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SUMMARY OF THE RESEARCH PROGRESS MEETING

Margaret Foss Folden

April 1, 1948

Berkeley, California

Standard Distribution	Copy No.
Argonne National Laboratory	1-10
Atomic Energy Commission, Washington	11-13
Brookhaven National Laboratories	14-21
Carbide & Carbon Chemicals Corp. (K-25 Area)	22-23
Carbide & Carbon Chemicals Corp. (Y-12 Area)	24-25
Oak Ridge National Laboratories	26-33
General Electric Company	34-37
Hanford Engineer Works	38-39
Iowa State College	40
Los Alamos	41-43
Office of New York Directed Operations	44
Monsanto Chemical Company	45
National Bureau of Standards	46-47
Patent Advisor	48
Library Branch, Oak Ridge, (for NEPA)	49
Library Branch, Oak Ridge	50-64
University of Rochester	65
Office of Chicago Directed Operations	66
University of California, Radiation Laboratory	
Information Division	67-69
Patent Department	70
Chemistry Department	71-72

UCRL-79
Physics-General

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Meson Fission Counter. H. York

Experiments have been in progress to detect meson fissions in lead plates bombarded in the 184-inch cyclotron. The apparatus used is shown in Figure 1.

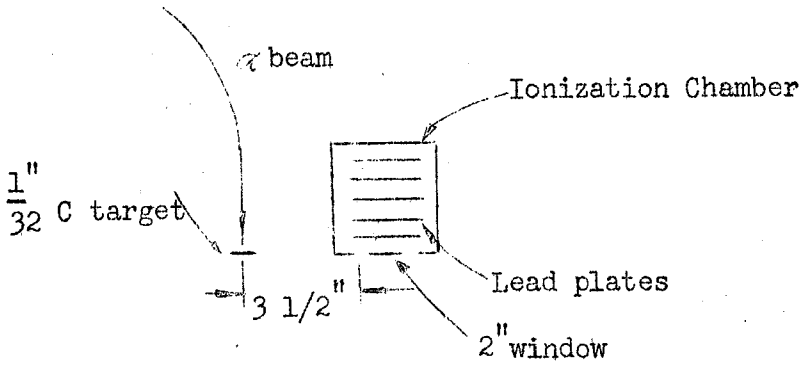

Figure 1.

The ionization chamber contained 5 lead plates of 20 mg/cm^2 thickness set 1 cm apart. Mesons of $\sim$ 1 Mev energy stop at the first plate and mesons up to 2.75 Mev will stop at last plate.

The target was placed at $\sim$ 81" radius in a beam intensity of .075 R. With the window open, 86 counts were obtained at a rate of 15.7 $\pm$ 1 per 5 min. interval; with the window closed, 23 counts at $\sim$ 6.2 $\pm$ 1 per 5 min. interval. This gives a difference of about two meson producing events per minute.

An oscilloscope was synchronized with the beam; this showed an rf pick-up with the high voltage on and the tube off. With the chamber counting, the beam and the high voltage on, pulses between 60 and 100 Mev were obtained. A check was made to establish the fact that pulses were not caused by sparking pick-up.

Similar experiments are planned with bismuth and possibly with thorium.

Delayed Neutron Periods. B. J. Moyer

A program has been formulated to survey the elements for delayed neutron emission. An element is bombarded and run to the counter as shown in the sketch of the apparatus in Figure 2.

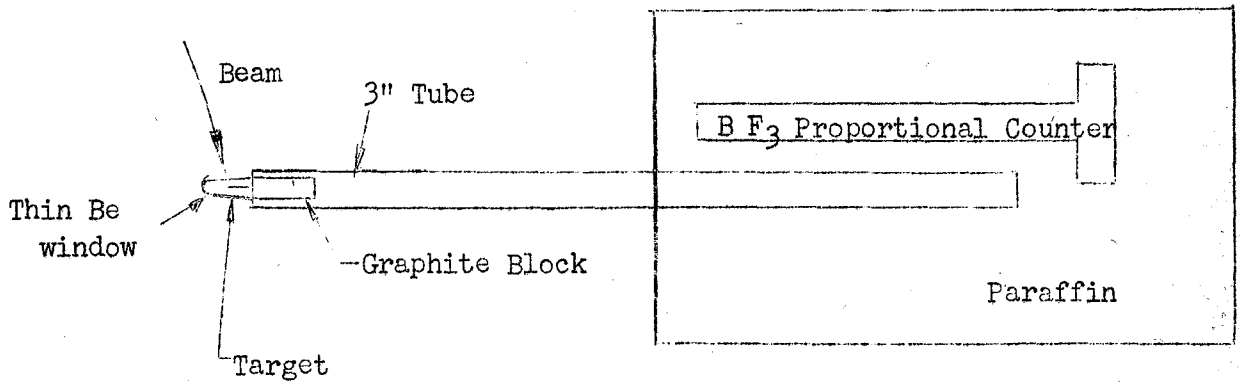

Figure 2.

Counting the intense γ radiation must be guarded against. The counter tubes show good flat plateaus over a range of 100 to 200 volts.

A 4.14 ± .04 seconds period was determined for N^{17} on 10 measurements. For Ce, on 11 runs, a 53 ± 2 second period was obtained. When Ce was run

out to background a longer period of about 57 seconds, was obtained. With Ce metal targets and Ce O_2, on 9 runs, two shorter periods, of 16.4 ± .8 seconds and ~ 4 seconds were obtained.

With heavier elements, an array of periods is obtained, corresponding to

58 ± 4 sec.

15 - 20 sec.

shorter, very weak.

Neighboring elements to Ce on the periodic table which have been bombarded show these properties:

La	Ce	Pr	Nd	Sm	Gd
same long life as Ce		no long life	faint trace of long life		trace

It is clear that a good deal more activity is needed for accurate counter measurements. A new counter arrangement is therefore being designed.

Products of Bombardment of Copper with High Energy Deuterons and Helium Ions. D. Miller

Preliminary observations have been made with natural copper ($_{29}Cu^{63,65}$) bombarded with 190 Mev deuterons and 380 Mev helium ions produced by the 184-inch frequency-modulated cyclotron. Following a 10 to 40 minute bombardment with a beam of about 0.5 microamperes for the deuterons or of unknown intensity of the helium ions, the copper target was dissolved in acid, inactive carrier elements added, and chemical

separations performed until pure elemental fractions were isolated. Aliquots of these fractions were evaporated on platinum foil discs and the rate of decay carefully followed with a thin window Geiger Müller counter. Identification of radioactive product isotopes was made by these half-life determinations supplemented by other methods. The results of the deuteron bombardments are summarized in Figure 3.

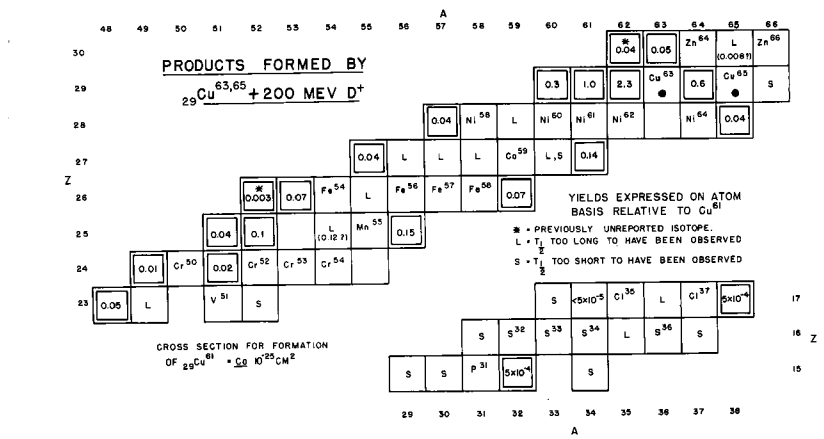

Figure 3.

Two previously unreported isotopes were found. Freshly precipitated zinc fractions showed a growth corresponding to ca. 11 minutes half-life, followed by a 9.5-hour decay. Removal of copper from the zinc fractions yielded in the copper fractions a pure 11-minute activity which was identified as Cu^{62}; the 9.5-hour activity was therefore assigned to Zn^{62}. A 7.8-hour activity was noted in the iron fractions and was shown by iron-manganese separations to give growth to a 21-minute manganese daughter

activity. An aluminum absorption curve of the parent-daughter equilibrium mixture showed, in addition to a component of ca. 2.3 Mev attributable to the 21 minute Mn^{52}, a component of ca. 0.55 Mev maximum energy presumably due to the 7.8-hour parent, assigned to Fe^{52}.

In the most extensively investigated region, from chromium through zinc, practically all known radioisotopes which could have been observed in view of half-life and experimental time considerations were identified. Intermittent deuteron bombardment of one target over a period of several months, in which the total bombardment was about 20 times that of the usual shorter bombardment, resulted in observation of long-lived activities ($\geq$ 70 d.), which have not been positively identified, in the zinc, cobalt, manganese, and titanium fractions. It is noteworthy that little or no positron activity was found in the chlorine fraction; the yield of Cl^{34} (33 m beta plus) is $\leq$ 0.00005.

One bombardment with approximately 380 Mev helium ions (contaminated with about 20% deuterons) was conducted. The yields of the radioisotopes in the fractions investigated (copper, iron, manganese, chromium, and chlorine) were in all cases except one within the range of the yields obtained from the several deuteron bombardments (within a factor of about 2). The exception was Cl^{38}, which was produced with a yield six times as great as that from deuteron bombardments.

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