



# Exercise 12: Heavy ions beams

Beginners' FLUKA Course

# Exercise 12: Heavy Ions beams

## **Aim of the exercise:**

- 1- Use of heavy ions beams
- 2- Use of USRYIELD detector
- 3- Compile custom executable

# Exercise 12: Heavy Ions Beams

- Start from the solution of ex5 (copy both inp and flair files):

```
mkdir ex12 ; cp ex5/ex5.* ex12/. ; cd ex12
```

- Replace the proton beam with an oxygen beam having same energy per nucleon
- Swap water and lead material assignment (to save CPU time)

# Exercise 12: Heavy Ions Beams

- Score the charge spectrum of ions ( $Z \geq 3$ ) at the boundaries: Lead-Aluminum, Aluminum-Water, Water-CO2

*Define a dummy cylindrical region 1 micron thick*

*between  $z=9.9999\text{cm}$  and  $z=10\text{cm}$*

*Add 3 USRYIELD detectors (unformatted unit 68) with:*

*1<sup>st</sup> quantity: particle charge (from 2.5 to 9.5)*

*2<sup>nd</sup> quantity: polar lab angle (from 0 to 90 degrees)*

- Score the Linear Energy Transfer spectrum (in water) of ions ( $Z \geq 3$ ) and charged particles at the end of the target

*Add 2 USRYIELD detectors (unformatted unit 69) with:*

*1<sup>st</sup> quantity: Linear Energy Transfer (from 0.0 to 20.0)*

*[given in  $\text{keV}/(\mu\text{m g}/\text{cm}^3)$ ]*

*2<sup>nd</sup> quantity: particle charge (from -2.5 to 9.5)*

# Exercise 12: Heavy Ions Beams

- In order to run with ions user should compile linking **dpmjet** (`$FLUPRO/flutils/ldpmqmd`) to produce a custom executable



- Run 4 cycles x 500 primaries