

2008 APS April Meeting and HEDP/HEDLA Meeting

St. Louis, Missouri

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## Saturday, April 12, 2008 3:30PM - 5:18PM –

Session E5 DNP GHP: Computational Nuclear Physics Hyatt Regency St. Louis Riverfront (formerly Adam039;s Mark Hotel), Promenade C

**3:30PM E5.00001 Hadron Physics Computations in Lattice QCD** COLIN MORNINGSTAR, Carnegie Mellon University — Progress in extracting excited-state baryon and mesons masses in lattice QCD using large sets of spatially-extended operators is presented. The use of stochastic estimates of all-to-all quark propagators with variance reduction techniques is described. Such techniques are crucial for incorporating multi-hadron operators into the correlation matrices. The current status of form factor and structure function computations is also reviewed.

**4:06PM E5.00002 Modeling Type Ia Supernova Explosions**, ALAN CALDER, Stony Brook University — Type Ia Supernovae are one class of bright stellar explosions that are distinguished by a lack of hydrogen in the observed spectra. The most widely accepted scenario is a thermonuclear runaway occurring in a C/O white dwarf that has gained mass from a companion star. The details of the explosion mechanism are incompletely understood, and at present there are competing models that differ in the details of the initial conditions and the nature of the thermonuclear burning. I will present an overview of proposed mechanisms for the explosion and describe the requisite physics for each. Many scenarios invoke a deflagration born near the center of the white dwarf, and the subsequent evolution of the fireball sensitively depends on the relative size of the ignition point and its location. I will describe the flame and ash nuclear energetics and demonstrate that for the case of rising bubbles, featured in some explosion scenarios, the bubble evolution depends sensitively on the nuclear physics included in the models.

**4:42PM E5.00003 Nucleon structure study using a polarized  $^3\text{He}$  target**, HAIYAN GAO, Duke University — Due to the unique ground state spin structure of the  $^3\text{He}$  nucleus, polarized  $^3\text{He}$  nuclear targets have been used widely in experiments ranging from measurements of the neutron electric and magnetic form factors to the study of the neutron spin structure. In this talk, I will highlight some of the recent results and also discuss upcoming experiments. Particularly, I will discuss the upcoming neutron transversity experiment in Hall A at Jefferson Lab using a vertically polarized  $^3\text{He}$  target and the planned polarized Compton scattering experiment from a polarized  $^3\text{He}$  target at the HI $\gamma$ S facility located at the Duke Free Electron Laser Laboratory using the circularly polarized photons. All these experiments benefit greatly from theoretical developments in calculating the three-body system. The work is supported in part by a U.S. Department of Energy grant DE-FG02-03ER41231.

## Sunday, April 13, 2008 10:45AM - 12:33PM –

Session J7 GHP: Recent Highlights in Hadronic Physics Hyatt Regency St. Louis Riverfront (formerly Adam039;s Mark Hotel), Rose Garden

**10:45AM J7.00001 Highlights on Hadronic Physics from Heavy Ion Physics**, JAMES DUNLOP, Brookhaven National Laboratory — The program at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory has been a resounding success, leading to qualitative advances in our understanding of both the properties of the universe in its earliest stages and the spin of the proton. The study of this matter, created in the laboratory through collisions between nuclei at high energies, is entering into a new, quantitative phase with upgrades to both the detectors and the collider, termed RHIC II. Limitations of current measurements will be reviewed, along with the upcoming methods to produce high precision quantification of the properties of the matter produced at RHIC.

**11:21AM J7.00002 The New Charmonium States**, ERIC SWANSON, University of Pittsburgh — A review of the properties and theoretical interpretations of the newly discovered charmonium states is presented.

**11:57AM J7.00003 Partial Wave Analysis Results for  $\gamma p \rightarrow p\omega$  using Data from CLAS at Jefferson Lab**, MIKE WILLIAMS, Carnegie Mellon University — Relativistic quark models predict strong couplings to  $p\omega$  — relative to  $N\pi$  — for some of the *missing*  $N^*$  states. Previous searches for these states in  $\gamma p \rightarrow p\omega$  have relied solely on differential cross section measurements. I will present final differential cross section and  $\omega$  spin density matrix element measurements obtained from the CLAS  $g11a$  dataset. Measurements at  $\sim 20$  points in each of 112  $\sqrt{s}$  bins over the range  $1.72 \text{ GeV} < \sqrt{s} < 2.84 \text{ GeV}$  have been made ( $\sim 2000$  total points). These are the first *high precision* polarization measurements made for  $\omega$  photoproduction. I will also present partial wave analysis results for this channel. These results are the first to be constrained by precise polarization information. Strong evidence for resonance contributions to  $\gamma p \rightarrow p\omega$  has been found.