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REPORT ON TRIP

TO UNIVERSITY OF CALIFORNIA RESEARCH LABORATORY
LIVERMORE, CALIFORNIA - DECEMBER 3, 1958

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REPORT ON TRIP
TO UNIVERSITY OF CALIFORNIA RESEARCH LABORATORY
LIVERMORE, CALIFORNIA - DECEMBER 3, 1958

By

John E. Faulkner

Nuclear Physics Research
 Physics and Instrument Research and Development Operation
 HANFORD LABORATORIES

December 8, 1958

HANFORD ATOMIC PRODUCTS OPERATION

RICHLAND, WASHINGTON

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The Neutronics Division of the University of California Research Laboratory was visited. This division is headed by A. J. Kirschbaum. James Carothers is the Assistant Division Leader and was the contact for the trip. The portion of their work which I saw is devoted to reactivity measurements on fast metal systems and moderated systems such as might be used in rocket propulsion. Fred Kloverstrom showed me the facilities for this work.

The experimental facilities used in the reactivity determinations are located in two heavily shielded rooms or cells. A water window permits observation of experiments in progress. A third shielded cell is being built now. Current cells are about 20' x 30' x 15'. The new cell will occupy half of a cylindrical shell about 80 feet in diameter. Shielding walls will be located within the semicircular area allotted to the cell.

Reactivity measurements for rocket propulsion have been made on graphite-moderated and beryllium oxide-moderated systems fueled with 94 percent U^{235} . Critical assemblies are built. They are about four-foot cubes for graphite and three-foot cubes for BeO. The graphite cubes were built from layers of plates six inches square and 1/2 inch thick. U^{235} foils about 0.002 inch thick were placed as icing between the layers. This stacking arrangement was not wholly satisfactory because the stack was squishy. C/ U^{235} ratios of 300 to 9550 were used in this work. Only about 0.1 percent of the neutrons are thermalized for low C/ U^{235} ratios.

Pulsed neutron techniques were applied to the graphite moderated systems. The exponential decay rate of the prompt neutron population was measured as a function of the buckling (stack size). The results need interpretation by a theoretician. Dr. Kirschbaum regards these experiments as being potentially more useful than conventional reactivity measurements (such as subcritical multiplication work), because significant data is obtained when the system is far from critical. He does not see how to apply this technique to reflected systems.

BeO- U^{235} systems are being measured now with BeO/ U^{235} ratios ranging upward from 250. To remove the problem of squishiness in the stack, the stack is divided by a horizontal plane through its center. The upper half is supported on a 0.020-inch stainless steel diaphragm. The lower half is mounted on a vertical ram for assembly. Additions are made to the lower half. Both the graphite and the BeO stacks are in one of the cells.

The fast metal systems are studied in the second cell using subcritical multiplication techniques to get the needed data. Pulsed neutrons are used also, but no real reliance is placed on this work as yet. Work has been done on

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solid U^{235} spheres, solid and hollow U^{235} spheres tamped inside and out with beryllium, and solid and hollow spheres tamped with CH_2 . The latter work was inconclusive because the thickness of CH_2 available was inadequate. A water tank is being built now. When it is finished the work will be resumed using water tamping. H. R. Ralston is in charge of this work. Harvey L. Vredeveld showed me the data they now have.

The pulsed neutron source used at Livermore produces 10^7 neutrons in 2 μ sec bursts. It is a clever device using plasma techniques to produce the neutrons. A description of the source is given in UCRL-8480, "A Simple Pulsed Neutron Source Based on Crossed-Field Trapping" by Lawrence Ruby.

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