

# NUCLEAR/PARTICLE PHYSICS SEMINAR

## TRACKING THE BARYON NUMBER CARRIER AT RHIC AND EIC



**DR. ZHANGBU XU**

*BROOKHAVEN NATIONAL LABORATORY*

Baryon number ( $B$ ) is a conserved quantum number that prevents protons ( $B = 1$ ) and stable nuclei from disintegration and governs the visible Universe as it is today. It is conventionally assumed that the unit baryon number in a nucleon is distributed equally among its three valence quarks. An alternative picture was proposed at the birth of the theory of the Quantum Chromodynamics (QCD) half a century ago that the baryon number is instead traced by the baryon junction, a non-perturbative Y-shaped topology of gluons that is connected to all three valence quarks. In most of the physics processes, these two scenarios are indistinguishable. Neither of these pictures have been experimentally verified while different experiments have demonstrated the fractional charges carried by the quarks. Relativistic heavy-ion collisions provide the necessary tools to study baryon transports in a non-perturbative way over large rapidity distance. I will present three experimental results we carried out at the Relativistic Heavy Ion Collider (RHIC) at the Brookhaven National Laboratory in the US recently to test the hypotheses using isobar and Beam Energy Scan data collected by the STAR Collaboration. I will also review the previous experimental measurements in lepton+hadron and p+p collisions relevant to this topic, and discuss what we can do in the future at RHIC, the LHC and EIC.



**MONDAY NOVEMBER, 20TH || 1PM IN THE NEBULA ROOM**

**JOIN US ON ZOOM**