```
TOTAL COUNTS         0        2        8    31538         C    15793     3730        0        0        0
TOTAL COUNTS        91    12329     2820        0         C        0        0        0        0        0
TOTAL COUNTS      1337      456    10270       18         0      438     1240       29    12731        0
TOTAL COUNTS         4       22      384      975       124        8      843      446      924      780
TOTAL COUNTS         0        0        0        0         0        0        0        0        0        0
TOTAL COUNTS      1257       25        2       78         0        0        0        0        0        0
TOTAL COUNTS         0        0        0        0         0      156        0        0        0        0
TOTAL COUNTS       210        0        0        0         C        0       40        0     2781      436
         EVENTS READ     ++++++++   STATISTICS FOR RUN    0              ++++++++++++++
                           31533         PULSER EVENTS       91              REAL EVENTS        31447
************ WRONG NO. CF PULSER EVENTS *****
 OVERFLOW EVENTS   40, LGCALB ERROR RETURNS      0, LLAI EVENTS    436

   12329    40.63% EVENTS FAILED TRIGGER CHECK         18616      59.03% PASSED TRIGGER CHECK
     210     0.67% EVENTS HAD BAD LGLASS BLOCKS
    2821     8.94% EVENTS WITH T1-ACCEPT, BUT IWRT = C
    1362     4.32% EVENTS WITH WRITE FLAG: (IWFT=1-7)  1257     25     2     78     >>>>> REJECTED <<<<<
       0     0.0 % EVENTS HAD NO ID HITS AND WRITE FLAG OFF                          C      0      0
       0     0.0 % EVENTS HAD NO ID HITS AND WRITE FLAG ON                    >>>>> REJECTED <<<<<
   15798    50.09% EVENTS                                         '----- PASSED -----          ***** ACCEP

   15793    50.08% EVENTS ENTERED ZVERTEX ROUTINE
    1337     4.24% EVENTS WITH WRITE FLAG ON
      18     0.06% EVENTS WITHOUT "ZVTX"-BANK                                                  ***** ACCEP
                   ZVTX FLAG 0,1,2,3:     438   1.39%     1240   3.93%      29   0.09%  >>>>> REJECTED <<<<<
     455     1.45% FAILED TO FIND Z VERTEX                                                 12731 40.37%
   10270    32.55% EVENTS HAD ZVTX > 350                                              >>>>> REJECTED <<<<<
    3712    11.77% EVENTS HAD ZVTX < 350                          '----- PASSED -----  >>>>> REJECTED <<<<<

    3730    11.83% EVENTS THROUGH PATREC
       4     0.01% EVENTS WITOUT "PATR"-BANK
      22     0.07% EVENTS 0 TRACKS AND  NC WRITE FLAG                                 >>>>> REJECTED <<<<<
    3701    11.74% EVENTS HAD AT LEAST ONE TRACK                                      >>>>> REJECTED <<<<<

    1359     4.31% EVENTS WITH TRACKS AND TAG FLAG
     384     1.22% TAG-EVENTS WITH TRACKS OF LOW MOMENTUM
     975     3.09% TAG EVENTS WITH TRACKS OF HIGH MOMENTUM                            >>>>> REJECTED <<<<<
                                                                                                  ***** ACCEP
     124     0.39% SHORT TRACK IN R-Z AND R-FI
       9     0.03% SHORT TRACK IN R-Z, LONG TRACK IN R-FI                              >>>>> REJECTED <<<<<
                                                                                                  ***** ACCEP
     841     2.67% LONG TRACK OF LOW MOMENTUM ONLY
                                                                                       >>>>> REJECTED <<<<<
    2150     6.82% LONG TRACKS OF HIGH MOMENTUM
     416     1.41% ZMIN > 300
    1704     5.40% EVENTS WENT INTO RMIN CUT                                           >>>>> REJECTED <<<<<
     924     2.93% EVENTS REJECTED BY RMIN CUT
     780     2.47% EVENTS PASSED RMIN CUT AND ZMIN                                     >>>>> REJECTED <<<<<
                                                                                                  ***** ACCEP
 31533EVENTS WERE READ AND A TOTAL OF       2781  EVENTS WERE WRITTEN . REDUCTION FACTOR OF        8.82%
```

events with > 12 hits in the r-z-projection

- accept events with $\geq$ 1 track of $\geq$ 600 MeV originating from $|z| < 300$ mm and a distance < 60 mm from the z-axis
- reject all other events

For all accepted events the slow pattern recognition is performed.
In addition:

Every fourth rejected lumi event is accepted but no PATR-bank is generated.
Rejected overflow events that pass the TRIGGER CHECK are accepted but no PATR-bank is generated.

TRIGGER CHECK: SUBROUTINE TRGCHK
Check if events with T2 accept have tracks corresponding to TOF counters.

- A track is assumed if there are at least hits in 6 out of 8 layers in a half cell of ring 3 and if the corresponding TOF-counter is hit.
- Events are accepted if there are

  1. $\geq$ 2 tracks in ring 3
  2. $\geq$ 1 track in ring 3 if tagging event
  3. $\geq$ 1 track in ring 3 with an associated lead glass energy $\geq$ 1 GeV
  4. 1 track in ring 3 and 2 tracks in ring 1 and $\leq$ 48 hits in ring 1

LGCUT:

Check lead glass energy of events with T1-accept:
The energy in the cylinder and in the end caps is calculated.

Events are accepted if

- the total energy is > 7 GeV or
- the energy in the cylinder is > 3.5 GeV

Events are rejected if the total energy is > 6 GeV and > 95% of it is in a single end cap block, which is not an edge block.

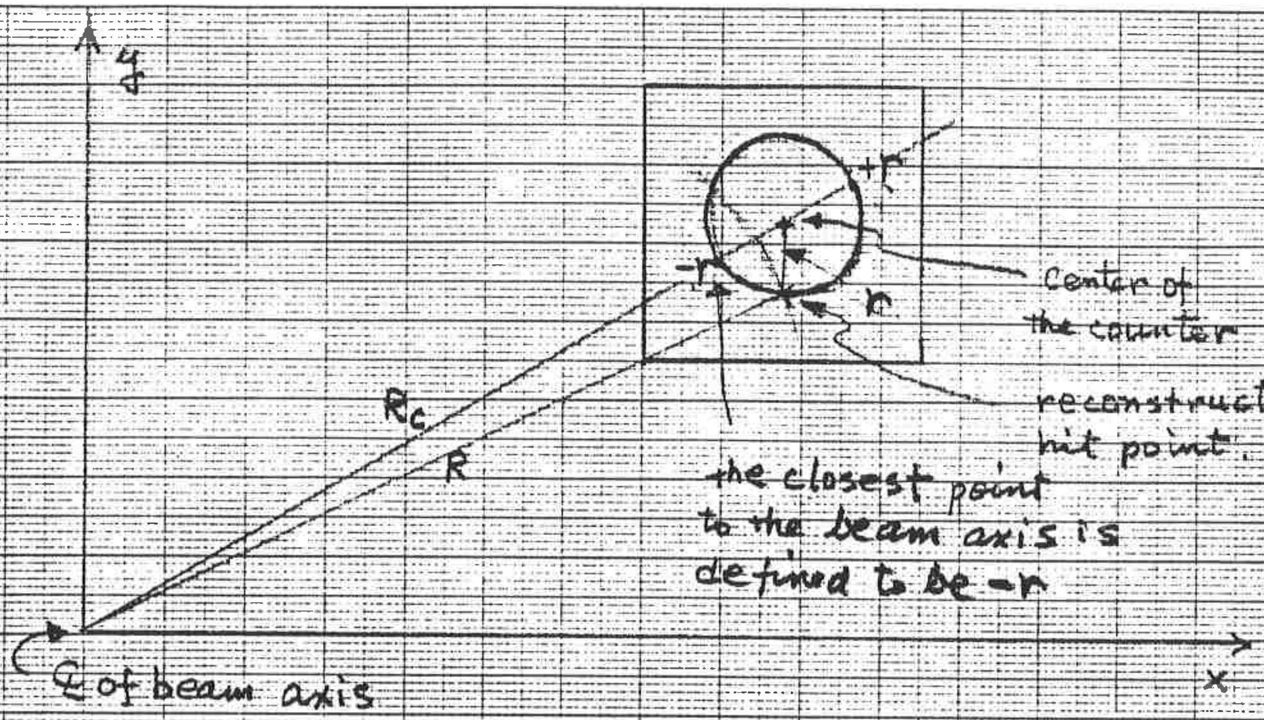


Fig 4a

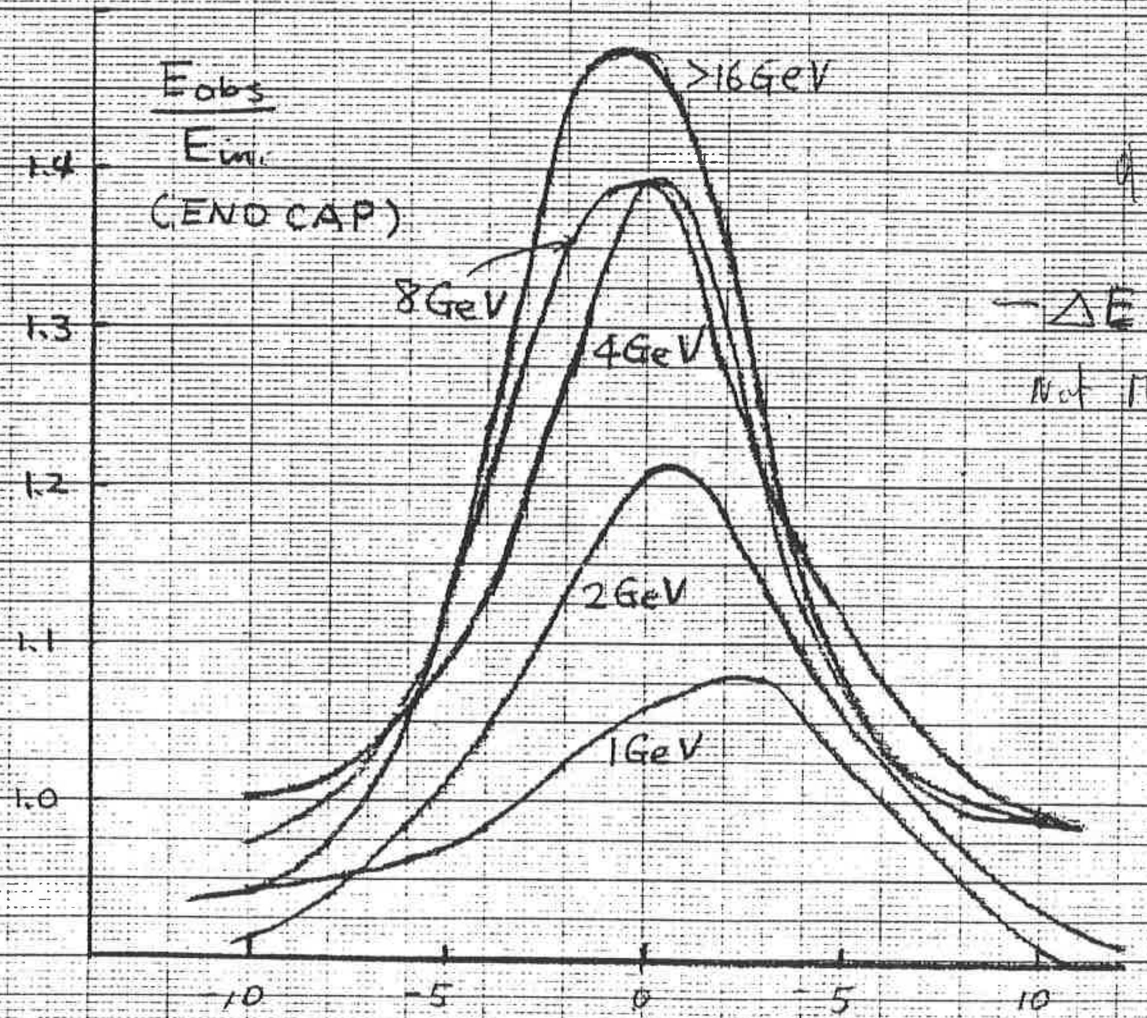


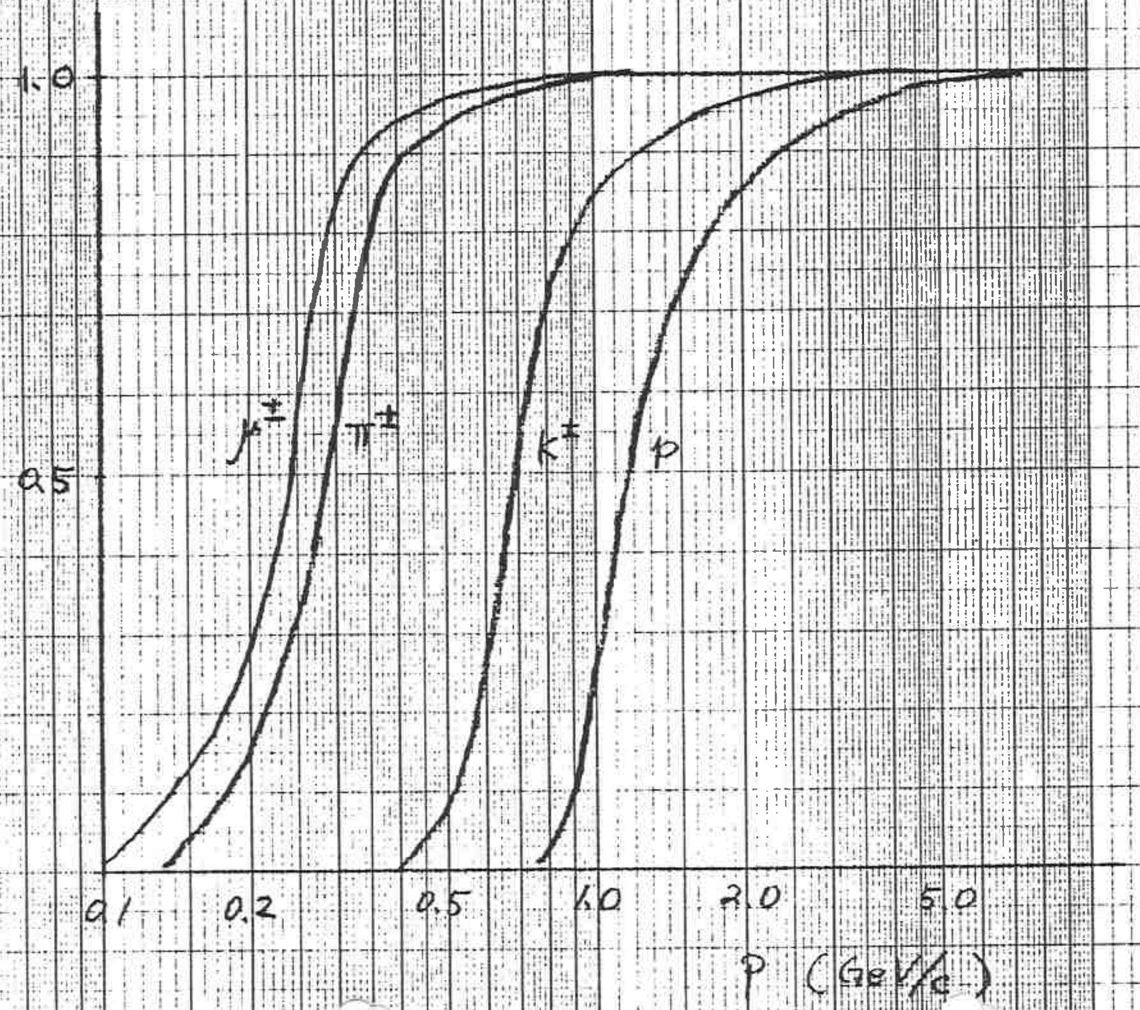
Fig 4 b

JIS A4 180×250mm

Fig. 1

L.G. pulse height vs incident momentum

(NORMAL INCIDENCE)



At present, clusters are thought to be electrons if they are associated with charged particles detected by the inner detector.
The energy corrections are done at the stage of LGCDIR. The correction no. 3 for the barrel part is not applied, because the position resolution is generally poor to obtain the hit position within each individual counter. It is applied for the end cap part to reduce the resolution of Bhabha peaks, even though the position resolution is poor for less energetic showers.
The corrections are determined by combining:

1) Beam calibration data up to 5 GeV (taken with e^+ beam).

2) Bhabha events at beam energies of 6 - 15.8 GeV.

3) Monte Carlo simulation of showers. (Some aspects of corrections are not well reproduced yet.)

Correction factors E_{obs}/E_{in} are given in a data statement at representative values of energies and angles (or positions). The actual corrections for given energy and angle (or position) are obtained by linearly interpolating between two closest points. Then the actual value of E_{in} for given E_{obs} and angle (or position) is obtained after a few itterations. (Because E_{obs} instead of desired E_{in} has to be used for the lookup table). Correction factors used in the program are plotted in Figs. 2,3 and 4.

Figure Captions

1) Response of lead glass counters to nonshowering particles.
The asymptetic value is about 200 MeV. (This is obtained by using the subroutine described in Jade note no. 20. The effect of energy loss through lead glass counter is also included).

2) The loss of shower energy due to the 1/2 rad. length coil, plotted as a function of incident angle at various incident energies. (Barrel part)

3) The factor E_{obs}/E_{in} as a function of incident angle at E_{in} = 1 and $\geq$ 5 GeV. (Barrel part)

The vertex package may be used in three different ways.
For each one an example is given below:

1. FULL VERTEX SEARCH

```
.
CALL VTXINI
.
IH = ...       (POINTER TO 'HEAD' BANK)
IP = ...       (POINTER TO 'PATR' BANK)
CALL VTXPRE(IH,IP)
CALL VTXSRC
CALL VTXAFT
CALL VTXBNK(IP)
.
```

2. VERTEX FIT FOR SELECTED TRACKS (SAY 3 AND 6)

```
COMMON /CWORK1/ NT,T(1500),NV,V(200)
.
I1 = 3
I2 = 6
.
CALL VTXPRE(IH,IP)
N = 0
J = 0
DO 1 I=1,NT
IF(IT(J+1).EQ.0) GOTO 1       (THIS CAN HAPPEN IF VTXPRE FINDS
IT(J+1) = 1                     THIS TRACK TO BE TOO BAD)
IF(I.NE.I1 .AND. I.NE.I2) GOTO 1
N = N + 1
IT(J+1) = 2
1 J = J + 30
IF(N.NE.2) GOTO ...
NV = 1
CALL VERTEX                   (OR ANY OTHER NUMBER BETWEEN 1 AND 20)
CALL VTXAFT
.
```

3. SEARCH FOR PHOTON CONVERSIONS ONLY

```
.
CALL VTXPRE(IH,IP)
NV = 0
CALL VTXEE
IF(NV.EQ.0) GOTO ...
L = 0
DO 2 I=1,NV
J = 0
K1 = 0

DO 1 K=1,NT
IF(IT(J+14).EQ.I .AND. K1.NE.0) K2=K
IF(IT(J+14).EQ.I .AND. K1.EQ.0) K1=K
1 J = J + 30
.
2 L = L + 10           (K1,K2 ARE THE TWO TRACK NUMBERS OF VERTEX I)
.
```

4. GRAPHICS

VX 0 main vertex (automatic with CDTL 27)

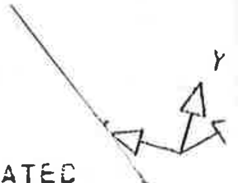
VX 1 all vertices

VX 2 e^+e^- vertices

VX 3 creation of bank 'GVTX' (can be looked at with BW command)

```
C*                                                                            *
C*   INPUT PARAMETERS IN /CWORK1/ (MM, MEV, RADIANS)                          *
C*   ================                                                         *
C*   NT     = TOTAL NR OF TRACKS OF EVENT                                     *
C*   IT(1) =             FLAG (0 = TRACK INCOMPLETE OR BAD, NOT USED         *
C*                              1 = GOOD, BUT DO NOT USE IN VERTEXFIT        *
C*                              2 = GOOD)                                     *
C*   T(  2) = +-R         RADIUS(+ MEANS ANTICLOCKWISE LOOKING TO -Z)        *
C*       3  = PHI         AZIMUTH AT POINT XT,YT,ZT                           *
C*       4  = THETA       POLAR ANGLE TO XY-PLANE(0=VERTICAL TO BEAM)        *
C*       5  = XT          .                                                   *
C*       6  = YT          . FIRST MEASURED POINT ON TRACK                     *
C*       7  = ZT          .                                                   *
C*       8  = DPHI        ERROR OF PHI                                        *
C*       9  = DTHETA      ERROR OF THETA                                      *
C*      10  = DXT         .                                                   *
C*      11  = DYT         . ERROR OF XT,YT,ZT                                 *
C*      12  = DZT         .                                                   *
C*      13  = NPT         NUMBER OF POINTS ON TRACK (INTEGER)                 *
C*      14  = 0.          NOT USED ON INPUT                                   *
C*      15  = 0.          NOT USED ON INPUT                                   *
C*      16-30             FOR INTERNAL USE (SEE BELOW)                        *
C*    (31-60)             2. TRACK                                            *
C*     .....              ........                                            *
C*                                                                            *
C*   OUTPUT PARAMETERS IN /CWORK1/ (MM, MEV, RADIANS)                         *
C*   =================                                                        *
C*   FOR TRACKS WITH IT(1) GT 0                                               *
C*   IT(1) =              FLAG (3 = TRACK WAS USED IN VERTEXFIT)              *
C*   T(  3) = PHI         AZIMUTH AT POINT XT,YT,ZT                           *
C*       5  = XT          .                                                   *
C*       6  = YT          . POINT ON TRACK NEAREST TO VERTEX                  *
C*       7  = ZT          .                                                   *
C*      10  = DXT         .                                                   *
C*      11  = DYT         . ERROR OF XT,YT,ZT                                 *
C*      12  = DZT         .                                                   *
C*      14  = NV          NUMBER OF VERTEX TO WHICH TRACK BELONGS (I)        *
C*      15  = S           EXTRAPOLATED ARC LENGTH (USUALLY NEGATIVE)         *
C*   ALL OTHER T'S ARE UNCHANGED                                              *
C*                                                                            *
C*   NV     = TOTAL NUMBER OF VERTICES                                        *
C*   IV(1) =              FLAG (0 = NO VERTEX FIT                             *
C*                              1 = BAD VERTEX FIT                            *
C*                              2 = VERTEX OF 1- OR COLLINEAR 2-PRONG        *
C*                              3 = GOOD VERTEX FIT                           *
C*                              4 = E+E- PAIR VERTEX                          *
C*                              5 = ISOLATED SINGLE TRACK VERTEX)            *
C*                                                                            *
C*   V(  2) = X           .                                                   *
C*       3  = Y           . VERTEX COORDINATES                                *
C*       4  = Z           .                                                   *
C*       5  = DX          .                                                   *
C*       6  = DY          . ERROR OF X,Y,Z                                    *
C*       7  = DZ          .                                                   *
C*   IV(8) = NTR          NUMBER OF TRACKS USED IN VERTEX FIT                 *
C*   V(  9) = CHI2        CHISQARE OF FIT (N.D.F. = 2*NTR-3)                 *
C*   IV(10)= NTRALL       NUMBER OF TRACKS BELONGING TO THIS VERTEX          *
C*    (11-20)             2. VERTEX                                           *
C*                                                                            *
C*     .....              .........                                           *
C*
```

Another way to obtain the results is to call VTXBNK(IP). This routine creates a bank 'GVTX' with the same number as the corresponding 'PATR' bank with pointer IP. The results are stored in the following order: NV, V(1... 10*NV), NT, T(1... 15*NT)



====== FOR EACH TRACK THE PROCEDURE OF TRACK1 IS REPEATED WITH A TIGHTER CUT,NAMELY CUT2 WHICH IS TYPICALLY 0.5 DEGREES.

6) TRACK3 CALCULATES THE DIRECTION COSINES OF THE TRACKS WHICH
====== SURVIVE THE RIGOUR OF TRACK2,AS WELL AS OTHER USE-FULL TRACK PARAMETERS. FINALLY THE DATA FOR EACH TRACK IS STORED IN THE BOS BANK 'MUR3' BANK NUMBER '1'.(SEE LAST SECTION)

GRAPHICS DISPLAY OF P3

SOME RESULTS OF P3 CAN BE DISPLAYED ON THE GRAHICS. (AT THE MOMENT ONLY THE TRACKS ARE DISPLAYED). THE PROGRAM WHICH DRAWS THE PICTURES,AND WHICH IS STILL UNDER DEVELOPMENT, IS 'MUR3GH'.

TO SEE THE TRACKS THE USER SHOULD USE THE FOLLOWING GRAHICS MODULE:

'F22HAY.MUR3(G)'

WITH THE COMMAND 'SPVA'. I WELCOME YOU TO TRY OUT P3.
(NOTE: THERE IS A GEOMETRICAL PROBLEM WITH THE DISPLAY PROGRAM IN THE 'ZXC' AND 'ZYC' VIEWS,WHICH IS UNDER INVESTIGATION)

DETAILS OF PHILOSOPHY 3 RESULTS BANK MUR3 BANK 1

WORD	TYPE	CONTENT
1	I*4	NUMBER OF TRACKS
2	"	NUMBER OF HITS
3	"	POINTER 'IP1' TO TRACK DATA
4	"	NUMBER OF WORDS/TRACK
5	"	UNUSED
6	"	RUN NUMBER
7	"	EVENT NUMBER
8	R*4	NAME OF PROGRAM (TRAC)
9		AUTHOR'S INITIALS (HEP)
10		NAME OF EXPERIMENT (JADE)
IP1 + 1	R*4	X
IP1 + 2	"	Y CENTROID OF POINTS
IP1 + 3	"	Z
IP1 + 4	"	DX
IP1 + 5	"	DY DIRECTION COSINES OF TRACK
IP1 + 6	"	DZ
IP1 + 7	"	X1
IP1 + 8	"	Y1 POSITION OF FIRST MEASURED POINT
IP1 + 9	"	Z1
IP1 + 10	"	X1
IP1 + 11	"	Y1 POSITION OF LAST MEASURED POINT
IP1 + 12	"	Z1
IP1 + 13	"	RMIN1 (DEFINED BY THE PROJECTED)
IP1 + 14	"	RMIN2 (MUON TRACK)
IP1 + 15	"	THETA &
IP1 + 16	"	PHI OF TRACK
IP1 + 17	I*4	NUMBER OF HITS IN TRACK
IP1 + 18	R*4	PHI OF FIRST MEASURED POINT
IP1 + 18	"	PHI OF LAST MEASURED POINT
IP1 + 20	I*4	ERROR CODE (= 1 = OK)

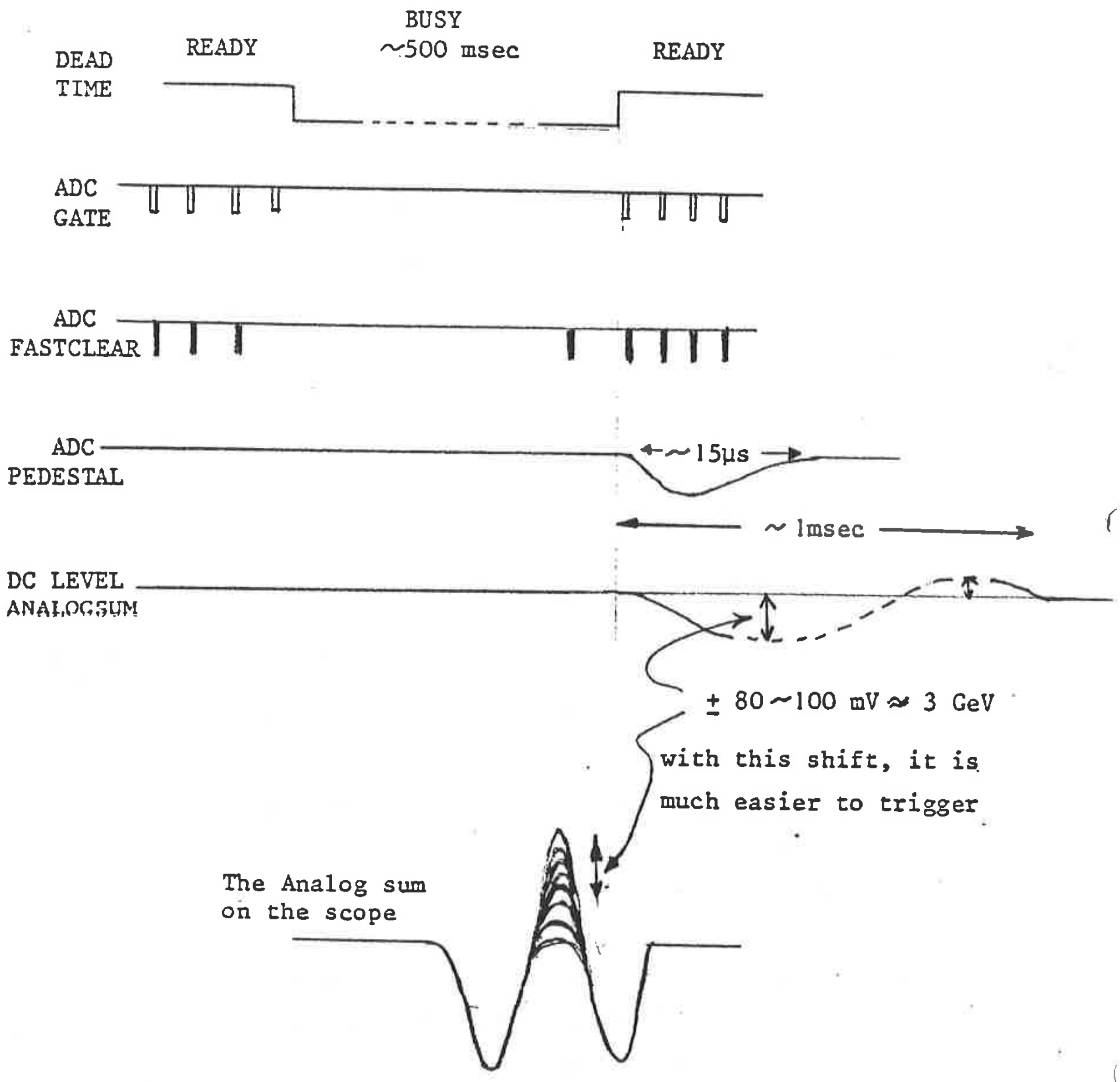


Fig. 1 Timing diagram of
spurious triggers and
"monopole" events

Appendix defective ADC operations

Some of the characteristics of LeCroy 2282 have been identified as defective. Those relevant to us are listed below.

(1) Pre-gate feedthrough

Any input signal of amplitude greater than -50 mV that is present 0-5 msec before a gate causes a pedestal change of up to 70 counts. The closer the signal is to the gate, the larger the pedestal shifts. This case may be realized by e.g. cosmic rays which come randomly.

(2) Fast clear rate effect

A pedestal value depends on the time between the gate and the fast clear signal. The pedestal is shifted by 7 to 10 counts if this time is decreased from 1 second to 1 μsec. The situation could be realized after a pause, ID trip or each event. There is also a pedestal shift of 3-5 counts if fast clears come too rapidly in succession. This probably is very seldom.

(3) Ground loop problem?

Because of the ground loop problem, the input to ADC may shift coherently, which may be another cause of "monopole" events.

(5) "monopole" events

Sometimes more than 2000 channels fire, each having typically $5 \sim 10$ counts. Were these events real, they may be caused by the production and the fusion of a pair of monopoles. Some of these events are believed to be associated with spurious triggers, which are likely to occur right after accepted events. The linear sum output for the trigger could shift up to $\pm$ 100 mV, equivalent of about 3 GeV. The pedestals also shift because the steady repetition of gates and FAST CLEAR's is interrupted. This situation is illustrated in Fig. 1 reproducing the explanation given by Y. Totsuka. According to P. Dittmann, the step observed in on-line histogram of lead glass hitmap I is due to these "monopole" events, because he displays "only" up to 500 hit channels.

These hardware problems are no doubt to be improved, by replacing the whole ADC's as recommended by LeCroy, by increasing the power capacity of crates, by installing a separate circuit for the linear sum trigger to avoid the pickup of gates, and so on. Probably even then, the "spinning block" analysis described in the next section may still be necessary.

II. The analysis of "spinning blocks"

As a part of reformatting job, "spinning blocks" are listed run by run and are written into disk. The analysis reflects the nature of "spinning blocks" described in the previous section, and divides them into the following categories:

(1) "monopole" (# hit channels $\geq$ 600 out of 2880 channels total)

(2) each crate (# hit channels $\geq$ 80 out of 960 channels)

(3) each ADC (# hit channels $\geq$ 24 out of 48 channels)

(4) each channel

For each category, the following quantities are obtained:

f = frequency of occurance

aph = average pulse heigths

σ = average sigma of pulse heigths

The format of the input 4 vector-bank VECT has been changed to contain the origin of the particles:

TYPE	WORDS	VECT
		0
		0 BOS words
		length
Ix4	1	length of header LO = 9
"	2	length of particle data L1 = 10
"	3	event no.
"	4	no. of final state particles
"	5	no. of charged particles in the final state
"	6	no. of neutrals "
Rx4	7	PHI } angles of jet axis
Rx4	8	COS(THETA) } angles of jet axis
Ix4	9	primary quark flavour (1,2,3,4,5,) for (u,d,s,c,b) resp.
Rx4	LO + 1 . . 4	four vector for this particle
Rx4	5	mass
Ix4	6	charge
"	7	type (see Jade Computer Note No. 10)
Rx4	8 . .	coordinates of origin for this
"	10	particle.

10-12 0
13 Ebeam McV

The COMMON /C4VECT/ is no longer filled.

4. <u>Existing datasets</u>

DSN = F22ELS.TRJETB30.TAPEM, UNIT = TAPE (619 evts.) and

DSN = F22ELS.JETD30, UNIT=FAST (100 evts.)

contain jet events in the above format. They can be read with the scheme described in JADE Computer Note No. 25.

DSN = F22ELS.SFOR.JETD30, UNIT = FAST

is a temporary copy of the above file in S-format.