Beamline and SVT in the Geant4 simulation

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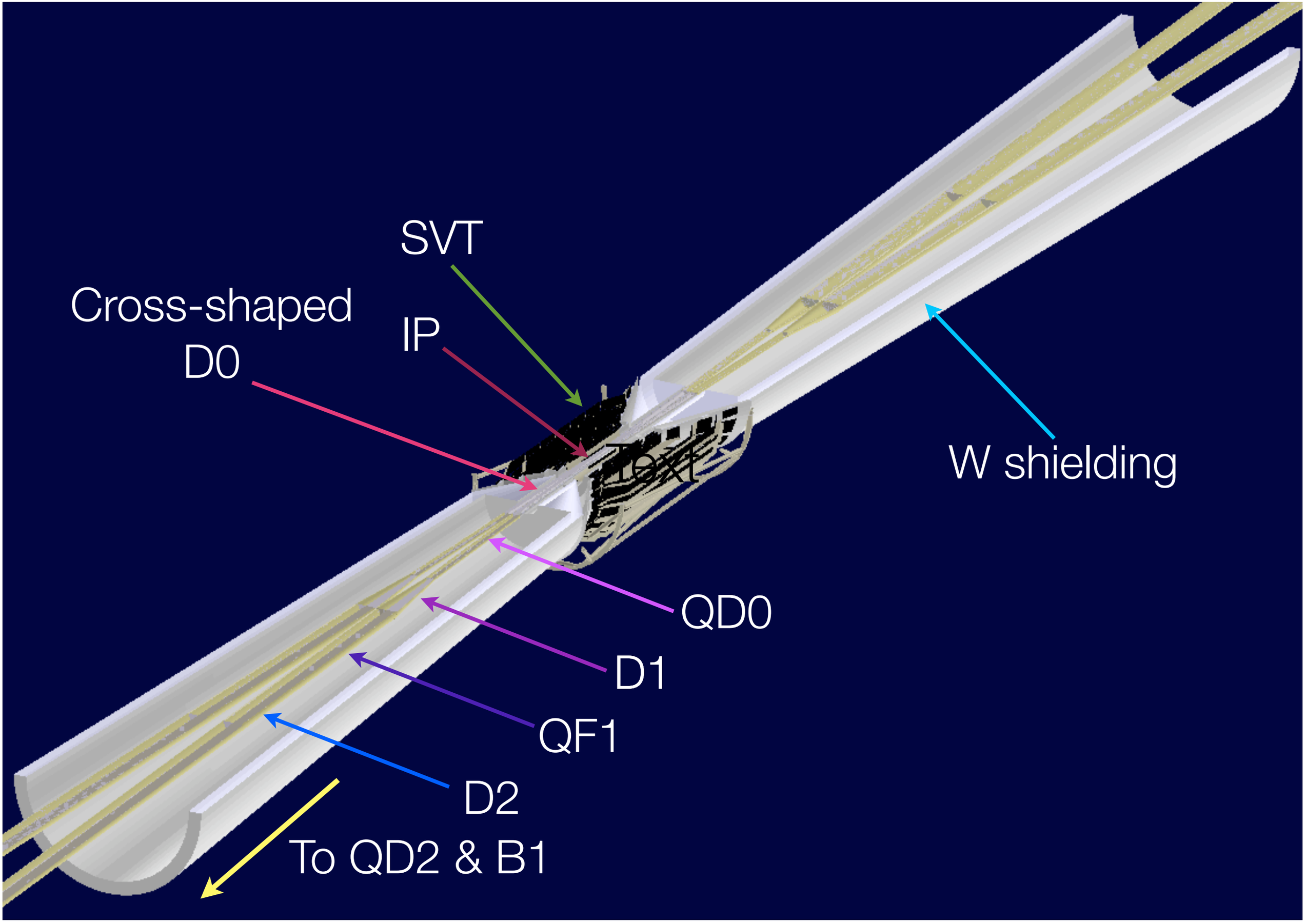
Beamline model (GM)

- GDML geometrical model built from the parameters of the final focus (position along the nominal beamline, length, multipole field coefficients) from MAD files of HER/LER FF (Marica)
    - MAD file -> GMAD file (via mad2gmad.sh)
    - GMAD file -> Geant4 model (BDSIM)
    - Geant4 model -> GDML file (GDML writer bundled with Geant4)
        - automatic positioning of all the optics elements (modeled as iron cylinders)
            - thickness not specified in MAD files -> has to be added
        - automatic addition of straight drift sections (iron cylinders 1 mm-thick)
- the magnetic field multipole coefficients are also stored (as additional volume attributes) in the GDML file (hacked the Geant4 GDML writer)
    - read-back and setting of correct magnetic field inside not yet fully deployed, temporarily hard-coded into the C++ simulation code

Beamline model cont'd

- manual work required in order to:
  - trim the final focus GDML file to only the few elements close enough (~25m) to the IP
  - rotate (by +/- the crossing angle) the two beamlines and make them coexist
  - place a cross beampipe around the I.R.
    - added a few days ago, I have to provide a more detailed model:
      - current: just an Fe beampipe
      - CDR: Be beampipe with water jacket (cooling), Au coating
  - place a 3cm-thick W shielding (polycone) around the beamline
  - define the envelope (polycone)
- some of the above can be made automatic with some coding


SVT
Cross-shaped
D0
IP
Textl
W shielding
QD0
D1
QF1
D2
To QD2 & B1

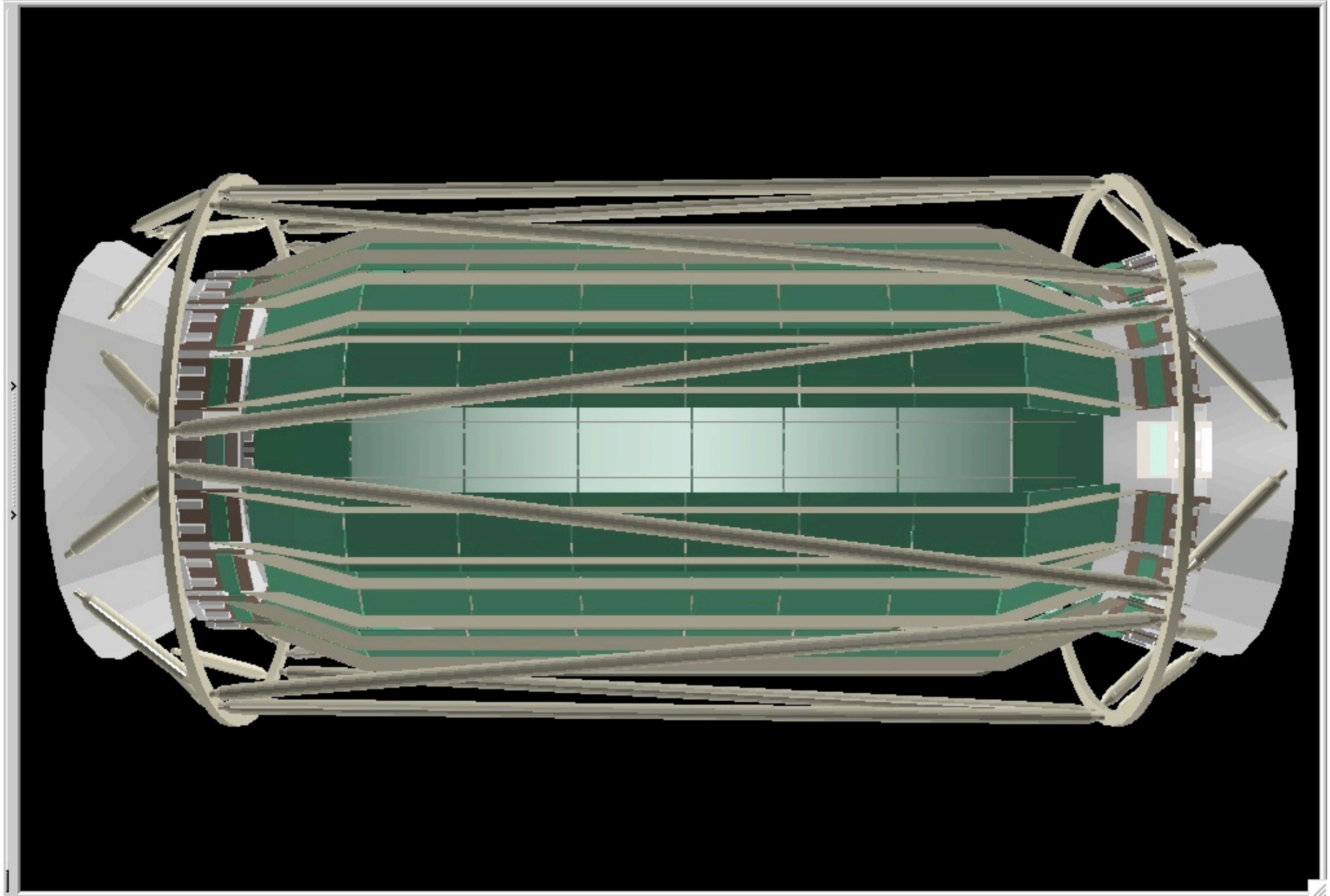
SVT model (EP)

- The previous (CDR) simulation used a simplified SVT model:
  - 6 cylinders in the barrel (L0 @r=1.2 cm, 50 μm thick, L1-5 @same r as in BaBar)
  - 2 wedges in the forward and backward directions (L4-5, like current SVT)

- The current simulation uses a more realistic SVT model:
  - the BaBar SVT, with 5 layers of Si wafers, ribs, supporting cones (obtained directly from the full BaBar Geant4-based MC Moose)
  - + inner L0 (r=1.5 cm, 9 cm long, 300 μm thick)

ROOT's GL viewer

File Camera Help



To-do list

- Check overlaps:
  - run ROOT overlap check (use Bruno first to convert original GDML file to simpler GDML understandable by ROOT)
  - run Geant4 overlap check at build time
  - run Geant4 overlap checks after the whole world geometry has been assembled

- Check geometry/fields:
  - make a test run with neutral (for geometry) and charged (for field) uniformly fired in all the directions from either the IP or the whole z axis? In this case, to perform a radiography, should we make everything sensitive? Does it make sense?

To-do list (II)

- Naming (lower priority):
  - rename volumes with more esplicative names, in particolar remove 0x.. suffixes
  - annotate GDML file as much as possible (file is few thousand lines liong)

- Strange results from preliminary study of bkg ntuples require investigation (with the help of BaBar expertes or other people)
  - will probably need to do some work on the quantities stored in the ntuples for the SVT hits

- Additional manpower is appreciated and welcome