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C3Or2A-02: Cryogenic helium circulation cooling system with high capacity GM Cryocooler

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Sumitomo (SHI) Cryogenics of America, Inc. has investigated the capabilities of a circulating cooling system utilizing a Sumitomo CH-160 High-Capacity Gifford-McMahon (HCGM) cryocooler and helium gas circulator for cooling a remote thermal load (e.g., a superconducting magnet). System cooling performance was investigated for circulation loop pressures of up to 20 bar-g. The system is comprised of a CH-160 HCGM cryocooler with an integrated heat exchanger, an off-the-shelf circulator, bayonets (which are housed in a cryostat), vacuum jacketed transfer lines, a vacuum pump and electrical controls for system operation and testing. In this paper, we present system configuration, cryocooler performance, input power, and net system cooling performance delivered to the remote thermal load. Cooling losses of the circulation loop associated with the cryostat, transfer lines, circulator are discussed and analyzed to characterize the system. An example of using the system for constant cooling and cool-down applications are discussed and presented.

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