with the 4-Mc crystal marker signal. The circuit is so arranged that the next count cannot occur until after the Schmitt trigger pulse has gone out of coincidence with that from the crystal marker circuit, so that each standing-wave position is counted but once.

These FM interferometer circuits have proved sensitive and reliable. In making measurements with a modulation band width of 5 kc, a 1-μ motion of the reflector 6 cm from the transmission plate shifts the oscilloscope pattern 0.83 mm, while the same motion 16 cm from the transmission plate shifts the pattern 0.36 mm. Thus the reflector is easily brought within a micron of a standing-wave position.

Experimental Methods.—The water was distilled, passed through a deionization column, and degassed by boiling to prevent formation of air bubbles in the pycnometers and on the interferometer transducer or reflector. Its specific conductance was 1.8×10^{-6} mho. The salts, with a quoted purity of 99.9 per cent, were analyzed spectrometrically and found to have <0.1 per cent metallic impurities. They were dried by prolonged heating and final fusion in a platinum crucible. Solutions were prepared by weighing dried salt and dissolving it in a weighed amount of water. All weights were calibrated, weighings were by substitution, and vacuum corrections were applied. The atomic weights were taken from the report of the International Commission of Atomic Weights (1961).[6]

The density of each solution was determined as the mean of three measurements with 30-ml Ostwald-type quartz pycnometers. These were filled carefully to avoid trapping air bubbles, equilibrated for 20 min in a water thermostat at 25.000-($\pm$0.005)°C, capped, washed, dried, and equilibrated at room temperature to constant weight. Their volumes were determined by the weight of water they held at 25.000°C, and its density, d_1 (see tables).[7, 8]

Two measurements of the wavelength of sound were made in each instance, moving the reflector away from the transmission plate in one and toward it in the other, through 411 standing wave maxima, none nearer than 6 cm from the plate. The positions of the first and last 11 maxima were measured, with about every hundredth between as a check. The wavelength was then determined in one of two ways. The first involved a least-squares solution of the equation:

$$x_n = x_0 + n(\lambda/2), \tag{1}$$

where n is the ordinal number of the maximum, x_n is its position, x_0 is that of the original maximum, and the wavelength, λ, is twice the slope of the curve. The least-squares solution, utilizing all points, was programmed for our IBM 709 electronic computer. A second, almost identical method was to calculate the average positions of the first and last 11 standing wave maxima and divide the difference by 200. The velocity, u, of sound in the liquid was determined from the wavelength, λ, and frequency, f, (4 Mc) by the equation

$$u = f\lambda. \tag{2}$$

Reversal of the direction of motion of the reflector shifted the positions of the maxima about 5 μ; but this offset made much less change in the half-wavelength distances. The two values of the sound velocity agreed to within about 0.05 m sec^{-1}, with no observable systematic difference between them.

TABLE 1

SUMMARY OF RESULTS FOR NACL (M_2 = 55.442)

$c^{1/2}$	d (gm cc^{-1})	$10^5 \Delta d$ obs. − calc.	ΦV_2 (cc $mole^{-1}$)	u (m sec^{-1})	$10^6\beta$ (bar^{-1})	$10^8\Delta\beta$ obs. − calc.
0.00000	0.99704_6	...	(16.36)	1496.5_5	44.780_8	...
0.40568	1.00345	+1, −3, −4	17.38	1507.0	43.862	+0.9
0.54589	1.00924	−2, −1, −3	17.56	1515.2	43.156	+1.6
0.72262	1.01823	−3, −3, −3	17.92	1528.9	42.011	+1.2
0.99860	1.03699	+1, +1, +1	18.44	1557.6	39.750	−0.4
1.23398	1.05731	+5, +4, +3	18.92	1588.6	37.479	−1.3
1.40198	1.07409	+4, +1, +2	19.30	1614.3	35.727	−1.3
1.69325	1.10757	0, 0, 0	19.95	1665.2	32.560	+0.1
1.81497	1.12309	−8, −4, −5	20.24	1688.5	31.229	+1.2
1.93134	1.13884	−3, −2, −3	20.49	1711.9	29.961	+1.2
2.04248	1.15469	+5, +6, +5	20.71	1735.1	28.766	+1.1
2.12947	1.16746	0, 0, −2	20.92	1753.6	27.855	−1.0
deviations		σ = 4				σ = 1.1

TABLE 2

SUMMARY OF RESULTS FOR KCL (M_2 = 74.555)

$c^{1/2}$	d (gm cc^{-1})	$10^5 \Delta d$ obs. − calc.	ΦV_2 (cc $mole^{-1}$)	u (m sec^{-1})	$10^6\beta$ (bar^{-1})	$10^8\Delta\beta$ obs. − calc.
0.00000	0.99704_6	...	(26.84)	1496.5_5	44.780_8	...
0.51492	1.00947	+1, +3, +2	27.77	1510.9	43.393	−0.5
0.71405	1.02070	−2, −1, −2	28.24	1523.2	42.225	−1.8
0.99386	1.04239	+9, +9, +1	28.73	1547.0	40.082	+0.9
1.20506	1.06293	+1, +1, −1	29.27	1569.1	38.213	+0.1
1.37587	1.08225	+3, +6, +3	29.63	1589.3	36.580	0.0
1.65955	1.11917	+3, +2, +1	30.30	1627.0	33.755	−1.5
1.89158	1.15375	+7, +7, +6	30.85	1660.8	31.421	−1.1
deviations		σ = 5				σ = 1.0