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## **C2Po1F-05: Conceptual design of a replacement 2.1 K cold box for the Spallation Neutron Source Central Helium Liquefier**

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The Central Helium Liquefier (CHL) for the Spallation Neutron Source (SNS) at Oak Ridge National Laboratory (ORNL) supports a primary superconducting linear accelerator (LINAC) load up to 2.4 kW at 2.1 K. Sub-atmospheric saturation conditions in the LINAC are generated and maintained by a sub-atmospheric cold box (SCB) within the CHL. The SCB contains four magnetic bearing cold compressors with a nominal flow rate of 125 g/s and a demonstrated operating envelope of 90 –140 g/s. After more than 20 years of operation the cold compressor technology is obsolete, and replacement parts and service are not available. SNS has partnered with Jefferson Lab to design and construct a replacement SCB using modern cold compressor technology. The general design follows from Jefferson Lab's experience on other recent sub-atmospheric cold box projects. Design decisions are backed by thorough engineering analysis to ensure technical requirements are met in a cost-effective manner. Conceptual design of the replacement cold box has been completed, and will be summarized in this paper. It features five cold compressors with an expanded operating flow range of  $110\pm 30$  g/s, and includes new piping and valving to support cold compressor maintenance without interrupting flow circulation to the load. The approach to thermal shielding, insulation, and integration of the upgraded cold compressor hardware into the existing SNS control system will also be addressed. In addition to the operability improvements, process modeling suggests that resource consumption at the CHL will be reduced due to the efficiency of the modern cold compressor system.

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