gation axis of the nucleus does not change. In this respect such β-transitions are analogous to electric multipole transitions. For tensor and pseudo-vector interactions transitions can occur with and without the change of the spin projection of the particle on the z-axis; this is analogous to magnetic multipole transitions. The fourth column gives the selection rules for n_z. In order to obtain these (as in the case of Λ, Σ) the wave functions of the nucleons of a strongly deformed nucleus must be used. The last column gives the selection rules for N. Selection rules for N and n_z are related to each other, as in the case for electromagnetic transitions.[6]

We emphasize that the selection rules for n_z, Λ, Σ are approximate. They hinder β-transitions rather than forbid them.

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POLARIZATION OF 635 MEV PROTONS BY DEUTERONS IN QUASI-ELASTIC p — p SCATTERING

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EXPERIMENTS on the study of the interaction of high energy nucleons with nuclei show that in most cases the incident nucleon interacts with the individual nucleons of the nucleus. This is particularly evidenced by experiments on the quasi-elastic p — p and p — n scattering by nuclei,[1—4] carried out with unpolarized proton beams. The differences observed in these investigations between elastic and quasi-elastic scattering are explained by the fact that the latter is produced by nucleons moving inside the target nucleus. If polarized proton beams are used it is possible to make still another comparison between elastic and quasi-elastic scattering. Bradner and Donaldson[5] showed that at 285 Mev the polarization in quasi-elastic p — p scattering by Li, Be, and C nuclei has an angular dependence analogous to the angular dependence of polarization in elastic p — p scattering, but much smaller in magnitude than the latter. Thus, the polarization in quasi-elastic p — p scattering by Be amounts to only approximately 40% of the polarization in elastic p — p scattering. Such a reduction in polarization in quasi-elastic p — p scattering was attributed[6] to distortion of polarization in purely-elastic p — p scattering, caused by intra-nuclear motion of the target nucleons. Since the role of this motion becomes less important at greater energies, one can expect the polarization in quasi-elastic p — p scattering to approach the value of the polarization in elastic p — p scattering with increasing energy. This was actually observed by Mescheriakov, Nurushev, and Stoletov[7,8] in the scattering of 635-Mev protons by Be. Here the quasi-elastic polarization was 85% of the elastic one. One can expect that a scattering by nuclei with smaller binding energies, for example by deuterons, this difference will be even less. Chamberlain et al.[9] found that the polarization and quasi-elastic p — p scattering by deuterons at 312 Mev in the range 60 — 90° (c.m.s.) does not differ from the polarization in elastic p — p scattering.

The author measured the polarization of protons in quasi-elastic p — p scattering by deuterons at energies 635 ± 15 Mev. A proton beam from the synchrocyclotron of the Joint Institute of Nuclear Research with polarization 58 ± 3%, described in Ref. 7, was used. The measurements were made by the counter-telescope method, and the angular resolution of the apparatus was 6°. Heavy water was used as the target. The background due to oxygen amounted to 30% of the counting rate and was determined by scattering polarized protons by the H_2O equivalent of the number of target nuclei under conditions excluding the counting of elastic p — p scatterings. The results obtained are given in the third line of the table. Only statistical errors are indicated here. For comparison, the fourth line of the table gives data on polarization in elastic p — p scattering, obtained in Ref. 8, while the fifth line gives data on quasi-elastic p — p scattering by beryllium, obtained in Ref. 7. It is seen from the table that at 635 Mev there is no difference in the polarization in elastic and quasi-elastic p — p scattering by deuterons, within the limits of experimental error. Thus, for a given energy, the intra-nuclear motion of the proton in the deuteron does not lead to a difference between the polarizations in quasi-elastic p — p scattering by deuterons and the polarization in free p — p scattering. Bearing this result in mind, one can expect that in this energy range the polarization in quasi-elastic p — n scattering by deuterons will equal the polarization in free p — n scattering. This is of interest, since the observation of the quasi-elastic p — n scattering by deuterons is one of the methods of studying the polarization effects in n — p interactions.

Values of Polarization at 635 Mev, Percent;
P_D — quasi-elastic p — p scattering by deuterons
P — elastic p — p scattering
P_{Be} — quasi-elastic p — p scattering by beryllium

θ lab. sys.	18°	24°	30°	36°	41°	52° (30°)
θ c.m.s.	41,2°	54,5°	67,5°	80,1°	90°	
P_D	43.5 ± 3.0	39.0 ± 3.8	30.2 ± 4.0	17.2 ± 4.5	—0.8 ± 4.5	—29.5 ± 3.5
P	42.4 ± 2.9	35.7 ± 2.3	27.9 ± 2.7	16.7 ± 2.6	—1.6 ± 2.5	
P_{Be}	35.4 ± 4.7		21.4 ± 3.1	11.2 ± 3.6	—1.0 ± 3.5	

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