

# „Plug-n-Play“ Direct Recovery with the ATL80

The Fullerton Group, CMRR, UCSD, San Diego, CA

The Fullerton Group – working in the Center for Magnetic Recording Research at UCSD – has a 9 Tesla PPMS system with a daily boil off of 7 liters. The group’s expertise is in thin-film magnetic and nano-materials. Professor Fullerton is an internationally acclaimed scholar in areas such as thin film and superlattice growth, magnetic recording and nano-technologies, and x-ray and neutron scattering. The PPMS system is generally used for magnetization and electric transport measurements, and in the near future will add MFM measurement capabilities.

Based on the daily boil off rate of 7 liters, and the fact that the Fullerton Group had only one cryogenic system that consumes liquid helium on a regular basis, it was determined that a direct recovery system using the ATL80 would provide sufficient liquefaction for their needs (figure 1 above). The ATL80 can be „parked“ directly next to the PPMS to capture normal helium boil off (figure 1 below).

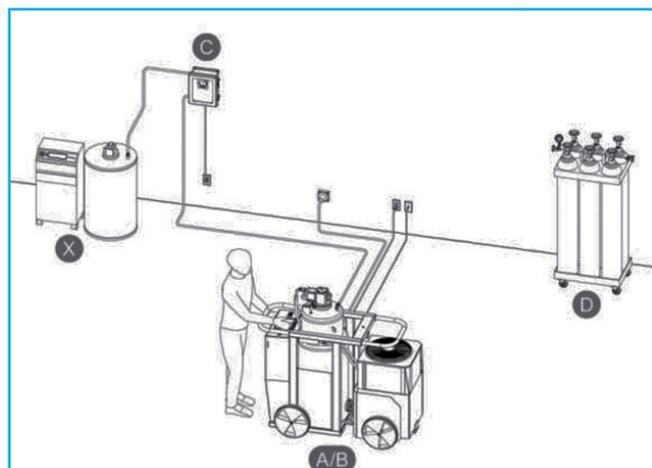


Figure 1 (above) ATL80 Direct Recovery Laboratory Configuration – A/B: ATL80 dewar and compressor; C: Electronic back pressure controller; D: 6-pack helium gas cylinders; X: user apparatus (below) ATL80 directly recovers helium from PPMS system

The ATL80 has its dewar and compressor integrated on a single cart so the whole unit is mobile and ready for plug-n-play recovery and liquefaction (figure 2 left). There is essentially no site preparation needed from the user other than providing a 3-phase electrical power outlet. The ATL80 has two helium gas inputs, one for directly recovered gas, another for high purity gas from cylinders (figure 2 right). Dual gas input is a unique feature of the ATL product line, which allows the user to make extra liquid helium from gas cylinders in addition to helium recovery from a cryostat or other cryogenic instrument. A 0.5 psi set point was chosen for the ATL80 in Direct Recovery mode.

When the evaporated helium from the PPMS is insufficient for the cooling power of the ATL cold head, cylinder gas is automatically drawn into the dewar via the Direct Recovery input.



Figure 2 (left) ATL80 connected with PPMS and 6-pack of helium cylinders (right) Dual gas inputs on ATL80

The PPMS 9 tesla system has a normal daily boil off of roughly 7 liters, a combination from the liquid helium bath and the cooling annulus. Figure 3 (left) shows the recovery connection at the top of PPMS dewar. A provided recovery kit designed for the PPMS, which utilizes an oil-free scroll pump (figure 3 right), is connected to the annulus. The output from the annulus is joined with boil off from the bath and sent to the ATL80 via a flexible stainless steel tube. In this case, a back pressure controller was not needed between the PPMS dewar and ATL80.

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Figure 3 PPMS recovery lines: (above) Bath boil off (below) Output from annulus via scroll pump

The ATL80 was installed in April 2012 and has been in continuous operation. Liquefaction rate is about 7 liters per day, which is 100% of PPMS boil off, with an additional 2 liters per day liquefied from the gas cylinders.

Transferring liquid helium back into the PPMS is easy with the ATL80. With the coldhead power turned off, the ATL80 is rolled close to the PPMS and liquid helium transfer is accomplished using a standard transfer line (figure 4 a). The Fullerton Group typically completes two transfers, of about 20 liters per transfer, per week. Helium loss can be as low as 2 liters when care is taken during transfer periods. This loss easily can be re-supplied using the 2nd gas source of helium cylinders.



Figure 4 a Liquid helium transfer from ATL80 to PPMS system



Figure 4 b Control screen showing liquefaction

This is a fairly typical example that shows how easy it is to directly recover helium using the ATL80 in a plug-n-play fashion. Given the ATL80's plug-n-play nature along with its portability, it is also extremely easy to relocate the ATL80 to different laboratories so that its recovery functions can be used with other cryostats as well.