



Contribution ID: 6

Type: **not specified**

KEYNOTE5: Future in Neutrino Physics

Friday 1 September 2023 17:30 (2 hours)

Chaired by Prof. Stefan Soldner-Rembold (Manchester U, Head of the Physics Department)

Abstract: In this lecture we look forward, beyond the next generation giant neutrino experiments presently under construction, T2HK and DUNE, and will explore the landscape of experiments and facilities that are in preparation or being considered for precision oscillation studies and could become 'next-to next' generation experiments, depending on the open questions in neutrino physics that will emerge at the time. We will also e.g. look forward to planned experiments for measuring properties of neutrinos such as mass measurements or the Majorana/Dirac nature of this fundamental particle.

Next, we report on opportunities offered by colliders as neutrino factories, the first pathfinder experiments of which that have produced first results in 2023 at the LHC namely the FASER and SND@LHC experiments. A proposal for a dedicated TeV neutrino detector facility at CERN for the High-Luminosity LHC to take data in 2030 is being prepared.

These activities will be very inspiring for the long-term plans of future high energy colliders at CERN or elsewhere.

Finally a very important part of the present and future neutrino program will be the study of neutrinos from the sky with large detectors in the ice or water, such as IceCube and KM3NET.

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Lecturer: Prof. Dr. Albert De Roeck is a senior research scientist and staff member of the largest particle physics laboratory in the world, CERN, home of the Large Hadron Collider (LHC). De Roeck is also a professor at the University of Antwerp (Belgium) and a visiting professor at UC Davis, the British University in Cairo (Egypt) and NTU in Singapore. He obtained his PhD at the university of Antwerp on an experiment at CERN, studying the multi-particle dynamics in hadron-hadron interactions. De Roeck spent then 10 years at DESY (Germany) where he and his team made very precise measurements of the quark and gluon structure of the proton, and precise tests of the strong force. At the end of the 90's his interest turned to the possibility to discover new physics at future particle colliders, in particular Supersymmetry and Extra Dimensions, and returned to CERN. He first joined an experiment at the large electron-positron collider LEP, studying the strong force and searching for signals of new physics. He played a significant role in the preparation of one of the experiments at the LHC: the Compact Muon Solenoid (CMS) (2000-2009). De Roeck has become one of the leaders in the CMS/LHC physics program, actively involved in physics analyses. He was deputy spokesperson at CMS (2010-2011), and convener of the Higgs search physics group (2012-2013) with a leading role in the Higgs discovery (July 2012).

At the LHC he is a leader of the long-lived particle search effort and involved in several new experiments such as SND@LHC and FPF (Forward Physics Facility). He leads the neutrino physics group at CERN (since 2017) and is an active member in the DUNE and ICARUS experiments in the US and the T2K experiment in Japan (text informed by the Lecturer).

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Photos one during Albert's keynote with Stefan chairing this keynote session and the other photo taken at the end of Albert's keynote (courtesy Douglas Novaes)

Presenter: Prof. DE ROECK, Albert (CERN)