

The 235th HENPIC seminar by Feng-Kun Guo(郭奉坤): Precise determination of gravitational form factors

Title: Precise determination of gravitational form factors

Abstract: Being closely connected to the origin of the nucleon mass, the gravitational form factors of the nucleon have attracted significant attention in recent years. We present the first model-independent determinations of the gravitational form factors of the pion and nucleon at the physical pion mass, using a data-driven dispersive approach. The so-called “last global unknown property” of the nucleon, the D-term, is determined up to a 10% uncertainty. The root mean square radius of the scalar trace density inside the nucleon is determined to be (0.97 ± 0.03) fm. It is notably larger than the proton charge radius, suggesting a modern structural view of the nucleon—gluons, responsible for most of the nucleon mass, are distributed over a larger spatial region than quarks, which dominate the charge distribution. It also indicates that the radius of the trace density may be regarded as a confinement radius. I will also comment on the mechanisms of near-threshold photoproduction of J/ψ and of the J/ψ -nucleon scattering at low energies.

Brief introduction about the speaker:

Feng-Kun Guo is a Professor at the Institute of Theoretical Physics (ITP), Chinese Academy of Sciences (CAS). He received his B.Sc. from Shandong University in 2002 and his Ph.D. from the Institute of High Energy Physics, CAS, in 2007. Then he worked as a postdoctoral researcher and project leader at Forschungszentrum Jülich and the University of Bonn up to 2015 when he joined ITP in 2015. His research focuses on non-perturbative strong interactions. His representative works in recent years include: revealing rules connecting near-threshold structures in the heavy hadron spectrum and S-wave attraction; proposing a novel method using triangle singularities to precisely measure the binding energy of near-threshold particles; providing a natural and simultaneous explanation for several puzzles concerning positive-parity charmed mesons; precisely calculating the gravitational form factors of the nucleon. He is a recipient of the National Science Fund for Distinguished Young Scholars in 2021. He is a member of the Theory Advisory Group for the PANDA experiment and serves on the International Advisory Committees for international conferences such as HADRON, Chiral Dynamics, and the Erice School/Workshop on Nuclear Physics, etc. He has published over 180 papers in journals including Rev. Mod. Phys., Phys. Rev. Lett., Nature Commun. And so on, with a total of more than 15,000 citations.

Summary