LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the eighteenth of the preceding month, for the second issue, the third of the month. Because of the late closing dates for the section no proof can be shown to authors. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

Communications should not in general exceed 600 words in length.

A New Precision Determination of e/m for Electrons

In a recent* issue of this journal, I presented a preliminary account of a study which had been made to develop a new focusing criteria for electrons in superimposed electric and magnetic fields, in connection with a precision determination of e/m. Since this account was published, it has been possible experimentally to demonstrate the validity and great precision of both the magnetic and the electrostatic focusing methods. In this way means are provided for the elimination of the uncertainties due to contact potential difference in the accelerating field. It is, in fact, interesting to note, that in the measurement of e/m for electrons by this method, the ultimate precision attainable appears to be limited only by the mechanical accuracy of the present apparatus.

The constants of the magnetic field and the geometrical constants of the apparatus have been rechecked carefully and e/m computed from the best set of observations to be

$$e/m_0 = (1.7571 \pm 0.0013) \times 10^7 \text{ e.m.u.},$$

where 0.0013 is the probable error derived from a least squares solution applied to a set of 14 observations on e/m for various electric field intensities. Other sets differed from this by less than 1 : 5000.

As already stated, the accuracy of the measurement of the geometrical dimensions of the present apparatus sets an upper limit on the ultimate accuracy, but the error due to this cause is less than the probable error. A full account of the complete determination will be published shortly.

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* Shaw, Phys. Rev. **51**, 58 (1937).

Note on the Sign of the Magnetic Moment of the K^{39} Nucleus

Observations on the hyperfine structure splitting of the $4s\ ^2S$ state of K^{39} made by Jackson and Kuhn[1] using spectroscopic methods and by Millman,[2] Fox and Rabi,[3] and Torrey[4] using the magnetic deflection methods are in good agreement so far as the magnitude of the splitting is concerned but in contradiction in regard to the sign of the nuclear magnetic moment. Jackson and Kuhn conclude from the relative intensities of the doublet into which each of the potassium resonance lines is split that the hyperfine levels are inverted and that the magnetic moment of the nucleus of K^{39} therefore is negative. Torrey finds the moment to be positive as determined by the method of nonadiabatic transitions in an atomic beam. The contradiction has been attributed by Bethe and Bacher[5] to reversal effects in Jackson and Kuhn's lines which were obtained by absorption in an atomic beam.

Recently I have observed structure in the resonance lines of potassium produced in emission. The excitation is accomplished by projecting an atomic beam of potassium into a space in which an electrodeless discharge is maintained in argon, the argon being at such a pressure that the mean free path for collisions between atoms is several centimeters. Electron impacts alone then produce the excitation of the potassium. This source gives lines having a half intensity width of less than 0.010 cm^{-1}. That the source is free from absorption and reversal effects is demonstrated by the fact that the hyperfine structure components of the resonance lines of sodium produced by it show the 5 : 3 intensity ratio with good accuracy.

The potassium resonance lines produced by this source show a doublet structure with a separation of 0.016 cm^{-1} between the two components. The weaker of the two components unquestionably lies on the side of lower frequency. This is substantially the structure observed by Jackson and Kuhn in absorption. It therefore confirms their observation of the inversion of the hyperfine multiplet and indicates a negative nuclear magnetic moment for K^{39}.

The components were not here sufficiently separated to permit an accurate quantitative comparison of their intensities. I hope that further refinements of the source may make this possible.

The resolving element used in these observations was a Fabry-Perot interferometer with an 11 centimeter invar spacer. The temperature of the interferometer was held constant within 0.02°C during exposures.

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[1] Jackson and Kuhn, Nature **137**, 107 (1936).
[2] Millman, Phys. Rev. **47**, 739 (1935).
[3] Fox and Rabi, Phys. Rev. **48**, 746 (1935).
[4] Torrey, Phys. Rev. **51**, 501 (1937).
[5] Bethe and Bacher, Rev. Mod. Phys. **8**, 82 (1936).