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## **C1Or2B-07: Investigation of Cryogenic Mixed-Refrigerant Cooled Current Leads in Combination with Peltier Elements**

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Current leads supply electrical energy from a room-temperature power supply to a superconducting application, representing thus a major thermal load. State-of-the-art cooling solutions use either open (vapor cooled) or multi-stage closed cycle systems. The multi-stage concept can be integrated in one cryogenic mixed refrigerant cycle (CMRC), where a wide-boiling fluid mixture absorbs the heat load continuously along the current lead.

In this paper, we study the combination of CMRC cooling with Peltier elements at the warm end of DC current leads. The Peltier cooling may cause a temperature drop on the order of 80 K. This allows an optimization of the CMRC mixture composition towards lower temperatures, avoiding the use of high-boilers that risk to freeze out at low temperatures. Our studies suggest that Peltier and CMRC cooling can reduce the thermal load at the cold end by 30 to 45 % compared to conventional conduction-cooled current leads.

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