Einladung zum

Physikalischen Kolloquium

Wintersemester 2022/2023

Physikzentrum der Technischen Universität Braunschweig

Dr. Dmitry Karlovets

(Max-Planck Institute for Nuclear Physics, Heidelberg)

will give a talk on

January 24th, 16:45, MS 3.1

Vortex particles with orbital angular momentum in labs and Nature

Light can propagate in the form of plane, spherical or cylindrical waves. After the quantization, cylindrical waves consist of the so-called twisted photons, which – unlike the plane waves – have an orbital angular momentum in addition to the polarization. Such twisted light can naturally be generated, for instance, in neutron stars, as well as in the labs from the radio- to the gamma range for optical manipulations, material studies, biology, atomic and nuclear physics, etc. The charged particles -- such as electrons, protons, and even ions and nuclei – can also carry orbital angular momentum representing cylindrical de Broglie waves. These massive vortex beams are close siblings of the Landau states in magnetic fields and of the classical rotating beams in particle accelerators. They have already been generated for electrons at electron microscopes, for neutrons at nuclear reactors, and even for atoms and molecules. In this Colloquium, I will give a general overview of the vortex beams, of their peculiar properties and the generation techniques, and discuss their potential applications in surface and material studies, astrophysics, atomics physics, accelerator physics, high-energy and nuclear physics.