High p_T hadron production in Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV

Y. Akiba,[*1] R. Akimoto,[*1] H. Asano,[*1] S. Bathe,[*1,*2] S. Baumgart,[*1] K. Boyle,[*1] J. Bryslawskyj,[*2] C-H. Chen,[*1] L. Ding,[*3] A. Enokizono,[*4] S. Esumi,[*5] T. Hachiya,[*1] S. Horiuchi,[*5] J. Koster,[*1] K. Kurita,[*4] M. Kurosawa,[*1] A. Lebedev,[*3] M. McCumber,[*6] H. Nakagomi,[*4] R. Nouicer,[*1] C. Ogilvie,[*3] Z. Rowan,[*2] H. Sako,[*1] S. Sato,[*7] A. Shaver,[*3] M. Shimomura,[*1,*3] M. Stepanov,[*8] A. Taketani,[*1] M. Wysocki,[*9] and the PHENIX VTX group

One of the most significant discoveries at RHIC has been the suppression of high p_T hadrons in central Au+Au collisions[1)]. In pQCD models, the data constrain the transport coefficient, $\hat{q}$[2)].

Currently the best measurement at RHIC is achieved by neutral pions[3)]. For charged hadrons, the measurement is limited by a background from photon conversions and random tracks, both mimicking high transverse momentum tracks.

With the recent addition of a Silicon Vertexing Tracker (VTX)[4)] to PHENIX, it is possible to significantly reject this background and to extend hadron measurement to a higher p_T. Tracks need to be reconstructed with a small Distance of Closest Approach (DCA) of the track projection on the primary vertex. Real tracks are reconstructed with zero DCA convoluted with the detector resolution, whereas fake tracks can have any DCA.

Figure 1 shows the raw DCA distribution in the transverse plane. A peak is observed around zero DCA, which is dominated by real tracks, above a background of random tracks and weak decays.

Figure 2 shows the transverse momentum distribution of tracks with and without the small-DCA requirement. At high p_T, the spectrum without the DCA requirement appears unphysically flat, whereas the spectrum with the requirement continues to fall. This observed behavior suggests that the DCA requirement successfully suppresses the background.

These plots indicate the potential of this method. Recently, significant progress has been made in rejecting misfunctioning parts of the detector and improving the tracking algorithm. The analysis is still in progress.

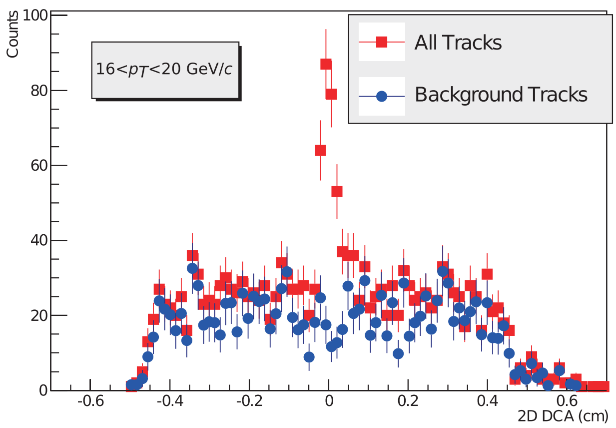

Fig. 1. Raw DCA distribution in the transverse plane. The peak around zero DCA is dominated by real tracks. The underlying background comes from random tracks and weak decays. The fall-off at ± 0.4 cm is an artifact of the tracking algorithm.

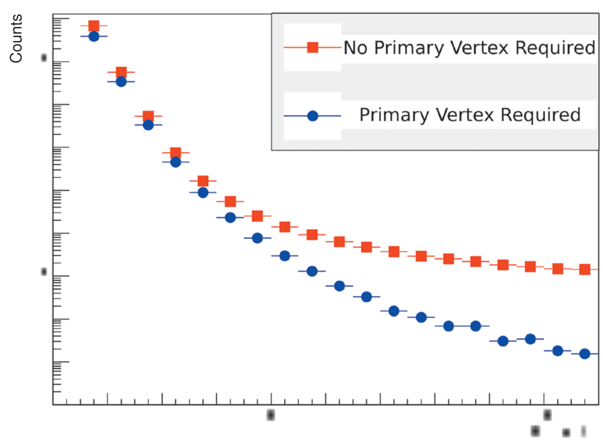

Fig. 2. Uncorrected hadron p_T spectra for different purity cuts. At high p_T, the spectrum without the DCA requirement appears unphysically flat while the spectrum with the DCA requirement continues to fall.

*1 RIKEN Nishina Center
*2 Department of Natural Sciences, Baruch College, CUNY
*3 Department of Physics & Astronomy, Iowa State University
*4 Department of Physics, Rikkyo University
*5 Institute of Physics, University of Tsukuba
*6 Department of Physics, University of Colorado, Boulder
*7 Advanced Science Research Center, Japan Atomic Energy Agency
*8 Physics Department, University of Massachusetts, Amherst
*9 Physics Division, Oak Ridge National Laboratory

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