Exercise 10: Importance biasing

FLUKA Beginner's Course

Exercise 10: Importance biasing

Aim of the exercise:

1- Discover biasing power

2- Experience region importance

3- Use of cylindrical mesh USRBIN

4- Plot USRBIN in the Geometry Editor

5- Use of Conditional Directives

Exercise 10: Importance biasing

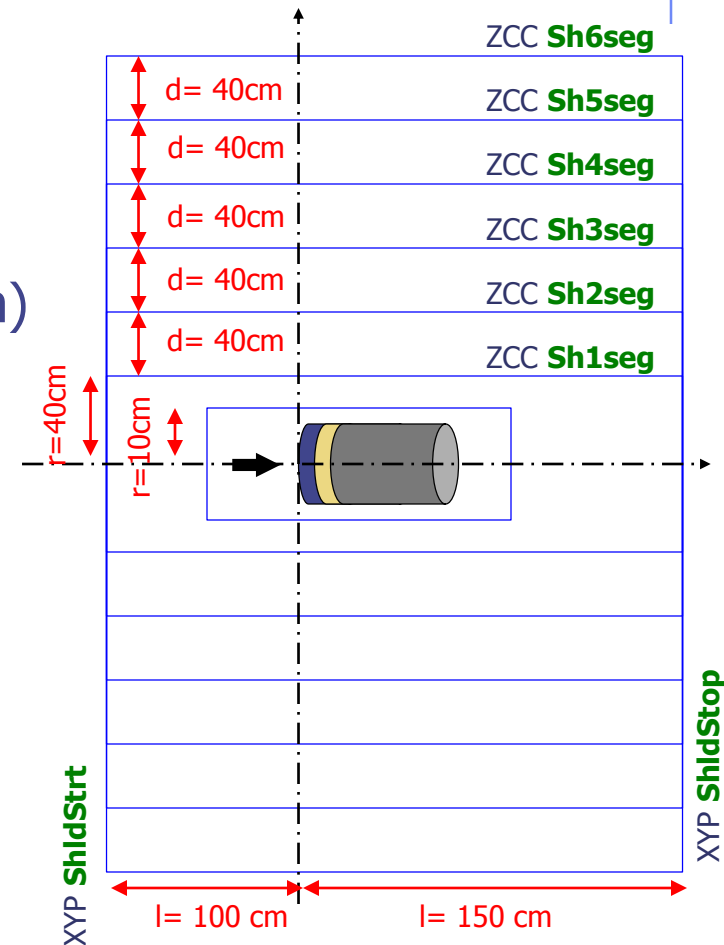❑ Start from the solution of ex5 (copy both inp and flair files):

  mkdir ex10 ; cp ex5/ex5.inp ex10/ ; cp ex5/ex5.flair ex10/ex10.flair ; cd ex10

❑ Geometry modifications:

  create a concentric shielding

❑ e.g.:

- Add 1 RCC surrounding the target

  (R=10cm ; Zmin=-10cm ; Zmax=30cm)

- Add 6 ZCC (radius = n x 40cm)

- Add 2 XYP planes

  (z=-100cm and z=150cm)

- Add 1 XZP plane (y=0)

Exercise 10: Importance biasing

Materials

❑ Shielding will be made of concrete

❑ Concrete is not a FLUKA predefined material

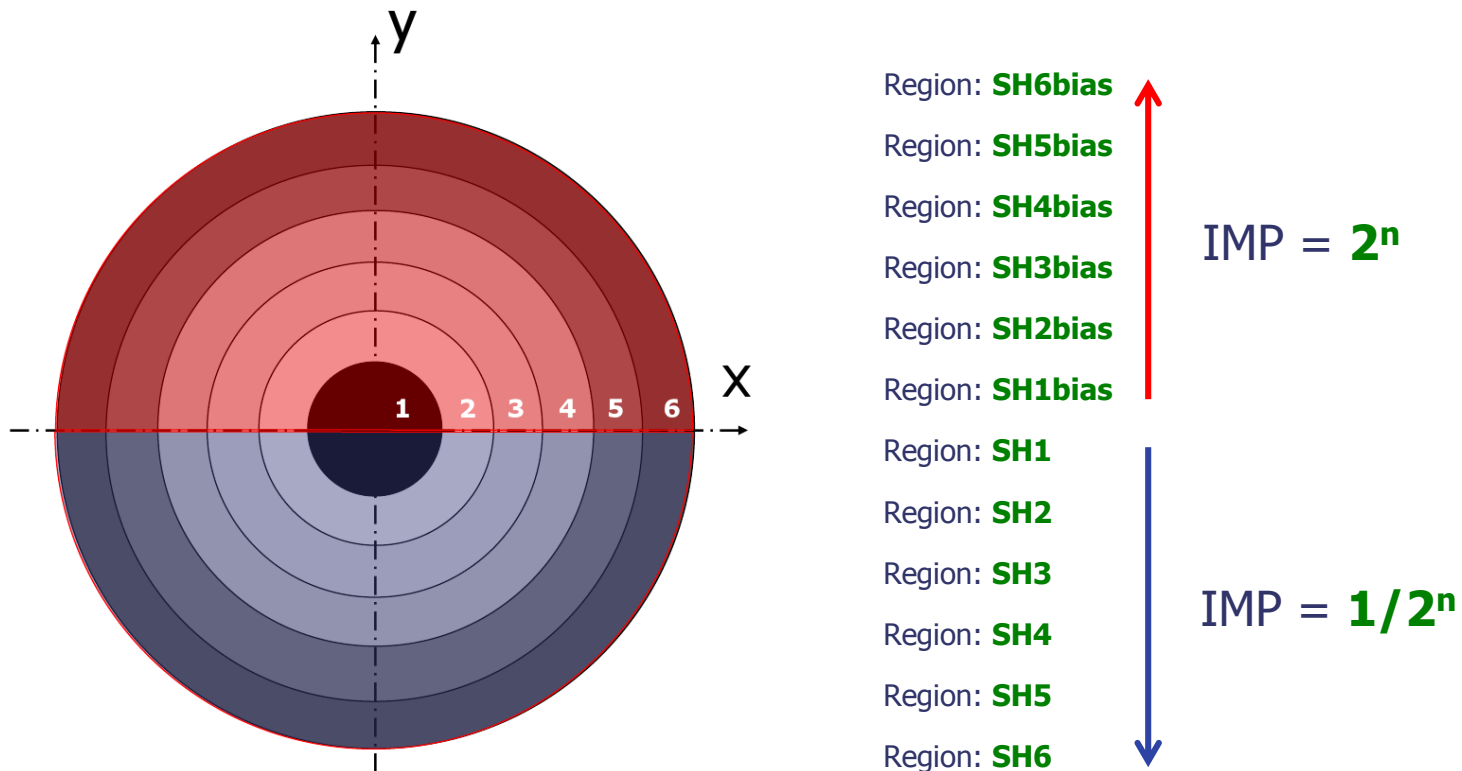❑ It has to be defined

<u>**Concrete:**</u>   (mass fraction)

Hydrogen	0.01	Aluminum	0.034
Carbon	0.001	Silicon	0.337
Oxygen	0.529	Potassium	0.013
Sodium	0.016	Calcium	0.044
Magnesium	0.002	Iron	0.014

Density: 2.42g/cm^3

❑ Assign it to all the shielding region

-Try doing it with one single card

Exercise 10: Importance biasing

- ❏ Set the importance to 1, for all regions and particles
- ❏ For regions having y>0 set importance to 2^n (n =#layer)
- ❏ For regions having y<0 set importance to $1/2^n$ (n =#layer)
- ❏ Enclose biasing within a #if Flag_BIAS statement

  (to be activated through #define)

y

X

1 2 3 4 5 6

Region: **SH6bias**

Region: **SH5bias**

Region: **SH4bias**

Region: **SH3bias**

Region: **SH2bias**

Region: **SH1bias**

$IMP = 2^n$

Region: **SH1**

Region: **SH2**

Region: **SH3**

Region: **SH4**

Region: **SH5**

Region: **SH6**

$IMP = 1/2^n$

Exercise 10: Importance biasing

Scoring

- ❑ Add one region independent scoring for neutrons (USRBIN)
  - ○ To span over the whole geometry
  - ○ To have sufficient bins
  - ○ To have cylindrical coordinates [i.e. **R-Phi-Z**]
  - ○ Unformatted output on unit 54

Run

- ❑ 2 separate runs, w/ and w/o biasing (do not overwrite results)
- ❑ 5 cycles, 10000 primaries each

Plot

- ❑ USRBIN results in Flair
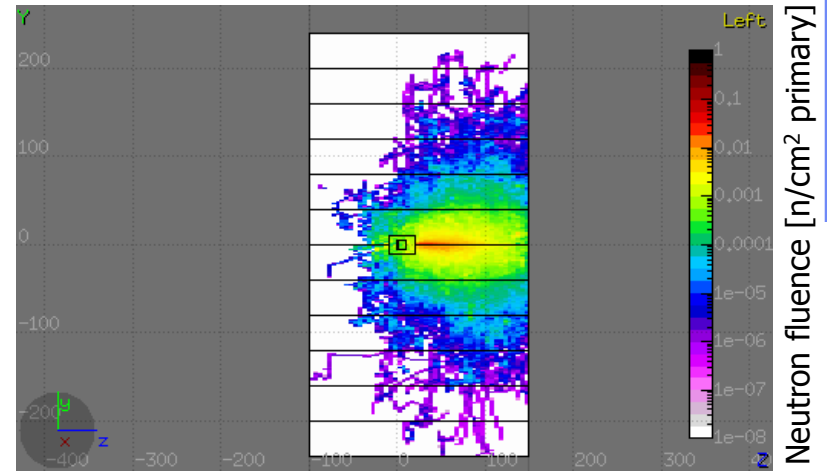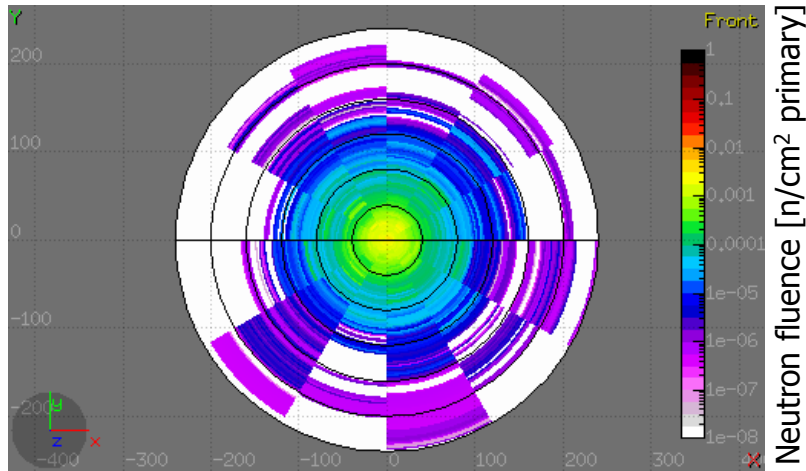- ❑ Region importance in the Geometry Editor
- ❑ USRBIN results in the Geometry Editor

Exercise 10: Importance biasing

How to display region importance in the Geometry Editor

Exercise 10: Importance biasing - Results

No BIAS

Region Importance Biasing

IMP = 2^n

IMP = $1/2^n$

IMP = 2^n

IMP = $1/2^n$