

Basic comparison of hydraulic schemes for the FCC-hh cold mass cooling with supercritical helium

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The possible operation of the FCC-hh cold mass cooling system with supercritical helium at a temperature of 4 K –4.5 K is currently under investigation at CERN. The completely different thermodynamic and flow-mechanical properties of supercritical helium compared to pressurized superfluid helium at 1.8 K used in the LHC requires a cryogenic system based on a different concept for cooling the superconducting material. In several particle accelerators cold mass cooling systems working with supercritical helium are realized and serve as a basis for the development of a possible refrigeration scheme for the FCC-hh at a cold mass temperature of about 4 K. Dependent on the final magnet design and the possible installation of piping and auxiliary equipment for cryogenic applications in the cryostat, a probate cooling scheme to extract the heat load of 1.5 W/m reliably can be designed. A basic analysis of different concepts adapted to the specifications of the FCC-hh in advance is important to enable the development of well-matching machinery systems. This poster compares various hydraulic schemes for a cold mass cooling system based on a supercritical helium cycle with respect to the feasibility, the exergetic efficiency and the technical requirements.

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