



Contribution ID: 116

Type: **Contributed Oral**

C3Or3B-05: Large diameter helium pulsating heat pipe as promising thermal link for cryocooler-cooled superconducting magnet systems

Wednesday 21 May 2025 15:00 (15 minutes)

Cryogenic pulsating heat pipes (PHPs) are considered as alternative efficient thermal link to cool moderate heat load superconducting devices to replace heavy thermal braids or gravity-assisted cooling loops associated in general to cryocooler as cold source. A perfect application to these type of heat pipe is rotating application such as Gantry system where gravity-assisted loops are prohibited. This motivates the development of cryogenic PHPs and especially at helium temperature. This work presents an experimental characterization of the thermal performance of a 0.4 m long helium PHP which consists of 20 turns of 1.0 mm inner diameter stainless steel tube with 120 mm long copper evaporator and condenser. The inner diameter of the tube is ~ 1.75 times larger than that prescribed by the well-known Bond number criteria that is used to ensure that capillarity effect is dominant allowing plug/slug PHP mode. Despite the large diameter, the PHP presents interesting overall thermal resistance even if the PHP mode is not sustained. At higher heat loads, the PHP evaporator temperature is seen to surpass the helium supercritical temperature although the overall thermal resistance can be as low as 1.0 K/W. We have studied the effect of the orientation in testing the PHP in horizontal and vertical orientation. A study of the effect of filling ratio has also been showcased.

Author: BAUDOUY, Bertrand (CEA Paris-Saclay)

Co-authors: DIXIT, Tisha (CEA Paris-Saclay); DAVAL, Marc (CEA Paris-Saclay); Mr AUTHELET, Gilles (CEA Paris-Saclay); STEPANOV, Vadim (CEA Paris-Saclay); MAILLERET, Charles (CEA Paris-Saclay); GOUIT, Florian (CEA Paris-Saclay)

Presenter: BAUDOUY, Bertrand (CEA Paris-Saclay)

Session Classification: C3Or3B - New Devices, Novel Concepts, and Miscellaneous III