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M E M O R A N D U M

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To/A: J. Lefrançois, Chairman of the SPSC

From/De: F. Brasse, Coordinator of NA2/NA9

Subject/: Concerne Cogne Meeting 1981, Future Plans of the EMC.

The plans of the EMC for the next years using the muon beam at the SPS had been described in detail for the 1980 Cogne Meeting of the SPSC (SPSC/ 80-80, SPSC/M 245).As these plans are basically unchanged I want to refer mainly to that document. The program as defined there consists of the following main parts:

a) Physics with the Vertex System

b) Physics with Heavy Targets

c) Physics with Polarised Target

d) Extension of Physics with Forward Spectrameter

For each of the four parts some additional information will be given in the following sections.

a) Physics with the Vertex System

For the detailed study of target fragmentation, target jets and of strange and charm particle production clearly the data of the full Vertex System are important, especially the analysis of the streamer chamber pictures. This analysis has been well prepared at several institutes of the collaboration and should start during the next weeks. On the basis of the reconstruction of the scattered muon in the forward spectrometer the streamer chamber pictures will be selected for the question of eliminating background and choosing the kinematical range of interest. For inclusive production of pions, kaons and protons in the forward hemisphere leading to a detailed study of the current fragmentation the particle identification detectors are essential, but not the streamer chamber. Therefore it is planned to take electronically all events by bypassing any deadtime of the streamer chamber and analyse them also independently.

b) Physics with Heavy Target

Depending to some extent on the results which we get from the NA2 data having used carbon and copper targets the total running time with heavy targets could be larger than required in SPSC/80-80 to get better statistics. It should be mentioned, that a MWPC-system consisting of 8 planes is being prepared to cover a region with a radius of about 40 cm around the beam in the forward spectrometer in front of the hadron absorber to improve the detection of particle tracks close to the beam.

c) Physics with Polarised Target

In order to reduce the running time and even to reduce the statistical errors on the asymmetry at high values of Q^2 the following improvements are being planned:

1) Changing from pentanol to ammonia as the target material would increase the content of free protons from 14 to 18%. This reduces the statistical error on the asymmetry in proportion. Tests on small samples of ammonia have shown that it is feasible to use it.

2) The EMC forward spectrometer can be modified such, that a factor 2-3 higher intensity of the muon beam ($\sim 4.10^7$ μ/burst) can be used. This can be done without any major new investments. Proportional chambers from the Vertex System would be installed into the forward spectrometer.

3) Using 280 GeV instead of 200 GeV would enrich the high Q^2 region, if sufficient number of muons are available. This means one has to use 450 GeV primary protons.

With the new conditions and using 10^{13} muons the error bars on the asymmetry and the range of Q^2 covered using 280 GeV looks as shown in fig.1. This figure can directly be compared with fig.3-1 in SPSC/80-80. The large extension of the range in Q^2 in comparison to the SLAC experiments is evident. It will allow us to test whether the asymmetry scales as a function of Q^2 for a given x. The much higher energy of the EMC experiment would also lead to a considerable extension to lower values of x, which is important for the test of the Bjorken sum rule $\int A_1 F_2 (1 + R) dx/x$. A_1F_2 is shown in fig. 2 as a function of x for the SLAC data with the fit to their data and for the EMC Monte Carlo predictions.

d) Extension of Physics with Forward Spectrometer

For the interpretation of scaling violation in structure functions using QCD beyond leading order together with higher twists and mass effects it is important to have an as large range in Q^2 as possible and especially covering small values of Q^2. This means going to higher (325 GeV) and smaller (< 100 GeV) primary energies and to smaller scattering angles. Our present analysis shows, that there is up to 10% systematic normalisation difference between our data and the SLAC data which makes the use of the combined data difficult.

A system of hodoscopes is being built which allows us to trigger on scattered muons below the present lower limit of 0.5° on the scattering angle. For these measurements at small scattering angles it is also foreseen to use the proportional chambers, mentioned in section b), which will be made sensitive in the beam region, to be able to reconstruct particles at small angles.

For the interpretation of F_2 from nuclear targets at very small values of x shadowing might have some significance. Therefore measurements for F_2 are also planned using short nuclear targets. Furthermore shadowing has its own physics interest and by using 325 GeV primary energy the kinematical range can be extended considerably over that of earlier measurements (209 GeV at FNAL).

Concluding remarks

The further program of the EMC covers a large area of important physics in lepton nucleon scattering which within the next years can only be studied at the CERN SPS. It is therefore important, that the SPS with all its services keeps the high level of performance, which it had during the years of 1979 and 1980. The present program of the EMC will last at least until 1985, but possibly longer, taking into account that fixed target operation will only be available for part of the time.

Parts of the collaboration plan to use the vertex system at the FNAL Tevatron (Proposal E665).

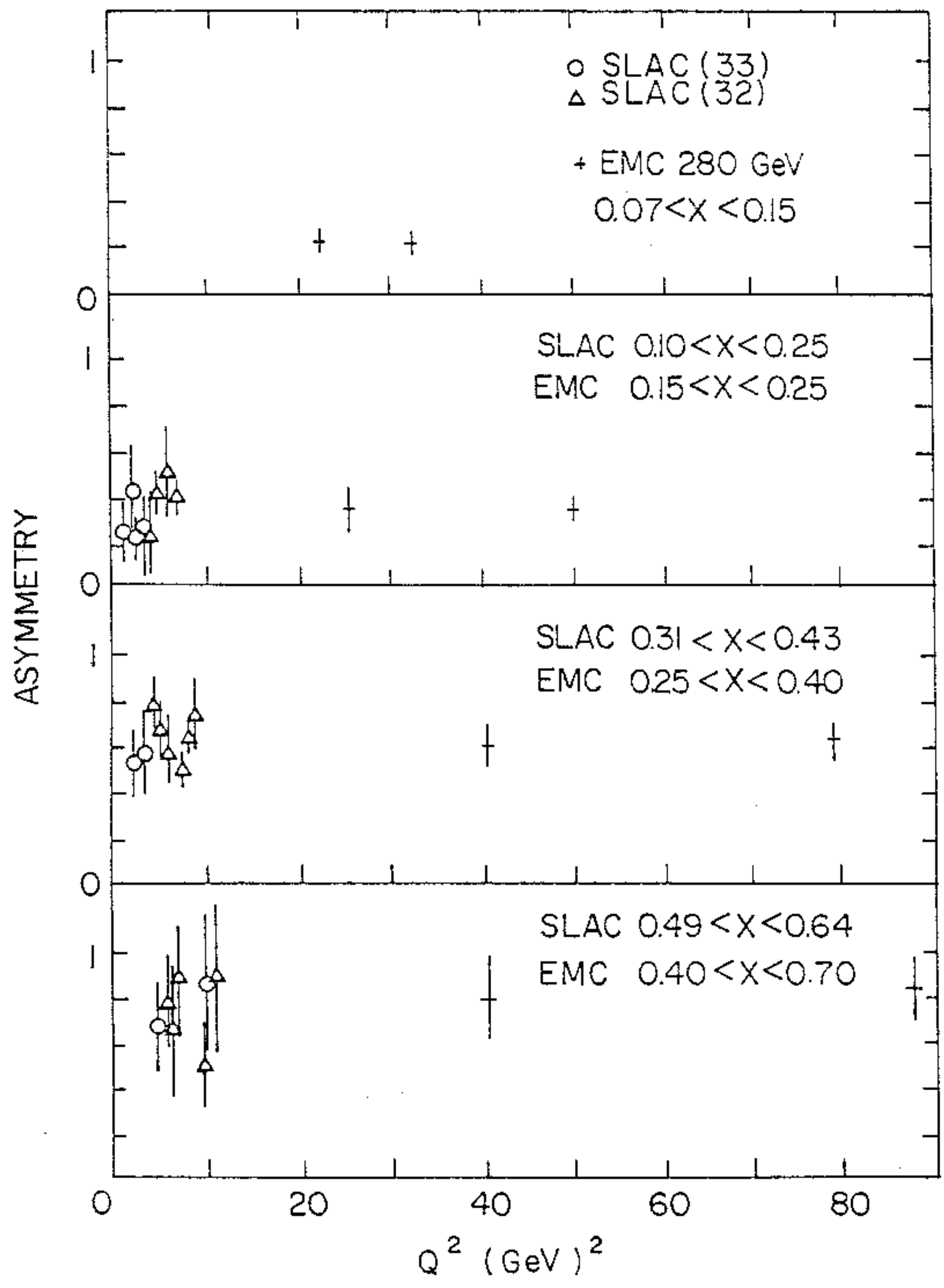
o SLAC (33)
△ SLAC (32)
+ EMC 280 GeV
0.07<X<0.15
SLAC 0.10<X<0.25
EMC 0.15<X<0.25
SLAC 0.31<X<0.43
EMC 0.25<X<0.40
SLAC 0.49<X<0.64
EMC 0.40<X<0.70
ASYMMETRY
0
20
40
60
80
Q² (GeV)²

Fig. 1

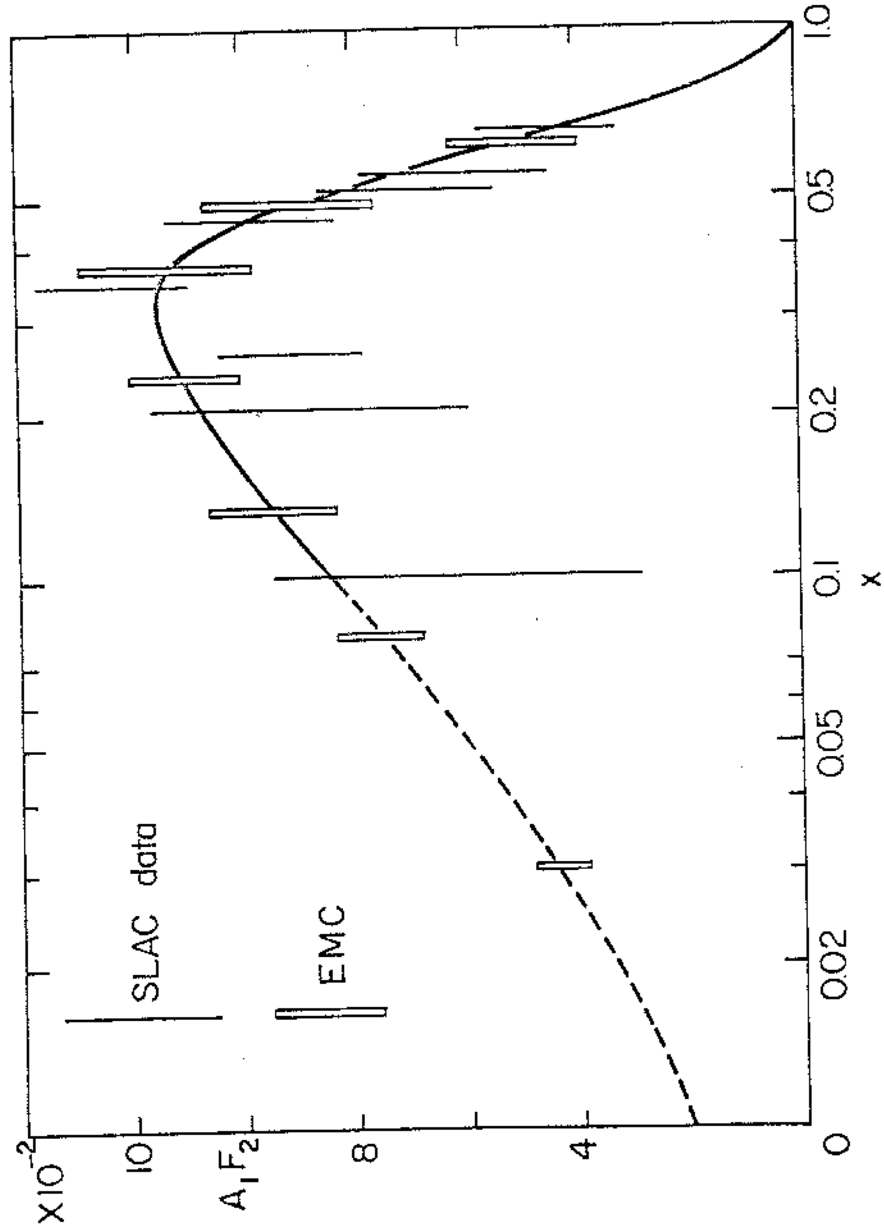

Fig. 2