Copy 7

[redacted]

LA REPORT 185

[redacted]

December 13, 1944 — This document contains 7 pages

I. THE RATIO OF ν_{23}/ν_{25}

II. SLIGHTLY DELAYED NEUTRONS FROM 23

WORK DONE BY:

J. W. DeWire

R. R. Wilson

W. M. Woodward

REPORT WRITTEN BY:

W. M. Woodward

[redacted]

[redacted]

[redacted]

ABSTRACT

The ratio of ν_{23}/ν_{25} has been measured by a coincidence method to be 1.033 ± .009. The number of neutrons delayed by as much as $5 \cdot 10^{-9}$ seconds for 23 is (9 ± 5) percent.

[redacted]

[redacted]

I. THE RATIO OF ν_{23}/ν_{25}

II. SLIGHTLY DELAYED NEUTRONS FROM 23

The availability of small amounts of 23 have made it possible to measure some of its properties in order to determine its possible use in a chain reaction. Among these properties, ν, the number of neutrons per fission, is important. In this report we give the results of measurements of this quantity.

The coincidence method described in LAMS-104 was used. The same chamber, Fig. 1, apparatus, Fig. 2, and procedure described therein were used in this measurement. The only changes in the apparatus were the substitution of two Model 500 amplifiers and a new coincidence stage. The increased stability of these feed-back amplifiers over the older ones was a great advantage. The coincidence circuit was essentially the same as the one previously used, the only differences being that a flip-flap discriminator was used to drive the blocking oscillator and a mixer tube (6L7) was used for detecting coincidences. Fig. 3 is a plot of C/F, the number of coincidences per fission, against R/T, the number of recoil counts per unit time the slope of which gives the resolving time, which was .13 μsec for these measurements. This corresponds to a correction for accidental counts of 0.5%. For further details of the measurements the reader is referred to LAMS-104.

Three samples were used, one of 23 containing 3 mg of oxide, one of β-stage 25 containing 3.6 mg oxide, and one of 49 containing 1.2 mg metal. Three runs were concluded. In the first, 23, 25, and 49 were compared and in the second and third, 23 and 25 were compared. The measurement of delayed neutrons (of the order of 10^{-9} sec) was also made. The recoil-counter filling for all runs was 60 cm Hg of argon corresponding to a threshold sensitivity permitting the counting of neutrons of about 400 Kev and up. The results are given in the following table:

[redacted]

1.065
1.007
1.023

32 1000
26 680
10 160
1780

42/3 = 14

self consistency
1.033 ± .014

[redacted]

Run		Experimental Probable Error	Statistical Error
1	$\nu_{23}/\nu_{25} = 1.065$	.009	.015
	$\nu_{49}/\nu_{25} = 1.173$	.020	.021
2	$\nu_{23}/\nu_{25} = 1.007$	.014	.016
3	$\nu_{23}/\nu_{25} = 1.023$	.014	.013
Average of 1, 2, 3	$\nu_{23}/\nu_{25} = 1.033$	.007	.009

The measurements of the percent of neutrons delayed by more than 5×10^{-9} secs and less than 10^{-7} secs gives

for 23, (9.6 ± 4.4) %;

for 25, (-4.0 ± 5.3)%;

It is a reassuring check on this method to note that within the experimental error, it gives for ν_{49}/ν_{25} the same value previously reported. Our value for $\nu_{23}/\nu_{25} = 1.033$ is to be compared with a value of 1.08 ± ~~0.2~~ 0.02 reported by H.L.Anderson[1]. The latter measurement measured all neutrons per thermal fission -- while ours measures only the prompt neutrons. Since there are 2.5 times as many delays[2] for 23 as for 25, this would make Anderson's value for the prompt neutrons about 1.07.

1) Private communication, to be reported from Argonne.

2) A. N. May, G. Malinckrodt; CP-2301, p. 5.

[redacted]

[redacted]

[redacted]

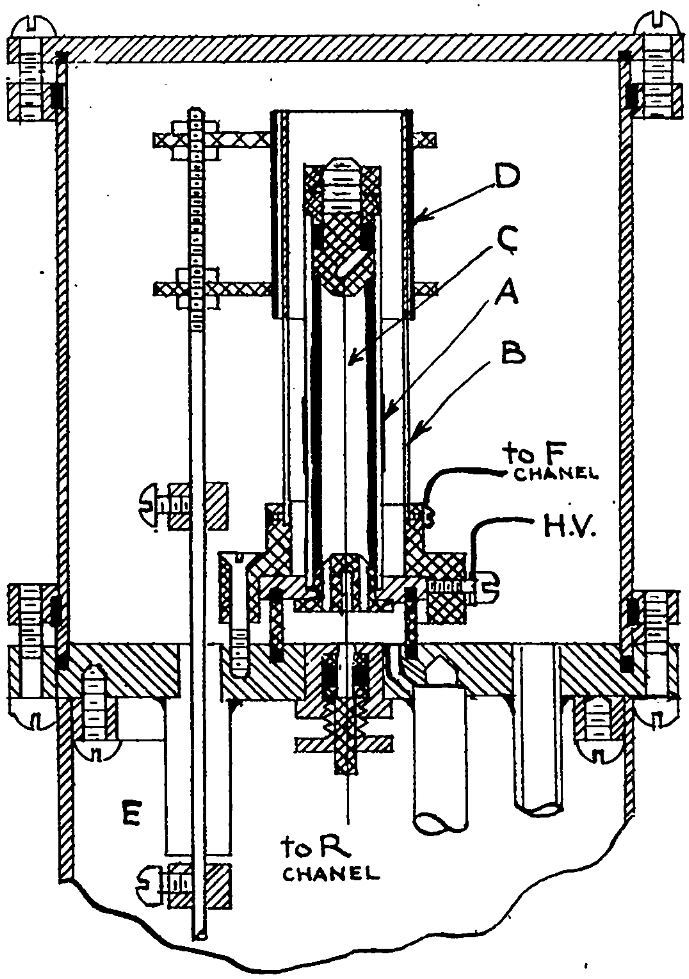

FIG. 1

[redacted]

[redacted]

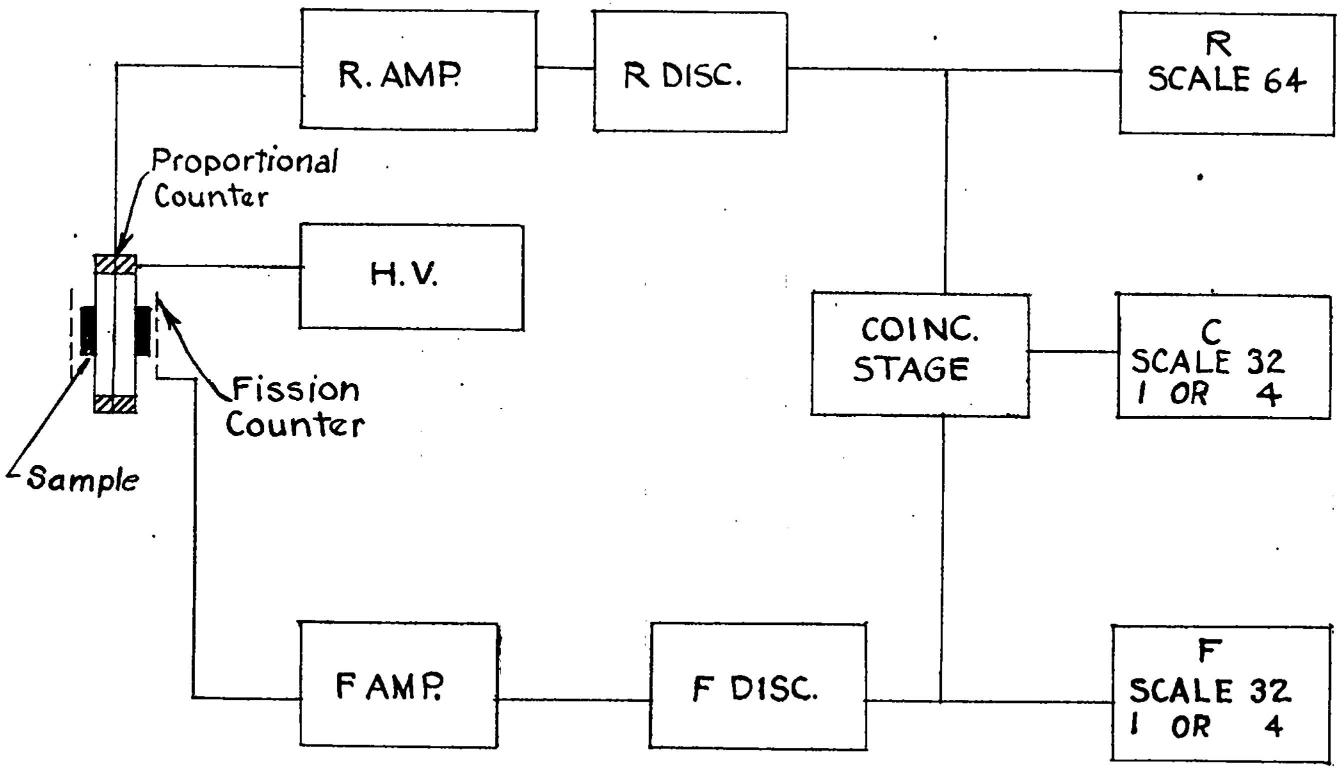

FIG 2

APPROVED FOR PUBLIC RELEASE

[redacted]

[redacted]

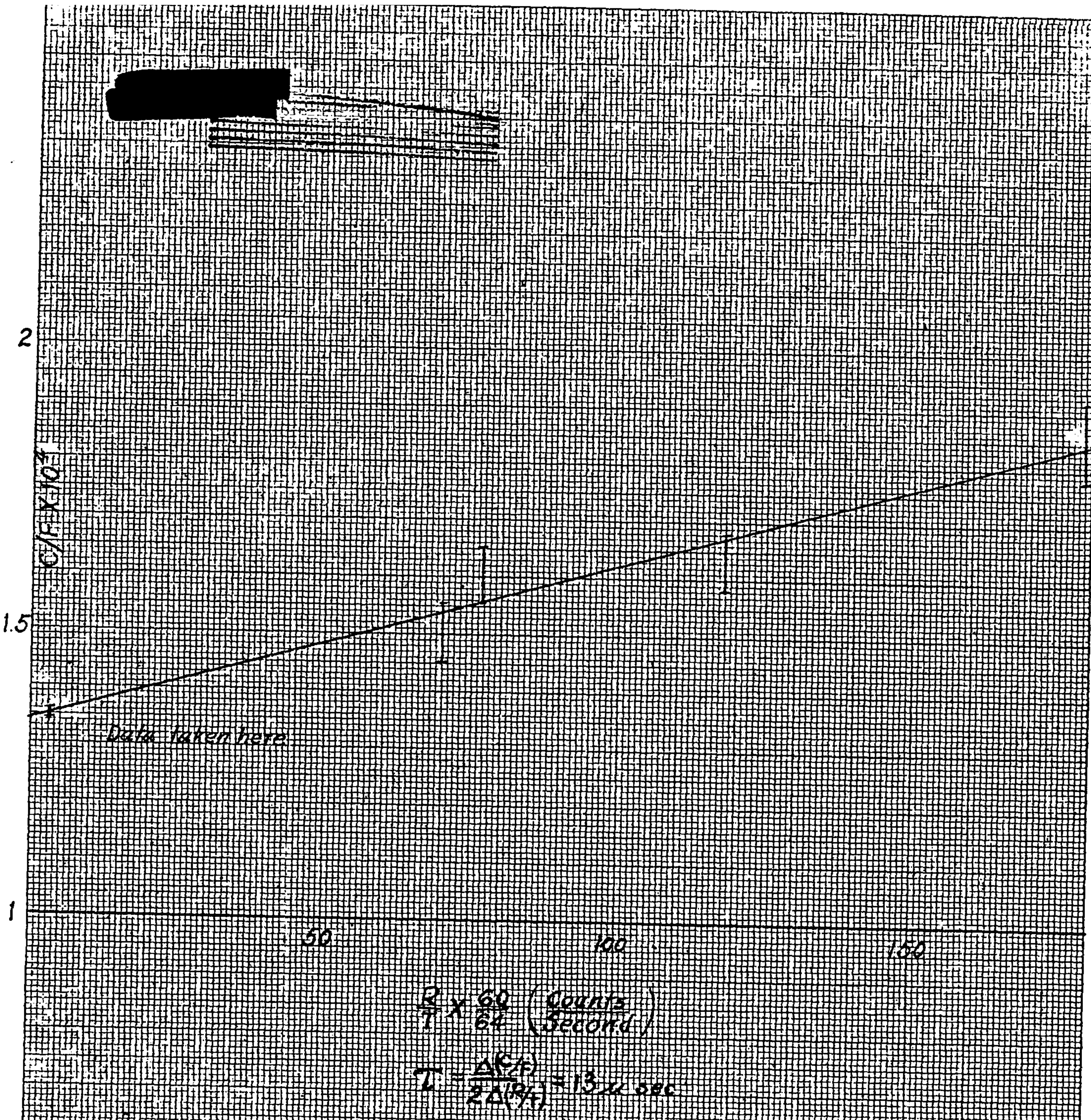

FIGURE 3

[redacted]

APPROVED FOR PUBLIC RELEASE