DPG-Frühjahrstagung 2025 (Göttingen)

Report of Contributions

https://indico.desy.de/e/48220

Contribution ID: **52** Type: **Plenary Talk**

The solar magnetic field and variability

Monday 31 March 2025 11:30 (45 minutes)

The solar magnetic field influences many aspects of the Sun, including its activity and its brightness variability. Solar activity manifests itself in numerous ways, such as the presence of sunspots and faculae on the solar surface, of a hot corona, bright flares and mighty coronal mass ejections. The variations in solar brightness are important for the atmosphere of the Earth, which receives almost all of its energy from the Sun and which is consequently influenced by changes in this irradiation. In recent years there has been considerable progress in both the theoretical and observational study of solar magnetism and variability, not least thanks to work that has been done at the Max Planck Institute for Solar System Research. The talk will present some of the highlights of this research, including realistic radiation-MHD simulations of solar magnetic features in the solar atmosphere, observations of the solar magnetic field with novel instrumentation and from unusual vantage points, as well as studies of archives of historic and prehistoric solar variability.

Presenter: SOLANKI, Sami K. (Max Planck Institute for Solar System Research, Göttingen)

Session Classification: Plenary

Contribution ID: **53** Type: **Plenary Talk**

The Role of Applications in the History of Quantum Mechanics

Monday 31 March 2025 12:15 (45 minutes)

In my talk, I will challenge the conventional division between foundations and applications in physics and explore how physicists throughout the history of quantum mechanics have applied the theory and extended its scope beyond its original domains. Rather than merely solving specific problems, many applications of quantum mechanics to new domains (scattering, complex atoms, molecules, solids, nuclei) were drivers of conceptual innovation and played pivotal roles in shaping both the theory and its interpretation. I will illustrate this with a few examples from the early history of quantum mechanics. Without these applications, which are often dismissed as merely derivative extensions, the textbooks of quantum mechanics would look very different. There is untapped potential for physicists, historians, and philosophers to delve deeper into the applications of quantum mechanics. This perspective not only enriches historical studies and broadens the focus to include developments in fields that conventional wisdom considers less fundamental, but also provides tools for understanding contemporary developments in fields like quantum information and quantum computing, where practical applications carry considerable weight.

Presenter: JOAS, Christian (Niels Bohr Archive and Department of Science Education, University of Copenhagen)

Session Classification: Plenary

Contribution ID: **54** Type: **Symposium**

Fluid-dynamic description of heavy-quark diffusion in the quark-gluon plasma

Monday 31 March 2025 14:15 (30 minutes)

Relativistic heavy-ion collisions are a powerful tool to explore the phase diagram of Quantum Chromodynamics (QCD). Under the extreme energy conditions reached within these experiments, nuclear matter undergoes a transition to a deconfined phase, in which the active degrees of freedom are quarks and gluons, known as quark-gluon plasma (QGP). The characterization of the QGP and its transport properties constitutes one of the main goals of the high-energy nuclear physics program worldwide. Heavy quarks, i.e., charm and beauty, have long been established as excellent probes to characterize the QGP. Due to their large mass, heavy quarks can be produced only via hard partonic scattering processes that take place at the very beginning of the collision, before the QGP is formed. In this talk, I will present a new way of describing heavy-quark dynamics in the QGP based on fluid dynamics. On the one hand, our model allows us to phenomenologically access QCD properties such as the heavy-quark spatial diffusion coefficient. Secondly, it pursues the idea of a universal effective description unifying light and heavy degrees of freedom. It poses the fundamental question of whether the behavior of a complex system like the QGP, which spans over three orders of magnitude in mass scales (from MeV to GeV), can be described by a few macroscopic thermodynamic quantities defined in local kinetic equilibrium.

Presenter: CAPELLINO, Federica (GSI Helmholtzzentrum Darmstadt)

Session Classification: Plenary

Contribution ID: **55** Type: **Symposium**

Fast and faithful effective-one-body models for gravitational waves from generic compact binaries

Monday 31 March 2025 14:45 (30 minutes)

The detection and analysis of gravitational waves (GWs) from compact binary systems rely on precise modeling of the expected signals. However, accurately modeling GWs emitted by coalescing binary black hole (BBH) and binary neutron star (BNS) systems remains a formidable challenge due to the complexity of the underlying physical processes.

In this talk, I will summarize my efforts toward the development of computationally efficient and accurate models for GWs emitted by generic compact binary systems within the effective-one-body framework. The term "generic" here encompasses both the nature of the binary components – black holes, neutron stars, or mixed systems – and the diverse properties influencing their evolution, including eccentricity, spin effects, and matter interactions. I will then discuss their application to real GW data analysis.

Presenter: GAMBA, Rossella (UC Berkeley, Berkeley (CA), USA)

Session Classification: Plenary

Contribution ID: **56** Type: **Symposium**

Nuclear Structure Near Doubly Magic Nuclei

Monday 31 March 2025 15:15 (30 minutes)

In this contribution, we investigate the strong force in atomic nuclei, i.e. the way nucleons arrange themselves in a many-body system governed by the repulsive Coulomb interaction and the attractive strong interaction. We will focus on nuclear structure near nuclei with a "magic number"of Z protons and N neutrons, so-called doubly-magic nuclei, exhibiting a particularly stable configuration with respect to neighboring nuclei. Within the nuclear shell model, similar to the atomic shells, the magic numbers indicate shell closures accompanied by energy gaps. Nuclei at double-shell closures and their direct vicinity provide an important playground to benchmark nuclear theories and models that aim to predict the intricate interplay of the nucleons that lead to enhanced nuclear binding energies, significant changes in charge radii and transition strengths, etc. Of particular interest are nuclear isomers, long-lived excited states, in which the nucleon configuration is altered, resulting in a modification of their nuclear properties despite having the same number of protons and neutrons. In 99In, one proton away from the important doubly-magic nucleus 100Sn, we found the isomeric state exhibiting contrasting trends in binding energies and compared these with nuclear electromagnetic moments. In 79Zn, near the doubly-magic nucleus 78Ni, we discovered that the isomer shows signs of shape coexistence, which has strong implications on the magicity of 78Ni. In this presentation, we will revisit these two isomers and put them into a greater context in modern nuclear theory.

Presenter: NIES, Lukas (CERN)

Session Classification: Plenary

Contribution ID: **57** Type: **Symposium**

Optimisation strategies for proton acceleration from thin foils with petawatt ultrashort pulse lasers

Monday 31 March 2025 15:45 (30 minutes)

Laser-driven plasma accelerators can produce pulsed multi-MeV ion beams with high peak currents by irradiating solid materials with ultra-intense laser pulses. This innovative concept attracts much attention for various multidisciplinary applications as a compact and energy-efficient alternative to conventional accelerators. The maturation of plasma accelerators from complex physics experiments to turnkey particle sources for practical applications requires breakthroughs in the generated beam parameters, their robustness and scalability.

In this work, new benchmarks for accelerator performance and understanding of the underlying interaction physics were achieved through combining innovative laser diagnostics, advanced measurement techniques and hybrid simulation approaches. This enabled precise tuning of interaction conditions for optimized performance in established acceleration regimes and facilitated the exploration of relativistically transparent targets. The results from this advanced regime far exceeded previous records, demonstrating the immense potential of this technology. The strategies outlined provide a roadmap for advancing and integrating plasma accelerators into scientific, industrial, and medical fields.

Presenter: ZIEGLER, Tim (HZDR)

Session Classification: Plenary

Contribution ID: **58** Type: **Plenary Talk**

The Dawn of Multimessenger Astrophysics

Tuesday 1 April 2025 09:00 (45 minutes)

The recent discoveries of high-energy astrophysical neutrinos and gravitational waves have opened new windows of exploration to the Universe. Neutrinos can escape dense environments from where photons can not reach us and travel undeflected through the Universe. In combination with measurements of electromagnetic radiation, neutrinos can help to solve long-standing problems in astrophysics and probe physics in extreme environment that otherwise are hardly accessible to laboratory experiments. They are key to unraveling the origin of cosmic rays.

Recent multimessenger observations reveal TeV-PeV neutrino production in interactions of cosmic rays in our own galaxy and in distant galaxies when massive stars explode or the central supermassive black hole accretes large amounts of matter. This talk will summarize recent discoveries and give an outlook on new experiments and possible future breakthroughs.

Presenter: FRANCKOWIAK, Anna (Ruhr-Universität Bochum)

Session Classification: Plenary

Contribution ID: **59** Type: **Plenary Talk**

Equipping the Next Generation: Quantum Education and Workforce Development in the U.S.

Tuesday 1 April 2025 09:45 (45 minutes)

Quantum sensing, networking and communication, and computing have garnered significant attention due to their transformative potential and advantages over traditional technologies. The second quantum revolution has not only advanced technological frontiers, but also created a growing need for STEM graduates equipped with quantum-specific expertise. Preparing students to be successful in this rapidly evolving field requires empowering them with a range of technical and professional skills and knowledge.

I will present findings from extensive studies of both the landscape of quantum education in the U.S. and insights from the quantum industry. These findings include an overview of existing programs (e.g., certificates, minors, degrees) and courses across the U.S., as well as an analysis of key industry activities, job profiles, and the skillsets valued across roles. Additionally, I will highlight our local initiatives to bridge the gap between education and industry needs. These efforts include experimental training embedded in lab courses and a novel, two-semester, project-based course. In this course, student teams collaborate on industry-sponsored projects to develop practical skills in areas such as nanofabrication and servo electronics, alongside essential professional competencies like project management, communication, and budget planning.

Presenter: LEWANDOWSKI, Heather (JILA and Department of Physics, University of Colorado, Boulder, USA)

Session Classification: Plenary

Contribution ID: **60** Type: **Symposium**

Robert-Wichard-Pohl-Prize 2025: Zum Verhältnis von Physikdidaktik und Physikunterricht

Tuesday 1 April 2025 11:00 (30 minutes)

In der Begründung zur Verleihung des Robert-Wichard-Pohl-Preises wird u.a. die Unterrichtsnähe meiner bisherigen wissenschaftlichen Tätigkeit herausgehoben. Der Vortrag geht deshalb der Frage nach, in welchem Verhältnis die Physikdidaktik eigentlich zur Unterrichtspraxis steht und welche Randbedingungen dieses Verhältnis prägen. Aus der Analyse und Reflexion der Entwicklungen in der Physikdidaktik sollen mögliche Konsequenzen für zukünftige Entwicklungen abgeleitet werden.

Presenter: WODZINSKI, Rita (Universität Kassel)

Session Classification: Plenary

Contribution ID: **61** Type: **Symposium**

Georg-Kerschensteiner-Prize 2025: (Quanten-)Physik für alle mit dem PhotonLab

Tuesday 1 April 2025 11:30 (30 minutes)

Seit 2011 ist das Schülerlabor PhotonLab die Anlaufstelle für alle, die mehr über Laser, Licht und Quanten wissen möchten. Hier gibt es viele Versuche, die Schülerinnen und Schüler nach Anleitungen auf iPads selber durchführen können.

Oberstufenschüler können in die Welt der Quanten eintauchen und von unserem Einzelphotonenexperiment bis zum Workshop Vom "Qubit zum Quantencomputer" an Hand des Mach-Zehnder-Interferometers einiges über die Quantenphysik lernen.

Zur Vor- und Nachbereitung haben wir interaktive Bücher entwickelt, die auf kurzweilige Art mit Animationen, Videos und Quizzen die Grundlagen der einzelnen Experimente vermitteln.

Um auch kleineren Kindern diese faszinierende Welt näher zu bringen, haben wir das Hörspiel "Alice im Quantenland" entwickelt. Hier lernt Alice auf spielerische Art grundlegende Phänomene der Quantenphysik kennen. Das Hörspiel steht in den gängigen Podcast-Apps zur Verfügung.

Zusätzlich sind wir auch mit einzelnen Experimenten auf Messen, Tagen der offenen Tür, im Deutschen Museum etc. für die breite Öffentlichkeit präsent. www.photonworld.de

Presenter: STÄHLER-SCHÖPF, Silke (Max-Planck-Institut für Quantenoptik, Garching)

Session Classification: Plenary

Contribution ID: **62** Type: **Symposium**

Hertha-Sponer-Prize 2025: Searching for the fingerprints of new phenomena with top quarks

Tuesday 1 April 2025 12:00 (30 minutes)

New phemonena may be more difficult to spot at the LHC than commonly assumed. Unlike the Higgs boson discovered in 2012, which was identified as a clear, localised peak on top of a smooth background distribution, additional heavier Higgs bosons or axion-like particles could manifest themselves as much more complicated interference patterns if they decayed primarily to a top-antitop quark pair. While much more challenging to identify and treat statistically, these interference patterns, like fingerprints, would carry valuable information about the properties of the new particles.

In this talk, I will present a comprehensive search for interference patterns on the ATLAS Run-2 dataset. For the first time, a consistent and proper statistical treatment of signal-background interference is presented. The search provides stringent constraints on previously unexplored parameter spaces of models with an extended Higgs sector or dark matter.

Presenter: BEHR, Katharina (ATLAS (Fingerprint of the Vacuum))

Session Classification: Plenary

Contribution ID: **63** Type: **Invited Topical Talk**

An introduction to gas electron multipliers and their time to shine during the CMS phase 2 upgrade

Tuesday 1 April 2025 13:45 (30 minutes)

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 O(105).

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.

Presenter: ZALESKI, Shawn

Session Classification: Invited Topical Talks 1 / Eingeladene Vorträge 1

Contribution ID: **64** Type: **Invited Topical Talk**

Searches for rare Higgs boson decays

Tuesday 1 April 2025 14:15 (30 minutes)

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 $H \longrightarrow Z/\gamma^* + \gamma$ 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 $H \longrightarrow Z\gamma$ decay rate of $(2.2 \pm 0.7) \times$ the SM prediction.

Presenter: OJEDA, Martina Laura (CERN)

Session Classification: Invited Topical Talks 1 / Eingeladene Vorträge 1

Contribution ID: **65** Type: **Invited Topical Talk**

Novel opportunities with the LHCb Software Trigger

Tuesday 1 April 2025 14:45 (30 minutes)

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.

Presenter: MOMBÄCHER, Titus (IGFAE Universidade de Santiago de Compostela (ES))

Session Classification: Invited Topical Talks 1 / Eingeladene Vorträge 1

Contribution ID: **66** Type: **Invited Topical Talk**

Dark sector searches with invisible and displaced signatures at Belle II

Tuesday 1 April 2025 15:15 (30 minutes)

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 Y(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.

Presenter: DE PIETRO, Giacomo (Karlsruhe Institute of Technology)

Session Classification: Invited Topical Talks 1 / Eingeladene Vorträge 1

Contribution ID: **67** Type: **Invited Topical Talk**

The KM3NeT Ultra-High Energy Neutrino and its Possible Astrophysical Origins

Tuesday 1 April 2025 13:45 (30 minutes)

High-energy astrophysical neutrinos, first discovered by the IceCube Neutrino Observatory, are key messengers for the understanding of hadronic acceleration processes in the Universe, with the potential to unveil the sources of ultra-high energy cosmic rays. The KM3NeT Collaboration is building two neutrino detectors in the Mediterranean Sea by instrumenting large volumes of seawater with photomultiplier tubes, sensitive to the Cherenkov light induced by secondary particles produced in neutrino interactions. KM3NeT has recently reported the observation of an ultra-high energy neutrino in the tens of PeV range, possibly the most energetic neutrino observed to date. The particle's incoming direction points slightly below the horizon, where atmospheric backgrounds are negligible, indicating a most likely cosmic origin. This talk will report on the KM3NeT detection of this exceptional event and its implications for our knowledge of astrophysical neutrinos. The talk will explore the neutrino's potential origins, including the search and characterisation of candidate extragalactic astrophysical counterparts.

Presenter: LINCETTO, Massimiliano (Z_GA (Gammaastronomie))

Session Classification: Invited Topical Talks 2 / Eingeladene Vorträge 2

Contribution ID: **68** Type: **Invited Topical Talk**

Multimessenger astronomy with ultra-high-energy cosmic rays and high-energy neutrinos

Tuesday 1 April 2025 14:15 (30 minutes)

Multi-messenger astrophysics has advanced rapidly in the last decade, owing, primarily, to the newly discovered and growing body of observations of high-energy neutrinos and gravitational waves. Meanwhile, ultra-high energy cosmic ray experiments have made groundbreaking observations during this time, such as the discovery of dipole anisotropy in the UHECR arrival directions, which have revitalised the field of ultra-high energy cosmic ray astronomy. In this talk, I will review recent results in the search for the origin of high-energy neutrinos and ultra-high-energy cosmic rays. I will also summarise our current understanding of the role of active galactic nuclei, gamma-ray bursts, and tidal-disruption events as high-energy-cosmic-ray accelerators based on the latest multimessenger observations.

Presenter: OIKONOMOU, Foteini (NTNU)

Session Classification: Invited Topical Talks 2 / Eingeladene Vorträge 2

Contribution ID: **69** Type: **Invited Topical Talk**

Peering into the Cosmos from Deep Underground – Astroparticle Physics with Xenon Detectors

Tuesday 1 April 2025 14:45 (30 minutes)

What is the dark matter in the Universe? Astronomical observations at all scales provide indirect evidence of weakly interacting and non-baryonic particles with possible masses spanning many orders of magnitude. However, a direct detection in an experiment is still pending. Xenon time projection chambers located deep underground lead the worldwide searches for dark matter in the form of weakly interacting massive particles (WIMPs) with masses of few GeV to hundreds of TeV. WIMPs are well-motivated dark matter candidates, but the expected signals are feeble and interaction rates would be on the order of few events per tonne of xenon and year. Therefore, detectors such as XENONnT need multi-tonne targets, ultra-low backgrounds and energy thresholds of few keV. Incidentally, this makes them ideal observatories for many astroparticle physics signals beyond WIMPs: neutrinos from various sources, alternative dark matter candidates and rare nuclear decays. The talk will present recent results from XENONnT and provide an outlook on the future XLZD/DARWIN observatory as the Swiss army knife of low-energy astroparticle physics.

Presenter: WITTWEG, Christian (Universität Zürich)

Session Classification: Invited Topical Talks 2 / Eingeladene Vorträge 2

Contribution ID: **70** Type: **Invited Topical Talk**

Feebly Interacting Particles in the Early Universe

Tuesday 1 April 2025 15:15 (30 minutes)

Feebly interacting particles (FIPs) have gained attention as a compelling alternative to WIMP dark matter. In this talk, I will present recent advancements in the precise determination of FIP production rates from a thermal plasma, emphasizing the role of finite-temperature effects. I will also discuss how experimental searches, including long-lived particle and direct detection experiments, can probe FIPs and potentially reveal insights into early universe phenomena such as inflationary reheating.

Presenter: BECKER, Mathias (University of Padova)

Session Classification: Invited Topical Talks 2 / Eingeladene Vorträge 2

Contribution ID: **71** Type: **Plenary Talk**

Quantum field theory, quantum reference frames and the type of local algebras

Wednesday 2 April 2025 09:00 (45 minutes)

Algebraic quantum field theory (AQFT) assigns a von Neumann algebra to each bounded spacetime region, generated by the associated observables. Under reasonable assumptions, these algebras are all isomorphic to a specific von Neumann algebra of type III1 [1], leading to significant physical differences between quantum field theory and quantum mechanics. Recently, Chandrasekaran, Longo, Penington and Witten (CLPW) [2] have argued that the inclusion of gravity can require the introduction of an "observer", and that the physical observables constitute an algebra of type II. This talk will explain these developments and their significance, without assuming familiarity with von Neumann algebras or AQFT. I will focus on the CLPW model and an operationally motivated generalisation [3], which reinterprets the observer as a quantum reference frame (QRF), and sheds light on the roles of gravity and the QRF/observer.

[1] D. Buchholz, C. D'Antoni, and K. Fredenhagen, The Universal Structure of Local Algebras, Comm. Math. Phys. 111 (1987) 123-135.

[2] V. Chandrasekaran, R. Longo, G. Penington, and E. Witten, An algebra of observables for de Sitter space. JHEP 2023(2) 1-56.

[3] C.J. Fewster, D.W. Janssen, L.D. Loveridge, K. Rejzner and J. Waldron, Quantum Reference Frames, Measurement Schemes and the Type of Local Algebras in Quantum Field Theory, Comm. Math. Phys. 406 (2025) 19:1-87.

Presenter: FEWSTER, Christopher (University of York, UK)

Session Classification: Plenary

Contribution ID: **72** Type: **Plenary Talk**

Image-guided radiotherapy for cancer treatment: recent developments and future innovations

Wednesday 2 April 2025 09:45 (45 minutes)

Cancer treatment with radiation therapy has experienced significant innovations in the last two decades, leading to highly precise and personalized treatments today, allowing to deposit high energy doses in the tumor while sparing critical healthy tissue as much as possible.

Modern high-precision radiation treatments are delivered using image-guided radiotherapy systems. During this presentation, an overview of recently developed hybrid systems for online image-guided radiotherapy will be given, including CT-adaptive radiotherapy, magnetic resonance-guided radiotherapy and also image-guided particle therapy approaches. In addition to an introduction to the technical and physical realization of the hardware systems, potential and challenges related to radiation dose deposition in tissue, dosimetry and assessment of biological tissue properties will be highlighted. Moreover, current and future innovations aiming at real-time adaptation of radiotherapy treatment beams for moving targets will be discussed.

Presenter: THORWARTH, Daniela (Universität Tübingen)

Session Classification: Plenary

Contribution ID: **73** Type: **Invited Overview Talk**

Direct neutrino-mass measurements - current and next generations

Wednesday 2 April 2025 11:00 (30 minutes)

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.

Presenter: SCHLÖSSER, Magnus (KIT)

Session Classification: Invited Overview Talks / Hauptvorträge

Contribution ID: **74** Type: **Invited Overview Talk**

Mapping out the Higgs Boson: Highlights from the LHC Experiments

Wednesday 2 April 2025 11:30 (30 minutes)

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.

Presenter: SCHOPF, Elisabeth

Session Classification: Invited Overview Talks / Hauptvorträge

Contribution ID: **75** Type: **Invited Overview Talk**

Computing at the LHC and its transformation towards the HL-LHC

Wednesday 2 April 2025 12:00 (30 minutes)

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.

Presenter: WOZNIEWSKI, Sebastian

Session Classification: Invited Overview Talks / Hauptvorträge

Contribution ID: **76** Type: **Invited Overview Talk**

Advances in Silicon Detectors

Wednesday 2 April 2025 13:45 (30 minutes)

Silicon detectors play a crucial role in modern particle physics experiments, highly performing in demanding environments. Many planned experiments put ever higher requirements on these detectors in terms of radiation dose, hit, data and trigger rates, timing, radiation length and more.

In my presentation I will talk about recent advances in the design of silicon detectors and detail how these advances enable upcoming experiments to meet these requirements. I will cover developments for hybrid and monolithic silicon tracking detectors and silicon calorimeters. I will highlight novel features that have been successfully implemented already, as well as the path ahead towards the realisation of some of the most challenging experiments yet.

Presenter: HAMER, Matthias (Uni Bonn)

Session Classification: Invited Overview Talks / Hauptvorträge

Contribution ID: **77** Type: **Invited Overview Talk**

Exploring the dark universe: the experimental quest for axions and ALPs

Wednesday 2 April 2025 14:15 (30 minutes)

Axions and axion-like particles (ALPs) are hypothetical particles predicted in extensions of the Standard Model (SM) of particle physics. Originally proposed as a solution to the strong CP problem in strong interactions, axions have since gained prominence due to their potential role as dark matter candidates. ALPs, more broadly, arise in various beyond-the-SM theories, such as string theory. Both are characterized by extremely low masses and weak couplings to ordinary matter, making them elusive yet fundamental to understanding the universe's hidden structure.

Experimental searches for axions and ALPs span a diverse range of techniques. Haloscopes, helioscopes, and laboratory-based experiments use cutting-edge technologies to detect faint axion signals, while astrophysical and cosmological observations provide indirect constraints. These efforts leverage advances in resonant cavities, magnet technology, and high-intensity lasers to probe unexplored parameter space. The ongoing quest for axions and ALPs is not only a test of theoretical models but a potential gateway to groundbreaking discoveries in physics.

In this talk we will review the landscape of axion and ALP searches introducing the various types of experimental setups employed to look for these hypothetical particles. We will also discuss current results and outline future prospects.

Presenter: VOGEL, Julia Katharina (TU Dortmund)

Session Classification: Invited Overview Talks / Hauptvorträge

Contribution ID: **78** Type: **Invited Overview Talk**

Shifting paradigms in Gravitational-wave Astrophysics

Wednesday 2 April 2025 15:15 (30 minutes)

The decade since the first detection of gravitational waves brought about several transformational discoveries. The LIGO and Virgo observatories detected more and heavier black holes than anticipated; the first detection of a neutron star merger through gravitational waves and across the electromagnetic spectrum provided invaluable insights on the production of the heaviest elements in the universe; and a particularly heavy black hole was discovered that could have not come from stellar core collapse. With the exponentially increasing rate of discoveries over the next decade and a half, gravitational waves are all but guaranteed to further shift our astrophysical paradigms. The talk will primarily focus on one of these shifting paradigms: the merger of black holes that was historically considered to be "dark" events producing only gravitational waves, but new observations point towards a brighter, more impactful, multimessenger picture.

Presenter: BARTOS, Imre (University of Florida)

Session Classification: Invited Overview Talks / Hauptvorträge

Contribution ID: **79** Type: **Invited Overview Talk**

Overview on coherent elastic neutrino nucleus scattering and successful first detections

Wednesday 2 April 2025 14:45 (30 minutes)

Coherent elastic neutrino nucleus scattering (CEvNS) refers to the standard model process when the neutrino interacts with the nucleus as a whole. The cross section is enhanced by the neutron number squared of the target nucleus, which is ideal for a precision test of the standard model and to look for physics beyond the standard model. Neutrino energies below 50 MeV are required for a coherent interaction. The observable is the tiny recoil of the nucleus hit by the neutrino, which poses a huge challenge on the noise threshold of the detectors. A multitude of experiments with different technologies at different neutrino energies is desirable. The COHERENT collaboration was the first to observe CEvNS at the spallation neutron source at the Oak Ridge national laboratory, USA, with a CsI scintillating crystal in 2017. This was followed by two more successful observations, the most recent one in 2023 with high-purity germanium (HPGe) spectrometers. At lower neutrino energies, the CONUS collaboration also employs HPGe detectors at the Leibstadt power plant, Switzerland, to observe CEvNS for the first time at reactor site with the first data taking run concluded in 2024. The NUCLEUS experiment located at the Chooz reactor, France, and currently under commissioning aims at achieving the lowest energy threshold of these experiments with their cryogenic calorimeters. In my talk, I will present the current status of these experiments and achieved results followed by an outlook on the future.

Presenter: HAKENMUELLER, Janina Dorin (Duke University)

Session Classification: Invited Overview Talks / Hauptvorträge

Contribution ID: **80** Type: **Plenary Talk**

The ESA Euclid mission: a journey to understand the dark side of the universe

Thursday 3 April 2025 09:00 (45 minutes)

Euclid is a medium-class space mission led by ESA, with contributions from NASA, selected in October 2011 and successfully launched in July 2023. Its primary objective is to shed light on the nature of Dark Matter, which constitutes about 25% of the Universe's energy content, and Dark Energy, which makes up approximately 70% and is believed to drive the current accelerated expansion of the Universe.To achieve these goals, Euclid is creating the most comprehensive and precise 3D map of the Universe by surveying one-third of the sky. Understanding Dark Matter and Dark Energy requires performing a demanding statistical analysis to compare Euclid*s data to cosmological models using two complementary probes: weak gravitational lensing and galaxy clustering. In this talk, I will provide an update on the Euclid mission since its launch, discuss its key science objectives, oand explain how we construct theoretical predictions for its primary observables to achieve Euclid's ultimate goal: understand the dark Universe. I will also present the latest forecasts on cosmological parameters and extended models preparing ahead of the internal Euclid first cosmological data release.

Presenter: CAÑAS-HERRERA, Guadalupe (European Space Agency, Noordwijk, the Netherlands)

Session Classification: Plenary

Contribution ID: **81** Type: **Plenary Talk**

Negative hydrogen ion sources - utilizing low temperature plasmas in ITER's neutral beam systems

Thursday 3 April 2025 09:45 (45 minutes)

Large and powerful negative hydrogen ion sources (H-, D-) will be used at the international fusion experiment ITER to deliver after acceleration and neutralization energetic beams of neutral particles (H, D) to the tokamak. These beams will be used for heating and current drive, but also for plasma diagnostics. The inductively coupled plasma source (ICP) operates at low gas pressure (0.3 Pa) using a frequency of 1 MHz and a total power of 800 kW to illuminate an area of 1 x 2m. The ion source relies on surface conversion of hydrogen atoms and positive hydrogen ions into negative ions at a low work function converter surface, for which caesium is injected into the low temperature plasma. The latter introduces temporal and, together with the magnetic filter field, a spatial component into the otherwise stable plasma, which adds to the challenge of generating up to 60 A of homogeneously extracted negative ions for up to an hour. The diagnostics and modelling of the plasma and the extraction provide access to exciting aspects of plasma physics. The development of such negative ion sources follows the European step-ladder approach to meet the ITER target parameters. The development phases, the status and the challenges, as well as the way forward, are discussed.

Presenter: FANTZ, Ursel (Max-Planck-Institut für Plasmaphysik)

Session Classification: Plenary

Contribution ID: **82** Type: **Invited Overview Talk**

Neutrino properties from the laboratory and the cosmos

Thursday 3 April 2025 11:00 (30 minutes)

This talk reviews the present knowledge about neutrino properties, focusing on the determination of neutrino masses and PMNS mixing angles. I will review the implications of global data on neutrino oscillations and discuss the results of latest global fits, and I comment on expected near-term developements. For the determination of the absolute neutrino mass, complementary inforamtion is needed. In particular, recent results from cosmology lead to stringent upper limits on the sum of neutrino masses which start to be in slight tension with the lower bound implied by oscillation data. I will review the present status of this emerging tension and possible near future scenarios in light of upcoming data from DESI and EUKLID. A corroborated neutrino tension may be a sign of new physics in the cosmological model and/or in neutrino physics.

Presenter: SCHWETZ-MANGOLD, Thomas (KIT)

Session Classification: Invited Overview Talks / Hauptvorträge

Contribution ID: **83** Type: **Invited Overview Talk**

Highlights from Standard Model physics at the LHC in the precision era

Thursday 3 April 2025 11:30 (30 minutes)

With the first two runs of the Large Hadron Collider (LHC) successfully completed, and Run 3 currently underway at an unprecedented center-of-mass energy of 13.6 TeV, the experiments at the LHC continue to collect a wealth of data for physics analysis. Following the discovery of the final component of the Standard Model (SM)—the Higgs boson—in 2012, the LHC physics program has entered an era of precision, aiming to measure the fundamental parameters of the SM and the properties of its constituent particles to the most precise extent possible. The quest for precision is complemented by a vast array of searches for phenomena beyond the SM (BSM), which directly benefit from the improved knowledge of the SM. In this contribution, I will present a selection of recent results from the ATLAS and CMS collaborations, focusing on SM electroweak and QCD physics, and touching upon searches for BSM phenomena.

Presenter: SAVOIU, Daniel (UNI/EXP (Uni Hamburg, Institut fur Experimentalphysik))

Session Classification: Invited Overview Talks / Hauptvorträge

Contribution ID: **84** Type: **Invited Overview Talk**

Cosmological results from the Dark Energy Spectroscopic Instrument

Thursday 3 April 2025 12:00 (30 minutes)

The Dark Energy Spectroscopic Instrument (DESI) is conducting by far the most comprehensive survey of galaxy distances to date. Its primary goal is a precision measurement of the expansion of the Universe over the past 10 billion years. This expansion may reveal more about the nature of one of the biggest mysteries of modern physics, the late-time accelerating effect called Dark Energy.

I will review the results of Baryonic Acoustic Oscillation measurements, which provide a 'standard ruler' of fixed physical scale that can be observed to track expansion from the embryonic to the adult universe. The first year of DESI data, together with cosmic microwave background and supernova observations, has provided tantalising evidence that Dark Energy indeed is not a constant vacuum energy density. The analysis of three years of DESI galaxy observations, potentially concluded by Göttingen25, will again sharpen what we know about the recent past and the future of our cosmos.

Presenter: GRUEN, Daniel (Ludwig-Maximilians-Universität München)

Session Classification: Invited Overview Talks / Hauptvorträge

Contribution ID: **85** Type: **Invited Topical Talk**

Performance of the ATLAS New Small Wheels

Thursday 3 April 2025 13:45 (30 minutes)

As the Large Hadron Collider (LHC) transitions into the High-Luminosity era (after 2029), all experiments are undergoing significant upgrades to cope with the more intense collision environment and to select the most interesting – and often rarest – events. For the ATLAS experiment, these upgrades are carried out in multiple steps. The first upgrade (Phase 1) was completed in 2022, while the second phase (Phase 2) is currently being prepared for 2026.

A major upgrade during Phase 1 was the replacement of the inner forward muon spectrometer (Small Wheels) with the New Small Wheels (NSWs) to handle the increased particle fluxes with excellent spatial and temporal resolution, effectively reducing fake triggers and pile-up. The NSWs consist of two gaseous detector technologies: small-strip Thin-Gap Chambers (sTGCs) and Micro-Mesh Gaseous Structure (Micromegas) detectors.

This talk will highlight the performance of these new detector technologies in the ATLAS muon spectrometer and assess their success in reducing pile-up while maintaining excellent spatial and temporal resolution with high efficiency and longevity during HL-LHC operation.

Further, studies on Micromegas position reconstruction will be presented, focusing on algorithms optimized for inclined particle trajectories.

Keywords: ATLAS; NSW; Micromegas; sTGC; Muon spectrometer

Presenters: VOGEL, Fabian (Ludwig Maximilians Universitat (DE)); VOGEL, Fabian (LMU München)

Session Classification: Invited Topical Talks 1 / Eingeladene Vorträge 1

Contribution ID: **86** Type: **Invited Topical Talk**

Top quark and friends

Thursday 3 April 2025 14:15 (30 minutes)

With the conclusion of Run 2 at the LHC, and a successful ongoing Run 3, the amount of data collected at the CMS experiment allows for precision measurements of rare top quark-associated processes and measurements of interesting top quark properties which have previously not been accessible.

In this talk I will highlight some of the recent CMS measurements in top quark physics, including (but not limited to) top quark-antiquark pair production in association with bosons or jets. I will discuss the improvements that have been made in recent years and what still remains unanswered.

Presenters: VAN DER LINDEN, Jan (KIT); VAN DER LINDEN, Jan (UGent)

Session Classification: Invited Topical Talks 1 / Eingeladene Vorträge 1

Contribution ID: **87** Type: **Invited Topical Talk**

Searching for New Physics in Soft Unclustered Energy Patterns

Thursday 3 April 2025 14:45 (30 minutes)

Most collider-based searches for new physics focus on final states with a small number of high-momentum particles. In contrast, a Soft Unclustered Energy Pattern (SUEP) represents a distinct signature characterized by a high multiplicity of spherically distributed, low-momentum particles. Such a signature can arise from strongly coupled, quasi-conformal Hidden Valley models.

Although it may seem very exotic, such an extension of the Standard Model is well-motivated, as quantum chromodynamics exhibits similar behavior in its non-perturbative regime. However, identifying SUEPs at the LHC poses unique challenges, as their diffuse, low-momentum nature closely resembles the ubiquitous background from pile-up interactions. Furthermore, detecting them often requires pushing detector performance beyond its original design specifications.

Despite these challenges, the signature offers promising opportunities to explore new physics in uncharted regions of the kinematic phase space. This presentation reviews existing experimental searches for SUEPs and explores potential new strategies.

Presenter: LORY, Alexander (LMU Munich)

Session Classification: Invited Topical Talks 1 / Eingeladene Vorträge 1

Contribution ID: **88** Type: **Invited Topical Talk**

Alignment and calibration at the LHCb experiment

Thursday 3 April 2025 15:15 (30 minutes)

The LHCb software trigger allows splitting the triggering of events in two stages, allowing to perform the detector alignment and calibration in real time. The real-time alignment and calibration procedure is a fully automatic procedure at LHCb that is executed at the beginning of each fill of the LHC. The alignment estimates the position of detector elements and is essential to achieve the best data quality. The procedure is implemented for the full tracking system at LHCb with the event reconstruction run as a multithreaded process ensuring consistency between triggered and offline selected events. The operational and technical aspects of this procedure during data-taking is discussed with the focus on the performance in the 2024 data-taking period where the first global tracker alignment was obtained.

Presenter: MITRESKA, Biljana (University of Manchester (GB))

Session Classification: Invited Topical Talks 1 / Eingeladene Vorträge 1

Contribution ID: **89** Type: **Invited Topical Talk**

Searching for Axions and other Light Bosons at DESY

Thursday 3 April 2025 13:45 (30 minutes)

Light bosons, including the axion and axion-like particles (ALPs) inspired by string theory, are compelling candidates for new physics. These particles are of interest not only for their potential to address the strong CP problem but also as promising dark matter candidates and mediators of novel interactions. Experimental searches for light bosons span three main approaches: haloscopes probe signals from the galactic dark matter halo; helioscopes explore particles produced in the sun; and laboratory-based experiments aim to produce and detect these particles in controlled settings.

DESY is uniquely positioned to potentially host cutting-edge experiments in all three categories, including the haloscope MADMAX, the helioscope IAXO, and the light-shining-through-wall experiment ALPSII. In this talk, I will provide an update on DESY's efforts to search for axion-like particles, highlighting the results of the initial data-taking campaigns for MADMAX and ALPSII.

Presenter: EGGE, Jacob Mathias (ALPS (ALPS _ Any Light Particle Search))

Session Classification: Invited Topical Talks 2 / Eingeladene Vorträge 2

Contribution ID: **90** Type: **Invited Topical Talk**

14 years of coordinated outreach for particle physics: methods, impact and prospects

Thursday 3 April 2025 14:15 (30 minutes)

The outreach program "Netzwerk Teilchenwelt" was created in 2010 as a means of opening the LHC and its data for public engagement with science, ranging from analysis of original data to research participation in high school theses. Now, 14 years later, the network has expanded to more than 30 institutions with more than 200 scientists participating and includes now also hadron, nuclear and astroparticle physics.

The impact of a coordinated, large scale outreach program is profound: by focusing mostly on high school students and teachers, "Netzwerk Teilchenwelt" has managed to bridge the gap between scientists and schools. A three step program for students provides guidance and fosters interest, while the consecutive "Fellows" program allows for direct connection between researchers and university students. Alongside these programmes, a multitude of events for the general public help push particle physics into view.

The efforts of the community have shown to have long-term effects. This talk provides insights into the methods and the achievements of "Netzwerk Teilchenwelt" as a coordinated outreach program and its future prospects.

Presenter: PLURA, Saskia (Johannes Gutenberg Universität Mainz)

Session Classification: Invited Topical Talks 2 / Eingeladene Vorträge 2

Contribution ID: **91** Type: **Invited Topical Talk**

The Emerging Population of Seyfert Galaxies as Neutrino Sources in IceCube

Thursday 3 April 2025 14:45 (30 minutes)

The IceCube detection of neutrinos from the X-ray-bright Seyfert galaxy NGC 1068, combined with the lack of a gamma-ray counterpart, suggests that gamma-ray hidden cores of Active Galactic Nuclei (AGN) could be powerful cosmic-ray accelerators. The X-ray-bright corona, near the AGN supermassive black hole, provides a suitable environment for neutrino production and gamma-ray absorption at the same time. This talk will review recent IceCube results from searches for extragalactic neutrino sources, adding to the growing evidence that X-ray-bright, non-blazar AGN could be the first emerging population of neutrino sources.

Presenter: BELLENGHI, Chiara (TUM)

Session Classification: Invited Topical Talks 2 / Eingeladene Vorträge 2

Contribution ID: **92** Type: **Invited Topical Talk**

First detection of neutrinos in water-based liquid scintillator at ANNIE

Thursday 3 April 2025 15:15 (30 minutes)

Water-based liquid scintillator (WbLS) is a novel detector medium that allows for the separation of the scintillation and Cherenkov components of a signal. As such, it is of great interest for the development of future hybrid neutrino detectors, allowing for a low energy-threshold, directional event reconstruction, reconstruction of hadronic recoils, and enhanced particle identification.

The Accelerator Neutrino Neutron Interaction Experiment (ANNIE) is a 26-ton gadolinium-loaded water Cherenkov neutrino detector installed on the Booster Neutrino Beam (BNB) at Fermilab. As its main physics goals the experiment aims to investigate neutrino-nucleus interactions and cross sections. Additionally, ANNIE has an equally important focus on the research and development of new detector technologies, such as WbLS and Large Area Picosecond Photodetectors (LAPPDs).

This talk presents the deployment of a 70cm x 90cm WbLS vessel in ANNIE and the subsequent first detection of neutrinos in WbLS. The successful observation of both scintillation and Cherenkov light in ANNIE corresponds to a proof-of-concept for the hybrid event detection. This allows for the development of reconstruction and particle identification algorithms, as well as dedicated analyses in ANNIE, that make use of both the Cherenkov and scintillation component.

This work is supported by the DFG (490717455).

Presenter: MARTYN, Johann (Johannes Gutenberg - University Mainz)

Session Classification: Invited Topical Talks 2 / Eingeladene Vorträge 2

Contribution ID: **93** Type: **Invited Overview Talk**

Galactic Astrophysics with H.E.S.S.

Friday 4 April 2025 11:00 (30 minutes)

The High Energy Stereoscopic System (H.E.S.S.) is an array of imaging atmospheric Cherenkov telescopes that has been used to observe the sky in TeV γ rays since 2004. Thanks to its unique location in the Southern Hemisphere and several upgrades to the system, the experiment continues to enable cutting-edge astrophysics despite its age. In this contribution, I will review the latest H.E.S.S. results on Galactic γ-ray sources, including pulsar wind nebulae, young massive star clusters, microquasars, and the Galactic Centre region.

Presenter: MOHRMANN, Lars (MPIK)

Session Classification: Invited Overview Talks / Hauptvorträge

Contribution ID: **94** Type: **Invited Overview Talk**

Physics in the era of big data: AI in particle and astroparticle physics

Friday 4 April 2025 11:30 (30 minutes)

Physics and artificial intelligence (AI) are interconnected. The recent Nobel Prize for Physics has once again revealed this productive connection. While physics concepts laid the foundation for today's neural networks, these algorithms, in turn, enable efficient physics analyses with exceptional precision. This emerging technology opens new perspectives for the data-intensive research field of particle and astroparticle physics. In this talk, I will give an overview of the versatile applications of AI in particle and astroparticle physics, review the breakthroughs that this new technology made possible, and discuss future directions and challenges.

Presenter: GLOMBITZA, Jonas (Erlangen Centre for Astroparticle Physics, FAU)

Session Classification: Invited Overview Talks / Hauptvorträge

Contribution ID: **95** Type: **Invited Overview Talk**

What the LHC tells us about the top quark, the heaviest particle in nature

Friday 4 April 2025 12:00 (30 minutes)

The unprecedented data collected during proton-proton collisions at 13 and 13.6 TeV by the CERN LHC have significantly advanced our understanding of the top quark, the heaviest known elementary particle. This talk will highlight recent results on top quarks from the ATLAS and CMS collaborations, including precise determinations of key properties such as its mass and the production rates of rare processes, including four-top quark production. Additionally, the top quark's unique role in the Standard Model, particularly its large Yukawa coupling, close to unity, establishes a strong connection with the Higgs boson and makes it therefore a compelling focus for exploring potential new particles. Investigating top quark interactions at the highest energy scales underscores the potential of the LHC experiments to uncover fundamental new aspects of our universe.

Presenter: KOMM, Matthias (CMS (CMS Fachgruppe Searches))

Session Classification: Invited Overview Talks / Hauptvorträge

Contribution ID: **96** Type: **Invited Overview Talk**

The flavor intensity frontier: latest results from Belle II and LHCb

Friday 4 April 2025 12:30 (30 minutes)

The study of the different flavors of quarks and leptons may answer some of the most interesting questions of particle physics, including explaining why the visible universe is built only of matter, not antimatter, and discovering new particles and forces not yet known to us. The Belle II and LHCb experiments, located at KEK in Tsukuba, Japan and at CERN in Geneva, Switzerland, precisely measure flavor phenomena using their uniquely large data sets. I will present an accessible overview of both experiments, their measurement techniques, and some of their recent results.

Presenter: GREENWALD, Daniel (TU München)

Session Classification: Invited Overview Talks / Hauptvorträge

Contribution ID: **97** Type: **not specified**

Report from Division Particle Physics of DPG

Thursday 3 April 2025 19:00 (20 minutes)

Presenter: HALLER, Johannes (Institut für Experimentalphysik, Universität Hamburg)

Session Classification: Members' Assembly of Division Particle Physics of DPG

Contribution ID: **98** Type: **not specified**

Report from KET

Thursday 3 April 2025 19:40 (20 minutes)

Presenter: Prof. FELD, Lutz (RWTH Aachen)

Session Classification: Members' Assembly of Division Particle Physics of DPG

Contribution ID: **99** Type: **not specified**

Report from KAT

Thursday 3 April 2025 20:00 (20 minutes)

Presenter: KATZ, Ulrich (Friedrich-Alexander-Universität Erlangen-Nürnberg)

Session Classification: Members' Assembly of Division Particle Physics of DPG

Contribution ID: **100** Type: **not specified**

Election of Division Chair and Deputy for 2025-2027

Thursday 3 April 2025 19:20 (20 minutes)

Presenters: HAUNGS, Andreas (Karlsruhe Institute of Technology - KIT); Prof. FELD, Lutz (RWTH Aachen)

Session Classification: Members' Assembly of Division Particle Physics of DPG

Contribution ID: **101** Type: **not specified**

AOB

Thursday 3 April 2025 20:20 (20 minutes)

Session Classification: Members' Assembly of Division Particle Physics of DPG

Contribution ID: **102** Type: **not specified**

Von Quanten und Kollisionen –Göttingen trifft Genf"

Thursday 3 April 2025 19:30 (1 hour)

Der Vortrag nimmt die Zuhörer mit auf eine faszinierende Reise durch die Geschichte und Gegenwart der Quantenphysik. Beginnend mit den revolutionären Entdeckungen des frühen 20. Jahrhunderts, als Physiker in Göttingen die Grundsteine der Quantenmechanik legten, beleuchtet der Vortrag Schlüsselkonzepte wie den Welle-Teilchen-Dualismus und die Quantenverschränkung. Göttingen, einst Epizentrum dieser wissenschaftlichen Revolution, wurde in den 1920er Jahren zum Ausgangspunkt für eine Entwicklung, die bis in die moderne Teilchenphysik reicht. Der Bogen spannt sich von den Arbeiten von Born und Planck, getrieben von dem Bedürfnis zu verstehen, "Was die Welt im Innersten zusammenhält", bis hin zu den monumentalen Experimenten am CERN in Genf. Dort, am ATLAS-Experiment des Large Hadron Collider (LHC), prallen Teilchen mit ungeheurer Energie aufeinander, um Antworten auf die grundlegensten Fragen des Universums zu finden. Wie die Erkenntnisse der Quantenmechanik bis heute die Suche nach neuen Teilchen und Kräften im Universum prägen, wird anschaulich erklärt und in den Kontext aktueller Forschung gestellt. Freuen Sie sich auf eine spannende Mischung aus historischer Wissenschaftsgeschichte, physikalischen Einsichten und modernen Entdeckungen –von Göttingens Quantenpionieren bis zu den Teilchenkollisionen der Gegenwart.

Presenter: KORN, Steffen (II Physikalisches Institut, Georg-August-Universität Göttingen)

Session Classification: Public Evening Talk