

**Stony Brook University  
The Graduate School**

Doctoral Defense Announcement

**Abstract**

Energy Loss and Flow of Heavy Quarks in Au+Au Collisions at  $\sqrt{s_{NN}} = 200$  GeV

By

**Alan Dion**

Two of the most interesting results to come from the heavy ion program at the Relativistic Heavy Ion Collider are the observation of jet suppression and elliptic flow. The production of light mesons from  $Au+Au$  collisions is suppressed compared to that from  $p+p$  collisions at the same energy per nucleon when the number of nucleon-nucleon collisions is taken into account. In addition, the meson production is highly asymmetric with respect to the reaction plane, the plane formed by the impact parameter and the beam axis, indicating strong interaction of the created medium, consistent with hydrodynamic expansion.

Jet suppression and azimuthal anisotropy of mesons containing heavy quarks can in principle give more direct information about the properties of the medium than can light mesons. Charm and bottom quarks are believed to be formed exclusively in the initial hard nucleon scatterings, predominately by gluon-gluon fusion. Since the heavy quarks are formed early in the collision, their spectrum is sensitive to the entire lifespan of the medium formed. Heavy quarks are predicted to lose less energy than light quarks traversing the medium due to the "dead-cone" effect, and as such could be more sensitive to medium effects than are the light quarks.

This dissertation details the measurement of electrons from heavy quark decays from Au+Au collisions at  $\sqrt{s_{NN}} = 200$  GeV using the PHENIX detector over a transverse momentum range of  $0.3 \text{ GeV}/c < p_T < 9.0 \text{ GeV}/c$ . The measurement of the azimuthal anisotropy with respect to the reaction plane of electrons from heavy quark decays is also presented. The results of the measurement are compared to predictions from recent theoretical work, from which bulk properties of the medium created in heavy ion collisions can be estimated.

**Date:** May 10, 2007

**Time:** 10 AM

**Place:** Physics, C-120

**Program:** Physics

**Dissertation Advisor:** Axel Drees