

Dynamic simulations of large cryogenic systems for future particle accelerators

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PhD may follow: No

Summary :

High-field superconducting magnets of the international and challenging FCC project coordinated by CERN may require more than 100 kW-range helium refrigeration at 1.8 K and 10 MW-range refrigeration around 50 K. To produce such large cooling powers, classic gas compression/expansion cycles will be used and require efficient and reliable processes and components (compressors, expanders, heat exchangers). Such large refrigeration systems have been never operated or studied. CEA has launched a design study in collaboration with CERN and industries to evaluate the process cycles and the required key technologies.

The proposed internship will focus on modelling and dynamic simulations of such large cryogenic systems. First, the trainee will have to review the potential process cycles and to model the selected cycles in nominal operation. Second, the intern will perform dynamic simulations for reduced capacity and transient modes to estimate the overall capability and the performance limits of the cryogenic systems.

Requested skills :

Basic knowledge in heat transfer, thermodynamics, cryogenics, modelling, Matlab