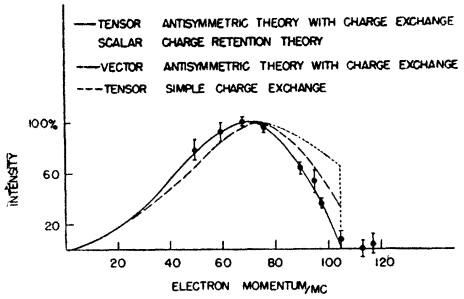

FIG. 2. Observed energy spectrum, and comparison with theory.

theory with charge exchange. However,[4] by using an appropriate linear combination (e.g., vector and pseudovector) of the various forms of coupling in the simple charge exchange theory, it is possible to obtain curves which also have their maximum at $p/mc=70$ and $IE_{max}/II_{max}<1/10$.

Efforts are being made to improve the accuracy, especially for the value of maximum energy, which in turn should give the mass value of the μ-meson.

Our results may be summarized in the following three major points:

1. $E_{max}=53\pm2$ Mev, from which we get $m_\mu=212\pm5m_e$ with the assumptions $\mu^+\rightarrow e^++2\nu$ where $m_\nu\cong0$.
2. Intensity maximum at $p=70mc\pm3$ on a momentum scale.
3. Intensity at high energy end approaches zero. That is, the intensity at this limit is indicated to be less than 1/10 of that at $p=70mc$—namely, $IE_{max}/II_{max}<1/10$.

The authors are grateful to Dr. W. Powell for the use of the magnet, and to Dr. W. Barkas for his continuous interest and help throughout the work. Thanks are also due to the crew members of the cyclotron. One of the authors extends his thanks to Professor Lawrence for the privilege of visiting and working at the Radiation Laboratory.

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Thermal Neutron Fission of Am^{241}

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(Received March 26, 1951)

MEASUREMENTS first performed in 1946 with microgram amounts of Am^{241} indicated a small but definite fission cross section with thermal (i.e., cadmium absorbable) neutrons. These earlier attempts to measure the cross section were inconclusive, because of the small amounts of material available and the inadequate sensitivity of the fission pulse measuring apparatus. Upon the accumulation of larger amounts of Am^{241} and improvement of the fission counting apparatus[1], it became possible in 1947 to measure the cross section more accurately. Since the Am^{241} is produced as the decay product of Pu^{241} in pile plutonium, it is associated initially with a relatively large amount of Pu^{239} and requires very stringent purification.

The purification procedure used by us consisted of the following steps: (a) separation of the bulk of the plutonium by a precipitation process, leaving americium in the supernatant liquid; (b) separation of trace amounts of plutonium by oxidation[2] with argentic oxide to the hexapositive "fluoride soluble" state and precipitation of the americium with lanthanum fluoride carrier; and (c) separation from lanthanum on a cation exchange column, using Dowex 50 and 0.25M citric acid-ammonium citrate solution[3] of pH 3.2.

Half-microgram to one-microgram samples of the purified americium were spread as thin uniform deposits on one-inch diameter platinum disks for fission measurements. These measurements were carried out in the thermal neutron column of the Argonne National Laboratory's heavy water uranium pile at Chicago. The cross sections were measured relative to that of Pu^{239}. In several instances samples were removed from the plates after the first measurements, repurified, and remeasured. No significant differences in the apparent cross section were noted following repurification. The mean value of the cross section, as computed from several measurements, was 3.0 ± 0.2 barns, consistent within the experimental error of the measurements themselves.

We wish to express our appreciation to Dr. W. H. Zinn, who made available to us the facilities of the Argonne heavy water pile, and to Dr. W. M. Manning for permission to utilize the facilities of the Chemistry Division laboratories of the Argonne National Laboratory.

We are particularly grateful to Professor G. T. Seaborg for suggesting the problem and for his interest and advice in connection with the measurements.

* This work was done under the auspices of the AEC.
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The Uranium Isotope U^{236}

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FOLLOWING the early observation[1] that U^{235} captures slow neutrons to an appreciable extent in competition with the fission reaction, an attempt was made to detect the expected alpha-particles from the resultant U^{236}, and the negative result led to the placement of a lower limit of 3×10^5 years for this half-life.[2] A little later the isotope U^{236} was detected with the mass spectrograph[3] in a sample of enriched U^{235} which had been irradiated with slow neutrons in the uranium chain reacting pile.

In the summer of 1945 a sample of enriched U^{235} which had been strongly irradiated with slow neutrons became available for measurements of the alpha-radiation. Measurements with the alpha-pulse analyzer apparatus[4] on the chemically purified uranium indicated alpha-particle activity of energy about 4.5 Mev (i.e., slightly greater than that of the main group of U^{235} alpha-particles) with intensity about half as great as that of the U^{235}. This corresponded to an alpha-half-life for U^{236} of about 2×10^7 years. Measurements, a little later, on another sample similarly prepared, containing a different concentration of U^{236}, led to the same result.

This alpha-particle energy corresponds very well with that expected for U^{236} from the systematics of alpha-radioactivity.[5] The half-life is just that expected for a nucleus of atomic number 92 of the even-even type, in which case the decay is not hindered. The isotope U^{236} is, of course, expected to be beta-stable.

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