

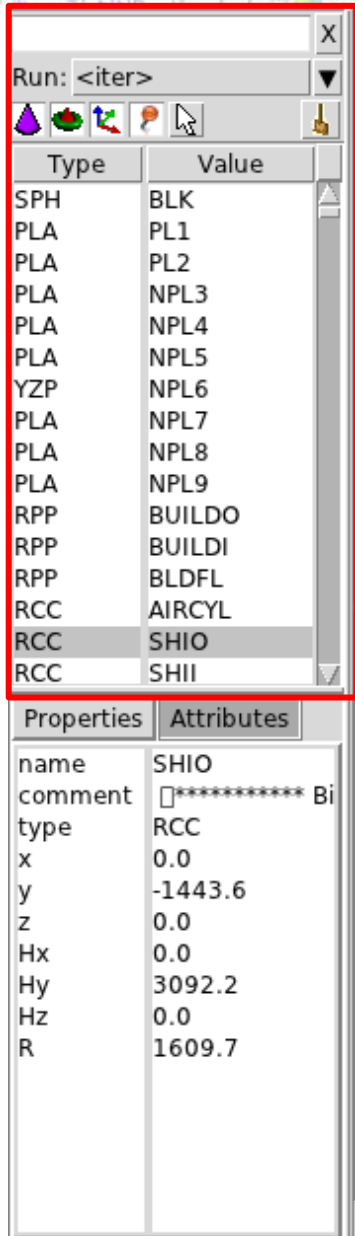


Flair Geometry Editor

Part II: The Editor as an editor



FLUKA Beginner's Course

Listbox - Objects

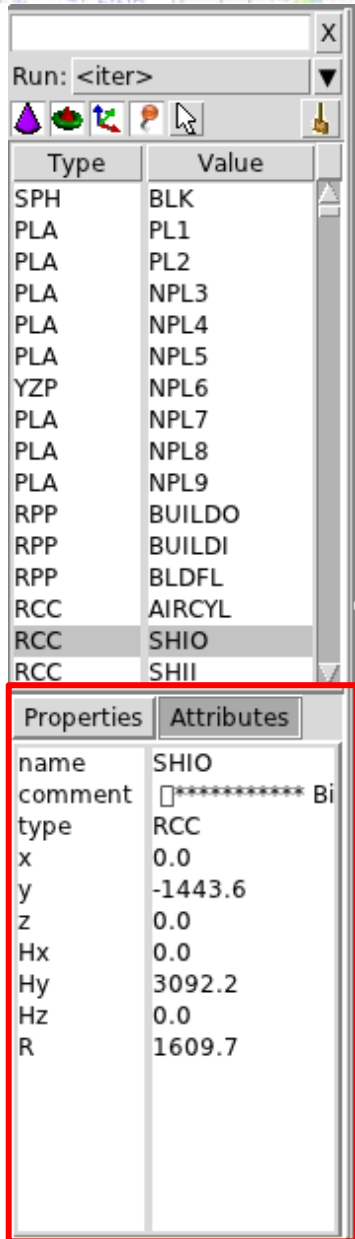


- Lists the type/name of bodies, regions, objects
- Text coloring:
 - RED Error in the card description
 - Magenta Visible body/object
 - Orange Selection locked
- Filtering text box can narrow the list with items containing the typed-in text

Buttons – on/off the display of

-  Bodies
-  Regions
-  Transformations
-  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

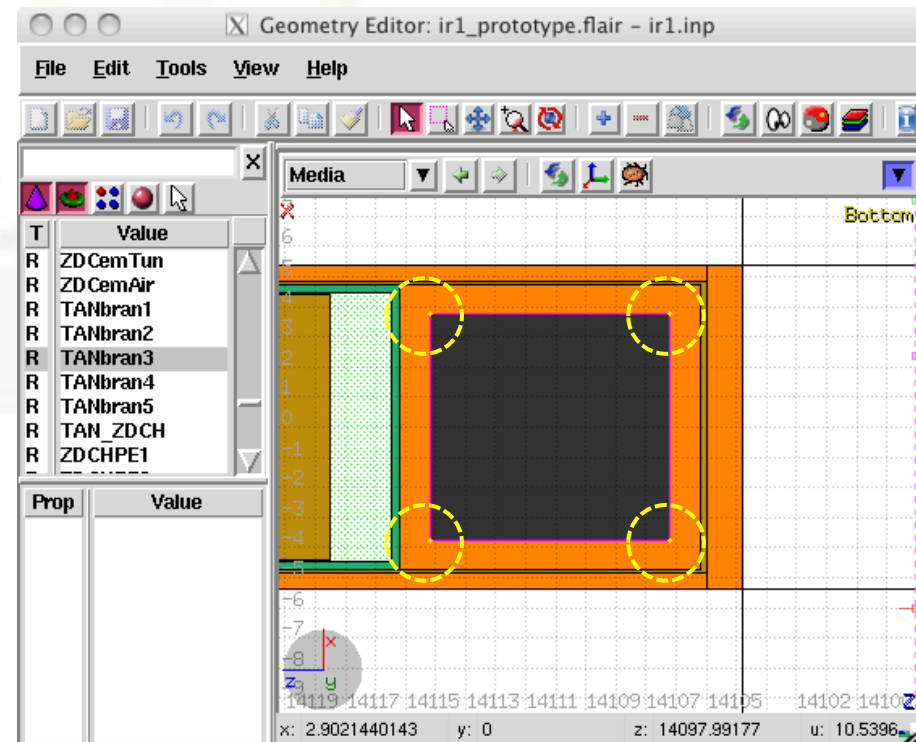
Attributes:

- 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

[ESCAPE] cancels the selection





Objects

There are a few auxiliary objects in flair for helping the drawing

- **Point [p]**
 - to be used as snapping points
 - provide help text to the user
 - automatically generated after image calibration
- **Arrow or line**
 - to be used as snapping points
 - provide basic drawing/pointing means to the user
- **Ruler simple or angle**
 - to measure distances and angles
 - to project snapping points to a different location
 - to be used as snapping points
- **Light for the 3D**

The objects are stored in the input file with the special flair tags:

!point, !arrow, !ruler, !light

All tags starting with ! are treated as comments and ignore by FLUKA

New Body

- Add a body: **Right-Click**, or [**b**] or [**Space**] or [**Ins**] Menus is organized in sub-categories
- [**B**] (capital) to repeat last add body
 - **left-click** on the wished location of the new body
 - **keeping the left-button pressed drag** to the location of the first extend of the body
 - **release** and continue with the next one...
- Renaming a body will automatically rename any reference to it without asking the user
- All new bodies will use the same **name** prefix from the last body renaming



[**n**]ame allows to fast edit the name of the object



New Body Mouse Steps

The default dimension/radius of all new bodies is one grid unit

XYP, ZXP, YZP: Viewport should not be parallel to body

Location

PLA: \perp viewport

Location \rightarrow Second point belonging on the plane

RPP: symmetric around the w-axis

Location \rightarrow Outer corner on the viewing plane

BOX: XY plane // viewport, Z vector = $-\mathbf{w}$

Location \rightarrow X-vector end \rightarrow Move outer plane

WED: as in BOX

Location \rightarrow X-vector \rightarrow Y-vector (forced \perp X)

New Body Mouse Steps

RCC: Height will be lying on viewport

Location → Height → Radius

REC: Height will be lying on viewport

Location → Height → Radius-X [→ Radius-Y if viewport permits it]

XCC, YCC, ZCC

Location → Radius

XEC, YEC, ZEC: *be careful on the chosen viewport*

Location → Radius-X [→ Radius-Y if viewport permits it]

TRC: Height will be lying on viewport



Location → Height → Apex radius → Base Radius

ARB: not possible for the moment

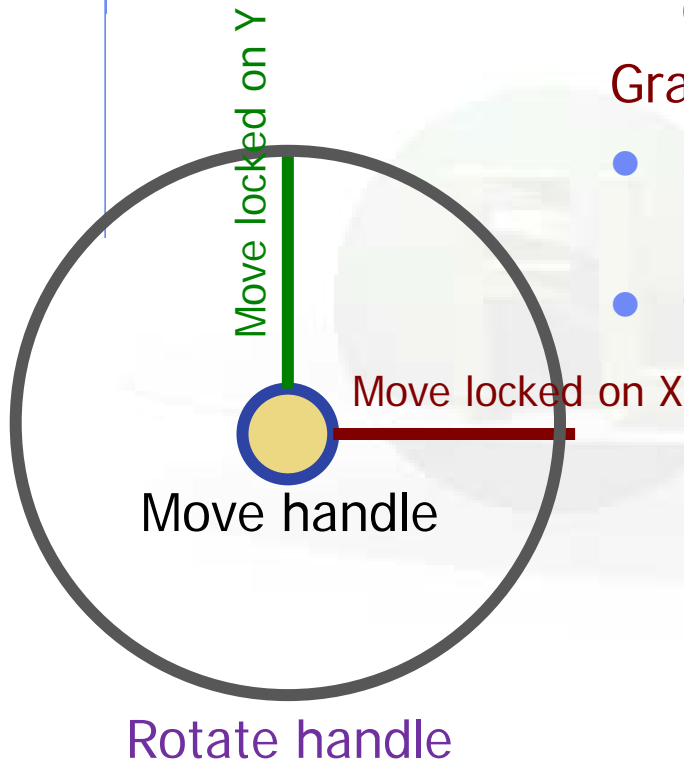
QUA: will generate a sphere at desired location

Location

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 

Body Editing



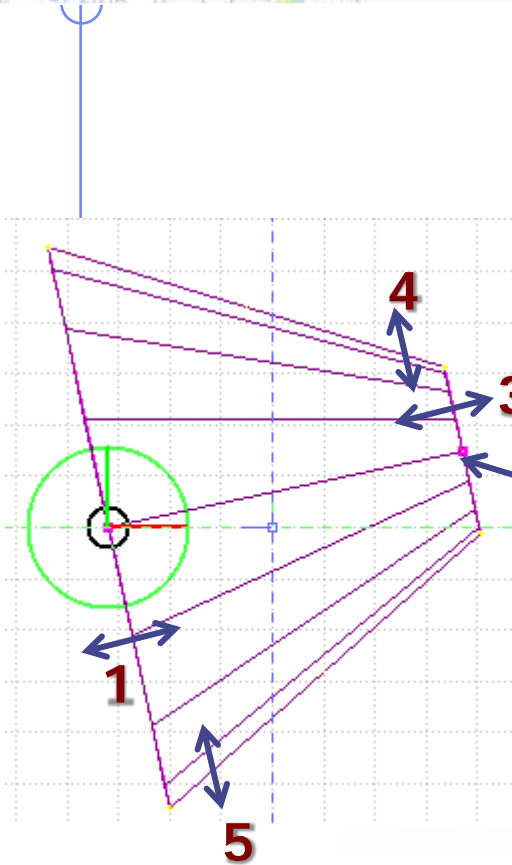
Text:

- Bodies can be edited by typing the correct coordinates in the Properties or in flair

Graphically:

- Select the body and the action handler(s) will be displayed
- Click with the mouse for a second time:
 - on the small circle to freely move [**g**]rab
 - on the large circle to rotate [**r**]otate around **w** axis
 - on the red/green/blue line to move but locked on X, Y or Z axis
 - Hitting [**x**], [**y**], [**z**] while moving a body toggles the locking on the axis

Body Editing



- When a body is selected and the action handlers are shown you can either click 'n drag the handlers for moving, rotating, resizing the object:

TRC example, click 'n drag:

1. On the **base plane**, to move it perpendicular \perp to height vector
2. On the **small square handler** on the apex plane, to freely move the height, axis or normal of body
This handler appears only if it lies on the viewing plane
3. On the **apex plane**, to move it perpendicular to the height vector
4. On the **conic surface close to the apex** to resize the apex radius
5. On the **conic surface close to the base** to resize the base radius

Region Editing

- Add a **REGION**: **Right-Click** or [**R**] or [**Space**] or [**Ins**]
- Immediately the properties listbox will be activated to edit the name
- Renaming a region will automatically rename any reference to it without asking the user
- When changing the material or transformation of a region flair will automatically add the appropriate **ASSIGNMAT** and/or **LATTICE** cards
- However deleting a region will not delete the associated **ASSIGNMAT** and/or **LATTICE** cards

Zone editing

With the keyboard:

- **Add**: Enter an expression in the “+zone” field
- **Modify**: Select the zone to modify and alter with the keyboard the zone expression
- **Delete**: Select the zone and then **Right-Click**→**Delete** or hit the [**Del**] key **INSIDE** the Property Listbox!

Zone: is a subregion expressed in terms of + and – only

e.g. REGION +a +b | +c –d


contains three zones

zone01: +a +b

zone02: +c –d

Zone editing

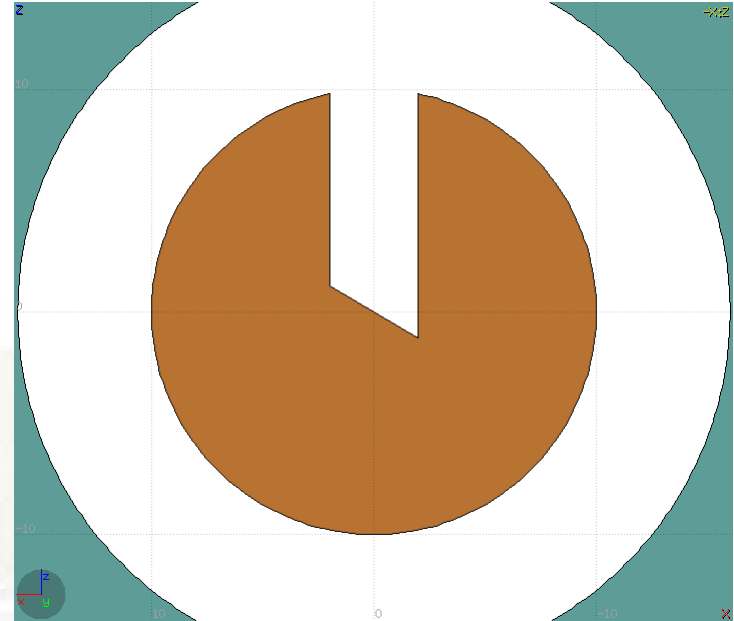
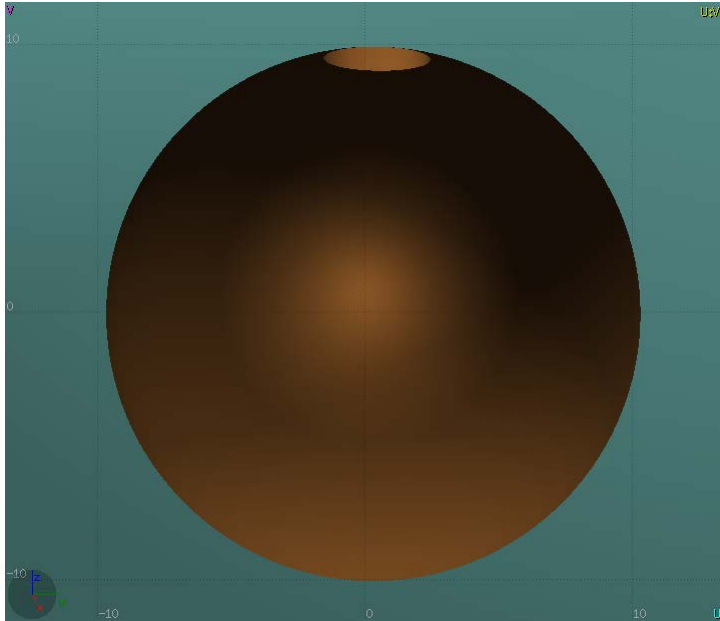
Graphically:

- First select the desired **REGION** to add/modify the zone
- **Add** a new zone:
 - Verify that there is no zone selected in the property listbox. If there is any hit **Escape** to unselect them
 - **Add on the selection ONLY** the bodies representing the borders of the zone
 - Click on **Right-click** or **[Space]->Zone**  or with **[D]efine (capital)**
 - Move the mouse and click in one of the viewports a point that should belong to the wished zone
 - Automatically the zone expression will be created
- **Modify/Edit** an existing zone:
 - Select the zone either on the property listbox or graphically in any viewport clicking a point that belongs to it
 - Automatically all bodies involved in the zone expression will be selected
 - With the zone selected, select or unselect additional bodies if needed
 - Then like in the “Add a new zone” click on **“Zone”** or with **[d]efine (small)** and click on point that belongs to it



Do not select bodies that you don't need

Zone Editing: Example [1/7]



- In this example we will create a sphere with a cylindrical hole cut with a tilted plane (@ 30°)
- First we have to create all necessary bodies
 - sphere
 - infinite cylinder
 - tilted plane

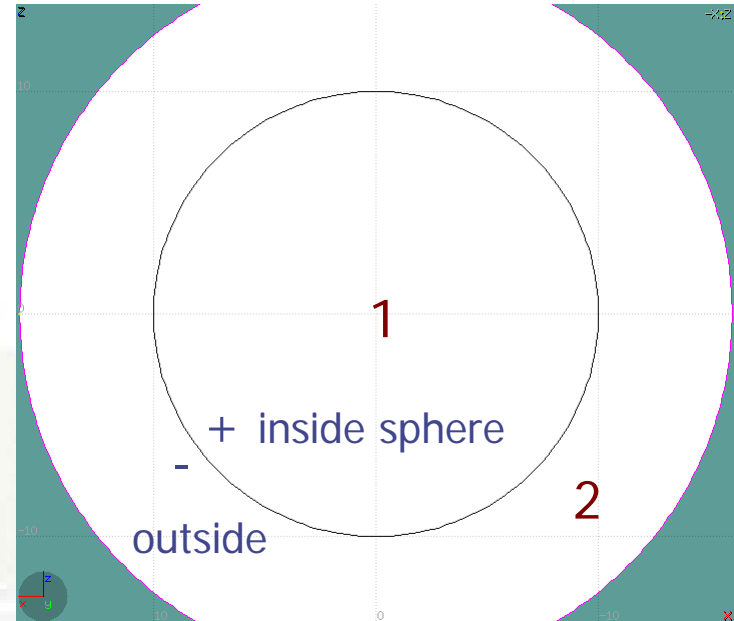
Zone Editing: Example [2/7]

- Then we add a new REGION [Spacebar] → Region 
- The region expression is empty
- Type-in the name and select the appropriate material
- Press [ESCAPE]



The region should remain selected

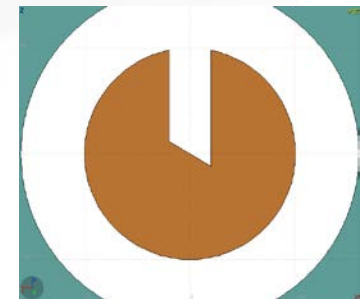
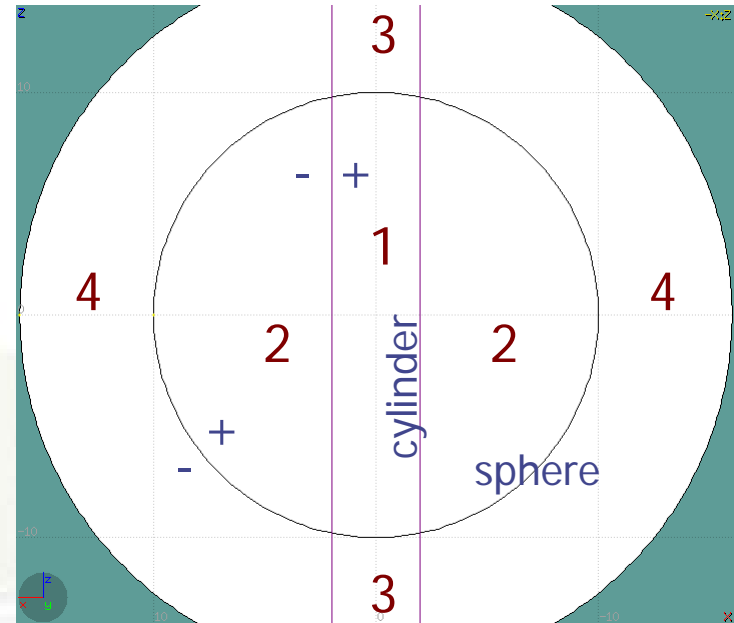
- Each body e.g. sphere divides the space into 2 zones
- Add to the selection the sphere (holding [Ctrl] pressed) and the sphere outline will be highlighted
- The sphere divides the space into two zones:
 - 1 +sphere inside the sphere
 - 2 -sphere outside the sphere



Reference image

Zone Editing: Example [3/7]

- Add to the selection the infinite cylinder with **[Ctrl]** + Left mouse click
 - The 2 selected bodies divides the space into 4 zones
- 1 +sphere +cylinder
 - 2 +sphere - cylinder
 - 3 - sphere +cylinder
 - 4 - sphere - cylinder

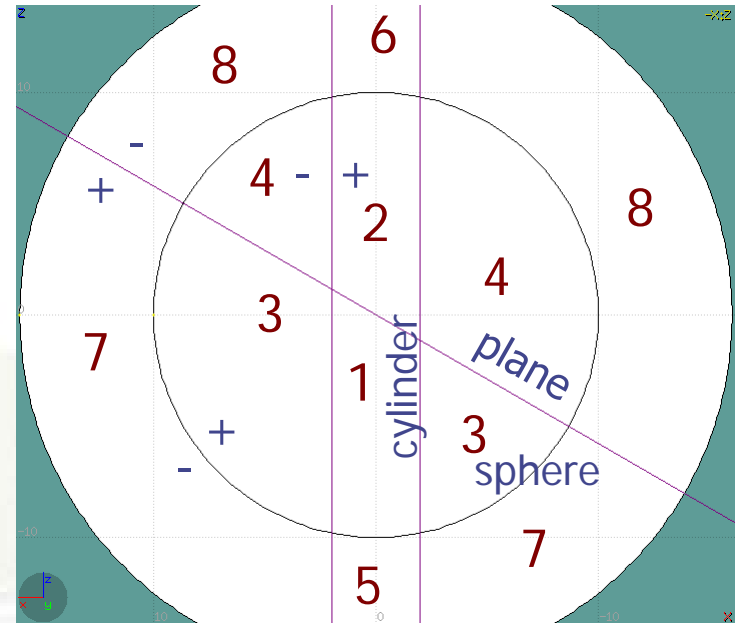


Reference image

Zone Editing: Example [4/7]

- Add to the selection [**Ctrl**]+left click the tilted plane.
- Now the space is divided into 8 zones


1	+ sphere	+ cylinder	+ plane
2	+ sphere	+ cylinder	- plane
3	+ sphere	- cylinder	+ plane
4	+ sphere	- cylinder	- plane
5	- sphere	+ cylinder	+ plane
6	- sphere	+ cylinder	- plane
7	- sphere	- cylinder	+ plane
8	- sphere	- cylinder	- plane

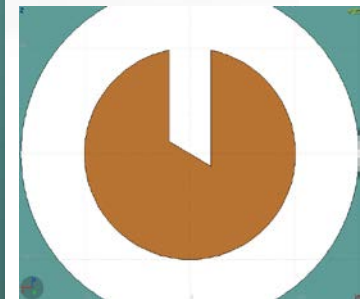
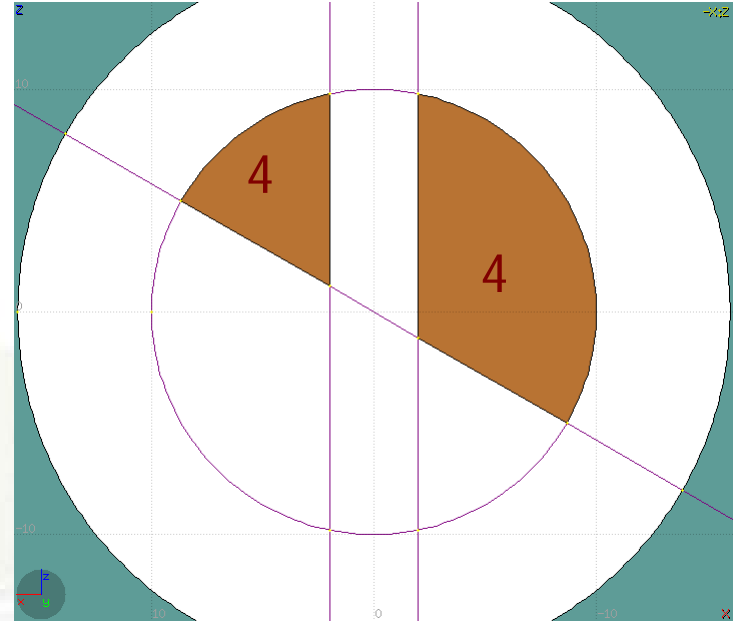


Reference image

Number of valid zones $\leq 2^{\text{bodies}}$

Zone Editing: Example [5/7]

- Press [**Spacebar**] and select the action **Zone**  or with the shortcut [**d**]efine
- Moving the mouse, shows the various subdivisions of space and their corresponding expression.
- Point and click with the mouse somewhere inside zone 4
- Automatically the zone expression
+sphere -cylinder -plane
will be added to the **REGION**

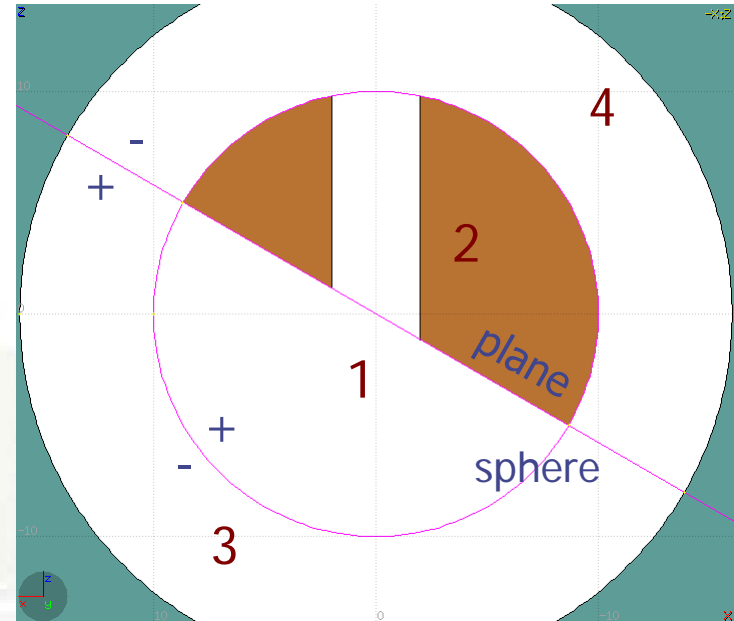


Reference image

Zone Editing: Example [6/7]


- Finally we have to add as second zone the lower half of the sphere.
- Press **once [ESCape]** to unselect the bodies, but to **leave the region selected**
- Select the sphere and plane (or by deselecting the cylinder)
- Again the space is divided into 4 regions

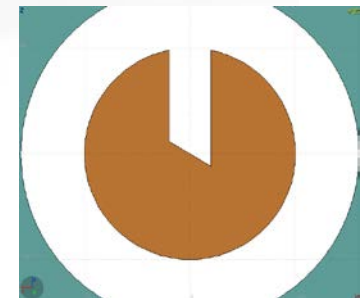
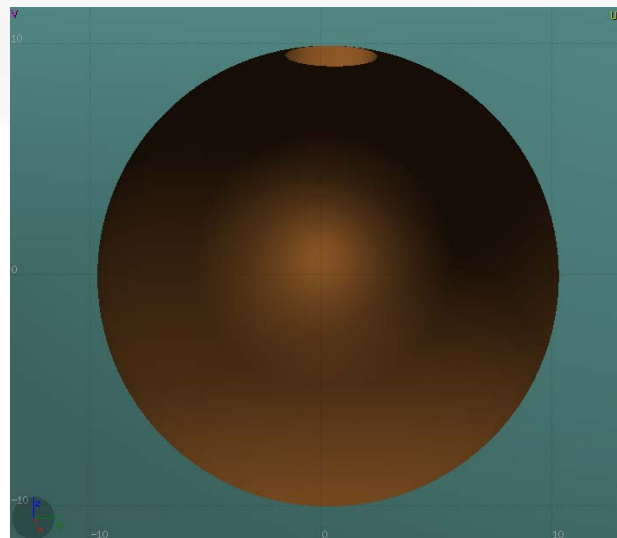
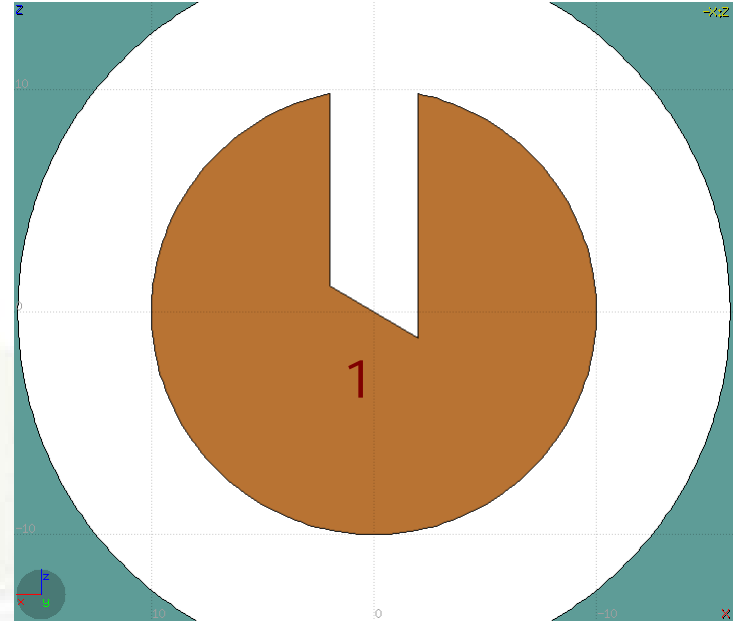
- | | | |
|---|----------|---------|
| 1 | + sphere | + plane |
| 2 | + sphere | - plane |
| 3 | - sphere | + plane |
| 4 | - sphere | - plane |



Reference image

Zone Editing: Example [7/7]


- Press [**Spacebar**] and select the action **Zone**  or with the shortcut [**d**]
- Point and click with the mouse somewhere inside zone **1**
- Automatically the zone expression
+sphere +plane
will be appended to the REGION



Reference image

Summary: Region and Zone Editing

Remember the sequence:

1. **Create** or **Select** the region to edit
2. Select the **REGION** if not selected
3. Select a **zone to modify** or **none to add** a new one
4. **Add on** the selection the **bodies** that involve in the zone expression
5. Click on the [**Spacebar**] "**Zone**  action [**d**] or [**D**]
6. Move the mouse and click to a point that belongs to the wished zone
7. Repeat steps 2-6 as many times as required

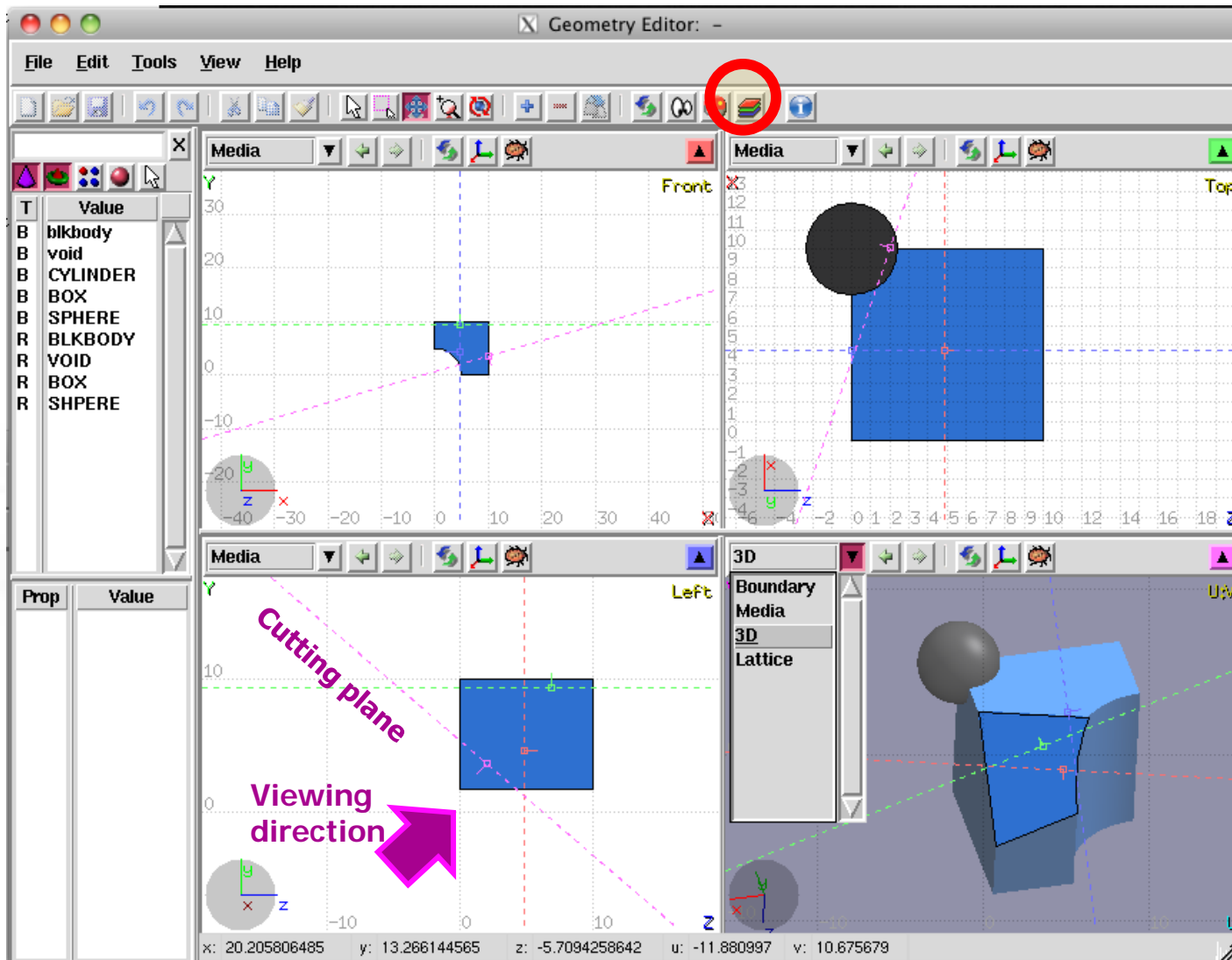


You have to create a selection containing:

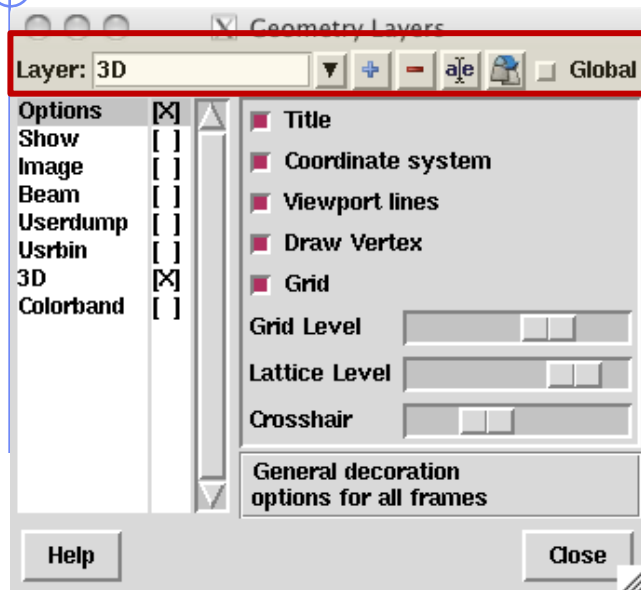
- the **REGION** to edit;
- the **bodies** representing the boundaries of the new zone;
- **optionally an existing zone** if you want to modify it
- Verify the selected items and do NOT select bodies that you don't need

Geometry Layers [1/6]

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



Geometry Layers [2/6]



Toolbar:

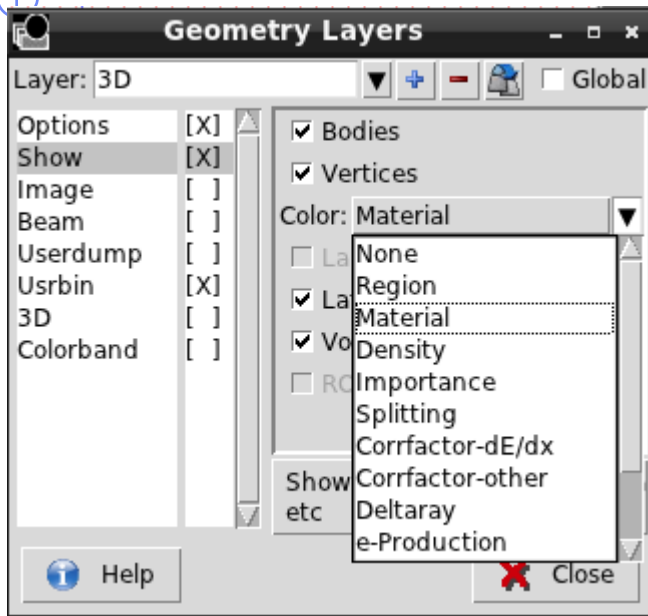
- Add/delete/rename/clone layers.

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)

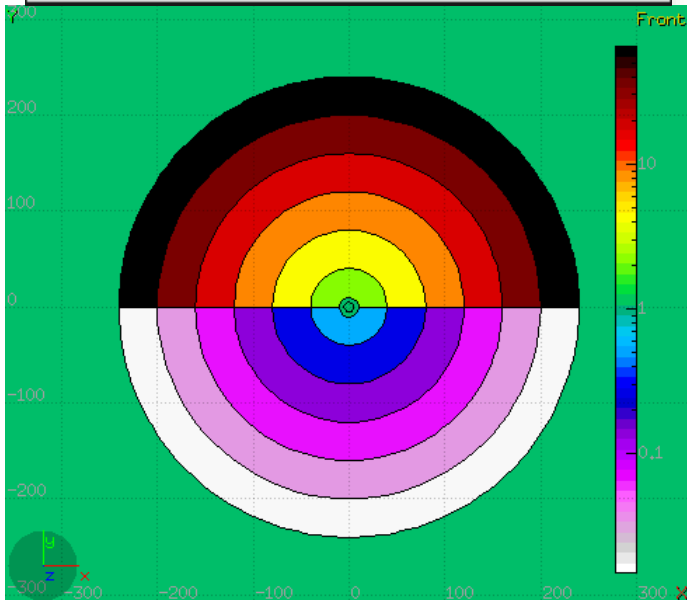
- All layers can be combined together e.g:
 - USRBIN and 3D
 - Custom color values (EMFCUT) with 3D
 - Image and USRBIN
 - ...

Geometry Layers [3/6]



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 [4/6]

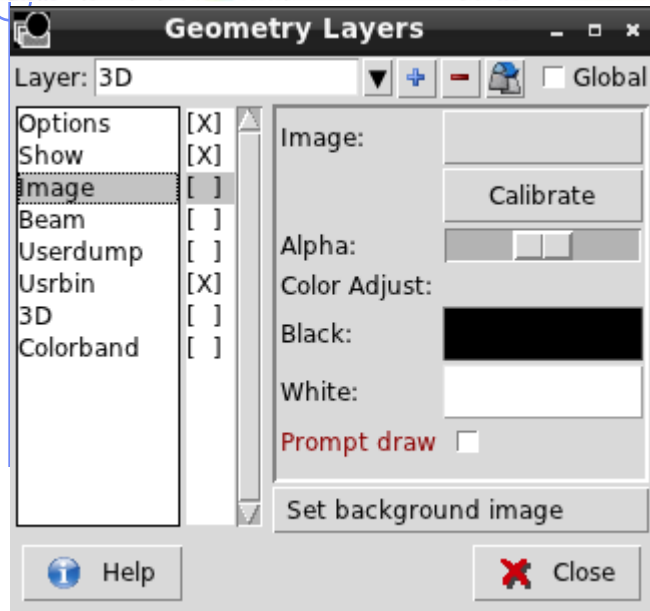
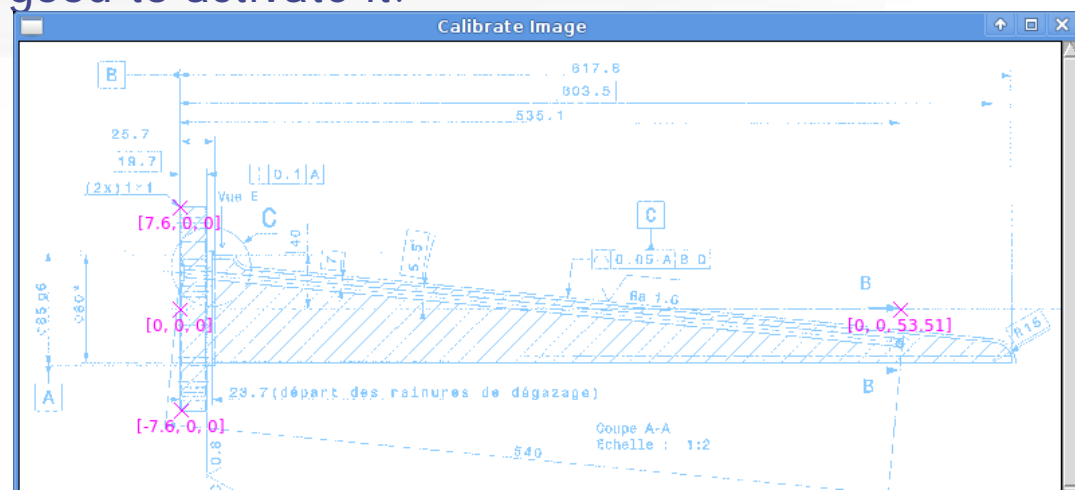
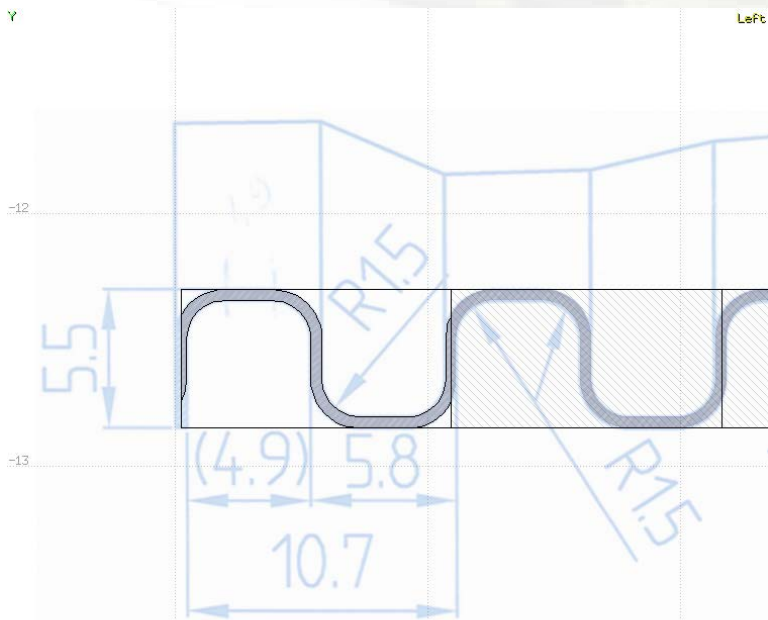
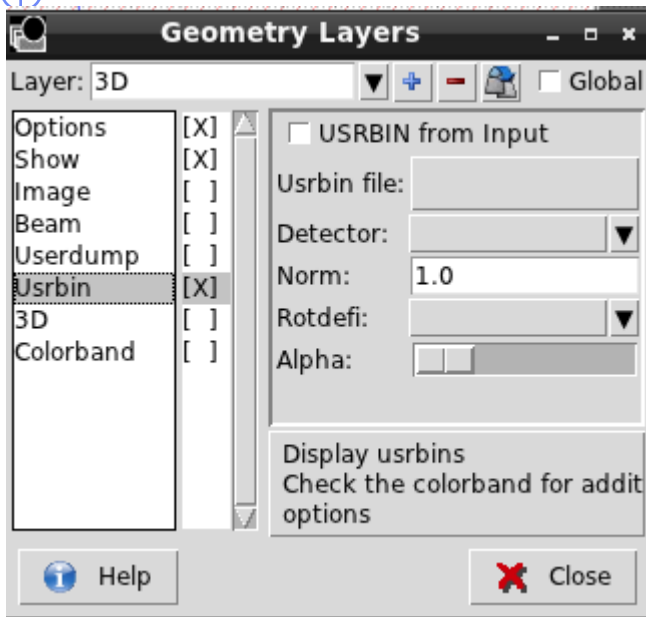


Image: set a background image to the geometry (i.e. a CAD-drawing);

- **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 [5/6]



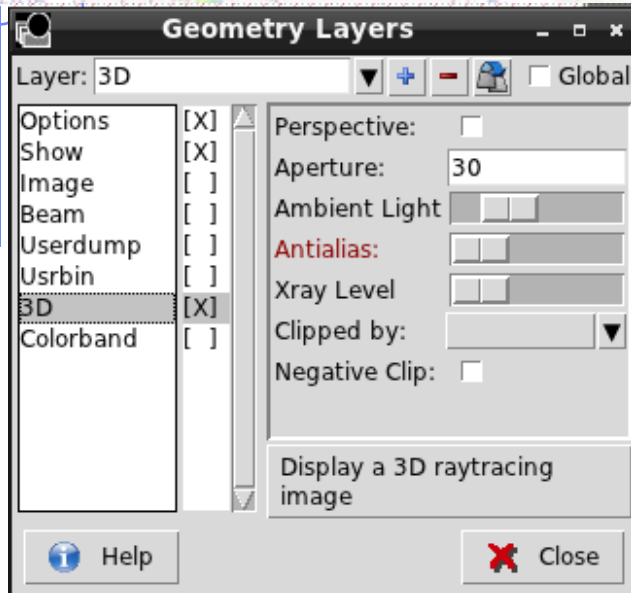
USRBIN:

- 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 USRBIN) among the ones present in the file;
- **Normalization** constant;
- Associate a **ROT-DEFI** transformation;
- Alpha blending between USRBIN colors and materials colors



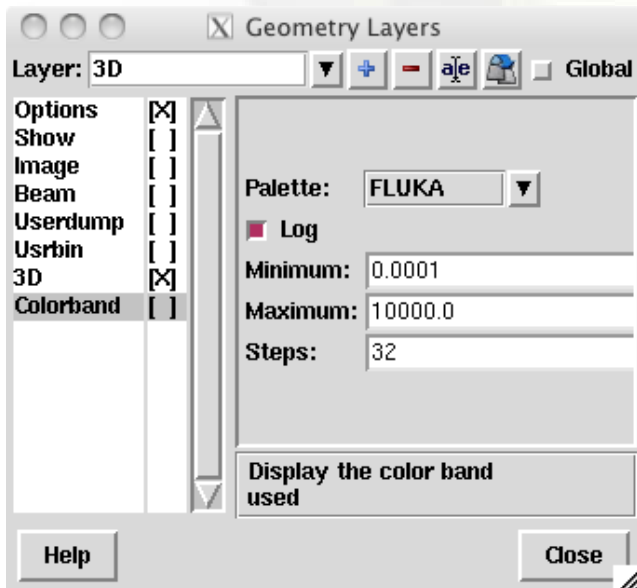
USRBIN should be combined with the Colorband to define the color limits

Geometry Layers [6/6]



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



Colorband: enable/set color band properties

- Change the default color **Palette**;
- **Enable/Disable Log** scale;
- **Set: Maximum, Minimum** and color **steps**.



ESCAPE

[**ESC**APE] will stop/unselect in the following order on item at a time:

1. Stop the current action e.g. during rotation or panning
2. If a zone is selected unselected the zone
3. Unselect any selected bodies
4. Unselect any selected region