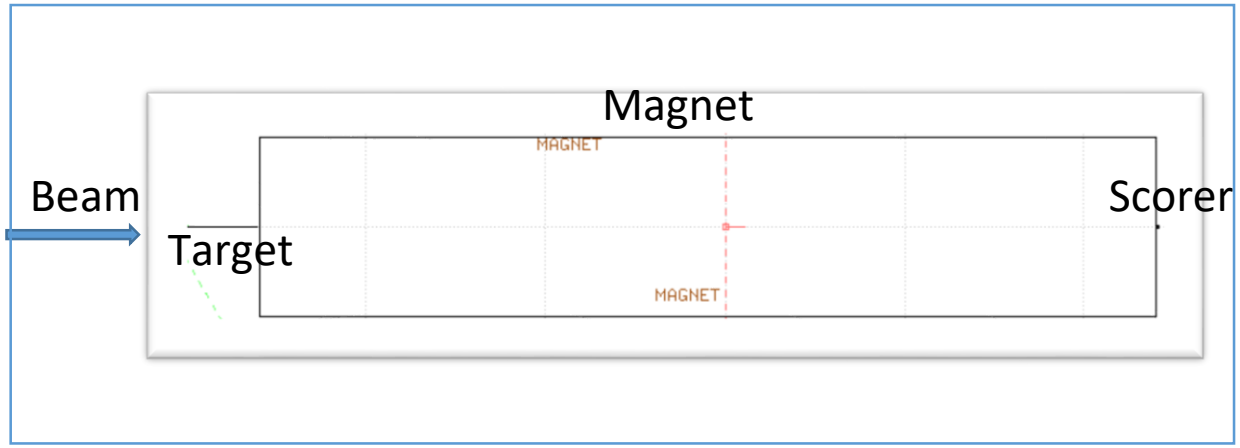
Secondary Beam Lines Exercise Solutions

First complete beam line in FLUKA

Secondary Beam Lines

Solutions for secondary beam lines exercise:

- Build the main components as described in the exercise task.
- Set the Magnet region to magnetic



SBL exercise solutions – Input File

Preparation of the input file:

- ```
  Magnetic field definition: 2 Tesla field in y
  MGNFIELD     Max Ang (deg):     Bound Acc. (cm):     Min step (cm):
                        Bx: 0              By: 2              Bz: 0
  ```

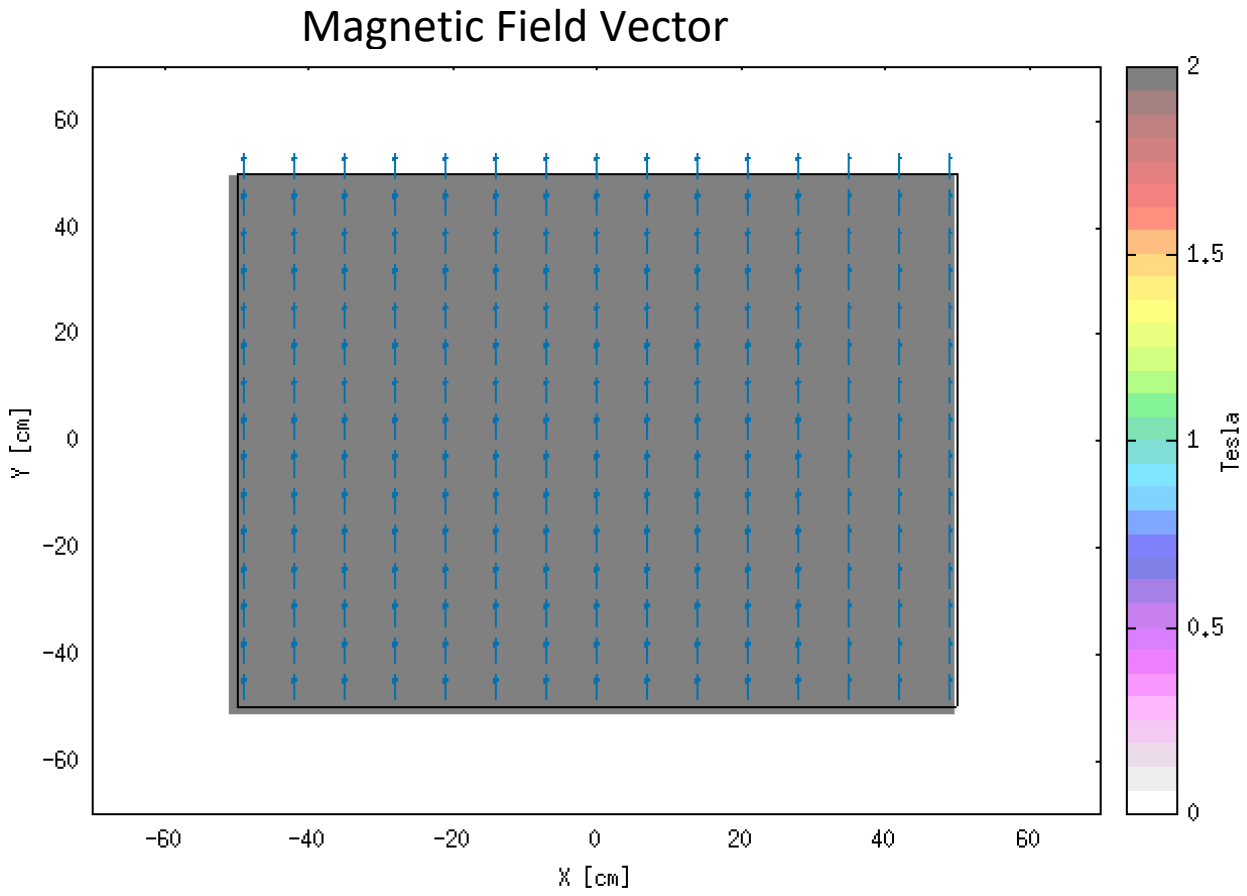
- ```
  Activated the magnetic option in field
  ASSIGNMA          Mat: VACUUM ▾     Reg: MAGNET ▾     to Reg:  ▾
                Mat(Decay):  ▾          Step:          Field: Magnetic ▾
  ```

- ```
  Scoring particles with usrtrack, neutrons in this case
  USRTRACK                                  Unit: 21 BIN ▾      Name: scoren
          Type: Log ▾          Reg: SCORE ▾                        Vol: 1
          Part: NEUTRON ▾      Emin: 50.      Emax: 400.           Bins: 50
  ```
  ```

SBL exercise solutions

Plotting Field

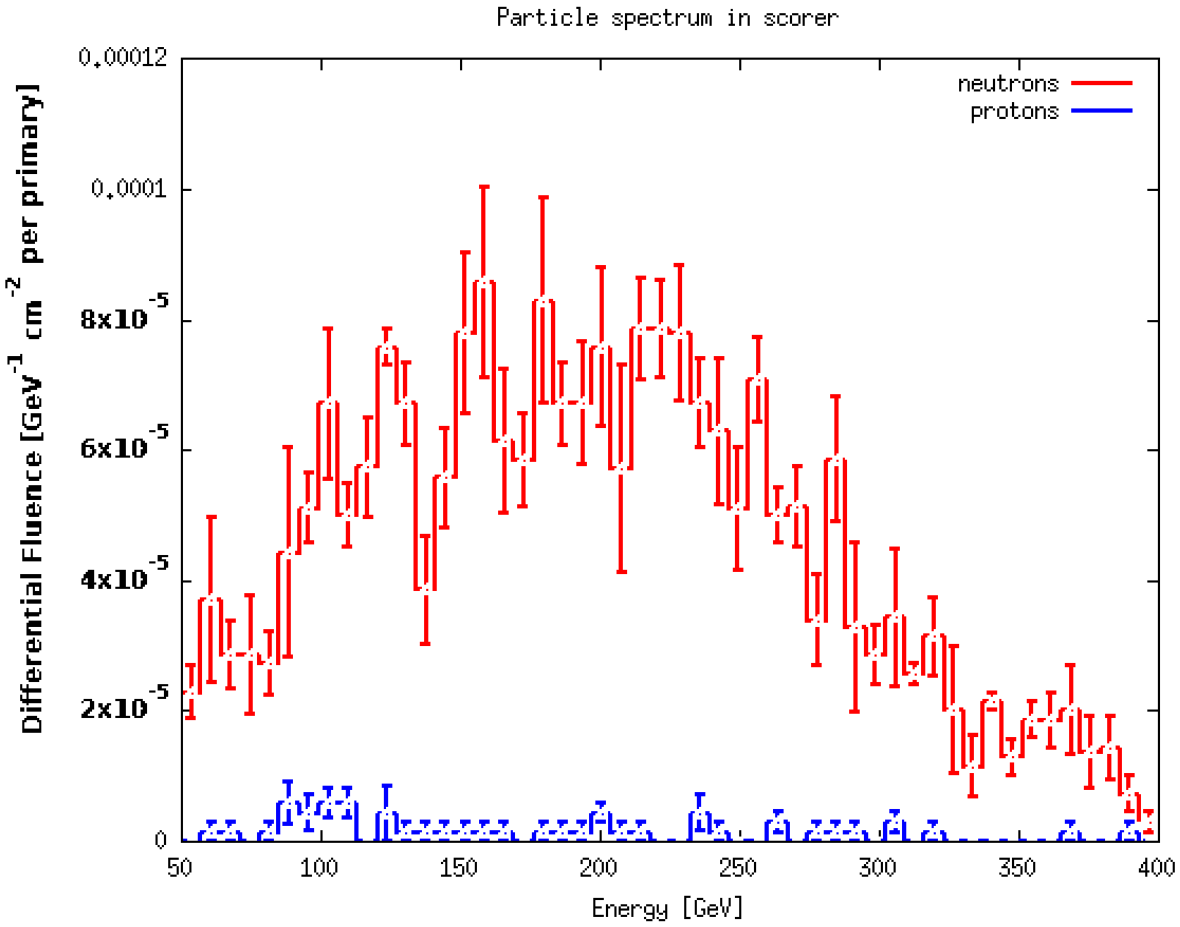
- In Flair Plot tab, check magnetic field:



SBL exercise solutions

Plotting particles spectra

- In Flair Plot tab, plot spectra:
  - The bending magnet sweeps away all the charged particles,
    therefore, we can only see neutrons with the defined scorer.



Spectrum for 100000 primaries

SBL exercise solutions – Optional Task

Calculating scoring volume size

- ϑ[rad] can be found using our values:

$$\vartheta[\text{rad}] = (0.29979 \times 2[T] \times 5[m])/400[\frac{\text{GeV}}{\text{c}}] = \sim 7 \text{ mrad}$$

- To see the displacement in x we can use:

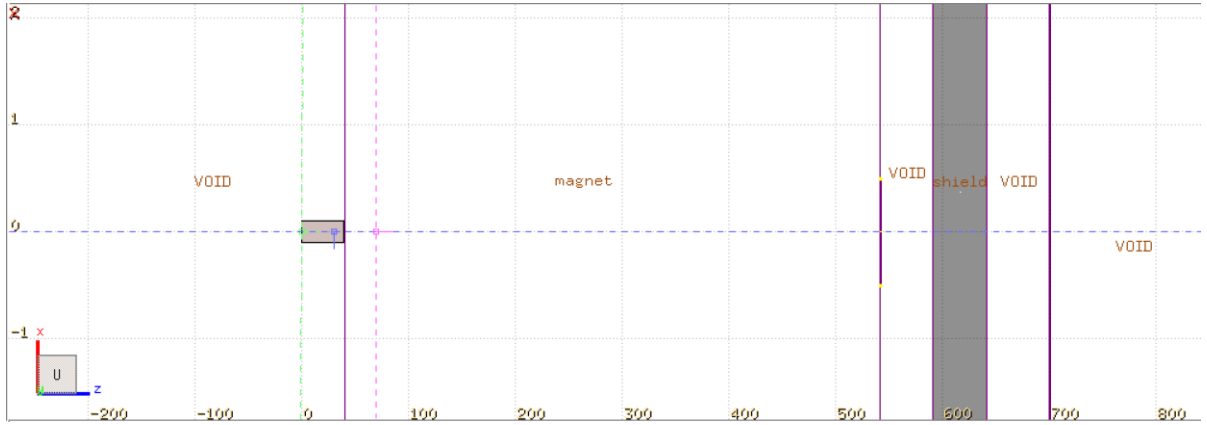
$$x = L/2 \times \vartheta \sim 2 \text{ cm}$$

- Therefore, our detector has to have an extension in *X* less than 2 cm in order to not detect primaries at 400 GeV/c.

SBL exercise solutions – Optional Task

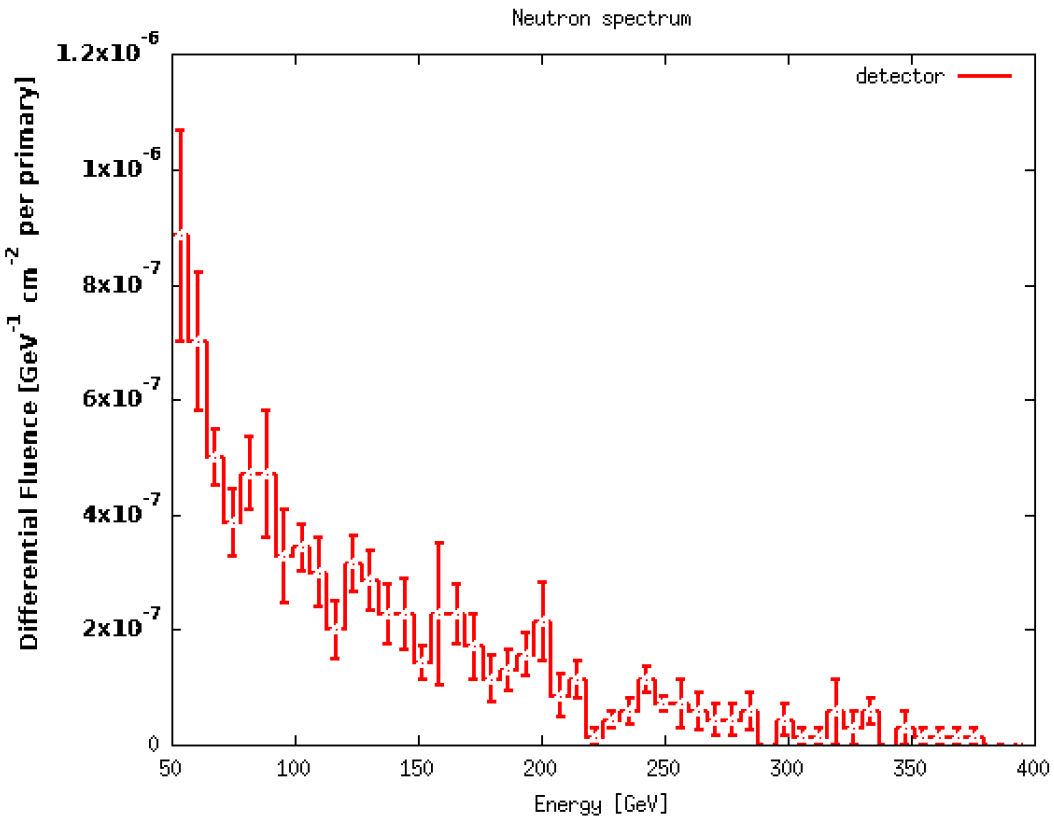
Adding Shielding

- The shielding and detector are added to the geometry:



- The fluence can be checked placing a USRTRACK card in the detector volume as done before:

USRTRACK		Unit: 22 BIN	Name: n
Type: Linear	Reg: detector		Vol:
Part: NEUTRON	Emin: 50	Emax: 400	Bins: 50




FLUKA