

Lawrence Berkeley National Laboratory

LBL Publications

Title

The Radiofrequency Spectra of LiF by the Molecular Beam Electric Resonance Method

Permalink

<https://escholarship.org/uc/item/8kj028bj>

Authors

Hebert, A J
Hollowell, C D

Publication Date

2023-09-06

5

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

A. J. Hebert and C. D. Hollowell

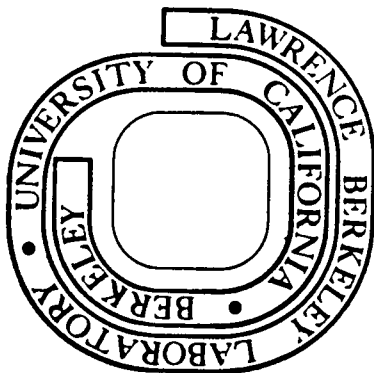
May 10, 1976

(UC 4/46 45 05)

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

For Reference

Not to be taken from this room



LEGAL NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Energy Research and Development Administration, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or 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.

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 ${}^6\text{Li}^{19}\text{F}$ and ${}^7\text{Li}^{19}\text{F}$ 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.

${}^6\text{Li}^{19}\text{F}$:

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

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

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

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

	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 $0.21 \pm .04$ kc/sec, while our best values for the J # 1 and 2 and V = 0,1,2 levels of ${}^7\text{Li}{}^{19}\text{F}$ 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