EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

PH III-72/22
14 March 1972

PHYSICS III COMMITTEE

DOUBLE CHARGE EXCHANGE WITH POST-SCIP BEAMS

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It is our intention to put forward proposals concerning double charge exchange reactions, both of the kind e.g. $^{18}O(\pi^+,\pi^-)^{18}Ne$ and of the kind e.g. $^{9}Be(p,\pi^-)^{10}C$. The technical requirements are good energy resolution, < 1 MeV, and good intensity, which should be satisfied by the High Resolution π Beam produced from the external proton-beam (see Fig. 2 and Table I of the beam report of Cox, Domingo and Skarek, PH III-72/21).

(a) Resolution tests and momentum calibration using the reactions $pp \rightarrow d\pi^+$, $pd \rightarrow t\pi^+$ and $p\,^3He \rightarrow {}^4He\pi^+$ with 80° (= 40° + 40°) deflection and an intermediate parallel beam. Measurements will not be count rate limited.

(b) Pion charge exchange of 390 MeV/c π^+ focused onto 1 gm/cm^2 ^{18}O at the analyser focal plane will yield 5 π^- per minute at the achromatic focus for a cross-section of 11 μb/sr (Parsons, Trefil and Drell, Phys. Rev. 138, B847 (1965)) and a solid angle of 5 m.s.r. In this case the beam elements form an achromatic doublet but an additional stage of magnetic deflection will be required to ensure a distinction between π^- and scattered π^+. An angular distribution measurement out to ~ 60° should be possible.

(c) The present limit on $^{9}Be(p,\pi^-)^{10}C$ is < 10^{-3} μb/sr at 0°. With a factor 10 improvement in resolution and factor 10^2 improvement in beam, it should be possible to reach 10^{-5} μb/s.r. i.e. ~ 10^{-4} of the cross-section for the mirror reaction $^{9}Be(p,\pi^+)^{10}Be$, using the beam as in (b).

The field of pion double charged exchange has been reviewed recently by Becker and Batusov (Nuovo Cimento Suppl. 1, 309 (1971)), but see also Koltun (Adv. in Nucl. Phys. 3, 71 (1969)) and Rost and Edwards (Phys. Lett. 37B, 247 (1971)). In the case of (p,π^-) the only prediction is that due to Reitan (Nucl. Phys. B29, 525, (1971)), which we have already established is wrong by an order of magnitude.