EP 8: Astroparticles: Invited talks (joint session T/EP)

Time: Thursday 11:00–12:30 Location: T-H15

Invited Talk EP 8.1 Thu 11:00 T-H15

Borexino looks in the direction of solar neutrinos — •Livia Ludhova for the Borexino-Collaboration — Forschungszentrum Jülich, Jülich, Germany — RWTH Aachen University, Aachen, Germany

Borexino is a 280-ton liquid scintillator detector located at the LNGS in Italy. Characterized by an unprecedented radio-purity, it has succeeded in providing several milestone measurements of MeV-scale neutrinos, with the main focus on solar neutrinos. The latter are the only direct probe of the Hydrogen-to-Helium fusion powering our Sun. The European Physical Society awarded the 2021 Giuseppe and Vanna Cocconi Prize to the Borexino Collaboration for the ground-breaking observation of solar neutrinos from the pp chain and CNO cycle that provided unique and comprehensive tests of the Sun as a nuclear fusion engine. Borexino has developed a new method, Correlated and Integrated Directionality (CID), to exploit the sub-dominant directional Cherenkov light in a liquid scintillator detector. This technique can disentangle the solar neutrino signal, correlated with the known position of the Sun, from the isotropic background. In the region of interest dominated by the signal from 0.862 MeV Be-7 solar neutrinos, the no-solar neutrino hypothesis has been excluded with $>5\sigma$ C.L. This novel method is readily applicable to next generation experiments. The talk will focus on the recent Borexino solar neutrino results, including the motivation, analysis details, as well as their interpretation.

Invited Talk EP 8.2 Thu 11:30 T-H15

Gravitational waves - a new probe of the early Universe — •Valerie Domcke — CERN, Geneva, Switzerland

Due to their extremely weak interactions with the matter content of the Universe, gravitational waves generated right after the Big Bang can traverse the Universe basically unperturbed, carrying information about their production processes and the expansion history of our Universe. This makes them a unique probe of BSM physcis at very high energies. I will talk about possible next steps in this field, including the search for the stochastic gravitational wave background and new ideas for searching for gravitational waves at ultra-high frequencies.

Invited Talk EP 8.3 Thu 12:00 T-H15

Gravitational wave detectors - current and future challenges — •Michèle Heurs — Leibniz Universität Hannover

Since the first direct detection in 2015, gravitational wave signals have been enriching the field of multi-messenger astronomy with insights into formerly "invisible" regimes of the universe. Despite their mind-boggling sensitivities, the current (second) generation of ground-based gravitational wave detectors are limited by various noise sources in their detection band, in particular quantum noise, thermal noise, and seismic noise. Next-generation detectors (e.g. Einstein Telescope, Cosmic Explorer) aim for sensitivities one or two orders of magnitude better even, making innovative techniques for noise reduction or mitigation a requirement. This talk will present challenges and technical developments on the road to ever-higher gravitational wave event detection rates.