From: Richard Petti <richard.petti@stonybrook.edu>
Subject: **thesis defense announcement and abstract**
Date: October 18, 2013 3:42:38 PM EDT
To: Jacobus Verbaarschot <jv@chi.physics.sunysb.edu>
1 Attachment, 103 KB

Dear Prof. Verbaarschot,

I would like to submit to you my thesis defense announcement and my abstract. I have filled out the form from the graduate school web page and have attached the document as a pdf. The date is set for Nov. 13th and the website indicates that the form must be sent to the graduate school 3 weeks in advance, that puts it to this coming Wednesday. I hope I gave you enough time to look over, approve, and send the abstract to the graduate school.

Thank you,
-Richard Petti

Stony Brook University
The Graduate School

Doctoral Defense Announcement

Abstract

Low Momentum Direct Photons as a Probe of Heavy Ion Collisions

By

Richard Michael Petti

Relativistic heavy ion collisions have been a major research interest in the field of nuclear physics for the past few decades. Large collider facilities have been constructed to study the exotic matter produced in relativistic heavy ion collisions, one of which is the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory in Upton, NY. Essential to the study of heavy ion collisions are probes that are produced in the collision itself. Photons are a very useful probe of the collisions, since they escape the fireball virtually unmodified and carry with them information about the environment in which it was produced. Recent interest in low momentum direct photons has increased, due to the onset of the "thermal photon puzzle" and the apparent inability for typical models to explain both a large direct photon yield excess and large azimuthal production asymmetry (v_2) at low momentum measured by PHENIX. The focus of this thesis will be the measurement of direct photons at low momentum with the PHENIX detector in $s^{1/2}_{NN}$ = 200GeV Au+Au collisions.

Low momentum direct photons (direct is any photon not from a hadron decay) are notoriously difficult to measure in a heavy ion environment, due to large decay photon backgrounds, neutral hadron contamination, and worsening calorimeter resolution. A novel technique for measuring direct photons via their external conversion to di-electron pairs has been developed. The method virtually eliminates the neutral hadron contamination due to the very clean photon identification based on di-electron pair invariant mass cuts. The direct photon fraction, R_γ, defined as the ratio of the yield of inclusive photons to hadron decay photons is measured through a double ratio, further reducing systematic uncertainties to manageable levels at low momentum. The direct photon fraction is converted to a direct photon invariant yield and a detailed look at the

centrality dependence of the excess yield is presented. This dependence is confronted with recent theoretical calculations predicting novel production mechanisms of direct photons and possible solutions to the "thermal photon puzzle".

Date: November 13th, 2013
Time: 11am
Place: Physics, C-120

Program: Physics and Astronomy
Dissertation Advisor: Axel Drees