Thallium-203.—Extensive measurements of the internal conversion coefficients of the 279-kev transition in Tl^{203} have recently been made by several groups of workers.[3,4] Starting with experimental values for α^K, α^{L_I}, and $\alpha^{L_{II}}$ and with the assumption $G_K=G_{L_I}=G_{L_{II}}$ they found $E2/M1=1.38\pm0.25$ and $G_K=0.53\pm0.08$. Since this reduction factor depends rather decisively on the value of $E2/M1$, we felt that a measurement of $E2/M1$ independent of internal conversion coefficients would be desirable. The measured angular distribution of the 279-kev γ rays following Coulomb excitation could be fitted equally well by $(E2/M1)^{\frac{1}{2}}=1$ to 2. However, a polarization-direction measurement is very sensitive to this range of $(E2/M1)^{\frac{1}{2}}$ for a transition of the type $3/2(E2+M1)^{\frac{1}{2}}$ and the value observed for $E2/M1$ is listed in Table I.

Rhenium-187, -185.—These transitions are of limited value as evidence for a reduction in $\beta_1{}^K$ because of the uncertainty in $E2/M1$. The determination of the $E2/M1$ value from the angular distribution is unfavorable for these transitions because the transition of the type $7/2(E2+M1)5/2$ is nearly isotropic for a wide range of $E2/M1$. The angular distributions have been measured and they are found to be isotropic. A K/L measurement has been made for the transition in Re^{187}, [12] and the $E2/M1$ value of 1/9 is based on this measurement.

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Beta Decay of a C^9 Nucleus*

M. S. Swami, J. Schneps, and W. F. Fry

Department of Physics, University of Wisconsin, Madison, Wisconsin

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In a systematic survey of photographic emulsions, exposed to 3-Bev protons, for excited nuclear fragments, a connected double star was found which is interpreted to be the disintegration of a C^9 nucleus. It was thought worthwhile to describe the event in detail since there has been no evidence for a long-lived C^9 nucleus.

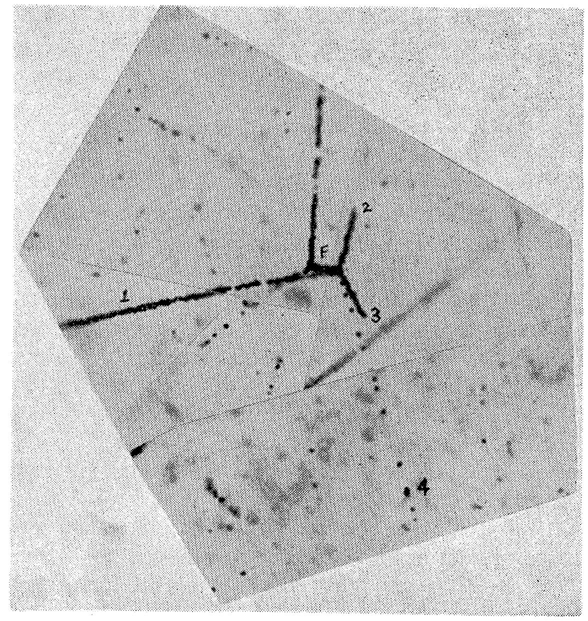

Fig. 1. A photograph of an event interpreted as the beta decay of C^9. The C^9 nucleus (track *F*) was produced in star (*A*) and disintegrated into a proton, two alpha particles, and a positron (tracks 1, 2, 3, and 4, respectively).

A photograph of the connected stars is shown in Fig. 1. The primary star (*A*), which was probably produced by a neutron, has three outgoing tracks. Track *F* is saturated, 6.2 microns long and was caused by a slow multiply-charged particle. The absence of δ rays and the presence of some visible scattering along *F* suggest that the particle came to rest before it gave rise to the secondary star (*B*). The secondary star which appears at the end of track *F* consists of four charged particles. The main characteristics of the secondary star and the fragment are given in Table I. Measurements of multiple Coulomb scattering and grain density along track 4 indicate that it was caused by a 3.1-Mev electron. Tracks 1, 2, and 3 are coplanar to within one degree. The coplanarity strongly suggests that the fragment that caused track *F* came to rest before it decayed and that no neutrons were involved in the decay. Since track 1 was produced by a singly-charged particle, the coplanarity and the momentum balance uniquely determine that the particles which produced

Table I. Characteristics of C^9 decay.

Track	Range in microns	Identification	Energy in Mev	Angles
F	6.2	C^9	9.4	65°
1	341.0	P	7.6	115°
2	9.9	He^4	2.7	
3	7.8	He^4	2.1	136.5°
4	...		3.1	11°

tracks 1, 2, and 3 were a proton and two alpha particles, respectively. With this assignment, the momentum unbalance for tracks 1, 2, and 3 is 15 ± 10 Mev/c. Depending on the sign of the charge of the beta particle, the fragment (track F) was either Be^9 or C^9. Since Be^9 is stable, the fragment was probably a C^9 nucleus and the beta particle was positive. The possible decay schemes are

$$C^9 \rightarrow Be^{8*} + p + \nu + \beta + Q_1, \quad (1)$$

$$Be^{8*} \rightarrow He^4 + He^4 + Q_2, \quad (2)$$

or

$$C^9 \rightarrow He^4 + He^4 + P + \nu + \beta + Q_3. \quad (3)$$

The similarity in the energy of the two alpha particles suggests the formation of Be^8 in an excited state, in which case Q_2 is found to be 3.8 Mev.

For the decay scheme (3), the value of Q_3 is found to be greater than 15.4 Mev. Of course the energy of the neutrino cannot be measured. However, if Q_3 were greater than 16.4 Mev, C^9 would be unstable against decay into B^8 and a proton. Hence the maximum energy of the neutrino is 1.0 Mev. The limits on the mass of C^9 are 8408.6 and 8409.6 Mev.

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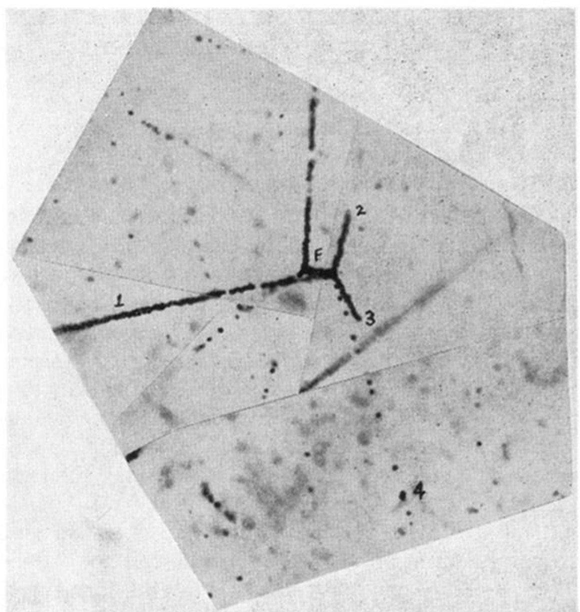

FIG. 1. A photograph of an event interpreted as the beta decay of C^9. The C^9 nucleus (track *F*) was produced in star (*A*) and disintegrated into a proton, two alpha particles, and a positron (tracks 1, 2, 3, and 4, respectively).