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C3Po1D-05: Study on the thermal coupling structure of cryogenic liquid ZBO storage system cooled by a high-frequency pulse tube cryocooler

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With the improvement of passive thermal insulation technology, the heat leakage of cryogenic storage tanks has been effectively reduced. However, with the growth of storage time, the accumulation of heat leakage inevitably makes the liquid in the tank continuously gasification, resulting in the quality loss of the liquid. Zero-boil-off storage systems, which generally use cryocoolers to re-condense the evaporated gas, can effectively solve the above issue. In this paper, a zero-boil-off storage system based on high-frequency pulse tube cryocooler cooling is studied numerically and experimentally. The storage characteristics of directly re-condensing evaporating gas and refrigerating the stored cryogenic liquid are compared. Numerical results of liquid hydrogen and liquid nitrogen, and experimental results based on liquid nitrogen will be presented.

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