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# Synchrotron Laboratory Welcomes New Particle Accelerator Module

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**By MICHAEL MERRILL**

Last month, the basement of Newman Laboratory opened to transport a distinctive red pipe containing the Main Linac Cyromodule — a prototype designed to accelerate particles with unparalleled energy efficiency — across campus. Now housed inside the Wilson Synchrotron Laboratory, the MLC is the latest addition to Cornell's own particle accelerator located under Alumni Field.

The MLC is the product of over twenty thousand hours of work within Newman Lab, built and designed with the help of a grant from the National Science Foundation to explore technologies for use in the next generation of particle accelerators. Its seven superconducting cavities funnel energy into particle beams to help scientists study, basic building blocks of matter, solid state physics and even human biology.

Truck talk | The Main Linac Cyromodule, housed in the red cylinder pictured above, was transported into the Wilson Synchotron Laboratory on the morning of March 10. (Courtesy of Ralf Eichhorn)

"The topic of this research and development program was to build a very efficient sort of conducting accelerator. This is what the MLC is," said Prof. Ralf Eichhorn, phyics, Nordic Institute for Theoretical Physics, a key scientist on the project.

Particle accelerator modules of a similar construction and purpose require liquid helium to keep their superconducting components at less that two degrees celsius above absolute zero. Liquid helium requires large amounts of energy to produce, so cryogenic modules require much more energy to cool than they impart into their particle beams, according to Eichhorn.

Say "Cryomodule" | The team that worked on the Main LInac Cyromodule poses with the device in Newman Laboratory

"This cryogenic module is beyond the state of the art accelerator cryogenic module in terms of efficiency," Eichhorn said.

The MLC's transport through campus drew as much concern from its creators as it did confused glances from onlookers.

"This module was designed to be operated in a fixed location. The more you try to constrain the cold mass, the thing that is inside the cryo module,

before transporting it to its new home in the Wilson Synchotron Laboratory. The module was under construction in Newman since September by the Cornell Laboratory for Accelerator-based Sciences and Education. (Courtesy of Ralf Eichhorn)

the more possibilities you add to bring heat into the module," explained Eichhorn.

Any structure inside the casing that allowed the superconducting cavities to be firmly anchored to the pipe would also allow heat to be conducted into the MLC and lower its efficiency, according to Eichhorn. As a result, the module was loosely suspended inside its red casing, where it was extremely sensitive to any bumps or other forces that it might have come in contact with as it was transported.

"We were a bit concerned about all of the students moving around and especially that students might not pay attention to the oncoming truck which might have forced him to step on the brakes," Eichhorn said.

In fact, so much as a single collision with a pothole or a curb could have damaged the MLC, which would have required costly and time consuming repair.

At the end of its journey the MLC was unloaded at Wilson Laboratory, where it will undergo extensive testing before being installed into the main particle accelerator. Eichhorn said he hopes the module will be operational by mid-June. The MLC is also part of a planned expansion to the Wilson Laboratory that is currently awaiting funding from the National Science Foundation.