'Faster-than-light' particles spark science drama

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Oh Albert. Did you get it wrong? In 2011, physics was shaken by an experiment which said the Universe's speed limit, enshrined by Einstein in his 1905 theory of special relativity, could be broken.

Normally staid scientists rushed to defend a foundation theory of modern physics -- and one even vowed to eat his blue boxer shorts if the findings were confirmed.

The fuss began in September when a European team announced that ghostly sub-atomic particles called neutrinos had been found to travel some six kilometres (3.75 miles) per second faster than the velocity of light.

The neutrinos had been generated at the giant underground lab of the European Centre for Nuclear Research (CERN) in Geneva.

They were timed at their departure and, after travelling 732 kms (454 miles) through Earth's crust, at their arrival at the Gran Sasso Laboratory in Italy.

To do the trip, the neutrinos should have taken 0.0024 seconds.

Instead, the ornery little critters hit the detectors in Italy 0.00000006 seconds sooner than expected.

"If the effect were confirmed, it would show some particles can travel

faster than the speed of light," Professor David Wark, director of the Particle Physics Department at Britain's Science and Technology Facilities Council, told AFP.

"This would be a profound revolution in physics, probably the most significant one to happen in the last 100 years."

Right now, the OPERA experiment is a long way from being accepted as "five sigma," or a claim that is tried and tested and deemed authentic. A team in the United States is already working to see if the result can be replicated.

But what would happen if it turns out to be true?

One possibility: the speed of light can be broken and Einstein was wrong.

Another: the particles, as they made their trip, crossed into some extra dimension or two, beyond the four dimensions of reality that we know, which comprise three of space and one of time.

If so, our traditional concept of the Universe would be ripped apart.

Yet this counter-intuitive idea would also save Einstein's reputation.

By traversing into an extra dimension, the particles would in effect have taken a short cut to get to their destination. They would not have been superluminal, or faster than light.

"It could mean that Einstein was right in some respects, but not completely. It could be that there is a bigger theory which lies outside his theory, like a nested doll," said Pierre Binetruy of the Astroparticle and Cosmology Laboratory of Paris.

Fearing an outcry, the OPERA scientists went over their results again and again for six months before going public. They larded their announcement with caution and admissions of bewilderment, and pleaded with others to verify what they had seen.

The response came, well, at light speed, in physics forums and the media.

"If this result at CERN is proved to be right, and particles are found to travel faster than the speed of light, then I am prepared to eat my shorts, live on TV," declared Jim Al-Khalili, a professor of theoretical physics at Britain's University of Surrey.

The squabble became a common news item and even a source of jokes ("We don't serve faster-than-the-speed-of-light particles in here!" says the barman. A neutrino walks into a bar).

In contributions to the open-access website arXiv, scores of physicists laid into the OPERA experiment, seeing potential anomalies.

Scientists involved in another Gran Sasso experiment called ICARUS, using the same neutrino beam from CERN, argued that the particles should have lost most of their energy if they had bust the light barrier.

But when the neutrinos arrived, their energy values were entirely consistent with travel at the speed of light.

Many papers noted that the tiniest technical inaccuracy would have skewed the outcome.

Some questioned whether the OPERA team had properly tagged the pulses of neutrinos so that the particles could be identified at the start and end of their flight.

Others said the use of GPS to synchronise the timing may have affected measurement.

The geopositioning signals from orbiting satellites were moving relative to the neutrinos and to the detector, resulting in a shorter time-of-flight measurement of exactly 64 nanoseconds -- QED!

The OPERA team have now finetuned the neutrino beam to tag the particles better, but say they still have the same result.

And they are looking at using a fibre optic cable, rather than GPS, to synchronise the timing.

In the coming 12 months, Einstein could be confirmed on his mighty pedestal, or worrying cracks may appear in it.

And CERN is expected to deliver its judgement on whether the Higgs Boson, the elusive "God particle" which would explain mass, exists or not.

So 2012 is set to be a year to remember -- and not just in the lab.