Tuesday
Oct. 30th
At 3:45pm

Novel Quantum Phenomena in the Subatomic Swirls

Abstract:

By colliding heavy ions at high energies, physicists are able to ``break up" nuclear particles like protons and neutrons and create a hot ``subatomic soup" — a new form of matter called a quark-gluon plasma (QGP). The QGP forms at a temperature of about one trillion degrees or higher, and briefly occupied the baby Universe. Such primordial environment is now replicated in laboratory at the Relativistic Heavy Ion Collider (RHIC) and the Large Hadron Collider (LHC). Experiments at RHIC and the LHC have opened the door to what I'd call the Quantum-Chromo-Material Science, by revealing and characterizing the fascinating many-body phenomena and properties of strongly interacting matter. For example, over the past decade, the collider-born QGP is found to be a nearly perfect quantum fluid. Very recently, there emerged compelling evidences showing that the hot fluid formed in these collisions behaves like ``subatomic swirls" carrying a large angular momentum with the resulting nontrivial fluid vorticity field as well as a super-strong magnetic field. The nontrivial interplay of such extreme fields with the spin degrees of freedom of the underlying microscopic constituents, leads to a number of novel quantum phenomena that have triggered widespread enthusiasm. In this talk, I will discuss two tantalizing examples, the vorticity-induced global spin polarization of produced hadrons and the magnetic-field-driven anomalous transport known as the Chiral Magnetic Effect (CME).

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Refreshments will be served at 3:30pm