3. On the Beta- and Gamma-Spectrum of Cs^{137}

Toshio AZUMA and Kiichi KIMURA.

(K. Kimura Laboratory)

Using the double coil, thin lens magnetic beta-ray spectrometer, we measured the beta and gamma spectrum of Cs^{137}. As the shape of its spectrum was accurately known (H.M.Agnew and H.I.Anderson, *Rev.Sci.Inst.* **20**, 873 (1949)), we studied the Kurie-plots of the 518 kev beta-rays and the effect of the internal L-conversion line on the value of the internal conversion coefficient of 665 kev gamma-rays.

The source used was the Cesium chloride of 0.1mc. intensity deposited on a Zapon film of about 20 μg·/cm.^{2} in thickness. The detector used was an end-window type G-M counter whose mica window was 2.9 mg·/cm.^{2} in thickness. We could resolve the internal L-conversion line of 665 kev gamma-rays, after we sputtered the aluminium of about 0.3 mm. thickness on the brass helical baffle in the spectrometer. We studied the Kurie-plots of the 518 kev beta-rays, using the correction factors (a) and (c) of Langer and Price (*Phys. Rev.* **76**, 641 (1949)).;

first forbidden; $a \sim (w^2-1)+(w_0-w)^2$, $\Delta j=\pm2$, *parity change, yes.*

second forbidden; $c \sim 3(w^2-1)^2+3(w_0-w)^4+10(w^2-1)(w_0-w)^2$, $\Delta j=\pm2$, *parity chenge, no.*
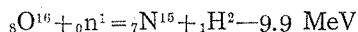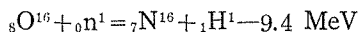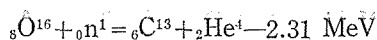
The Kurie-plot with the correction factor of (a) was on a straight line, where w_0 was 2.04. The influence of the thickness of the mica window was corrected by this straight Kurie-plot of the first forbidden. The ratio of corrected area of 518 kev beta-rays and the area of internal K-conversion line was estimated as 5720 mm^2 /545 mm.^{2} = 0.095. This value of the internal conversion coefficient corresponded to that of the former author (M.A.Waggon: *Phys, Rev.* **82**, 906 (1951)). But the ratio of the area of L and K line was 12 percent. There seems to be some obscureness in the separation of K and L lines.

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4. On the Reaction of O^{16} by Fast Neutrons. (I)

Kiichi KIMURA, Ryutaro ISHIWARA, Masakatsu SAKISAKA,

Isao KUMABE, Sukeaki YAMASHITA and Kozo MIYAKE

(K. Kimura Laboratory)

The resonances in the reactions of O^{16}

$$_8O^{16} + _0n^1 = _6C^{13} + _2He^4 - 2.31 \text{ MeV}$$

$$_8O^{16} + _0n^1 = _7N^{16} + _1H^1 - 9.4 \text{ MeV}$$

$$_8O^{16} + _0n^1 = _7N^{15} + _1H^2 - 9.9 \text{ MeV}$$

by fast neutrons have been studied by the method of Wilhelmy (*Z.f.Phys.*, **107**, 769 (1937)) using an ionization chamber filled with oxygen and (Li+D) neutrons. The principle of the method is as follows: the ionization chamber filled with oxygen is irradiated by fast neutrons with continuous energy spectrum, then the output pulses produced by the reactions are registered and the pulse height distribution is determined. If resonances of the reaction exist, they will be detected as peaks in this pulse height distribution.

The ionization chamber used is a parallel plate type one. (R.Ishiwari and K.Yuasa, *Mem. Coll. Sci., Univ. of Kyoto*, **26**, 151 (1950)) Its depth is 1.5 cm. and the diameter of the electrode is 11.3 cm. The applied voltage is 4500V and the time constant of the amplifier is 1×10^{-3} sec. Tank oxygen of 99.5 % purity was dried by $CaCl_2$ and filled in the chamber. The output of the amplifier was put into an oscilloscope and the pulses were registered on the phtographic film. The energy calibration was carried out with ThC' α-rays. (R.Ishiwari and K.Yuasa, *loc. cit.*) The stopping power of oxygen was taken as 1.060. (L.H.Gray, *Proc.Camb.Phil.Soc.*, **40.** 72 (1944)). To avoid microphonic noise, the ionization chamber and the pre-amplifier were mounted in a sound arresting box, thus the noise level was reduced to about 50 KeV in the energy scale. To moderate and smooth the energy spectrum of (Li+D) neutrons, paraffin block of various thicknesses was inserted between the target and the chamber, and the chamber was surrounded with paraffin plates (Fig.1).
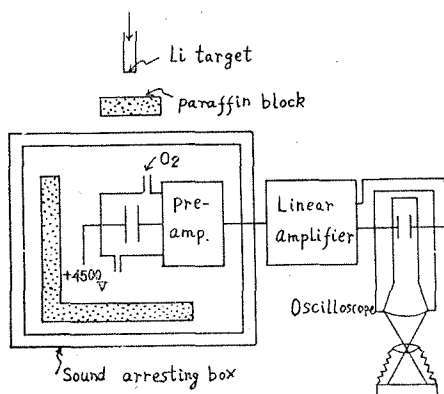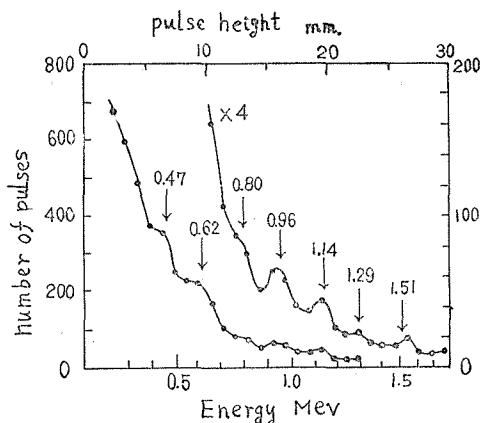

Fig.1.

Fig.2.

Fig.2 shows the distribution of the pulses when paraffin block of 4 cm. thick was used. We can recognize the peaks at 0.47, 0.62, 0.80, 0.96, 1.14, 1.29 and 1.51 MeV.

To ascertain that these peaks are not due to statistical fluctuations, we divided the total data in half in an arbitrary way and examined the pulse height distributions.

In each half, we could find the peaks at the same positions as in Fig.2. Thus, though the number of registered pulses is not yet sufficiently large, we can attribute these peaks to the resonanses in the reactions of O^{16} with tolerable reliance.

At the present stage, we can not conclude about the type of reactions and the energy levels of the compound nucleus O^{17} or the residual nuclei to which these peaks belong. To clarify these points, further experiments are now being continued by using (Be+D) neutrons and varying the chamber pressure.

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5. On the Characteristics of the External Cathode Counter

Masateru SONODA, Hiroshi KUBO and Kazusuke SUGIYAMA

(K. Kimura Laboratory)

An external cathode counter is very simple in its construction and convenient for use as compared with an ordinary G.M. counter. It was described by a few workers, but its characteristics were not shown. We, therefore, studied such a counter and obtained satisfactory results.

The counter used is shown in Fig.1. The envelope is of an ordinary soda-glass
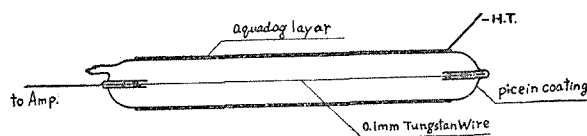

Fig. 1. O. dia. 20 mm., length 135 mm.

and 1 mm. in thickness. A thin layer of aquadag is coated on its outer surface
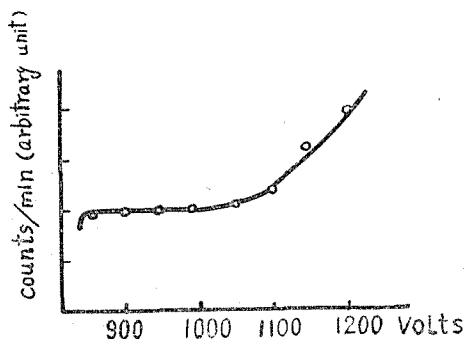

Fig. 2.