DAΦNE TECHNICAL NOTE

INFN - LNF, Accelerator Division

Frascati, Oct. 9, 1991

Note: **DI-3**

DAΦNE EXPERIMENTAL AREA STUDY STATUS REPORT DATED OCTOBER 4, 1991

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Summary:

Detector assembly hall and DAΦNE experimental zone lay-out updating. Fixed constraints, pits for 2 experimental apparatus in the main rings hall and the proposed solutions to the accessibility problems: how to get the s.c. coil, contained in its cryostat, into the building and how to handle two possible Detectors, is synthetically described. A desirable possible use of the Aleph s.c. coil construction equipment has been also envisaged and it is recorded in this summary. All the documents and sketches, here reported, have been discussed in the meeting of September 6th 1991 (S. Bertolucci, P. Franzini, P. Laurelli, J. Lee Franzini and A. Cattoni) and in two subsequent meetings, O. Cerafogli, P. Laurelli, G. Vignola and A. Cattoni September 10th, and P. Franzini, G. Vignola and A. Cattoni few days later. This note reports also a minor modification of the under ground level (pit bottom) due to the new Detector radial dimension foreseeable, after the proposed use of Aleph s.c. coil construction equipment.

1) Decisions already taken:

1.1 - The D.A.H. (Detector Assembly Hall) will be placed in the present Puls area. The Jet Target hall will be kept for the DAΦNE future needs.

1.2 - The DAΦNE orbit plan will lay at 1.2 m above the Adone present floor.

1.3 - The reinforced concrete perimeter wall of the Adone building will not be cut at all, above the ground level . The vertical height of the existing tufa blocks window (4m) is the maximum allowance, above the ground level, to push the Detector on the DAΦNE orbit. Obviously a suitable pit, whose depth will be discussed in a following paragraph, will be excavated, cutting the Adone building floor, to allow the passage.

1.4 - The cable belt will be situated on a side of the Detector not on top in order to keep the above mentioned vertical limitation.

1.5 - The main requests, from a planimetric point of view, presented in Detector technical note No. 002, will be kept .

1.6 - The synchrotron radiation activities on DAΦNE is possible. The sketched solution shows the fans led into the SCOW and PWA buildings. Photon beam lines from two bendings and from a wiggler magnet are involved.

1.7 - The D.A.H. building vertical cross section sketched (see Fig. 2) fits the Detector technical note No. 002 requests. In particular, an aesthetical appropriate solution has been found (See Fig. 3 by O. Cerafogli) to connect the new building to the Adone building, keeping the maximum height at the dome cornice level. Figg. 1 and 2 give the actual accepted lay-out where an under ground pit, not less than 3m deep, is foreseen.

1.8 - If the Detector radial extension would have overcome 2.8 m for a reasonable amount, the possibility to lower it down to pass through the 4 m window and to raise it again for the final positioning and alignment operations, was accepted.

1.9 - It was proposed, and in principle accepted, that the most cumbersome item to be entered in the D.A.H., the s.c. coil, would be lowered from the transporting truck on a suitable platform, using an external movable crane to be rent, and simply pulled in until the internal 20 tons crane would have hooked it for the final positioning in the pit.

1.10- Movable metallic floors and platforms should be foreseen, at different levels from the pit bottom, to allow the detector assembly and to allow appropriate space for all the operations needed around the Detector.

2) Lay-out modifications to leave open the possibility of using a second experimental apparatus.

2.1 - The Experimental Area plane view, sketched in Fig. 1, has a footprint differing from the lay-out reported in Note: DI-2 Sept. 2, 1991, because the possibility of allowing the operation of two Detectors in DAΦNE should be in principle foreseen. No reasonable access to the DAΦNE second experimental section, passing through the perimeter wall from the opposite side of the first one, has been found, due to structural obstacles of the existing Adone buildings. This means that the eventual second Detector should have the possibility of entering into the DAΦNE hall, following the same way of the first one (assembly hall, pit, perimeter wall tufa window, rails etc.). The accessibility and compatibility problems will be solved in this way:

a) The first Detector will be retracted from the machine orbit and pulled apart (west side of D.A.H.) where a suitable space has been reserved. The D.A.H. area, at ground level, has been increased by a 20% for this reason, also with the necessary pit and rails prolongation, to allow the Detector lateral movement. This operation should be done without disconnecting the cables so that the cable belt allowance will be foreseen also for the Detector lateral movement.

b) The second Detector, after a period of assembling and testing in the D.A.H. area (standing in the building east side) will be pulled into DAΦNE, following the track represented in the sketch. During this operation the machine will be obviously shut down and there will be a full accessibility for components and equipments related to the second detector. Rails and pit into the DAΦNE building have been prolonged until the second experimental section.

c) Installation, alignment and connection to the data acquisition system (control room location ect.) are still to be investigated due to the present lack of informations concerning the second Detector.
d) It must be noted that the second Detector option will at least double time and cost of digging the pit in the DAΦNE hall.

3) ALEPH s. c. coil equipment & design option.

The great advantages of such an option are self explaining. To define the new version of the Detector will be a task for the experimental Group, but two preliminary checks can be tentatively done also from the beginning:

3.1 - The 0.5 m thick iron yoke, foreseen in the Detector Technical note No. 002, is still able to carry the magnetic flux? A rough evaluation of the iron saturation level with the new coil diameter, to be checked running Poisson, gives a flux density of about 1.8 T at Bo = 0.7 T; perhaps a small increase of the yoke thickness will be needed to bearing the return flux very easily and to increase the field quality.

3.2 - What will become the pit depth to fit with the new Detector radial dimension? (See Fig. 4 for a tentative sketch and Fig 5 to recall the ALEPH cross-section). Taking into account the cryostat external diameter (5.84 m from ALEPH design) and adding the yoke thickness, the Detector diameter comes out to be of the order of 6.84 m instead of 6 m as in the previous version. Adding also the allowance for supporting beams, rollers and rails (about 1 m, but could result less after an effective mechanical design), the pit bottom would lay at not less than -3.22 m below the ground level (- 4.42 with respect to the machine orbit plane) simply to fit the Detector overall radial extension. But this should be still increased for a certain amount.

Notice that Fig 4 shows also the tufa window height (4 m above the floor level) and it is evident that the new Detector height over the DAΦNE orbit - about 3.42 m- would require a window of more than 4.62 m to pull the Detector into DAΦNE, unless lowering it for about 0.7- 0.8 m, with a corresponding increase of the pit depth. (See also paragraph 1.8). Perhaps a more economical way to follow and without any mechanical risk, is to foresee the possibility of installing the upper parts of the iron yoke directly into the DAΦNE hall.

With such a mechanical design the necessity of lowering the Detector to pass through the DAΦNE perimeter wall and to raise it again for the final alignment on the orbit, is reduced to just 12 cm theoretically. (In practice 15 to 20 cm).

Taking this into account, a first tentative quote of the pit bottom should be at - 3.42 m below the DAΦNE floor.

Again it must be pointed out that the above considerations are intended just as a starting point to evaluate roughly costs and schedule of a possible solution, and should be confirmed in details by the Detector constructive design.

Fig. 1

General Layout (10/09/91)

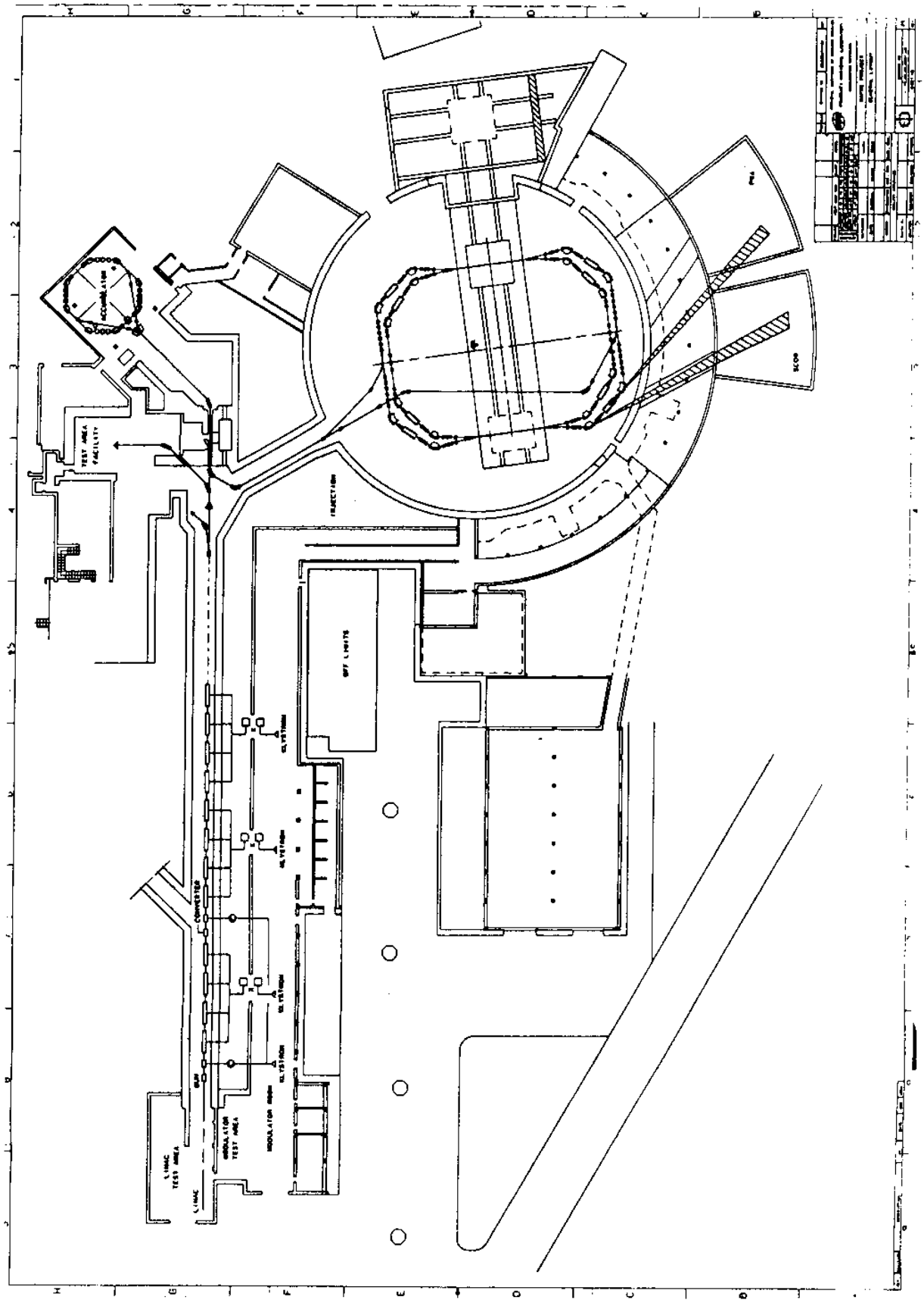

Fig. 2

DAΦNE Hall - Detector building interface cross section

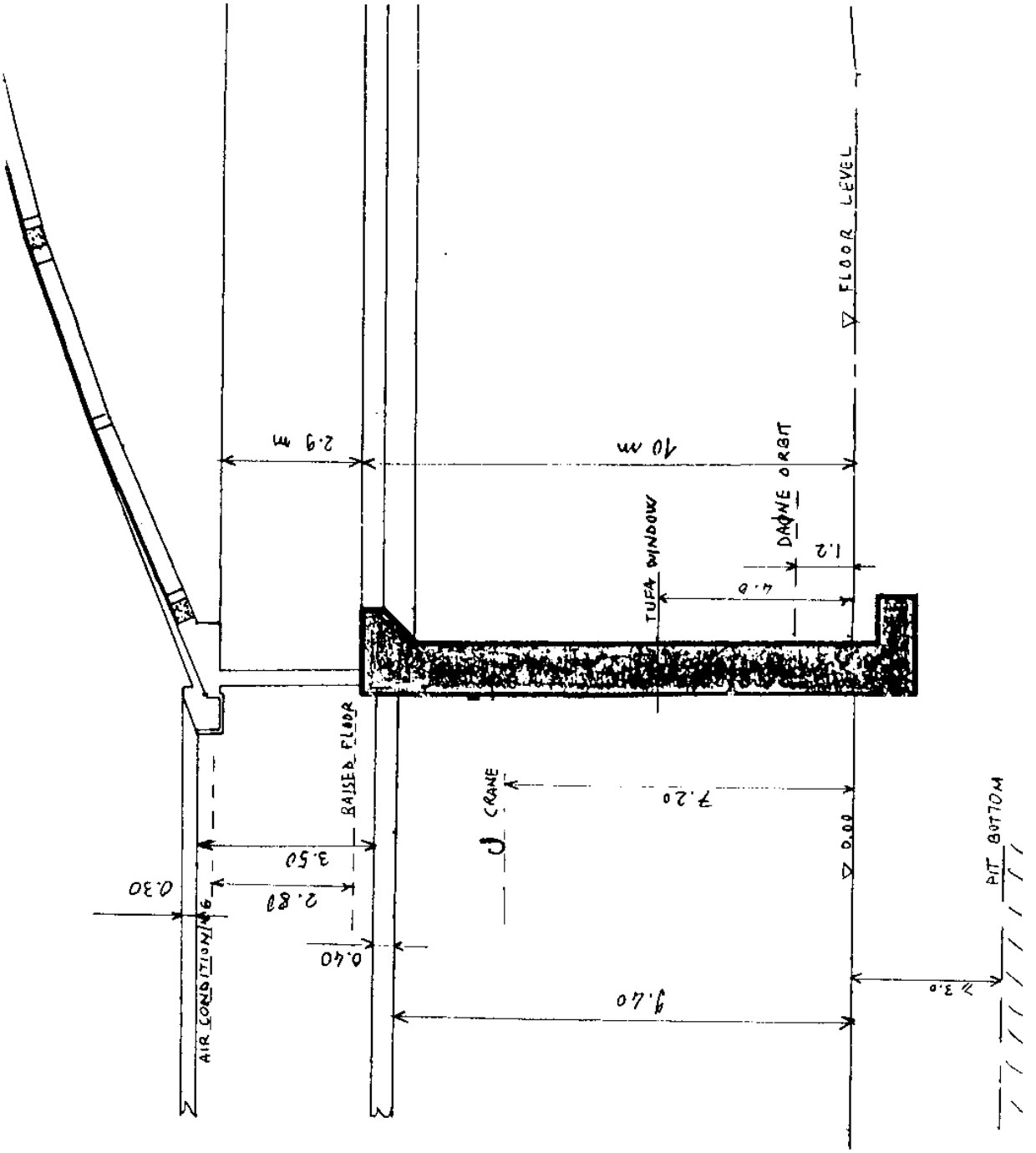

Fig. 3

Detector building very preliminary study (O. Cerafogli)

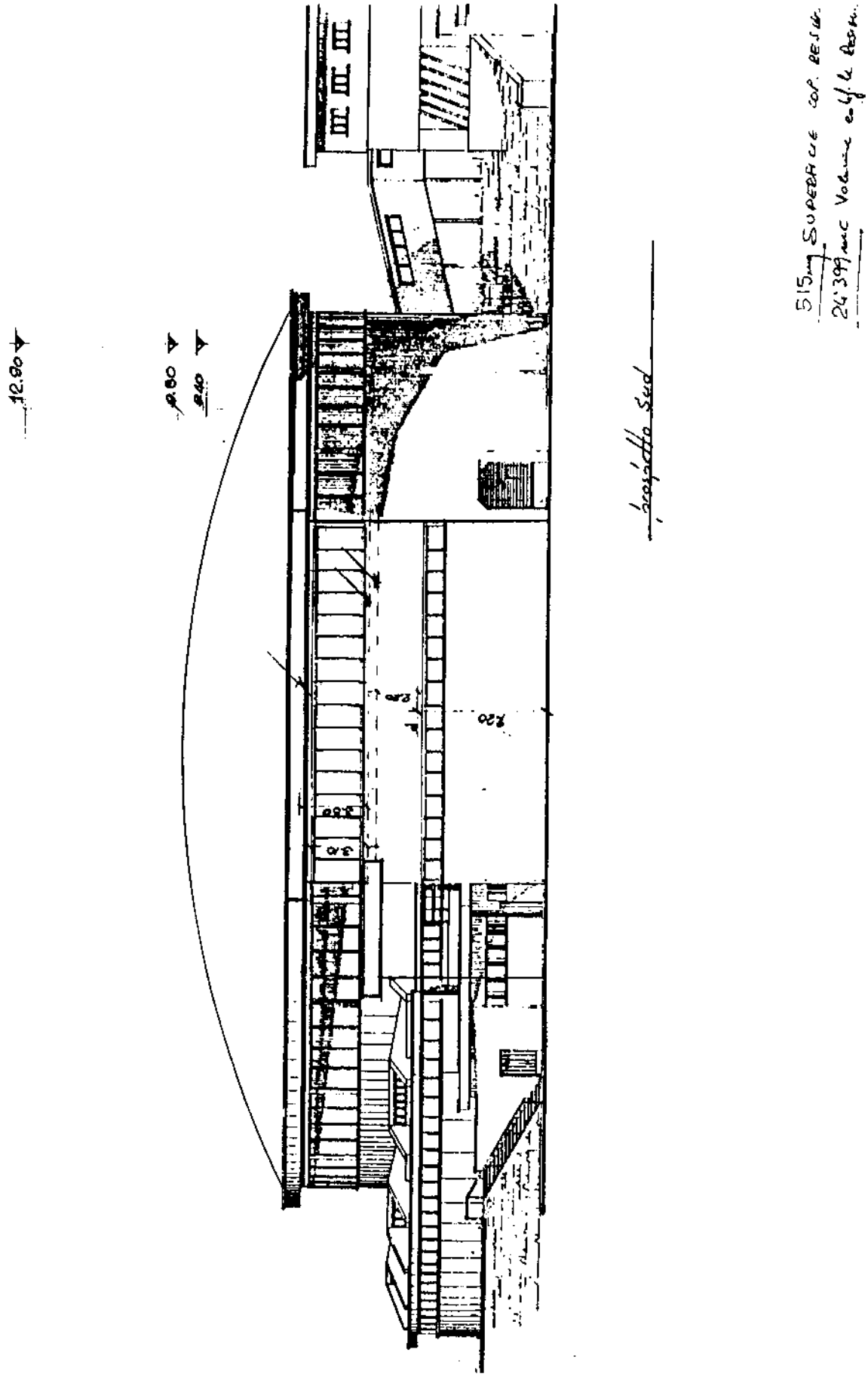

Fig. 4

Detector radial extension with ALEPH s.c. coil option

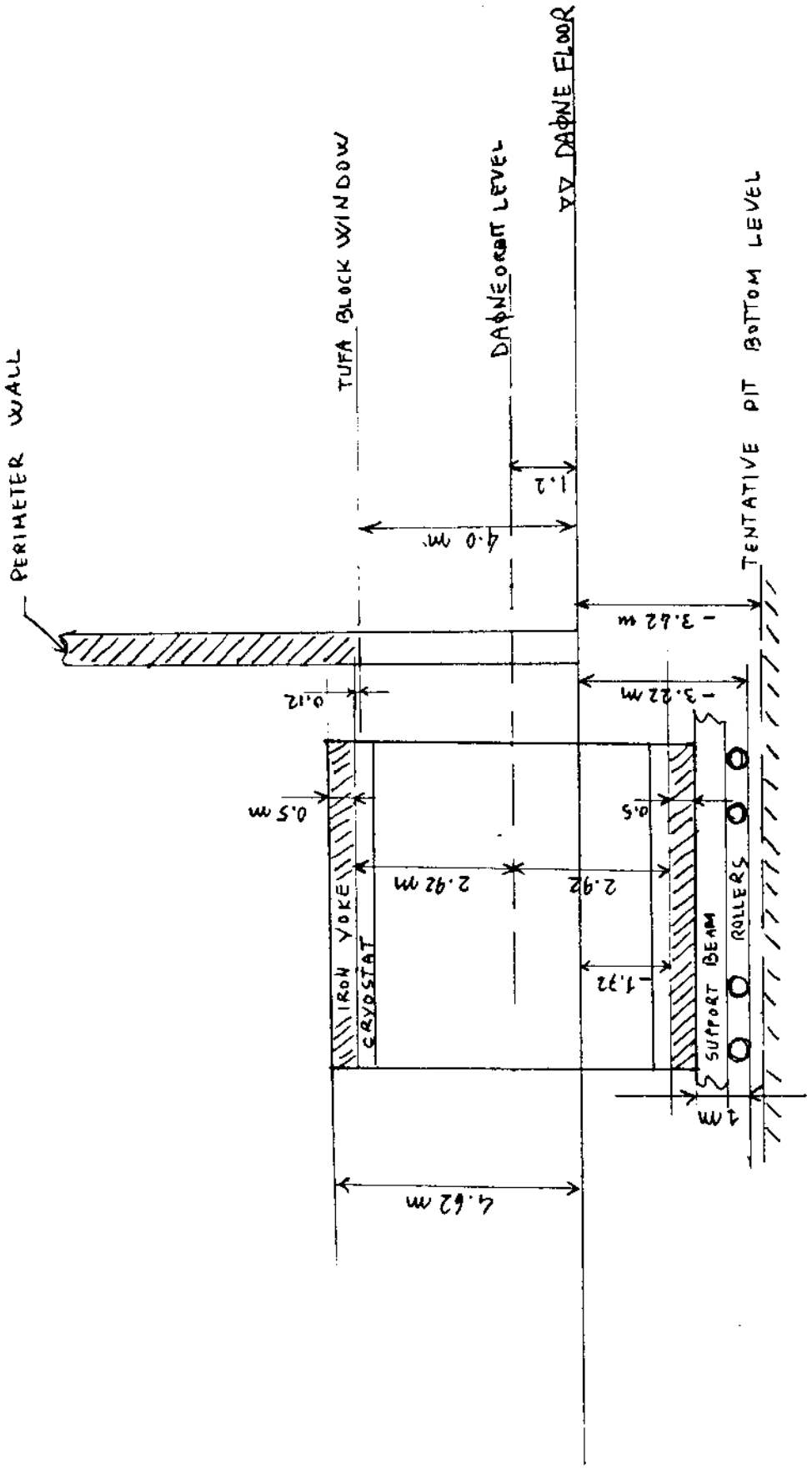

Fig. 5

Cross-section through the magnet, seen along the beam