

Faces & Places

ASTROPARTICLE PHYSICS

CERN hosts Patras Workshop on Axions, WIMPs and WISPs



The Patras Workshop returned to CERN in July for its 10th anniversary, having begun there in 2005. The initial aim was to provide academic training to the new generations of scientists working within the EU's Integrated Large Infrastructure for Astroparticle Science network, which covered the already mature field of astroparticle physics (*CERN Courier* July/August 2006 p19). Following increasing worldwide interest in the workshop, the organizers widened its agenda, inspired by the possibilities that are opening up in ongoing searches for exotica such as axions, WIMPs, etc. Results from direct and indirect searches for axion-like particles (ALPs), also dubbed weakly interacting slim (light) particles (WISPs), and new, more sensitive searches for electric-dipole moments, were also covered in the latest workshop. Participants from more than 40 institutions around the world had the opportunity to present their latest results and discuss detector-upgrade plans and exciting new ideas for future research. As a result of the high number of participants, the programme also included a poster session for the first time.

Speakers covered diverse new approaches in dark-matter, dark-energy and neutrino physics, including astrophysical observations, as well as novel ideas for detection using state-of-the-art instrumentation. In his opening address, CERN's director-general, Rolf Heuer, emphasized that following the discovery of a Higgs boson, there remain big questions related to the hidden side of the universe. The talks that followed demonstrated the breadth in experimental searches for constituents of dark matter and dark energy, from direct searches for WIMPs in underground experiments with the lowest noise, axion or WISP searches with cavity and "light-shining-through-a-wall" experiments, and not-so-indirect searches in specific solar or cosmic observations with orbiting equipment, to searches at the

LHC. Hidden photons and gauge bosons of various kinds are also being searched for with accelerators and solar observations. Theories span an even greater breadth, as manifest in the mass range of the expected exotica.

The Patras programme traditionally features results, theoretical ideas and exciting projects beyond the main focus of the meeting. This time, participants heard about the latest results from space X-ray missions, the Indian SOXs and the Chinese Chang 'E1. Data from both missions are being re-analysed to search for overlooked signatures of dark-matter or dark-energy constituents in their solar X-ray observations.

Upgrade plans were also presented at the workshop. The performance of experimental techniques – either in use or suggested – to unravel the nature of the enigmatic dark sector is advancing impressively, with a remarkable overlap between LHC physics and astroparticle physics. The state-of-the-art equipment used faces two extreme situations: the LHC experiments have to deal with unprecedented high background rates, while the dark-matter/dark-energy searches with the lowest signal levels require ever increasing background screening. Here, equipment developed for high-energy physics and other disciplines finds an increasing number of applications in astroparticle physics. Micromegas detectors, powerful magnets and high-sensitivity antennae in the sub-electron-volt range, for example, are typical of the interdisciplinary character of many experiments that are being upgraded or are in the conceptual-design phase.

In the spirit of the workshop series, discussions were lively and the atmosphere friendly, although occasionally not without scientific controversy. A number of new ideas were presented, mostly highly interdisciplinary in character, profiting from the strong synergies developed between theory and experiment. By bringing together experts working on so many diverse topics, the workshop continues to contribute to the ongoing scientific revolution in astroparticle physics to uncover the unknown universe.

● For more information, visit <http://axion-wimp2014.desy.de/>.