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EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

PHYSICS I
ELECTRONIC EXPERIMENTS COMMITTEE

LETTER OF INTENTION

HIGH-ENERGY PROTON EXPERIMENTS USING THE SLOW EXTRACTED PROTON BEAM (e₃)

by

J.V. Allaby, A.N. Diddens, A. Klovning, E.J. Sacharidis, K. Schlüpmann,
A. Thorndike and A.M. Wetherell

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To : The Members of the E.E.C.
From : J.V. Allaby, A.N. Diddens, A. Klovning, E.J. Sacharidis, K. Schlüpmann,
A. Thorndike and A.M. Wetherell
Re : High-energy proton experiments using the slow extracted proton beam
(e₃)

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The arrangement of experiments associated with the beam e₃ is to be considered for the period following the 1968 shut-down of the PS. This note is to point out the interest of providing facilities for performing high-energy proton experiments with the beam as well as its function of providing secondary particle beams.

The emission of high-energy particles at relatively wide angles in proton-proton and proton-neutron collisions is a study of considerable current importance. One may list, briefly, the following interesting experiments in which protons are detected.

- A. (1) Large-angle p-p scattering, for incident momenta above ~12 GeV/c. The angular distributions measured so far up to 12 GeV/c show interesting s and t dependences and it seems important to extend these measurements to the highest energies available at the PS.
- (2) Isobar production ($p + p \rightarrow p + N^*$) for momenta above ~10 GeV/c. Angular distributions for such processes exist (from Berkeley) up to 7 GeV/c. Just as for the elastic channel the s and t variation of the cross sections at high energies is of great interest.
- (3) Missing mass experiments of the type described by $p + p \rightarrow p + p + X^0$. X⁰ may be a photon, π⁰, ρ⁰ etc. The emission of photons in p-p collisions may be divided into external and internal bremsstrahlung. It appears that for low photon energies the external part may be uniquely obtained from knowledge of the elastic scattering. Measurements of photon emission may then give information on the internal part. The production of heavy bosons is, of course, of general interest.

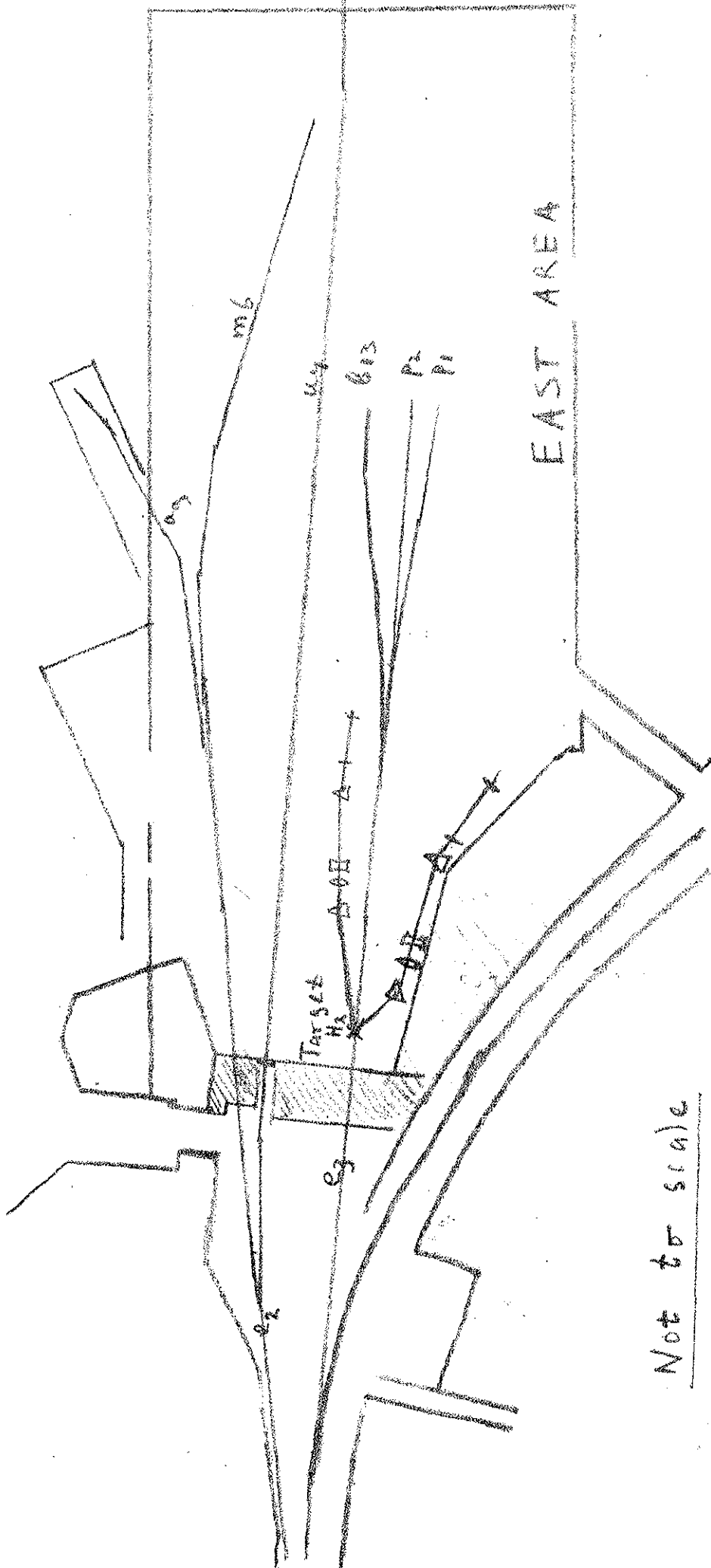
Collisions in which other secondaries emitted at large angles are detected are also of interest, for example

- B. (1) Detection of low-energy secondaries has implications for production spectra studies and complements the present small-angle experiment S61.
- (2) Muon pair production, $p + p \rightarrow \mu^+ + \mu^- + \dots$ via an intermediate heavy photon state may be related to the possibility of detection of the hypothetical vector boson W of weak interactions.

At the present time, it seems to us that experiment A(1) is the most logical and appealing continuation of the current CERN Programme but as the new e_3 arrangement cannot start until the autumn of 1968 this emphasis may change.

It is clear, however, that the only location for any of these studies is on beam e_3 and we propose that a target station for proton experiments be established at about 10 m from the shielding wall of the East Area. The implication is that the e_3 beam shall have a focus at this point.

The figure shows a sketch of a set-up for the most elaborate experiment considered, namely A(3) in which the momentum vectors of two protons are accurately measured by a wire spark chamber system. This experimental arrangement occupies more space than any of the others mentioned.



Not to scale