Submitted to Journal of Chemical Physics

URCL-11026 Rev.
Preprint c.2

THE RADIOFREQUENCY SPECTRA OF LiF BY THE MOLECULAR BEAM ELECTRIC RESONANCE METHOD

A. J. Hebert and C. D. Hollowell

May 10, 1976

Prepared for the U. S. Energy Research and Development Administration under Contract W-7405-ENG-48

TWO-WEEK LOAN COPY

This is a Library Circulating Copy which may be borrowed for two weeks. For a personal retention copy, call Tech. Info. Division, Ext. 5716

LAWRENCE BERKELEY LABORATORY • UNIVERSITY OF CALIFORNIA • BERKELEY
4

UCRL-11026 Rev.
c.2

DISCLAIMER

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor the Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or the Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof or the Regents of the University of California.

THE RADIOFREQUENCY SPECTRA OF LiF BY THE MOLECULAR BEAM ELECTRIC RESONANCE METHOD*

A. J. Hebert and C. D. Hollowell

Lawrence Berkeley Laboratory
University of California
Berkeley, California 94720

(Received 10 May 1976)

The molecular beam electric resonance method has been used to obtain dipole moments, μ_v, lithium quadrupole interaction constants, eqQ, spin-rotation interaction constants, c_F and c_{Li}, and spin-spin interaction constants, c_3 and c_4, for $^6Li^{19}F$ and $^7Li^{19}F$ in several of the lower vibrational levels. The observation of spectra for the three lowest vibrational states resulted in the following values.

All hyperfine constants are given in kc/sec.

$^6Li^{19}F$:

$$\mu_v = 6.2841 + 0.08627\ (v + 1/2) + 0.00054_5(v + 1/2)^2 \pm 0.001 \text{ Debye}$$

	v=0	v=1	v=2
eqQ	8.5 ± 0.8	8.6 ± 1.2	7.1 ± 2.0
c_{Li}	0.71 ± 0.08	0.71 ± 0.12	0.73 ± 0.20
c_F	36.8 ± 0.4	36.1 ± 0.5	35.7 ± 0.7
c_3	4.307 ± 0.08	4.224 ± 0.12	4.140 ± 0.20
c_4	0.00 ± 0.15	0.00 ± 0.20	0.00 ± 0.40

$^{7}Li^{19}F$:

$$\mu_v = 6.2839 + 0.08153(\ \ + 1/2) + 0.000445(v + 1/2)^2 \pm 0.001 \text{ Debye}$$

	v=0	v=1	v=2
eqQ	415.6 ± 0.4	406.1 ± 0.6	396.5 ± 0.8
c_{Li}	1.87 ± 0.04	1.84 ± 0.04	1.79 ± 0.04
c_F	32.68 ± 0.16	32.20 ± 0.22	31.84 ± 0.24
c_3	11.382 ± 0.020	11.173 ± 0.030	10.964 ± 0.030
c_4	0.00 ± 0.08	0.00 ± 0.11	0.00 ± 0.14

These results are in general agreement with those reported earlier by Wharton, Gold, and Klemperer with the exception of the spin-spin interaction constant, c_3, for which they obtain a value of 0.21 ± .04 kc/sec, while our best values for the J # 1 and 2 and V = 0,1,2 levels of $^{7}Li^{19}F$ are all 0.0 ± 0.1 kc/sec.

---

[1] L. Wharton, L. P. Gold, and W. Klemperer, Phys. Rev. 133, B 270 (1964).

This report was done with support from the United States Energy Research and Development Administration. Any conclusions or opinions expressed in this report represent solely those of the author(s) and not necessarily those of The Regents of the University of California, the Lawrence Berkeley Laboratory or the United States Energy Research and Development Administration.

TECHNICAL INFORMATION DIVISION
LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA 94720