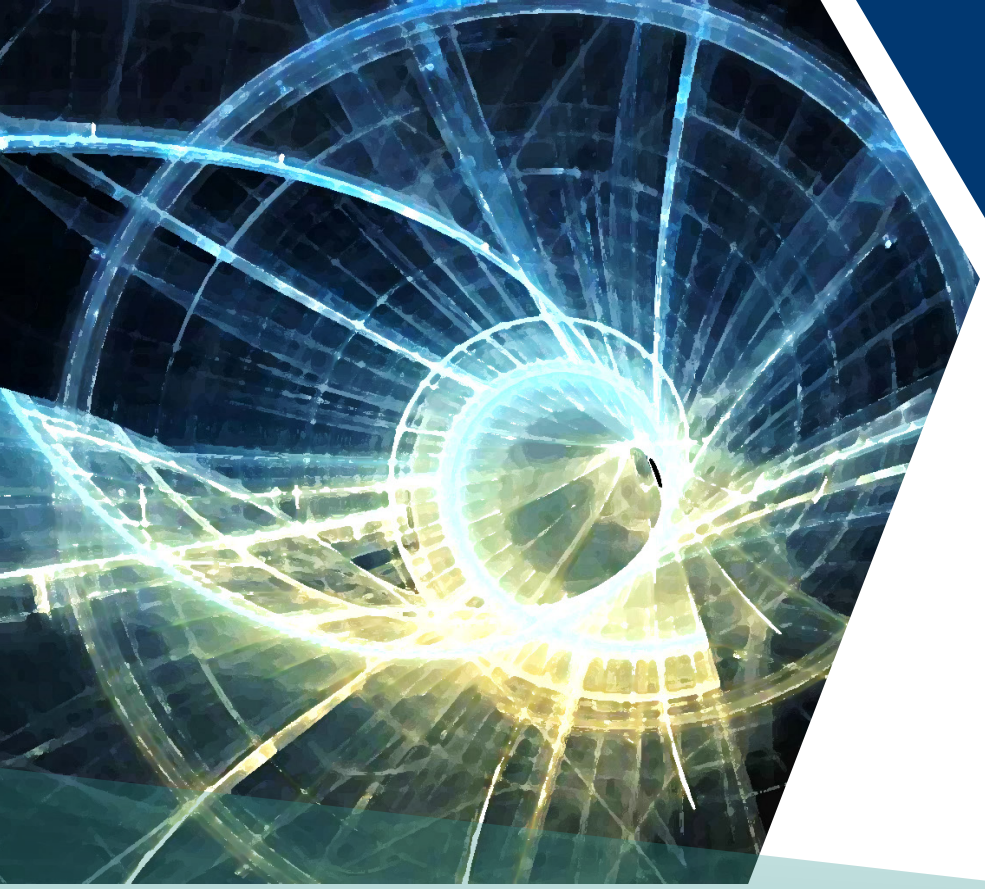

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PHYSICS COLLOQUIUM

Tuesday, May 17, 2016
KSU Library- Rm 508
3:00pm

Refreshments @ 2:45pm

Probing the Phase Diagram of QCD Matter at the Relativistic Heavy Ion Collider

Prashanth Shanmuganathan

Excited nuclear matter at high temperature and density results in the creation of a new state of matter called Quark Gluon Plasma (QGP). It is believed that the Universe was in theQGP state a few millionths of a second after the Big Bang. A QGP can be experimentallycreated for a very brief time by colliding heavy nuclei, such as gold, at ultra-relativistic energies. An important component of the physics effort of the STAR collaboration at Brookhaven National Lab is the Beam Energy Scan (BES), designed to study the properties of the Quantum Chromodynamics (QCD) phase diagram. In this talk, I focus on one of the main goals of the BES program, which is to search for a possible first-order phase transition from hadronic matter to QGP and back again, using measurements of azimuthal anisotropy. The momentum-space azimuthal anisotropy of the final-state particles from collisions can be expressed in Fourier harmonics. The first harmonic coefficient is called directed flow, and reflects the strength of the collective sideward motion, relative to the beam direction, of the particles. Models tell us that directed flow is imparted during the very early stage of a collision and is not much altered during subsequent stages of the collision. Thus directed flow can provide information about the early stages when the QGP phase exists for a short time. A subset of hydrodynamic and nuclear transport model calculations with the assumption of a first-order phase transition show a prominent dip in the directed flow versus beam energy, with some qualitative resemblance to measurements from the STAR collaboration.

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