measured by phase changes of the photographed traces as the photomultiplier is moved. Although the analysis of data is not yet complete, certain results have already emerged which seem worth reporting now.

From analysis of data taken with 13.5 ma passing through neon, the following results have been found:

(a) At 2-mm pressure there is some evidence for fast negative striations near the head of the positive column. These only appear at intensity minima, as in argon.[5] At 4.8-mm pressure no negative striations have been found.

(b) Positive striations with speeds from 25 to 500 m/sec were found consistently in the positive column. Variations in velocity occur near anode, probes, and the head of the column.

(c) An increase in brightness occurs near the anode side of a probe. Whatever its origin, it introduces a new uncertainty in assessing probe measurements.

(d) Probe measurements in the positive column indicate Maxwellian electron energy distributions. Temperatures vary between 28 000°K and 50 000°K at 2 mm pressure, and 21 000°K and 40 000°K at 4.8 mm. Electron concentrations vary between 7×10^8 and 3×10^9/cc (2 mm) and 1.9×10^9 and 4.3×10^9 cc (4.8 mm).

(e) Field intensity at a typical point in the column varies between -12 and 4.5 v/cm at 2.0 mm, and -7 and 14 v/cm at 4.8 mm.

(f) Nowhere in the column does the light intensity fall to zero. This confirms previous results for argon.[6,7]

(g) Oscillations can be detected with probes several cm inside the Faraday dark space, measuring relative to either anode or cathode.

(h) The phase of voltage at which striations leave the anode depends on anode-cathode distance, in disagreement with Donahue and Dieke's results for argon.[4]

(i) Oscillation frequency depends on anode-cathode distance, with a roughly sinusoidal variation.[1] However, cathode movement caused greater change than anode movement, suggesting that tube geometry is significant. Typical variations are 1260 to 1560 cps (2.0 mm), and 1125 to 1350 cps (4.8 mm).

(j) Amplitude of voltage oscillations across the tube varies in a more complex periodic manner with anode-cathode distance. Amplitudes of 5 to 20 v occur.

The over-all picture remains one of great complication, and our experiments indicate that the oscillatory properties are determined by conditions near both anode and cathode.

We wish to thank Professor K. G. Emeleus for his interest in the work.

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Properties of Fermium-253

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(Received December 21, 1956)

THE isotope fermium-253 was identified and measured among the products of the reaction of californium-252 with 40-Mev alpha particles. A target of 2.5×10^{12} atoms of Cf^{252} was prepared by electroplating the californium on a 0.002-inch gold disk. The californium was produced from Pu^{239} by successive neutron captures and beta decays.[1] It contained also Cf^{249}, Cf^{250}, and Cf^{251}. The target was irradiated with an effective beam of 1 microampere of alpha particles for 11 hours at the 60-inch cyclotron of the Crocker Laboratory. The products of the reaction were collected on a thin gold catcher foil by a recoil technique previously described.[2] The fermium fraction was separated by using precipitation and ion-exchange techniques,[3] and was electroplated on a 0.001-inch platinum disk. The alpha energy spectrum was measured in an ionization-grid-chamber with a 48-channel alpha pulse-height analyzer. Figure 1 represents a characteristic pulse analysis four days after the end of the bombardment. The main fermium activity in the first days of measurement was due to 30-hr Fm^{252} of 7.04 ± 0.02 Mev alphas, being produced by the $Cf^{252}(\alpha,4n)$ reaction. The decay of the 6.94 ± 0.04 Mev peak of Fm^{253} was followed by a corresponding growth of a 6.64 ± 0.03 Mev peak of E^{253}. The alpha-particle energy emitted by the Fm^{253} was found in the range of 6.90–6.98 Mev. An earlier experiment carried out in this laboratory gave the same results. The growth of E^{253} was found to result from the decay of Fm^{253} with a 4.5 ± 1.0 day half-life. Thus, the Fm^{253} is the longest lived fermium isotope known; only the undiscovered Fm^{257} is expected to have a longer half-life. The activity of Fm^{253} produced at the end of the bombardment was 0.77 disintegration per minute.

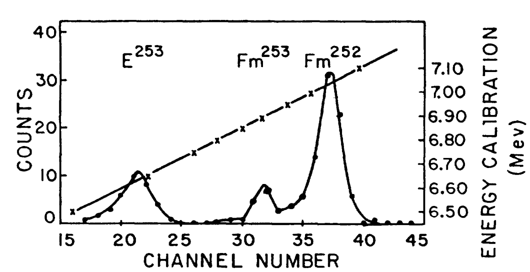

FIG. 1. Alpha spectrum of fermium fraction after 4 days.

The branching ratio of the two modes of decay of Fm^{253}, i.e., E.C./α, was found to be about 8.5—which gives ~89.5% decay by electron capture and ~10.5% by alpha emission. It was not possible to measure the cross section for the $Cf^{252}(\alpha,3n)Fm^{253}$ reaction because Fm^{253} could also be produced from other californium isotopes in the target.

A previous publication[4] on a possible identification of the Fm^{253} gave the values of 6.85±0.04 Mev for the alpha-particle energy, and a half-life >10 days.

It is a pleasure to thank the crew of the 60-inch cyclotron for their extremely careful and skillful operation of the machine during the bombardment. We wish to thank Professor Glenn T. Seaborg for his continued interest.

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Experimental Test of Parity Conservation in Beta Decay*

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(Received January 15, 1957)

In a recent paper[1] on the question of parity in weak interactions, Lee and Yang critically surveyed the experimental information concerning this question and reached the conclusion that there is no existing evidence either to support or to refute parity conservation in weak interactions. They proposed a number of experiments on beta decays and hyperon and meson decays which would provide the necessary evidence for parity conservation or nonconservation. In beta decay, one could measure the angular distribution of the electrons coming from beta decays of polarized nuclei. If an asymmetry in the distribution between θ and $180°-\theta$ (where θ is the angle between the orientation of the parent nuclei and the momentum of the electrons) is observed, it provides unequivocal proof that parity is not conserved in beta decay. This asymmetry effect has been observed in the case of oriented Co^{60}.

It has been known for some time that Co^{60} nuclei can be polarized by the Rose-Gorter method in cerium magnesium (cobalt) nitrate, and the degree of polarization detected by measuring the anisotropy of the succeeding gamma rays.[2] To apply this technique to the present problem, two major difficulties had to be overcome. The beta-particle counter should be placed *inside* the demagnetization cryostat, and the radioactive nuclei must be located in a *thin surface* layer and polarized. The schematic diagram of the cryostat is shown in Fig. 1.

To detect beta particles, a thin anthracene crystal $\frac{3}{8}$ in. in diameter$\times\frac{1}{16}$ in. thick is located inside the vacuum chamber about 2 cm above the Co^{60} source. The scintillations are transmitted through a glass window and a Lucite light pipe 4 feet long to a photomultiplier (6292) which is located at the top of the cryostat. The Lucite head is machined to a logarithmic spiral shape for maximum light collection. Under this condition, the Cs^{137} conversion line (624 kev) still retains a resolution of 17%. The stability of the beta counter was carefully checked for any magnetic or temperature effects and none were found. To measure the amount of polarization of Co^{60}, two additional NaI gamma scintillation counters were installed, one in the equatorial plane and one near the polar position. The observed gamma-ray anisotropy was used as a measure of polarization, and, effectively, temperature. The bulk susceptibility was also monitored but this is of secondary significance due to surface heating effects, and the gamma-ray anisotropy alone provides a reliable measure of nuclear polarization. Specimens were made by taking good single crystals of cerium magnesium nitrate and growing on the upper surface only an additional crystalline layer containing Co^{60}. One might point out here that since the allowed beta decay of Co^{60} involves a change of spin of

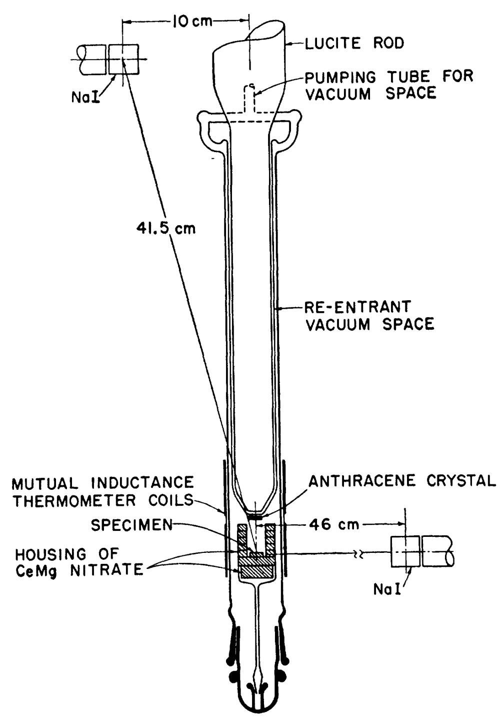

Fig. 1. Schematic drawing of the lower part of the cryostat.