Exercise: Simple sources and preprocessor

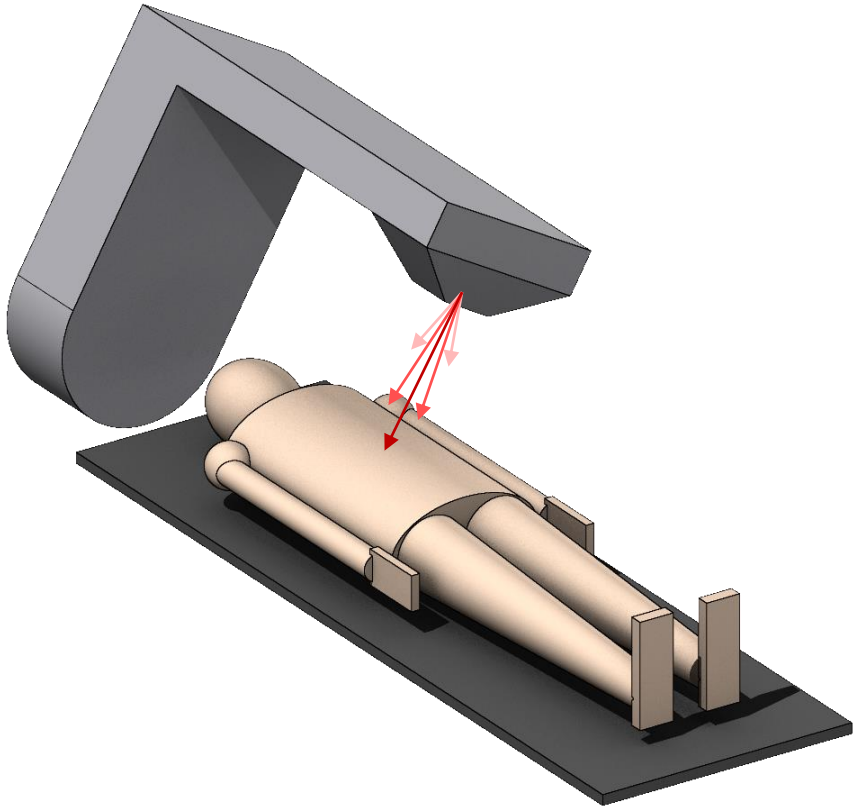
Exercise objectives

- Setting up different simple beams
  - Point source with **BEAM** and **BEAMPOS** card
- Using conditional preprocessor
- Using separate runs
- Visualising the beams
- Plotting the predefined scorings

Problem description

- Start from the provided input
- We want to run a simulation for radiation therapy (the geometry is provided)

- The beams should start in the gantry
  (x = 22.5, y = 38.97114317, z = 0.0)
  and be directed towards the origin (0,0,0)



- The following scorings are already included:
  - Side view of the beam
  - Shape of the beam close to the patient
  - Beam energy spectrum

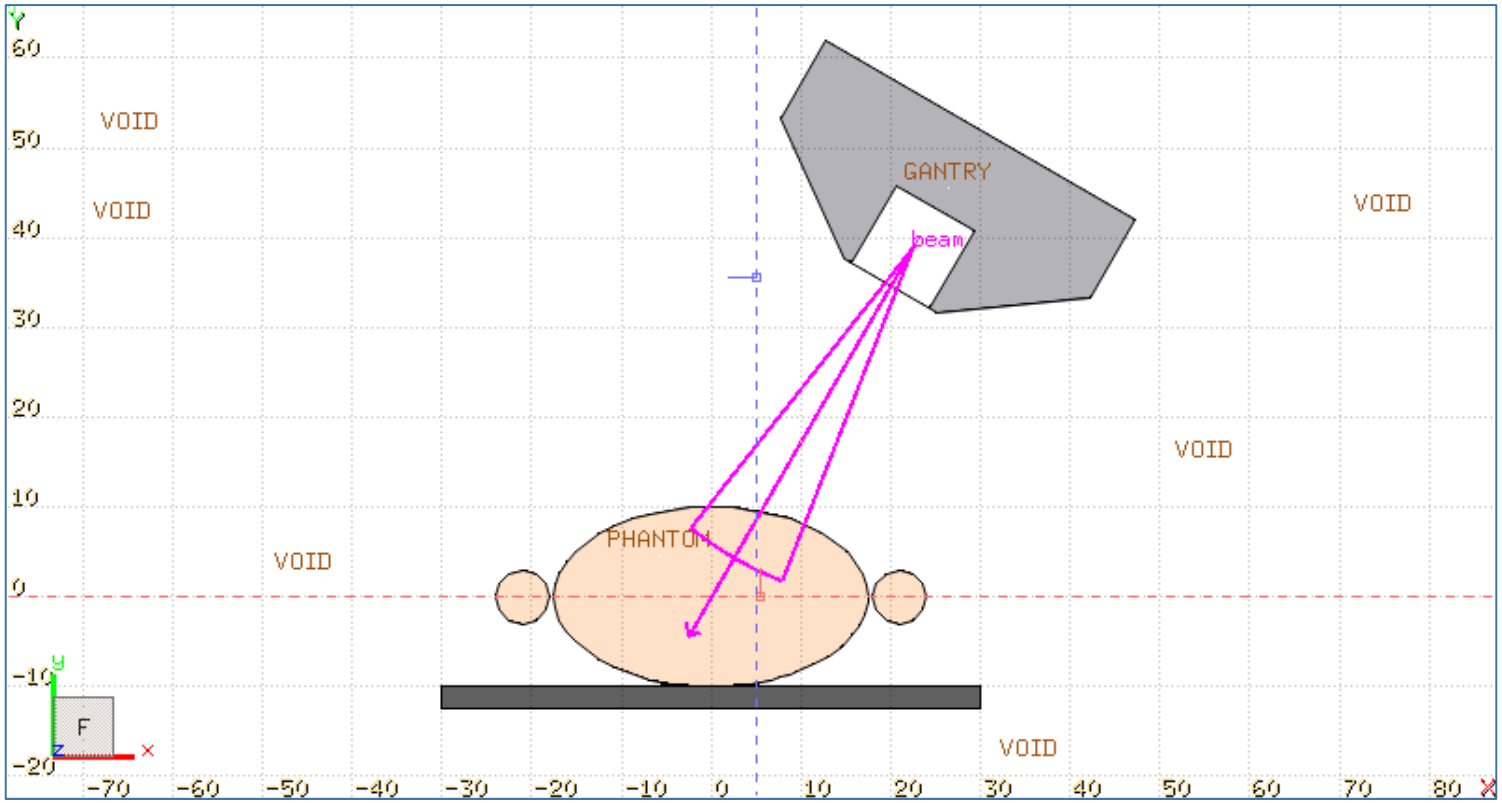
Defining and selecting a beam

- Set up two different photon beams with a flat 0.3 rad angular divergence but different momentum distributions:
  1. Flat momentum distribution between 5 and 10 MeV/c
  2. Gaussian momentum distribution: Mean energy = 10 MeV, FWHM = 1 MeV/c

- Define (`#define`) an identifier named "**Gaussian**"
- Make the two beams selectable using conditional preprocessor directives (`#if`, `#else` and `#endif`)
  - Make sure that if the "**Gaussian**" identifier is enabled, the corresponding Gaussian beam is used

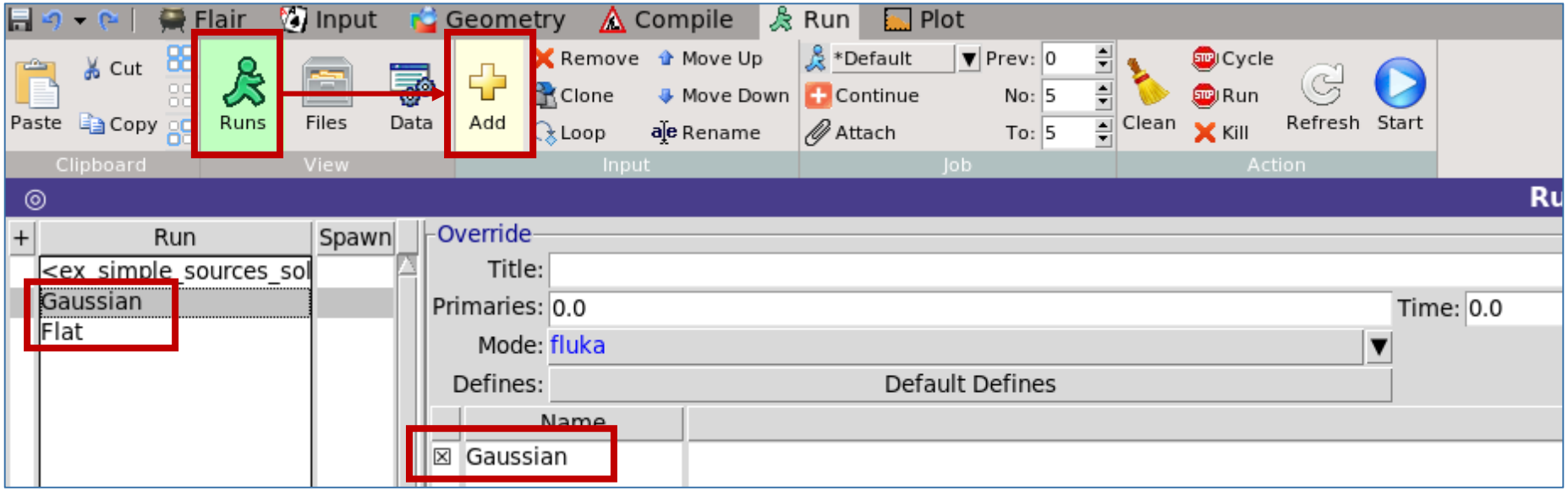
Visualising the beam

- Use the Geometry tab (Geoviewer) to see if the direction and angular divergence are correct
  - Set the scale property to 5000 to be able to see the beam



Creating separate runs (in the Run tab)

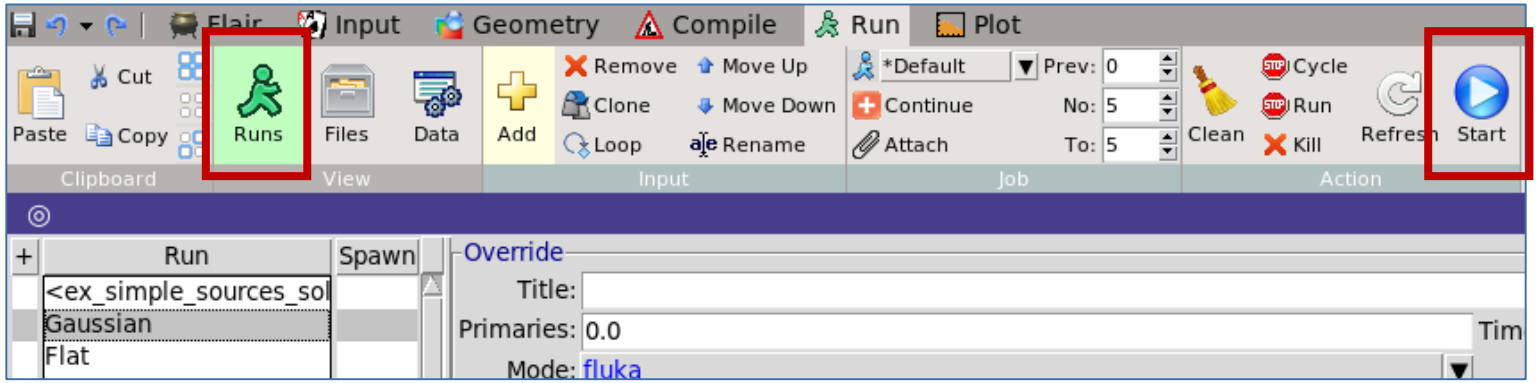
- Create two new runs called “**Gaussian**” and “**Flat**” in the Run tab



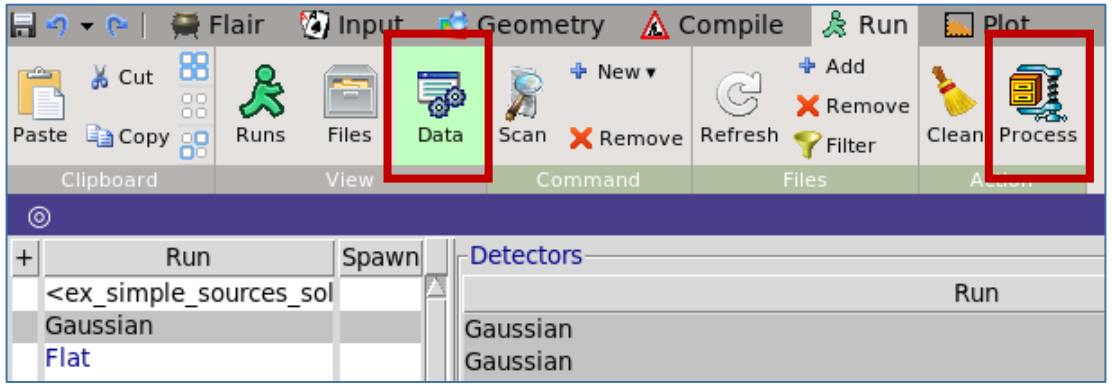
- You can enable or disable an identifier without changing it in the Input tab.
- If the box is checked then the identifier will be enabled, if it is unchecked the identifier will be disabled for the specific run
  - **Enable** the Gaussian identifier for the **Gaussian** run
  - **Disable** the Gaussian identifier for the **Flat** run

Run and process the simulations (in the Run tab)

- Run both simulations:
  - Select the name of the run and click **Start** on the Ribbon



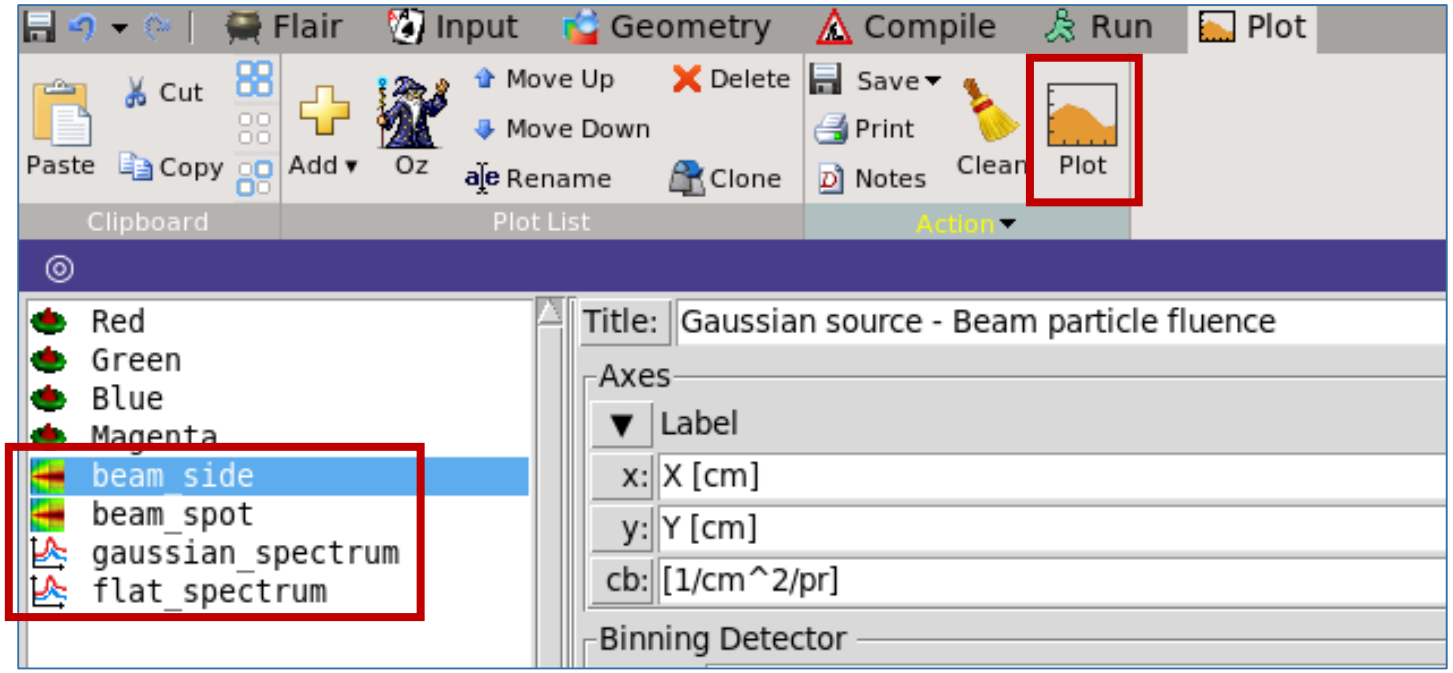
- Process both simulations after the runs are complete:
  - Click **Data** on the Ribbon, select the name of the run and click **Process** on the Ribbon



Plot the results

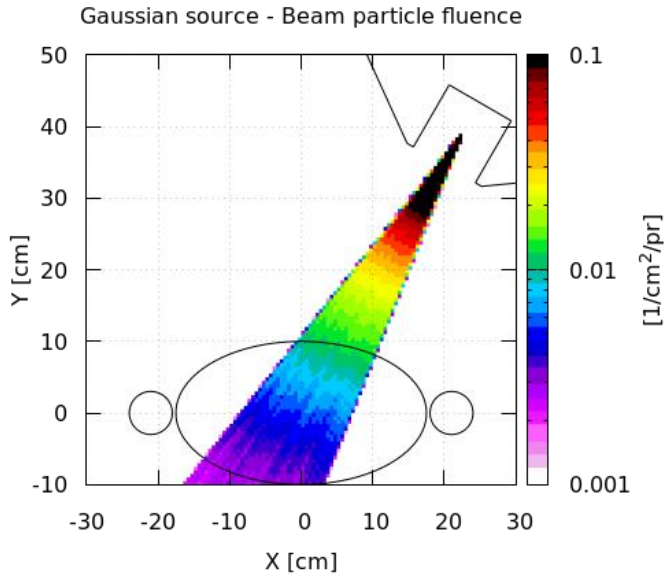
- 4 plots are already prepared:
  - Side profile of the beam
  - Spot shape of the beam
  - Energy spectrum of the Gaussian beam
  - Energy spectrum of the Flat beam

- To plot (in the Plot tab), select the name of a plot on the left side, then click the **Plot** button on the Ribbon

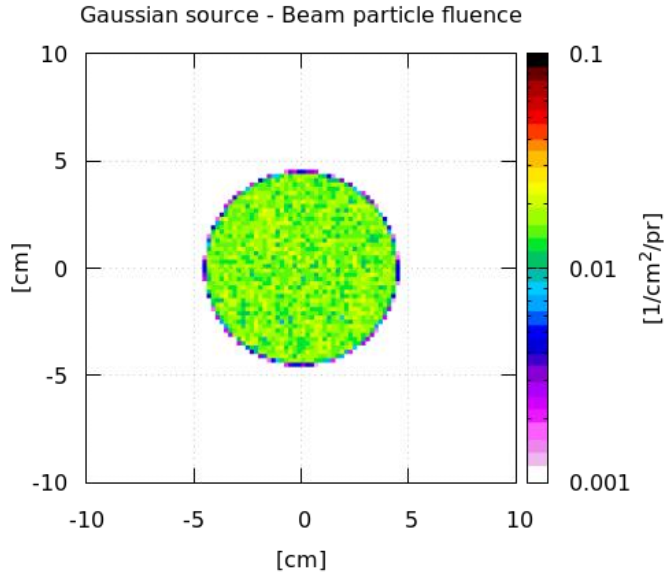


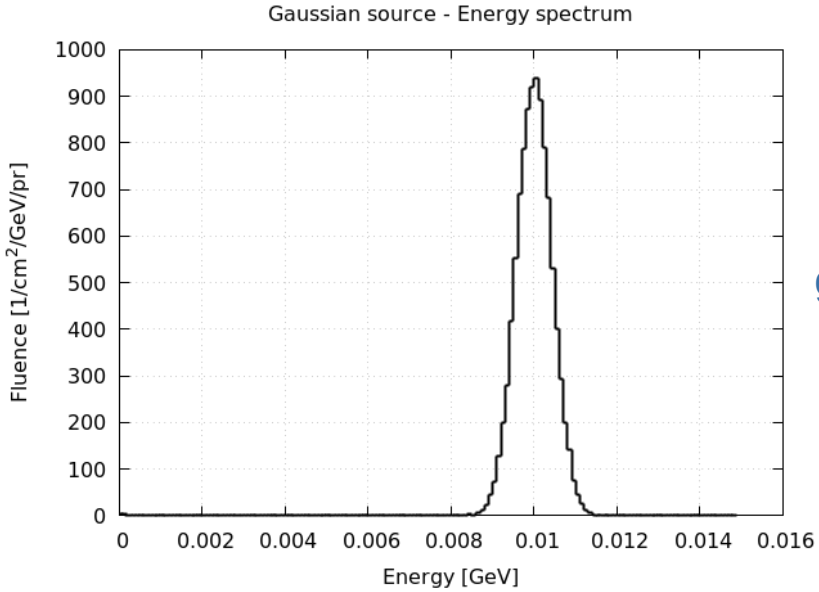
Expected results

beam_side

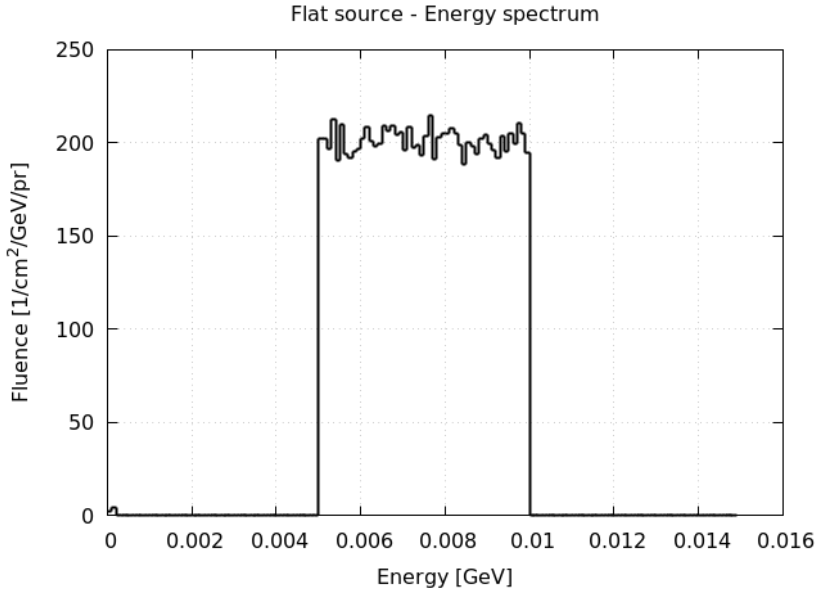


beam_spot





gaussian_spectrum



flat_spectrum


FLUKA