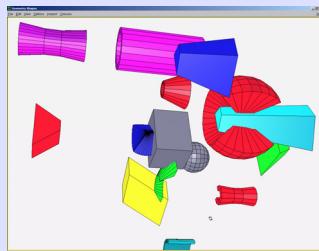


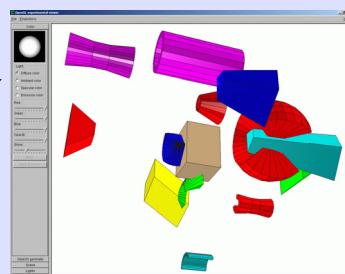
R. Moulder¹⁾, T.Pocheptsov⁴⁾
 1) CERN – European Organization for Nuclear Research, Geneva, Switzerland
 4) Joint Institute for Nuclear Research (JINR)

GL Viewer: Can now be used as a standalone viewer and as built in pad. TPad can render classical 2D graphics, using X11 or Windows graphics and 3D graphics using OpenGL. We intend to exploit this to offer wide new range of data representation techniques.

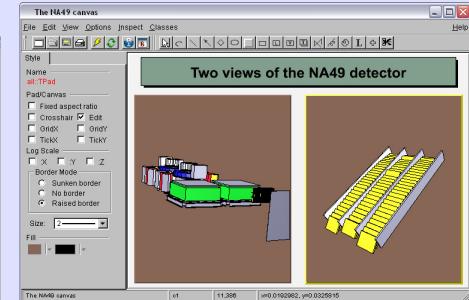
```
root[0] gStyle->SetCanvasPreferGL(kTRUE);
root[1] .x shapes.C
```



Canvas

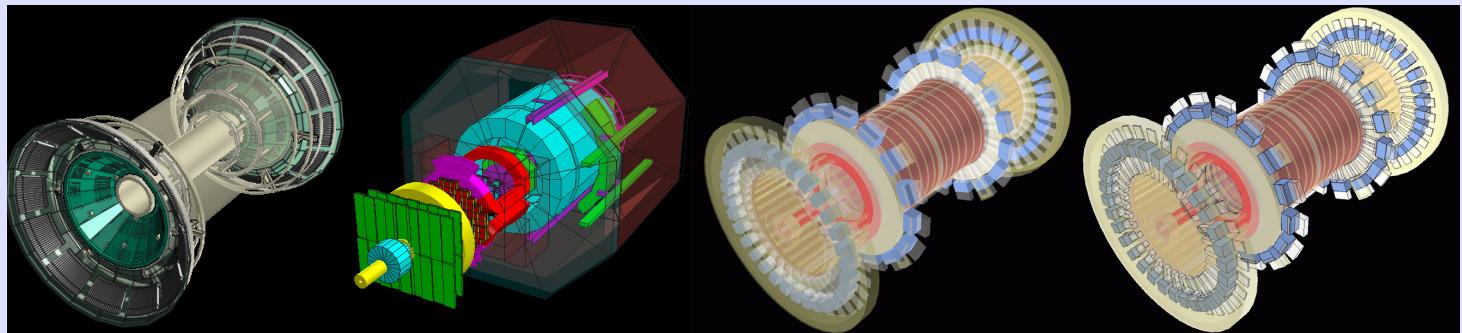


Standalone GL viewer



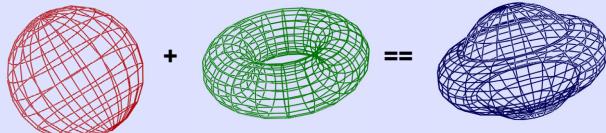
na49view.C

Draw Style: Objects can be drawn as solids and solids with outlines:

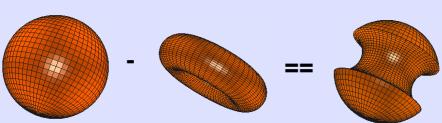


Composite Shapes: ROOT's composite shapes (TGeoCompositeShape) can now be visualized with GL viewer:

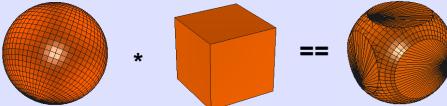
```
new TGeoCompositeShape("cs", "sphere + torus")
```



```
new TGeoCompositeShape("cs", "sphere - torus")
```



```
new TGeoCompositeShape("cs", "box * sphere")
```



```
TGeoCompositeShape *cs1 = new TGeoCompositeShape("cs1", "tub1+tub1:r1");
TGeoCompositeShape *cs2 = new TGeoCompositeShape("cs2", "tub2+tub2:r1");
TGeoCompositeShape *cs3 = new TGeoCompositeShape("cs3", "cs1*cs2");
TGeoCompositeShape *cs = new TGeoCompositeShape("cs", "cs3*box:r2");
```



Clipping: Remove subset of objects to show detector internals etc.

Two techniques

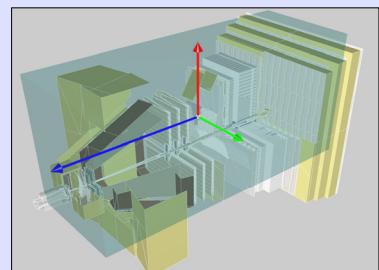
• **OpenGL® Clip Planes:** Multiple renders, each with one or more clip planes, combine together e.g. 3 sides of box:



Pros: Fast and simple, interactive (few planes)

Cons: Accurate only for shapes described by planes - approx otherwise.

Clipped solids not capped -hollow.

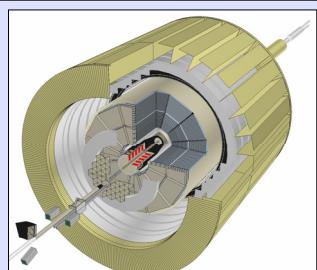


• **CSG Operation:** Add all object meshes (o1..on), subtract clipping object mesh (c) :

$o1 + o2 + \dots + on - c$

Pros: Any arbitrary clipping shape possible

Cons: Cannot adjust interactively
Slow, complex
Proper capping of solids



Adding both methods, clip planes for interactive setup, CSG for high quality renders.