the large glass tube G_2. We use two GM counters N_1 and N_2 and measure with Au and Al foils (scattering angle 120°). The scattering part can be rotated (together with the counters). The RaE source was obtained from a RaD+E solution by precipitating the RaE with Fe carrier. The RaE +Fe was then electroplated to 0.2 mg/cm^2 Al which was evaporated onto 1 mg/cm^2 Melinex. We corrected for the following influences: depolarization in the source, plural scattering in the scattering foil,[6] apparatus asymmetry, solid angle corrections, spin deflection, and back scattering from the walls.

The influence of screening to the asymmetry function S (without screening tabulated by Sherman[7]) was measured, assuming full polarization for Co^{60} electrons (allowed GT transition). We find $S_{\text{exp}}/S_{\text{theor}} = 0.86 \pm 0.02$, 0.96 ± 0.02, and 1.00 ± 0.02 for $v/c = 0.58$ (120 kev), 0.64 (155 kev), and 0.70 (209 kev), respectively.

The results for the degree of longitudinal polarization of RaE electrons are $P/(-v/c) = 0.69 \pm 0.04$, 0.75 ± 0.04, 0.75 ± 0.04, and 0.66 ± 0.06 for $E_{\text{kin}} = 120$, 155, 209, and 290 kev, respectively. These values are nearly energy independent and are somewhat higher than the upper limit of the possible values as calculated by Bincer et al.[8] according to the "best fit" of the RaE spectrum. But it is possible to fit the spectrum with parameters which involve a higher degree of polarization. In Fig. 2, $P/(-v/c)$ is shown as a function of E_{kin}. The thoretical limits are taken from reference 8. All experimental data known to us are included.

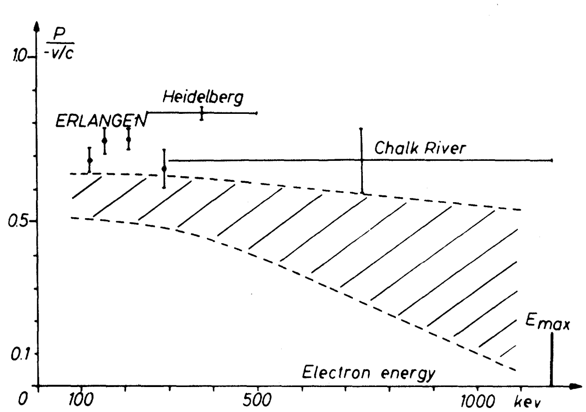

FIG. 2. Electron polarization of RaE versus energy. The range of theoretical values after the "best fit" of the spectrum is shown. The experimental values of Erlangen (present work) have been obtained with Mott scattering after electrostatic deflection, Heidelberg (Heintze et al.) with Mott scattering after deflection by multiple scattering, Chalk River (Geiger et al.) with Møller scattering.

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STRENGTH FUNCTIONS FOR DEFORMED NUCLEI*

D. J. Hughes, R. L. Zimmerman, and R. E. Chrien
Brookhaven National Laboratory, Upton, New York
(Received November 24, 1958)

Optical models have recently been successful in accounting for the interaction of various particles with nuclei over wide ranges of energy. One fundamental property of the models is the low-energy neutron "strength function," or $\bar{\Gamma}_n^0/D$ ratio, with $\bar{\Gamma}_n^0$ the mean reduced neutron width of s resonances, and D their spacing. This ratio is proportional to the cross section for compound nucleus formation and is thus closely related to the penetrability of the potential barrier at the surface of the nucleus. The compound nucleus formation can be well measured at low energy, where, averaged over resonances, it is inversely proportional to neutron velocity. The experimental strength function has been useful as a test of the applicability of optical models and as a means for establishing their parameters.

Although the "cloudy crystal ball" model of Feshbach, Porter, and Weisskopf,[1] with a spherical sharp-surfaced well, gave better agreement with measured strength functions than a "black" nucleus, it was obvious that more accurate models were needed. Inclusion of a diffuse boundary in the model was made by Feshbach, Porter, and Campbell,[2] using the experimental strength functions and high-energy cross sections of various types to fix the model parameters. The strength functions calculated from this model compared well with measurements except for A near 160; here the theory predicted a single broad peak but experiments[3] indicated a more complicated shape. It was possible, however, that inclusion of nuclear deformations, which are large near $A = 160$, would result in better agreement with experiments. Several calculations[4-7] for aspherical nuclei have been undertaken recently, and the program of strength function measurements with the Brookhaven fast chopper has been devoted to the deformed nuclei in the past few months.

The significance of the strength function in nuclear reaction theory is closely related to the methods for its measurement. Although it can be determined from the neutron widths and spacings of individual resonances, it is actually not a property of the resonances but rather of the penetrability of the nuclear surface. The mean neutron width is an emission probability, but division by the spacing removes the specific level characteristics; the resulting $\bar{\Gamma}_n^0/D$ ratio is proportional to compound nucleus formation, averaged over levels. Thus the average cross section for compound nucleus formation, σ_c, gives the strength function directly, in fact, for 1-kev neutron energy:

$$\bar{\Gamma}_n^0/D = 13.0\times10^{-4}\,\bar{\sigma}_c\ \text{(barns)}.$$

The statistical accuracy of the strength function determined from $\bar{\sigma}_c$ is typically high because of the contribution of many levels.

In the average cross section method, as developed with the Brookhaven fast chopper, the transmission of a thin sample is measured in the region of a few kilovolts. The transmission plotted against time of flight is then a straight line whose slope is directly proportional to the strength function. Experiments at Brookhaven have shown that results at several kilovolts agree with those obtained from individual resonances at low energy, indicating that effects of p waves are unimportant and that the neutron widths are proportional to neutron velocity.

The present Brookhaven results,[8] for elements and separated isotopes, are listed in Table I and plotted in Fig. 1. The experimental method used in each case is designated by the symbol in Fig. 1. For the lower A values in Fig. 1, the averaging method gives higher accuracy, primarily because the number of individual levels available at low energy is small. The theoretical curves shown in Fig. 1 correspond to (1) the black nucleus, (2) the spherical nucleus with diffuse boundary,[2] and (3) the inclusion of nuclear deformations. The last curve is the one computed by Chase, Wilets, and Edmonds,[6] for which the deformations are those corresponding to the experimental values of the nuclear quadrupole moments. It is seen that the experimental points exhibit clearly the double peak predicted by the recent theory, although they are definitely below the theoretical curve for A near 100. The agreement at the double peak is particularly striking in view of the fact that no additional adjustable parameters were present in the calculation of curve (3) relative to curve (2). It is interesting that the strength function varies with atomic weight much less violently than the level spacing, which can change by factors of 100 in a few units of A. In such cases the mean neutron width changes correspondingly and the resulting $\bar{\Gamma}_n^0/D$ ratio varies only slowly.

Even though the optical model corresponding to curve (3) is of a relatively simple type, a deformed diffuse well, it shows rather good agreement with the details of the measured

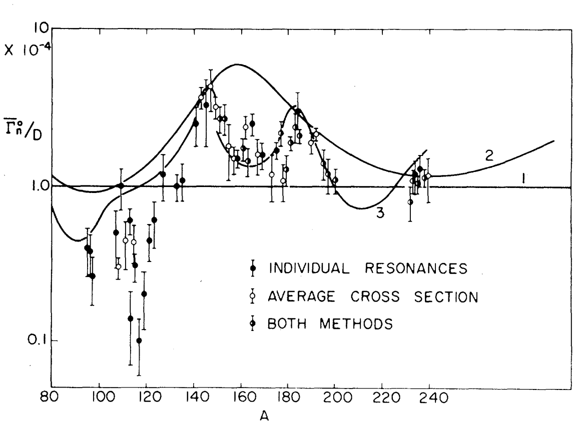

FIG. 1. Experimental strength functions compared with various nuclear models; (1) is the black nucleus, (2) the spherical nucleus with diffuse boundary, (3) the inclusion of nuclear deformations.

Table I. Neutron strength functions. Where no mass number is indicated, the value is for the normal element; "even" signifies an average value for isotopes of even mass number.

Isotope or element	Γ_n^0/D (10^{-4})	Isotope or element	Γ_n^0/D (10^{-4})	Isotope or element	Γ_n^0/D (10^{-4})	Isotope or element	Γ_n^0/D (10^{-4})
Mo^{even}	0.38±0.11	Sb^{123}	0.6 ±0.2	Dy	2.4 ±0.4	Re^{185}	2.1 ±0.2
Mo^{95}	0.40±0.14	I	1.2 ±0.4	Dy^{161}	1.75±0.3	Os	1.9 ±0.3
Mo^{97}	0.26±0.09	Cs	1.0 ±0.2	Dy^{163}	1.45±0.3	Ir	2.2 ±0.2
Ag	0.30±0.05	Ba^{135}	1.1 ±0.3	Ho	2.5 ±0.4	Pt	1.4 ±0.3
Ag^{107}	0.5 ±0.2	Pr	2.5 ±0.7	Er^{167}	1.6 ±0.4	Au	1.2 ±0.3
Ag^{109}	1.0 ±0.3	Nd^{143}	3.7 ±0.6	Tm	1.6 ±0.3	Hg	1.1 ±0.2
Cd^{111}	0.44±0.15	Nd^{145}	3.3 ±1.5	Yb^{173}	1.2 ±0.4	Th	0.8 ±0.2
Cd^{113}	0.14±0.07	Sm^{147}	4.3 ±1.3	Lu^{175}	1.7 ±0.2	U^{233}	1.1 ±0.2
In	0.44±0.12	Sm^{149}	3.2 ±0.5	Hf	1.1 ±0.3	U^{234}	1.2 ±0.3
In^{113}	0.60±0.11	Eu^{151}	2.7 ±0.5	Hf^{177}	2.2 ±0.4	U^{235}	1.05±0.15
In^{115}	0.31±0.06	Eu^{153}	2.7 ±0.6	Hf^{179}	1.3 ±0.3	U^{236}	1.3 ±0.3
Sn^{even}	0.20±0.08	Gd^{155}	1.8 ±0.7	Ta^{181}	1.9 ±0.2	U^{238}	1.15±0.15
Sn^{117}	0.10±0.04	Gd^{157}	1.5 ±0.3	W	3.0 ±1.0	Pu^{239}	1.2 ±0.4
Sb^{121}	0.45±0.12	Tb	1.5 ±0.2	W^{183}	2.4 ±0.5		

strength functions. A similar correspondence between predictions[6] based on the deformed well and experiment has already been found[9] for the potential scattering, related to the radius of the potential well. Strength function measurements are continuing, in order to investigate fine structure in the strength functions, which might be correlated with properties of individual nuclei.

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SYMMETRIES IN BARYON-K MESON INTERACTIONS*

Y. Shimamoto
Brookhaven National Laboratory, Upton, New York
(Received October 8, 1958)

It was shown by Pais[1] that, under weaker assumptions than those of Gell-Mann[2] and Schwinger,[3] certain symmetries are incompatible with experiment independent of the dynamical cause for the Σ-Λ mass splitting. These symmetries can be expressed in terms of the following two rules: (A) the separate conservation in strong interactions of two quantum numbers S_1 and S_2, which emerge from the assumed baryon-K meson $[B\text{-}K]$ interaction, and (B) the invariance of the latter under a certain interchange. Thus, (A), e.g., forbids processes like $\pi^+ + p \rightarrow \Sigma^+ + K^+$, $K^0 + p \rightarrow K^+ + n$, and $K^- + p \rightarrow \pi^- + \Sigma^+$, while the application of (B) leads to incorrect hyperon production amplitudes in π-p collisions. It has further been shown by Pais[4] that (B) can be eliminated by assuming the relative parity of K^+ and K^0 to be odd, while those processes forbidden by (A) can be reinstated by the introduction of an interaction of the form $[\bar{K}K\pi] = f(2m_K)\,(\bar{K}^+K^0\pi^+ + \bar{K}^0K^+\pi^-)$. Interactions quadrilinear in the fields are also being considered.[5]

It is the purpose of this note to indicate that,