

## Finite Volume thermal analysis for the CMS Phase II Tracker Modules

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The CMS detector is going to be substantially upgraded during LS3 in order to exploit the increase in luminosity provided by the HL-LHC. The CMS Tracker for the Phase II will be populated by silicon sensors which are expected to operate at a temperature of about  $-20^{\circ}\text{C}$ . The cooling system have to maintain this setpoint value and remove the total power dissipated in the tracking volume by electronics and sensors (i.e. modules), avoiding the thermal runaway. Because of the high granularity of the sensors and the associated electronics in the new Tracker, the total power dissipated in its volume and the heat leaks coming from the surroundings is expected to be about 100 kW for the Outer Tracker and about 50 kW for the Inner Tracker. Within this framework, finite volume simulations can offer a useful tool to predict the thermal behaviour of the system when the boundary conditions vary and to guide the design choices in selecting the optimal engineering solutions to achieve the desired conditions. For the purpose of predicting the thermal runaway, a model with heat generation dependent from point by point sensors temperature is implemented, so allowing to take into account of the radiation dose received over time in the various CMS structures.

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