A caesium-filled pressure controlled heat pipe at NRC

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A CAESIUM-FILLED PRESSURE CONTROLLED HEAT PIPE AT NRC

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It is well known that a pressure controlled heat pipe creates a very uniform temperature environment and has extremely high temporal stability provided that the pressure is precisely controlled. These features are well suited for the purpose of calibration-by-comparison and assessment of non-uniqueness of thermometers in the temperature range between the Zn point and the Al point which is within the coverage of a caesium-filled pressure controlled heat pipe (Cs-PCHP) previously established at NRC (*K.D. Hill, D.J. Woods, Temperature: Its Measurement and Control in Science and Industry, 6 (1992) 215*). This original Cs-PCHP has been recommissioned with a number of changes to improve its function as a comparison apparatus. In particular, the new gas handling system was installed side by side with the previously reported one. For the current purpose, the absolute value of pressure is not essential but a robust stable measurement of pressure with high resolution and high speed is required. Therefore, an absolute 110 kPa (16 psia) pressure sensor with a quartz crystal resonator is employed for the regulation of pressure in nanoresolution mode. Circulation of helium gas is precisely controlled with two 100 sccm flow controlling valves connected to a helium supply side and vacuum pump side. The gas handling system is capable of controlling the pressure in the Cs-PCHP within ±0.2 Pa of the set point. Its performance in terms of temperature stability is better (when compared to the original capacitance 1000 Torr pressure gauge (*ibid*)) or the same (when an original differential 10 Torr capacitance pressure gauge is used (*ibid*)).