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C3Po1B-04: Development of an 18 kW@4.5 K & 4 kW@2 K Helium Refrigerator

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ABSTRACT: An 18 kW@4.5 K & 4 kW@2 K helium refrigerator is being developed in China by the Technical Institute of Physics and Chemistry, CAS. This large-scale helium refrigerator provides different cooling capacity at the 50-75 K, 4.5-75 K and 2 K levels. This helium refrigerator works based on Claude cycle refrigeration process, which uses 5 sets of turbines (10 turbines totally) to bring the temperature down to 4.5 K. Four cold compressors are arranged in series to pump gaseous helium from atmospheric pressure to 0.03 bar in order to decrease the temperature of 2 K helium bath from 4.5 K down to 2 K. A set of subatmospheric pressure compressors is used to compress subatmospheric helium gas downstream from cold compressors to medium pressure 4.05 bar and is connected directly to high pressure compressors. This paper provides an overview on the process design, system design and preliminary component design results in the development of this 18 kW@4.5 K & 4 kW@2 K helium refrigerator.

KEYWORDS: Large-scale helium refrigerator, Superfluid helium refrigerator, Process flow diagram, Cold box

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