Defying the Speed of Light

Studies suggest neutrinos travel faster than previously believed possible

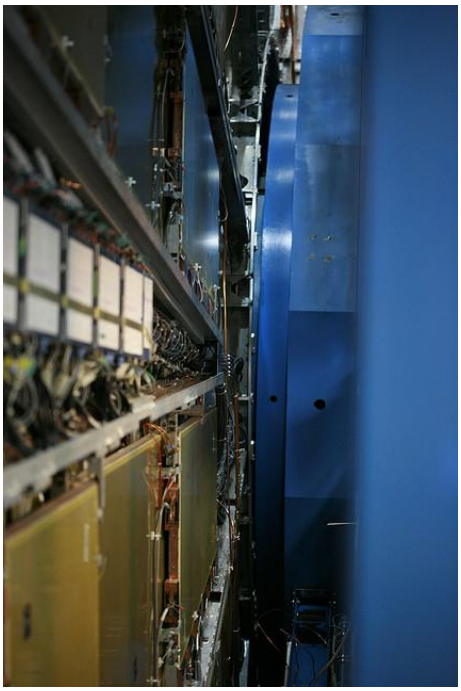
by TIFFANY LIU under mentor VALERIE BROWN

21 December 2011 – Experimental results from the collaborative efforts between two European laboratories, if confirmed, will shake up the field of physics. The research efforts of OPERA, Italy's Gran Sasso National Laboratory, and CERN, the European Organization for Nuclear Research in Switzerland, have reported that neutrinos defy the fundamental rule of physics that nothing travels faster than the speed of light.

Neutrinos are analogous to electrons without the electric charge. They can travel through everything from water vapor to lead. Also, the lack of a charge allows neutrinos to interact with other particles very weakly and travel quickly through the universe.

For three years, researchers in Italy used the particle detector Oscillation Project with Emulsion-tRacking Apparatus (OPERA) to measure the time required for approximately 16,000 neutrinos to travel from CERN to OPERA. They found that the neutrinos traveled 58 billionth of a second faster than what would have been expected if the particles traveled at the speed of light.

University of Bern physicist Antonio Ereditato explains how this was accomplished: "We measure the distance and we measure the time, and we take the ratio between the two to get the velocity, just as you learned to do in high school."



Light speed no more. Early results from experiments conducted at the Large Hadron Collider (shown above) and other facilities suggest that neutrinos can travel faster than ever thought possible.

Image: "Sensor array at CERN" by Robert Scoble available under Creative Commons license at http://www.flickr.com/photos/scobleizer/2256288492/in/photostream/.

However, the inherent difficulty in neutrino detection makes other scientists skeptical about neutrinos' faster-than-light speed. Stony Brook University's Chang Kee Jung believes this discrepancy between the speed of light and the speed neutrinos travel was the result of an error in measurement.

Many physicists in the field share this skepticism and have contended that further investigation is necessary. Currently, two laboratories in the United States – one in Illinois and one in Minnesota – are seeking to test the speedy neutrino results.

Note: Two months following the initial report about neutrinos, Opera repeated their experiment a second time. Their results from the second trial confirmed their initial findings that neutrinos indeed travel faster than the speed of light. ■

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