



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

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

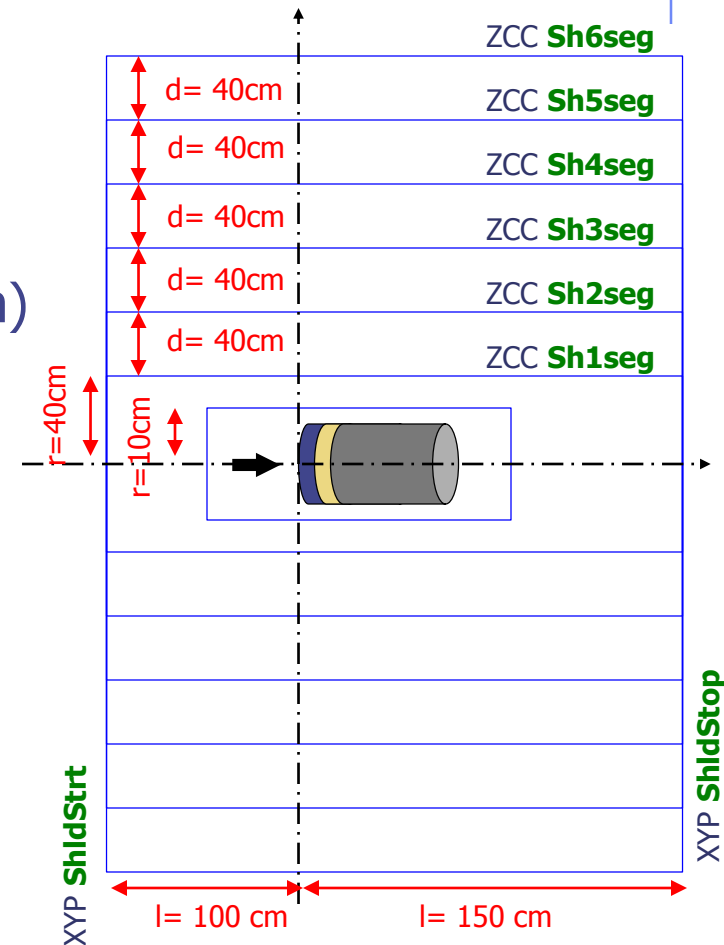
```
mkdir ex10 ; cp ex5/ex5.inp ex10/ ; cp ex5/ex5.flair ex10/ex10.flair ; cd ex10
```

- Geometry modifications:

create a concentric shielding

- e.g.:

- Add 1 RCC surrounding the target
($R=10\text{cm}$; $Z_{\min}=-10\text{cm}$; $Z_{\max}=30\text{cm}$)
- Add 6 ZCC (radius = $n \times 40\text{cm}$)
- Add 2 XYP planes
($z=-100\text{cm}$ and $z=150\text{cm}$)
- Add 1 XZP plane ($y=0$)



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Materials

- ❑ Shielding will be made of concrete
- ❑ Concrete is not a FLUKA predefined material
- ❑ It has to be defined

Concrete: (mass fraction)

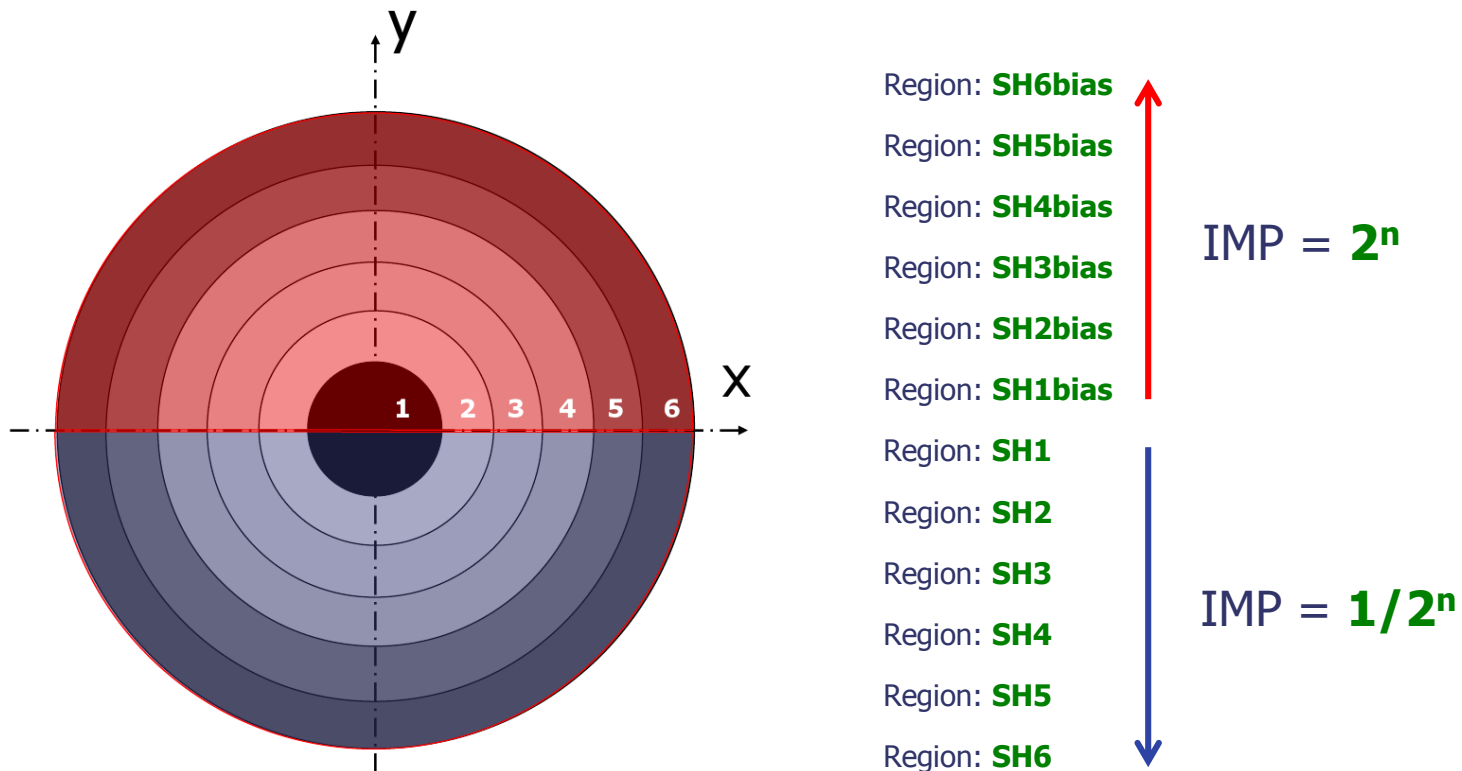
Hydrogen	0.01	Aluminum	0.034
Carbon	0.001	Silicon	0.337
Oxygen	0.529	Potassium	0.013
Sodium	0.016	Calcium	0.044
Magnesium	0.002	Iron	0.014

Density: 2.42g/cm³

- ❑ Assign it to all the shielding region
 - Try doing it with one single card

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- ❑ Set the importance to 1, for all regions and particles
- ❑ For regions having $y > 0$ set importance to 2^n ($n = \# \text{layer}$)
- ❑ For regions having $y < 0$ set importance to $1/2^n$ ($n = \# \text{layer}$)
- ❑ Enclose biasing within a `#if Flag_BIAS` statement
(to be activated through `#define`)



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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

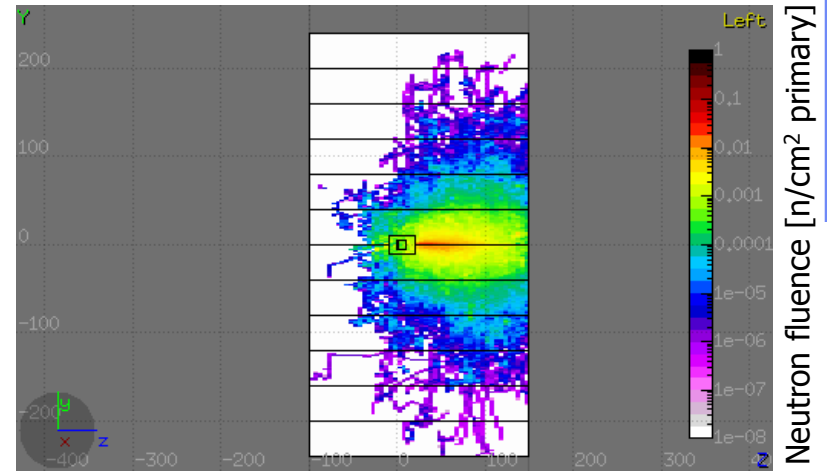
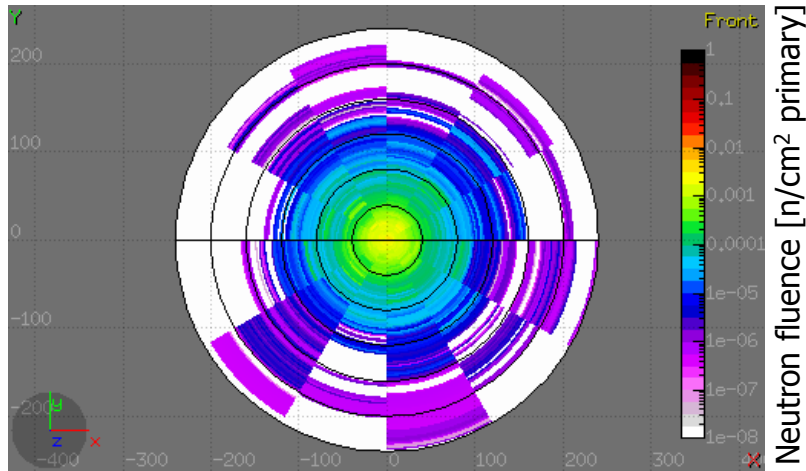
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How to display region importance in the Geometry Editor

The screenshot displays the Geometry Editor interface. The main window shows a circular region with concentric rings of different colors, representing importance biasing. The rings are labeled SH1 through SH6. The center is labeled SH1. The outermost ring is labeled SH6. The region is divided into two halves by a vertical dashed line. The left half is labeled 'OUTAIR'. A color scale on the right indicates importance values from 0.1 to 10. The interface includes a toolbar with various tools like Cut, Copy, Paste, Select, Pan, Orbit, Info, Body, Zone, Object, Clone, Visibility, Wireframe, Lock, Layer, and Layout. The menu bar includes Flair, Input, Geometry, Run, Plot, and Compile. The settings panel on the left shows the 'Bias(IMP)' menu item selected, with options for 'Show' and 'Palette'. The 'Show' section is checked, and the 'Color' is set to 'Importance-N'. The 'Palette' is set to 'Palette'. The status bar at the bottom shows the input file 'Inp: ex10.inp' and coordinates 'x: 158.7387039 y: -70.53883114 z: 97.5113'.

Exercise 10: Importance biasing - Results

No BIAS



Region Importance Biasing

