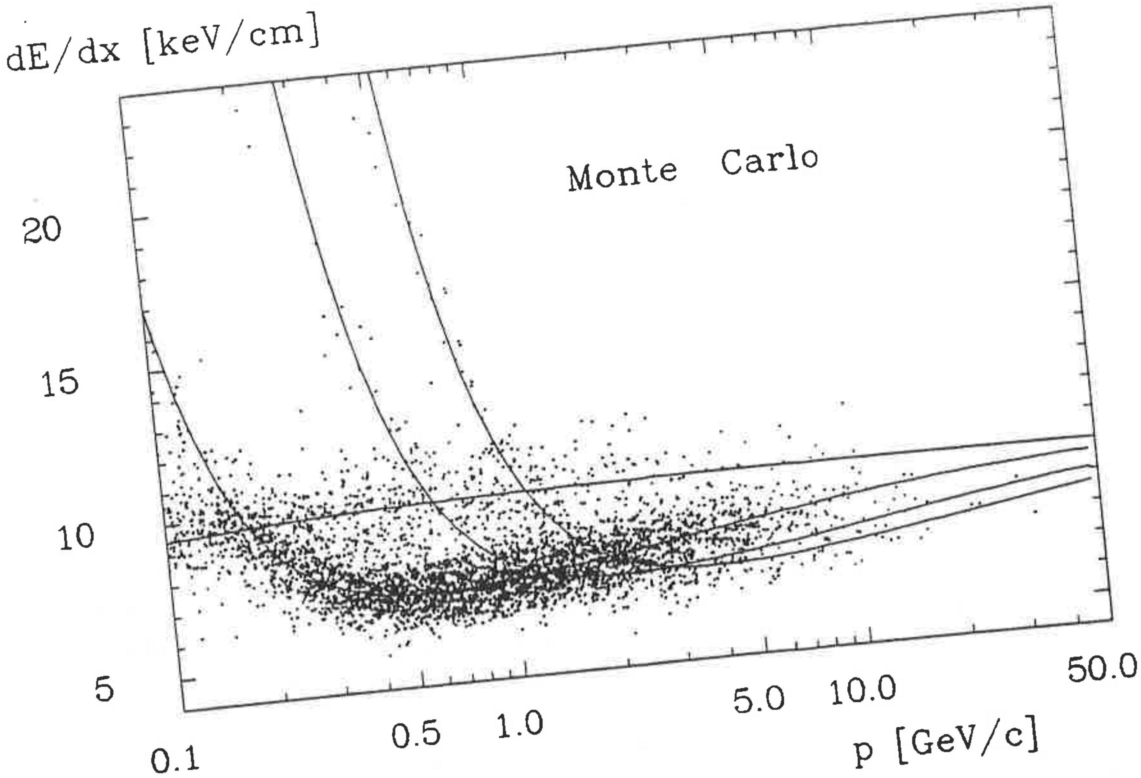

Figure 1: dE/dx vs momentum for multihadronic events. The curves indicate the theoretical values for the standard particles.

Implementation Two main routines had to be modified:

ZSFIT The main task of this routine is to perform $z-s$-fits. It also has to perform a detailed hit selection which is used in DEDXBN (see Jade Computer Note 96). The routine now also provides this information for Monte Carlo data. In fact, the quality of the 'hit cleaning' procedure which is also applied for real data could be verified this way (Fig. 2).

DEDXBN The main routine for the dE/dx calculation had to be modified to execute for Monte Carlo data all parts that are not concerned with the details of the amplitude calibration. The reason for this is that the Monte Carlo amplitude generator produces 'calibrated' amplitudes and no attempt has been made to simulate the behaviour of the raw Jet chamber amplitude. The generator is called within DEDXBN.

The graphics module has been modified to deal with Monte Carlo dE/dx. Note, however, that with every request to recreate a new DEDX bank (command **DEDX -1**) a new Monte Carlo simulation with different random numbers is forced.

DEDXDS The main display routine for dE/dx was changed to place the results of the analysis immediately into a BOS bank. Subsequent commands display the results from this bank rather than calling DEDXBN again, which would cause a new Monte Carlo simulation. For the single track display (command **DEDX n**) the theoretical values are displayed together with the truncated mean analysis.

DEDXB1 This routine was used in earlier single track displays. It was, however, out of date since the last calibration update earlier this summer. It is now obsolete since its function has been integrated into DEDXBN.

Small changes to a few other routines are not mentioned here.

The bank has to be seen in conjunction with the bank JHTL, where the information for a hit j is mapped onto half words, addressed relative to the INTEGER*2 JHTL BOS Pointer:

$$HW(\ldots + 2 + (j-1) * 2 + 1)$$

and

$$HW(\ldots + 2 + (j-1) * 2 + 2)$$

The corresponding dE/dx-Bits can be found in bank JHTQ, addressed relative to the INTEGER*4 JHTQ BOS Pointer:

$$IW(\ldots + 1 + (j-1)/NHPW + 1)$$

at bit position

$$31 - mod(j-1, NHPW) * JHTQBT$$

and

$$31 - (mod(j-1, NHPW) * JHTQBT + 1)$$

respectively. (IBM notation! Bit 31 denotes lowest order bit.)

The bank JHTQ is deleted after calculation of dE/dx-values in DEDXBN.

	80	81	82	83	84	85	86
$\sigma\left(\frac{z_{01}-z_{02}}{\sqrt{2}}\right)$ (mm)	14.3	12.7	13.0	16.6	18.4	17.2	25.4
with z-chamber:					13.5		20.0
$\sigma\left(\frac{\cot\vartheta_1+\cot\vartheta_2}{\sqrt{2}}\right)/10^{-3}$	34	28	31	35	37	37	48
with z-chamber:					25		30

Table 1. Resolutions for μ-pairs with and without z-chamber.

and hence the comparison with the FADC was not quite fair. The values given here in Table 1. separately for the years correspond to fits without constraints. While the width of the $(z_{01} - z_{02})/\sqrt{2}$ distribution directly represents the measurement error, the width of $(\cot\vartheta_1 + \cot\vartheta_2)/\sqrt{2}$ includes the effect of initial state radiation as explained in JCN 95.

The results with the z-chamber are not shown separately for '84 because of the smallness of the statistics. Table 1. represents the net improvement, no selection was made for tracks with z-chamber hits. The fraction of tracks with two associated z-chamber hits is 78%, with one hit 4% in the DL8 sample, 63% and 11%, resp. in the FADC sample. (The hits are allowed to be discarded in the course of hit cleaning in ZSRFT1. This might be one of the reasons why the optimum weight is smaller than expected and why supplying both hits gives slightly better result than just giving one hit with averaged coordinates although, in case of two hits, even relatively small calibration errors might disturbe the fit due to the large weight.) Subtracting the effect of the initial state radiation, one obtains for the improvement in the intrinsic angular resolution 19/33 for the DL8 and 25/45 for the FADC which are close to factor half even without correcting for the fact that not all tracks have z-chamber hits. (One would roughly expect an improvement of 0.3 in the angle and a smaller improvement, factor 0.6 in z_0 when fixing the track completely at the z-chamber.)

The performance of the z-chamber in multihadronic events is not known in detail. For long isolated tracks, it should be just as useful as for μ-pairs or Bhabha's. The only check I've made was to look at the distribution of χ^2_{z0} (introduced in JCN 95) which measures the spread of the track intersections at $r = 0$ within events. A definite improvement can be observed in Fig.2*d* although the fraction of tracks with two z-chamber hits is only 45% and with one, 10%. These figures can slightly be increased by loosening the acceptance cut for the hit association from 75 to 100 mm. Since no further improvement was seen, I left the value set by Susan (probably optimized for the DL8).

Since the z-chamber seems to provide a fair improvement, I've tried to understand why Susan failed to demonstrate it in the K^0 mass resolution. According to the current state of the code, she provided just one hit (the one on the outer wire in case of two associated hits) to the fitting routine ZRVOPT. The weight was chosen to be 800 (divided by $\sqrt{2}$ in case there was

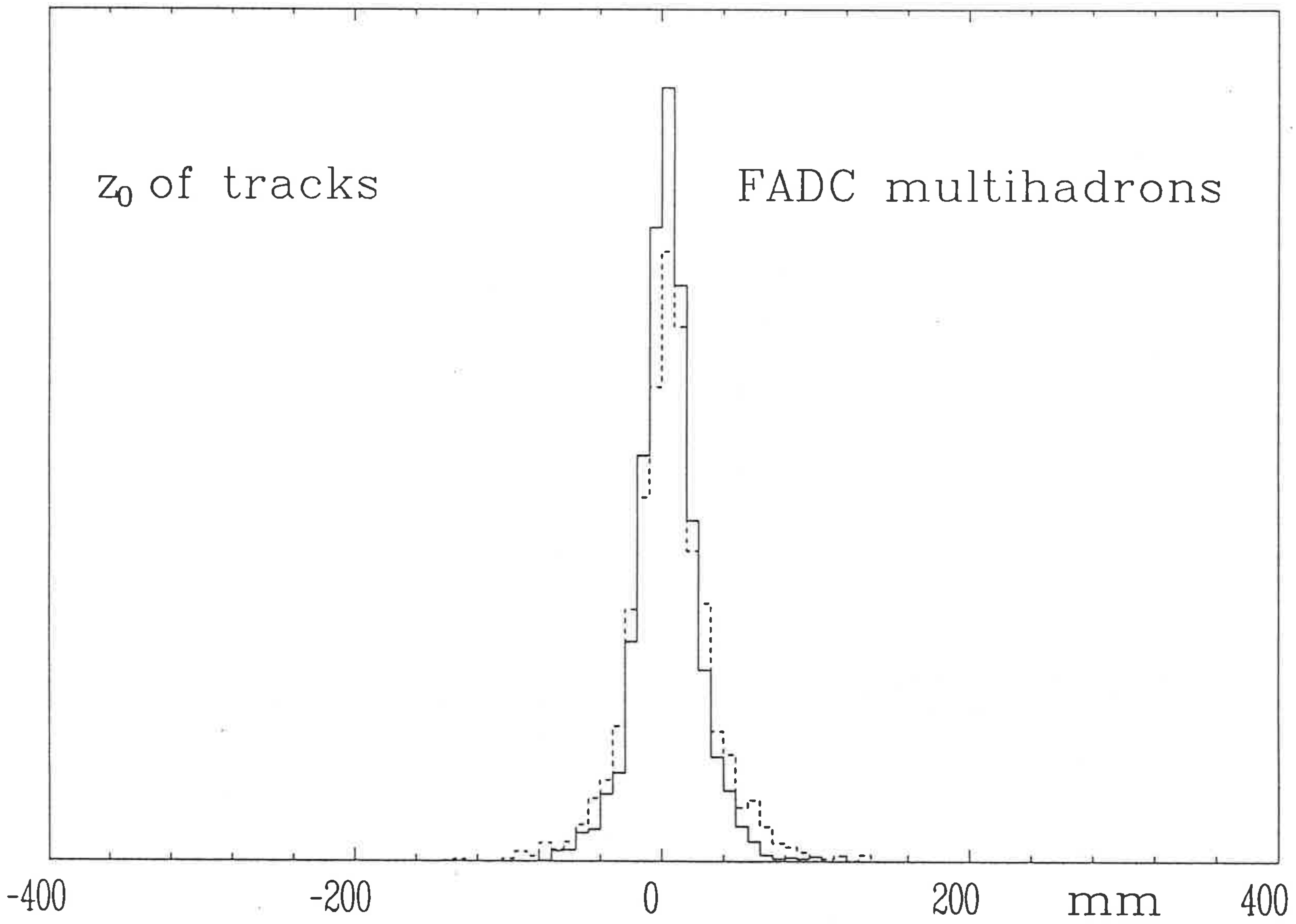

Fig.11. Common z fits w/ and w/o constraint to $z \approx 0$ (ZSRFTV)