Highlights

Starting in the neutrino sector, we had a share in the 2017 "Breakthrough in Science" prize for the first multi-messenger observation of a neutron star merger. This consolidated the Nobel prize given to LIGO in 2017 for the first observation of gravitational waves. No neutrinos from this merger event were actually seen by IceCube, but we did look for them and improved the strategies for searching for point sources of astrophysical neutrinos, thus raising the chances of yet another discovery around the corner. The Discovery IceCube group also made further progress in the search for the appearance of tau neutrinos that were originally created as muon neutrinos in the atmosphere and in the search for neutrinos from the galactic center.

The elusive neutrino may indeed hold the answers to some of the deepest questions we can ask about the Universe. Thus, the phenomenology group discovered a possible deep connection between the model widely believed to be responsible for neutrino mass generation and the emergence of the Higgs potential. Also the possibility of an astrophysical abundance of a sterile right-handed neutrino was investigated and was found to be consistent with, at least not excluded by, present observations.

In 2017 the LHC machine again delivered an impressive luminosity at 13 TeV. The ATLAS run II data set now integrates to 80 fb^{-1} and the analysis of this data set is progressing well. Among the milestone papers published in 2017 were a new measurement of the W mass (the first from the LHC), the top quark (mass and cross-section) and various Higgs production and decay channels. The observed Higgs production rate divided by the expectation is now 0.99+-0.15 which constitutes an important test of the standard model. Also many searches were published, among those a Discovery led search for di-boson resonances where one boson decays into leptons and the other one into quarks. No departures from the standard model were seen.

In the Discovery ALICE group, "small systems", pp and pA collisions, attracts a lot of attention since these systems exhibit some of the same features, which in high-energy head-on nucleus-nucleus collisions are interpreted in terms of a quark-gluon plasma. This is totally unexpected and possible explanations are currently being pursued in collaboration with theorists from the Lund phenomenology group. We furthermore published the charged particle distributions from 13 TeV Pb+Pb collisions and took a first look at Xe+Xe collisions.

In the opposite end of the energy spectrum, the CMB group has made a reanalysis of the galactic dust emission, an important foreground to the coveted CMB B-mode polarization signal. New data from the Discovery led, Greenland based, experiment, GreenPol, will shed further light on the unresolved features in foreground emissions, due to the large number of frequency bands that will be measured.

These achievements have been supported by several new successful grants in 2017: Villum Young Investigator and ERC Starting Grant (Bourjaily), Villum Starting Grant (Ruchayskiy), Marie Curie Fellowship (von Hippel) a VR fellowship (Bierlich) and a Carlberg fellowhip (Zhou). In the LHC experiments, three Discovery members were elected to central management posts: Kris Guldbrandsen (ALICE Run Coordinator), Stefania Xella (ATLAS Trigger Coordinator), Peter Hansen (ATLAS TRT Project Leader). In addition Mogens Dam was appointed Convenor of the Detector Design Group for the CERN Future Circular Collider Study. Jens Jørgen Gaardhøje was reelected vice-president of CERN Finally, Jürgen Schukraft, member of the external advisory board for the Discovery center, was awarded the Niels Bohr medal of honor.