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## **Plate-Fin Heat-Exchangers for a 10 kW Brayton Cryocooler and a 1 km HTS Cable**

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Plate-fin heat exchangers are designed and fabricated for an integrated cryogenic system, serving for a 10 kW Brayton cryocooler and a 1 km HTS cable under development in Korea. The main heat exchanger is a counter-flow recuperator between high-pressure and low-pressure helium of the Brayton cooler, and the second heat exchanger is a sub-cooler of liquid nitrogen that circulates through the 3-phase cable in transmission class. The heat transfer coefficient and friction coefficient are calculated with real fluid properties and engineering correlations to determine the physical dimension of two compact heat exchangers. A key feature is the coldest part of sub-cooler, where the streams of liquid nitrogen and gaseous helium are arranged as cross-flows in order to reduce the risk of freeze-out of liquid nitrogen. Our recent experimental works showed that the cross-flow heat exchanger is less vulnerable to the freeze-out, since the temperature distribution is basically two-dimensional. Details of fabricated hardware are presented and discussed towards an immediate application to the HTS cable system.

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