actual magnitude is not markedly affected by the form of the dispersion relation and is roughly that of the observed anisotropy.

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Relativistic and Screening Effects in Radiative Electron Capture

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THE continuous gamma-ray spectrum (inner bremsstrahlung) accompanying orbital electron capture was recently investigated theoretically.[1] This theory takes the p-electron capture as well as the s-electron capture and the Coulomb effects into consideration and gives a better agreement with experiments in the low-energy region than earlier theories.[2,3] A check of the theory was subsequently made[4] by investigating the inner bremsstrahlung from A^{37} by the method of scintillation spectroscopy with particular emphasis on the low-energy region.

A general formulation of the problem of radiative capture from the various electronic states has been made.[5] According to this theory, the general expression for the radiative events ω_k per $1S$-electron capture $(\omega_c)_{1S}$ can be written, in the absence of relativistic and screening effects, as

$$\frac{\omega_k dk}{(\omega_c)_{1S}}=\frac{\alpha}{\pi}\sum_l\left(\frac{Z^2\alpha^2}{2}\right)^2\left[1-\frac{x-(E_l-E_{1S})}{x_{\max}}\right]^2 I_l(x)dx, \quad (1)$$

where x is the photon energy given in units of Z^2 ry $=Z^2\times 13.5$ ev; $x_{\max}$ is the upper limit of the photon energy; E_l is the ionization potential for the l-electron, and $I_l(x)$ is a tabulated function. The summation has been carried out for $l=1S$, $2S$, $2P$, and $3P$. In Fig. 8 of reference 4 is shown the application of this theory to the inner bremsstrahlung from A^{37}. The agreement down to 100 kev is excellent. As predicted by the theory, the experimental distribution does show a sudden increase at around 30 kev. However, the experimental points below 100 kev lie below the theoretical curve. This discrepancy was found also for the inner bremsstrahlung from Fe^{55} by Madansky and Rasetti (Fig. 9, reference 4).

In order to explain these discrepancies, the calculations have recently been performed[5] taking account of the relativistic effects for the S-state spectrum, and including correction factors for screening. Both the

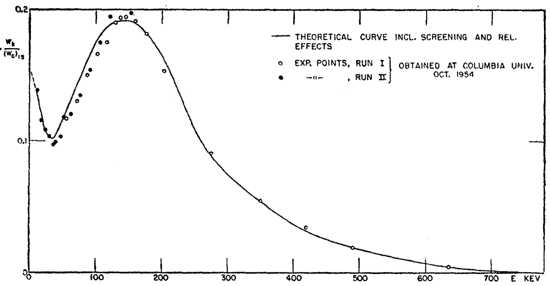

Fig. 1. Inner bremsstrahlung from A^{37}.

relativistic and screening corrections are energy- and charge-dependent, but the variation of the latter with energy is very small. The general expression (1) can therefore be written

$$\frac{\omega_k dk}{(\omega_c)_{1S}}=\frac{\alpha}{\pi}\sum_l\frac{S_l(Z)}{S_{1S}(Z)}R_l(x,Z)\left(\frac{Z^2\alpha^2}{2}\right)^2 \times\left[1-\frac{x-(E_l-E_{1S})}{x_{\max}}\right]^2 I_l(x)dx, \quad (2)$$

where $S_l(Z)$ is the screening correction factor for the lth electron and $R_l(x,Z)$ is the relativistic correction factor for the energy x and charge Z. The numerical values for these correction factors were determined.

The experimental data[4] on A^{37} have been used in a comparison with the theory given by formula (2). The treatment of the data is exactly the same as before,[4] i.e., the experimental points are corrected only for background and the theoretical curve is corrected for the various effects in the NaI scintillation counter. Figure 1 shows the result. The agreement is now excellent over the whole energy region.

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Decay of Co^{61} and Cu^{61}†

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THE decay of 1.66-hr Co^{61} and 3.33-hr Cu^{61} was investigated in this institute with β- and γ-scintillation spectrometers in various coincidence setups, with