function of pressure along five
rresponds to the saturated vapor

0.58±0.02 at 4.2° K. There
ere. Unfortunately, there is
made earlier by Goldstein
m in their analysis of the
ey calculated $\mathscr{L}_0 = 0.458$,
1954) also calculated $\mathscr{L}_0$ at
y 0.61±0.03* which agrees
nited by the lack of direct
of the liquid.
d the expected zero-angle
eutrons scattered by liquid

0.

ction of helium, to be 0.75
the highest temperatures
' records this as 0.16.

liquid compressibilities were inferred by a considerable extrapolation of Keesom and Keesom's 1933 data. Our calculated σ_s values (obtained by multiplying our $\mathscr{L}_0$ values by 0.093) are higher than Egelstaff and London's by 6.8% at 3.0° K, 6.8% at 3.5° K, 15% at 4.0° K, 26% at 4.5° K, and 680% at 5.0° K. Egelstaff and London also measured σ_s for cold neutrons (45° K) for angles of scatter of 4.6° to 12.3° at liquid helium temperatures of 1.57° to 5.2° K. Their experimental data have been extrapolated to zero angle on plots of σ_s against $\sin^2(\theta/2)$, and are shown as lying close to their calculated σ_s values. At 3.19° K and below, these plots are nearly horizontal straight lines, and their extrapolated intercepts unambiguous. At higher temperatures, however, we believe the extrapolation, allowing for possible curvature at lower angles, could equally well pass through our calculated σ_s values.

5. CONCLUSIONS

The experiments reported here have given accurate information about the diagram of state of liquid helium in a region not covered previously. They provide the first direct measurements of the liquid compressibility. The results have been used to calculate the ratio of heat capacities γ, of liquid He^4 at 3.0, 3.5, and 4.0° K where first sound velocities u_1 are known. At 4.5° and 5.0° K, γ may also be obtained from these results when u_1 results become available. These results also permitted calculations of the limiting liquid structure factor to be made over the region covered, for zero-angle scattering of X rays and of slow neutrons.

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