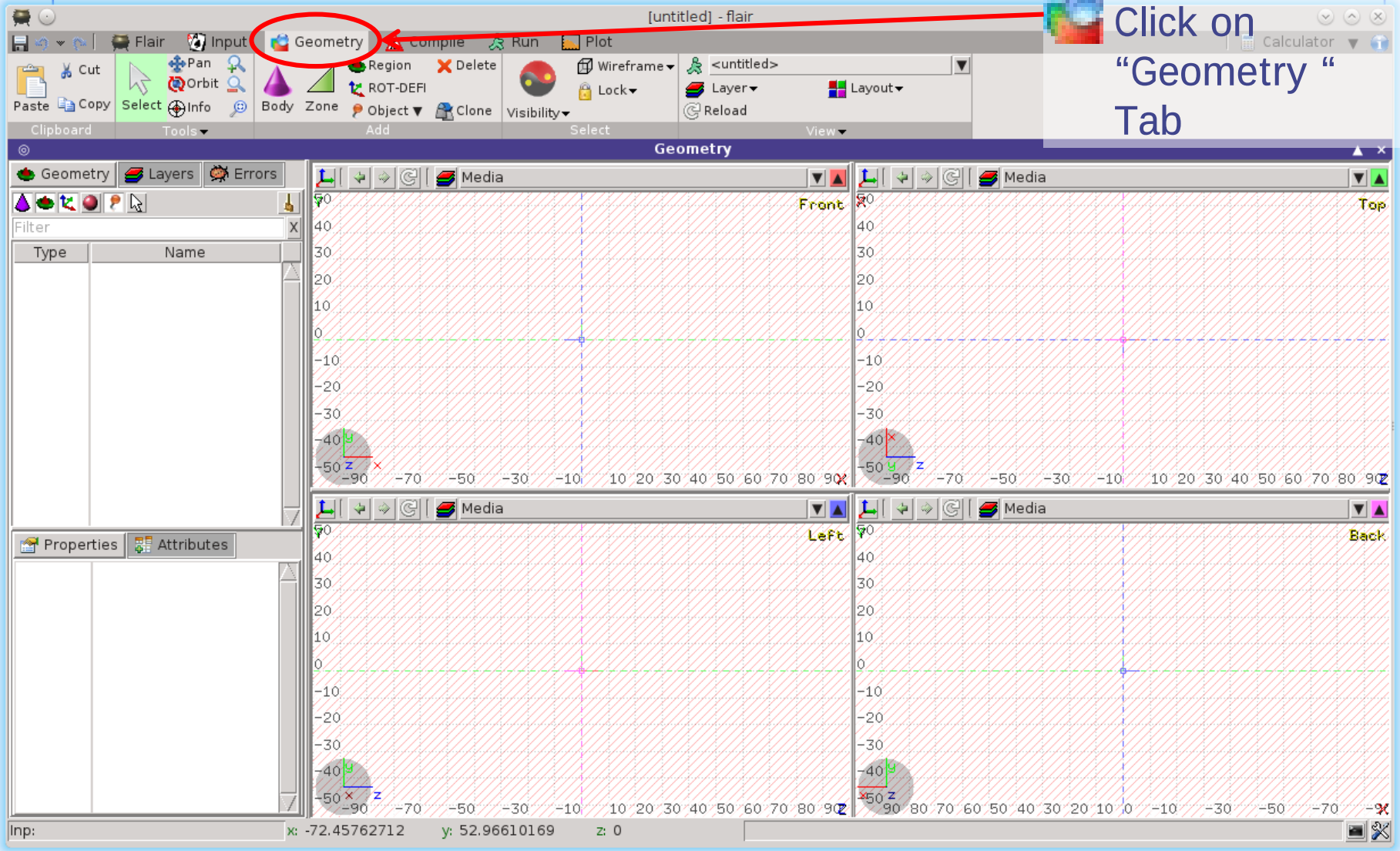
Flair – Geometry Editor

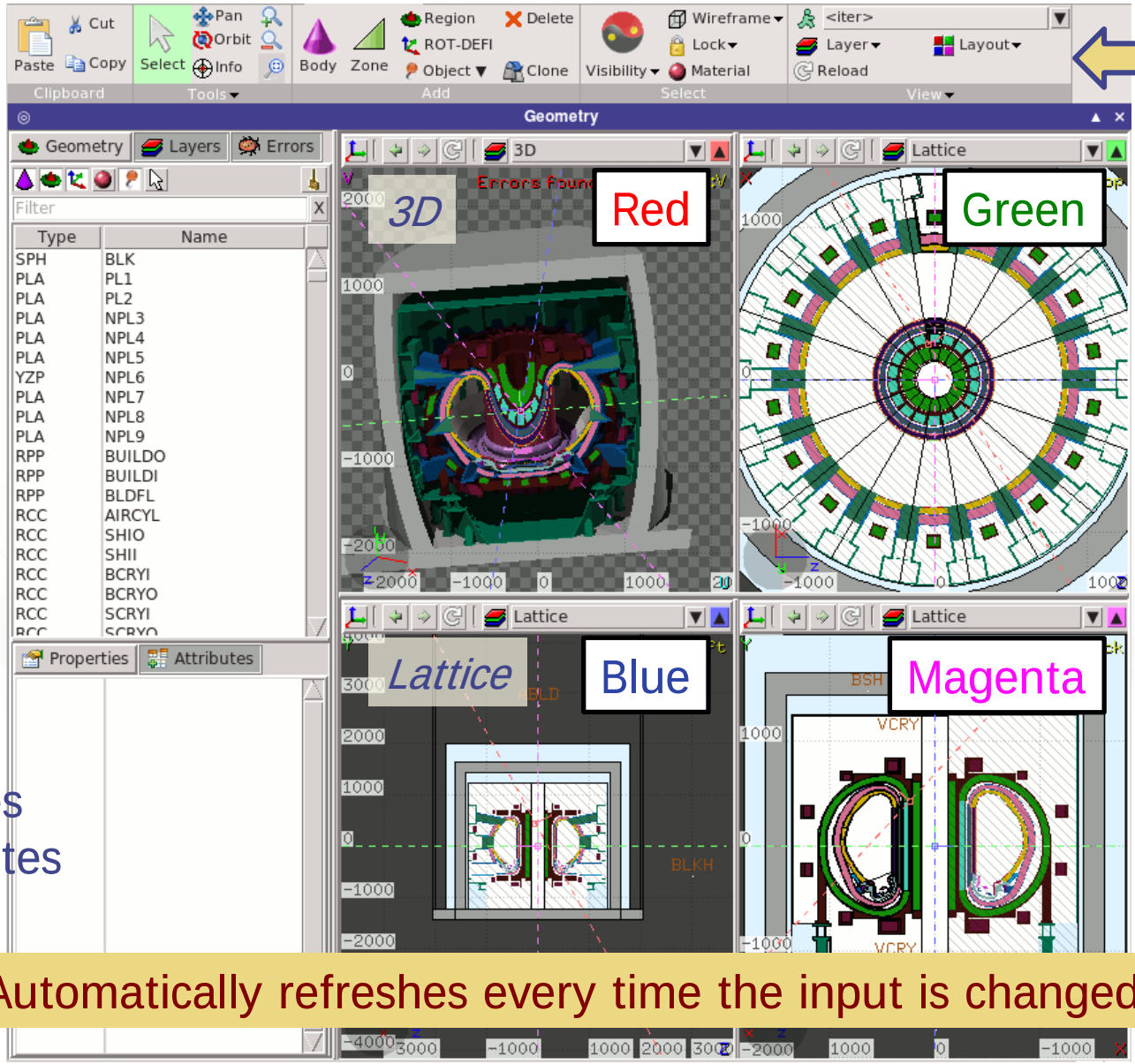
Advanced FLUKA Course

Starting the Geometry Editor



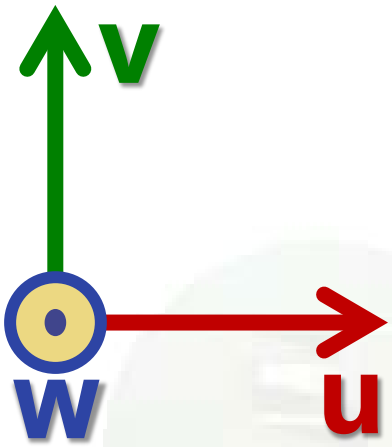
Click on "Geometry " Tab

Geometry Editor: Interface



Automatically refreshes every time the input is changed!

Viewport axes System

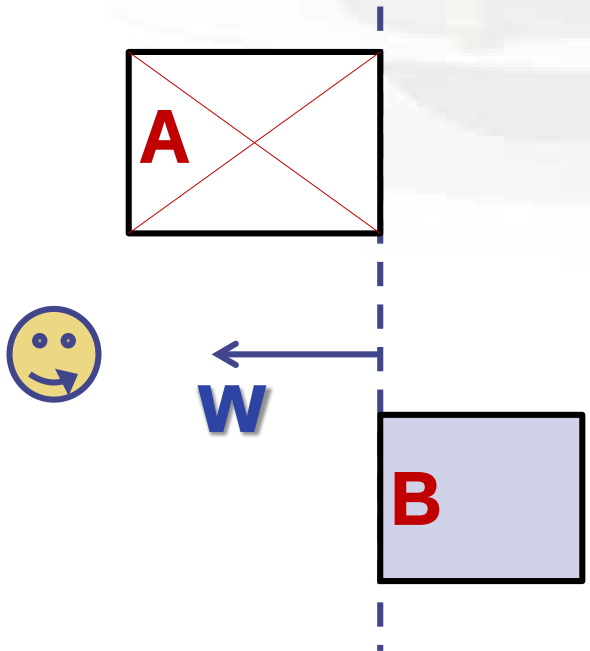


Each viewport is defined by:

- 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*] + [Shift]	orbit viewport around **u,v** axes rotates by 90^{o}
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 **o**rigin/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]**
Escape	undo selection of regions/zones

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

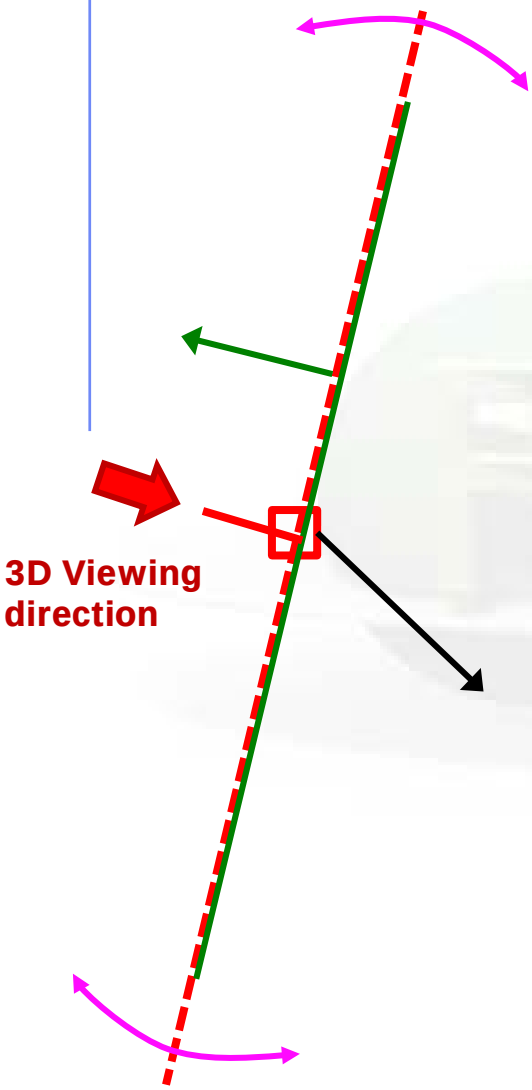
	function	key	description
	Select	s	Select regions or zones
	Pan	x	Pan viewport
	Orbit	t	Orbit viewport using a virtual **t**rackball
	Zoom	z	Drag area to **z**oom In ([**Ctrl**] to zoom out)
		Shift-Z	Zoom viewport on selected items
		Alt-Left	Go to previous in history projection
		Alt-Right	Go to next 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 Config/Preferences/Geometry then the middle and right buttons are swapped

Navigation – Viewport lines



Description:

- Dashed lines represent other viewports (the intersection of other viewports with the current one);
- The center is represented with a square;
- Viewing direction 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

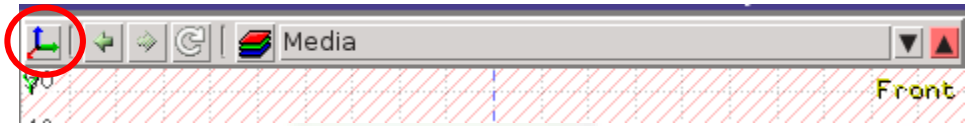
Drag the center square to reposition the viewport

Drag the line close to the center to reposition the viewport along the vertical **w** axis

Drag the extremities to rotate it

Navigation – Projection dialog

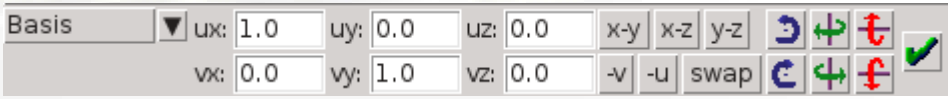
With the projection [**o**] button you can change, move, shift, rotate, save and reload the projection of a viewport



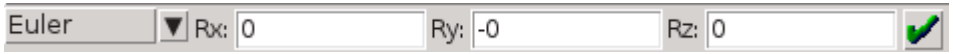
Shift the coordinate system

Set the **o**rigin of the viewport

Change the reference axis



Rotate around the Cartesian axis



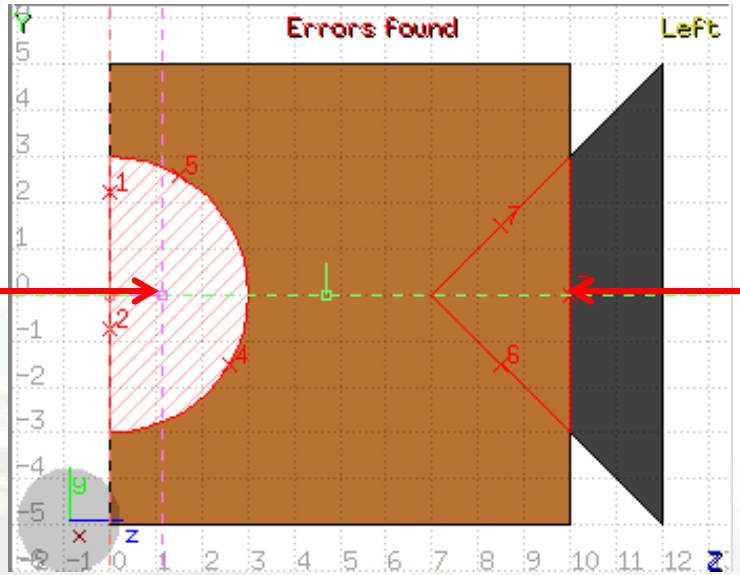
Shortcut: Ctrl + (1-6)

Add and Select Bookmark

Select Transformation

Debugging Geometry Errors

Undefined region

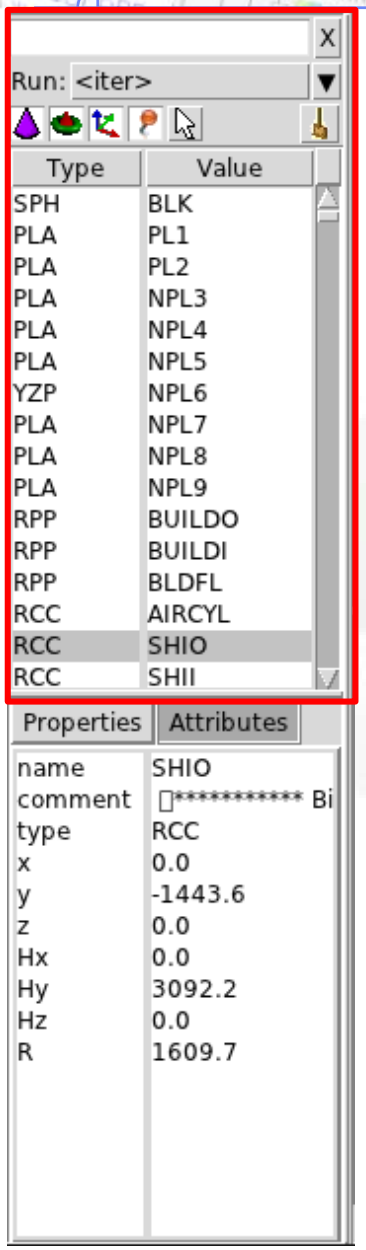


Overlapping regions

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.
  - Clicking on the “+”sign gives additional information
- 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

Listbox - Objects

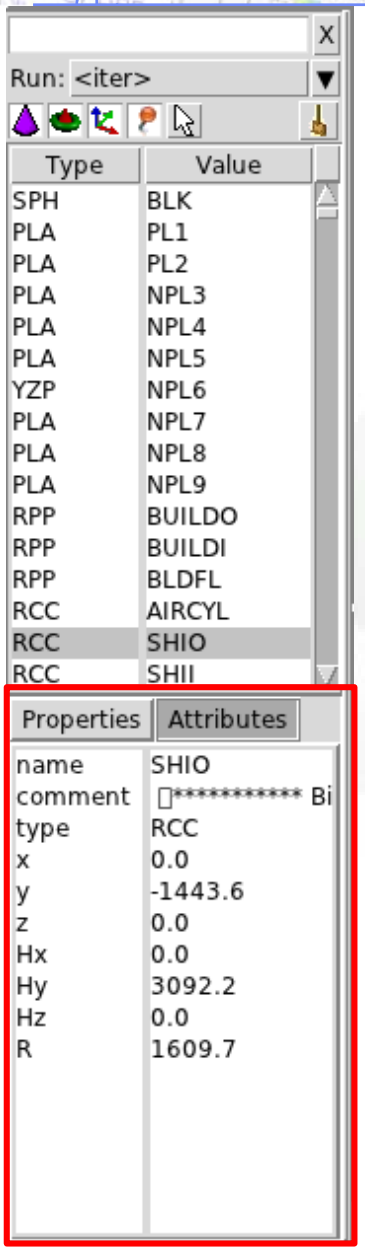


- Lists the type/name of bodies, regions, objects
- Text coloring:
  - RED Error in the card description
  - Magenta Visible body/object
  - Orange Selection locked
- Filtering text box can narrow the list with items containing the typed-in text

Buttons – on/off the display of

- Bodies
- Regions
- Transformations
- Materials
- Objects
- Selected or Visible items

Listbox – Properties / Attributes



Properties:

- Displays the common WHATs of the selected cards
- REGION:
  - If one REGION and Bodies are selected the REGION will stay visible
  - Additionally one can select the MATERIAL and automatically an ASSIGNMAt will be created/modified
    WARNING: Only if this region is not part of a range or inside an #if..#endif

Tips:

- [**Enter**] moves to the next field
- Typing multiple values splits them into many fields:
  e.g. x: **1 2 3** [**Enter**]
  will split it to x: 1, y: 2, z: 3

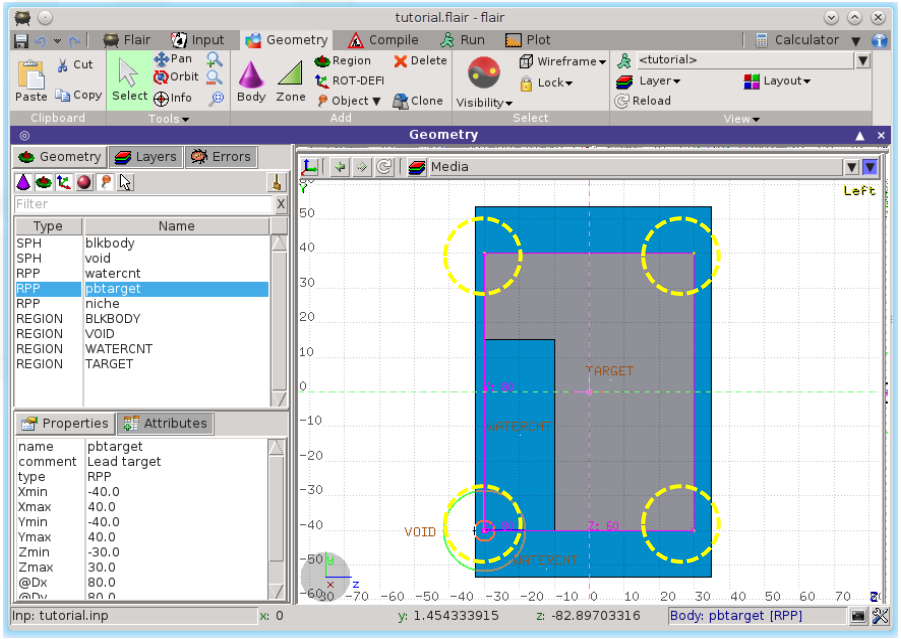
Attributes:

- Displays other information related to the card
- Bodies: Visibility, Selection Locking, Wireframe
- Regions: NAZ, Alpha(Transparency), ROT-DEFI...

Selection

- Objects/Bodies/Regions/Zones can be selected using:
  - Object and/or Properties list boxes
  - graphically with the action [**s**]  using the **left mouse button** on the viewport;
- [**Ctrl**] + left mouse button: allows to toggle the selection (select/unselect);
- Area selection: Click on the background and drag the mouse to draw a rectangle area. Everything inside the area will be selected.

- The selected bodies are:
  - outlined in magenta
  - yellow dots appear on their vertices;
  - highlighted also into the object list in the left bar;
  - Their common properties & attributes will be displayed on the list boxes.
- The selected regions are shaded;
- The select zones are shaded with a hash pattern; To select a zone first you have to select the REGION



[**ESC**ape] cancels the selection

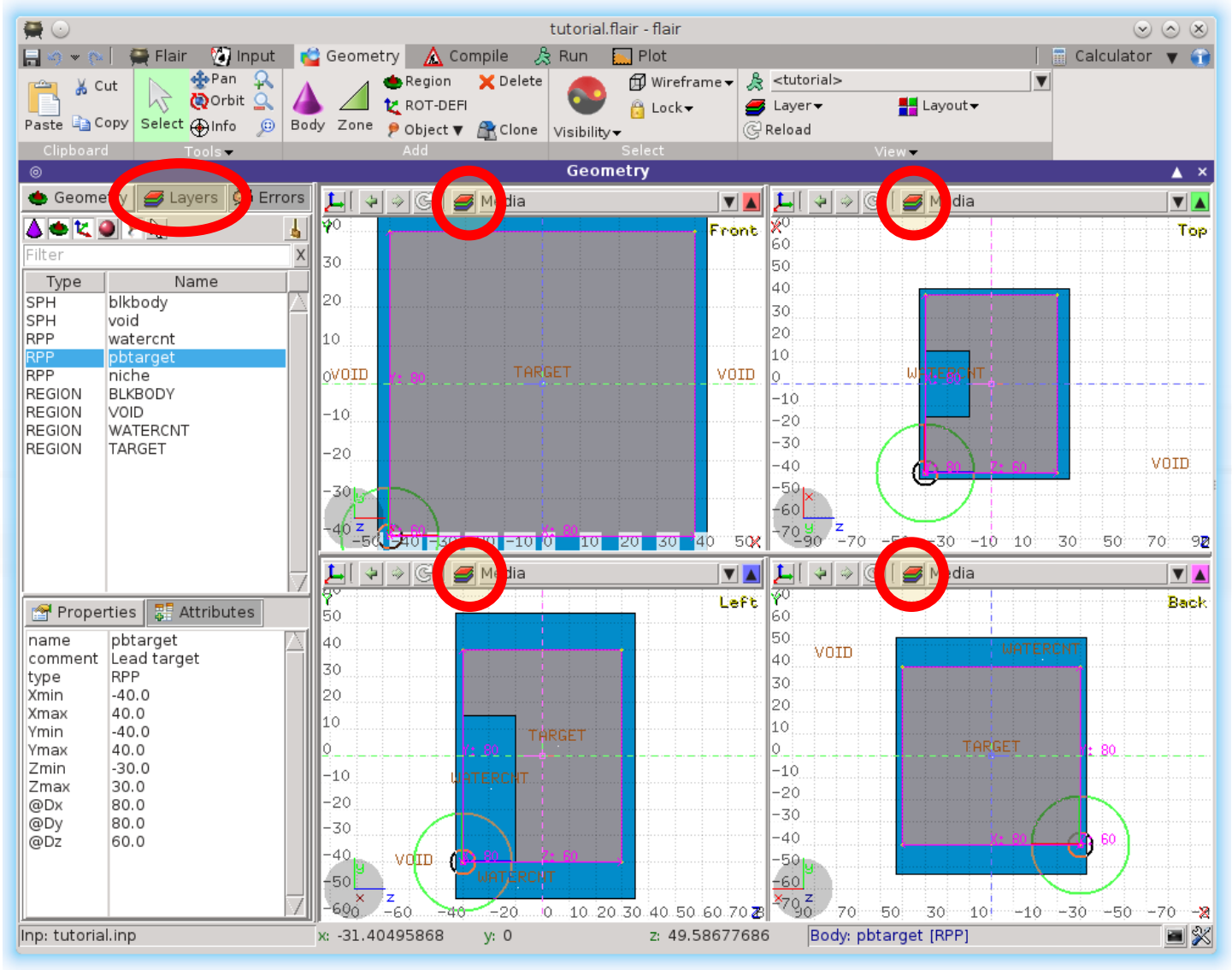
Body Visibility

- Default: Body SEGMENTS ARE ONLY VISIBLE when they represent borders of REGIONs
- In order to make them visible (to be able to visually select them):
  - Select the body (from the list box, or from its visible segment) and

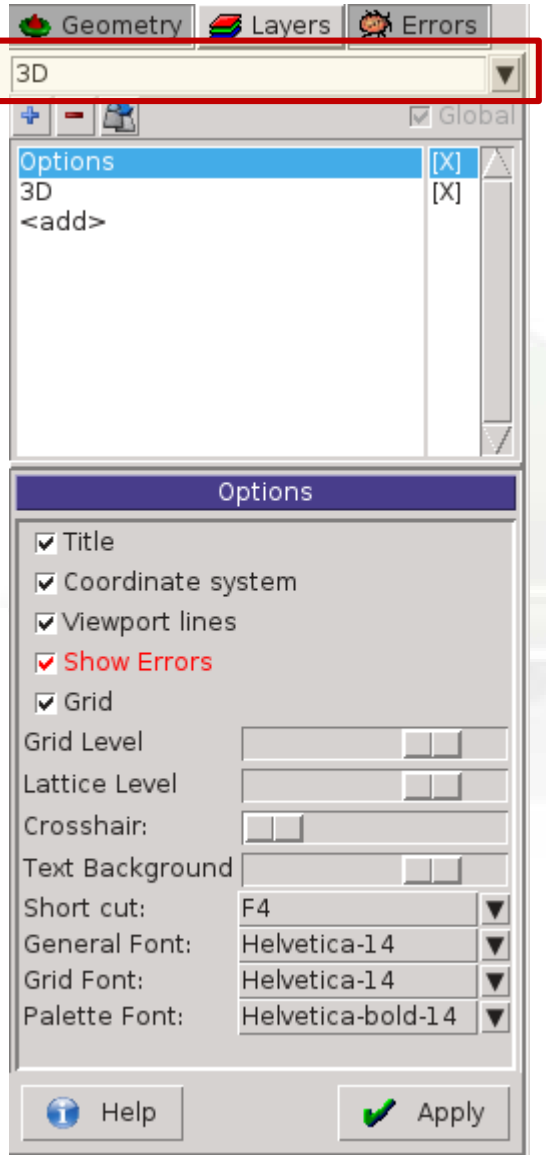
  Either
  - Go to the Attributes and click on Visible [X] check box
  - Right-click → Visibility → Set
  - Shortcut [**v**]
  - Icon on Toolbar 
- Wireframe (experimental) display an approximate 3D wireframe of the bodies. Useful to select or visualize bodies that do not intersect the viewport
  - Go to the Attributes and click on Wireframe [X] check box
  - Right-click → Wireframe → Set
  - Shortcut [**#**]
  - Icon on Toolbar 

Geometry Layers [1/7]

Custom Layers can be specified in the “Configure Layer menu” ()



Geometry Layers [2/7]



Toolbar:

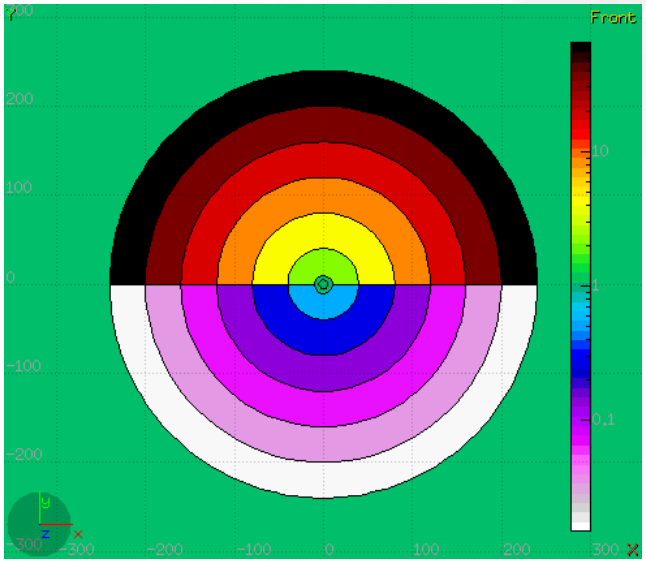
- **Add / delete / rename / clone layers.**

Options:

- **Enable / Disable**: Title, Coordinate system, Viewport lines, Vertexes and Grid;
- **Adjust:**
  - Grid level (set gridline intensity);
  - Lattice level (set lattice hash line intensity);
  - Crosshair (dimension of the crosshair in the center of the project)

- All layers can be combined together e.g:
  - USRBIN and 3D
  - Custom color values (EMFCUT) with 3D
  - Image and USRBIN
  - ...

Geometry Layers [3/7]



Show: (2D drawing, and color filling options)

- **Bodies:** display the boundaries of bodies;
- **Vertices:** display the intersection of bodies;
- **Enable / Disable**: Lattice and Voxel;
- **Associate Region Colors to:**
  - Regions
  - Materials
  - Density
  - Importance Biasing
  - Splitting
  - Corrfactor
  - Deltaray
  - Thresholds
  - ...

Geometry Layers [4/7]

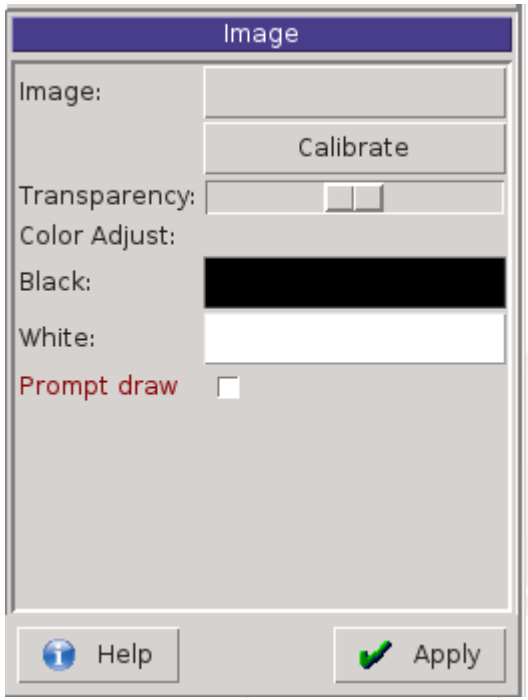
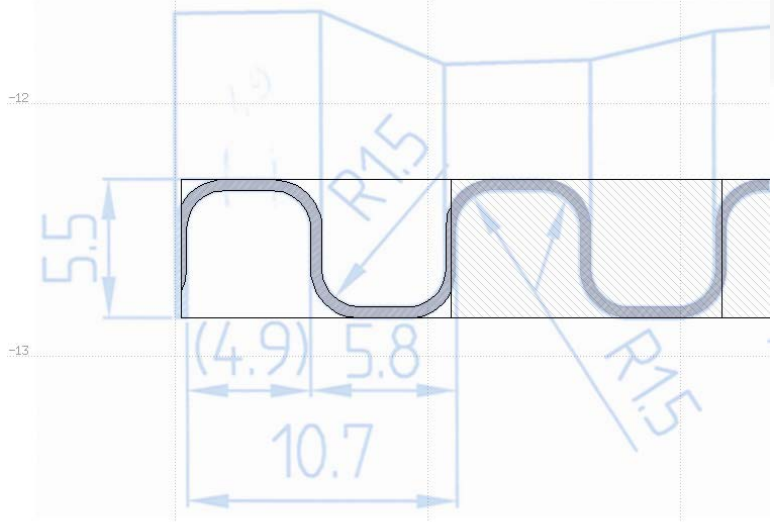
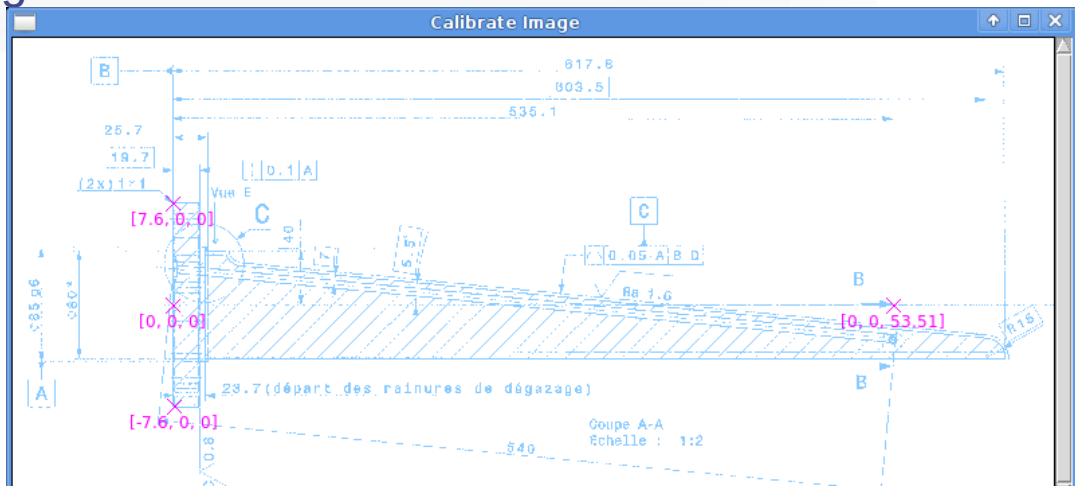


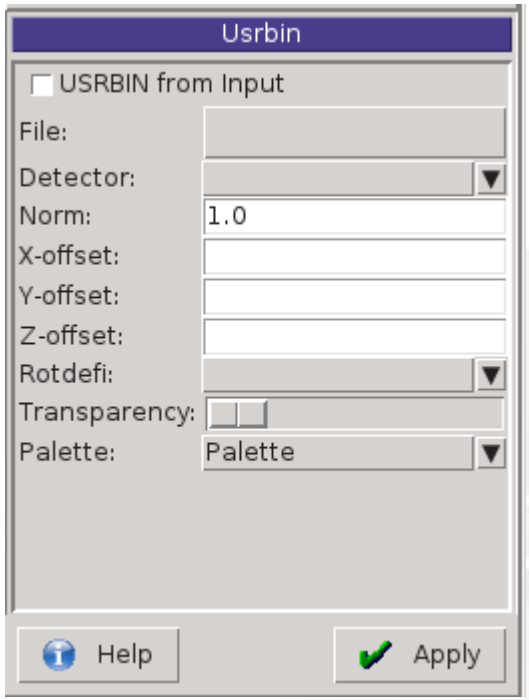
Image: set a background image to the geometry (i.e. a CAD-drawing);

- **Image**: load an image file (.png, .gif or .jpg);
- **Calibrate**: calibrate the image. Define a set of points (min. 3) on the image and specify their coordinate;
- **Alpha**: blending of the image
- **Color Adjust**: readjust the **black** and **white** colors of the loaded image.
- **Prompt draw**: immediate drawing of image (slower) or when display is idle. For editing is good to activate it.





Geometry Layers [5/7]

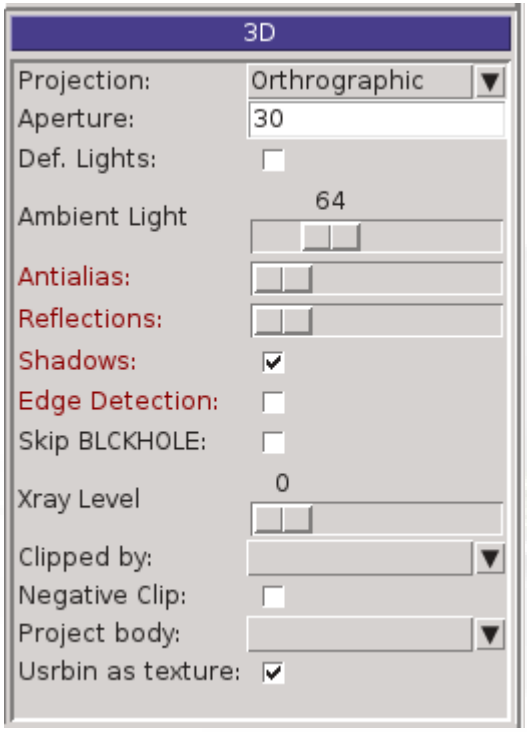


USRBIN:

- Up to 10 USRBINs can be superimposed per layer
- USRBIN from input: To select a USRBIN card from input and displayed with a checker pattern
- Load **USRBIN file** (see SCORING lecture);
- Select a **detector** (or URSBIN) among the ones present in the file;
- **Normalization** constant;
- Associate a **ROT-DEFI** transformation;
- Alpha blending between USRBIN colors and materials colors

USRBIN should be combined with the Colorband to define the color limits

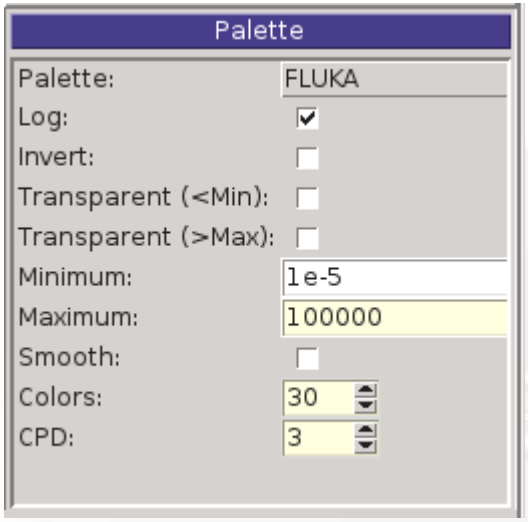
Geometry Layers [6/7]



3D: enable 3D rendering

- **Enable / Disable Perspective**;
- Set camera **aperture** angle;
- Intensity of ambient light;
- **Antialias** for supersampling (slow rendering);
- Xray – automatic transparencies;
- Clipped by: setting a clipping body;
- Negative Clip: Use the –clipping body

Geometry Layers [7/7]



Palette: enable/set color band properties

- Up to 3 palettes can be used per layer
- Change the default color **Palette**;
- **Enable / Disable Log** scale;
- Enable transparency outside the limits useful when combining multiple USRBIN's
- **Set: Maximum, Minimum** and color **steps**.