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INTERPRETATION OF MICROWAVE SPECTRAL-ABSORPTION INTENSITY MEASUREMENTS ON PARTIALLY SATURATED LINES

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16. Abstract

A method has been developed which allows the use of intensity measurements made under other than maximum signal conditions. The method is based on the experimentally determined variation of signal with applied power. Measurement of the second derivative of the curve for variation of signal with power provides a test for many of the errors which can occur. The use of the method with data on isopropanol is illustrated. All necessary tables are included to allow interpretation of the measured derivatives of the curve for variation of signal with power.

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INTERPRETATION OF MICROWAVE SPECTRAL-ABSORPTION INTENSITY MEASUREMENTS ON PARTIALLY SATURATED LINES

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SUMMARY

Recent work by Howard W. Harrington has resulted in the formulation of a microwave spectral-absorption intensity law. Harrington has shown that intensity parameters can be defined so that the effects of molecular-relaxation rate are separated from those of molecular concentration in the initial energy state. The experimental techniques used to determine these parameters have relied upon the measurement of the maximum absorption signal attainable from a spectral line as a function of applied microwave power. It has frequently been found that insufficient power is available to reach maximum signal conditions. A method has been developed which allows the use of intensity measurements made under other than maximum signal conditions. The method is based on the experimentally determined variation of signal with applied power. Measurement of the second derivative of the curve for variation of signal with power provides a test for many of the errors which can occur. The use of the method with data on isopropanol is illustrated. All necessary tables are included to allow interpretation of the measured derivatives of the curve for variation of signal with power.

INTRODUCTION

Gas-phase spectral-absorption intensity measurements in the microwave region have a history of being unreliable and difficult to interpret. This unpredictability is due to the saturation effects in the microwave portion of the spectrum, which result in a dependence of the Beer's law absorption intensity coefficient on incident microwave power and molecular-relaxation rates. The rates, in turn, depend on sample pressure and composition. The Beer's law absorption intensity coefficient is therefore of limited usefulness.

A microwave spectral-absorption intensity law has been formulated by Howard W. Harrington (refs. 1 and 2) which allows the effects of molecular-relaxation rate to be separated from those of molecular concentration in the initial energy state. By separating these effects, the intensity measurements can be reliably related to the partial pressure of the absorbing gas or vapor without regard to the presence of any other gases. However, there are practical problems in the application of Harrington's theory. For example, the theory requires that the microwave power incident to the sample be increased until the maximum signal is obtained. The term "signal" refers to the loss in microwave field strength due to the gas absorption. The maximum signal obtainable from a spectral line is directly related to the quantity of sample, according to the theory. The amount of power required to obtain maximum signal varies with the square of the sample pressure. Power levels of a few milliwatts are typically available in the sample cell of current spectrometers, so that the sample pressure is limited to the order of 10 millitorr (1 torr = 133.22 N/m^2) or less. The use of such low sample pressures increases the percentage of error likely in pressure measurements and increases the importance of small leaks or outgassing. Spectrometer stability requirements are also stringent because of the narrower, weaker spectral lines at low pressures.

Other problems exist which are not related to equipment limitations. The maximum signal is not directly proportional to sample pressure. There is a small deviation at very low pressures which can cause significant errors, although the maximum signal may be considered to be proportional to pressures above about 10 millitorr with less than 1.0 percent error. The error decreases rapidly with increasing pressure. Also, errors can be caused by unsuspected interference from another spectral line at or near the frequency of the line the intensity of which is to be measured. This interference can result in quantitative measurements of excellent precision but poor accuracy. The intensity law provides a test for most errors caused by interference as well as for systematic instrumental errors, but this test cannot be applied to a single measurement at maximum signal.

The present investigation describes an analytical approach to the interpretation of intensity measurements made at arbitrary power levels. This approach is valid only when partial saturation is achieved, and it allows the use of higher sample pressures than would be otherwise possible. Furthermore, the method includes the capability of testing for many kinds of systematic errors without requiring that maximum signal be reached. Appendix A includes tables of the theoretical data necessary for the interpretation of intensity measurements and the use of the error test. With the use of tables I to IV, the method is applied to a spectral line of isopropanol as an illustration.

SYMBOLS

A coefficient of E^2 term for second-order Stark effect

B coefficient of $(ME)^2$ term for second-order Stark effect

E	Stark modulation electric field, volts centimeter^{-1}
$\mathcal{E}$	microwave electric field, volts centimeter^{-1}
J	angular-momentum quantum number
K	power saturation coefficient, milliwatt^{-1}
L	length of absorption cell, centimeters
M	angular-momentum spatial-orientation quantum number
P	microwave power, milliwatts
U	waveguide insertion loss, decibels
Z	microwave attenuator readings, decibels
α	waveguide attenuation coefficient, centimeter^{-1}
γ	Beer's law absorption intensity coefficient, centimeter^{-1}
Γ	absorption intensity coefficient proportional to signal, milliwatts$^{1/2}$ centimeter^{-1}
η	absorption intensity coefficient, $\gamma_{max}K^{-1/2}$, milliwatts$^{1/2}$ centimeter^{-1}
ν	frequency, megahertz
ϕ	dimensionless function which describes variation of signal with microwave power

Subscripts:

o	initial value
c	calibrator
g	gas

max maximum

p power

THEORY

General Theory

The power absorbed by a gas or a solution from an electromagnetic field is given in general by Beer's law,

$$P = P_o e^{-\gamma L} \tag{1}$$

where P is the intensity of the field in terms of microwave power, L is the path length through the sample, and γ is the absorption intensity coefficient. In the microwave region, the product γL is very small: it ranges from 10^{-2} down to 10^{-6} or less. For values of γL in this range, equation (1) may be expressed as

$$P = P_o(1 - \gamma L) \tag{2}$$

and the power absorbed by the sample as

$$\Delta P = \gamma L P_o \tag{3}$$

In the microwave region, saturation effects are important, and the Beer's law absorption intensity coefficient γ is dependent on microwave power level, sample composition, and sample pressure. The coefficient has therefore been of limited usefulness, particularly for quantitative analysis of gas mixtures.

Harrington has shown (refs. 1 and 2) that intensity parameters can be defined so that the effects of molecular-relaxation rate are separated from those of molecular concentration in the initial energy state. Detectors respond to microwave electric fields; therefore, the field change $\Delta \mathcal{E}$ is the quantity of interest and is considered to be the signal. Since power is proportional to electric field squared, equation (3) may be rewritten as

$$\Delta \mathcal{E}_g \propto \gamma L P_o{}^{1/2} \tag{4}$$

The parameters Γ, η, and ϕ defined by Harrington are related to the quantities of equation (4) by

$$\Gamma = \gamma P_o{}^{1/2} = \eta\phi \tag{5}$$

Inspection of equations (4) and (5) reveals that Γ is proportional to the gas signal and may be readily determined under experimental conditions. The quantity η is an absorption intensity coefficient from which the relaxation dependence has been removed. It is defined as

$$\eta = \frac{\gamma_{max}}{K^{1/2}} \tag{6}$$

where K is the power saturation coefficient of the sample and γ_{max} is the unsaturated Beer's law coefficient, that is, the limit of γ as microwave power approaches zero and thermal equilibrium is attained. The quantity η depends directly on the number of molecules of the absorbing species present, but unlike γ it is not affected by the presence or absence of other species.

The quantity ϕ is a dimensionless function of the product KP_o; its form depends on the microwave power distribution in the sample. For the usual case of a rectangular waveguide cell operated in the TE_{10} mode (ref. 2),

$$\phi = \frac{2e^{-\alpha L/2}}{\left(KP_o\right)^{1/2}\alpha L}\left\{e^{\alpha L} - 1 + \left(1 + KP_o\right)^{1/2} - \left[e^{\alpha L}\left(e^{\alpha L} + KP_o\right)\right]^{1/2}\right.$$

$$\left. - KP_o \log_e \frac{1 + \left(1 + KP_o\right)^{1/2}}{\left(e^{\alpha L} + KP_o\right)^{1/2} + e^{\alpha L/2}}\right\} \tag{7}$$

In this equation P_o is the input power to the cell, and α is the waveguide attenuation coefficient per unit length; thus, αL is a measure of the loss of microwave power down the length L of the cell due to the resistivity of the walls. The quantity αL is related to the waveguide insertion loss U, in dB, by $\alpha L = 0.230259U$.

The quantity ϕ is the term which completely describes saturation effects. At very low power levels, where $KP_o << 1$, equation (7) reduces to

$$\phi = \left(KP_o\right)^{1/2} e^{-\alpha L/2} \tag{8}$$

When KP_o is much less than one, equations (4) to (6) indicate that the signal is proportional to $\gamma_{max} P_o^{1/2}$, and no information about η can be obtained. As KP_o increases from the low power levels, some saturation sets in. The value of ϕ increases less rapidly with KP_o until it reaches a maximum; therefore, ϕ decreases with increasing KP_o.

By measuring values of P_o and Γ at the maximum signal and by using the theoretical maximum value of ϕ, finding the unknowns η and K is simply a matter of solving equations (5) and (7). However, measurement at maximum signal is not always possible and at least two measurements must be taken in order to solve for η and K. The form of ϕ given in equation (7) renders it impractical to find the unknowns by solving simultaneous sets of equation (5).

As defined, Harrington's intensity law takes advantage of the properties of logarithms and may be represented by the plot of $\log \phi$ against $\log KP_0$. Because ϕ is also a function of insertion loss, there is a family of these curves. Figure 1 illustrates the variation of $\log \phi$ with $\log KP_0$ for several values of insertion loss. For a given sample composition and pressure, η and K for a spectral line are constant. Thus, the variation in $\log \phi$ is due to the variation in $\log P_0$. Plots of $\log \phi$ against $\log P_0$ for different values of K are identical except for a horizontal translation corresponding to the value of $\log K$. Furthermore, taking the logarithm of equation (5) yields

$$\log \Gamma = \log \eta + \log \phi \tag{9}$$

It is evident that a plot of $\log \Gamma$ against $\log P_0$ for a given value of K will be identical to the plot of $\log \phi$ against $\log P_0$ for that K value, except for a vertical shift equal to $\log \eta$. Thus, plots of the measured quantities Γ and P_0 for any spectral line will have identical shapes on log-log paper and may be superposed upon each other or upon the theoretical plot of ϕ against KP_0 by a suitable translation of axes. The values of $\log K$ and $\log \eta$ are found by determining the amount of translation necessary to superpose the plot of $\log \Gamma$ against $\log P_0$ on the plot of $\log \phi$ against $\log KP_0$.

It is also mentioned in reference 2 that the inability to superpose theoretical and experimental curves is an indication of systematic error in the experimental data. Systematic instrument errors, sample changes during measurement, and many types of interference by either Stark lobes (see fig. 2) or overlapping lines may be detected in this manner. However, the fact that the curves superpose is not a guarantee of accuracy since certain types of error increase or decrease the values of $\log \Gamma$ or $\log P_0$ by the same amount at each point on the curve and therefore do not change its shape.

Maximum Signal Method

In order to determine η from experimental measurements, the value of ϕ must be known. Since P_0 is known but K is unknown, ϕ cannot be calculated or measured directly. Therefore, the properties of the variation of ϕ with KP_0 must be used to locate a point on the curve. Harrington's method involves experimentally increasing power until maximum signal is obtained. Because the maximum value of ϕ is always the same for a given insertion loss, the maximum signal point provides the value of ϕ.

There is a practical experimental advantage to operation at the maximum signal point, since the signal-to-noise ratios are better than those achieved with very low power levels. However, measuring K in this manner is difficult because there is little or no detectable change in signal over a range of power settings at the maximum of the curve.

The uncertainty in the exact power required to produce maximum signal is directly reflected as an uncertainty in K. Good practice dictates that a series of points be taken, both to allow more accurate location of the curve maximum and to allow a check for systematic errors.

Presently available microwave sources typically result in power levels at the cell of only a few milliwatts. Depending on the saturation characteristics of the molecule to be observed, this power level usually limits the maximum operating pressure to from 5 to 10 millitorr if maximum signal is to be achieved. The value of K for a given spectral line is inversely proportional to pressure squared; thus, even an order-of-magnitude increase in the available power allows an increase in operating pressure of only a factor of three. Accurate pressure measurements of arbitrary mixtures of gases and condensable vapors are very difficult at pressures of only a few millitorr. Furthermore, proportionately larger errors arise from small leaks or desorption at the lower pressures. Finally, the spectral lines are weaker and sharper and thus require greater spectrometer stability and more accurate measurement techniques.

Slope Method

A means of determining ϕ has been developed which does not require complete saturation of the spectral line. The first derivative of the intensity law curve is a single-valued function of $\log KP_O$ (see fig. 3) and may be used to specify uniquely a point on the curve. Thus, the derivative of the experimental curve for variation of $\log \Gamma$ with $\log P_O$ may be compared with the derivative of the theoretical curve for variation of $\log \phi$ with $\log KP_O$ to find the corresponding points on the curves. The absorption intensity coefficient η may then be found from the relationship in equation (9), and the power saturation coefficient K may be found from the relationship

$$\log K = \log KP_O - \log P_O \tag{10}$$

The curve shown in figure 3 indicates that the slope method is most useful for values of $\log KP_O$ between -1 and +1. The slope is almost independent of KP_O at values of $\log KP_O$ less than -1. Thus, in principle the power level must be within 10 to 15 dB of that required to produce maximum signal if η is to be measured. In practice, it may be necessary to make measurements within 5 dB of the maximum signal point in order to reduce the effects of random errors in the slope measurement. These errors are fixed by the measurement precision and are not related to the degree of saturation. They are therefore most significant at low values of KP_O, where a large uncertainty in $\log KP_O$ results from a small uncertainty in slope.

Systematic errors may be detected by comparing the experimental curve shape with the theoretical shape, as discussed previously. This comparison may be accomplished by using the experimental and theoretical second derivatives. Figure 2 illustrates the effect of interference by a Stark component which is easier to saturate than the spectral line. The maximum signal for the Stark component occurs at one-third of the power required for the spectral line to reach its maximum; therefore, the worst interference occurs at the lower end of the curve. As KP_O continues to increase, the maximum signal for the Stark component is passed and the interfering signal decreases with increasing power, whereas the signal from the spectral line is still increasing. Therefore, the second derivative shows too much curvature over the range of $\log KP_O$ below the maximum and gradually approaches the theoretical value at very high values of $\log KP_O$. If the Stark component had been harder to saturate than the spectral line, the greatest interference would have been at the upper end of the curve. In general, Stark (out-of-phase) interference results in curvature which is too great over at least part of the curve. Similar considerations indicated that overlapping spectral lines (in-phase interference) tend to broaden the curve and result in a second derivative which shows too little curvature.

Various instrumentation effects may also be detected by comparison of experimental and theoretical curves. For example, improperly adjusted phase between the Stark modulation and reference signals can produce an effect similar to Stark component interference. Stray in-phase noise pickup at the modulation frequency may appear to be interference from an overlapping line. Although further investigation is usually necessary to determine the problem, the second derivative test gives the warning signal.

The second derivative of an experimental curve is especially subject to large fluctuations; therefore, it is important to look for a trend rather than to rely on a single value. With very precise measurements, the data may be used directly with fair results, but to obtain the most accurate results from the slope method, the data should be smoothed. This smoothing can be done either graphically or analytically. For analytic smoothing, a fourth-degree polynomial can reproduce the intensity law curve within a 0.1-percent accuracy up to the curve maximum. If data are taken across the maximum of the curve so that the derivative varies significantly over both positive and negative values, another term is necessary. This extended polynomial is capable of reproducing the theoretical values of second derivative to 1.0 or 2.0 percent, although individual points on an experimental curve may have larger errors resulting from a tendency of the curve to follow scatter in the points.

Implicit in the slope method is the use of tables or graphs. Figures 1 and 3 have shown the variation of $\log \phi$ and the first derivative with $\log KP_O$, and figure 4 has illustrated the behavior of the second derivative as a function of $\log KP_O$. Although these curves could be used to apply the slope method, the resolution would be poor and better results would be obtained by using the tables in appendix A.

EXPERIMENTAL PROCEDURES

Apparatus

The spectrometer used in the experimental investigation was a standard Stark modulated instrument with a sample cell approximately 87 centimeters in length. Figure 5 is a simplified block diagram of the system. For intensity measurements, a small amount of microwave power is coupled off ahead of the cell, and its amplitude is modulated by a diode modulator at the same frequency and phase as the Stark modulation voltage. The power is reduced to the desired level by three precision attenuators and coupled back into the waveguide section leading to the crystal detector. There it is detected and amplified as if it were a signal due to gas absorption in the cell.

The three attenuators in the calibration arm allow measurements to be made by setting two of the attenuators exactly on calibration marks and by reading the third attenuator on the 0- to 10-dB range, where the resolution is best. By using the attenuators in this way, the calibrator signal can be determined with a precision of 0.01 dB. For weaker lines more attenuation must be added with the third attenuator; consequently, the precision is less. When the attenuators are used in either manner, the accuracy of the reading may be considerably less than the precision, since the accuracy of the attenuator is quoted as 0.1 dB or ±2 percent of the reading in dB, whichever is greater.

Pressure measurements were made with a thermocouple gage which is sensitive to sample composition. Subsequent experience with a capacitance manometer indicates that the true pressure was probably somewhat less than half the pressure indicated by the thermocouple gage.

Intensity Measurement Techniques

The substitution method of intensity measurement may be accomplished by switching between modulator and calibrator operation and by adjusting the calibrator attenuators until the two signals are equal. Or the null method may be used to measure intensity. The signal is nulled by reversing the phase of the calibrator signal with respect to the modulator signal and by operating calibrator and modulator simultaneously. In addition to the null and substitution methods of intensity measurement, several other methods have been evaluated. One of these methods is the direct observation of spectrometer output for which the calibration arm is used only to measure the response of the spectrometer at the line frequency. This method is rapid and allows the calibration to be done after the gas measurements are completed. However, the precision of direct observation is the worst of all the methods, and the results are also affected by nonlinearities in amplifier gain and meter response.

The null method was chosen for the present investigation since it eliminates the effects of detector, amplifier, and meter characteristics. Furthermore, by increasing the gain of the amplifiers after an approximate null is achieved, the null can be more accurately determined than a finite signal level. These assets, coupled with the 0.01-dB precision in reading the calibrator attenuation, result in repeatable data which falls on a smooth curve with little scatter. This precision is important when first and second derivatives are to be found.

The spectrometer was tuned to the 38 413.38-MHz line of isopropanol for the present experiment. Tests were made at high gain with no sample in the cell to insure that no error would be introduced by stray pickup of signals at the modulation frequency. After the sample was admitted, the calibrator phase was adjusted 180° with respect to the modulators, and the precision attenuators were adjusted for an approximate null. The gain was then increased in several steps to a value of 50 to 100 times that at the start, and an exact null was obtained. After the calibrator attenuation at this point was recorded, the power attenuator was changed by 1.0 dB and a new null was obtained. The usual range of power variation for the experiments was about 15.0 dB, the maximum power at the cell being approximately 2.75 mW. The experiment was run for Stark modulation voltages of 200, 500, and 1500 volts. During the course of the measurements, the validity of the null was insured by varying the gain over a wide range and verifying that the meter remained at zero. Improper adjustment of the Stark modulation phase may cause a variation in meter readings as the gain is changed.

RESULTS AND DISCUSSION

Measurements on Isopropanol

Isopropanol was chosen for this experiment because it provides a relatively stable sample in the cell; the spectral line was chosen because it is of moderate intensity and easy to saturate. Easy saturation allowed data to be obtained past saturation for comparison with the predicted maximum signal. Isopropanol has numerous spectral lines of intensity comparable to that of the line chosen; therefore, some degree of Stark interference is almost certain regardless of the modulating voltage used. However, the intensity was observed as voltage was varied, and the fluctuations due to Stark interference are very small once the voltage is high enough to provide complete modulation. One set of data was taken at a Stark voltage of 200 volts in order to produce an undermodulated condition to demonstrate the error test. The attenuator readings were fit in a least-squares sense to a fifth-degree polynomial by a computer routine. The root mean square (rms) residual of the fit was in the region of 0.02 dB. Table I includes the attenuator readings and derivatives calculated from the polynomial for the 500-volt modulation case.

TABLE I.- SMOOTHED INTENSITY LAW DATA FOR ISOPROPANOL

AT STARK VOLTAGE OF 500

Attenuator readings, dB		Derivatives	
Power	Calibrator	First	Second
1.0	55.72	-0.229	-0.086
2.0	55.53	-.141	-.090
3.0	55.43	-.050	-.092
4.0	55.43	.042	-.092
5.0	55.52	.133	-.090
6.0	55.71	.222	-.088
7.0	55.96	.308	-.085
8.0	56.31	.391	-.081
9.0	56.74	.470	-.076
10.0	57.25	.544	-.072
11.0	57.83	.613	-.067
12.0	58.47	.678	-.063
13.0	59.18	.740	-.060
14.0	59.95	.798	-.057
15.0	60.78	.855	-.056
16.0	61.66	.910	-.056

Intensity Law Curves

The curves for the three modulation voltages are shown in figure 6. The plotted points are the smoothed values of calibrator arm attenuator settings as a function of power input attenuator settings. Thus, within additive constants, the axes (fig. 6) are proportional to $20 \log \phi$ (appendix B) and $10 \log KP_O$. The peak intensities of the curves for 500 and 1500 volts differ by approximately 0.3 dB, which is equivalent to about a 3-percent disagreement in η. A difference this small could result from a sample pressure change of only a few tenths of a millitorr during the experiment. However, at least part of the difference is probably due to Stark interference from nearby lines. Some errors could also be present from instrumentation effects due to the wide range of modulation voltages and input powers used.

The peak intensity measured at 200 volts is about 1.6 dB (17 percent in η) less than that measured at 500 volts. The maximum signal also occurs at a lower power level; thus, the effect is similar to a reduction in sample pressure except for the change in curve shape. This effect is the opposite of that illustrated in figure 2, in that the Stark lobe has smaller values of K than the isopropanol line and the most deviation occurs at the high-power end of the curve. This behavior is characteristic of undermodulated Q-branch lines. (See appendix C.) The 200-volt experimental curve for the isopropanol line fits the theoretical curve well at lower powers. (See fig. 6.) In this particular case, the predicted maximum signal is more accurate than the observed maximum signal since the prediction was made by using data on a portion of the curve which is less affected by the Stark interference than the maximum is.

Determination of Intensity Parameters

The first step toward determining the intensity parameters should be a check of the data for errors. Obviously, the 200-volt curve does not fit the theoretical curve in figure 6. Table II includes the second derivatives for the theoretical curve and for all three experimental curves. None of the three is a perfect fit along its entire length. Since the effect of the second derivative is cumulative, the trend over a large segment of the data range is informative. The experimental second derivatives of the 500-volt and the 1500-volt curves show too much curvature at the higher slope values and too little curvature at slope values near zero. In view of the 0.02 rms residual in fitting the data,

TABLE II.- EXPERIMENTAL AND THEORETICAL VALUES OF SECOND DERIVATIVE FOR SELECTED VALUES OF FIRST DERIVATIVE

Experimental first derivative	Second derivative			
	Theoretical	Experimental at Stark voltage of –		
		200 V	500 V	1500 V
-0.20	-0.090	-0.106	-0.087	-0.106
-.10	-.095	-.106	-.091	-.100
.00	-.098	-.106	-.092	-.094
.10	-.099	-.105	-.091	-.090
.20	-.098	-.104	-.089	-.085
.30	-.095	-.101	-.085	-.080
.40	-.089	-.097	-.081	-.075
.50	-.081	-.091	-.074	-.069
.60	-.070	-.082	-.068	-.064
.70	-.056	-.067	-.062	-.057
.80	-.041	-.041	-.057	-.051

these deviations are not necessarily significant. More importantly, the second derivatives of the 500-volt and the 1500-volt curves do not show a consistent trend of being either too high or too low. The 200-volt data, on the other hand, show a curvature which is consistently greater than the theoretical curvature at every point except one. Because the 200-volt data are obviously unreliable, the choice must be between the 500- and 1500-volt data. Of these, the 1500-volt data show a marked increase in curvature at and past the maximum, which is an indication of Stark interference. This indication is strengthened by the fact that the maximum of the curve occurs at an intensity somewhat lower than that of the 500-volt curve. Therefore, the 500-volt curve must be assumed to provide the most reliable data on the basis of available information.

From table I, the maximum of the 500-volt curve is about 55.4 dB, at a power attenuator setting of 3.5 dB. Since these values are attenuator readings, large numbers correspond to small signals and low powers. From the calibration data for the spectrometer used in this work, it is found that $20 \log \Gamma = -67.08 \text{ dBm} - Z_c$, and $10 \log P_o = 4.4 \text{ dBm} - Z_p$, where Z_c and Z_p are the calibrator and power attenuator readings. Therefore, the maximum signal is $20 \log \Gamma = -122.48$ dBm, and is obtained at an input power of $10 \log P_o = 0.9$ dBm. From equation (9),

$$\eta = \text{antilog} \frac{20 \log \Gamma - 20 \log \phi}{20} \tag{11}$$

The power saturation coefficient K is found from the relation

$$K = \text{antilog} \frac{10 \log KP_o - 10 \log P_o}{10} \tag{12}$$

From table IV the maximum value of $20 \log \phi$ and the corresponding value of $10 \log KP_o$ for an insertion loss of 0.5 dB are found by looking up the values at a slope of 0. These values are, respectively, -4.681 and 2.347. From equations (11) and (12), $\eta = 1.29 \times 10^{-6} \text{ mW}^{1/2}\text{cm}^{-1}$ and $K = 1.39 \text{ mW}^{-1}$.

In order to verify that the method of slopes gives correct answers at arbitrary power levels, another point will be chosen from table I, the point with a power attenuator setting of 8.0 dB, at which the slope is 0.391 and the calibrator attenuation is 56.31 dB. At this point, $20 \log \Gamma = -123.39$ dBm and $10 \log P_o = -3.6$ dBm. From table IV, $20 \log \phi = -5.482$ and $10 \log KP_o = -1.693$ at a slope of 0.391. From equations (11) and (12), $\eta = 1.27 \times 10^{-6} \text{ mW}^{1/2}\text{cm}^{-1}$ and $K = 1.55 \text{ mW}^{-1}$. At the 12-dB setting, the values are $\eta = 1.26 \times 10^{-6} \text{ mW}^{1/2}\text{cm}^{-1}$ and $K = 1.62 \text{ mW}^{-1}$.

There is a systematically increasing error in both η and K as power is decreased, but the values of η agree within about 2.0 percent over a factor of nearly 10 in power. At 12 dB, K deviates about 16.0 percent from the value obtained at the curve maximum. The value of K may be expected to be less accurate than the value of η because K depends on both pressure squared and sample composition, whereas η depends on only the partial pressure of the absorbing molecules. Therefore, small leaks and adsorption or desorption affect K much more than η. The characteristics of the spectrometer used in this investigation may also affect the accuracy of measurements. There are a number of small (a few tenths of a decibel) dips in power transmission of the cell due to the generation of higher order modes at waveguide joints and transitions. One of these dips occurs at the operating frequency for this experiment and has been treated as insertion loss. Actually, ϕ is affected in an unknown manner by the small amounts of power distributed differently from the sine-squared distribution assumed in its derivation. This effect may contribute to the small deviations from the theory.

CONCLUDING REMARKS

The microwave spectral-absorption intensity law proposed by Howard W. Harrington has been tested, and a method has been developed for its application to partially saturated lines. The method allows interpretation of intensity measurements made at power levels 10 dB lower than those required for saturation. This lower power level in turn allows the sample pressure to be increased to three times the value at which saturation can be achieved with the available microwave power. This method reduces the effect of small changes in sample pressure and in sample composition due to leaks or desorption, and makes more accurate pressure measurements possible. The method also provides for the evaluation of the intensity data for systematic errors caused by interfering spectral lines or Stark lobes with different saturation characteristics from those of the line the intensity of which is measured, as well as many types of instrumentation errors.

The method utilizes the slope of the curve for variation of log (signal) with log (microwave power) to locate a corresponding point on the theoretical intensity law curve of Harrington. With this information and the spectrometer calibration data, the intensity and saturation coefficients may be found. In order to detect systematic errors, the second derivatives of the experimental curves are compared with those of the theoretical curves to test for deviations from the theoretical curve shape. Tables of the necessary intensity law data and theoretical derivatives are included for absorption cells with insertion losses up to 5.0 dB.

Data are presented for the variation of intensity with power of the 38 413.38-MHz line of isopropanol. The measurements were repeated at several Stark modulation voltages, one of which produced an intensity decrease by deliberate undermodulation. The use of the second derivative in evaluation of the data is illustrated. Application of the slope technique over a range of conditions from maximum signal down to an input power of 10 dB less than that required for saturation yielded values of intensity coefficients which agreed within about 2.0 percent. The saturation coefficient calculated from the low-power measurement was 16.0 percent greater than that found at maximum signal.

Langley Research Center,
National Aeronautics and Space Administration,
Langley Station, Hampton, Va., January 15, 1970.

APPENDIX A

INTENSITY LAW TABLES

The tables in this appendix give the theoretical values of the intensity law curve and of the first and second derivatives at each point. Table III was generated by inserting values of KP_O ranging from 0.001 to 1000 into equation (7) and by taking logarithms. The results were numerically differentiated to obtain the first and second derivatives. Table IV is an extension of table III. Linear interpolation between adjacent values in either table is accurate within 0.1 percent.

The tables are based on values of insertion loss up to 5.0 dB in 0.25-dB increments. Linear interpolation between insertion losses is also valid but not generally necessary. If the true insertion loss falls between tabulated values, choosing the table value for insertion loss nearest the true value will not result in errors greater than 0.2 percent in $\log KP_O$ or greater than 0.1 percent in $\log \phi$.

The data in table III give the theoretical variation of $\log \phi$ with $\log KP_O$ for values of $\log KP_O$ ranging from -3 to 2.9. The data in table IV are useful with spectrometers of the type illustrated in figure 5, for which the attenuators are calibrated in terms of 10 log (power) and 20 log (signal). The data were obtained from those in table III by multiplying the $\log KP_O$ column by 10 and the $\log \phi$ column by 20 and by taking the derivatives of the product.

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = .25 DB							
-3.000	-1.513	.499	-.0017	.000	-.240	.110	-.4897
-2.900	-1.463	.499	-.0021	.050	-.235	.085	-.4949
-2.800	-1.413	.499	-.0027	.100	-.231	.060	-.4972
-2.700	-1.363	.499	-.0033	.150	-.229	.035	-.4968
-2.600	-1.313	.498	-.0042	.200	-.228	.011	-.4937
-2.500	-1.263	.498	-.0053	.250	-.228	-.014	-.4880
-2.400	-1.214	.497	-.0066	.300	-.229	-.038	-.4799
-2.300	-1.164	.496	-.0083	.350	-.232	-.062	-.4696
-2.200	-1.114	.495	-.0105	.400	-.235	-.085	-.4575
-2.100	-1.065	.494	-.0131	.450	-.240	-.108	-.4436
-2.000	-1.016	.493	-.0165	.500	-.246	-.129	-.4285
-1.900	-.966	.491	-.0207	.550	-.253	-.150	-.4122
-1.800	-.917	.489	-.0259	.600	-.261	-.171	-.3952
-1.700	-.869	.486	-.0323	.650	-.270	-.190	-.3777
-1.600	-.820	.482	-.0403	.700	-.280	-.208	-.3599
-1.550	-.796	.480	-.0450	.750	-.291	-.226	-.3420
-1.500	-.772	.478	-.0502	.800	-.303	-.243	-.3242
-1.450	-.749	.475	-.0560	.850	-.315	-.258	-.3067
-1.400	-.725	.472	-.0623	.900	-.329	-.273	-.2895
-1.350	-.701	.469	-.0694	.950	-.343	-.287	-.2729
-1.300	-.678	.465	-.0771	1.000	-.357	-.301	-.2569
-1.250	-.655	.461	-.0856	1.050	-.373	-.313	-.2415
-1.200	-.632	.456	-.0950	1.100	-.389	-.325	-.2268
-1.150	-.609	.451	-.1052	1.150	-.405	-.336	-.2127
-1.100	-.587	.446	-.1163	1.200	-.422	-.346	-.1994
-1.050	-.565	.440	-.1285	1.250	-.440	-.356	-.1869
-1.000	-.543	.433	-.1416	1.300	-.458	-.365	-.1750
-.950	-.521	.426	-.1558	1.350	-.476	-.373	-.1638
-.900	-.500	.417	-.1710	1.400	-.495	-.381	-.1533
-.850	-.480	.409	-.1873	1.450	-.514	-.389	-.1434
-.800	-.459	.399	-.2047	1.500	-.534	-.395	-.1342
-.750	-.440	.388	-.2230	1.550	-.554	-.402	-.1255
-.700	-.421	.376	-.2422	1.600	-.574	-.408	-.1174
-.650	-.402	.364	-.2621	1.700	-.615	-.419	-.1027
-.600	-.384	.350	-.2828	1.800	-.658	-.429	-.0900
-.550	-.367	.336	-.3039	1.900	-.701	-.437	-.0788
-.500	-.351	.320	-.3253	2.000	-.745	-.444	-.0691
-.450	-.335	.303	-.3467	2.100	-.790	-.451	-.0607
-.400	-.320	.285	-.3679	2.200	-.835	-.457	-.0533
-.350	-.307	.266	-.3884	2.300	-.881	-.462	-.0469
-.300	-.294	.246	-.4081	2.400	-.928	-.466	-.0413
-.250	-.282	.225	-.4265	2.500	-.974	-.470	-.0364
-.200	-.271	.204	-.4434	2.600	-1.022	-.473	-.0321
-.150	-.262	.181	-.4585	2.700	-1.069	-.476	-.0284
-.100	-.253	.158	-.4713	2.800	-1.117	-.479	-.0251
-.050	-.246	.134	-.4818	2.900	-1.165	-.481	-.0222

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = .50 DB							
-3.000	-1.525	.499	-.0017	.000	-.248	.116	-.4878
-2.900	-1.475	.499	-.0020	.050	-.242	.091	-.4936
-2.800	-1.425	.499	-.0026	.100	-.238	.067	-.4967
-2.700	-1.376	.499	-.0032	.150	-.236	.042	-.4970
-2.600	-1.326	.498	-.0041	.200	-.234	.017	-.4946
-2.500	-1.276	.498	-.0051	.250	-.234	-.008	-.4895
-2.400	-1.226	.497	-.0065	.300	-.235	-.032	-.4820
-2.300	-1.177	.496	-.0081	.350	-.237	-.056	-.4723
-2.200	-1.127	.496	-.0102	.400	-.241	-.079	-.4606
-2.100	-1.077	.494	-.0128	.450	-.245	-.102	-.4472
-2.000	-1.028	.493	-.0160	.500	-.251	-.124	-.4323
-1.900	-.979	.491	-.0201	.550	-.257	-.145	-.4164
-1.800	-.930	.489	-.0252	.600	-.265	-.166	-.3995
-1.700	-.881	.486	-.0315	.650	-.274	-.185	-.3821
-1.600	-.833	.483	-.0393	.700	-.284	-.204	-.3644
-1.550	-.809	.481	-.0438	.750	-.294	-.222	-.3465
-1.500	-.785	.478	-.0489	.800	-.306	-.238	-.3287
-1.450	-.761	.476	-.0545	.850	-.318	-.254	-.3111
-1.400	-.737	.473	-.0607	.900	-.331	-.270	-.2939
-1.350	-.713	.470	-.0676	.950	-.345	-.284	-.2771
-1.300	-.690	.466	-.0751	1.000	-.360	-.297	-.2609
-1.250	-.667	.462	-.0834	1.050	-.375	-.310	-.2454
-1.200	-.644	.458	-.0926	1.100	-.391	-.322	-.2305
-1.150	-.621	.453	-.1026	1.150	-.407	-.333	-.2163
-1.100	-.599	.447	-.1135	1.200	-.424	-.343	-.2028
-1.050	-.576	.441	-.1254	1.250	-.441	-.353	-.1900
-1.000	-.555	.435	-.1383	1.300	-.459	-.362	-.1780
-.950	-.533	.428	-.1522	1.350	-.478	-.371	-.1666
-.900	-.512	.420	-.1671	1.400	-.496	-.379	-.1559
-.850	-.491	.411	-.1832	1.450	-.515	-.387	-.1459
-.800	-.471	.401	-.2002	1.500	-.535	-.394	-.1365
-.750	-.451	.391	-.2183	1.550	-.555	-.400	-.1277
-.700	-.432	.379	-.2373	1.600	-.575	-.406	-.1194
-.650	-.413	.367	-.2571	1.700	-.616	-.418	-.1045
-.600	-.395	.354	-.2775	1.800	-.659	-.427	-.0915
-.550	-.378	.339	-.2986	1.900	-.702	-.436	-.0802
-.500	-.361	.324	-.3199	2.000	-.746	-.444	-.0703
-.450	-.345	.307	-.3413	2.100	-.790	-.450	-.0617
-.400	-.330	.290	-.3625	2.200	-.836	-.456	-.0542
-.350	-.316	.271	-.3832	2.300	-.882	-.461	-.0477
-.300	-.303	.251	-.4032	2.400	-.928	-.465	-.0420
-.250	-.291	.231	-.4219	2.500	-.975	-.469	-.0370
-.200	-.280	.209	-.4392	2.600	-1.022	-.473	-.0326
-.150	-.270	.187	-.4547	2.700	-1.069	-.476	-.0288
-.100	-.262	.164	-.4682	2.800	-1.117	-.479	-.0255
-.050	-.254	.140	-.4792	2.900	-1.165	-.481	-.0225

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = .75 DB							
-3.000	-1.538	.499	-.0016	.000	-.255	.122	-.4856
-2.900	-1.488	.499	-.0020	.050	-.250	.098	-.4921
-2.800	-1.438	.499	-.0025	.100	-.246	.073	-.4959
-2.700	-1.388	.499	-.0032	.150	-.242	.048	-.4969
-2.600	-1.338	.498	-.0040	.200	-.241	.023	-.4952
-2.500	-1.288	.498	-.0050	.250	-.240	-.001	-.4908
-2.400	-1.239	.497	-.0063	.300	-.241	-.026	-.4839
-2.300	-1.189	.497	-.0079	.350	-.243	-.050	-.4748
-2.200	-1.139	.496	-.0099	.400	-.246	-.073	-.4636
-2.100	-1.090	.495	-.0124	.450	-.250	-.096	-.4506
-2.000	-1.040	.493	-.0156	.500	-.255	-.118	-.4361
-1.900	-.991	.491	-.0196	.550	-.262	-.140	-.4204
-1.800	-.942	.489	-.0245	.600	-.269	-.160	-.4038
-1.700	-.893	.486	-.0306	.650	-.278	-.180	-.3866
-1.600	-.845	.483	-.0382	.700	-.287	-.199	-.3689
-1.550	-.821	.481	-.0427	.750	-.298	-.217	-.3510
-1.500	-.797	.479	-.0476	.800	-.309	-.234	-.3332
-1.450	-.773	.476	-.0531	.850	-.321	-.250	-.3156
-1.400	-.749	.473	-.0591	.900	-.334	-.266	-.2983
-1.350	-.726	.470	-.0658	.950	-.348	-.280	-.2814
-1.300	-.702	.467	-.0732	1.000	-.362	-.294	-.2651
-1.250	-.679	.463	-.0813	1.050	-.377	-.307	-.2493
-1.200	-.656	.459	-.0902	1.100	-.393	-.319	-.2343
-1.150	-.633	.454	-.1000	1.150	-.409	-.330	-.2199
-1.100	-.610	.449	-.1107	1.200	-.426	-.341	-.2062
-1.050	-.588	.443	-.1223	1.250	-.443	-.351	-.1933
-1.000	-.566	.436	-.1350	1.300	-.461	-.360	-.1811
-.950	-.545	.429	-.1486	1.350	-.479	-.369	-.1695
-.900	-.523	.422	-.1633	1.400	-.498	-.377	-.1587
-.850	-.502	.413	-.1791	1.450	-.517	-.385	-.1485
-.800	-.482	.404	-.1959	1.500	-.536	-.392	-.1389
-.750	-.462	.393	-.2137	1.550	-.556	-.399	-.1299
-.700	-.443	.382	-.2324	1.600	-.576	-.405	-.1215
-.650	-.424	.370	-.2520	1.700	-.617	-.416	-.1064
-.600	-.406	.357	-.2723	1.800	-.659	-.426	-.0931
-.550	-.388	.343	-.2932	1.900	-.702	-.435	-.0816
-.500	-.371	.328	-.3144	2.000	-.746	-.443	-.0715
-.450	-.355	.311	-.3358	2.100	-.791	-.449	-.0628
-.400	-.340	.294	-.3571	2.200	-.836	-.455	-.0552
-.350	-.326	.276	-.3779	2.300	-.882	-.460	-.0485
-.300	-.313	.256	-.3981	2.400	-.928	-.465	-.0427
-.250	-.300	.236	-.4171	2.500	-.975	-.469	-.0376
-.200	-.289	.215	-.4348	2.600	-1.022	-.472	-.0332
-.150	-.279	.193	-.4508	2.700	-1.069	-.476	-.0293
-.100	-.270	.170	-.4647	2.800	-1.117	-.478	-.0259
-.050	-.262	.146	-.4764	2.900	-1.165	-.481	-.0229

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 1.00 DB							
-3.000	-1.550	.499	-.0016	.000	-.263	.128	-.4831
-2.900	-1.500	.499	-.0019	.050	-.257	.104	-.4903
-2.800	-1.450	.499	-.0024	.100	-.253	.079	-.4948
-2.700	-1.401	.499	-.0031	.150	-.249	.054	-.4965
-2.600	-1.351	.498	-.0039	.200	-.247	.030	-.4955
-2.500	-1.301	.498	-.0049	.250	-.246	.005	-.4918
-2.400	-1.251	.497	-.0061	.300	-.247	-.020	-.4856
-2.300	-1.201	.497	-.0077	.350	-.248	-.044	-.4770
-2.200	-1.152	.496	-.0096	.400	-.251	-.067	-.4663
-2.100	-1.102	.495	-.0121	.450	-.255	-.090	-.4538
-2.000	-1.053	.493	-.0152	.500	-.260	-.113	-.4397
-1.900	-1.004	.492	-.0190	.550	-.266	-.134	-.4244
-1.800	-.955	.490	-.0238	.600	-.274	-.155	-.4080
-1.700	-.906	.487	-.0298	.650	-.282	-.175	-.3910
-1.600	-.857	.484	-.0372	.700	-.291	-.194	-.3734
-1.550	-.833	.482	-.0415	.750	-.301	-.212	-.3556
-1.500	-.809	.479	-.0463	.800	-.312	-.230	-.3378
-1.450	-.785	.477	-.0517	.850	-.324	-.246	-.3201
-1.400	-.761	.474	-.0576	.900	-.337	-.262	-.3027
-1.350	-.738	.471	-.0641	.950	-.350	-.276	-.2857
-1.300	-.714	.468	-.0713	1.000	-.364	-.290	-.2693
-1.250	-.691	.464	-.0793	1.050	-.379	-.303	-.2534
-1.200	-.668	.460	-.0880	1.100	-.395	-.316	-.2382
-1.150	-.645	.455	-.0975	1.150	-.411	-.327	-.2236
-1.100	-.622	.450	-.1080	1.200	-.427	-.338	-.2098
-1.050	-.600	.444	-.1194	1.250	-.445	-.348	-.1967
-1.000	-.578	.438	-.1318	1.300	-.462	-.358	-.1842
-.950	-.556	.431	-.1452	1.350	-.480	-.367	-.1725
-.900	-.535	.424	-.1596	1.400	-.499	-.375	-.1615
-.850	-.514	.415	-.1751	1.450	-.518	-.383	-.1511
-.800	-.493	.406	-.1916	1.500	-.537	-.390	-.1414
-.750	-.473	.396	-.2091	1.550	-.557	-.397	-.1323
-.700	-.454	.385	-.2276	1.600	-.577	-.403	-.1237
-.650	-.435	.373	-.2470	1.700	-.618	-.415	-.1083
-.600	-.416	.360	-.2671	1.800	-.660	-.425	-.0948
-.550	-.399	.347	-.2878	1.900	-.703	-.434	-.0831
-.500	-.382	.332	-.3090	2.000	-.746	-.442	-.0728
-.450	-.366	.316	-.3303	2.100	-.791	-.448	-.0639
-.400	-.350	.299	-.3516	2.200	-.836	-.454	-.0561
-.350	-.336	.280	-.3725	2.300	-.882	-.460	-.0494
-.300	-.322	.261	-.3928	2.400	-.928	-.464	-.0434
-.250	-.310	.241	-.4122	2.500	-.975	-.468	-.0383
-.200	-.298	.220	-.4302	2.600	-1.022	-.472	-.0338
-.150	-.288	.198	-.4466	2.700	-1.069	-.475	-.0298
-.100	-.278	.176	-.4610	2.800	-1.117	-.478	-.0263
-.050	-.270	.152	-.4733	2.900	-1.165	-.480	-.0233

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

log KP_o	log ϕ	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	log KP_o	log ϕ	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 1.25 DB							
-3.000	-1.563	.499	-.0015	.000	-.271	.134	-.4803
-2.900	-1.513	.499	-.0019	.050	-.265	.110	-.4882
-2.800	-1.463	.499	-.0024	.100	-.260	.086	-.4934
-2.700	-1.413	.499	-.0030	.150	-.256	.061	-.4958
-2.600	-1.363	.498	-.0038	.200	-.254	.036	-.4955
-2.500	-1.313	.498	-.0047	.250	-.253	.011	-.4925
-2.400	-1.264	.497	-.0059	.300	-.253	-.013	-.4869
-2.300	-1.214	.497	-.0075	.350	-.254	-.037	-.4790
-2.200	-1.164	.496	-.0094	.400	-.257	-.061	-.4689
-2.100	-1.115	.495	-.0118	.450	-.260	-.084	-.4569
-2.000	-1.065	.494	-.0148	.500	-.265	-.107	-.4432
-1.900	-1.016	.492	-.0185	.550	-.271	-.128	-.4282
-1.800	-.967	.490	-.0232	.600	-.278	-.149	-.4122
-1.700	-.918	.487	-.0290	.650	-.286	-.170	-.3953
-1.600	-.870	.484	-.0362	.700	-.295	-.189	-.3779
-1.550	-.845	.482	-.0404	.750	-.305	-.207	-.3602
-1.500	-.821	.480	-.0451	.800	-.315	-.225	-.3424
-1.450	-.797	.478	-.0503	.850	-.327	-.242	-.3247
-1.400	-.774	.475	-.0561	.900	-.340	-.257	-.3072
-1.350	-.750	.472	-.0625	.950	-.353	-.272	-.2902
-1.300	-.726	.469	-.0695	1.000	-.367	-.287	-.2736
-1.250	-.703	.465	-.0773	1.050	-.381	-.300	-.2576
-1.200	-.680	.461	-.0858	1.100	-.397	-.312	-.2422
-1.150	-.657	.456	-.0951	1.150	-.413	-.324	-.2275
-1.100	-.634	.451	-.1054	1.200	-.429	-.335	-.2134
-1.050	-.612	.446	-.1165	1.250	-.446	-.345	-.2001
-1.000	-.590	.440	-.1286	1.300	-.464	-.355	-.1875
-.950	-.568	.433	-.1418	1.350	-.482	-.364	-.1756
-.900	-.546	.425	-.1559	1.400	-.500	-.373	-.1644
-.850	-.525	.417	-.1711	1.450	-.519	-.381	-.1539
-.800	-.505	.408	-.1874	1.500	-.538	-.388	-.1440
-.750	-.485	.399	-.2047	1.550	-.558	-.395	-.1347
-.700	-.465	.388	-.2229	1.600	-.578	-.402	-.1260
-.650	-.446	.376	-.2420	1.700	-.618	-.413	-.1103
-.600	-.427	.364	-.2620	1.800	-.660	-.424	-.0966
-.550	-.409	.350	-.2825	1.900	-.703	-.433	-.0846
-.500	-.392	.335	-.3035	2.000	-.747	-.441	-.0741
-.450	-.376	.320	-.3248	2.100	-.791	-.448	-.0651
-.400	-.360	.303	-.3461	2.200	-.836	-.454	-.0571
-.350	-.346	.285	-.3671	2.300	-.882	-.459	-.0502
-.300	-.332	.266	-.3875	2.400	-.928	-.464	-.0442
-.250	-.319	.246	-.4070	2.500	-.975	-.468	-.0390
-.200	-.307	.226	-.4254	2.600	-1.022	-.472	-.0343
-.150	-.296	.204	-.4421	2.700	-1.069	-.475	-.0303
-.100	-.287	.181	-.4571	2.800	-1.117	-.478	-.0268
-.050	-.278	.158	-.4699	2.900	-1.164	-.480	-.0237

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 1.50 DB							
-3.000	-1.575	.499	-.0015	.000	-.279	.141	-.4772
-2.900	-1.525	.499	-.0018	.050	-.273	.116	-.4858
-2.800	-1.475	.499	-.0023	.100	-.267	.092	-.4916
-2.700	-1.426	.499	-.0029	.150	-.263	.067	-.4948
-2.600	-1.376	.498	-.0037	.200	-.261	.043	-.4952
-2.500	-1.326	.498	-.0046	.250	-.259	.018	-.4929
-2.400	-1.276	.497	-.0058	.300	-.259	-.007	-.4881
-2.300	-1.226	.497	-.0073	.350	-.260	-.031	-.4808
-2.200	-1.177	.496	-.0091	.400	-.262	-.055	-.4712
-2.100	-1.127	.495	-.0115	.450	-.265	-.078	-.4598
-2.000	-1.078	.494	-.0144	.500	-.270	-.101	-.4466
-1.900	-1.028	.492	-.0180	.550	-.275	-.123	-.4320
-1.800	-.979	.490	-.0226	.600	-.282	-.144	-.4162
-1.700	-.930	.488	-.0282	.650	-.290	-.164	-.3996
-1.600	-.882	.484	-.0353	.700	-.298	-.184	-.3824
-1.550	-.858	.483	-.0394	.750	-.308	-.202	-.3648
-1.500	-.834	.480	-.0440	.800	-.319	-.220	-.3470
-1.450	-.810	.478	-.0490	.850	-.330	-.237	-.3293
-1.400	-.786	.476	-.0547	.900	-.342	-.253	-.3118
-1.350	-.762	.473	-.0609	.950	-.355	-.268	-.2947
-1.300	-.739	.469	-.0678	1.000	-.369	-.283	-.2780
-1.250	-.715	.466	-.0753	1.050	-.384	-.296	-.2618
-1.200	-.692	.462	-.0836	1.100	-.399	-.309	-.2463
-1.150	-.669	.457	-.0928	1.150	-.415	-.321	-.2314
-1.100	-.646	.453	-.1028	1.200	-.431	-.332	-.2172
-1.050	-.624	.447	-.1137	1.250	-.448	-.343	-.2037
-1.000	-.602	.441	-.1256	1.300	-.465	-.352	-.1909
-.950	-.580	.435	-.1385	1.350	-.483	-.362	-.1788
-.900	-.558	.427	-.1524	1.400	-.501	-.370	-.1675
-.850	-.537	.419	-.1673	1.450	-.520	-.378	-.1567
-.800	-.516	.411	-.1833	1.500	-.539	-.386	-.1467
-.750	-.496	.401	-.2003	1.550	-.559	-.393	-.1372
-.700	-.476	.391	-.2183	1.600	-.578	-.400	-.1284
-.650	-.457	.379	-.2371	1.700	-.619	-.412	-.1124
-.600	-.438	.367	-.2568	1.800	-.661	-.422	-.0984
-.550	-.420	.353	-.2772	1.900	-.703	-.431	-.0862
-.500	-.403	.339	-.2981	2.000	-.747	-.440	-.0755
-.450	-.386	.324	-.3192	2.100	-.791	-.447	-.0663
-.400	-.370	.307	-.3405	2.200	-.836	-.453	-.0582
-.350	-.356	.290	-.3615	2.300	-.882	-.458	-.0512
-.300	-.342	.271	-.3820	2.400	-.928	-.463	-.0450
-.250	-.328	.251	-.4018	2.500	-.974	-.467	-.0397
-.200	-.316	.231	-.4204	2.600	-1.021	-.471	-.0350
-.150	-.305	.209	-.4375	2.700	-1.069	-.474	-.0309
-.100	-.295	.187	-.4529	2.800	-1.116	-.477	-.0273
-.050	-.287	.164	-.4662	2.900	-1.164	-.480	-.0241

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 1.75 DB							
-3.000	-1.588	.499	-.0014	.000	-.287	.147	-.4739
-2.900	-1.538	.499	-.0018	.050	-.280	.123	-.4831
-2.800	-1.488	.499	-.0022	.100	-.275	.098	-.4896
-2.700	-1.438	.499	-.0028	.150	-.271	.074	-.4935
-2.600	-1.388	.498	-.0036	.200	-.268	.049	-.4946
-2.500	-1.338	.498	-.0045	.250	-.266	.024	-.4930
-2.400	-1.289	.498	-.0056	.300	-.265	-.000	-.4889
-2.300	-1.239	.497	-.0071	.350	-.266	-.024	-.4823
-2.200	-1.189	.496	-.0089	.400	-.268	-.048	-.4734
-2.100	-1.140	.495	-.0112	.450	-.271	-.072	-.4625
-2.000	-1.090	.494	-.0140	.500	-.275	-.095	-.4498
-1.900	-1.041	.492	-.0176	.550	-.280	-.117	-.4356
-1.800	-.992	.490	-.0220	.600	-.286	-.138	-.4202
-1.700	-.943	.488	-.0275	.650	-.294	-.159	-.4038
-1.600	-.894	.485	-.0344	.700	-.302	-.178	-.3868
-1.550	-.870	.483	-.0384	.750	-.312	-.197	-.3694
-1.500	-.846	.481	-.0428	.800	-.322	-.215	-.3517
-1.450	-.822	.479	-.0478	.850	-.333	-.233	-.3340
-1.400	-.798	.476	-.0533	.900	-.345	-.249	-.3165
-1.350	-.774	.473	-.0593	.950	-.358	-.264	-.2993
-1.300	-.751	.470	-.0661	1.000	-.372	-.279	-.2825
-1.250	-.727	.467	-.0734	1.050	-.386	-.292	-.2662
-1.200	-.704	.463	-.0816	1.100	-.401	-.305	-.2505
-1.150	-.681	.459	-.0905	1.150	-.416	-.317	-.2355
-1.100	-.658	.454	-.1003	1.200	-.433	-.329	-.2211
-1.050	-.636	.449	-.1110	1.250	-.449	-.340	-.2074
-1.000	-.613	.443	-.1226	1.300	-.466	-.350	-.1944
-.950	-.591	.436	-.1352	1.350	-.484	-.359	-.1822
-.900	-.570	.429	-.1489	1.400	-.502	-.368	-.1706
-.850	-.548	.421	-.1635	1.450	-.521	-.376	-.1597
-.800	-.528	.413	-.1792	1.500	-.540	-.384	-.1495
-.750	-.507	.403	-.1960	1.550	-.559	-.391	-.1398
-.700	-.487	.393	-.2137	1.600	-.579	-.398	-.1308
-.650	-.468	.382	-.2323	1.700	-.619	-.410	-.1145
-.600	-.449	.370	-.2518	1.800	-.661	-.421	-.1002
-.550	-.431	.357	-.2719	1.900	-.704	-.430	-.0878
-.500	-.413	.343	-.2926	2.000	-.747	-.438	-.0770
-.450	-.397	.328	-.3137	2.100	-.791	-.446	-.0675
-.400	-.381	.311	-.3349	2.200	-.836	-.452	-.0593
-.350	-.366	.294	-.3559	2.300	-.882	-.458	-.0521
-.300	-.351	.276	-.3765	2.400	-.928	-.462	-.0458
-.250	-.338	.256	-.3964	2.500	-.974	-.467	-.0404
-.200	-.326	.236	-.4152	2.600	-1.021	-.471	-.0356
-.150	-.314	.215	-.4327	2.700	-1.068	-.474	-.0314
-.100	-.304	.193	-.4485	2.800	-1.116	-.477	-.0277
-.050	-.295	.170	-.4623	2.900	-1.164	-.479	-.0245

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 2.00 DB							
-3.000	-1.600	.499	-.0014	.000	-.295	.153	-.4703
-2.900	-1.550	.499	-.0017	.050	-.288	.129	-.4801
-2.800	-1.500	.499	-.0022	.100	-.282	.105	-.4873
-2.700	-1.451	.499	-.0028	.150	-.278	.080	-.4919
-2.600	-1.401	.498	-.0035	.200	-.274	.056	-.4937
-2.500	-1.351	.498	-.0044	.250	-.272	.031	-.4929
-2.400	-1.301	.498	-.0055	.300	-.271	.006	-.4894
-2.300	-1.251	.497	-.0069	.350	-.272	-.018	-.4835
-2.200	-1.202	.496	-.0087	.400	-.273	-.042	-.4752
-2.100	-1.152	.495	-.0109	.450	-.276	-.065	-.4649
-2.000	-1.103	.494	-.0136	.500	-.280	-.088	-.4528
-1.900	-1.053	.493	-.0171	.550	-.285	-.111	-.4390
-1.800	-1.004	.491	-.0214	.600	-.291	-.132	-.4240
-1.700	-.955	.488	-.0268	.650	-.298	-.153	-.4080
-1.600	-.906	.485	-.0335	.700	-.306	-.173	-.3912
-1.550	-.882	.483	-.0374	.750	-.315	-.192	-.3739
-1.500	-.858	.481	-.0417	.800	-.325	-.210	-.3563
-1.450	-.834	.479	-.0466	.850	-.336	-.228	-.3387
-1.400	-.810	.477	-.0519	.900	-.348	-.244	-.3212
-1.350	-.786	.474	-.0579	.950	-.361	-.260	-.3039
-1.300	-.763	.471	-.0644	1.000	-.374	-.275	-.2870
-1.250	-.739	.468	-.0716	1.050	-.388	-.289	-.2706
-1.200	-.716	.464	-.0796	1.100	-.403	-.302	-.2548
-1.150	-.693	.460	-.0883	1.150	-.418	-.314	-.2396
-1.100	-.670	.455	-.0979	1.200	-.434	-.326	-.2250
-1.050	-.648	.450	-.1083	1.250	-.451	-.337	-.2112
-1.000	-.625	.444	-.1197	1.300	-.468	-.347	-.1980
-.950	-.603	.438	-.1321	1.350	-.485	-.356	-.1856
-.900	-.581	.431	-.1454	1.400	-.503	-.365	-.1738
-.850	-.560	.423	-.1598	1.450	-.522	-.374	-.1628
-.800	-.539	.415	-.1753	1.500	-.541	-.382	-.1523
-.750	-.519	.406	-.1917	1.550	-.560	-.389	-.1426
-.700	-.499	.396	-.2092	1.600	-.580	-.396	-.1334
-.650	-.479	.385	-.2275	1.700	-.620	-.408	-.1167
-.600	-.460	.373	-.2467	1.800	-.661	-.419	-.1022
-.550	-.442	.360	-.2667	1.900	-.704	-.429	-.0895
-.500	-.424	.346	-.2872	2.000	-.747	-.437	-.0785
-.450	-.407	.331	-.3081	2.100	-.791	-.445	-.0688
-.400	-.391	.315	-.3292	2.200	-.836	-.451	-.0604
-.350	-.376	.298	-.3502	2.300	-.881	-.457	-.0531
-.300	-.361	.280	-.3709	2.400	-.927	-.462	-.0467
-.250	-.348	.261	-.3909	2.500	-.974	-.466	-.0411
-.200	-.335	.241	-.4100	2.600	-1.021	-.470	-.0363
-.150	-.323	.220	-.4277	2.700	-1.068	-.473	-.0320
-.100	-.313	.199	-.4439	2.800	-1.115	-.476	-.0283
-.050	-.304	.176	-.4582	2.900	-1.163	-.479	-.0250

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

log KP_o	log ϕ	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	log KP_o	log ϕ	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 2.25 DB							
-3.000	-1.613	.499	-.0014	.000	-.304	.159	-.4665
-2.900	-1.563	.499	-.0017	.050	-.296	.135	-.4768
-2.800	-1.513	.499	-.0021	.100	-.290	.111	-.4847
-2.700	-1.463	.499	-.0027	.150	-.285	.087	-.4899
-2.600	-1.413	.499	-.0034	.200	-.281	.062	-.4925
-2.500	-1.363	.498	-.0042	.250	-.279	.038	-.4924
-2.400	-1.314	.498	-.0053	.300	-.278	.013	-.4897
-2.300	-1.264	.497	-.0067	.350	-.278	-.011	-.4844
-2.200	-1.214	.496	-.0084	.400	-.279	-.035	-.4769
-2.100	-1.165	.495	-.0106	.450	-.281	-.059	-.4672
-2.000	-1.115	.494	-.0133	.500	-.285	-.082	-.4555
-1.900	-1.066	.493	-.0167	.550	-.289	-.104	-.4423
-1.800	-1.017	.491	-.0209	.600	-.295	-.126	-.4277
-1.700	-.968	.488	-.0261	.650	-.302	-.147	-.4120
-1.600	-.919	.486	-.0326	.700	-.310	-.167	-.3955
-1.550	-.895	.484	-.0365	.750	-.319	-.187	-.3784
-1.500	-.870	.482	-.0407	.800	-.328	-.205	-.3610
-1.450	-.846	.480	-.0454	.850	-.339	-.223	-.3434
-1.400	-.822	.477	-.0506	.900	-.351	-.240	-.3259
-1.350	-.799	.475	-.0564	.950	-.363	-.255	-.3086
-1.300	-.775	.472	-.0628	1.000	-.376	-.270	-.2916
-1.250	-.752	.468	-.0699	1.050	-.390	-.285	-.2751
-1.200	-.728	.465	-.0776	1.100	-.405	-.298	-.2592
-1.150	-.705	.461	-.0862	1.150	-.420	-.311	-.2438
-1.100	-.682	.456	-.0955	1.200	-.436	-.322	-.2291
-1.050	-.659	.451	-.1058	1.250	-.452	-.333	-.2151
-1.000	-.637	.445	-.1169	1.300	-.469	-.344	-.2018
-.950	-.615	.439	-.1290	1.350	-.487	-.354	-.1891
-.900	-.593	.433	-.1421	1.400	-.504	-.363	-.1772
-.850	-.572	.425	-.1562	1.450	-.523	-.371	-.1659
-.800	-.551	.417	-.1714	1.500	-.542	-.379	-.1553
-.750	-.530	.408	-.1876	1.550	-.561	-.387	-.1454
-.700	-.510	.398	-.2047	1.600	-.580	-.394	-.1360
-.650	-.490	.387	-.2228	1.700	-.620	-.407	-.1191
-.600	-.471	.376	-.2418	1.800	-.662	-.418	-.1042
-.550	-.453	.363	-.2615	1.900	-.704	-.428	-.0913
-.500	-.435	.350	-.2818	2.000	-.747	-.436	-.0800
-.450	-.418	.335	-.3026	2.100	-.791	-.444	-.0702
-.400	-.401	.319	-.3236	2.200	-.836	-.450	-.0616
-.350	-.386	.303	-.3445	2.300	-.881	-.456	-.0541
-.300	-.371	.285	-.3652	2.400	-.927	-.461	-.0476
-.250	-.357	.266	-.3853	2.500	-.973	-.466	-.0419
-.200	-.344	.246	-.4046	2.600	-1.020	-.469	-.0370
-.150	-.333	.226	-.4226	2.700	-1.067	-.473	-.0326
-.100	-.322	.204	-.4391	2.800	-1.115	-.476	-.0288
-.050	-.312	.182	-.4538	2.900	-1.162	-.479	-.0254

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 2.50 DB							
-3.000	-1.625	.499	-.0013	.000	-.312	.165	-.4624
-2.900	-1.575	.499	-.0017	.050	-.304	.142	-.4733
-2.800	-1.525	.499	-.0021	.100	-.298	.118	-.4818
-2.700	-1.475	.499	-.0026	.150	-.293	.093	-.4877
-2.600	-1.426	.499	-.0033	.200	-.289	.069	-.4910
-2.500	-1.376	.498	-.0041	.250	-.286	.044	-.4916
-2.400	-1.326	.498	-.0052	.300	-.284	.020	-.4896
-2.300	-1.276	.497	-.0065	.350	-.284	-.005	-.4851
-2.200	-1.227	.496	-.0082	.400	-.285	-.029	-.4782
-2.100	-1.177	.495	-.0103	.450	-.287	-.052	-.4691
-2.000	-1.127	.494	-.0129	.500	-.290	-.076	-.4581
-1.900	-1.078	.493	-.0162	.550	-.294	-.098	-.4454
-1.800	-1.029	.491	-.0203	.600	-.300	-.120	-.4312
-1.700	-.980	.489	-.0255	.650	-.306	-.141	-.4159
-1.600	-.931	.486	-.0318	.700	-.314	-.162	-.3997
-1.550	-.907	.484	-.0355	.750	-.322	-.181	-.3828
-1.500	-.883	.482	-.0397	.800	-.332	-.200	-.3656
-1.450	-.859	.480	-.0443	.850	-.342	-.218	-.3481
-1.400	-.835	.478	-.0494	.900	-.354	-.235	-.3306
-1.350	-.811	.475	-.0550	.950	-.366	-.251	-.3133
-1.300	-.787	.472	-.0613	1.000	-.379	-.266	-.2963
-1.250	-.764	.469	-.0682	1.050	-.392	-.280	-.2797
-1.200	-.740	.466	-.0757	1.100	-.407	-.294	-.2637
-1.150	-.717	.462	-.0841	1.150	-.422	-.307	-.2482
-1.100	-.694	.457	-.0932	1.200	-.437	-.319	-.2333
-1.050	-.671	.452	-.1032	1.250	-.454	-.330	-.2191
-1.000	-.649	.447	-.1142	1.300	-.470	-.341	-.2056
-.950	-.627	.441	-.1260	1.350	-.488	-.351	-.1927
-.900	-.605	.434	-.1389	1.400	-.505	-.360	-.1806
-.850	-.583	.427	-.1527	1.450	-.524	-.369	-.1692
-.800	-.562	.419	-.1676	1.500	-.542	-.377	-.1584
-.750	-.541	.410	-.1835	1.550	-.561	-.385	-.1482
-.700	-.521	.401	-.2004	1.600	-.581	-.392	-.1387
-.650	-.501	.390	-.2182	1.700	-.621	-.405	-.1215
-.600	-.482	.379	-.2369	1.800	-.662	-.416	-.1063
-.550	-.464	.366	-.2564	1.900	-.704	-.426	-.0931
-.500	-.446	.353	-.2765	2.000	-.747	-.435	-.0816
-.450	-.428	.339	-.2971	2.100	-.791	-.443	-.0716
-.400	-.412	.323	-.3179	2.200	-.835	-.449	-.0628
-.350	-.396	.307	-.3388	2.300	-.881	-.455	-.0552
-.300	-.381	.290	-.3595	2.400	-.926	-.460	-.0486
-.250	-.367	.271	-.3797	2.500	-.973	-.465	-.0427
-.200	-.354	.252	-.3991	2.600	-1.019	-.469	-.0377
-.150	-.342	.231	-.4173	2.700	-1.066	-.472	-.0332
-.100	-.331	.210	-.4341	2.800	-1.114	-.476	-.0293
-.050	-.321	.188	-.4493	2.900	-1.161	-.478	-.0259

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 2.75 DB							
-3.000	-1.638	.499	-.0013	.000	-.320	.171	-.4581
-2.900	-1.588	.499	-.0016	.050	-.313	.148	-.4695
-2.800	-1.538	.499	-.0020	.100	-.306	.124	-.4786
-2.700	-1.488	.499	-.0025	.150	-.300	.100	-.4852
-2.600	-1.438	.499	-.0032	.200	-.296	.076	-.4892
-2.500	-1.388	.498	-.0040	.250	-.293	.051	-.4905
-2.400	-1.338	.498	-.0051	.300	-.291	.027	-.4892
-2.300	-1.289	.497	-.0064	.350	-.290	.002	-.4855
-2.200	-1.239	.497	-.0080	.400	-.290	-.022	-.4793
-2.100	-1.189	.496	-.0100	.450	-.292	-.046	-.4709
-2.000	-1.140	.494	-.0126	.500	-.295	-.069	-.4605
-1.900	-1.091	.493	-.0158	.550	-.299	-.092	-.4483
-1.800	-1.041	.491	-.0198	.600	-.304	-.114	-.4346
-1.700	-.992	.489	-.0248	.650	-.310	-.135	-.4197
-1.600	-.944	.486	-.0310	.700	-.318	-.156	-.4038
-1.550	-.919	.485	-.0346	.750	-.326	-.176	-.3872
-1.500	-.895	.483	-.0387	.800	-.335	-.194	-.3701
-1.450	-.871	.481	-.0432	.850	-.345	-.213	-.3528
-1.400	-.847	.478	-.0482	.900	-.356	-.230	-.3354
-1.350	-.823	.476	-.0537	.950	-.368	-.246	-.3181
-1.300	-.799	.473	-.0598	1.000	-.381	-.262	-.3011
-1.250	-.776	.470	-.0665	1.050	-.394	-.276	-.2844
-1.200	-.752	.466	-.0739	1.100	-.409	-.290	-.2682
-1.150	-.729	.463	-.0821	1.150	-.423	-.303	-.2526
-1.100	-.706	.458	-.0910	1.200	-.439	-.315	-.2376
-1.050	-.683	.453	-.1008	1.250	-.455	-.327	-.2232
-1.000	-.661	.448	-.1115	1.300	-.472	-.338	-.2095
-.950	-.639	.442	-.1231	1.350	-.489	-.348	-.1965
-.900	-.617	.436	-.1357	1.400	-.506	-.357	-.1842
-.850	-.595	.429	-.1493	1.450	-.524	-.366	-.1725
-.800	-.574	.421	-.1639	1.500	-.543	-.375	-.1616
-.750	-.553	.412	-.1795	1.550	-.562	-.382	-.1512
-.700	-.533	.403	-.1961	1.600	-.581	-.390	-.1416
-.650	-.513	.393	-.2136	1.700	-.621	-.403	-.1239
-.600	-.493	.382	-.2321	1.800	-.662	-.415	-.1085
-.550	-.474	.369	-.2513	1.900	-.704	-.425	-.0950
-.500	-.456	.356	-.2712	2.000	-.747	-.434	-.0833
-.450	-.439	.342	-.2916	2.100	-.790	-.441	-.0730
-.400	-.422	.327	-.3123	2.200	-.835	-.448	-.0641
-.350	-.406	.311	-.3331	2.300	-.880	-.454	-.0563
-.300	-.391	.294	-.3537	2.400	-.926	-.460	-.0495
-.250	-.377	.276	-.3740	2.500	-.972	-.464	-.0436
-.200	-.363	.257	-.3934	2.600	-1.019	-.468	-.0384
-.150	-.351	.236	-.4119	2.700	-1.066	-.472	-.0339
-.100	-.340	.215	-.4290	2.800	-1.113	-.475	-.0299
-.050	-.330	.194	-.4445	2.900	-1.161	-.478	-.0264

TABLE III. - INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\dfrac{d(\log \phi)}{d(\log KP_o)}$	$\dfrac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\dfrac{d(\log \phi)}{d(\log KP_o)}$	$\dfrac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 3.00 DB							
-3.000	-1.650	.499	-.0013	.000	-.329	.177	-.4535
-2.900	-1.600	.499	-.0016	.050	-.321	.154	-.4655
-2.800	-1.550	.499	-.0020	.100	-.314	.130	-.4751
-2.700	-1.500	.499	-.0025	.150	-.308	.106	-.4824
-2.600	-1.451	.499	-.0031	.200	-.303	.082	-.4870
-2.500	-1.401	.498	-.0039	.250	-.300	.058	-.4891
-2.400	-1.351	.498	-.0049	.300	-.297	.033	-.4886
-2.300	-1.301	.497	-.0062	.350	-.296	.009	-.4855
-2.200	-1.251	.497	-.0078	.400	-.296	-.015	-.4800
-2.100	-1.202	.496	-.0098	.450	-.298	-.039	-.4723
-2.000	-1.152	.495	-.0123	.500	-.300	-.062	-.4626
-1.900	-1.103	.493	-.0154	.550	-.304	-.085	-.4510
-1.800	-1.054	.492	-.0193	.600	-.309	-.107	-.4378
-1.700	-1.005	.489	-.0242	.650	-.315	-.129	-.4234
-1.600	-.956	.487	-.0302	.700	-.322	-.150	-.4078
-1.550	-.932	.485	-.0338	.750	-.330	-.170	-.3915
-1.500	-.907	.483	-.0377	.800	-.339	-.189	-.3747
-1.450	-.883	.481	-.0421	.850	-.349	-.207	-.3575
-1.400	-.859	.479	-.0470	.900	-.359	-.225	-.3402
-1.350	-.835	.477	-.0524	.950	-.371	-.241	-.3229
-1.300	-.812	.474	-.0583	1.000	-.383	-.257	-.3058
-1.250	-.788	.471	-.0649	1.050	-.397	-.272	-.2891
-1.200	-.765	.467	-.0721	1.100	-.411	-.286	-.2728
-1.150	-.741	.463	-.0801	1.150	-.425	-.299	-.2571
-1.100	-.718	.459	-.0889	1.200	-.440	-.312	-.2419
-1.050	-.695	.455	-.0984	1.250	-.456	-.323	-.2274
-1.000	-.673	.449	-.1089	1.300	-.473	-.334	-.2135
-.950	-.650	.444	-.1203	1.350	-.490	-.345	-.2003
-.900	-.628	.437	-.1326	1.400	-.507	-.354	-.1878
-.850	-.607	.430	-.1459	1.450	-.525	-.363	-.1760
-.800	-.585	.423	-.1602	1.500	-.544	-.372	-.1648
-.750	-.564	.414	-.1756	1.550	-.562	-.380	-.1543
-.700	-.544	.405	-.1919	1.600	-.582	-.387	-.1445
-.650	-.524	.395	-.2092	1.700	-.621	-.401	-.1265
-.600	-.504	.384	-.2273	1.800	-.662	-.413	-.1108
-.550	-.485	.372	-.2463	1.900	-.704	-.423	-.0970
-.500	-.467	.360	-.2659	2.000	-.746	-.432	-.0850
-.450	-.450	.346	-.2861	2.100	-.790	-.440	-.0746
-.400	-.433	.331	-.3067	2.200	-.834	-.447	-.0654
-.350	-.416	.315	-.3274	2.300	-.879	-.453	-.0575
-.300	-.401	.298	-.3480	2.400	-.925	-.459	-.0505
-.250	-.387	.280	-.3682	2.500	-.971	-.464	-.0445
-.200	-.373	.261	-.3877	2.600	-1.018	-.468	-.0392
-.150	-.361	.242	-.4064	2.700	-1.065	-.471	-.0346
-.100	-.349	.221	-.4237	2.800	-1.112	-.475	-.0305
-.050	-.338	.199	-.4395	2.900	-1.160	-.477	-.0269

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 3.25 DB							
-3.000	-1.663	.499	-.0012	.000	-.338	.183	-.4488
-2.900	-1.613	.499	-.0015	.050	-.329	.160	-.4612
-2.800	-1.563	.499	-.0019	.100	-.322	.137	-.4714
-2.700	-1.513	.499	-.0024	.150	-.315	.113	-.4793
-2.600	-1.463	.499	-.0030	.200	-.310	.089	-.4846
-2.500	-1.413	.498	-.0038	.250	-.307	.065	-.4874
-2.400	-1.363	.498	-.0048	.300	-.304	.040	-.4876
-2.300	-1.314	.497	-.0061	.350	-.303	.016	-.4853
-2.200	-1.264	.497	-.0076	.400	-.302	-.008	-.4805
-2.100	-1.214	.496	-.0096	.450	-.303	-.032	-.4735
-2.000	-1.165	.495	-.0120	.500	-.306	-.056	-.4644
-1.900	-1.115	.493	-.0150	.550	-.309	-.079	-.4534
-1.800	-1.066	.492	-.0189	.600	-.313	-.101	-.4408
-1.700	-1.017	.490	-.0236	.650	-.319	-.123	-.4268
-1.600	-.968	.487	-.0295	.700	-.326	-.144	-.4117
-1.550	-.944	.485	-.0330	.750	-.333	-.164	-.3957
-1.500	-.920	.484	-.0368	.800	-.342	-.183	-.3791
-1.450	-.896	.482	-.0411	.850	-.352	-.202	-.3621
-1.400	-.872	.480	-.0458	.900	-.362	-.219	-.3449
-1.350	-.848	.477	-.0511	.950	-.374	-.236	-.3277
-1.300	-.824	.474	-.0569	1.000	-.386	-.252	-.3107
-1.250	-.800	.471	-.0633	1.050	-.399	-.267	-.2939
-1.200	-.777	.468	-.0704	1.100	-.413	-.282	-.2775
-1.150	-.753	.464	-.0782	1.150	-.427	-.295	-.2617
-1.100	-.730	.460	-.0868	1.200	-.442	-.308	-.2464
-1.050	-.707	.456	-.0961	1.250	-.458	-.320	-.2317
-1.000	-.685	.451	-.1064	1.300	-.474	-.331	-.2176
-.950	-.662	.445	-.1175	1.350	-.491	-.341	-.2043
-.900	-.640	.439	-.1296	1.400	-.508	-.351	-.1916
-.850	-.618	.432	-.1426	1.450	-.526	-.361	-.1796
-.800	-.597	.425	-.1567	1.500	-.544	-.369	-.1682
-.750	-.576	.416	-.1717	1.550	-.563	-.377	-.1575
-.700	-.555	.407	-.1878	1.600	-.582	-.385	-.1475
-.650	-.535	.398	-.2048	1.700	-.621	-.399	-.1292
-.600	-.516	.387	-.2226	1.800	-.662	-.411	-.1131
-.550	-.497	.375	-.2413	1.900	-.703	-.422	-.0991
-.500	-.478	.363	-.2608	2.000	-.746	-.431	-.0868
-.450	-.460	.349	-.2807	2.100	-.789	-.439	-.0761
-.400	-.443	.335	-.3011	2.200	-.834	-.446	-.0668
-.350	-.427	.319	-.3216	2.300	-.879	-.452	-.0587
-.300	-.411	.303	-.3422	2.400	-.924	-.458	-.0516
-.250	-.397	.285	-.3624	2.500	-.970	-.463	-.0454
-.200	-.383	.266	-.3820	2.600	-1.017	-.467	-.0400
-.150	-.370	.247	-.4007	2.700	-1.064	-.471	-.0353
-.100	-.358	.226	-.4183	2.800	-1.111	-.474	-.0311
-.050	-.347	.205	-.4344	2.900	-1.158	-.477	-.0275

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 3.50 DB							
-3.000	-1.675	.499	-.0012	.000	-.346	.189	-.4439
-2.900	-1.625	.499	-.0015	.050	-.338	.166	-.4567
-2.800	-1.575	.499	-.0019	.100	-.330	.143	-.4675
-2.700	-1.525	.499	-.0024	.150	-.323	.119	-.4759
-2.600	-1.476	.499	-.0030	.200	-.318	.095	-.4819
-2.500	-1.426	.498	-.0037	.250	-.314	.071	-.4853
-2.400	-1.376	.498	-.0047	.300	-.311	.047	-.4863
-2.300	-1.326	.497	-.0059	.350	-.309	.023	-.4847
-2.200	-1.276	.497	-.0074	.400	-.308	-.001	-.4807
-2.100	-1.227	.496	-.0093	.450	-.309	-.025	-.4744
-2.000	-1.177	.495	-.0117	.500	-.311	-.049	-.4660
-1.900	-1.128	.494	-.0147	.550	-.314	-.072	-.4556
-1.800	-1.079	.492	-.0184	.600	-.318	-.094	-.4436
-1.700	-1.029	.490	-.0230	.650	-.323	-.116	-.4301
-1.600	-.981	.487	-.0288	.700	-.330	-.137	-.4154
-1.550	-.956	.486	-.0322	.750	-.337	-.158	-.3998
-1.500	-.932	.484	-.0359	.800	-.346	-.177	-.3835
-1.450	-.908	.482	-.0401	.850	-.355	-.196	-.3667
-1.400	-.884	.480	-.0447	.900	-.365	-.214	-.3497
-1.350	-.860	.478	-.0499	.950	-.376	-.231	-.3325
-1.300	-.836	.475	-.0555	1.000	-.388	-.247	-.3155
-1.250	-.812	.472	-.0618	1.050	-.401	-.263	-.2987
-1.200	-.789	.469	-.0687	1.100	-.415	-.277	-.2823
-1.150	-.765	.465	-.0764	1.150	-.429	-.291	-.2663
-1.100	-.742	.461	-.0847	1.200	-.444	-.304	-.2509
-1.050	-.719	.457	-.0939	1.250	-.459	-.316	-.2361
-1.000	-.697	.452	-.1039	1.300	-.475	-.327	-.2219
-.950	-.674	.446	-.1148	1.350	-.492	-.338	-.2083
-.900	-.652	.440	-.1267	1.400	-.509	-.348	-.1954
-.850	-.630	.434	-.1394	1.450	-.527	-.358	-.1832
-.800	-.609	.426	-.1532	1.500	-.545	-.367	-.1717
-.750	-.588	.418	-.1680	1.550	-.563	-.375	-.1608
-.700	-.567	.410	-.1837	1.600	-.582	-.383	-.1506
-.650	-.547	.400	-.2004	1.700	-.621	-.397	-.1320
-.600	-.527	.389	-.2181	1.800	-.662	-.409	-.1156
-.550	-.508	.378	-.2365	1.900	-.703	-.420	-.1012
-.500	-.489	.366	-.2556	2.000	-.745	-.429	-.0887
-.450	-.471	.353	-.2754	2.100	-.789	-.438	-.0778
-.400	-.454	.338	-.2956	2.200	-.833	-.445	-.0682
-.350	-.437	.323	-.3159	2.300	-.878	-.451	-.0599
-.300	-.422	.307	-.3364	2.400	-.923	-.457	-.0527
-.250	-.407	.289	-.3565	2.500	-.969	-.462	-.0464
-.200	-.393	.271	-.3762	2.600	-1.016	-.466	-.0408
-.150	-.380	.252	-.3950	2.700	-1.062	-.470	-.0360
-.100	-.367	.232	-.4128	2.800	-1.110	-.474	-.0318
-.050	-.356	.210	-.4292	2.900	-1.157	-.477	-.0281

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 3.75 DB							
-3.000	-1.688	.499	-.0012	.000	-.355	.194	-.4388
-2.900	-1.638	.499	-.0015	.050	-.346	.172	-.4521
-2.800	-1.588	.499	-.0018	.100	-.338	.149	-.4633
-2.700	-1.538	.499	-.0023	.150	-.331	.126	-.4722
-2.600	-1.488	.499	-.0029	.200	-.325	.102	-.4789
-2.500	-1.438	.498	-.0036	.250	-.321	.078	-.4830
-2.400	-1.388	.498	-.0046	.300	-.318	.054	-.4847
-2.300	-1.339	.497	-.0058	.350	-.316	.030	-.4838
-2.200	-1.289	.497	-.0072	.400	-.315	.005	-.4806
-2.100	-1.239	.496	-.0091	.450	-.315	-.018	-.4750
-2.000	-1.190	.495	-.0114	.500	-.317	-.042	-.4673
-1.900	-1.140	.494	-.0143	.550	-.319	-.065	-.4576
-1.800	-1.091	.492	-.0179	.600	-.323	-.088	-.4461
-1.700	-1.042	.490	-.0225	.650	-.328	-.110	-.4332
-1.600	-.993	.488	-.0281	.700	-.334	-.131	-.4190
-1.550	-.969	.486	-.0314	.750	-.341	-.152	-.4038
-1.500	-.944	.484	-.0351	.800	-.349	-.171	-.3878
-1.450	-.920	.483	-.0391	.850	-.358	-.190	-.3712
-1.400	-.896	.481	-.0437	.900	-.368	-.209	-.3544
-1.350	-.872	.478	-.0487	.950	-.379	-.226	-.3373
-1.300	-.848	.476	-.0542	1.000	-.391	-.242	-.3204
-1.250	-.825	.473	-.0604	1.050	-.403	-.258	-.3036
-1.200	-.801	.470	-.0671	1.100	-.416	-.273	-.2871
-1.150	-.778	.466	-.0746	1.150	-.430	-.287	-.2711
-1.100	-.754	.462	-.0828	1.200	-.445	-.300	-.2555
-1.050	-.731	.458	-.0917	1.250	-.460	-.312	-.2406
-1.000	-.709	.453	-.1015	1.300	-.476	-.324	-.2262
-.950	-.686	.448	-.1122	1.350	-.493	-.335	-.2125
-.900	-.664	.442	-.1238	1.400	-.510	-.345	-.1994
-.850	-.642	.435	-.1363	1.450	-.527	-.355	-.1870
-.800	-.620	.428	-.1498	1.500	-.545	-.364	-.1753
-.750	-.599	.420	-.1643	1.550	-.564	-.372	-.1642
-.700	-.578	.412	-.1798	1.600	-.582	-.380	-.1538
-.650	-.558	.402	-.1962	1.700	-.621	-.395	-.1348
-.600	-.538	.392	-.2135	1.800	-.661	-.407	-.1181
-.550	-.519	.381	-.2317	1.900	-.703	-.418	-.1034
-.500	-.500	.369	-.2506	2.000	-.745	-.428	-.0906
-.450	-.482	.356	-.2701	2.100	-.788	-.436	-.0795
-.400	-.464	.342	-.2901	2.200	-.832	-.444	-.0697
-.350	-.448	.327	-.3103	2.300	-.877	-.450	-.0612
-.300	-.432	.311	-.3306	2.400	-.922	-.456	-.0538
-.250	-.417	.294	-.3506	2.500	-.968	-.461	-.0473
-.200	-.402	.276	-.3703	2.600	-1.015	-.466	-.0417
-.150	-.389	.257	-.3892	2.700	-1.061	-.470	-.0368
-.100	-.377	.237	-.4071	2.800	-1.108	-.473	-.0324
-.050	-.365	.216	-.4237	2.900	-1.156	-.476	-.0286

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 4.00 DB							
-3.000	-1.700	.500	-.0011	.000	-.364	.200	-.4336
-2.900	-1.650	.499	-.0014	.050	-.355	.178	-.4472
-2.800	-1.600	.499	-.0018	.100	-.346	.155	-.4588
-2.700	-1.550	.499	-.0022	.150	-.339	.132	-.4684
-2.600	-1.501	.499	-.0028	.200	-.333	.109	-.4756
-2.500	-1.451	.498	-.0036	.250	-.328	.085	-.4804
-2.400	-1.401	.498	-.0045	.300	-.325	.061	-.4827
-2.300	-1.351	.498	-.0056	.350	-.322	.037	-.4826
-2.200	-1.301	.497	-.0071	.400	-.321	.012	-.4801
-2.100	-1.252	.496	-.0089	.450	-.321	-.011	-.4753
-2.000	-1.202	.495	-.0111	.500	-.322	-.035	-.4683
-1.900	-1.153	.494	-.0140	.550	-.324	-.058	-.4593
-1.800	-1.103	.492	-.0175	.600	-.328	-.081	-.4485
-1.700	-1.054	.490	-.0219	.650	-.333	-.103	-.4361
-1.600	-1.005	.488	-.0274	.700	-.338	-.125	-.4224
-1.550	-.981	.486	-.0306	.750	-.345	-.145	-.4076
-1.500	-.957	.485	-.0342	.800	-.353	-.165	-.3919
-1.450	-.932	.483	-.0382	.850	-.362	-.184	-.3757
-1.400	-.908	.481	-.0426	.900	-.371	-.203	-.3590
-1.350	-.884	.479	-.0475	.950	-.382	-.220	-.3421
-1.300	-.860	.476	-.0530	1.000	-.393	-.237	-.3252
-1.250	-.837	.473	-.0589	1.050	-.405	-.253	-.3085
-1.200	-.813	.470	-.0656	1.100	-.418	-.268	-.2920
-1.150	-.790	.467	-.0728	1.150	-.432	-.282	-.2759
-1.100	-.766	.463	-.0809	1.200	-.447	-.296	-.2602
-1.050	-.743	.459	-.0896	1.250	-.462	-.308	-.2451
-1.000	-.721	.454	-.0992	1.300	-.477	-.320	-.2306
-.950	-.698	.449	-.1097	1.350	-.494	-.331	-.2167
-.900	-.676	.443	-.1210	1.400	-.511	-.342	-.2035
-.850	-.654	.437	-.1333	1.450	-.528	-.352	-.1909
-.800	-.632	.430	-.1466	1.500	-.546	-.361	-.1790
-.750	-.611	.422	-.1608	1.550	-.564	-.369	-.1677
-.700	-.590	.414	-.1760	1.600	-.583	-.378	-.1571
-.650	-.569	.404	-.1921	1.700	-.621	-.392	-.1378
-.600	-.549	.394	-.2091	1.800	-.661	-.405	-.1207
-.550	-.530	.384	-.2270	1.900	-.702	-.417	-.1057
-.500	-.511	.372	-.2456	2.000	-.744	-.426	-.0927
-.450	-.493	.359	-.2649	2.100	-.787	-.435	-.0812
-.400	-.475	.345	-.2846	2.200	-.831	-.443	-.0713
-.350	-.458	.330	-.3046	2.300	-.876	-.449	-.0626
-.300	-.442	.315	-.3248	2.400	-.921	-.455	-.0550
-.250	-.427	.298	-.3448	2.500	-.967	-.460	-.0484
-.200	-.412	.280	-.3644	2.600	-1.013	-.465	-.0426
-.150	-.399	.262	-.3834	2.700	-1.060	-.469	-.0375
-.100	-.386	.242	-.4014	2.800	-1.107	-.473	-.0331
-.050	-.375	.221	-.4182	2.900	-1.154	-.476	-.0292

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 4.25 DB							
-3.000	-1.713	.500	-.0011	.000	-.373	.206	-.4282
-2.900	-1.663	.499	-.0014	.050	-.363	.184	-.4421
-2.800	-1.613	.499	-.0017	.100	-.355	.162	-.4542
-2.700	-1.563	.499	-.0022	.150	-.347	.139	-.4642
-2.600	-1.513	.499	-.0028	.200	-.341	.115	-.4720
-2.500	-1.463	.498	-.0035	.250	-.336	.091	-.4775
-2.400	-1.413	.498	-.0044	.300	-.332	.068	-.4805
-2.300	-1.364	.498	-.0055	.350	-.329	.043	-.4811
-2.200	-1.314	.497	-.0069	.400	-.327	.019	-.4793
-2.100	-1.264	.496	-.0087	.450	-.327	-.004	-.4753
-2.000	-1.215	.495	-.0109	.500	-.328	-.028	-.4690
-1.900	-1.165	.494	-.0136	.550	-.330	-.051	-.4607
-1.800	-1.116	.492	-.0171	.600	-.333	-.074	-.4505
-1.700	-1.067	.491	-.0214	.650	-.337	-.096	-.4387
-1.600	-1.018	.488	-.0268	.700	-.343	-.118	-.4256
-1.550	-.993	.487	-.0299	.750	-.349	-.139	-.4112
-1.500	-.969	.485	-.0334	.800	-.356	-.159	-.3960
-1.450	-.945	.483	-.0373	.850	-.365	-.178	-.3800
-1.400	-.921	.481	-.0416	.900	-.374	-.197	-.3636
-1.350	-.897	.479	-.0464	.950	-.385	-.215	-.3469
-1.300	-.873	.477	-.0517	1.000	-.396	-.232	-.3301
-1.250	-.849	.474	-.0576	1.050	-.408	-.248	-.3134
-1.200	-.825	.471	-.0640	1.100	-.421	-.263	-.2969
-1.150	-.802	.468	-.0712	1.150	-.434	-.278	-.2807
-1.100	-.779	.464	-.0790	1.200	-.448	-.291	-.2650
-1.050	-.755	.460	-.0876	1.250	-.463	-.304	-.2498
-1.000	-.733	.455	-.0970	1.300	-.479	-.316	-.2351
-.950	-.710	.450	-.1072	1.350	-.495	-.328	-.2211
-.900	-.688	.444	-.1183	1.400	-.511	-.338	-.2077
-.850	-.666	.438	-.1304	1.450	-.529	-.348	-.1949
-.800	-.644	.431	-.1433	1.500	-.546	-.358	-.1828
-.750	-.622	.424	-.1573	1.550	-.564	-.367	-.1714
-.700	-.601	.416	-.1722	1.600	-.583	-.375	-.1606
-.650	-.581	.407	-.1880	1.700	-.621	-.390	-.1408
-.600	-.561	.397	-.2048	1.800	-.661	-.403	-.1234
-.550	-.541	.386	-.2224	1.900	-.702	-.415	-.1081
-.500	-.522	.375	-.2407	2.000	-.744	-.425	-.0947
-.450	-.504	.362	-.2597	2.100	-.787	-.434	-.0831
-.400	-.486	.349	-.2792	2.200	-.830	-.441	-.0729
-.350	-.469	.334	-.2991	2.300	-.875	-.448	-.0640
-.300	-.453	.319	-.3190	2.400	-.920	-.454	-.0562
-.250	-.437	.302	-.3389	2.500	-.966	-.460	-.0494
-.200	-.422	.285	-.3585	2.600	-1.012	-.464	-.0435
-.150	-.409	.266	-.3775	2.700	-1.059	-.468	-.0384
-.100	-.396	.247	-.3956	2.800	-1.106	-.472	-.0338
-.050	-.384	.227	-.4126	2.900	-1.153	-.475	-.0299

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 4.50 DB							
-3.000	-1.725	.500	-.0011	.000	-.382	.211	-.4226
-2.900	-1.675	.499	-.0014	.050	-.372	.190	-.4369
-2.800	-1.625	.499	-.0017	.100	-.363	.168	-.4494
-2.700	-1.575	.499	-.0021	.150	-.355	.145	-.4599
-2.600	-1.526	.499	-.0027	.200	-.349	.122	-.4682
-2.500	-1.476	.499	-.0034	.250	-.343	.098	-.4743
-2.400	-1.426	.498	-.0043	.300	-.339	.074	-.4780
-2.300	-1.376	.498	-.0054	.350	-.336	.050	-.4793
-2.200	-1.326	.497	-.0067	.400	-.334	.026	-.4783
-2.100	-1.277	.496	-.0085	.450	-.333	.003	-.4749
-2.000	-1.227	.495	-.0106	.500	-.334	-.021	-.4694
-1.900	-1.178	.494	-.0133	.550	-.335	-.044	-.4618
-1.800	-1.128	.493	-.0167	.600	-.338	-.067	-.4523
-1.700	-1.079	.491	-.0209	.650	-.342	-.089	-.4411
-1.600	-1.030	.488	-.0261	.700	-.347	-.111	-.4285
-1.550	-1.006	.487	-.0292	.750	-.353	-.132	-.4147
-1.500	-.981	.486	-.0326	.800	-.360	-.153	-.3998
-1.450	-.957	.484	-.0364	.850	-.368	-.172	-.3842
-1.400	-.933	.482	-.0407	.900	-.377	-.191	-.3681
-1.350	-.909	.480	-.0453	.950	-.387	-.209	-.3516
-1.300	-.885	.477	-.0505	1.000	-.398	-.226	-.3349
-1.250	-.861	.475	-.0562	1.050	-.410	-.243	-.3183
-1.200	-.838	.472	-.0626	1.100	-.423	-.258	-.3018
-1.150	-.814	.468	-.0695	1.150	-.436	-.273	-.2856
-1.100	-.791	.465	-.0772	1.200	-.450	-.287	-.2698
-1.050	-.768	.461	-.0856	1.250	-.464	-.300	-.2545
-1.000	-.745	.456	-.0948	1.300	-.480	-.312	-.2397
-.950	-.722	.451	-.1048	1.350	-.496	-.324	-.2255
-.900	-.700	.446	-.1157	1.400	-.512	-.335	-.2120
-.850	-.677	.440	-.1275	1.450	-.529	-.345	-.1990
-.800	-.656	.433	-.1402	1.500	-.547	-.355	-.1867
-.750	-.634	.426	-.1539	1.550	-.565	-.364	-.1751
-.700	-.613	.418	-.1685	1.600	-.583	-.372	-.1641
-.650	-.592	.409	-.1841	1.700	-.621	-.387	-.1440
-.600	-.572	.399	-.2005	1.800	-.660	-.401	-.1262
-.550	-.552	.389	-.2178	1.900	-.701	-.413	-.1106
-.500	-.533	.377	-.2359	2.000	-.743	-.423	-.0969
-.450	-.515	.365	-.2546	2.100	-.786	-.432	-.0850
-.400	-.497	.352	-.2739	2.200	-.829	-.440	-.0745
-.350	-.480	.338	-.2935	2.300	-.874	-.447	-.0654
-.300	-.463	.322	-.3133	2.400	-.919	-.453	-.0575
-.250	-.447	.306	-.3331	2.500	-.964	-.459	-.0506
-.200	-.432	.289	-.3526	2.600	-1.010	-.463	-.0445
-.150	-.418	.271	-.3715	2.700	-1.057	-.468	-.0392
-.100	-.405	.252	-.3897	2.800	-1.104	-.471	-.0346
-.050	-.393	.232	-.4068	2.900	-1.151	-.475	-.0305

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Continued

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 4.75 DB							
-3.000	-1.738	.500	-.0011	.000	-.391	.217	-.4170
-2.900	-1.688	.499	-.0013	.050	-.381	.196	-.4315
-2.800	-1.638	.499	-.0017	.100	-.372	.174	-.4444
-2.700	-1.588	.499	-.0021	.150	-.364	.151	-.4553
-2.600	-1.538	.499	-.0026	.200	-.357	.128	-.4642
-2.500	-1.488	.499	-.0033	.250	-.351	.105	-.4708
-2.400	-1.438	.498	-.0042	.300	-.346	.081	-.4752
-2.300	-1.388	.498	-.0052	.350	-.343	.057	-.4772
-2.200	-1.339	.497	-.0066	.400	-.340	.033	-.4769
-2.100	-1.289	.496	-.0083	.450	-.339	.010	-.4743
-2.000	-1.239	.495	-.0104	.500	-.339	-.014	-.4695
-1.900	-1.190	.494	-.0130	.550	-.341	-.037	-.4626
-1.800	-1.141	.493	-.0163	.600	-.343	-.060	-.4538
-1.700	-1.091	.491	-.0204	.650	-.347	-.083	-.4433
-1.600	-1.042	.489	-.0255	.700	-.351	-.104	-.4313
-1.550	-1.018	.487	-.0285	.750	-.357	-.126	-.4180
-1.500	-.994	.486	-.0319	.800	-.364	-.146	-.4036
-1.450	-.969	.484	-.0356	.850	-.372	-.166	-.3883
-1.400	-.945	.482	-.0397	.900	-.381	-.185	-.3725
-1.350	-.921	.480	-.0443	.950	-.390	-.203	-.3562
-1.300	-.897	.478	-.0494	1.000	-.401	-.221	-.3398
-1.250	-.873	.475	-.0550	1.050	-.412	-.237	-.3232
-1.200	-.850	.472	-.0611	1.100	-.425	-.253	-.3068
-1.150	-.826	.469	-.0680	1.150	-.438	-.268	-.2906
-1.100	-.803	.466	-.0754	1.200	-.451	-.282	-.2747
-1.050	-.780	.462	-.0837	1.250	-.466	-.295	-.2593
-1.000	-.757	.457	-.0927	1.300	-.481	-.308	-.2444
-.950	-.734	.452	-.1025	1.350	-.497	-.320	-.2301
-.900	-.711	.447	-.1131	1.400	-.513	-.331	-.2163
-.850	-.689	.441	-.1247	1.450	-.530	-.341	-.2032
-.800	-.667	.434	-.1372	1.500	-.547	-.351	-.1907
-.750	-.646	.427	-.1506	1.550	-.565	-.361	-.1789
-.700	-.625	.419	-.1649	1.600	-.583	-.369	-.1677
-.650	-.604	.411	-.1802	1.700	-.621	-.385	-.1472
-.600	-.584	.401	-.1964	1.800	-.660	-.399	-.1291
-.550	-.564	.391	-.2134	1.900	-.701	-.411	-.1131
-.500	-.545	.380	-.2312	2.000	-.742	-.421	-.0992
-.450	-.526	.368	-.2496	2.100	-.785	-.431	-.0869
-.400	-.508	.355	-.2686	2.200	-.828	-.439	-.0762
-.350	-.490	.341	-.2880	2.300	-.872	-.446	-.0669
-.300	-.474	.326	-.3076	2.400	-.917	-.452	-.0588
-.250	-.458	.310	-.3272	2.500	-.963	-.458	-.0517
-.200	-.443	.293	-.3466	2.600	-1.009	-.463	-.0455
-.150	-.428	.276	-.3656	2.700	-1.055	-.467	-.0401
-.100	-.415	.257	-.3838	2.800	-1.102	-.471	-.0354
-.050	-.403	.237	-.4010	2.900	-1.150	-.474	-.0312

TABLE III.- INTENSITY LAW IN LOGARITHMIC FORM – Concluded

$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$	$\log KP_o$	$\log \phi$	$\frac{d(\log \phi)}{d(\log KP_o)}$	$\frac{d^2(\log \phi)}{d(\log KP_o)^2}$
INSERTION LOSS = 5.00 DB							
-3.000	-1.750	.500	-.0010	.000	-.401	.222	-.4113
-2.900	-1.700	.499	-.0013	.050	-.390	.201	-.4260
-2.800	-1.650	.499	-.0016	.100	-.380	.180	-.4392
-2.700	-1.600	.499	-.0020	.150	-.372	.157	-.4505
-2.600	-1.550	.499	-.0026	.200	-.365	.135	-.4599
-2.500	-1.501	.499	-.0032	.250	-.359	.111	-.4671
-2.400	-1.451	.498	-.0041	.300	-.354	.088	-.4721
-2.300	-1.401	.498	-.0051	.350	-.350	.064	-.4748
-2.200	-1.351	.497	-.0064	.400	-.347	.041	-.4752
-2.100	-1.302	.496	-.0081	.450	-.346	.017	-.4733
-2.000	-1.252	.496	-.0101	.500	-.345	-.007	-.4692
-1.900	-1.202	.494	-.0127	.550	-.346	-.030	-.4631
-1.800	-1.153	.493	-.0159	.600	-.348	-.053	-.4550
-1.700	-1.104	.491	-.0199	.650	-.352	-.076	-.4452
-1.600	-1.055	.489	-.0249	.700	-.356	-.098	-.4338
-1.550	-1.030	.488	-.0279	.750	-.361	-.119	-.4210
-1.500	-1.006	.486	-.0311	.800	-.368	-.140	-.4071
-1.450	-.982	.485	-.0348	.850	-.375	-.160	-.3923
-1.400	-.958	.483	-.0388	.900	-.384	-.179	-.3768
-1.350	-.934	.481	-.0433	.950	-.393	-.197	-.3608
-1.300	-.910	.478	-.0482	1.000	-.404	-.215	-.3445
-1.250	-.886	.476	-.0537	1.050	-.415	-.232	-.3281
-1.200	-.862	.473	-.0598	1.100	-.427	-.248	-.3118
-1.150	-.838	.470	-.0664	1.150	-.439	-.263	-.2956
-1.100	-.815	.466	-.0738	1.200	-.453	-.277	-.2797
-1.050	-.792	.462	-.0818	1.250	-.467	-.291	-.2642
-1.000	-.769	.458	-.0906	1.300	-.482	-.304	-.2492
-.950	-.746	.453	-.1002	1.350	-.498	-.316	-.2347
-.900	-.723	.448	-.1106	1.400	-.514	-.327	-.2208
-.850	-.701	.442	-.1220	1.450	-.530	-.338	-.2075
-.800	-.679	.436	-.1342	1.500	-.547	-.348	-.1949
-.750	-.658	.429	-.1473	1.550	-.565	-.357	-.1828
-.700	-.636	.421	-.1614	1.600	-.583	-.366	-.1715
-.650	-.615	.413	-.1764	1.700	-.621	-.382	-.1506
-.600	-.595	.404	-.1923	1.800	-.660	-.396	-.1321
-.550	-.575	.393	-.2090	1.900	-.700	-.409	-.1158
-.500	-.556	.383	-.2265	2.000	-.741	-.420	-.1015
-.450	-.537	.371	-.2447	2.100	-.784	-.429	-.0890
-.400	-.519	.358	-.2635	2.200	-.827	-.438	-.0780
-.350	-.501	.344	-.2826	2.300	-.871	-.445	-.0685
-.300	-.484	.330	-.3020	2.400	-.916	-.451	-.0602
-.250	-.468	.314	-.3215	2.500	-.961	-.457	-.0529
-.200	-.453	.298	-.3407	2.600	-1.007	-.462	-.0466
-.150	-.438	.280	-.3596	2.700	-1.054	-.466	-.0410
-.100	-.425	.262	-.3778	2.800	-1.101	-.470	-.0362
-.050	-.412	.242	-.3951	2.900	-1.148	-.473	-.0319

TABLE IV.- INTENSITY LAW IN DECIBEL FORM

10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = .25 DB							
-30.000	-30.256	.999	-.0003	.000	-4.797	.219	-.0979
-29.000	-29.258	.998	-.0004	.500	-4.700	.170	-.0990
-28.000	-28.260	.998	-.0005	1.000	-4.627	.121	-.0994
-27.000	-27.263	.997	-.0007	1.500	-4.579	.071	-.0994
-26.000	-26.266	.996	-.0008	2.000	-4.556	.021	-.0987
-25.000	-25.270	.995	-.0011	2.500	-4.558	-.028	-.0976
-24.000	-24.275	.994	-.0013	3.000	-4.584	-.076	-.0960
-23.000	-23.282	.993	-.0017	3.500	-4.634	-.124	-.0939
-22.000	-22.290	.991	-.0021	4.000	-4.707	-.170	-.0915
-21.000	-21.300	.989	-.0026	4.500	-4.804	-.215	-.0887
-20.000	-20.313	.986	-.0033	5.000	-4.922	-.259	-.0857
-19.000	-19.329	.982	-.0041	5.500	-5.062	-.301	-.0824
-18.000	-18.350	.977	-.0052	6.000	-5.223	-.341	-.0790
-17.000	-17.375	.971	-.0065	6.500	-5.403	-.380	-.0755
-16.000	-16.407	.964	-.0081	7.000	-5.603	-.417	-.0720
-15.500	-15.926	.960	-.0090	7.500	-5.820	-.452	-.0684
-15.000	-15.447	.955	-.0100	8.000	-6.054	-.485	-.0648
-14.500	-14.971	.950	-.0112	8.500	-6.305	-.517	-.0613
-14.000	-14.498	.944	-.0125	9.000	-6.571	-.547	-.0579
-13.500	-14.027	.937	-.0139	9.500	-6.851	-.575	-.0546
-13.000	-13.560	.930	-.0154	10.000	-7.145	-.601	-.0514
-12.500	-13.097	.922	-.0171	10.500	-7.452	-.626	-.0483
-12.000	-12.639	.913	-.0190	11.000	-7.771	-.649	-.0454
-11.500	-12.185	.903	-.0210	11.500	-8.101	-.671	-.0425
-11.000	-11.736	.892	-.0233	12.000	-8.442	-.692	-.0399
-10.500	-11.293	.880	-.0257	12.500	-8.793	-.711	-.0374
-10.000	-10.856	.866	-.0283	13.000	-9.153	-.729	-.0350
-9.500	-10.427	.851	-.0312	13.500	-9.522	-.746	-.0328
-9.000	-10.005	.835	-.0342	14.000	-9.899	-.762	-.0307
-8.500	-9.592	.817	-.0375	14.500	-10.284	-.777	-.0287
-8.000	-9.189	.797	-.0409	15.000	-10.676	-.791	-.0268
-7.500	-8.795	.776	-.0446	15.500	-11.075	-.804	-.0251
-7.000	-8.413	.753	-.0484	16.000	-11.480	-.816	-.0235
-6.500	-8.043	.728	-.0524	17.000	-12.307	-.838	-.0205
-6.000	-7.686	.700	-.0566	18.000	-13.155	-.857	-.0180
-5.500	-7.343	.671	-.0608	19.000	-14.021	-.874	-.0158
-5.000	-7.015	.640	-.0651	20.000	-14.903	-.889	-.0138
-4.500	-6.704	.606	-.0693	21.000	-15.798	-.902	-.0121
-4.000	-6.409	.570	-.0736	22.000	-16.706	-.913	-.0107
-3.500	-6.134	.532	-.0777	23.000	-17.624	-.923	-.0094
-3.000	-5.877	.493	-.0816	24.000	-18.552	-.932	-.0083
-2.500	-5.641	.451	-.0853	25.000	-19.488	-.940	-.0073
-2.000	-5.427	.407	-.0887	26.000	-20.431	-.947	-.0064
-1.500	-5.234	.362	-.0917	27.000	-21.381	-.953	-.0057
-1.000	-5.065	.316	-.0943	28.000	-22.336	-.958	-.0050
-.500	-4.919	.268	-.0964	29.000	-23.296	-.963	-.0044

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = .50 DB							
-30.000	-30.506	.999	-.0003	.000	-4.950	.232	-.0976
-29.000	-29.508	.998	-.0004	.500	-4.847	.183	-.0987
-28.000	-28.510	.998	-.0005	1.000	-4.768	.133	-.0993
-27.000	-27.512	.997	-.0006	1.500	-4.714	.083	-.0994
-26.000	-26.515	.996	-.0008	2.000	-4.684	.034	-.0989
-25.000	-25.519	.996	-.0010	2.500	-4.680	-.015	-.0979
-24.000	-24.524	.994	-.0013	3.000	-4.700	-.064	-.0964
-23.000	-23.531	.993	-.0016	3.500	-4.744	-.112	-.0945
-22.000	-22.539	.991	-.0020	4.000	-4.811	-.158	-.0921
-21.000	-21.549	.989	-.0026	4.500	-4.902	-.204	-.0894
-20.000	-20.561	.986	-.0032	5.000	-5.015	-.248	-.0865
-19.000	-19.577	.982	-.0040	5.500	-5.150	-.290	-.0833
-18.000	-18.597	.978	-.0050	6.000	-5.305	-.331	-.0799
-17.000	-17.622	.972	-.0063	6.500	-5.480	-.370	-.0764
-16.000	-16.653	.965	-.0079	7.000	-5.675	-.407	-.0729
-15.500	-16.171	.961	-.0088	7.500	-5.888	-.443	-.0693
-15.000	-15.692	.956	-.0098	8.000	-6.118	-.477	-.0657
-14.500	-15.215	.951	-.0109	8.500	-6.364	-.509	-.0622
-14.000	-14.741	.945	-.0121	9.000	-6.626	-.539	-.0588
-13.500	-14.270	.939	-.0135	9.500	-6.903	-.568	-.0554
-13.000	-13.802	.932	-.0150	10.000	-7.193	-.594	-.0522
-12.500	-13.338	.924	-.0167	10.500	-7.497	-.620	-.0491
-12.000	-12.878	.915	-.0185	11.000	-7.813	-.644	-.0461
-11.500	-12.423	.905	-.0205	11.500	-8.140	-.666	-.0433
-11.000	-11.973	.895	-.0227	12.000	-8.479	-.687	-.0406
-10.500	-11.528	.883	-.0251	12.500	-8.827	-.706	-.0380
-10.000	-11.090	.870	-.0277	13.000	-9.185	-.725	-.0356
-9.500	-10.659	.855	-.0304	13.500	-9.552	-.742	-.0333
-9.000	-10.235	.839	-.0334	14.000	-9.927	-.758	-.0312
-8.500	-9.820	.822	-.0366	14.500	-10.310	-.773	-.0292
-8.000	-9.414	.802	-.0400	15.000	-10.700	-.787	-.0273
-7.500	-9.018	.782	-.0437	15.500	-11.097	-.801	-.0255
-7.000	-8.633	.759	-.0475	16.000	-11.500	-.813	-.0239
-6.500	-8.259	.734	-.0514	17.000	-12.325	-.835	-.0209
-6.000	-7.899	.707	-.0555	18.000	-13.170	-.855	-.0183
-5.500	-7.552	.679	-.0597	19.000	-14.034	-.872	-.0160
-5.000	-7.221	.648	-.0640	20.000	-14.913	-.887	-.0141
-4.500	-6.905	.615	-.0683	21.000	-15.807	-.900	-.0123
-4.000	-6.607	.579	-.0725	22.000	-16.713	-.912	-.0108
-3.500	-6.326	.542	-.0766	23.000	-17.630	-.922	-.0095
-3.000	-6.065	.503	-.0806	24.000	-18.557	-.931	-.0084
-2.500	-5.824	.461	-.0844	25.000	-19.492	-.939	-.0074
-2.000	-5.604	.418	-.0878	26.000	-20.434	-.946	-.0065
-1.500	-5.406	.374	-.0909	27.000	-21.383	-.952	-.0058
-1.000	-5.230	.328	-.0936	28.000	-22.338	-.957	-.0051
-.500	-5.078	.280	-.0958	29.000	-23.298	-.962	-.0045

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = .75 DB							
-30.000	-30.756	.999	-.0003	.000	-5.106	.244	-.0971
-29.000	-29.758	.998	-.0004	.500	-4.956	.195	-.0984
-28.000	-28.759	.998	-.0005	1.000	-4.910	.146	-.0992
-27.000	-27.762	.997	-.0006	1.500	-4.850	.096	-.0994
-26.000	-26.765	.997	-.0008	2.000	-4.814	.046	-.0990
-25.000	-25.769	.996	-.0010	2.500	-4.803	-.003	-.0982
-24.000	-24.774	.995	-.0013	3.000	-4.817	-.052	-.0968
-23.000	-23.780	.993	-.0016	3.500	-4.855	-.100	-.0950
-22.000	-22.788	.991	-.0020	4.000	-4.916	-.147	-.0927
-21.000	-21.797	.989	-.0025	4.500	-5.001	-.192	-.0901
-20.000	-20.810	.986	-.0031	5.000	-5.109	-.237	-.0872
-19.000	-19.825	.983	-.0039	5.500	-5.238	-.279	-.0841
-18.000	-18.844	.978	-.0049	6.000	-5.388	-.321	-.0808
-17.000	-17.868	.973	-.0061	6.500	-5.558	-.360	-.0773
-16.000	-16.899	.966	-.0076	7.000	-5.748	-.398	-.0738
-15.500	-16.417	.962	-.0085	7.500	-5.956	-.434	-.0702
-15.000	-15.937	.958	-.0095	8.000	-6.181	-.468	-.0666
-14.500	-15.459	.953	-.0106	8.500	-6.423	-.501	-.0631
-14.000	-14.984	.947	-.0118	9.000	-6.681	-.531	-.0597
-13.500	-14.512	.941	-.0132	9.500	-6.954	-.560	-.0563
-13.000	-14.044	.934	-.0146	10.000	-7.241	-.588	-.0530
-12.500	-13.579	.926	-.0163	10.500	-7.542	-.613	-.0499
-12.000	-13.118	.917	-.0180	11.000	-7.854	-.637	-.0469
-11.500	-12.661	.908	-.0200	11.500	-8.179	-.660	-.0440
-11.000	-12.210	.897	-.0221	12.000	-8.514	-.681	-.0412
-10.500	-11.764	.886	-.0245	12.500	-8.860	-.701	-.0387
-10.000	-11.324	.873	-.0270	13.000	-9.216	-.720	-.0362
-9.500	-10.891	.859	-.0297	13.500	-9.580	-.738	-.0339
-9.000	-10.466	.843	-.0327	14.000	-9.953	-.754	-.0317
-8.500	-10.048	.826	-.0358	14.500	-10.334	-.769	-.0297
-8.000	-9.640	.807	-.0392	15.000	-10.722	-.784	-.0278
-7.500	-9.241	.787	-.0427	15.500	-11.118	-.797	-.0260
-7.000	-8.853	.765	-.0465	16.000	-11.519	-.810	-.0243
-6.500	-8.477	.740	-.0504	17.000	-12.341	-.833	-.0213
-6.000	-8.113	.714	-.0545	18.000	-13.183	-.852	-.0186
-5.500	-7.763	.686	-.0586	19.000	-14.045	-.870	-.0163
-5.000	-7.428	.655	-.0629	20.000	-14.923	-.885	-.0143
-4.500	-7.108	.623	-.0672	21.000	-15.815	-.899	-.0126
-4.000	-6.805	.588	-.0714	22.000	-16.719	-.910	-.0110
-3.500	-6.520	.552	-.0756	23.000	-17.635	-.921	-.0097
-3.000	-6.254	.513	-.0796	24.000	-18.560	-.930	-.0085
-2.500	-6.008	.472	-.0834	25.000	-19.494	-.938	-.0075
-2.000	-5.782	.429	-.0870	26.000	-20.436	-.945	-.0066
-1.500	-5.579	.385	-.0902	27.000	-21.384	-.951	-.0059
-1.000	-5.398	.339	-.0929	28.000	-22.338	-.957	-.0052
-.500	-5.240	.292	-.0953	29.000	-23.297	-.962	-.0046

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 1.00 DB							
-30.000	-31.006	.999	-.0003	.000	-5.262	.256	-.0966
-29.000	-30.007	.998	-.0004	.500	-5.146	.208	-.0981
-28.000	-29.009	.998	-.0005	1.000	-5.055	.158	-.0990
-27.000	-28.012	.997	-.0006	1.500	-4.988	.109	-.0993
-26.000	-27.015	.997	-.0008	2.000	-4.946	.059	-.0991
-25.000	-26.018	.996	-.0010	2.500	-4.929	.010	-.0984
-24.000	-25.023	.995	-.0012	3.000	-4.936	-.039	-.0971
-23.000	-24.029	.993	-.0015	3.500	-4.967	-.087	-.0954
-22.000	-23.037	.992	-.0019	4.000	-5.023	-.134	-.0933
-21.000	-22.046	.989	-.0024	4.500	-5.102	-.180	-.0908
-20.000	-21.058	.987	-.0030	5.000	-5.203	-.225	-.0879
-19.000	-20.073	.983	-.0038	5.500	-5.326	-.268	-.0849
-18.000	-19.092	.979	-.0048	6.000	-5.471	-.310	-.0816
-17.000	-18.115	.974	-.0060	6.500	-5.636	-.350	-.0782
-16.000	-17.145	.967	-.0074	7.000	-5.821	-.388	-.0747
-15.500	-16.662	.963	-.0083	7.500	-6.024	-.425	-.0711
-15.000	-16.182	.959	-.0093	8.000	-6.245	-.459	-.0676
-14.500	-15.704	.954	-.0103	8.500	-6.483	-.492	-.0640
-14.000	-15.228	.948	-.0115	9.000	-6.737	-.523	-.0605
-13.500	-14.755	.942	-.0128	9.500	-7.006	-.553	-.0571
-13.000	-14.286	.936	-.0143	10.000	-7.289	-.580	-.0539
-12.500	-13.820	.928	-.0159	10.500	-7.586	-.607	-.0507
-12.000	-13.358	.920	-.0176	11.000	-7.895	-.631	-.0476
-11.500	-12.900	.910	-.0195	11.500	-8.217	-.654	-.0447
-11.000	-12.448	.900	-.0216	12.000	-8.549	-.676	-.0420
-10.500	-12.000	.889	-.0239	12.500	-8.892	-.696	-.0393
-10.000	-11.559	.876	-.0264	13.000	-9.245	-.715	-.0368
-9.500	-11.124	.862	-.0290	13.500	-9.607	-.733	-.0345
-9.000	-10.697	.847	-.0319	14.000	-9.978	-.750	-.0323
-8.500	-10.278	.830	-.0350	14.500	-10.357	-.765	-.0302
-8.000	-9.867	.812	-.0383	15.000	-10.743	-.780	-.0283
-7.500	-9.466	.792	-.0418	15.500	-11.137	-.794	-.0265
-7.000	-9.075	.770	-.0455	16.000	-11.537	-.806	-.0247
-6.500	-8.696	.746	-.0494	17.000	-12.355	-.830	-.0217
-6.000	-8.329	.721	-.0534	18.000	-13.195	-.850	-.0190
-5.500	-7.975	.693	-.0576	19.000	-14.054	-.868	-.0166
-5.000	-7.636	.663	-.0618	20.000	-14.930	-.883	-.0146
-4.500	-7.313	.631	-.0661	21.000	-15.820	-.897	-.0128
-4.000	-7.005	.597	-.0703	22.000	-16.723	-.909	-.0112
-3.500	-6.716	.561	-.0745	23.000	-17.637	-.919	-.0099
-3.000	-6.445	.523	-.0786	24.000	-18.561	-.929	-.0087
-2.500	-6.193	.482	-.0824	25.000	-19.494	-.937	-.0077
-2.000	-5.963	.440	-.0860	26.000	-20.435	-.944	-.0068
-1.500	-5.753	.396	-.0893	27.000	-21.382	-.950	-.0060
-1.000	-5.566	.351	-.0922	28.000	-22.335	-.956	-.0053
-.500	-5.403	.304	-.0947	29.000	-23.294	-.961	-.0047

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 1.25 DB							
-30.000	-31.256	.999	-.0003	.000	-5.421	.269	-.0961
-29.000	-30.257	.998	-.0004	.500	-5.299	.220	-.0976
-28.000	-29.259	.998	-.0005	1.000	-5.201	.171	-.0987
-27.000	-28.261	.997	-.0006	1.500	-5.128	.122	-.0992
-26.000	-27.264	.997	-.0008	2.000	-5.079	.072	-.0991
-25.000	-26.268	.996	-.0009	2.500	-5.055	.023	-.0985
-24.000	-25.273	.995	-.0012	3.000	-5.056	-.026	-.0974
-23.000	-24.278	.993	-.0015	3.500	-5.081	-.075	-.0958
-22.000	-23.286	.992	-.0019	4.000	-5.131	-.122	-.0938
-21.000	-22.295	.990	-.0024	4.500	-5.203	-.168	-.0914
-20.000	-21.306	.987	-.0030	5.000	-5.299	-.213	-.0886
-19.000	-20.321	.984	-.0037	5.500	-5.416	-.257	-.0856
-18.000	-19.339	.980	-.0046	6.000	-5.555	-.299	-.0824
-17.000	-18.362	.974	-.0058	6.500	-5.715	-.339	-.0791
-16.000	-17.391	.968	-.0072	7.000	-5.854	-.378	-.0756
-15.500	-16.908	.964	-.0081	7.500	-6.093	-.415	-.0720
-15.000	-16.427	.960	-.0090	8.000	-6.309	-.450	-.0685
-14.500	-15.948	.955	-.0101	8.500	-6.542	-.483	-.0649
-14.000	-15.472	.950	-.0112	9.000	-6.792	-.515	-.0614
-13.500	-14.998	.944	-.0125	9.500	-7.057	-.545	-.0580
-13.000	-14.528	.937	-.0139	10.000	-7.337	-.573	-.0547
-12.500	-14.061	.930	-.0155	10.500	-7.630	-.600	-.0515
-12.000	-13.598	.922	-.0172	11.000	-7.936	-.625	-.0484
-11.500	-13.140	.913	-.0190	11.500	-8.254	-.648	-.0455
-11.000	-12.686	.903	-.0211	12.000	-8.584	-.670	-.0427
-10.500	-12.237	.892	-.0233	12.500	-8.924	-.691	-.0400
-10.000	-11.794	.879	-.0257	13.000	-9.274	-.710	-.0375
-9.500	-11.358	.866	-.0284	13.500	-9.634	-.728	-.0351
-9.000	-10.929	.851	-.0312	14.000	-10.002	-.745	-.0329
-8.500	-10.507	.835	-.0342	14.500	-10.379	-.761	-.0308
-8.000	-10.094	.817	-.0375	15.000	-10.763	-.776	-.0288
-7.500	-9.691	.797	-.0409	15.500	-11.155	-.790	-.0269
-7.000	-9.298	.776	-.0446	16.000	-11.553	-.803	-.0252
-6.500	-8.916	.752	-.0484	17.000	-12.368	-.827	-.0221
-6.000	-8.546	.727	-.0524	18.000	-13.205	-.847	-.0193
-5.500	-8.189	.700	-.0565	19.000	-14.062	-.865	-.0169
-5.000	-7.846	.671	-.0607	20.000	-14.935	-.881	-.0148
-4.500	-7.518	.639	-.0650	21.000	-15.824	-.895	-.0130
-4.000	-7.207	.606	-.0692	22.000	-16.725	-.907	-.0114
-3.500	-6.913	.570	-.0734	23.000	-17.638	-.918	-.0100
-3.000	-6.637	.532	-.0775	24.000	-18.561	-.927	-.0088
-2.500	-6.381	.493	-.0814	25.000	-19.492	-.936	-.0078
-2.000	-6.145	.451	-.0851	26.000	-20.432	-.943	-.0069
-1.500	-5.930	.408	-.0884	27.000	-21.378	-.950	-.0061
-1.000	-5.737	.363	-.0914	28.000	-22.331	-.955	-.0054
-.500	-5.567	.316	-.0940	29.000	-23.288	-.960	-.0047

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 1.50 DB							
-30.000	-31.506	.999	-.0003	.000	-5.581	.281	-.0954
-29.000	-30.507	.998	-.0004	.500	-5.453	.233	-.0972
-28.000	-29.509	.998	-.0005	1.000	-5.349	.184	-.0983
-27.000	-28.511	.997	-.0006	1.500	-5.269	.135	-.0990
-26.000	-27.514	.997	-.0007	2.000	-5.214	.085	-.0990
-25.000	-26.517	.996	-.0009	2.500	-5.184	.036	-.0986
-24.000	-25.522	.995	-.0012	3.000	-5.178	-.013	-.0976
-23.000	-24.528	.994	-.0015	3.500	-5.197	-.062	-.0962
-22.000	-23.535	.992	-.0018	4.000	-5.240	-.109	-.0942
-21.000	-22.544	.990	-.0023	4.500	-5.306	-.156	-.0920
-20.000	-21.555	.987	-.0029	5.000	-5.396	-.201	-.0893
-19.000	-20.569	.984	-.0036	5.500	-5.507	-.245	-.0864
-18.000	-19.587	.980	-.0045	6.000	-5.641	-.288	-.0832
-17.000	-18.609	.975	-.0056	6.500	-5.795	-.328	-.0799
-16.000	-17.637	.969	-.0071	7.000	-5.969	-.368	-.0765
-15.500	-17.154	.965	-.0079	7.500	-6.162	-.405	-.0730
-15.000	-16.672	.961	-.0088	8.000	-6.373	-.441	-.0694
-14.500	-16.193	.956	-.0098	8.500	-6.602	-.474	-.0659
-14.000	-15.716	.951	-.0109	9.000	-6.847	-.506	-.0624
-13.500	-15.242	.945	-.0122	9.500	-7.108	-.537	-.0589
-13.000	-14.771	.939	-.0136	10.000	-7.384	-.565	-.0556
-12.500	-14.303	.932	-.0151	10.500	-7.673	-.592	-.0524
-12.000	-13.839	.924	-.0167	11.000	-7.976	-.618	-.0493
-11.500	-13.379	.915	-.0186	11.500	-8.291	-.642	-.0463
-11.000	-12.924	.905	-.0206	12.000	-8.617	-.664	-.0434
-10.500	-12.474	.894	-.0227	12.500	-8.955	-.685	-.0407
-10.000	-12.030	.882	-.0251	13.000	-9.302	-.705	-.0382
-9.500	-11.592	.869	-.0277	13.500	-9.659	-.723	-.0358
-9.000	-11.161	.855	-.0305	14.000	-10.025	-.741	-.0335
-8.500	-10.738	.839	-.0335	14.500	-10.400	-.757	-.0313
-8.000	-10.323	.821	-.0367	15.000	-10.782	-.772	-.0293
-7.500	-9.917	.802	-.0401	15.500	-11.172	-.786	-.0274
-7.000	-9.521	.781	-.0437	16.000	-11.568	-.799	-.0257
-6.500	-9.136	.758	-.0474	17.000	-12.380	-.823	-.0225
-6.000	-8.763	.734	-.0514	18.000	-13.214	-.845	-.0197
-5.500	-8.403	.707	-.0554	19.000	-14.068	-.863	-.0172
-5.000	-8.056	.678	-.0596	20.000	-14.939	-.879	-.0151
-4.500	-7.725	.647	-.0638	21.000	-15.825	-.893	-.0133
-4.000	-7.409	.614	-.0681	22.000	-16.725	-.906	-.0116
-3.500	-7.111	.579	-.0723	23.000	-17.636	-.917	-.0102
-3.000	-6.831	.542	-.0764	24.000	-18.558	-.926	-.0090
-2.500	-6.569	.503	-.0804	25.000	-19.488	-.935	-.0079
-2.000	-6.328	.462	-.0841	26.000	-20.427	-.942	-.0070
-1.500	-6.108	.419	-.0875	27.000	-21.372	-.949	-.0062
-1.000	-5.909	.374	-.0906	28.000	-22.324	-.954	-.0055
-.500	-5.734	.328	-.0932	29.000	-23.281	-.960	-.0048

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 1.75 DB							
-30.000	-31.755	.999	-.0003	.000	-5.744	.293	-.0948
-29.000	-30.757	.998	-.0004	.500	-5.609	.246	-.0966
-28.000	-29.758	.998	-.0004	1.000	-5.498	.197	-.0979
-27.000	-28.761	.998	-.0006	1.500	-5.412	.148	-.0987
-26.000	-27.763	.997	-.0007	2.000	-5.350	.098	-.0989
-25.000	-26.767	.996	-.0009	2.500	-5.314	.049	-.0986
-24.000	-25.771	.995	-.0011	3.000	-5.302	-.000	-.0978
-23.000	-24.777	.994	-.0014	3.500	-5.314	-.049	-.0965
-22.000	-23.784	.992	-.0018	4.000	-5.350	-.097	-.0947
-21.000	-22.792	.990	-.0022	4.500	-5.410	-.143	-.0925
-20.000	-21.803	.988	-.0028	5.000	-5.494	-.189	-.0900
-19.000	-20.817	.985	-.0035	5.500	-5.599	-.233	-.0871
-18.000	-19.834	.981	-.0044	6.000	-5.727	-.276	-.0840
-17.000	-18.856	.976	-.0055	6.500	-5.875	-.317	-.0808
-16.000	-17.883	.970	-.0069	7.000	-6.044	-.357	-.0774
-15.500	-17.399	.966	-.0077	7.500	-6.232	-.395	-.0739
-15.000	-16.918	.962	-.0086	8.000	-6.438	-.431	-.0703
-14.500	-16.438	.957	-.0096	8.500	-6.662	-.465	-.0668
-14.000	-15.960	.952	-.0107	9.000	-6.903	-.498	-.0633
-13.500	-15.485	.947	-.0119	9.500	-7.160	-.528	-.0599
-13.000	-15.014	.940	-.0132	10.000	-7.431	-.557	-.0565
-12.500	-14.545	.933	-.0147	10.500	-7.717	-.585	-.0532
-12.000	-14.080	.926	-.0163	11.000	-8.016	-.611	-.0501
-11.500	-13.620	.917	-.0181	11.500	-8.327	-.635	-.0471
-11.000	-13.163	.908	-.0201	12.000	-8.650	-.658	-.0442
-10.500	-12.712	.897	-.0222	12.500	-8.985	-.679	-.0415
-10.000	-12.267	.885	-.0245	13.000	-9.330	-.699	-.0389
-9.500	-11.827	.872	-.0270	13.500	-9.684	-.718	-.0364
-9.000	-11.394	.858	-.0298	14.000	-10.047	-.736	-.0341
-8.500	-10.969	.843	-.0327	14.500	-10.420	-.752	-.0319
-8.000	-10.552	.826	-.0358	15.000	-10.800	-.768	-.0299
-7.500	-10.144	.807	-.0392	15.500	-11.187	-.782	-.0280
-7.000	-9.745	.786	-.0427	16.000	-11.582	-.796	-.0262
-6.500	-9.358	.764	-.0465	17.000	-12.390	-.820	-.0229
-6.000	-8.982	.740	-.0504	18.000	-13.221	-.842	-.0200
-5.500	-8.618	.714	-.0544	19.000	-14.072	-.860	-.0176
-5.000	-8.268	.685	-.0585	20.000	-14.941	-.877	-.0154
-4.500	-7.933	.655	-.0627	21.000	-15.825	-.891	-.0135
-4.000	-7.614	.623	-.0670	22.000	-16.723	-.904	-.0119
-3.500	-7.311	.588	-.0712	23.000	-17.633	-.915	-.0104
-3.000	-7.026	.552	-.0753	24.000	-18.553	-.925	-.0092
-2.500	-6.760	.513	-.0793	25.000	-19.482	-.933	-.0081
-2.000	-6.513	.472	-.0830	26.000	-20.420	-.941	-.0071
-1.500	-6.288	.430	-.0865	27.000	-21.364	-.948	-.0063
-1.000	-6.084	.386	-.0897	28.000	-22.315	-.954	-.0055
-.500	-5.902	.340	-.0925	29.000	-23.271	-.959	-.0049

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 2.00 DB							
-30.000	-32.005	.999	-.0003	.000	-5.907	.306	-.0941
-29.000	-31.007	.998	-.0003	.500	-5.766	.258	-.0960
-28.000	-30.008	.998	-.0004	1.000	-5.650	.210	-.0975
-27.000	-29.010	.998	-.0006	1.500	-5.557	.161	-.0984
-26.000	-28.013	.997	-.0007	2.000	-5.489	.111	-.0987
-25.000	-27.016	.996	-.0009	2.500	-5.445	.062	-.0986
-24.000	-26.021	.995	-.0011	3.000	-5.427	.013	-.0979
-23.000	-25.026	.994	-.0014	3.500	-5.433	-.036	-.0967
-22.000	-24.033	.992	-.0017	4.000	-5.462	-.084	-.0950
-21.000	-23.041	.991	-.0022	4.500	-5.516	-.131	-.0930
-20.000	-22.052	.988	-.0027	5.000	-5.593	-.177	-.0906
-19.000	-21.065	.985	-.0034	5.500	-5.692	-.221	-.0878
-18.000	-20.082	.981	-.0043	6.000	-5.814	-.264	-.0848
-17.000	-19.103	.976	-.0054	6.500	-5.957	-.306	-.0816
-16.000	-18.130	.970	-.0067	7.000	-6.120	-.346	-.0782
-15.500	-17.646	.967	-.0075	7.500	-6.302	-.384	-.0748
-15.000	-17.163	.963	-.0083	8.000	-6.504	-.421	-.0713
-14.500	-16.683	.958	-.0093	8.500	-6.723	-.455	-.0677
-14.000	-16.205	.954	-.0104	9.000	-6.959	-.488	-.0642
-13.500	-15.729	.948	-.0116	9.500	-7.211	-.520	-.0608
-13.000	-15.257	.942	-.0129	10.000	-7.478	-.549	-.0574
-12.500	-14.787	.935	-.0143	10.500	-7.760	-.577	-.0541
-12.000	-14.322	.928	-.0159	11.000	-8.055	-.603	-.0510
-11.500	-13.860	.919	-.0177	11.500	-8.363	-.628	-.0479
-11.000	-13.403	.910	-.0196	12.000	-8.683	-.651	-.0450
-10.500	-12.950	.900	-.0217	12.500	-9.014	-.673	-.0422
-10.000	-12.503	.888	-.0239	13.000	-9.356	-.694	-.0396
-9.500	-12.062	.876	-.0264	13.500	-9.708	-.713	-.0371
-9.000	-11.628	.862	-.0291	14.000	-10.069	-.731	-.0348
-8.500	-11.201	.847	-.0320	14.500	-10.438	-.748	-.0326
-8.000	-10.782	.830	-.0351	15.000	-10.816	-.763	-.0305
-7.500	-10.371	.811	-.0383	15.500	-11.201	-.778	-.0285
-7.000	-9.970	.791	-.0418	16.000	-11.594	-.792	-.0267
-6.500	-9.580	.770	-.0455	17.000	-12.399	-.817	-.0233
-6.000	-9.201	.746	-.0493	18.000	-13.227	-.839	-.0204
-5.500	-8.835	.720	-.0533	19.000	-14.075	-.858	-.0179
-5.000	-8.481	.693	-.0574	20.000	-14.941	-.875	-.0157
-4.500	-8.142	.663	-.0616	21.000	-15.824	-.889	-.0138
-4.000	-7.819	.631	-.0658	22.000	-16.719	-.902	-.0121
-3.500	-7.512	.597	-.0700	23.000	-17.627	-.914	-.0106
-3.000	-7.222	.561	-.0742	24.000	-18.546	-.924	-.0093
-2.500	-6.951	.523	-.0782	25.000	-19.474	-.932	-.0082
-2.000	-6.700	.483	-.0820	26.000	-20.410	-.940	-.0073
-1.500	-6.469	.441	-.0855	27.000	-21.354	-.947	-.0064
-1.000	-6.259	.397	-.0888	28.000	-22.304	-.953	-.0057
-.500	-6.072	.352	-.0916	29.000	-23.259	-.958	-.0050

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 2.25 DB							
-30.000	-32.255	.999	-.0003	.000	-6.073	.318	-.0933
-29.000	-31.256	.999	-.0003	.500	-5.926	.271	-.0954
-28.000	-30.258	.998	-.0004	1.000	-5.803	.223	-.0969
-27.000	-29.260	.998	-.0005	1.500	-5.704	.174	-.0980
-26.000	-28.263	.997	-.0007	2.000	-5.629	.125	-.0985
-25.000	-27.266	.996	-.0008	2.500	-5.579	.075	-.0985
-24.000	-26.270	.995	-.0011	3.000	-5.554	.026	-.0979
-23.000	-25.275	.994	-.0013	3.500	-5.553	-.023	-.0969
-22.000	-24.282	.993	-.0017	4.000	-5.576	-.071	-.0954
-21.000	-23.290	.991	-.0021	4.500	-5.623	-.118	-.0934
-20.000	-22.301	.988	-.0027	5.000	-5.694	-.164	-.0911
-19.000	-21.314	.985	-.0033	5.500	-5.787	-.209	-.0885
-18.000	-20.330	.982	-.0042	6.000	-5.902	-.252	-.0855
-17.000	-19.351	.977	-.0052	6.500	-6.039	-.294	-.0824
-16.000	-18.377	.971	-.0065	7.000	-6.196	-.335	-.0791
-15.500	-17.892	.968	-.0073	7.500	-6.374	-.373	-.0757
-15.000	-17.409	.964	-.0081	8.000	-6.570	-.410	-.0722
-14.500	-16.928	.960	-.0091	8.500	-6.784	-.446	-.0687
-14.000	-16.449	.955	-.0101	9.000	-7.015	-.479	-.0652
-13.500	-15.973	.949	-.0113	9.500	-7.263	-.511	-.0617
-13.000	-15.500	.943	-.0126	10.000	-7.526	-.541	-.0583
-12.500	-15.030	.937	-.0140	10.500	-7.803	-.569	-.0550
-12.000	-14.564	.929	-.0155	11.000	-8.094	-.596	-.0518
-11.500	-14.101	.921	-.0172	11.500	-8.399	-.621	-.0488
-11.000	-13.642	.912	-.0191	12.000	-8.715	-.645	-.0458
-10.500	-13.189	.902	-.0212	12.500	-9.043	-.667	-.0430
-10.000	-12.740	.891	-.0234	13.000	-9.382	-.688	-.0404
-9.500	-12.298	.879	-.0258	13.500	-9.731	-.707	-.0378
-9.000	-11.862	.865	-.0284	14.000	-10.089	-.726	-.0354
-8.500	-11.433	.850	-.0312	14.500	-10.456	-.743	-.0332
-8.000	-11.012	.834	-.0343	15.000	-10.831	-.759	-.0311
-7.500	-10.599	.816	-.0375	15.500	-11.215	-.774	-.0291
-7.000	-10.196	.796	-.0409	16.000	-11.605	-.788	-.0272
-6.500	-9.803	.775	-.0446	17.000	-12.406	-.813	-.0238
-6.000	-9.422	.752	-.0484	18.000	-13.231	-.836	-.0208
-5.500	-9.052	.727	-.0523	19.000	-14.076	-.855	-.0183
-5.000	-8.695	.699	-.0564	20.000	-14.940	-.872	-.0160
-4.500	-8.353	.670	-.0605	21.000	-15.820	-.887	-.0140
-4.000	-8.025	.639	-.0647	22.000	-16.714	-.900	-.0123
-3.500	-7.714	.605	-.0689	23.000	-17.620	-.912	-.0108
-3.000	-7.420	.570	-.0730	24.000	-18.537	-.922	-.0095
-2.500	-7.145	.532	-.0771	25.000	-19.464	-.931	-.0084
-2.000	-6.888	.493	-.0809	26.000	-20.399	-.939	-.0074
-1.500	-6.652	.452	-.0845	27.000	-21.342	-.946	-.0065
-1.000	-6.437	.408	-.0878	28.000	-22.291	-.952	-.0058
-.500	-6.244	.364	-.0908	29.000	-23.245	-.957	-.0051

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 2.50 DB							
-30.000	-32.505	.999	-.0003	.000	-6.241	.330	-.0925
-29.000	-31.506	.999	-.0003	.500	-6.087	.283	-.0947
-28.000	-30.508	.998	-.0004	1.000	-5.958	.235	-.0964
-27.000	-29.510	.998	-.0005	1.500	-5.852	.187	-.0975
-26.000	-28.512	.997	-.0007	2.000	-5.771	.138	-.0982
-25.000	-27.516	.996	-.0008	2.500	-5.714	.089	-.0983
-24.000	-26.520	.995	-.0010	3.000	-5.682	.040	-.0979
-23.000	-25.525	.994	-.0013	3.500	-5.675	-.009	-.0970
-22.000	-24.531	.993	-.0016	4.000	-5.691	-.057	-.0956
-21.000	-23.539	.991	-.0021	4.500	-5.732	-.105	-.0938
-20.000	-22.549	.989	-.0026	5.000	-5.796	-.151	-.0916
-19.000	-21.562	.986	-.0032	5.500	-5.883	-.196	-.0891
-18.000	-20.578	.982	-.0041	6.000	-5.992	-.240	-.0862
-17.000	-19.598	.978	-.0051	6.500	-6.123	-.282	-.0832
-16.000	-18.623	.972	-.0064	7.000	-6.274	-.323	-.0799
-15.500	-18.138	.969	-.0071	7.500	-6.446	-.362	-.0766
-15.000	-17.655	.965	-.0079	8.000	-6.636	-.400	-.0731
-14.500	-17.173	.961	-.0089	8.500	-6.845	-.436	-.0696
-14.000	-16.694	.956	-.0099	9.000	-7.072	-.469	-.0661
-13.500	-16.218	.951	-.0110	9.500	-7.314	-.502	-.0627
-13.000	-15.744	.945	-.0123	10.000	-7.573	-.532	-.0593
-12.500	-15.273	.938	-.0136	10.500	-7.846	-.561	-.0559
-12.000	-14.806	.931	-.0151	11.000	-8.134	-.588	-.0527
-11.500	-14.342	.923	-.0168	11.500	-8.434	-.614	-.0496
-11.000	-13.882	.914	-.0186	12.000	-8.747	-.638	-.0467
-10.500	-13.428	.905	-.0206	12.500	-9.072	-.660	-.0438
-10.000	-12.978	.894	-.0228	13.000	-9.407	-.682	-.0411
-9.500	-12.534	.882	-.0252	13.500	-9.753	-.701	-.0385
-9.000	-12.097	.868	-.0278	14.000	-10.108	-.720	-.0361
-8.500	-11.666	.854	-.0305	14.500	-10.473	-.738	-.0338
-8.000	-11.243	.838	-.0335	15.000	-10.846	-.754	-.0317
-7.500	-10.828	.820	-.0367	15.500	-11.227	-.769	-.0296
-7.000	-10.423	.801	-.0401	16.000	-11.615	-.784	-.0277
-6.500	-10.027	.780	-.0436	17.000	-12.412	-.810	-.0243
-6.000	-9.643	.757	-.0474	18.000	-13.233	-.832	-.0213
-5.500	-9.270	.733	-.0513	19.000	-14.076	-.852	-.0186
-5.000	-8.910	.706	-.0553	20.000	-14.937	-.870	-.0163
-4.500	-8.564	.678	-.0594	21.000	-15.815	-.885	-.0143
-4.000	-8.233	.647	-.0636	22.000	-16.707	-.898	-.0126
-3.500	-7.918	.614	-.0678	23.000	-17.611	-.910	-.0110
-3.000	-7.620	.579	-.0719	24.000	-18.527	-.921	-.0097
-2.500	-7.339	.542	-.0759	25.000	-19.452	-.930	-.0085
-2.000	-7.078	.503	-.0798	26.000	-20.386	-.938	-.0075
-1.500	-6.836	.462	-.0835	27.000	-21.327	-.945	-.0066
-1.000	-6.616	.420	-.0868	28.000	-22.275	-.951	-.0059
-.500	-6.417	.375	-.0899	29.000	-23.229	-.957	-.0052

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 2.75 DB							
-30.000	-32.755	.999	-.0003	.000	-6.410	.342	-.0916
-29.000	-31.756	.999	-.0003	.500	-6.251	.296	-.0939
-28.000	-30.758	.998	-.0004	1.000	-6.115	.248	-.0957
-27.000	-29.760	.998	-.0005	1.500	-6.003	.200	-.0970
-26.000	-28.762	.997	-.0006	2.000	-5.915	.151	-.0978
-25.000	-27.765	.996	-.0008	2.500	-5.851	.102	-.0981
-24.000	-26.769	.996	-.0010	3.000	-5.813	.053	-.0978
-23.000	-25.774	.994	-.0013	3.500	-5.798	.004	-.0971
-22.000	-24.780	.993	-.0016	4.000	-5.808	-.044	-.0959
-21.000	-23.788	.991	-.0020	4.500	-5.842	-.091	-.0942
-20.000	-22.798	.989	-.0025	5.000	-5.900	-.138	-.0921
-19.000	-21.810	.986	-.0032	5.500	-5.980	-.183	-.0897
-18.000	-20.826	.983	-.0040	6.000	-6.083	-.228	-.0869
-17.000	-19.846	.978	-.0050	6.500	-6.207	-.270	-.0839
-16.000	-18.870	.973	-.0062	7.000	-6.353	-.312	-.0808
-15.500	-18.385	.969	-.0069	7.500	-6.519	-.351	-.0774
-15.000	-17.901	.966	-.0077	8.000	-6.704	-.389	-.0740
-14.500	-17.419	.962	-.0086	8.500	-6.907	-.425	-.0706
-14.000	-16.939	.957	-.0096	9.000	-7.129	-.460	-.0671
-13.500	-16.462	.952	-.0107	9.500	-7.367	-.492	-.0636
-13.000	-15.988	.946	-.0120	10.000	-7.620	-.523	-.0602
-12.500	-15.516	.940	-.0133	10.500	-7.889	-.552	-.0569
-12.000	-15.048	.933	-.0148	11.000	-8.173	-.580	-.0536
-11.500	-14.583	.925	-.0164	11.500	-8.469	-.606	-.0505
-11.000	-14.123	.916	-.0182	12.000	-8.778	-.631	-.0475
-10.500	-13.667	.907	-.0202	12.500	-9.100	-.654	-.0446
-10.000	-13.216	.896	-.0223	13.000	-9.432	-.675	-.0419
-9.500	-12.771	.885	-.0246	13.500	-9.775	-.696	-.0393
-9.000	-12.332	.872	-.0271	14.000	-10.127	-.715	-.0368
-8.500	-11.899	.857	-.0299	14.500	-10.489	-.732	-.0345
-8.000	-11.475	.842	-.0328	15.000	-10.859	-.749	-.0323
-7.500	-11.058	.825	-.0359	15.500	-11.238	-.765	-.0302
-7.000	-10.650	.806	-.0392	16.000	-11.624	-.779	-.0283
-6.500	-10.252	.785	-.0427	17.000	-12.417	-.806	-.0248
-6.000	-9.865	.763	-.0464	18.000	-13.235	-.829	-.0217
-5.500	-9.490	.739	-.0503	19.000	-14.074	-.849	-.0190
-5.000	-9.127	.713	-.0542	20.000	-14.933	-.867	-.0167
-4.500	-8.777	.685	-.0583	21.000	-15.808	-.883	-.0146
-4.000	-8.442	.654	-.0625	22.000	-16.698	-.897	-.0128
-3.500	-8.123	.622	-.0666	23.000	-17.600	-.909	-.0113
-3.000	-7.820	.588	-.0707	24.000	-18.514	-.919	-.0099
-2.500	-7.535	.551	-.0748	25.000	-19.438	-.928	-.0087
-2.000	-7.269	.513	-.0787	26.000	-20.371	-.937	-.0077
-1.500	-7.023	.473	-.0824	27.000	-21.311	-.944	-.0068
-1.000	-6.797	.431	-.0858	28.000	-22.258	-.950	-.0060
-.500	-6.592	.387	-.0889	29.000	-23.211	-.956	-.0053

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 3.00 DB							
-30.000	-33.005	.999	-.0003	.000	-6.581	.354	-.0907
-29.000	-32.006	.999	-.0003	.500	-6.416	.308	-.0931
-28.000	-31.007	.998	-.0004	1.000	-6.273	.261	-.0950
-27.000	-30.009	.998	-.0005	1.500	-6.155	.213	-.0965
-26.000	-29.012	.997	-.0006	2.000	-6.060	.164	-.0974
-25.000	-28.015	.997	-.0008	2.500	-5.990	.116	-.0978
-24.000	-27.019	.996	-.0010	3.000	-5.945	.067	-.0977
-23.000	-26.024	.995	-.0012	3.500	-5.924	.018	-.0971
-22.000	-25.030	.993	-.0016	4.000	-5.927	-.030	-.0960
-21.000	-24.037	.991	-.0020	4.500	-5.954	-.078	-.0945
-20.000	-23.047	.989	-.0025	5.000	-6.005	-.125	-.0925
-19.000	-22.059	.986	-.0031	5.500	-6.079	-.170	-.0902
-18.000	-21.074	.983	-.0039	6.000	-6.175	-.215	-.0876
-17.000	-20.093	.979	-.0048	6.500	-6.293	-.258	-.0847
-16.000	-19.117	.973	-.0060	7.000	-6.433	-.300	-.0816
-15.500	-18.631	.970	-.0068	7.500	-6.593	-.340	-.0783
-15.000	-18.147	.966	-.0075	8.000	-6.772	-.378	-.0749
-14.500	-17.665	.963	-.0084	8.500	-6.970	-.414	-.0715
-14.000	-17.185	.958	-.0094	9.000	-7.186	-.449	-.0680
-13.500	-16.707	.953	-.0105	9.500	-7.419	-.482	-.0646
-13.000	-16.232	.948	-.0117	10.000	-7.668	-.514	-.0612
-12.500	-15.759	.941	-.0130	10.500	-7.933	-.544	-.0578
-12.000	-15.290	.935	-.0144	11.000	-8.212	-.572	-.0546
-11.500	-14.825	.927	-.0160	11.500	-8.504	-.598	-.0514
-11.000	-14.364	.919	-.0178	12.000	-8.810	-.623	-.0484
-10.500	-13.907	.909	-.0197	12.500	-9.127	-.647	-.0455
-10.000	-13.455	.899	-.0218	13.000	-9.456	-.669	-.0427
-9.500	-13.008	.887	-.0241	13.500	-9.796	-.689	-.0401
-9.000	-12.567	.875	-.0265	14.000	-10.145	-.709	-.0376
-8.500	-12.133	.861	-.0292	14.500	-10.504	-.727	-.0352
-8.000	-11.707	.846	-.0320	15.000	-10.872	-.744	-.0330
-7.500	-11.288	.829	-.0351	15.500	-11.248	-.760	-.0309
-7.000	-10.878	.810	-.0384	16.000	-11.632	-.775	-.0289
-6.500	-10.478	.790	-.0418	17.000	-12.421	-.802	-.0253
-6.000	-10.088	.769	-.0455	18.000	-13.235	-.826	-.0222
-5.500	-9.710	.745	-.0493	19.000	-14.071	-.846	-.0194
-5.000	-9.344	.719	-.0532	20.000	-14.926	-.865	-.0170
-4.500	-8.991	.692	-.0572	21.000	-15.799	-.880	-.0149
-4.000	-8.652	.662	-.0613	22.000	-16.687	-.894	-.0131
-3.500	-8.329	.630	-.0655	23.000	-17.588	-.907	-.0115
-3.000	-8.023	.597	-.0696	24.000	-18.500	-.918	-.0101
-2.500	-7.733	.561	-.0736	25.000	-19.422	-.927	-.0089
-2.000	-7.462	.523	-.0775	26.000	-20.353	-.935	-.0078
-1.500	-7.211	.483	-.0813	27.000	-21.293	-.943	-.0069
-1.000	-6.979	.442	-.0847	28.000	-22.239	-.949	-.0061
-.500	-6.769	.398	-.0879	29.000	-23.191	-.955	-.0054

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 3.25 DB							
-30.000	-33.255	.999	-.0002	.000	-6.754	.366	-.0898
-29.000	-32.256	.999	-.0003	.500	-6.582	.320	-.0922
-28.000	-31.257	.998	-.0004	1.000	-6.434	.273	-.0943
-27.000	-30.259	.998	-.0005	1.500	-6.309	.226	-.0959
-26.000	-29.262	.997	-.0006	2.000	-6.208	.178	-.0969
-25.000	-28.264	.997	-.0008	2.500	-6.131	.129	-.0975
-24.000	-27.268	.996	-.0010	3.000	-6.079	.080	-.0975
-23.000	-26.273	.995	-.0012	3.500	-6.051	.032	-.0971
-22.000	-25.279	.993	-.0015	4.000	-6.047	-.017	-.0961
-21.000	-24.286	.992	-.0019	4.500	-6.068	-.064	-.0947
-20.000	-23.296	.990	-.0024	5.000	-6.112	-.111	-.0929
-19.000	-22.307	.987	-.0030	5.500	-6.179	-.157	-.0907
-18.000	-21.322	.983	-.0038	6.000	-6.269	-.202	-.0882
-17.000	-20.341	.979	-.0047	6.500	-6.381	-.245	-.0854
-16.000	-19.364	.974	-.0059	7.000	-6.514	-.287	-.0823
-15.500	-18.878	.971	-.0066	7.500	-6.668	-.328	-.0791
-15.000	-18.393	.967	-.0074	8.000	-6.841	-.366	-.0758
-14.500	-17.911	.963	-.0082	8.500	-7.034	-.403	-.0724
-14.000	-17.430	.959	-.0092	9.000	-7.244	-.439	-.0690
-13.500	-16.952	.954	-.0102	9.500	-7.472	-.472	-.0655
-13.000	-16.476	.949	-.0114	10.000	-7.717	-.504	-.0621
-12.500	-16.003	.943	-.0127	10.500	-7.976	-.535	-.0588
-12.000	-15.533	.936	-.0141	11.000	-8.251	-.563	-.0555
-11.500	-15.067	.929	-.0156	11.500	-8.539	-.590	-.0523
-11.000	-14.605	.921	-.0174	12.000	-8.841	-.616	-.0493
-10.500	-14.147	.911	-.0192	12.500	-9.155	-.639	-.0463
-10.000	-13.693	.901	-.0213	13.000	-9.480	-.662	-.0435
-9.500	-13.245	.890	-.0235	13.500	-9.816	-.683	-.0409
-9.000	-12.803	.878	-.0259	14.000	-10.163	-.703	-.0383
-8.500	-12.368	.864	-.0285	14.500	-10.519	-.721	-.0359
-8.000	-11.940	.849	-.0313	15.000	-10.884	-.739	-.0336
-7.500	-11.519	.833	-.0343	15.500	-11.257	-.755	-.0315
-7.000	-11.107	.815	-.0376	16.000	-11.639	-.770	-.0295
-6.500	-10.705	.795	-.0410	17.000	-12.423	-.798	-.0258
-6.000	-10.312	.774	-.0445	18.000	-13.233	-.822	-.0226
-5.500	-9.931	.751	-.0483	19.000	-14.066	-.843	-.0198
-5.000	-9.562	.726	-.0522	20.000	-14.919	-.862	-.0174
-4.500	-9.206	.698	-.0561	21.000	-15.789	-.878	-.0152
-4.000	-8.864	.669	-.0602	22.000	-16.674	-.892	-.0134
-3.500	-8.537	.638	-.0643	23.000	-17.573	-.905	-.0117
-3.000	-8.226	.605	-.0684	24.000	-18.483	-.916	-.0103
-2.500	-7.932	.570	-.0725	25.000	-19.404	-.926	-.0091
-2.000	-7.656	.533	-.0764	26.000	-20.334	-.934	-.0080
-1.500	-7.400	.493	-.0801	27.000	-21.272	-.942	-.0071
-1.000	-7.163	.452	-.0837	28.000	-22.217	-.948	-.0062
-.500	-6.948	.410	-.0869	29.000	-23.168	-.954	-.0055

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 3.50 DB							
-30.000	-33.504	.999	-.0002	.000	-6.928	.377	-.0888
-29.000	-32.506	.999	-.0003	.500	-6.751	.332	-.0913
-28.000	-31.507	.998	-.0004	1.000	-6.596	.286	-.0935
-27.000	-30.509	.998	-.0005	1.500	-6.465	.239	-.0952
-26.000	-29.511	.997	-.0006	2.000	-6.358	.191	-.0964
-25.000	-28.514	.997	-.0007	2.500	-6.274	.143	-.0971
-24.000	-27.518	.996	-.0009	3.000	-6.215	.094	-.0973
-23.000	-26.522	.995	-.0012	3.500	-6.180	.045	-.0969
-22.000	-25.528	.994	-.0015	4.000	-6.170	-.003	-.0961
-21.000	-24.535	.992	-.0019	4.500	-6.183	-.051	-.0949
-20.000	-23.545	.990	-.0023	5.000	-6.220	-.098	-.0932
-19.000	-22.556	.987	-.0029	5.500	-6.281	-.144	-.0911
-18.000	-21.571	.984	-.0037	6.000	-6.364	-.189	-.0887
-17.000	-20.589	.980	-.0046	6.500	-6.469	-.232	-.0860
-16.000	-19.611	.975	-.0058	7.000	-6.596	-.275	-.0831
-15.500	-19.125	.972	-.0064	7.500	-6.744	-.316	-.0800
-15.000	-18.640	.968	-.0072	8.000	-6.911	-.355	-.0767
-14.500	-18.157	.964	-.0080	8.500	-7.098	-.392	-.0733
-14.000	-17.676	.960	-.0089	9.000	-7.303	-.428	-.0699
-13.500	-17.197	.955	-.0100	9.500	-7.526	-.462	-.0665
-13.000	-16.720	.950	-.0111	10.000	-7.765	-.495	-.0631
-12.500	-16.247	.944	-.0124	10.500	-8.020	-.525	-.0597
-12.000	-15.776	.938	-.0137	11.000	-8.290	-.554	-.0565
-11.500	-15.309	.930	-.0153	11.500	-8.574	-.582	-.0533
-11.000	-14.846	.922	-.0169	12.000	-8.872	-.608	-.0502
-10.500	-14.387	.913	-.0188	12.500	-9.182	-.632	-.0472
-10.000	-13.933	.904	-.0208	13.000	-9.503	-.655	-.0444
-9.500	-13.483	.893	-.0230	13.500	-9.836	-.676	-.0417
-9.000	-13.040	.881	-.0253	14.000	-10.180	-.697	-.0391
-8.500	-12.603	.867	-.0279	14.500	-10.533	-.715	-.0366
-8.000	-12.173	.853	-.0306	15.000	-10.895	-.733	-.0343
-7.500	-11.751	.837	-.0336	15.500	-11.266	-.750	-.0322
-7.000	-11.337	.819	-.0367	16.000	-11.645	-.765	-.0301
-6.500	-10.932	.800	-.0401	17.000	-12.424	-.794	-.0264
-6.000	-10.537	.779	-.0436	18.000	-13.231	-.818	-.0231
-5.500	-10.153	.756	-.0473	19.000	-14.060	-.840	-.0202
-5.000	-9.781	.732	-.0511	20.000	-14.910	-.859	-.0177
-4.500	-9.422	.705	-.0551	21.000	-15.777	-.876	-.0156
-4.000	-9.076	.677	-.0591	22.000	-16.660	-.890	-.0136
-3.500	-8.746	.646	-.0632	23.000	-17.557	-.903	-.0120
-3.000	-8.431	.613	-.0673	24.000	-18.465	-.914	-.0105
-2.500	-8.133	.579	-.0713	25.000	-19.385	-.924	-.0093
-2.000	-7.852	.542	-.0752	26.000	-20.313	-.933	-.0082
-1.500	-7.591	.503	-.0790	27.000	-21.250	-.940	-.0072
-1.000	-7.349	.463	-.0826	28.000	-22.194	-.947	-.0064
-.500	-7.128	.421	-.0858	29.000	-23.144	-.953	-.0056

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 3.75 DB							
-30.000	-33.754	.999	-.0002	.000	-7.105	.389	-.0878
-29.000	-32.755	.999	-.0003	.500	-6.921	.344	-.0904
-28.000	-31.757	.998	-.0004	1.000	-6.761	.299	-.0927
-27.000	-30.759	.998	-.0005	1.500	-6.623	.252	-.0944
-26.000	-29.761	.997	-.0006	2.000	-6.509	.204	-.0958
-25.000	-28.764	.997	-.0007	2.500	-6.419	.156	-.0966
-24.000	-27.767	.996	-.0009	3.000	-6.353	.108	-.0969
-23.000	-26.772	.995	-.0012	3.500	-6.311	.059	-.0968
-22.000	-25.777	.994	-.0014	4.000	-6.294	.011	-.0961
-21.000	-24.785	.992	-.0018	4.500	-6.300	-.037	-.0950
-20.000	-23.793	.990	-.0023	5.000	-6.330	-.084	-.0935
-19.000	-22.805	.987	-.0029	5.500	-6.384	-.130	-.0915
-18.000	-21.819	.984	-.0036	6.000	-6.461	-.175	-.0892
-17.000	-20.836	.980	-.0045	6.500	-6.559	-.219	-.0866
-16.000	-19.859	.975	-.0056	7.000	-6.680	-.262	-.0838
-15.500	-19.372	.972	-.0063	7.500	-6.821	-.303	-.0808
-15.000	-18.887	.969	-.0070	8.000	-6.983	-.343	-.0776
-14.500	-18.403	.965	-.0078	8.500	-7.164	-.381	-.0742
-14.000	-17.921	.961	-.0087	9.000	-7.363	-.417	-.0709
-13.500	-17.442	.956	-.0097	9.500	-7.580	-.452	-.0675
-13.000	-16.965	.951	-.0108	10.000	-7.814	-.484	-.0641
-12.500	-16.491	.946	-.0121	10.500	-8.065	-.516	-.0607
-12.000	-16.020	.939	-.0134	11.000	-8.330	-.545	-.0574
-11.500	-15.552	.932	-.0149	11.500	-8.609	-.573	-.0542
-11.000	-15.088	.924	-.0166	12.000	-8.903	-.599	-.0511
-10.500	-14.628	.916	-.0183	12.500	-9.209	-.624	-.0481
-10.000	-14.172	.906	-.0203	13.000	-9.527	-.648	-.0452
-9.500	-13.722	.895	-.0224	13.500	-9.856	-.669	-.0425
-9.000	-13.277	.883	-.0248	14.000	-10.196	-.690	-.0399
-8.500	-12.839	.870	-.0273	14.500	-10.546	-.709	-.0374
-8.000	-12.407	.856	-.0300	15.000	-10.905	-.728	-.0351
-7.500	-11.983	.840	-.0329	15.500	-11.273	-.744	-.0328
-7.000	-11.567	.823	-.0360	16.000	-11.650	-.760	-.0308
-6.500	-11.160	.804	-.0392	17.000	-12.425	-.789	-.0270
-6.000	-10.763	.784	-.0427	18.000	-13.227	-.814	-.0236
-5.500	-10.376	.762	-.0463	19.000	-14.052	-.837	-.0207
-5.000	-10.001	.738	-.0501	20.000	-14.899	-.856	-.0181
-4.500	-9.639	.712	-.0540	21.000	-15.764	-.873	-.0159
-4.000	-9.290	.684	-.0580	22.000	-16.644	-.888	-.0139
-3.500	-8.955	.654	-.0621	23.000	-17.539	-.901	-.0122
-3.000	-8.637	.622	-.0661	24.000	-18.445	-.912	-.0108
-2.500	-8.334	.587	-.0701	25.000	-19.363	-.922	-.0095
-2.000	-8.050	.551	-.0741	26.000	-20.290	-.931	-.0083
-1.500	-7.783	.513	-.0778	27.000	-21.225	-.939	-.0074
-1.000	-7.536	.474	-.0814	28.000	-22.168	-.946	-.0065
-.500	-7.310	.432	-.0847	29.000	-23.117	-.952	-.0057

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 4.00 DB							
-30.000	-34.004	.999	-.0002	.000	-7.283	.400	-.0867
-29.000	-33.005	.999	-.0003	.500	-7.093	.356	-.0894
-28.000	-32.007	.998	-.0004	1.000	-6.927	.311	-.0918
-27.000	-31.008	.998	-.0004	1.500	-6.783	.265	-.0937
-26.000	-30.011	.998	-.0006	2.000	-6.662	.217	-.0951
-25.000	-29.013	.997	-.0007	2.500	-6.565	.170	-.0961
-24.000	-28.017	.996	-.0009	3.000	-6.493	.121	-.0965
-23.000	-27.021	.995	-.0011	3.500	-6.444	.073	-.0965
-22.000	-26.027	.994	-.0014	4.000	-6.420	.025	-.0960
-21.000	-25.034	.992	-.0018	4.500	-6.419	-.023	-.0951
-20.000	-24.042	.990	-.0022	5.000	-6.443	-.070	-.0937
-19.000	-23.053	.988	-.0028	5.500	-6.489	-.116	-.0919
-18.000	-22.067	.985	-.0035	6.000	-6.559	-.162	-.0897
-17.000	-21.084	.981	-.0044	6.500	-6.651	-.206	-.0872
-16.000	-20.106	.976	-.0055	7.000	-6.765	-.249	-.0845
-15.500	-19.619	.973	-.0061	7.500	-6.900	-.291	-.0815
-15.000	-19.133	.970	-.0068	8.000	-7.055	-.331	-.0784
-14.500	-18.649	.966	-.0076	8.500	-7.230	-.369	-.0751
-14.000	-18.167	.962	-.0085	9.000	-7.424	-.406	-.0718
-13.500	-17.687	.957	-.0095	9.500	-7.635	-.441	-.0684
-13.000	-17.210	.952	-.0106	10.000	-7.864	-.474	-.0650
-12.500	-16.735	.947	-.0118	10.500	-8.109	-.506	-.0617
-12.000	-16.263	.941	-.0131	11.000	-8.370	-.536	-.0584
-11.500	-15.794	.934	-.0146	11.500	-8.645	-.564	-.0552
-11.000	-15.329	.926	-.0162	12.000	-8.934	-.591	-.0520
-10.500	-14.869	.918	-.0179	12.500	-9.236	-.616	-.0490
-10.000	-14.412	.908	-.0198	13.000	-9.550	-.640	-.0461
-9.500	-13.961	.898	-.0219	13.500	-9.875	-.662	-.0433
-9.000	-13.515	.886	-.0242	14.000	-10.212	-.683	-.0407
-8.500	-13.075	.873	-.0267	14.500	-10.559	-.703	-.0382
-8.000	-12.641	.859	-.0293	15.000	-10.915	-.722	-.0358
-7.500	-12.215	.844	-.0322	15.500	-11.280	-.739	-.0335
-7.000	-11.797	.827	-.0352	16.000	-11.654	-.755	-.0314
-6.500	-11.388	.809	-.0384	17.000	-12.424	-.785	-.0276
-6.000	-10.989	.789	-.0418	18.000	-13.222	-.810	-.0241
-5.500	-10.600	.767	-.0454	19.000	-14.044	-.833	-.0211
-5.000	-10.222	.743	-.0491	20.000	-14.887	-.853	-.0185
-4.500	-9.857	.718	-.0530	21.000	-15.749	-.870	-.0162
-4.000	-9.504	.690	-.0569	22.000	-16.627	-.885	-.0143
-3.500	-9.167	.661	-.0609	23.000	-17.519	-.899	-.0125
-3.000	-8.844	.629	-.0650	24.000	-18.424	-.911	-.0110
-2.500	-8.537	.596	-.0690	25.000	-19.340	-.921	-.0097
-2.000	-8.248	.561	-.0729	26.000	-20.265	-.930	-.0085
-1.500	-7.977	.523	-.0767	27.000	-21.199	-.938	-.0075
-1.000	-7.725	.484	-.0803	28.000	-22.141	-.945	-.0066
-.500	-7.494	.443	-.0836	29.000	-23.089	-.951	-.0058

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	$10 \log KP_o$	$20 \log \phi$	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 4.25 DB							
-30.000	-34.254	.999	-.0002	.000	-7.462	.412	-.0856
-29.000	-33.255	.999	-.0003	.500	-7.267	.368	-.0884
-28.000	-32.257	.998	-.0003	1.000	-7.095	.323	-.0908
-27.000	-31.258	.998	-.0004	1.500	-6.944	.277	-.0928
-26.000	-30.260	.998	-.0006	2.000	-6.817	.230	-.0944
-25.000	-29.263	.997	-.0007	2.500	-6.714	.183	-.0955
-24.000	-28.267	.996	-.0009	3.000	-6.635	.135	-.0961
-23.000	-27.271	.995	-.0011	3.500	-6.579	.087	-.0962
-22.000	-26.276	.994	-.0014	4.000	-6.548	.039	-.0959
-21.000	-25.283	.992	-.0017	4.500	-6.540	-.009	-.0951
-20.000	-24.291	.990	-.0022	5.000	-6.556	-.056	-.0938
-19.000	-23.302	.988	-.0027	5.500	-6.596	-.103	-.0921
-18.000	-22.316	.985	-.0034	6.000	-6.659	-.148	-.0901
-17.000	-21.332	.981	-.0043	6.500	-6.744	-.193	-.0877
-16.000	-20.354	.976	-.0054	7.000	-6.851	-.236	-.0851
-15.500	-19.866	.974	-.0060	7.500	-6.980	-.278	-.0822
-15.000	-19.380	.970	-.0067	8.000	-7.129	-.318	-.0792
-14.500	-18.896	.967	-.0075	8.500	-7.298	-.357	-.0760
-14.000	-18.413	.963	-.0083	9.000	-7.485	-.394	-.0727
-13.500	-17.933	.958	-.0093	9.500	-7.691	-.430	-.0694
-13.000	-17.455	.954	-.0103	10.000	-7.915	-.463	-.0660
-12.500	-16.979	.948	-.0115	10.500	-8.155	-.496	-.0627
-12.000	-16.507	.942	-.0128	11.000	-8.410	-.526	-.0594
-11.500	-16.037	.935	-.0142	11.500	-8.680	-.555	-.0561
-11.000	-15.572	.928	-.0158	12.000	-8.965	-.582	-.0530
-10.500	-15.110	.919	-.0175	12.500	-9.263	-.608	-.0500
-10.000	-14.652	.910	-.0194	13.000	-9.573	-.632	-.0470
-9.500	-14.200	.900	-.0214	13.500	-9.895	-.655	-.0442
-9.000	-13.752	.889	-.0237	14.000	-10.228	-.677	-.0415
-8.500	-13.311	.876	-.0261	14.500	-10.571	-.697	-.0390
-8.000	-12.876	.863	-.0287	15.000	-10.924	-.716	-.0366
-7.500	-12.449	.848	-.0315	15.500	-11.286	-.733	-.0343
-7.000	-12.029	.831	-.0344	16.000	-11.657	-.750	-.0321
-6.500	-11.618	.813	-.0376	17.000	-12.422	-.780	-.0282
-6.000	-11.216	.794	-.0410	18.000	-13.216	-.806	-.0247
-5.500	-10.824	.772	-.0445	19.000	-14.034	-.829	-.0216
-5.000	-10.444	.749	-.0481	20.000	-14.873	-.850	-.0189
-4.500	-10.076	.724	-.0519	21.000	-15.732	-.867	-.0166
-4.000	-9.720	.697	-.0558	22.000	-16.608	-.883	-.0146
-3.500	-9.379	.668	-.0598	23.000	-17.498	-.897	-.0128
-3.000	-9.052	.637	-.0638	24.000	-18.400	-.909	-.0112
-2.500	-8.742	.604	-.0678	25.000	-19.314	-.919	-.0099
-2.000	-8.448	.570	-.0717	26.000	-20.238	-.928	-.0087
-1.500	-8.173	.533	-.0755	27.000	-21.171	-.937	-.0077
-1.000	-7.916	.494	-.0791	28.000	-22.111	-.944	-.0068
-.500	-7.679	.454	-.0825	29.000	-23.058	-.950	-.0060

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 4.50 DB							
-30.000	-34.504	.999	-.0002	.000	-7.644	.423	-.0845
-29.000	-33.505	.999	-.0003	.500	-7.443	.380	-.0874
-28.000	-32.506	.999	-.0003	1.000	-7.264	.335	-.0899
-27.000	-31.508	.998	-.0004	1.500	-7.108	.290	-.0920
-26.000	-30.510	.998	-.0005	2.000	-6.975	.243	-.0936
-25.000	-29.513	.997	-.0007	2.500	-6.865	.196	-.0949
-24.000	-28.516	.996	-.0009	3.000	-6.778	.149	-.0956
-23.000	-27.520	.995	-.0011	3.500	-6.716	.101	-.0959
-22.000	-26.526	.994	-.0013	4.000	-6.678	.053	-.0957
-21.000	-25.532	.993	-.0017	4.500	-6.663	.005	-.0950
-20.000	-24.540	.991	-.0021	5.000	-6.672	-.042	-.0939
-19.000	-23.551	.988	-.0027	5.500	-6.705	-.089	-.0924
-18.000	-22.564	.985	-.0033	6.000	-6.761	-.134	-.0905
-17.000	-21.580	.982	-.0042	6.500	-6.839	-.179	-.0882
-16.000	-20.601	.977	-.0052	7.000	-6.939	-.222	-.0857
-15.500	-20.113	.974	-.0058	7.500	-7.061	-.265	-.0829
-15.000	-19.627	.971	-.0065	8.000	-7.204	-.305	-.0800
-14.500	-19.142	.968	-.0073	8.500	-7.366	-.345	-.0768
-14.000	-18.659	.964	-.0081	9.000	-7.548	-.382	-.0736
-13.500	-18.179	.959	-.0091	9.500	-7.748	-.418	-.0703
-13.000	-17.700	.955	-.0101	10.000	-7.966	-.453	-.0670
-12.500	-17.224	.949	-.0112	10.500	-8.201	-.485	-.0637
-12.000	-16.751	.943	-.0125	11.000	-8.451	-.516	-.0604
-11.500	-16.281	.937	-.0139	11.500	-8.716	-.546	-.0571
-11.000	-15.814	.929	-.0154	12.000	-8.996	-.573	-.0540
-10.500	-15.351	.921	-.0171	12.500	-9.290	-.600	-.0509
-10.000	-14.893	.912	-.0190	13.000	-9.596	-.624	-.0479
-9.500	-14.439	.902	-.0210	13.500	-9.914	-.648	-.0451
-9.000	-13.991	.891	-.0231	14.000	-10.243	-.669	-.0424
-8.500	-13.548	.879	-.0255	14.500	-10.583	-.690	-.0398
-8.000	-13.112	.866	-.0280	15.000	-10.933	-.709	-.0373
-7.500	-12.682	.851	-.0308	15.500	-11.292	-.727	-.0350
-7.000	-12.261	.835	-.0337	16.000	-11.660	-.744	-.0328
-6.500	-11.848	.817	-.0368	17.000	-12.420	-.775	-.0288
-6.000	-11.444	.798	-.0401	18.000	-13.208	-.802	-.0252
-5.500	-11.050	.777	-.0436	19.000	-14.022	-.826	-.0221
-5.000	-10.667	.755	-.0472	20.000	-14.859	-.846	-.0194
-4.500	-10.295	.730	-.0509	21.000	-15.714	-.864	-.0170
-4.000	-9.937	.704	-.0546	22.000	-16.587	-.880	-.0149
-3.500	-9.592	.675	-.0587	23.000	-17.474	-.894	-.0131
-3.000	-9.262	.645	-.0627	24.000	-18.375	-.907	-.0115
-2.500	-8.947	.613	-.0666	25.000	-19.287	-.917	-.0101
-2.000	-8.650	.578	-.0705	26.000	-20.210	-.927	-.0089
-1.500	-8.369	.542	-.0743	27.000	-21.141	-.935	-.0078
-1.000	-8.108	.504	-.0779	28.000	-22.080	-.943	-.0069
-.500	-7.866	.464	-.0814	29.000	-23.026	-.949	-.0061

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Continued

10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 4.75 DB							
-30.000	-34.754	.999	-.0002	.000	-7.827	.434	-.0834
-29.000	-33.755	.999	-.0003	.500	-7.621	.391	-.0863
-28.000	-32.756	.999	-.0003	1.000	-7.436	.347	-.0889
-27.000	-31.758	.998	-.0004	1.500	-7.273	.302	-.0911
-26.000	-30.760	.998	-.0005	2.000	-7.134	.256	-.0928
-25.000	-29.763	.997	-.0007	2.500	-7.017	.210	-.0942
-24.000	-28.766	.996	-.0008	3.000	-6.924	.162	-.0950
-23.000	-27.770	.995	-.0010	3.500	-6.855	.115	-.0954
-22.000	-26.775	.994	-.0013	4.000	-6.809	.067	-.0954
-21.000	-25.781	.993	-.0017	4.500	-6.788	.019	-.0949
-20.000	-24.789	.991	-.0021	5.000	-6.790	-.028	-.0939
-19.000	-23.800	.989	-.0026	5.500	-6.815	-.074	-.0925
-18.000	-22.812	.986	-.0033	6.000	-6.864	-.120	-.0908
-17.000	-21.829	.982	-.0041	6.500	-6.936	-.165	-.0887
-16.000	-20.849	.977	-.0051	7.000	-7.029	-.209	-.0863
-15.500	-20.361	.975	-.0057	7.500	-7.144	-.251	-.0836
-15.000	-19.874	.972	-.0064	8.000	-7.280	-.292	-.0807
-14.500	-19.389	.968	-.0071	8.500	-7.436	-.332	-.0777
-14.000	-18.906	.965	-.0079	9.000	-7.612	-.370	-.0745
-13.500	-18.424	.960	-.0089	9.500	-7.806	-.406	-.0712
-13.000	-17.945	.956	-.0099	10.000	-8.018	-.441	-.0680
-12.500	-17.469	.951	-.0110	10.500	-8.247	-.474	-.0646
-12.000	-16.995	.945	-.0122	11.000	-8.492	-.506	-.0614
-11.500	-16.524	.938	-.0136	11.500	-8.753	-.536	-.0581
-11.000	-16.057	.931	-.0151	12.000	-9.028	-.564	-.0549
-10.500	-15.593	.923	-.0167	12.500	-9.317	-.591	-.0519
-10.000	-15.134	.914	-.0185	13.000	-9.618	-.616	-.0489
-9.500	-14.679	.905	-.0205	13.500	-9.932	-.640	-.0460
-9.000	-14.229	.894	-.0226	14.000	-10.258	-.662	-.0433
-8.500	-13.785	.882	-.0249	14.500	-10.594	-.683	-.0406
-8.000	-13.348	.869	-.0274	15.000	-10.941	-.703	-.0381
-7.500	-12.917	.854	-.0301	15.500	-11.297	-.721	-.0358
-7.000	-12.493	.839	-.0330	16.000	-11.662	-.738	-.0335
-6.500	-12.078	.821	-.0360	17.000	-12.416	-.770	-.0294
-6.000	-11.672	.803	-.0393	18.000	-13.200	-.798	-.0258
-5.500	-11.276	.782	-.0427	19.000	-14.010	-.822	-.0226
-5.000	-10.890	.760	-.0462	20.000	-14.843	-.843	-.0198
-4.500	-10.516	.736	-.0499	21.000	-15.695	-.861	-.0174
-4.000	-10.155	.710	-.0537	22.000	-16.565	-.878	-.0152
-3.500	-9.806	.682	-.0576	23.000	-17.450	-.892	-.0134
-3.000	-9.473	.652	-.0615	24.000	-18.348	-.905	-.0118
-2.500	-9.154	.621	-.0654	25.000	-19.259	-.916	-.0103
-2.000	-8.852	.587	-.0693	26.000	-20.179	-.925	-.0091
-1.500	-8.568	.551	-.0731	27.000	-21.109	-.934	-.0080
-1.000	-8.301	.514	-.0768	28.000	-22.047	-.941	-.0071
-.500	-8.054	.475	-.0802	29.000	-22.991	-.948	-.0062

TABLE IV.- INTENSITY LAW IN DECIBEL FORM – Concluded

10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$	10 log KP_o	20 log ϕ	$\frac{d(20 \log \phi)}{d(10 \log KP_o)}$	$\frac{d^2(20 \log \phi)}{d(10 \log KP_o)^2}$
INSERTION LOSS = 5.00 DB							
-30.000	-35.004	.999	-.0002	.000	-8.012	.445	-.0823
-29.000	-34.005	.999	-.0003	.500	-7.800	.403	-.0852
-28.000	-33.006	.999	-.0003	1.000	-7.609	.359	-.0878
-27.000	-32.008	.998	-.0004	1.500	-7.441	.315	-.0901
-26.000	-31.010	.998	-.0005	2.000	-7.295	.269	-.0920
-25.000	-30.012	.997	-.0006	2.500	-7.172	.223	-.0934
-24.000	-29.015	.996	-.0008	3.000	-7.072	.176	-.0944
-23.000	-28.019	.996	-.0010	3.500	-6.996	.129	-.0950
-22.000	-27.024	.994	-.0013	4.000	-6.943	.081	-.0950
-21.000	-26.031	.993	-.0016	4.500	-6.915	.034	-.0947
-20.000	-25.039	.991	-.0020	5.000	-6.910	-.014	-.0938
-19.000	-24.049	.989	-.0025	5.500	-6.928	-.060	-.0926
-18.000	-23.061	.986	-.0032	6.000	-6.970	-.106	-.0910
-17.000	-22.077	.982	-.0040	6.500	-7.034	-.151	-.0890
-16.000	-21.096	.978	-.0050	7.000	-7.120	-.195	-.0868
-15.500	-20.608	.975	-.0056	7.500	-7.229	-.238	-.0842
-15.000	-20.121	.972	-.0062	8.000	-7.358	-.279	-.0814
-14.500	-19.636	.969	-.0070	8.500	-7.508	-.319	-.0785
-14.000	-19.152	.965	-.0078	9.000	-7.677	-.358	-.0754
-13.500	-18.670	.961	-.0087	9.500	-7.865	-.395	-.0722
-13.000	-18.191	.957	-.0096	10.000	-8.071	-.430	-.0689
-12.500	-17.714	.952	-.0107	10.500	-8.295	-.463	-.0656
-12.000	-17.239	.946	-.0120	11.000	-8.534	-.495	-.0624
-11.500	-16.768	.940	-.0133	11.500	-8.790	-.526	-.0591
-11.000	-16.300	.933	-.0148	12.000	-9.060	-.555	-.0559
-10.500	-15.835	.925	-.0164	12.500	-9.344	-.582	-.0528
-10.000	-15.375	.916	-.0181	13.000	-9.642	-.607	-.0498
-9.500	-14.919	.907	-.0200	13.500	-9.951	-.632	-.0469
-9.000	-14.468	.896	-.0221	14.000	-10.273	-.654	-.0442
-8.500	-14.023	.885	-.0244	14.500	-10.605	-.676	-.0415
-8.000	-13.584	.872	-.0268	15.000	-10.948	-.696	-.0390
-7.500	-13.151	.858	-.0295	15.500	-11.301	-.715	-.0366
-7.000	-12.726	.842	-.0323	16.000	-11.663	-.732	-.0343
-6.500	-12.309	.825	-.0353	17.000	-12.412	-.765	-.0301
-6.000	-11.901	.807	-.0385	18.000	-13.191	-.793	-.0264
-5.500	-11.503	.787	-.0418	19.000	-13.997	-.818	-.0232
-5.000	-11.114	.765	-.0453	20.000	-14.825	-.839	-.0203
-4.500	-10.738	.742	-.0489	21.000	-15.674	-.858	-.0178
-4.000	-10.373	.716	-.0527	22.000	-16.541	-.875	-.0156
-3.500	-10.022	.689	-.0565	23.000	-17.424	-.890	-.0137
-3.000	-9.685	.660	-.0604	24.000	-18.320	-.902	-.0120
-2.500	-9.362	.629	-.0643	25.000	-19.228	-.914	-.0106
-2.000	-9.056	.595	-.0681	26.000	-20.147	-.924	-.0093
-1.500	-8.767	.560	-.0719	27.000	-21.075	-.932	-.0082
-1.000	-8.496	.523	-.0756	28.000	-22.011	-.940	-.0072
-.500	-8.244	.485	-.0790	29.000	-22.955	-.947	-.0064

APPENDIX B

RELATION BETWEEN ATTENUATOR READINGS AND SIGNAL

Microwave attenuators and power meters are frequently calibrated in decibels (in terms of 10 log (power)), as is the spectrometer in figure 5. However, the detector responds to the microwave electric field rather than to power. The signal was therefore defined as the field change produced by the absorption. The field incident on the detector is $\mathcal{E}_o$ when the modulating field is on and the gas is not absorbing, and $\mathcal{E}_o - \Delta\mathcal{E}_g$ when the modulating field is off and the gas is absorbing. The alternation between these conditions produces the alternating signal $\Delta\mathcal{E}_g$ which is observed. In order to measure the intensity of the line, this signal must be matched by a calibrator signal $\Delta\mathcal{E}_c$. The calibrator signal $\Delta\mathcal{E}_c$ is coupled into the waveguide ahead of the detector, where it adds vectorially to the main microwave field $\mathcal{E}_o - \Delta\mathcal{E}_g$. Since the calibrator attenuators are calibrated in terms of power, they show a power change ΔP_c, which is proportional to $\Delta\mathcal{E}_c^2$. In decibels, then, the readings are related by $10 \log \Delta P_c = 10 \log \Delta\mathcal{E}_c^2 = 20 \log \Delta\mathcal{E}_c$. From equations (4) and (5), $\Gamma \propto \Delta\mathcal{E}_c$ when $\Delta\mathcal{E}_c = \Delta\mathcal{E}_g$. The calibrator attenuator readings are therefore proportional to $20 \log \Gamma$ $(20 \log \Gamma = 20 \log \eta + 20 \log \phi)$.

APPENDIX C

NATURE OF STARK INTERFERENCE DUE TO UNDERMODULATION

Only a second-order Stark effect is considered, since it is the only type of effect likely to be of concern in practice. The frequencies of the various Stark components are shifted away from the zero-field line by

$$\Delta\nu = \left(A + BM^2\right)E^2 \tag{C1}$$

where E is the applied Stark modulation field and A and B are constants. Unless A is considerably larger than B and of opposite sign, the components with the lowest values of M will be shifted the least and therefore are most likely to overlap the zero-field line.

For a Q-branch line ($\Delta J = 0$), the relative intensities and saturation coefficients of the Stark components depend on M^2. Undermodulation is less of a problem with Q-branch lines because the interfering components are usually the weakest ones and are harder to saturate than the zero-field line. Thus, their effect is most important at and above the maximum signal point on the intensity curve.

For an R-branch line ($\Delta J = +1$) the intensities and saturation coefficients vary with $(J + 1)^2 - M^2$; thus, the components with the lowest value of M are the strongest and easiest to saturate. They are therefore the most likely to cause trouble in cases of undermodulation. The component with a value of $M = 0$ is a special problem since the value of A is occasionally orders of magnitude less than B in equation (C1). In such a case there will be a wide range of Stark voltages which produce little or no effect on the line after the components with $M \geqq 1$ have been shifted away, and the line may be mistakenly assumed to be completely modulated. This condition is readily detected by the intensity law, since a small change in power produces a greater signal change than is theoretically possible at the low-power end of the curve. Several transitions of this type have been observed when A and B differ by a factor of 10 000 and when the lobe for $M = 0$ accounts for approximately 25 percent of the line intensity. In such a case the percent of error would be greater than 25 percent at low saturation values.

Frequently, A and B will be of opposite sign and of relative values so that one of the Stark components is affected very little by the modulation voltage. Under these conditions, complete modulation of the line may be impossible. Inability to modulate the line may be detected by the intensity law unless the interfering component has nearly the same saturation coefficient as the line.

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2. Harrington, Howard W.: Intensity Law for Microwave Spectroscopy: Theoretical and Experimental. J. Chem. Phys., vol. 49, no. 7, Oct. 1, 1968, pp. 3023-3035.

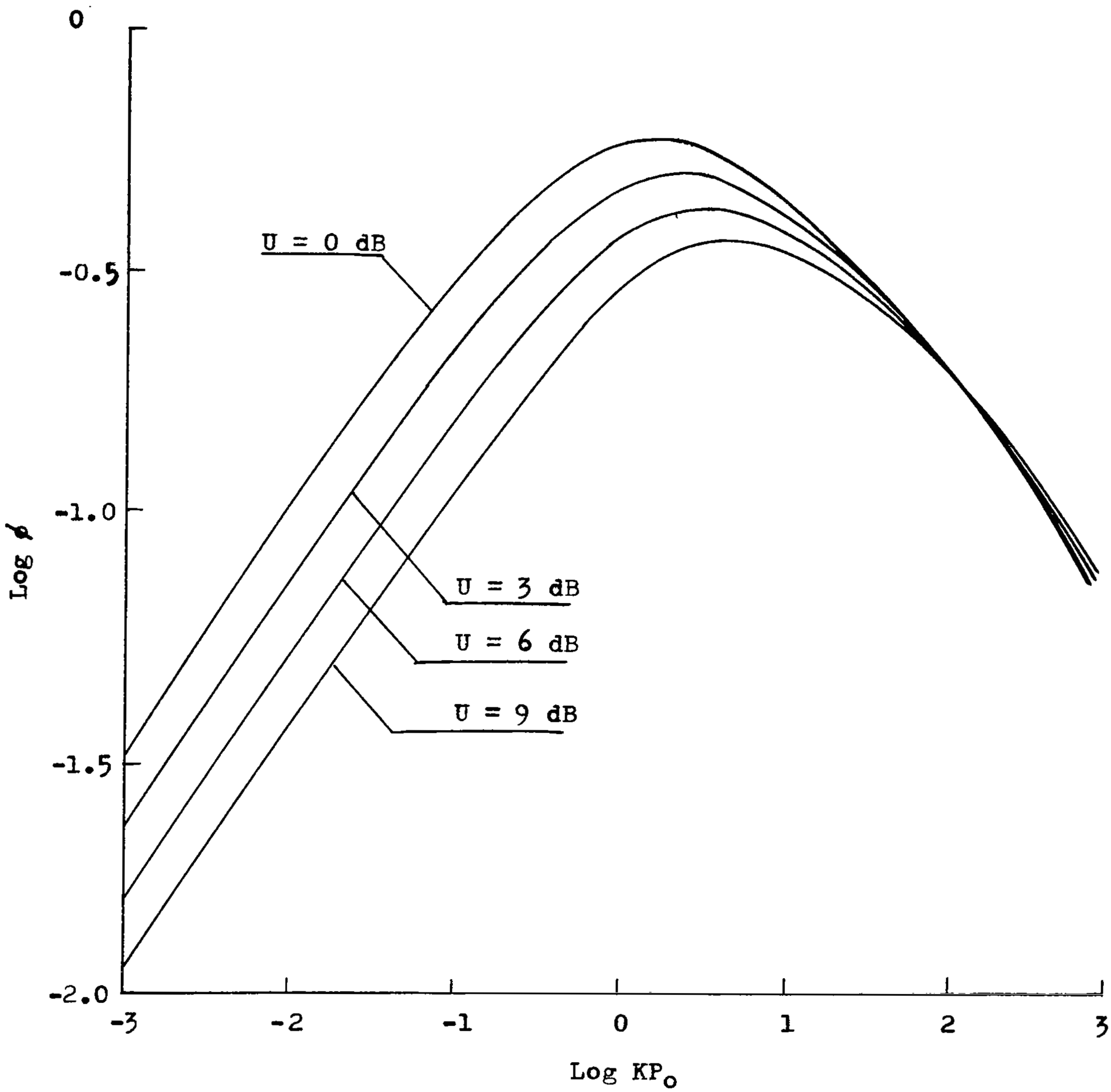

Figure 1.- Variation of log Φ with log KP_o for several values of waveguide insertion loss U.

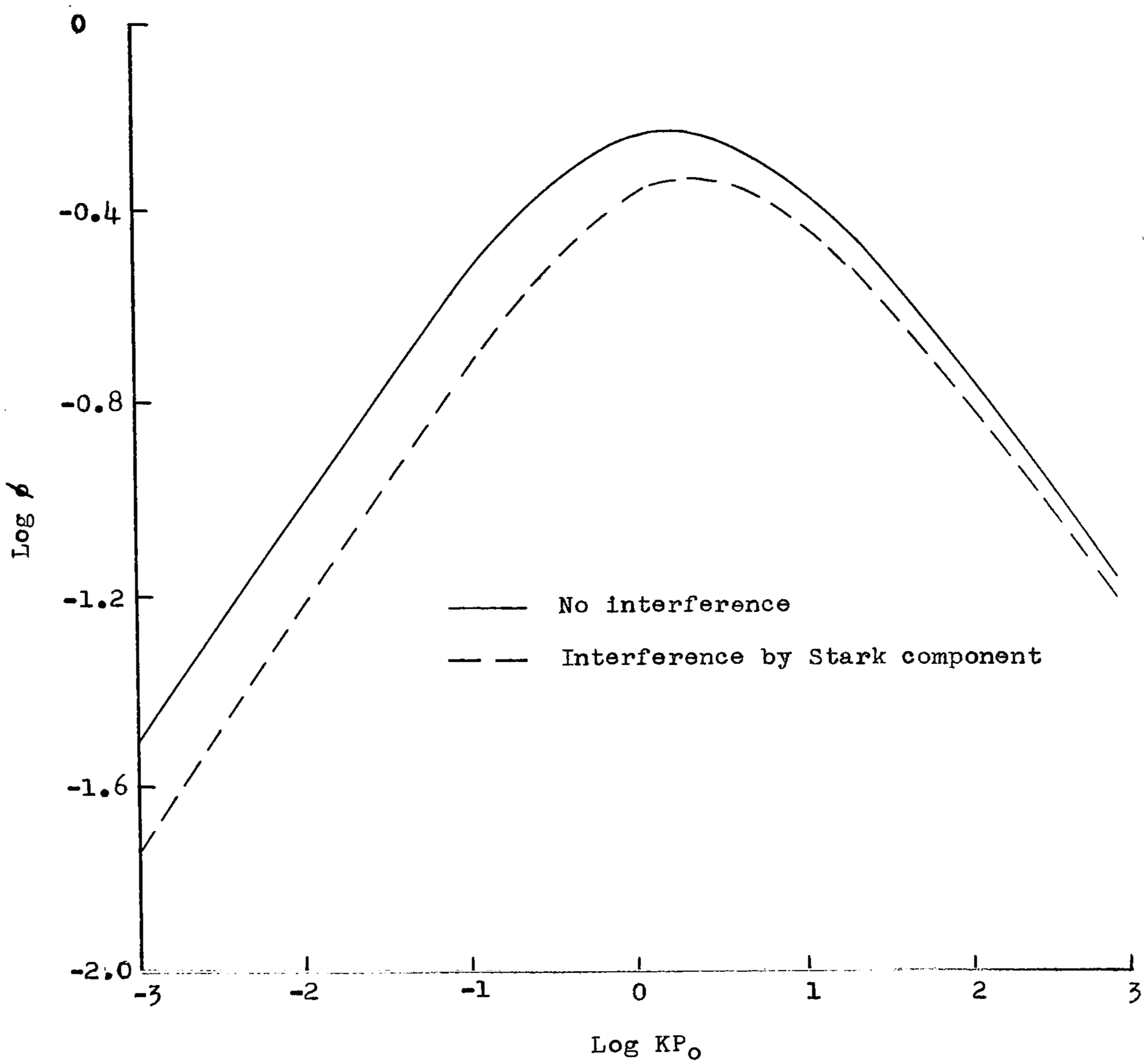

Figure 2.- Effect of Stark component interference on variation of log Φ with log KP_0. U = 1 dB. (Value of η is equal to one-fourth value of spectral line. Value of K is equal to three times value of spectral line.)

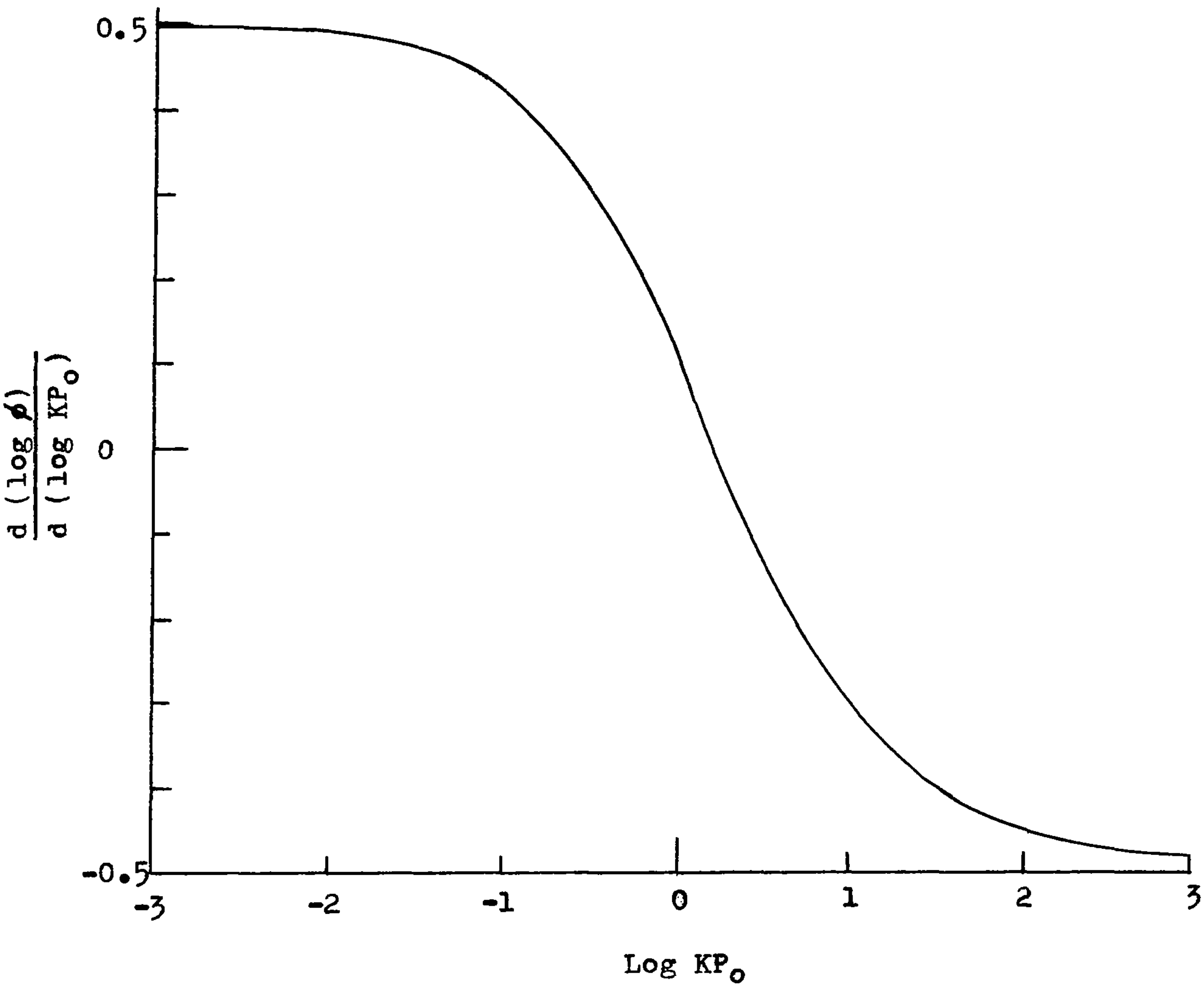

Figure 3.- First derivative of curve for variation of $\log \Phi$ with $\log KP_0$ plotted as a function of $\log KP_0$. U = 1 dB.

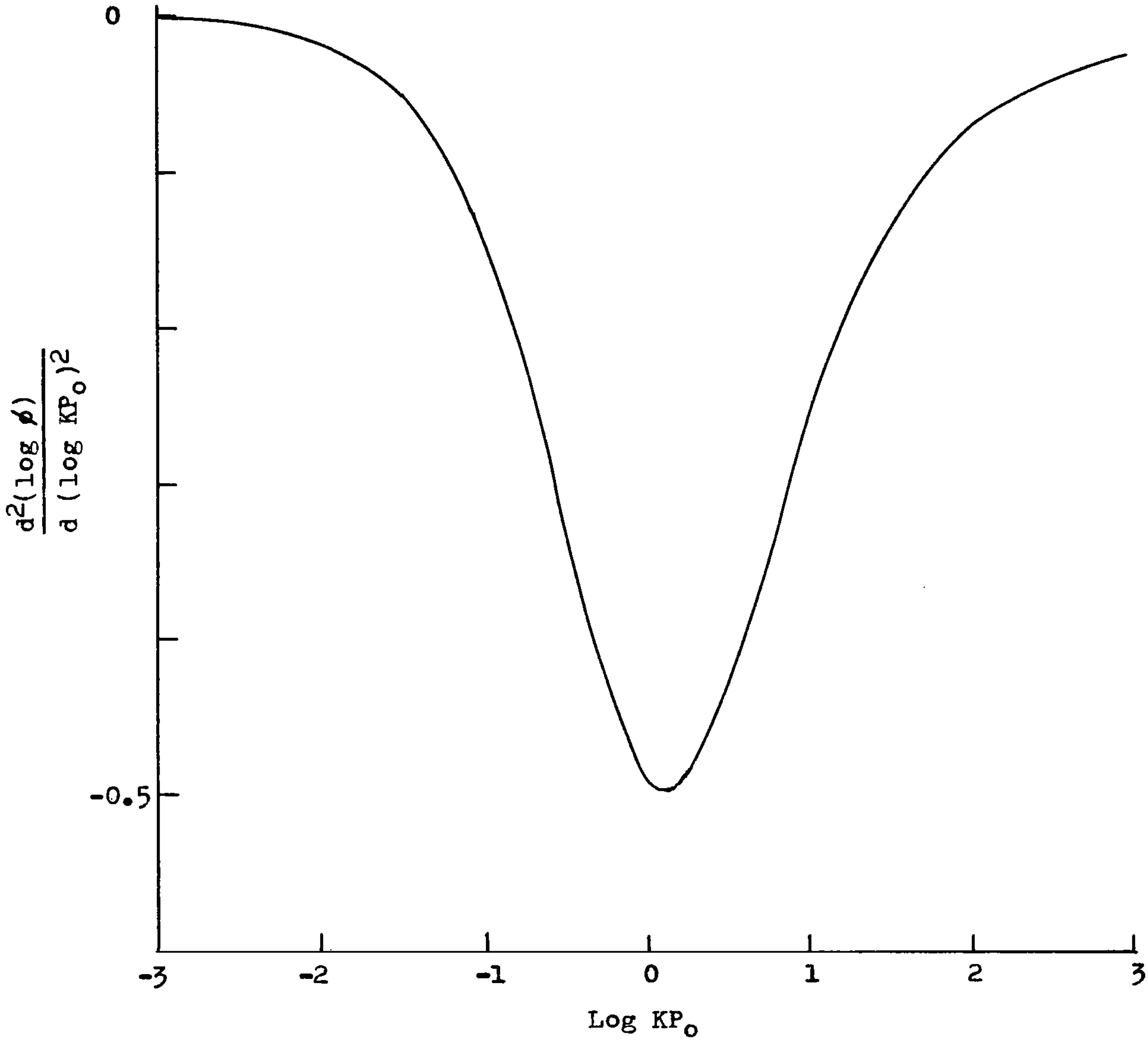

Figure 4.- Second derivative of curve for variation of log Φ with log KP_0 plotted as a function of log KP_0. U = 1 dB.

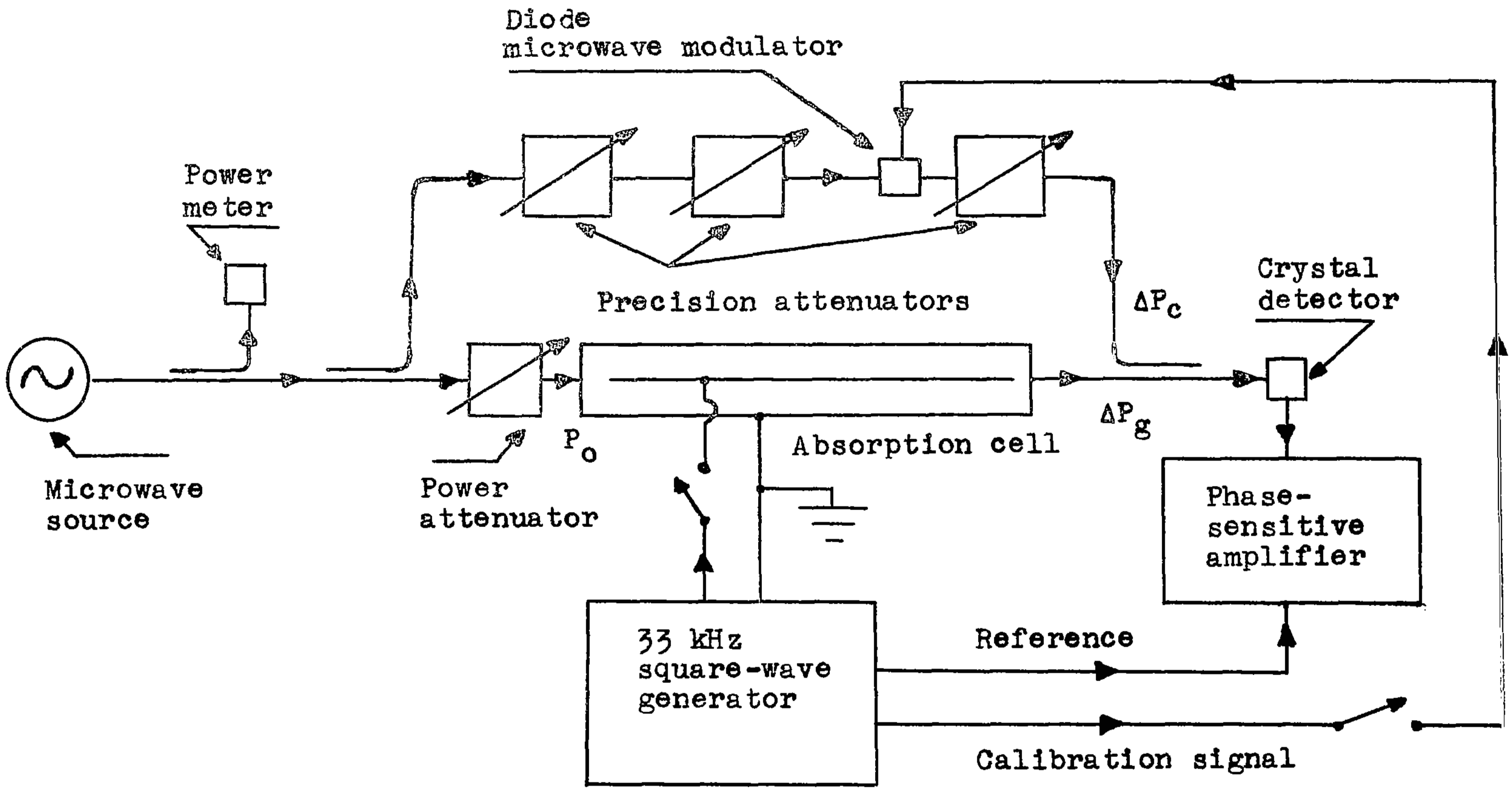

Figure 5.- Diagram of the Stark modulated spectrometer.

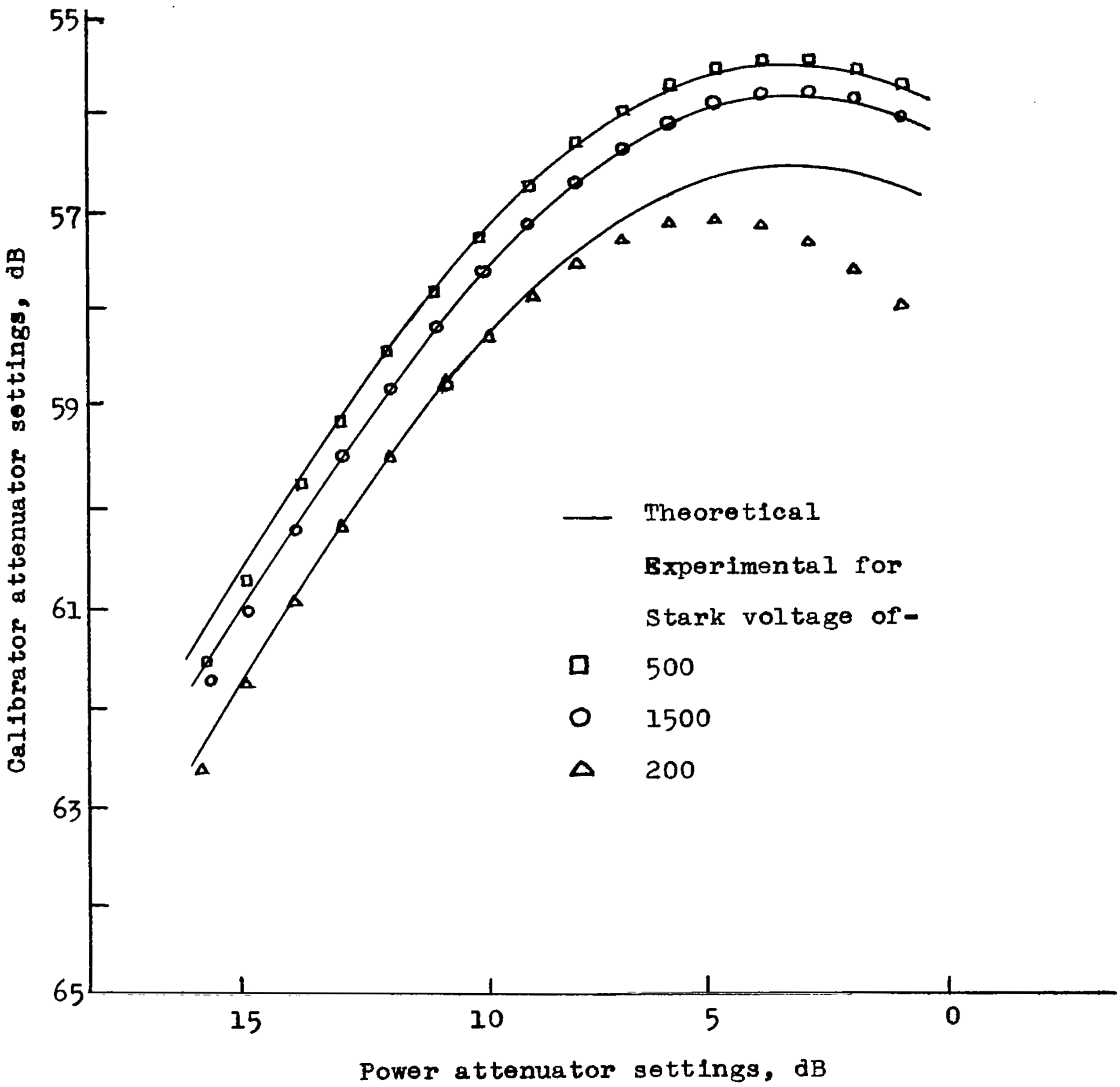

Figure 6.- Theoretical and experimental intensity curves for isopropanol line at 38 413.38 MHz. (Theoretical curves are superposed plots of $20 \log \Phi$ against $10 \log KP_0$.)