Current dependence of heat leak on the terminals in the superconducting DC transmission and distribution system of CASER-2

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Superconductivity can solve the energy problems in the world as energy saving technologies. Among them, superconducting direct current (DC) transmission and distribution (T&D) systems should be promising, as it can be easily enlarged to the large scale energy transmission systems as energy sharing. We are developing low temperature systems for the effective cooling for superconducting T&D systems. In the cooling experiments on the 200 m-class superconducting DC transmission and distribution system (CASER-2), we have estimated several performances of systems as superconducting applications. For example, our superconducting cable is connected to the outside terminals using the Peltier current lead (PCL). PCL is constructed by a thermoelectric material and a copper lead. [1] Small thermal conductivity and large thermopower of thermoelectric ones can effectively insulate the heat leak to the low temperature end. We measured the temperature on the current leads and the heat leak on the terminals. As current leads have optimal shape factor, and then the optimum operation current exists. The current dependence of the systems performance will be discussed.

[1]S. Yamaguchi *et al.*, Rev. Sci. Instrum. **75**, 207 (2004).