Visible and ultraviolet spectra were also measured for all compounds, using SF-2 and SF-4 equipment. In the visible part of the spectrum all the radicals investigated show absorption maxima at 520 mμ, and the maximum absorption decreases in the same manner as at radio frequencies. No sharp maxima were found in the ultraviolet spectral region.

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ASYMPTOTIC SELECTION RULES FOR BETA DECAY OF DEFORMED NUCLEI

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IT was shown in a number of investigations[1-6] that for particle transitions in deformed nuclei one must take into account not only the selection rules for the total angular momentum I and parity π but also the selection rules for asymptotic quantum numbers Λ, Σ, and also N and n_z (or n_z and $n_\perp$) introduced by Nilsson.[7] Λ and Σ are quantum numbers of the projection of orbital and spin angular momenta on the elongation axis of the nucleus (the z-axis); $\Lambda + \Sigma = \Omega$, where Ω is the quantum number of the projection of the total angular momentum of the particle on the z-axis; N is the principal quantum number of the oscillator, and n_z and $n_\perp$ are the quantum numbers of nuclear oscillations along the z-axis and in the plane normal to the z-axis respectively.

Type	Matrix Element	$k=\Delta\Omega=\Delta I$	$\Delta\Lambda$	$\Delta\Sigma$	Δn_z	ΔN
S, V	$\int y_{\lambda k}(\mathbf{r})$	$\pm\lambda$	$\pm\lambda$	0	0	$\lambda, \lambda-2, \ldots -\lambda$
V	$\int y_{\lambda k}(\nabla)$	$\pm\lambda$	$\pm\lambda$	0	0	$\lambda, \lambda-2, \ldots -\lambda$
T, A	$\int y_{\lambda+1 k}(\boldsymbol{\sigma})$	$\pm\lambda$ $\pm\lambda$ $\pm(\lambda+1)$	$\pm(\lambda-1)$ $\pm\lambda$ $\pm\lambda$	± 1 0 ± 1	± 1 0 0	$\lambda, \lambda-2, \ldots -\lambda$
T, A	$\int y_{\lambda k}[\boldsymbol{\sigma}\mathbf{r}]$	$\pm\lambda$	$\pm(\lambda-1)$ $\pm\lambda$	± 1 0	± 1 0	$\lambda, \lambda-2, \ldots -\lambda$
T	$\int y_{\lambda k}[\boldsymbol{\sigma}\nabla]$	$\pm\lambda$	$\pm(\lambda-1)$ $\pm\lambda$	± 1 0	± 1 0	$\lambda, \lambda-2, \ldots -\lambda$

In this work selection rules for asymptotic quantum number N, n_z, Λ, Σ are established for β-transitions of an arbitrary order of forbiddenness ($\lambda > 1$) for different types of interactions. (Allowed and singly-forbidden transitions were considered by Alaga.[1]) The table gives the results of the calculations. The first column in the table shows the type of interaction — S, V, T, or A. For all transitions except $\lambda = 1$ the pseudoscalar interaction gives only small corrections to the matrix elements of transitions of $(\lambda - 2)$-fold forbiddenness. The second column gives the matrix elements of interaction operators in a non-relativistic approximation. Spherical representation is chosen.[8] Here

$$y_{\lambda k}(\mathbf{x}) = (i/\lambda\hbar)\,\mathbf{x}\,\{\mathbf{p}y_{\lambda k}(\mathbf{r})\}, \quad \mathbf{x} = \boldsymbol{\sigma},\ \nabla,\ [\boldsymbol{\sigma}\mathbf{r}],\ [\boldsymbol{\sigma}\nabla], \qquad y_{\lambda k}(\mathbf{r}) = r^\lambda Y_{\lambda k}(\vartheta, \varphi).$$

The third column gives the selection rules for the total angular momentum I. Since in a strongly deformed nucleus the integral of motion is the projection of the total angular momentum on the elongation axis, we let $\Delta I = \Delta\Omega = k$. Thus the rotational and the K-forbidden modes are excluded. Next two columns give the selection rules for Λ and Σ. These, of course, are related to the data of the preceding column (the condition $\Delta\Lambda + \Delta\Sigma = \Delta\Omega$ must be satisfied). Let us note that for scalar or vector interactions only those transitions can take place for which the projection of the spin of the particle on the elongation 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