XXF(1-3) - E1,E2,A, fitted values of the measured quantities
CHI = value of chi-squared
NST = number of steps to converge (-1 means solution not found in LITER iterations)

MATHEMATICAL DESCRIPTION

The standard technique for adjusting the values of a set of measured quantities to be consistent with some set of constraints is the method of least squares. One writes the sum of squares of the discrepancies between the data and the (unknown) values of the adjusted quantities and adds to this the products of the Lagrange multipliers and the constraint functions. Minimizing this sum then provides the necessary condition for a local minimum which also satisfies the constraints. In the current case we have only one constraint so the modified least squares sum can be written as:

$$M=\sum_j\Big((X_j-x_j)/\sigma_j\Big)^2 -\lambda(X_1X_2X_3 - \mu)$$

where X_1 and X_2 are the fitted energies, X_3 is the fitted angle variable ($\sin^2(\delta/2)$). The x_j are the corresponding measured values and $\mu=(EMAS)^2/4$. Minimizing this expression with respect to the X_j and λ leads to the four equations (skipping some of the algebra):

$$(1)\quad X_1 = \frac{1+(1/\gamma)W}{1-W^2}\,x_1$$

$$(2)\quad X_2 = \frac{1+\gamma W}{1-W^2}\,x_2$$

$$(3)\quad X_3{}^3 = x_3X_3{}^2+x_3{}^3\alpha W$$

$$(4)\quad (1-W^2)^2 = \rho(X_3/x_3)\Big((1+W^2)+\beta W\Big)$$

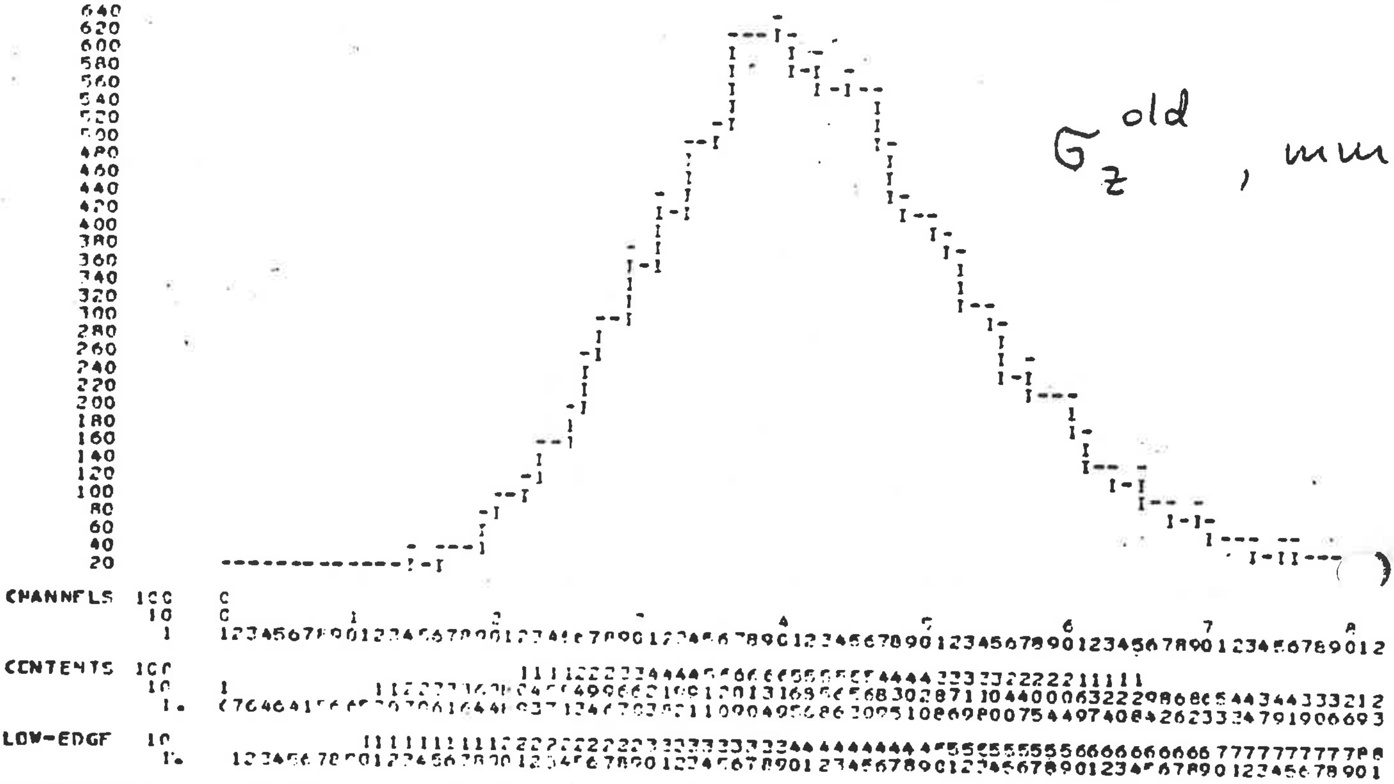
Several abbreviations have been introduced:

$$W = \lambda\sigma_1\sigma_2X_3$$

$$\gamma = (\sigma_2/\sigma_1)(x_1/x_2)$$

SIG OLD

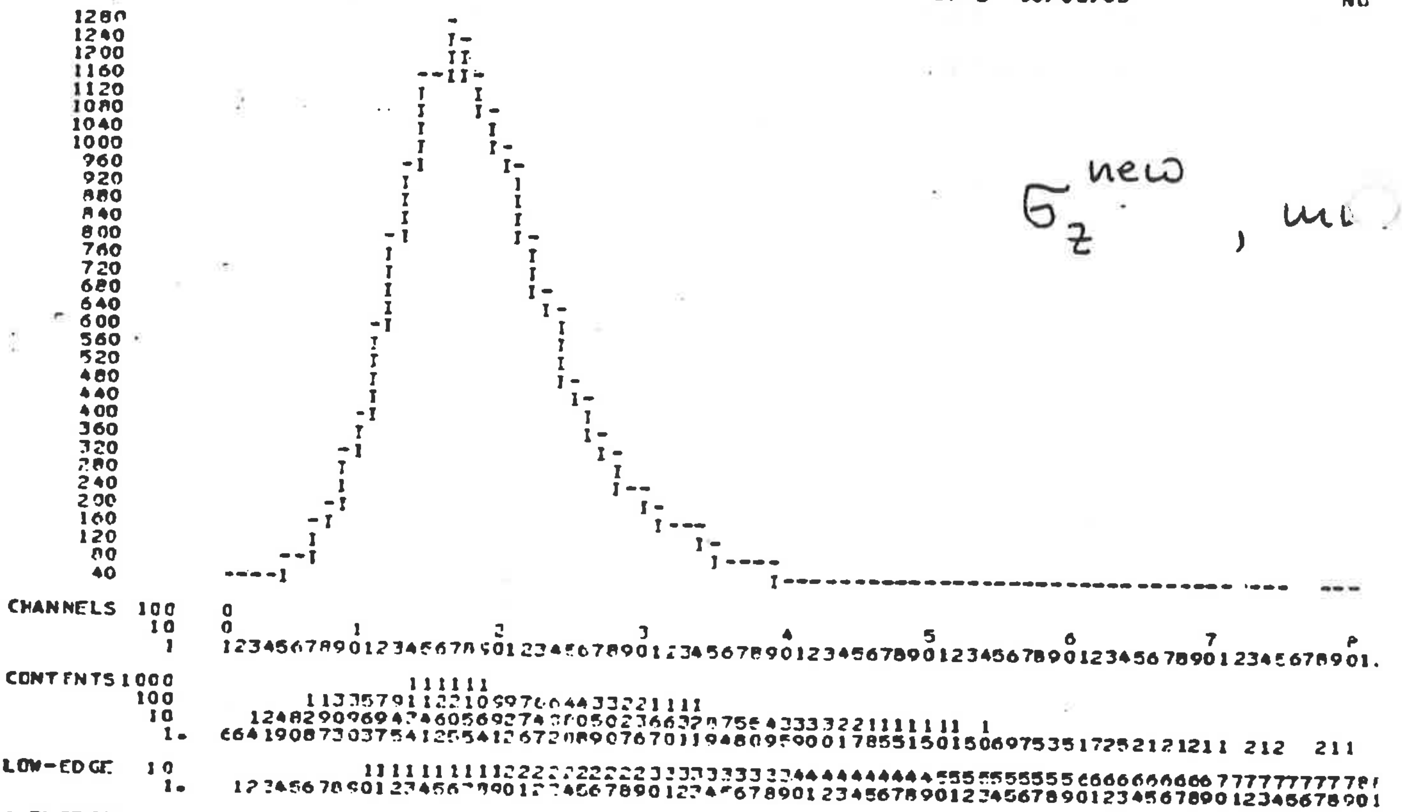
HBOOK ID = 4 DATE 05/05/83



* ENTRIES = 17687 * ALL CHANNELS = 0.1765E+05 * UNDERFLOW = 0.0 * OVER
* BIN WID = 0.1000E+01 * MEAN VALUE = 0.4267E+02 * R . M . S = 0.1307E+02 * ABNO

SIG NEW

HBOOK ID = 5 DATE 05/05/83 NO



* ENTRIES = 17687 * ALL CHANNELS = 0.1767E+05 * UNDERFLOW = 0.0 * OVER
* BIN WID = 0.1000E+01 * MEAN VALUE = 0.1878E+02 * R . M . S = 0.7646E+01 * ABNO

Fig. 1

A measure for the improvement of recalibration and refit is

$$\sigma_z = [\Sigma(z_i^{meas} - z_i^{fit})^2/(n-2)]^{1/2}$$

In Fig. 1 the σ_z distributions before and after recalibration, refit and hit-cleaning are given. As an example, how the mass resolution of the JADE detector can be improved, the K^0 mass spectrum for 1981 data is shown in Fig. 2 - without and with z-recalibration. (Note however that Komamiya with a special hit cleaning program has obtained a nearly as good mass resolution for the K^0).

Programs for z-Calibration

A set of programs together with a calibration data file has been established for common usage.

The programs are on the library

F11LHO.JADEGS (Source)
F11LHO.JADEGL (Load)

and the calibration file name is

DSN = F11DIT.ZCAL8305

The user has to make two calls for each event :

1. CALL ZSREAD(NRUN,LUN)
   or CALL ZSSPEC (NRUN,LUN) if the supervisor is not used.

2. CALL ZSFIT(IJETC,IJETU, IJHTL, IPATR, MODE)

note update!

with the following parameters :

NRUN	=	current run #
LUN	=	FORTRAN unit of calibration file
IJETC	=	pointer to calibrated jet chamber bank
IJETU	=	pointer to uncalibrated jet chamber bank (= IDATA(IJETC-1))

Any member of the JADE group should be able to submit the program during the shifts with the help of the NEWLIB CLIST facility. For this purpose a new identifier and password have been introduced :

Identifier	:	JADEOL
Password	:	JADE

The names of the source and load libraries are :

PS	:	REFORM.S
PL	:	REFORM.L

The program is started by entering the name of the CLIST member in parentheses :

(#REFORM)

The CLIST is self-explanatory.

The two text members FASTSTAT and RUTHSTAT are automatically listed on the screen. With the help of these listings the user should select the number of the next YEN tape and REFORM tape which will be processed by the REFORM-job. The RUTHSTAT text member gives the numbers of free Rutherford tapes from which the user has to chose one.

After job submission the text members are updated.

The CLIST may be terminated at any stage before the actual submission of the REFORM job. The last chance of aborting occurs after the input of 'SUB' when the user is asked whether he really wants to submit the job. After abortion the CLIST may be started again by typing (#REFORM) in the command field. Aborting the CLIST has no further consequences.

II. Analysis step

The selected data on the FASTSEL-files are analyzed by a program written by M. Minowa, which includes pattern recognition. The ANALYSE program produces the following output files :

i. F22MIN. MUHA.DS...
   this file contains clean multihadron events

ii. F22MIN. SCAN.DS...
   this file contains multihadron candidates, which require visual inspection

iii. A luminosity summary file is updated

D. Format of banks VECT

VECT, 0: 4-vectors and origins of the particles supplied to the tracking program

I * 4	1	length of header LØ (≤ 13)
"	2	length of particle data L1 (= 10)
"	3	event no.
"	4	no. of final state particles = nf_1
"	5	no. of charged particles in the final state
"	6	" neutral "
R * 4	7	PHI } angles of jet axis
R * 4	8	cos (THETA) } angles of jet axis
I * 4	9	primary quark flavour (1,2,3,4,5) for (u,d,s,c,b)
I * 4	10	if not zero, jet pointers:
"	11	particles in jet 1, jet 1 + 2, jet 1 + 2 + 3
"	12	in the following list.
I * 4	13	beam energy in MeV

LØ+1
:
LØ+L1 } data of 1. track

LØ+L1+1
:
LØ+2*L1 } data of 2. track

repeated nf_1 times.

- data for a track:

R * 4	1	p_x
"	2	p_y
"	3	p_z
"	4	E
"	5	m
I * 4	6	q
I * 4	7	type
R * 4	8	x } of origin
"	9	y } of origin
"	10	z } of origin

D. Format of banks VECT

VECT, 0: 4-vectors and origins of the particles supplied to the tracking program

I * 4	1	length of header LØ (≤ 13)
"	2	length of particle data L1 (= 10)
"	3	event no.
"	4	no. of final state particles = nf_1
"	5	no. of charged particles in the final state
"	6	" neutral "
R * 4	7	PHI } angles of jet axis
R * 4	8	cos (THETA) } angles of jet axis
I * 4	9	primary quark flavour (1,2,3,4,5) for (u,d,s,c,b)
I * 4	10	if not zero, jet pointers:
"	11	particles in jet 1, jet 1 + 2, jet 1 + 2 + 3
"	12	in the following list.
I * 4	13	beam energy in MeV

LØ+1 ... LØ+L1 } data of 1. track

LØ+L1+1 ... LØ+2*L1 } data of 2. track

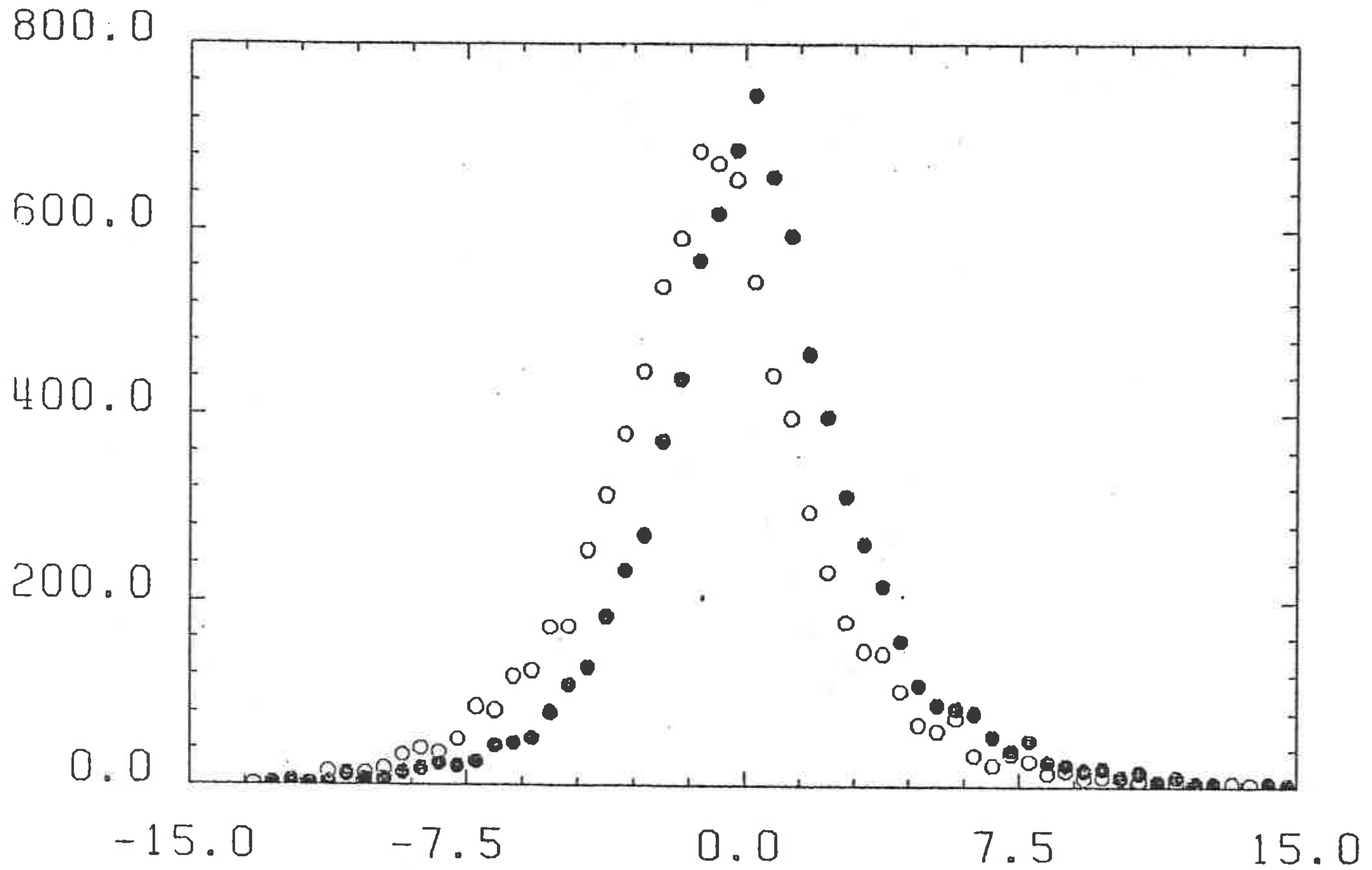
etc.

- data for a track:

R * 4	1	p_x
"	2	p_y
"	3	p_z
"	4	E
"	5	m
I * 4	6	q
I * 4	7	type
R * 4	8	x } of origin
"	9	y } of origin
"	10	z } of origin

13

```
N=F11G0D.GEP.T4JTRK
/05/81 KA    1   1
.15.10 KB   59 158
       KC    0   0
     NSYM  -12  -2
```



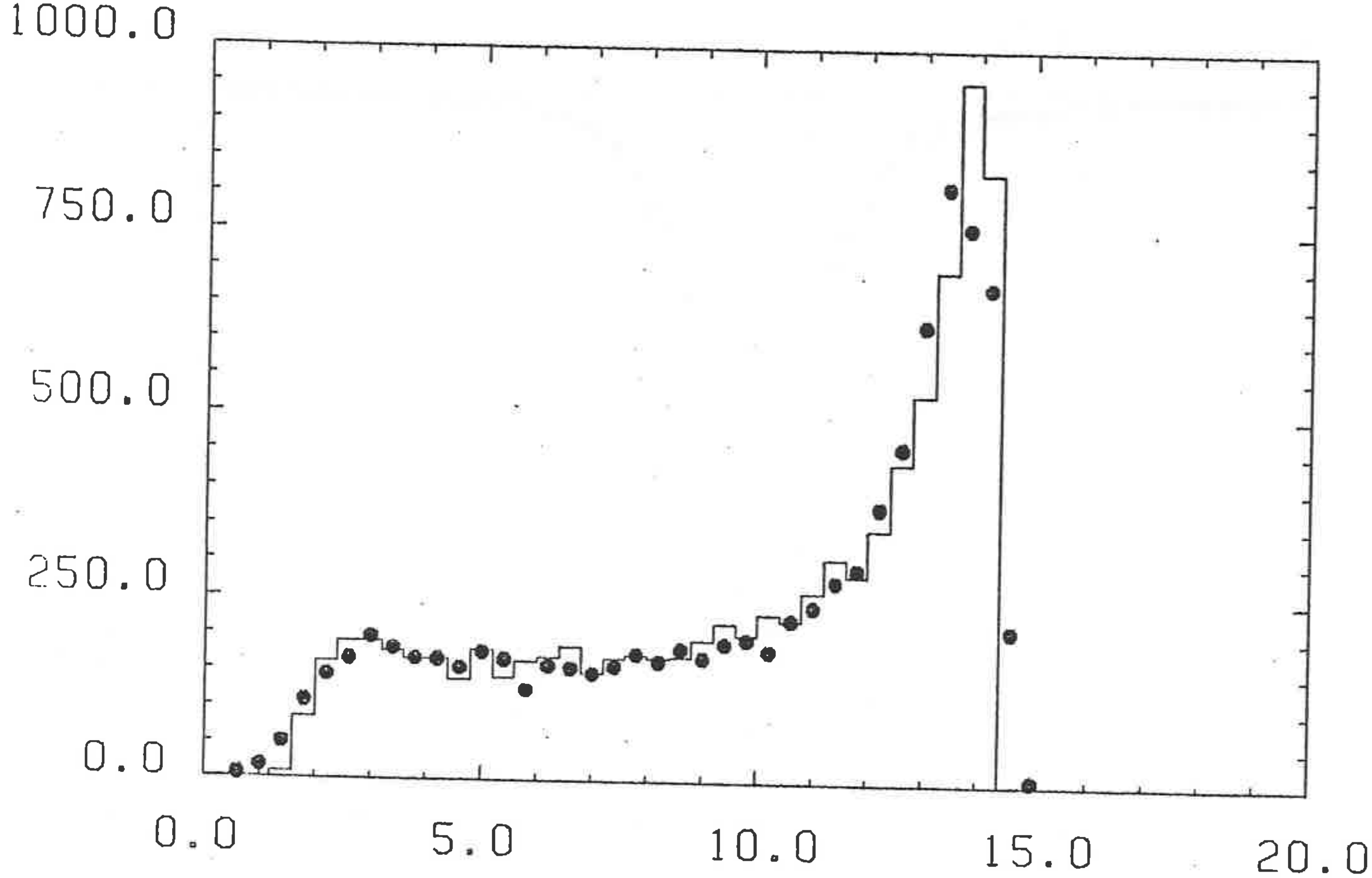
FOUR-JET TRACKED

~~VIS-JET E~~ E_{REC}-PAR E

13

11

DSN=F11GOD.GEP.T3J4V
06/04/81 KA 1 1
14.36.00 KB 9 12
KC 0 0
NSYM 10 -2



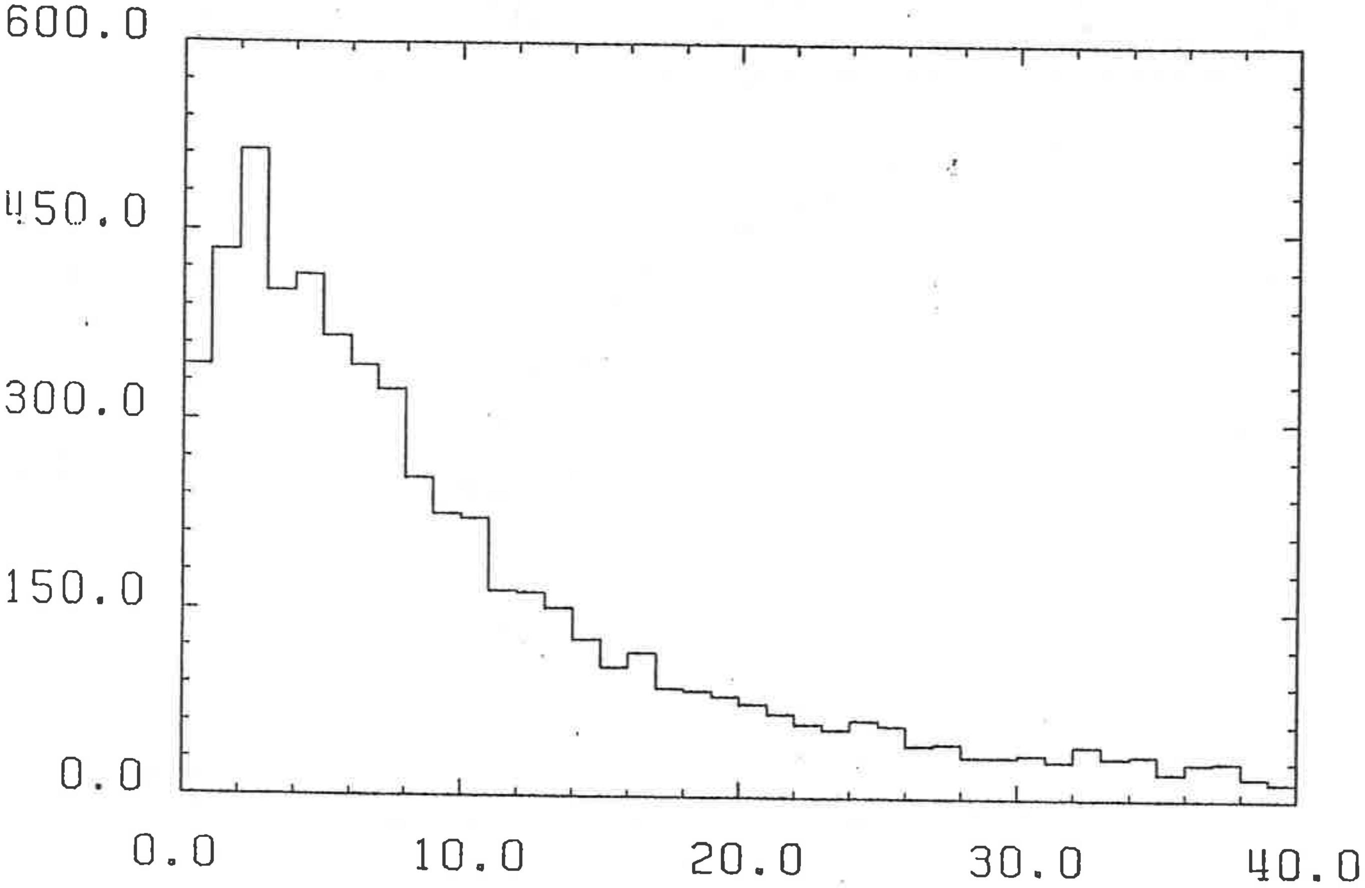
THREE-JET 4V
PARTON E

11

START OF PAGE

9

DSN=F11G0D.GEP.T4J4V
10/03/81 KA 1
17.03.21 KB 104
KC 0
NSYM 10

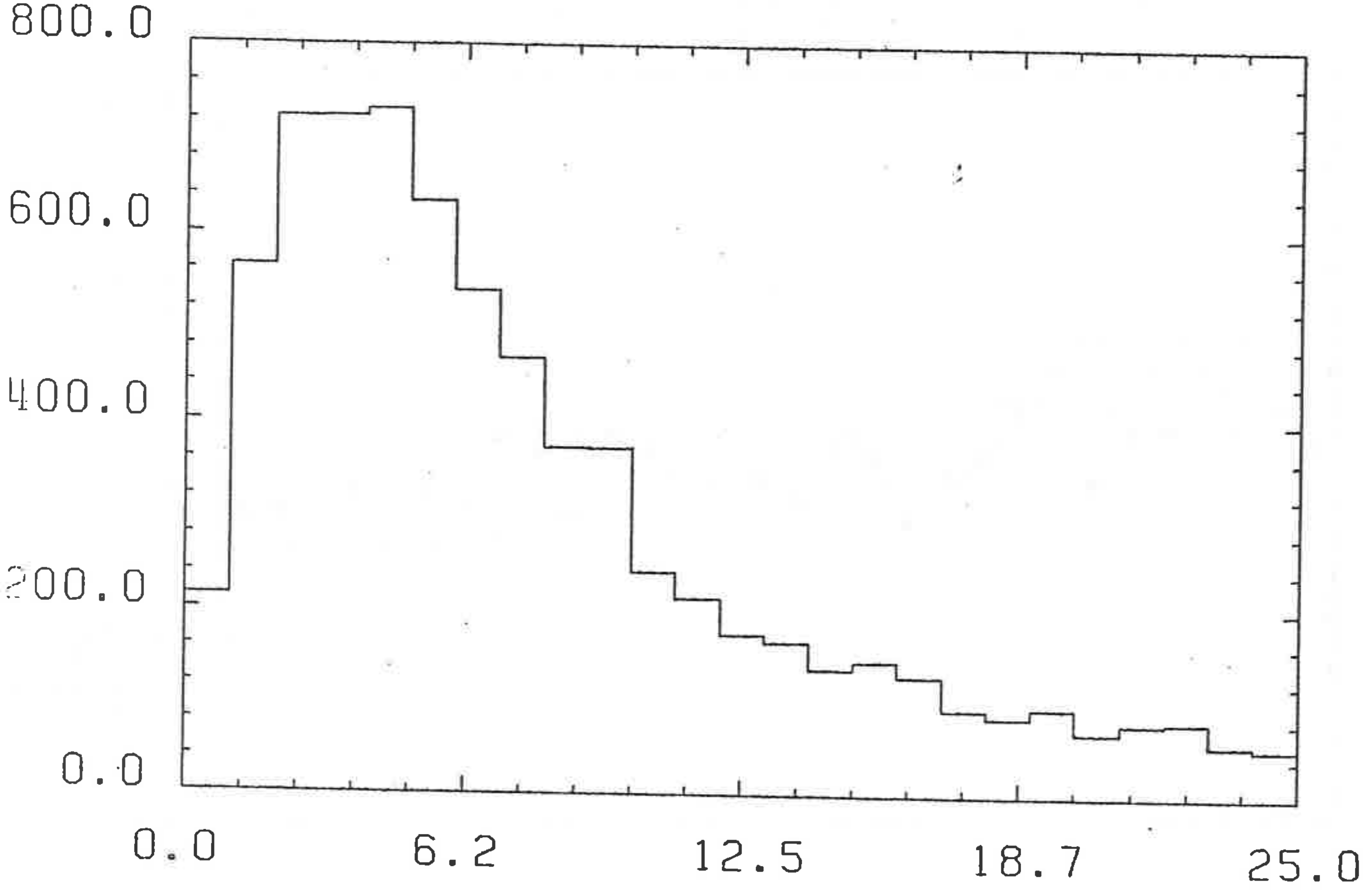


FØUR-JET 4V
MIN ERRØR TØ SUM

8(a)

8 (a)

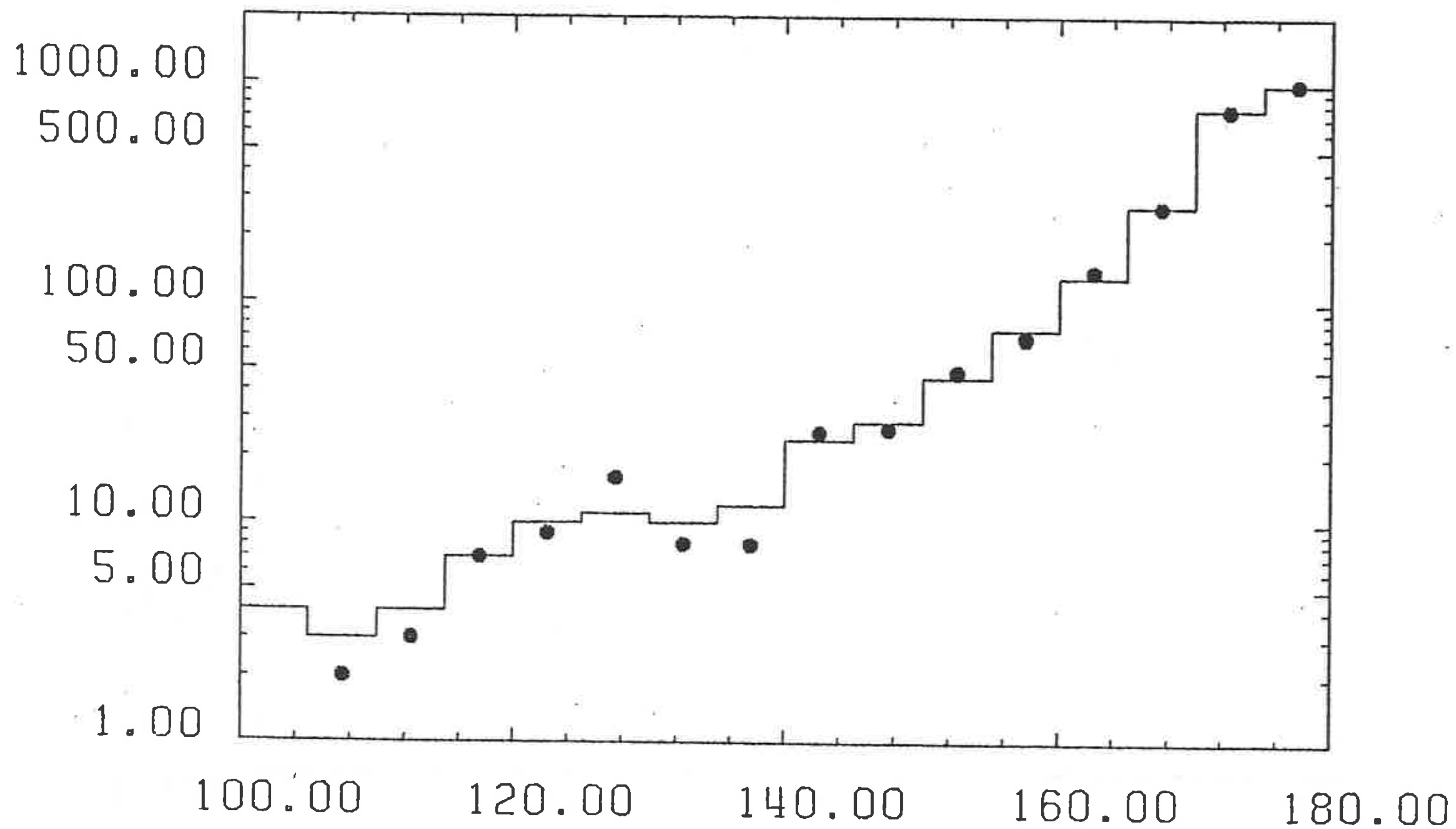
SN=F11G0D.GEP.T3J4V
5/03/81 KA 1
6.59.26 KB 20
KC 0
NSYM 10



THREE-JET 4V
ERRØR (WITH MATCHING)

DSN=F11GOD.GEP.T2JTRK4V
11/03/81 KA 1 1
23.47.51 KB 498 1499
KC 0 0
NSYM -2 10

6

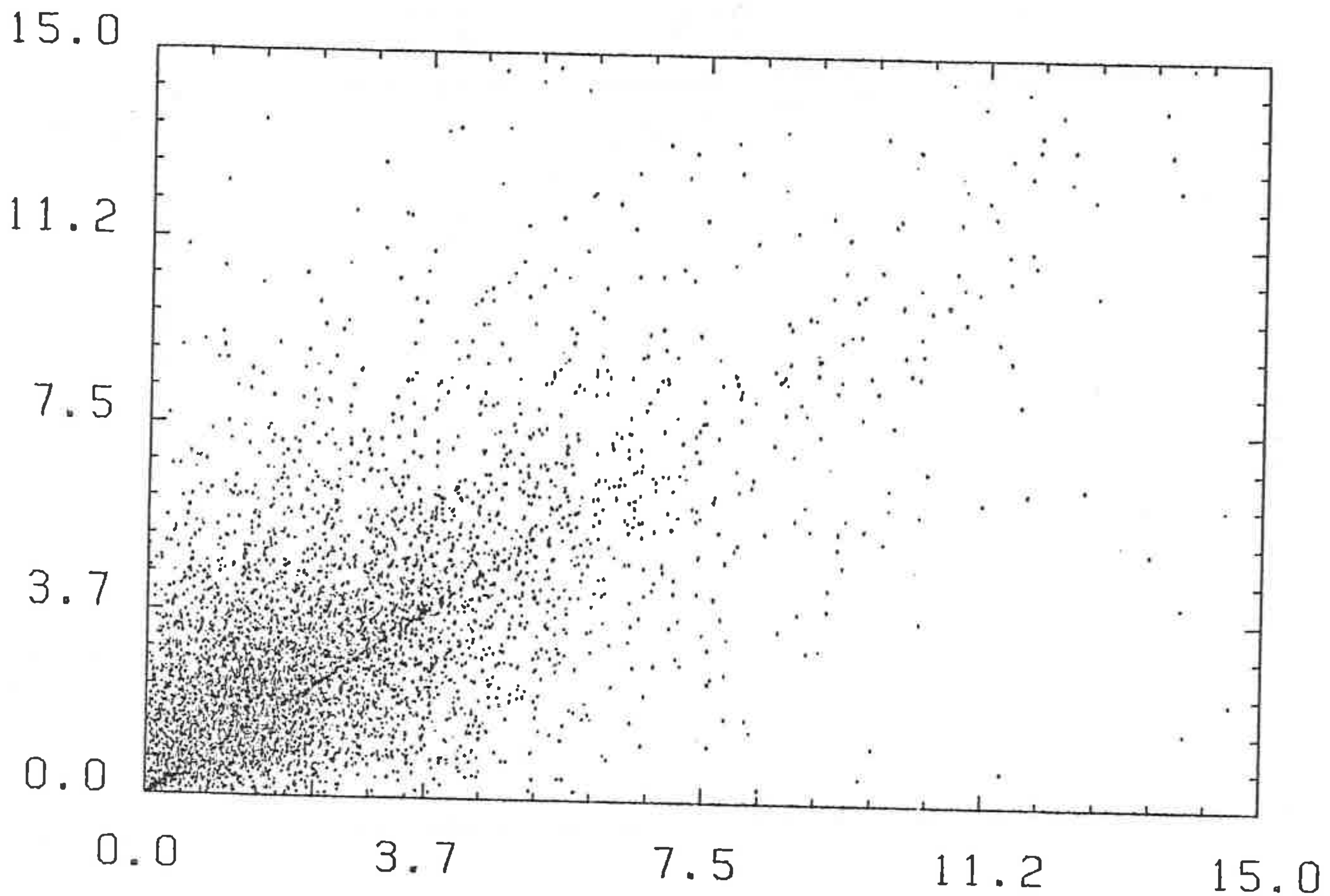


TWO-JET 4V
ANGLE VIS MC

START OF PAGE 1

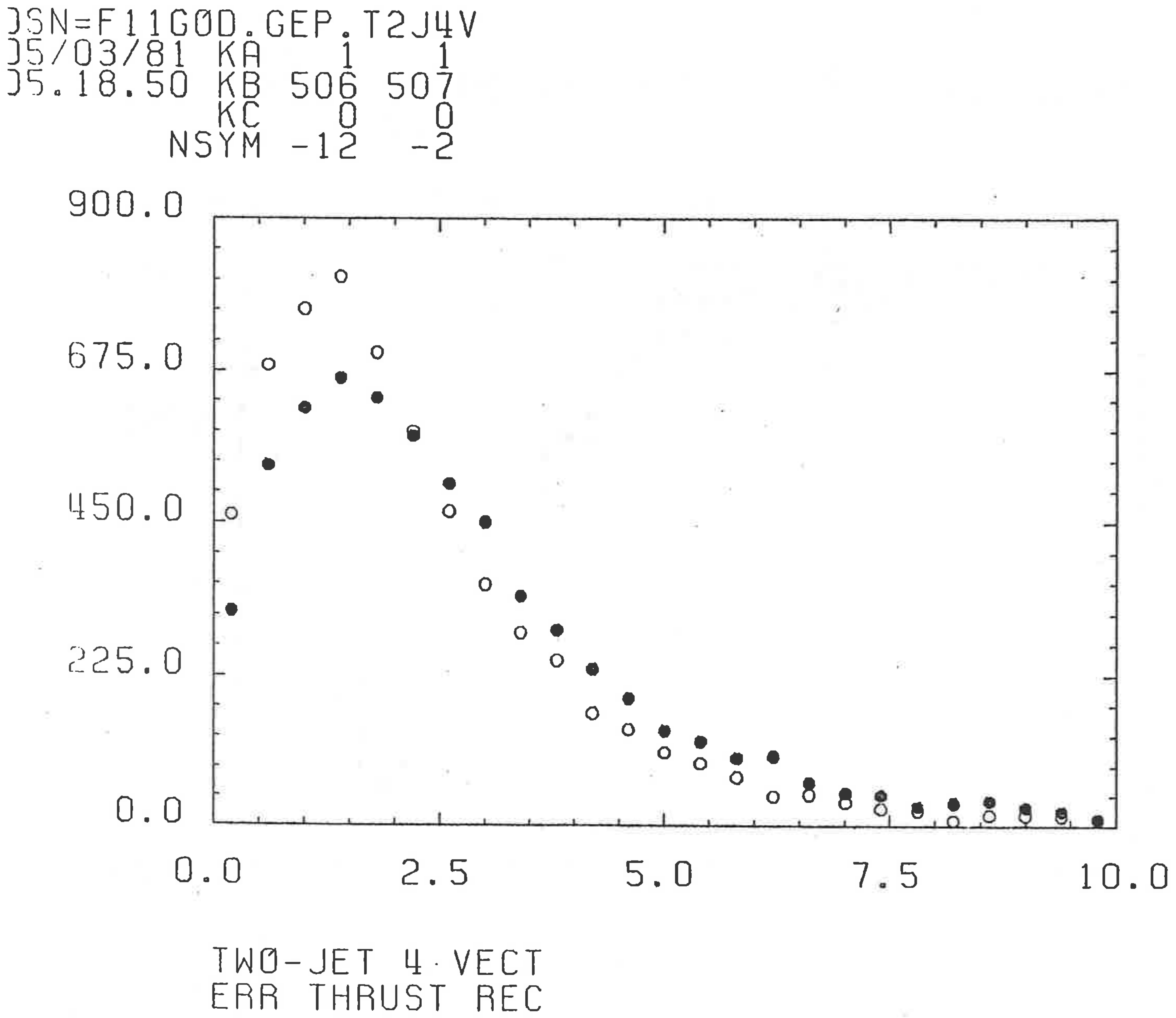
4

DSN=F11G0D.GEP.T2J4V
05/03/81 KA 2
05.21.37 KB 508
KC 0
NSYM -3



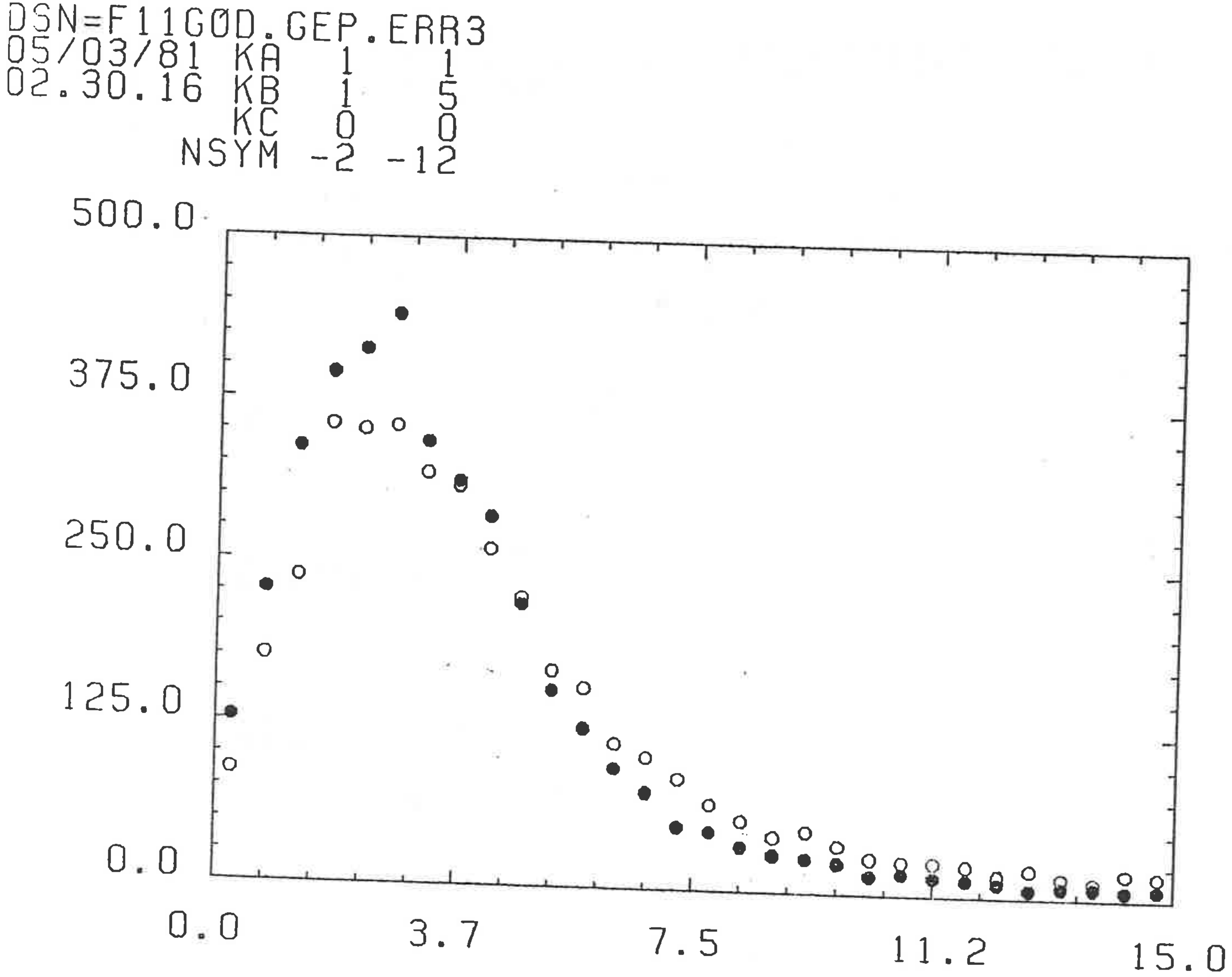
TWØ-JET 4 VECT
ERR THR REC VS ERR THR

4


DSN=F11G0D.GEP.T2J4V
05/03/81 KA 1 1
05.18.50 KB 506 507
KC 0 0
NSYM -12 -2
900.0
675.0
450.0
225.0
0.0
0.0
2.5
5.0
7.5
10.0
TWO-JET 4 VECT
ERR THRUST REC

2

1(b)



THREE-JET
ERRØR IN RECØNSTRUCTING JET AXIS FRØM FRAG PRØDUCTS (G=0)

1(b)

Table 1

Number of Events Reconstructed per Sec

Multiplicity					
	15	19	22	28	35
2-jet Thrust	460 9	390 7	350 7	300 7	
3-jet Triplicity Gen Spher	70 30 2	55 14	45 9 0.7	35 4	
4-jet TASSO 4-J	42	32	28 0.5	22	 0.1

References and Footnotes

1) I do not consider cluster-finding algorithms which search for clusters of particles in events rather than a pre-determined number of jet axes.

2) S. Brandt, H. Dahmen, Z. Physik C1, 61 (1979)

3) S. Wu, G. Zobernig, Z. Physik C2, 107 (1979)

4) S. Wu, DESY 80/127 (1980)

5) The two configurations for three-jet events are:

$$\vec{T}_1^{(o)} = \vec{x} \; , \; \vec{T}_{2,3}^{(o)} = -\vec{x} \pm \vec{z}$$

plus one configuration with the above axes reversed. $\vec{X}$ is the thrust axis (previously determined from TWO-Jet reconstruction) and $\vec{Z}$ is in the event plane perpendicular to $\vec{X}$.

6) A.Ali, E. Pietarinen, G. Kramer, J.Willrodt, Phys. Lett. 93B, 155 (1980)

7) R. Field, R. Feynman, Nucl. Phys. B136,1 (1978)

8) Coded by E. Elsen

9) F. Berends, R. Kleiss, DESY 80/73 (1980)

10) The visible jet direction is the vector sum of the visible fragmentation products.

11) J. Ellis, M. Gaillard, G. Gross, Nucl. Phys. B111, 253 (1976)

12) This equation is valid only if all angles are less than 180 degrees.

13) Coded by T. Kobayashi

Figure Captions

1) The angle between the generated parton axis and the axis determined using all of the fragmentation products of the jet, for two-jet (A), three-jet (B) and four-jet (C) events. The open circles correspond to neutrinos and K_L^0 not being included in the axis determination.

2) The difference between the generated two-jet axis and the reconstructed thrust axis for the standard thrust algorithm (closed circles) and this algorithm (open circles).

3) The difference between the thrust axis determined using the two algorithms.

energies of three-jet events. The jet energies are obtained by simply scaling the raw reconstructed energies by the quantity alpha:

$$\alpha = \sqrt{s} / \sum_K E_K^R$$

where E_K^R is the raw reconstructed energy of jet K. Figures 13 and 14 show the resolution obtained. The sigma for reconstructing the jet energies is about 2 GeV.

Timing

Table 1 compares the CPU time required by this algorithm to that needed by others. For two-jet (or thrust) reconstruction I compare with the standard thrust routine used in JADE[8]. The time needed for three-jet reconstruction is compared with the triplicity routine used in JADE[13] and by TASSO[3]. The four-jet reconstruction is compared with TASSO's algroithm[4].

The table shows that the present algroithm is approximately fifty times faster for thrust axis determination from two to one hundred times faster for three-jet reconstruction and ten to one hundred times faster for four-jet reconstruction. There is only a very weak (approximately linear) dependence on event multiplicity.

How to Use the Routine

The program exists on the libraries 'F11LHO.JADEGS/L'.

1) Input

The user must fill the following common block before each call to the subroutine:

```
    COMMON/SENSE/PP(4,100),INUM
```

The array PP contains INUM particles to be used in the reconstruction. The momenta in the X,Y,Z directions for track K should be stored in PP(1,K), PP(2,K), PP(3,K). In location four the user may store a track

Because of radiation in the initial state, the parton axes in two jet events are in general not 180 degrees apart. Figure 5 shows the angle between the generated parton axes in two jet events versus the energy of the radiated photon in the initial state[9]. Figure 6 compares the angle between the visible jet directions from the Monte Carlo[10] and the angle between the reconstructed jets . The reconstructed angle is then used to determine the energy of the initial state photon. Figure 7 compares this reconstructed energy with the photon energy predicted by the Monte Carlo. The figure shows only the result for medium energy photons although the distributions are normalized to the same number of events in the complete spectrum. For photon energies close to zero the reconstructed energy is extremely sensitive to the angle between the jets and therefore the reconstruction is not accurate in this region. Since the algorithm is primarily intended to reconstruct two jet events where the jets are nearly back to back it does not efficiently reconstruct the hard part of the photon spectrum where the jets are very close together. This could be easily rectified by including an additional configuration for these cases. However, for medium energy photons figure 7 shows that the reconstructed spectrum agrees quite well with the Monte Carlo prediction.

3) Three and Four Jet Reconstruction

The errors in reconstructing the jet directions for three jet and four jet events are determined by matching the Monte Carlo axes to the reconstructed axes. This is achieved by permuting the ordering of the Monte Carlo axes. That permutation which minimizes the differences between the reconstructed and Monte Carlo axes summed over all jets in the event determines the correspondence. The errors in the spatial reconstruction of the jets determined in this way are shown in figure 8. Using the triplicity method[13] gives results indistinguishable from figure 8. Figure 9 is shown so that the reader may compare it to the similar distribution in ref. 4. One concludes from this comparison that the reconstruction errors of the two algorithms are essentially the same.

for each jet. For the results shown here δ was one degree and this typically required four or five iterations.

How well the reconstructed axes correspond to the real jet axes depends on how good a choice for the zeroth approximation we can find. In general the iteration will converge on the real jet axis K if $C_K^{(1)}$ contains most of the fast particles from the fragmentation of parton K and none from any other. This means that the $\vec{T}_K^{(0)}$ should be chosen such that if $\vec{T}_{K'}^{(0)}$ is the closest of all the $\vec{T}_K^{(0)}$ to parton jet K then the closest parton jet to $\vec{T}_{K'}^{(0)}$ is jet K. In other words there should be an unambiguous one to one correspondence between $\vec{T}_K^{(0)}$ and real jet axes. The set of $\vec{T}_K^{(0)}$ for reconstructing M jets is called a 'configuration'. The configurations are chosen to meet the condition above based on Monte Carlo studies of jet events. For two jet events there is only one configuration and this is where $\vec{T}_1^{(0)}$ is the fastest particle in the event and $\vec{T}_2^{(0)} = -\vec{T}_1^{(0)}$. Two configurations are used for three jet events and 10 for four jet events[5].

After convergence of the iteration we have a set of $\vec{T}_K$ from each configuration. That set with the maximum value of T is chosen as the final reconstructed jet axes.

Although this algorithm can reconstruct an arbitrary number of jets. The present version is coded for only up to four jets. This is sufficient for presently available energies. To extend it to more than four jets one needs to simply include the necessary configurations.

Results

The effectiveness of the algorithm in reconstructing the jet axes can be determined using Monte Carlo events[6]. Since the directions and energies of the partons are known they can be directly compared with the reconstructed quantities. In this manner the resolution in reconstructing the energy and the error in the reconstructed jet directions can be obtained.

Jet Reconstruction

Assume we have a set C_K of N_K particles which are hypothesized to belong to jet number K. Let $\vec{T}_k$ be that function of the momenta which is chosen as the estimator of the original parton axis. This algorithm takes for $\vec{T}_k$ the thrust axis of jet K:

$$\vec{T}_k = \sum_{i \in C_k} \vec{p}_i$$

This is the direction $\hat{N}$ which maximizes the quantity $\sum_{i \in C_k} (\vec{p}_i \cdot \hat{N})$. It has the advantage that it is linear in the momenta and therefore not affected by particle decays. A measure of the correctness of the assignment of C_k to jet K is then :

$$|\vec{T}_k| = \frac{\vec{T}_k \cdot \vec{T}_k}{|\vec{T}_k|} = \sum_{i \in C_k} \vec{p}_i \cdot \hat{T}_k$$

The correctness of the reconstruction of the whole event is measured by:

$$T \equiv \sum_K |\vec{T}_k| = \sum_K \sum_{i \in C_K} (\vec{p}_i \cdot \hat{T}_k)$$

which is, apart from a normalization factor, an extension of the definition of triplicity[2) .

Standard algorithms for the reconstruction of M jets[2,3)] use the method of partitioning the particles of the event into M (non-empty) subsets. This generates all possible sets C_K and the partition which maximizes the chosen function T determines the jet axes. The number of different partitions of N objects into M (non-empty) subsets is:

$$S_n^{(m)} = \frac{1}{m!} \sum_{k=1}^{m} (-1)^{m-k} \binom{m}{k} k^n \qquad (1)$$

$$\sim m^{n-1}/(m-1)! \qquad \text{for } n \gtrsim 10$$

The CPU time needed for one partition is typically 50 microsec. For two jet events this means a fraction of a sec per event for multiplicity 15 but hundreds of seconds for multiplicity 25. Each three jet event would require hours of CPU time. However because three jet events are planar, they can be projected onto the event plane without distorting the under-

IWRK(HPTRO): track number
:
IWRK(HPTRO + 47) } track array in /CWORK) with fit results.

If one wants to replace the track array in the PATR-bank by the new fit results (e.g. if WRK(HPTRØ + 22).LT.ADATA(IPTR + 23): $\sigma_{new} < \sigma_{old}$) one can do so by copying the track array from CWORK TO CDATA:

```
CALL MVCL(ADATA(IPTR+1),0,WRK(HPTRØ),0,192)
```

Users not running their programs under the SUPERV-program must take care that INPATR is called at program start and KALIBR and INPATC are called for each new run. In addition the BLOCK DATA of the SUPERV-program must be included.

The systematic errors of momentum and direction at the origin are very much improved (P. Warming).

Track array in PATR-bank:

Tracks found in the preprocessor step are labelled by a 16 in word 2 of the track array (program identifier).
Tracks assumed to come from the origin in the x-projection are labelled by a 1 in word 4 of the track array (type of 1st point of the track).
Tracks assumed to come from a pair conversion in the beampipe or the pressure tank are labelled by a 2 in word 4 of the track array (type of 1st point of the track). However the fit parameters in the track array are obtained without constraining the track to pass through the origin, or to come from a pair conversion.

```
C
C     3) DRIFT VELOCITY
C
C
C          RING   C (MM/CLOCK)    V(CM/MICRO SEC)     V(NEW)/V(OLD)
C   ---------------------------------------------------------------------
C           1     0.3724              5.032                1.0054
C           2     0.3773              5.010                1.0068
C           3     0.3827              5.041                1.0022
C   ---------------------------------------------------------------------
C
C     4) AVERAGE LORENTZ ANGLE
C
C       ALPHA =   21.0 DEGREE
C
C       LORENTZ ANGLE IS NOT CHANGED WITHIN THE ERROR OF ESTMATION
C       OF 1 PERCENT
C
C
C
C     5) AVERATIONS . CELL DEPENDENT LORENTZ ANGLES AND WIRE POSITIONS
C
C       THESE CORRECTIONS ARE ASSUMED TO BE THE SAME AS BEFORE
C       BUT WE MUST MODIFY OLD CALIBRATION FILE 'F11NOZ.DELTV3.A7502'
C       SINCE ODERING OF NEW CAKE PIECES ARE CHANGED AS FOLLOWS.
C
C               SEGMENT NUMBER
C            NEW      OLD                NEW      OLD
C     ----------------------------------------------
C             1        5                 13       13
C             2        4                 14       14
C             3        1                 15       15
C             4        2                 16       16
C             5        3                 17       17
C             6       24                 18       18
C             7        7                 19       19
C             8        8                 20       20
C             9        9                 21       21
C            10       10                 22       22
C            11       11                 23       --    COMPLETELY NEW ONE
C            12       12                 24       --    COMPLETELY NEW ONE
C     ----------------------------------------------
C
C       WE DONT HAVE CORRESPONDING OLD CONSTANTS FOR SEGMENTS 23 AND 24
C       SINCE THEY ARE COMPLETELY NEW CAKE PIECES
C       BUT WE TAKE CONVENTION TO BORROW THE OLD CONSTANTS FOR OLD CAKE
C       PIECES 23 AND 24 WHICH DOES NOT CORRESPOND TO NEW 23 24 ONES.
C
C       CALIBRATION FILE MODIFIED IN THIS WAY IS GIVEN BY
C
C         ' F11NOZ.DELTV3.Y81.SALL'
C
C
C     5) CALIBRATION CONSTANTS FOR AMPLITUDES
C
C       THEY ARE GIVEN BY THE FOLLWING PULSER DATA.
C
C         'F11HEU.PEDES1.RUN6325'
C
C     6) CALIBRATION CONSTANTS FOR WIRE RESISTANCE
C
C       THEY ARE GIVEN BY THE FOLLWING PULSER DATA
C
C         'F11NOZ.PEDEST.MOD.R6325.R6328'
C
C       THE CONSTANTS ARE OBTAINED FROM OLD CONTANTS CONTAINED IN
C       'F22PWA.PEDEST.R6328V' BY CORRECTING FOR THE CHANGE OF
C       ODERING OF SEGMENTS
C
C
C
C
C
C
C
C
C
C
C
C
```

$$\psi = ((\mathrm{ICELL}-1) \times 4+2) \times 3.75^{o} \text{ for IRING} = 1$$
$$= ((\mathrm{ICELL}-25) \times 4+2) \times 3.75^{o} \text{ for IRING} = 2$$
$$= ((\mathrm{ICELL}-49) \times 2+1) \times 3.75^{o} \text{ for IRING} = 3$$

FSENSW = 211.0, 421.0, 632.33 mm

where

WIRE = 1 - 16

ZFT = Z coordinate calculated by a fitted line in R-Z plane.

ZMX = 1211.5 mm

TAN(β) = Slope of a track element in a cell with respect to the wire plane

II-2) The correction for the cell dependent Lorentz angle, $\Delta Y9$.

If the 96 Lorentz angle α's are used in the conversion of the Y coordinate from the drift direction to the direction perpendicular to the wire plane, no further correction is needed.

In this case, the Lorentz angle for each cell is calculated by

$$\alpha(\text{ICELL}) = \alpha_0 + \text{DELTA9(ICELL)}$$

δ9 in degrees!

and

$$\Delta Y9 = 0$$

If α_0 is used for the conversion, the following correction is needed:

$$\Delta Y9 = \text{DELTA9(ICELL)} \times \text{TAN}(\alpha+\beta) \times Y$$

II-3) The correction for the parabolic distortion of the drift field in the large drift space, ΔY_0.

$|Y| < \text{YS(IRING)}$; $\Delta Y_0 = 0$

$Y < -\text{YS(IRING)}$;

$$\Delta Y_0 = +\,\text{DELTA0(ICELL,1)} \times (\text{WIRE}-\text{WMID}) \times \text{TAN}(\alpha+\beta) \times (Y + \text{YS(IRING)})$$

$Y > \text{YS(IRING)}$

$$\Delta Y_0 = -\,\text{DELTA0(ICELL,2)} \times (\text{WIRE} - \text{WMID}) \times \text{TAN}(\alpha+\beta) \times (Y - \text{YS(IRING)})$$

I-8) Correction for the flight-time of a particle.

$|Y| = |Y| - \text{CFLTM} \times R$

R = radial distance from the interaction point in mm

FLTM = 1.67×10^{-4}

I-9) Correction for the propagation of a signal along the wire.

$|Y| = |Y| - \text{CPROP} \times (\text{ZPHYS} - |\text{ZFT}|)$

ZFT = Z coordinate of a hit calculated by using a fitted line in R-Z plane. Unit mm

ZPHYS = half of the physical wire length

= 1222.9 mm

CPROP = 2.17×10^{-4}

I-10) Time pedestral correction after pattern recognition.

The overcorrection of the time pedestral is now corrected.

$|Y| = |Y| + \text{TOFIX(IRING)} \times \text{C(IRING)}$

After these corrections, the new type of corrections is applied by using the calibration constants which are given by disk files.

II) The corrections which vary cell (half cell) by cell (half cell)

The calibration constants to be used in this stage can be obtained by reading disk files of the calibration constants.

Now we have two calibration files.

F11NOZ.DELTV3.SALL

F11NOZ.DELTV3.A7502.SALL

I-2) Time slewing correction.

AMPMX = MAX(AMPL,AMPR)

old formula

$AMPMX < 300$:

$T = T + A1 + A2 \times AMPMX$
$A1 = -1.0356$, $A2 = 0.00345$

new formula:

$AMPMX < AMPLIM(1)$

$T = T + (A1 + A2 \times AMPMX + A3 \times AMPMX\ xx\ 2)$

$AMPLIM(1) < AMPMX < AMPLIM(2)$

$T = T + (A4 + A5 \times AMPMX + A6 \times AMPMX\ xx\ 2)$

$AMPLIM(1) = 250$, $AMPLIM(2) = 500$

$A1 = -1.494$, $A2 = 7.872 \times 10^{-3}$, $A3 = -1.157 \times 10^{-5}$

$A4 = -0.8207$, $A5 = 2.926 \times 10^{-3}$, $A6 = -2.561 \times 10^{-6}$

I-3) The conversion from the drifttime to the space coordinate in the drift direction.

$Y = C\ (IRING) \times T\ \ > 0$
$C(1) = 0.3769$, $C(2) = 0.3753$, $C(3) = 0.3826$

I-4) The correction for the aberration due to the dispersion of the drift path.

$Y = Y + TSHFT$

$Y > RADI$; $TSHFT = (1/\cos(\alpha+\beta) - 1) \times RADI$

$Y < RADI$; $TSHFT = (1/\cos(\alpha+\beta) - 1) \times Y$

where

α = Lorentz angle > 0,
β = angle of the track with respect to the wire plane.

$\gamma = \alpha+\beta < 0$; RADI = RADTL

$\gamma = \alpha+\beta > 0$; RADI = RADIR

```
.UN 5
2)   RUNOFF asks for a default IMBED file which can be null or a file
containing standard settings.  One such file called ^GDIABLO:RUNF
is stored under user SYSTEM and is available to all users.  It
contains setup commands for the DIABLO together with a command
to turn off the paging mode since I suspect most users will
not require page numbers.  You may of course override these
statements within your file.
.SP 1
.UN 5
3)   The Diablo should be connected at 1200 baud.  If the
interface is not defined at this speed it can be altered by
the program ^G(CA)BDCHGE.^E  This remains effective until the
computer is reloaded.  The Diablo should have the LOCAL button
up, the UC ONLY button down, and the SCROLL switch off.
.SP 1
.UN 5
4)   When loading paper into the Diablo, ensure that the margin
is just to the left of the print head when the carriage is
fully at the left hand side.  The RUNOFF program ensures
that a reasonable margin is left.
*
```

```
.C64 ON
^U^IJADE COMPUTER NOTE 41
.SP 1
^IDOCUMENT PREPARATION USING THE NORD 10^/S
.SP 1
H.E. M^LILLS
.SP 1
25 /JUNE 1980
.SP 1
^C^IINTRODUCTION
 /FACILITIES EXIST TO PREPARE DOCUMENTS USING THE ^CRUNOFF
PROGRAMS ON THE /NORD 10.  /THE ADVANTAGES OF
THIS METHOD OF DOCUMENT PREPARATION ARE THAT THE DOCUMENT IS NEATLY
FORMATTED AND IS IS EASY TO CORRECT AND UPDATE.  /THIS NOTE HAS BEEN
PREPARED VIA THE ^CEMBL ^CRUNOFF PROGRAM.
 /TWO TEXT FORMATTING PROGRAMS
CALLED ^CRUNOFF ARE AVAILABLE.  /ONE COMES FROM ^C^GNORSK-DATA^E AND
THE OTHER FROM /MR. /HERZOG OF ^CEMBL AT /HEIDELBERG.  /IT IS RECOMMENDED
THAT THE ^CEMBL VERSION IS USED AND THE DESCRIPTIONS IN
THIS NOTE REFER TO IT.
 /A PROGRAM CALLED ^CRLISTER HAS BEEN WRITTEN TO TAKE THE ^CRUNOFF
OUTPUT FILE AND TO DISPLAY IT IN A WAY SUITABLE FOR SEVERAL DIFFERENT
TYPES OF TERMINAL.
 /THE INPUT FILE REQUIRED TO PRODUCE THIS NOTE IS ATTACHED AS APPENDIX /A
AND AN EXAMPLE OF COMMANDS USED TO DRIVE ^CRUNOFF AND ^CRLISTER
IS ATTACHED AS APPENDIX /B.
.C64 OFF
.SP 2
^IPRODUCTION MECHANISM
 Document preparation consists of first entering the text and any layout
instructions into a NORD file from a normal terminal.  RUNOFF is then
used to process the file and produce an output file containing the
formatted text.  This can be read by the RLISTER program which will
write it on your terminal in a way suitable for that device.
Normally you will do this on a VDU or Tektronix terminal until you
*
```

2/

3

This document was produced using both methods and you are recommended to look at the attached input file as an example.

Please note that the Diablo and Tektronix devices can deal with the neat underline and so ↑_ and ↑I should be used instead of .UL.

NOTES

1) EMBL recommend that the input text is stored in a file of type :RUNF. This type of file will not be backed up by the backup system and can be a little awkward to handle when editing with QED which expects type :SYMB by default. Therefore I suggest that the input text is stored in a :SYMB file and you only have to add :S to your file specification to RUNOFF.

2) RUNOFF asks for a default IMBED file which can be null or a file containing standard settings. One such file called DIABLO:RUNF is stored under user SYSTEM and is available to all users. It contains setup commands for the DIABLO together with a command to turn off the paging mode since I suspect most users will not require page numbers. You may of course override these statements within your file.

3) The Diablo should be connected at 1200 baud. If the interface is not defined at this speed it can be altered by the program (CA)BDCHGE. This remains effective until the computer is reloaded. The Diablo should have the LOCAL button up, the UC ONLY button down, and the SCROLL switch off.

4) When loading paper into the Diablo, ensure that the margin is just to the left of the print head when the carriage is fully at the left hand side. The R NOFF program ensures that a reasonable margin is left.