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COMMUNIQUÉ DE PRESSE NATIONAL I PARIS I 23 SEPTEMBRE 2011

Faster than light?

Neutrinos that travel faster than light? This seems to be the conclusion of the measurements performed by a team of researchers led by Dario Autiero, a CNRS researcher, as part of the OPERA international experiment. This unexpected result will be published on Friday 23rd September 2011 at 2:00 am (Paris time) on ArXiv and presented on the same day at 4:00 pm from CERN, in Geneva, during a seminar which will be webcast live.

Einstein's restricted theory of relativity had proved back in 1905 that nothing could exceed the speed of light in vacuum. However, more than a century on and after three years of very-high precision measurements and complex analyses, the OPERA[1] experiment has led to a totally unexpected result: neutrinos travel slightly but significantly ahead of the time it would take light to cover the same distance in vacuum.

The OPERA experiment is dedicated to the observation of a neutrino beam produced by the CERN accelerators in Geneva and detected 730 km further, from the underground laboratory of Gran Sasso, in Italy. Light travels the distance in 2.4 milliseconds. Yet the OPERA experiment has detected neutrinos reaching Gran Sasso 60 nanoseconds sooner. In other words, after a 730 km run, neutrinos cross the finish line 20 meters ahead of hypothetical photons that would have travelled the same distance.

"*We have set up a system enabling us to achieve synchronization between CERN and Gran Sasso with nanosecond accuracy and we have measured the distance between both sites to within 20 cm. Due to the low uncertainty of these measurements, we are very confident in our results*," says Dario Autiero, CNRS researcher at the Institute Nuclear Physics (IPNL) in Lyon. "*We are therefore anxious to compare our measurements with those of other experiments, as nothing in our data explains why neutrinos seem to travel so fast*." These results are based on the observation of over 15,000 neutrinos.

"*This outcome is totally unexpected*," stresses Antonio Ereditato, of the University of Bern and spokesperson for the OPERA experiment. "Months of research and verifications have not been sufficient to identify an instrumental effect that could explain the result of our measurements. While the researchers taking part in the experiment will continue their works, they look forward to comparing their results with those of other experiments so as to fully assess the nature of this observation.

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[1] The OPERA detector has been designed and is being operated by a team of researchers from Belgium, Croatia, France, Germany, Israel, Italy, Japan, Korea, Russia, Switzerland and Turkey. This experiment represents a complex scientific undertaking that has been successfully carried out thanks to the expertise of many scientists, engineers, technicians and students, and with the strong commitment of the various actors of the project. In particular we wish to mention the LNGS/INFN and CERN laboratories; the major financial support of Italy and Japan and substantial contributions from Belgium, France, Germany and Switzerland. The Collaboration presently includes about 160 researchers from 30 institutions across 11 countries.

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So far, the speed of light has always been considered insuperable. Should it not be the case, it could open entirely new theoretical perspectives. Considering the huge impact that such result could have on physics, independent measurements are necessary for the effect observed to either be refuted or formally established. This is the reason why researchers taking part in the OPERA collaboration want to submit this result to the examination of their fellow physicists worldwide.

The OPERA experiment was inaugurated in 2006 to o bserve the rare transformations (oscillations) of muon neutrinos into tau neutrinos. One such oscillation was detected in 2010, demonstrating the experiment's unique capacity in terms of detection of the elusive signals of tau neutrinos.

Four CNRS laboratories are involved in the OPERA experiment:

- the INPL Institute of Nuclear Physics in Lyon (CNRS/Université Claude Bernard-Lyon 1),
- the Hubert Curien Pluridisciplinary Institute (CNRS/Université de Strasbourg),
- the Linear Accelerator Laboratory (CNRS/Université Paris-Sud 11), which participated until 2005,
- the Particle Physics Laboratory in Annecy le Vieux (CNRS/Université de Savoie).

Dario Autiero, IPNL, Lyon, September 2011

Gran Sasso Laboratory. OPERA experiment's 1,800-ton detector

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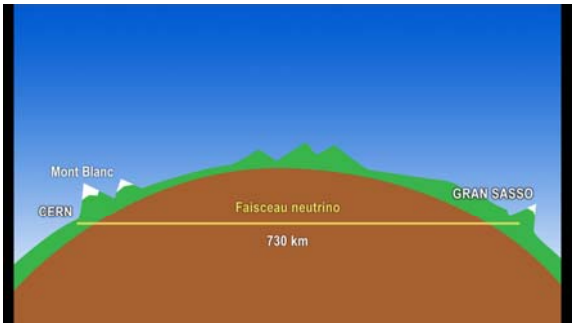

Diagram of the CNGS neutrino beam between CERN and Gran Sasso. The OPERA Experiment, dedicated to the observation of a neutrino beam sent by CERN to the INFN Gran Sasso Laboratory in Italy, has completed a three-year complex research study showing that neutrinos covered the 730 km distance separating the two sites sooner t han expected. According to calculations, neutrinos are in f act 60 nanoseconds ahead of the 2.4 milliseconds it would take light to cover the same trajectory.

These results are published on Friday 23rd Septebmer at 2:00 am (Paris time) on the "open archive" site ArXiv : http://xxx.lanl.gov/list/hep-ex/

They will be presented today at 4:00 pm by CNRS researcher Dario Autiero during a seminar at CERN in Geneva.

The seminar will be webcast from 4:00 pm at the following address : http://webcast.cern.ch. Journalists are welcome to ask questions during the seminar by using twitter at: @CERN.

Photos available at: https://filez.auteuil.cnrs-dir.fr/pppwv
« Faster than light? » high definition report in English accessible at:
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