T 29: Invited Topical Talks 2

Time: Tuesday 14:00–15:40 Location: T-H16

Invited Topical Talk T 29.1 Tue 14:00 T-H16

Testing the Standard Model through Gauge-boson Self-interactions — •Philip Sommer — The University of Sheffield, Sheffield, United Kingdom; CERN, Geneva, Switzerland

In the Standard Model, electroweak interactions of fermions proceed through the exchange of gauge bosons, the W and Z bosons, and the photon. In addition, self-interactions of the gauge bosons through trilinear and quartic couplings are predicted. At the LHC, these lead to the production of single- and multiboson final states. Measurements of such processes, thus, provide a sensitive probe of the gauge structure of the electroweak theory. The pp collision data from the second experimental phase of the LHC has allowed for precise measurements of processes proceeding through trilinear couplings and facilitated, for the first time, the observation of a number of processes that proceed through quartic electroweak couplings. Recent measurements of single- and multi-boson production by the ATLAS collaboration are presented. The agreement of the measurements with the theoretical predictions is quantified by constraining Effective Field Theory operators that modify the trilinear and quartic gauge-boson self-interactions in a general extension of the Standard Model.

Invited Topical Talk T 29.2 Tue 14:25 T-H16

Axions and similar particles - how to cover 10^{17} orders of magnitude in mass — •Kristof Schmieden — Johannes Gutenberg-Universität Mainz

Axions, the famous hypothetical particle that explains the absence of CP violation in QCD, was already though of in the 70ies. Yet only in the past decade the hunt for this and similar particles took up pace, which huge advancements in the recent years. The reason behind the growing interest is the understanding that axions and axion-like particles can contribute to the dark matter content of the universe. In fact, pseudo-scalar particles are a natural prediction of many extensions of the Standard model and even possibly explain the muon (g-2) anomaly. Considering the general case of pseudo-scalar particles a huge parameter space in mass and coupling to SM particles opens up, requiring a variety of experimental approaches to hunt for these particles. This talk will briefly introduce the phenomenology of axions and axion-like particles and discuss a selection of experiments and their latest results in more detail.

Invited Topical Talk T 29.3 Tue 14:50 T-H16

From GERDA to LEGEND - Hunting no neutrinos — •Christoph Wiesinger — Max-Planck-Institut für Physik, München — Physik-Department, Technische Universität München, Garching

Hidden by their tiny mass, neutrinos may carry a profound secret with far-reaching consequences for both particle physics and cosmology. Given zero electric charge and no color, they may be Majorana particles - fermions that are their own anti-particles. Double beta decay offers a unique probe for this hypothesis. Finding no neutrinos, but solely two electrons sharing the full available decay energy, would prove lepton number non-conservation and reveal the Majorana character of neutrinos. The superb spectroscopic performance of high-purity germanium detectors provides exceptional discovery potential for this mono-energetic peak. The Germanium Detector Array (GERDA) experiment has operated 40 kg of enriched germanium in an instrumented low-background liquid argon environment. In a total exposure of more than 100 kg yr, taken under record-low background conditions, no signal was found. The corresponding half-life limit for neutrinoless double beta decay of ^{76}Ge is $>1.8\cdot10^{26}$ yr at 90% C.L., and coincides with the median sensitivity for the null hypothesis. The Large Enriched Germanium Experiment for Neutrinoless double beta Decay (LEGEND) is about to expand this search towards 10^{28} yr and beyond. Following LEGEND-200, the initial 200-kg phase currently under construction, LEGEND-1000 will probe the full parameter space spanned by the inverted ordering scenario.

Invited Topical Talk T 29.4 Tue 15:15 T-H16

Mapping Highly-Energetic Messengers throughout the Universe — •Sara Buson — Institut für Theoretische Physik und Astrophysik, Universität Würzburg

Cosmic rays prove that our Universe hosts elusive astrophysical "monsters" capable of continuously and efficiently accelerating particles at extreme energies. High-energy photons and neutrinos may be the key to ultimately decipher the mystery of cosmic rays. In 2017, the candidate detection of neutrino emission from the direction of the gamma-ray flaring blazar TXS 0506+056 has put forward gamma-ray blazars as promising neutrino point-sources, hence cosmic-ray accelerators. However, to date there is neither a consistent picture for the physical mechanism nor a theoretical framework capable of convincingly explain the full set of multi-messenger observations. I will present initial encouraging steps in this multimessenger (electromagnetic and neutrino) quest and finally discuss the latest status of the field.