



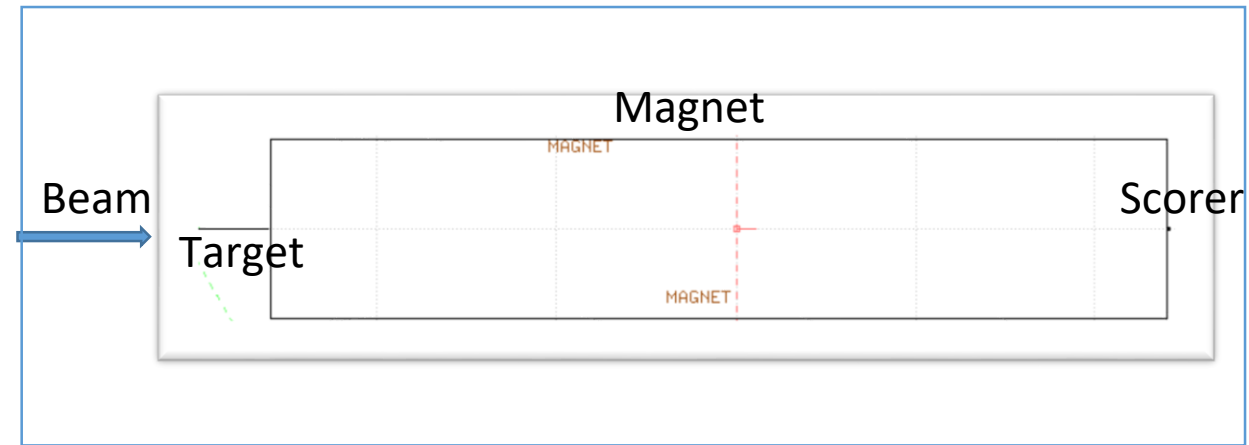
# Secondary Beam Lines Exercise Solutions

First complete beam line in FLUKA

# Secondary Beam Lines

## Solutions for secondary beam lines exercise:

- Built 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

```
U 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 ▼
```

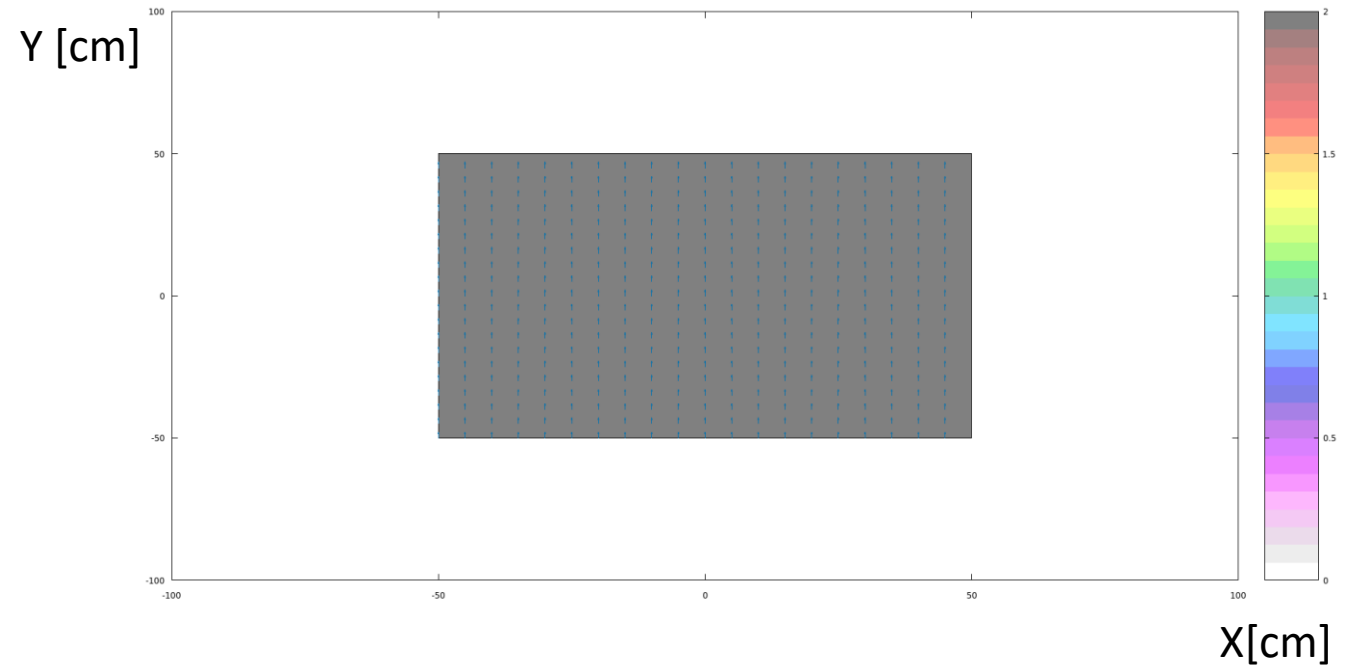
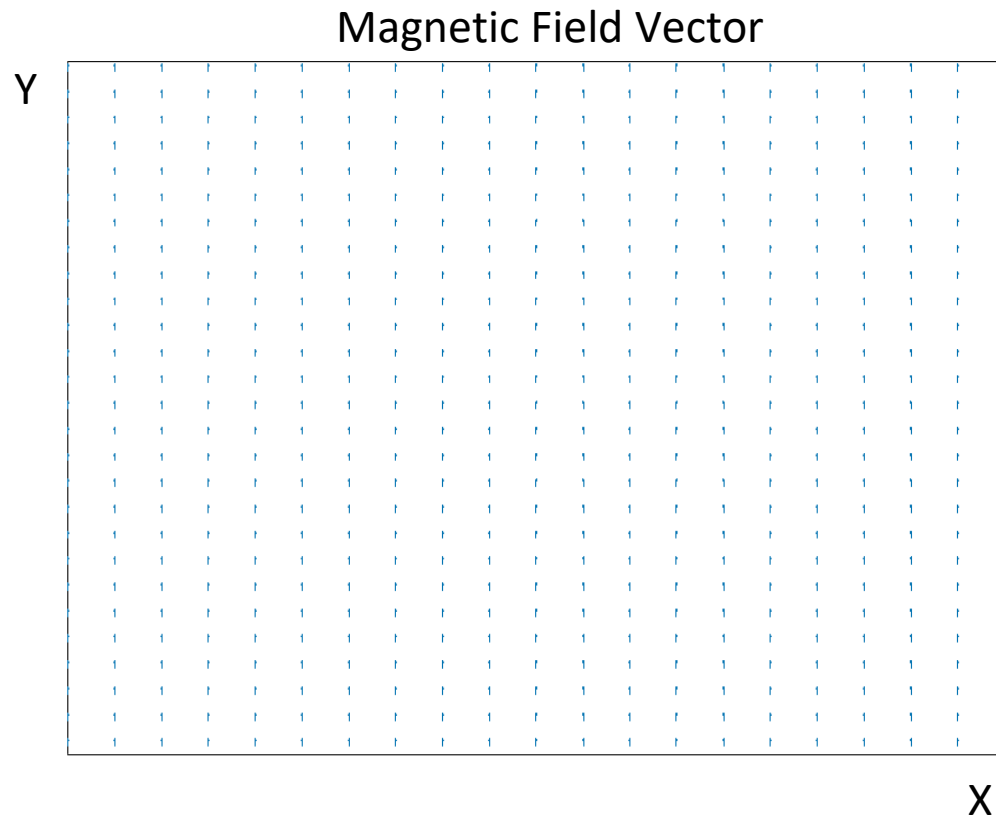
- Scoring particles with usrtrack, neutrons in this case

```
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:

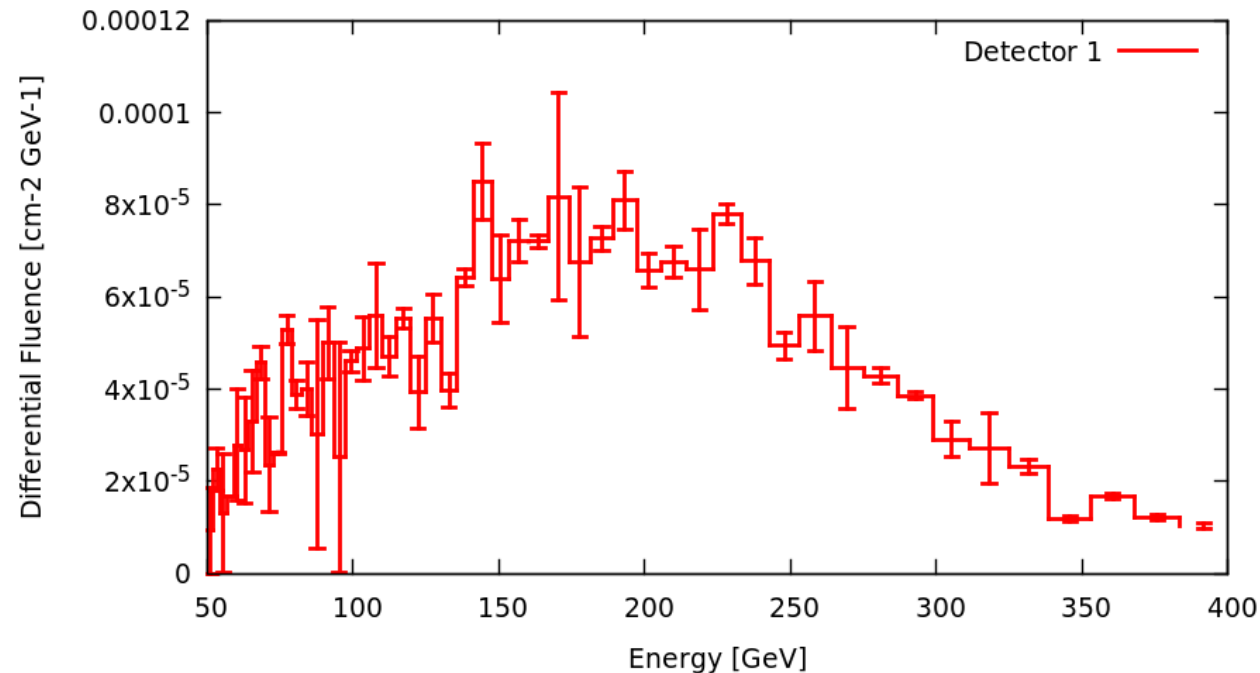


# SBL exercise solutions

## 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.

Neutrons Spectrum for 100000 primaries



# SBL exercise solutions – Optional Task

## Calculating scoring volume size

- $\vartheta$ [rad] can be found using our values:

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

- To see the displacement in x we can use:

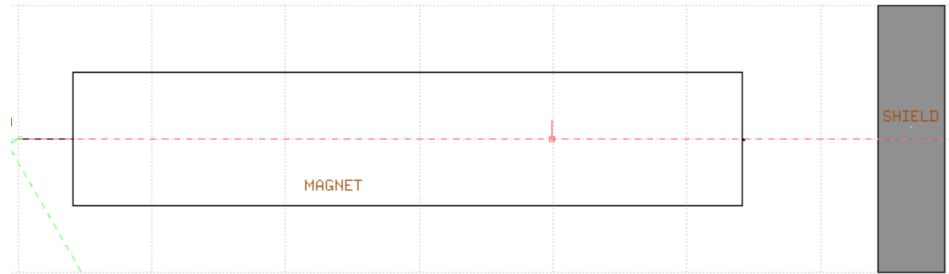
$$x = L/2 * \vartheta \sim 2 \text{ cm}$$

- Our detector has to therefore have an extension in x less than 2 cm in order to not detect primaries at 400 GeV/c.

# SBL exercise solutions – Optional Task

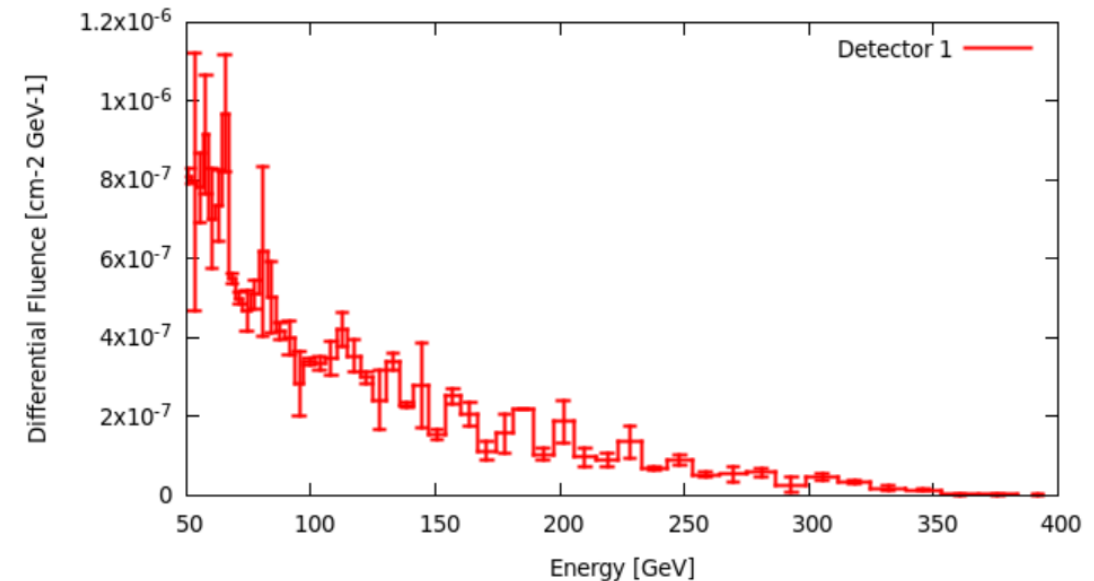
## Adding Shielding

- 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:

```
Scoring neutron at the experiment
USRTRACK                               Unit: 22 BIN ▼   Name: scoren1
Type: Log ▼                             Reg: SCORE1 ▼   Vol: 2500
Part: NEUTRON ▼                         Emin: 50.      Emax: 400.    Bins: 50
```





**FLUKA**