flair for FLUKA
+ geometry editor

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What's new in Version 0.9.1

- Reworked Undo/Redo and refreshing of windows when the change is performed from a different window
- 2D frames for editing
- Work for #include support

Geometry Viewer

- Enhanced Interface
- More robust floating point operations
- Layers introduction and late-drawing (sub-thread):
  - Lattice's and Voxels
  - Colors-plots for various input parameters (BIASING, CUT's...)
  - Background Image aligned with the view
  - USRBIN cuts in 2D & 3D
  - 3D raytracing
  - Colorband scale
- Automatic definition of zone description
- Display of zones
- Image exporting (.png, .jpg, .gif..., and .dxf)

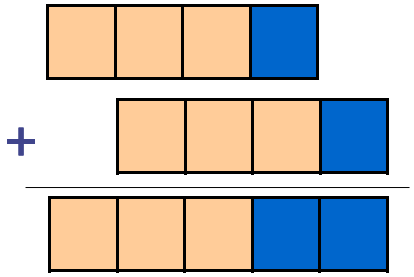
Floating point operations

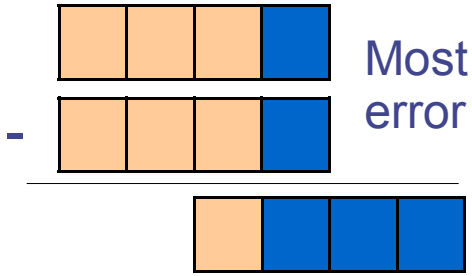
- Check for equality $|x\text{-}x_{ref}| < acc$ is often problematic
  - What *acc*uracy to choose if x is a result of a complex operation?

- Geometry viewer has to solve many Cubic and Quartic equations, 3x3 & 4x4 determinants as well use trigonometric and hyperbolic functions

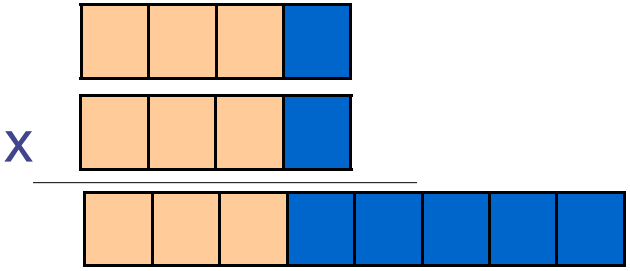
  → prone to many numerical precision problems

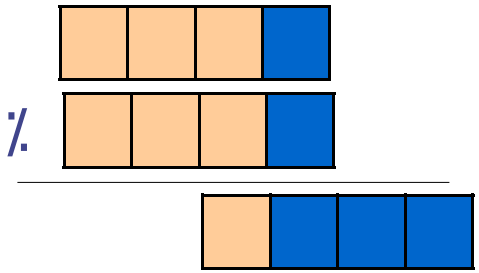
Floating point errors





Most catastrophic error “Cancelation”





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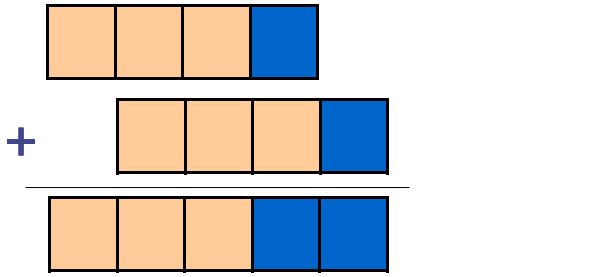
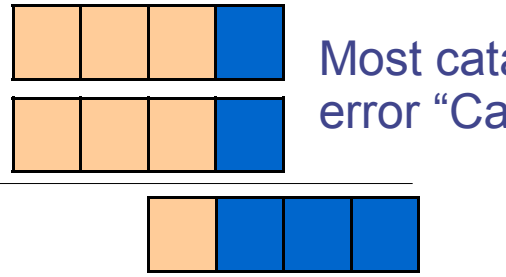


$$c = \sqrt{\left(\frac{\partial c}{\partial a}\Delta a\right)^2 + \left(\frac{\partial c}{\partial b}\Delta b\right)^2}$$
$$\leq e(|a|+|b|)$$



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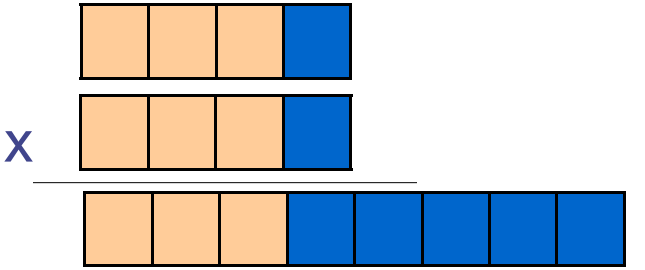
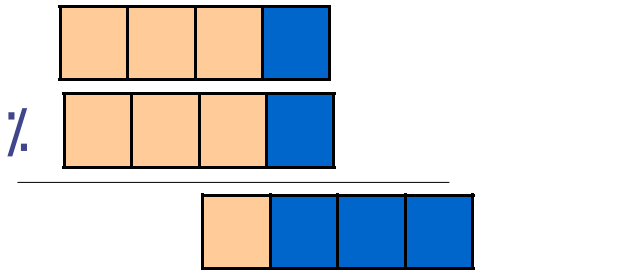


$$c = \sqrt{\left(\frac{\partial c}{\partial a}\Delta a\right)^2 + \left(\frac{\partial c}{\partial b}\Delta b\right)^2}$$
$$\leq e|a \times b|$$



$$c = \sqrt{\left(\frac{\partial c}{\partial a}\Delta a\right)^2 + \left(\frac{\partial c}{\partial b}\Delta b\right)^2}$$
$$\leq e\left|\frac{a}{b}\right|$$

Assuming that Δa=e|a|

Floating point operations

- Check for equality $|x-x_{ref}| < acc$ is often problematic
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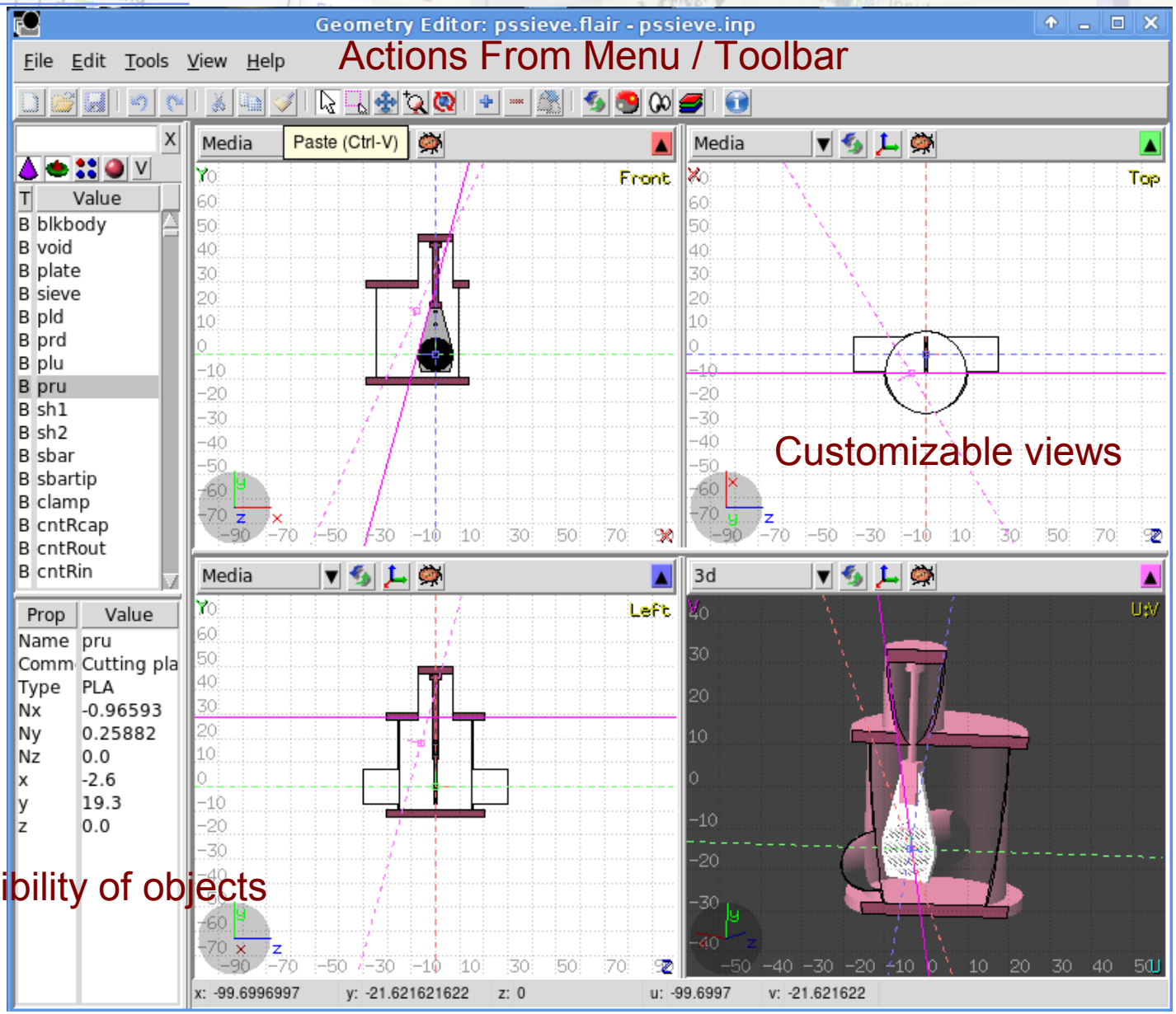
- Geometry viewer has to solve many Cubic and Quartic equations, 3x3 & 4x4 determinants as well use trigonometric and hyperbolic functions

  → prone to many numerical precision problems

  Solution:
  - The precision loss follows closely the error propagation laws
  - However trying always to keep the power of the numbers to minimum e.g
    - $x^2-y^2 = (x+y)(x-y)$
    - $a^2 + a*b + c = a\,(a+b) + c$

Improved Interface



Select visibility of objects

Easy zone definition

- Select the bodies that compose your region.
- Select the “zone” tool and click somewhere in the region
- The program displays the zone description and copies it to the clipboard

  xi= 222

  yi= 187

  u= -0.79371617357001956

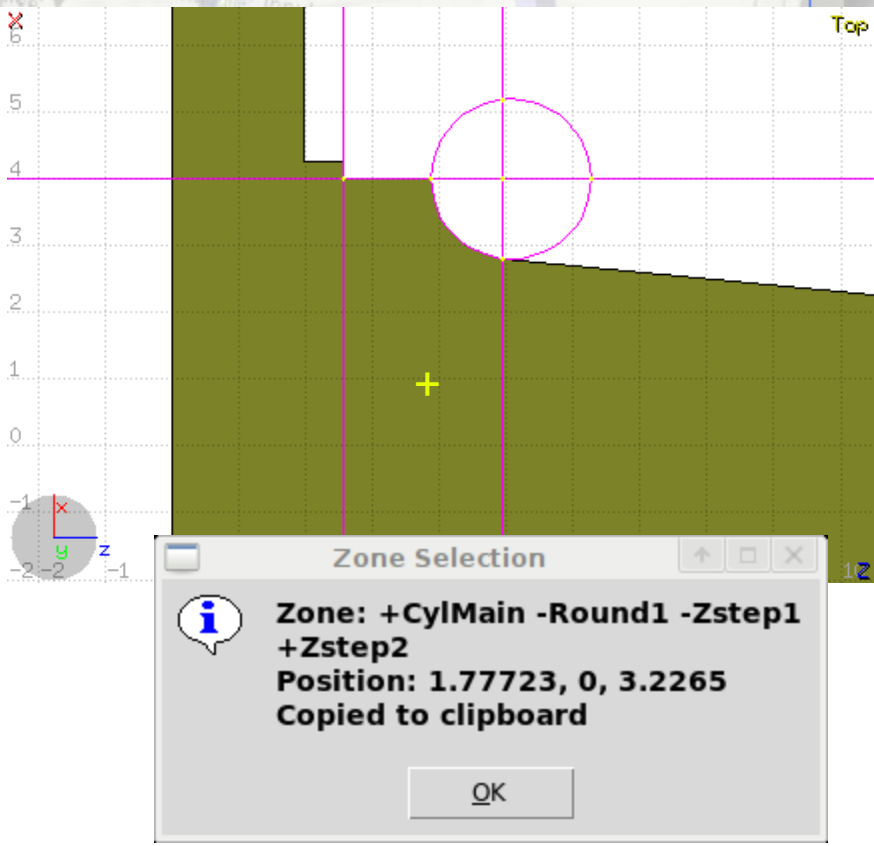
  v= -0.48647120315581849

  x= 1.7772256033139977

  y= 0.0

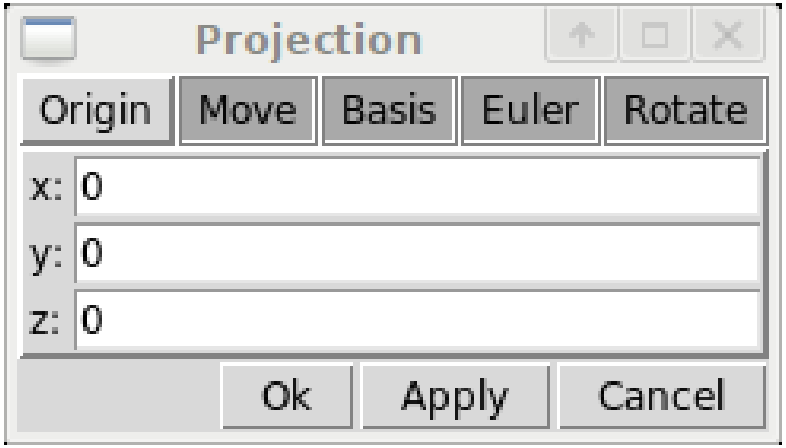
  z= 3.2264978751271922

  Zone= +CylMain -Round1 -Zstep1 +Zstep2



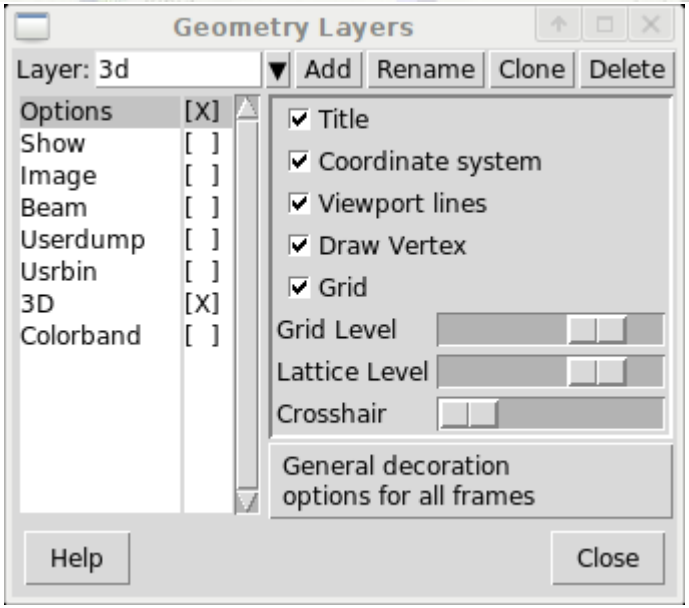
Projection Selection

- Dialog:
  - Absolute positioning of origin
  - Relative displacement
  - Absolute basis selection
  - Using Euler angles
  - Or relative rotation of the viewport
- Using the viewport cut in other windows



Layers

- User can create additional layers to overlay additional information
- Options: general display options
- Show: Information to be displayed
- Image: background image
- ~~*Beam: information*~~
- ~~*Userdump: overlay particle tracks*~~
- Usrbin: display arbitrary cuts of usrbin
- 3D: raytracing image
- Colorband: color scale



Show – Layer

- Select color to fill the regions:
  - Region: Random color
  - Material: User selectable
  - Density: from MATERIAL card
  - USRBIN: from region-USRBIN
  - Importance: BIASING what(3)
  - Splitting: BIASING what(2)
  - Corrfactor-dE/dx: what(1)
  - Corrfactor-other: what(2)
  - Deltaray: what(1)
  - e-Production: EMFCUT
  - e-Transport: EMFCUT
  - g-Production: EMFCUT
  - g-Transport: EMFCUT
- ~~Region labels~~
- Lattices
- Voxel
- ~~ROTDEFI~~

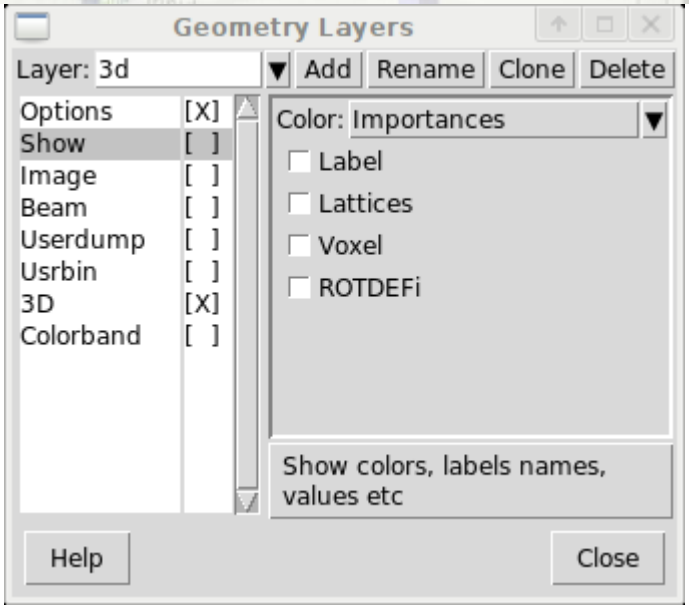
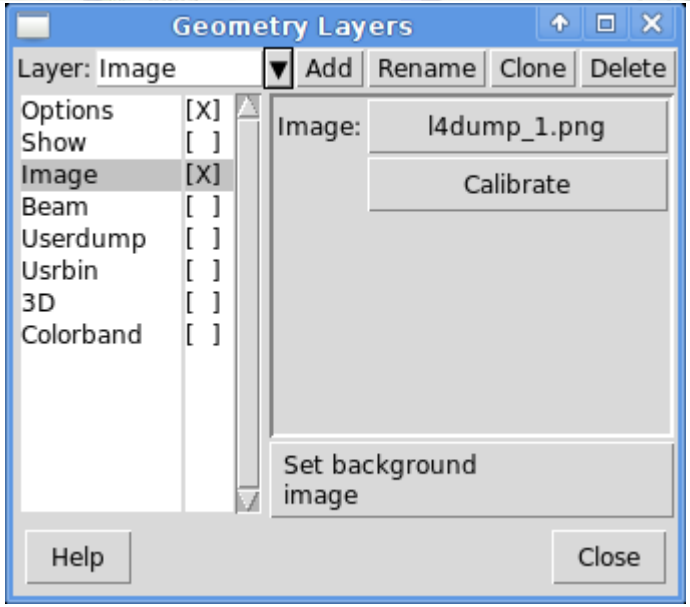


Image - Layer

- “Calibrate” an image to be used as a background to the current viewport.

  Useful to check for errors in geometry



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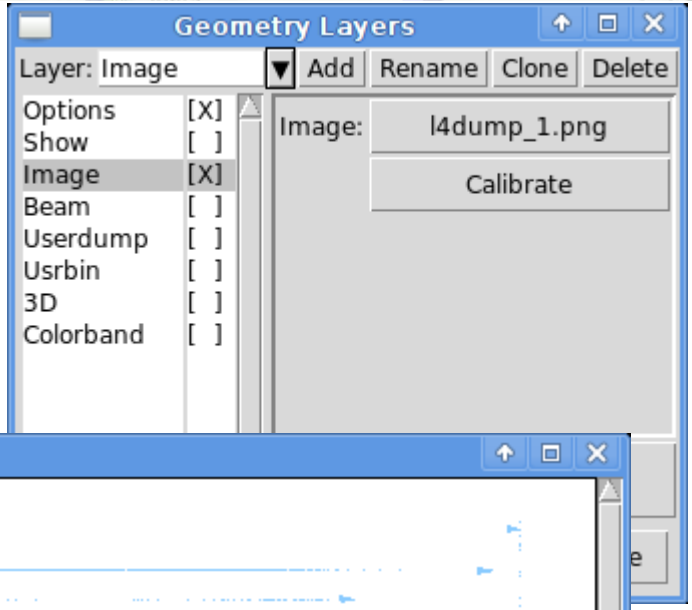

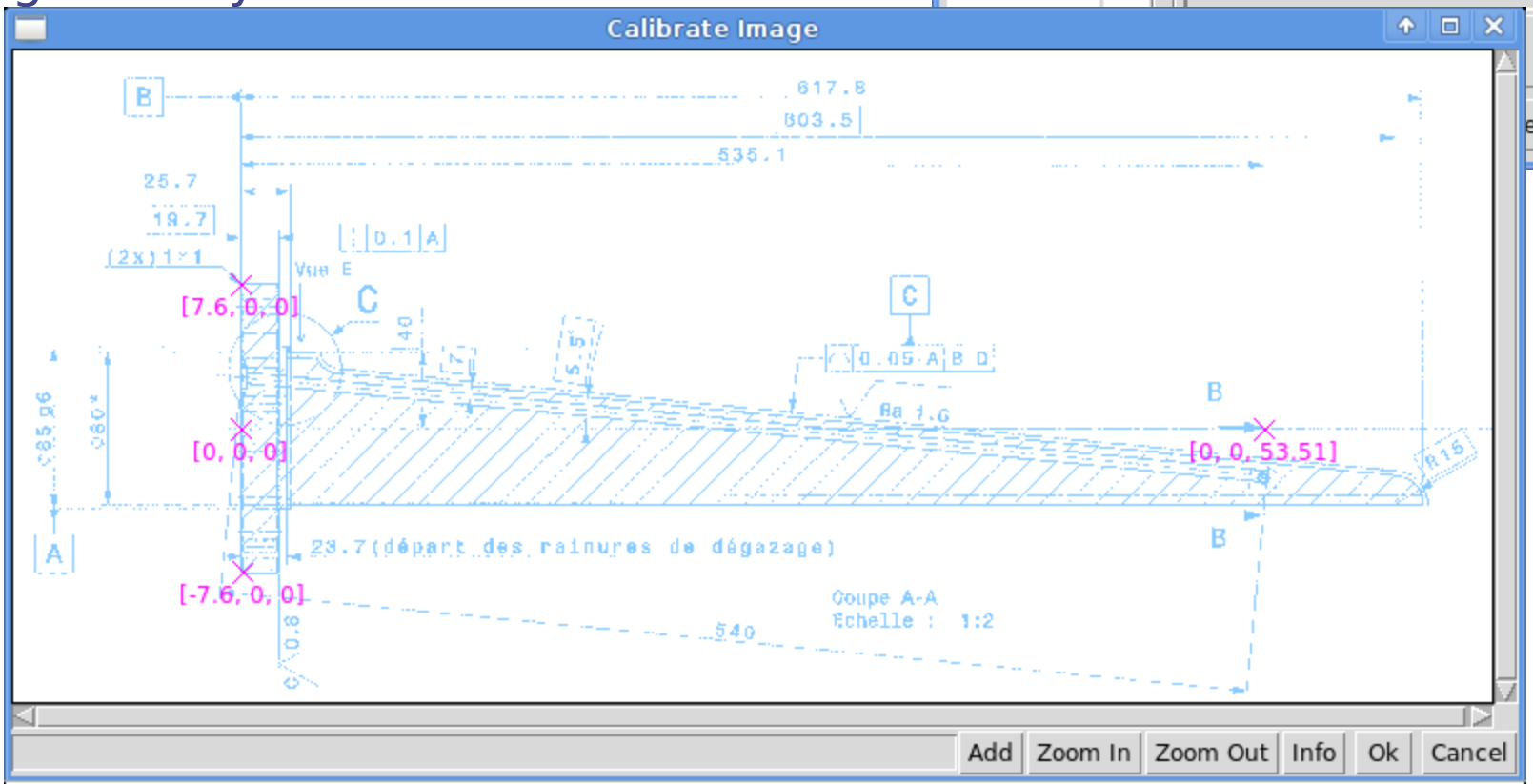

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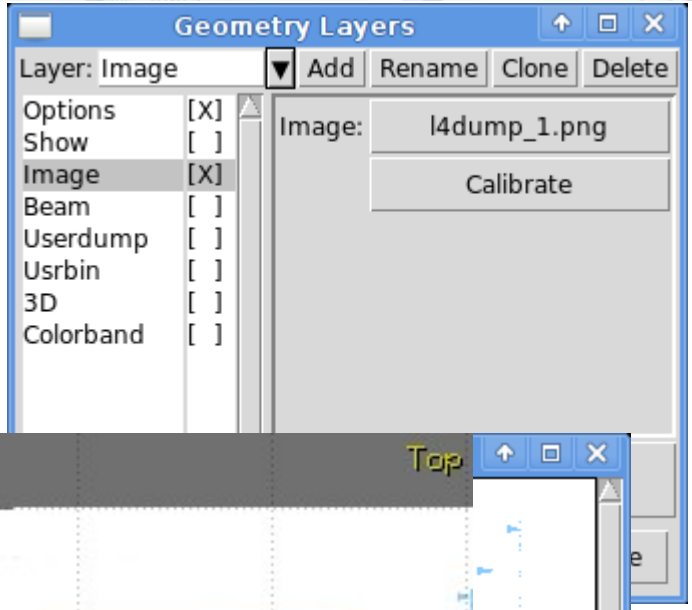
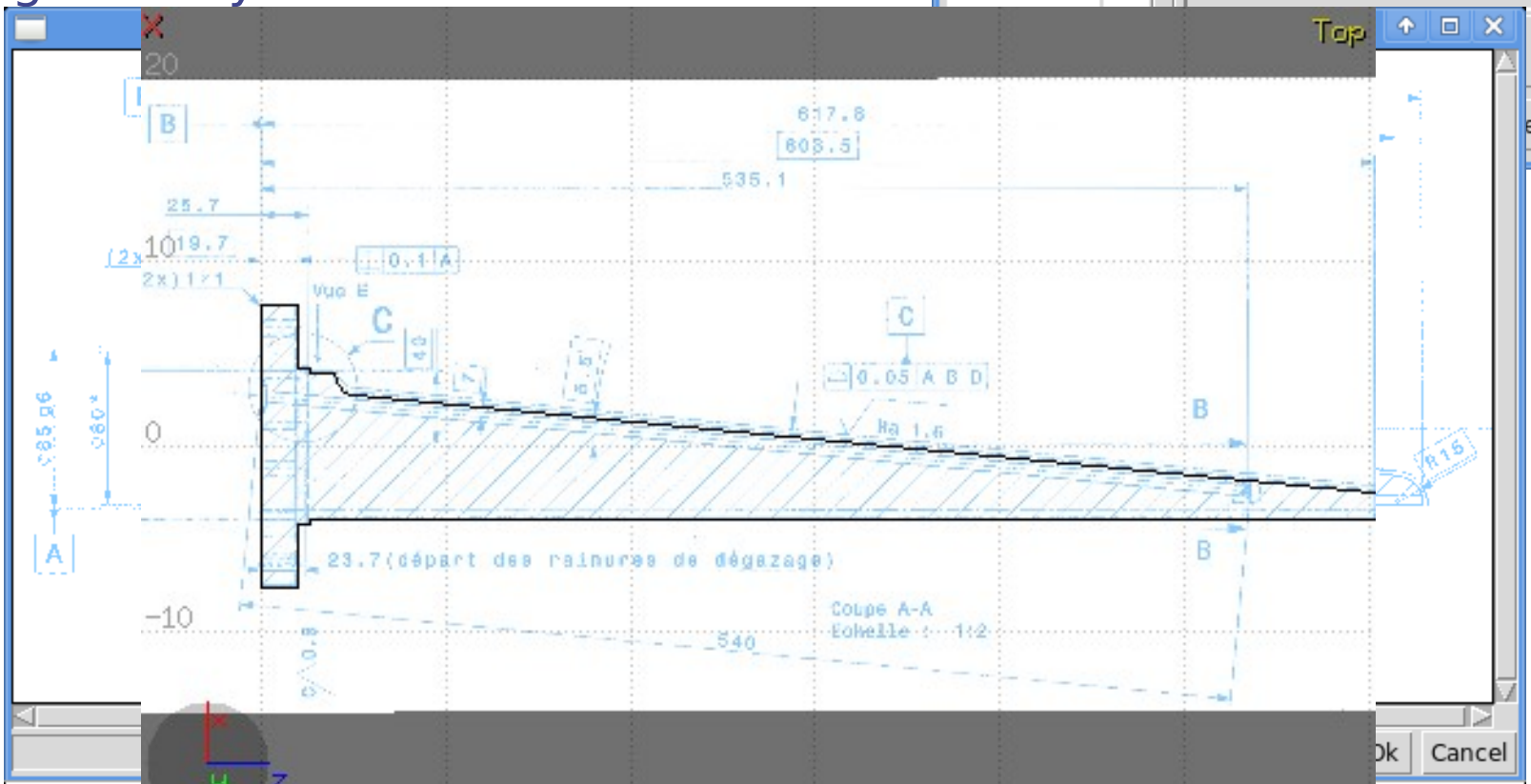
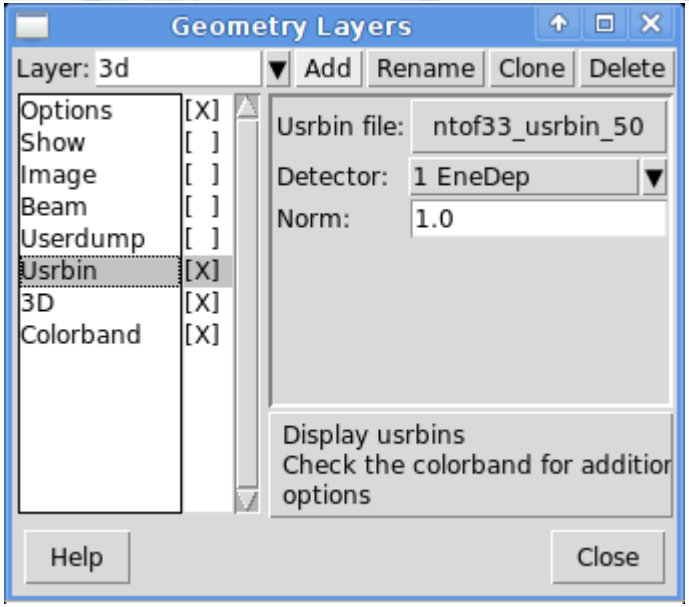
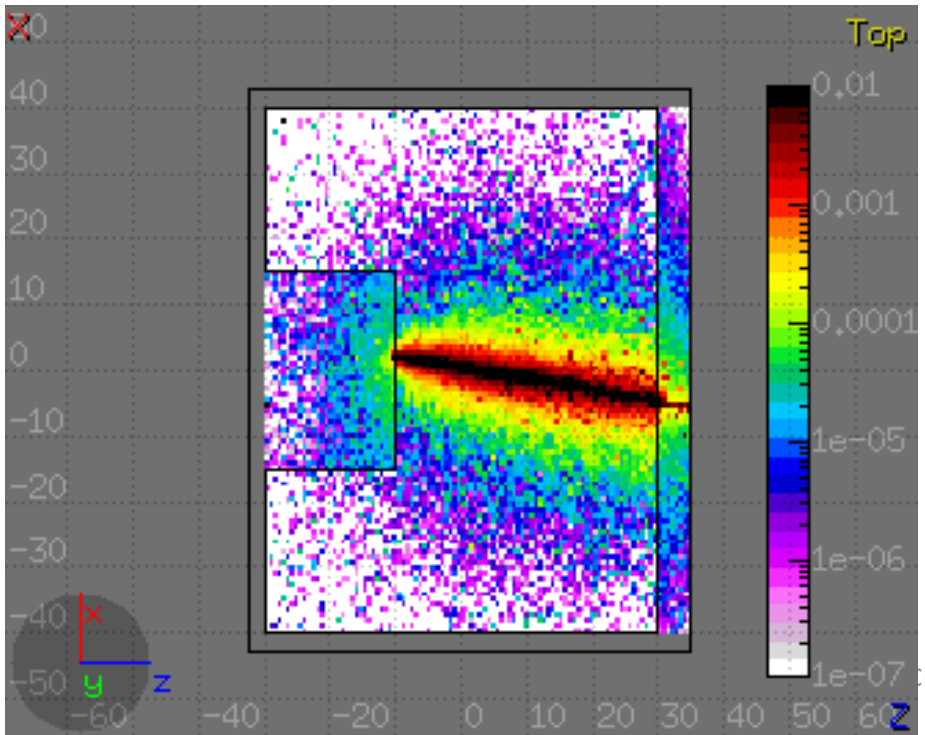




USRBIN - Layer

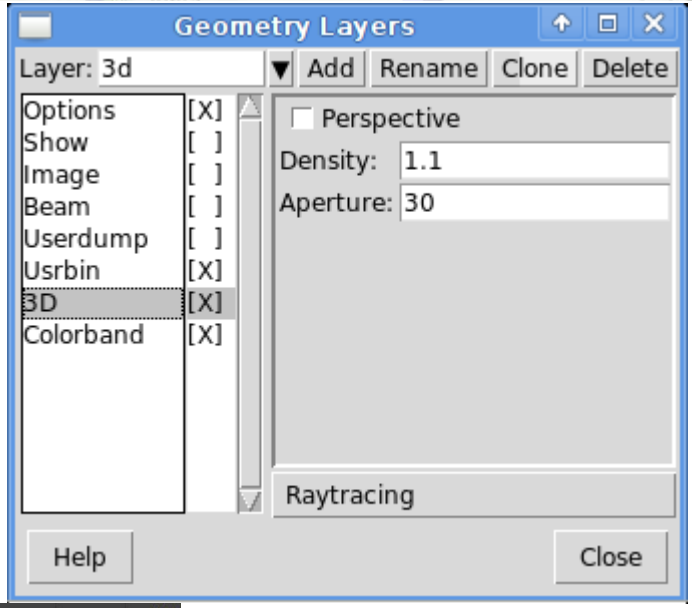
- Import a USRBIN file and display arbitrary cuts of the selected detector.
- Normalization and ~~rotation~~ can be applied
- Can be coupled with the Colorband and also the 3D display

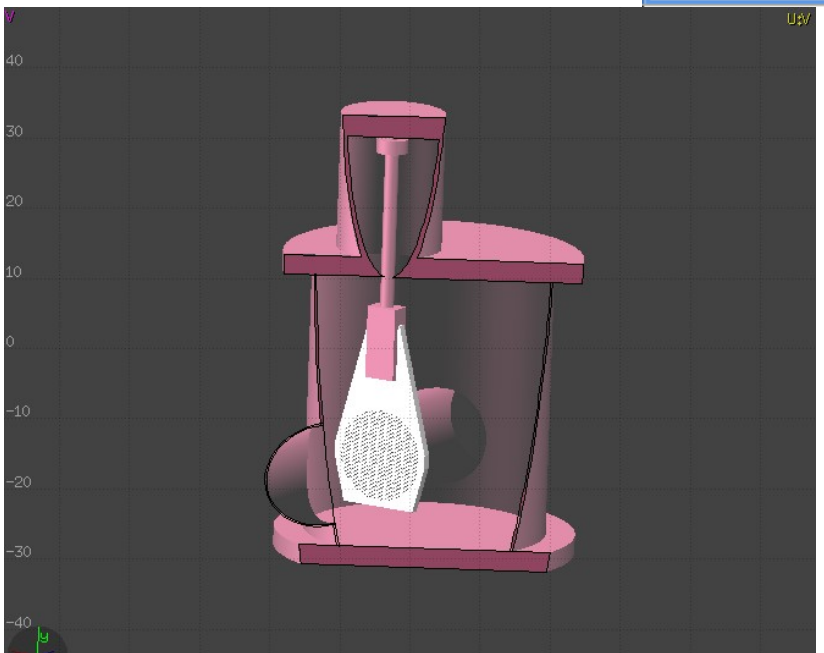




3D - Layer

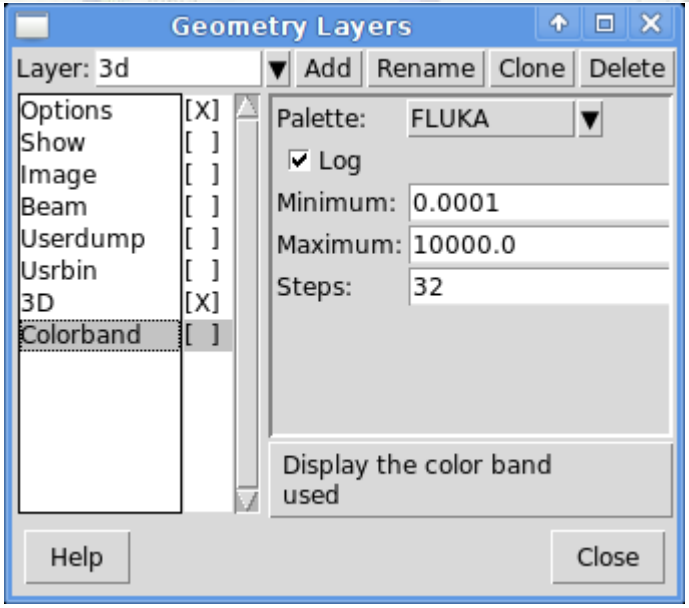
- Fast 3D display with raytracing on viewports
- “Orthographic” or “Perspective”
- Treat as transparent objects with density lower than a certain value
- User defined aperture
- For the moment there are 3 fixed lights, will be user-defined in the future

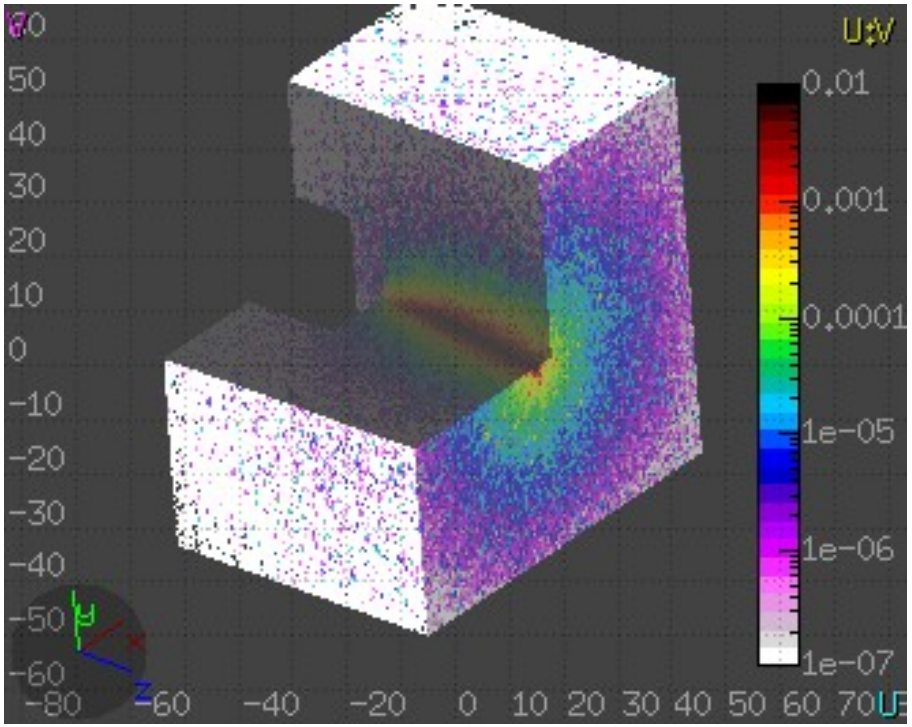




Colorband - Layer

- Select and display color band
- Log/Lin and limits





Status & Future

Plotting engine

- Geometry engine operates reasonably
- Quite robust for debugging geometries
- Could be further optimized (factor x2)

Interface

- A lot of work for a user friendly interface
- Editing of bodies / regions / transformations should be added