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C2Po2D-01: Development of the Liquid Nitrogen Cooling system for Cryogenic Permanent-Magnet Undulator at NSRRC

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Two Cryogenic Permanent-Magnet Undulators (CPMU) had been developed at the National Synchrotron Radiation Research Center (NSRRC) by using different magnet materials and cooling methods. The PrFe-Bbased CPMU (CU15) was installed in 2019 was cooled by cryocooler, and the NdFeB-based CPMU (CUT18) was installed in 2021 was cooled by liquid nitrogen (LN2) tank. Several benefits were considered in the LN2 tank cooling design of CUT18. The annual operational costs (including maintenance costs) are lower. The mechanical vibration during operation is lower. The PLC-based control units located at non-radiation area that means most inspection could be done during normal operation of accelerator. As the required temperature of magnet is 100 K higher at CUT18 than that of CU15. A large margin of the temperature control on magnets is an advantage for CUT18. The design, manufacture and control of LN2 tank cooling system were performed by NSRRC, which also brings the shortened troubleshooting time. In this paper, we presented the design, control and operation of the LN2 cooling system for CPMU.

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