TABLE II. Parameters derived from the spectra.

	B_e	α
$Br^{79}Cl^{35}$	4570.92 ±0.04 Mc/sec.	23.22 ±0.03 Mc/sec.
$Br^{81}Cl^{35}$	4536.14 ±0.04	22.95 ±0.03
$Br^{79}Cl^{37}$	4499.84 ±0.04	21.94 ±0.03
$Br^{81}Cl^{37}$	4365.01 ±0.04	21.67 ±0.03
	$eqQ(Br^{79}) = +876.8 \pm 0.9$ Mc/sec.	
	$eqQ(Br^{81}) = +732.9 \pm 0.5$	
	$eqQ(Cl^{35}) = -103.6 \pm 0.1_5$	
	$eqQ(Cl^{37}) = -81.1_4 \pm 0.1_5$	
	$r_e = 2.138(10)^{-8}$ cm	
	$\mu = 0.57 \pm 0.02$ Debye units	

variation from one isotopic species to another suggests that these are random experimental errors.

The value of the dipole moment has not been obtained by exact computation but has been estimated on the assumption that, neglecting quadrupole effects, the dipole moment lies between that obtained from the largest and the smallest observed Stark coefficients, and that the best value is given by the average of the observed Stark coefficients.

The values of the vibrational stretching coefficient for the Cl^{37} isotopic species have been obtained from the known variation of α with the $\frac{3}{2}$ power of the reduced mass, and used to obtain the equilibrium rotational constants. These lead to two semi-independent values for the chlorine mass ratio. The ratio $m(Cl^{35})/m(Cl^{37})$ is 0.945987 ± 0.000008 for the $Br^{79}Cl^{35}$, $Br^{79}Cl^{37}$ pair, and 0.945986 ± 0.000008 for the $Br^{81}Cl^{35}$, $Br^{81}Cl^{37}$ pair. This is to be compared with the value 0.945980 ± 0.000005 obtained from[4] ICl and $0.945977_5 \pm 0.000004$ obtained in[5] ClF, and as pointed out by Townes, Merritt, and Holden[4] to be contrasted with the mass spectrographic results $0.945944_5 \pm 0.000007$.

The values for $m(Br^{79})/m(Br^{81})$, 0.975218 ± 0.000028 for the $Br^{79}Cl^{35}/Br^{81}Cl^{35}$ pair and 0.975210 ± 0.000028 for the $Br^{79}Cl^{37}$, $Br^{81}Cl^{37}$ pair are considerably lower than the mass spectrographic values[6] of 0.975316 ± 0.000005. A recalculation of this ratio in[7] BrF yields 0.975168 ± 0.000068.

The ratio of the chlorine quadrupole moment ratios $eqQ(Cl^{35})/eqQ(Cl^{37})$, 1.2768 ± 0.004 is in better agreement with the ratio obtained from measurements of the moments in atomic beams $1.279 \pm 0.0026_5$ than was found[5] for ClF, 1.2704 ± 0.004. The ratio for the bromine quadrupole coupling appears to be in excellent agreement with that obtained in other compounds. Professor B. P. Dailey, in private conversation, has pointed out that the magnitudes of the coupling coefficients for chlorines are considerably larger than expected, and that to a lesser extent the bromine coupling coefficients are also large.

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Transport Rates of the Liquid He II Film over Various Surfaces

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OUR recent letter[1] describing a new method for measuring transport rates of the He II film reported that the rate over copper was significantly higher than that over glass. Owing to the fact that the transport rate was found to be strongly dependent on surface treatment, numerical values were not given, it being felt that details might await the publication of a full report. While the letter was in press, however, Mendelssohn and White[2] reported measurements of the transport rate over nickel and platinum which demonstrated a dependence on substrate and surface treatment.

It seems worth while, therefore, to point out that we have found the effect to be quite general and that both metals and dielectrics show rates different from each other and from glass. In fact, of all of the substances which we have measured, glass shows the smallest rate at any given temperature, as is apparent from Table I below. In each experiment the rate over glass was measured for comparison purposes and to be sure that there was no significant contamination arising from gases solidified on the transfer surfaces.

TABLE I. Transport rate in cm³/cm-sec. ×10⁵.

	1.3°	1.5°	1.8°	2.0°
Pyrex glass	7.6	7.5	—	—
Lucite	14.4	16.6	11.5	—
Stainless steel	10.4	9.7	6.8	3.3
Lead	33.3	31.1	26.6	16.5
Cold-rolled steel	10.5	—	—	—
Machined copper	14.8	14.8	12.4	7.9
Polished copper	23.0	19.8	14.7	7.1
Etched copper	51.2	49.0	40.0	24.8
Etched copper, oxidized	26.0	24.8	20.4	13.7

It seemed of particular interest to determine whether or not the rate over a metal in the superconducting state was different from the normal state, the temperature being constant. The experiment was tried using lead, the normal state being achieved by the application of a sufficiently strong transverse magnetic field. While there appeared to be small systematic differences at various temperatures, further investigations (now under way) will be necessary to determine whether these are real. The same remarks apply to iron, transversely magnetized and in the nonmagnetized state.

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‡ Assisted by ONR, Research Corporation, and The Linde Air Products Company.

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Displacement of Oxygen in $BaTiO_3$

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ATTEMPTS to explain the ferroelectric character of $BaTiO_3$ in terms of ionic displacements[1–7] have usually concentrated attention on the Ti ion. Megaw[1] has pointed out that if one assumes the Goldschmidt ionic radii, the Ba ions at the corners of the unit cell are slightly too large to fit into a close-packed perovskite structure; consequently the lattice is expanded and the Ti ions, at the body centers, are free to move through small distances. In such a model each oxygen ion, at a face center, is squeezed between four Ba ions, but is free to move at right angles to the plane of Ba ions, toward the Ti ions. Devonshire[5] has estimated the forces on the Ti and O ions following Born's treatment, with the result that the Ti ion is definitely bound to its symmetrical position, but the force restoring an oxygen ion to its symmetrical position is much smaller, and of uncertain sign. It therefore appears that any theory of $BaTiO_3$ based on this model must consider displacement of the oxygen ions as being at least as effective a cause of polarization as is Ti displacement.

A model in which ionic polarization arises chiefly from the oxygen ions is capable of explaining in a very simple way the observed three phase transitions, and predicts the correct magnitude of the transverse electrostriction in the tetragonal phase. Each unit cell contains three oxygen ions, O_x, O_y, O_z, which are