# T 48: Eingeladene Vorträge 2

Zeit: Dienstag 14:00–16:15 Raum: H 3

**Eingeladener Vortrag** T 48.1 Di 14:00 H 3

**Status of the neutrino mass experiment KATRIN** — •Florian Fränkle for the KATRIN-Collaboration — Institute for Nuclear Physics, Karlsruhe Institute of Technology (KIT)

The KArlsruhe TRItium Neutrino (KATRIN) experiment is a large-scale experiment with the objective to determine the effective electron anti-neutrino mass with an unprecedented sensitivity of 200 meV/$c^2$ at 90% CL in a model-independent way. The measurement method is based on precision $\beta$-decay spectroscopy of molecular tritium. The experimental setup consists of a high luminosity windowless gaseous tritium source, a magnetic electron transport system with differential and cryogenic pumping for tritium retention, and an electro-static spectrometer section for energy analysis, followed by a segmented detector system for counting transmitted $\beta$-electrons. First commissioning measurements of the complete beamline were performed in November 2016.

This talk will give an overview of the current status of the KATRIN experiment and will present results from the first beamline commissioning measurements.

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**Eingeladener Vortrag** T 48.2 Di 14:27 H 3

**The search for neutrinoless double beta decay with EXO-200 and nEXO** — •Thilo Michel — Erlangen Centre for Astroparticle Physics (ECAP), Friedrich-Alexander-Universität Erlangen-Nürnberg

Are neutrinos Dirac- or Majorana-fermions? Still today, this question has not been answered although huge efforts have been made to search for neutrinoless double beta decay which is the most practical way to get an answer. Furthermore, a possible detection of this decay could give valuable information about the masses of the neutrino mass eigenstates as the half-life depends on the effective Majorana neutrino mass. The Enriched Xenon Observatory EXO-200 has carried out one of the most sensitive searches for this decay channel in $^{136}$Xe with two years of data. The EXO-200 detector is a double-sided, single-phase liquid xenon time-projection-chamber. EXO-200 started a second phase of data taking in April 2016. The next-generation, tonne-scale experiment nEXO is the successor of EXO-200. With its single-sided, single-phase time-projection-chamber filled with 5 tonnes of enriched liquid xenon nEXO will be able to probe the possible effective Majorana neutrino masses in the inverted mass hierarchy regime. Light-detection in nEXO will be carried out with silicon photomultipliers. The charge measurement will be realized with a checkerboard style electrode matrix. With the projected energy resolution of 1% ($\sigma$) at the Q-value of the decay, nEXO aims at a half-life sensitivity of $6.2 \times 10^{27}$ years at 90% C.L. after 5 years of measuring time. In this talk, the EXO-200 experiment and the development of nEXO will be presented.

**Eingeladener Vortrag** T 48.3 Di 14:54 H 3

**Top-Antitop Pair Production Near Threshold in Electron-Positron Annihilation** — •Jan Piclum — Universität Siegen, Siegen, Germany

A future electron-positron collider like the envisioned International Linear Collider will offer the possibility to measure the cross section for the production of top-antitop quark pairs close to the production threshold with high precision. From a comparison of the measured cross section to a theoretical calculation, one can then determine properties of the top quark like its mass and decay width. This requires a precise prediction of the cross section, which makes it necessary to compute it to high order in perturbation theory. In this talk I will explain the effective theory framework that is employed in this calculation and present results at next-to-next-to-next-to-leading order in QCD. I will also discuss the inclusion of electroweak corrections, for example due to virtual Higgs bosons, which are also important at this level of precision.

**Eingeladener Vortrag** T 48.4 Di 15:21 H 3

**Ausblick auf Neue Physik durch das Higgs-Fenster** — •Oleg Brandt — Universität Heidelberg, Kirchhoff-Institut für Physik

Als eine der am wenigsten erforschten Regionen des Standardmodells ist der erst einige Jahre junge Higgs-Sektor sehr bedeutend als "Fenster" für Suchen nach Neuer Physik. Viele Erweiterungen des Standardmodells sagen erhöhte Raten für die paarweise Produktion von Higgs-Bosonen und/oder ihre assoziierte Produktion mit elektroschwachen Eichbosonen voraus; ferner fungiert das Higgs-Boson in vielen potentiellen Szenarien als Portal zwischen Teilchen des Standardmodells und Dunkler Materie. In diesem Vortrag werden Suchen nach Neuer Physik im Higgs-Sektor in Proton-Proton-Kollisionen bei 13 TeV mittels des ATLAS-Detektors vorgestellt; ein besonderer Fokus wird auf hadronische Endzustände, die das höchste Verzweigungsverhältnis und damit oft die höchste Sensitivität auf Neue Physik in sich vereinen, gelegt.

**Eingeladener Vortrag** T 48.5 Di 15:48 H 3

**Measuring the Higgs Self-coupling at the International Linear Collider** — •Claude Dürig — DESY, Hamburg Germany

Since the discovery of the Higgs boson at the LHC in 2012, the precise exploration of the Higgs sector is one of the key goals of future particle collider experiments. A planned next generation particle collider project is represented by the International Linear Collider (ILC), offering model-independent precision measurements of particle properties. The Higgs physics programme of the ILC includes a model-independent precision measurement of the Higgs self-coupling, which can either verify the SM mechanism of electroweak symmetry breaking or uncover new physics. At a centre-of-mass energy of 500GeV information on the Higgs self-coupling can be extracted from a model-independent cross-section measurement of double Higgs-strahlung ZHH. However, the small signal production cross section poses challenges to the detector and event reconstruction techniques.

The prospects of the Higgs self-coupling measurement at the ILC in the context of a 20-year-long physics programme are studied in a full detector simulation for a 125GeV Higgs boson, using TDR detector parameters. In this presentation, recent results of the Higgs self-coupling measurement and its connection to new physics are outlined. We also discuss the prospects of an 1TeV energy upgrade, which offers complementary capabilities for the observation of double Higgs production and the Higgs self-coupling. This contribution gives an overview of the study, focussing on the application of kinematic fits.