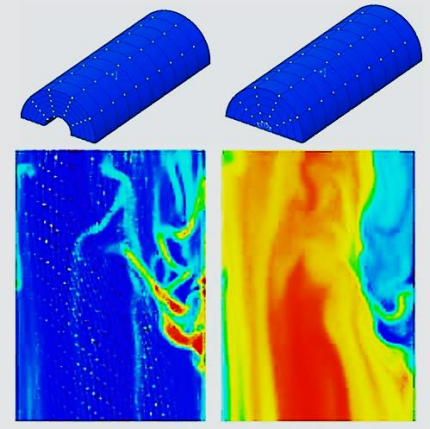
Analysis of the temperature distribution inside the housing of The Inner tracking System for the MPD, by means of a gas cooling system.



Research Area: Particle Detectors

Abstract/Brief Description: The purpose of this work is to determine the temperature variation within the housing of the ITS detector operating with a gas cooling system and determine the optimal operating conditions. Its importance lies in the possibility of stabilizing the temperature of the electronics components which work in a given temperature range.

Tasks:
3D design of the ITS detector housing or a section to perform the analysis.
Simulation of heat transfer by convection.
Determine the optimal operating conditions.
Report of the analysis by the finite element method.

Preliminary schedule by topics/tasks:
Week 1 - 2 Introduction to high energy detectors, training on detector components.
Week 3 - 4 Perform the 3D model of the housing, determine operating conditions and material properties.
Week 5 - 6 Meshing and gas cooling system simulation
Week 7 - 8 Analysis and report of results.

Required skills: SolidWorks, Siemens NX, Ansys or Fusion 360, Thermal system, Mechanical Design, English or Spanish language for communication.

Acquired skills and experience: The student will become familiar with the design of high-energy detectors, will have a broader vision about the work and opportunity areas of mechanical engineers in projects related to applied physics.
You will learn how to perform analysis with real data and validate experimental results with simulations.

Recommended literature: Golovatyuk, V., Kekelidze, V., Kolesnikov, V. *et al.* The Multi-Purpose Detector (MPD) of the collider experiment. *Eur. Phys. J. A* **52**, 212 (2016). https://doi.org/10.1140/epja/i2016-16212-1

Murin, Y.A., Ceballos, C. & for the MPD-ITS Collaboration. The Inner Tracking System for the MPD Setup of the NICA Collider. *Phys. Part. Nuclei* **52**, 742–751 (2021). https://doi.org/10.1134/S1063779621040444