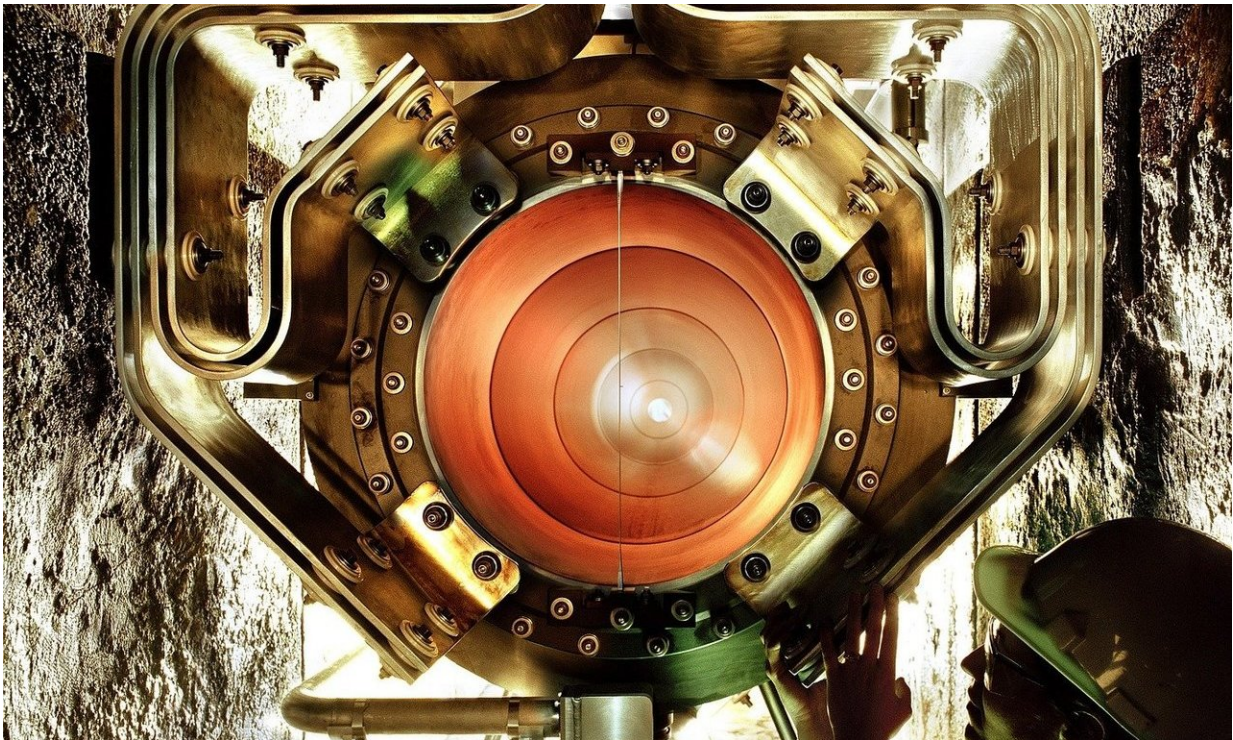


Can elementary particles change their flavor in flight?

December 5 2018



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Can elementary particles change their flavor in flight?

The answer is yes, though it only applies to the most elusive kind of [elementary particles](#). A recent Ph.D. thesis in University of Jyväskylä, Finland, finds that the properties of the ghost-like [particles](#), the so-called

[neutrinos](#), can be studied at a high precision in the next generation of accelerator-based experiments.

In his fresh Ph.D. thesis, Sampsa Vihonen explored how accurately the mixing of the neutrino flavors and masses can be measured in the so-called long baseline neutrino experiments. Long baseline experiments are a type of particle physics experiments where intense beams of neutrinos and antineutrinos are sent to traverse very long distances underground. Vihonen's thesis focuses on the numerical evaluation of the precision at which the properties of the neutrino mixing can be measured.

"I focused on the determination of the octant of the mixing angle θ_{23} , which is the dominant parameter that governs the metamorphosis of neutrinos that are born in the Earth's atmosphere," says Vihonen.

Neutrinos can oscillate from one particle type to another, which is caused by the mysterious entanglement of the neutrino masses and their flavors. The mechanism that dictates the [neutrino oscillations](#) is yet to be determined precisely, though, and it takes careful planning to reach the precision that is necessary to understand the fundamental properties of neutrinos.

M.Sc. Sampsa Vihonen will defend his doctoral dissertation in [theoretical physics](#) under the title "Numerical studies on neutrino oscillations in long baseline experiments" on Wednesday 5th of December at 12 o'clock. The opponent of the event is professor Mattias Blennow (KTH Royal Institute of Technology, Sweden) and custos professor Kimmo Kainulainen (University of Jyväskylä). The language of the event is English.

Sampsa Vihonen graduated from high school at Jyväskylän Normaalikoulu in 2006 and obtained his Master's degree in theoretical

physics at the University of Jyväskylä in 2014. He has also worked as visiting scientist at the University of Lisbon in Portugal.

More information: Numerical studies on neutrino oscillation physics in long baseline experiments. jyx.jyu.fi/handle/123456789/60352

Provided by University of Jyväskylä

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