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PROGRESS REPORT NUMBER EIGHT OF THE RESEARCH DIVISION OF THE LOS ALAMOS PROJECT

April 1, 1945

[redacted]

GROUP R-1 MONTHLY REPORT, R. R. Wilson, Group Leader - April 1, 1945

JOB AND PERSONNEL	PROGRESS
3. F.M. Anderson, Lavatelli, Snyder, Woodward	An external beam of 3 μa was focused on to a target in a 1" O.D. tube 5 meters from the cyclotron. This beam has been modulated such that a neutron pulse was produced which was .5 μsec at half width. Preliminary tests using a BeO tamper indicate that the detecting equipment is satisfactory to measure reaction time of the order of .2 μsecs. A critical assembly of 25 in a WC tamper will be available in building X from April 20-23 during which time α will be measured using the fast modulation of the cyclotron and by the Rossi method which uses the same detecting equipment.
9. Model Experiment. Anderson, Snyder, Sutton	The following runs have now been completed: A. Target Assembly. Measurements were made to determine how much active material can be placed in the target before criticality is reached. [redacted] DOE b(3) for one series (the result of which was reported last time), the counter was covered with 0.050 in. gold, for the second with 0.030 in. of gold, and for the third with no gold. For each series data were taken of decay time as a function of diameter of "active" cylinder. To find the critical point, measurements were taken of the decay time of tamped spheres of "active" material as a function of sphere diameter. The decay times measured with 0.050 in. and 0.030 in. of gold on the counter agreed with one another within experimental error; those measured with no gold differed by 6 percent or less. However, the result as to how much active material can be placed in the target in order just to be critical does not seem to depend very much on these differences. The results are 1.34, 1.37, and 1.30 crits for the 0.050, 0.030 and no gold data, respectively. Here and in the following it is a WC tamped crit that is referred

9. (Continued)

B. Gun Assembly. Measurements were made to determine how much active material could be placed in the gun barrel before it became critical. [redacted]

DOE 6(3)

These measurements indicated that 2.4 crits can be put in the barrel.

C. Predetonation. With the counter in the position it occupied in series A a curve was taken of decay time vs distance of projectile from its seated position. The area under the curve (proportional to predetonation probability) agreed well with that which had been previously calculated. [redacted]

DOE 6(3)

D. Miscellaneous.

DOE 6(3)

1. [redacted]

2. The decay time for an active cylinder at the side of the cavity was compared to the decay time for the cylinder at the center. The measurement indicated that although the difference was small the assembly was less critical with the cylinder on the side.

Various effects such as the curvature of the decay curves, the manner in which the decay period depends on counter position, etc., are not well understood. A discussion of these effects will be given in a forthcoming report.

10. Measurement of a_0 of the test gadget.

Bridge, DeWire, Sutton, Wilson

Tests which have been made on the use of electron multiplier tubes indicate that they are sensitive and fast enough to be used as detectors for the gamma rays accompanying the early stages of neutron multiplication. A modified oscilloscope tube [a scope]

10. (Continued)

to measure the rate of multiplication has been constructed and partially tested. Cables for transmitting a signal from the α scope which is located at the gadget to the recording station 800 yards away have been procured and tested. A square pulse of .08 μsec rise time can be transmitted down 800 yards of R.G.8U coaxial cable. Photographic recording of the oscillograph pulses has been tested. A check method for measuring α has been worked out and successfully instrumented.

Sub Group R-1a

Arc Source D-D Initiator.
Corney, Wilson

Further tests have been made and the results were sufficiently discouraging that further work has been abandoned. Although the source did not work, none of the tests indicated the reason for its failure.

GROUP R-2 - MONTHLY REPORT, J. H. Williams, Group Leader, April 1, 1945

JOB AND PERSONNEL	PROGRESS
10. Conversion of long tank to D-D operation. Blair, Bush, Klema, Seagondollar, Taschek, Turner	Preliminary tests with 2 Mev deuterons have bee made on the D2 gas target of about 100 kv stopping power, using a 400 kv aluminum foil betwee the gas chamber and vacuum system. These tests indicate that, (1) The D-D yield at 0^{o} will be approximately the same as that from a 30 kv lithium target; (2) The background yield from the Al foil is about 25 percent of the D-D yiel Attempts are being made to secure foils of higher atomic number metals which will give a lower background; (3) Carbon is deposited on the foil from decomposition of oil vapor at an intolerable rate. A liquid air trap is being put on the target tube near the target to minimize this.
13. $\sigma_f(25)$ as $f(E_n)$. Bailey, Frisch, Taschek, Turner	No further work.
18. The efficiency of detection of various fast detectors. Tank operations crews	No further work.
21. The energy degradation experiment. Hanson	LA in preparation.
25. Measurements of scattering cross sections of various tamper materials in cooperation with Group R-3. Long tank crew	No further work.
33. Determination of the capture cross section of various tamper materials in the form of spheres with the Y-Be, Ra-La-Be, Ra-Be and mock fission sources and long counter detectors. Hanson, Williams	LA in preparation.

38.	ν_{49}/ν_{25} as a function of the energies of the neutrons emitted and the energy of the neutrons causing fission. Blair	No further work.
39.	Cloud chamber investigation of low energy portions of spectra. Richards	Postponed because of TR measurements.
40.	Mock fission sources of small dimensions. Richards	Measurement of spectrum of source no. 3 almost completed
41.	Inelastic scattering of 25 by the photo-plate investigation of degraded spectra. Richards	Measurements in progress on plates exposed to M.F. source no. 3 surrounded by 4-1/2" beta stage spheres.
42.	Measurement of $\overline{\nu\text{-}1\text{-}\alpha}$, $\overline{\sigma_f}$, and possibly critical mass with a metal sphere and mock fission source. Bailey, Hanson, Hush, Klema, Krohn, Seagondollar, Williams	LA in preparation.
47.	External initiator source. McKibben	No voltage was observed across accelerating gap due presumably to too rapid spreading of the ga when the wire was flashed. A straight discharg chamber is now being tried. This chamber is so designed that the bulk of ions must come from a shielded region. It is hoped that currents can be held to low enough rise so that the lead inductance will not absorb too much of the volt
48.	Electron collection in argon and argon-gas mixtures. Klema, Taschek	CaH_2 and TiH_4 + Mg give reproducible results in counters if first heated with H_2 over compound. TiH_4 + Mg can give a rapidly reversible vapor, pressure of H_2 up to 30 cm at 500° if initially kept in H_2 atmosphere; the VP is a function of time of vacuum preheating.

48. (cont'd.) In the test counter used at a total of about 35 lbs gauge pressure.
1) Pure argon multiples before saturation,
2) 66 percent H_2 + 33 percent A gives saturation with no multiplication above 1000 V,
3) $\leq$ 0.1 percent H_2 in A at 35 lbs. gives about 90 percent saturation at 200 V,
4) Increasing amounts of H_2 up to 66 percent increases saturation voltage continuously,
5) At the lowest H_2 concentrations used ($<<$ 0.1 percent) the saturation appears to be argon-like but this small amount of H_2 completely inhibits the multiplication.

49. Scattering cross section of H, C and U for neutrons of energy less than 500 Kev.

Frisch

Report in preparation. Richman is recalculating $\sigma_H(E)$ on basis of 20.8 barns epithermal cross section. Agreement good with Chicago data on σ_C and σ_U. Equipment to be used on experiment no. 300.1.

50. The energy of neutrons emitted from photo-neutron sources.

Hanson.

Report delayed because of a discrepancy in the comparison of maximum energy of MsTh-D neutrons and Li(p,n) neutrons. An additional check with MsTh-Be neutrons is planned.

51. Measurements on 49 spheres to determine multiplication and $\overline{(\nu-1-\alpha)}$ for fast neutrons from a mock fission source.

Hanson, Hush, Seagondollar, Williams.

No further work until larger sphere is available

52. Measurements on tamped 25 spheres of large diameter to determine multiplication and tamper effects in order to determine the tamped critical mass.

Bailey, Hanson, Hush, Williams

Measurements completed. density about 17.5, 76 percent 25 are:

Multiplication (Bare)	2.01 ± .02
" tamped in WC	4.35 ± .08
" tamped in U	3.32 ± .06

53. Measurements of the flux of neutrons for $\sigma_f(25)$ in the energy from 2 to 6 Mev.

Bailey, Klema, Taschek, Turner

Electron collection counter to work at 15 atm is ready for test with internal α source. Compensated ionization chamber is essentially instrumented for this purpose, and data can be taken whenever time is found and the long tank is in running order.

55. Neutron spectrum from fast fission of 49.

Richards

No further work.

100. 49 mass spectrometer.

Bartlett, Swinehart

Mass spectrometric examination of a sample of plutonium (CN1B) reirradiated in the Hanford pile was made. The ratio of the peak heights 240/239 was measured giving a value of 0.00651 ± 0.00020. A peak was found at the 241 mass position. The ratio of this peak to that at 240 was not constant with temperature showing that the particles responsible for the 241 peak are not isotopic with plutonium. The identity of the 241 ion is still uncertain.

200. Isotopic Analysis for 25.

Dudley Williams, Yuster

The following analyses were made:

Sample	Mass Percent 25	X-Site Value
BF-85	83.0 percent	82.6 percent
Omega Material	14.0	14.06*

*Previous measurements here and at X.

201. Detection of rarer components.

Dudley Williams, Yuster

A. 24 - The following S values were obtained:

Sample	S = 25/24
BF-85	157
Omega Material	141

B. 26 - Irradiated samples from X and W have been obtained and prepared for analysis. The analysis will be performed in the near future.

C. 23 - Isotopic analysis of a 20 mg sample of 23 yielded the following results for the U content:

Mass Percent of 23	Mass Percent of 28
97.2 percent	2.8 percent

The amount of the sample recovered was 87 percent of the original sample.

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GROUP [illegible] MONTHLY REPORT, J. H. Manley Group Leader - April 1, [illegible]

JOB AND PERSONNEL	PROGRESS
25. Scattering of [illegible] materials Barschall and shift	See [illegible]
39. Source measurement Walker, Davis	[illegible] [illegible] percent [illegible] /45 [illegible] mg [illegible] [illegible] x 10⁶ n/[illegible] percent [illegible] 2/27/45
52. Multiplication of [illegible] Walker, [illegible]	With [illegible] detector [illegible] [illegible] Measured [illegible] center - detector center distance = [illegible] inches
58. Boron scattering Barschall and shift	See [illegible]
88. 25 Gadget distribution Bright, E. Graves	[illegible]
91. 25 multiplication [illegible] detector Coon, Nobles, [illegible]	[illegible] of detecting equipment. Requires additional instrument [illegible] under [illegible]

TRINITY JOBS

1001 Piezo Blast gauge [illegible] Walker, Myer, Kupferberg, Cattat	[illegible] gauges frequencies [illegible] new amplifiers. Blast [illegible] gauge, calibration [illegible] intercalibrated with Woods [illegible] percent agreement. Gauges cannot be used as planned because of temperature coefficient [illegible] drifts with long [illegible] equipment [illegible] for this job. Possibly thermal stabilization is being investigated.

1006	Geophone Earth Measurements Houghton, Coon, Nobles	Same situation on amplifiers as Job 1001. New design has flat frequency response 1 - 40 cycles per sec, and field tests show that shock mounting is adequate to remove microphonics. 14 amplifiers under construction. Control relay not yet available. All geophone magnets now procured. 15 units should be assembled by April 23. Shake table for horizontal and vertical calibration nearly complete. Fairly complete vertical tests show velocity response independent of frequency down to 1 c.p.s.
1007	Crater dimensions and permanent earth displacement Houghton, Coon, Nobles	Stakes procured. It has been agreed that W. G. Penney will assume responsibility for this job.
1008	Chimneys	Abandoned.
1009	Firing summary E. Graves	Completed for "Z" shot.
1010	Location summary E. Graves	Completed for "Z" shot.
1011	Power requirements E. Graves	In process.
1012	Shelter space E. Graves	In process.

GROUP P-4 - MONTHLY REPORT - E. Segrè, Group Leader - April 1, 1945

JOB AND PERSONNEL

1. Spontaneous fission.

Chamberlain, Farwell, Wiegand

PROGRESS

Several shipments of Hanford material were measured. They gave the following results:

	f/gr hr	%40
2 W	$4.69 \pm 6\% \times 10^3$	0.290
3 W	$4.83 \pm 7\% \times 10^3$	0.298

The work on 25 is finished and it gives 1.3 ± 0.6 f/gr hr. This number takes into account all our work and is corrected for cosmic ray effect.

We give here a summary of all spontaneous fission data available up to now:

Substance	f	mg x hr of observation	f/gr hr
22	3	4.6×10^{-2}	67
23	0	1360	<0.74
24	0	33.7	< 30
25			1.3 ± 0.6
26			600 ± 1000
28			24.8 ± 0.9
37	1	91.2	(11)
48			1.1×10^7 ($T_{\frac{1}{2}}$ y)
49	12	347	35
40	-	-	1.62×10^6
11	17	417	41
02	90		<0.15
00	2	184	(11)

24.	Fragments and ν of spontaneous fission of 40. Segrè, Wiegand	A provisional value for ν spontaneous of 40 is 2.4 ± 0.4. The experiment is not yet finished.
25.	Measurements of heat production of 49. Jones and Stout in X-4.	Calibration showed slight inconsistencies that are being worked out.
26.	α/σ_f Ratio for reirradiated and Berkeley 49. Farwell	Slight indication that the slow neutron fissio cross section for a given alpha activity of 40 is less than the same quantity for 49. The experiments are being pursued.
27.	TR tests. Whole group.	A large part of the activity of our group has been devoted to preparations of the γ ray measurements at TR. The general plan has been frozen. The building of the equipment is under way. Chamberlain is in charge of designing the mechanical parts and shelters; Deutsch is in charge of the ionization chambers and tests concerning radiation; Wiegand is in charge of the electrical part. The plan calls for equipment able to measure γ rays over a factor 10^4 of intensity with the resolving time of 10^{-2} seconds. Several laboratory calibrations on the γ intensity emitted after fission as a function of time and on the absorption and scattering of γ by air are needed and in progress.
28.	Neutron Assays. Wiegand	Eight neutron assays, mainly for Mr. Jette, have been made this month.

Mr. W. Nobles was added to our group during this month and T/3 Wahlig has been temporarily transferred to R-3.