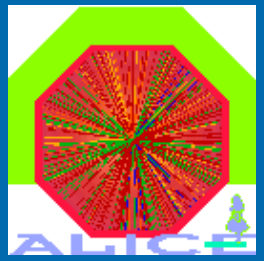
TS/CV/DC CFD TEAM



CFD Simulations of

The ALICE L3,

and ATLAS Muon

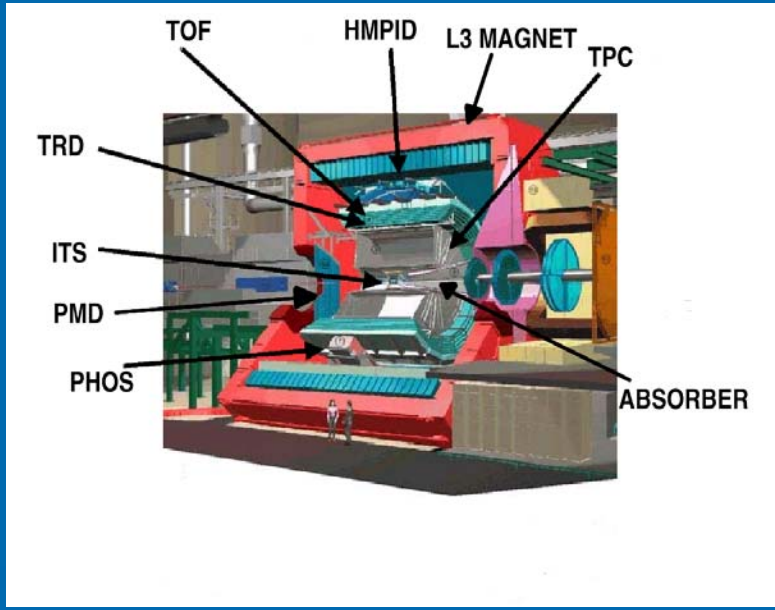
Ventilation

Anna.Mueller@cern.ch

ALICE - THE PROBLEM

For the optimum operation of the detectors a stringent temperature uniformity is required.

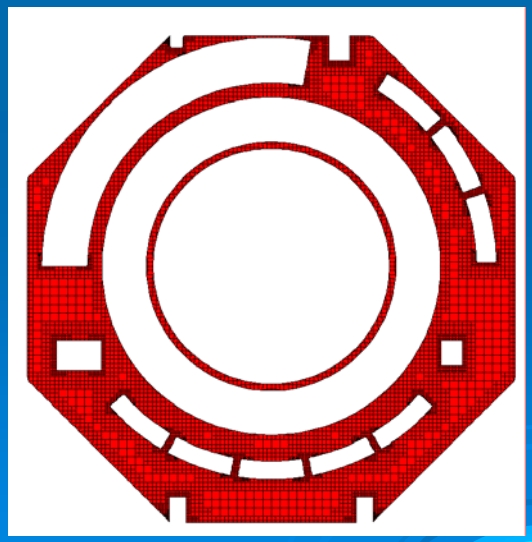
We are looking for the solution of the air flow **velocity** and **temperature** field in a closed volume with the **17 kW** of heat dissipated.

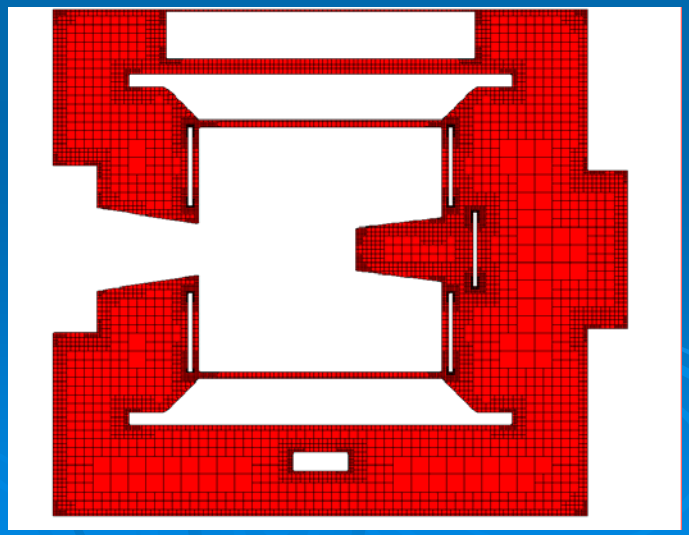


What is the best ventilation configuration ensuring the uniform temperature field in the air surrounding the detectors?

ALICE - THE MESH.

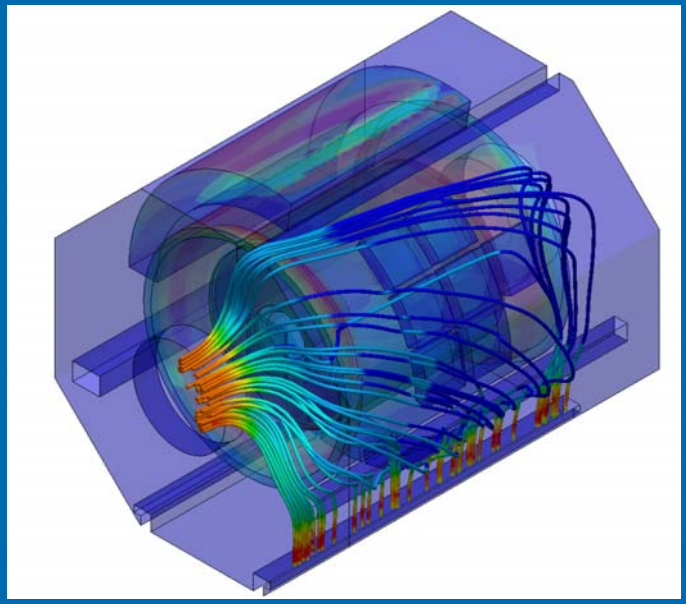
- The trimmed, nonuniform mesh was used,
- 1 milion of cells,
- 16 different configurations of inlets studied.





ALICE - THE MODEL

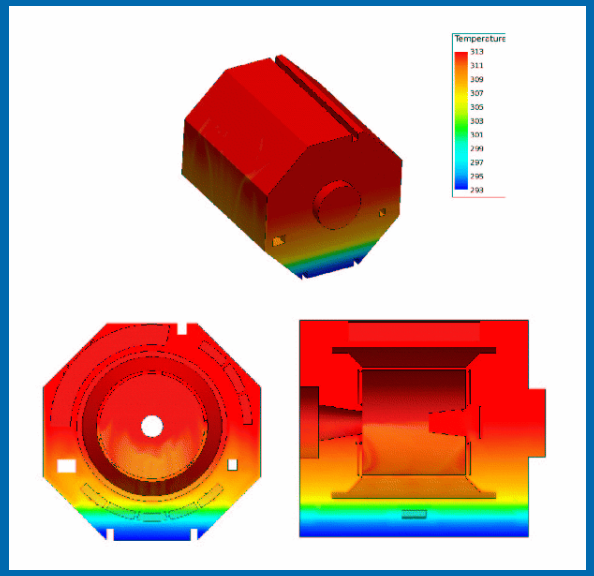
- 3D flow simulation,
- Time dependent study (strong influence of natural convection)
- Air treated as the ideal gas,
- Turbulence modeled – k-epsylon,

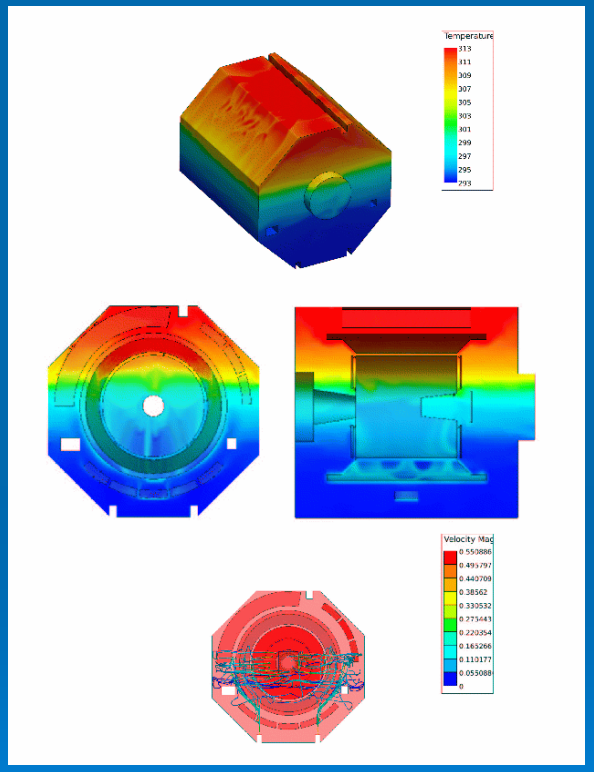


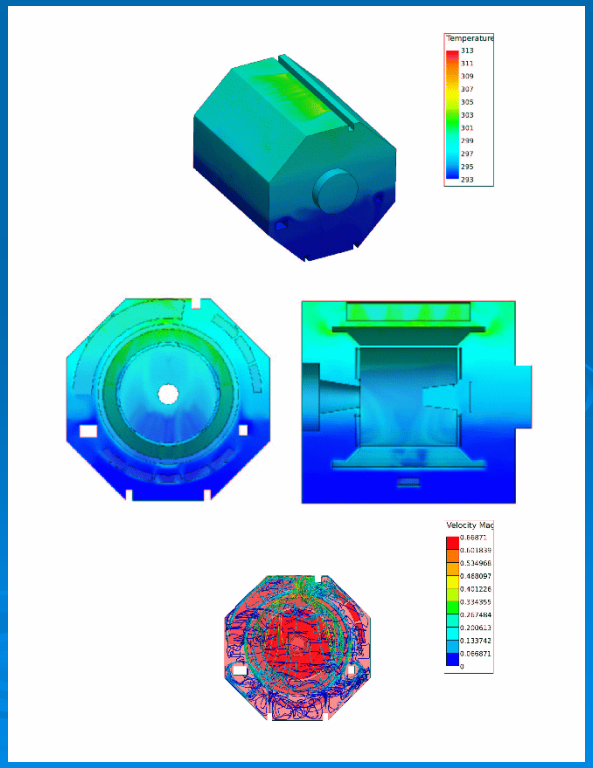
- Heat dissipation applied on subdetectors' outer surfaces – 17 kW,
- Heat sink – L3 magnet thermal screen kept at constant temperature 293 K.

- There will be supplied 6000 m3/h of air at 293 K.
- It is possible to install ventilating ducts in 5 to 6 positions, parallel to the beam pipe.

ALICE - RESULTS







For details see: EDMS 528133

ALICE - RESULTS

- Understanding the flow originated by the natural convection fenomena,

- Pointing the hot-spots located over the EMC detector,

- The best configuration (out of 16 tested) allowed to reduce the maximum temperature from 331K to 310 K

For details see: EDMS 528133

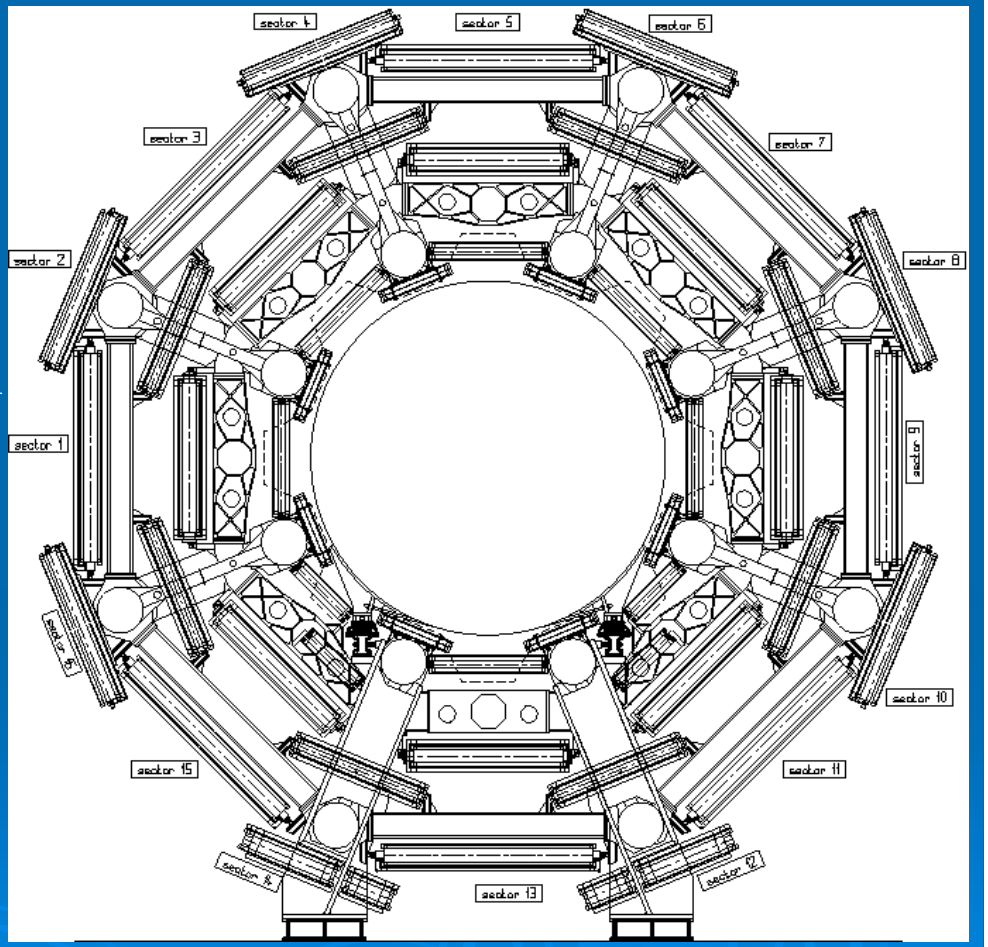
ATLAS – THE PROBLEM

- **80 kW** of heat is being dissipated from the Muon Chambers and the Calorimeter.

- The Cavern ventilation: 60000 m3/h of air at 17 C.

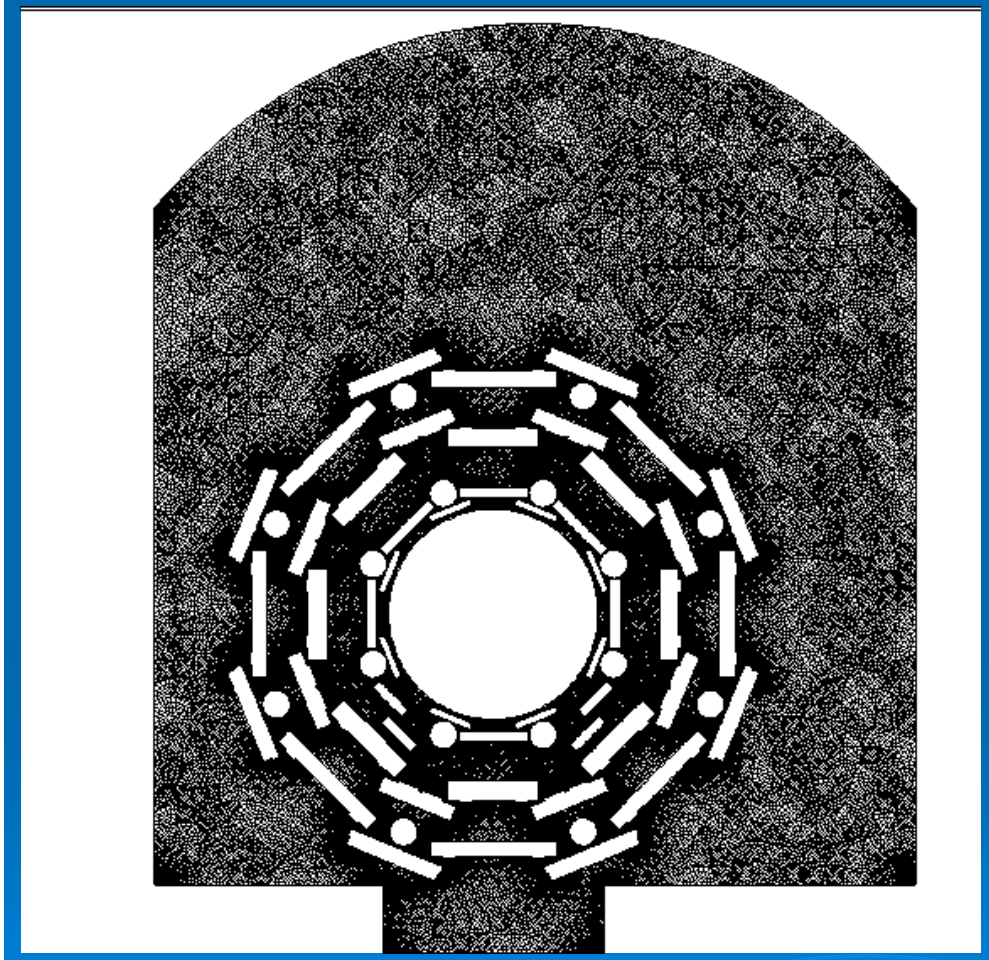
- The possibility of introducing the thermal screens kept at 20 C in the inner layer of sectors 3, 5 and 7.

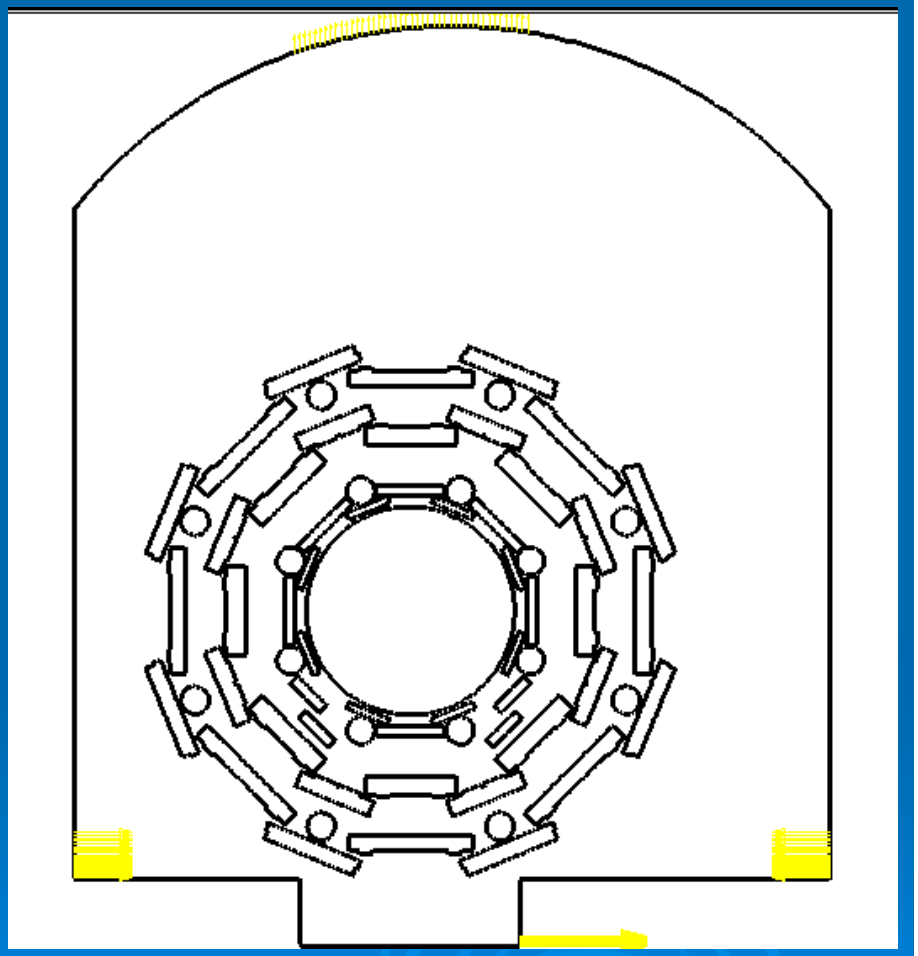
- The resulting temperature and velocity field will be used for more detailed thermal study of chambers realised by RFNC-VNIITF – LLC Strela, Snezhinsk, Russia .



Diameter ~ 20 m

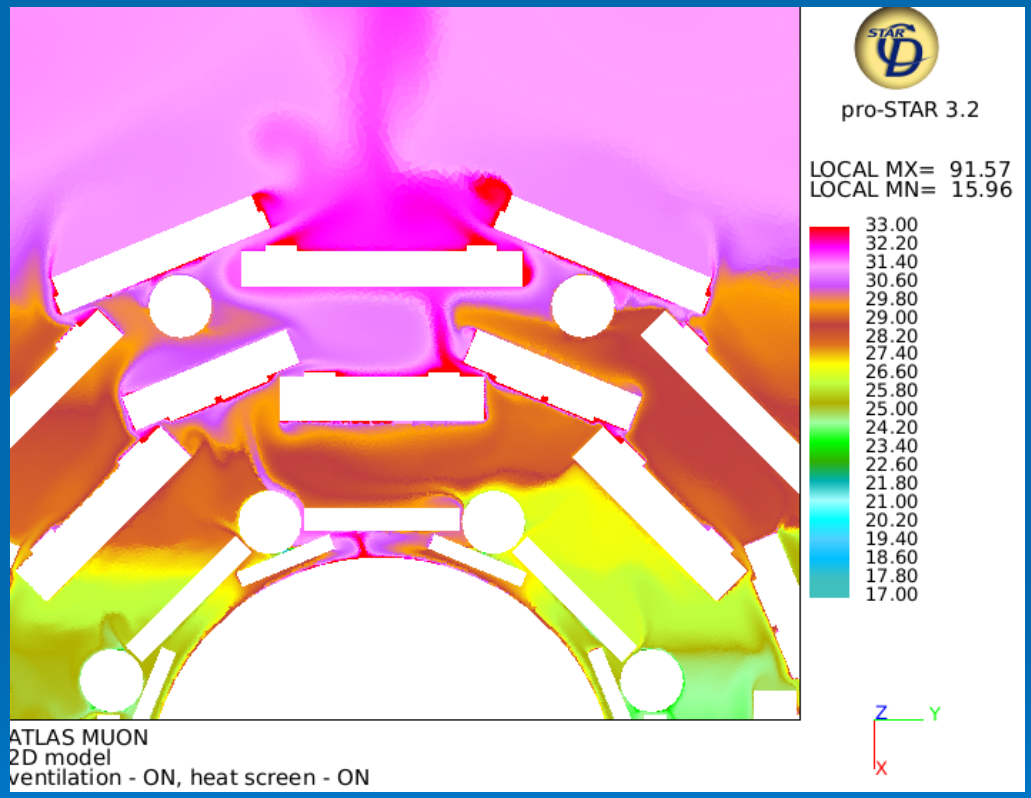
ATLAS – THE MODEL

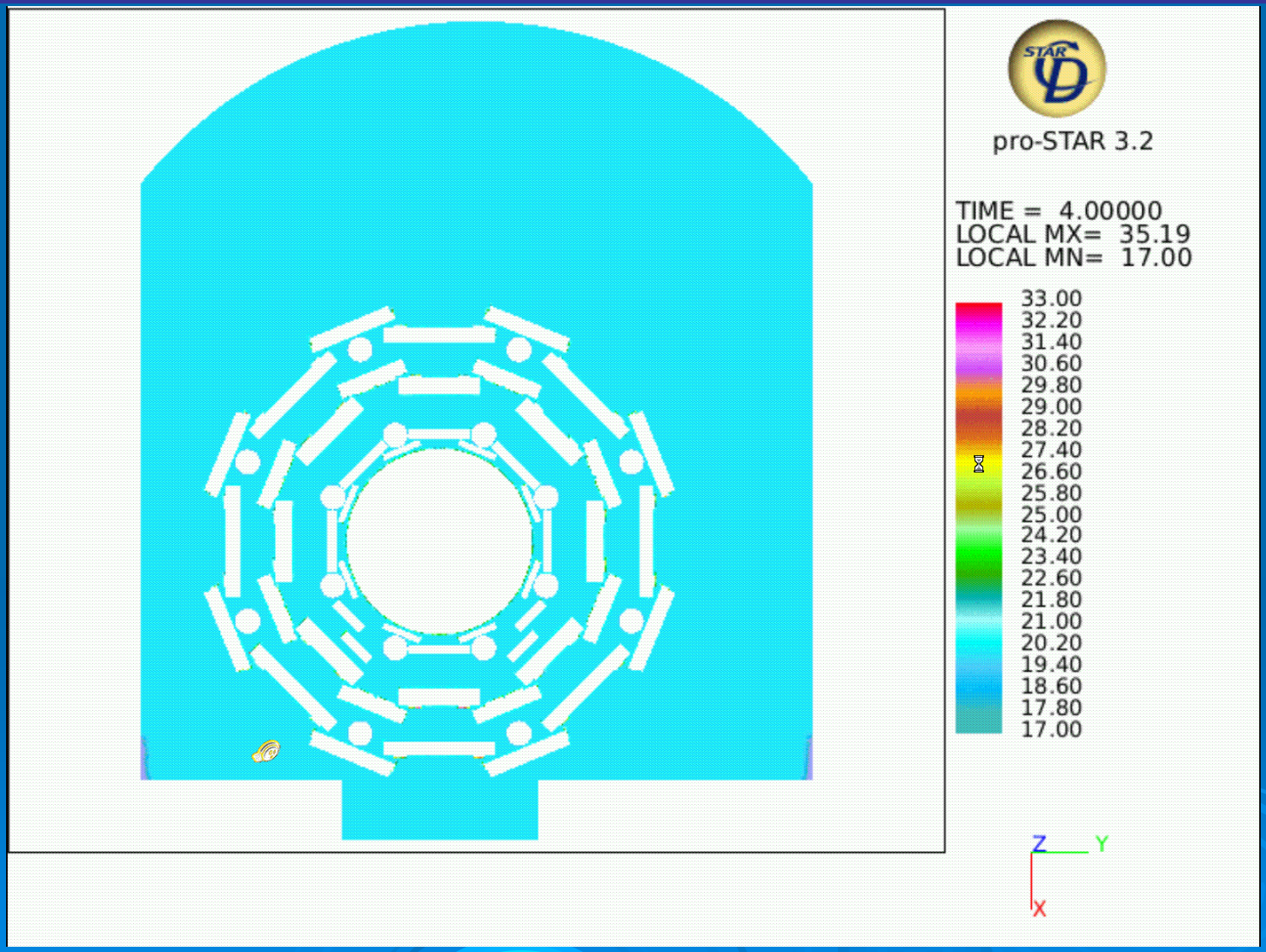




2D model. 230000 cells.

ATLAS – THE RESULTS



Thermal screen takes away 2 % of heat dissipation in the volu

ATLAS – THE RESULTS