

In determining the absorption curves threefold (1, 2, 3) and twofold (1, 2) coincidences were recorded simultaneously with the aluminum absorbers placed immediately in front of counter 3 (Fig. 1). The twofold coincidence rate was employed to monitor

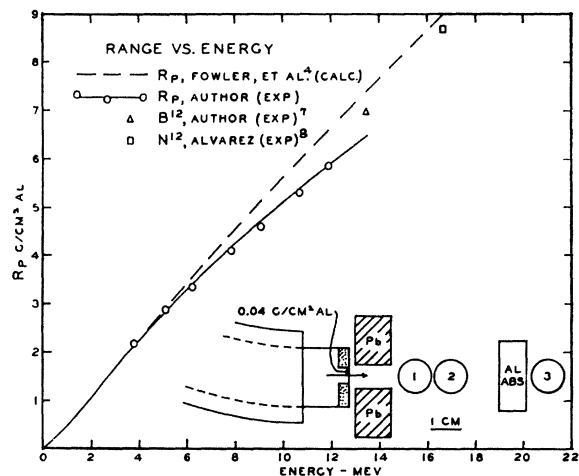


FIG. 1. The practical maximum range in aluminum (R_p) versus electron energy. The counter arrangement relative to the magnetic analyzer is shown in the lower right corner.

the electron beam emerging through the 0.04 g/cm² aluminum window of the spectrometer. The results yielded a family of absorption curves (corrected for counter wall thicknesses) for various electron energies selected by the spectrometer. The shape of these curves agreed well with that of computed curves⁴ and the linearity near the end point allowed accurate determination of the practical maximum range. These values of R_p are shown in Fig. 1 plotted against the corresponding electron energies.

It is seen that in the high energy region the experimental points indicate a practical range somewhat less than that expected on the basis of the theoretical energy loss (dotted line). It seems likely that this may be due to two factors: (1) several cloud chamber investigations⁶ have provided evidence that the energy loss of electrons traversing thin foils is greater than that predicted by theory by as much as 40 percent in the region of energy involved here, (2) multiple scattering effects have been shown to give rise to actual path lengths through absorbers which are appreciably greater than the absorber thickness.⁶

Corrected to maximum range ($R_0 = R_p + 0.14$ g/cm²), the solid curve should be satisfactory for energy measurements of monoenergetic gamma-rays by coincidence absorption as outlined in reference 4. However, the data do not necessarily furnish a range-energy curve suitable for end point measurements of beta-ray spectra. It is difficult to correlate the maximum range as determined here with that obtained by extrapolation of a logarithmic plot or by a Feather analysis. In this connection the end point ranges of B^{12} and N^{12} ⁸ have been indicated in Fig. 1 plotted at energy values corresponding to the spectrometrically determined end point for B^{12} and to that expected from the atomic masses and (p, n) threshold for N^{12} . The good agreement of these points with the modified Feather formula given by Glendenin and Coryell⁹ is evidence for the validity of that relation for absorption measurements of high energy beta-rays.

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Hyperfine Structure of Te^{125}

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HYPERFINE structure in the spectrum of singly ionized Te^{125} has been observed with a Fabry Perot etalon. Using 20 mg of 80 percent enriched isotope in a water-cooled Schuler tube, photographs were obtained in three to five minutes on Eastman 103a-F plates. About a dozen lines in the region from 4000 to 6000 Å show hyperfine structure, all of them giving only two components. The average separation of the components is about 0.2 cm⁻¹. In some of the lines, for example λ5666, the intensities of the two components have the ratio 3:1, with corresponding displacements relative to the single component of the even isotopes. Thus it can be concluded that the spin of Te^{125} is $\frac{3}{2}$. The ratio of intensities in the line λ5708 corresponds to a j value of $\frac{3}{2}$ which does not agree with the classification $6s^2P_{\frac{1}{2}}$ given by Rao and Sastry¹ for the lower level of this line.

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Spurious Counts in Geiger Counters and the Pretreatment of the Electrodes

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GEIGER-MÜLLER counters and point counters are found under certain conditions to give spurious counts which cannot be attributed to photoelectric emission. It has been found by various observers^{1,2} that newly made counters show a marked activity of this kind, which decreases with time until finally the normal background count only remains. Because of this phenomenon, various recipes for the preparation of counter cathodes have been proposed and some workers^{1,2} have put forward explanations for this behavior in terms of the conditions existing on the surface of the cathode. In a recent letter to *The Physical Review*, Wiedenbeck and Crane³ described a very interesting experiment with counters which showed nearly similar effects after having been operated at voltages above the plateau. These authors concluded that the effect which they observed could be attributed to delayed emission of electrons from the cathode. In view of their method of pretreatment of the cathodes made from various metals (dry polishing with fine steel wool) it seems possible that a connection may exist between their observations and that of J. Kramer.⁴ He maintains that the disturbances observed in newly made counters offer a new method for investigating the surfaces of metals, as regards their structure and stability. He concludes from his experiments that electrons are emitted by metals during exothermal processes.

As a result of a previous private communication of Kramer with one of the authors (S.M.N.), in which he proposed the Geiger-Müller counter or the Geiger point counter as new tools for studying metal surfaces, a series of experiments were conducted by the authors as a repetition of those by Kramer, and they were able to confirm his findings for the effects which were tried. The effects studied can briefly be stated as follows:

(1) Metal surfaces which have been ground or polished exhibit strong counting activity when placed in a counter. This activity diminishes with time according to the severity of the pretreatment and differing also in extent for various metals.

(2) On heating such a metal surface inside the counter after the activity has died down to the level of the normal background, a gradual, steep rise in counting rate may set in above a certain temperature. The behavior of the metal depends on the nature of the pretreatment, the time elapsed since treatment, and the particular metal.

Typical curves obtained by us illustrating these two phenomena are given in Figs. 1 and 2.