Quantum Design

PPMS Service Note 1091-209

PPMS System Check for DR (Flow, HiVac)

I. Check PPMS Base Performance

It is necessary to check the base PPMS performance once to ensure it is capable of running the QD dilution refrigerator. This check is only necessary on the legacy PPMS systems and is not required on the PPMS Dynacool. The DR will not reach its base temp if the PPMS base system does not meet the specification outlined in this section.

1.1. Check: High-Z flow

- Install the sample chamber baffle (4078-113) in PPMS, and purge-seal the sample chamber.
- Set PPMS temperature to 300K in MultiVu and leave the system to stabilize at this temperature for at least 30 minutes (ideally, several hours).
- Connect the clear Polyethylene tube (QD p/n: YT-Poly-.250) from the pump exhaust port in the PPMS cabinet to the flow gauge (QD p/n: HRMA-2) to measure the flow. This flow gauge can measure the flow of helium up to one liter per minute (LPM). (*Note: Since the flow gauge is calibrated for air, the helium flow observed in the gauge may not be very accurate*).

Image 1 Flow gauge (HRMA-2)

- Run the High-Z flow from, MultiVu Sequence>Advanced>Run Macro, then open C:\QdPpms\Macros\CLT Scripts\High-Z-flow-test.bas. To install this script, locate the zip package High-Z-flow-test-XXX.zip (https://www.qdusa.com/pharos/view.php?fDocumentId=869) and unzip the script files and folder structure into the c:\qdppms\macros directory so that the High-Z script is located at C:\QdPpms\Macros\CLT Scripts\High-Z-flow-test.bas.

- High-Z flow is performed to check the PPMS probe secondary (CLT) impedance flow at 300K. In this configuration, the script will measure Enthalpy Flow and Recovery Time. By observing the flow meter at the right time during this procedure, an additional flow measurement can be obtained. For best operation of the DR, both the Enthalpy flow and the external flow gauge (HRMA-2) reading should be no less than 0.650 LPM.
- While the script is running, after 20 minutes, check the Enthalpy flow and flow gauge reading. (*Note in case if the flow gauge reading oscillates take the average of the oscillation to count the flow rate*).
- Flow gauge reading and Enthalpy flow should be greater than 0.650 LPM. (If the flow is good it should be above 0.650 LPM after 20 minutes, refer image 2 and 3).

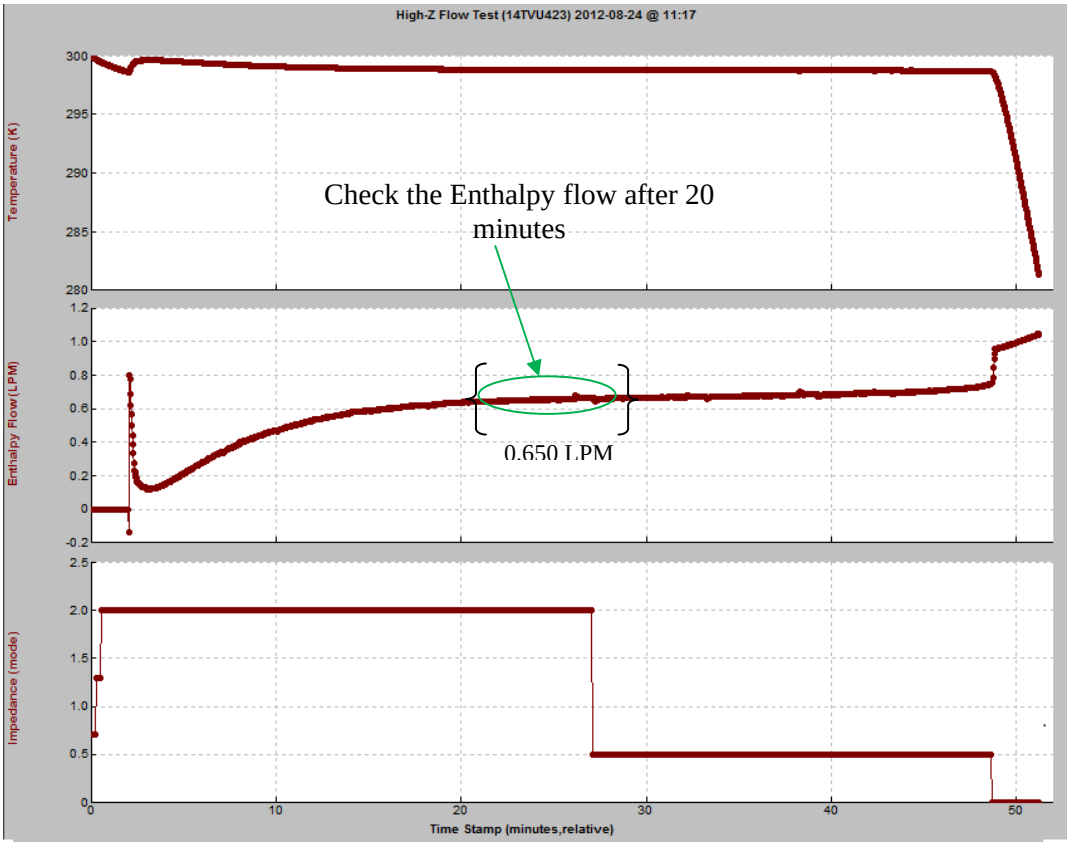

Image 2 High-Z Flow

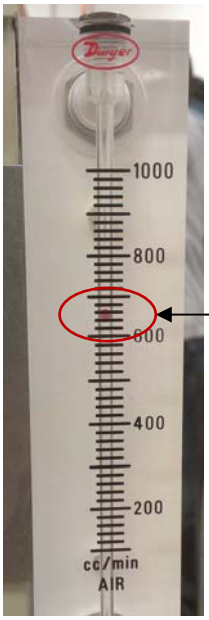

Image 3 Flow gauge showing 0.650LPM flow rate

- The high-Z test will also record the Enthalpy Flow at the completion of the script. This can be viewed by right clicking the High –Z graph and select the Raw Data View. The Enthalpy flow will be in the end of the recorded high-Z data (Refer Image 4).

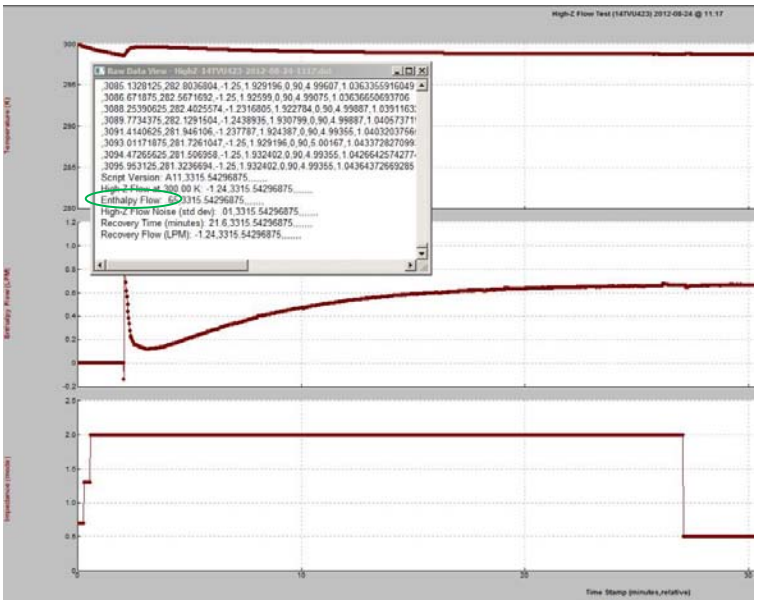

Image 4 Raw Data View – Enthalpy Flow 0.650LPM

- Note the quantity Enthalpy Flow is a calculated flow number based on the chamber heater power required to hold the chamber temperature constant. This can be a very accurate measure of flow if the chamber has been allowed to stabilize at 300 K for several hours prior to running this script.

1.2 Check: Hi-Vac

- Install the sample chamber baffle (4078-113) in PPMS, and purge-seal the sample chamber.
- Set PPMS temperature to 300K in MultiVu and wait for the system to declare stable.
- Set Hi-Vac in MultiVu and record (every 1 sec) the pressure at room temperature for 30 minutes.
- The pressure reading should remain stable below $1x10^{-5}$ Torr

1.2. Check: Sample Chamber

- Set PPMS temperature to 300K in MultiVu and wait for the system to declare stable.
- Vent-seal the sample chamber in MultiVu.
- Install contact baffle (4083-010) on end of sample chamber baffle (4078-113).
- Slowly insert the contact baffle into the sample chamber.
- Pay close attention to the resistance when inserting the baffle. The resistance should be about the same the entire length of the baffle, except for the last 2".
- The resistance should be higher in the last 2" (5cm). If is not tight it is assumed the sample chamber is bulged outwards. (Note: DR will not work properly with the bulged sample chamber)