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The Cost of Coolers for Cooling Superconducting Devices from 4.2 to 4.7 K, from 20 to 30 K, and from 65 to 80 K

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This author and other authors have written papers concerning the cost of refrigeration at liquid helium temperature and higher temperature as a function of the refrigeration delivered. These papers have included small coolers as well. The lowest temperature range from 4.2 K to 4.7 K (the liquid helium temperature range) is covered using coolers that have two stages. The use of magnets and power equipment that use MgB2 conductors and HTS conductors have spurred the development of coolers that work well temperature ranges from 20 K to 30 K (for potential hydrogen temperature applications) and from 65 K to 80 K (for applications in the liquid nitrogen temperature range). This paper will present some cost data for a number of commercial two-stage and single-stage coolers. This data will be fitted to allow one to estimate the cost of coolers as a function of refrigeration for the three temperature ranges given above. The efficiency of several coolers over a range of temperatures will be discussed.

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