The apparatus was thus sufficiently sensitive to detect a *change* in sound velocity of 1 part in 2×10^4.

We examined the effect of allowing a tin rod 15 cm long to pass several times through the superconducting transition in a longitudinal magnetic field at 3.5°K, 3°K, 2°K, and 1.3°K. No significant change in voltmeter reading could be observed.

A similar investigation was made on a lead rod 10 cm long in a longitudinal field at 4.2°K and 2°K and in a transverse field at 3°K. Although a large (but not well reproducible) change in absorption occurred while magnetic flux was penetrating or being ejected, no permanent difference could be observed between the completely normal and completely superconducting states.

It may be concluded from our measurements, therefore, that any change in the velocity of sound of 1-Mc/sec frequency during the superconducting transitions in lead and tin is less than 1 part in 20 000. We were also able to exclude any change in absorption greater than 1 part in 1000.

Although our results fit in well with the very small change (1 in 100 000) to be expected[4] in the static elastic constants, it would be wrong to conclude that no change can be expected in the velocity of waves of frequency closer to that of the main thermal vibrations (10 000 Mc/sec) of the metal. It is also known, of course, that the mean free path of these waves is very different in the two states.[5]

This work was carried out in collaboration with the Physical Institute of the University of Zürich and the new Low Temperature Institute of the Eidg. Hochschule Zürich. We are grateful to Professor Dr. H. H. Staub and Professor Dr. P. Grassmann for their encouragement and interest and for allowing us to use the facilities of their institutes.

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Microwave Spectrum of DI at 1.5-mm Wavelength

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The microwave spectrum of the $J=0\rightarrow 1$ transition of DI^{127} has been observed in the region of 195 000 Mc/sec. The frequencies of the lines and their assignments are given in the following tabulation:

F	$5/2\rightarrow 3/2$	$5/2\rightarrow 7/2$	$5/2\rightarrow 5/2$
Frequency	195 320±15	195 152±8	194 776±8

The value obtained for B_0, the molecular rotation constant, is 97 532±5 Mc/sec, in good agreement with the value 97 970 predicted from infrared data on HI.[1] The value for eqQ, the quadrupole coupling constant, is −1805±15 Mc/sec.

The observed quadrupole coupling constant gives information about the bond character of DI. The relationships for ionic character *versus* electronegativity[2,3] indicate that DI is 5 percent ionically bound. This reduces the coupling constant from the free atom value of 2400 Mc/sec[4] to 2300 Mc/sec. The difference between 2300 and the observed value of 1805 Mc/sec can be attributed to a 15 or 20 percent s hybridization of the bond.

The frequencies needed for this experiment were obtained at the eighth harmonic of a $2K33$ klystron, using the harmonic generator and detector described previously.[5] The signal at these frequencies, with a band width of 80 cycles/sec, was approximately ten times noise. A 4000-cycle/sec square-wave repeller modulation was used with a lock-in detection system.

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The Vapor Pressure and Entropy of Liquid He^3

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Recently Chen and London[1] have given an equation for the vapor pressure of liquid He^3 which differs from the equation given by Abraham, Osborne, and Weinstock[2] who had measured this vapor pressure down to about 1°K. One of the consequences of the AOW equation was the need for a transition below 1°K, while this does not follow from the CL equation. It seems to us, therefore, to be worth while to give the reasons why we think that the conclusion of AOW is essentially correct.

The entropy S_0 of liquid He^3 at the absolute zero follows from Eq. (8) of AOW,

$$S_0=(2.0085-C)R\ln 10, \tag{1}$$

where R is the gas constant and C is the constant appearing in the vapor pressure equation [AOW, Eq. (3)]; p (measured in mm Hg) is given by

$$\log_{10}p=-A/T+2.5\log_{10}T+C+f(T). \quad [f(0)=0.] \tag{2}$$

At low temperatures the term $f(T)$ is unimportant, and it is thus tempting to plot $\log_{10}(p/T^{5/2})$ against $1/T$ and see whether a straight line ensues. This has been done in Fig. 1. We see that, indeed, the experimental points, which have been taken from Table II of AOW, do fall very nearly on a straight line. Concentrating on the data pertaining to $T\leq 2.3$°K we get line II, while a straight line through the higher temperature points gives line I. The equations of I and II are, respectively,

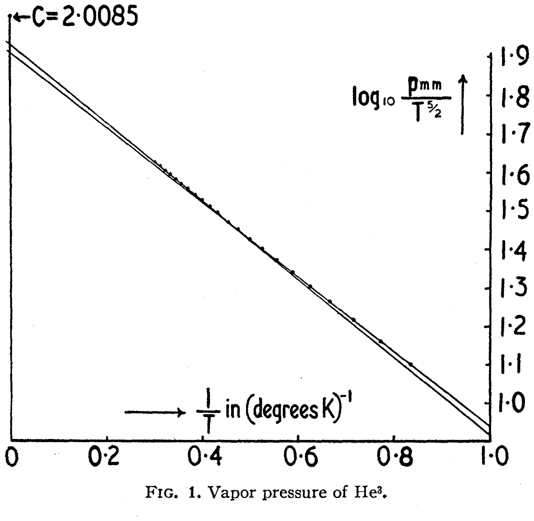

FIG. 1. Vapor pressure of He^3.

$$\text{I:}\quad \log_{10}p=-1.02/T+2.5\log_{10}T+1.934, \tag{3}$$

$$\text{II:}\quad \log_{10}p=-0.97/T+2.5\log_{10}T+1.913, \tag{4}$$