



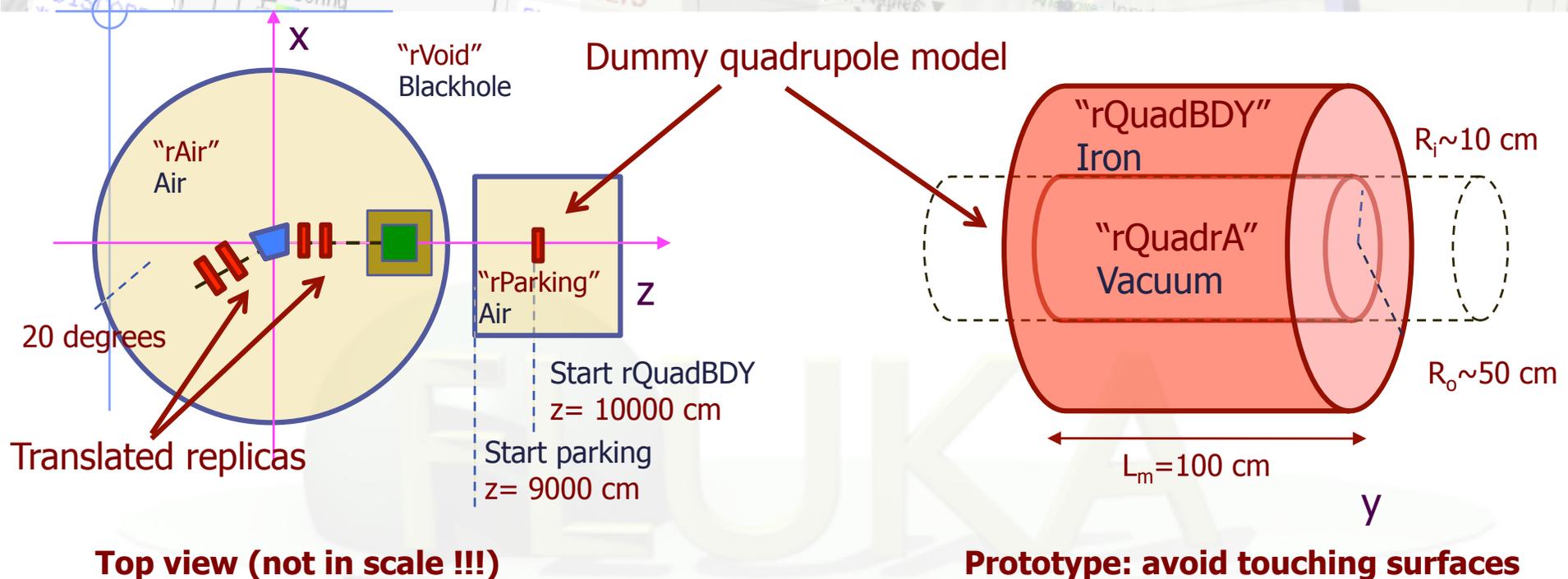
Fluka Exercise – Day 2

Hands on Fluka

Ex03 – LATTICE

- **GOAL:** complete the setup geometry with 4 **quadrupoles** and a **phantom**. **Magnetic field** for steering and focusing will be implemented in the next exercise;
- Recipe for **Lattice**:
 - Create a simplified prototype of quadrupole in a separate region of the geometry enclosed inside a blackhole boundary (called "**Parking**") away from the main geometry (for example at $z=10000$).
 - A **RCC** with a hole is sufficient for the quadrupole prototype (avoid touching surfaces);
 - Clone the prototype body 4 times (assign different names...);
 - Assuming the coordinate s running along the proton beam-axis, the entrance faces of quadrupole replicas should be located at $s[\text{cm}]=-800, -450, 350, 750$. (Note that for $z>0$ $s=z$ while for $z<0$ the beam line is inclined by 20 degree). Create 4 transformations (**ROT-DEFI**) which bring each replica over the prototype.
 - Use the geometrical directives $\$start_transform$ to place the replica bodies in their locations. As now you move the body (and not the particle) from the parking to the beam-line use the inverse transformation: $-[ROT-DEFI_name]$;
 - **Don't forget the LATTICE cards;**

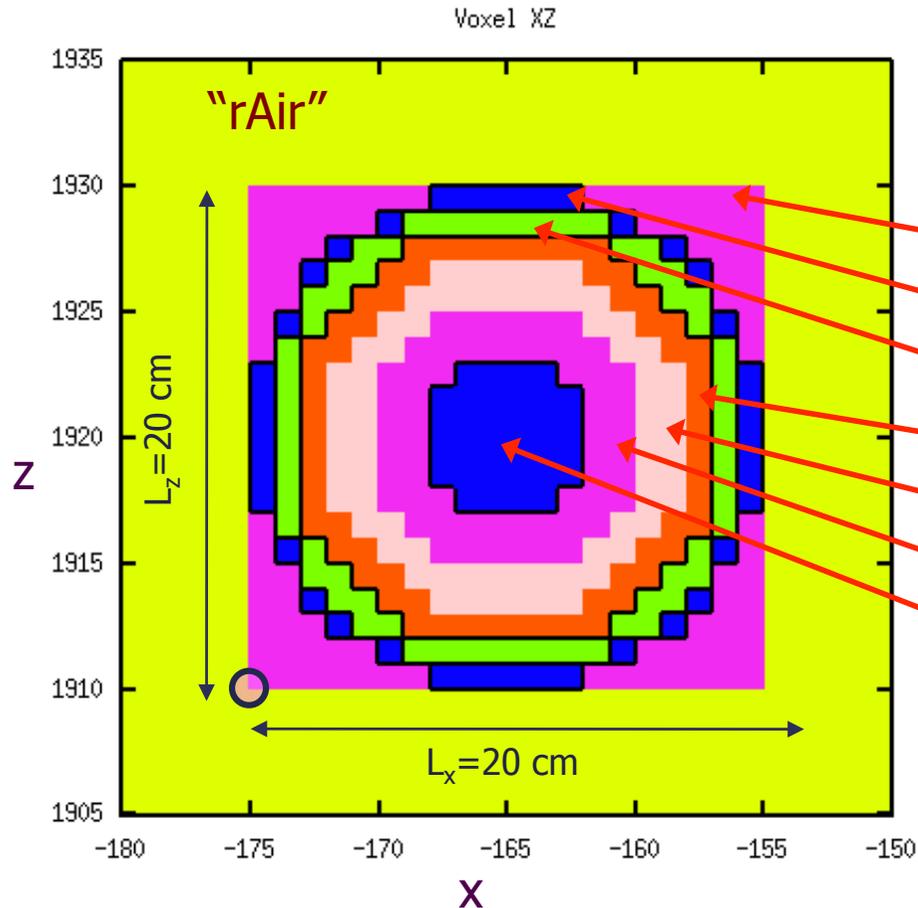
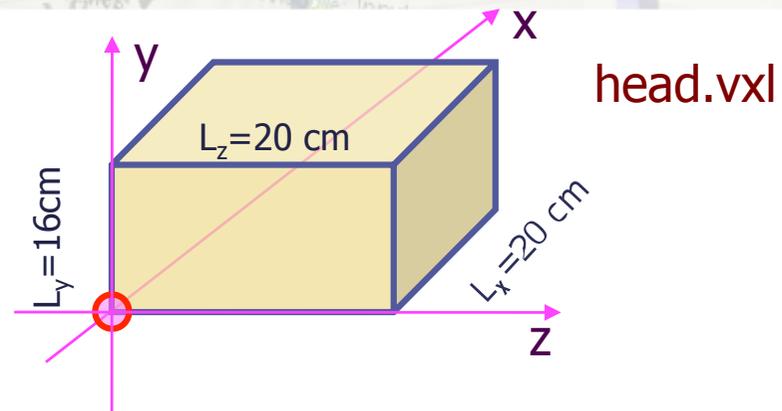
Ex03 – LATTICE and VOXEL



- Recipe for the VOXELS (Phantom):
 - The Phantom is defined with VOXELS. A brain egg-like structure is already available in the file `head.vxl` (generated with the program in `ex03-LatticeAndVoxels/head/writect.f`)
- Warning: Geoedit cannot see (yet) inside LATTICE and VOXELS which will therefore be represented by the containing boxes.

Ex03 – LATTICE and VOXEL

- Some hints for the **VOXEL** position and materials
- $1 \times 1 \times 1 \text{ cm}^3$ **VOXELS**



Example of ASSIGNMATs for the different regions (search the DB):

- "VOXEL": Vacuum;
- "VOXEL01" : Air (implicitly defined)
- "VOXEL02" : Skin, human (W&W type 2)
- "VOXEL03" : BONECOMP (implicitly def.)
- "VOXEL04" : Brain (ICRP)
- "VOXEL05" : Brain (ICRP)
- "VOXEL06" : Brain (ICRP)
- "VOXEL07" : Borated (^{10}B) brain.

Ex03 – LATTICE and VOXEL

- ^{10}B : You must create a single isotope material. Name the element BORON-10 to automatically load the low energy neutron cross sections;
- For the borated brain make a new compound. Set a mass composition of 70% Brain – 30% ^{10}B (even though it's unrealistic!!!)
- Useful scoring to be inserted:
 - Score the energy deposition and the neutron fluence in the VOXELS;
 - Adapt the USRBIN binning to the VOXEL structure;