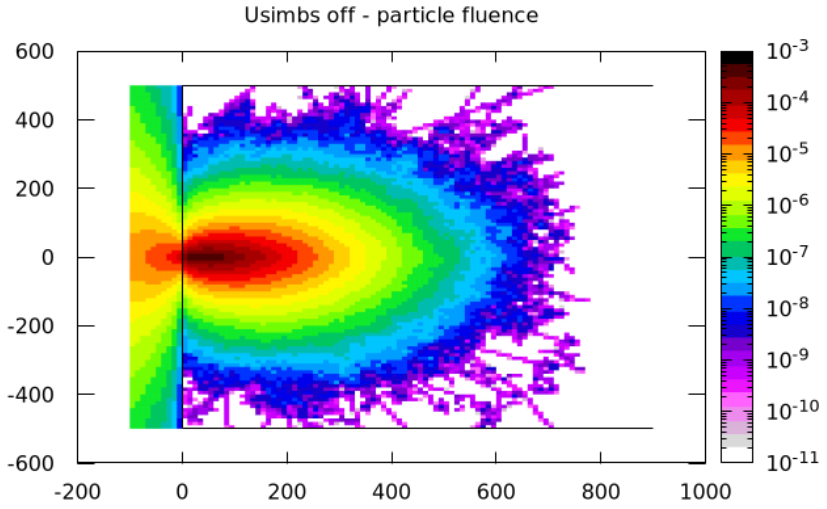
Usimbs biasing exercise

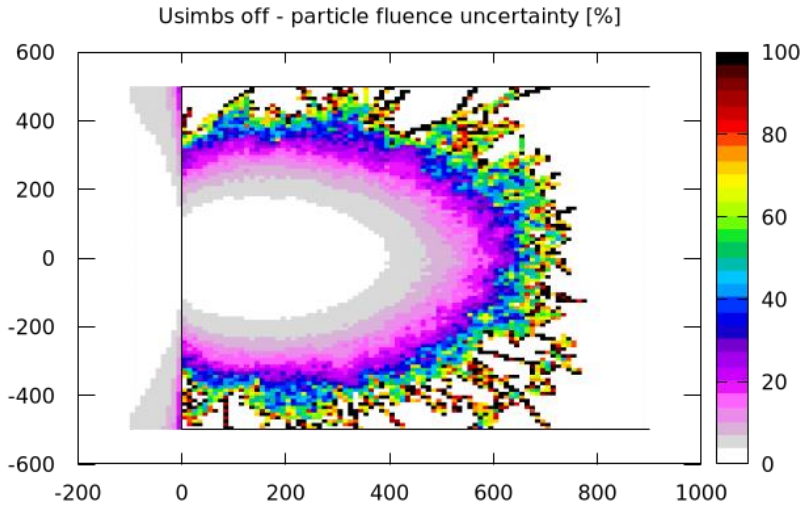
Usimbs biasing exercise

- Try to replicate the plots shown in the lecture

Usimbs off

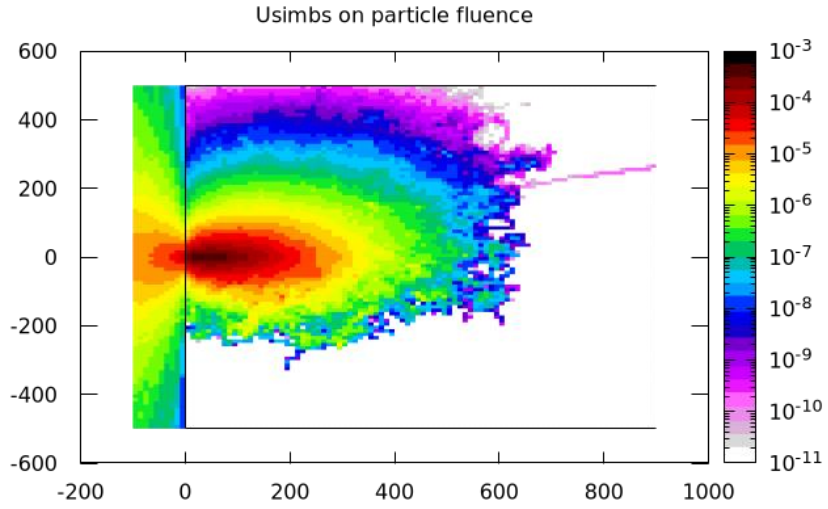
250000 primaries

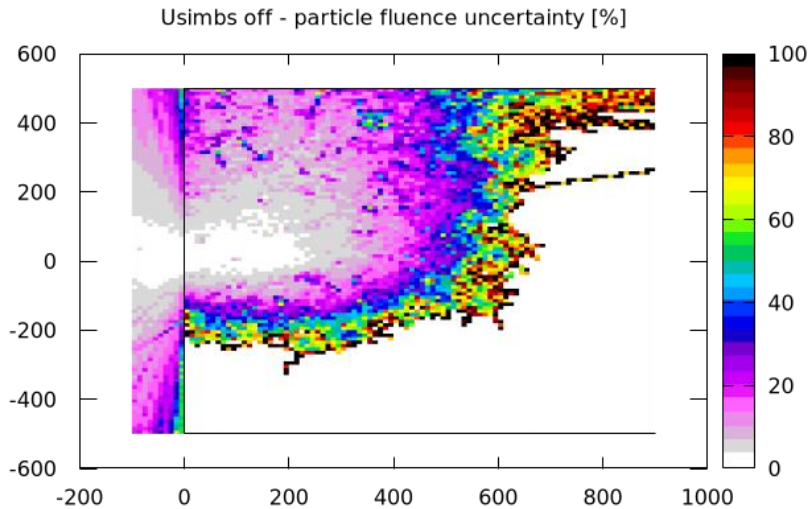




Usimbs on

25000 primaries





Usimbs biasing exercise

Input preparation and running

- Start from the input file provided
- No need to change the geometry (neutron on a concrete target)
- Add preprocessor instructions to use the same input to run with and without biasing
- Activate a call to usimbs
- Write your own usimbs.f function and compile
- Run a total of 25000 primaries, use cycles and spawn
  - Warning: 25000 primaries are not enough to reproduce the same plots shown
- Do not forget to merge the results

Usimbs biasing exercise

usimbs.f routine preparation (1/2)

- Start from the default routine that you can find in the Fluka installation folder
- Apply biasing only to neutrons in concrete
- Since dealing with neutrons, apply the biasing in the middle of the step, hints:
  - use entry **`USIMST`** use
  - don’t forget to save the modified step to use it in the **`USIMBS`** subroutine
- Modify particle importance to counterbalance neutron attenuation in concrete
  - Attenuation coefficient of 100 MeV neutron in concrete is 0.0204 cm^{-1}
- Increase neutron importance by 20%

Usimbs biasing exercise

usimbs.f routine preparation (2/2)

- Divert the shower toward the target point (x,y,z) = (10m, 0, 2m)
- Hints:
  - Find the current position and direction of the particle looking in the proper include file
    Have a look in the FLUKA environment lecture to find which one it is
  - Calculate the vector of the direction toward the target point
  - Exploit the angle between the direction of the particle and direction toward the target point
  - Remember that a cosine spans between -1 and 1
  - If the particle is going in the “right direction”, that’s good…
  - If the particle is going in the “opposite direction, that’s bad…

Usimbs biasing exercise

Plotting results

- In flair Geometry tab
  - Create four new layers to show all particles and neutron fluence with and without biasing
  - Add for each layer the appropriate USRBIN and detector
  - Use longitudinal views to see the biasing effect
- In flair Plot tab
  - Create eight USRBIN plots to show:
    - all particles and neutron fluence
    - with and without biasing
    - the corresponding statistical uncertainty
- Compare the results


FLUKA