



# Flair – Geometry Editor – Part I

Advanced FLUKA Course

# Starting the Geometry Editor

The screenshot shows the Geometry Editor software interface. The main window title is "[untitled] - flair". The top menu bar includes "Flair", "Input", "Geometry", "Compile", "Run", and "Plot". The "Geometry" menu is circled in red, and a red arrow points from this circle to a text box on the right that says "Click on 'Geometry' Tab". Below the menu bar is a toolbar with various icons for "Region", "Delete", "Wireframe", "Lock", "Layer", "Layout", "Body", "Zone", "Object", "Clone", and "Visibility". The main workspace is divided into four orthographic views: "Front", "Top", "Left", and "Back". Each view shows a 3D coordinate system with axes labeled x, y, and z. The "Front" view shows the x-z plane, "Top" shows the x-y plane, "Left" shows the y-z plane, and "Back" shows the x-z plane from the opposite side. The status bar at the bottom displays the coordinates: "Inp: x: -72.45762712 y: 52.96610169 z: 0".

Click on "Geometry" Tab

# Geometry editor

- Working on 2D cross sections of the geometry;
- Interactive visual editing of the geometry in 2D;
- Debugging bodies/regions in a graphical way;
- Fast 3D rendering of the geometry;

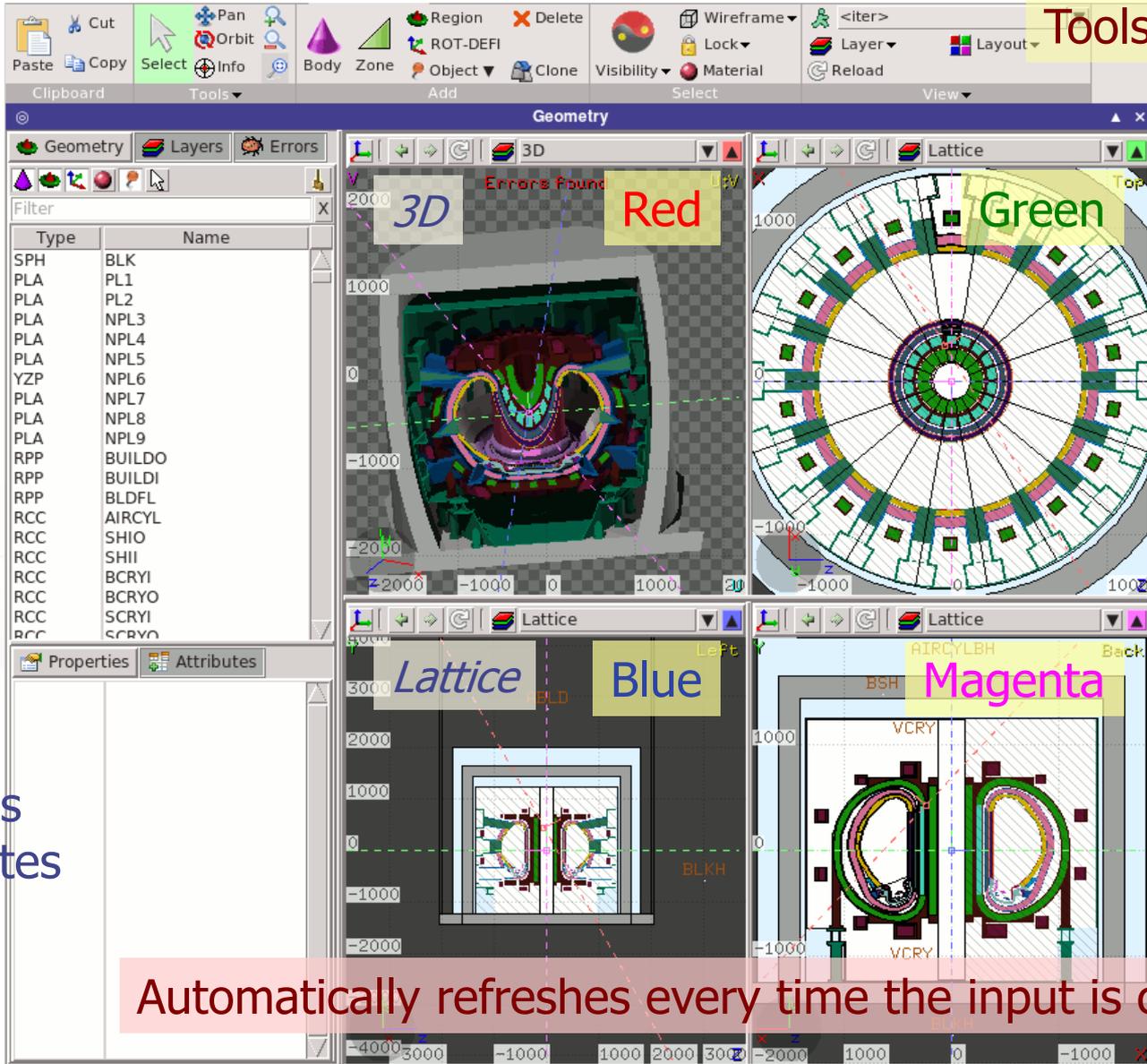
## Pros

- Fast display of complex geometries;
- Many user-customizable layers;
- Graphical editing of the bodies with snapping mechanism to generate accurate coordinates;
- Visual selection and editing of zones **w/o the need to know the orientation of bodies;**
- Use real curve of bodies with no conversion to vertices/edges;
- Interactive debugging with information of problematic bodies, regions and/or zones;

## Cons

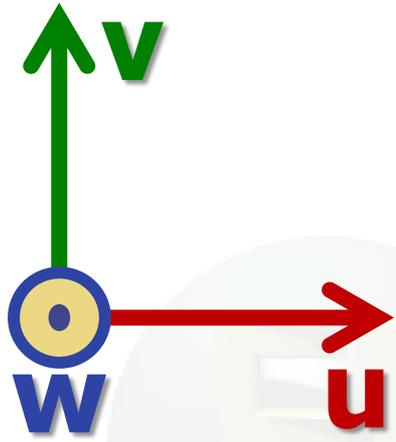
- Tricky to orientate in an unknown geometry;
- Difficult to find region using the expression;

# Geometry Editor: Interface



Automatically refreshes every time the input is changed

# Viewport axes System

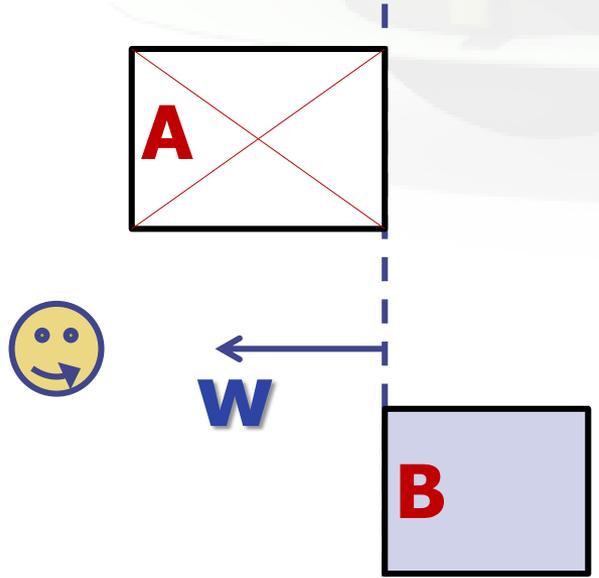


Each viewport is defined by:

- **Origin** center of viewport
- **Basis** relative axes system  $u, v, w$ .  $w$  is coming out of the screen towards the user
- **Extends** zooming

**Note:**

- Each viewport is facing towards negative  $-w$
- If bodies  $A, B$  are touching the viewport like on the plot.
- Only body  $B$  will be **visible**



# Navigation - Keyboard

- [arrows] pan viewport
- Ctrl + [arrows] orbit viewport around **u,v** axes
- + [Shift] rotates by 90°
- Page Up/ Page Down pan viewport front/back
- Ctrl + PgUp/PgDn rotate viewport around **w** axis
- = / - zoom in / zoom out
- o open projection dialog to set the origin/basis/save/recall etc...
- Ctrl-0 (zero) Center to origin
- Ctrl-1, Ctrl-2 **front [X:Y] / back [-X:Y]**
- Ctrl-3, Ctrl-4 **left [Z:Y] / right [-Z:Y]**
- Ctrl-5, Ctrl-6 **top [Z:X] / bottom [-Z:X]**

*Assuming: Z = direction of the beam (horizontal)  
X = horizontal  
Y = vertical*

# Navigation – Mouse [1/2]

With the **left** mouse button:

1. Select the appropriate action pan/orbit/zoom with:
  - I. Menu → Tools
  - II. Toolbar
  - III. Keyboard shortcut
2. Click and drag the desired viewport

	function	key	description
	Pan	x	Pan viewport
	Orbit	t	Orbit viewport using a virtual <b>t</b> trackball
	Zoom	z	Drag area to <b>zoom</b> In ([ <b>Ctrl</b> ] to zoom out)
		Shift-Z	Zoom viewport on selected items
		Alt-Left	Go to previous in history projection
		Alt-Right	Go to next in history projection
	Center	c	Center all (non 3D) viewports to mouse location

# Navigation – Mouse [2/2]

- With the **middle** mouse button
  - Click                      centers clicked position (defines it rotation center)
  - drag                        Pan/Move viewport
  - **Ctrl**                        orbit projection using a virtual trackball
  - **Ctrl-Middle-Shift** orbit projection using a virtual trackball with steps of 15 degrees
  - **Shift**                        select rectangle region and zoom into
  - **Shift-Middle-Ctrl** select rectangle region and zoom out
- **Wheel** (if any)            zoom in/zoom out
  - **Ctrl-Wheel**                pan/move forward or backward
  - **Ctrl-Shift-Wheel** smoother pan/move forward/backward
- With the **right** mouse button
  - alone                        opens popup menu
  - Shift                        pan/move viewport
  - Ctrl                         orbit projection using a virtual trackball



When **laptop mode** is enabled in the Preferences/Geometry then the **middle** and **right** buttons are **swapped**

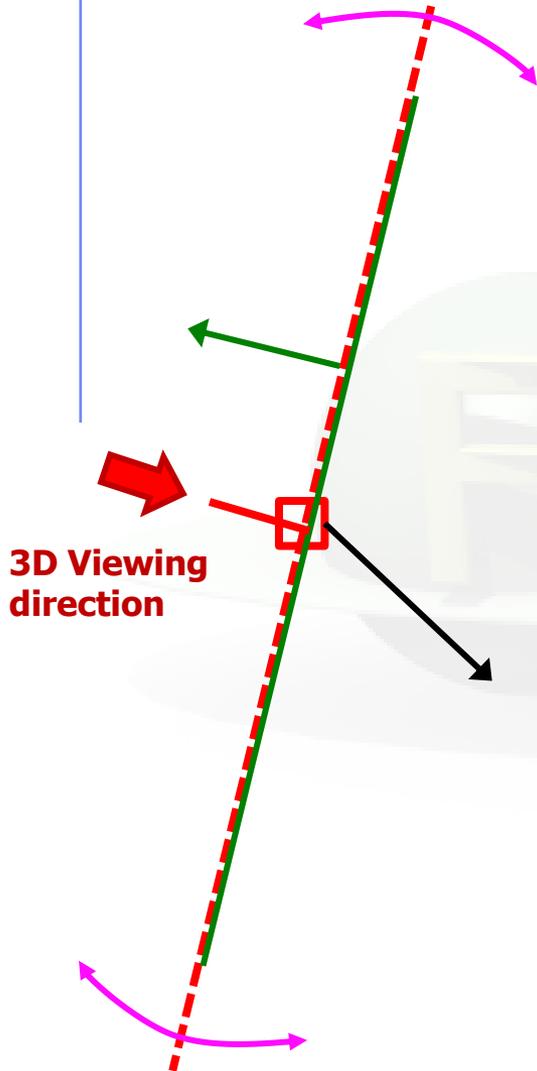
# Navigation – Viewport lines [1/2]

## Description:

- Dashed lines represent other viewports (the intersection of other viewports with the current one);
- The center is represented with a square;
- Viewing direction  $w$  is indicated by a short line;
- When another viewport is outside the view window, the viewport-line will be displayed on the closest edge;

**Actions:** Select  + left mouse button

- Drag the center square to reposition the viewport
- Drag the line close to the center to reposition the viewport along the vertical  $w$  axis
- Drag the extremities to rotate it



# Navigation – Viewport lines [2/2]

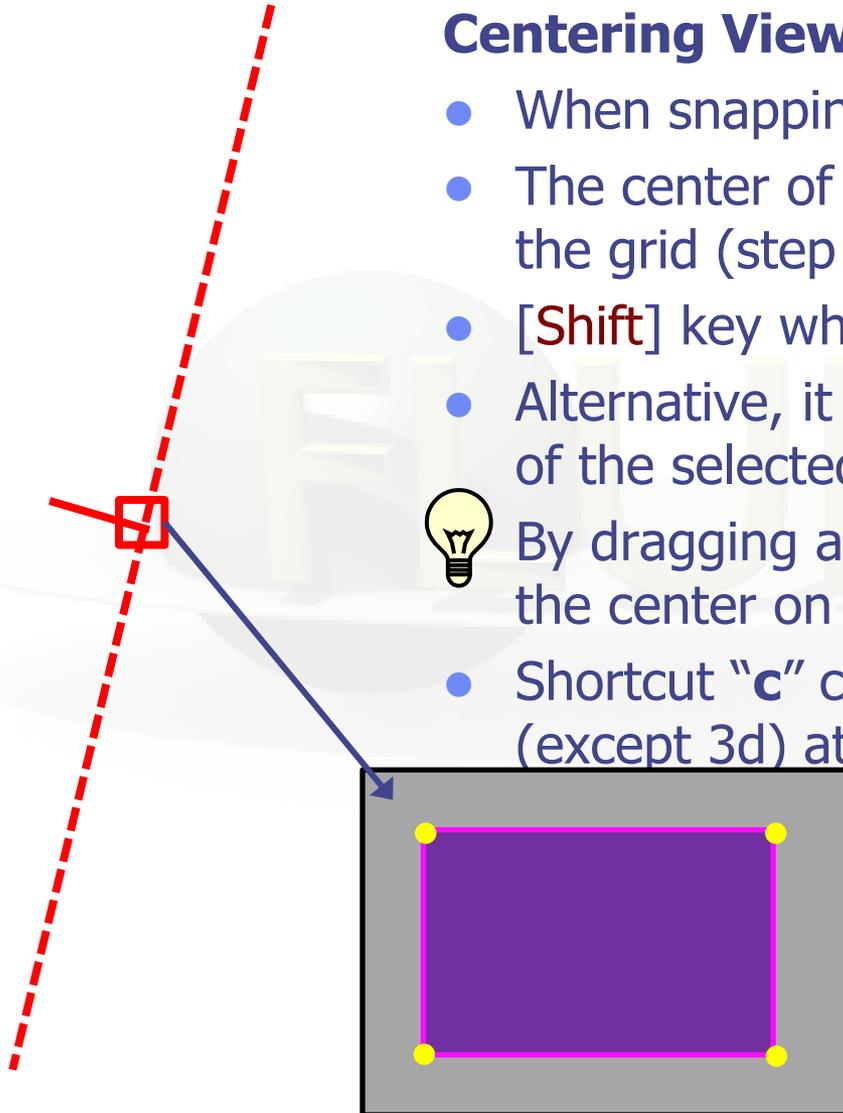
## Centering Viewports

- When snapping to grid  is activated
- The center of the viewport will be aligned to the grid (step of 1/10 of the main grid)
- [**Shift**] key while toggle the snapping action;
- Alternative, it can be centered on the vertices of the selected bodies;



By dragging a viewport center it always moves the center on the current viewing plane.

- Shortcut “**c**” centers all other viewports (except 3d) at the mouse pointer

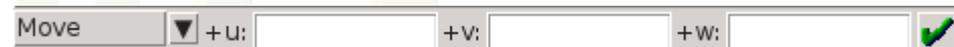


# Navigation – Projection dialog

With the projection [o]  button you can change, move, shift, rotate, save and reload the projection of a viewport



Shift the coordinate system



Set the **o** origin of the viewport



Change the reference axis



Rotate around the Cartesian axis



Shortcut: Ctrl + (1-6)

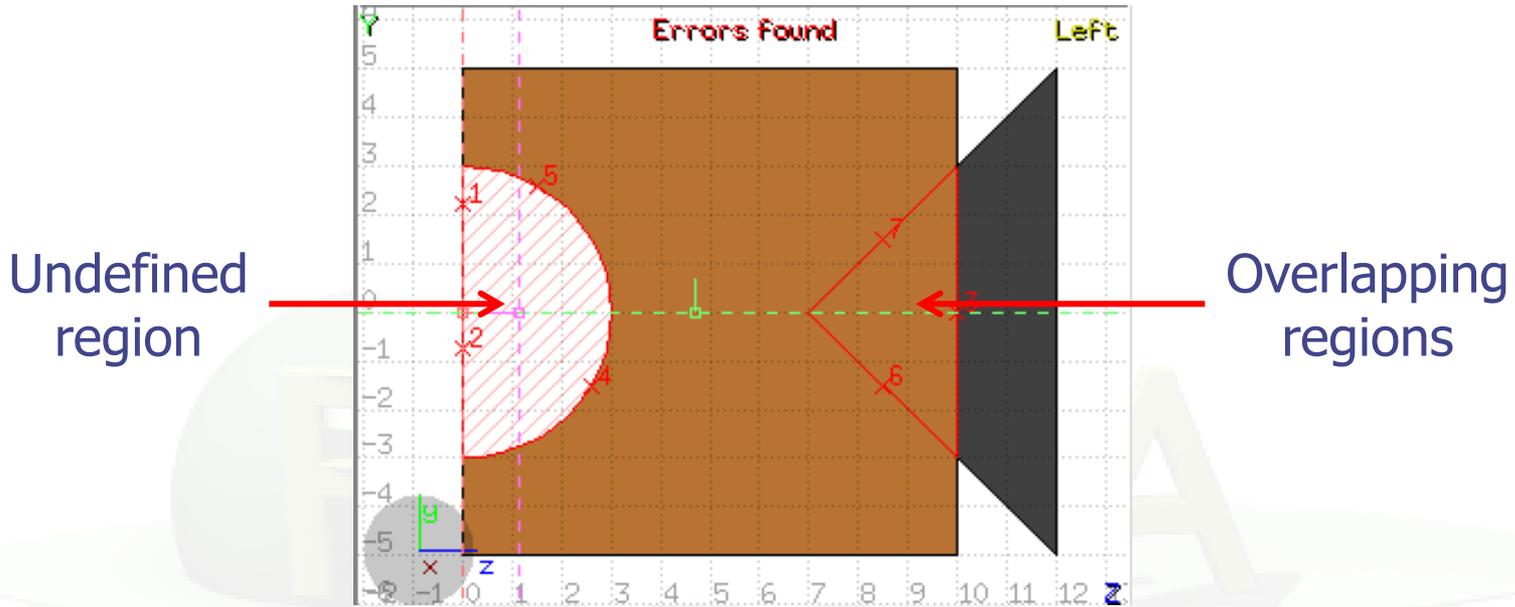
Add and Select Bookmark



Select Transformation



# Debugging Geometry Errors



**Errors found** notifies that are errors in the geometry (on the current projection):

- The areas affected by the errors are outlined with a **Red** stroke:
  - Areas filled with a full color correspond to overlapping regions;
  - Areas filled with red lines correspond to a missing region definition;
  - Body segments that are involved in the errors are numbered;
- Clicking the  Errors tab (on the left) displays the dialog with the errors.
- Touching surfaces are checked against **10** significant digits
- Non-strictly geometrical errors (i.e. missing Material Assignment to a region, non recognized cards) are also notified;