Abstract for an Invited Paper
for the DNP10 Meeting of
The American Physical Society

Heavy quarkonium as a probe of the Quark-Gluon Plasma[1]

ANTHONY D. FRAWLEY, Florida State University

It was first proposed by Matsui and Satz in 1986 that a clear signal of deconfinement in high energy heavy ion collisions would be suppression of the yield of J/ψ mesons caused by those hadrons "melting" in the Quark-Gluon Plasma. Since then, there has been strong theoretical and experimental interest in the use of bound heavy quark states (charmonia and bottomonia) as a probe of the QGP. Because of their large masses, charm and bottom quark pairs are produced only in hard scatterings during the initial nuclear collision, so their population is fixed and predictable. Some of the quarkonia states have significant branches directly to di-lepton pairs, making them easy to reconstruct even in heavy ion collisions. There have been measurements of J/ψ production in heavy ion collisions first at lower energies at the CERN SPS, and more recently at RHIC. All show strong suppression. However the amount of suppression observed at the SPS and at different rapidities at RHIC has shown no easily understood pattern, and in fact the observed trends are somewhat counter-intuitive. In the last year or so it has been shown experimentally that there are large effects on J/ψ production rates in heavy ion collisions that are not related to the hot, dense final state. These are termed "cold nuclear matter" effects and they are very interesting in their own right. I will discuss how these recent measurements have clarified the previously confusing experimental picture for J/ψ production, and discuss the status and outlook for quarkonia as a probe of the QGP at the SPS, RHIC and the LHC.

[1]Work supported in part by the National Science Foundation.