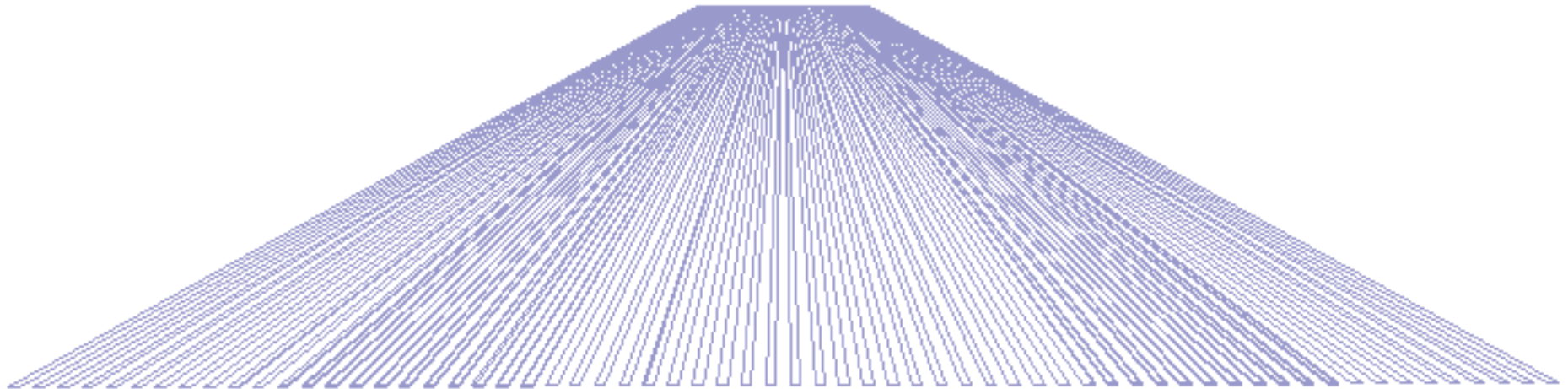# ICARUS T600 geometry

within Larsoft

Work by D. Gibin, C. Hilgenberg, A.M., A. Rappoldi, M. Torti

- ICARUS T600 geometry is based on a gdml file built from a perl script which creates the different geometry fragments from the definitions of the basic volumes following Larsoft philosophy of "nested dolls":

  - TPC (Wires, Race Tracks)

  - Cryostat (TPC + PMT planes, Cathode, Argon, Steel Shell)

  - Enclosure (Crysotat + Warm vessel)

  - World (Enclosure + Building, Overburden, Dirt)

  - CRT is treated differently: built apart with a python script and then merged with the ICARUS gdml file with a dedicated program.

- The official gdml file used for the last production is built from the perl script: *generate_icarus_complete_test12jul.pl*

- In this version some major upgrades have been inserted with respect to the release used for the last SBN joint meeting, namely:

  - Cathode plane was made semi-transparent to scintillation light.

  - Race track rings were added.

  - PMT shape was made hemi-spherical.

- The cathode panel is now made of 64 stainless-steel strips:

  - Width = 2.1 cm

  - Pitch = 5.0 cm

- Despite the difference with the true «punched sheets» structure, this geometry is a good compromise choice to have the correct cathode transparency to scintillation light (58%), with a limited number of geometry objects.
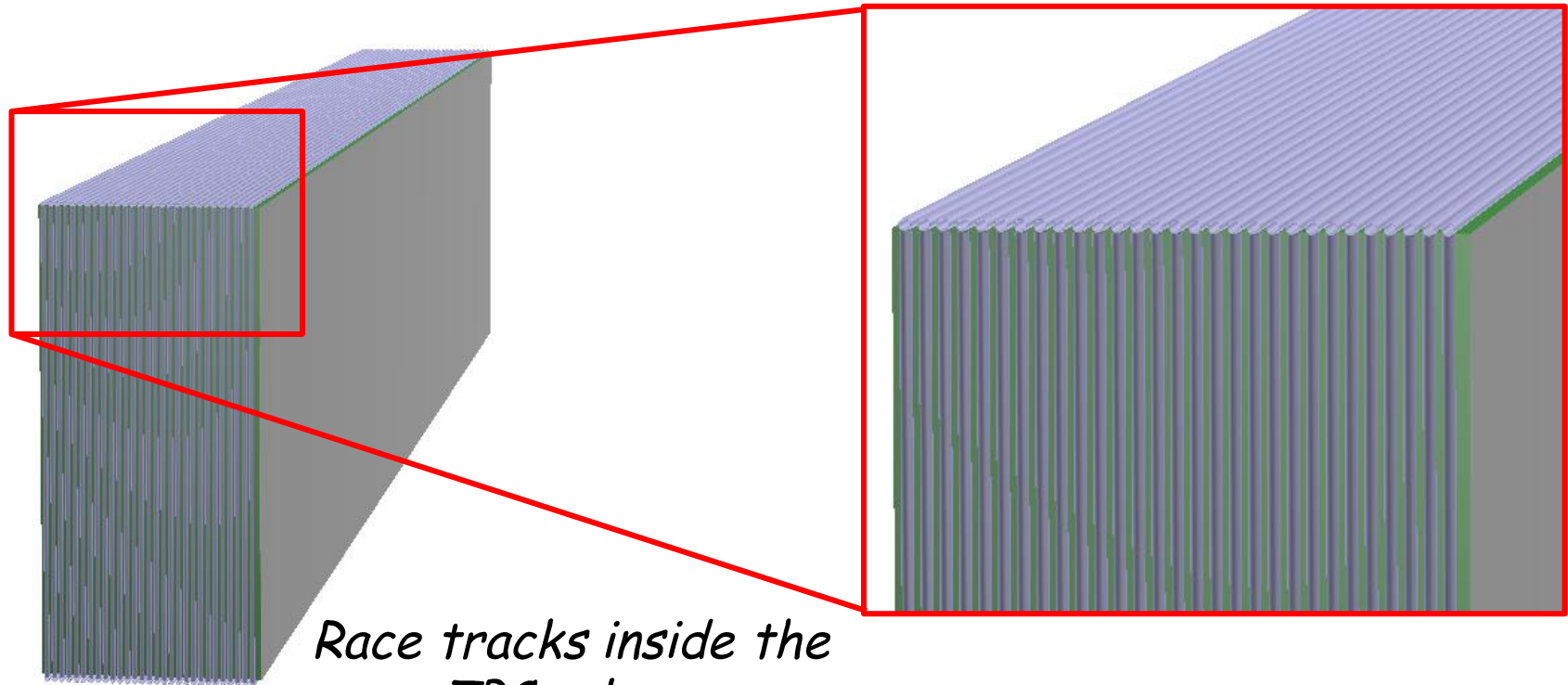
- 29 race track electrodes have been added to each TPC, forming the rectangular rings closing the field cage.
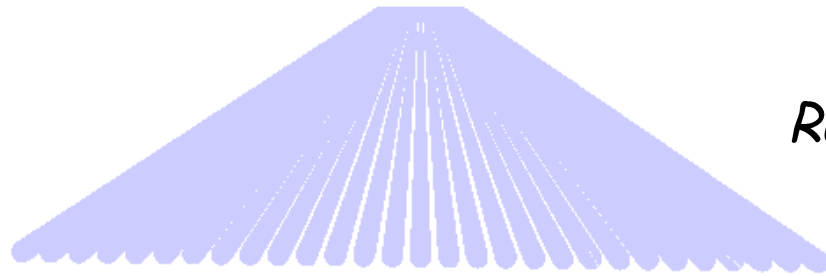
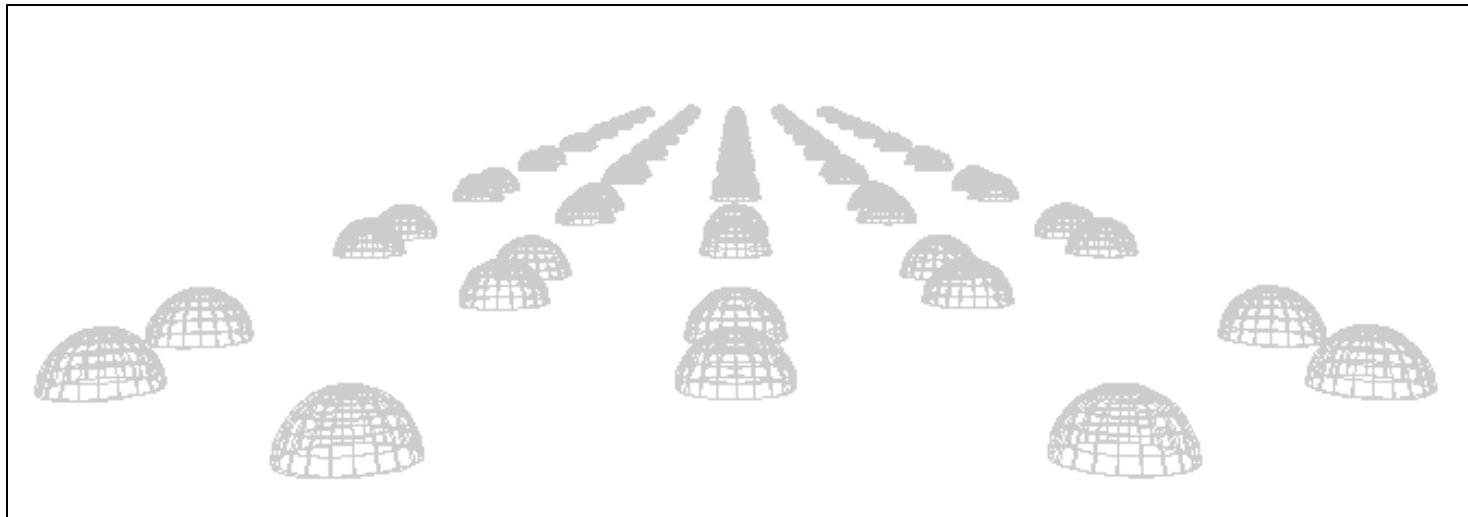*Race tracks bottom plane*
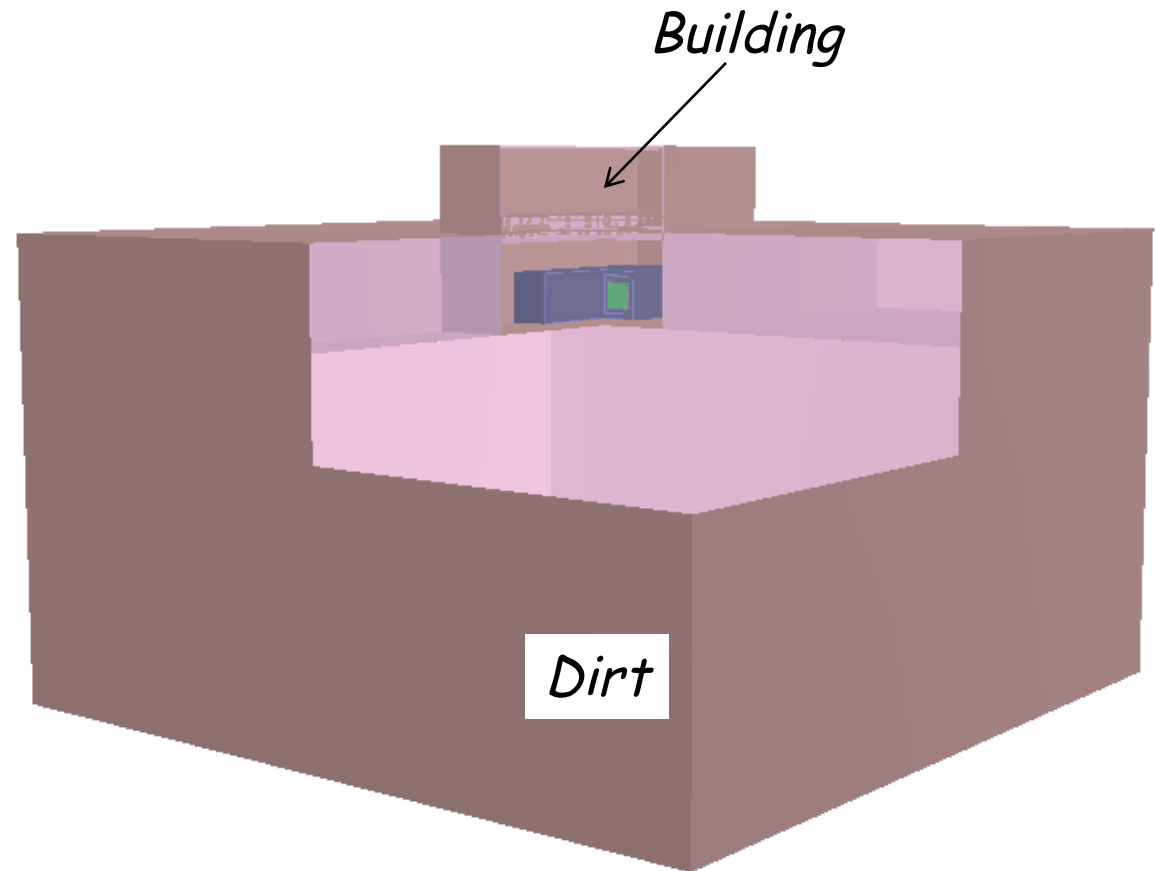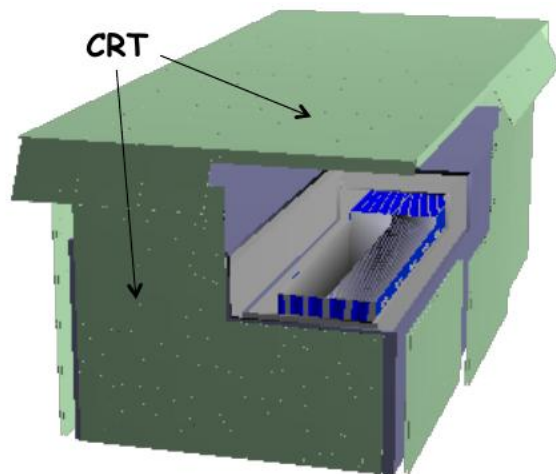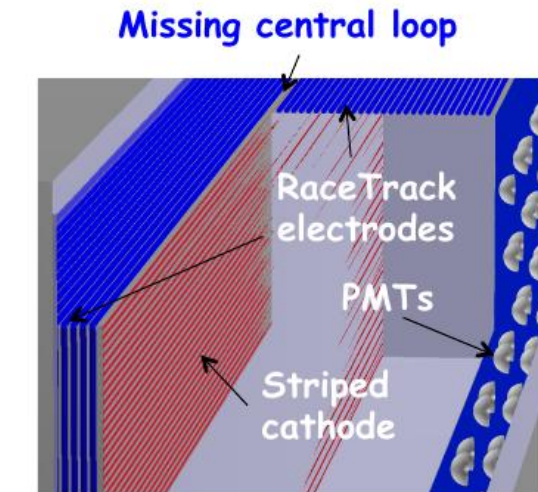
Race tracks inside the TPC volume

- New PMT window shape: from disk to hemisphere (ϕ = 8"), more resembling the true geometry:

- This is the present status of ICARUS geometry description with the new features (+ CRT):

- The inner detector description is quite satisfactory, but few improvements are needed:

    1) A missing race track ring must be inserted around the cathode.

    2) Horizontal wires should be splitted in two (easy, but then the simulation must take care of it!).

    3) Wire holding structure (relevant for light propagation).

    4) TPC mechanical structure - stainless-steel beam and pillars - should be inserted (missing high-mass budget!)

- The outer shell description is now very rough in terms of mass budget and size of: *cryostat, cold shields, thermal insulation and warm vessel.*

- We now have all information from ICARUS official technical drawings and these details will be soon implemented.

- Further improvements: top equipment and down-stream cryogenic equipment.

- The detector geometry is presently generated as a multi-step process:

  1) Perl script → gdml description of all the components but CRT

  2) Python script → gdml description of the CRT geometry

  3) Merge the two previous gdml files with an ad hoc program

- The first two steps collide because both define a DetEnclosure volume (with slightly different dimensions) containing different daughters.

- A solution was already found to modify both perl and python scripts: a call of the python script has been introduced inside the perl script to generate the ICARUS geometry without the merging. The inner hierarchies are not modified → to be soon implemented!