Exercise 2: Thresholds

Advanced FLUKA Course

Exercise 2: Thresholds

Aim of the exercise:

1. Brief reminder on heavy-ions and efficient use of Flair (in order to be fast)
2. Have a critical look on observed results
3. Try finding out a reason for the seemingly non-physical behavior
4. Try to simplify the problem in order to understand
5. Apply lessons from lecture before

Exercise 2: Thresholds- Part I

Start with a new example (flair template: **heavy-ions)**

Instructions: settings and geometry

- Change defaults to NEW-DEFAULTS (hint: not default in FLAIR!)
- Change the radius of the body void to Radius: 1000cm
- Change the body target to Height: 1cm, Radius: 0.3cm
- Assign material AIR to region VOID
- Assign material ALUMINUM to region TARGET
- Beam:
  - Shoot (z-direction) with a Uranium-238 beam on the target
  - Energy: 950MeV per nucleon (in fact per nmu)
  - Beam-width: sigma 0.2 x 0.2 cm^2 (x and y)

Note: **Don't forget (for consistency, not really required for this example)**
…to link the DPMJET/RQMD event generators for enabling ion-ion interactions above 125MeV/n either using FLAIR or **$FLUPRO/flutil/ldpmqmd**
Reminder: the BME event generator, covering the low energy range up to 150MeV/n (125MeV/n is the default threshold, that you can change through PHYSICS/SDUM=DPMTHRES), does not need to be linked since it's already embedded in the main FLUKA library.

Exercise 2: Thresholds- Part I

Scoring instructions:

- Score with USRBIN dose deposition in the air around the target
  - Dimensions (X × Y × Z): **40** x 200 x 200cm Bins: **1** x 100 x 100
- Add additional dose scoring looking separately for the contribution of: heavy-ions, protons, neutrons, photons, electrons and pions
- For the same particle types, score the particle fluence exiting the target (USRBDX from target to air) with a suitable energy resolution

Run/Analysis instructions:

- Run about 100-200 particles (5 cycles)
- Process the results and produce the plots of the above scoring
- Try to explain the dose/energy results
- Find out which particle/energy is driving the observed result
- In case you agree that it's not physical, how can you solve it?

Exercise 2: Thresholds- Part II

Start with the same example as before, but with no target (set it to AIR)!

Instructions: settings and geometry:

- Create a uniform source in the center of your geometry
- Particle type: what you think is the responsible for Part-I
- Energy: take the one corresponding to the peak of the respective spectrum

Scoring instructions:

- Use the same scoring as before

Run/Analysis instructions:

- Run about 10000 particles in a few cycles
- Process the results and produce the plots of the above scoring
- Do you observe the same effect?
- Try solving it (applying the lessons learned in the lecture before!)