東北大学　宇宙創成物理学国際共同大学院プログラム

GP-PU (Graduate Program on Physics for the Universe) Seminars

by Georg Wolschin (Heidelberg University)

- **16:00-18:00, September 2nd, 2021**

“Relativistic heavy-ion collisions - an introduction”

Zoom registration: https://us02web.zoom.us/meeting/register/tZYudOurpz0jGdB9TiRoMx0S5CSRCMkRtPHW

Abstract: A short survey of relativistic heavy-ion collisions with phenomena such as fluctuations, jet quenching, two-particle correlations, photon spectroscopy, hard probes of the transient quark-gluon plasma is given. Going into more detail, the rapid local thermalization of quarks and gluons in the initial stages of relativistic heavy-ion collisions is treated using analytic solutions of a nonlinear diffusion equation. On a similarly short time scale of t ≤ 1 fm/c, the stopping of baryons is accounted for through a QCD-inspired approach based on the parton distribution functions of valence quarks, and gluons. Results are compared to data from SPS and RHIC. Charged-hadron production is considered phenomenologically using a linear relativistic diffusion model with two fragmentation sources, and a central gluonic source that rises with the cubic logarithm of the energy. Quarkonia are used as hard probes for the properties of the quark-gluon plasma (QGP) through a comparison of theoretical predictions with recent CMS, ALICE and LHCb data for Pb-Pb and p-Pb collisions.

- **16:00-18:00, September 7th, 2021**

“Quarkonia spectroscopy in the quark-gluon plasma”

Zoom registration: https://us02web.zoom.us/meeting/register/tZYscuGqqTwoHtOPXbaXhD_DK_zBIvu9uWgT

Abstract: The spectroscopic properties of heavy quarkonia are substantially different in the quark-gluon plasma (QGP) that is created in relativistic heavy-ion collisions as compared to the vacuum situation that can be tested in pp collisions at the same center-of-mass energy. Here the dissociation of the Y(nS) and xb(nP) states in the hot QGP is considered. Quarkonia dissociation occurs due to (1) screening of the real quark-antiquark potential, (2) collisional damping through the imaginary part of the potential, and (3) gluon-induced dissociation. In addition, reduced feed-down plays a decisive role for the spin-triplet ground state. Transverse-momentum and centrality-dependent data are well reproduced in Pb-Pb collisions at LHC energies. In the asymmetric p-Pb system, alterations of the parton density functions in the lead nucleus account for the leading fraction of the modifications in cold nuclear matter (CNM), but the hot-medium effects turn out to be relevant in spite of the small initial spatial extent of the fireball, providing additional evidence for the generation of a quark-gluon droplet.

Contact : Yusuke Tanimura (E-mail: tanimura@nucl.phys.tohoku.ac.jp)