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Performance Test of the Cryogenic Cooling System for the Superconducting Fault Current Limiter

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The Superconducting Fault Current Limiter (SFCL) is an electric power device which limits the fault current immediately in a power grid. The SFCL must be cooled to below the critical temperature of HTS(High Temperature Superconductor) modules. In general, they are submerged in sub-cooled liquid nitrogen for their stable thermal characteristics of HTS modules. To cool and maintain the target temperature and pressure of the sub-cooled liquid nitrogen should be designed well with a cryocooler and circulation devices. The pressure of the cryostat for the SFCL should be pressurized to reduce the generation of nitrogen vapor in quench mode of the SFCL.

In this study, we tested the performance of the cooling system for the prototype 154 kV SFCL, which consist of a 4 kW stirling cryocooler, a subcooling cryostat, a pressure builder and a main cryostat for the SFCL module, to verify the design of the cooling method and the electric performance of the SFCL. The normal operation condition of the main cryostat is 71 K and 500 kPa. This paper present results of tests of the overall cooling system.

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