



Mini Vertex Detector

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Aleph Italia 2023

BARI 7 / 11

FIRST OF ALL

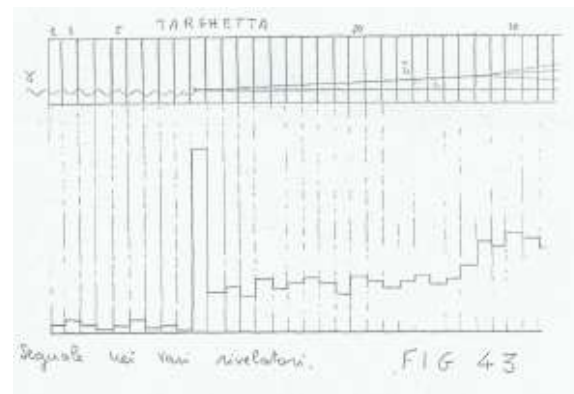
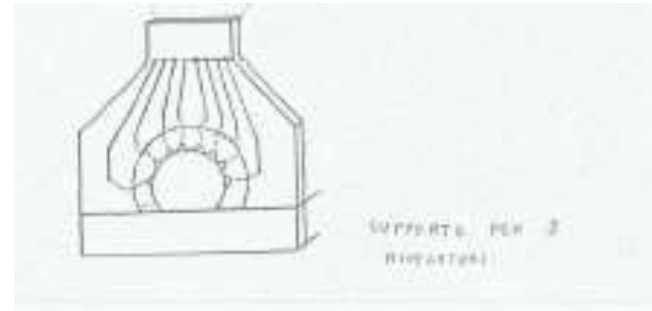
I cannot start this short presentation without reminding the key role that Lorenzo Foà has played in Aleph, for Aleph Italia and for Pisa.

OUTLINE

- Pre-History
- 1980-1981 at FNAL and at Villars sur olon
- Aleph LOI.
- Detector staged project & procurement
- The Group

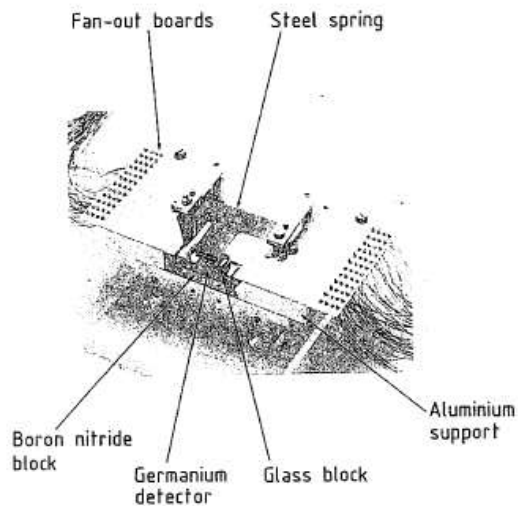
Pre-History (1978)

- Charm lifetime measurement. The idea.
- The important contribution of Giovanni Batignani (thesis).



Pre-History (1980)

- For Charm Lifetime: Development in Pisa of home made semiconductor detectors .
- **The fundamental role of Luciano Bosisio.**



Thick Ge
strip detector
50 μ m pitch .
Hand made
by Luciano.

MONOLITHIC GERMANIUM TARGET
40 electrodes 50 μ m wide 50 μ m apart

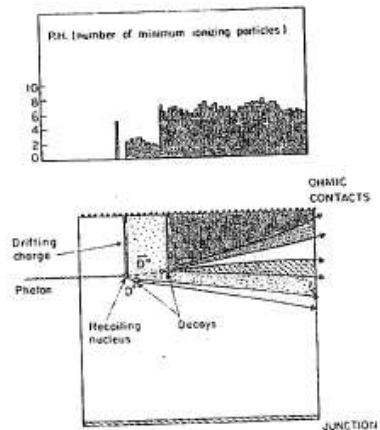
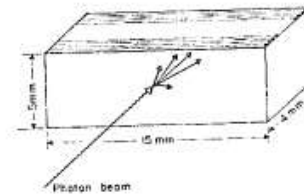


Fig. 18. Sketch of the germanium multi-electrode target under study for the CERN NA1 photoproduction experiment.

Pre-History (1980)

- First generation of strip detectors
- Important contributions of Mauro Dell'Orso and Aldo Menzione.



Fig. 3: The assembly of MESD.

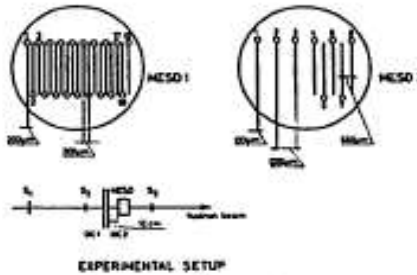


Fig. 7: Experimental set-up.

Miniaturization of High-Energy Physics Detectors

Edited by
A. Stefanini
INFN Centre of Pisa
1980

Plenum Press • New York and London

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M. A. GIORGI

6) High spatial resolution

MESD is therefore a very powerful tool to investigate production vertices and decay path of long living heavy mesons in fixed target experiments.

Point 3 can allow them to be put inside the pipes of colliding beams accelerators around interaction regions to work in situation free of multiple scattering from the pipe walls.

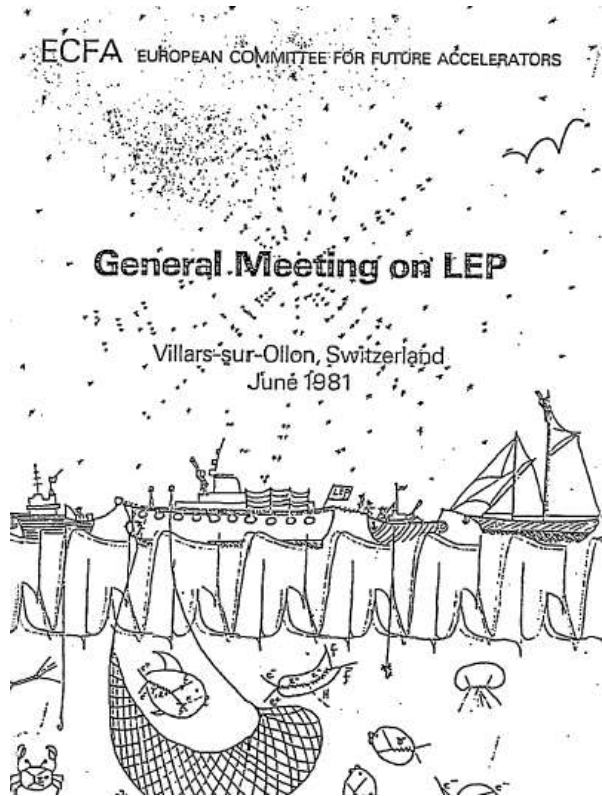
Small angle processes with high angular resolution and decay of new heavy flavours produced in e^+e^-/pp extremely high energy collisions could be then studied.

FIRST STRIP PROTOTYPE

First Pisa meeting on advanced Detectors (now Elba series)

(M.A.G./ Proc. Miniaturization of High Energy Physics Detectors 1980-. Plenum Press)

History (1981)



CHARGE-COUPLED DEVICES (CCDs) AS POSSIBLE LEP DETECTORS

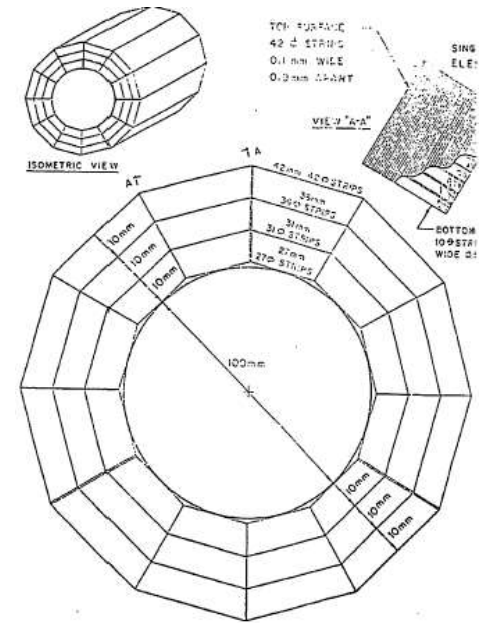
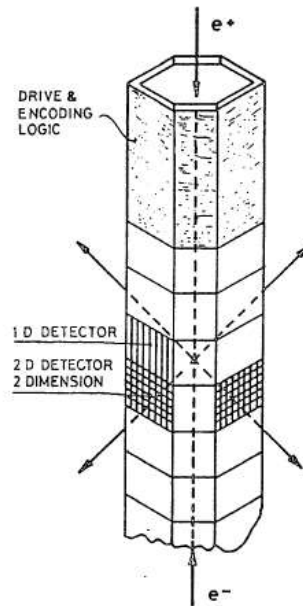


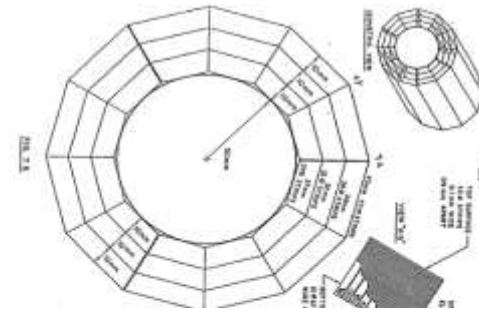
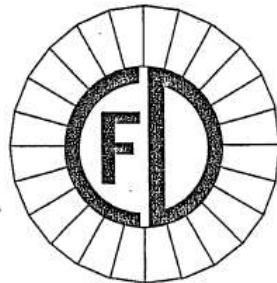
Fig. 13

Double side detectors

History (1981)

Aldo Menzione and Giorgio Bellettini asked to spend one month in FNAL working to the insertion of a chapter on B tagging in the Design Report of CDF.

DESIGN REPORT
FOR THE
FERMILAB COLLIDER DETECTOR FACILITY
(CDF)
AUGUST, 1981



University of Pisa - G. Bellettini, R. Bertani, L. Dosisio,
C. Bradaschia, R. Delfabbro, E. Focardi, M.A. Giorgi,
A. Menzione, L. Ristori, A. Scribano, G. Tonelli

The Start : LOI

My personal recollection : Lorenzo met with J. Steinberger and representatives of several european institutions in July 1980.

Early in 1982 Lorenzo asked me to write a contribution to Aleph LOI about a vertex detector for heavy flavour studies.

That was the start of the MiniVertex project.

The Start

from J.Lefrancois talk for Lorenzo(november 2017)

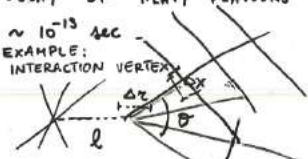
ALEPH note 62

Shown here is the first page of ALEPH note 62 (26/11/1981) explaining that the required accuracy was about 30 μm and on following slides how this could be obtained from silicon detectors

M.A. GIORGI, MINI VERTEX DETECTOR
LEP Note # 62

PROBLEM :
MEASURE OF SECONDARY VERTICES FROM
DECAY OF HEAVY FLAVOURS WITH LIFETIMES
 $\sim 10^{-13}$ sec

EXAMPLE:
INTERACTION VERTEX



$\Delta r \propto \frac{1}{B} \cdot l \cdot \theta \quad l \approx \tau \gamma \beta c$

$\frac{\Delta r}{l} \sim \text{CONSTANT}$

IF $\tau = 10^{-13}$ sec

$\frac{\Delta r}{c} \approx \frac{\Delta x}{c} = \frac{\Delta x}{30 \mu\text{m}}$

RESOLUTION OF DETECTOR
MUST BE $\sim 30 \mu\text{m}$

Construction

The construction was staged , the motivation was the cost. Anyway when the construction started several years later, INFN spent a very little amount of money all the detector project was in Pisa including the recipe for the foundery. The sensor production was continuously monitored mainly by Ettore Focardi and Guido Tonelli.

The initial group

I will only remember here the initial group of the italian young and determined people that with courage, determination and a poor funding started the Aleph VDET adventure.

- **Pisa** : G.Batignani, F.Bosi, L.Bosisio, E.Focardi, F.Forti, D.Rizzi, G.Tonelli, G.Triggiani and M.Favati.
- **Firenze**: G.Parrini and E.Scarlini

Historical Photo (from F.Forti archive)



End of my introduction

Francesco will now present the “core” of the MiniVertex.