Contribution ID: **35** Type: **not specified**

Studies on supercritical carbon dioxide as a refrigerant for future detectors

Friday 2 June 2023 11:00 (30 minutes)

High thermal capacities and low values of density and viscosity are some of the main characteristics of supercritical fluids. These, in combination with the nature of a supercritical fluid - a single phase fluid - make them very interesting candidates for the thermal management of High Energy Physics detectors.
For future warm detectors operating at ambient temperatures and environments characterized by low radiation levels, supercritical carbon dioxide is a great candidate. The critical point of carbon dioxide is found at approximately 74 bar and 31 °C. Above this temperature, sharp changes in the fluid density as well as in the heat capacity occur. This, combined with its intermediate nature between a gas and a liquid –while being a single-phase fluid –lead to unknown mechanisms when it comes to heat transfer. While the heat transfer coefficient of supercritical carbon dioxide is shown to be excellent near the critical point, many parameters influencing heat transfer are not yet well understood. As such, further research and development in this area is necessary to fully leverage the potential benefits of using supercritical fluids for thermal management in HEP detectors. A deeper understanding of the fundamental mechanisms can lead to the development of more accurate models and optimization techniques, enabling the design of more efficient and effective thermal management systems.
In this talk, a new system designed and developed at CERN is presented. This test setup aims to provide high precision measurements of thermal-fluidic properties of supercritical carbon dioxide in the range of temperatures of interest for possible ultra-light detectors, operating at warm temperatures.

Primary author: Ms PEDANO MEDINA, Camila Rocio (KIT - Karlsruhe Institute of Technology (DE))

Presenter: Ms PEDANO MEDINA, Camila Rocio (KIT - Karlsruhe Institute of Technology (DE))

Session Classification: Plenary