''Faster than light'' particles threaten Einstein

Sub-atomic particles apparently traveling faster than light could force a major rethink of theories about how the cosmos works and even allow dreams of time travel and extra dimensions, scientists said on Friday.

Jeff Forshaw, a professor of particle physics at Britain's Manchester University, said the results, if confirmed, would mean it would be possible in theory "to send information into the past."

"In other words, time travel into the past would become possible ... (though) that does not mean we'll be building time machines any time soon," he told Reuters.

The international physicists who made the startling findings at CERN near Geneva said they must now be confirmed by independent research teams. The wider scientific community expressed astonishment and skepticism.

"Extraordinary claims require extraordinary evidence, and this is an extraordinary claim," cosmologist and astrophysicist Martin Rees told Reuters.

CERN, also home to the Large Hadron Collider that is probing how the universe began and developed, said measurements over three years had shown invisible neutrino particles covering the 730 km to a laboratory in Italy 60 nanoseconds -- or 60 billionths of a second -- faster than light.

That reading could show that Albert Einstein, father of modern physics, was wrong when he laid down in his 1905 theory of special relativity that the speed of light was a "cosmic constant," and nothing could go faster.

CORNERSTONE OF SCIENCE

That principle, and Einstein's later general relativity theory, which expanded it into wider fields of physics, have been cornerstones of scientific views of the cosmos and how it works ever since.

The new finding was recorded when 15,000 neutrino beams were pumped over three years from CERN to an underground Italian laboratory at Gran Sasso near Rome.

Physicists on the experiment, called OPERA after the initials of its formal scientific title, say they had checked and rechecked over many months anything that could have produced a misreading before announcing what they had found.

Professor Jenny Thomas, who works on neutrinos at Fermilab, the U.S. physics research center near Chicago, commented: "The impact of this measurement, were it to be correct, would be huge."

OPERA's Dario Auterio, presenting the findings to a packed and clearly sceptical auditorium at CERN on Friday, said they were of "high statistical accuracy" and could not be explained by extraneous effects such as seismic tremors or moon phases.

He declined to get into theoretical interpretations and told his audience of largely CERN scientists that other research centres -- Fermilab and probably Japan's T2K neutrino research team -- must now take up the baton.

"In science, you can never be sure. Something odd can always happen, however careful you are," said CERN spokesman James Gillies. "You've always got to get an independent result from someone else before you can say it's a discovery."

SCEPTICISM VOICED

Many leading scientists were sceptical that Einstein's theories would have to be abandoned.

"It is premature to comment on this," said Professor Stephen Hawking, perhaps the world's best-known physicist, who has come up with contested ideas of his own. "Further experiments and clarifications are needed."

The high level of caution is normal in science where anything that could be a breakthrough discovery, especially one that overturns well-established thinking, is rigorously inspected by other researchers to see if they get the same results.

CERN's research director, Sergio Bertolucci, reaffirmed this principle.

"When an experiment finds an apparently unbelievable result and can find no artefact of the measurement to account for it, it is normal to invite broader scrutiny ... That is good scientific practice," he said.

The measurements were posted on the scientific website arxiv.org/abs/1109.4897.

Einstein's theory has been tested thousands of times over the past 106 years and only recently have there been slight indications that the behavior of some elementary particles of matter might not fit into it.

OPERA spokesman Antonio Ereditato said the sub-atomic neutrino, which is normally produced in nuclear decay or nuclear reactions such as those on the Sun and was only confirmed to exist in 1934, "is still surprising us with its mysteries."

Scientific bloggers on the Internet said the particle might be slipping into and out of dimensions, other than the known four of length, breadth, depth and time, as predicted by the controversial "string theory" of how the cosmos works.

"Only when the dust finally settles should we dare draw any firm conclusions," said Professor Forshaw. "It is in the nature of science that for every new and important

discovery there will be hundreds of false alarms."

(Additional reporting by John Manley and Steve Addison; Editing by Robert Woodward and Kevin Liffey)