T 20: Invited Topical Talks I

Time: Tuesday 13:45–15:45 Location: ZHG011

Invited Topical Talk T 20.1 Tue 13:45 ZHG011

An introduction to gas electron multipliers and their time to shine during the CMS phase 2 upgrade — •Shawn Zaleski — III. Physikalisches Institut A, RWTH Aachen University

Gas electron multipliers (GEMs) are a sub-class of micro-pattern gaseous detectors in which passing charged particles ionize the gas inside to create an electronic avalanche through multiple stages of amplification. Each GEM foil is copper-cladded Kapton with a chemically etched micro-pattern of holes allowing electrons to pass through and be amplified. Each amplification stage allows a moderate amplification gain per GEM foil to be achieved, yielding an overall gain of $\mathcal{O}(10^5)$.

The CMS GEM project makes use of the largest area GEM chambers up to now. GEMs were first installed in the first muon station of the CMS end caps during the last long shutdown (LS2) in 2021 and 2022. These chambers compliment the existing cathode strip chamber system improving the transverse momentum measurement of muons traversing the CMS end caps. A new addition to the GEM system, so-called ME0, will be installed adjacent to the planned high-granularity hadron calorimeter (HGCAL) in the nose of the CMS end caps. This will extend the pseudorapidity reach of the muon system from 2.4 to 2.8. The ME0 stacks, sets of six triple GEM chambers are planned to be installed during the next LHC long shutdown (LS3). Production of the ME0 stacks is currently underway and the first stacks are already undergoing quality control (QC) checks to test detector readiness. The production status and initial QC results will be presented.

Invited Topical Talk T 20.2 Tue 14:15 ZHG011

Searches for rare Higgs boson decays — •Martina Laura Ojeda — CERN, Geneva, Switzerland

Throughout the decade that has elapsed since the discovery of the Higgs boson, a considerable amount of effort has been put into precise measurements of its properties. Higgs boson couplings to vector bosons, τ leptons, bottom/top quarks, and (via loop processes) photons and gluons have now been established. As all current measurements point to the Higgs boson being Standard Model (SM)-like, rare and unobserved Higgs boson decay modes are an important contribution to further test the SM. This is particularly true for decay modes mediated by loops, which can be especially sensitive to physics beyond the SM.

This talk will focus on challenges and opportunities associated with rare decay searches, and highlight one such ATLAS search: the yet-unobserved $H \to Z/\gamma^* + \gamma$ decay. While not sensitive enough to claim observation of this decay process, current results hint at a slight tension with the SM expectation, with a $H \to Z\gamma$ decay rate of $(2.2 \pm 0.7)\times$ the SM prediction.

Invited Topical Talk T 20.3 Tue 14:45 ZHG011

Novel opportunities with the LHCb Software Trigger — •Titus Mombächer — CERN, Geneva, Switzerland

The LHCb experiment at the LHC has a unique acceptance and a highly flexible trigger system which enables a rich physics program, while keeping the processed and stored data sizes at a manageable level. Since the beginning of the current data taking period its flexibility got further enhanced by relying fully on a software-only trigger. This talk will describe the LHCb trigger system and illustrate its potential far beyond the design goals with examples from past, present and future, focusing on rare strange decays and particles with exotic signatures.

Invited Topical Talk T 20.4 Tue 15:15 ZHG011

Dark sector searches with invisible and displaced signatures at Belle II — •Giacomo De Pietro — Institut für Experimentelle Teilchenphysik, Karlsruher Institut für Technologie, 76131 Karlsruhe, Germany

Experimental evidence points to the existence of so-called dark matter, which makes up 85The Belle II experiment is collecting samples of e^+e^- collision data at center-of-mass energies near the $\Upsilon(4S)$ resonance. These data have constrained kinematics and low multiplicity, allowing searches for dark sector particles in the mass range from a few MeV to O(10) GeV. In this talk I will review some of the recent dark sector searches at Belle II, focusing on the results with invisible and displaced signatures.