

## **Air Liquide Cryogenic Space Coolers for Science Applications – Past, Present and Future**

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Air Liquide Advanced Technologies (AL-AT) is an industry leader in space and ground based cryogenics for scientific and industrial applications thanks to its long standing heritage. It roots in the early development of all insulated and equipped cryogenic tanks for the Ariane launcher. Its business expanded in the last two decades into scientific and commercial Satellite applications with cryogenic devices. Recent achievements include:

- MELFI, a -80°C turbo Brayton freezer onboard the International Space Station. This cooler is achieving more than 80,000 hours and almost 10 years operations and proving to be one very reliable asset of ISS.
- HERSCHEL, a superfluid helium cryostat supplying 1.8K cold fluid to the far infra red instruments for more than 3 years
- Planck, the world's first Helium dilution cooler functioning in space, achieving flawless operation at 0.1K for 2.5 years.

Space qualified cryocooler development is a challenging endeavor and can be of great concern for an instrument development team. Thanks to its wide range expertise, Air Liquide Advanced Technology not only provides a trouble free cooling solution, but brings additional scientific and technological know-how to the developers to integrate the instrument at higher system level.

Air Liquide Advanced Technology looks forward and remains at the fore-front of spatial scientific exploration. We are already engaged in the development of a 15K pulse tube which will provide the foundation of cryogenic cooling chains. We are collaborating closely with the research team working on the next generation closed loop dilution cooler for sub-50mK applications.

The presentation will showcase our experience and the lessons learnt from past programs. The presentation will also introduce the development and performance of our novel 15K cooler.

Air Liquide is committed to work with the science community to offer high performance, reliable and tailored cooling solutions.