Identified Charged Hadron Spectra in Au + Au Collisions at $\sqrt{s} = 130$ GeV in the PHENIX Experiment at RHIC

PHENIX Time-of-Flight Detector

- design and PID capability
- detector performance in year-1 operation
- Hadron PID by TOF
- Single Particle Spectra
- Summary

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PHENIX Time-of-Flight Detector

- Mechanical Design
- 960 plastic scintillators
- PMT readout at both ends of scint. (1920 ch.)
- Geometry
 - located at 5 m from the vertex
 - $-0.35 < \eta < 0.35, \Delta \phi = 45 \text{ deg.}$
- <u>PID Capability</u>

Performance of TOF in CERN-WA98 $\sigma_{TOF} = 85 \text{ ps}$ PHENIX-TOF tested at WA98 • Promised performance (@ flight path = 5m) $4\sigma \pi/K$ separation at p = 2.4 GeV/c

 4σ K/p separation at p = 2.4 GeV/c 4σ K/p separation at p = 4.0 GeV/c



TEC/TOF Matching



• $\sigma_{\text{TOF-TEC}} = 2 \text{cm}$ Corresponding to the TOF resolution of 120 ps

• Consistent with TOF intrinsic timing resolution without slewing correction.

Timing resolution will be improved by fine tuning of calibration parameters.



Global Track/TOF Association



Association window size : $dr = 5 \text{ cm} (\sim 2\sigma \text{ of in y-z projection plane})$

*Clear correlation between global tracks and TOF hit positions are seen

Hadron PID by TOF



Squared Mass Distribution



Raw Single Particle Spectra (minimum bias)

* No decay/acceptance/efficiency corrections applied



Summary

- Tracking detectors (DC/PC/TEC) and TOF detector had been operated successfully during the first year of physics run.
- TOF intrinsic timing resolution ~120 ps have been achieved by TEC/TOF hit position matching without slewing correction.
- Fine tuning of TOF timing calibration parameters will be done.
- Raw (uncorrected) single particle spectra for π^+ , π^- , K⁺, K⁻, p and \overline{p} are shown.
- Acceptance, decay, efficiencies corrections will be applied soon.
- Lots of interesting physics will come next.
 - 1) Single particle spectra for π^+ , π^- , K^+ , K^- , p and p(<p_t>, centrality dependence)
 - 2) Particle ratio K/ π , p/p etc. and their centrality dependence
 - 3) HBT analysis
 - 4) $\phi \longrightarrow K^+K^-$ physics
 - 5) And more