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LETTER OF INTENT

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To : The ISRC

Subject : SEARCH FOR CHARMED PARTICLES AND ELECTRONS PAIRS

The discovery of a relatively large production cross section [1,2,3] of single leptons at large transverse momentum in high energy p p collisions suggests the correlation study of these leptons with other particles emitted at large angle.

The most probable production mechanism is the pair production of charged leptons by electromagnetic interactions. Gauge theories of weak and electromagnetic interactions suggest the existence of charmed particles. These charmed particles can be detected by their decay product, namely a strange hadron and leptons.

The CCRS experiment (R 105) performed at the CERN ISR was successful in detecting single electron ; the ratio of e to pion is of the order of 1.4 10^{-4}. This experiment was able to reject converted photons and hadrons to the level of 10^{-5} with respect to hadrons. The momenta measurement with a magnet, the electron energy determination with lead glass detectors and an air filled Cerenkov achieved the rejection of 10^{5}. The Cerenkov by itself gave a rejection of 10^{3} against hadrons. The solid angle of this electron detector was 0.20 str. The second spectrometer in CCRS experiment had a solid of 0.06 str. These solid angles are relatively small and the rate of correlation of the electrons with other particles will be small.

We propose to keep all the features that made the success of the CCRS experiment, but with a much larger solid angle. The two Saclay magnets will be placed in the closest position relative to the ISR beams (fig. 1). The magnet centers will be set at 0.6 m. from the two intersecting beams. In these positions the solid angle of each spectrometer is 0.9 steradians. The magnetic field of one magnet will be in the opposite direction of the other one in order to cancel as much as possible the magnetic field on the ISR beam pipe. The magnetic field should be reduced to an acceptable value for ISR operation by additional shielding on the beam pipe.

An air filled Cenrenkov detector will equip each magnet. This Cerenkov separates hadrons from electrons up to 5.6 GeV/c. The lever arm to measure the track directions on each side of the magnets will be short, of the order of 20 cm. To obtain a good precision in the deflection angle we plan to use drift chambers. These drift chambers are of small dimensions (fig. 1). A lead glass array behind each spectrometer will measure the electron energy and be used for trigger purposes.

With 0.9 steradian solid angle on each side of the apparatus, the rate of correlation for electron events is 50 times larger than in the CCRS experiment. It should be stressed that the comparison of $e^- X^-$, $e^+ X^+$, $e^+ X^-$ and $e^- X^+$, is of great help to understand the origin of the electron signal, in particular when X is an electron. Invariant masses below 2 GeV are detected in one arm, higher masses in both arms.

For the search of charmed particles through the correlated production of electron and strange particules, we envisage to study the correlation $e^\pm$ with K_{os} or Λ^0 (Λ^0). The large horizontal acceptance of each spectrometer (± 47°) gives a very good efficiency to detect the K_{os} by their decays into $\pi^+ \pi^-$, and the Λ's by their decays into π p. The topology of an event is represented in figure 2 :

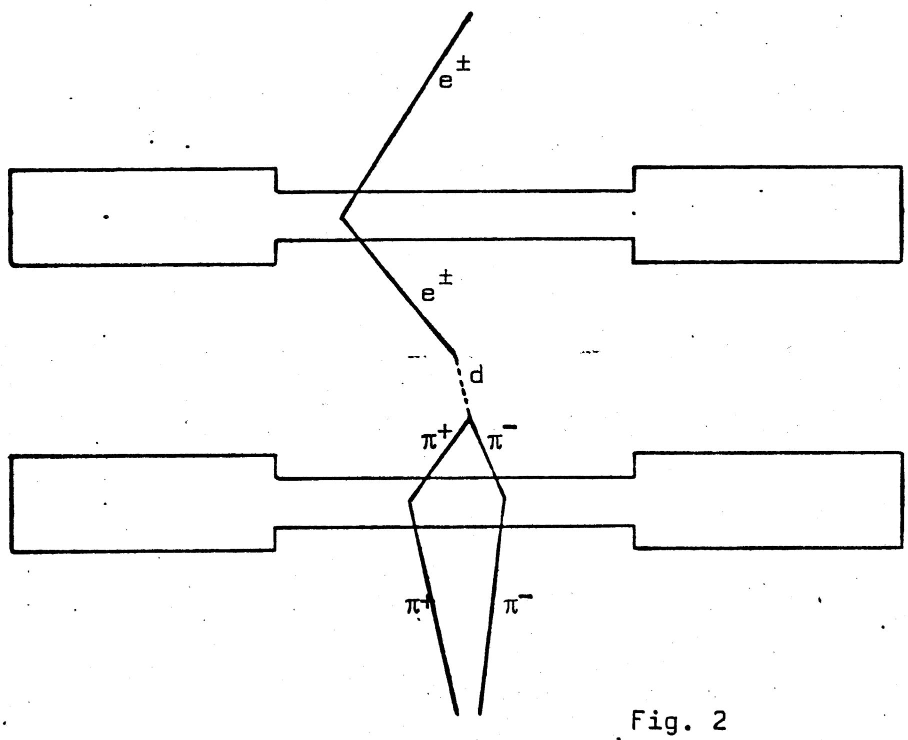


Fig. 2

The requirement that the distance d in fig. 2 be larger than 1 or 2 cm will considerably reduce the hadron background. It is to be recalled that in fact the single electron detection is performed in a total solid angle of 1.8 steradians. We have chosen the charm hunt through the correlation strange particle leptons because we hope to see the lepton and the strange particle from the same charmed particle decay. The search trough electrons-muons correlation assume's that one electron is a decay of a charmed particle, and the muon from the anti charmed particle or vice versa. Therefore, the rate of e-μ correlation is proportionnal to the product of the branching ratios charm to leptons, whereas electron - strange particle is only proportionnal to the branching ratio.

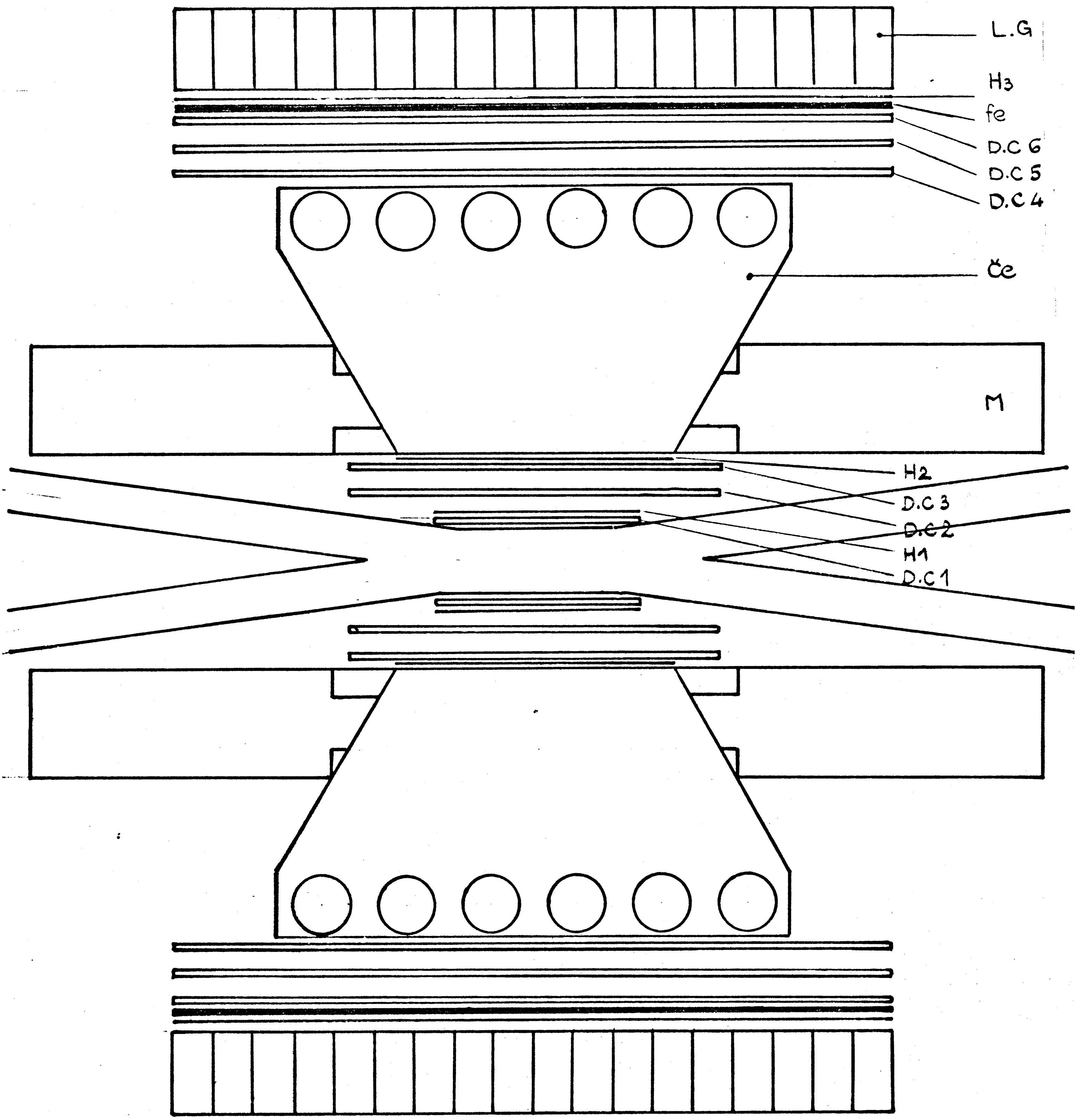
It is clear that with such a set-up, hadronic correlations for transverse momenta up to 10 GeV/c can be studied. One can search for charmed particle through the K_0 π^0 correlation.

Due to the importance of the proposed study, we will provide for the next ISRC a detailed proposal.

Compared to the FNAL, electrons are easier to identify at the ISR because there is no target to convert gamma rays, and compared to muons search we do not have the pion decay problem.

The set-up is relatively simple and its size is of the order of the CCRS experiment, in which Saclay has provided the magnets, the Cerenkovs, the hodoscopes, the chambers and the computer system. We therefore have a good experience of the proposed detector. If an ISRC decision is taken in a reasonnable delay this experiment could be ready for the summer 1975.

[1] Büsser et al - London Conference Report.
[2] Boymond et al - London Conference Report.
[3] Appel et al - London Conference Report.



DC 1.2.3.4.5.6 DRIFT CHAMBERS
H 1.2.3 HODOSCOPES
M MAGNET
Če ČERENKOV
L.G LEAD GLASS

Fig 1

scale 1/20