SUMMARY OF THE ACTIVITIES OF THE EXPERIMENTAL SECTION OF THE NUCLEAR PHYSICS DIVISION IN THE PAST MONTH

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Argonne Pile

Work has been completed on the test of a composite shield of iron and paraffin. The results of this investigation have formed the basis for the design of the shield to be used in the "W" pile.

Measurements have been performed in order to determine the absorption cross section of oxygen and deuterium. Oxygen was introduced into the pile in the form of CO_2, and deuterium in the form of D_2O. Both experiments indicate a considerably smaller cross section for oxygen than had been so far assumed. An attempt to check on the cross section of oxygen by using beryllium oxide has not given constructive results so far due to some impurity introduced into the oxide.

The cross section of O^{18} has been newly measured by determining the activity of O^{19} formed by neutron capture. The result is in substantial agreement with the one obtained in the West Stands.

A test has been made for determining the relative effectiveness of control rods of different cross section: cylinder, cross, and plate.

Some investigation has been conducted on the radioactive gases that emanate from the pile. Most of the activity is due to gas emanating from pressed oxide lumps. Appreciable activity is also directly induced in air, primarily due to the activation of the atmospheric argon.

The usual program of testing of metal lumps has been regularly carried out during the month. The possibility of the use of the pile for testing of graphite has also been investigated with the result that it appears easily possible to determine absorption cross sections of graphite with a sensitivity of the order of magnitude of 1% using samples of the order of 50 or 100 kilograms.

The thermal neutron density across a lattice cell has been determined in order to obtain an experimental measurement of the disadvantage factor.

A series of measurements have been performed using the thermal neutron purification unit on top of the pile. The test has indicated that all epithermal neutrons are removed to a very great extent, so that cadmium ratios of the order of 20,000 have been observed with indium foils. The thermal neutrons escaping from the column have been used to produce a beam for the measurement of cross sections. Certain irregularities in the results obtained in this investigation have led to the observation that neutrons of energy apparently much lower than thermal neutrons can be filtered out of such a beam using a graphite scatterer. These very slow neutrons have in most cases cross sections very substantially different from the cross sections for normal thermal neutrons; in particular the cross section in graphite drops down from the normal value of 4.8×10^{-24} to $.7 \times 10^{-24}$, while the boron cross section