T 21: Invited Topical Talks II

Time: Tuesday 13:45–15:45 Location: ZHG010

Invited Topical Talk T 21.1 Tue 13:45 ZHG010

The KM3NeT Ultra-High Energy Neutrino and its Possible Astrophysical Origins — •Massimiliano Lincetto — Lehrstuhl für Astronomie, Julius-Maximilians-Universität Würzburg, Würzburg, Germany — Deutsches Elektronen-Synchrotron (DESY), Zeuthen, Germany

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.

Invited Topical Talk T 21.2 Tue 14:15 ZHG010

Multimessenger astronomy with ultra-high-energy cosmic rays and high-energy neutrinos — •Foteini Oikonomou — Norwegian University of Science and Technology

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.

Invited Topical Talk T 21.3 Tue 14:45 ZHG010

Peering into the Cosmos from Deep Underground – Astroparticle Physics with Xenon Detectors — •Christian Wittweg for the XENON-Collaboration — Physik-Institut, University of Zürich, 8057 Zürich, Switzerland

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.

Invited Topical Talk T 21.4 Tue 15:15 ZHG010

Feebly Interacting Particles in the Early Universe — •Mathias Becker — University of Padova

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.