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Letter of Intention



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To : Members of the E.E.C.
From : A. Gautschi, E. Heer and J.F. Renevey - University of Geneva
G. von Dardel - CERN
G. Jarlskog and S. Hendriksson - University of Lund, Sweden
Re : Test and calibration of a proton-polarimeter with Vidicon and on-line computer

This is a joint project of the University of Geneva and the University of Lund.

The University of Geneva has already in April 1962, in a letter of intent, manifested its interest in performing a series of nucleon-nucleon scattering experiments at the SC. The reasons for performing such experiments - the study of the nuclear force - have been explained there in detail and are not repeated here.

The experiments which are planned to be done first are n-p triple scattering experiments. Polarized protons will be scattered from the neutrons in a liquid deuterium target. The polarization of the scattered protons will be measured in a carbon-plate-spark-chamber-polarimeter.

The group from the Institute of Physics, Lund, is planning a precision measurement on the polarization of the recoil proton in photoproduction of π^0 with polarized photons from the Lund 1.2 GeV electron synchrotron. A polarimeter very similar in principle to the one built for this experiment will be used, the high statistics needed in the photoproduction experiment makes it imperative in the Lund experiment to use automatic methods of data handling, rather than film, and the Lund group has therefore developed a Vidicon system for on-line operation on a small computer.

The similarity of the problems has prompted the two groups to engage in a collaboration which started about a year ago. The progress made on the Vidicon system in the meantime is promising and we have decided to use this system for the actual experiment, since the treatment of the data and the

feed-back of the results on the experiment will be much quicker. However, photographic recording in parallel with Vidicon system will be retained for later reference, and will allow a direct evaluation of the performance of the the Vidicon system. As this is a first application of a Vidicon system to a high-energy experiment in Europe, the result of such a comparison should be of general interest.

The polarimeter.

The polarimeter, a large spark chamber, has been constructed in 1963-1964 and tested in parasiting proton beams in the fall and in the winter of 1964. It was planned to proceed to calibration measurements early in 1965 when an accident in December 1964 damaged the polarimeter heavily. The polarimeter is now under reconstruction, will be partly ready for tests in April and will be completely reassembled at the end of June. Scanning equipment and liquid deuterium targets approach completion. Triggering electronics is available.

Status report of Vidicon.

After a proto-type of the Vidicon system had been tested, a final version was constructed by the CERN wiring pool and put into operation in December. Successful runs were performed on a test picture with data transfer to the Mercury computer and feeding-back of the information on teleprinter to the experiment. Tracks could be seen in the spark chamber, but because of the accident we have not yet been able to set up the Vidicon with the spark chamber and run them together. Programmes are available and almost debugged for the reconstruction of the events, statistical analysis of the results and display of this analysis by teleprinter at the experiment.

Time requested at the SC and computer.

To test and calibrate the rebuilt polarimeter with the Vidicon on-line with the Mercury computer, we propose the following program and time allocation.

1) Tests in parasiting p-beam.

Purpose : test of individual spark chambers and of the whole system, including Vidicon, computer and programs.

Beam : parasiting proton-beam, 10^2 to 10^5 protons per sec.

SC-time : from April on, whenever possible, details will be arranged with the SC coordinator.

Computer-time : The test with the Vidicon system will be started in the second half of May and will require about 14 days of Mercury operation during May and June. Once started up, Mercury can be operated by us. Maintenance and repair of the computer will not be required outside normal working hours.

2) Beam study of a polarized (weak) p-beam.

This beam will be made by scattering the external p-beam off a C-target (in the SC Hall). The arrangement is the same as that used for the π -production experimenter (Michaelis-Heer). No change of beam transport is required.

Purpose : tuning up of beam transport
measurement of beam properties in P-Room
take some pictures with the polarimeter to check on the beam

Beam : a detailed lay-out of all elements is in preparation

SC-time : approx. 3 shifts, somewhere in May 1965

Computer-time : included in the above estimate

3) Calibration of polarimeter.

Purpose : determination of the analyzing power of the polarimeter at several different energies

Beam : as in 2)

Time : (SC and computer) approx. 12 shifts, from July on, split up in 4 x 3 shifts.

For these runs we would like to have maintenance staff for the computer available or on call so as not to lose too much data in case of failure. As an alternative we are looking into the possibilities, in case of computer failure, to salvage the data on magnetic tape.

4) Actual experiment.

After this calibration run will follow a period of data evaluation and of preparation for the actual n-p run. At this moment, when performance and capabilities of the set-up are known, a proposal for an actual n-p scattering experiment will be submitted.

We expect to be ready for such experiments in October. These runs will require the use of Mercury. If the experiment will go on after 1 January 1966, we would, however, redesign the system for recording on magnetic tape and data treatment with the CDC 6600, and will no longer require Mercury.