Plenarvortrag PV I Mo 11:45 S1/01 A1

Neutrinos - a window to new physics — •Christian Weinheimer — University of Münster, Institut für Kernphysik, Germany

With the discovery of neutrino oscillations (Nobel Prize in Physics 2015) with atmospheric and solar neutrinos as well as its confirmation by reactor and accelerator neutrinos, it became evident that neutrinos feature very interesting properties, like neutrino mixing or non-zero masses. The origin of the neutrino masses probably lies beyond the usual Yukawa-coupling to the Higgs boson and might be connected to physics beyond the Standard Model at much higher scales. In such models neutrinos are their own antiparticles giving rise to neutrinoless double beta decays. The neutrino mixing angles, the possible leptonic CP violating phase as well as the sizes and the hierarchy of neutrino masses have very important consequences. In addition to the 3 known neutrinos even additional sterile neutrinos might exist.

Neutrino masses and mixing are equally important for astrophysics and cosmology: The sizes of the neutrinos masses define their role in the evolution of the universe or neutrino oscillations help cooling in supernova explosions. Finally neutrinos are very interesting messengers to understand astrophysical processes from nuclear fusion in our sun up to ultrahigh energetic processes in the universe.

After a brief recap of the discovery of neutrino oscillations an overview on these questions will be given concentrating on topics related to nuclear and hadron physics like the search for neutrinoless double beta decay, neutrino oscillation experiments with solar and reactor neutrinos as well as the direct search for the neutrino mass scale.