

Feature

Fermilab begins operation of first SRF cryomodule



More than 100 Fermilab employees contributed to the Cryomodule 1's assembly and operation. They include scientists, engineers, technicians, safety personnel and administrators. *Photo: Reidar Hahn*

Editor's note: Watch a [video](#) of the installation of the first SRF cryomodule at Fermilab.

At particle physics laboratories around the world, people have closely followed a much anticipated cooldown at Fermilab.

Years of effort by more than 100 staff members at Fermilab have led to the cooldown of Cryomodule 1 at the laboratory's SRF Accelerator Test Facility. At 11 a.m. on Nov. 22, liquid helium flowed through CM1, cooling it to 2 Kelvin (-271° C).

It was the 'lift-off' moment for the facility, which will conduct tests on superconducting radiofrequency cavity modules, the chief pioneering technology for future accelerators. During the next couple of years, Fermilab plans to use cryomodules such as this one to accelerate particle beams for experimentation.

"It's a big deal for the facility," said Jerry Leibfritz, test facility project leader. "Now we're finally going to begin operating, and scientists have an additional facility where they can study and test a cryomodule."

The cryomodule comprises eight 9-cell, 1.3 GHz SRF cavities arranged end-to-end, all housed in a long tube that insulates them from the outside world. The cavities are crucial to the next generation of particle accelerators, and particularly important to proposed experiments such as Project X and the International Linear Collider.

CM1 is the only cryomodule of its type in the United States. The laboratory is working closely with U.S. industry and international laboratories to advance the SRF technology. Now that CM1 is cold, Fermilab has entered the arena as a serious player for SRF accelerators.

"We hope to play a major role in whatever future accelerator is built, whether it's here or not," Leibfritz said. "Of course, we hope it will be at Fermilab."

The path to the CM1 launch began in 2007 when scientists and engineers began assembling the cryomodule from a kit that came from DESY. They installed the completed device at the test facility, housed in the New Muon Lab.

Earlier this year, they completed the cryogenic system and the many support systems needed to operate the cryomodule.

In September, employees conditioned the cavity input couplers to handle all the power that will be fed to them, about four megawatts on the first go-round of tests.

Now it's showtime for CM1.

"Even though we routinely cool down single RF cavities for testing purposes, to cool and power a complete module is proof that everything is put together, it fits and it's ready to be operational," said Elvin Harms, who coordinates operations for CM1.

The cool-down marks the near completion of the test facility's first



Cryomodule 1 is the only eight-cavity SRF cryomodule in the United States. It was successfully cooled to 2 Kelvin (-271° C) on Nov. 22. *Photo: Reidar Hahn*

commissioning phase. During this stage, scientists will fine-tune the various systems that keep the cavities cold and powered up.

"We'll be able to measure everything but beam," Leibfritz said.

Scientists will begin the second phase in March 2011, installing the parts that will generate the electron beam.

"People are excited. It's been a long time coming," Harms said. "It's never a single person or small group of people. It's everybody coming together, mutual sharing and education. The team effort makes it all happen."

-Leah Hesla