Title	An Attempt to Eliminate the Natural Counts of the G-M Counter. (II)
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38. On the Stability of the Tube Potentiometer.

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In the present experiment, the stability of the DuBridge and Browns' balancing circuit of a single tube potentiometer with UX 54 tube is studied. The balancing conditions of this circuit are:

i) $e=0$

ii) $\frac{de}{dI_f}=0$

where e is the potential difference across the galvanometer, and I_f is the filament current. It has been found that there were two cases where the above conditions were satisfied, namely, $\frac{d^2e}{dI_f^2}>0$ and $\frac{d^2e}{dI_f^2}<0$. We are going to know which is preferable for the practical usage.

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39. An Attempt to Eliminate the Natural Counts of the G-M Counter. (II)

Kiichi Kimura, Takeo Hayashi, Yoshihide Ishizaki and *Kiyoshi Nishikawa.*

Whenever we measure very weak radioactivities with the G–M counters, we are used to be troubled by their natural counts. In our last report, we arranged linearly the two cylindrical counters with their common axis (we call them coincidence counters) and connected them to the coincidence circuits. Surrounding the councidence counters with many counters (we call them guard counters), we connected the latters to the anticoincidence circuits to eliminate the natural counts. Thus we could reduce the natural counts to 0.21/min.. In this case, we measured the β rays that came into the counters through the thin mica window at the end of the counter, and found that the solid angle of the back counter to measure the activity.

Therefore, we next devised *a* rectangular coincidence counters which had a common side wall of Al foil. Each of toem had a volume of $2\times5\times1.5$ cm^3, a window of Al foil (5 mg/cm^2 in thickness and 2×5 cm^2 in area) and a plateau of about 300 volts (from 1050 volts to 1350 volts). We also prepared guard counters of rectangular type, each of which was made in dividing the volume of $14\times14\times2$ cm^3 in 7 parts and had a plateau of about 400 volts (from 1100 volts to 1500 volts).

Under this arrangement the natural counts were found to be 10.6/min., while

according to our other experiments, the efficiency of the guard counters for cosmic rays was nearly 100 %, the anticoincidence circuits being, on the other hand, supposed to be in perfect operation, and the resolving time of our circuits was so small (1.93×10^{-5} sec) that we needed no particular consideration on the accidental coincidences. This means {the 10.6/min. of the remained counts} are too much to be explained.

We then separated the coincidence counters into two parts and measured the natural counts, inserting an absorber (Pb plate of 1.02 g/im^2 in thickness) between the two, when the remained counts were found to be 3.5/hour. Using an absorber of various kinds in place of the Pb plate, we got an absorption curve very similar to β rays. So it might be reasonable to conclude that the counters have activities by themselves on account of contamination.

1) "An attempt t) extinguish the natural counts of G-M counters (I)" Rep. -f Inst, for Chem. Res. Kyoto Univ,, Vol. 18, P. 86. (1949).

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40. On the γ Rays of K^{40}.

Kiichi Kimura, Takeo Hayashi, Yoshihide Ishizaki and *Kiyoshi Nishikawa.*

In studying the disintegration schema of K^{40}, it is important that we should make clear the relation between its β-rays and γ-rays. We could measure this relation with conincidence counters which were specially devised to eliminate the natural background as less as possible (The details of this counter will be described in this reports under the title of "an attempt to eliminate the natural counts of the G-M counter (II)"). The size of the sample (pure KCl) was 5 mm thick, 50 mm long and 20 mm wide, weighing 7 g, which was inserted between two Geiger counters of rectangular section. In addition to this, a lead plate of 1.05 g/cm^2 thick was interposed between the one counter and the sample to absorb β-rays. The window of the other counter (β counter) was of Al-foil (5 mg/cm^2 in thickness). These two coincidence counters were so arranged as to be surrounded by the guard counters which were connected with the anti-coincidence circuits to eliminate the natural counts.

According to our measurement, the mean counts of the β rays from the sample were 145/min and the γ counts 0.60/min. Using these values and the number of the β decay-26.8$\pm$1.2 per second per gram of potassium (T. Graf, phys, Rev, 74, 831 (1948)), we came to calculate the estimated value of β-γ coincidence, which was found to be 0.98 per hour.

The actual counts of coincidence in our experiments are as follows: