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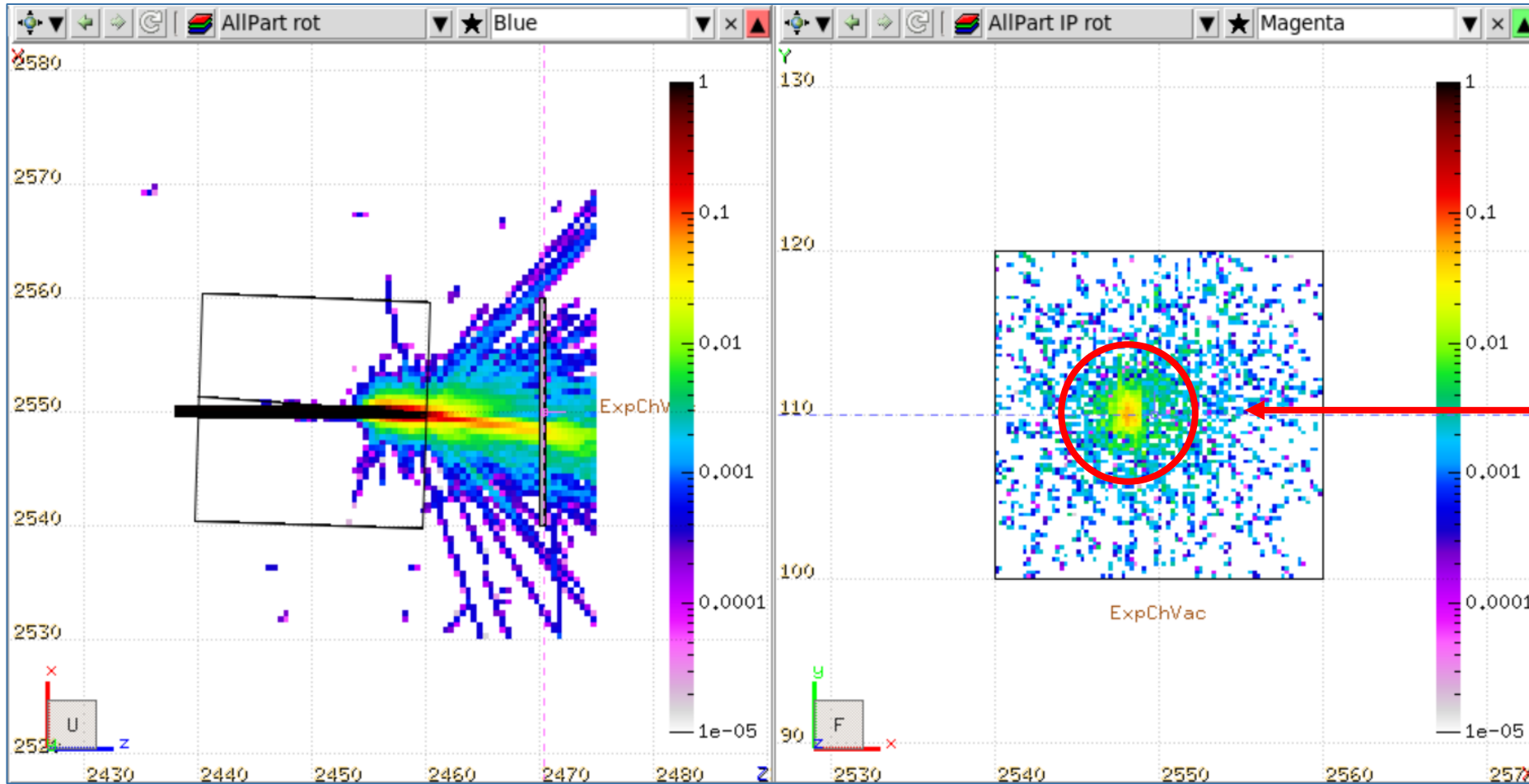
The electron beam does not hit the center of the Image Plate

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)

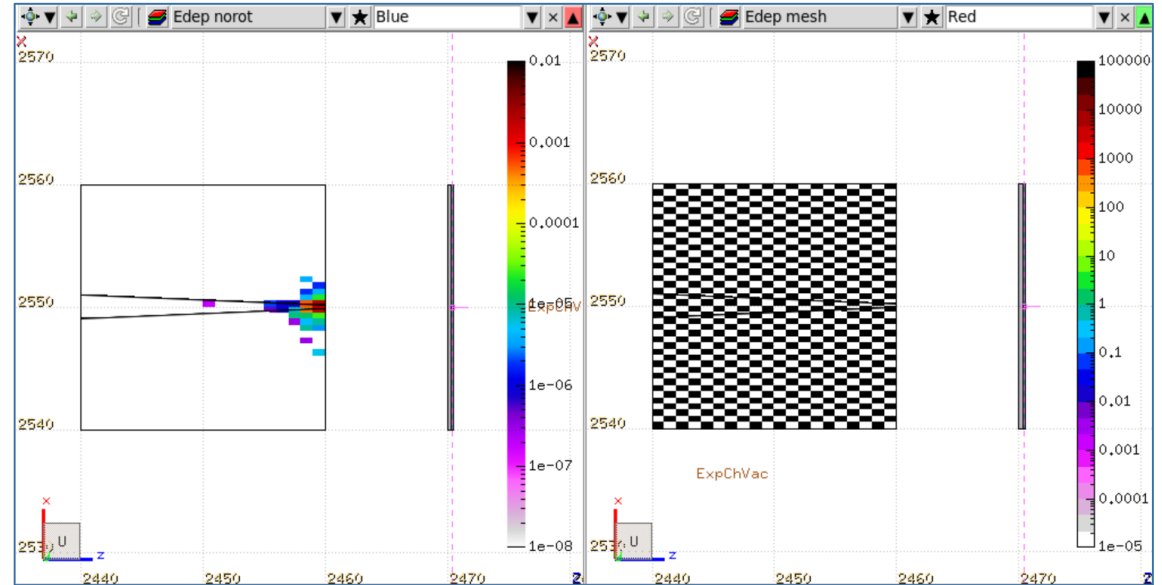# Result: particle fluence with straight collimator
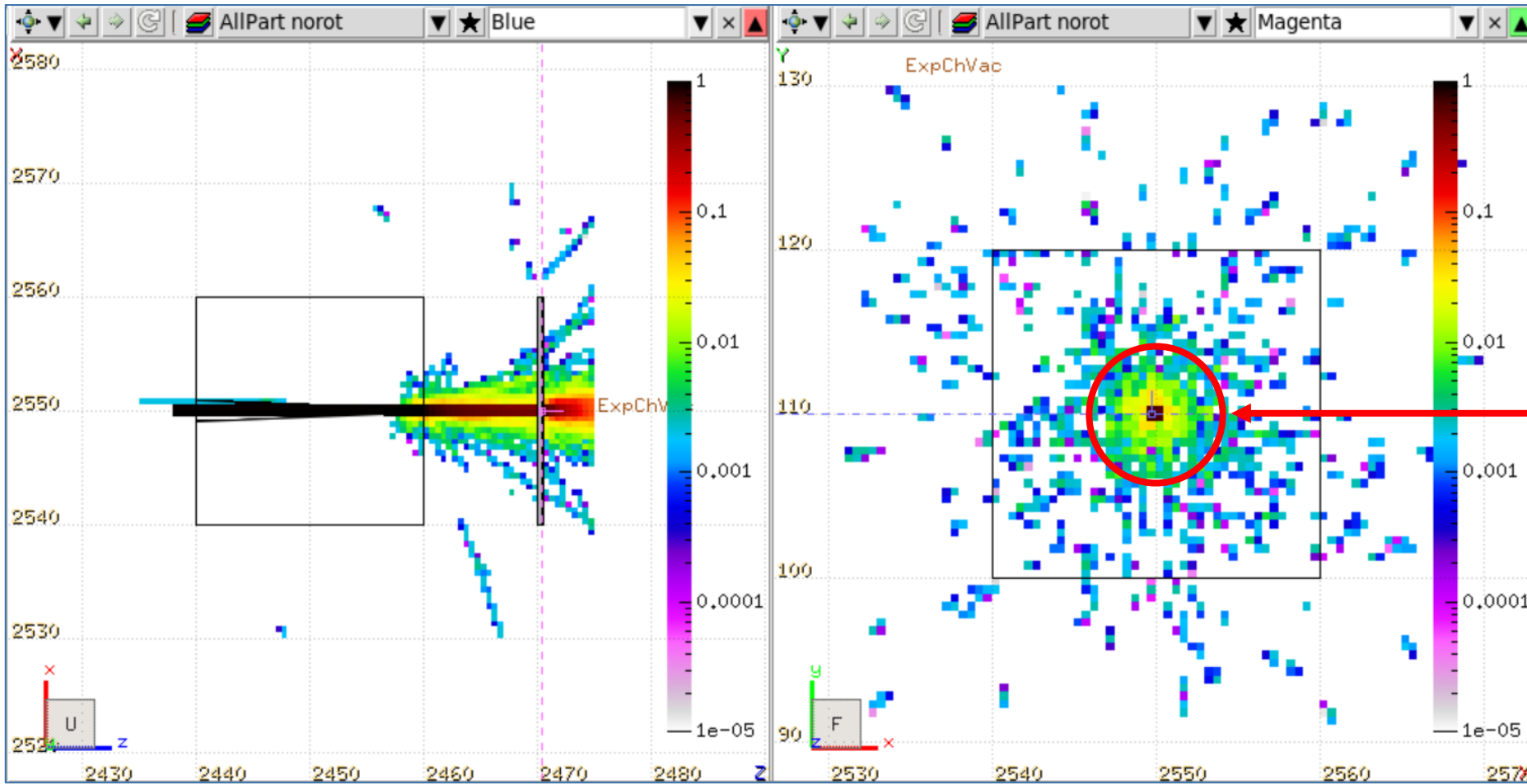
The electron beam hits the center of the Image Plate

Energy deposition

Without collimator rotation

With collimator rotation