The Beta-Rays from Radium E

Jauncey[1] has described experiments which suggest that radium E may emit heavy electrons. We have repeated his experiment and obtained similar results and have also tried the experiment with screens between the plates designed to eliminate electrons scattered from the plates which A. H. Compton[2] has suggested may explain Jauncey's results. The screens appeared to stop the line observed by Jauncey so confirming Compton's suggestion.

Our apparatus is similar to that of Jauncey, with the plates 6 cm long and separated by 1.0 mm, and with 5.1 cm between the ends of the condenser plates and the photographic plate. The source was Ra E deposited on a small nickel wire from a solution containing Ra D and its products.

The calculated positions of the lines are shown below the plates.

Plate 1, Fig. 1, shows the line supposedly due to heavy electrons. As well as can be determined the deflection is about 1 mm more than predicted from the theory.

We next, at the suggestion of Dr. H. A. Wilson, placed thin strips of ebonite between the condenser plates as shown in cross section in Fig. 2.

Plates 2, 3, and 4 were obtained with the modified apparatus.

Plate 2 shows by the width of the alpha-particle line that the strips have effectively reduced the width between the condenser plates, and also shows that many ordinary electrons are being recorded with an $H\rho$ of approximately 1750, which is near the maximum of intensity according to O'Conor's table.[3]

We next tried twice to record heavy electrons whose momentum was that of the maximum on the distribution curve, but both times were unsuccessful. The calculated deflection was about 1 cm. The heavy line was eliminated (or at least its intensity was decreased many fold). Plate 3 is one of these attempts. (This plate was also examined with a microphotometer which easily recorded the scratches on the film, but which failed to show any definite indication of the expected line.)

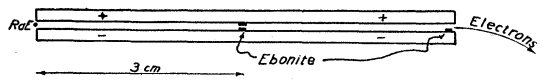

FIG. 2. *A*, Slit between ebonite strips 0.035 cm wide. *B*, Slit between ebonite strip and brass plate 0.065 cm wide. *C*, Ra E source.

Plate 4 shows an attempt to record both the ordinary and the heavy electrons. The fields were selected so that nearly equal numbers of the two should have been present, but there is no indication of a heavy line although the ordinary line is present (but weak).

The apparatus is shown to be recording electrons with $H\rho$ of 1750, but never, after the strips were introduced, were we able to record heavy electrons with this (or any other) value of $H\rho$. The conclusion is that the heavy line is really due to scattering from the condenser plates, and that the strips eliminated this.

We are grateful to Dr. H. A. Wilson, who suggested the experiment, and who directed the work. We wish also to thank Dr. T. W. Bonner for the loan of the Ra D solution.

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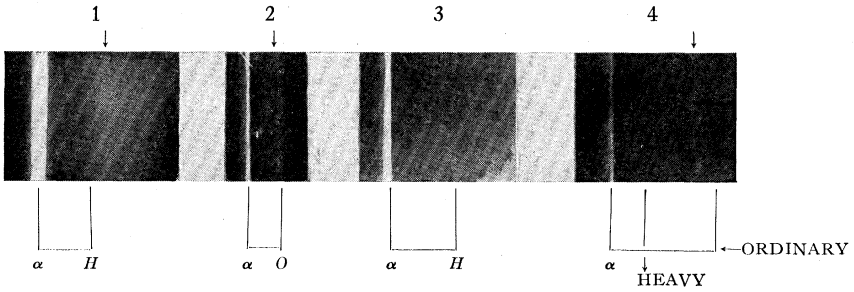
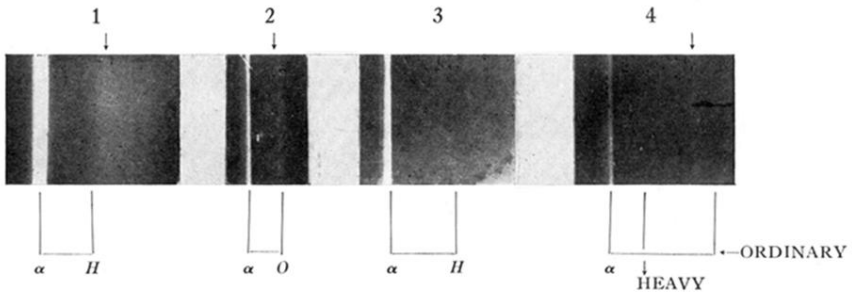
June 5, 1938.

[1] G. E. M. Jauncey, Phys. Rev. **53**, 197 (1938).
[2] A. H. Compton, Phys. Rev. **53**, 431 (1938).
[3] John S. O'Conor, Phys. Rev. **52**, 303 (1937).



IG. 1. Photographs taken with β-ray spectrograph. Plate 1 was taken without the ebonite strips. Plates 2, 3, and 4 were taken with these strips introduced. The following table gives the essential data for each plate. Subscripts o and h refer to ordinary and heavy electrons, respectively. s is the calculated displacement from the α-particle line.

Plate	X v/cm	H gauss	β	p	$(H\rho)_o$	$(H\rho)_h$	ρ_o cm	ρ_h cm	s_o cm	s_h cm
1	13700	115	0.40	2.80	730	2050	6.36	17.8	2.5	0.7
2	15000	70	0.71	2.14	1730	3700	24.8	53	0.5	0.2
3	12500	122	0.34	2.90	615	1780	5.1	14.6	5.1	0.9
4	15000	98	0.51	2.63	1000	2630	10.2	26.8	1.4	0.5



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