The NOvA Neutrino Experiment

Fermilab's latest project will help scientists determine the role that particles known as neutrinos played in the evolution of the universe.

Mysterious neutrinos

Neutrinos are among the most abundant particles in the universe, a billion times more abundant than the particles that make up stars, planets and people. Each second, a trillion neutrinos from the sun and other celestial objects pass through your body.

Although neutrinos are all around us, they interact so rarely with other particles that they are very difficult to detect. That is why researchers use particle accelerators to create intense beams with lots of neutrinos and build very large particle detectors—the size of a house and larger—that can spot neutrinos when they interact with other matter.

Technicians completed the first of 28 NOvA far detector blocks, 51 feet high and wide, and seven feet deep, in September 2012.

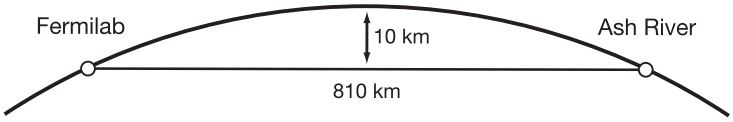
The NOvA detectors

When complete, NOvA will consist of a 200-ton particle detector on the Fermilab site (near detector) and a 14,000-ton detector in northern Minnesota (far detector). The near detector will be installed in a cavern 350 feet underground, connected to an existing underground hall on the Fermilab site. The far detector is under construction in a brand-new building near Ash River, Minnesota.

Moving at close to the speed of light, the neutrinos will travel the 500-mile distance from Fermilab to Ash River in less than three milliseconds—enough time for the neutrinos to transform from one type into another. Data taking will begin in 2013.

The world's best neutrino beam

Fermilab's accelerator complex produces the most intense neutrino beam in the world. The NOvA experiment will use this neutrino beam to study the strange properties of neutrinos, especially the elusive transition of muon neutrinos into electron neutrinos. The neutrino beam will go straight through the earth from Fermilab to a new laboratory in Ash River, Minnesota—no tunnel necessary. The experiment will help answer some of the most important scientific questions about neutrino masses, neutrino oscillations and the role neutrinos may have played in the evolution of the universe.



For more information

NOvA website:
www-nova.fnal.gov

NOvA video:
www.youtube.com/watch?v=Fe4veClYxkE

Webcam at the NOvA construction site in Minnesota:
www.fnal.gov/pub/webcams/nova_webcam/