Deficiency in $\cos\theta$ of hadron tracks

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Abstract

Deficiency in $\cos\theta$ of hadron tracks are observed and discussed.

1 Who joined

(1) Analysis : Guangshun, Jiangcuan and Zepu

(2) Organizor for special runs : Xiaonan

(3) Participants for Special runs discussion : Zhengguo, Changchun, Dinxing, Jinzhi, Jianping, Binyung, Huaimin, Guangpei, Zepu, Guangshun and Jiangchuan

2 Deficiency observation

Obvious discrepancy in $\cos\theta$ of charged tracks of J/ψ data has been observed by Chen Jiangcuan in his comparison between MC and data. Li Haibo also found this disagreement earlier. Jiangchun then carefully looked at plots from BES-I and -II data and found that discrepancy is confirmed. The distribution for BES-I J/ψ is flat but drops down in vertical direction for BES-II J/Psi data taken in both 1998 and 1999. In the analysis, Guangshun's hadron selection routines are used. Jiangcuan checked that cos(theta) distribution for all tracks with Mfit = 2, -19 and all others included shows same problem.

3 Software bug ?

Zepu reported that he has made a check with J/ψ data (run12064). He has tried to make $\cos\theta$ distribution of hadron tracks with no hit dropped in track reconstruction (even a hit having big chi2) and found that deficiency in $\cos\theta$ does exist still.

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Further check on $\cos\theta$ distribution of charged tracks of J/ψ is going on still. $\cos\theta$ behaviour for different momentum regions are studied. It is shown that both BES-I and -II has flat distribution for p=(100,200)MeV but obvious deficiency in BES-II's plots for p=(200,500),(500,1000) and (1000,1300)MeV. Much higher dEdx in average for p=(100,200), seen clearly from dEdx vs p plots, explaines why.

Test run data taken in the summer shows that it is much improved in the deficiency of $\cos\theta$. Preliminary study shows that possibility for software bug can be removed.

4 Special test runs

Test runs for study of the problem is suggested by Xiaonan at the meeting, held in 18 May 99, where many software and hardware experts, Jingzhi, Yongyung, Guangpei, Zepu, Huaimin, Dixing and others attended.

Averaged dEdx for the test run data are at same level as for set (2) (see Figure 4). Trigger conditions are the same as used for R physics runs. Three kinds of run conditions used in the special test run are listed as below.

1. MDC threshold=625 and VC HV=3700V; Deficiency is improved comparing with the data taken in the winter.
2. MDC threshold=425 and VC HV=3800V; Deficiency is more improved than one in case 1.
3. MDC threshold=525 and VC HV=3800V;

5 Suggestions

A proper correction required for $\cos\theta$ deficiency is necessary for R measurement. Jiangcuan has started his study to add threshold in MDC timing simulation. New estimate on MC acceptance with and without threshold is expected.

Test J/ψ run should be taken this winter since minimum dEdx effect can be observed in the winter time. High voltage for MDC wires will be adjusted in order to increase dEdx output signal. MDC threshold for J/ψ physics runs can be selected between 525 and 625. One should insure that no deficiency in $\cos\theta$ is shown up in winter runs. Surely a check on momentum and dEdx resolution is also needed after HV is changed.

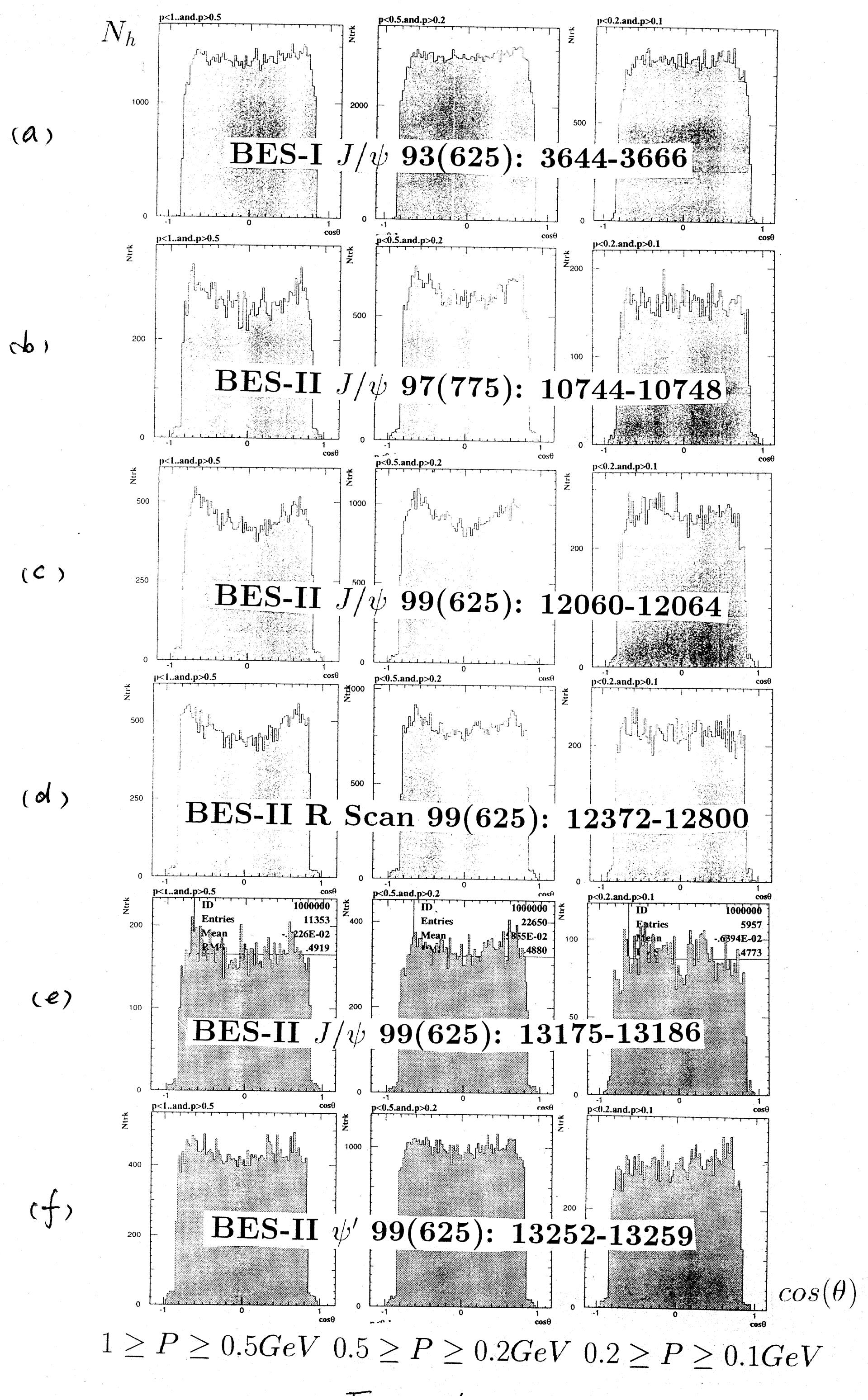

Figure 1: $\cos\theta$ distribution of charged tracks of hadron events, selected by Guangshun's routines. (a) J/ψ data of BES-I; (b) J/ψ data of BES-II taken in 1998; (c) J/ψ data of BES-II taken in winter of 1999; (d) BES-II R data; (e) J/ψ data of BES-II taken in summer of 1999; (f) $\psi(2s)$ data of BES-II taken in summer of 1999.

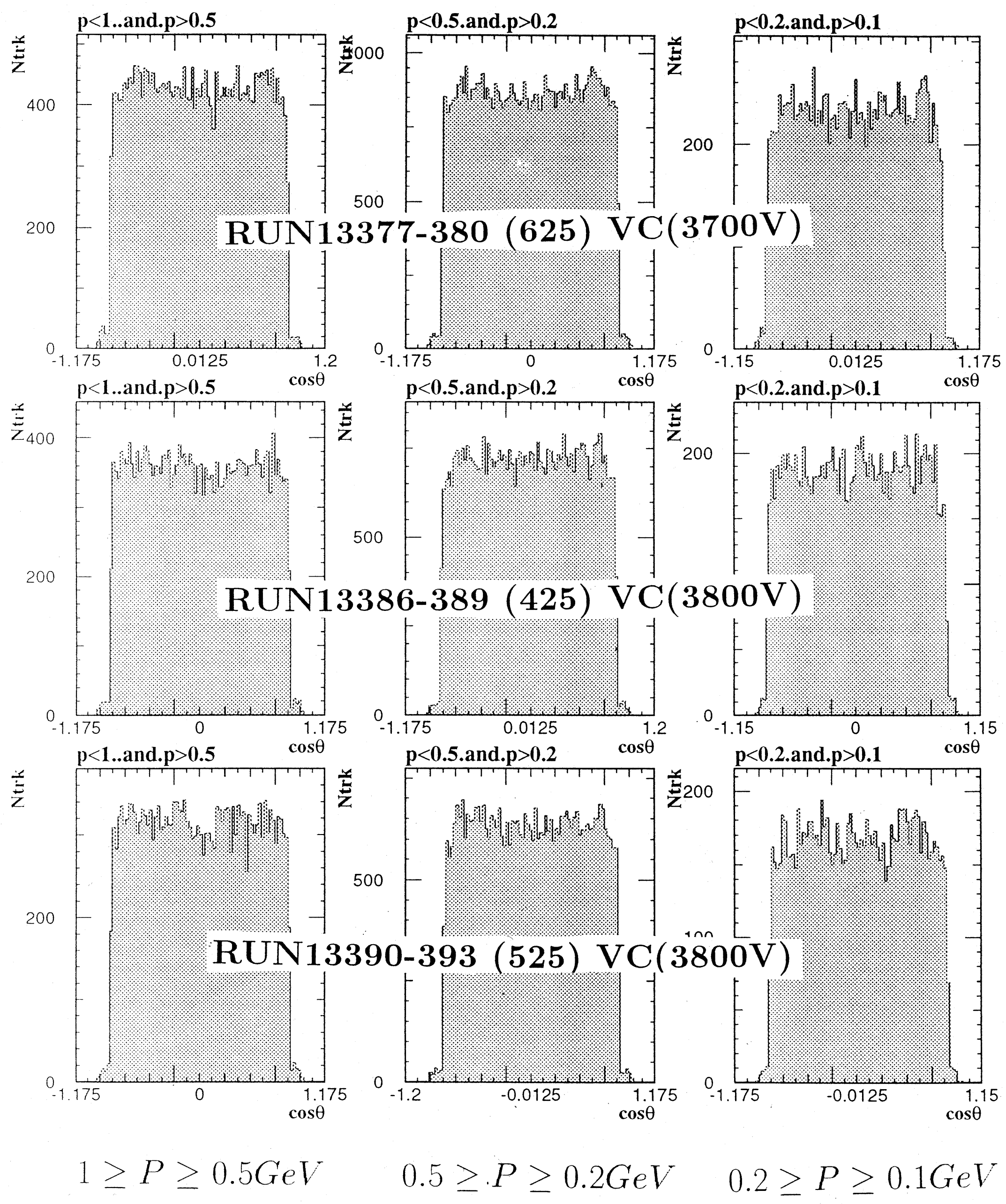

Figure 2: $\cos\theta$ distribution of charged tracks in hadron events. (a) MDC threshold = 625 and VC HV = 3700V; (b) MDC threshold = 425 and VC HV = 3800V; (c) MDC threshold = 525 and VC HV = 3800V.

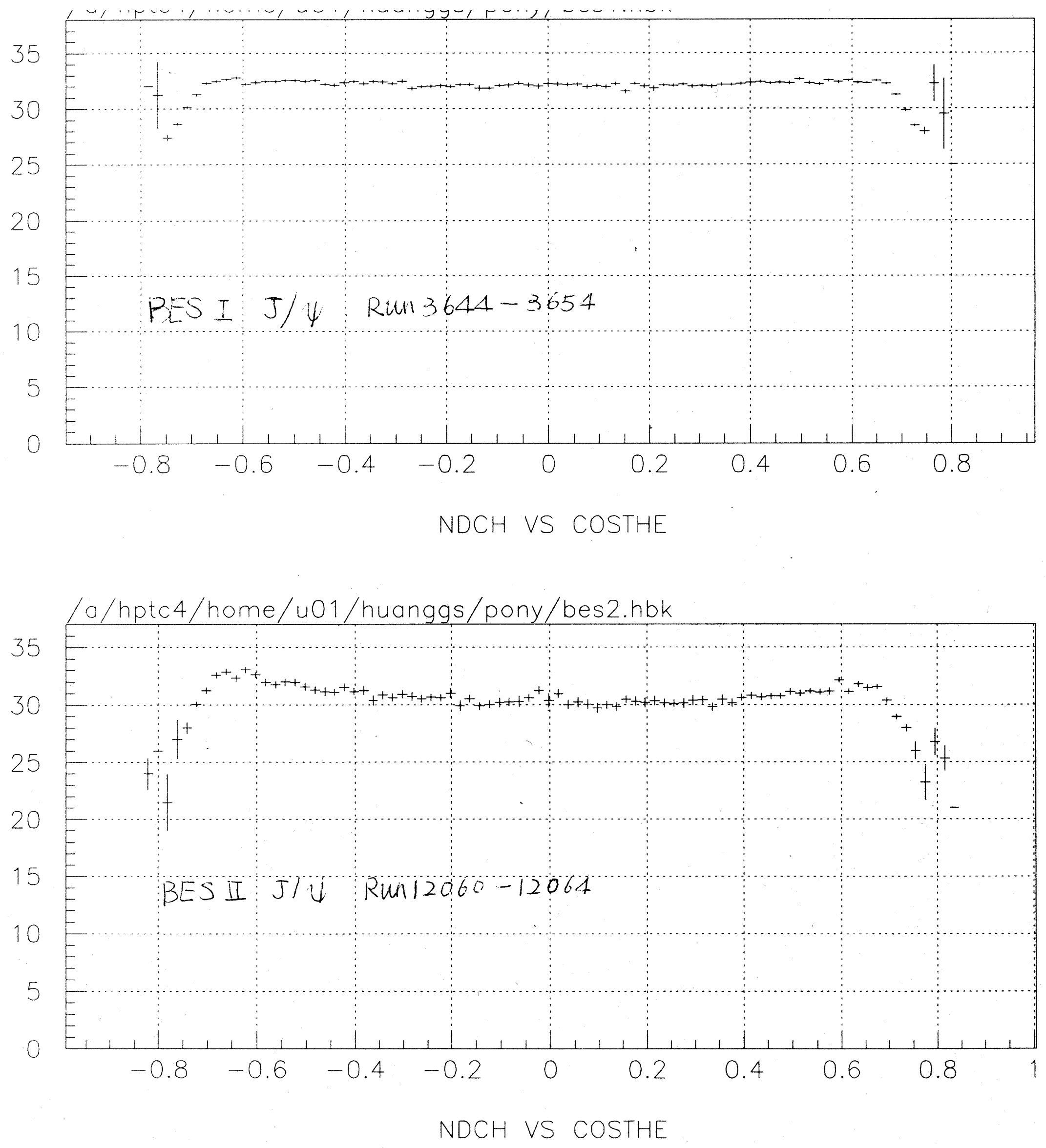

Figure 3: Number of dEdx hits vs $\cos\theta$ of charged tracks for hadron events. (a) J/ψ data of BES-I; (b) J/ψ data of BES-II.

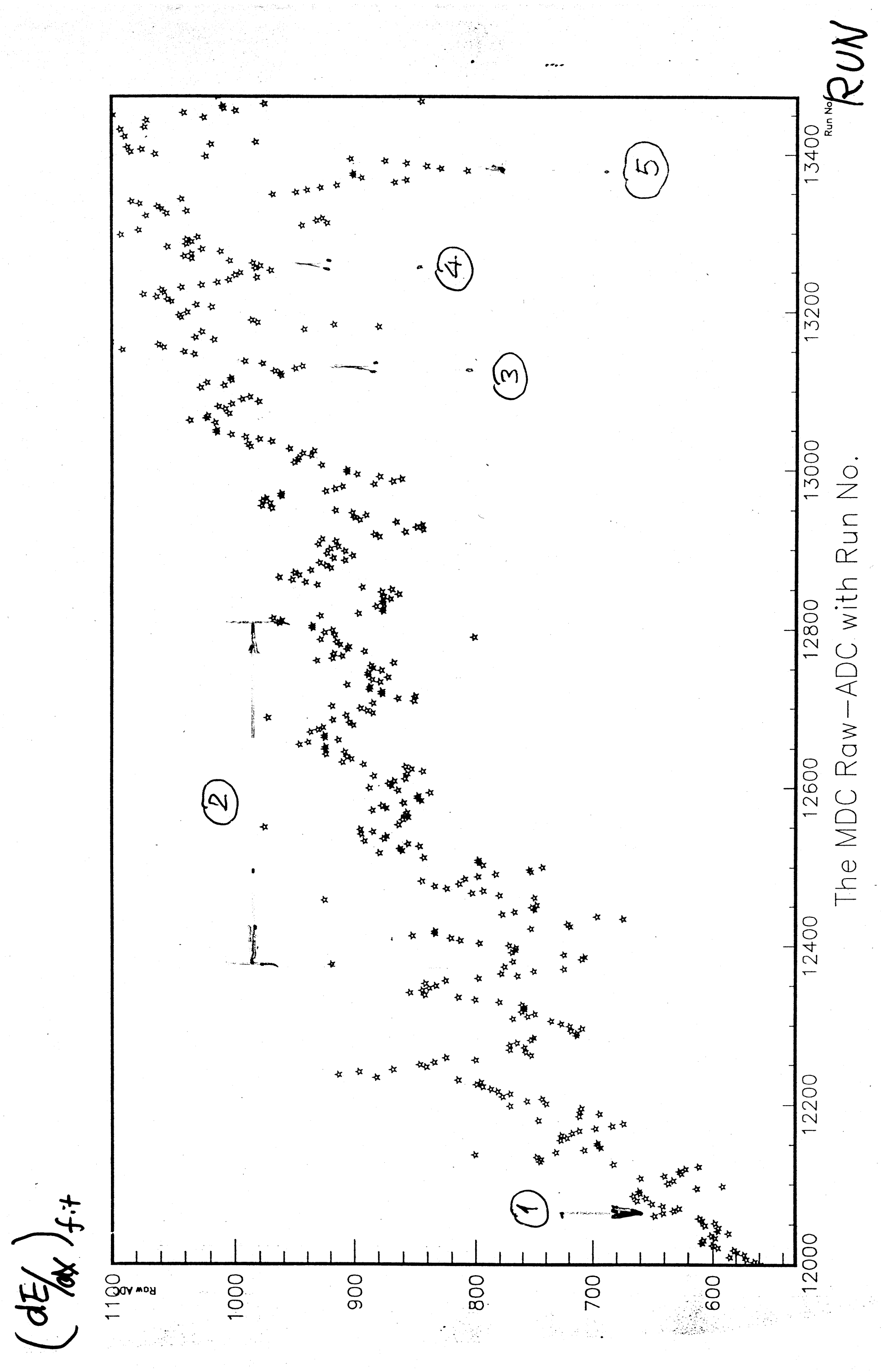

Figure 4: Averaged dEdx, found with a fit of dEdx distribution from hadron tracks, vs run numbers of data taken in 1999.