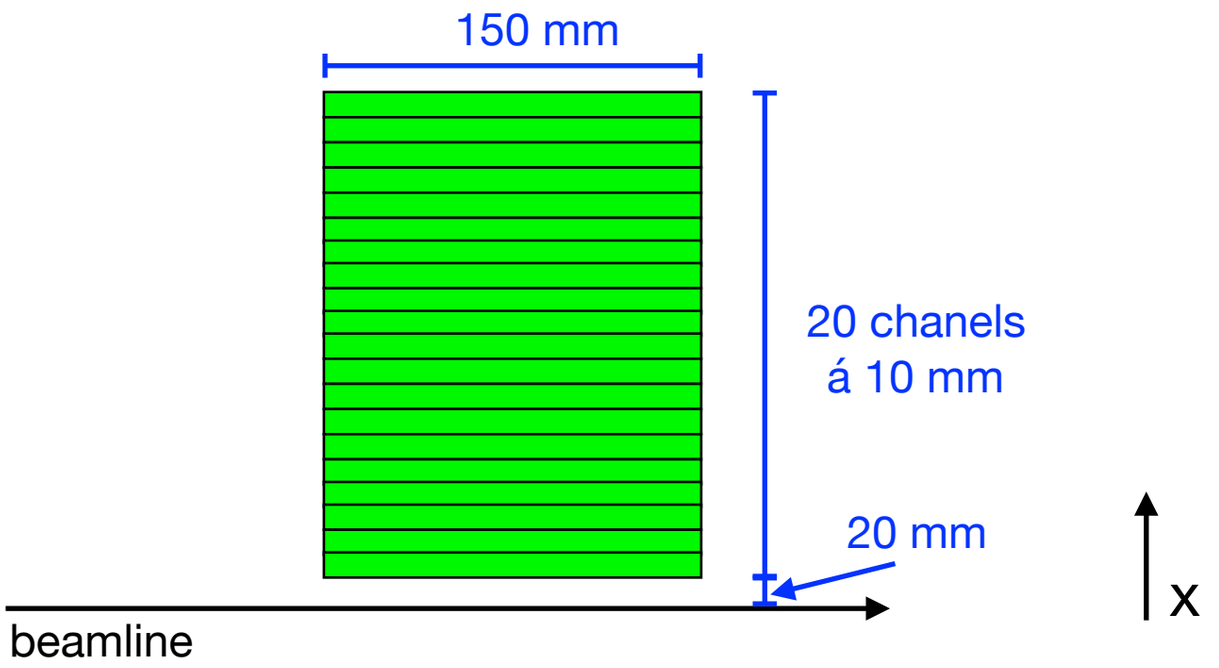
HELMHOLTZ RESEARCH FOR GRAND CHALLENGES

DESY.

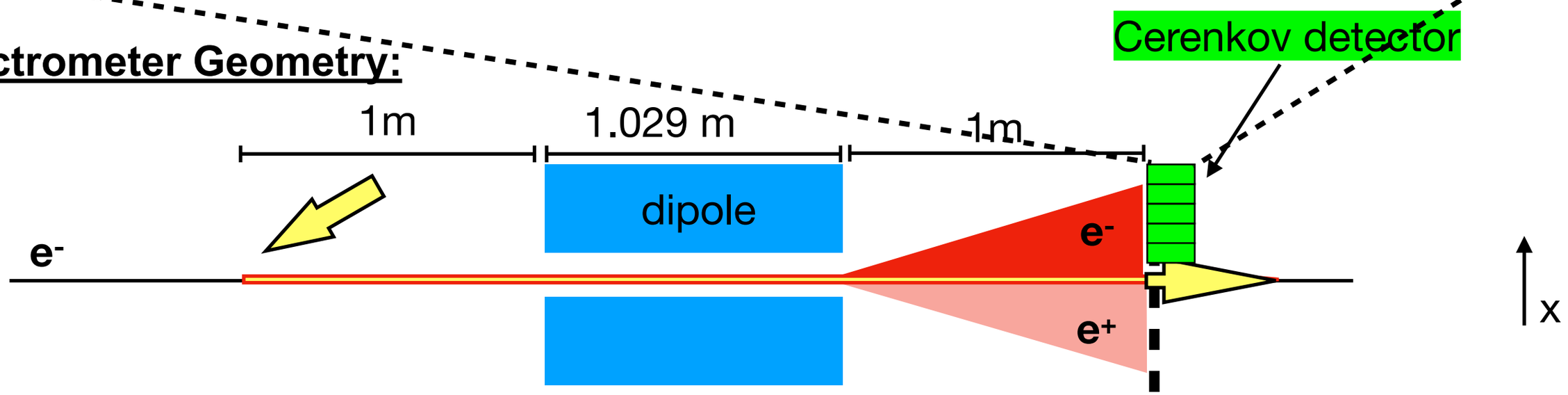
REMINDER: Detector Emulation: lcpolmc

Detector Geometry:



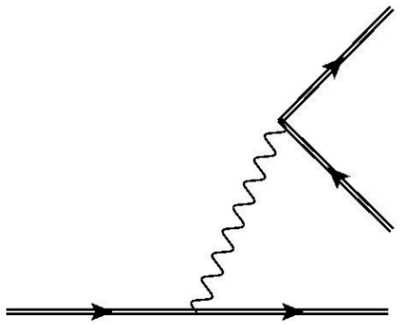


Spectrometer Geometry:

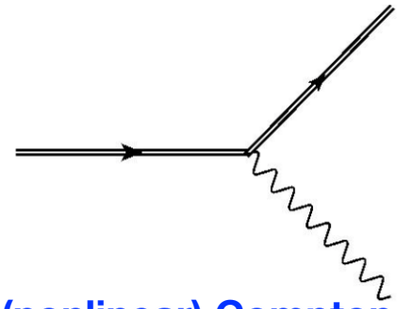


today: B-field 1.4T → 2.2 T

REMINDER: $e^- + \gamma_{Laser}$ MC samples



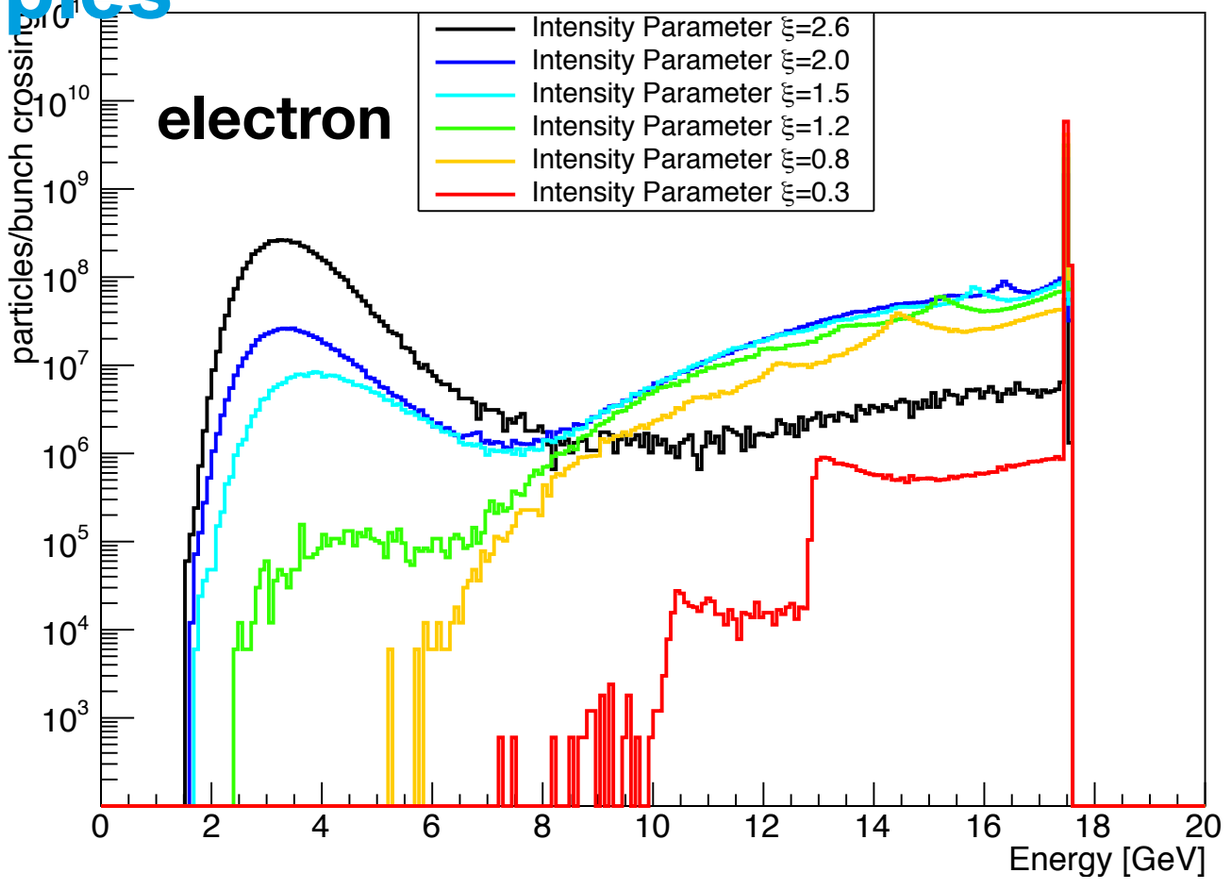
"trident process"

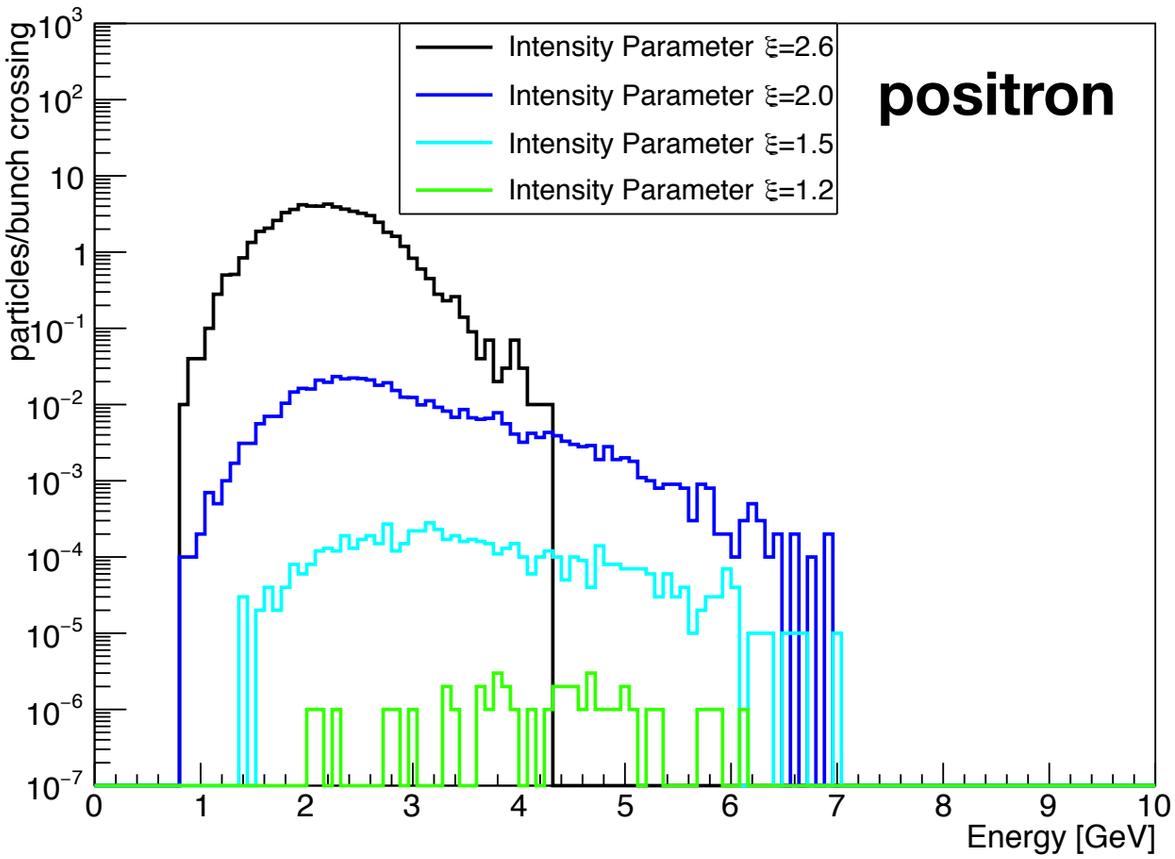


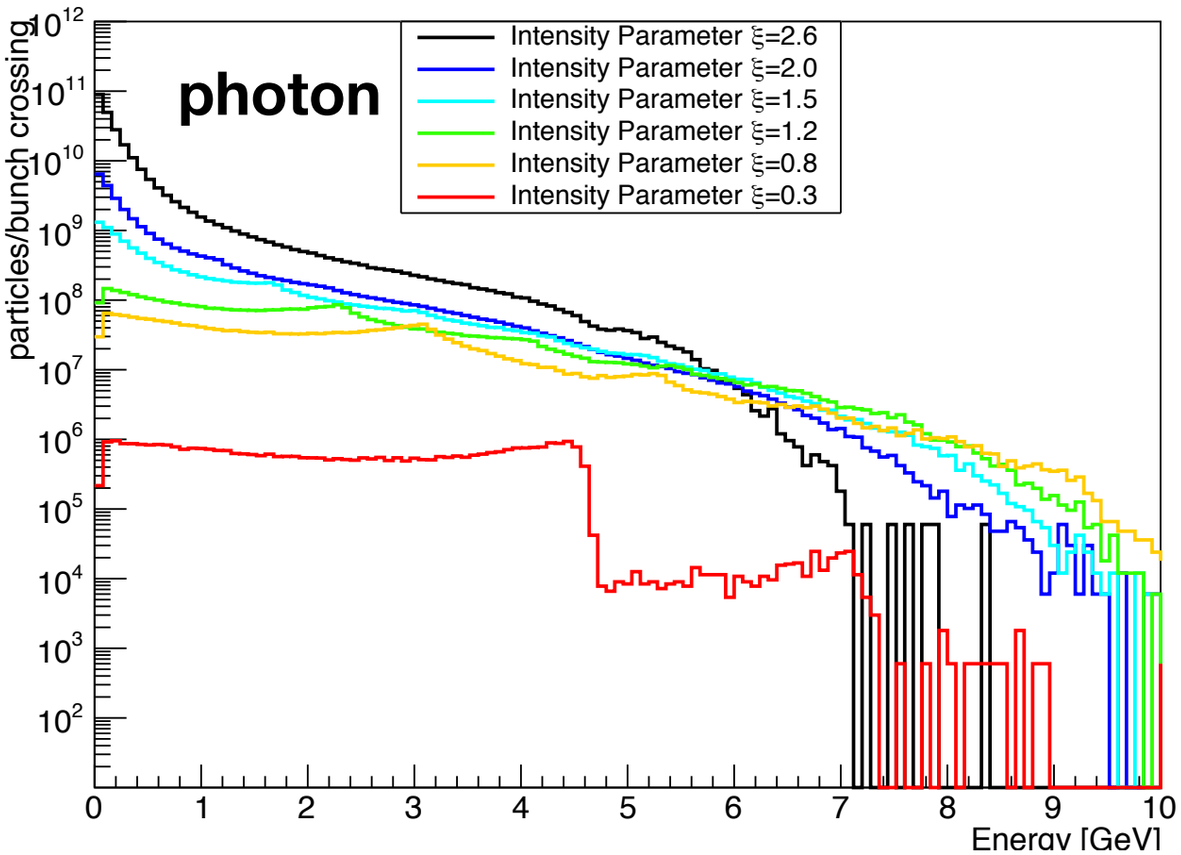
(nonlinear) Compton scattering

- interesting features in e^- energy spectrum:
  i) low-e: electrons from trident
  ii) high-e: shifted compton edge & higher-order edges ("kinks")

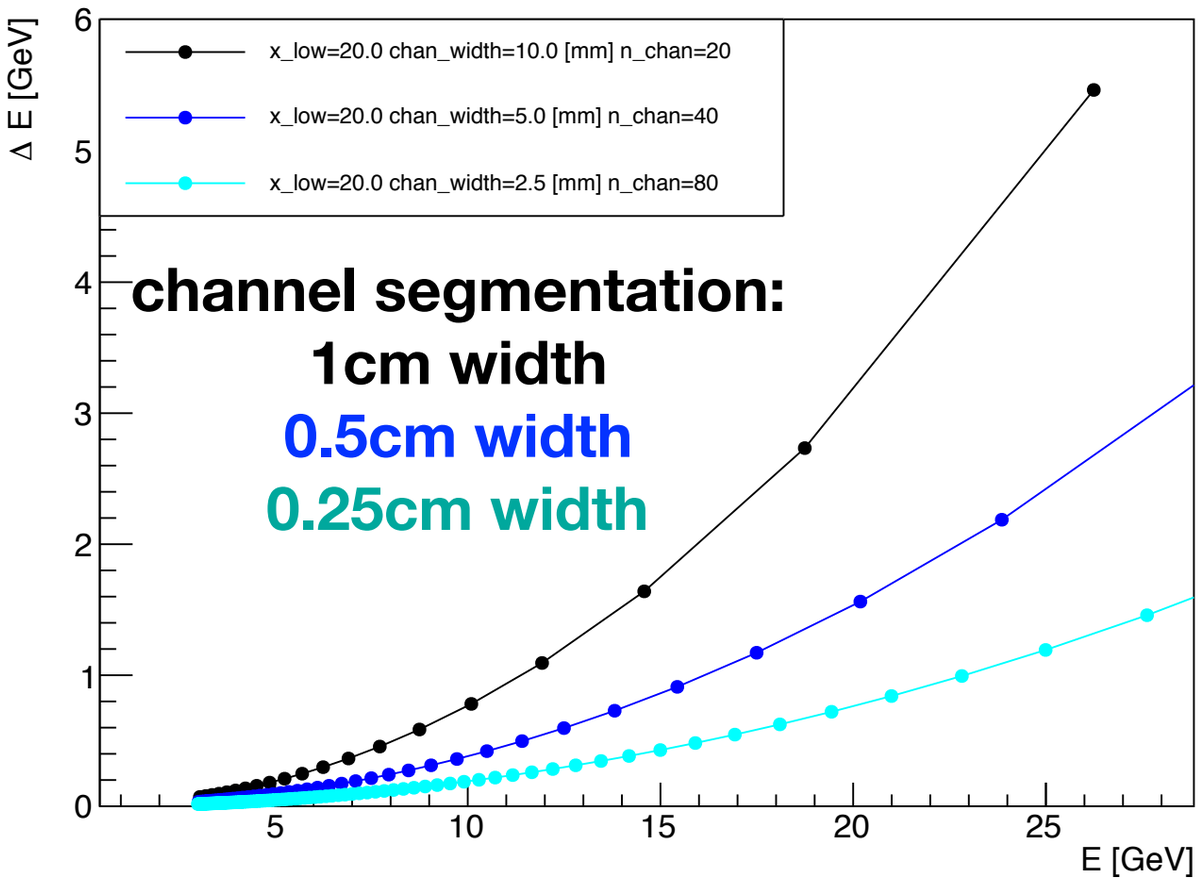
- study resolution of segmented Cerenkov detectors in emulation

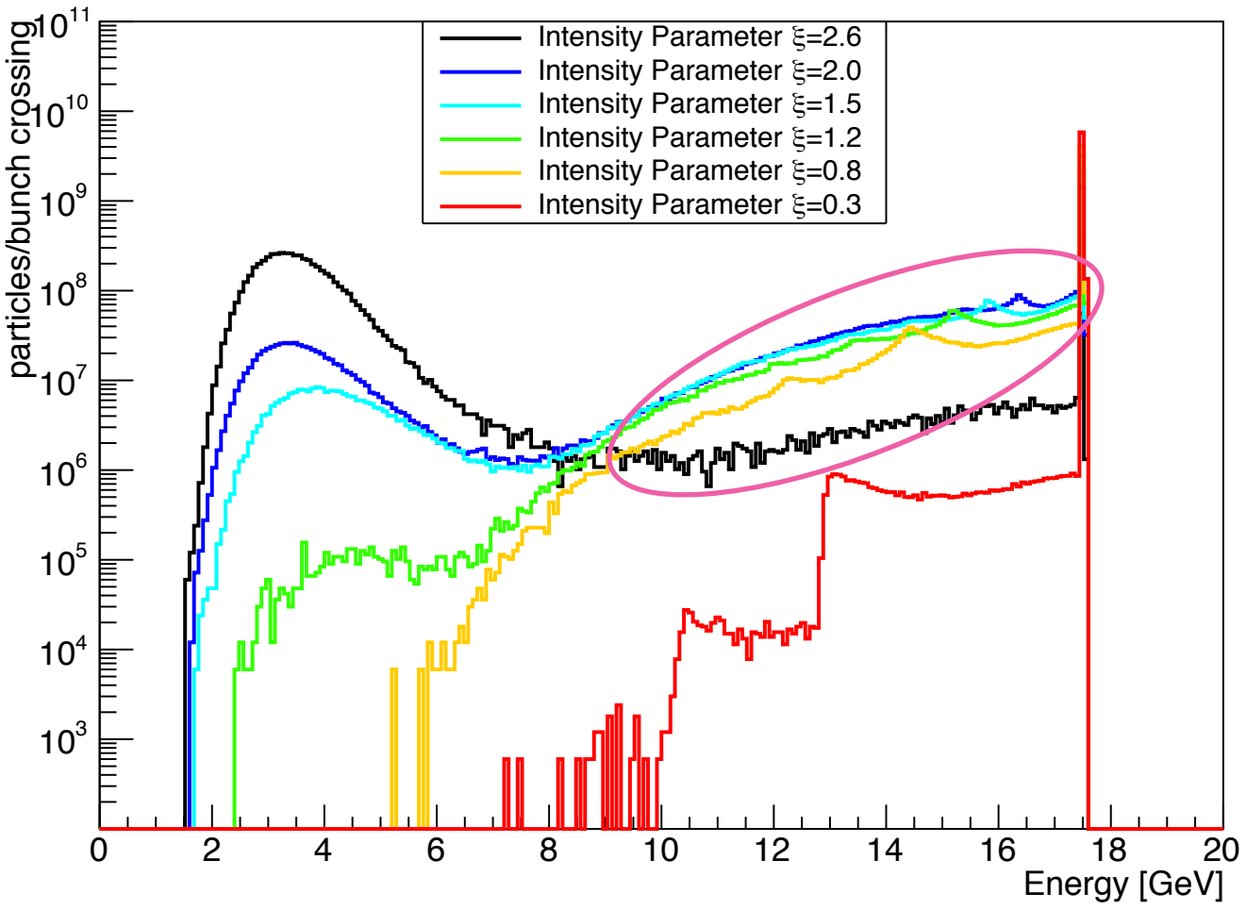




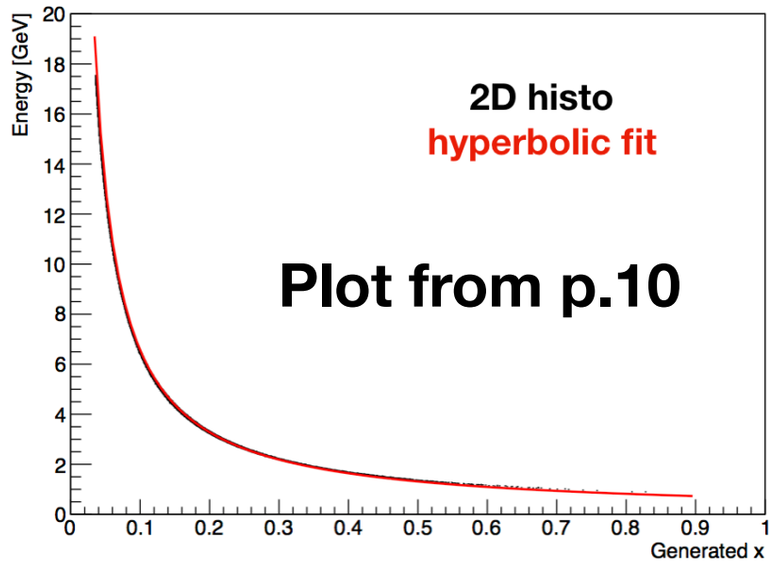


REMINDER: Varying the Channel Segmentation

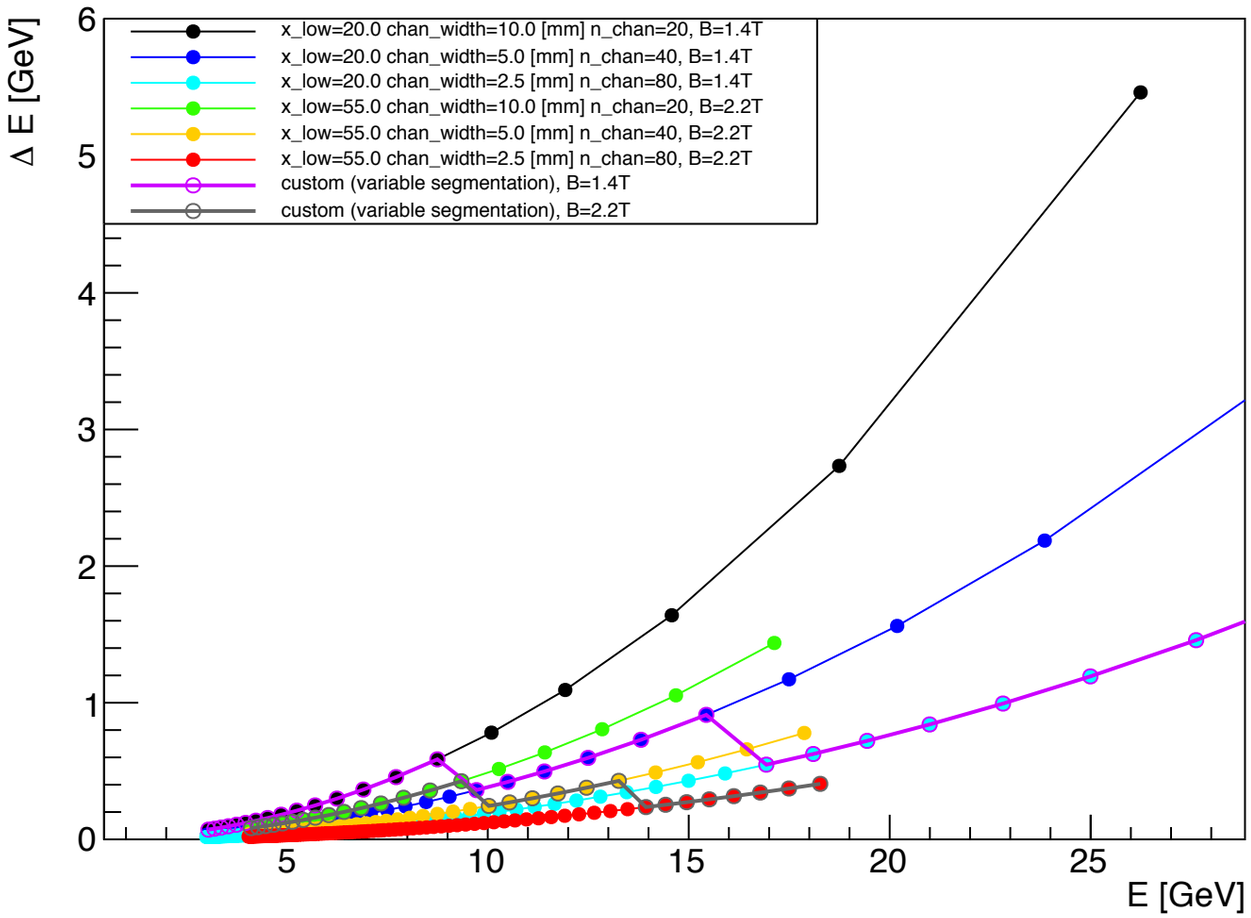


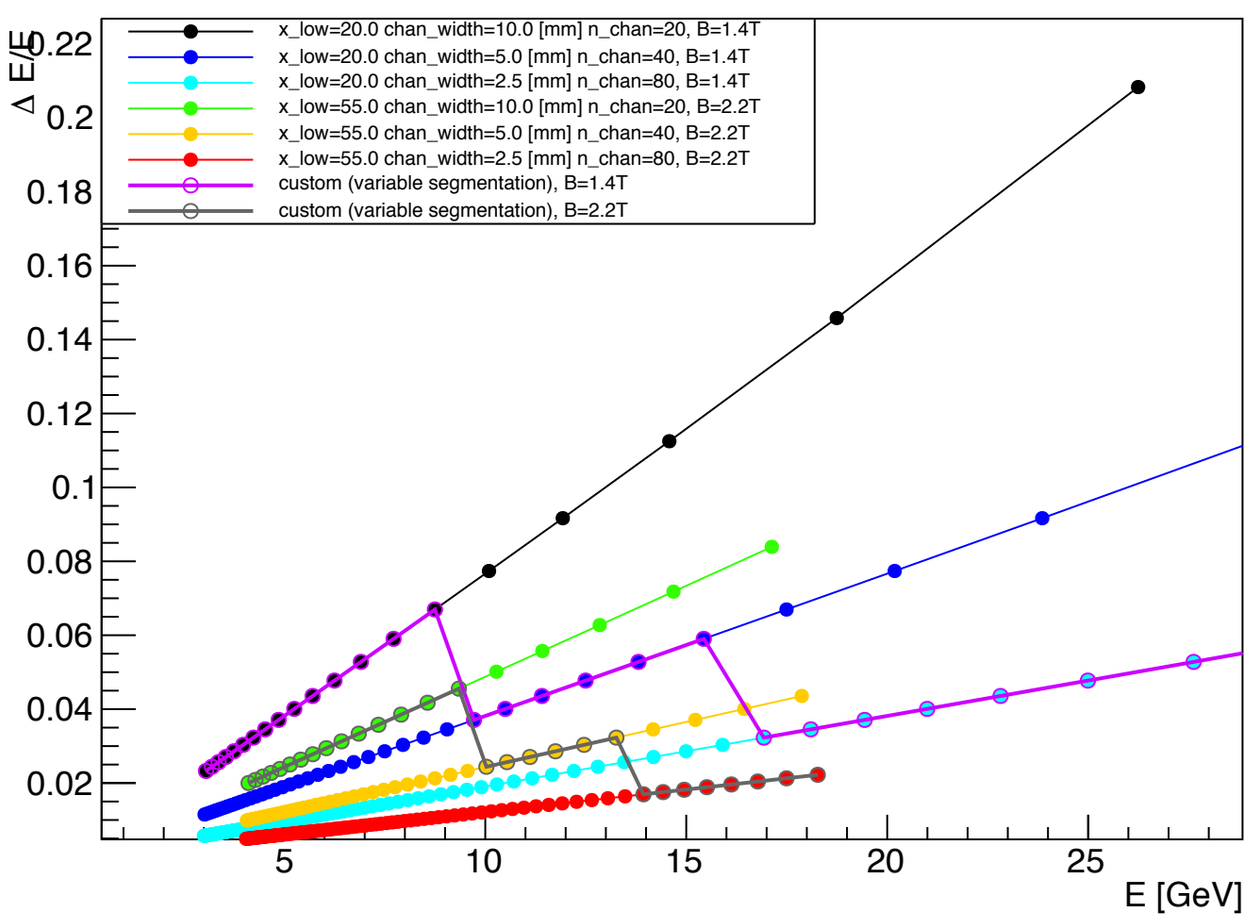


- How does varying our Cerenkov detector geometry change the resolution?
- How finely do we need to segment to resolve interesting features in electron spectrum?
- simple estimate based on the E vs. x parametrization



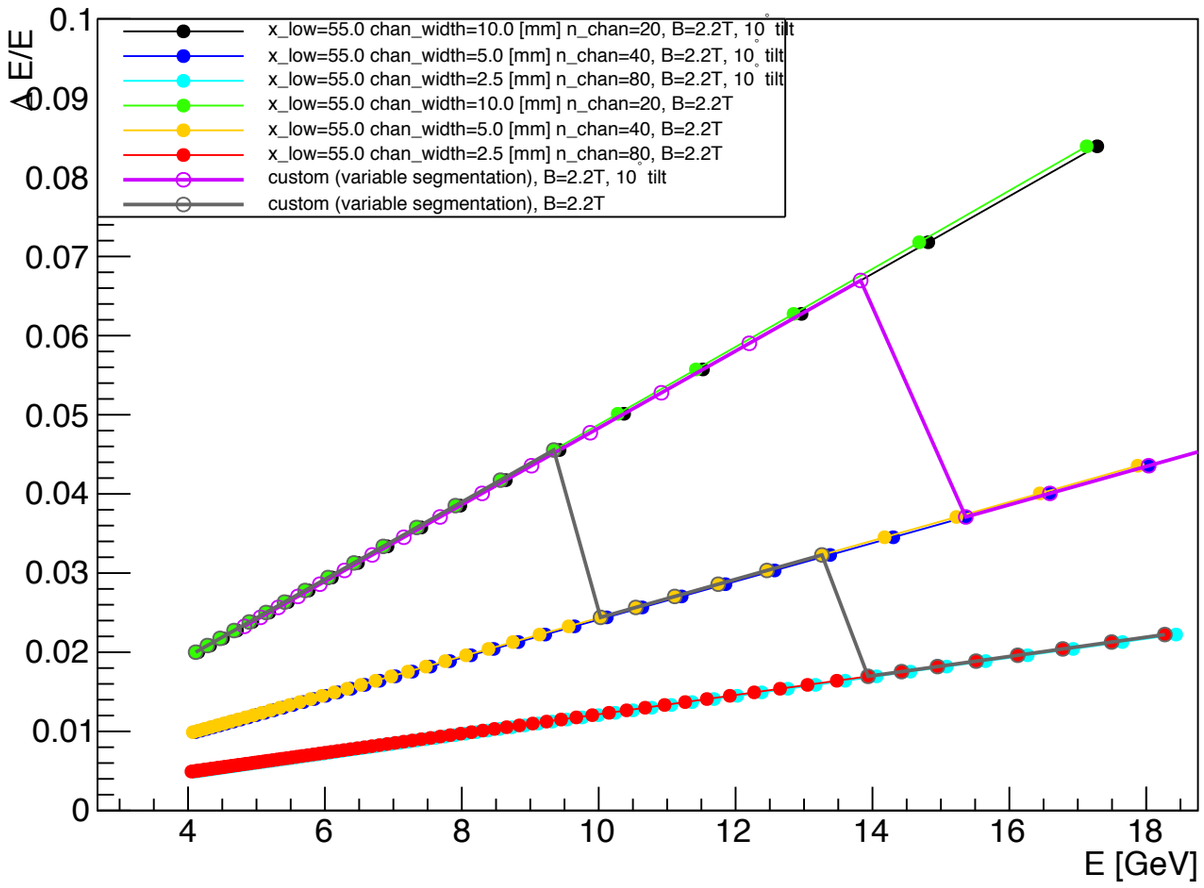
Stronger B-Field

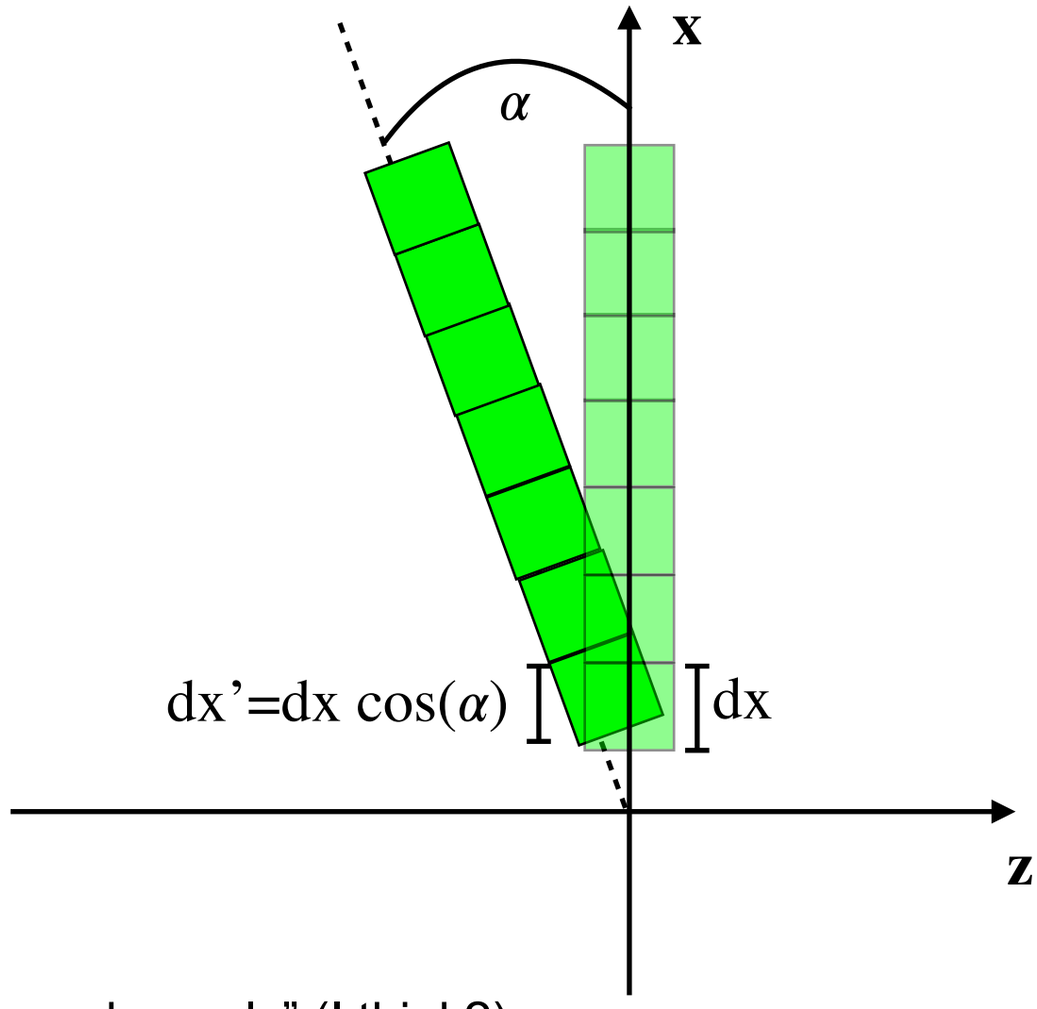




- Resolution studies were done with B=1.4 T
- Dipoles can to go up to 2.2 T max → What do we gain?
- As discussed last week, probably would not want to operate magnets at maximum possible fields, but this gives you an idea.

Tilting the detector: Simple Approach





- lcpolmc has a parameter for detector misalignment
- effectively: “stretching” of the spectrum, electron “sees narrower channels” (I think?)
  → this does not change our resolution much
- does not take into account tilted detector plane, dependence of drift distance after dipole on tilt angle, sharing between channels
- implementing more realistic tilt scenario now

Where to go with these studies? How much detail is needed?

Other news

- Marius, Jenny and I moved the Cerenkov prototype setup from Hera West to e-Lab (1B, EG)
- Marius and I will work on getting the setup back to operational state
- Plan is still to get prototype included for some functional tests in March TB
- Next step: