

Millikelvin Facility

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The millikelvin facility is based on an adiabatic demagnetization refrigerator (ADR) from High Precision Devices, Inc.

It is comprised of a cryogen-free pulse-tube cryocooler using the adiabatic demagnetization refrigerator to reach cryogenic temperatures for laboratory experiments.

The cryostat stage temperatures are approximately 60 K, 3 K, 500 mK, and 50 mK.

The pulse-tube cryocooler

A Cryomech pulse-tube cryocooler provides cooling for the 60 K and 3 K stages. It consists of a compressor, remote motor, cold head, bellows, and helium flex lines.

The pulse tube cooler is a closed-loop system using gaseous helium. No liquid cryogenes are used.

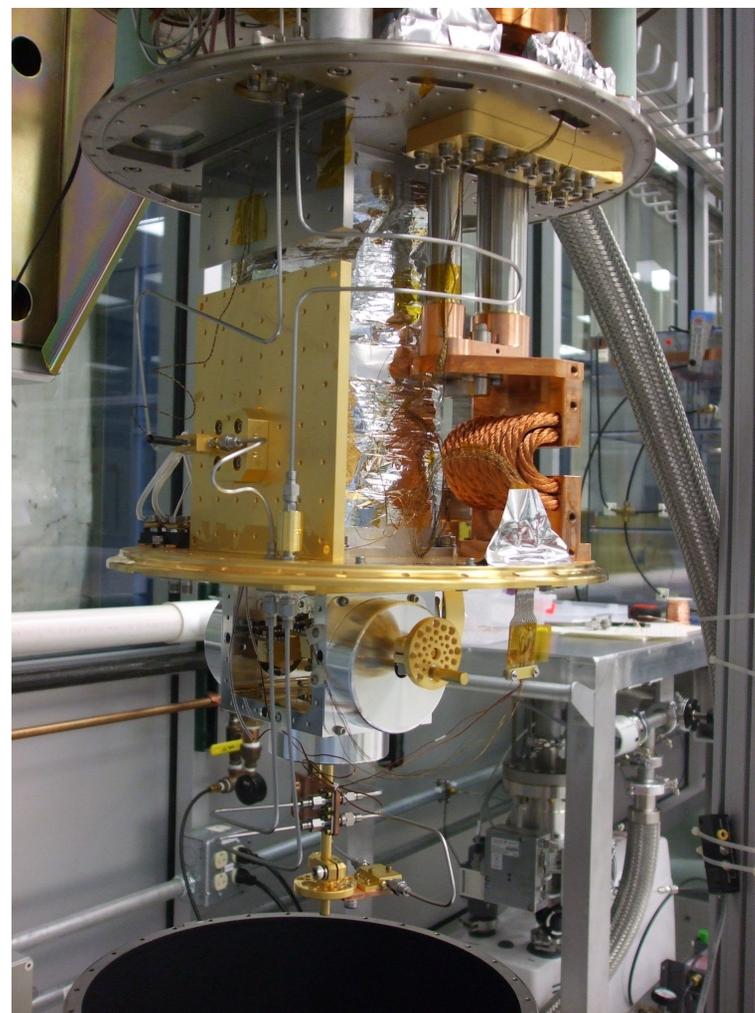
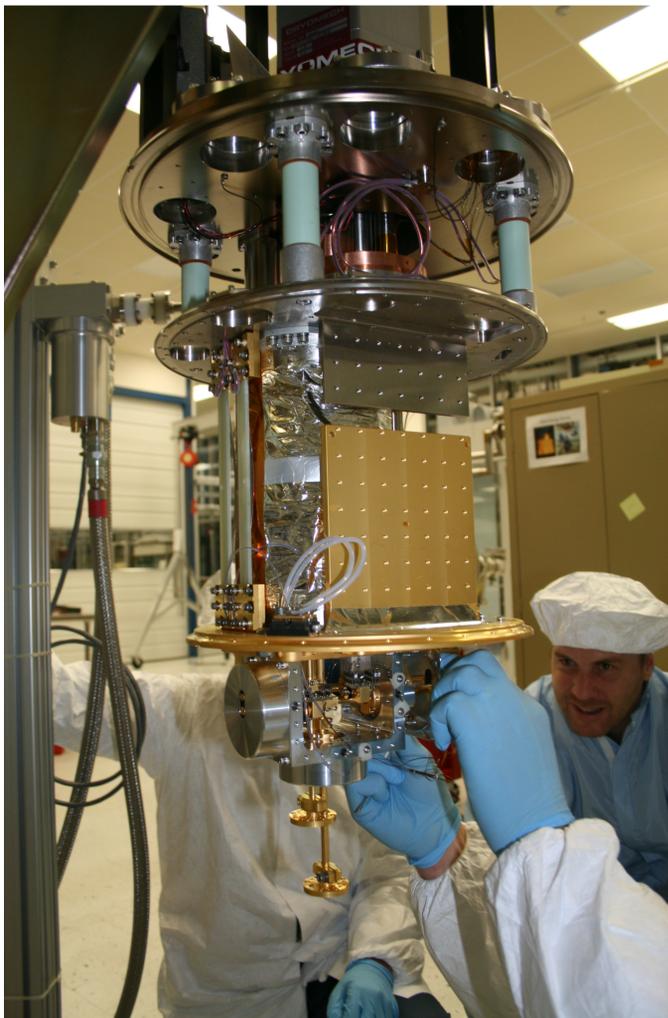
- 1st Stage Cooling Power is 25 W @ 55 K
- 2nd Stage Cooling Power is 0.7 W @ 4.2 K

The Adiabatic Demagnetization Refrigerator (ADR)

The ADR generates the coldest stage temperatures (500 mK and 50 mK). The ADR contains a superconducting 4 T magnet, a Gadolinium Gallium Garnet (GGG) paramagnetic salt pill, a Ferric Ammonium Alum (FAA) paramagnetic salt pill, a Hiperco 50 magnetic shield, and a Kevlar suspension system.

The ADR generates cooling through adiabatic demagnetization of the paramagnetic salt pills. The Kevlar suspension isolates the salt pills from warmer stage temperatures while supporting experimental payloads of 2 kg or less.

- No-load GGG cooling capacity is ~1.0 J from base temperature to 1 K
- No-load FAA cooling capacity is ~100 mJ at 100 mK



Two views of the ADR