Exercise 9: Low Energy Neutrons

FLUKA Beginner's Course

Exercise 9: Low Energy Neutrons

Aim of the exercise:

1- More geometry practice

2- Use of Conditional Directives

3- Run parallel cases

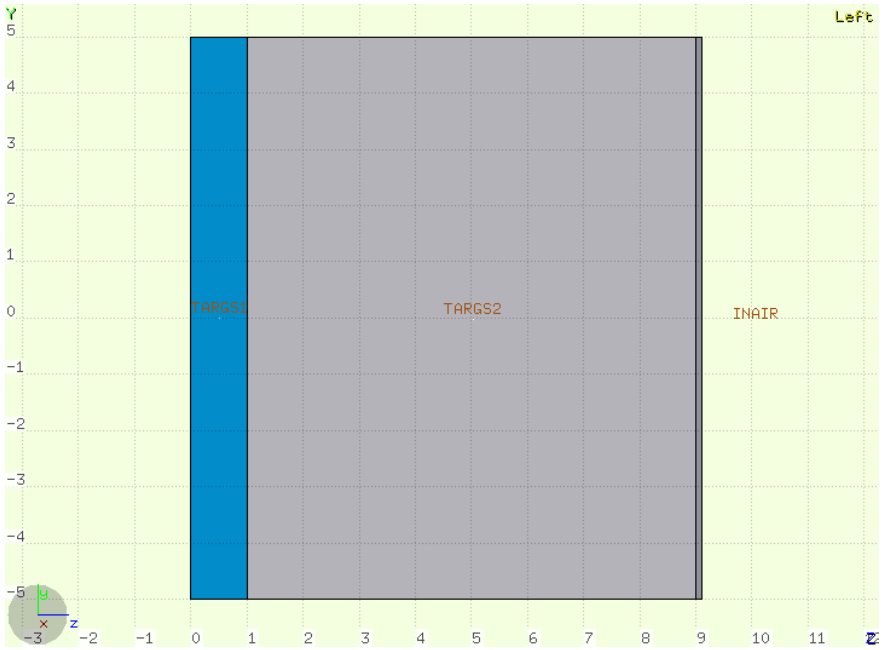
4- See FLUKA capabilities on low energy neutrons

Exercise 9: Low Energy Neutrons

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

  mkdir ex9 ; cp ex5/ex5.inp ex9/ ; cp ex5/ex5.flair ex9/ex9.flair ; cd ex9

- Geometry modifications:
  - Increase **TARGS2** size moving **T2seg** plane to **z=9 cm**
  - Squeeze **TARGS3** to 100 microns moving **ZThigh** to **z=9.01 cm**



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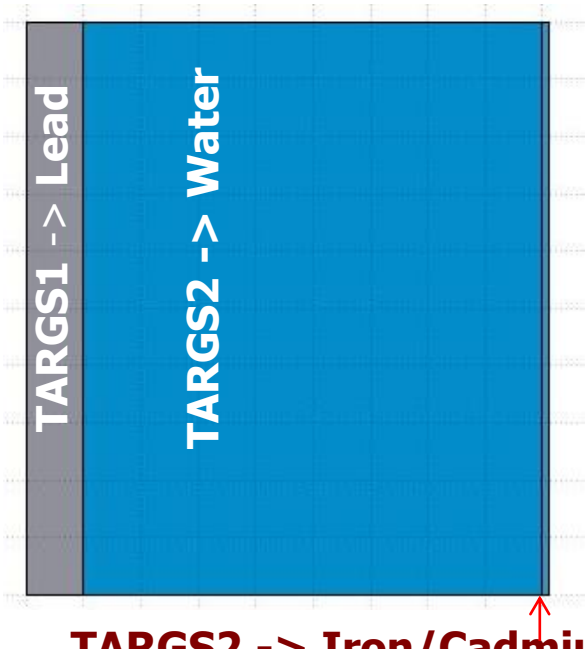
Material modifications:

- TARGS1 -> Lead
- TARGS2 -> Water
- TARGS3- > Iron/Cadmium

  (use #if … #else … #endif)
- NB: Cd is not a FLUKA predefined material

  MATERIAL cast must be defined

  (you can try to use Flair to add it)



#define Flag_IRON :

If Flag_IRON is defined, then Iron is assigned to the TARGS3 region otherwise Cadmium is assigned

#if	Flag_IRON ▼			
ASSIGNMA	Mat: IRON ▼	Reg: TARGS3 ▼	to Reg: ▼	
	Mat(Decay): ▼	Step:	Field: ▼	
#else				
ASSIGNMA	Mat: CADMIUM ▼	Reg: TARGS3 ▼	to Reg: ▼	
	Mat(Decay): ▼	Step:	Field: ▼	
#endif				
ASSIGNMA	Mat: CO2 ▼	Reg: INAIR ▼	to Reg: ▼	
	Mat(Decay): ▼	Step:	Field: ▼	

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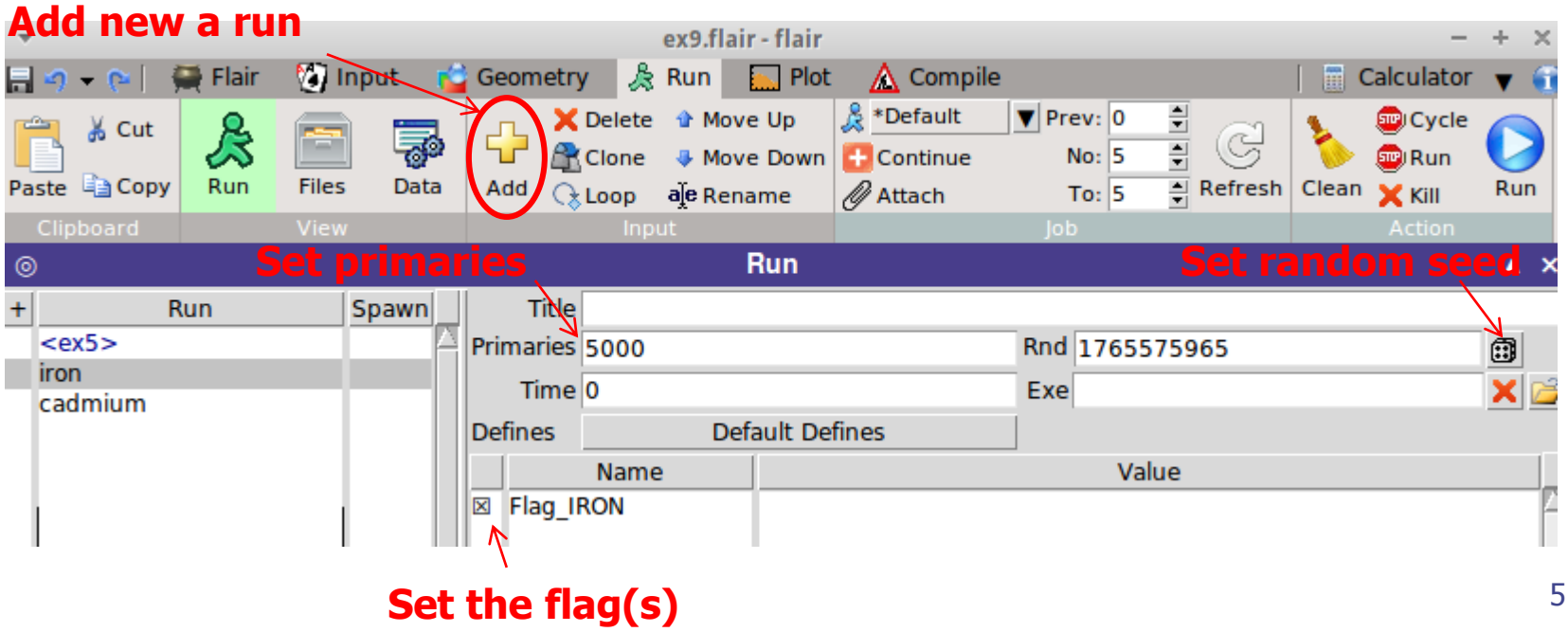
- Add boundary crossing scoring from TARGS3 to INAIR
  - Estimate neutron fluence (unformatted output on unit 53)
  - Use log energy binning down to the lowest energy group
- For both Fe and Cd: run 5 cycles, 5000 primaries each
- WARNING: do not overwrite results when running the 2nd case, create two runs in Flair and run them independently



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- Plot the results as a lethargy spectrum

  (x-axis: E [GeV],
  y-axis: dN/d(logE) [cm-2 per proton] (Value:<X>*Y),
  both log axis)

- For the **Iron** case:

  Identify the peak in thermal part of the spectrum

  Note the automatic matching of neutron group structure

- Compare with the results obtained in the **Cadmium** case