



Exercise 4: Magnetic field

Advanced FLUKA Course

Exercise 4a

- Goal

Modify the `magfld.f` routine from the exercises directory, for properly setting fields of the accelerator beam line previously built;

- Requirements

- Analytical expression of fields:

- ◆ dipole: constant in space, vertically directed (i.e. horizontal bending);
- ◆ Quadrupole: linear with transverse position on the local reference frame:

$$B_{\text{hor}} = g * y; \quad B_{\text{ver}} = g * x;$$

g is the gradient (T/m), x/y is the transverse position on the local reference frame (i.e. centred around the magnet axis);

- Magnetic settings:

- ◆ Dipole field: the one of the previous exercise;
- ◆ Quadrupole gradient: 4.9 T/m;

Exercise 4b

- **Goal**

shoot the beam through the entire beam line, and check the evolution of the beam position/profile in selected points;

- **Requirements**

- Activate the needed magnetic field regions (**ASSIGNMA** and **MGNFIELD** cards);
- Check that the sequence of quadrupoles is *Defocussing-Focussing – Focussing-Defocussing* (starting from the dipole);
- Link the magfld.f routine and compile Fluka;
- Use the same **USRBIN** detectors as those used when building the accelerator beam line;

Exercise 4b (II)

- **Tips & Suggestions:**
 - What is the net effect of the quadrupoles?
- **Variations:**
 - Displace vertically the first quadrupole: what happens at the end of the line?