II. MICROWAVE SPECTROSCOPY*

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A. VELOCITY SURFACES IN LITHIUM NIOBATE

The method for determining an analytical approximation for the velocity of sound surfaces for previously reported crystals[1] has been applied to lithium niobate. This method expresses an approximation to each of the three surfaces as a sum over functions of the appropriate symmetries. The method determines the coefficients in the sum by a least-squares fit to the exact surface. Lithium niobate has the symmetry of quartz or sapphire. The basis functions are those listed in Quarterly Progress Report No. 84. Table II-1 lists the coefficients in the expansion $V(\theta, \phi) = \Sigma\, C_n^{\sigma} W_n(\theta, \phi)$. ($\sigma = 1, 2, 3$ for each of the three surfaces.)

Table II-1. Coefficients C_n^{σ}.

n	$\sigma = 1$	$\sigma = 2$	$\sigma = 3$
1	.7920	.8610	1.4484
2	-.003786	-.02802	.07939
3	-.06458	-.01514	.04267
4	.04947	-.04637	-.001434
5	.04148	-.03404	-.004503
6	.02470	-.02417	-.006694
7	$-.1190 \times 10^{-6}$	$.1117 \times 10^{-6}$	$.3242 \times 10^{-8}$
8	.009004	-.008396	-.001100
9	.006779	-.006630	-.001841
10	$.70618 \times 10^{-8}$	$-.6717 \times 10^{-8}$	$-.9156 \times 10^{-9}$
11	.0003993	-.0007653	.0004249
12	.0007973	-.0007792	-.0002178
13	$.1125 \times 10^{-8}$	$-.8639 \times 10^{-9}$	$-.2138 \times 10^{-9}$
14	$.1676 \times 10^{-10}$	$-.1638 \times 10^{-10}$	$.1692 \times 10^{-12}$

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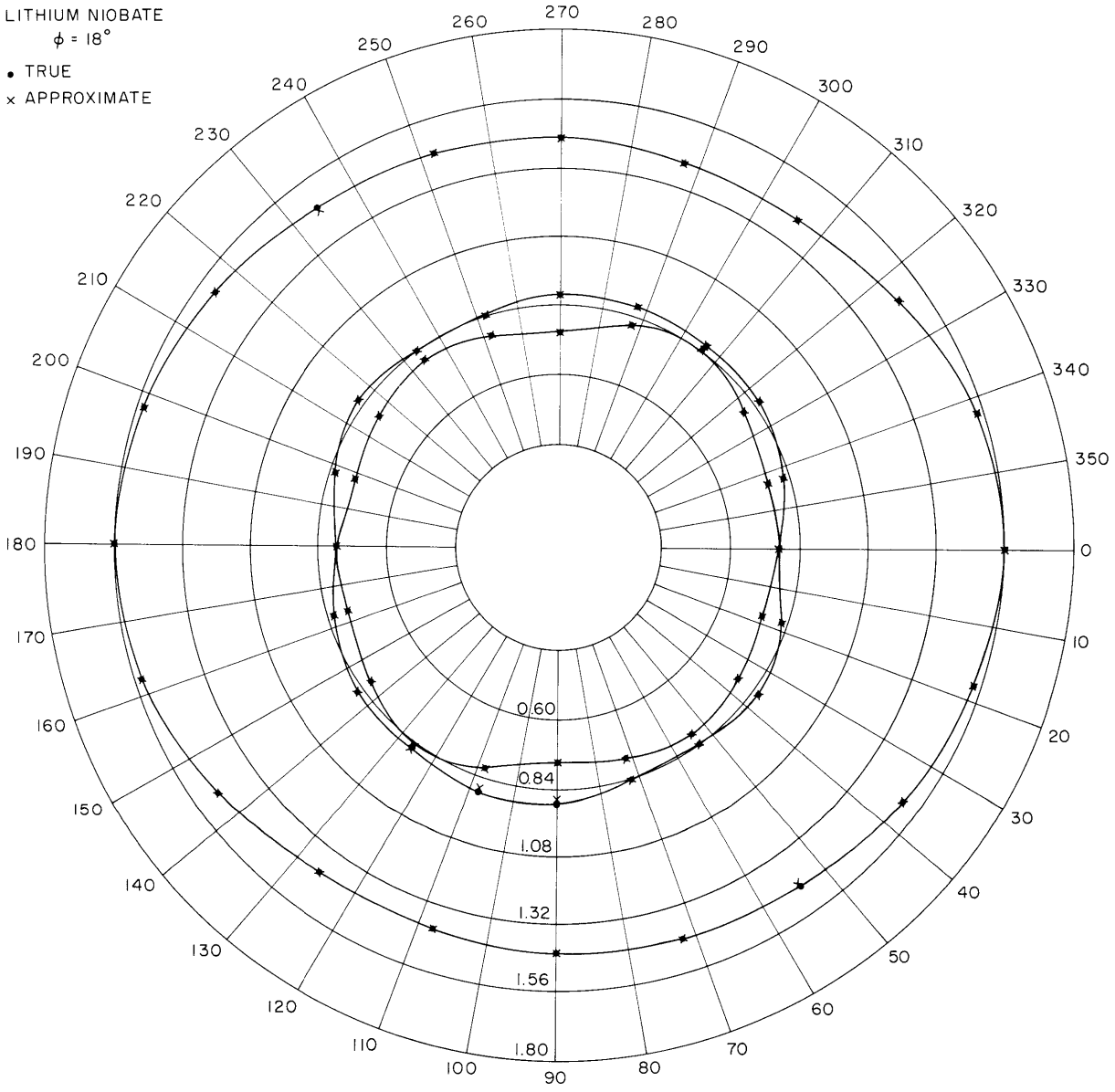

Fig. II-1. True and approximate values for the velocity of sound in Lithium Niobate.

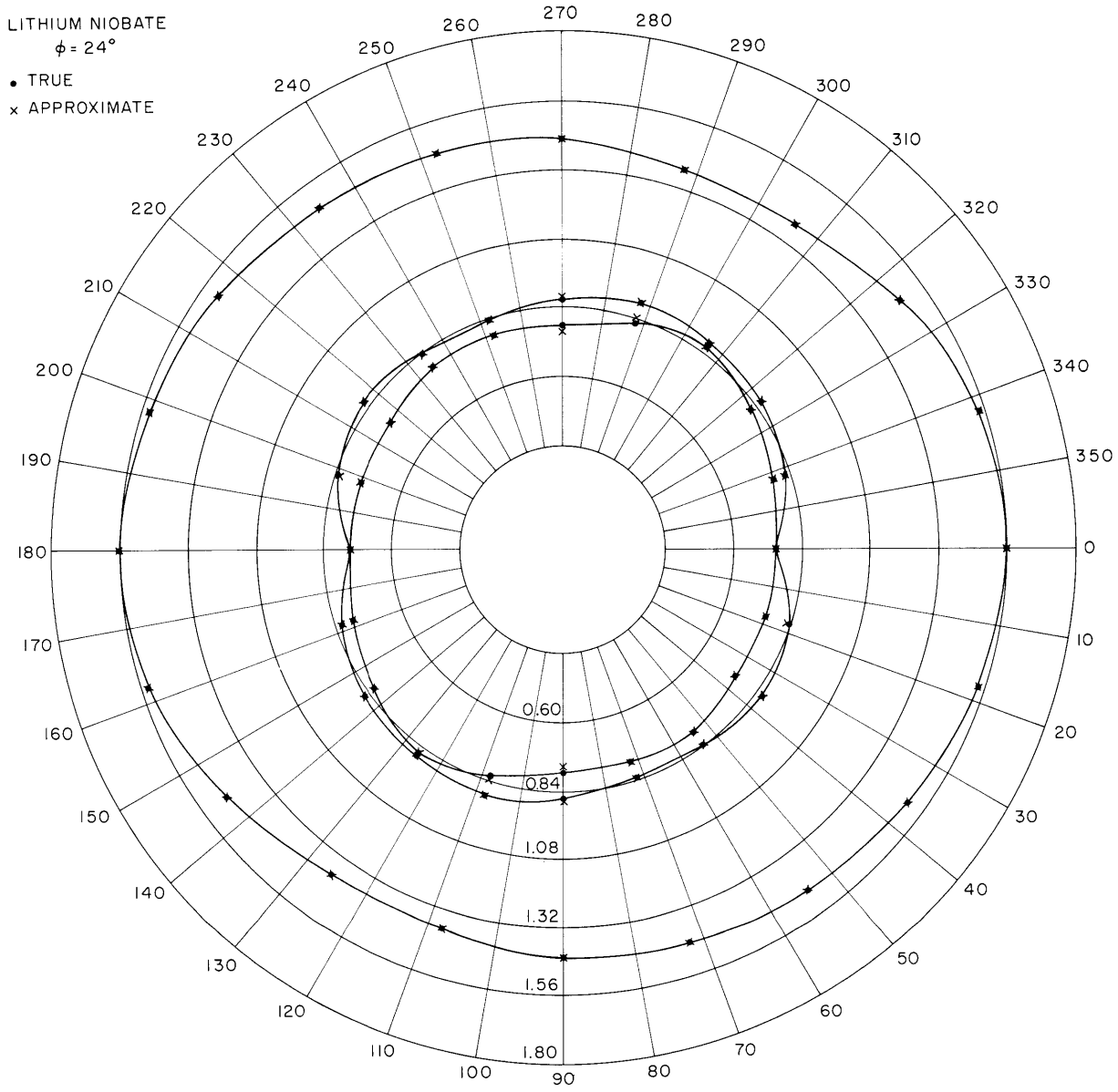

Fig. II-1. Continued.

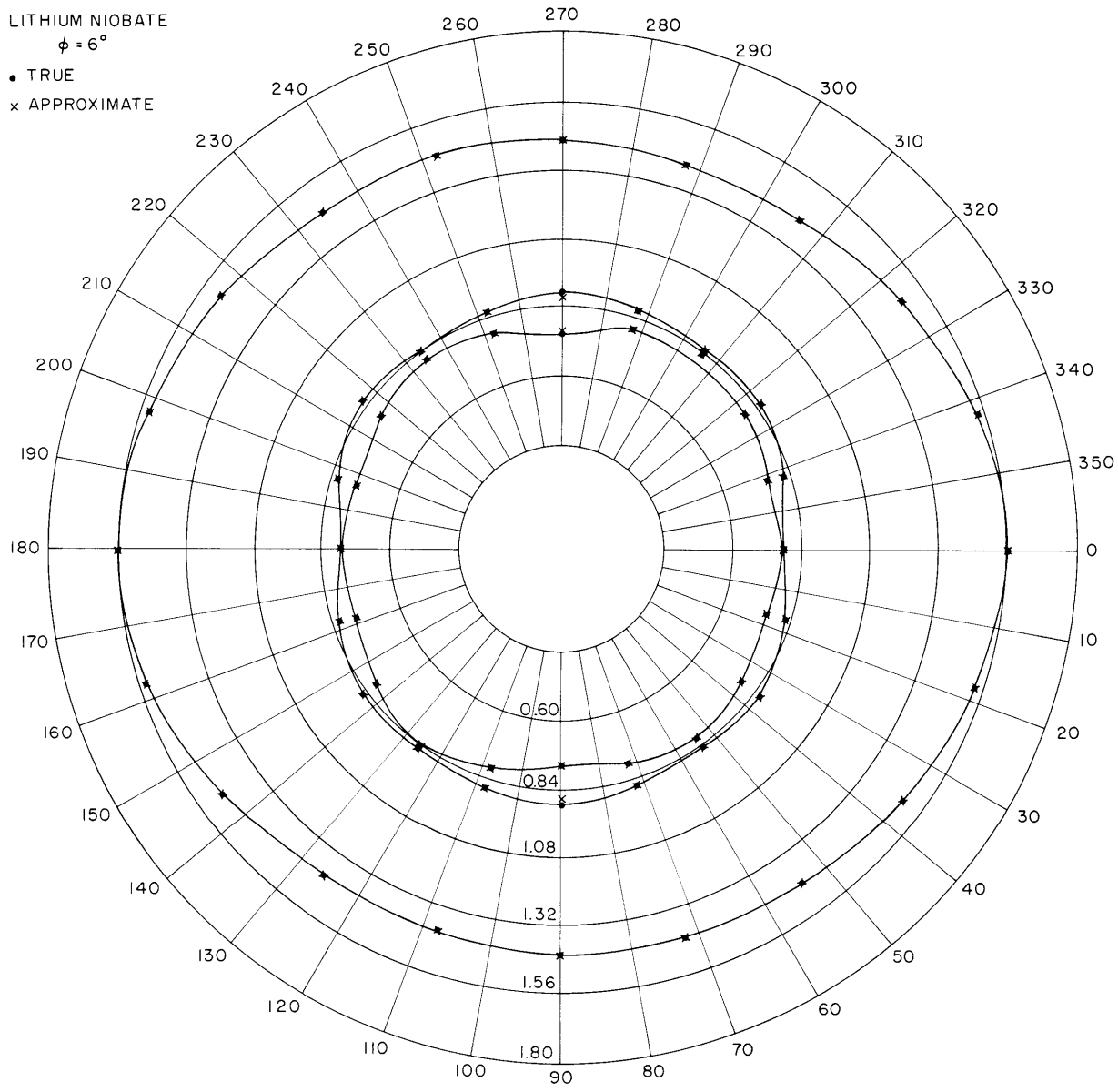

Fig. II-1. Continued.

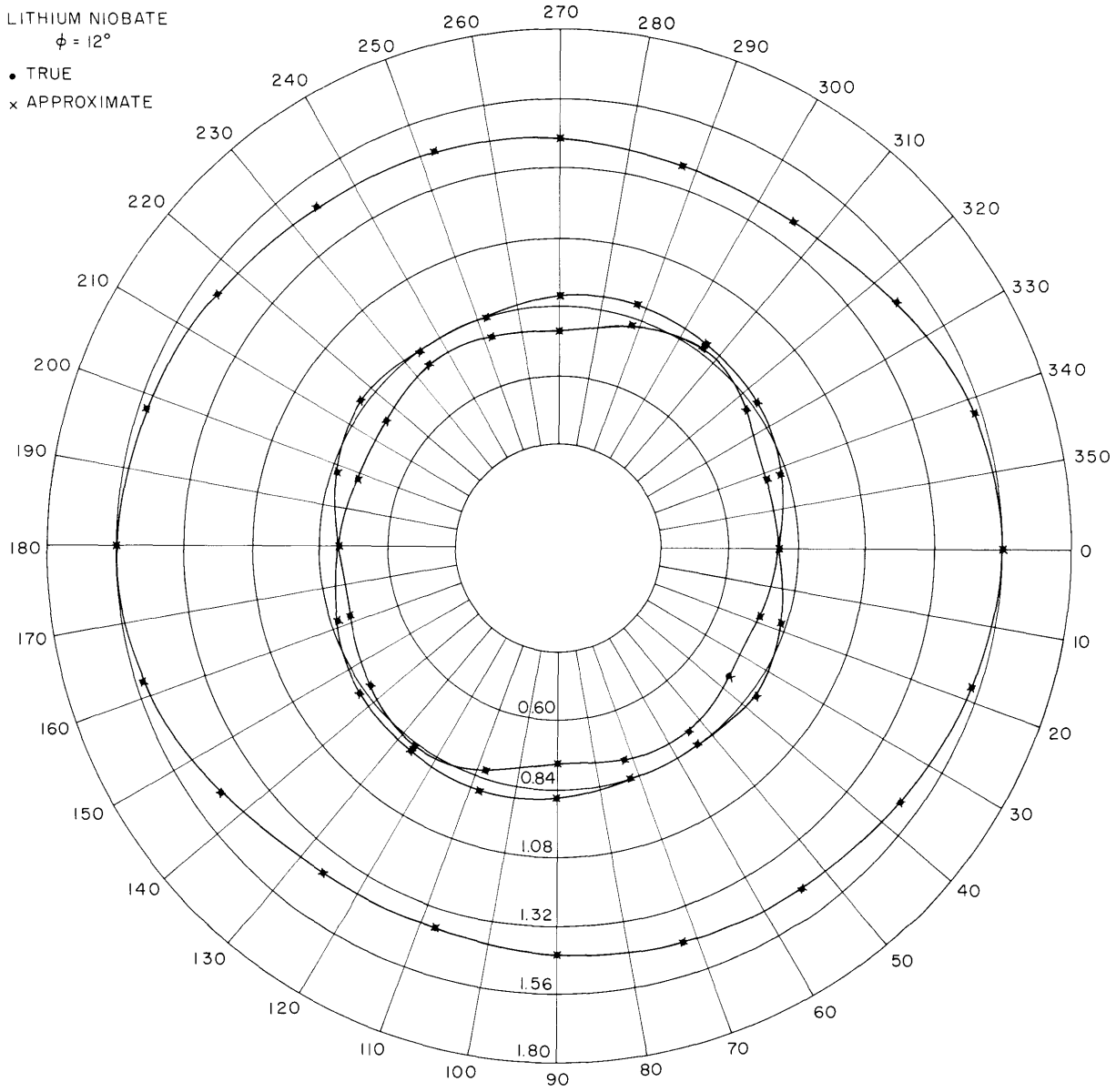

Fig. II-1. Continued.

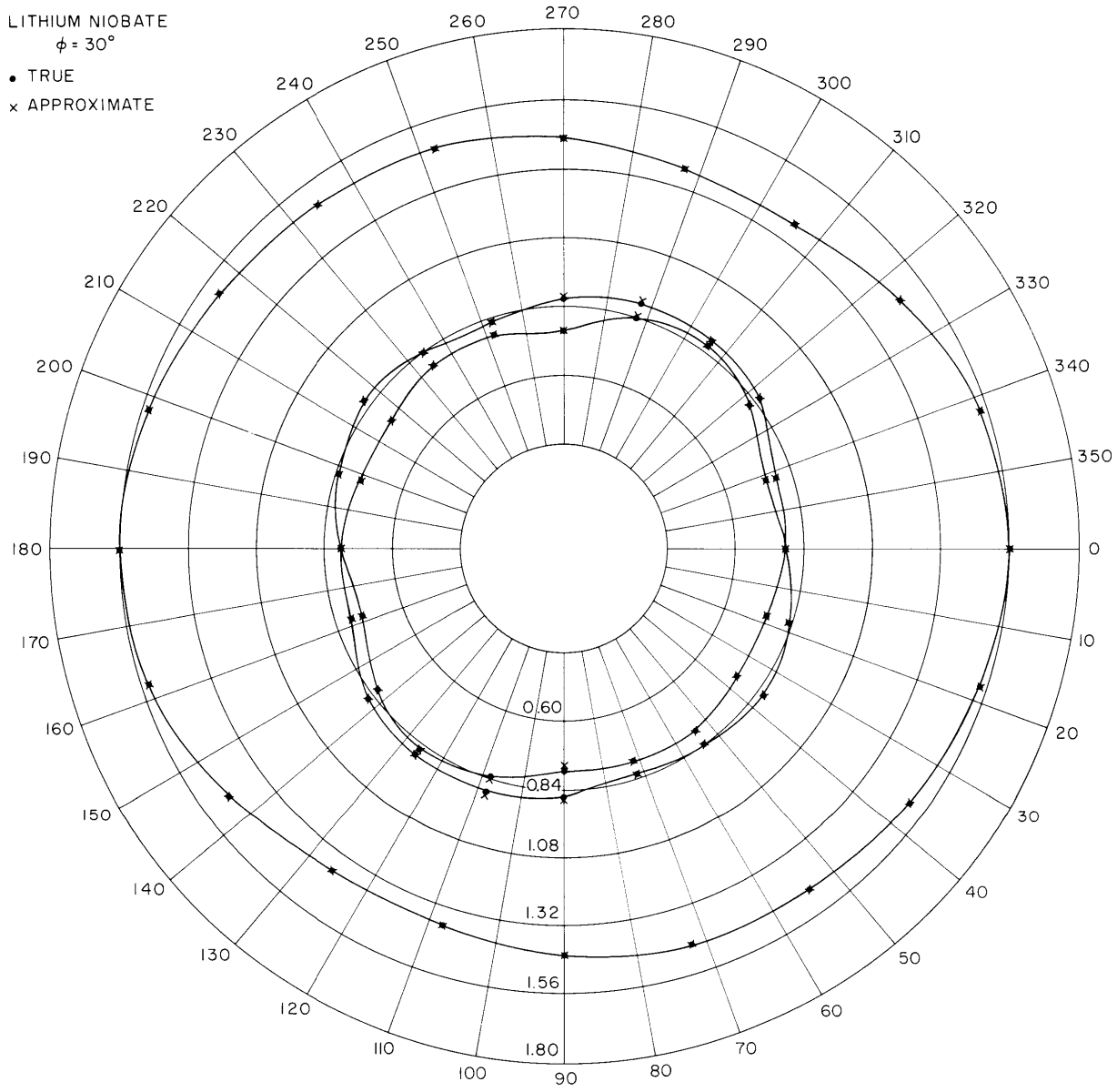

Fig. II-1. Continued.

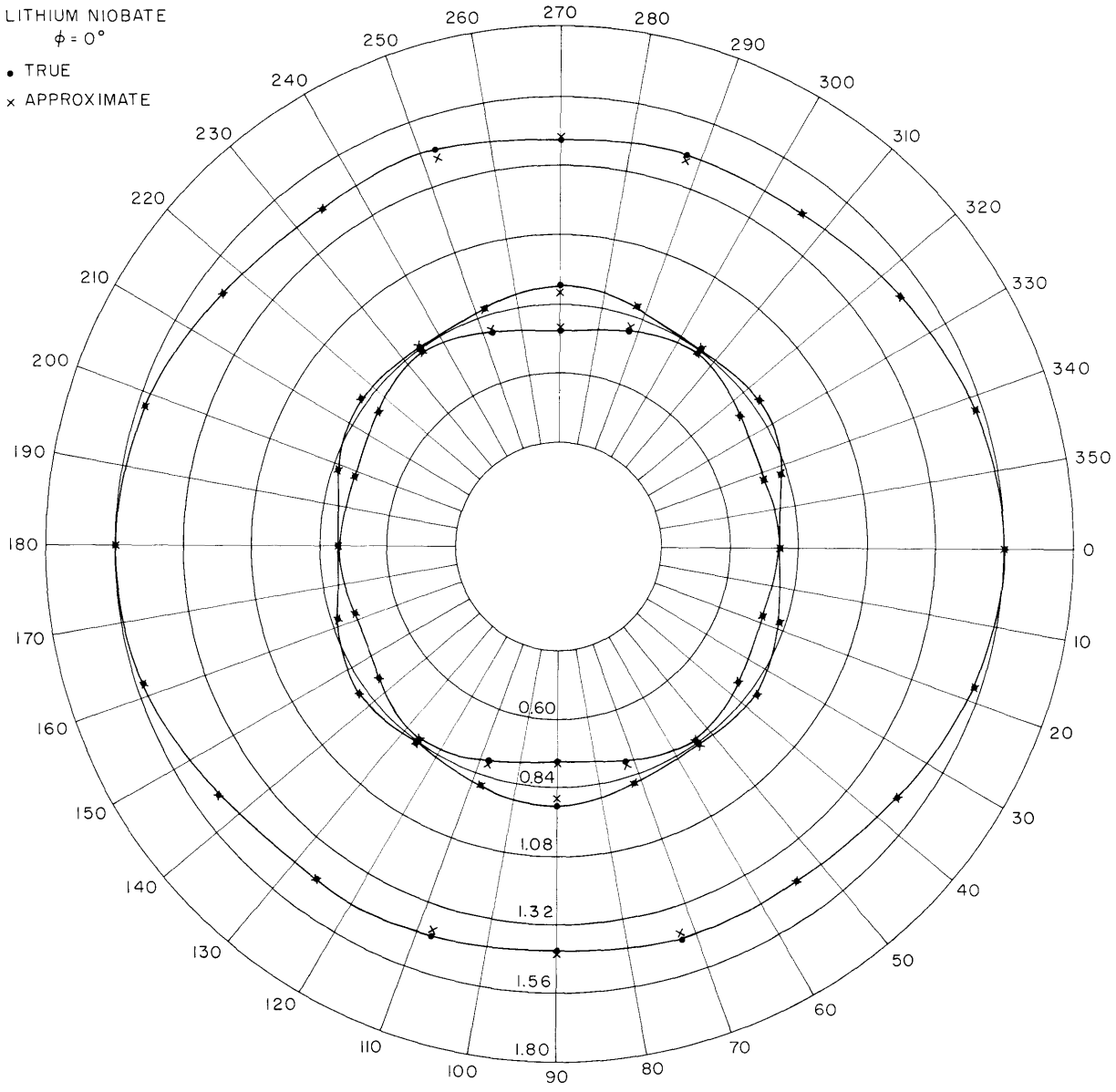

Fig. II-1. Concluded.

Figure II-1 shows the surfaces computed exactly and those computed by using the analytical approximations.

S. R. Reznek

References

1. S. R. Reznek, "Expansion of Velocity Surfaces in Spherical Harmonics," Quarterly Progress Report No. 84, Research Laboratory of Electronics, M.I.T., January 15, 1967, pp. 17-26.