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Preliminary study of a cryogen-free cryostat for a low-temperature superconducting magnet

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This report details the mechanism design and heat load budget for a cryostat that replace liquid helium and liquid nitrogen with commercially available cold heads (cryocoolers). However, to ensure the proper functioning of cryogenic superconducting magnets with the limited cooling capacity of cryocoolers, careful management of heat transfer, insulation, cooling, electrical power, and vacuum components is essential. This paper provides an in-depth analysis of the thermal loads of a prototype superconducting wiggler magnet within a three-layer cavity, suspension system, current system, and electron beam chamber, utilizing two cryocoolers.

Footnotes

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