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M E M O R A N D U M

To : Members of the SPSC

From : The Spokesman of WA 47

Subject : Further ν, $\bar{\nu}$ Narrow Band Beam running in Ne/H_2 in BEBC in 1979-1980

In the WA 47 NBB run in BEBC of last Autumn 1978, the number of ν, $\bar{\nu}$ events obtained are as follows:

- $\sim$ 400 cc and $\sim$ 200 nc $\bar{\nu}$ events in 260.000 pictures
- $\sim$ 2.500 cc and $\sim$ 800 nc ν events in 150.000 pictures

$E_\nu > 20$ GeV
$P_\mu > 5$ GeV/c for cc events

To date the entire $\bar{\nu}$ sample and approximately half of the ν sample has been completely measured and processed. We expect to finish all processing by the end of May this year.

We would like to request that, if further narrow band running is to be scheduled in 1979-1980 (before the $\bar{p}p$ shut-down), BEBC be filled with Ne/H_2 mixture in order to increase the statistics in experiment WA 47. The ABCDLOS collaboration has decided on the following order of priorities for such NBB running :

1) ν at 200 GeV

2) ν at 200 GeV

3) ν at 320 GeV (as proposed by WA 1)

This means that the collaboration would accept to run with $\bar{\nu}$ only (or predominantly $\bar{\nu}$) at P_{π^-}, k^- = 200 GeV, but would oppose to run exclusively with ν (especially at P_{π^+}, k^+ = 320 GeV). The reason for this choice is to achieve a balance of $\bar{\nu}$, ν statistics, taking into account that 300 GeV running gives a low event rate in BEBC.

Assuming, as an example, a 40 days run (P5 + P6 in 1979?) at 200 GeV/c parents momentum with 10^{13} ppp and a ratio of 2:1 between $\bar{\nu}$ and ν, we expect the following additional number of events in BEBC:

- $\sim$ 700 cc and $\sim$ 350 nc $\bar{\nu}$ events in $\sim$ 1.5 10^{18} protons
- $\sim$ 3.000 cc and $\sim$ 1.000 nc ν events in $\sim$ 0.8 10^{18} protons

at 450 GeV proton energy.

The main physics aims of the experiment WA 47 are discussed in the proposal and their importance was stressed at the CERN Neutrino Workshop 1978. Improved statistics in WA 47 will help to clarify the following issues:

1. Structure functions

Show scaling deviations in quantitative agreement with QCD. However discrepancies exist between the published results from the ABCLOS and the CDHS Collaborations especially in the XF_3 moments as shown in Fig. 1. It is clearly important to try to understand the source of this discrepancy. For this reason improved statistics in the bubble chamber experiment - especially in $\bar{\nu}$ - are most important.

2. Hadronic final state

Current interest centers on understanding the hadron final state in lepton induced reactions. The most promising approach seems to be to measure double moments of fragmentation functions and structure functions in order to investigate scaling deviations and breakdwon of factorization as studied in the WB ν H_2 experiment WA 21 [1] . The present NB/Ne experiment is an important complement to the WA 21 in that it provides ν $\bar{\nu}$ events,

- on isoscalar target, where charge symmetry constraints simplify the analysis,
- in the high Q^2 range (NB = Q^2 = 10 - 100 GeV^2
- with smaller systematic uncertainties due to the smaller correction factor for energy loss in Ne.

This type of analysis can also be extended to investigate the Q^2 dependence of P_T distributions. Significant Q^2 dependent effects in P_T distributions have been observed in the WA 19/22 experiments for ν interactions [2]. It is clearly important to establish the existence of this effect for $\bar{\nu}$ interactions. So far limited statistics in $\bar{\nu}$ ($\sim$70 cc $\bar{\nu}$ events for $E_{\bar{\nu}} > 100$ GeV) has not allowed us to obtain a conclusive result on this point.

3. Neutral current events

The NBB represents a unique advantage for the analysis of neutral current interactions. With the improved statistics, inclusive studies of nc interactions can provide - in a way similar to what we did in the WA 19/22 experiment [3] - an independent determination of the L-H and R-H coupling constants with an accuracy equivalent to the most precise to date ($u_R^2 + d_R^2 = 0.03 \pm 0.01$ from WA 1). In addition the bubble chamber allows also to examine questions related to the hadron final states in neutral current interactions e.g. π^+/π^- ratio, V^o and resonance production, etc.

4. Skew beam dump

In the clean conditions of the NBB $\bar{\nu}$ runs, events with identified e^- have been attributed to prompt ν produced at wide angle in the target [4]. Thus a NBB $\bar{\nu}$ runs is, at the same time also a 15 mrad "skew"

beam dump experiment. This, used in conjunction with the results from a "conventional" 0 mrad beam dump experiment, provides information on the mass of the prompt ν parents.

Conclusions

The ABCDLOS Collaboration request that if narrow band running is scheduled in 1979-1980, BEBC be filled with Ne/H_2 mixture in order to increase the statistics for the WA 47 experiment. We emphasize our preference for antineutrino running at 200 GeV

W.G. Scott - Contactman WA 47
B. Tallini - Spokesman WA 47

References:

Ref. [1] D.H. Perkins, Oxford University preprint 2/79.
[2] P. Bosetti et al. Nuclear Physics B149 (1979) 13.
[3] P. Bosetti et al. Nuclear Physics B149 (1979) 1.
[4] P. Bosetti et al. Phys. Lett. 74B (1978) 143.

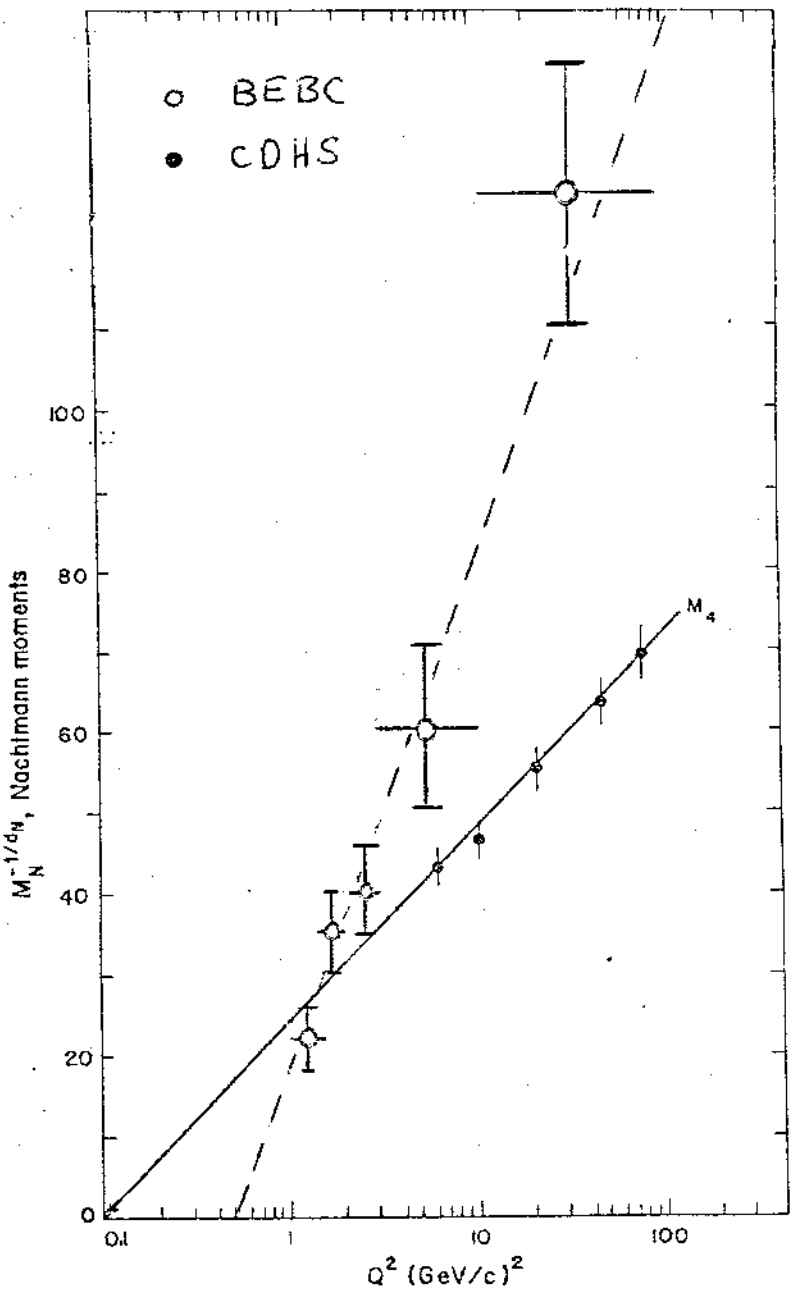

Fig. 1 Published data on N = 4 moment of XF_3 from the BEBC and CDHS experiments. Note that the two analyses assume different values for the k^+/π^+ ratio.