Current Status of Hadron Analysis

• Introduction

• Hadron PID by PHENIX-TOF

- Current status of charged hadron PID
- CGL and track projection point on TOF

• Single Particle Spectra for π , K, p and pbar

- \blacktriangleright p_T & M_T distributions
- Centrality dependence
- Invariant mass study
- Analysis Plan for QM'01

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Introduction

- During Run2000, we recorded ~3M "good" event (BBC,ZDC, BBC&ZDC trigger) in tapes.
- Many useful magnetic field ON data (run9666~)
- TOF system was operated successfully during almost all data taking.
- Lots of hadron physics using TOF for Run00 data set
- In this presentation, the current status of PID/hadron by TOF and plan for QM'01 are reported.
 - 1. Charged hadron PID by TOF
 - 2. Single particle spectra for π ,K,p and anti-proton (centrality dependence of inverse slope)
 - 3. First look at invariant mass spectrum of K⁺K⁻

PID by TOF



- Demonstrated clear PID by TOF
- In phs5 tag, K/ π separation < 2 GeV/*c*, p/K separation ~ 3.5 GeV/*c* in p_T
- New TOF calibration parameters are valid after phs7 tag.

Global Tracking Algorism (CGL) for field ON data



• <u>Track projection cut is very important for selection of</u> <u>"good track" and for PID by TOF.</u>

Residual between Track Projection Point and TOF Hit



For PID, 2σ cut is applied in both y and z direction (TOF).

Momentum dependence of dy and dz



Squared Mass Width



- Momentum resolution ~1% @ 0.5 GeV/c ?
- Found difficulty for parameterization by above formula.

Event Selection



- In this analysis, centrality is defined by PC1 multiplicity.
- BBC Zvertex range : < +-20 cm
- tag version: phs5+projection, processed at RIKEN CC-J
- Sampling 200K event for this analysis.

Cut Criteria



PID Cut ; m^2 vs. p (line cut)• π :-0.2 < m^2 < 0.15 GeV/ c^2 , 0.1 < p < 2.0 GeV/c• K :0.15 < m^2 < 0.4 GeV/ c^2 , 0.2 < p < 2.0 GeV/c• p/pbar : 0.5 < m^2 < 1.2 GeV/ c^2 , 0.2 < p < 4.0 GeV/c

• dy and dz cut PIDed particle (all charged) 100 pro_all ¥ [cm] ن₀0 ⊽ Dch quality > 20 Nent = 25163 Mean x = 0.8952 Eloss (TOF) > 2 MeV Mean y = 0.7937 RMS x = 12.67 40 20 0 -20 -40 dr = 5 cm -60 -80 -100 -100 -80 -60 -40 -20 20 80 0 40 60 - 10

• Energy loss cut (TOF scintillator)

∆z[cm]



Uncorrected Single Particle Spectra



Decay Correction



Centrality Dependence of Single Particle Spectra



Centrality Dependence of M_T Spectra (shape)



Centrality Dependence of p_T Spectra (shape)



BNL/ Tatsuya CHUJO @ Tsukuba-Yonsei Workshop Univ. of Tsukuba, 12/4/2000

Inverse Slope Parameters



- Mass dependence of slope : $T_{\pi} < T_{K} < T_{p}$
- Systematic difference between +/- : T₊ < T₋ (because momentum scale is wrong in phs5 tag?)
- Less centrality dependence for p,K, but p/pbar have a gap between (I) and (II).

Negative Hadrons and π^0 Spectra



Tracking Efficiency Estimation from Real Data



Tracking Efficiency Estimation by MC

- Dch evaluation software was updated (including TOF part).
- Used same tracking algorism as real data for MC.
- MC, Reconstructed info, and track projection points are stored.
- Used Dch dead channel map for reconstruction.
- Could estimate acceptance with efficiency.

Now, we started efficiency study by this evaluator.Used single track events, HIJING central event etc...



First look at $\phi \rightarrow K^+K^-$



- phs5+projection tag used (momentum scaling is wrong!)
- Applied same PID cut as single particle study
- No event class selection
- Event mixing with same event class selection
- Simulation work for acceptance and efficiency study
- QM'01 DSTs are expected to have good enough statistics with less software "bug".
- Stay turned!

•Identified Hadron's HBT

- * Started to look at it by A. Enokizono (Hiroshima Univ.), but an excess at low Q_{inv} is not observed so far.
- * Stay turned too!

Analysis Plan for QM'01

- Official DST production started, 12/1 at RCF.
- Analysis Track Ntuple will be produced at the same time

(not collaboration wide use).

 Analysis frame work for hadron analysis is nearly completed. Track Ntuple (1% file size of DST) root[1] MakeClass : Fast scanning of Ntuple, fast plot making by this method.

(few min. to make a plot from all data of Run00!)

- Lots of simulation work at RIKEN CC-J are on going using evaluation module.
- Corrected single particle spectra, particle ratios and their centrality dependence will be reported shortly and finalized for QM '01 presentation.