

MINUTES of the ALEPH TRIGGER MEETING

(Held at CERN on Sept. 14th, 1988)

Present:

Barcelona:	E. Fernandez
Bari:	F. Ruggieri
Beijing:	
CERN:	J. D. Hansen, H. Wachsmuth, W. Witzeling
Clermont:	
Copenhagen:	
Demokritos:	
Ecole Polytech.:	
Edinburgh:	
Frascati:	P. Laurelli
Florida S. U. :	
Glasgow	K. Smith
Heidelberg:	B. Brandl, O. Braun, R. Geiges, E. E. Kluge, Y. Maumary, M. Panter, K. Tittel
Imp. College:	P. J. Dornan, R. Forty, R. Galik
Innsbruck:	
Lancaster:	
Mainz:	
Marseille:	
MPI München:	W. Blum, M. Bosman, G. Lütjens
Orsay:	
Pisa:	J. Steinberger
Rutherford:	R. Clift
R. H-way Coll.:	J. Strong
Saclay:	P. Colas, A. Joudon, S. Loucatos, J. Rander
Sheffield:	
Siegen:	
Trieste:	
Wisconsin:	J. Horten, R. Johnson, K. Riles

(1) K. Tittel quickly reviewed the status of the level one trigger at Heidelberg. All components will be produced in 1988. The cosmic trigger based on the HCAL wire signals will be at CERN at the end of 88, the complete trigger system at end of march 89. More details can be found in the copies of transparencies of the general meeting held at 15. 9. 88.

P. Dornan communicated, that the $r\phi$ -processors for the ITC are expected to be ready at the end of october, the $r\phi$ z-processors at middle of 89.

(2) J. D. Hansen presented all triggers, which are necessary for the measurement of the luminosity. He summarized essentially the outcome of a meeting held in Heidelberg on 10. 6. 88 (See also the corresponding minutes). Copies of his transparencies are attached to these minutes.

(3) R. Geiges presented all physics triggers, which are foreseen for day one of ALEPH operation. Copies of his transparencies are attached to these minutes. In this context a trigger is just a logical combination of fired detector segments which results in a level one "YES". The aim of the triggers is to select all e^+e^- collisions from background. The whole set of different triggers should be seen as a flexible system to be adapted quickly to all imaginable beam situations at LEP. There is a lot of redundancy in this system and therefore names should'nt be taken too literally. The triggers can be classified as principal physics triggers on one, fall-back and technical triggers on the other side. To start with, all thresholds are determined by noise, but can be quickly adapted to the real background situation.

(4) P. Laurelli reported the status of the electronics providing the HCAL signals to the trigger. The trigger group has to know the shape and timing of these signals now, since the receiving circuits, based on specifications, are ready for production by industry. The cosmic trigger will use the HCAL wire signals and should be ready by end 88, so time is short.

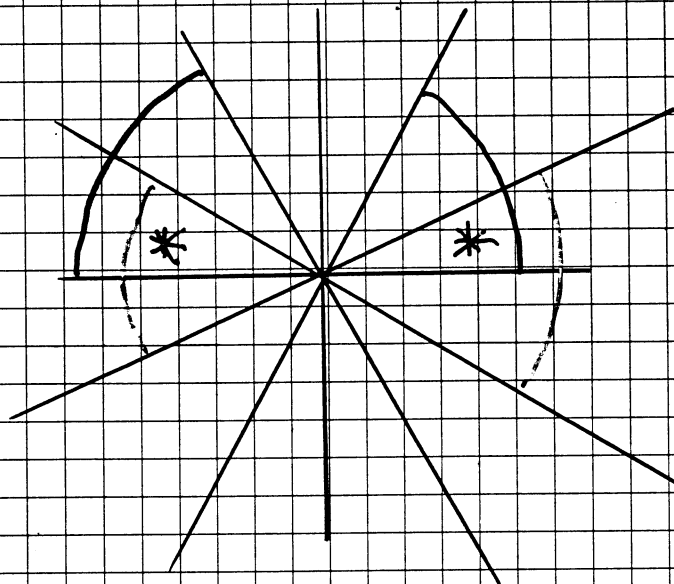
The status can be read from the attached copies of his transparencies. It was agreed, that the HCAL group mounts their circuits as soon as possible on the test calorimeter and invite people from the trigger to participate in tests with their electronics. This should happen beginning of october for the wire signals and end of october for the tower signals.

(5) J. Strong presented the status of the TPC track processing for the level two trigger. Everything seems to be well in schedule. Copies of his transparencies are attached to these minutes.

(6) At the end M. Panter raised again the problem of cabling between detectors and the trigger. There are still open questions which have to be finally settled in a month's time at the latest. Otherwise delivery of cables may cause unacceptable delays to the experiment. A meeting will be called for the beginning of october. This will be the last opportunity for fix specifications.

Next Meeting: wednesday, 16th november 1988
 at 11. 00 h
 place: CERN, bat. 32, room: see aleph notice board

LUMINOSITY TRIGGERS



TRIGGERS

HIGH (-z) * LOW (+z)

LOW (-z) * HIGH (+z)

LOW (-z) * LOW (+z)

PRESCALED

LOW (-z)

—||—

LOW (+z)

—||—

?

HIGH (-z)

—||—

?

HIGH (+z)

—||—

LUMINOSITY TRIGGERS

DELAYED COINCIDENCES

SCALED ONLY

HIGH (-Z) * LOW (+Z) DELAYED ONE TURN

LOW (-Z) * HIGH (+Z)

—||—

LOW (-Z) * LOW (+Z)

—||—

WILL BE IMPLEMENTED LATER.

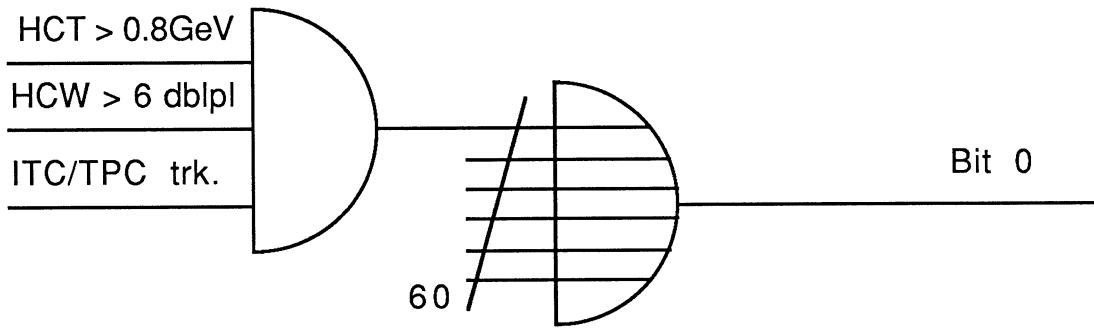
Definition of Level 1/2 trigger bits

	Description	Abrev.	Bit
X	Single Muon	SIMU	0
X	Single charged electromag. energy	SCEE	1
X	Single neutral electromag. energy	SNEE	2
X	Single charged hadronic energy	SCHE	3
X	Single neutral hadronic energy	SNHE	4
X	Isolated Photon with Veto	IPHV	5
X	Bhabha left high - right low	BHHL	6
X	Bhabha left low - right high	BHLH	7
X	Total Energy 1	ETO1	8
X	Total Energy 2	ETO2	9
X	Total Energy 3	ETO3	10
X	Total Energy 4	ETO4	11
	— — —		
	Special scaled Track Trigger	STMU	18
	Track Trigger on Track Multiplicity	TRMU	19
	Single charged elug. double cluster forward	SCDC	20
X	Cosmics Barrel	COBA	21
X	Cosmics Endcaps	COEC	22
X	Random Trigger (sc. GBX or TPC)	RNDM	23

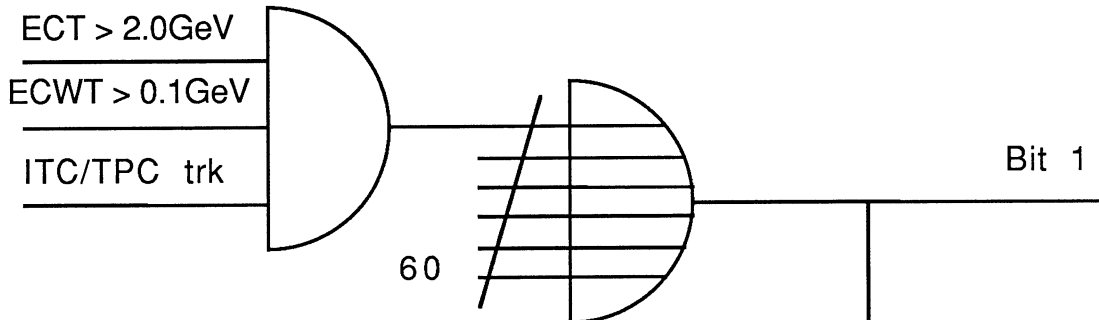
down scaled triggers

Description	Abbr.	Bit
Track Trigger ITC only	TRIT	24
Isolated Photon without Veto	IPHO	25
Double Track Trigger	TRDB	26
Bhabha low - low	BHLL	27
LCAL single arm left low	LSLL	28
LCAL single arm right low	LSRL	29
LCAL single arm left high	LSLH	30
LCAL single arm right high	LSRH	31

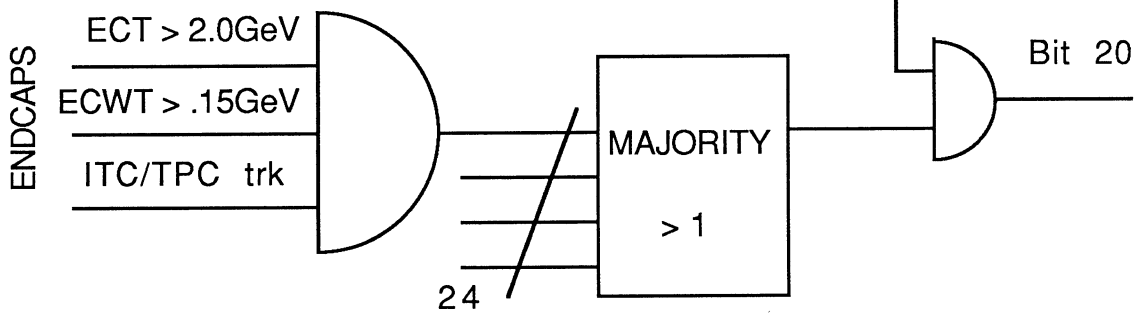
Single muon



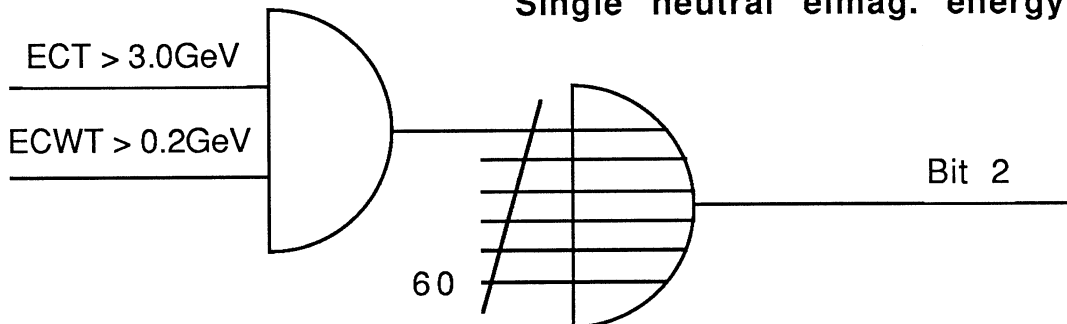
Single charged electromagnetic energy



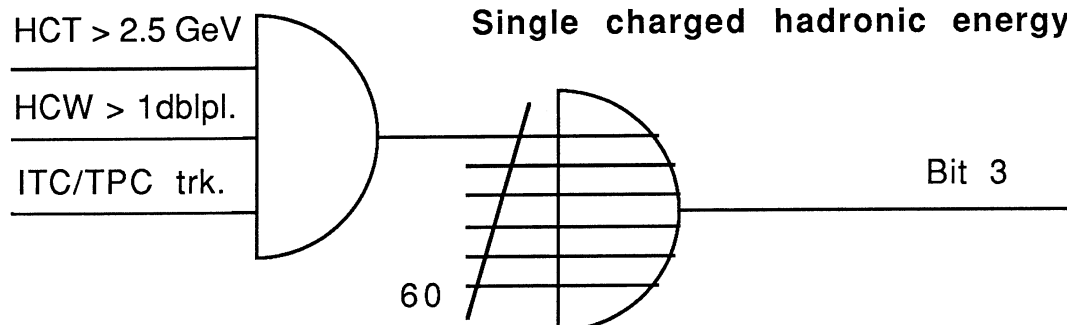
Si. char. elmag. with double cluster forward



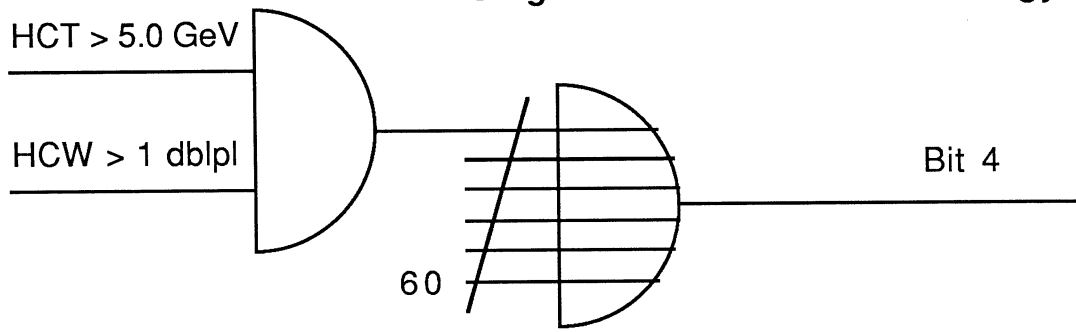
Single neutral elmag. energy



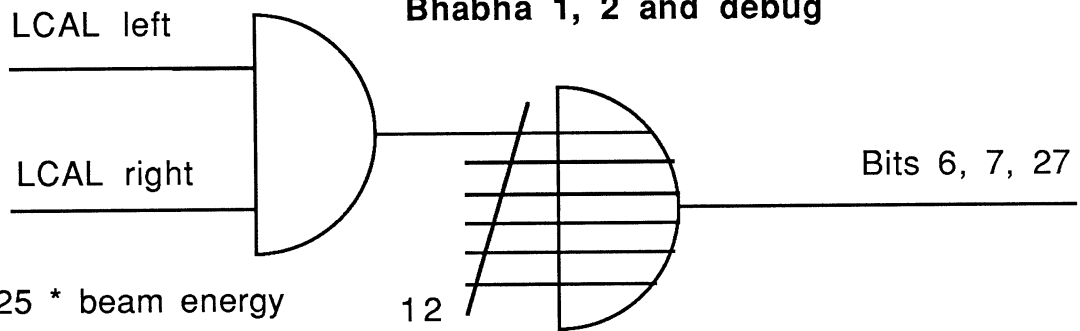
Single charged hadronic energy



Single neutral hadronic energy

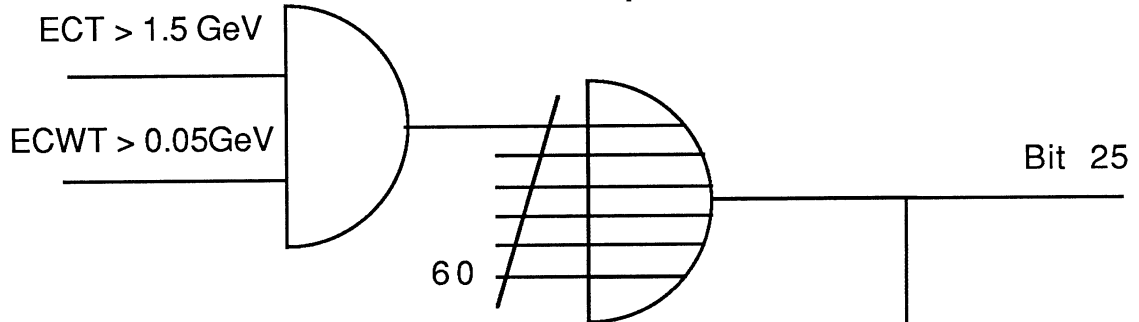


Bhabha 1, 2 and debug

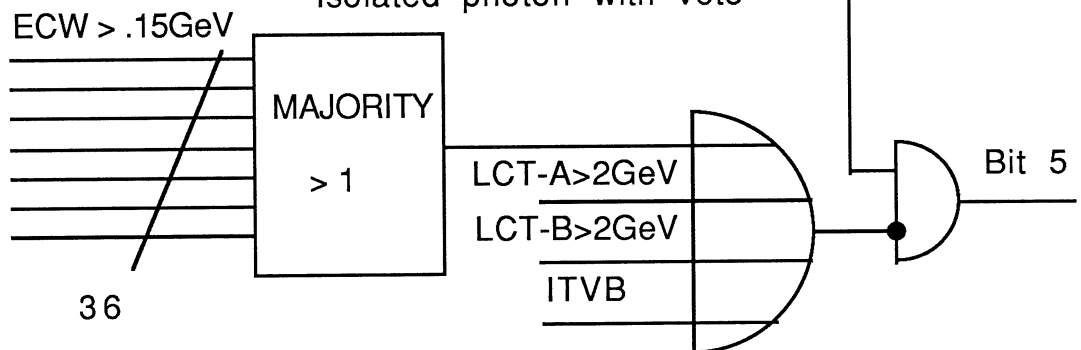


low = 0.25 * beam energy
high = 0.4 * beam energy

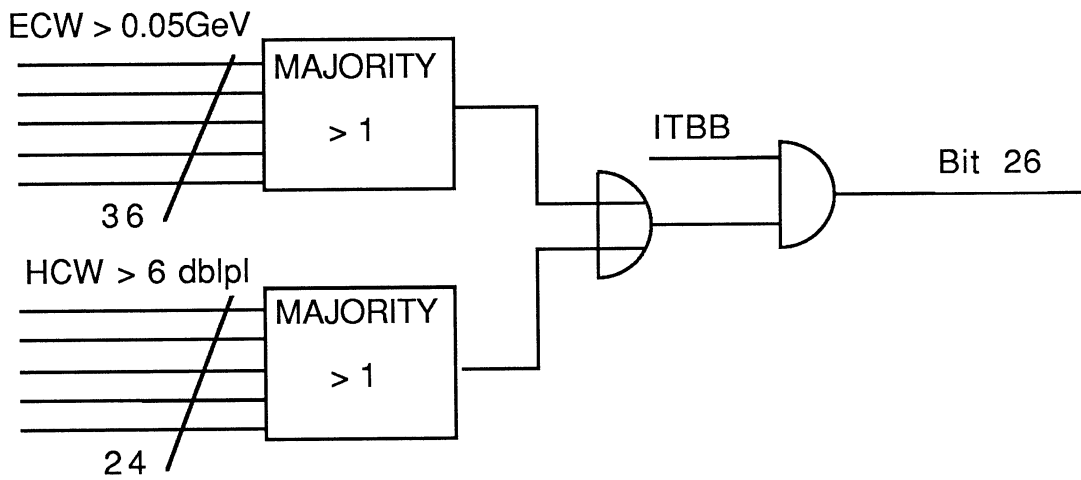
Isolated photon without veto



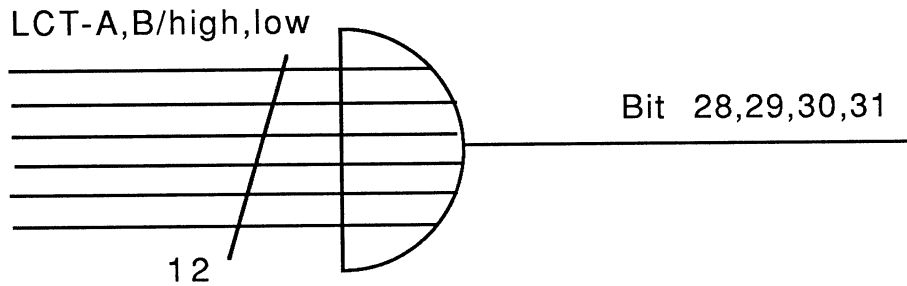
Isolated photon with veto



Double Track Trigger



LCAL debug



- Total Energy 1:** Bit 8
 $ECTE \quad \Sigma (\text{Endcap A}) > 6 \text{ GeV} \text{ OR } \Sigma (\text{Endcap B}) > 6 \text{ GeV}$
- Total Energy 2:** Bit 9
 $ECWE \quad \Sigma (\text{Barrel}) > 0.3 \text{ GeV}$
- Total Energy 3:** Bit 10
 $ECWE \quad \Sigma (\text{Total}) > 0.5 \text{ GeV}$
- Total Energy 4:** Bit 11
 $HCTE \quad \Sigma (\text{Endcap A}) > 7 \text{ GeV} \text{ OR } \Sigma (\text{Endcap B}) > 7 \text{ GeV}$

HCAL TRIGGER SIGNALS

1) FROM TOWERS (ENERGY TRIGGER)

Signals taken from ADC and summed up to build:

BARREL Side A 2x24 signals

Side B 2x24 signals

END CAPS Side A 2x24 signals

Side B 2x24 signals

Total of 192 signals

Signals balanced on twisted pairs

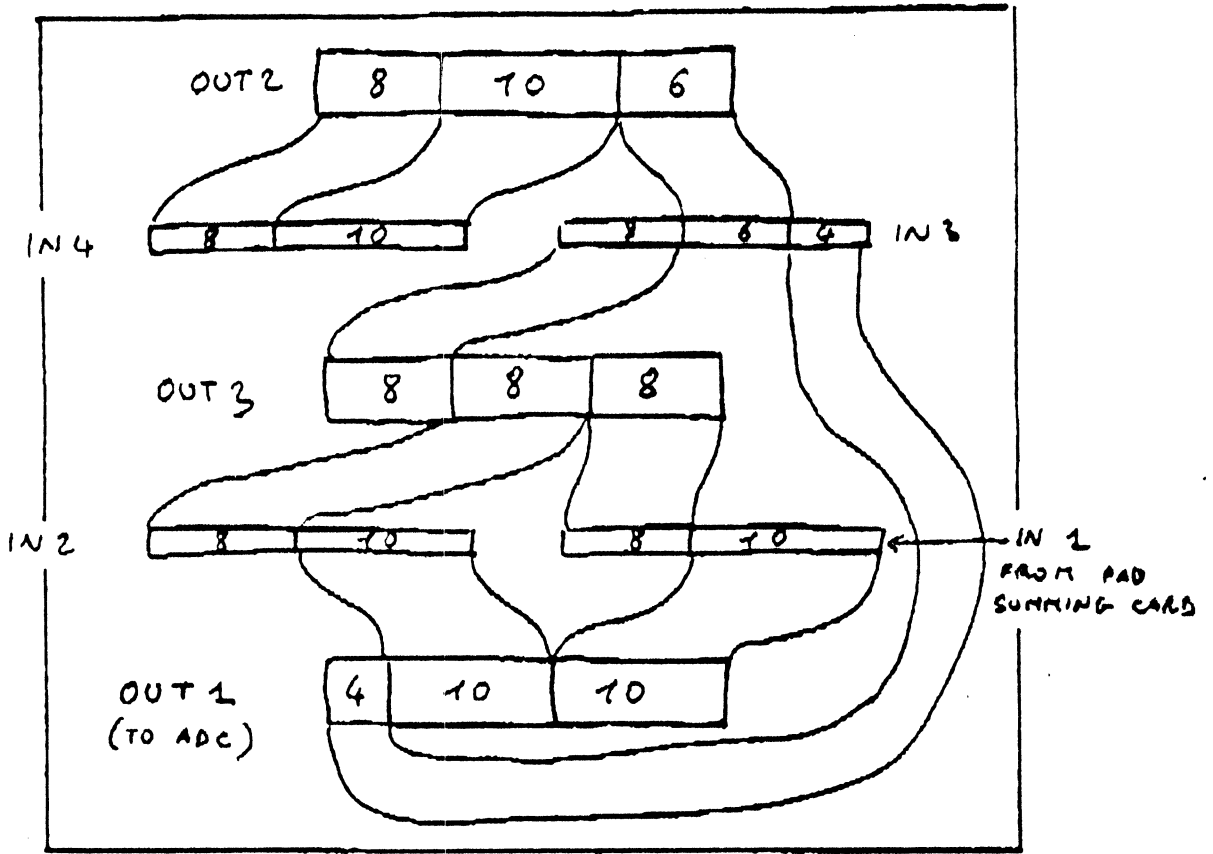
100 mV / Crv 

~ 50 ns rise time (+ time difference of cables)

~ 700 ns decay time

Status

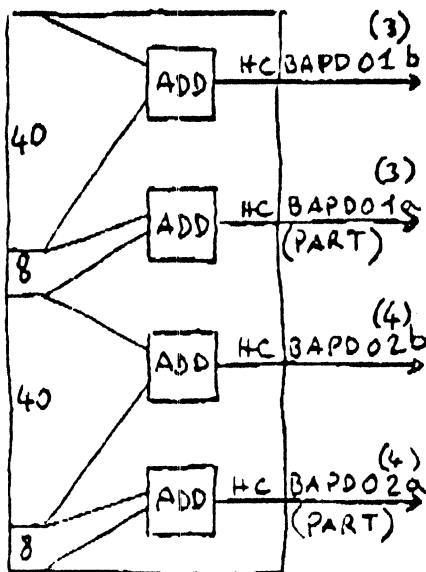
- Prototype in development



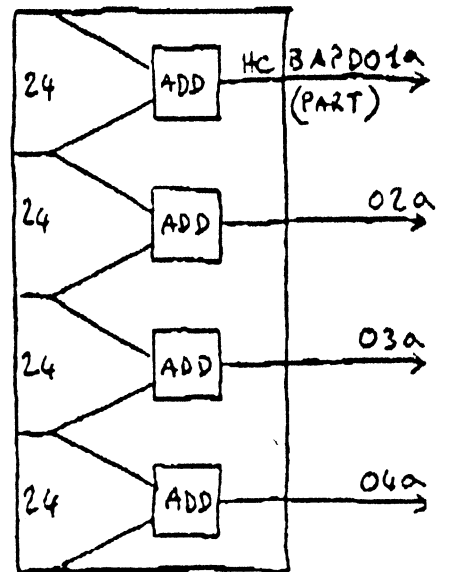
MIXER BOX PATCH PANEL

OUT 1	OUT 1	OUT 1	OUT 1
MODULE 1	MODULE 1	MODULE 3	MODULE 1
OUT 2	OUT 2	OUT 4	OUT 3
MODULE 2	MODULE 2	MODULE 4	MODULE 2
OUT 3	OUT 3	OUT 3	OUT 3
MODULE 3	MODULE 3	MODULE 3	MODULE 3
OUT 4	OUT 4	OUT 3	OUT 3
MODULE 4	MODULE 4	MODULE 3	MODULE 1

ADC 1 ADC 2 ADC 3



SUMMING CARD ADC 1, 2



SUMMING CARD ADC 3

FIG. 2

2) FROM WIRES (PENETRATION TRIGGER)

Signals from H.V. distributors and summed up to build:

BARNEL : SIDE B 12 Signals

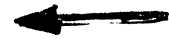
END CAPS : SIDE A 6 Signals

SIDE B 6 Signals

Total of 24 Signals

Signals balanced on twisted pairs

200 mV / double plane



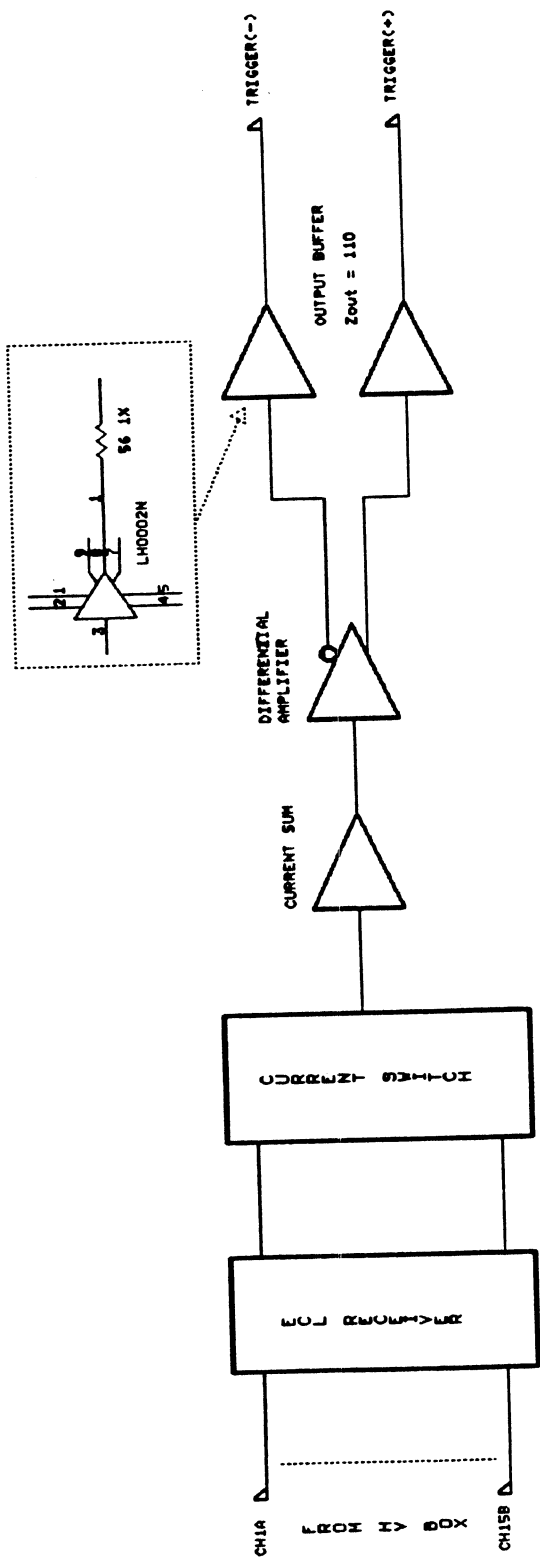
Status

- Prototype built, to be tested on the prototype calorimeter

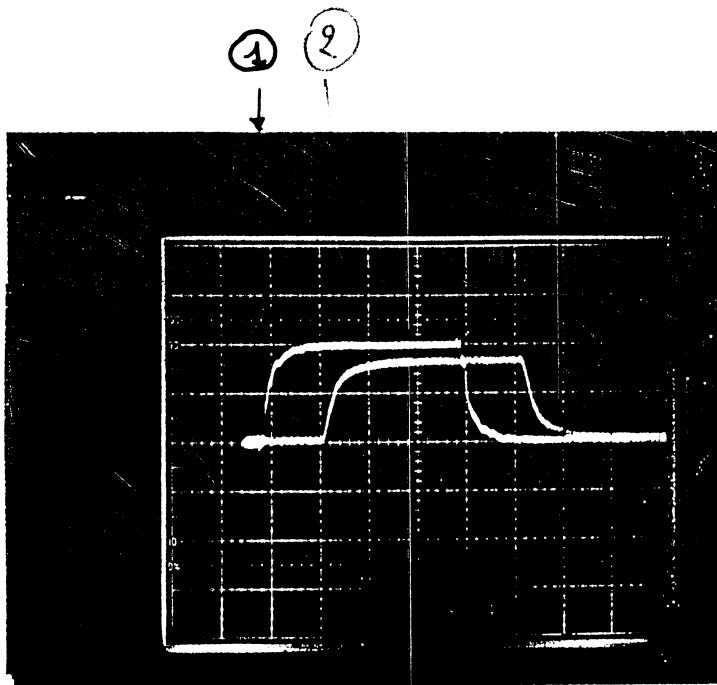
WHEN?

We need $N_2 + CO_2$ in the detector

Installation of electronics completed by end of the year?

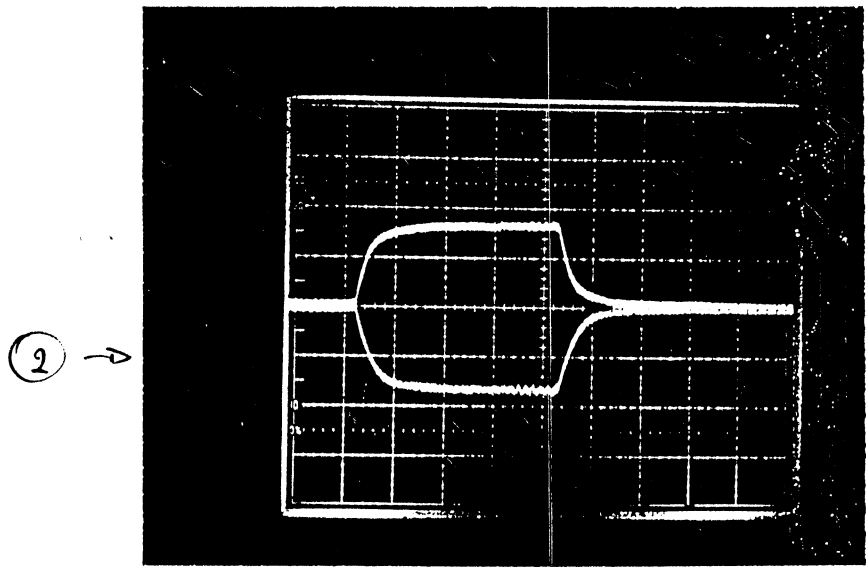


DIFFERENTIAL - ANOR



1) 100 ns/div
100 mV/div

- 1) BUFFER OUTPUT (LH002)
- 2) SIGNAL AFTER \approx 25m CABLE (56 Ω)



- 1) POSITIVE OUTPUT
- 2) NEGATIVE OUTPUT

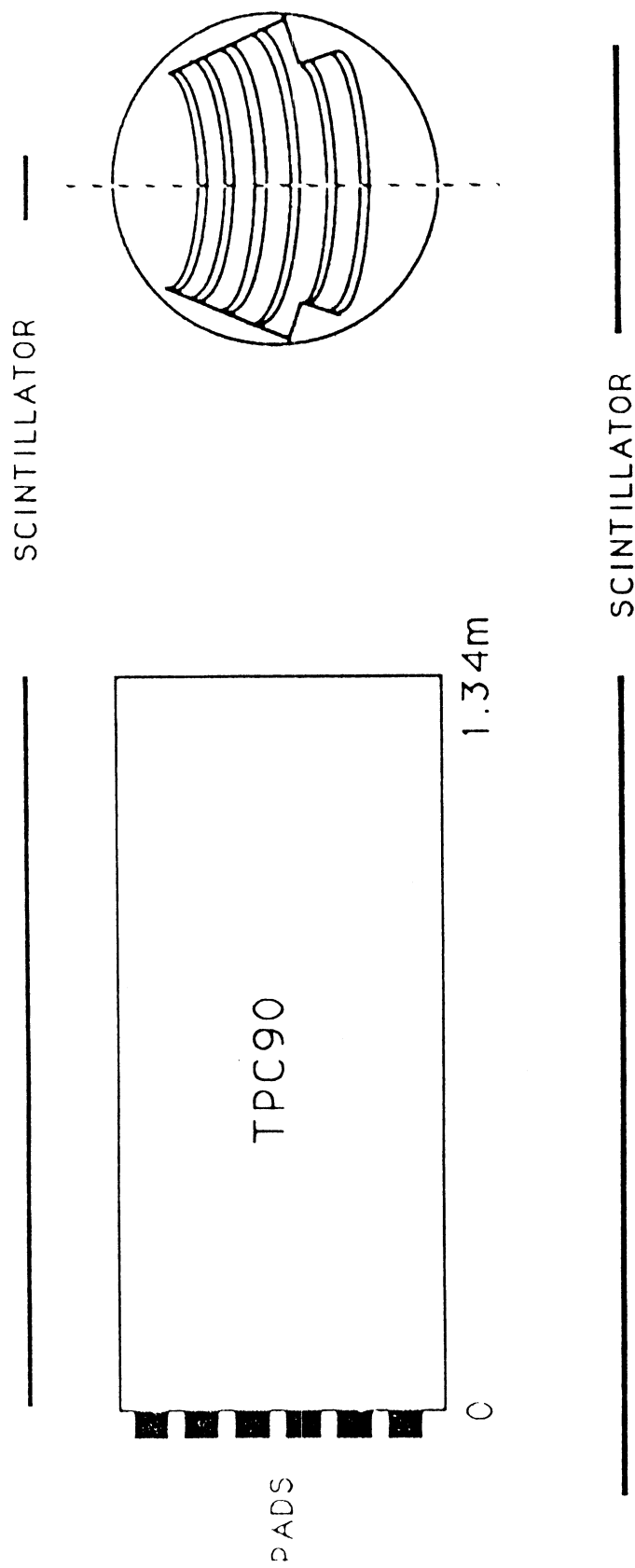
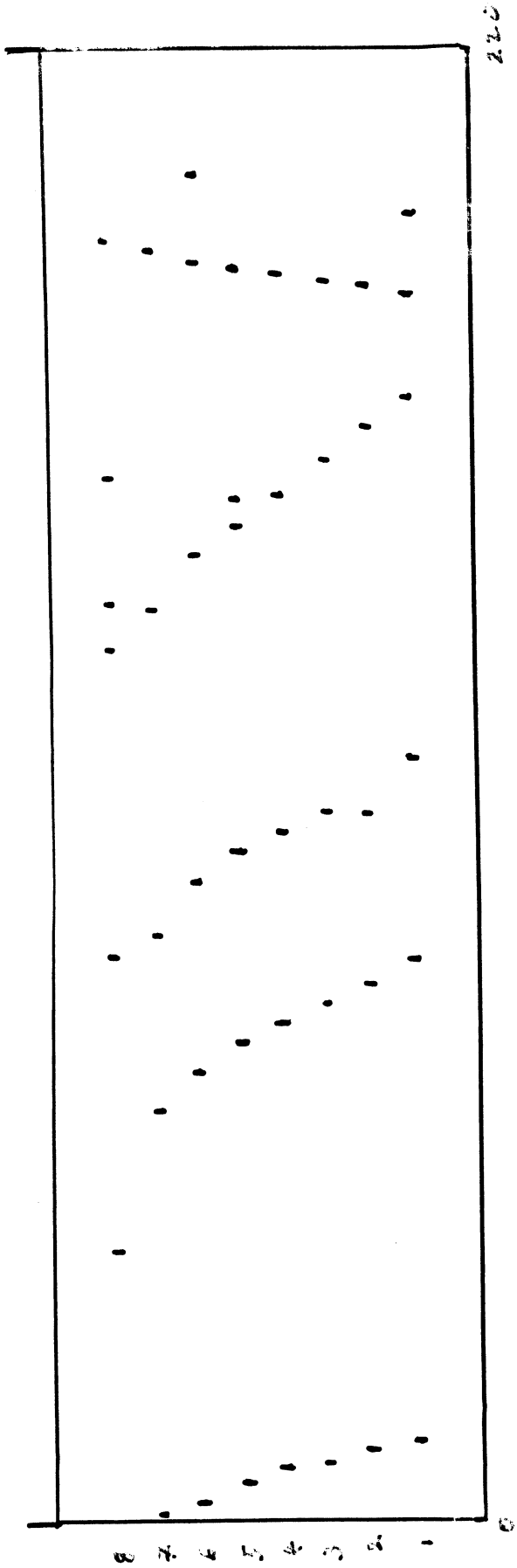


Fig. 10. Experimental arrangement for tests on TPC90/2



SECOND LEVEL TUBES

Sept '88

1. DISCRIMINATORS

1200 SUPERS - delivered end '87

80 SUPERS BEARDS - assembled and tested
(72) (Sept '88)

78 DISCRIMINATION BEARDS - assembled and
(77) tested (Sept '88)

15 INTERFACE BEARDS - assembled and tested
(12) (Sept '88)

Installation in TPC barracks expected
in October '88

2. PROCESSORS (24)

2 wire wrapped processors in TPC
barracks for cosmic track testing

P.C.B. layout under way at R.A.L.

Production expected in November.

3. COLLATOR (1)

Design complete - expected December

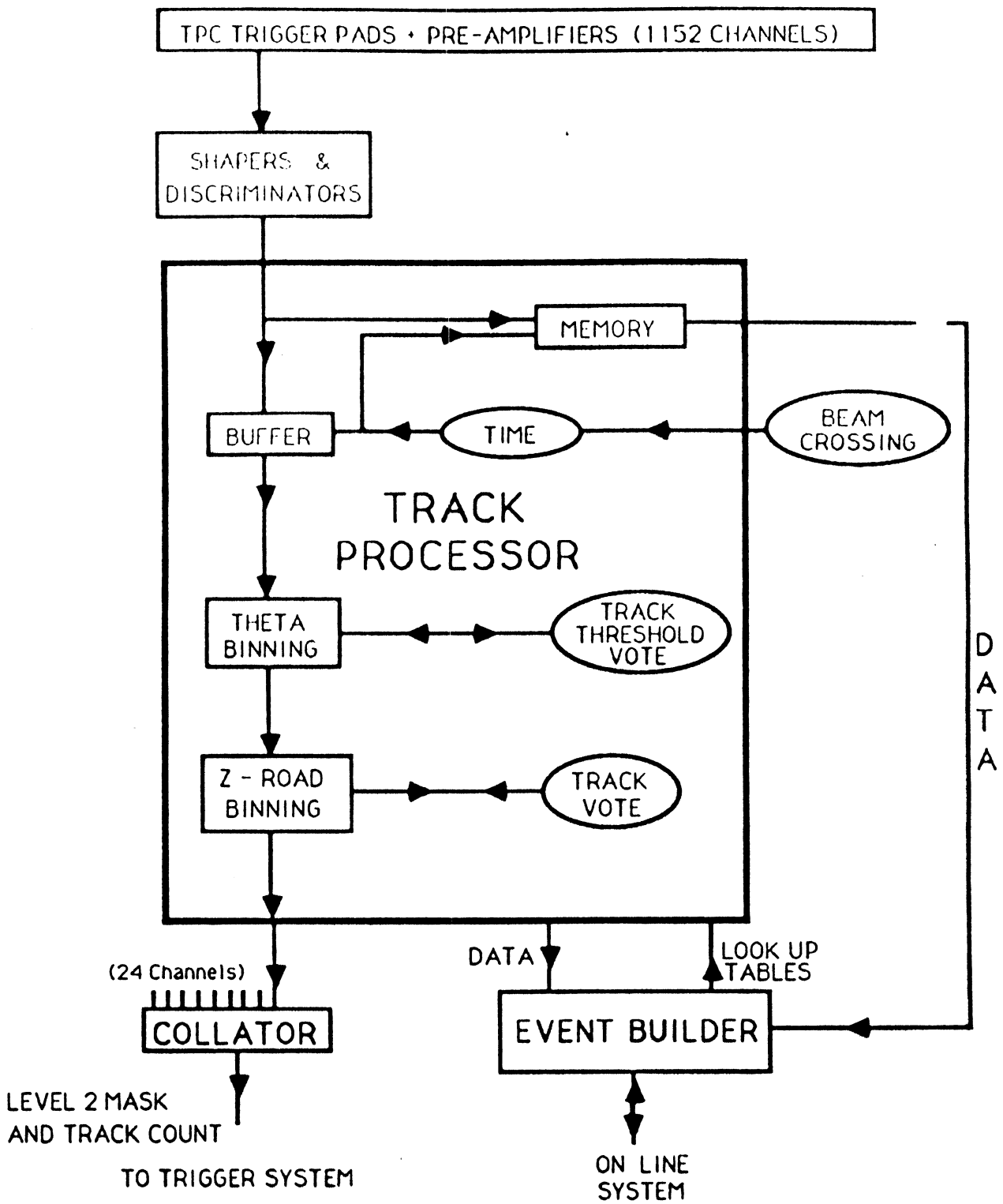
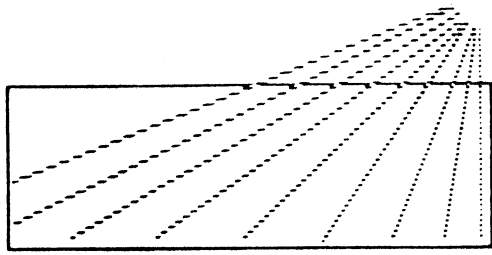
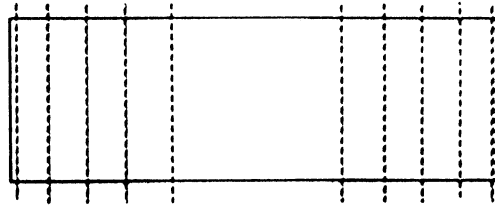


Fig. 7 Level 2 Trigger Electronics



Cell shape for (a)



Cell shape for (b)

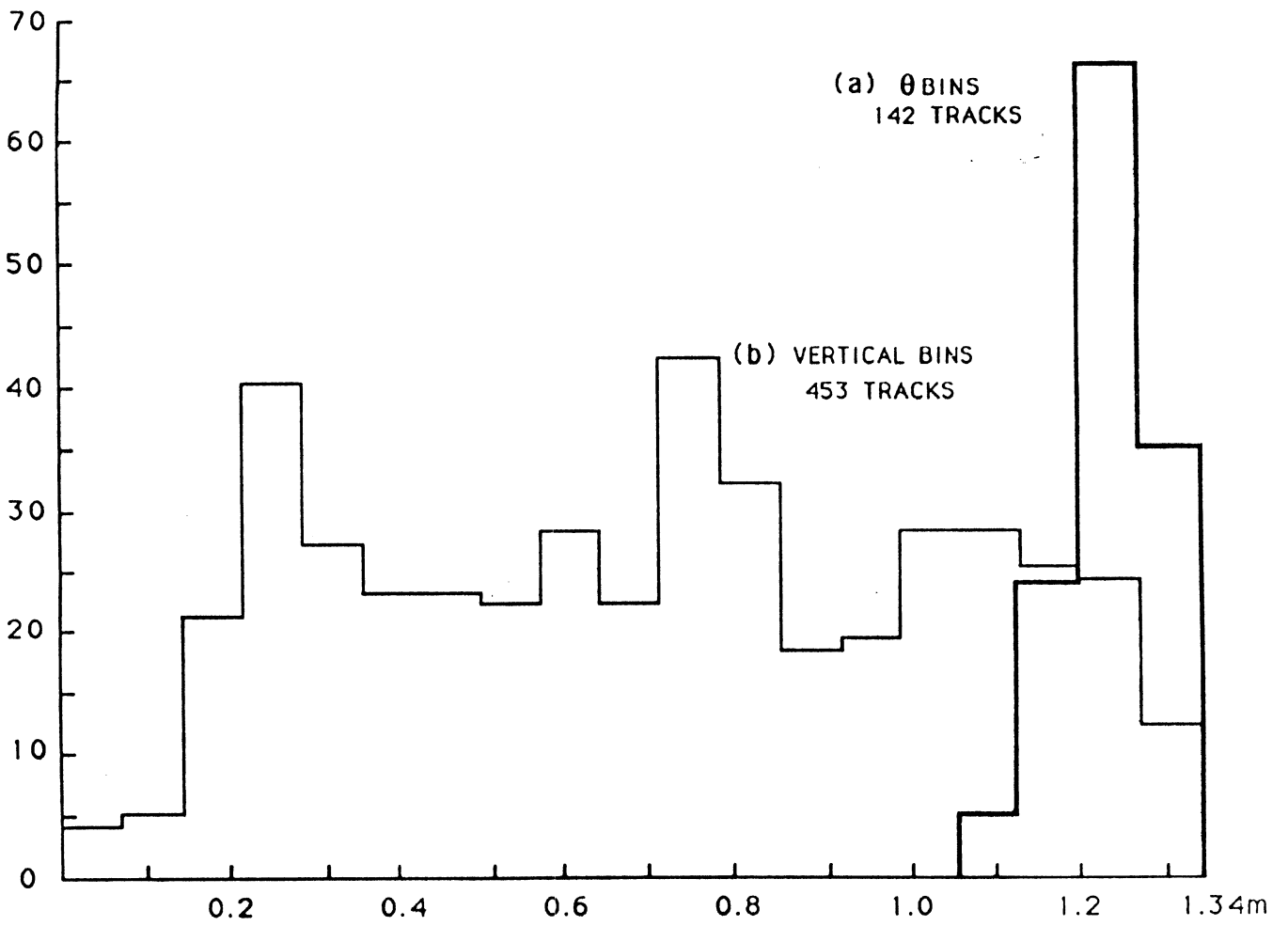


Fig.11. Z distribution of selected tracks

END