



## Cryogenics Operations 2018

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# Liquid Nitrogen System for Cryogenic Permanent Magnet Undulators

The cryogenic permanent magnet undulator (CPMU) is one new-type undulator with advantages such as higher magnetic performance compared with conventional undulators at the same magnetic period and gap. Shanghai Institute of Applied Physics (SINAP) has been studying the related technologies and developing the CPMU, and apply the CPMUs for the future SSRF upgrade and the XFEL projects in China. A subcooled liquid nitrogen circulation system based on a conventional semi open-cycle cooling system is adopted to cool the CPMU. Flow chart of subcooled liquid nitrogen loop system and result of the on-line test are given in this paper. During operation, the subcooled liquid nitrogen supplying temperature is at the range between 77.2K and 78.5K, and pressure fluctuation is lower than  $\pm 1\text{kPa}$ , which can meet the operation requirements of CPMU.

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