STATUS OF CALORIMETRY
DISCUSSION* AND SITES REPORTS

REQUIREMENTS

- HIGH GRANULARITY
- ~GOOD E RESOLUTION $\delta E/E$ $\frac{em}{E} \approx \frac{10\%}{\sqrt{E}} \oplus 1\%$ $\frac{had}{E} \approx \frac{40\%}{\sqrt{E}}$
- θ/π SEPARATION → LONG. SEGM. FOR ECAL
- H. CAL INSIDE COIL
- + ...

SOLUTIONS*

- SHASHLIK (CDR's)* → PROTOTYPE STUDIES (CALEIDO)
- PAD-PLATE CALORIMETER
- VERY COMPACT CALORIMETER (DREAM CAL, BRAZIL TO CAL ....)
- OTHERS ..... (CRISTALS, LAr ....)

QUESTIONS .... (PTO)

*PRESENTATIONS BY V. KORBEL, S.C. BRIENT, P. STEFFEN, P.C.

CALEIDO TEST RESULTS

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

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An electromagnetic shashlik calorimeter with longitudinal segmentation

A.C. Benvenuti[1)], I. Britvich[6)], T. Camporesi[2)], P. Checchia[5)], A. Fenyuk[6)], V. Hedberg[3)], V. Lishin[6)], M. Margoni[5)], M. Mazzucato[5)], V. Obraztsov[6)], M. Paganoni[4)], V. Poliakov[6)], F. Simonetto[5)], F. Terranova[4)], E. Vlasov[6)].

Abstract

A novel technique for longitudinal segmentation of shashlik calorimeters has been tested in the CERN West Area beam facility. A 25 tower e.m. calorimeter has been built with vacuum photodiodes inserted in the first 8 radiation lengths to sample the initial development of the shower. Results concerning energy resolution, impact point reconstruction and e/π separation are reported.

(*To be submitted to Nuclear Instruments and Methods A*)

$\frac{\sigma_E}{E} = \left(\frac{9.6\%}{\sqrt{E}} + .5\%\right) \oplus \frac{.13}{E}$

$\frac{\sigma_x}{E} = \frac{0.3\ \text{cm}}{\sqrt{E}} \oplus 0.1\ \text{cm}$

e/π: $\varepsilon_\pi = 4 \times 10^{-5}$ @ $\varepsilon_e = 90\%$ (50 GeV π)

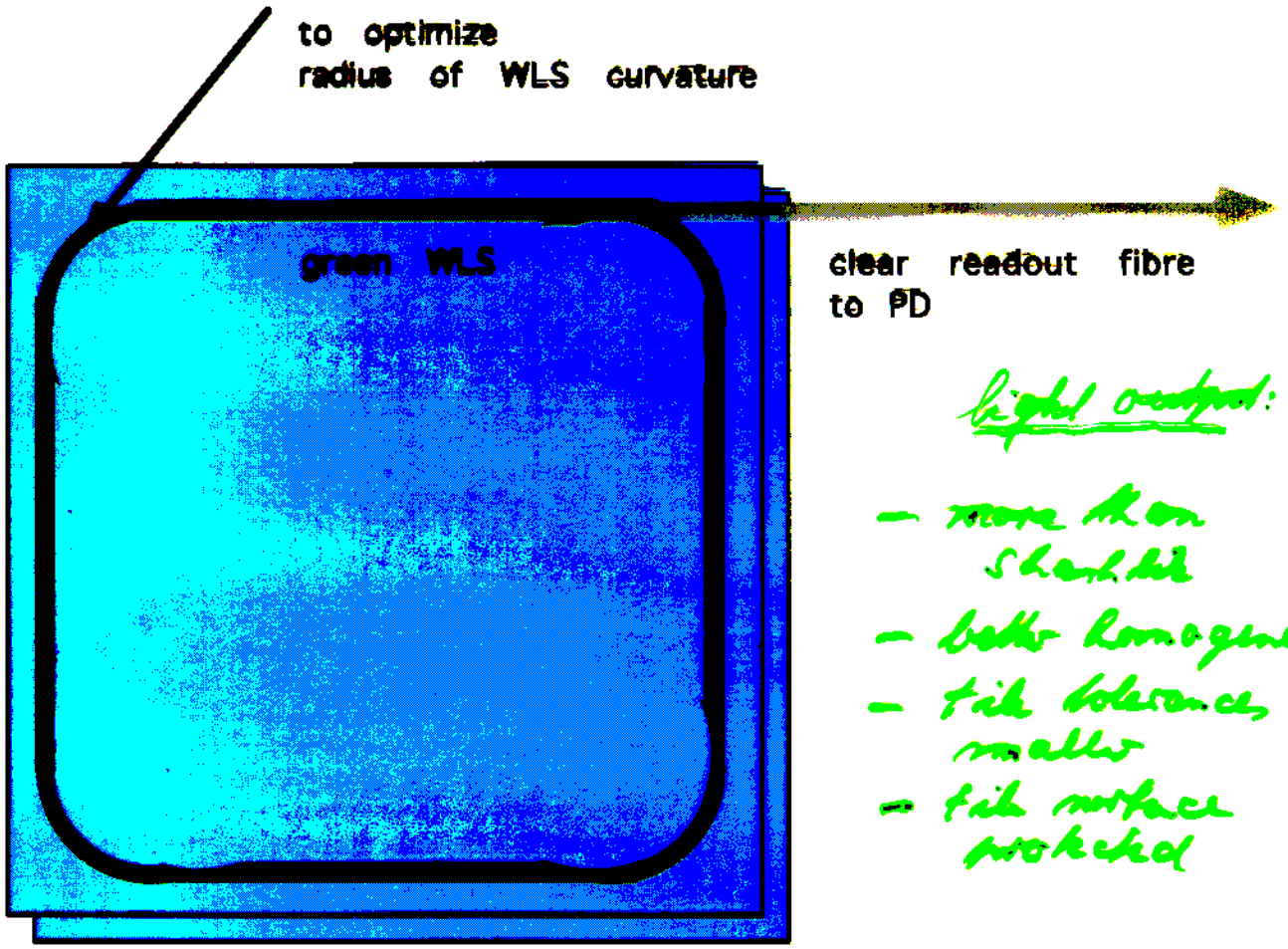
[1)] Dipartimento di Fisica, Università di Bologna and INFN, Bologna, Italy
[2)] CERN, European Organization for Nuclear Research, Geneva, Switzerland
[3)] Department of Physics, University of Lund, Lund, Sweden
[4)] Dipartimento di Fisica, Università di Milano and INFN, Milan, Italy
[5)] Dipartimento di Fisica, Università di Padova and INFN, Padua, Italy
[6)] Institute for High Energy Physics, Serpukov, Russia

5.12.98.V.Korbel

tile.singlepad

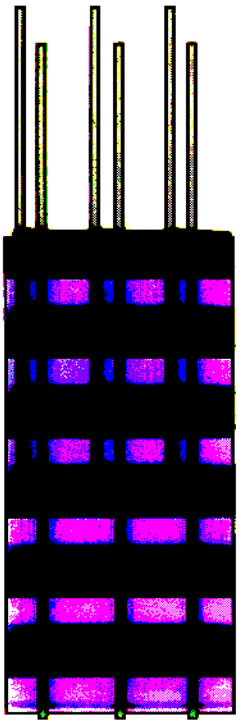
Tile Pad-Readout:

- to be tested for homogeneity
- to optimize readout



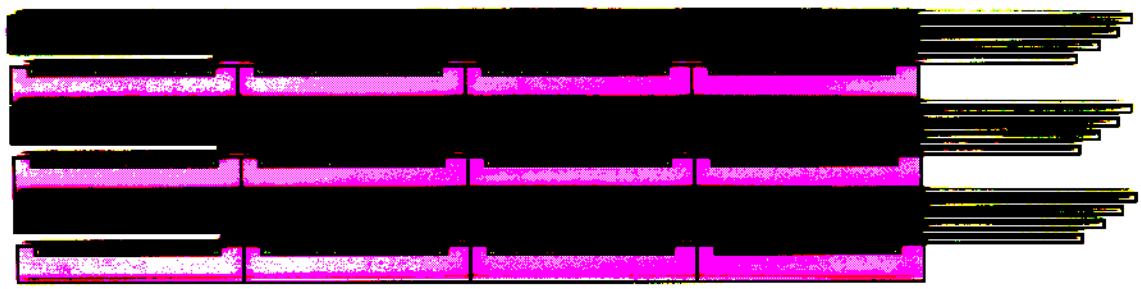
light output:

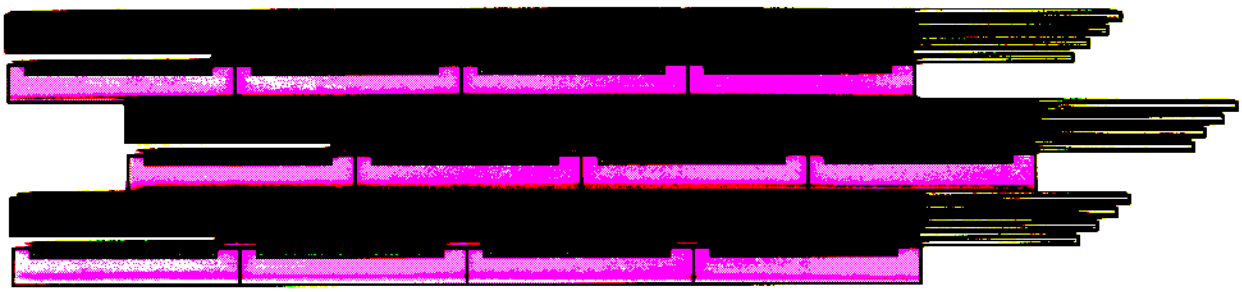
- more than standard
- better homogeneity
- fib tolerances smaller
- fib surface polished

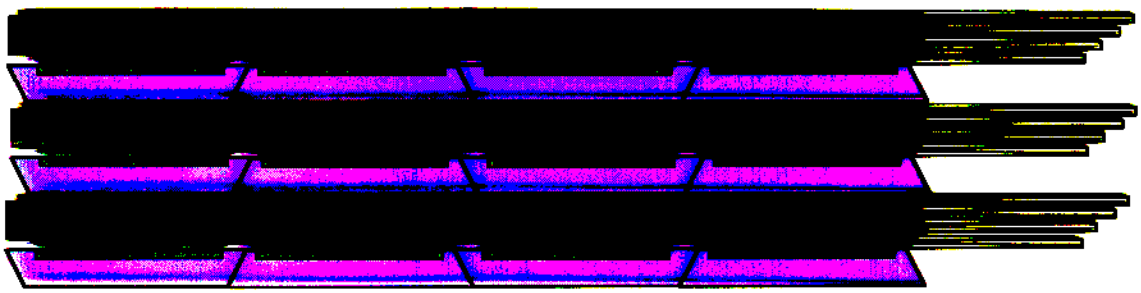


Shashlik or Tile Calorimeter?

Tile Calo Alternative:



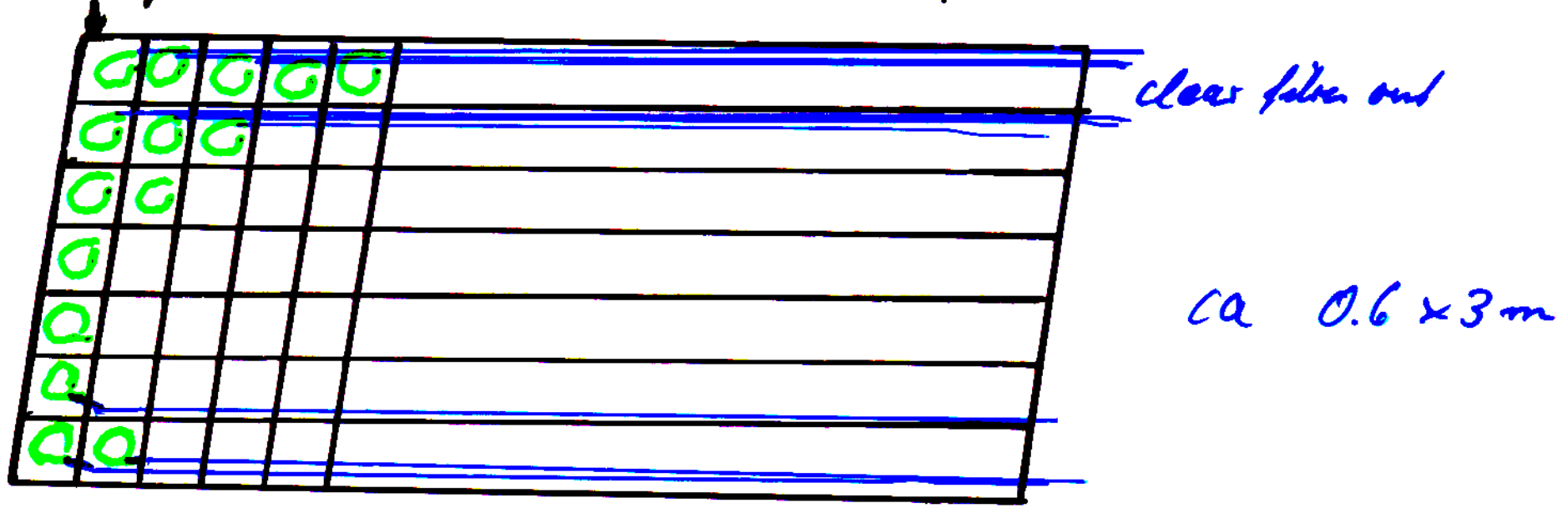




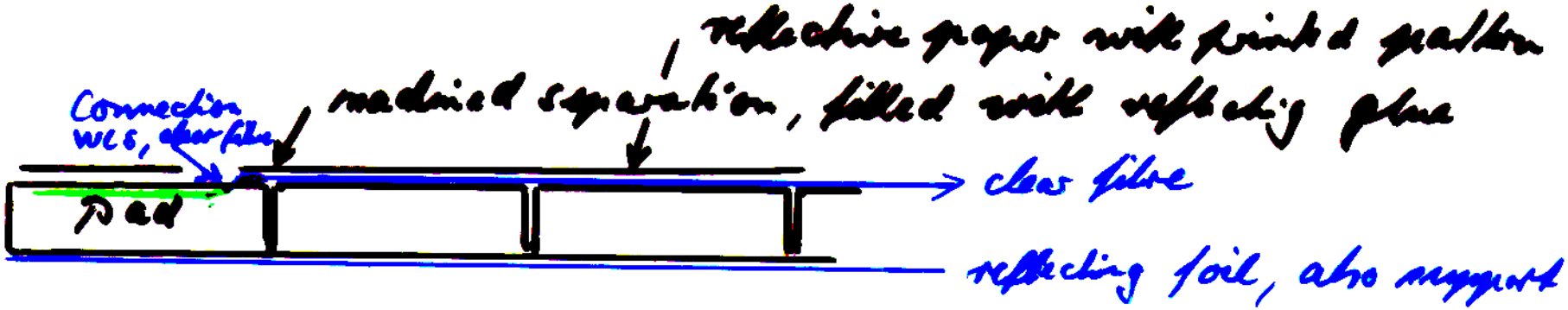
Cracks are only critical in Θ, not in Φ

15.2.99, VK

Scintillator-Pad-plate

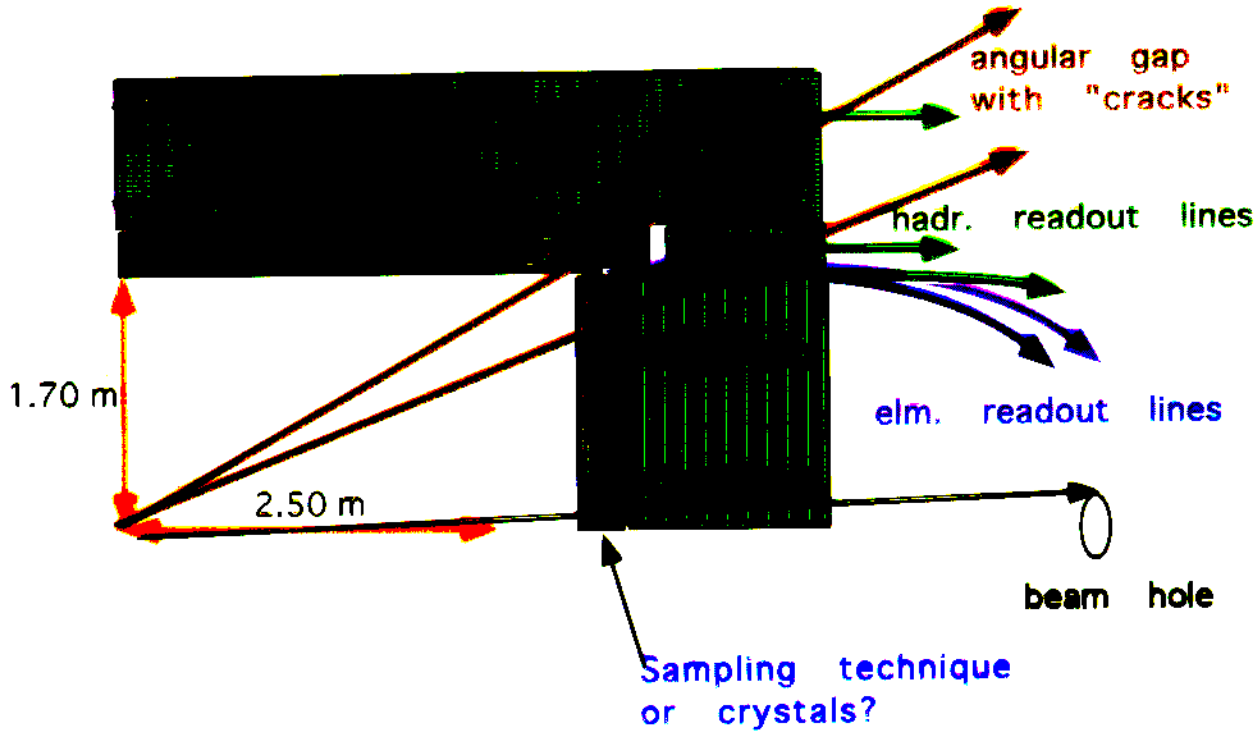


○ WLS fibre in groove



"hermetic" calorimeters,
- the problems:

modularity,
support,
service,
readout,
beamhole



Which calorimeter

ECAL

- Si+W 25X0, 1 λ_I
- Granularity/segmentation

cells size 1.5cm x 1.5cm x 1X0

25 segmentations

- thickness

25 times (.35(W)cm + 0.4(signal) + Si) = 20 cm

HCAL

- Si+Fe 2 λ_I
- 1.5 x 1.5 x 0.2λ_I 10 segmentations for 2 λ_I
- thickness

HCAL 33cm(Fe) + 10*.4 + 10cm = 47 cm

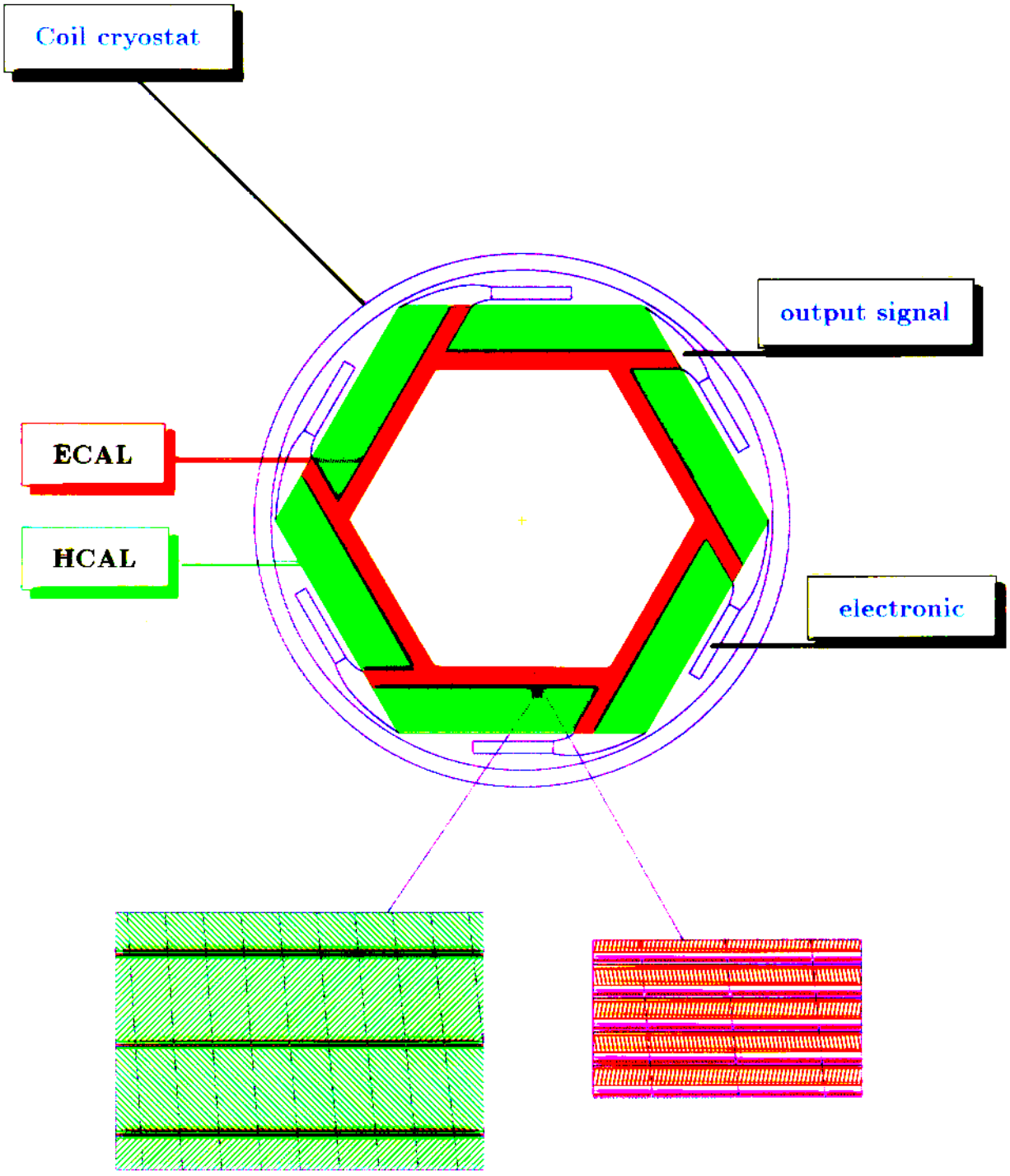
some numbers

- A total of about 15 10^6 channels !!!!!!

- It is very compact

thickness of about 70cm (a factor of 2 compare to CDR) $\Rightarrow$ gain on Coil and return-yoke

CALOR. BARREL - View XY



Advantages

- **excellent separation** e - μ - π - γ - k^0,n $\Rightarrow$ **EFLOW**
- **3D clustering**
  - $\rightarrow$ reconstruct low E photon at dist.$\geq$ 1-2 cm
  - $\rightarrow$ reconstruct neutral hadron at dist.$\geq$ 2-4 cm

(clearly dependant of Eh and momentum of the closest charged)

  - $\rightarrow$ good rejection of hadronic fake photon

- **direction of calorimetric object**

(noise reduction, interest for specific physics channels)

- **Good expected resolution** could be around $\frac{6\%}{\sqrt{E}}$ for ECAL

Probably the ideal calorimeter

Is it realistic ?

We propose to study the feasability of such a calorimeter

QUESTIONS

- ENERGY FLOW *

↕

CELL SIZE

↕

NUMBER OF CHANNELS

↕

COSTS

- HOW MANY HCAL Λ_I's INSIDE COIL? *

↕

WEIGHT

↕

MECHANICAL STRUCTURE

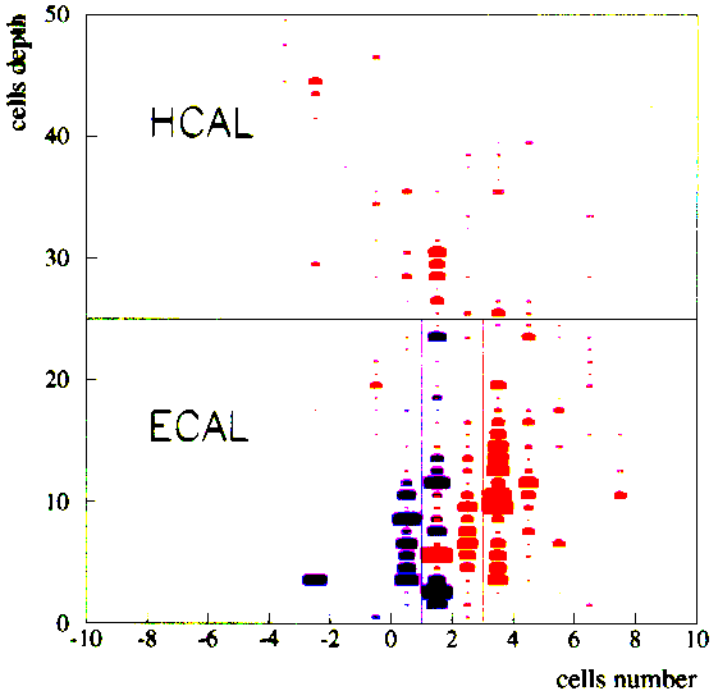
- MAGNETIC FIELD (i.e. 3 → 4 T) EFFECTS

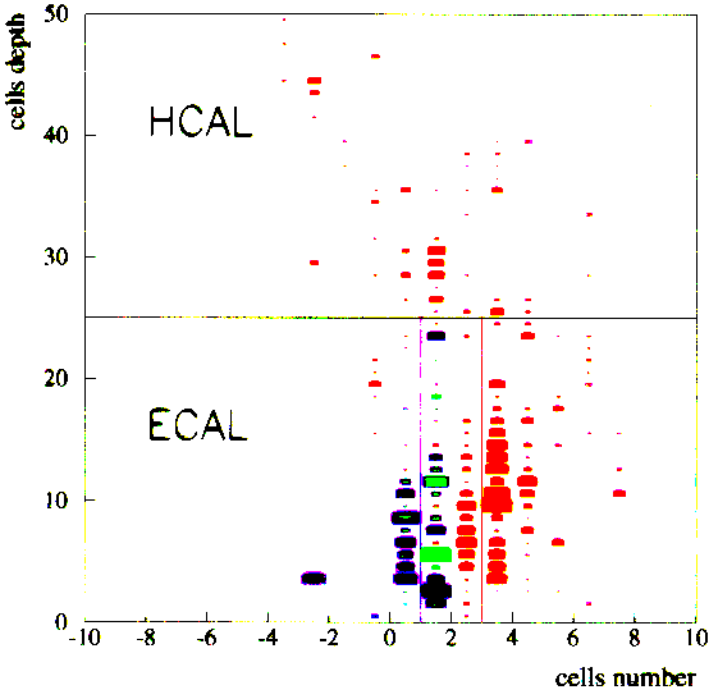
↓

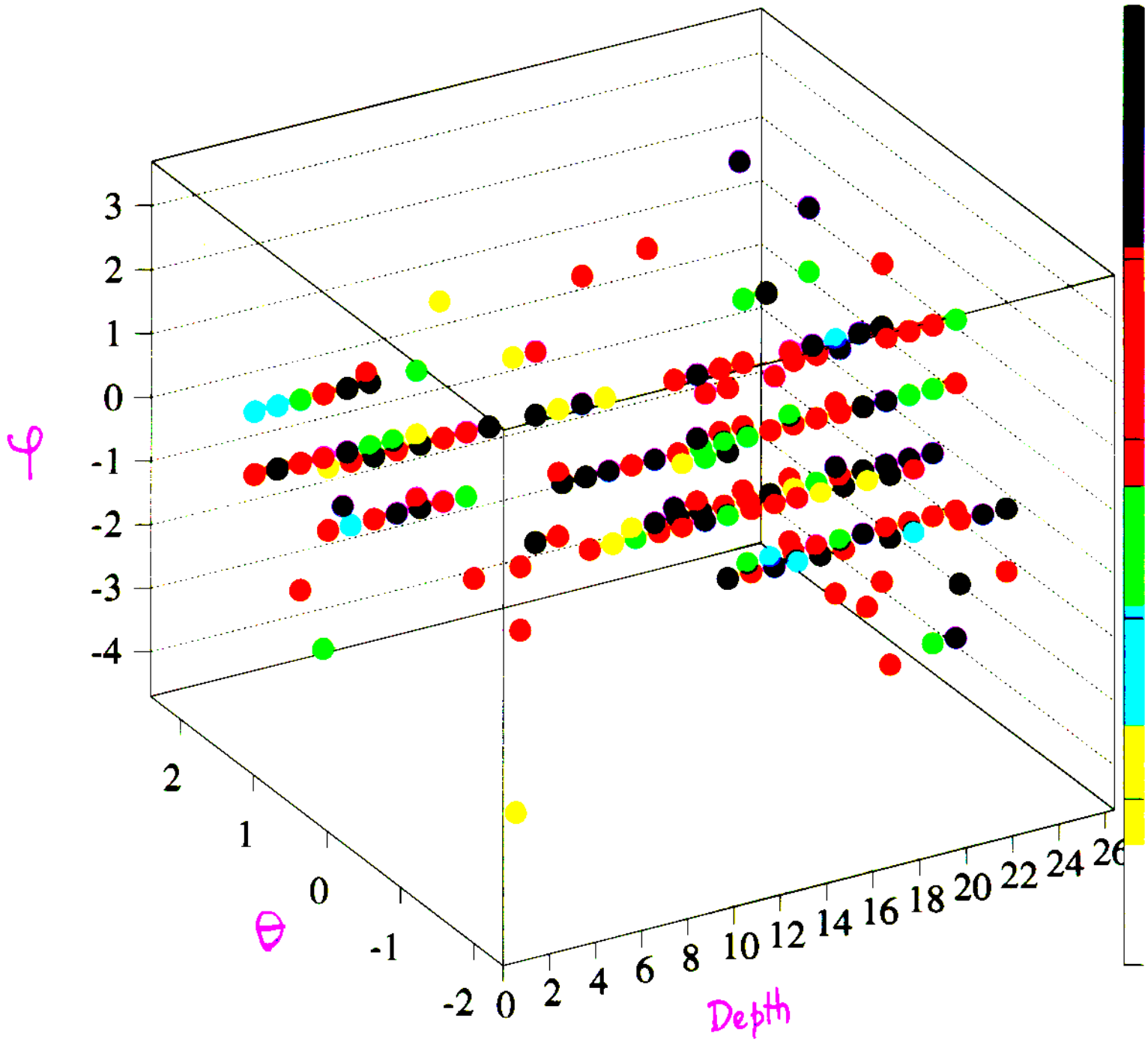
~ ACCEPTABLE

- END CAPS

PHOTON + Charged PION .






φ
3
2
1
0
-1
-2
-3
-4
θ
2
1
0
-1
-2
0
2
4
6
8
10
12
14
16
18
20
22
24
26
Depth

Weight estimates for calo version inside coil

all weight in to

I.electromagnetic section, barrel,(6m): 150

II. hadr. section, barrel,(6m):

1. λ: 116
2. λ: 126
3. λ: 136
4. λ: 146
5. λ/3: 51

sum hadr. barrel section = 576

total barrel, elm + hadr. calo, 6m: = 726

added barrel caloweight (increasing with radius):

30 X0 or 1 λ elm. : 150
1. λ hadr.: 266
2. λ hadr.: 392
3. λ hadr.: 528
4. λ hadr.: 674
5. λ/3 hadr.: 726

III.electromagnetic section, 2 endcaps: 40

IV. hadr. section, 2 endcaps: 240

sum endcaps =: 280

SITGES *

- CALORIMETER SESSION NOT DEFINED YET (WAIT FOR 'CONTINENTAL' DECISIONS)

- EUROPE :
  - 3 TALKS PROPOSED (NOT IN THIS ORDER)
    - * ALTERNATIVE SOLUTIONS (V. KORBEL)
    - * SHASHLIK (CDR-CALEIDO) PROTOTYPE RESULTS (P.C.)
    - * ENERGY FLOW OPTIMIZATION (J.C. BRIENT)
  - MINI MEETING NECESSARY JUST AFTER EASTER

* 4 HOURS PARALLEL SECTION