

PRELIMINARY design of a new Helium liquefaction system at LBL

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A new high efficient helium liquefaction system with high capacity is under design and will be built at Lawrence Berkeley National Laboratory in the next couple of years to replace a current 43 years old liquefier. The new liquefaction system will provide at least a mixed 80 liter per hour liquefaction rate and 35 W refrigeration capacity at 4.5K without liquid nitrogen pre-cooling, or a mixed 140 liter per hour liquefaction rate and 35 W refrigeration capacity at 4.5 K with liquid nitrogen pre-cooling. It can be operated mainly at two modes, liquefaction mode and liquefaction/refrigeration mixing mode. As a core element, the new liquefaction system will significantly improve the capability and efficiency of the magnet testing system at LBL in developing and testing novel magnet configurations. The system shall be designed and built with the capability to be further expanded to 1.8 K to 2 K by adopting a warm pumping system, as well as to furthermore enable future integration of helium recovery and purification capability. The new liquefaction system will be critical to deliver on LBL's commitments to the US Magnet Development Program (MDP) and to support the High Energy Physics (HEP) Program at LBL. This paper describes the preliminary design of the new LBL's liquefaction system including its performance, operation modes, functional analysis, main components, layout plan and piping route and so on.

Submitters Country

United States

Authors: SWANSON, James (Lawrence Berkeley National Lab); WANG, Li (Lawrence Berkeley National Lab); XU, Lianrong (Lawrence Berkeley National Lab); PRESTEMON, Soren (Lawrence Berkeley National Lab)

Presenter: WANG, Li (Lawrence Berkeley National Lab)

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