

## PHYSIKALISCHES KOLLOQUIUM

### Wintersemester 2023/24

Das Kolloquium findet (soweit unten nicht anders angegeben) jeweils montags **jeweils montags um 17:15 Uhr online via Zoom** statt.

(Der jeweilige Link wird noch zur Verfügung gestellt.).

**23.10.2023**

#### **Vorstellungsvortrag im Rahmen des Habilitationsverfahrens**

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**Study of electroweak vector boson scattering processes at the ATLAS detector and preparation for the high luminosity data-taking at the LHC**

#### **Abstract**

Proton-proton collision data collected at the Large Hadron Collider (LHC) at CERN have opened a possibility of experimental studies of fundamental properties of matter at the TeV energy scale. One of the important subjects of these studies are the self-interactions of the  $W^\pm$ ,  $Z^0$  and  $\gamma$  (photon) vector bosons that are carriers of the electroweak force in the Standard Model (SM) theory of the elementary particles. Measurements of the electroweak processes which are sensitive to these self-interactions, the triple and quartic gauge couplings between the vector bosons, are important tests of the electroweak sector of the SM and the Higgs mechanism of its spontaneous symmetry breaking. Possible new physics effects can modify the triple and quartic gauge couplings which are referred to as anomalous gauge couplings. That can lead to significant deviations of measured physics observables from their SM expectations in the affected process and hence, to a discovery of the new physics effect. Electroweak processes with vector boson scattering contributions are best suited to search for the anomalous quartic gauge couplings. Their measurements in the ATLAS experiment are reviewed. The main focus is made on the ongoing measurement of the electroweak production of the  $W^\pm\gamma$  final state. Precision of measurements of these and other rare physics processes are limited by the size of collected data. In order to collect larger data samples, the LHC will be upgraded to a higher luminosity during its long shutdown period from 2026 to 2028. The ATLAS detector and its electronic systems will be upgraded accordingly to handle the increased rates of incident particles. Upgrade work on the data readout electronic system of the Monitored Drift Tubes of the ATLAS Muon Spectrometer and the role of the ATLAS-Würzburg team in this activity are presented.

Für die Dozentinnen bzw. Dozenten der Fakultät

Prof. Dr. Assaad, Prof. Dr. Hinrichsen, Prof. Dr. Pflaum und Hr. Kuhr