Carlson and Oppenheimer was used for $k=1$ and new calculations were made for $k>1$. The relative contributions of the different m_k are not arbitrary so that the fit of curve B is impressive. Of course both A and B were adjusted in absolute magnitude to give the total ionization observed. The agreement at the top of the atmosphere is probably fortuitous. The moderate discrepancy in the lower regions can be diminished by improving some of the approximations that were used.

The details of the present analysis will be published when the calculations for the other bands of the cosmic radiations have been completed.

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[1] I. S. Bowen, R. A. Millikan and H. V. Neher, Phys. Rev. **53**, 217 (1938); **52**, 80 (1937).
[2] C. D. Anderson and S. H. Neddermeyer, Phys. Rev. **50**, 263 (1936); S. H. Neddermeyer and C. D. Anderson, Phys. Rev. **51**, 884 (1937); J. C. Street and E. C. Stevenson, Phys. Rev. **52**, 1005 (1937).
[3] J. F. Carlson and J. R. Oppenheimer, Phys. Rev. **51**, 220 (1937); H. J. Bhabha and W. Heitler, Proc. Roy. Soc. **159**, 432 (1937).
[4] S. H. Neddermeyer, Phys. Rev. **53**, 102 (1938).

The Magnetic Moments of $_3Li^6$, $_3Li^7$ and $_9F^{19}$*

We have measured the nuclear moments of $_3Li^6$, $_3Li^7$ and $_9F^{19}$ with the new molecular beam method[1] in which the precession frequency ν of the nucleus in a uniform magnetic field H is measured directly. The moment μ is obtained from the relation $\nu=\mu H/ih$, where i is the spin in units of $h/2\pi$. The spins of these nuclei are known[2] from h.f.s. measurements, band spectra and from atomic beam experiments. With these values of i and our measurement of ν and H we obtain μ directly.

The nuclei were identified by observing resonance curves as in Fig. 1 of R.Z.M.K.[1] for LiCl, LiF and NaF. The common values of ν/H of LiCl and LiF are those of the Li isotopes, and the common ν/H of LiF and NaF is that of F. The values of ν/H obtained over a range of H which represents a threefold increase agree within a few parts in a thousand. The values of ν/H obtained from different molecules are equally concordant.

The values of μ in units of nuclear magnetons ($\mu_0/1838$) are given in Table I.

TABLE I.

Nucleus	Spin	Moment
$_3Li^6$	1	0.823 ± 0.005
$_3Li^7$	3/2	3.265 ± 0.016
$_9F^{19}$	1/2	2.635 ± 0.014

The ratio of the moments of the Li isotopes μ_7/μ_6 was found to be 3.89 by Manley and Millman.[2] The present experiments yield 3.97 for this value, an increase of 2 percent. For $_3Li^7$ Granath[2] found the moment to be 3.29 from the h.f.s. of Li II with the theory of Breit and Doerman;[3] Fox and Rabi found 3.20 from atomic beam experiment with the theory of Goudsmit, Fermi and Segrè[3] while Bartlett, Gibbons and Watson find 3.33 from the same data. Using the h.f.s. data of Campbell,[2] Brown and Bartlett[3] calculate values of the moment of $_9F^{19}$ ranging from 1.9 to 3.8. For a discussion of the accuracy and validity of these calculations see the conclusion of the papers by Bartlett[3] and his co-workers.

Our results for the ratio of the nuclear moments of $_3Li^7$ and $_3Li^6$ and the moment of $_3Li^7$ diverge even more widely from the calculations of Rose and Bethe[4] than did the previous results of Manley and Millman.

It is very noteworthy that the agreement between our value of the magnetic moment and the results of calculations from h.f.s. measurements is so very close in the case of $_3Li^7$.

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[1] Rabi, Zacharias, Millman and Kusch, Phys. Rev. **53**, 318 (1938).
[2] For $_3Li^6$ and $_3Li^7$, Schuler, Zeits. f. Physik **66**, 431 (1930); Harvey and Jenkins, Phys. Rev. **35**, 789 (1930); Guttinger and Pauli, Zeits. f. Physik **67**, 743 (1931); Goudsmit and Inglis, Phys. Rev. **37**, 328 (1931); Granath, Phys. Rev. **42**, 44 (1932); Fox and Rabi, Phys. Rev. **48**, 746 (1935); Manley and Millman, Phys. Rev. **51**, 19 (1936). For $_9F^{19}$, Gale and Monk, Astrophys. J. **69**, 77 (1929); J. S. Campbell, Zeits. f. Physik **84**, 393 (1933).
[3] Goudsmit, Phys. Rev. **43**, 636 (1933); Fermi and Segrè, Zeits. f. Physik **82**, 729 (1933); Breit and Doerman, Phys. Rev. **36**, 1732 (1930); Brown and Bartlett, Phys. Rev. **45**, 527 (1934); Bartlett, Gibbons and Watson, Phys. Rev. **50**, 315 (1936).
[4] Rose and Bethe, Phys. Rev. **51**, 205 (1937).

Evidence for a Band System of Antimony Nitride

In a discharge through a mixture of nitrogen and antimony vapor a new band system has been found extending from 2890A towards longer wave-lengths. The experimental arrangement differed little from the one used by Herzberg[1] and Spinks[2] for the production of the PN and AsN bands. The high melting temperature of Sb and low vapor pressures even at higher temperatures made the use of a quartz discharge tube necessary which was heated while the discharge was running. The spectrum has been photographed with a Hilger E3 and a Hilger E1 quartz spectrograph. The new system which consists of bands degraded towards the red has very likely the SbN molecule as carrier. It shows the same intensity distribution as the band spectra of PN and AsN. Some bands are overlapped by nitrogen bands, but the members of the diagonals are easily recognizable. Most of the bands could be fitted into a scheme. The vibrational quanta of the lower and upper state are about 925 cm^{-1} and 820 cm^{-1}, respectively. A detailed description will be published later together with results of experiments on BiN which are now in progress including a comparison of the nitrides of group $V(b)$ elements.

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[1] J. Curry, L. Herzberg and G. Herzberg, Zeits. f. Physik **86**, 348 (1933).
[2] J. W. T. Spinks, Zeits. f. Physik **88**, 511 (1934).