which we obtain $g_{R155} = g_{R157} = 0.7$. This value differs appreciably from the approximate estimate $g_R \approx Z/A = 0.4$, and is in good agreement with the data of de Boer et al.,[6] but contradicts earlier measurements of Bjerregard and Meyer-Berkhout,[5] although the ratio g_{K155}/g_{K157} determined by them experimentally is in complete agreement with the value obtained by us. This confirms to some extent the correctness of the extrapolation of Nilsson's data made by us into the region of deformations $\delta > 0.3$. Similar calculations made by Gauvin[9] for strongly deformed nuclei with an unpaired nucleon ($153 < A < 197$) have shown that for a number of nuclei such an estimate leads to $g_R > Z/A$. The values obtained by him for g_K and g_R in the case of Gd^{155} agree with our estimate. In the case of Gd^{157} the estimates of g_K and g_R differ, since we based ours on the value $\delta_{157} = 0.37$, while Gauvin adopted $\delta_{157} = 0.31$. Gauvin discusses the possibility of a modification of the evaluation of g_K which would lead to the values of $g_R \approx Z/A$, but the new experimental data[6] on the value of g_R for Gd^{157} contradict such an estimate. Therefore an additional investigation of the odd isotopes of gadolinium by the method of Coulomb excitation is highly desirable.

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RESONANCE INTERACTION OF PIONS

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In order to explain the maximum in the π^--p interaction at energy E = 1 Bev, Piccioni,[1] Dyson,[2] and Takeda[3] advanced the hypothesis of resonance interaction between π mesons. This hypothesis was also used to explain the high multiplicity of π mesons produced in nucleon-antinucleon annihilation[4,5] and to explain the inelastic (π^--p) scattering for $E \geq 1$ Bev.[6,8] However, the assumption of a resonance π-π interaction was not obligatory in all cases considered in these articles, since the experimental results could be explained in other ways.

It is of interest to consider what conclusions would follow from the assumption of a resonance π-π interaction in the case of inelastic interactions of particles at $E \gg 1$ Bev, where a large number of π mesons would be produced, and an assumption about the π-π interaction would have a considerable effect on the results of calculation. As an example, we consider inelastic π^--p collisions at E = 5 Bev. We considered this case in detail earlier[9] without taking account of a resonance π-π interaction.

We assume, as in reference 9, that statistical equilibrium is established for the K mesons in a spatial volume of radius $r_K = \hbar/m_K c$, and, for all other particles, in a spatial volume of radius $r_\pi = \hbar/m_\pi c$, where m_K and m_π are the masses of the K- and π-mesons. As we showed in reference 9, these were the best choices for explaining experimental data on multiple production of ordinary and strange particles.* We will take the same conservation laws into account and use the same method for calculating statistical weights as in our previous work.

Taking account of the resonance π-π interaction is formally equivalent to introducing a "pion isobar" of mass $\mu = 0.47$ nucleon masses,[5] spin S = 0 and isotopic spin T = 0 (variant of Dyson[2]) or T = 1 (variant of Takeda[3]) into the statistical theory of multiple production.†

In the table we show the ratio of the experimental results from reference 11 to the theoretical results

Variant of the theory	Number of prongs 2	4	6
Without the π-π interaction	0.98±0.12	0.99±0.16	2±1.14
With the π-π interaction in Dyson's variant	1.21±0.15	0.83±0.13	0.49±0.28
With the π-π interaction in Takeda's variant	1.38±0.17	0.71±0.11	0.64±0.36

for two, four, and six-prong stars, the latter calculated for three variants of the theory. (The indicated statistical experimental error is $\Delta_n = \pm\sqrt{N_n}$ where N_n is the number of n-pronged stars.)

It can be seen that the results of calculations without account of the π-π interaction agree well with experiment. Inclusion of this resonance π-π interaction, especially with Takeda's variant, worsens this agreement. The disagreement between the theoretical and experimental values for stars with a small number of prongs is a characteristic feature of the calculations which take account of the resonance π-π interaction, not only at E = 5 Bev, but also, at other energies.

The proportion of charged strange particles produced in inelastic π^--p collisions constitutes 8.6% for the theory which neglects the π-π interaction (5.5% from K^+ and 0.3% from K^- mesons) and 6.4% and 5.7% for the variants of Dyson and Takeda. Of the 110 inelastic stars in the experiment, in only four cases (i.e., in 3.5% of all cases) were strange particles produced. However, it is not possible to differentiate between the three theoretical variants on this basis, as was proposed in reference 10, because stars in which strange particles are produced, but do not decay in the chamber, may be included in the remaining 106 stars. Considering the lack of statistics of stars with strange particles, one would expect such cases to be very probable.

Thus, available experimental data can, within the limits of experimental error, be explained without employing the hypothesis of resonance π-π interaction. Further assumptions would be necessary to bring the statistical theory, with this interaction, into agreement with experiment.

*If one is interested only in the production of ordinary particles, then all reactions with strange particles can simply be discarded (i.e., set $r_K = 0$). Such a simplification has little effect on the results obtained for pions and nucleons since the proportion of strange particles produced is small.

†Inelastic π^--p scattering at 5 Bev with account of the resonance π-π interaction was considered by Rus'kin.[10] However, only part of the possible inelastic reaction channels were included here. Thus, for reactions with strange particles, the neglected channels have approximately the same statistical weight as the reactions taken into account by Rus'kin. If these channels are included, then the ratio of the cross section for the production of strange particles to the cross section for production of the observed π mesons exceeds that indicated by Rus'kin by a factor of more than two and is several times larger than the experimental value. The agreement with experiment for the distribution of stars with number of prongs is correspondingly worsened. This well-known result (see reference 9) indicates that K mesons should be taken into account differently than π mesons in the statistical theory.

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ON THE DETERMINATION OF NUCLEAR DEFORMATION FROM THE ALPHA-DECAY FINE STRUCTURE

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We have shown earlier that by studying the α-decay fine structure it is possible to determine the form of the surface of the daughter nucleus.[1] A