Coherent diffraction of ρ mesons of Au nuclei in the STAR Ultra Peripheral Collisions program

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some good words

Whenever relativistic heavy ion pass near each other, they interact via their long range electromagnetic fields, which according to the Weizsacker-Williams formalism [1] appear as intense short short lived photon pulses in the respective rest frames. These photons can have energies that reach up to $2\gamma\hbar c/R_A$ where γ is the Lorentz boost of each beam and R_A the radius of the nuclei in a symmetric system. The photons fluctuate into vector mesons with masses below such upper limit [2, 3]. The vector meson produced by one of the ions interacts elastically with the with the other ion and is placed "on shell" and later detected by its decay products. The coherent ineraction of the vector mesons with the whole target nuclei is of particular interest.

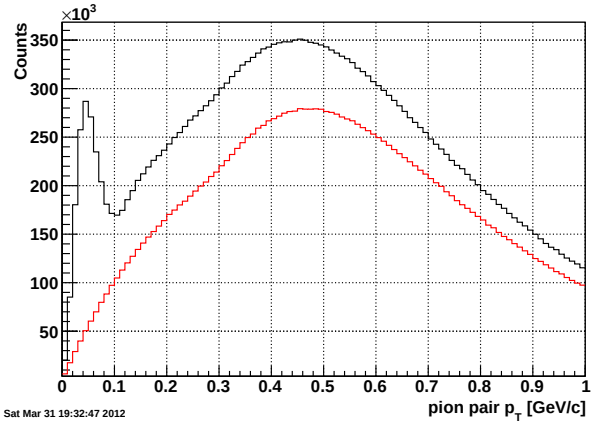

FIG. 1. from the WWND Proceedings

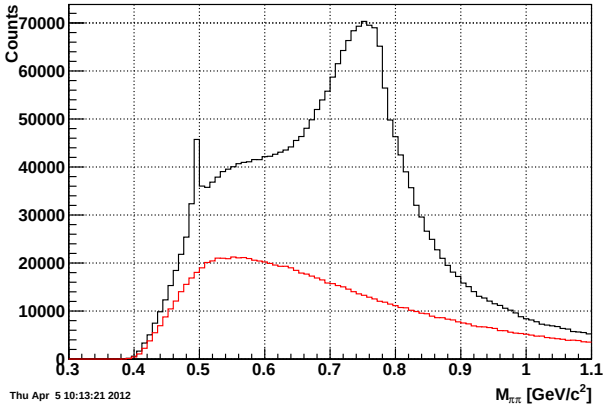

FIG. 2. from the WWND Proceedings

The data used for this analysis were collected with the STAR detector at RHIC from Au+Au collisions with center of mass energy per nucleon $\sqrt{s_{\rm NN}}$=200 GeV. The momentum of charged particles were detected with the STAR Time Projection Chamber (TPC) in two units of pseudo-rapidity centered around 0 ($|\eta| < 1$) and full azimuthal coverage. The TPC records up to 45 samples of the ionization left in the detector gas which allows for a good resolution particle identification based on energy loss. The charge left by particles inside the TPC drifts along its axis and is read out on the East and West sides which are divided into six sectors each. The TPC is also used to identify the vertex of the collisions and together with the bending power of the 0.5 Tesla magnetic field, it provides a momentum resolution equal to $\Delta p_T/p_T = 0.005 + 0.004 p_T$. More details about the TPC can be found in [4]. The cylindrical TPC is completely surrounded by the Time Of Flight (TOF) detector consisting of 23040 Resistive Parallel Plate gas detectors arranged in cells, groups of which form modules installed in two sets of trays along the East and West sides of the TPC, 10 TOF trays overlap the azimuth coverage of one TPC readout sector. The TOF detector was used to trigger the UPC events and provides good time-of-flight measurements, although this analysis doesn't make use of that information. STAR has two Zero Degrees Calorimeters (ZDC) installed at ±18 meters away from the nominal interaction point. These calorimeters are optimized for the detection of beam energy neutrons. These detectors are instrumental in the definition of the trigger used for this analysis, more details about them can be found in [5].

put your acknowledgments here.

[1] G. Baur, K. Hencken, D. Trautmann, S. Sadovsky, and Y. Kharlov, Phys.Rept. **364**, 359 (2002), arXiv:hep-ph/0112211 [hep-ph].

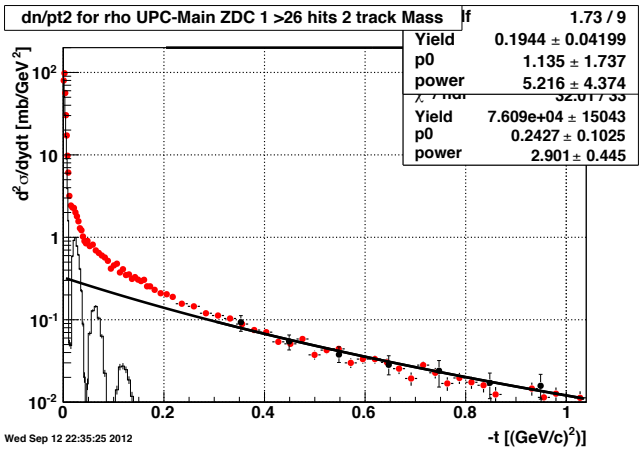

FIG. 3. from the WWND Proceedings

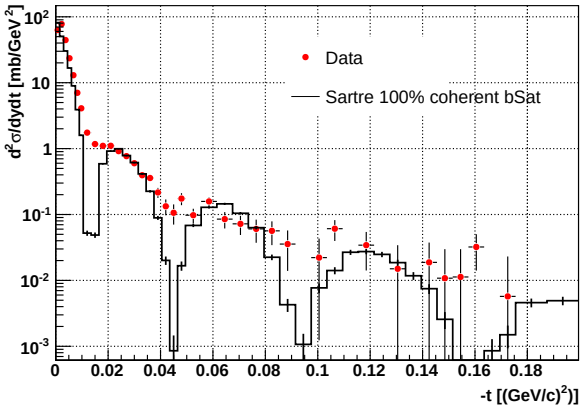

FIG. 4. from the WWND Proceedings

[2] S. R. Klein and J. Nystrand, Phis. Rev. Lett. **84**, 2330 (2000), arXiv:hep-ph/9909237 [hep-ph].
[3] S. R. Klein and J. Nystrand, Phys. Rev. C **60**, 014903 (1999).
[4] M. Anderson *et al.*, Nuclear Instrum. Methods **A499**, 659 (2003).
[5] C. Adler, H. Strobele, A. Denisov, E. Garcia, M. Murray, *et al.*, Nucl.Instrum.Meth. **A461**, 337 (2001).