



Exercise 2: Thresholds

FLUKA Advanced 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 an **Uranium (238)** beam on the target
 - ❑ Energy: **950MeV** per nucleon (in fact per nmu)
 - ❑ Beam-width: sigma **0.2 x 0.2 cm²** (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!)