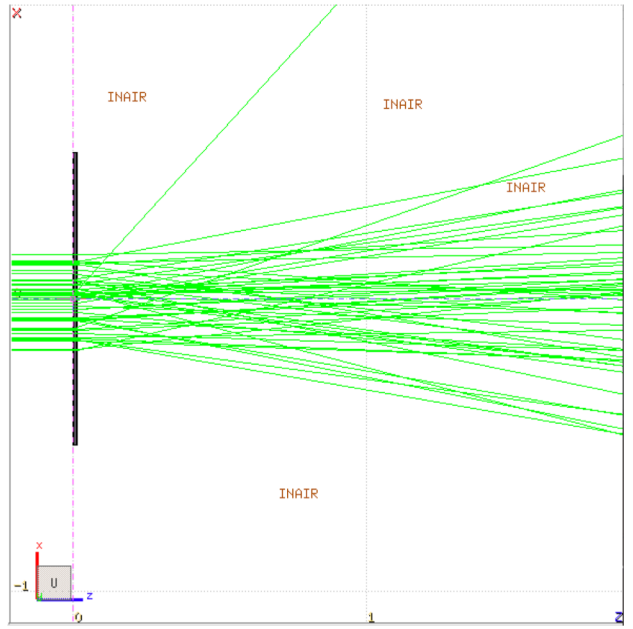
Exercise : Thresholds

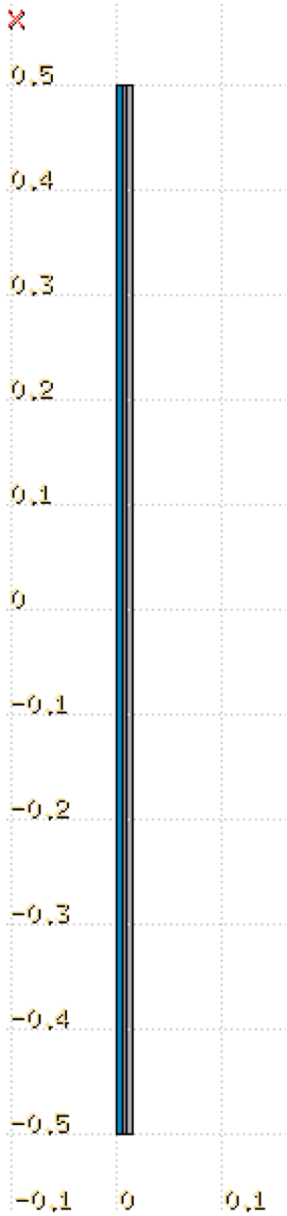
Aim of the exercise:

- Examine the effect of setting different threshold values
- Further interaction with the FLUKA manual
- Practice the use of preprocessor directives
- Strengthen plotting skills



Input file

- 10 MeV electron beam
  - Circular beam with 2 mm radius
- 5-mm radius target split in three layers, each 50 μm thick
  - Set to H_2O – Pb – Al
- Thin layers require high tracking precision. Thus, we set
  - **`DEFAULT PRECISIOn`** (should already be there)
- Notice that three preprocessor variables are defined
  - HI-THR, LOW-THR, VLOW-THR
- **`USRBIN`** scoring DOSE over the entire target
  - 1 μm bins in z, 1 μm bins in R, unformatted unit 55



Add EMFCUT cards

- Set both production and transport thresholds in all materials
  - Hint: when specifying the range of materials/regions, use @LASTMAT/@LASTREG as needed to refer to the last material or region, respectively

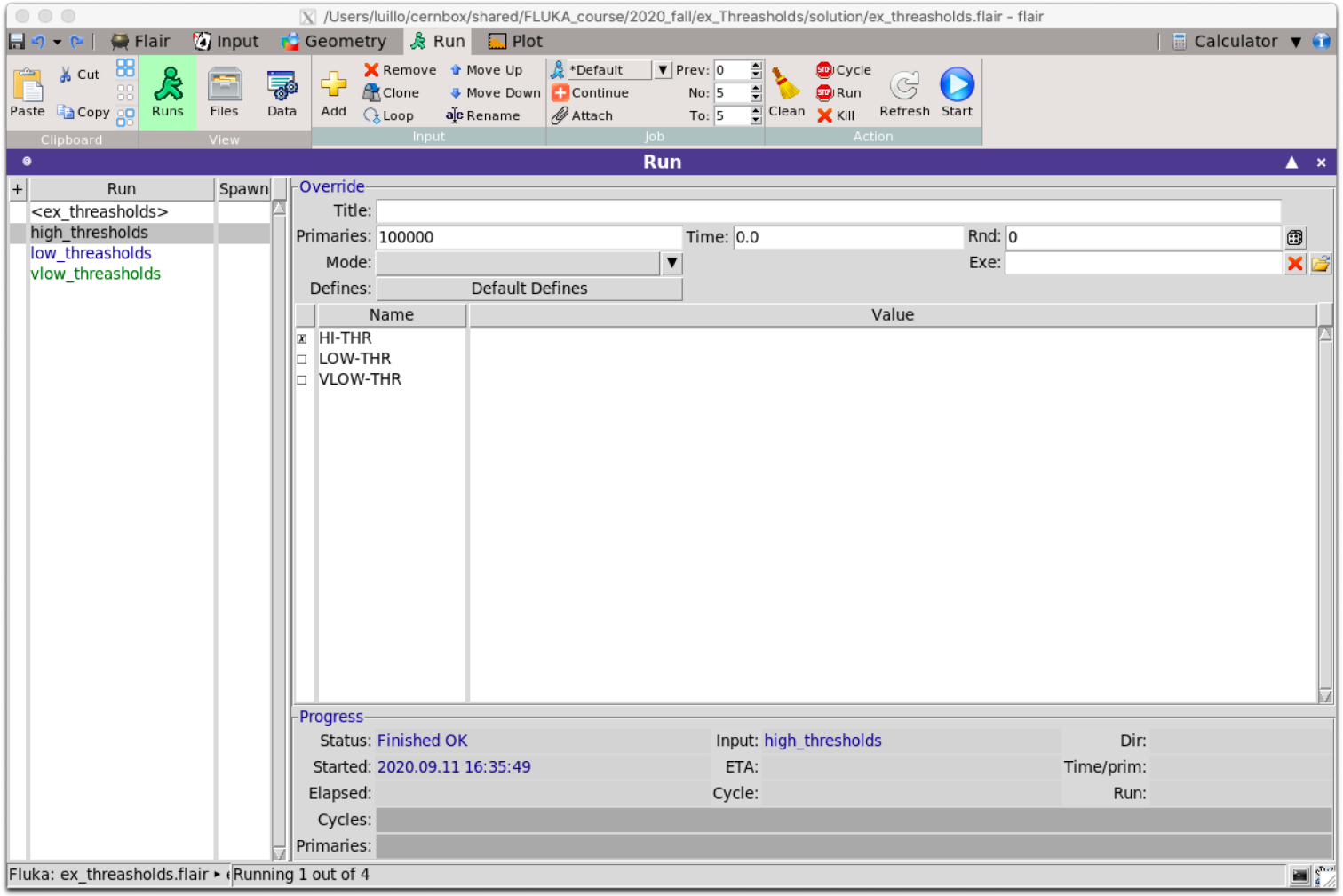
- Threshold cases:

```
#if HI-THR
      photons: 1 keV ,      electrons: 1 MeV kinetic energy,      FUDGEM=1
#elif LOW-THR
      photons: 1 keV ,      electrons: 100 keV kinetic energy,    FUDGEM=1
#elif VLOW-THR
      photons: 1 keV ,      electrons: 10 keV kinetic energy,     FUDGEM=0.5
#endif
```

- Note that the electron threshold is 100 keV in case of **PRECISIOn**

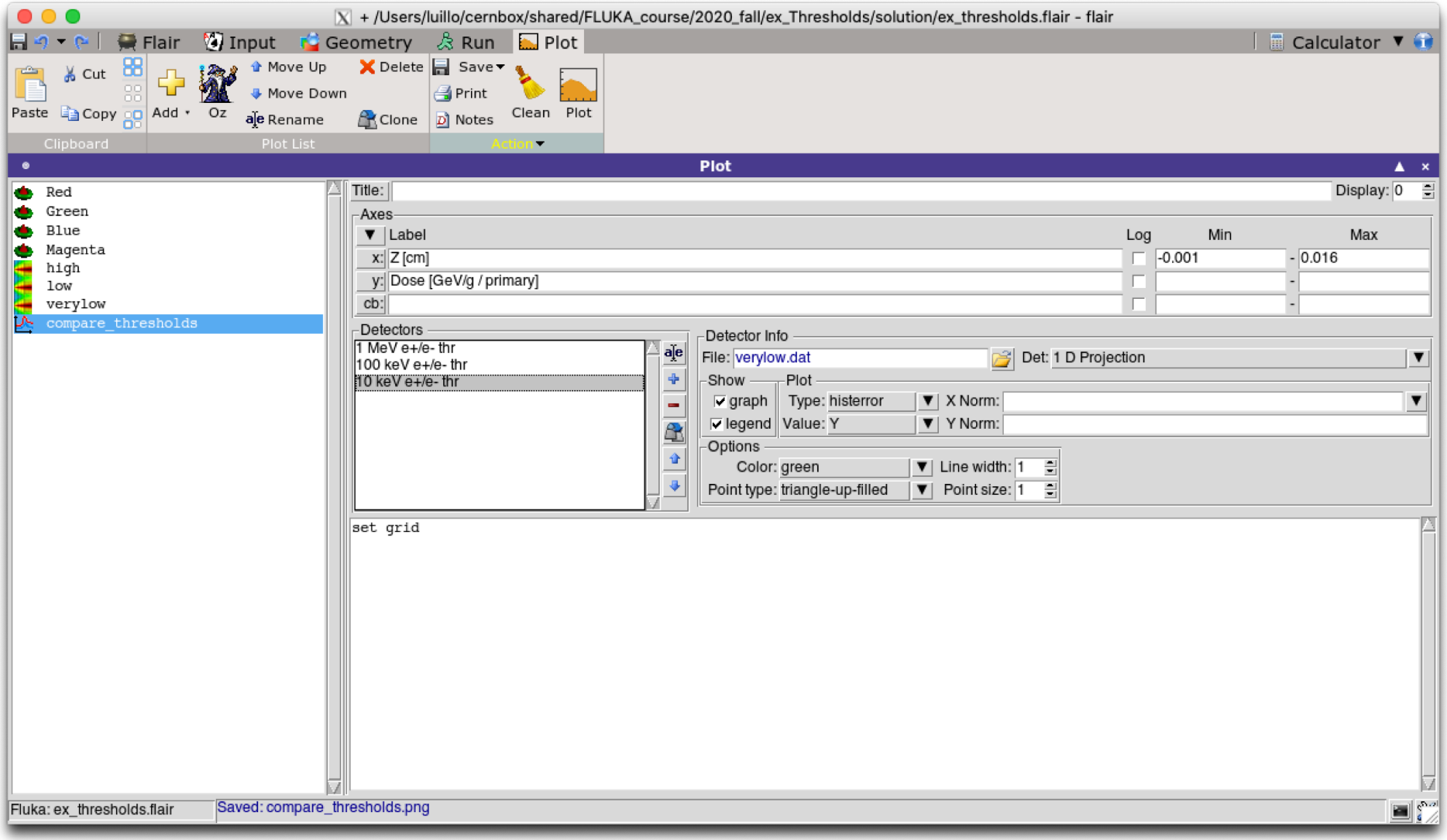
- Reminder: stopping powers and ranges for electrons, protons, and He ions are available on the NIST webpage: https://physics.nist.gov/PhysRefData/Star/Text/intro.html

Run



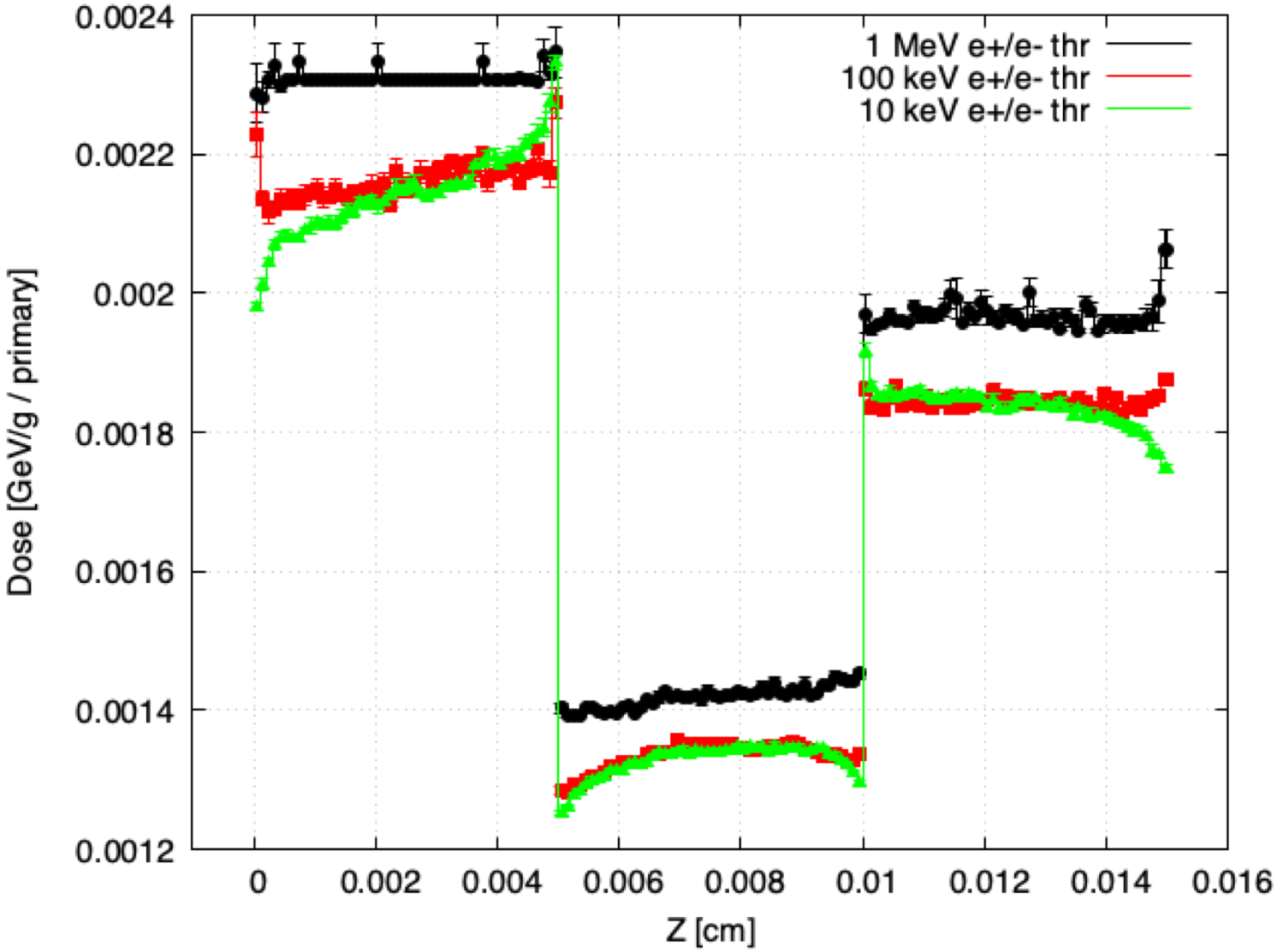
Run three simulations corresponding to high, low, or very low threshold values, with 5 cycles × 100000 primaries for each case
The three runs are already set up in the Flair project
Should take less than ~5 minutes on a reasonable machine.

Plot and compare the results



The plots are already set up in the Flair project

Result : Compare thresholds

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