The Simulation of Thermal Behaviour of the MQY Quadrupole

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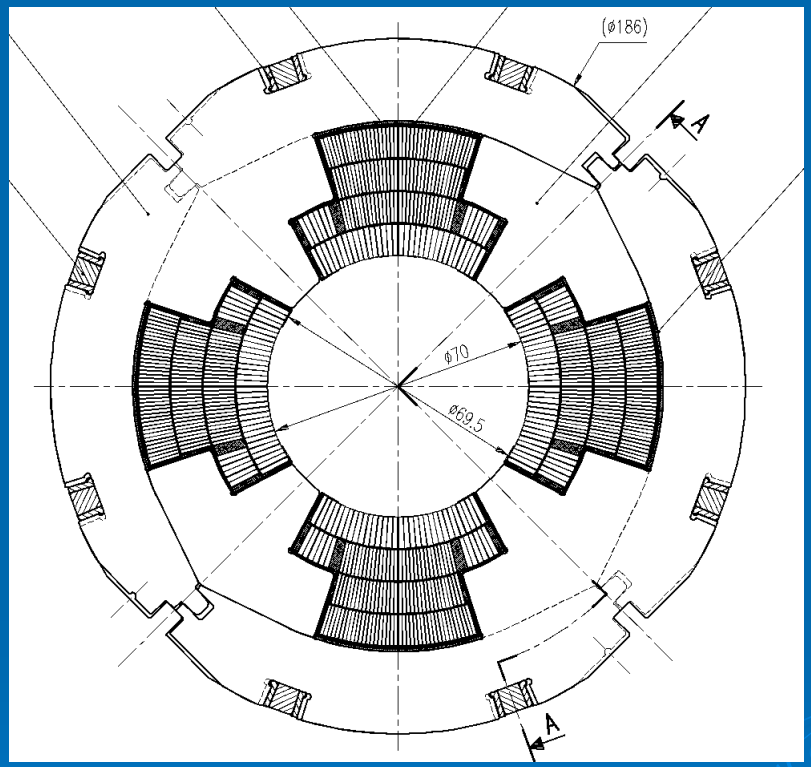
THE PROBLEM

- The MQY quadrupole is a superconducting magnet .

- To avoid quenching it has to be kept at the temperature below 5 K (liquid helium bath of 4.2 K).

- There will be heat dissipated due to particle deposition and friction.



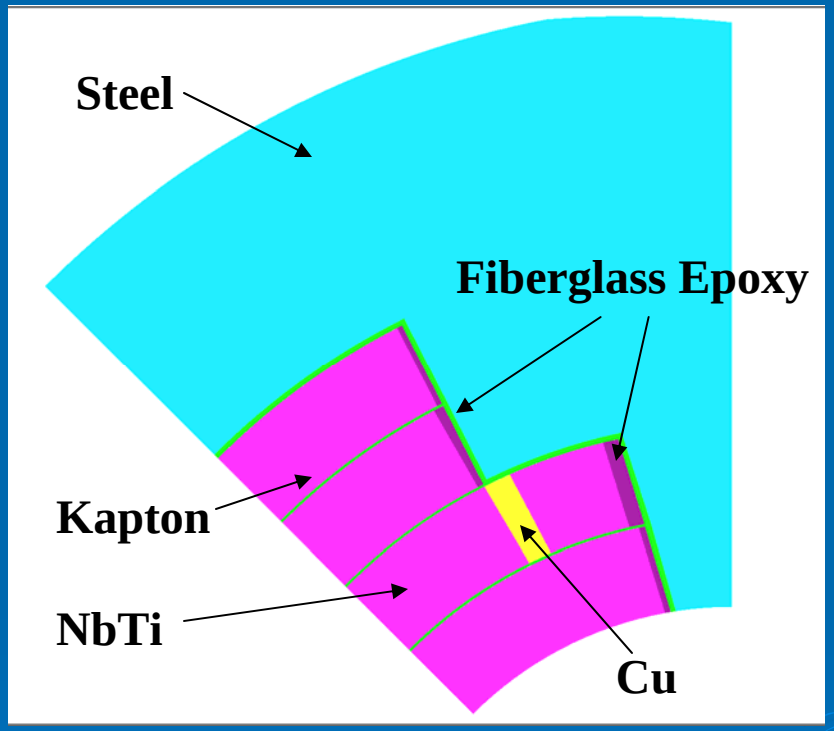
WE ARE LOOKING FOR THE TEMPERATURE FIELD IN THE QUADRUPOLE CROSS-SECTION.

THE MODEL

- 2 dimensional conduction in solid.

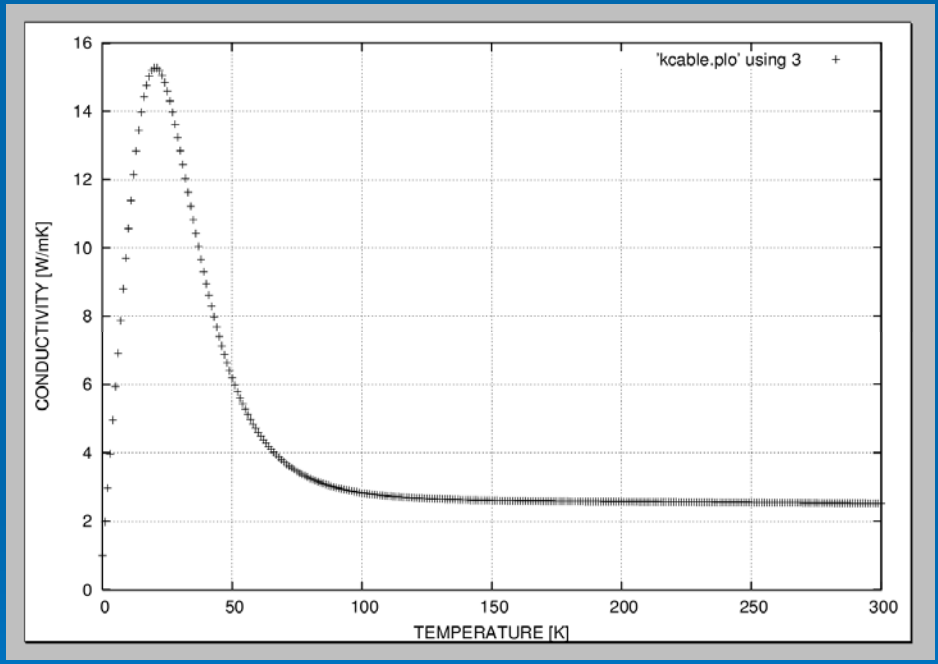
- 1/8 ---- the symmetry of the domain and the boundary conditions.

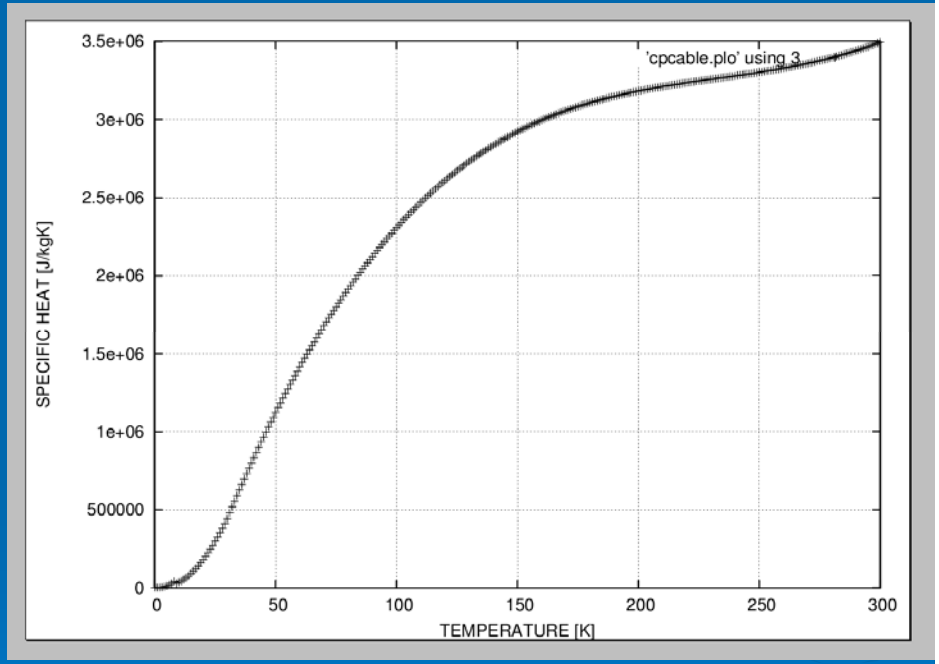
- Thermal characteristics of the materials in low temperatures are strongly dependent on temperature!



MATERIALS

NbTi superconductor

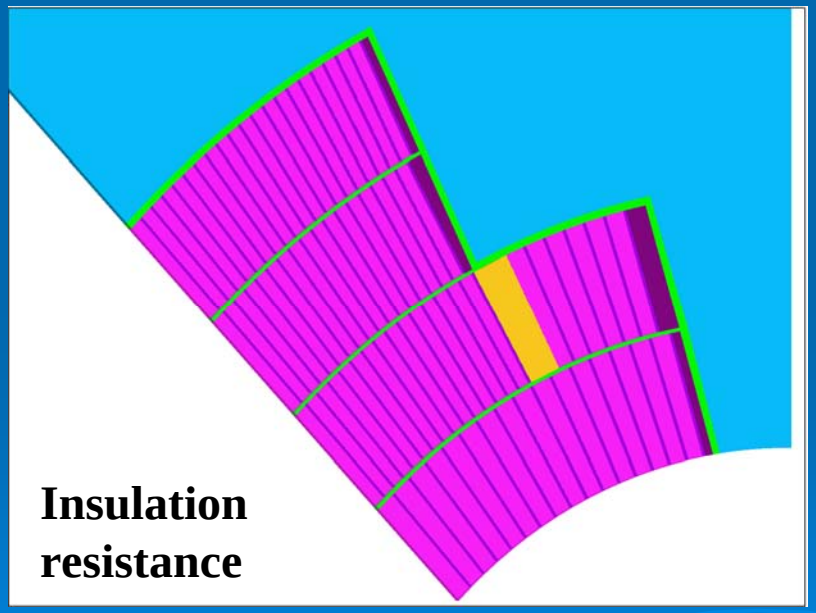


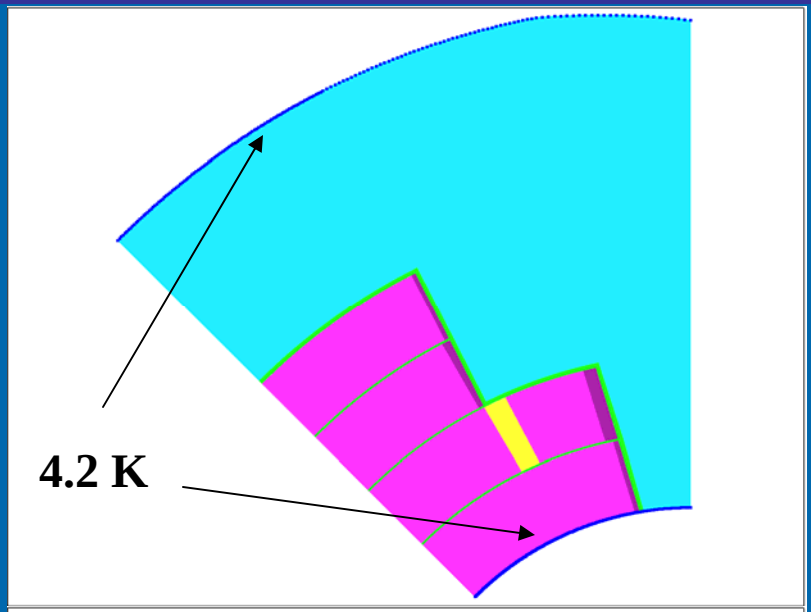


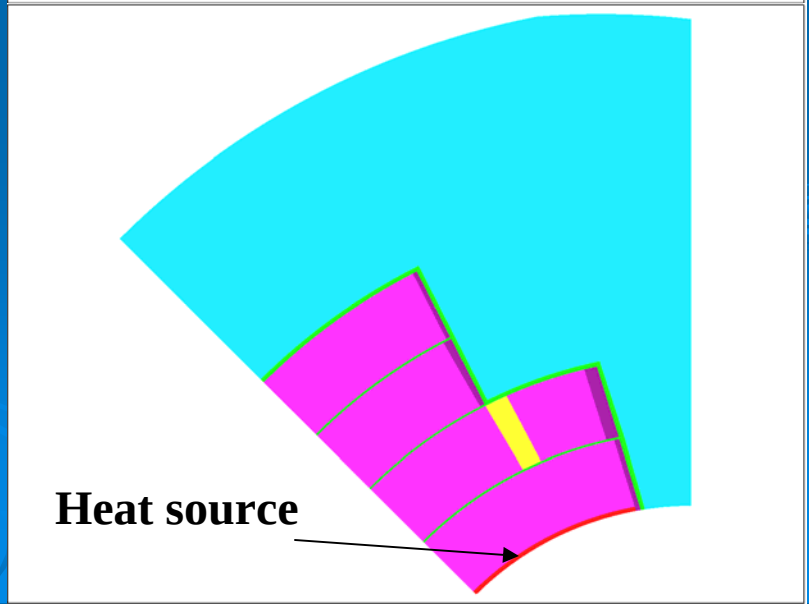
- Material properties have to be introduced by fortran subroutines

BOUNDARY & INITIAL CONDITIONS

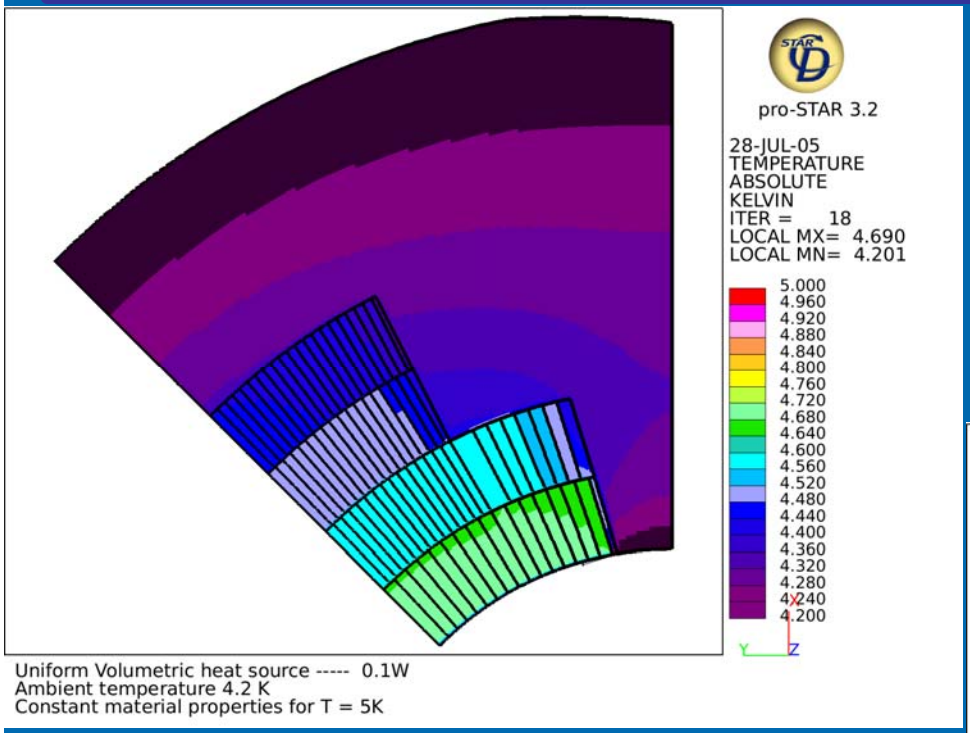
- The initial temperature is 4.2 K.



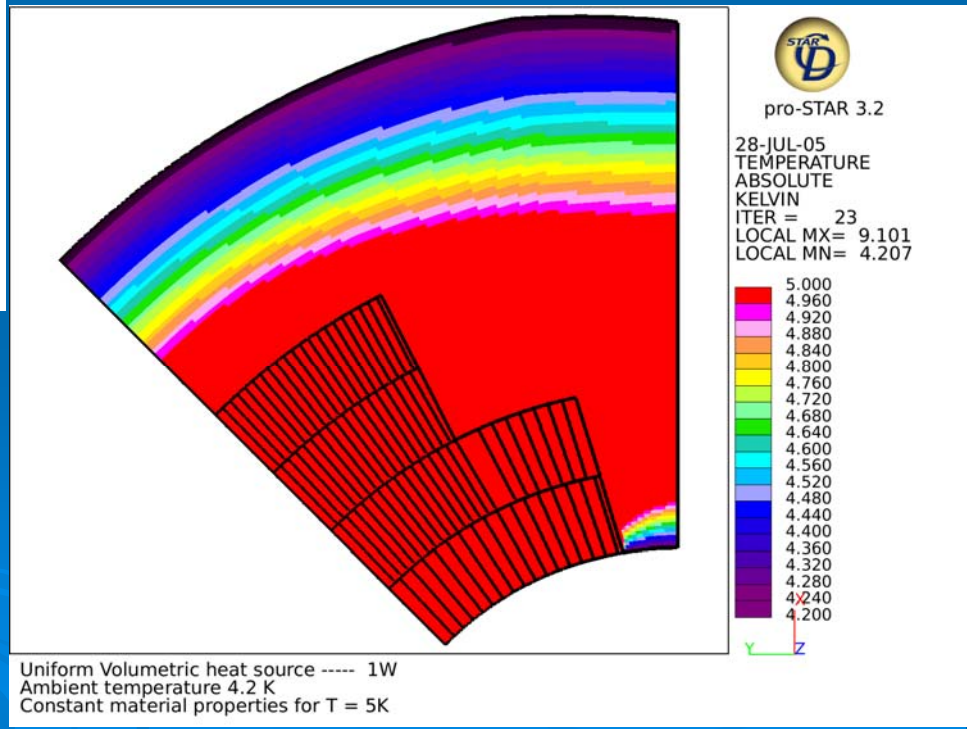




PRELIMINARY RESULTS



Uniform Volumetric heat source ----- 0.1W
Ambient temperature 4.2 K
Constant material properties for T = 5K



Uniform Volumetric heat source ----- 1W
Ambient temperature 4.2 K
Constant material properties for T = 5K

TO BE CONTINUED…

- The proper representation of the variable material properties.
- Different heat source schemes.