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## Progress in Development of a 10 kW Brayton Cryocooler for HTS Cable in Korea

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Recent progress in the development of a 10 kW Brayton cryocooler is presented for HTS cable systems under installation in Jeju Island, Korea. The role of this cryocooler is to continuously cool a liquid-nitrogen flow from 78 K to 67 K, and the liquid is pumped to three-phase 154 kV cable over a length of 1 km. The refrigerant of cryocooler is helium, whose operating pressure and flow rate was determined earlier from a thermodynamic study on reversed-Brayton cycle. As main components, heat exchangers and turbo-expanders are designed and fabricated by custom-orders. The heat exchangers are made of aluminum-brazed plate-fins, and the coldest part is arranged as two-pass cross-flow in accordance with our experimental study for preventing the freeze-out of liquid nitrogen. Two identical turbo-expanders are employed in parallel at the cold end, where the maximum rotating speed with gas bearings reaches 180,000 rpm and the output power is dissipated with eddy current brakes. The assembly is completed and the refrigeration capacity is measured with a dummy thermal load on the liquid-nitrogen stream. Details of thermal performance and short-term plans are reported towards an immediate application to the HTS cable systems.

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