



Fluka Exercise – Day 4

Hands on Fluka

Ex07 – DPA and heat load

- **GOALS:**
 - Calculate the average number of Displacements Per Atom (DPA) for a running scenario of 10^{12} protons per bunch, 1 bunch every 10 s, beam time of 8 hrs/day for 200 days/year;
 - Calculate the temperature rise of the target after each bunch (simplified model, take $C_p^{\text{Pb}} \sim 0.129$ J/gK).
- **Recipe (1):**
 - Add **MAT-PROP** card specifying a **DPA-ENER** threshold of **25 eV** for lead;
 - Specify the lowest transport threshold for proton and hadrons (**~ 1 keV**);
 - Add a **USRBIN** grid on the lead target scoring *with a suitable resolution* (depending on the beam size) **DPA-SCO** and **NIEL-DEP**;
- **Recipe (2):**
 - Add an energy scoring on the target and plot the longitudinal peak profile.

Ex08 — Biasing

- **GOAL:** bias the lateral neutron transport to compensate the absorption in the external concrete shield using the **usimbs.f** routine, in order to get more effectively estimation of neutron fluence and equivalent dose outside the target station;
- **Recipe:**
 - Add the **biasing routine** with flair from the *Process->Compile* frame (as done for *magfld.f*);
 - For each neutron step you can specify a **FIMP** (importance factor) defined as the importance ratio between the starting and ending track points. *Hint: use a meaningful exponential function of the radial step*
 - Score neutron fluence and equivalent dose outside the target and compare the cases with and without biasing for the same CPU time.