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CRYOGENIC SYSTEM FOR THE HIGH ENERGY PHOTON SOURCE AT IHEP

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High Energy Photon Source (HEPS) is a high-performance and high-energy synchrotron radiation light source with a beam energy of 6GeV and an ultra-low emittance of better than 0.06nm×rad. The HEPS is mainly composed of accelerator, beamlines and end-stations. The HEPS would provide the synchrotron beam with will brilliance higher than 1×1022 phs/s/mm2/mrad2/0.1%BW. And the hard X-ray with photo energy up to 300 keV would be provide in order to satisfy the requirement of in operando experiments. No less than 90 high performance beamlines and end-stations are capable to be built around the storage ring. The HEPS will be an important platform for supporting the original and innovative research in the fields of basic science and engineering science, and it also is scheduled to be put into operation in 2025 at Institute of High Energy Physics (IHEP) in China. A large cryogenic system will support a cryogenic environment temperature demand of the HEPS, which includes a helium refrigerator system and a nitrogen cryogenic plant. The helium refrigerator system consisted of a helium refrigerator on a capacity at 2500W@4.5K, a cryogenic distribution transfer system and helium recovery and purification system for 10 superconducting radio frequency cavity cryomodules. The nitrogen cryogenic plant is crucial for creating and maintaining operational conditions of the thermal shield of superconducting radio frequency cavity cryomodules, precooling the helium refrigerator coldbox, cooling photon beamline crystats and cryogenic inserts in the HEPS. The nitrogen cryogenic plant has an average capacity about 50kW at 80K in the HEPS phase I. The nitrogen cryogenic plant is mainly included of nitrogen cycle refrigerator system, liquid nitrogen tank and cryogenic fluid distribution tube network. The cryogenic system project engineering implementation has started at June 2019. The Schematic diagram, status and recent development of the cryogenic system are described in this paper.

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