as that for Cr^{53} in the large-angle region, and, moreover, in the case of the former, it increases rapidly and practically linearly with the angle, beginning from the minimum, while for Cr^{53} the curve passes through a maximum in the angular region 140 — 150°. There is also a visible difference in the depth of the minimum of the curves in the region of 90°. The region of small angles has to be investigated more carefully.

Shown for comparison in Fig. 2 are measurements we have made of the angular dependence of 5.45-Mev protons scattered elastically from Cu^{65} and Ni^{58}.[1] From the comparison it follows that the even-even Cr^{52} scatters protons, just like the even-even Ni^{58} and other even-even nuclei [Ni^{60}, Ni^{62} (reference 1), Fe, Ti (reference 2)]. The shape of the angular dependence for even-odd Cr^{53} is similar to the shape for odd-even Cu^{65}.

The results obtained by us are evidence of the fact that a change of one in the number of nucleons in the atomic nucleus, independently of the charge state of the nucleus, essentially changes the interaction between the nucleon and the nucleus. It is possible that the change is the result of a change in the spin of the nucleus in passing from even-even nuclei with spin zero to even-odd or odd-even nuclei with half-integer spin.

In addition, the decrease in the relative cross section for Cr^{53}, in comparison with Cr^{52}, in the large-angle region, apparently can be considered as an increase in the absorption at the boundary of the nucleus, owing to the diffuse surface of the Cr^{53} nucleus due to the addition of an odd neutron.

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61

ANGULAR DISTRIBUTION OF PROTONS FROM THE REACTION $Ca^{40}(d, p)\,Ca^{41}$

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THE theories of stripping reactions[1,2] give a surprisingly good overall agreement with many experiments, in spite of the fact that they do not take into account the Coulomb and nuclear interactions of the deuteron and proton with the nucleus, and compound-nucleus formation. In addition, the calculations have been carried out in the Born approximation, which can hardly be justified at low and medium deuteron energies. In a series of cases, substantial deviations from the predictions of the simple stripping theory have been observed. In some of these cases, these deviations are connected with effects of the Coulomb and nuclear interactions,[3] and in others, with the difference of reaction mechanism from that of pure stripping.[4,5] Therefore, it is of interest to obtain data making it possible to see the effects of the factors mentioned on the angular distributions.

We studied the angular distribution of protons from the reaction $Ca^{40}(d, p)\,Ca^{41}$ leading to the ground, first, and third excited states, for a deuteron energy of 13.6 Mev. The nucleus Ca^{40} was chosen for the measurements, since one might expect a small probability of compound-nucleus formation owing to the closed neutron and proton shells. In addition, at small deuteron energies, strong nuclear interaction is observed,[6,7] and it is of interest to carry out the measurements at higher energies.

The measurements were carried out with the external beam of the cyclotron of the Institute of Physics of the Academy of Sciences, Ukrainian S.S.R. The geometry of the experiment was the same as in previous work.[8] The only difference in the method was that a polystyrene absorber was placed before the entrance to the ionization chamber. It completely stopped deuterons, substantially relieving the amplifier of the chamber, and making it possible to increase the beam on the target. This also led to a complete elimination of background in d-p reactions from deuterons undergoing elastic scattering in the target for values $Q > 2.7$ Mev. The energy resolution was not significantly decreased by this. The target was prepared by vacuum coating and had a thickness of 3 mg/cm^2.

In Figs. 1, 2, and 3 we give the experimental and theoretical (solid lines) angular distributions of protons corresponding to the ground and excited states at 1.95 and 2.42 Mev. The total cross sections for these were in the ratios 1 : 7.5 : 2.5. In

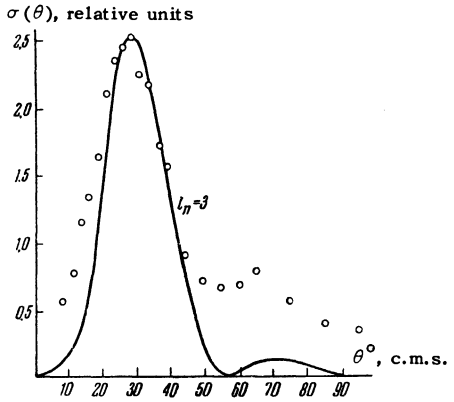

FIG. 1

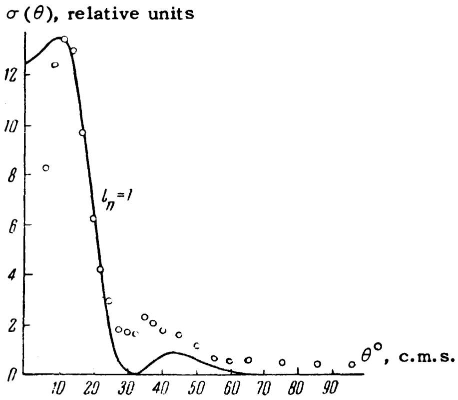

FIG. 2

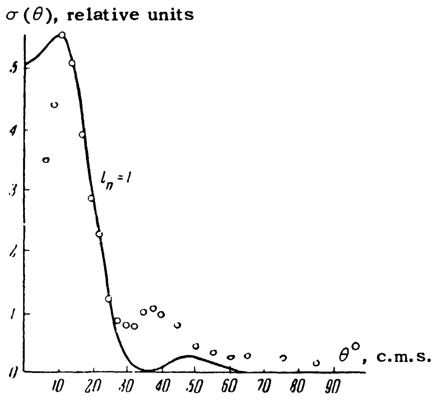

FIG. 3

calculating the angular distributions the interaction radius was chosen to be 6×10^{-13} cm. The values found for the spin and parity of the ground state, and also for the energies, spins and parities of the excited states are in agreement with data of previous works.[9,10]

The narrowing of the peaks of the experimental angular distributions in Figs. 2 and 3 can be related to the effect of nuclear interaction. The displacement of the peaks towards smaller angles, required in this case by the theory and observed by Teplov and Yur'ev[6] at low deuteron energies, becomes completely insignificant already for deuteron energies $E_d = 7$ Mev[10] and 8 Mev,[9] and it may be expected that it will be even smaller at higher energies. At the same time, for deuteron energies of 8 Mev, the experimental distribution of the group with $l_n = 1$ turned out to be the same as the theoretical one in the small-angle region.[9]

It should be noted that the "background" (isotropic part of the angular distribution) is less at 13.6 Mev than at 7 and 8 Mev, indicating the growing role of direct interaction with increasing energy.

In conclusion, the authors would like to express their gratitude to Prof. M. V. Pasechnik for his constant interest in the work, Yu. A. Bin'kovskiĭ for preparation of the targets, and also to the personnel of the cyclotron crew who made possible the continuous operation of the cyclotron.

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62

CROSS SECTION FOR THE FORMATION OF Ω^- PARTICLES IN THE REACTIONS $\pi^- + p \to \Omega^- + 3K$ AT 8 Bev AND $p + \bar{p} \to \Omega + \bar{\Omega}$ AT 4 Bev

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According to the Gell-Mann scheme, a hyperon can exist with strangeness −3 and isotopic spin zero.[1] We take the lower bound of its mass to be $M_\Xi + M_\pi$, and the upper bound to be $M_\Xi + M_K$, that is, its mass is located between 1.58 and 1.93 M_N. In this note, the cross section for the formation of Ω^- particles in the collisions of $\pi^- p$ at 8 Bev and $p\bar{p}$ at 4 Bev is estimated in the statistical model.

According to the statistical model of multiple production of particles, the probability of the formation of n particles in the final state is[2]

$$S_n = [V/(2\pi)^3]^{n-1} f_{TS} W\ (E_0), \tag{1}$$

where V is the spatial volume in which the par-