

T 42: Invited Overview Talks I

Time: Wednesday 11:00–12:30

Location: ZHG011

Invited Overview Talk T 42.1 Wed 11:00 ZHG011
Direct neutrino-mass measurements - current and next generations — ●MAGNUS SCHLÖSSER — Karlsruhe Institute of Technology, Tritium Laboratory Karlsruhe, Karlsruhe, Germany

The precise measurement of neutrino masses represents a critical frontier in particle physics, with implications that extend beyond the Standard Model and into cosmology. Direct neutrino mass measurements are uniquely model-independent and critical for cross-validating of other approaches. The Karlsruhe Tritium Neutrino (KATRIN) experiment, employing beta-decay spectroscopy to measure the incoherent sum of neutrino masses, is in its final year of data taking. KATRIN has progressively improved the upper limit on neutrino mass, achieving $m < 0.45$ eV at 90% C.L. and aims to reach a final sensitivity of $m < 0.3$ eV. This limit represents the reach of the current state-of-the-art technology. Next-generation experiments, targeting sensitivities below the inverted ordering range ($m < 0.05$ eV), require novel technologies, such as atomic tritium sources and differential detection methods, as explored by KATRIN++, Project8, and QTNM.

Another approach is to calorimetrically measure the energy released from electron capture reactions, e.g. from Ho-163 atoms implanted into cryogenic micro-calorimeters. This technology is currently employed by the ECHO and HOLMES collaborations with sensitivities in the order of O(10 eV). Next, their statistics will be improved by increasing the number of channels and measurement time.

This talk will present the latest results and plans for next-generation neutrino mass experiments.

Invited Overview Talk T 42.2 Wed 11:30 ZHG011
Mapping out the Higgs Boson: Highlights from the LHC Experiments — ●ELISABETH SCHOPF — Universität Siegen

The Higgs boson holds a unique position within the Standard Model of Particle Physics; it is the only known fundamental spin-0 particle and it has intrinsic links to the mass-generation mechanisms of fundamental particles and to the evolution of the Universe. It could hold a crucial key to unlocking access to yet unknown physics.

This talk will present the latest results of Higgs-boson research at

the ATLAS and CMS experiments using proton-proton collision data from the Large Hadron Collider. The unprecedented precision reached in probes of Higgs boson couplings to fundamental fermions, leptons and quarks, hone in on the question if these couplings are proportional to the fermion masses as expected in the Standard Model or reveal the existence of additional unknown sources of mass generation. More extensive measurements of differential cross-sections probe for new physics affecting Higgs-boson production. Pushing the limits on studies of the Higgs-boson self-coupling further maps out the shape of the Higgs-field potential, which is connected to the long-term stability of the Universe. New and improved searches for other Higgs-boson-like particles and exotic Higgs-boson decays are cornering theories of additional phase transitions in the early universe and theories on the nature of dark matter. This presentation will also discuss the challenges of Higgs-boson research at the Large Hadron Collider and feature recent advancements in measurement techniques.

Invited Overview Talk T 42.3 Wed 12:00 ZHG011
Computing at the LHC and its transformation towards the HL-LHC — ●SEBASTIAN WOZNIEWSKI — II. Institute of Physics, Georg-August-University, Göttingen, Germany

Together with the data taken at the LHC and the increasing number of physics analyses performed on this data, the capacity of the WLCG has grown continuously in the past. We look back on a time when the market offered data storage and computing power at a lower price year after year and thus the growing demand for resources could be covered even with a flat budget. This trend has weakened or at least requires more technological adjustments on the user side. At the same time, we are facing major challenges with regard to the large resource requirements of the HL-LHC and the necessity to provide these resources in a sustainable and environmentally friendly way. In many places, developments are being driven forward in terms of resource provision and utilisation to meet these challenges.

This presentation will provide a broad overview, with a particular focus on developments and related projects in Germany, and show a selection of highlights on the way to the future LHC Computing.