Exercise: advanced geometry

Exercise objectives

- Practice with translations and rotations in Fluka
  - `$start_translat`
  - `$start_transform`
  - `ROT-DEFI`
  - `ROTPRBIN`

Geometry

- Start from the given input file
- Notice that all the geometry elements are there:

  1 exp. hall, 1 exp. chamber, 1 collimator, 1 Image Plate detector

  (if you don’t see them, look in the origin and on different views)
- Notice the use of bounding boxes (container bodies) in the definition of the elements

Geometry changes and scoring

- Translate exp. chamber bodies by Δx=2500 cm, Δy=80 cm, Δz=2400 cm
- Translate Image Plate bodies by Δx=2550 cm, Δy=110 cm, Δz=2470 cm
- Transform collimator bodies using two **ROT-DEFI** cards:
  1. Rotation around Y-axis by 2° (inside an " **#if** / **#endif** " with a **#define** named "**rotation**" as condition)
  2. Translation by Δx=2550 cm, Δy=110 cm, Δz=2450 cm
- Score the energy deposition in the collimator on a grid
  - The **USRBIN** card is already included
  - A **ROTPRBIN** card needs to be associated to the scoring so that it appropriately matches the collimator in case of rotation

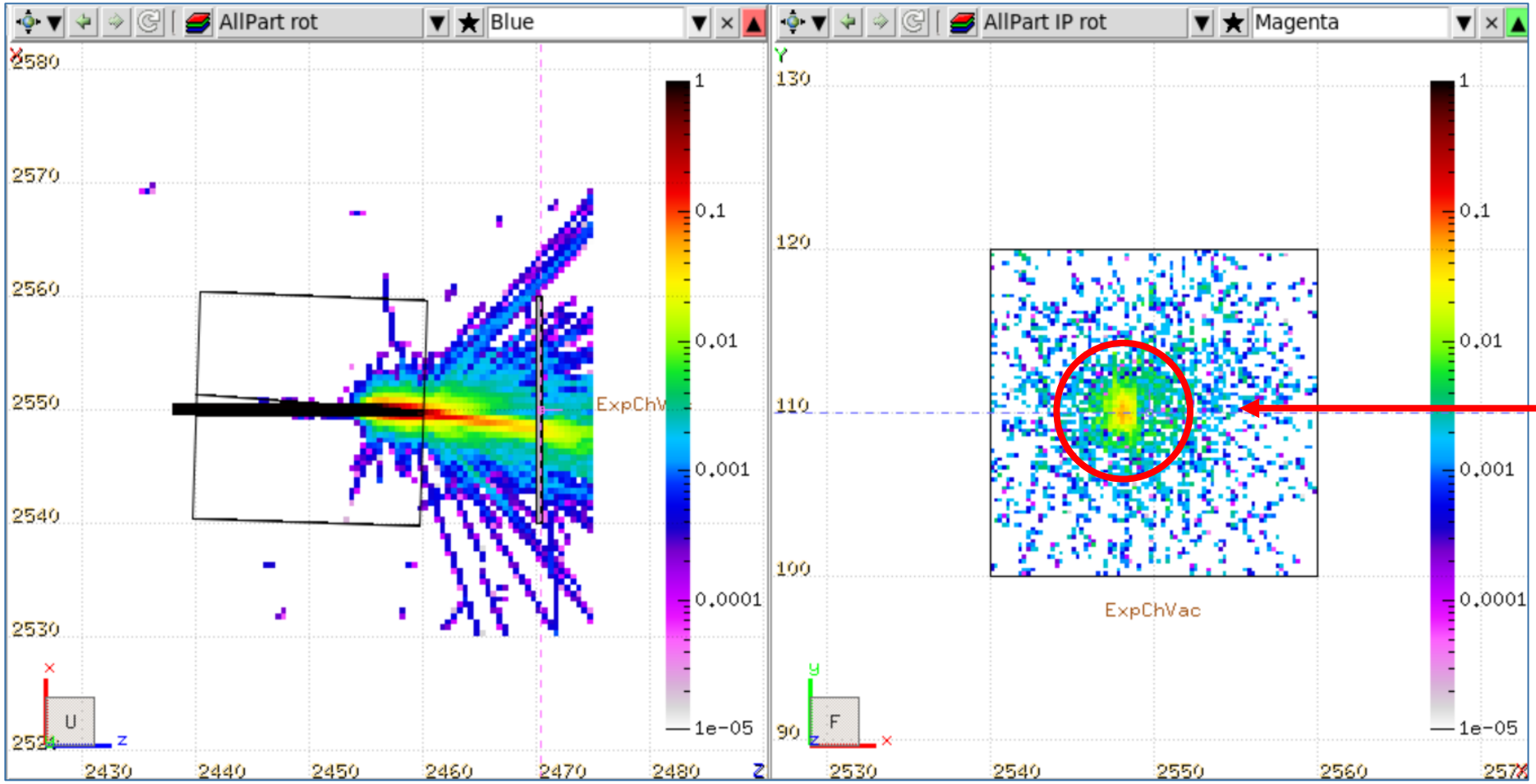
Run and look at results

- For the case with the rotation, run 5000 primaries (use cycles and spawns)
- Merge the results
- If necessary, adapt the already available layers in the Geometry editor
- Look at the particle fluences for the two cases:

  (X,Z) plane over the whole geometry (“AllPart rot”)

  (X,Y) plane over the image plate (“AllPart IP rot”)
- Look at the scoring of the energy deposition on the collimator
- In the geometry editor, try to add a layer (“Edep mesh”) to visualise the rotated **`USRBIN`** mesh from the input file (i.e. just the mesh definition, not the simulation results)

Result: particle fluence with tilted collimator

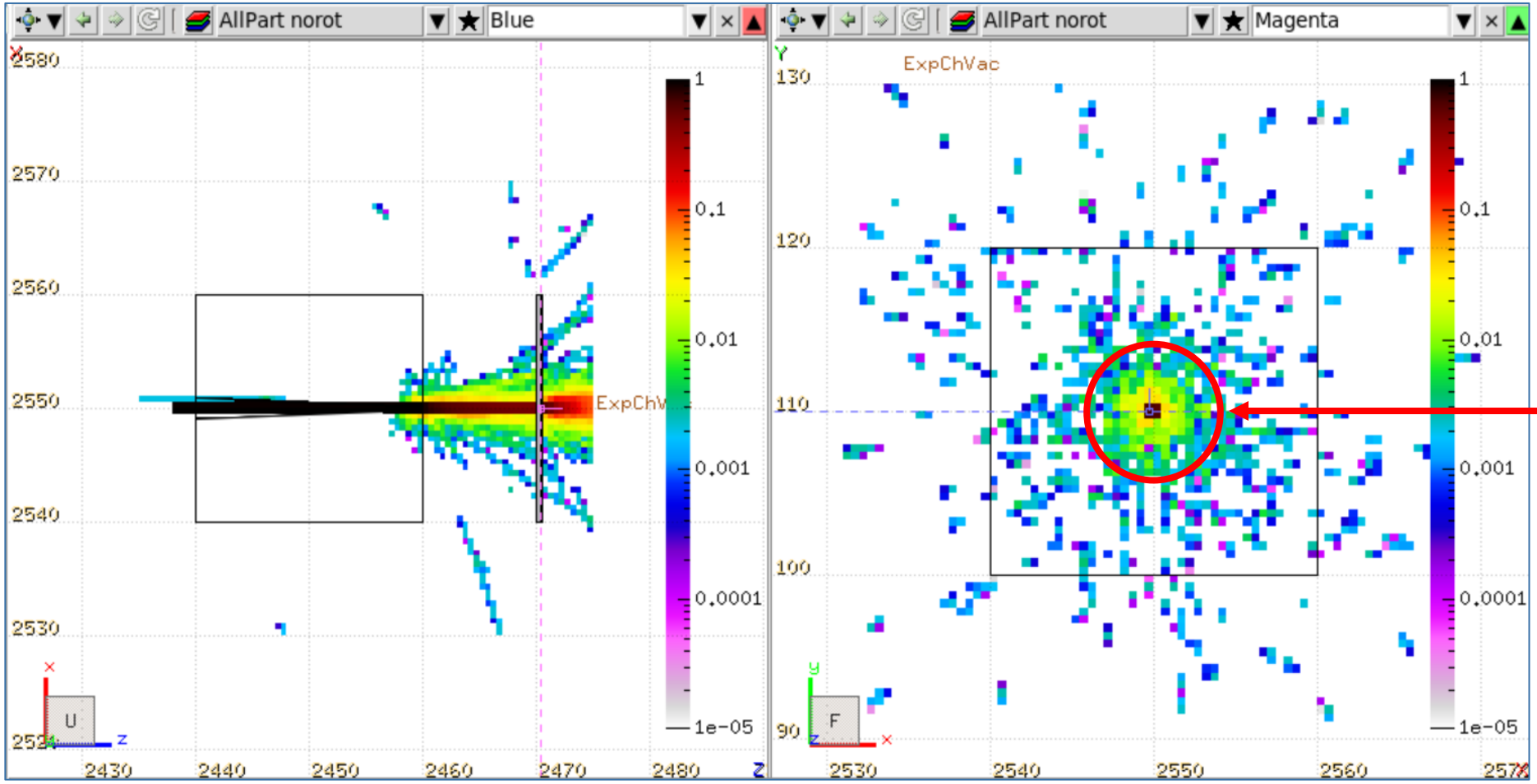


The electron beam does not hit the center of the Image Plate

Particle fluence with straight collimator

- Disable the collimator rotation using the preprocessor instruction
- Run with the collimator aligned
- Compare the results (impinging point on the Image Plate)

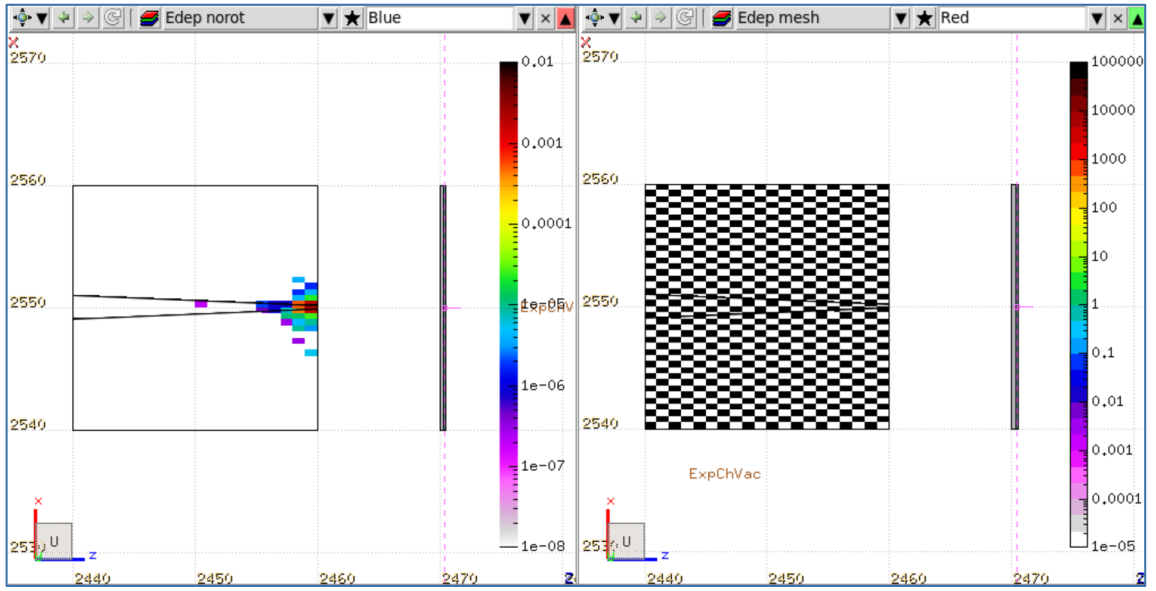
Result: particle fluence with straight collimator



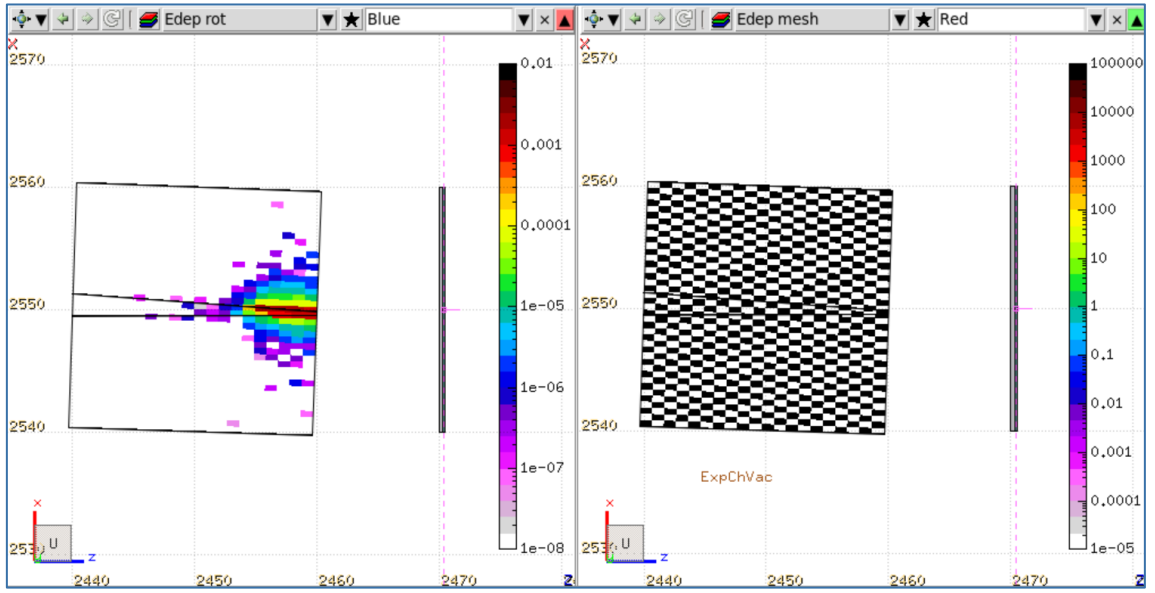
The electron beam hits the center of the Image Plate

Energy deposition

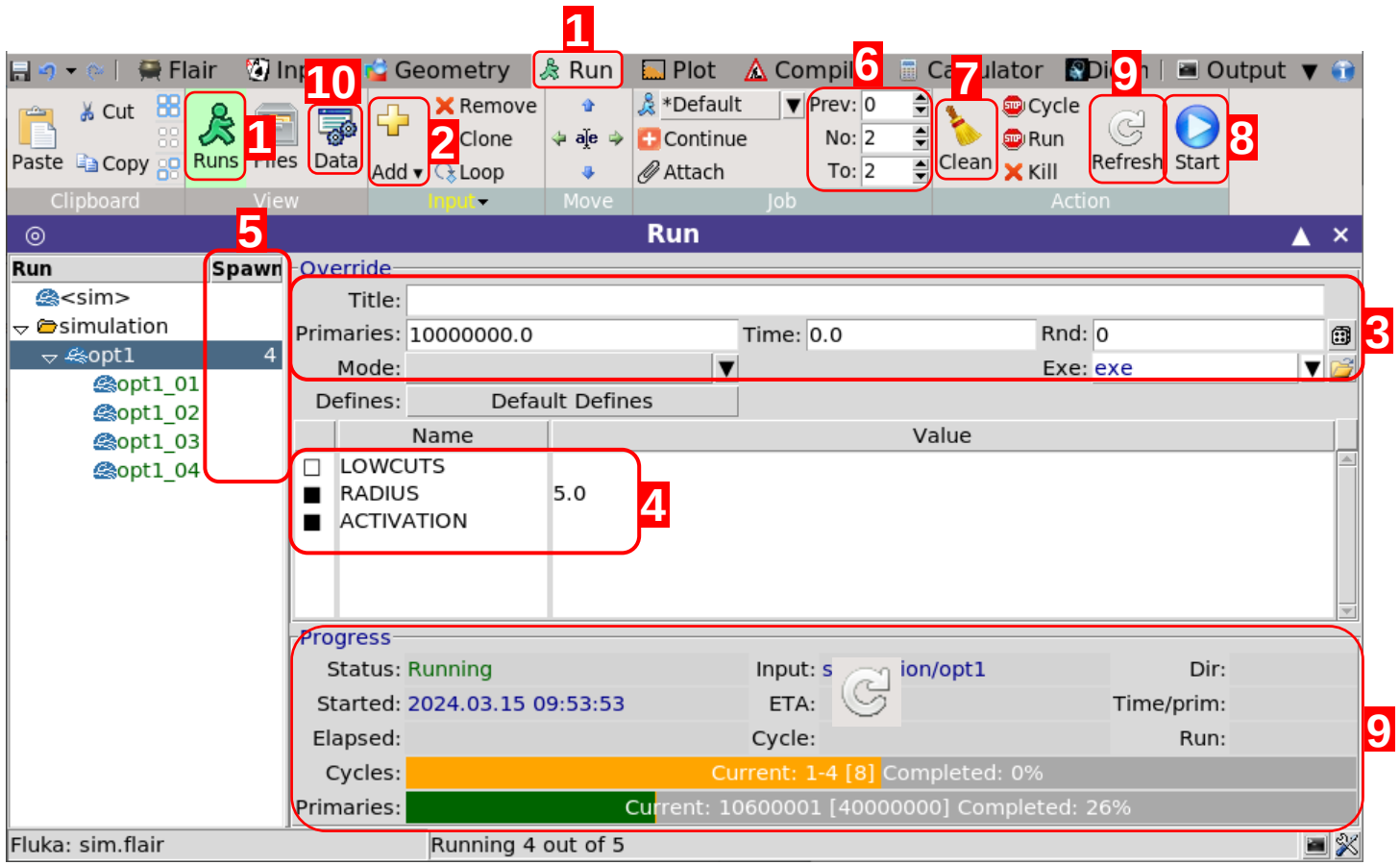
Without collimator rotation



With collimator rotation



Flair Cheat Sheet



Remember!

- You can **STOP** or **KILL** the run.
- You can edit your input while the simulation runs.

!!! WARNING !!!

- Mind the memory and CPU usage of your simulations!

1. Go to the ***Run* tab**, select ***Runs* view**.
2. Add **new folder** + Add **new run**.
3. Override the input run info:
   - **Number of primaries**
   - Title / Max. time per cycle / Seed / Exec.
4. Override/Define variables.
5. **Recommended:** Increase number of spawns
6. Set number of cycles per spawn
   - Recommend at least 5 cycles in total.
   - `num_cycles_tot = num_cycles_per_spawn * num_spawns`
7. ***Clean*** run files after change to input or run settings.
8. Click ***Start*** to launch the simulations.
9. Monitor the progress. Click ***Refresh*** to force update.
10. After all cycles end:
    - Go to the ***Data*** ( ) tab.
    - Click ***Process*** ( ) to combine all cycles and create simulation data files.
    - You may need to refresh ( ) and scan ( ) if detectors are missing.




FLUKA