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C1Po2B-02: Helium and Nitrogen Zero Boil-off System for Superconducting Magnets

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The NMR magnet is cooled by two kinds of cryogens. The boil-off rate of the cryogen in a general NMR magnet is 20 cc/h for liquid helium and 200 cc/h for liquid nitrogen. We have developed a zero boil-off system that can greatly suppress the evaporation of liquid helium and liquid nitrogen.
This system is equipped with a GM cryocooler, with a nitrogen cooling chamber on the 1st stage and a helium cooling chamber on the 2nd stage. Since NMR measurement is sensitive against external noise, each cooling chamber was connected to the NMR magnet using a flexible transfer tube to suppress the vibration of the magnet. The tube has a slope angle to generate efficient convection flow of gas and liquid.
This system was mounted on an NMR magnet, and it was confirmed that the noise generated by system vibration was at a level that would not interfere with NMR measurements. It has also maintained a stable zero boil-off for more than 6 months.

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