ALEPH 88-196
PHYSIC 88-55
E. Lange
13.12.88

Minutes of the q$\bar{q}$-meeting on 13.12.88 at CERN

Present: Thomas Barczewski (Mainz), Maria Bardadin (Clermont), Alain Blondel (CERN), Ed Blucher (CERN), Glen Cowan (MPI), Mark R. Dinsdale (CERN), Ada Farilla (Bari), John Harton (Wisconsin), Stephen Haywood (CERN), Eberhard Lange (MPI), Darren.R. Parker (CERN), Monica Pepe (CERN), Gerald Rudolph (Innsbruck), Michael Schmelling (Mainz), Ron Settles (MPI), Horst Wachsmuth (CERN)

1 Luminosity and trigger

Alain asked for people who volunteer in this group to take care of our need to understand luminosity and trigger in detail.

2 Status of energy flow

Monica gave a detailed report about the work done by herself and M.N. Minard. They investigated how to determine the energy flow. The results are preliminary because for instance the LCAL information is still missing. In general data available on JULIA level have been used.
The idea of the energy flow determination in principle is to use the charged energy (TPC), the neutral energy (calorimeters) and to remove the energy in a road around track extrapolation.
First a definition of the sample of events used in present test was given. Electrons were taken from the KINE banks (MC-information), in the future the e^--identification has to be added. For muons only the expected energy for each μ-candidate is removed and is not yet included in the current energy flow calculations. For charged tracks they did not use the TPC reconstruction (this will be done in the future) but used the generated tracks.

For the calculation of the energy flow three methods of fitting have been investigated:

- A more general fit using calorimetry and tracks (7 parameters).
- Using calorimetry alone (3 parameters).
- Fitting the neutral part alone and forcing the track coefficient to be 1 (6 Parameters).

The first method gives the best energy resolution ($64\%/\sqrt{E}$, i.e. 6.17 GeV at Z^0).
The present software uses banks which will not be in the final JULIA output so somehow the POT has to be used.
There is another group from Marseille (Ealet, Bonissent) working on this topic using a different scheme.
Glen stated that the prefered method would be the one which gives the best understood low energy tail.

3 Hadronic event selection: Background studies

Glen reported about work he had done on the background caused by Bhabha-events. He generated 2000 events with the BHABØ1-generator. If one requires a visible energy of 25 GeV and at least 3 charged tracks the relative background level on the peak is about 1%. It is about 0.1% if one requires at least 5 charged tracks. Off the peak the situation gets worse. However e^--indentification has not been included yet and using it should make it possible to get rid of this background completely.

4 ALPHA

Ed gave an introduction to the ALEPH PHysics Analysis package called ALPHA. The program unpacks the data from the BOS banks (nevertheless one can still use them) and gives easy access to them. The code is organized as a shell with user routines: QUINIT (initialization), QUEVNT (called per event) and QUTERM (termination). User commons and statement functions can be included. For each run a card file has to be supported. The program runs on VAX and IBM. The next version (102) will be available in January 1989. The files ALPHANEWS and ALPHADOC give information about the package.

5 Hadronic event selection: Clusterfragmentation

Eberhard presented results from HERWIG, a cluster fragmentation Monte Carlo. It has been compared on generator level to the LUND Monte Carlo (10000 events have been generated). He showed distributions of momenta and multiplicities. For protons there are fairly large differences.
For the computation of the selection efficiency HERWIG has been interfaced to GALEPH and about 2500 events have been generated. There is no evidence for an increase in the error of the hadronic selection efficiency so far. Eberhard will contact Brigitte Bloch to install the interface on the KINGAL disk.

6 Round the table: Work in progress

John is working on EXPOSTAR and succeeded in speeding up the program a lot.
Ron and **Eberhard** started working on the lineshape generators too.
Stephen is going to do more work on the Mini-DST in the beginning of next year.
Alain is also working with EXPOSTAR and he is in contact with the authors to remove bugs and to improve the program.
Glen will investigate the $\gamma\gamma$-Generator written by Alex Finch more carefully.
Horst Wachsmuth is concerned with the information flow between LEP and ALEPH.

7 The next meeting ...

... will be on February 14th, $14^{\underline{00}}$, room 32-RA-18.

Agenda:

- More on EXPOSTAR and line shape formulae (John Harton, Luis Garrido et al.).
- Trigger: What do we know, what can happen, what do we want (Alain Blondel et al.).
- Mini-DST: (Stephen Haywood)
- Any other contribution (what happens if the detector is incomplete, luminosity, etc...)

30/11/88

M.-N. MINARD
M. PEPE

STATUS OF ENERGY-FLOW

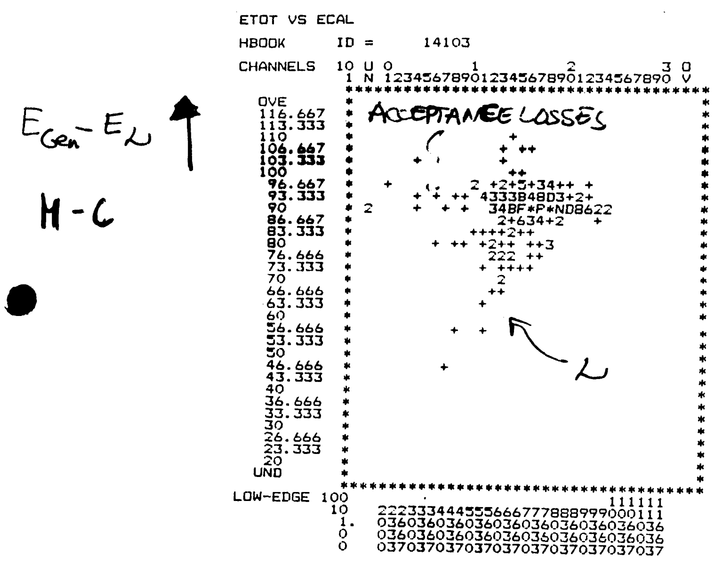
PRELIMINARY !

INTRODUCE IN JULIA ALREADY DEVELOPED ALGORITHM

- DEFINITION OF SAMPLE USED IN PRESENT TEST
- CHOICE OF PARAMETERS
- TREATMENT OF e^-, μ, CHARGED PARTICLES
- FITS AND RESULTS ON RESOLUTION
- AVAILABLE BANKS IN JULIA & POT

1. SAMPLE DEFINITION

GAL200 MC LUND (All flavors)
EVENTS GENERATED BETWEEN 0 & π

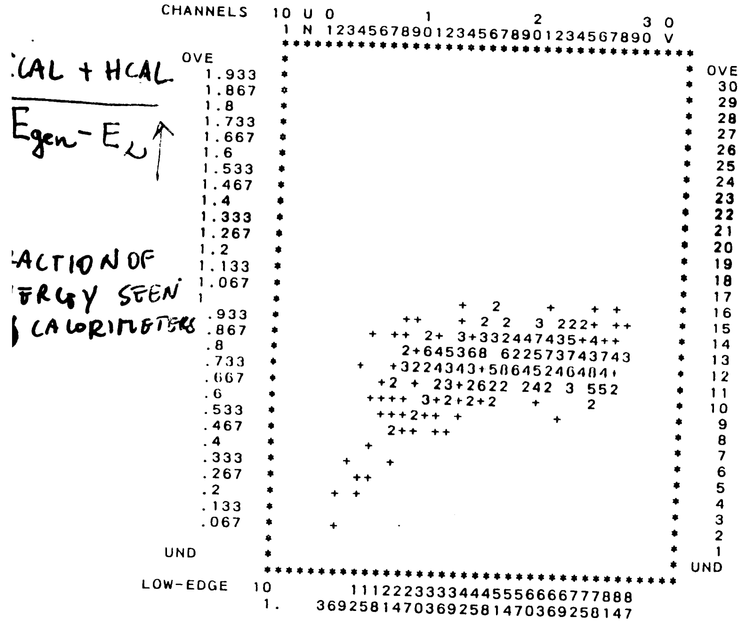
- 

  → ECAL + HCAL

  (No Luminosity calorimeter)

- FOR STUDY PURPOSE TRY TO REMOVE TAIL FROM ACCEPTANCE LOSSES

HBOOK ID = 14106



* ENTRIES = 333 $\theta(\vec{JET}, \vec{BEAM})$
* SATURATION AT= 31
* SCALE ..+,2,3,...., A,B,
* STEP = 1 * MINIMUM=0

PLOT (DIRECTION OF THRUST FOR PARTONS)

STATISTICS

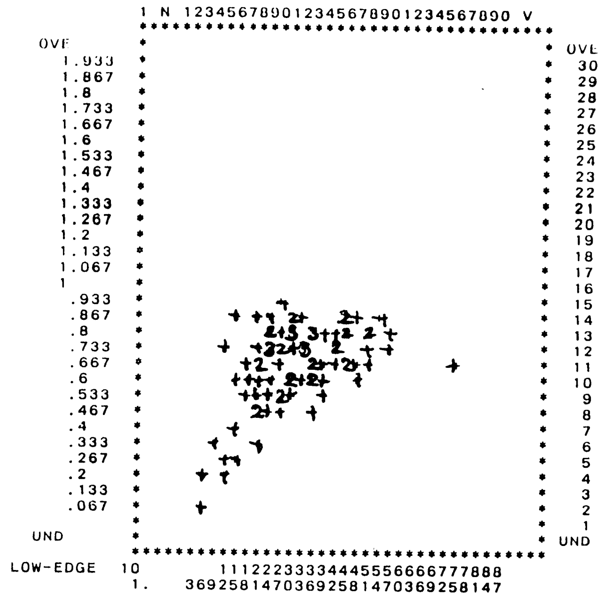
- Remove events for which

$(\Sigma P_{ch}^{i}\ ,\ \theta_i \sphericalangle(\vec{P_i}, \vec{Beam}) < 20^\circ\ ) > 3\%(E_{gen}-E_L)$

→ remove ~ 20% sample

- Complete study adding LCAL information and new coefficient adjustement for that region

Removed event



* ENTRIES = 86
* SATURATION AT= 31
* SCALE ..+,2,3,...., A,B,
* STEP = 1 * MINIMUM=0

PLOT --------

STATISTICS --------

• ALGORITHM PARAMETERS FOR CHARGED TRACKS

PURPOSE :

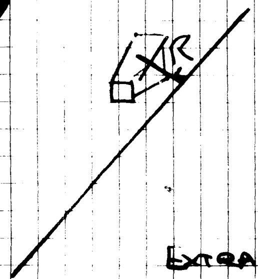
FOR ENERGY DETERMINATION USES :

CHARGED TRACKS = TPC

NEUTRAL ENERGY : CALORIMETRY

REMOVING ENERGY IN A ROAD AROUND TRACK EXTRAPOLATION

(1.)

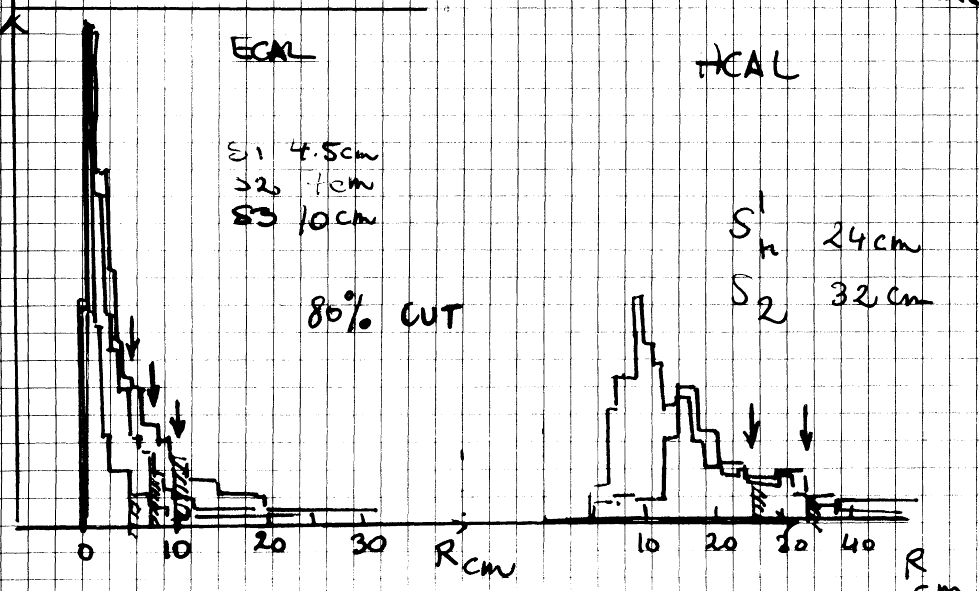


R : DISTANCE IN SPACE TO THE EXTRAPOLATED TRACK FOR EACH STOREY

ALL CELLS AT $R < R_0$ (defined/stack) ARE INCLUDED IN THE ROAD

EXTRAPOLATION WITH MAG FIELD IN ECAL

" WITHOUT " IN HCAL



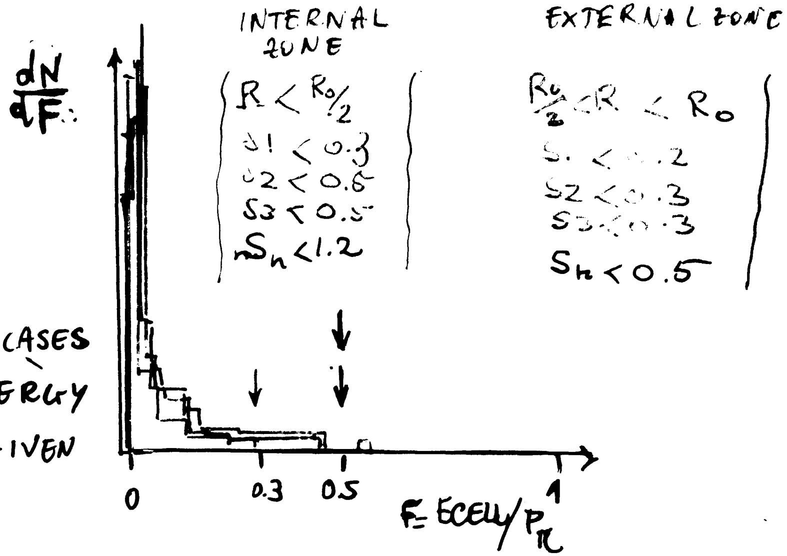
π 10 GeV

LUES AGREE WITH PREVIOUS STUDY - NEGLIGIBLE

[illegible] ON E AND θ

(2.) [illegible]

FOR EACH STACK ENERGY BOUNDED TO A FRACTION OF ENERGY OF INCOMING PARTICLE

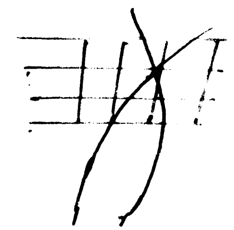


5 GeV π

• IN 90% OF CASES THE CELL ENERGY IS BELOW GIVEN BOUNDARY

(3.) AVOID DOUBLE COUNTING

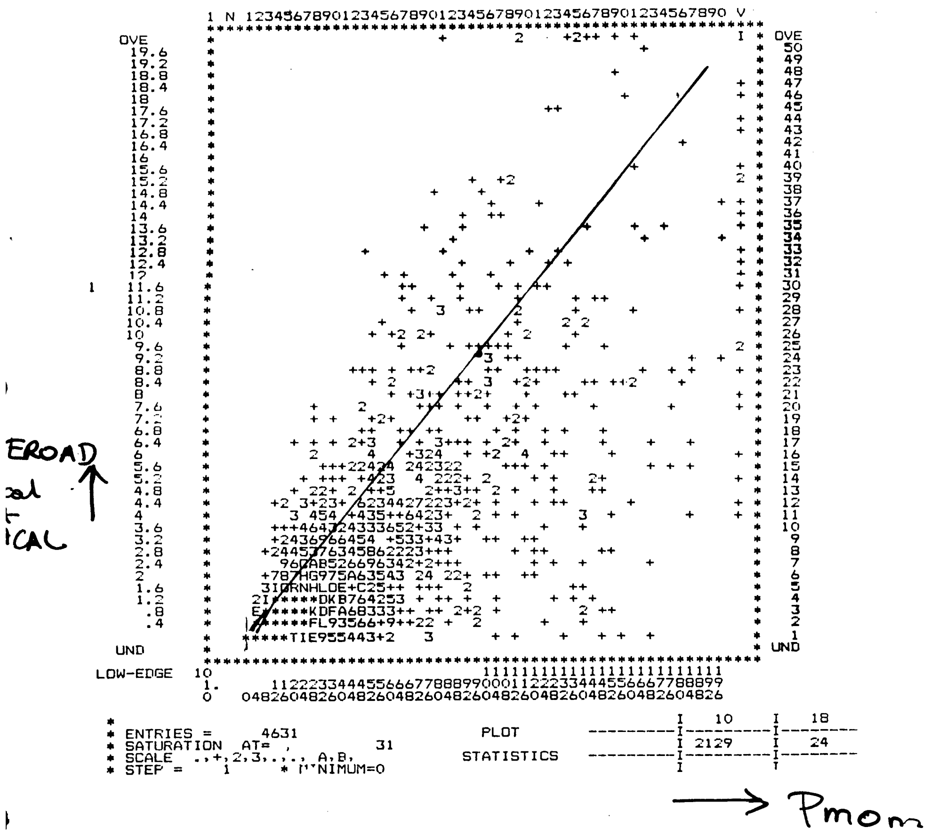
• WHEN 2 TRACKS INSIDE SAME CELL ⟹ BOUND TOTAL ENERGY REMOVED TO CELL ENERGY



(4.) TO GAIN TIME LOOP OVER CHARGED CLUSTERS

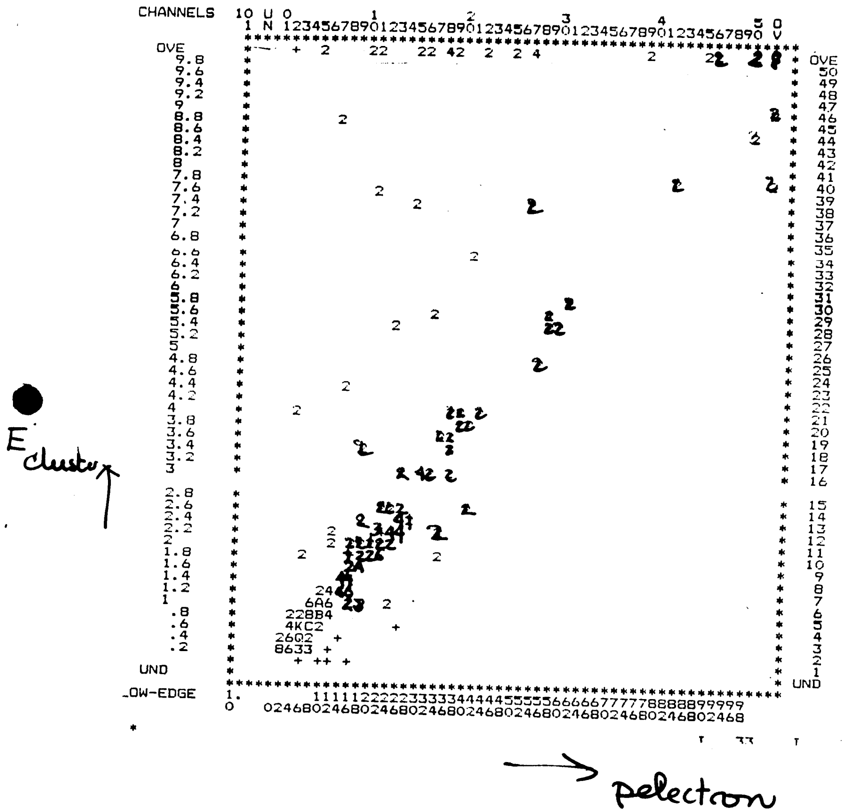
INCLUDE ALSO NEUTRAL CLUSTERS WHICH ARE IN THE ROAD

ELECTRON TREATMENT



ON GALEPH EVENTS

Energy found in the road will be substracted to the Ecal + Hcal recorded energy



- TAKE "KINE" ELECTRONS
  - PMOM > 1.5 GeV
  - E/P MATCHING

2 ESTIMATORS AVAILABLE AT THE MOMENT (JULIA)
- CHECK OF TRANSVERSE PROFILE
- CHECK OF LONGITUDINAL PROFILE

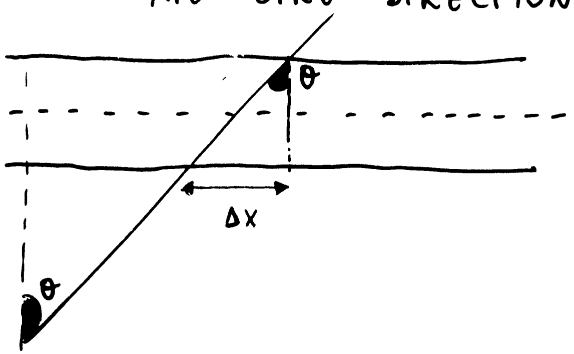
For identified electron.

- Take corresponding ECAL energy
- Trak not used in charged component

CALCULATION OF ENERGY DEPOSITED BY A μ

HCAL

- ENERGY DEPOSITED PROPORTIONAL TO THE NUMBER OF STREAMERS
- IN GALEFF THE # OF STREAMERS PRODUCED IN EACH TUBE IS PROPORTIONAL TO THE PROJECTION OF THE TRACK SEGMENT ALONG THE WIRE DIRECTION



whenever the information is available

$$E_\mu = \left(E_0 + k \tan\theta \right) * \frac{N_{FIRED\ PLANES}}{N_{TOTAL\ PLANES}}$$

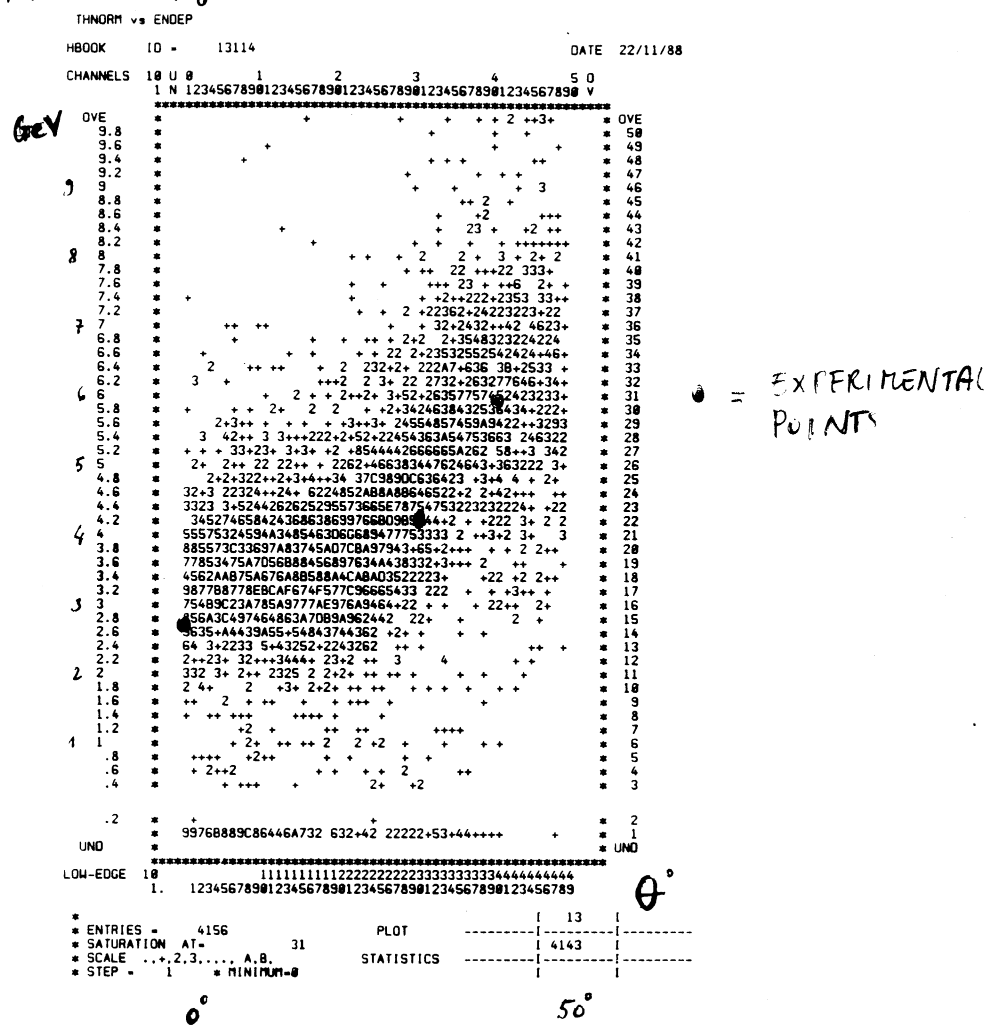
"OR" OF HCAD AND HMAD

ECAL

- ENERGY DEPOSITED PROPORTIONAL TO TRACK SEGMENT

μ

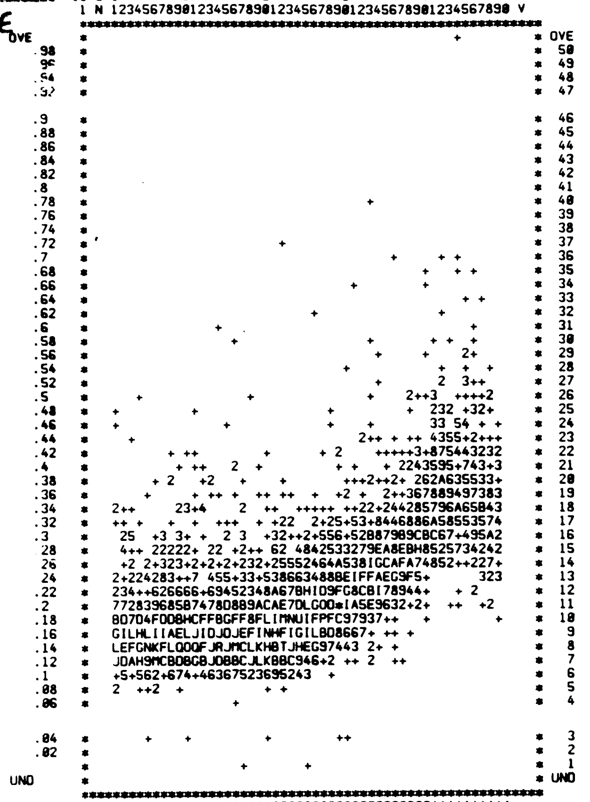
E in HCal (Galeff)



E/FIRED PLANE

HBOOK ID = 13120 DATE 22/11/88

CHANNELS 10 U 0 1 2 3 4 5 0
1 N 1234567890123456789012345678901234567890123456789 V



LOW-EDGE 10 11111111112222222222333333333344444444444
1. 1234567890123456789012345678901234567890123456789

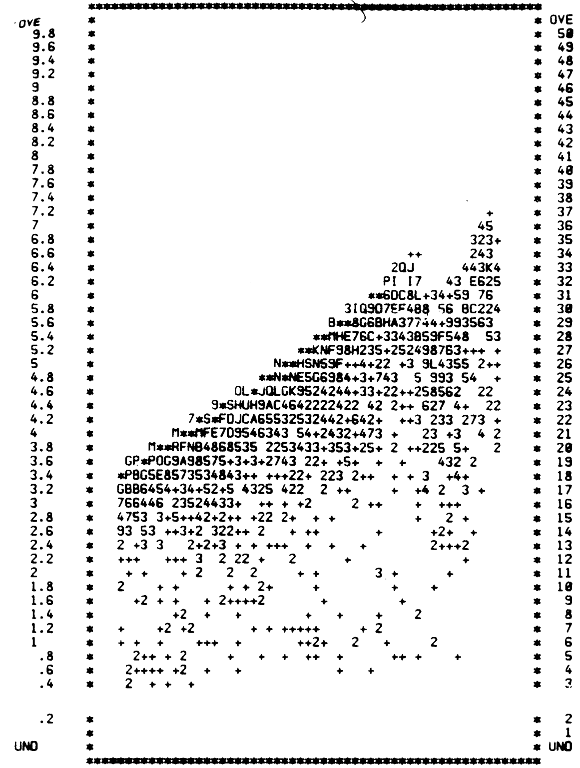
θ

```
* ENTRIES =      4156         PLOT        ---------I---------I---------
* SATURATION  AT=        31                        I  4153   I
* SCALE  .,+,2,3,.... A,B,    STATISTICS  ---------I---------I---------
* STEP =     1    * MINIMUM=0
```

0° 30°

CALCULATED ENERGY

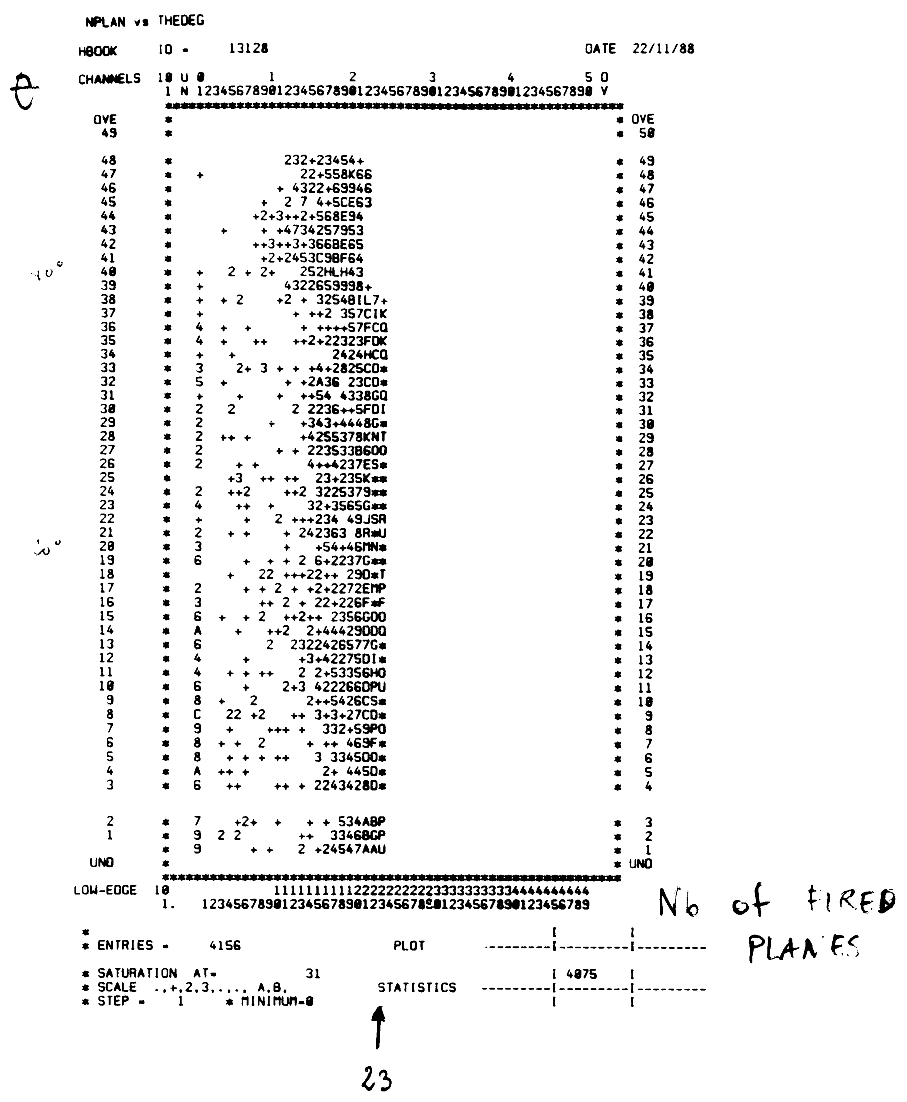
CHANNELS 10 U 0 1 2 3 4 5 0
1 N 1234567890123456789012345678901234567890123456789 V

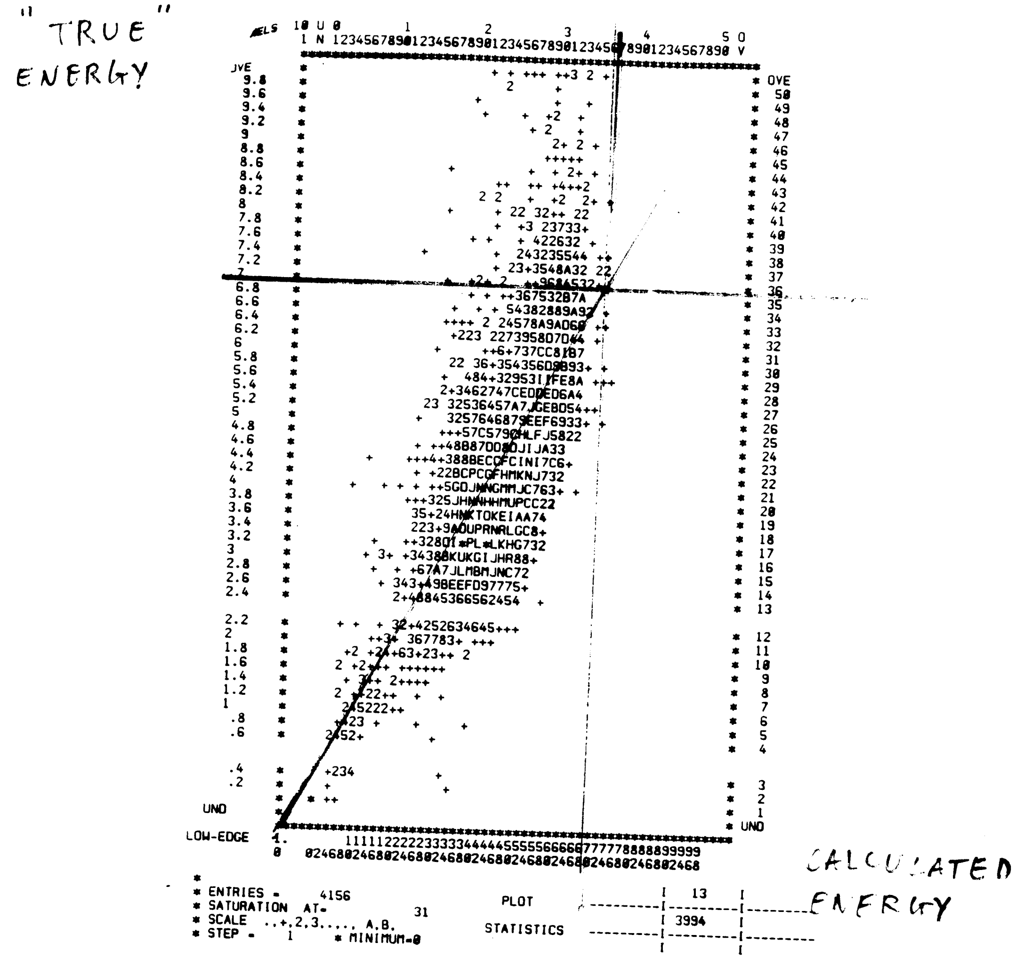


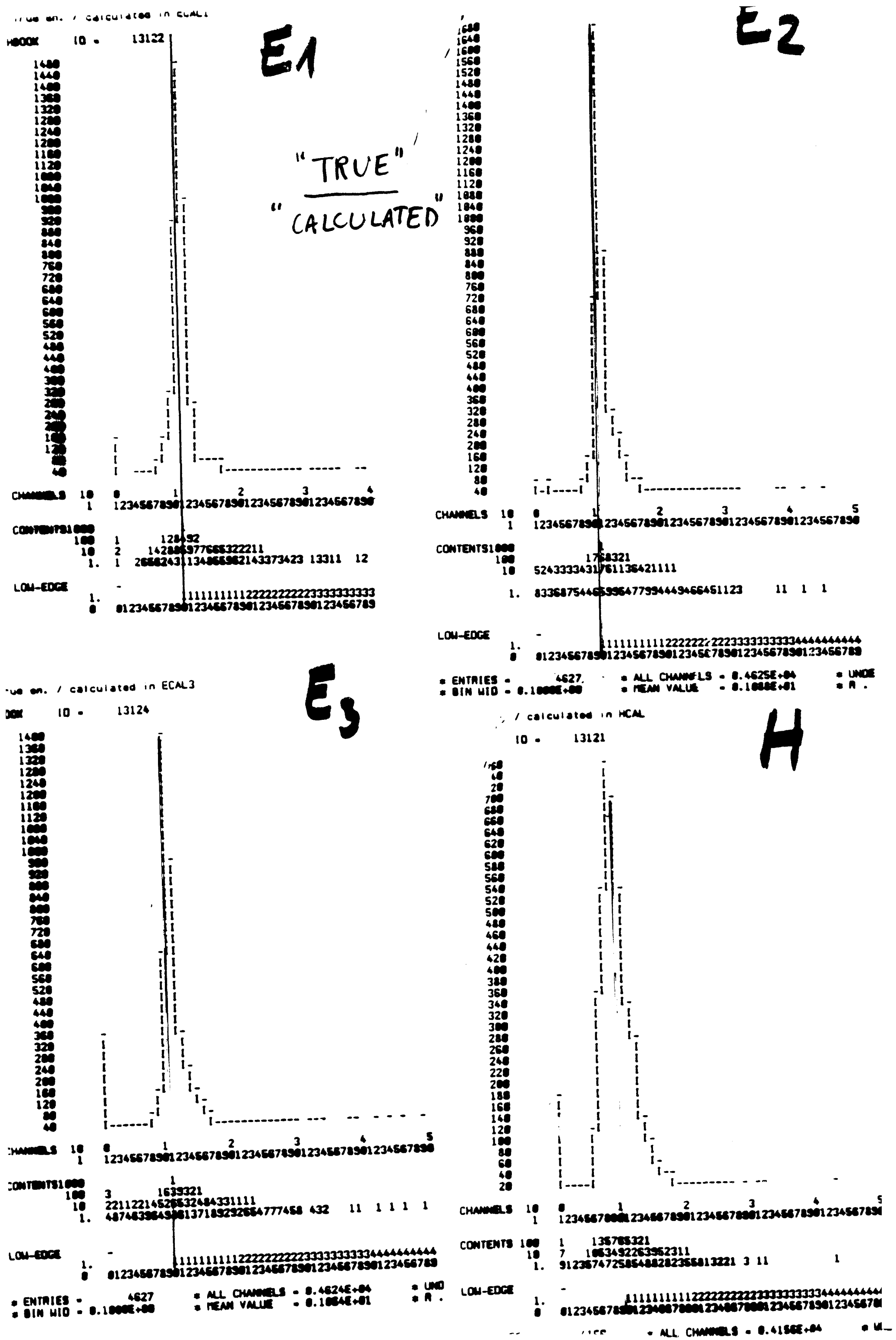
LOW-EDGE 10 11111111112222222222333333333344444444444
1. 1234567890123456789012345678901234567890123456789

θ

```
* ENTRIES =      4156         PLOT        ---------I---------I---------
* SATURATION  AT=        31                        I  3982   I
* SCALE  .,+,2,3,.... A,B,    STATISTICS  ---------I---------I---------
* STEP =     1    * MINIMUM=0
```


NPLAN vs THEDEG
HBOOK ID = 13128
DATE 22/11/88
CHANNELS
LOW-EDGE
ENTRIES = 4156
PLOT
SATURATION AT= 31
SCALE ..+,2,3,...., A,B,
STEP = 1 * MINIMUM=0
STATISTICS
4075
Nb of FIRED PLANES
23


"TRUE" ENERGY
LOW-EDGE
ENTRIES = 4156
SATURATION AT= 31
SCALE ..+,2,3,...., A,B,
STEP = 1 * MINIMUM=0
PLOT
STATISTICS
13
3994
CALCULATED ENERGY



TO-DAY STUDY

- MASK FOR CHARGED TRACK USED AS DESCRIBED

- ~~ELECTRON~~ IDENTIFICATION: USE ONLY ON KNOWN ELECTRON FROM MC. ~~IDENTIFICATION~~ NOT APPLIED TO CHARGED HADRON, WILL BE DONE

- MUON
  ~~FORESEEN~~:
  TAKE ENERGY ALONG THE TRACK
  REMOVE ONLY THE EXPECTED ENERGY FOR EACH μ CANDIDATE

  ALL TOOLS AVAILABLE, BUT NOT INCLUDED IN THE PRESENT ENERGY FLOW

- FOR CHARGED TRACKS, WE DO NOT USE THE TPC RECONSTRUCTION; WE USE THE GENERATED TRACKS INSTEAD

EFLOW CALCULATION

- More general fit

$$E_{FIT} = \alpha_1 \left[(E_1 + E_2) - (E_1^m + E_2^m) \right] + \alpha_2 \left[E_3 - E_3^m \right] + \alpha_3 \left[E_h - E_h^m \right] + \alpha_4 P_{ch} + \alpha_5 (E_1^m + E_2^m) + \alpha_6 E_3^m + \alpha_7 E_h^m$$

E^m = ENERGY INSIDE MASK

where P_{ch} does not include electron

7 parameters for

$$\sigma^2 = \frac{1}{N} \sum \left(E_{fit}^i - (E_i^g - E_e^i) \right)^2$$

with constraint

$$\sum E_i^g - E_e^i = \sum E_{fit}^i$$

FOR COMPARISON OTHER FIT TRIED

- 1. $\alpha_1 (E_1 + E_2) + \alpha_3 (E_3) + \alpha_4 E_h$

  using calorimetry alone

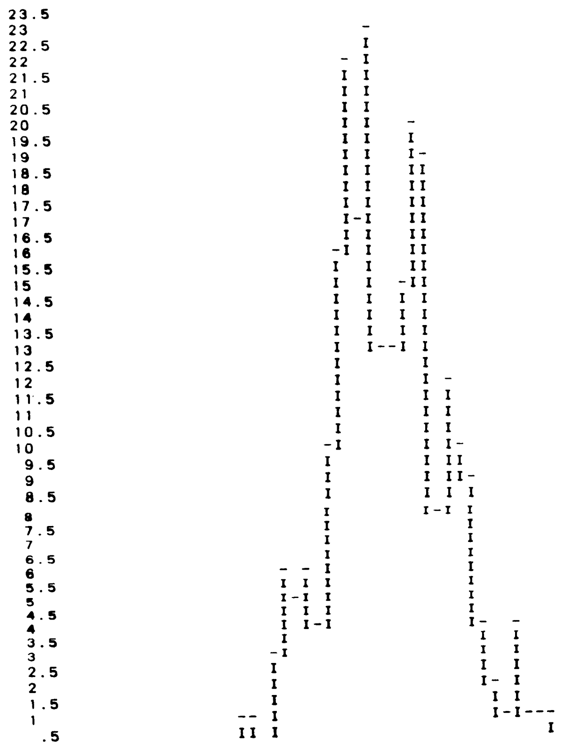
- 2. Fit neutral part alone and forcing track coefficient to 1

$$E_{neutr}^{fit} + E_{el} = \alpha_1 \left(E_1 + E_2 - (E_1^m + E_2^m) \right) + \alpha_2 \left[E_3 - E_3^m \right] + \alpha_3 \left[E_h - E_h^m \right] + \alpha_4 (E_1^m + E_2^m) + \alpha_5 (E_3^m) + \alpha_6 E_h^m$$

$$\sum E_{fit}^i + E_{el}^i = \sum E_g^i - E_\nu^i + E_{el}^i - E_g^{ch}$$

$E^{FIT} - (E^{GEN} - E)$

ID = 7915

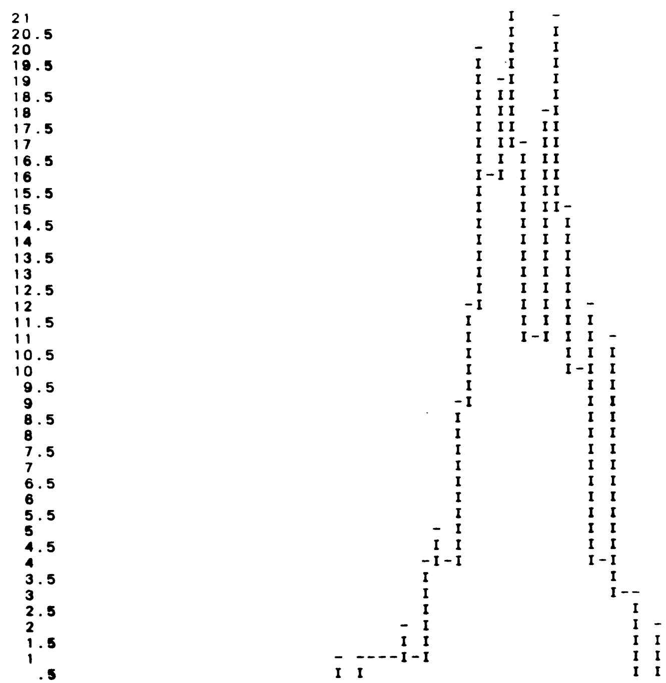


```
 1CHANNELS  10   0         1         2         3         4         5
             1   12345678901234567890123456789012345678901234567890

  CONTENTS  10                       1121211121 11
            1.                  11 3656406273335098209421411 1

  LOW-EDGE       -------------------------
            10   5444443333322222211111          1111122222333334444
            1.   0864208642086420864208642  2468024680246802468024 68

  * ENTRIES =       247      * ALL CHANNELS = 0.2470E+03      * UNI
  * BIN WID = 0.2000E+01     * MEAN VALUE   = 0.1174E+00      * R
```

3 PARAMETERS FIT

CALORIMETERS ALONE

$\sigma = 10.37$ GeV

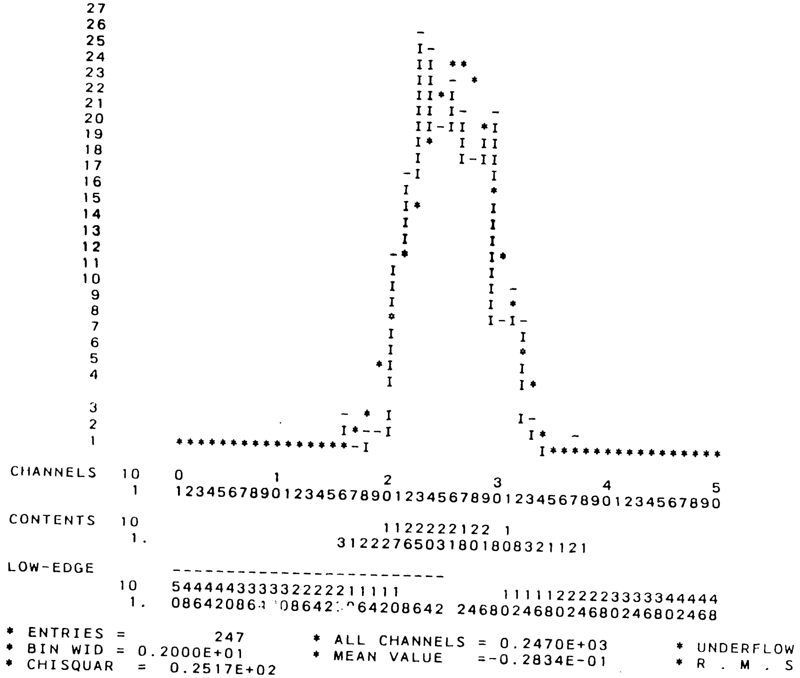


```
  NELS  10   0         1         2         3         4         5
         1   12345678901234567890123456789012345678901234567890

  ENTS  10                                  121121112111 1
        1.                       1 11112145492069371815024133  2

  EDGE       -
       100                                            11111111
        10       1111222233334444555566667777888899990000 1111
        1.   247924691468136803580257024792469146813680358 0257
```

RECONSTRUCTED ENERGY

CALORIMETERS ALONE

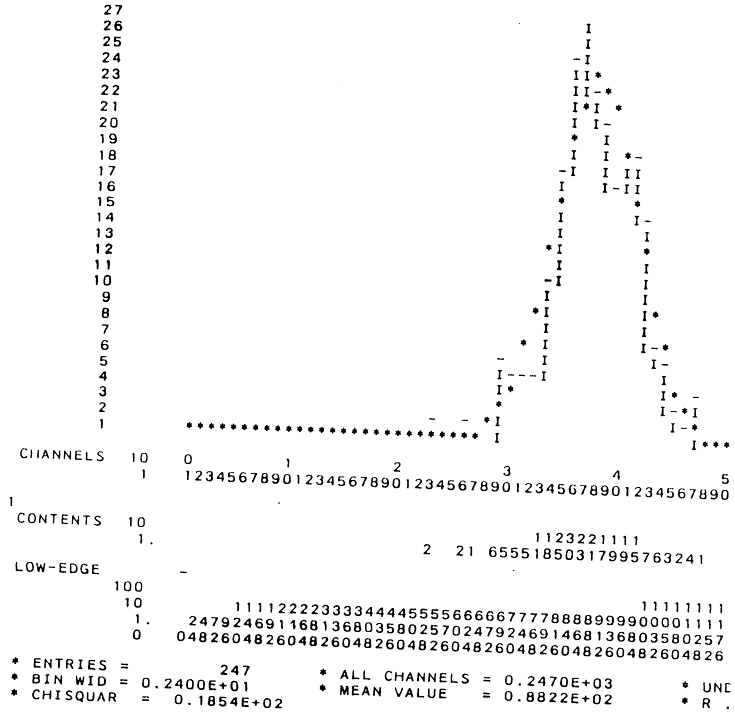
$\Delta(E_{FIT} - E_{GEN}) / \overline{E_{FIT}} \cdot \sqrt{E_{GEN}} = 11\%$



$$\text{Fit}: \left(E^{m}_{fit} + P_{ch} - \left(E_g - E_\nu\right)\right)$$

WEIGHT OF 1 GIVEN TO CHARGED TRACKS (6 PAR. FIT)

$\Upsilon_{FIT} = 7.38$



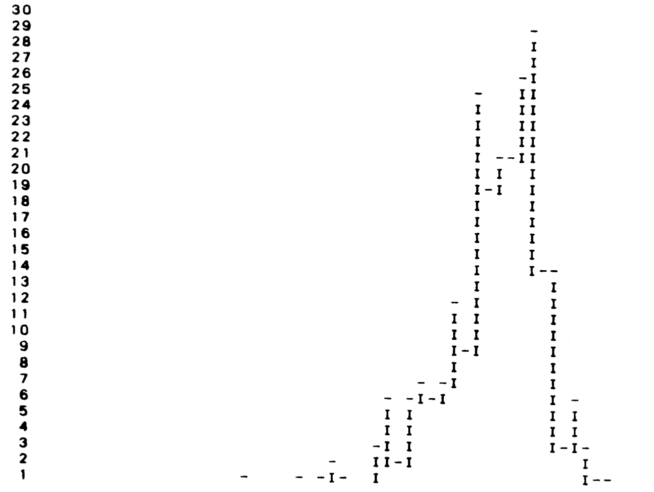
RECONSTRUCTED ENERGY

(6 PAR. FIT

(WEIGHT OF CHARGED TRACKS FORCED TO 1)

$$\frac{\Delta(E_{FIT} - E_{GEN})}{E_{FIT}}\sqrt{E_{FIT}} = 78.9\%$$

1HBOOK ID = 7913 DA1



CHANNELS 10 0 1 2 3 4 5
1 12345678901234567890123456789012345678901234567890

CONTENTS 10 1 21222211
1. 1 1 121 36267672959116944363 11

LOW-EDGE 100 1111111111
10 22222333334444455555666667777788888999990000011111
1. 02468024680246802468024680246802468024680246802468

* ENTRIES = 247 * ALL CHANNELS = 0.2470E+03 * UND
* BIN WID = 0.2000E+01 * MEAN VALUE = 0.8991E+02 * R..

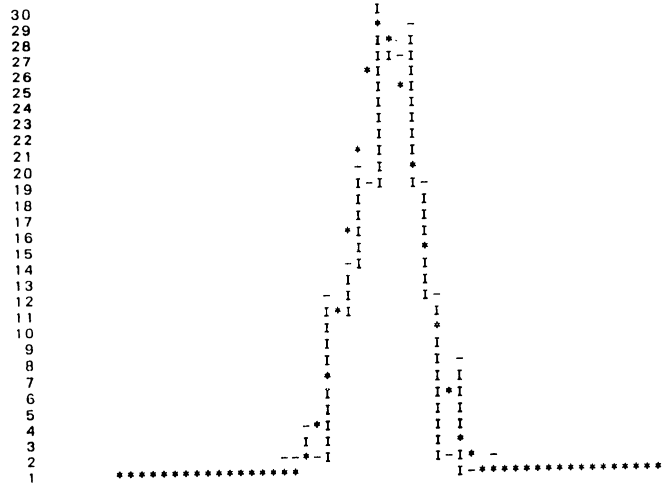
RECONSTRUCTED ENERGY

7 PAR. FIT

CALORIMETRY + TRACKS

$$\frac{\Delta(E_{FIT} - E_{GEN})}{E_{FIT}} \sqrt{E_{GEN}} = 64.7\ \%$$

$E_{FIT} - E^{GEN} - E^{\nu}$



CHANNELS 10 0 1 2 3 4 5
1 12345678901234567890123456789012345678901234567890

CONTENTS 10 11121322211
1. 1 224221409187992281 12

LOW-EDGE --------------------------- 11111222223333344444
10 54444433333222221111 1 24680246802468024680246 8
1. 08642086420864208642 2468024680246802468024 68

* ENTRIES = 247 * ALL CHANNELS = 0.2470E+03 * UN
* BIN WID = 0.2000E+01 * MEAN VALUE = -0.2834E-01 * R
* CHISQUAR = 0.2716E+02

7 PAR. FIT

$\sigma_{FIT} = 6.17$

α_1	1.09	} 1.01*	$E_1 + E_2 - (E_1^M + E_2^M)$
α_2	1.74		$E_3 - E_3^M$ ⇐ TOO BIG !
α_3	0.82	.87	$E_H - E_H^M$
α_4	0.65	.69	TRACKS
α_5	0.36	} .2	$E_1^M + E_2^M$
α_6	0.53		E_3^M.

* LOMBLEY & STEINBERGER USING GALEPH SINGLE

TEST BEAM RESULTS

e/π

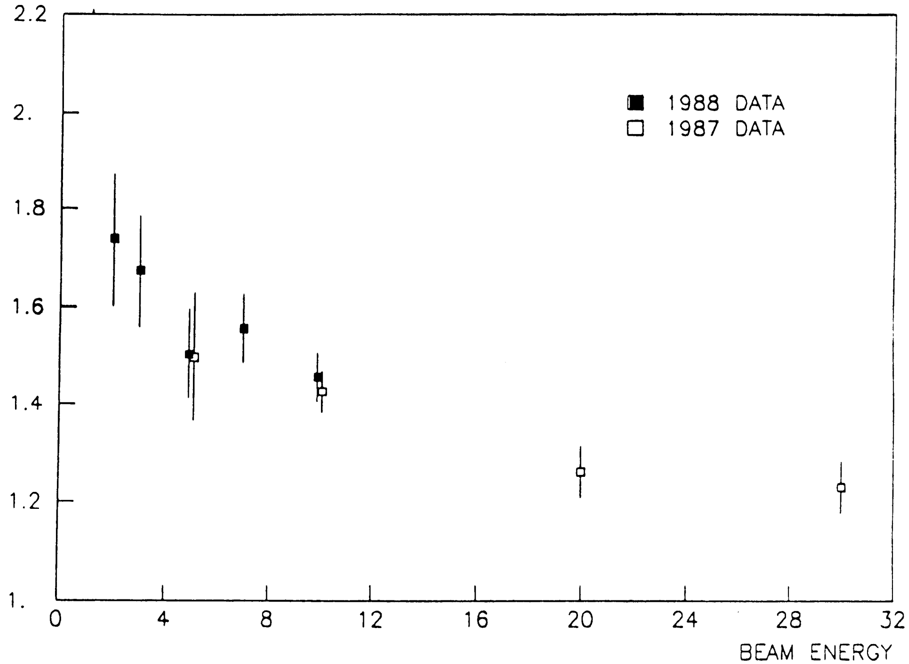
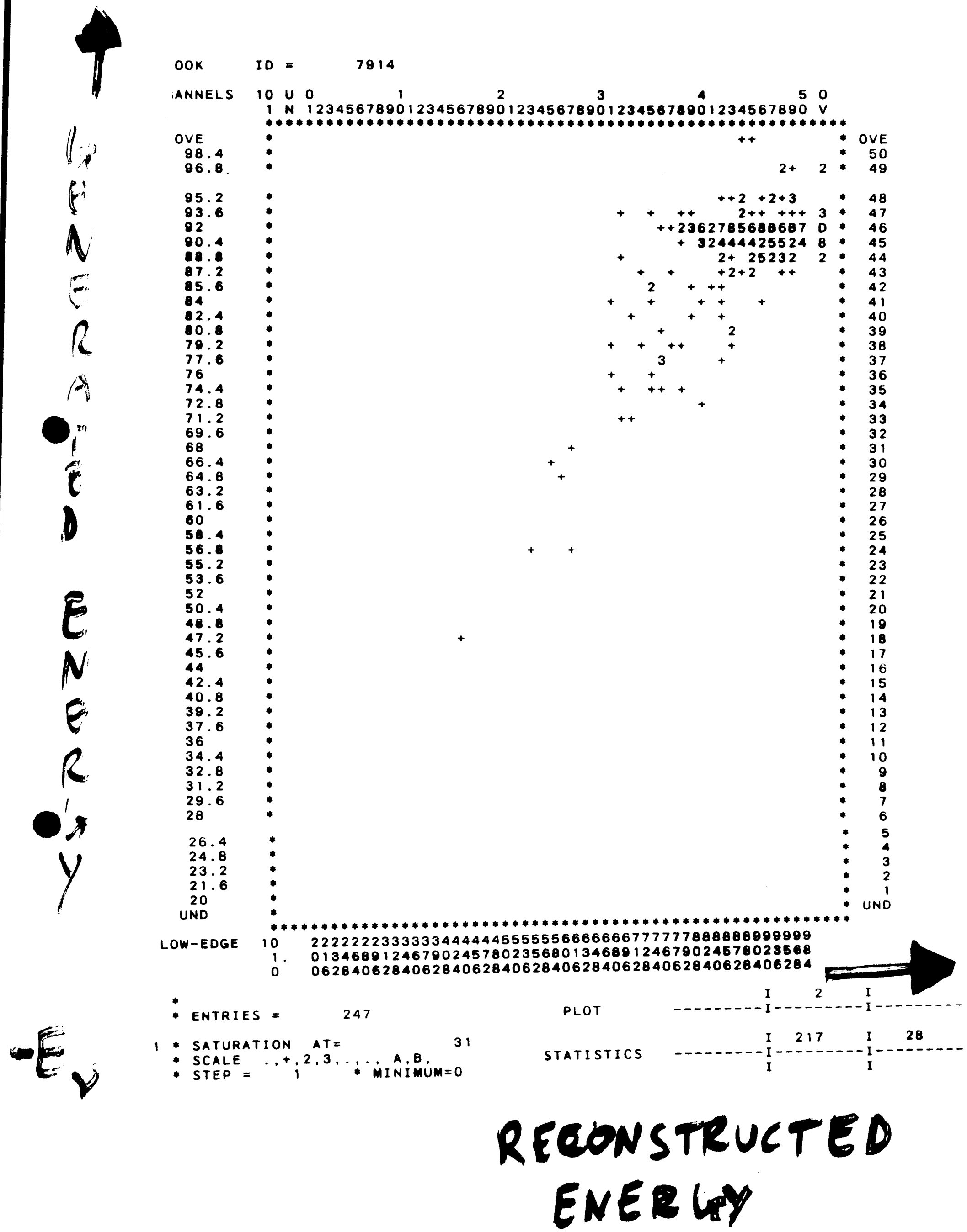


Figure 8 Electron to pion response ratio

E_fit general



- AVAILABLE BANKS & INFORMATION

PURPOSE IS TO BE ABLE FROM ENERGY FLOW BANK TO USE ANOTHER SET OF COEFFICIENTS.

- **JULIA**
  - TEMPORARY BANK : CFLO , CFRT

CFLO / each track contributing to energy balance ie:
- ENTERING CALORIMETER
- NOT AN IDENTIFIED ELECTRON

INNER ZONE
- $(E_{road}, \langle\Theta\rangle_{road}, \langle\varphi\rangle_{road}) \times 5$ Stacks for $R < R_0/2$

OUTER ZONE
- $(E_{road}, \langle\Theta\rangle_{road}, \langle\varphi\rangle_{road}) \times 5$ Stack for $R_0/2 < R < R_0$

- ΣE in each stack of the storeys crossed by a track

CFRT Relation bank from track to **CFLO** index

- THE PRESENT SOFTWARE HAS BEEN DEVELOPED INSIDE JULIA USING BANKS WHICH WILL NOT BE IN THE FINAL JULIA OUTPUT

- REWRITE THE CODE WITH THE NEW POT BANKS, AS SOON AS THEY ARE AVAILABLE

KEEP THE SOFTWARE AS IT IS, BUT REPEAT THE CLUSTERING WHENEVER ONE WANTS TO REDO THE EN-FLOW FROM THE POT

- FINAL e-ID TO BE ADDED
  μ-ID TO BE INCLUDED IN EN-FLOW

- TPC RECONSTRUCTION ALSO TO BE USED

PROPOSAL FOR THE POT/DST

<< Subschema : EFLOW >>

Pot/dst MaSKs used in energy flow analysis

1		I	Number of words/track (-11)		
2		I	Number of tracks		
1	KT	I	KTyp Subtraction type	[0,255]	1
2	EM	I	LMask Energy in mask	[0.0,300.]	2
3	F1	F	Fsta12 Fraction in stack 1+2	[0.0,1.00]	1
4	F3	F	Fsta3 Fraction in stack 3	[0.0,1.00]	1
5	T1	F	Teta12 Theta in stack 1+2	[0.0,3.14]	2
6	P1	F	Phi12 Phi in stack 1+2	[-3.14,3.14]	1
7	T3	F	Teta3 Theta in stack 3	[0.0,3.14]	2
8	P3	F	Phi3 Phi in stack 3	[-3.14,3.14]	1
9	TH	F	TetaH Theta in hcal	[0.0,3.14]	1
10	PH	F	PhiH Phi in hcal	[-3.14,3.14]	1
11	PF	I	PFRF Index in PFRF of the fitted track		1

14 bytes / track

ETPC : TOTAL ENERGY OF CHARGED TPC TRACKS

EGAIS : TOTAL ENERGY OF ISOLATED PHOTONS

→ EGAM : TOTAL ENERGY OF PHOTONS EXTRACTED FROM CHARGED ECAL CLUSTERS

ECN : TOTAL ENERGY IN NEUTRAL ECOBJECTS

EHN : TOTAL ENERGY IN NEUTRAL HCAL CLUSTERS

ECALON : TOTAL NEUTRAL ENERGY IN CHARGED CALOBJECTS :

→ 0 IF CALO ENERGY < TRACKS EN.

→ (CALOB.EN − TRACKS EN) IF > 0

■ ELIMINATE OVERLAP, CRACKS IN ECAL

$$EREC = \alpha_1 E_{TPC} + \alpha_2\ EGAIS + \alpha_3\ EGAM + \alpha_4 E_{CN} + \alpha_5\ EHN + \alpha_6\ ECALON$$

$$\sigma(E_{VIS} - E_{REC}) = 5.4\ GeV$$

Glen Cowan
13.12.88

"good track" → $|\lambda| \leq 75°$

Bhabha Background study:

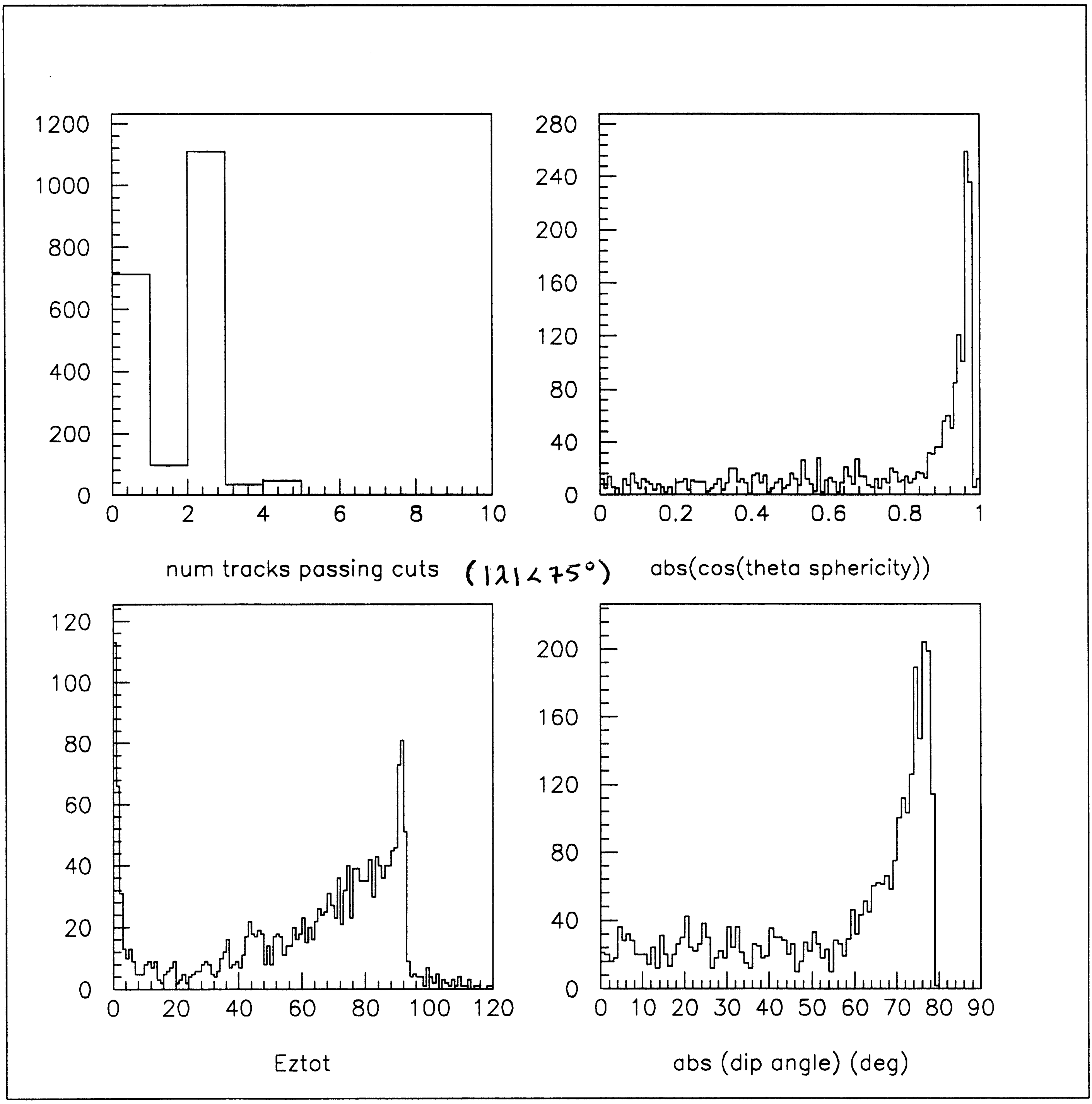
Generate 2000 Bhabhas, $10° < \theta < 170°$, $\sigma = 6.53$ nb

Require $N_{good\,tracks} \geq 3$, $E_{vis} \geq 25$ GeV

88/2000 pass; relative background level = 0,9 %

If require $N_{good\,tracks} \geq 5$, 3/2000 pass

BHAB01 - 2000 events



G. COWAN
12.12.88

HADRONIC EVENT SELECTION

ERROR IN SELECTION EFFICIENCY

→ DIFFERENT FRAGMENTATION MODELS
(DIFFERENT TRACKING)

SO FAR: LUND (PARTON SHOWER, 2ND ORDER MATRIX ELEMENTS, INDEPENDENT FRAGMENTATION)

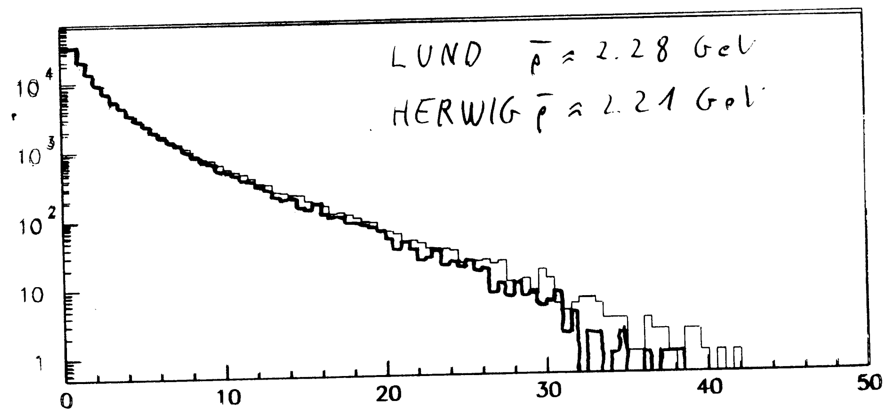
NOW: HERWIG (CLUSTER-FRAGMENTATION)

1.) COMPARISON LUND - HERWIG

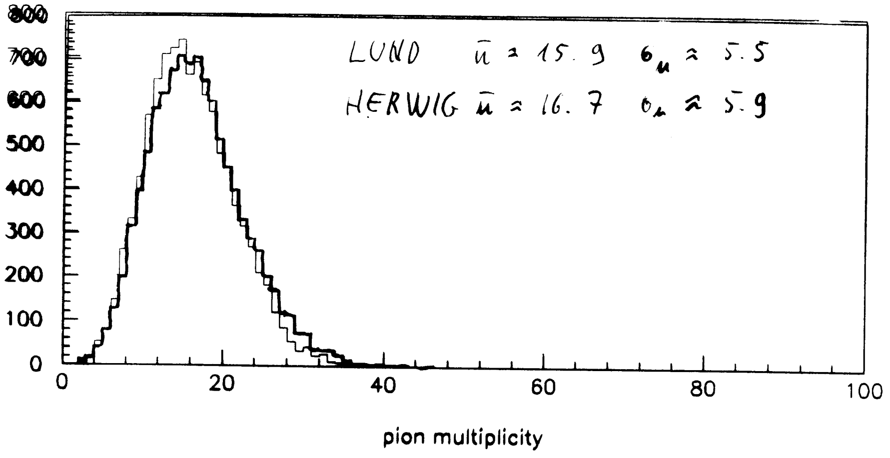
- MOMENTUM DISTRIBUTIONS
- MULTIPLICITIES

10000 EVENTS EACH, DEFAULT OPTIONS
$E_{CM} = 92$ GeV (NO RADIATIVE CORRECTIONS IN HERWIG YET, VERSION 3.0)

a.) π^+, π^-

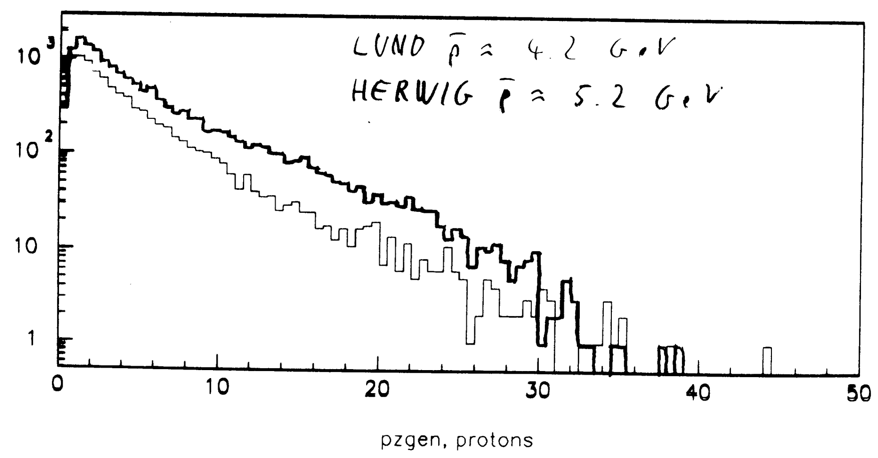


$\Delta \bar{p} \approx 3\%$

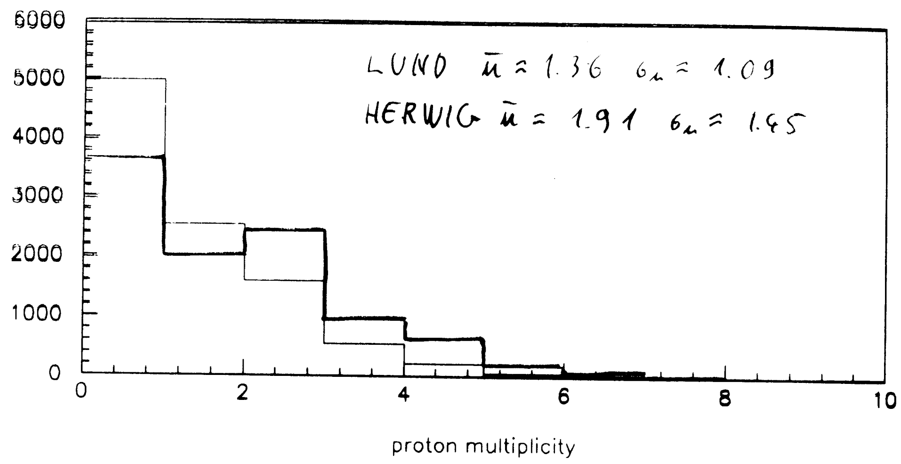


$\Delta n \approx 5\%$

6.) $p\bar{p}$



$\Delta p \approx 19\%$



$\Delta n \approx 29\%$

CHARGED MULTIPLICITY (ALL PARTICLES): $\Delta n \approx 5\%$

SELECTION EFFICIENCY

INTERFACE HERWIG - GALEPH IMILEMENTED
(BE CAREFUL !)

USE FAST TRACKING, SIMOST, READST (-> ALPHA)
(2689 EVENTS)

	$E_{vis} \geq 0.1\ E_{cm}$ $N_{ch} \geq 3$		$E_{vis} \geq 0.2\ E_{cm}$ $N_{ch} \geq 5$	
LUND, parton shower	99.6%	$\Delta = 0.2\%$	98.8%	$\Delta = 0.9\%$
LUND, 2nd order matrix elements	99.4%		97.9%	
2nd order matrix elements + independent fragmentation	99.5%		98.3%	
LUND, parton shower, full GEANT tracking	99.9%		99.2%	
HERWIG (CLUSTER-FRAGMENTATION)	100 %		99,5 %	

$$\frac{\Delta \varepsilon}{\varepsilon} \simeq 0.5\ \%\ ?$$

ALPHA: ALEPH Physics Analysis

1) Event I/O - ALPHA unpacks data and fills QVEC · physics variables.

Eg. P_x, P_y, P_z, E

2) Easy access to data: mnemonic symbols, statement functions, real functions, and subroutines.

Eg. QP(ITK) ITK = ALPHA #.
QE(ITK)

⟹ ALPHA track numbers ≠ JULIA #s.

Loop over <u>re</u>constructed tracks:

DO ITK = KF<u>RE</u>T, KL<u>RE</u>T

tracks = KN<u>RE</u>T

User must provide 3 subroutines and 1 card file.

<u>3 User Routines:</u> (see PHY: QUUSER.FOR / QUUSER FORTRAN K)

1. QUINIT · Book histograms
   - HBOOK1 → QBOOK1
   - HBOOK2 → QBOOK2
   - HBOOKN → QBOOKN
   - + QBOOKR, QHFR (Ntuple + Run, event)
2. QUEVNT · called once per event.
3. QUTERM - user termination.

ALPHA features in two INCLUDE statements:

QCDE INC

Your commons →

QMACRO INC

Your statement functions →

Card file: (see ALPHA.CARDS)

FILI input

FILO output

HISTO - HBOOK output

COPY - Copy all events

SEVT - Select events

READ - Read cards from other file

SYNTAX - Check syntax of card file

⋮

```
      SUBROUTINE QUINIT
C-----------------------------------------------------------------------
C user initialisation
C-----------------------------------------------------------------------
      INCLUDE 'PHY:QCDE.INC'     !VAX
C     INCLUDE 'QCDE INC *'       !IBM
      CALL QBOOK1(10,'Number of charged tracks$',50,-.5,100.5,0.)
      CALL QBOOK1(15,'Charged Energy (GeV)$',25,0.,100.,0.)
      CALL QBOOK1(20,'Charged-track momentum$',50,0.,25.,0.)
      CALL QBOOK1(30,'K-PI Invariant Mass$',20,1.7,2.1,0.)
      CALL QBOOK1(40,'COS Theta-K$',20,-1.,1.,0.)
C-----------------------------------------------------------------------
C
      END
      SUBROUTINE QUEVNT (QT,KT,QV,KV)
C
C-----------------------------------------------------------------------
C called once for each event
C-----------------------------------------------------------------------
      INCLUDE 'PHY:QCDE.INC'     !VAX
C     INCLUDE 'QCDE INC *'       !IBM
      DIMENSION QT(KCOLUT,1), KT(KCOLUT,1), QV(KCOLUV,1), KV(KCOLUT,1)
      DATA AMPI,AMK/.13956,.49367/
      INCLUDE 'PHY:QMACRO.INC'   !VAX
C     INCLUDE 'QMACRO INC *'     !IBM
C-----------------------------------------------------------------------
      ECHRG=0.
C-----histogram of charged multiplicity
      CALL HF1(10,FLOAT(KNCHT),1.)
C
C-----Loop over all charged tracks; calculate k-pi invariant mass for all
C-----oppositely-charged tracks.
C
      DO 20 IPI=KFCHT,KLCHT
        CALL HF1(20,QP(IPI),1.)
        CALL QVMASS(IPI,AMPI)
C-------Sum charged energy assuming pion masses
        ECHRG=ECHRG+QE(IPI)
        DO 21 IK=KFCHT,KLCHT
          IF(QCH(IPI)*QCH(IK).LT.0.)THEN
            CALL QVMASS(IK,AMK)
            EM=QM2(IPI,IK)
            COST=QDECA(IPI,IK)
            CALL HF1(30,EM,1.)
            CALL HF1(40,COST,1.)
          ENDIF
   21   CONTINUE
   20 CONTINUE
      CALL HF1(15,ECHRG,1.)
      END
```

```
****************** ALPHA.CARDS ****************************

   FILI 'SCWEEK:outdst.EPIO'
   FILI 'SCWEEK:DST019.EPIO'
   HISTO 'DSTEST'
   ENDQ
```

```
========> ALPHARUN EXEC K1 to Run P. A. S. - 88/11/17 <====   PANEL  0  =====

 You have actually the following configurations stored :

  TEST      QCD


 To discard one configuration type blank over its name

 To create a new one select a new name below

 Select a  name   ==> QCD       (non existing name creates a new one)
           Store ? ==> N        (Y/N)
          Modify ? ==> N        (if not 'Y' = No)




 CMS command :

 1= Help      2=          3= Quit    4=        5=        6=
 7=           8=          9=         10=       11=       12=
```

```
========> ALPHARUN EXEC K1 to Run P. A. S. - 88/11/17 <====   PANEL  1  =====



                          Job /  run_mode /  Historian

 Job name                ==> ALPHARUN


 Run mode                ==> I       ( B for Batch             )
                                     ( I for Interactive        )
 Run time (minutes)      ==> 10      (Irrelevant for interactive)


 ALPHA version           ==> 100

 Run Historian           ==> N


 CMS command :

 1= Help      2= Restart  3= Quit    4= File1   5=        6=
 7= Backward  8= Forward  9=         10=        11=       12=
```

```
 INPUT:                                Filename Filetype  Filemode

 ALPHA        TXTLIB       ==>      ALPHA100  TXTLIB      K
 Steering data cards       ==>      ALPHA     CARDS       *




 Additional  Fortran       ==>                FORTRAN     A      (Blank=none)
 Additional  Text          ==>                TEXT        A      (Blank=none)
 Additional  Txtlib        ==>      EDUTIL    TXTLIB      A      (Blank=none)

 EVENT_INPUT_FILE_ON_DISK
                        USERID  ==> PUBXU       ADDRESS  ==> 403

 CMS command :

 1= Help      2= Restart  3= Quit    4= File1    5=           6=
 7= Backward  8= Forward  9=         10=         11= X/Input  12= X/Cards
```

```
========> ALPHARUN EXEC K1 to Run P. A. S. - 88/11/17 <====   PANEL  3  =====



 OUTPUT:


 Output_Listing        ==> ALPHARUN  OUTPUT          (BLANK=CONSOLE)



 Historian Listing     ==> ALPHA100  LISTING     => N
 Compile File          ==> ALPHAXX   FORTRAN     => N
 Compiler Listing                                => N
 Load map                                        => N



 CMS command :

 1= Help      2= Restart  3= Quit    4= File1    5=           6=
 7= Backward  8= Forward  9=         10=         11= X/Input  12= X/Cards
```

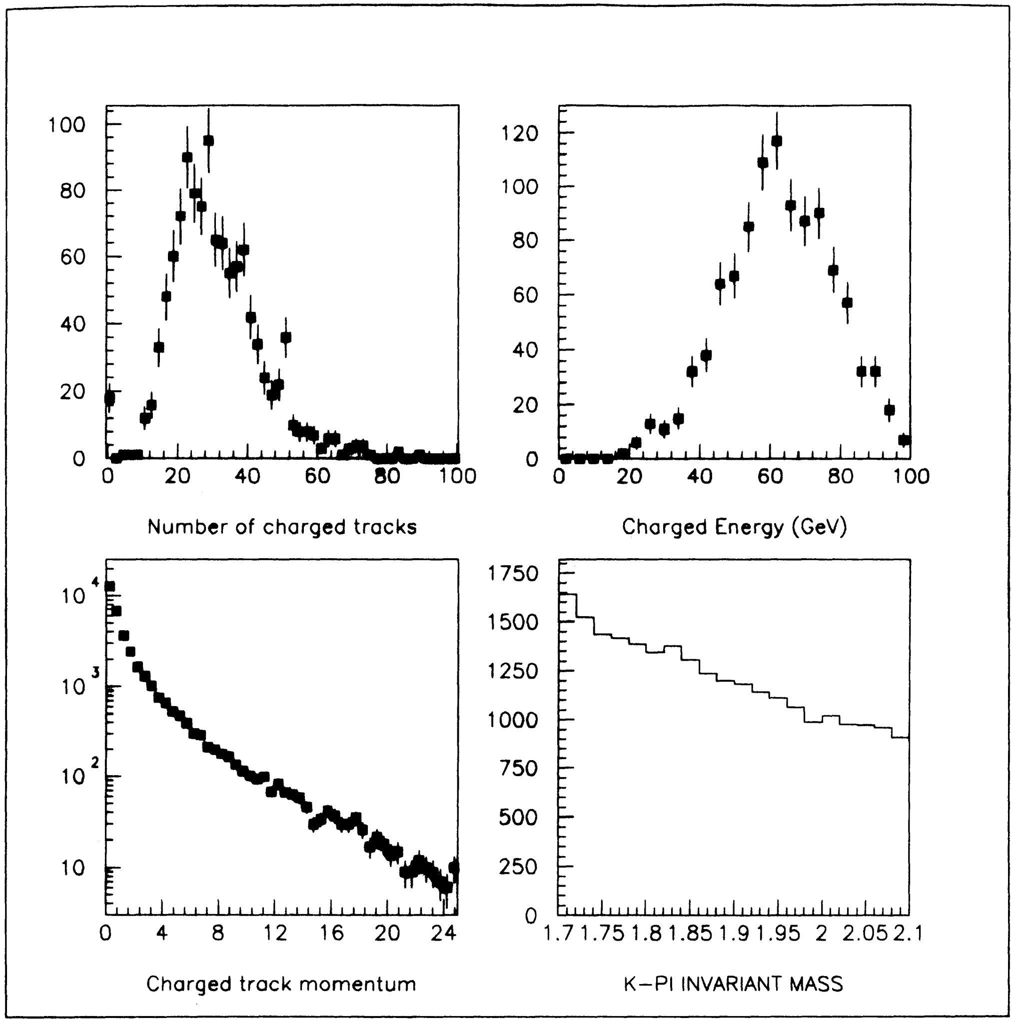
```
Type RETURN when satisfied

JOB_SUMMARY : Job ALPHARUN   Running mode I   Time 10
              Input Disk :   PUBXU    403

Input_files:            Unit          Output_Files:          Unit
 ALPHA      CARDS    *   05            ALPHARUN  OUTPUT     A
 ALPHA100   TXTLIB   K
```

Extra test file:
DSTØ19 EP10 on PUBXU 403
~800 events.

```
CMS command :
1= Help      2= Restart     3= Quit     4= Filel     5=          6=
7=           8=             9=          10=          11= X/Exec  12=
```

CN VXCERN, LAVC: PHY:ALPHARUN.COM

```
ecb_B>> alpha
   welcome to ALPHARUN 1.0, type "ALPHARUN ?" for help
 linked to HBOOK4 using CERNLIB GRAFLIB,GENLIB to define lib$
  if any problems on VAX please contact B. Bloch-Devaux/7356
  Answer ? on item in case you need help
---------------------------------------------
ALPHA name                    = PHY:ALPHA100
Historian or Fortran input    = ALUSER.FOR
Cards input                   = ALPHA.CARDS
Program name                  = ALPH.EXE   , ALPH.FOR, .OBJ Kept
Requested option              = NORMAL
Program output will be on Terminal
Extra libraries               = DISK$ALEPH2:[BLUCHER.UTIL]EBUTIL.OLB/L
Extra .OBJ files              = QVEC_SUB.OBJ
-------------------- Is it correct [Y] :
```



Some ALPHA features:

- HBOOK - Update
- Kinematics Routines
- Lock
- VAX debugger
- Utility routines for event I/O (QWRITE)

Version 102 - January 89

- Include ALEPH particle table
- More utility routines
- Jets, event shape
- Particle ID

See ALPHA NEWS.