Q-value of $-(1.006\pm0.010)$ Mev has been given[3] corresponding to a mass difference of (0.22 ± 0.01) Mev.

The new method of determining the energy-release in electron capture processes may be applied even in some cases where the disintegration goes over an excited level of the daughter nucleus with the emission of a nuclear γ-ray. A more detailed account will be published in *Helvetica Physica Acta*. We thank Professor P. Scherrer for his interest in this work.

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Angular Correlation of the Continuous Radiation Accompanying Beta-Decay*

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THE theory of the continuous gamma-radiation accompanying beta-decay was developed by Knipp and Uhlenbeck[1] and by Bloch.[2] An extension to forbidden transitions was made by Chang and Falkoff,[3] especially for the scalar interaction. This radiation has been found by several investigators,[4] and recently it has been possible to measure the shape of the gamma-ray continuum at low energies (50 kev–300 kev).[5] Theoretical predictions show that for low energies the shapes of the gamma-continua are almost identical for allowed and first-forbidden transitions for any interaction. This point has been verified experimentally (to be published).

We thought it might be of interest to calculate the angular correlation between the beta-particle and its associated gamma-quantum and to see if one could distinguish between allowed and forbidden transitions. We calculated the correlation for allowed and first-forbidden transitions, making use of the tensor interaction and neglecting charge dependence. We obtained the following expressions for the allowed and first-forbidden correlation functions $W(\theta)$. The first-forbidden formula is for the special selection rule ($\Delta J=2$; yes). Allowed correlation function

$$W_A(\theta)=\frac{[W_0-(W+k)]^2}{k}\sin\theta p\frac{(W+k)}{q^2}\left(\frac{(W+k)^2+W^2}{W+k}q-q^2-1\right),$$

first-forbidden correlation function, tensor interaction ($\Delta J=2$; yes)

$$W_F(\theta)=CW_A(\theta)\{[(W_0-(W+k)]^2+(W+k)^2-1-2kq\},$$

where W=final energy of beta-ray, $q=W-p\cos\theta$, $p=(W^2-1)^{\frac{1}{2}}$, k=photon energy in relativistic units, and C=a constant for equalization at 90° (see below).

We have plotted a correlation for the following experimental situation. The beta-transition is taken as first-forbidden tensor for the special case ($\Delta J=2$; yes). The upper energy of the beta-spectrum is $W_0=4mc^2$. We assume that we have a gamma-counter which accepts all gammas above 50 kev. The angular correlations for allowed cases are also plotted and are equalized to the forbidden curves at 90°. The results are plotted for various final energies of the beta-particle.

The curves demonstrate that the ratio of the number of coincidences at the forward peak to that at 90° is greater for the allowed than for the first forbidden. The ratio, of course, depends on the value of the range of final beta-energy one accepts. This ratio becomes quite appreciable if one accepts only high energy gamma-rays in the counter ($h\nu>2mc^2$). This occurs when one beta-particle is created with a high energy in the intermediate state and then emits a high energy photon. An experiment based on this condition is not feasible, however, since for an upper energy of $W_0=4mc^2$, only 10^{-5}-gammas per beta are emitted in the range above 1 Mev.

The calculations also show that it becomes easier to distinguish between allowed and forbidden as the upper energy of the beta-spectrum is increased. From the calculation we can conclude the following results:

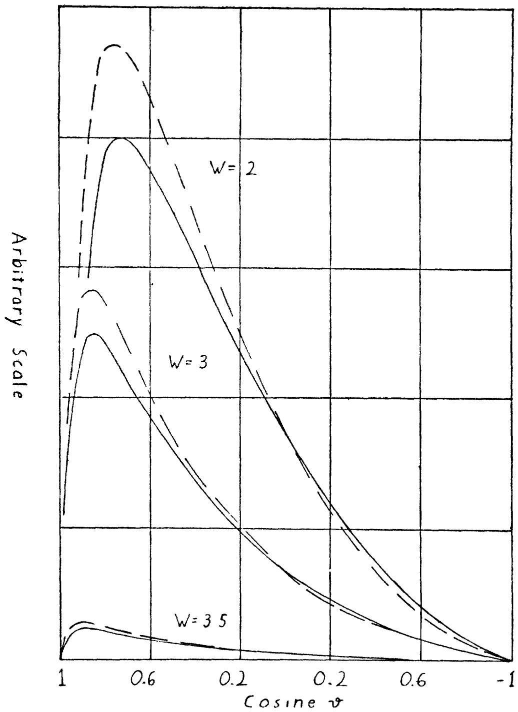

FIG. 1. The angular correlation $W(\theta)$ as a function of $\cos\theta$ for final beta-energies of 2, 3, and 3.5 mc^2. Dotted curves are for allowed transitions, solid curves for first-forbidden transitions—tensor interaction ($\Delta J=2$, yes). The curves for equalized at 90° for each final beta-energy.

1° The correlation for allowed transitions is independent of the form of the interaction;
2° The nuclear matrix elements for first-forbidden transitions are identical with the ones obtained in the ordinary beta-decay. Hence the shape of the beta-ray spectrum uniquely determines the angular correlation.

Although the internal bremsstrahlung does not provide any new information on the form of beta-decay interaction, it does provide a secondary means of studying beta-decay.

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Additional Data on the Radioactive Isotopes of Tin and Tellurium*

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THE existence of many stable isotopes in tin together with the small cross section for neutron capture displayed by most of them, has made difficult the correct assignment of the observed radioactivities. Spectrometric studies of specimens enriched in masses 112 (72.5 percent), 116 (89.6 percent), 122 (45.8 percent), and 124 (83.1 percent) and irradiated in the pile for two months, yield results differing from those previously reported[1,2] for certain of the isotopes.

Tin-113. This isotope is produced by neutron capture in Sn-112 with the largest cross section of any of the isotopes, and gives in the spectrometer several electron lines. Three low energy lines are interpretable as of Auger origin accompanying indium x-rays. Three strong lines are the K, L, and M electron groups for the known transition in indium-113 (112 min) whose energy is here