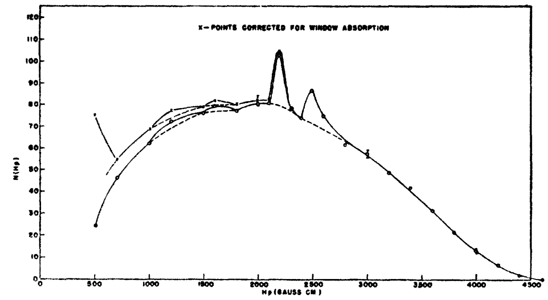

FIG. 2.

From the probable errors in the Kurie plot data near the end point, an upper limit on the neutrino mass can be made.[8] The present data give $\nu \leq 15$ kev, or $\nu \leq 0.03$ the electron mass.

No systematic search for internal conversion lines was made; the K and L peaks found give a γ-energy of $\sim$0.40 Mev. The rough conversion coefficients are $\sim$1 percent.

The recent work on the radiation from Au^{198} by Levy and Grueling[9] gives 0.97 ± 0.010 Mev for the β-end point, in very close agreement with the present data. However, the interpretation of the spectrum as complex, with $\sim$15 percent of a 0.605-Mev β, and γ's of 0.157 and 0.208 Mev in parallel with the 0.97-Mev β cannot be supported by the present work. There is no indication of the inflection at 0.6 Mev in Fig. 3.

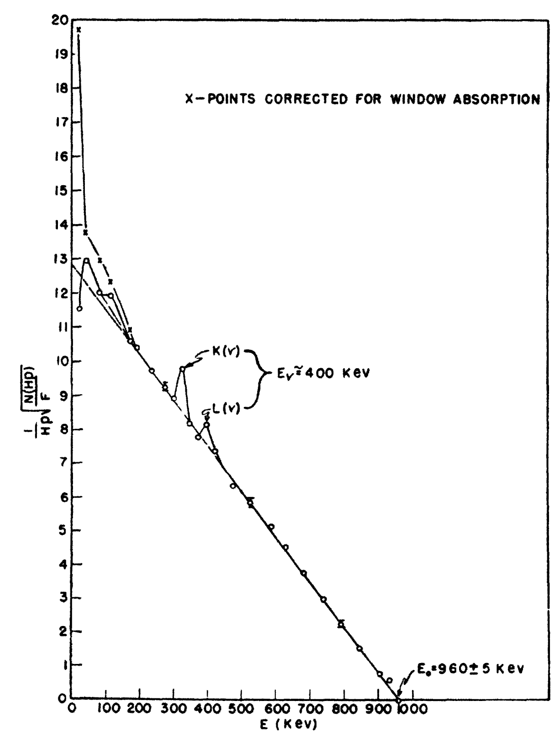

FIG. 3.

Wiedenbeck and Chu[10] have found $N\beta\gamma/N\beta$ independent of β-energy, indicating a simple spectrum. They find low energy γ's and γ-γ coincidences,[11] explainable as in cascade on the simple spectrum model.

The present work is part of a survey of the heavy elements. The author wishes to thank Professor Donald J. Hughes for his helpful supervision.

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Internal Conversion Electrons from 70-Day Ir^{192}

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February 20, 1948

THE internal conversion electron spectrum of long-lived Ir^{192} has been investigated recently by P. W. Levy[1] and J. M. Cork.[2] Both workers reported a large number of lines in the energy region up to approximately 600 kev, but the agreement between their results was not very satisfactory.

Using a high dispersion 180° photographic beta-ray spectrograph, we have studied the Ir^{192} spectrum up to approximately 300 kev. These results, together with those of the above two workers, are given in Table I. According to the present work, the energies of the converted gamma-rays in the region investigated are:

$$\gamma_1 = 137,\ \gamma_2 = 208,\ \gamma_3 = 296,\ \gamma_4 = 308,\ \gamma_5 = 317 \text{ kev.}$$

TABLE I. Internal conversion lines of 70-day Ir^{192}.

Intensity of line	Energy of line (kev) (present workers)	Energy of line (kev) (Levy)	Energy of line (kev) (Cork)
Weak	58(γ_1–K)	—	—
	—	121(γ_1–K)	—
Weak	124(γ_1–L_I)	124(γ_2–K)	—
Weak	126.5(γ_1–L_{III})	128(γ_3–K)	—
Medium	131(γ_2–K)	131(γ_4–K)	129.8(?)
	—	—	162.5(?)
Weak	193(γ_2–L_I)	193(γ_3–L)	190.9(γ_1–K)
Weak	195(γ_2–L_{III})	194(γ_4–L)	—
Weak	203(γ_2–M)	202(γ_4–M)	—
Weak	205(γ_2–N)	—	—
Strong	217.5(γ_3–K)	217(γ_5–K)	214.9(γ_2–K)
Strong	230(γ_4–K)	229(γ_6–K)	227.9(γ_3–K)
V. strong	238(γ_5–K)	237(γ_7–K)	236.2(γ_4–K)
	—	—	254.5(γ_1–L)
Medium	282(γ_3–L_I)	281(γ_5–L_I)	280.5(γ_2–L)
Weak	284(γ_3–L_{III})	284(γ_5–L_{III})	—
Weak	293(γ_3–M)	293(γ_5–M)	—
Weak	295.5(γ_3–N) and/or (γ_4–L_I)	295(γ_8–L_I)	292.5(γ_3–L)

This work was supported by the Office of Naval Research under Contract N6-ori-71. The Ir^{192} source was supplied by Clinton Laboratories, Oak Ridge, Tennessee, and obtained on allocation from the U. S. Atomic Energy Commission. We are grateful to Dr. M. Goldhaber for criticism.

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Electromagnetic Separation of Bromine and Chlorine Isotopes

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THE usual method of separating stable isotopes in the calutron is by collecting a beam of singly ionized particles in a chemical uncombined form such as Ag^+, Sn^+, etc. Bromine has been collected here using NaBr charge material and collecting the $NaBr^+$ particles. An analysis of the received material indicated 91.41 ± 0.5 percent Br^{81} and 8.59 ± 0.5 percent Br^{79} collected in the mass 104 position, while 90.54 ± 1 percent Br^{79} and 9.46 ± 1 percent Br^{81} appeared in the mass 102 position.* This method has greatly simplified the collection of isotopes of elements which are gaseous at room temperature and which are not chemically inert. A scan of the mass spectrum indicated that the $NaBr^+$ was the strongest beam received, comprising approximately 30 percent of the bromine ions in the total beam. Chlorine has been separated in a similar manner, using CuCl charge material and collecting the $CuCl^+$ particles in the mass 98 and 102 positions.

This document is based on work performed under Contract No. W-7401-eng-23 for the Atomic Energy Project at Tennessee Eastman Corporation, Oak Ridge, Tennessee.

* Isotope analyses by the mass spectrometer laboratory, R. F. Hibbs in charge.