TECHNISCHE UNIVERSITÄT DRESDEN

School of Science Faculty of Physics

PHYSICS COLLOQUIUM

Speaker: **Dr. Naser Ahmadiniaz**
Institute for Theoretical Physics, Helmholtz-Zentrum Dresden-Rossendorf (HZDR)

Topic: **Strong-field Quantum-Electrodynamics: from amplitudes to physical effects**
Introduction for habilitation

Time and place: Tuesday, July 4, 2023, **2:50 pm** – hybrid event
The colloquium will be held in REC/C213.
Online participation possible:
Zoom-Meeting: Meeting-ID: 631 3817 8900 / passcode: PK-SoSe23
https://tu-dresden.zoom.us/j/63138178900?pwd=RVVZM3N4azdmNmVJQ2RWUTZ0TkhXdz09

Host: Prof. Ralf Schützhold

Abstract: The presentation will begin with a concise introduction to Quantum Electrodynamics (QED) in the presence of external background fields, offering insights into the fundamental interactions between matter and electromagnetic fields. Following this, we will delve into the significance of light-by-light scattering in QED, examining ist amplitude (also known as the four-photon amplitude) with general kinematics. We will highlight its applications in accurately measured quantities, such as the electron's magnetic moment and the Lamb shift observed in atomic energy levels. Our computational strategy will be briefly outlined, emphasizing the advanced theoretical frameworks employed to investigate light-by-light scattering. Furthermore, we will explore the remarkable phenomena associated with light-by-light scattering, notably vacuum birefringence. Despite its long-standing prediction, experimental observation of this phenomenon remains challenging due to its tiny effects. We will provide an overview of the theoretical foundations behind vacuum birefringence and present our proposed experimental approaches and ongoing progress in this intriguing research area.

Bio: Naser Ahmadiniaz began his physics studies at the University of Kurdistan in Sanadaj, Iran. He completed his MSc in condensed matter physics at the Institute for Advanced Studies in Basic Science (IASBS) in Zanjan, Iran. Naser obtained his Ph.D. in theoretical high-energy physics under the supervision of Prof. Dr. Christian Schubert at the Institute for Physics and Mathematics, University of Michoacan in Mexico. He then worked as a research scientist at the Center for

Relativistic Laser Science (CoReLS, IBS) in South Korea. In 2019, he joined Prof. Dr. Ralf Schuetzhold's group at HZDR, focusing on strong field quantum electrodynamics. Naser's research expertise lies in amplitude calculations in Quantum Electrodynamics, Quantum Chromodynamics, and quantum gravity.