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Dielectric Properties of Low-Level Liquid Waste

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By:
M. A. Ebadian
L. E. Lagos

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U.S. Department of Energy
Office of Fossil Energy
Federal Energy Technology Center
P.O. Box 880
Morgantown, West Virginia 26507-0880

By
Florida International University
Hemispheric Center for Environmental Technology (HCET)
Center for Engineering & Applied Sciences
10555 West Flagler Street
EAS-2100
Miami, Florida 33174

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NOMENCLATURE

E	electric field vector [v], eq. (1)
H	magnetic field vector [A m^{-1}], eq. (2)
Z	residual real data value
$\hat{Z}$	estimated value of residual
$\overline{Z}$	mean of the experimental data
r	coefficient of determination
W	weight

Greek Symbols

β	microwave frequency
Δ	dimensionless node interval
ε	complex dielectric permittivity, $\varepsilon' - j\varepsilon''$ $\left[\mathrm{Fm}^{-1}\right]$
ε′	real part of the complex dielectric permittivity, or dielectric constant $\left[\mathrm{Fm}^{-1}\right]$
ε″	imaginary part of the complex dielectric permittivity on dielectric loss $\left[\mathrm{Fm}^{-1}\right]$
μ	magnetic permeability [Henries m^{-1}] on viscosity [NS m^{-2}]
μ′	real part of magnetic permeability [Henries m^{-1}]
μ″	imaginary part of magnetic permeability [Henries m^{-1}]
σ	electric conductivity [ohm^{-1}]
ω	microwave single frequency $2\pi f$ [rad s^{-1}]

1. INTRODUCTION

The purpose of this study was to develop a data collection containing values for the dielectric properties of various low-level liquid waste (LLLW) simulants measured as a function of frequency, temperature, and composition. The investigation was motivated by current interest in the use of microwave processing for the treatment of radioactive waste. A large volume of transuranic liquid and sludge produced by the U.S. Department of Defense (DOD) during the production of nuclear fuel bars is stored at several U.S. Department of Energy (DOE) sites around the United States. Waste storage and disposal space is scarce, expensive, and must be minimized. Thus, several DOE sites are pursuing the use of microwave heating as a means of achieving volume reduction and solidification of low-level liquid wastes.

It is important to know which microwave frequencies should be employed to achieve the most efficient processing at a range of different temperatures. The dielectric properties of the LLLW simulants can be utilized to determine the optimum frequencies for use with a particular LLLW or with other LLLWs of similar composition. Furthermore, nonlinear thermal processes, such as thermal runaway, which occur in the material being treated cannot be modeled without a knowledge of the temperature dependence of the dielectric properties. Often, this data does not exist; however, when it does, only very limited data near room temperature are available. The data collection generated in this study can be used to predict the behavior of a variety of microwave thermal treatment technologies, which have the potential of substantially reducing the volume of the LLLWs that are currently stored at many DOE sites. This information should help the users of the microwave reduction and solidification technology to optimize microwave processes used in the treatment of LLLW.

The microwave reduction and solidification technology has clear advantages over other methods of reducing LLLWs. These include the incineration of combustibles, the evaporation of combustibles, the evaporation of liquids, and the compaction of noncombustibles. The handling of radioactive liquid waste is generally carried out within closed systems consisting of highly corrosion-resistant, welded, leak-tight pipes, tanks, and other apparatus. High power microwave processing is a promising technology for reducing risks to the environment and human health, thereby supporting the DOE's decontamination and decommissioning (D&D) objectives.

The microwave system is designed to heat the waste in its final disposal container, thus eliminating the need to transport high pressure materials after melting by conventional methods. The microwave energy heats the liquid waste directly because as the microwave field interacts with the material, energy is transferred from the field to the molecular bonds of the material, causing these bonds to vibrate. The energy is then dissipated as heat and transported within the material. Microwave heating requires no local heating elements; the radioactive material becomes its own heating element. Furthermore, moving parts required in other methods are unnecessary.

After microwave processing, the resultant waste form is a brick-like ceramic, a stone-like monolith, or an amorphous glass form. Compared to the original wet sludge slurry, the

refractory, high-density waste forms render a volume reduction of a factor of 5 to 10. Moreover, the processed wastes show an enhanced leach resistance for regulated metals. Therefore, compared to the conventional thermal treatment technologies, microwave waste processing offers numerous advantages, including the production of a high-density, leach-resistant, robust waste form; volume and toxicity reduction; favorable economics; in-container treatment; positive public acceptance; isolated equipment; and instantaneous energy control.

2. PROJECT DESCRIPTION

The product of this study is a collection of data for the dielectric properties of several LLLW simulants. More specifically, we have focused on the dielectric permittivity of these simulants and used the measurements to generate values for a very useful quantity, the loss tangent. Correlations of the collected data were also performed in order to develop prediction formulas for the dielectric properties of the tested surrogates.

When Maxwell's equations are introduced to determine electric and magnetic fields, the dielectric properties of materials (ε, μ, σ) are defined. The term ε represents complex dielectric permittivity, μ denotes complex magnetic permeability, and σ represents electric conductivity. Permittivity and permeability are usually given in complex forms, such as $\varepsilon = \varepsilon' - j\varepsilon''$ and $\mu = \mu' - j\mu''$. These describe, respectively, the effect of the presence of the material on the electric and magnetic fields. In the expression for complex permittivity, ε', the dielectric constant, represents the ability of the material to store energy in the form of electric fields, whereas ε'', the dielectric loss, is a direct measure of how much energy a material can dissipate in the form of heat. The ratio $\varepsilon''/\varepsilon'$ is referred to the loss tangent, or $\tan\delta$ (since $\varepsilon = \varepsilon' - j\varepsilon'' = |\varepsilon| e^{-j\delta}$, then $\tan\delta = \varepsilon''/\varepsilon'$.) When $\varepsilon''/\varepsilon'$ is plotted against the frequencies for the various temperatures, the minima in each curve represent the optimal frequencies for microwave processing at that temperature.

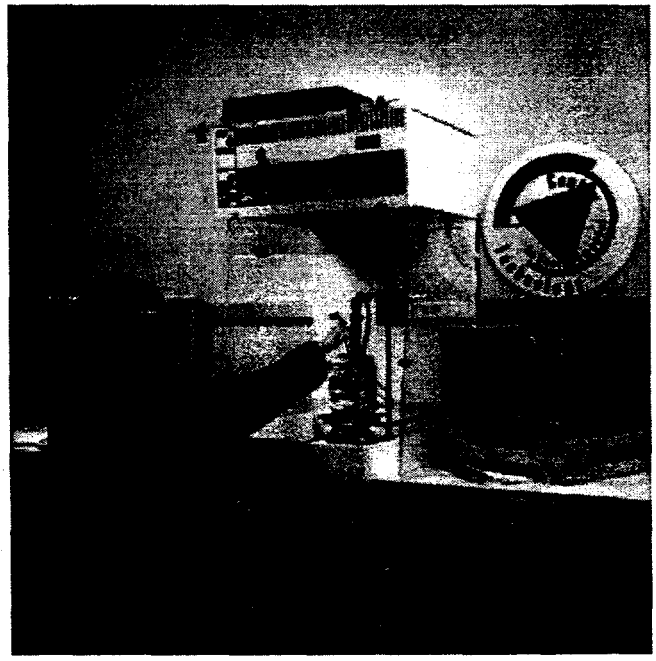


Figure 1. HCET investigator performing dielectric measurements.

3. TECHNOLOGY DESCRIPTION

Maxwell's Equations 1 and 2are used to determine the electric and magnetic fields show the case for a simple propagation of a plane wave within a uniform material. Practically, we may assume that the electric and magnetic fields resulting from the microwaves are perpendicular to each other and the propagation direction. Microwaves are electromagnetic waves having frequencies from 300MHz to 300GHz. Therefore, microwaves should satisfy Maxwell's Equations, which describe the electromagnetic fields, thus:

$$\nabla x \mathbf{E} = -i\mu\omega\mathbf{H} \tag{1}$$

$$\nabla x \mathbf{H} = (\sigma + I\varepsilon\omega)\mathbf{E} \tag{2}$$

where E and H are electric and magnetic fields vectors respectively; μ, σ, ε are dielectric properties (permeability, conductivity, and permittivity, respectively) and ω represents microwave angular frequency.

Permitivitty and permeability are given in the following complex forms:

$$\varepsilon = \varepsilon' - i\varepsilon'' \text{ and } \mu = \mu' - i\mu'' \tag{3}$$

where ε represents a complex number composed of ε' the real part of the complex dielectric permittivity or the dielectric constant, ε'' the imaginary part of the complex dielectric permittivity or the dielectric loss. By the same token, the dielectric permeability, μ, is also represented by a complex number composed of real and imaginary parts.

These properties describe, respectively, the effects of the presence of the material on the electric and magnetic fields. The real part of ε, ε' is always referred to as the dielectric constant, which represents the ability of a material to store electric energy. The imaginary part of ε, ε'', is referred to as loss factor or loss tangent, representing the ability of the substance to dissipate the stored energy as heat. The real part of μ, μ' describes the ability of a material to store the energy in the magnetic field, while the imaginary part of μ, μ'', reports the energy dissipation during the magnetization cycles. Electric conductivity, σ, has the following relation with the loss factor:

$$\sigma = \omega\varepsilon'' = 2\pi\beta\,\varepsilon'' \tag{4}$$

where β and ω are the frequency and angular frequency of the microwave, respectively. In general, the dielectric properties, ε, μ, σ, may be the function of the spatial coordinates; the

temperature; and the magnitude, direction, and frequency of the electric and magnetic fields. For uniform materials, these properties are usually a function of the temperature.

Measurement of the complex permitivitty is required in order to model the interaction of the materials with microwave energy. White (1990) has suggested that the dielectric constant would vary over a wide range with temperature variation during the solidification process. The dielectric characterization of saline by Stogryn (1971), and HCET's previous measurements with water-based materials simulating biological tissues (Stuchly and Stuchly 1980), guided HCET in predicting the variation in dielectric properties of the liquid radioactive waste with temperature and composition.

The three main principal methods that have been used for measuring the dielectric properties of materials are 1) the reflection method (Atley et al. 1982), 2) the transmission method (Franceschetti 1967), and 3) the perturbation method (Piotrowski 1974). In our study, the open ended coaxial line reflection method (Stuchly and Stuchly 1980; Athey et al. 1982) was used because it was not necessary to fill a special container, but the line was simply immersed in the material. Section 4 of this report explain in detail the measurement of dielectric properties and the steps taken to obtain the data presented in this report.

3.1 CHARACTERISTICS OF LOW-LEVEL LIQUID WASTE SIMULANTS

In order to obtain the simulants used for the permittvity measurements in this study, a survey was conducted among Environmental Management (EM) 30 and 50 personnel. This survey allowed the identification of simulants which represent waste material similar to the type of LLLWs targeted for treatment using microwave technology. Tables 1 through 7 show the chemical composition of the seven low-level liquid waste simulants identified and used in this study.

Table 1.
Hanford 4 Molar* Simulant

Constituent	Grams per Liter of Simulant
H_2O	1170.5
$Al(NO_3)_3x9H_2O$	102.63
$Ca(NO_3)_2x4H_2O$	0.161
$Cr(NO_3)_3x9H_2O$	2.872
$Fe(NO_3)_3x9H_2O$	0.166
KOH	0.556
$Mg(NO_3)_2x6H_2O$	0.0005
$Mn(NO_3)_2$	0.306
$Na_2MoO_4xH_2O$	4.138
$Sr(NO_3)_2$	2.558
$CsNO_3$	3.333
NaH_2PO_4	25.958
$NaIO_3$	3.384
Na_2CO_3	9.063
NaCl	0.92
NaF	9.337
Na_2SO_4	9.231
$NaNO_3$	4.36.05
$NaNO_2$	30.677
NaOH	150.48
Na_4EDTA	7.828

*This simulant is 4 Molar in the Nitrate ion.

Table 2.
Hanford 6 Molar* Simulant

Constituent	Grams per Liter of Simulant
H_2O	670.5
$Al(NO_3)_3x9H_2O$	102.63
$Ca(NO_3)_2x4H_2O$	0.161
$Cr(NO_3)_3x9H_2O$	2.872
$Fe(NO_3)_3x9H_2O$	0.166
KOH	0.556
$Mg(NO_3)_2x6H_2O$	0.0005
$Mn(NO_3)_2$	0.306
$Na_2MoO_4xH_2O$	4.138
$Sr(NO_3)_2$	2.558
$CsNO_3$	3.333
NaH_2PO_4	25.958
$NaIO_3$	3.384
Na_2CO_3	9.063
NaCl	0.92
NaF	9.337
Na_2SO_4	9.231
$NaNO_3$	4.36.05
$NaNO_2$	30.677
NaOH	150.48
Na_4EDTA	7.828

*This simulant is 6 Molar in the Nitrate ion.

Table 3.
Melton Valley Simulant

Constituent	Percentage by Weight
H_2O	75.15%
$NaNO_3$	23.91%
KCl	0.39%
Na_2CO_3	0.18%
Na_2HPO_4	0.58%
Na_2SO_4	0.58%
NaOH	0.11%

Table 4.
SAIC Simulant

Constituents	Percentage by Weight
$CaSO_4x2H_2O$	5%
Diatomaceous earth	9%
$Ca(OH)_2$	10%
Metal oxides [Iron oxide (Fe_2O_3)-50% Aluminum oxide (Al_2O_3)-25%; Magnesium oxide (MgO)-25%	14%
Portland cement	8%
$NaNO_3$	14%
H_2O	40%

Table 5.
Revised ORNL Simulant

Constituent	Percentage by Weight
$NaNO_3$	41.4%
H_2O	38.6%
$Ca(NO_3)_2$	11.4%
Bentonite Clay	2.61%
Na_2CO_3	2.06%
NaOH	1.67%
Sea Sand	1.34%
NaCl	0.83%
$Al(NO_3)_3$	0.09%

Table 6.
W-26 ORNL Simulant

Constituents	Percentage by Weight
H_2O	67.63%
$NaNO_3$	29.40%
KNO_3	1.03%
$Al(OH)_3$	0.55%
NaCl	0.52%
SiC (surrogate for U_2O_3 and ThO)	0.22%
$CaHPO_4$	0.17%
$Ca(OH)_2$	0.14%
Na(OH)	0.10%
Wyoming Bentonite clay	0.084%
$CaCO_3$	0.075%
$Mg(OH)_2$	0.030%
Fe_2O_3	0.030%
$Sr(NO_3)_2$	0.0029
$CsNO_3$	0.00017%

Table 7.
Savannah River Simulant
(Batch #95QAB400)

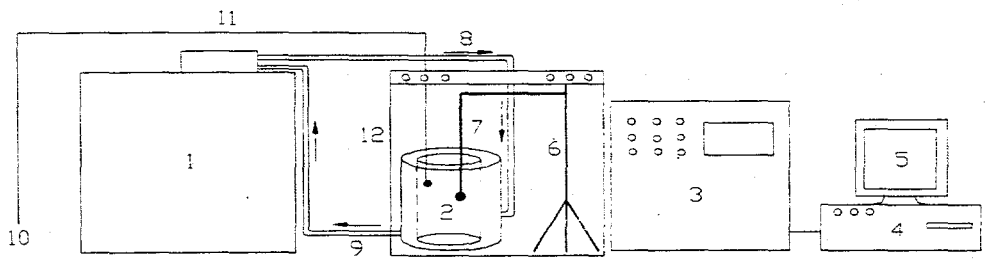
Constituent	Percent by Weight (Dry Basis)*
Al	6.76
Ba	0.012
Ca	2.67
Cr	.18
Cs	<0.01
Cu	0.026
Fe	26.8
K	0.14
Mg	1.31
Mn	2.80
Na	10.2
Nd	<0.01
Ni	0.24
Pb	0.10
Si	0.81
Sr	0.81
Ti	0.044
Zn	0.17
Zr	0.07
SO_4	0.33
C_2O_4	0.194
CO_3	1.94
NO_3	1.96
F	0.007
NO_2	5.86
OH	2.95

*The sample tested was 76.94% H_2O by weight.

4. EXPERIMENTAL INVESTIGATION

The dielectric properties of seven LLLW simulants were measured over the temperature range of 20° to 100°C at increments of twenty degrees using the open-ended coaxial line reflection method. A diagram of the experimental setup is shown in Figure 2. The sample holder consisted of a 150 ml Pyrex beaker immersed in an ethylene glycol bath inside a double jacket vessel that was connected to a Cole Palmer Polystat chiller charged with ethylene glycol and set to maintain the sample at the target temperature. The double jacket vessel was placed in a portable fume hood to protect the investigators from ethylene glycol fumes while conducting measurements at higher temperatures.

The measurements were performed by immersing the dielectric probe just below the surface of the sample. The dielectric probe was connected to a probe cable; both are components of the Hewlett-Packard dielectric probe kit (HP-85070B). The cable was connected to the Hewlett-Packard network analyzer (HP-8720C). The network analyzer, combined with a computer equipped with a HP-IB card, displayed and recorded the readings for the magnitude and phase of the complex reflection coefficient, which can be converted to complex permittivity. The computer displayed plots of the dielectric constant, ε'; the dielectric loss, ε"; and the loss tangent, tan δ, verses the frequency. It also generated the same information in tabular form. The measurements were performed in duplicate and then averaged in order to obtain the best values.



1. Cole Palmer Polystat chiller
2. Double jacket vessel
3. HP 8720C Network Analyzer
4. Gateway 2000 486/33C PC
5. Monitor
6. Stand
7. HP probe
8. Feed line to double-jacket vessel
9. Return line to chiller
10. Temperature controller
11. Thermocouple wire
12. Portable fume hood

Figure 2. Experimental setup.

4.1 CORRELATION ANALYSIS

The correlation presented in this section represent the correlated data obtained from the measurements performed on the seven simulants tested. For each case, the best correlation result is given for each simulant. In addition, data of the Hanford 4 molar and Hanford 6 molar simulants, which have the same constituents but different water content, has been correlated. The best fitted equation and its coefficients are presented in Figures 19 through 34. These equations give predictions for the permittivity of each simulant at various temperatures and frequency ranges.

For each simulate, the result of correlation is included in two figures: 1) the comparison graph of the data by the correlated equation (correlated results shown on the grid line curve) and 2) the experimental data (real data results shown by points). The other graphs presented are the residual graphs.

To perform the correlation, *TableCurve 3D*, a commercially available computer software, was used. The most important statistical parameters used in the generation of the correlation are presented and explained below.

4.1.1 Residual and Residual Percentage

The residual and residual percentage (%) represent how accurate the correlated results are to the real experimental data (Jandel Scientific 1993). In this study, the residual percentage (%) graphs are presented, by the following two equations:

$$\text{Residual} = \hat{Z}_i - Z_i \tag{5}$$

$$\text{Residual } \% = \frac{\hat{Z}_i - Z_i}{Z_i} \times 100\% \tag{6}$$

where $\hat{Z}_i$ is the estimated value and Z_i is the real data value (Jandel Scientific 1993).

4.1.2 Coefficient of Determination

In order to make the results of correlation more agreeable, it is not enough to draw a conclusion only by looking at the residual or residual percentage (%). Therefore, other statistic standards are usually applied for the determination of the correlation results. Thus, the coefficient of determination r^2 is defined by the following equations:

$$r^2 = 1 - \frac{SSE}{SSM} \tag{7}$$

where:

$$SSE = \sum_{i=1}^{n} w_i (\hat{Z}_i - Z_i)^2 \tag{8}$$

$$SSM = \sum_{i=1}^{n} w_i (\hat{Z}_i - \overline{Z})^2 \tag{9}$$

where w_i denotes weights and $\overline{Z}$ is the mean of the experimental data.

The r^2 coefficient of determination is by far the best parameter for fit measurement used and it is the default value used in data-fitting in TableCurve 3D [8]. The closest that r^2 is to one, the better the correlated results.

4.1.3 Degree of Freedom Adjusted r^2 ($DF\ Adj\ r^2$)

The Degree of Freedom Adjusted can be calculated by the following equation as:

$$DOF\,adj\,r^2 = 1 - \frac{SSE(n-1)}{SSM(DOF-1)} \tag{10}$$

where DOF is the Degree of Freedom.

This is a coefficient of determination that has been adjusted for degrees of freedom. The standard r^2 value increases with increasing terms in an equation even though there has been no real improvement in the standard error of the fit. The DOE Adjusted r^2 will furnish the same familiar r^2 sort criteria but will better represent Least Squares sort criteria. As with the unadjusted r^2, the closer to 1.0, the better this statistical measure of the fit will be. It is recommended that either this method or the fit standard error be used for approximating functions.

4.1.4 Fit Standard Error (Root MSE)

The Fit Standard Error is defined as:

$$FitStErr = \sqrt{MSE} \tag{11}$$

where MSE denotes the mean square root:

$$MSE = \frac{SSE}{DOF} \tag{12}$$

This sort criterion is the actual Least Squares error of fit. It is known as the Fit Standard Error or Root MSE. The closer this value is to zero, the better the least-square fit will be.

4.1.5 Fit Statistic (FSTAT)

$$Fstat = \frac{MSR}{MSE} = \frac{\frac{SSM - SSE}{m - 1}}{\frac{SSE}{DOF}} \tag{13}$$

where: MRS is Mean Square Regression

$$MSR = \frac{SSM - SSE}{m - 1} \tag{14}$$

The Fit statistic is a measure of the extent to which the given equation represents the data. If an additional parameter makes a statistically significant contribution to a model, the F-statistic increases. Otherwise, a decrease occurs. The higher the F-statistic, the more efficiently a given equation models the data.

5. RESULTS

In this study we measured the dielectric permittivity of the seven LLLW simulants whose components are tabulated in the section entitled "Technology Description." The data were obtained over a temperature range from 20° to 100°C at increments of twenty degrees over the frequency range from 0.1 to 20.0 GHz. Graphs showing ε', ε" and ε"/ε' versus the frequency for the five temperatures were constructed. In addition, a correlation was performed to determine the values for ε', ε", and ε"/ε' at temperatures between the measured values.

In Section 3.2, the chemical composition of the seven simulants used in this study is presented, while in Section 5.2, graphs of the loss tangent versus the frequency for seven simulants are provided. Two graphs are presented for each simulant. The first graph shows the full sweep measured; the second graph shows a scaled-down version so that the reader can better appreciate the difference of the loss tangent within the five temperature measured. In Section 5.2, the correlation for the data obtained is presented in the form of graphs, this graphs contain a prediction formula for the dielectric properties of the simulant.

Graphs showing the dielectric constant versus frequency and dielectric loss versus frequency and presented in Appendix A for all the simulants tested. All the tabulated data obtained in this study for the dielectric constant, the dielectric loss, and the loss tangent are presented in Appendix B. Appendix C presents the correlated data for the dielectric constant and the dielectric loss.

5.1 LOSS TANGENT RESULTS

For all seven simulants studied, it was found that the values for ε', ε" and ε"/ε' changed rapidly with increasing frequency in the low frequency range, whereas their rate of change declined considerably in the higher frequency range. For each simulant, a scaled-down graph is presented to show all of the values for the loss tangent versus frequency at the five temperatures. Another graph is scaled down to show more detail in the higher frequency range.

5.1.1 Hanford 4 Molar Simulants

Figures 3 and 4 show the loss tangent versus the frequency for the Hanford 4 Molar simulants.

For the most part the loss tangent increases with increasing temperature and decreases with increasing frequency. At 20°C, optimal processing could be obtained over a wide range of frequencies. For the higher temperatures, a more careful selection of frequency is clearly necessary in order to achieve the best efficiency.

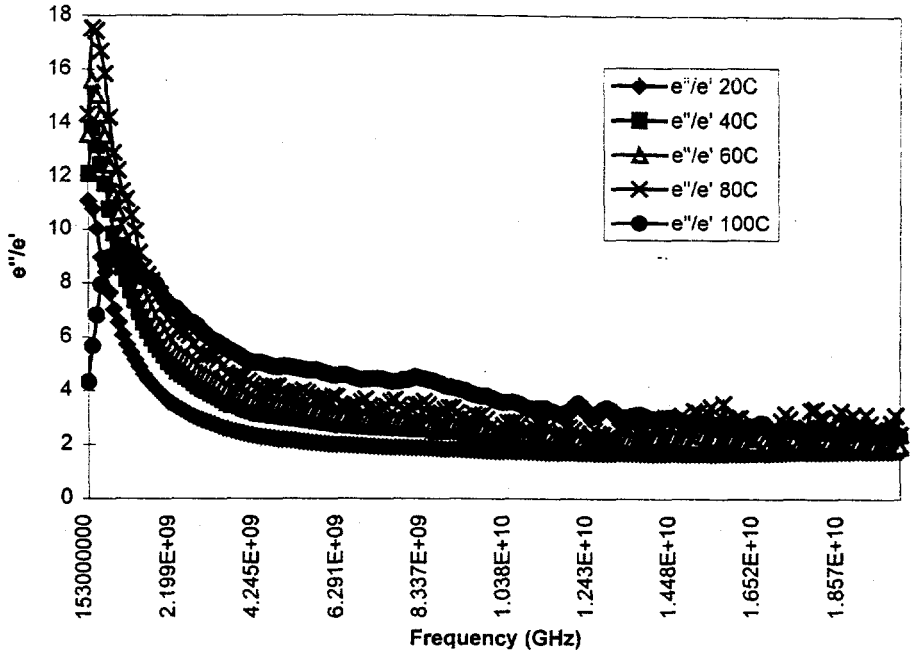


Figure 3. Loss tangent versus frequency for the Hanford 4 molar simulant. Full scale.

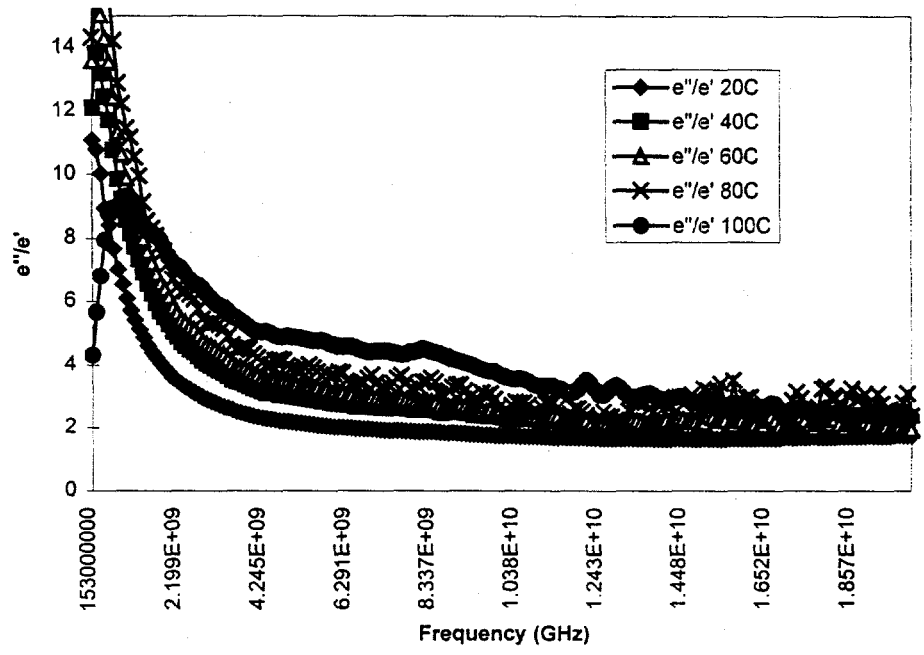


Figure 4. Loss tangent versus frequency for the Hanford 4 molar simulant. Scaled down.

5.1.2 Hanford 6 Molar Simulant

Figures 5 and 6 show the loss tangent versus the frequency for the Hanford 6 Molar simulant. The behavior of this simulant is similar to that of the Hanford 4 Molar simulant.

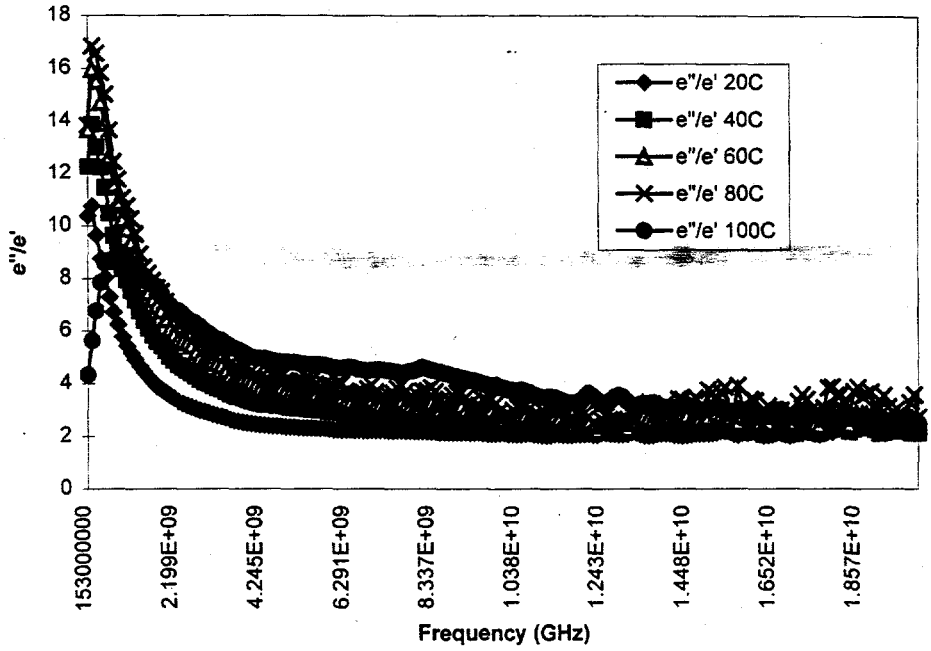


Figure 5. Loss tangent versus frequency for the Hanford 6 Molar simulant. Full scale.

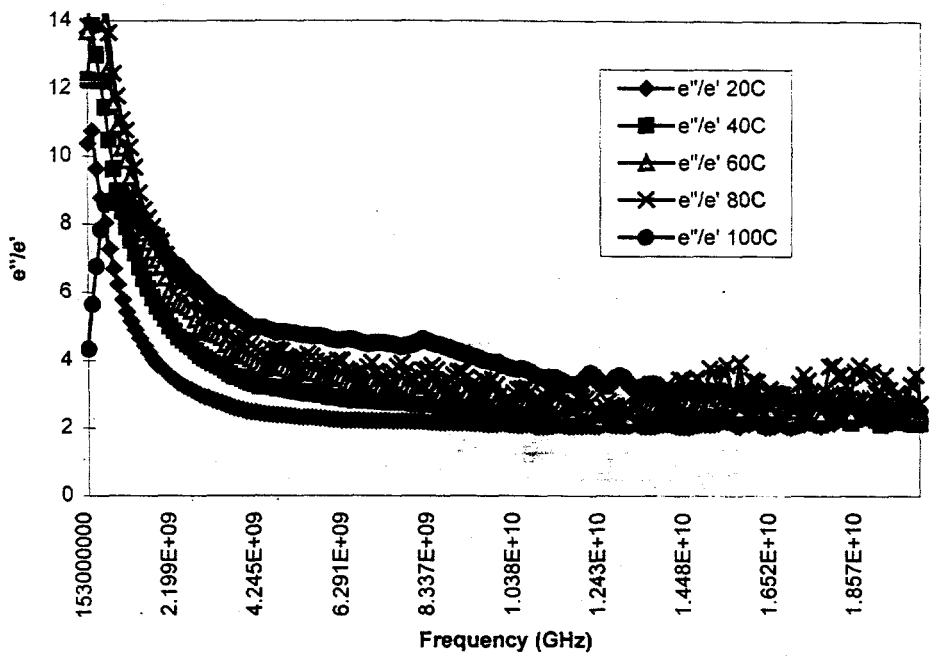


Figure 6. Loss tangent versus frequency for the Hanford 6 molar simulant. Scaled down.

5.1.3. Comparison of 4 and 6 Molar Hanford Simulants in Term of Water Content

A comparison of the Hanford simulants was conducted. The Hanford 4 molar simulant had 59.4 percent water, compared to the Hanford 6 molar simulant, which had 45.6 percent water. The distribution of the loss tangent is presented in this section for temperatures of 20° and 100°C. These two temperature setting represent both extremes of the temperature range used for this study.

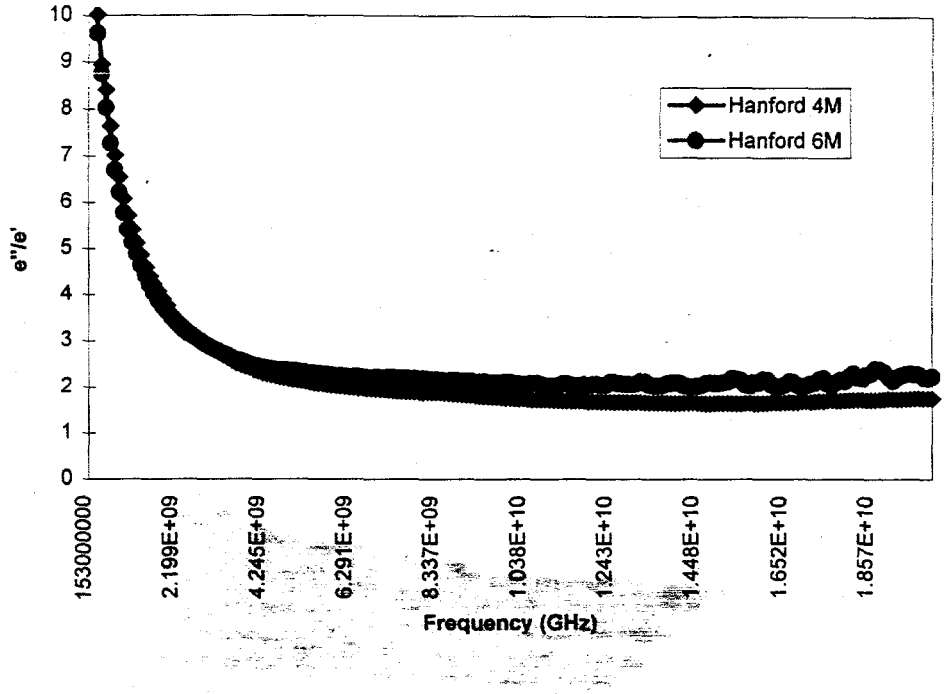


Figure 7. Loss tangent versus frequency for the Hanford 4 and 6 Molar simulants at 20°C.

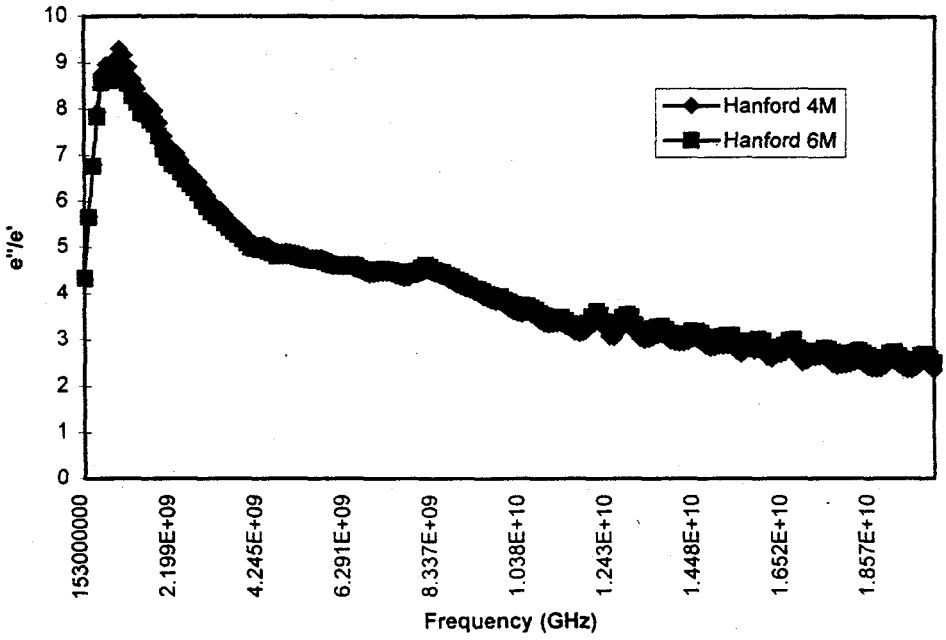


Figure 8. Loss tangent versus frequency for the Hanford 4 and 6 molar simulants at 100°C.

At 20°C, a difference in the loss tangent was observed between the 4 molar and 6 molar simulants (see Figure 7). However, as the temperature increased to 100°C, the water was driven off, and the value of the loss tangent of both simulants became closer (see Figure 8). Also, at 20°C the values of the dielectric constant and dielectric loss were higher for the simulant with the higher water constant (Hanford 4 molar), but as the temperature was increased to 100°C, the values for the dielectric constant and dielectric loss of both simulants became closer. It can be concluded that moisture constant in the simulants plays an important role in the permittivity measurements.

5.1.4 Melton Valley Simulant

Figures 9 and 10 show the loss tangent versus frequency for the Melton Valley simulant. It can be concluded that the loss tangent increases with temperature for this simulant, and the best efficiency is found in the higher frequency range.

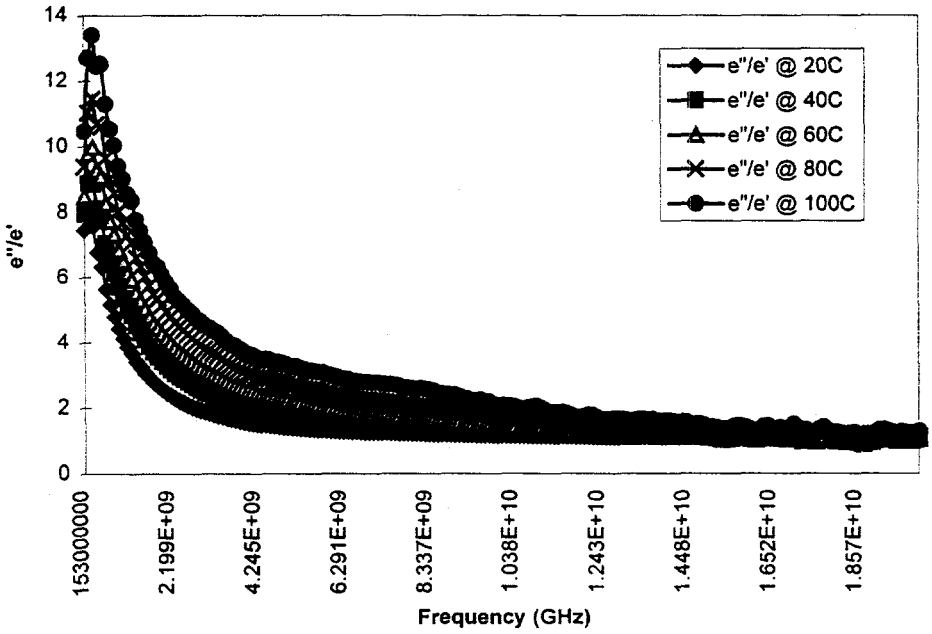


Figure 9. Loss tangent versus frequency for the Melton Valley simulant. Full Scale.

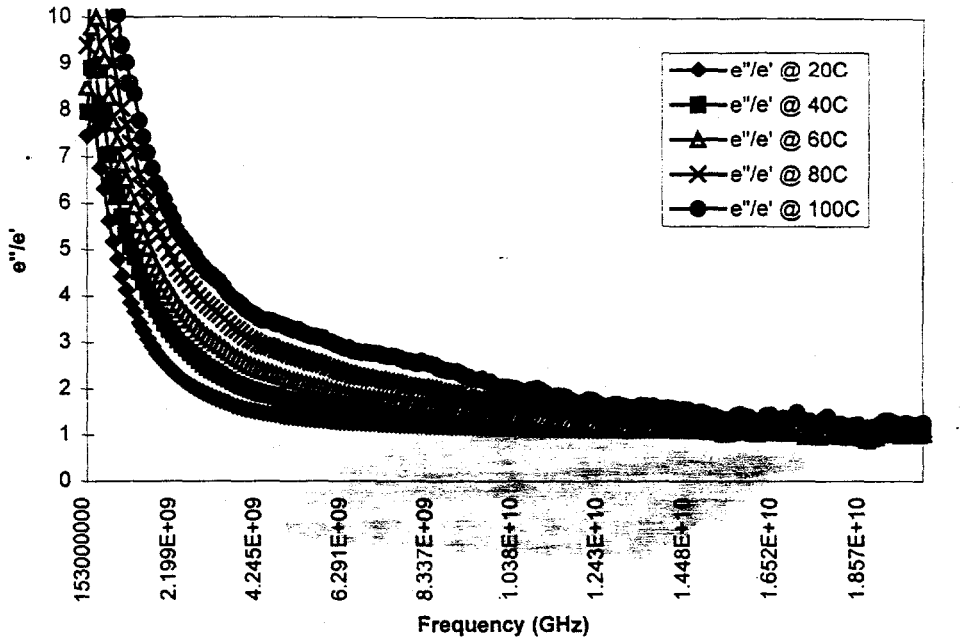


Figure 10. Loss tangent versus frequency for the Melton Valley simulant. Scaled down.

5.1.5 SAIC Simulant

Figures 11 and 12 show the loss tangent versus the frequency for the SAIC simulant. This plot shows that good efficiency can be achieved over most of the higher frequency range.

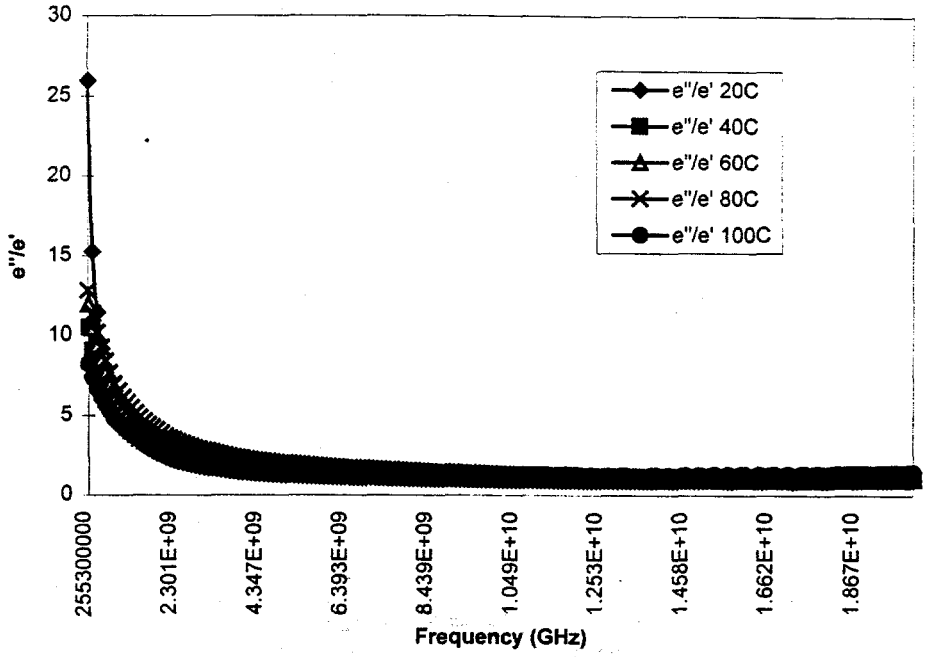


Figure 11. Loss tangent versus frequency for the SAIC simulant. Full scale.

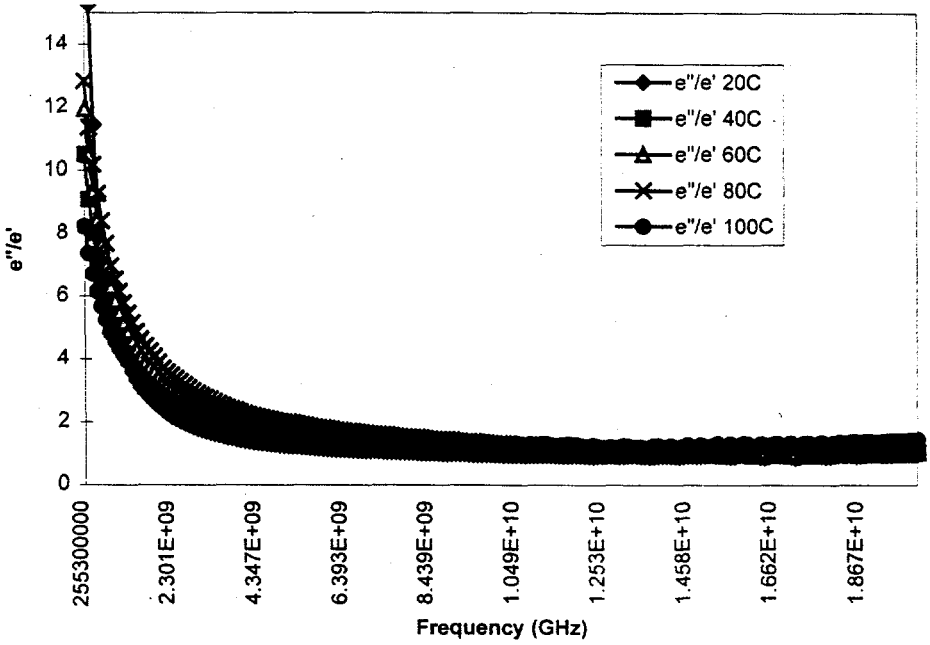


Figure 12. Loss tangent versus frequency for the SAIC simulant. Scaled down.

5.1.6 Revised ORNL Simulant

Figures 13 and 14 show the loss tangent versus frequency for the Revised ORNL simulant. These plots show that the loss tangent increases with increasing temperature over most of the frequency range. Thus, the most efficient processing would be achieved in the higher frequency ranges.

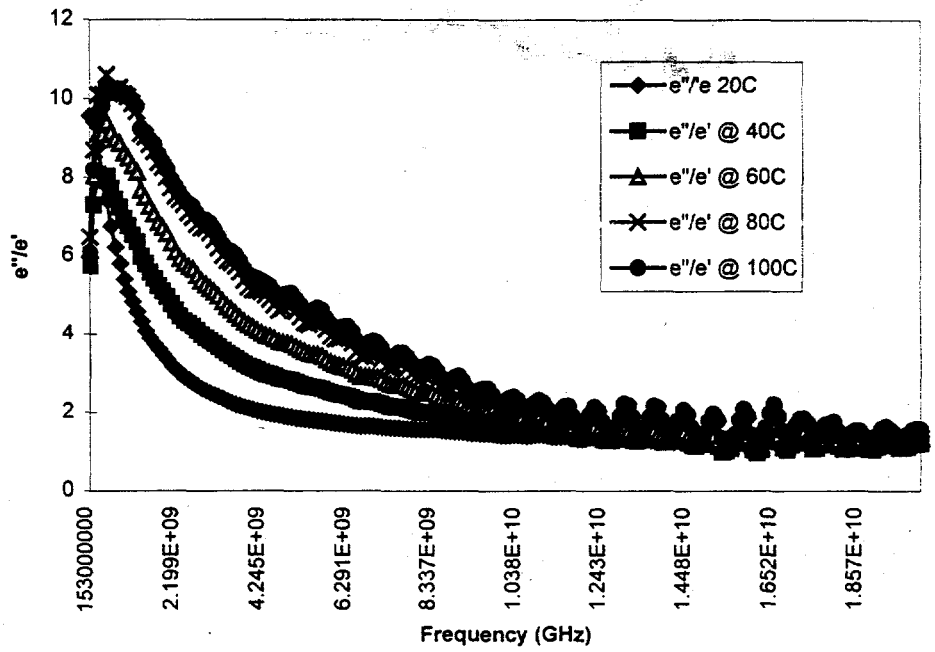


Figure 13. Loss tangent versus frequency for the Revised ORNL simulant. Full scale.

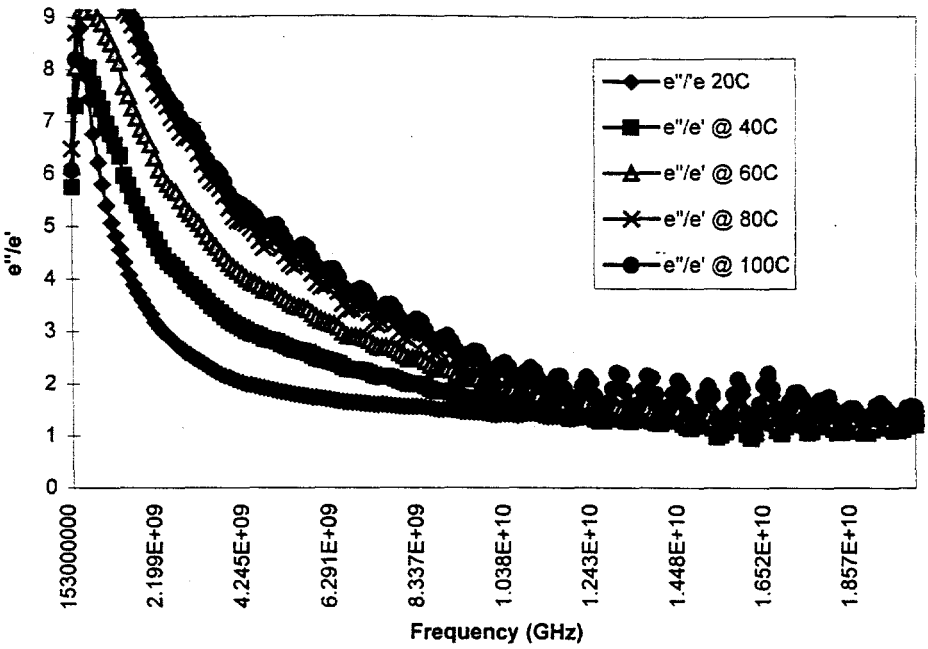


Figure 14. Loss tangent versus frequency for the Revised ORNL simulant. Scaled down.

5.1.7 W-26 ORNL Simulant

Figures 15 and 16 show the loss tangent versus frequency for the W-26 ORNL simulant. Again, the values for the loss tangent generally increase with increasing frequency, and the greatest efficiency would be achieved at the higher frequencies.

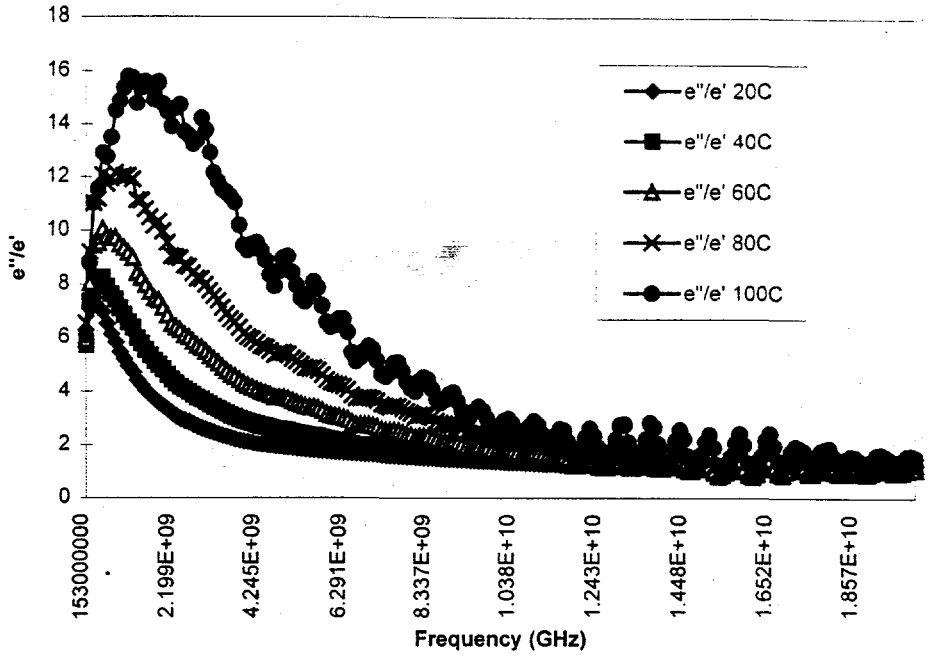


Figure 15. Loss tangent versus frequency for the W-26 ORNL simulant. Full scale.

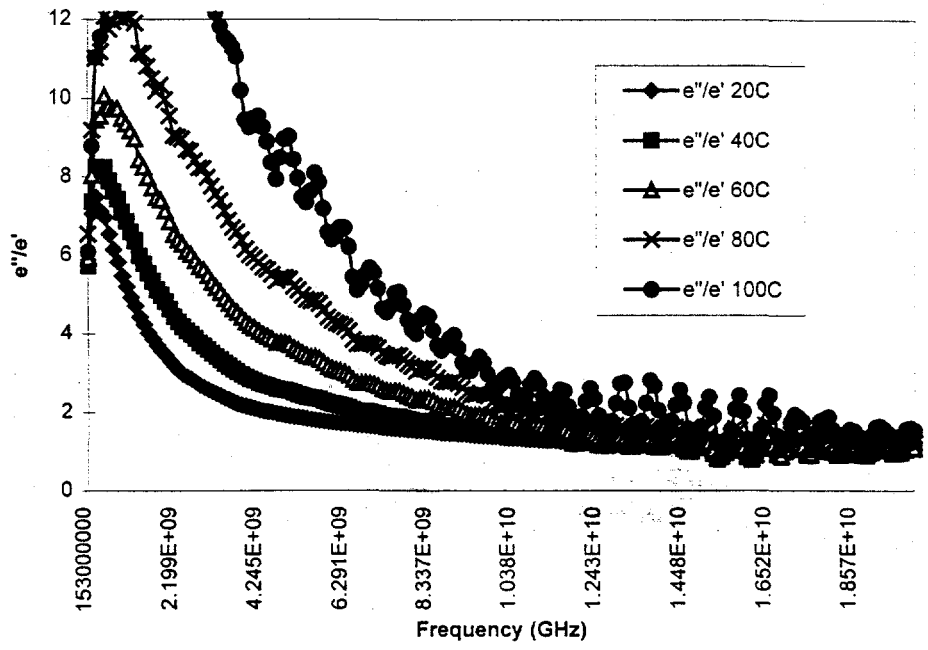


Figure 16. Loss tangent versus frequency for the W-26 ORNL simulant. Scaled down.

5.1.8 Savannah River Simulant

Figures 17 and 18 show the loss tangent versus frequency for the Savannah River simulant. Figure 18, which is highly scaled down, shows a minimum for the curve representing 20°C in the region of 4 GHz. All the measurements for this simulant show some rise in the loss tangent at the higher frequencies.

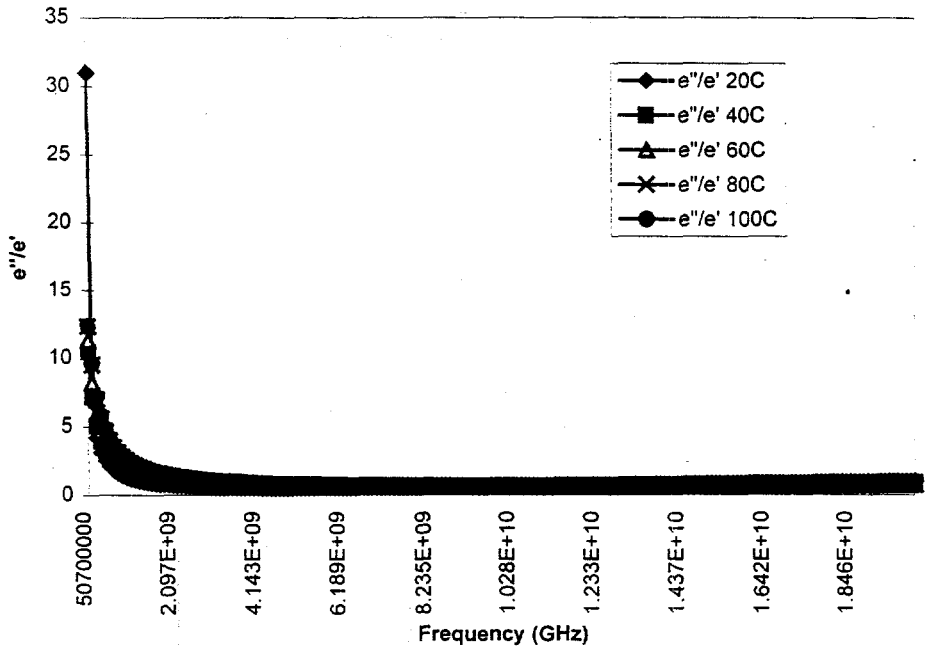


Figure 17. Loss tangent versus frequency for the Savannah River simulant. Full scale.

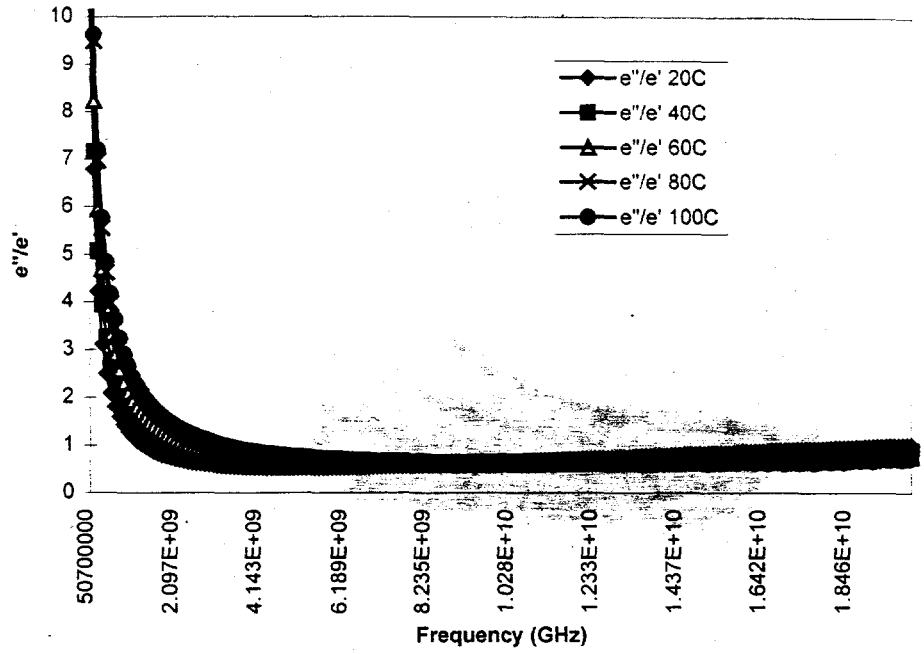


Figure 18. Loss tangent versus frequency for the Savannah River simulant. Scaled down.

5.2 ANALYSIS OF THE CORRELATED RESULTS FOR THE LOSS TANGENT

5.2.1 Hanford 4 Molar Simulant

Figures 19 and 20 are the correlation results of the loss tangent, tanδ. Figure 19 presents the correlated results for the temperature and frequency range defined in this study along with a prediction correlation formula and coefficients to predict the loss tangent at other frequency and temperature ranges. Figure 20 shows the loss tangent correlated residual percentage (%) results, most of which are within ± 20%.

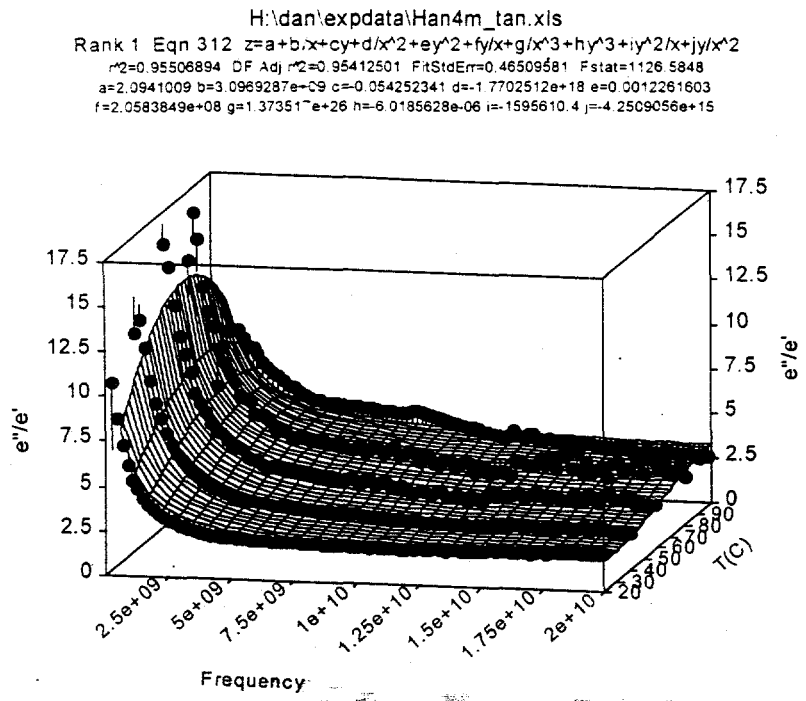


Figure 19. Correlation data for the loss tangent. Simulant: Hanford 4 Molar.

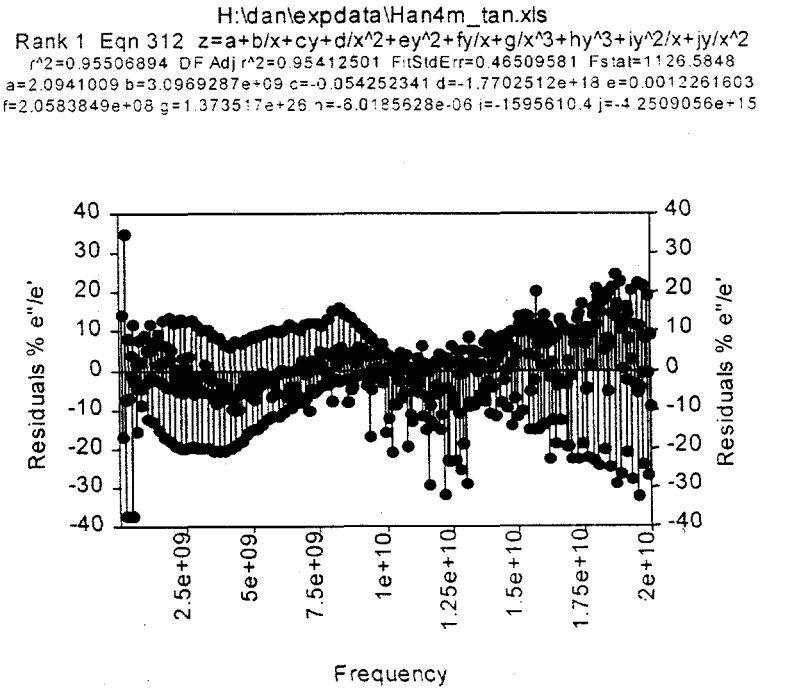


Figure 20. Residual percentage (%) for loss tangent Hanford 4 Molar simulant.

5.2.2 Hanford 6 Molar Simulant

Figures 21 and 22 present the correlation results of the loss tangent, tanδ. Figure 22 shows the loss tangent correlated residual percentage (%) results, most of which are within ± 20%.

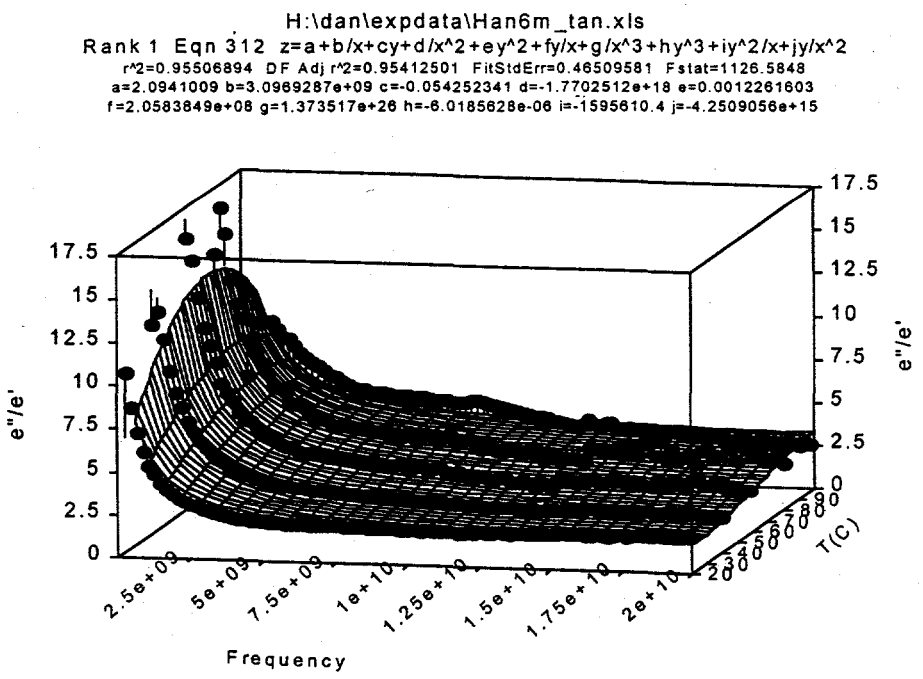


Figure 21. Correlation data for the loss tangent. Simulant: Hanford 6 Molar.

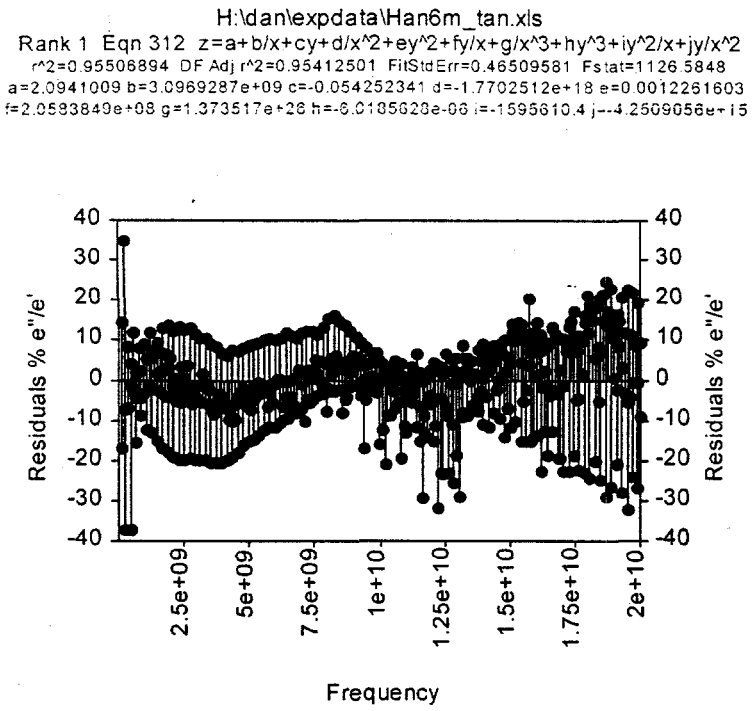


Figure 22. Residual percentage (%) for the loss tangent. Simulant: Hanford 6 Molar.

5.2.3 Hanford 4 and 6 Molar Simulants

Figures 23 and 24 present the correlation results of the loss tangent, tanδ. Figure 23 represents the correlation data for the Hanford 4 and Hanford 6 molar simulants. Here, the loss tangent (e"/e') is plotted versus frequency and temperature. Figure 24 shows the loss tangent correlated residual percentage (%) results, most of which are within ± 20%. The Hanford 4 and 6 simulants have the same constituents but different water content. It can be seen that the correlated results are not as satisfactory as the individual results presented earlier.

Rank 1 Eqn 312 z=a+b/x+cy+d/x^2+ey^2+fy/x+g/x^3+hy^3+iy^2/x+jy/x^2
r^2=0.94798339 DF Adj r^2=0.94757922 FitStdErr=0.51009434 Fstat=2608.1466
a=1.2137988 b=4.7200435e+09 c=-0.011662272 d=-1.9093669e+18 e=0.0005347558
f=1.4485955e+08 g=1.6252442e+26 h=-2.7124281e-06 i=-1032868.1 j=-5.0617205e+15

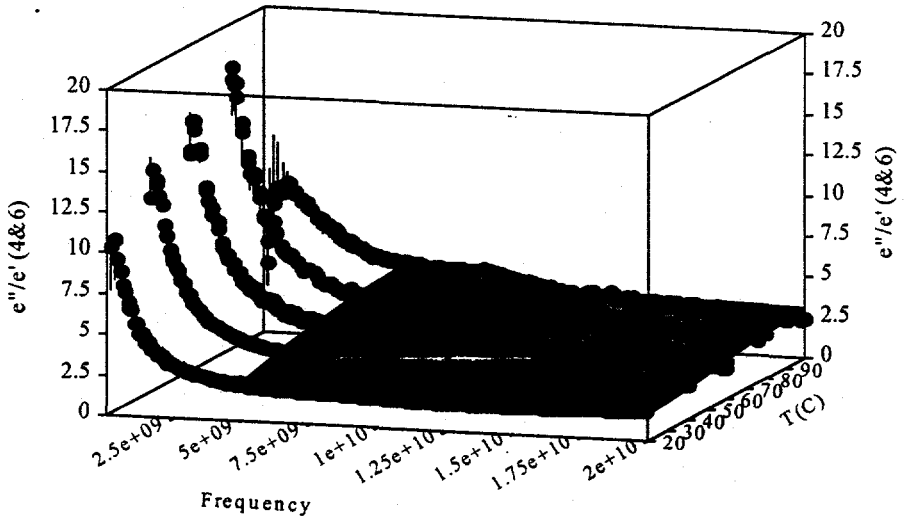


Figure 23. Correlation data for the Hanford 4 and Hanford 6 Molar simulants.

H:\dan\expdata\Han4m_tan.xls
Rank 1 Eqn 312 z=a+b/x+cy+d/x^2+ey^2+fy/x+g/x^3+hy^3+iy^2/x+jy/x^2
r^2=0.94798339 DF Adj r^2=0.94757922 FitStdErr=0.51009434 Fstat=2608.1466
a=1.2137988 b=4.7200435e+09 c=-0.011662272 d=-1.9093669e+18 e=0.0005347558
f=1.4485955e+08 g=1.6252442e+26 h=-2.7124281e-06 i=-1032868.1 j=-5.0617205e+15

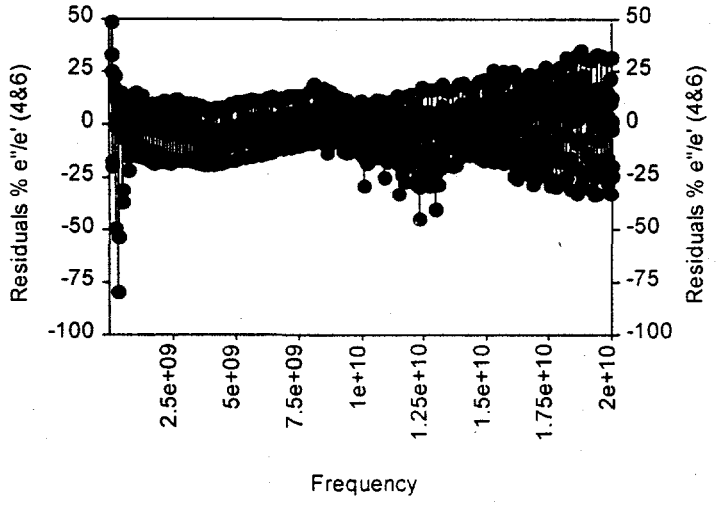


Figure 24. Residual percentage (%) for the Hanford 4 and Hanford 6 simulants.

5.2.4 Melton Valley Simulant

Figures 25 and 26 present the correlation results of the loss tangent, tanδ. Figure 26 shows the loss tangent correlated residual % results, most of which are within ± 20%. For higher temperatures, the correlated equation yields a better prediction.

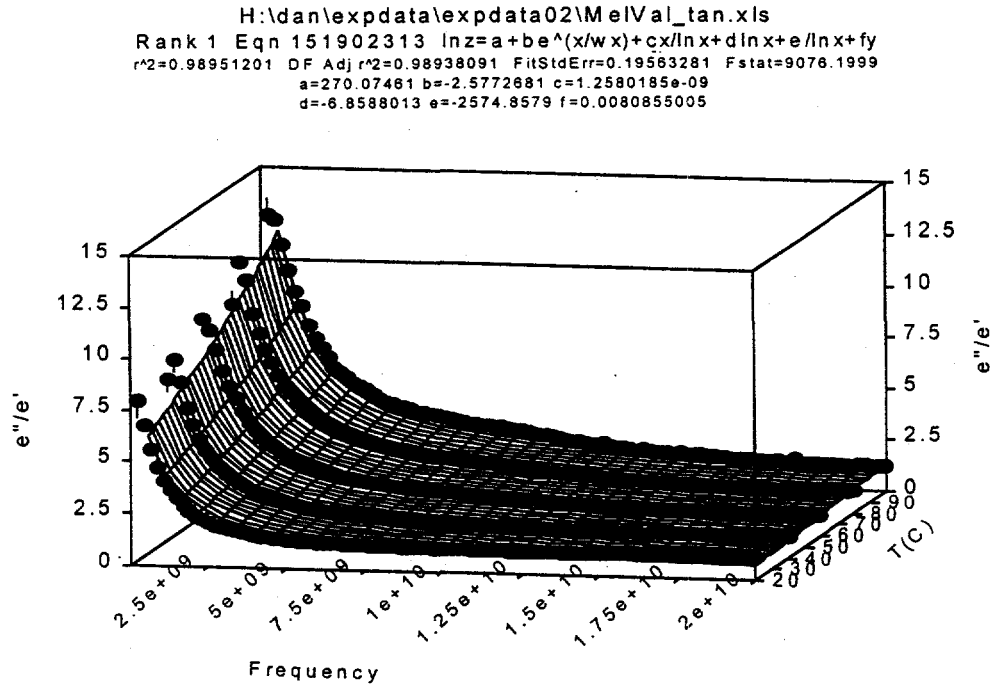


Figure 25. Correlation data for the Melton Valley simulant.

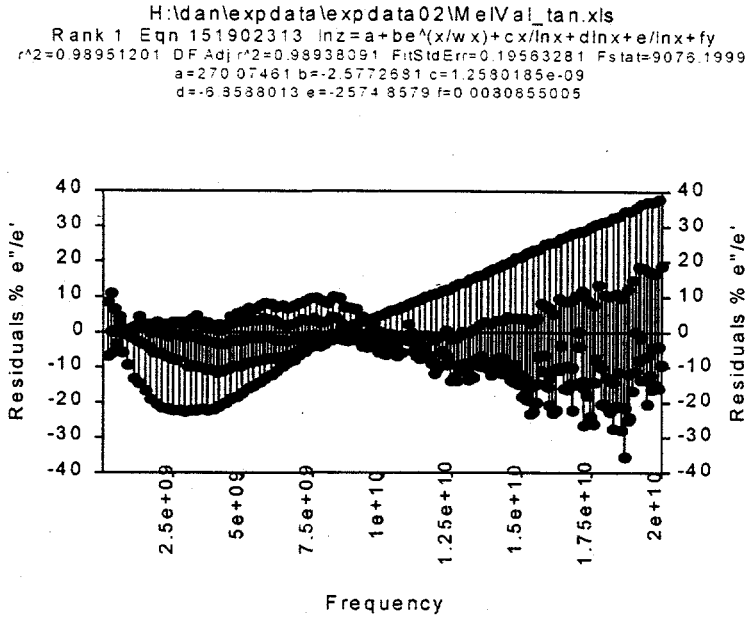


Figure 26. Residual percentage (%'s) for the Melton Valley simulant.

5.2.5 SAIC Simulant

Figures 27 and 28 present the correlation results of the loss tangent, tanδ. The residual distributions is quite even, most of them are within ± 20%, as shown in Figure 28.

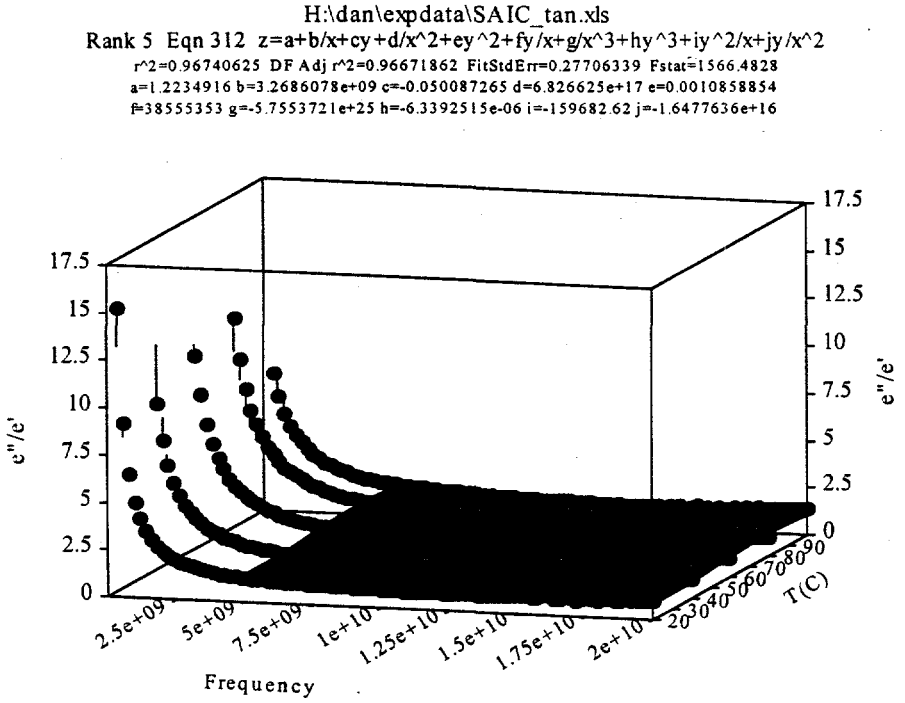


Figure 27. Correlation data for the SAIC simulant.

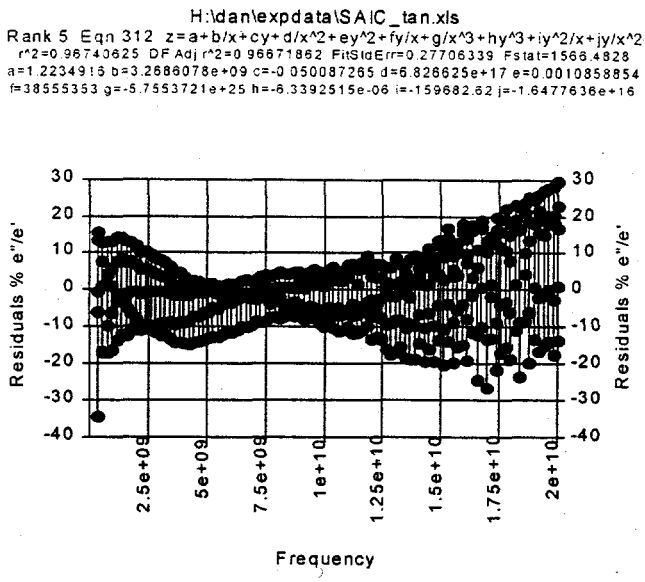


Figure 28. Residual percentage (%) for SAIC simulant.

5.2.6 Revised ORNL Simulant

Figures 29 and 30 present the correlation results of the loss tangent, tanδ. The loss tangent residual percentages are shown in Figure 30; most of them are within ± 20%.

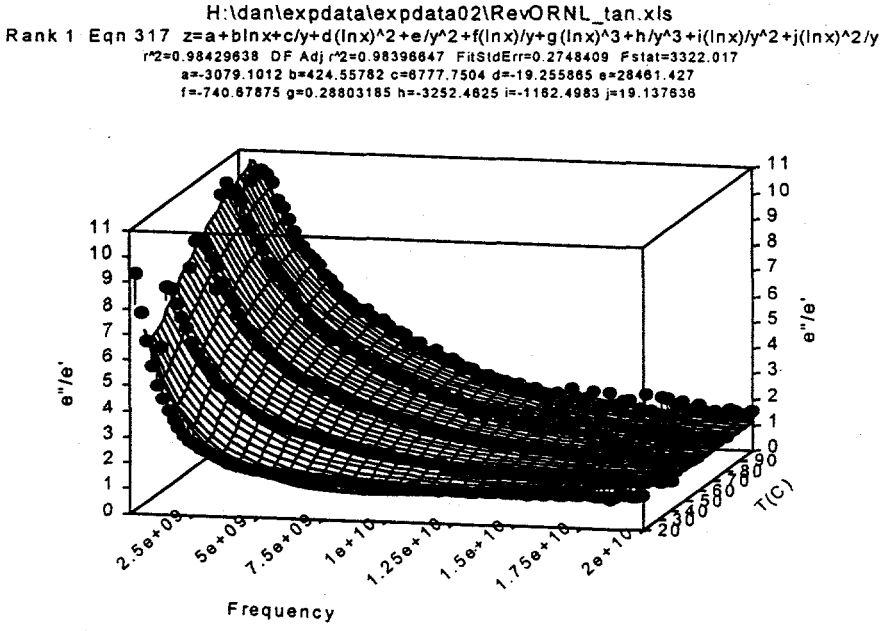


Figure 29. Correlation data for the Revised ORNL simulant.

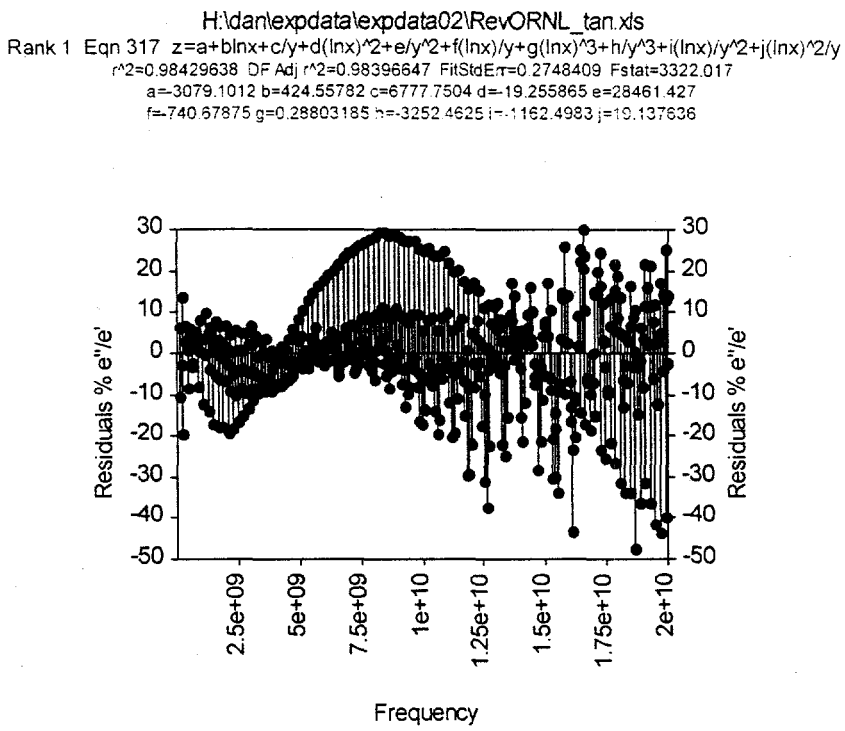


Figure 30. The residual percentages (%'s) for the Revised ORNL simulant.

5.2.7 W-26 ORNL Simulant

Figures 31 and 32 are the correlation results of the loss tangent, tanδ. Figure 32 shows the residual percentages of the loss tangent, most of which are within ± 20%.

H:\dan\expdata\expdata02\w26_tan.xls
Rank 1 Eqn 1303 z=(a+clnx+ey+g(lnx)^2+iy^2+kylnx)/(1+blnx+dy+f(lnx)^2+hy^2+jylnx)
r^2=0.9870617 DF Adj r^2=0.98676208 FitStdErr=0.35594882 Fstat=3631.4004
a=2.4435891 b=-0.096267834 c=-0.2208618 d=0.0009688775 e=0.0055026321 f=0.0023322573
g=0.0050325871 h=1.1617444e-07 i=1.8833406e-06 j=-4.776232e-05 k=-0.00024782524

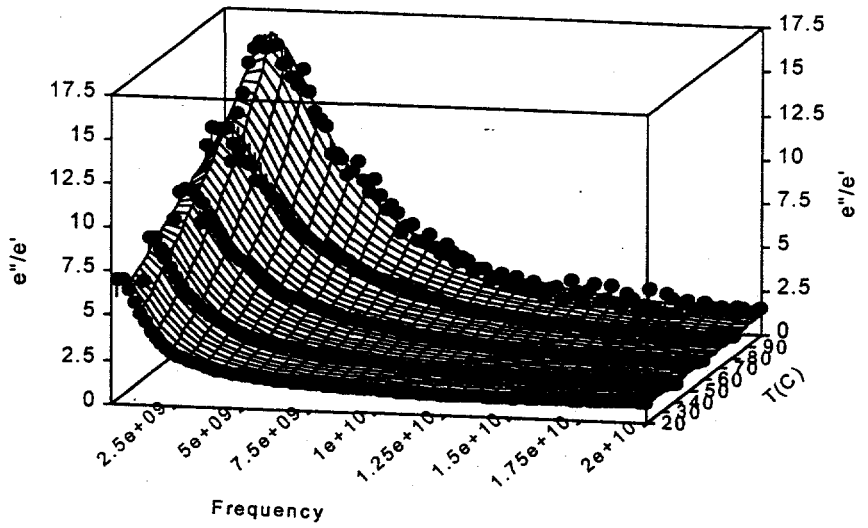


Figure 31. Correlation data for the W-26 ORNL simulant.

H:\dan\expdata\expdata02\w26_tan.xls
Rank 1 Eqn 1303 z=(a+clnx+ey+g(lnx)^2+iy^2+kylnx)/(1+blnx+dy+f(lnx)^2+hy^2+jylnx)
r^2=0.9870617 DF Adj r^2=0.98676208 FitStdErr=0.35594882 Fstat=3631.4004
a=2.4435891 b=-0.096267834 c=-0.2208618 d=0.0009688775 e=0.0055026321 f=0.0023322573
g=0.0050325871 h=1.1617444e-07 i=1.8833406e-06 j=-4.776232e-05 k=-0.00024782524

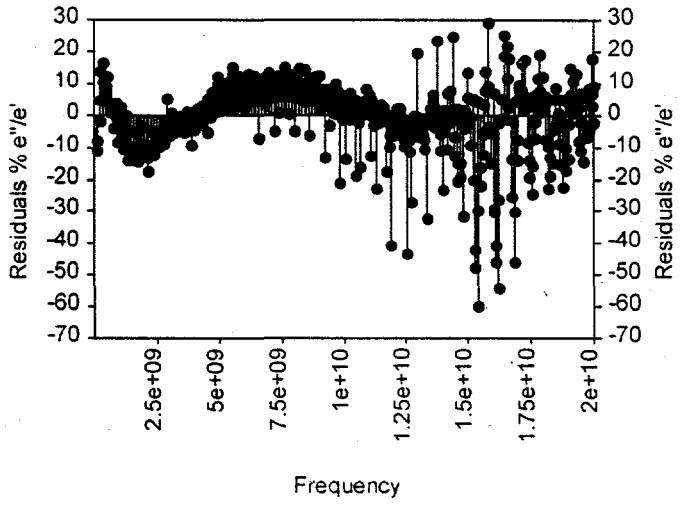


Figure 32. Residual percentage (%s) for the W-26 ORNL simulant.

5.2.8 Savannah River Simulant

Figures 33 and 34 present the correlation results of the loss tangent, tanδ. Figure 34 shows the loss tangent correlated residual percentage results, most of which are within ± 5%.

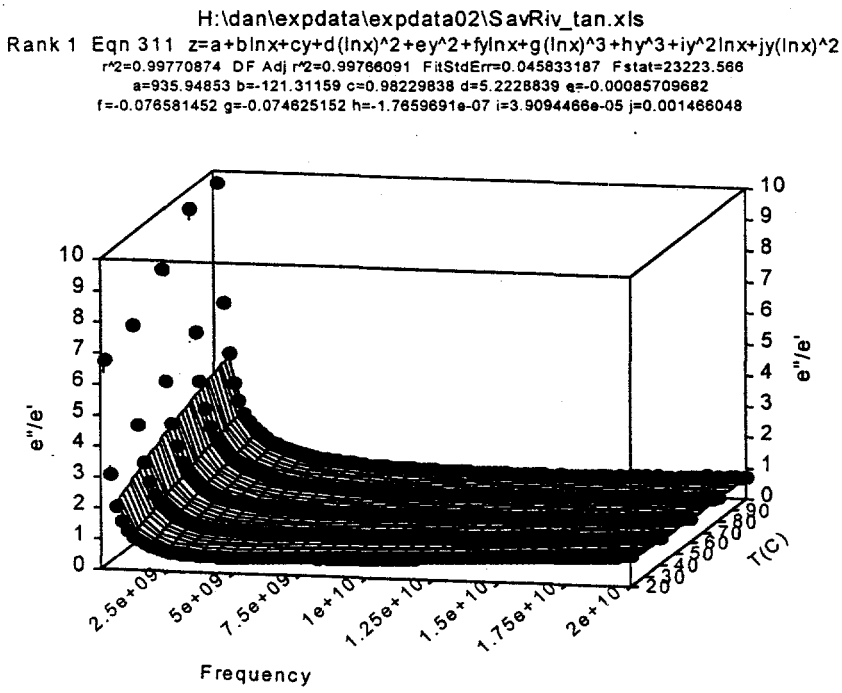


Figure 33. Correlation data for the Savannah River simulant.

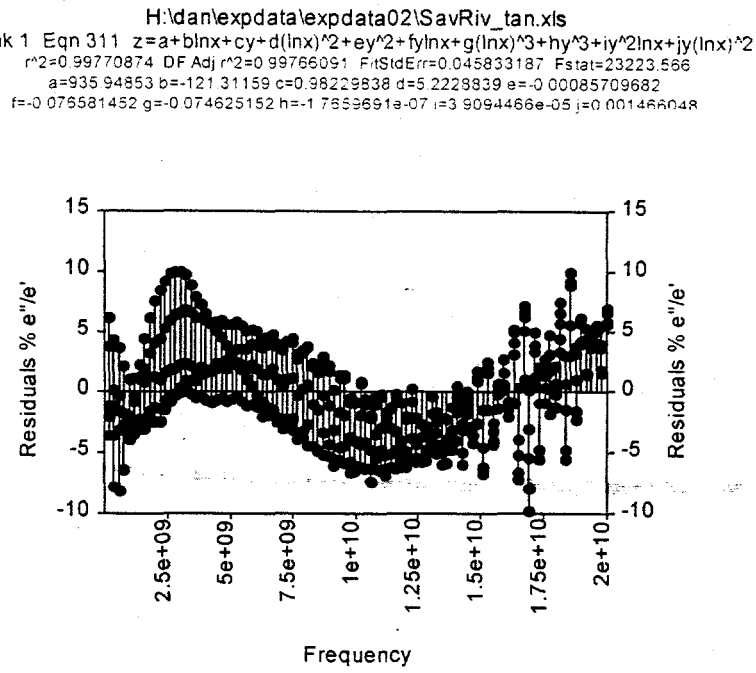


Figure 34. Residual percentage (%s) for the Savannah River simulant.

6. CONCLUDING REMARKS

The correlated equations with its coefficients, and the residuals are included in this analysis. It can be seen that the determination standards r^2, Degree of Freedom Adjusted r^2, and the Fit Statistic are quite high, the correlated equations for different simulants can be used to predict the dielectric properties for the measured low-level liquid waste (LLLW) within the frequency range from 0.1~20 GHz and temperature range from 20~100°C. The correlation equation for the loss tangent are provided in Table 8. Here, the x axis is represented by the frequency, the y axis is represented by the temperature and the z axis gives the desired loss tangent value. The coefficient for these equations can be obtained from the figures presented in section 5.2 (Figures 19 through 34). Similar equations are presented for the dielectric constant and the dielectric loss, these equations and constants are given with each graph in Appendix C.

Table 8.
Correlation Equations for the Loss Tangent

Simulants	Correlation Equations for the Loss Tangent	Figure #
Hanford 4 Molar Simulant	$z = a + b/x + cy + d/x^2 + ey^2 + fy/x + g/x^3 + hy^3 + iy^2/x + jy/x^2$	19
Hanford 6 Molar Simulant	$z = a + b/x + cy + d/x^2 + ey^2 + fy/x + g/x^3 + hy^3 + iy^2/x + jy/x^2$	21
Hanford 4 and 6 Molar Simulant	$z = a + b/x + cy + d/x^2 + ey^2 + fy/x + g/x^3 + hy^3 + iy^2/x + jy/x^2$	23
Melton Valley Simulant	$\ln z = a + be^{(x/wx)} + cx/\ln x + d\ln x + e/\ln x + fy$	25
SAIC Simulant	$z = a + b/x + cy + d/x^2 + ey^2 + fy/x + g/x^3 + hy^3 + iy^2/x + jy/x^2$	27
Revised ORNL Simulant	$z = a + b\ln x + c/y + d(\ln x)^2 + e/y^2 + f(\ln x)/y + g(\ln x)^3 + h/y^3 + i(\ln x)/y^2 + j(\ln x)^2/y$	29
W-26 ORNL	$z = (a + c\ln x + ey + g(\ln x)^2 + iy^2 + ky\ln x)/(1 + b\ln x + dy + f(\ln x)^2 + hy^2 + jy\ln x)$	31
Savannah River Simulant	$z = a + b\ln x + cy + d(\ln x)^2 + ey^2 + fy\ln x + g(\ln x)^3 + hy^3 + iy^2\ln x + jy(\ln x)^2$	33

The dielectric constants contained in this study were measured over a temperature range from 20° to 100°C at increments of twenty degrees. Testing has shown, as expected, that the water contained in the simulants is driven off before the temperature of 120°C is reached and that the remaining material is in the form of either solids or melted compounds mixed with high melting solids. A continuation of this study would involve measurements up to 200°C, the upper limit of the instrument employed. To carry this out, an oven would have to be incorporated into the setup to replace the ethylene glycol bath to achieve reliable temperature control in the samples.

Attempts were made to obtain measurements over the originally chosen frequency range (0.1-20.0 GHz) in two steps, one at a low range (0.1-4.0 GHz) and one at the higher range (4.0-20.0 GHz), in order to be able to produce a larger number of data points and therefore more detailed information about the behavior of the dielectric properties in each range. This approach led to problems because it proved to be impossible to control the loss of moisture due to the evaporation that occurred between the two steps. The measurements appear to be very sensitive to moisture content.

8. REFERENCES

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Franceschetti, G. "A Complete Analysis of the Reflection and Transmission Methods for Measuring the Complex Permeability and Permitivitty of Materials at Microwaves," *Alta Frequenza,* Vol. 36, 1967, pp. 757-764.

Jandel Scientific, *TableCurve 3D*, Vol. 1, User's Manual, San Rafael, CA, 1993.

Piotrowski, M. "Resonance Method for the Decontamination of the Complex Dielectric Constant of Biologic Materials in the Microwave Band," in Biologic Effects and Health Hazards of Microwave Radiation, Polish Medical Publisher, Warsaw, 1974, pp. 243-253.

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Stuchly, M.A. and Stuchly, S.S., "Coaxial Line Reflection Methods for Measuring Dielectric Properties of Biological Substances at Radio and Microwave Frequencies -- A Review," *IEEE Transactions on Instrumentation and Measurement,* Vol. IM-29, 1980, pp. 176-183.

Von Hippel, A.R., (ed.), *Dielectric Materials and Applications*, MIT Press, Cambridge, Massachusetts, 1954.

White, T.L., Youngblood, E.L., Berry, J.B., and Mattus, A.J., *First Results of In-Can Microwave Processing Experiments for Radioactive Liquid Wastes at the Oak Ridge National Laboratory*, Materials Research Society Spring Meeting, San Francisco, California, April 16-21, 1990.

APPENDIX A

DIELECTRIC CONSTANT AND DIELECTRIC LOSS VERSUS FREQUENCY GRAPHS

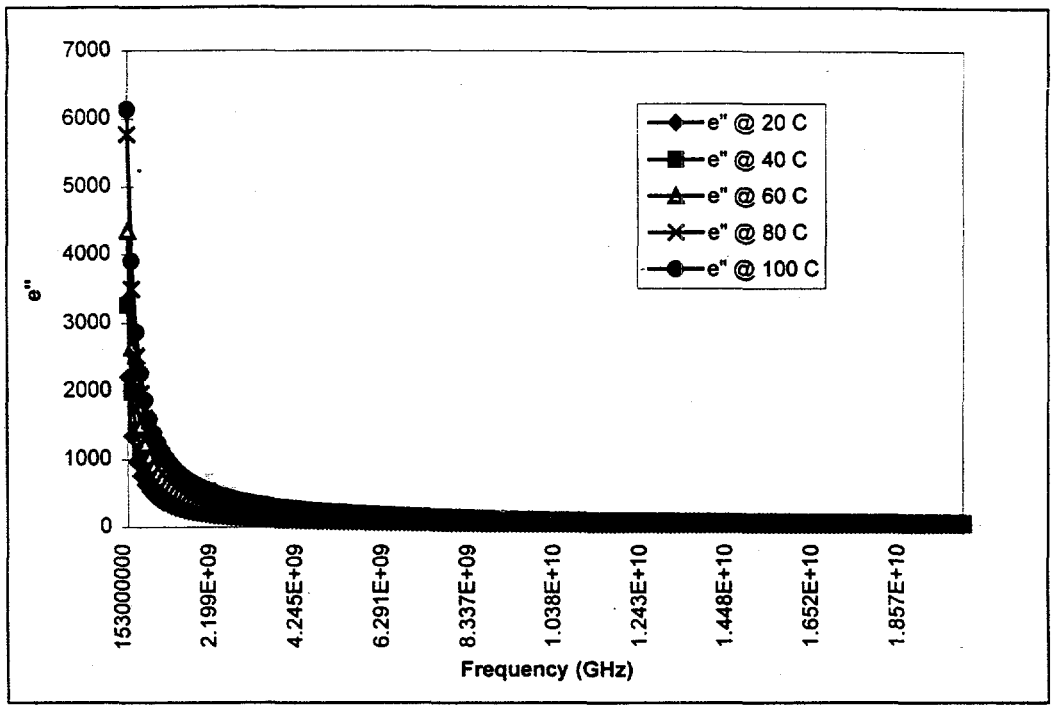

Figure A.1.a. Dielectric loss vs. frequency for the Hanford 4 molar simulant. Full scale.

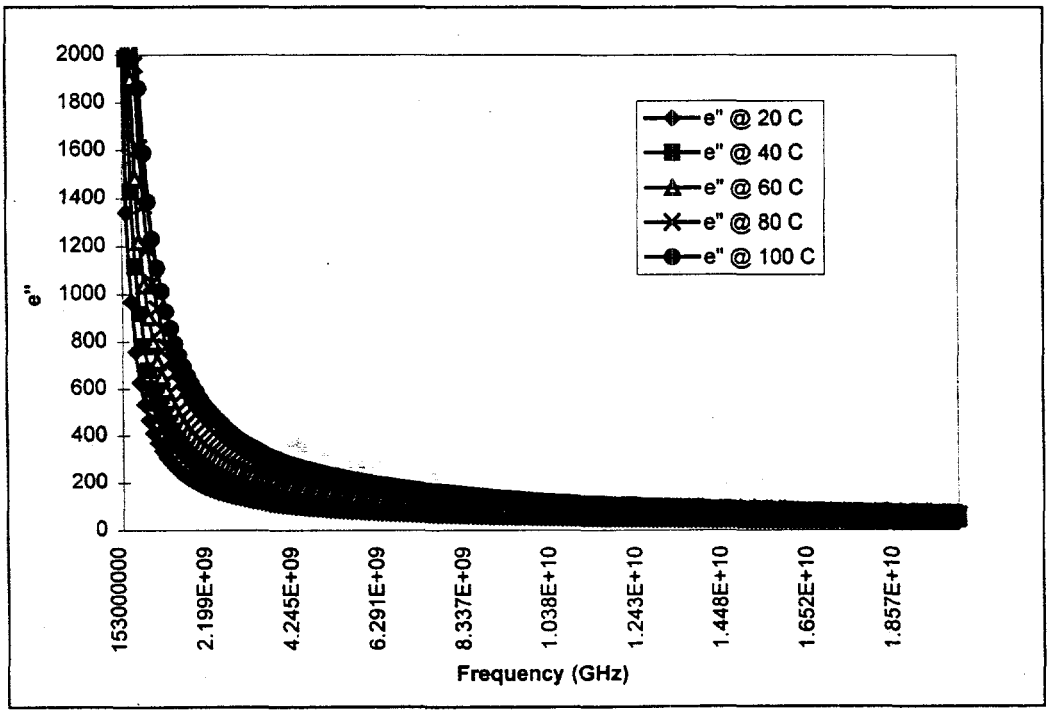

Figure A.1.b. Dielectric loss vs. frequency for the Hanford 4 molar simulant. Scaled down.

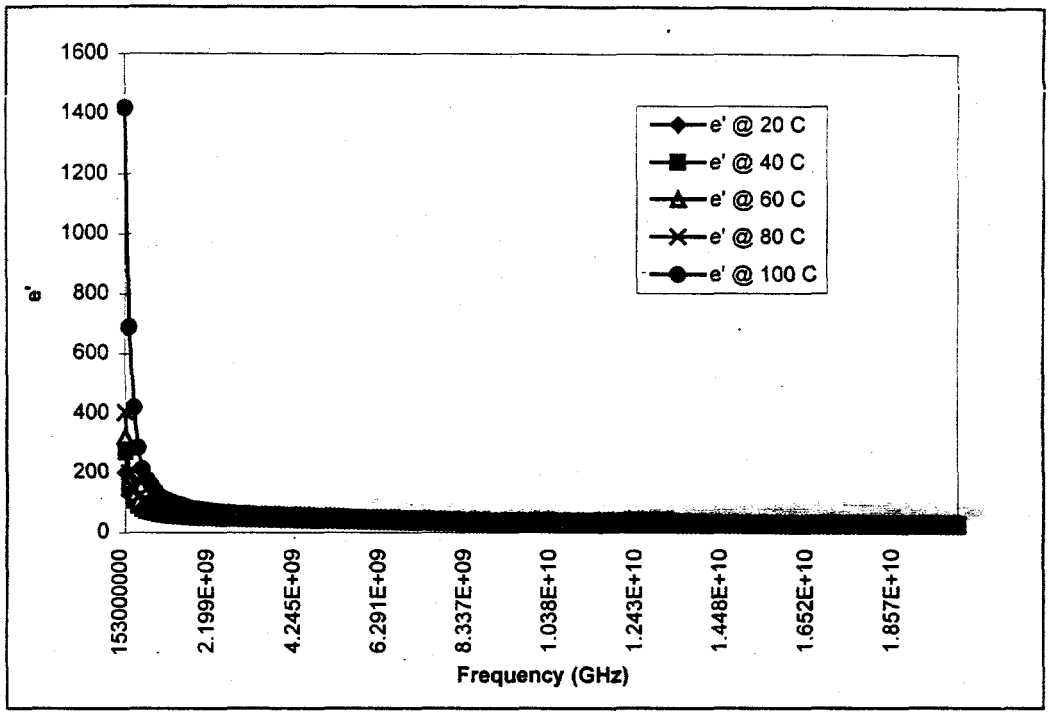

Figure A.1.c. Dielectric constant vs. frequency for the Hanford 4 molar simulant. Full scale.

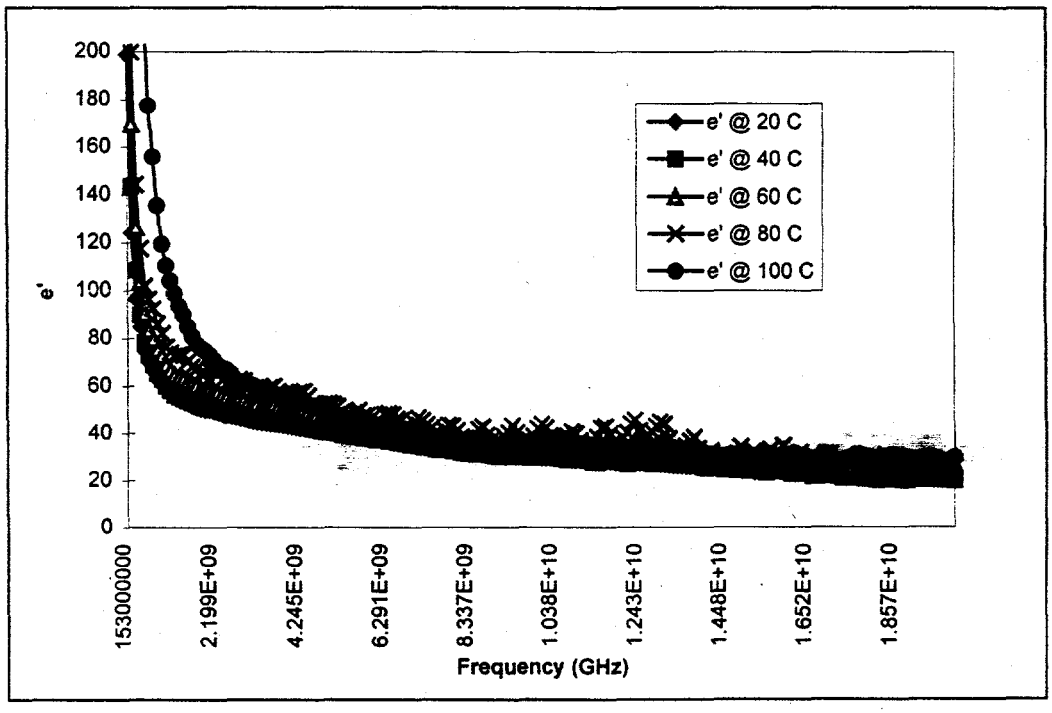

Figure A.1.d. Dielectric constant vs. frequency for the Hanford 4 molar simulant. Scaled down.

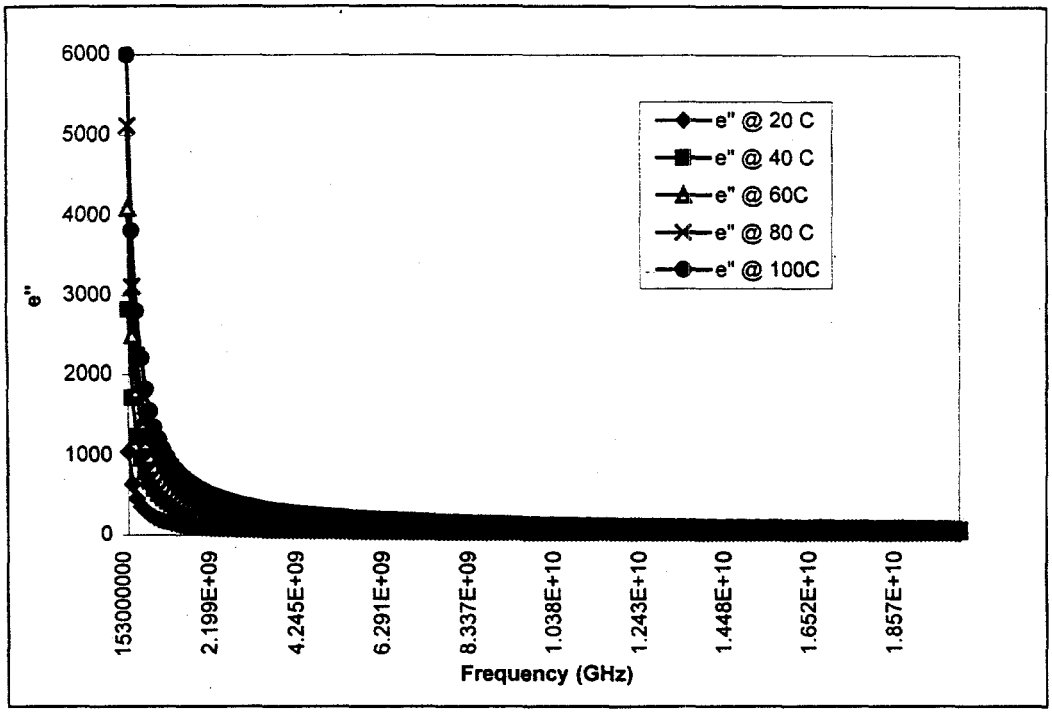

Figure A.2.a. Dielectric loss vs. frequency for the Hanford 6 molar simulant. Full scale.

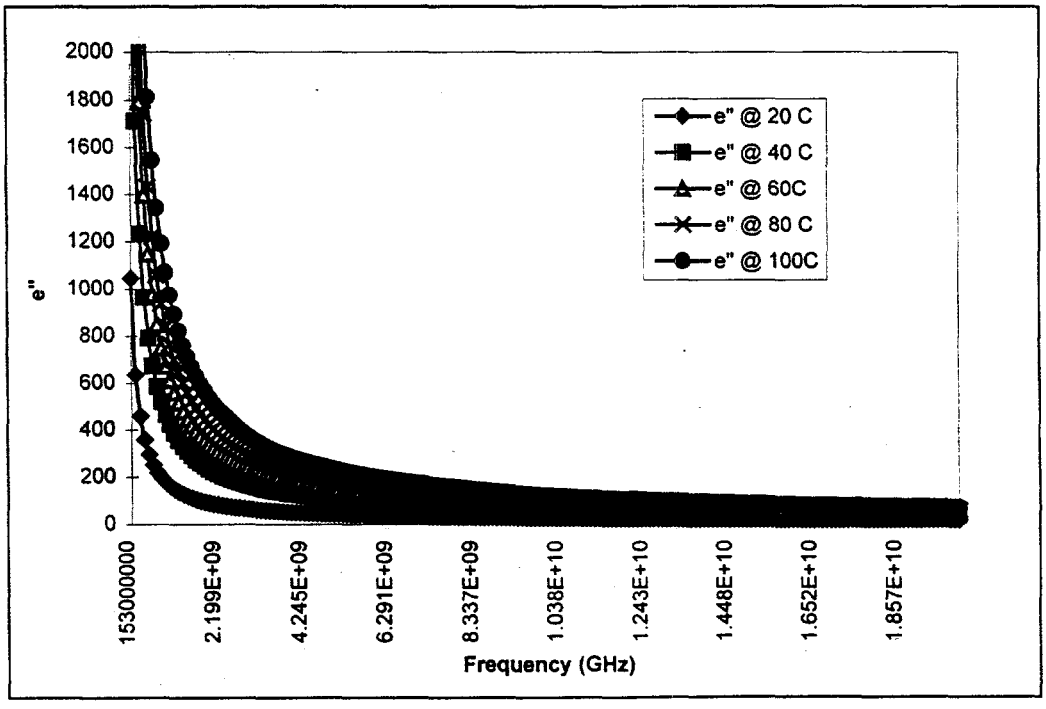

Figure A.2.b. Dielectric loss vs. frequency for the Hanford 6 molar simulant. Scaled down.

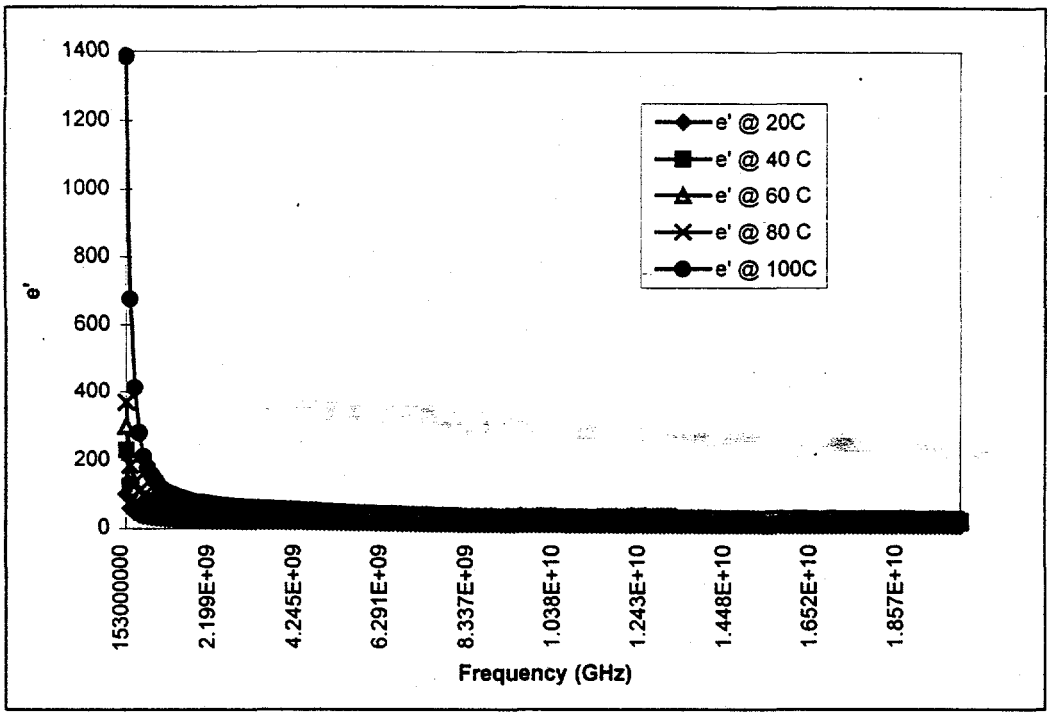

Figure A.2.c. Dielectric constant vs. frequency for the Hanford 6 molar simulant. Full scale.

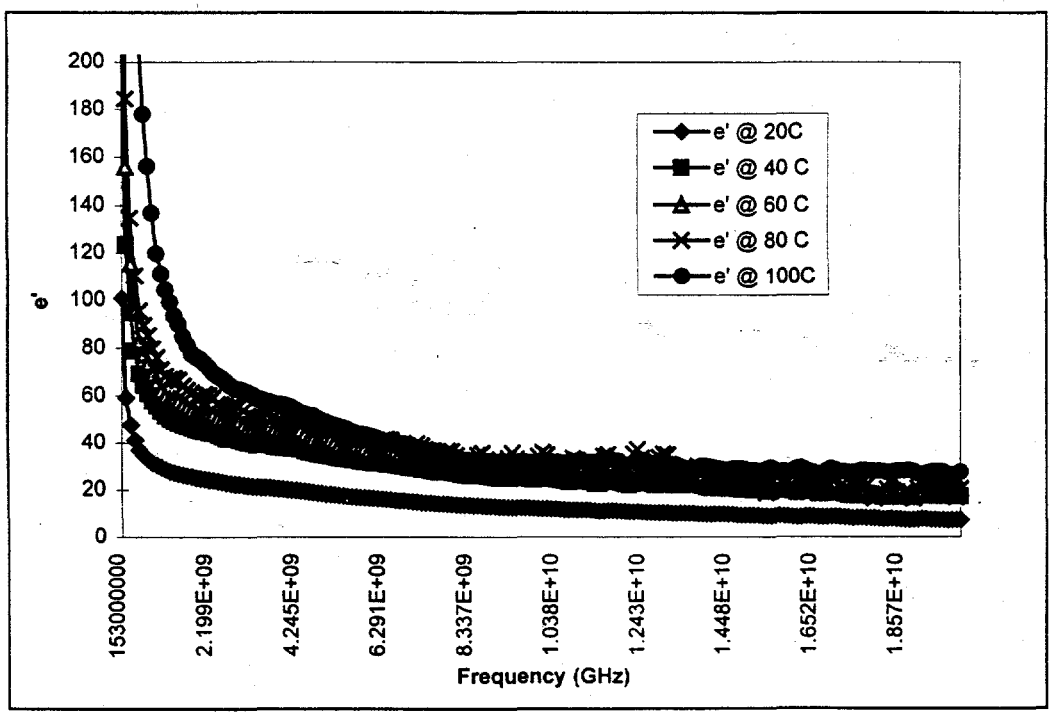

Figure A.2.d. Dielectric constant vs. frequency for the Hanford 6 molar simulant. Scaled down.

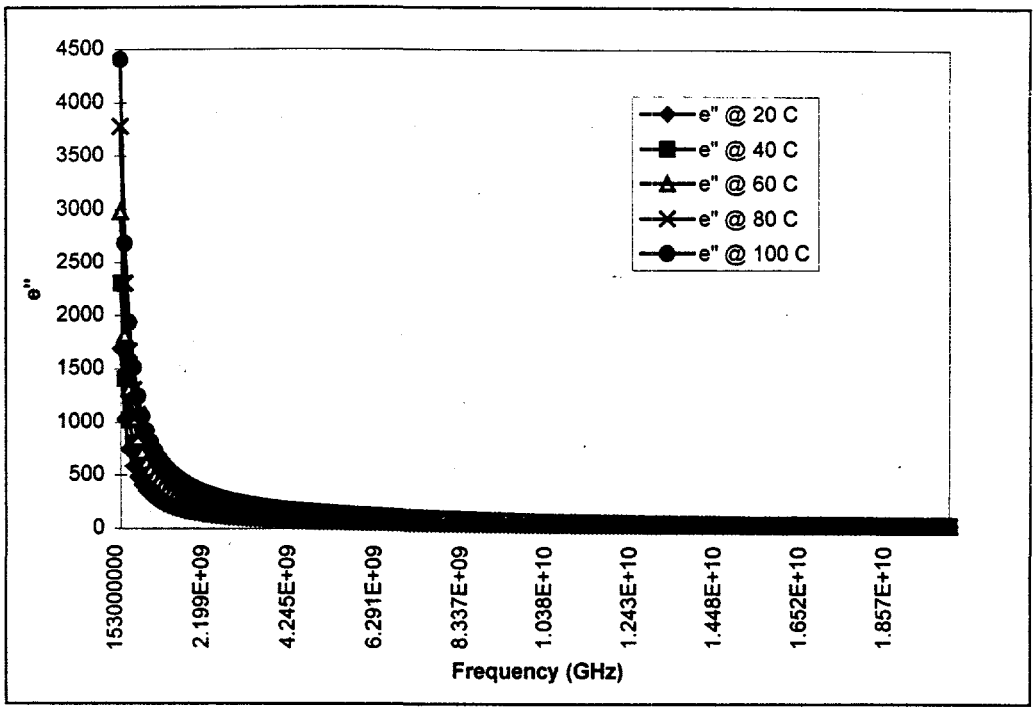

Figure A.3.a. Dielectric loss vs. frequency for the Melton Valley simulant. Full scale.

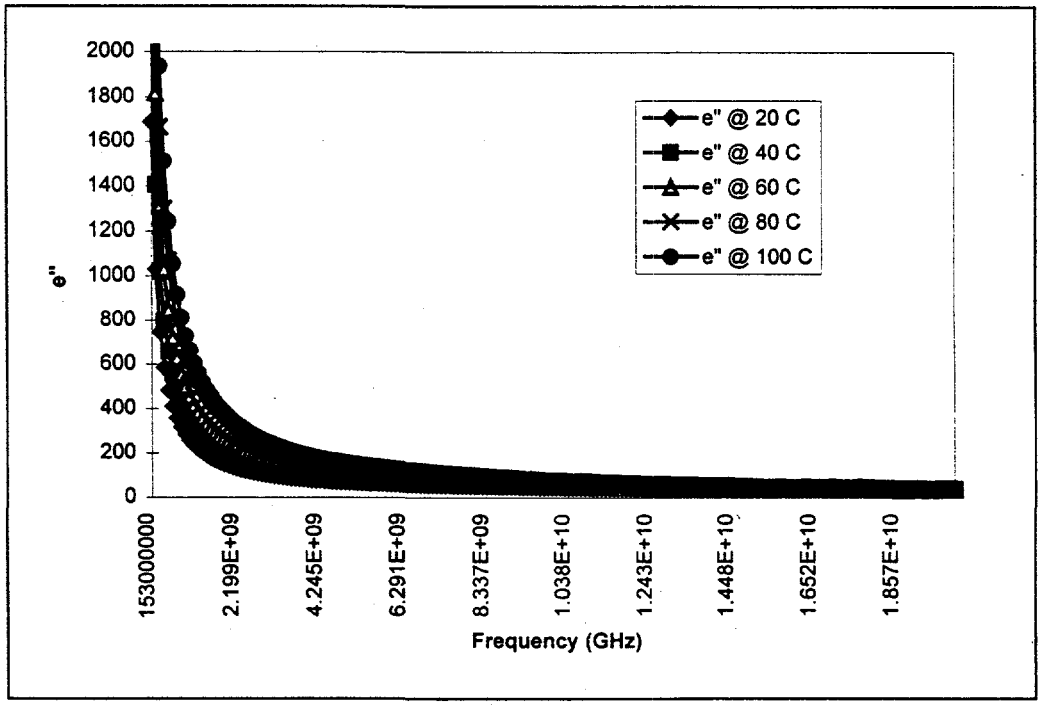

Figure A.3.b. Dielectric loss vs. frequency for the Melton Valley simulant. Scaled down.

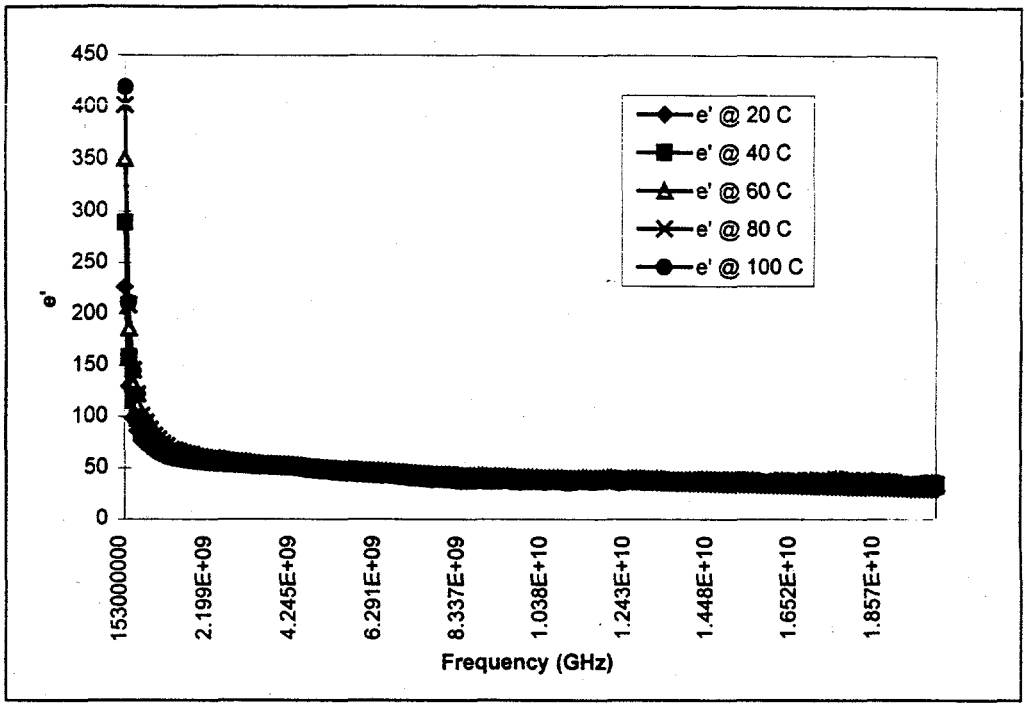

Figure A.3.c. Dielectric constant vs. frequency for the Melton Valley simulant. Full scale.

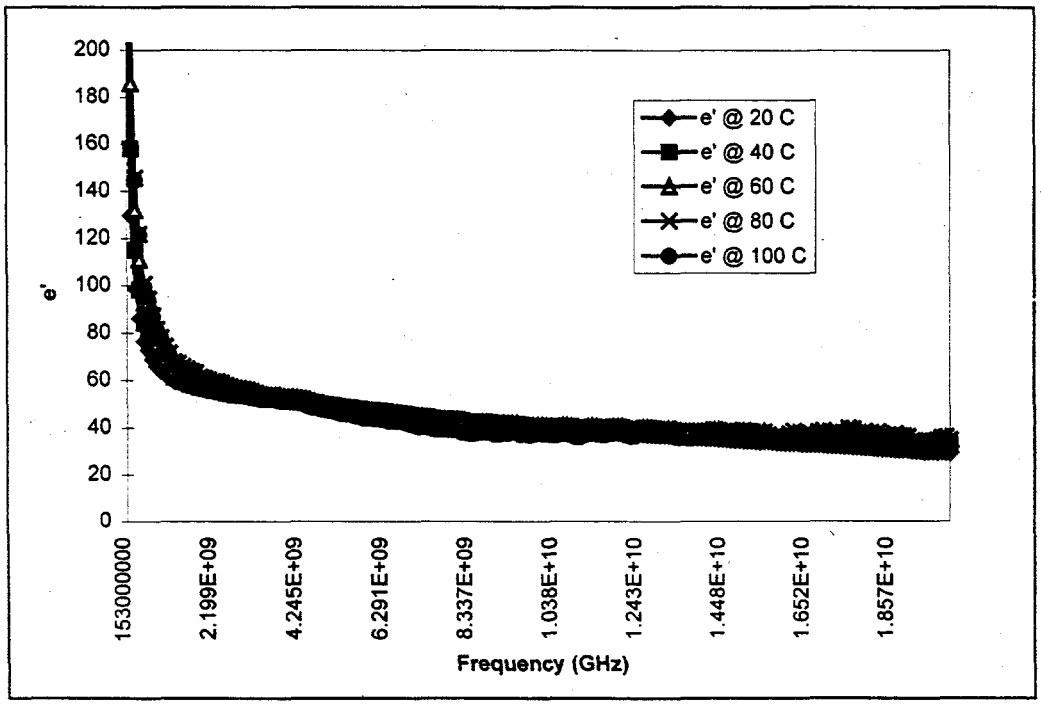

Figure A.3.d. Dielectric constant vs. frequency for the Melton Valley simulant. Scaled down.

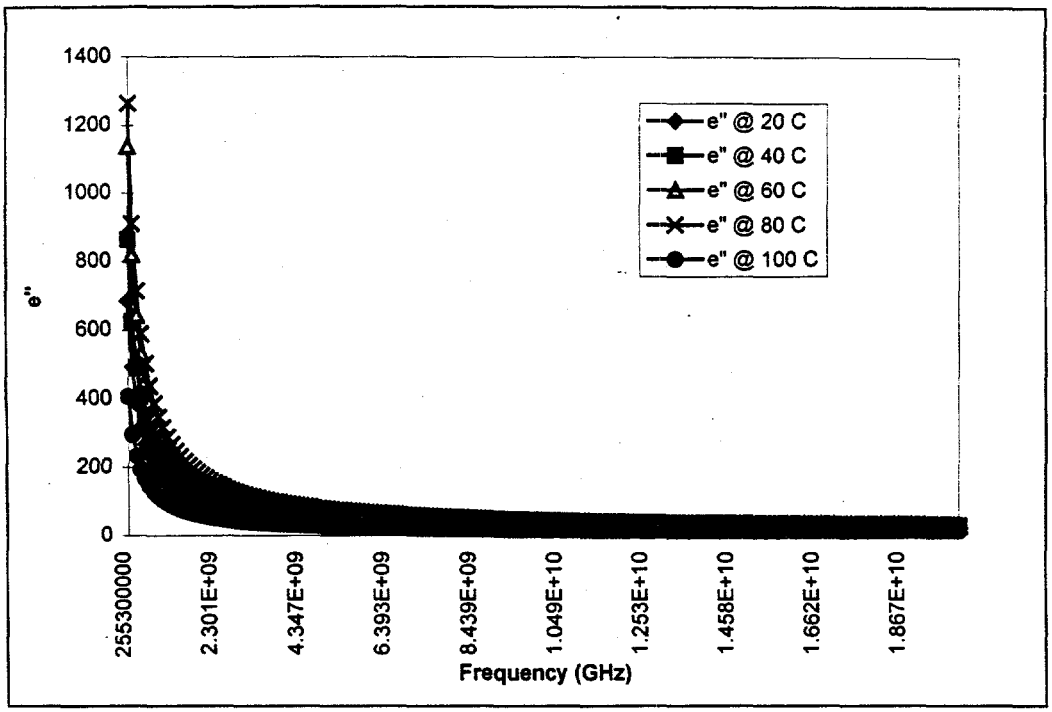

Figure A.4.a. Dielectric loss vs. frequency for the SAIC simulant. Full scale.

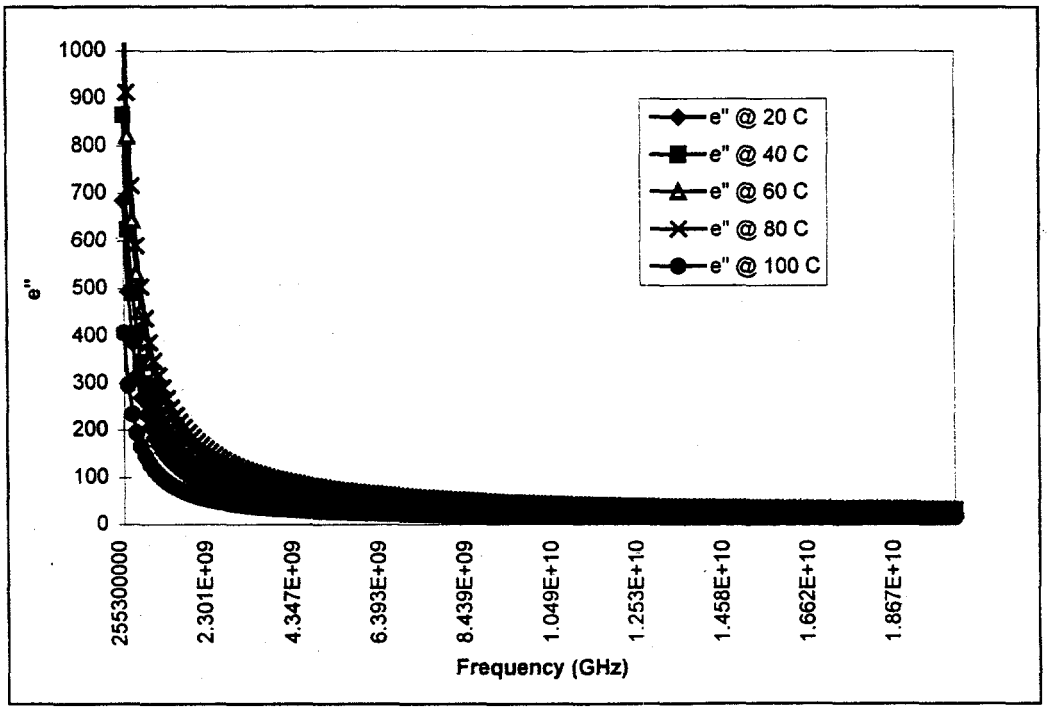

Figure A.4.b. Dielectric loss vs. frequency for the SAIC simulant. Scaled down.

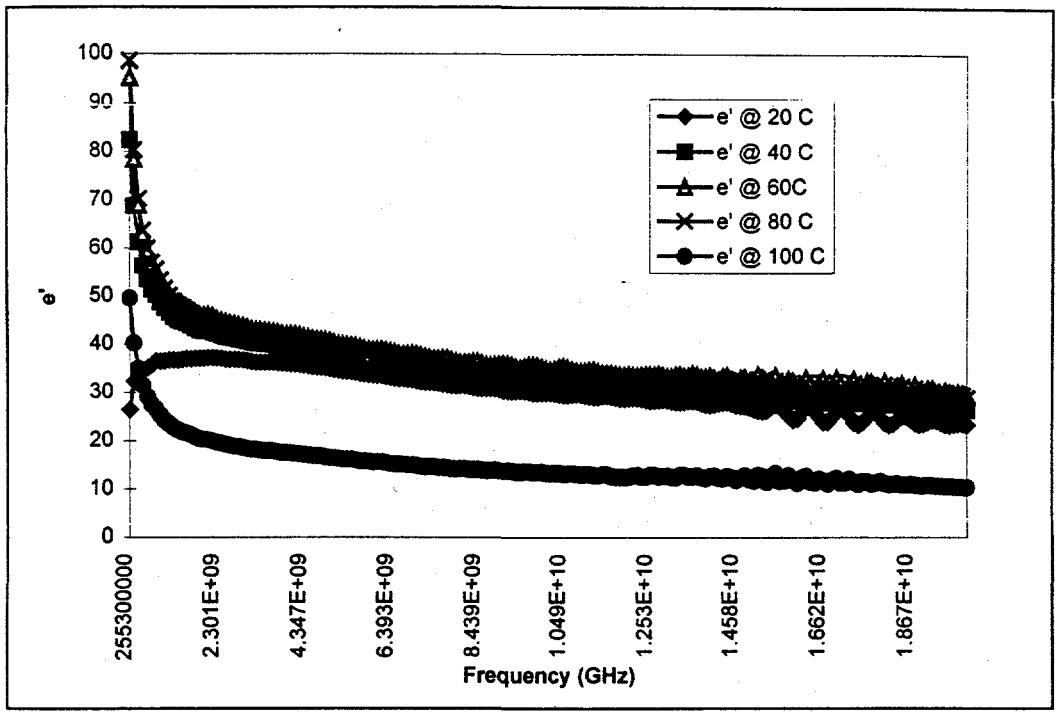

Figure A.4.c. Dielectric constant vs. frequency for the SAIC simulant. Full scale.

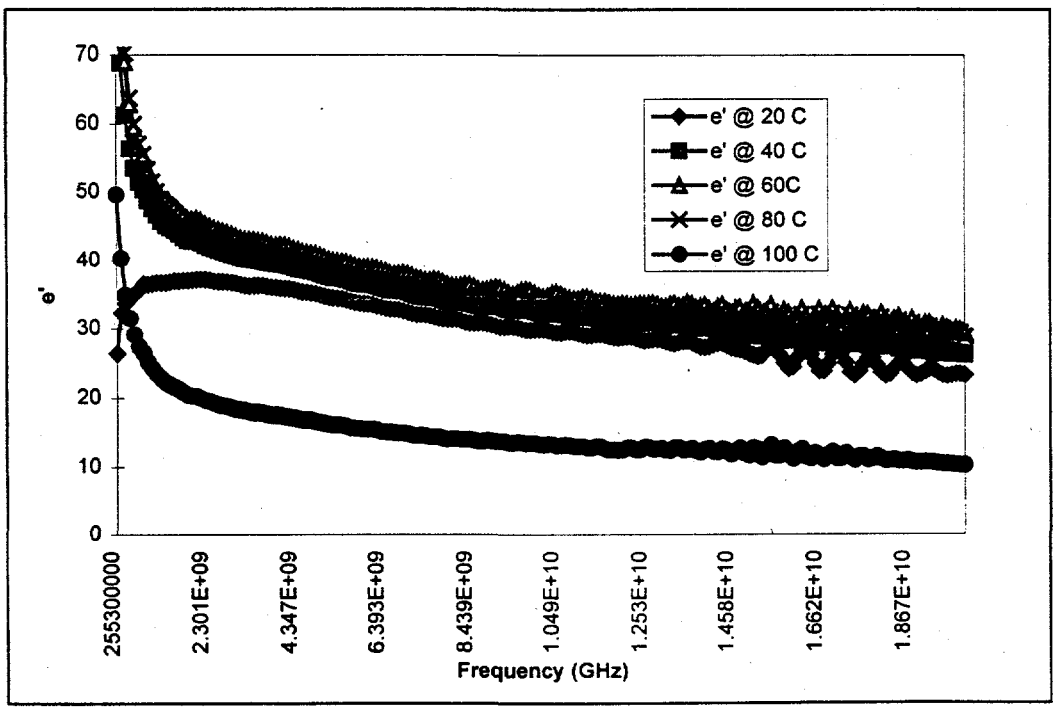

Figure A.4.d. Dielectric constant vs. frequency for the SAIC simulant. Scaled down.

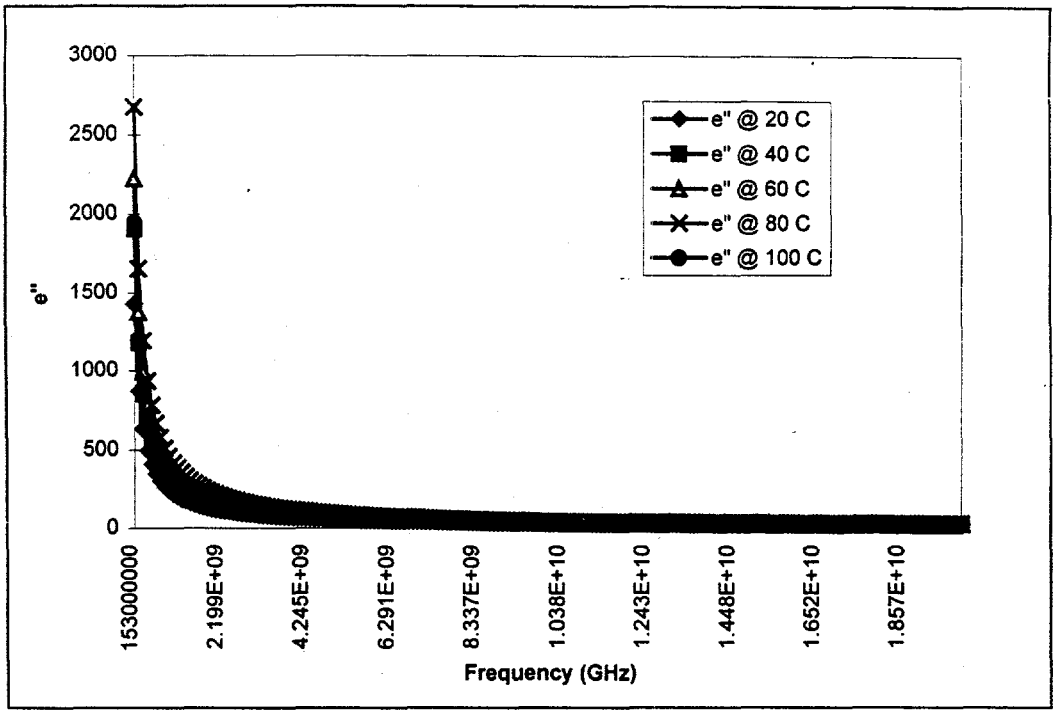

Figure A.5.a. Dielectric loss vs. frequency for the Revised ORNL simulant. Full scale.

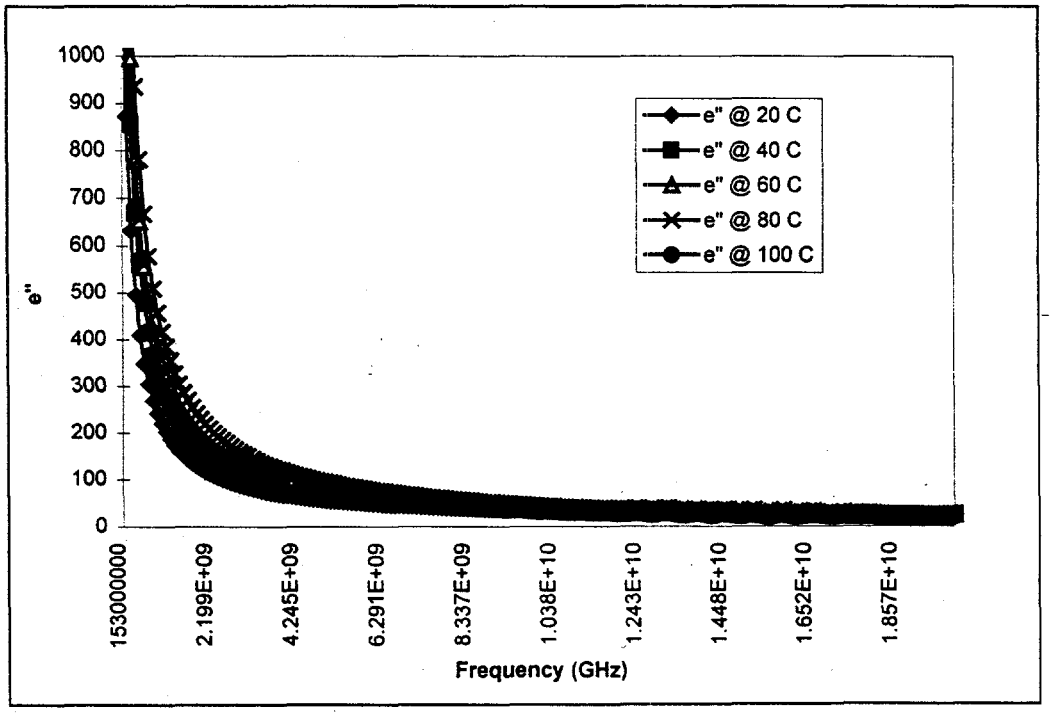

Figure A.5.c. Dielectric loss vs. frequency for the Revised ORNL simulant. Scaled down.

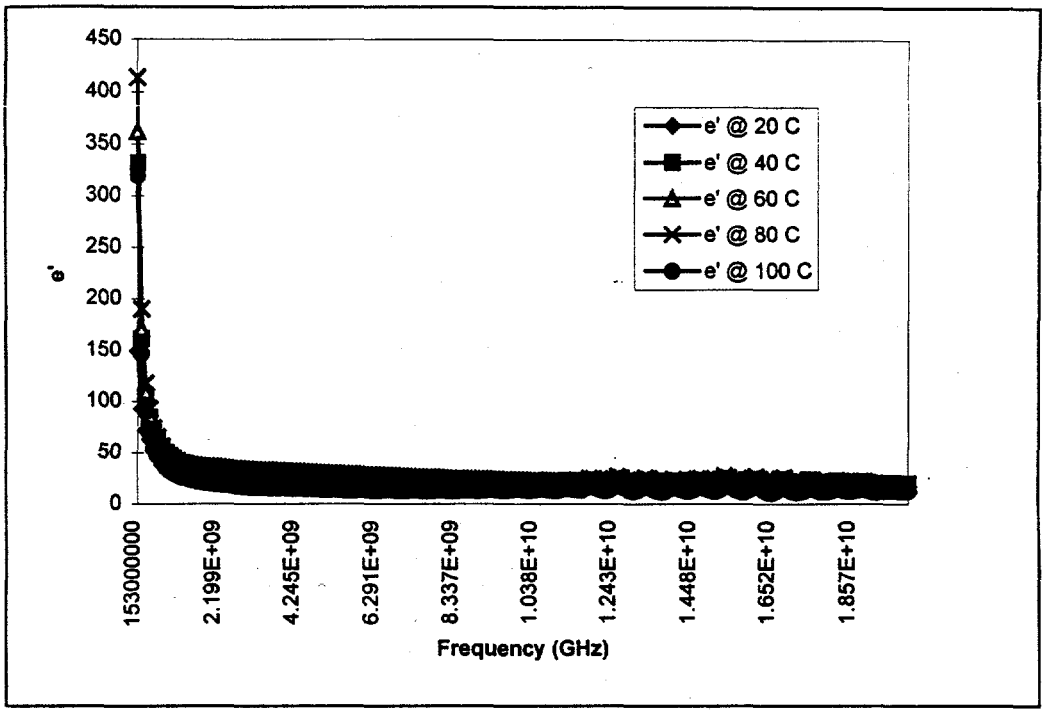

Figure A.5.c. Dielectric constant vs. frequency for the Revised ORNL simulant. Full scale.

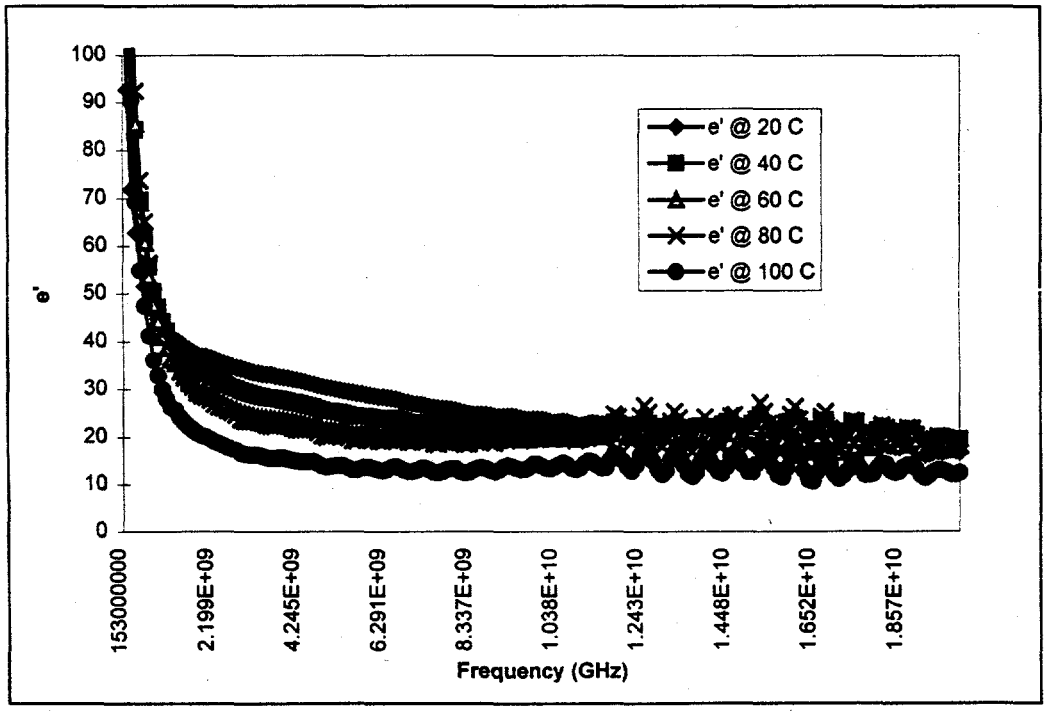

Figure A.5.d. Dielectric constant vs. frequency for the Revised ORNL simulant. Scaled down.

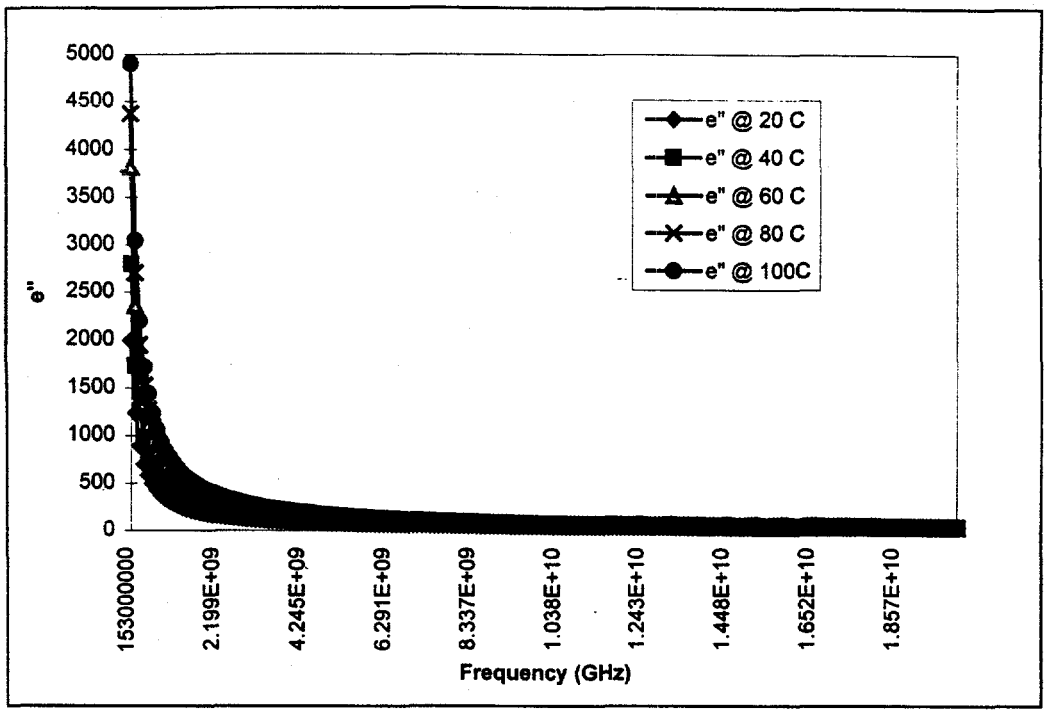

Figure A.6.a. Dielectric loss vs. frequency for the W-26 ORNL simulant. Full scale.

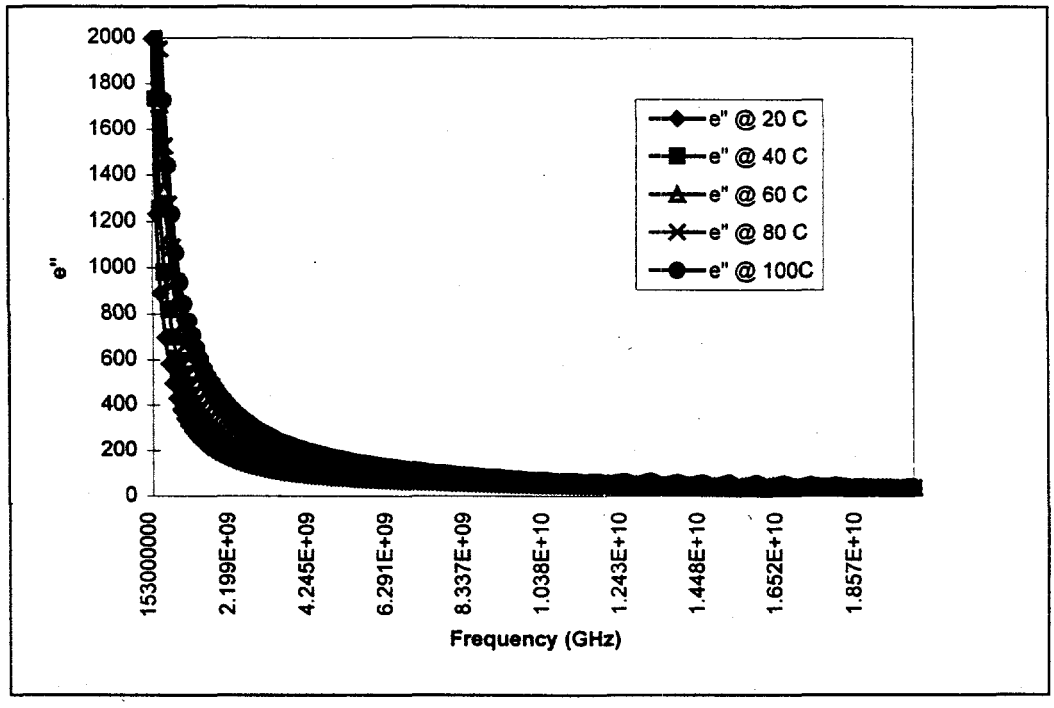

Figure A.6.b. Dielectric loss vs. frequency for the W-26 ORNL simulant. Scaled down.

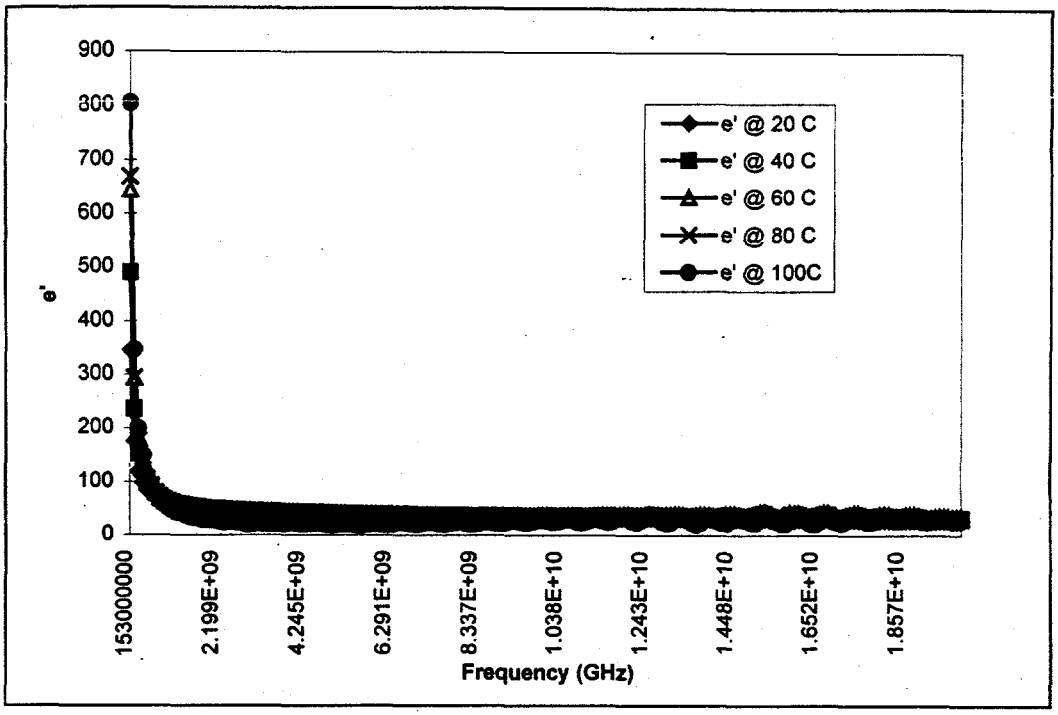

Figure A.6.c. Dielectric constant vs. frequency for the W-26 ORNL simulant. Full scale.

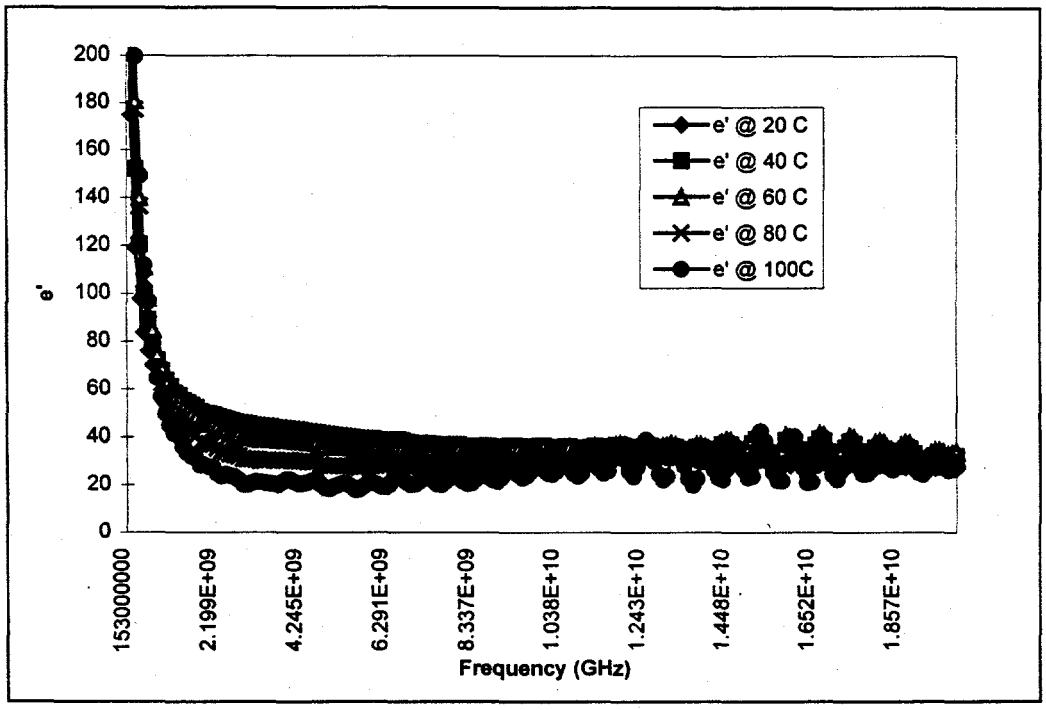

Figure A.6.d. Dielectric constant vs. frequency for the W-26 ORNL simulant. Scaled down.

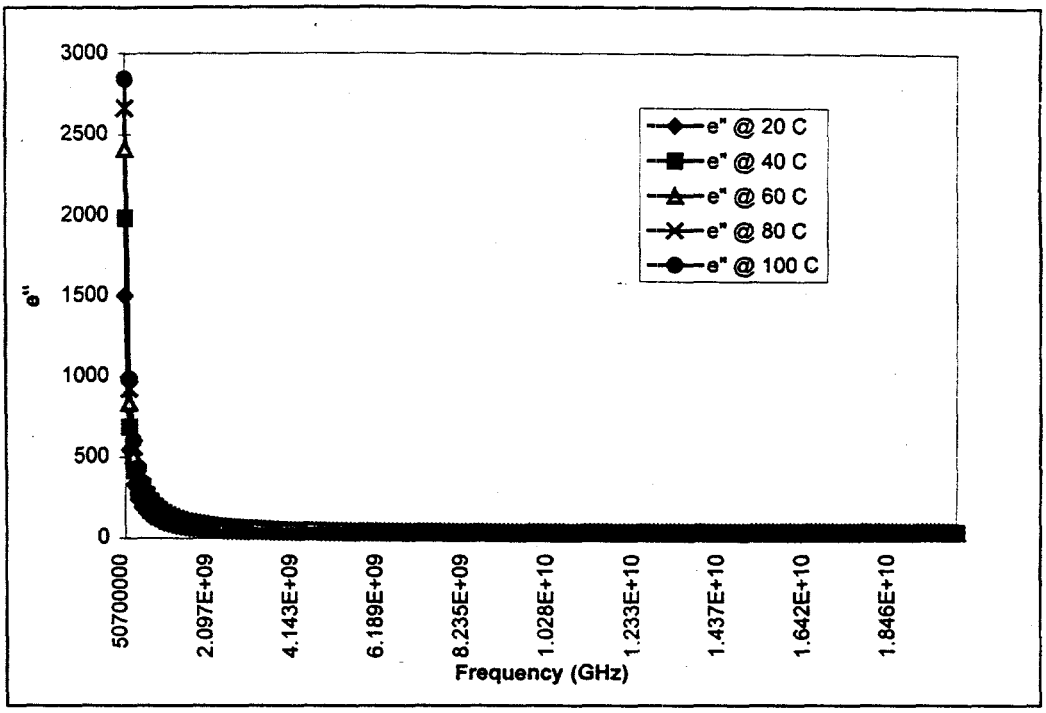

Figure A.7.a. Dielectric loss vs. frequency for the Savannah River simulant. Full scale.

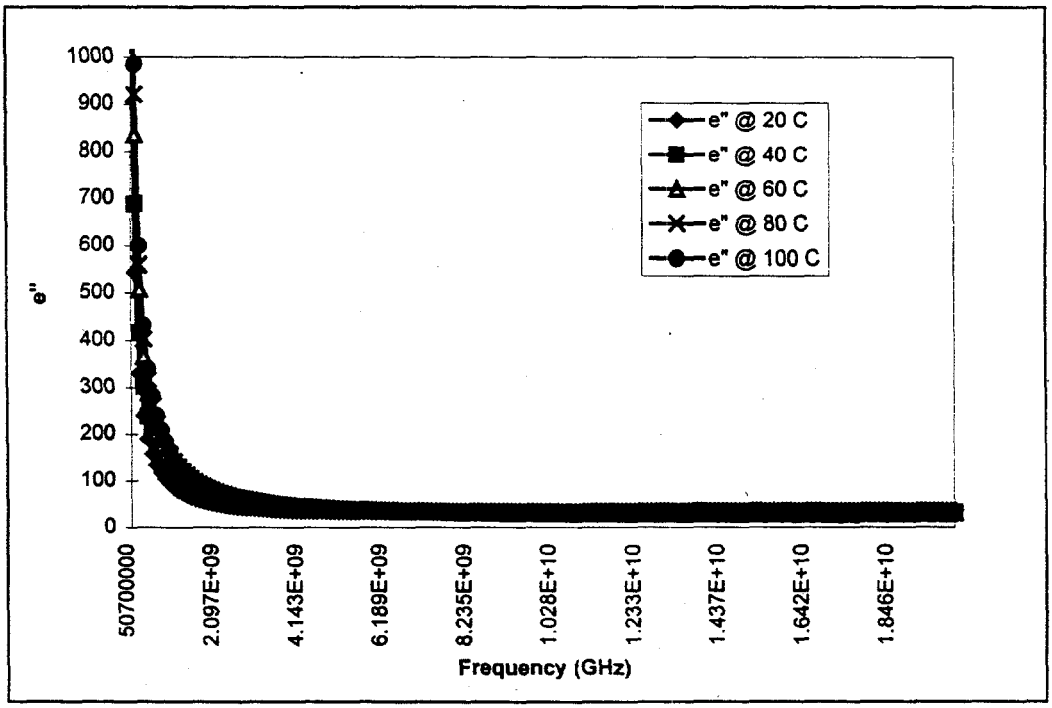

Figure A.7.b. Dielectric loss vs. frequency for the Savannah River simulant. Scaled down.

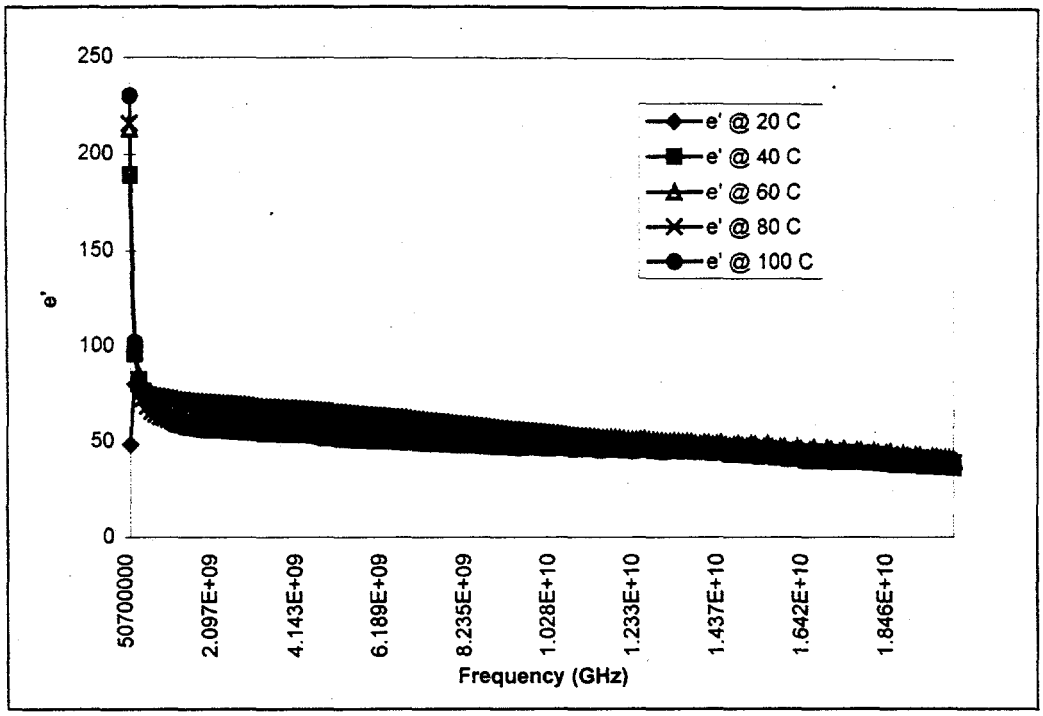

Figure A.7.c. Dielectric constant vs. frequency for the Savannah River simulant. Full scale.

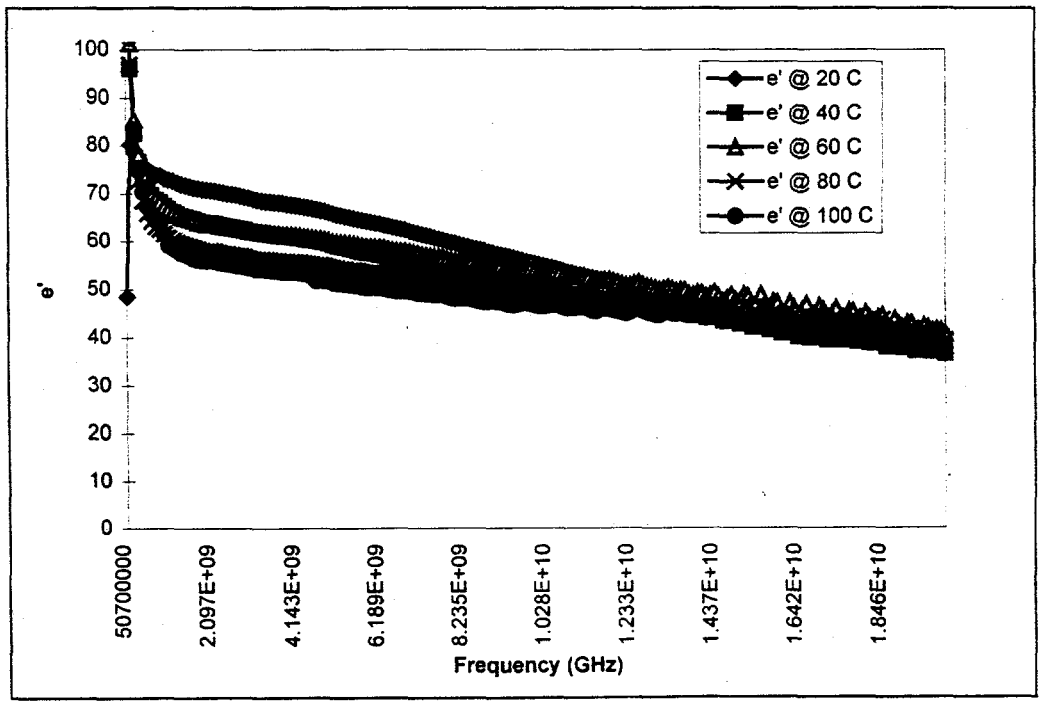

Figure A.7.d. Dielectric loss vs. frequency for the Savannah River simulant. Scaled down.

APPENDIX B

TABULATED RESULTS FOR LOSS TANGENT, DIELECTRIC CONSTANT, AND DIELECTRIC LOSS

Table 1. Dielectric Constant for Hanford 4M Simulant

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.53E+08	198.8575	270.3677	320.7074	402.9337	1419.842
2.55E+08	124.2155	143.5933	169.532	199.6412	689.4328
3.58E+08	96.62798	108.4729	126.3347	144.1173	420.9687
4.6E+08	84.84679	89.60063	103.7154	117.4237	284.8156
5.62E+08	74.46346	78.3095	90.02729	101.6916	212.5836
6.65E+08	69.75643	72.44598	83.36565	96.31848	177.311
7.67E+08	66.18846	68.84869	79.52852	92.30133	155.6548
8.69E+08	62.83495	65.0585	74.8873	85.71706	135.6266
9.71E+08	60.74841	62.70668	72.36627	82.05273	119.3228
1.07E+09	58.79125	59.95642	68.75328	76.44173	110.3758
1.18E+09	56.90724	57.98796	66.27603	74.00732	104.0247
1.28E+09	55.44015	56.26929	64.37692	72.46273	98.84793
1.38E+09	54.30958	55.43801	63.81259	73.10627	93.52054
1.48E+09	53.64628	54.63049	62.84035	72.74561	89.83873
1.59E+09	52.82432	53.76626	61.58675	70.14546	84.77519
1.69E+09	51.87058	53.0258	60.80892	67.85505	80.92936
1.79E+09	51.06159	52.3653	60.16007	66.92807	77.52104
1.89E+09	50.46592	51.39429	58.79424	65.19102	75.82886
1.99E+09	49.91249	50.85893	58.22349	65.3256	74.6111
2.1E+09	49.94468	50.82319	58.56358	66.82742	72.90152
2.2E+09	49.36027	50.16933	57.79177	66.26324	70.72926
2.3E+09	48.8052	50.03126	57.64889	65.47302	68.57728
2.4E+09	48.22308	49.24603	56.41697	62.57125	67.40107
2.51E+09	47.72968	48.59069	55.58798	61.13365	66.41566
2.61E+09	47.25594	47.69174	54.51638	60.37112	65.0521
2.71E+09	46.78081	47.50363	54.53228	61.47765	62.96508
2.81E+09	46.42739	47.4535	54.71778	62.64006	61.75412
2.92E+09	46.01113	47.10456	54.28043	62.17121	61.41821
3.02E+09	45.56462	46.34208	53.15263	60.02769	60.88928
3.12E+09	45.08565	45.96732	52.54845	57.76786	60.36689
3.22E+09	44.74699	45.60358	52.17025	56.84316	59.5021
3.32E+09	44.487	45.07481	51.40706	56.43211	58.37091
3.43E+09	44.27688	44.99108	51.63939	57.7697	57.80877
3.53E+09	44.04945	45.14579	52.13039	59.3356	57.47841
3.63E+09	43.95301	45.07441	52.22615	59.85189	56.81442
3.73E+09	43.61804	44.39832	51.12166	57.69346	56.28413
3.84E+09	43.31669	44.08243	50.57142	55.63667	56.01831
3.94E+09	43.05547	44.04169	50.54599	55.13123	55.75773
4.04E+09	42.79697	43.87368	50.5905	56.11195	55.37571
4.14E+09	42.50431	43.56371	50.30526	56.71352	54.80982
4.25E+09	42.28299	43.48488	50.52445	57.42696	53.87457
4.35E+09	41.97117	43.30425	50.41846	57.71585	52.55518
4.45E+09	41.59363	42.51819	49.20096	55.7971	52.02567

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
4.55E+09	41.29029	41.84721	48.08885	52.89943	51.7472
4.65E+09	41.00919	41.60053	47.83102	51.67468	51.19196
4.76E+09	40.6596	41.03431	46.99119	51.33894	50.23983
4.86E+09	40.39502	40.74681	46.86334	52.65176	49.04396
4.96E+09	40.07684	40.46598	46.73998	52.79685	48.46402
5.06E+09	39.75546	40.14061	46.3516	52.33352	47.78743
5.17E+09	39.44144	39.79174	45.83317	51.42322	47.25031
5.27E+09	39.18802	39.2152	44.94134	49.20433	46.68505
5.37E+09	38.87762	39.06737	44.70551	47.47822	46.15098
5.47E+09	38.6443	38.89102	44.57533	48.07843	45.5793
5.57E+09	38.38517	38.42684	44.05299	48.9435	44.81765
5.68E+09	38.10451	38.36361	44.2689	49.821	43.98962
5.78E+09	37.82517	37.69357	43.33183	47.61455	43.79572
5.88E+09	37.60801	37.71062	43.45015	47.78145	43.7678
5.98E+09	37.36262	37.42076	42.92975	46.61226	43.35502
6.09E+09	37.14096	37.09663	42.49049	44.9968	43.12332
6.19E+09	36.878	36.99787	42.39584	45.02856	42.55522
6.29E+09	36.68849	37.10379	42.84166	48.01135	41.84339
6.39E+09	36.36497	36.67763	42.39812	48.40819	41.14944
6.5E+09	36.16526	36.60127	42.67216	47.9779	40.89782
6.6E+09	35.82384	36.10319	41.9742	46.18852	40.8233
6.7E+09	35.57949	35.88825	41.5929	45.59117	40.51937
6.8E+09	35.28364	35.63172	41.06809	43.68999	40.36209
6.9E+09	35.02745	35.08358	40.25068	42.0903	39.66757
7.01E+09	34.79476	35.01702	40.33293	44.62388	39.06853
7.11E+09	34.57164	34.73974	40.29649	46.57688	38.40481
7.21E+09	34.42282	34.26612	40.00635	45.36502	37.95522
7.31E+09	34.19808	34.05195	39.71072	43.57117	37.61625
7.42E+09	33.92792	33.65367	38.98053	42.26415	37.46543
7.52E+09	33.70417	33.09713	38.04553	40.20439	37.25101
7.62E+09	33.53444	32.94894	37.75976	39.15504	37.1159
7.72E+09	33.27461	33.09606	38.11884	41.29863	36.65917
7.83E+09	33.12408	32.87328	37.99717	43.37428	35.6737
7.93E+09	32.96951	32.66676	38.02405	43.11761	35.34007
8.03E+09	32.79739	32.36681	37.82362	41.08045	34.59292
8.13E+09	32.40897	31.78922	36.67902	38.57102	33.63317
8.23E+09	32.16588	31.50158	36.16847	38.04096	33.40621
8.34E+09	31.85106	31.3188	35.86105	37.03819	33.25521
8.44E+09	31.65863	31.18446	35.7715	37.86529	33.0575
8.54E+09	31.4427	31.52872	36.56093	41.63111	32.9776
8.64E+09	31.31633	31.66019	37.02995	42.66135	32.97222
8.75E+09	31.18795	31.02415	36.22608	39.28166	32.9714
8.85E+09	31.04938	30.70922	35.66964	37.15709	33.11715
8.95E+09	30.8116	30.34145	34.90711	36.34598	33.05216
9.05E+09	30.78406	30.1137	34.63596	36.45005	32.96265

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
9.16E+09	30.6287	30.43621	35.39031	38.45933	32.86163
9.26E+09	30.46262	30.25596	35.33281	40.32688	32.84051
9.36E+09	30.43751	30.70406	36.36074	43.08851	32.84569
9.46E+09	30.26962	30.35319	35.97816	40.12464	33.07134
9.56E+09	30.16984	29.92448	34.98569	36.40663	33.10147
9.67E+09	30.09878	29.90542	34.90665	36.80038	33.06588
9.77E+09	29.86557	29.68317	34.51162	36.94777	33.03234
9.87E+09	29.84163	29.61417	34.80649	38.64902	32.57637
9.97E+09	29.72081	29.88757	35.50703	41.91084	32.91441
1.01E+10	29.57607	29.9979	35.90607	43.81517	33.22629
1.02E+10	29.51581	30.15968	36.19273	42.30949	33.33926
1.03E+10	29.37255	30.09904	35.99199	39.01195	33.32415
1.04E+10	29.26744	29.67555	35.07323	36.98296	33.20805
1.05E+10	29.24758	29.39732	34.77737	37.71555	32.72811
1.06E+10	29.0845	29.1314	34.60799	38.30263	32.72856
1.07E+10	28.8995	28.40333	33.83601	38.74431	32.93132
1.08E+10	28.72487	28.64204	34.27473	40.62776	33.46667
1.09E+10	28.57364	28.93438	34.5508	39.77088	33.65496
1.1E+10	28.45737	29.03385	34.52383	37.07762	33.52757
1.11E+10	28.37685	28.73757	33.97605	35.08922	33.12761
1.12E+10	28.3336	28.30993	33.60487	35.45368	32.85969
1.13E+10	28.24137	27.51639	32.97383	36.25889	32.83421
1.14E+10	28.1183	27.36991	33.31461	38.43703	33.47811
1.15E+10	28.04092	28.25791	34.76497	42.15563	33.95346
1.16E+10	27.92038	29.27576	35.90735	42.84805	34.22153
1.17E+10	27.79314	29.63988	35.99712	39.76398	34.0324
1.18E+10	27.73124	28.88766	34.66973	36.3858	33.37971
1.19E+10	27.63107	27.93919	33.48595	36.03058	32.50202
1.2E+10	27.50941	27.25975	33.2967	37.99913	31.29598
1.21E+10	27.43695	26.68176	33.36755	40.18912	30.02388
1.22E+10	27.30299	27.46484	34.94785	43.88034	30.85183
1.23E+10	27.1675	29.1664	37.00526	45.53902	32.08552
1.24E+10	27.0771	29.08247	36.0588	41.01776	33.42149
1.25E+10	26.99021	27.97669	34.05007	37.28528	33.05217
1.26E+10	26.91808	27.61974	33.81806	38.99109	31.41885
1.27E+10	26.85644	26.9014	33.70015	40.27479	29.90195
1.28E+10	26.81332	26.92404	34.78258	42.79678	29.36127
1.29E+10	26.6867	27.34234	35.70528	44.76396	29.92006
1.3E+10	26.57291	28.1266	36.13083	43.79115	31.35186
1.31E+10	26.35825	27.88753	34.78317	37.53	32.43513
1.32E+10	26.227	26.83203	32.29696	32.3258	32.29325
1.33E+10	26.19038	26.66046	31.68296	32.50265	31.53217
1.35E+10	26.07542	27.11966	32.66876	33.6392	30.71475
1.36E+10	25.96972	27.37159	33.6266	34.51131	30.25471
1.37E+10	25.90757	27.06255	33.63981	36.60953	30.24063

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.38E+10	25.84909	27.01093	33.74406	38.1677	31.0015
1.39E+10	25.79222	26.28413	32.35968	33.39861	31.69377
1.4E+10	25.7171	25.4135	30.6901	30.1229	31.63726
1.41E+10	25.57397	25.03708	29.82939	31.02586	31.28235
1.42E+10	25.46289	25.59722	30.56937	32.10623	30.79626
1.43E+10	25.33585	25.79165	31.0087	29.70589	30.42867
1.44E+10	25.21397	25.00401	29.96355	29.08776	30.05091
1.45E+10	25.2284	24.58234	29.46593	31.03228	30.28772
1.46E+10	25.21272	24.89926	30.00395	29.41471	30.69136
1.47E+10	25.13907	24.68228	29.83961	26.39843	30.99487
1.48E+10	25.02887	24.34063	29.534	29.99693	31.01528
1.49E+10	24.8671	24.74812	30.51158	34.05878	30.53112
1.5E+10	24.66083	25.20084	31.47414	29.06885	30.03004
1.51E+10	24.65609	23.87442	29.20796	27.28742	30.14681
1.52E+10	24.53987	23.99361	29.49286	32.24066	30.18461
1.53E+10	24.56818	23.93289	29.54149	27.75925	30.10143
1.54E+10	24.55823	23.88037	29.26193	23.54979	30.83383
1.55E+10	24.46075	23.16313	28.55451	29.235	31.29898
1.56E+10	24.22603	24.05307	29.99687	32.91968	30.05651
1.57E+10	24.02671	25.00525	31.24432	25.71477	29.35307
1.58E+10	24.02529	24.01441	29.85323	29.37451	29.91064
1.59E+10	23.9706	23.84344	29.76966	34.68655	29.8928
1.6E+10	23.88519	23.53713	29.61235	27.91455	29.76804
1.61E+10	23.82774	22.66222	28.30711	24.57649	31.09462
1.62E+10	23.70664	22.86397	28.32196	30.39048	31.3334
1.63E+10	23.46761	23.68876	29.31829	31.66887	30.22029
1.64E+10	23.47171	24.00232	29.59608	28.53707	29.5609
1.65E+10	23.41523	22.96963	28.01641	29.394	29.2733
1.66E+10	23.20905	21.88462	26.88989	30.6161	28.85421
1.67E+10	23.19566	21.89851	27.19591	29.28084	28.86557
1.68E+10	23.14145	22.70787	28.48376	29.17102	30.48058
1.69E+10	22.91899	23.5228	29.62761	31.23354	31.31281
1.7E+10	22.74058	23.01668	28.60571	31.17484	30.34324
1.71E+10	22.74065	22.17755	26.89035	27.25094	29.04355
1.72E+10	22.61404	21.7582	25.95822	24.44851	28.75338
1.73E+10	22.43703	21.1112	25.20646	25.17339	28.78668
1.74E+10	22.45845	21.04465	25.81281	28.4693	29.0507
1.75E+10	22.21217	22.04197	27.76968	28.92869	29.99308
1.76E+10	21.94574	22.52964	28.60133	28.76964	30.90991
1.77E+10	21.96113	21.50469	26.66933	27.51845	30.9201
1.79E+10	21.88148	20.71877	24.81679	23.00853	30.19295
1.8E+10	21.81803	20.825	24.42291	21.25157	29.83763
1.81E+10	21.71902	20.81983	24.82709	23.24469	29.69542
1.82E+10	21.64358	20.17762	24.94521	24.04841	29.68114
1.83E+10	21.55122	20.91646	26.51788	26.78515	29.58273

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.84E+10	21.40615	22.07432	28.39296	30.62028	30.12158
1.85E+10	21.27543	21.22831	27.13465	25.49066	30.52754
1.86E+10	21.28434	20.32472	25.45423	22.49949	30.53778
1.87E+10	21.14532	20.50149	25.37754	25.12964	30.14198
1.88E+10	21.07693	20.12526	25.06871	23.34292	30.0038
1.89E+10	21.04613	19.9173	25.19385	21.07464	29.59412
1.9E+10	20.80926	20.44313	26.15904	26.48664	28.97916
1.91E+10	20.77293	21.65063	27.88701	28.73562	28.75488
1.92E+10	20.76318	21.63373	28.35555	23.84855	29.33268
1.93E+10	20.6053	20.78344	27.09321	25.07382	29.81161
1.94E+10	20.49016	20.35521	26.39776	27.31464	29.943
1.95E+10	20.38669	21.2264	27.90021	26.87749	29.73552
1.96E+10	20.26377	20.54382	27.05007	25.02233	29.19837
1.97E+10	20.15467	20.42197	26.92744	27.78322	28.21305
1.98E+10	20.16713	20.60361	27.18537	25.42896	27.95032
1.99E+10	20.1204	20.61412	27.1963	21.90008	28.598
2E+10	20.05618	20.06602	26.54198	25.62997	29.70891

Table 2. Dielectric Loss for Hanford 4M Simulant

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.53E+08	2200.789	3268.7825	4347.7021	5769.373	6134.7219
2.55E+08	1338.945	1984.7412	2642.1542	3501.3281	3903.3275
3.58E+08	968.1721	1428.3204	1899.4608	2512.1689	2866.0409
4.6E+08	758.7456	1115.0812	1481.9623	1959.2966	2259.7699
5.62E+08	626.0177	916.77975	1218.2583	1609.9412	1861.1148
6.65E+08	533.0594	779.58932	1035.6961	1368.1258	1587.8288
7.67E+08	464.0386	677.86079	900.17872	1187.9548	1383.9451
8.69E+08	411.2912	599.46712	795.71548	1047.8946	1230.9437
9.71E+08	369.6174	537.77023	713.90774	939.43329	1109.6742
1.07E+09	335.9699	488.31603	648.21713	852.56419	1011.4885
1.18E+09	308.3073	447.09469	593.22265	780.25613	926.41758
1.28E+09	284.6326	412.93727	547.81876	720.76873	853.40203
1.38E+09	264.5612	383.04062	507.8212	667.28327	790.4849
1.48E+09	247.0863	357.52527	473.84568	622.36112	739.66621
1.59E+09	232.299	335.4922	444.46486	583.19031	693.75967
1.69E+09	219.0981	315.52058	417.98543	548.23136	654.16585
1.79E+09	207.5023	298.58209	395.45388	518.96779	616.94658
1.89E+09	196.93	283.67668	375.83509	494.39344	584.2139
1.99E+09	187.4545	269.89388	357.35771	470.77226	553.21833
2.1E+09	178.9404	257.42057	340.51044	448.32617	526.50103
2.2E+09	171.7897	246.43284	325.72345	428.21083	502.816
2.3E+09	164.9842	236.2509	312.43475	410.70882	482.96676
2.4E+09	158.7156	227.35163	300.65653	395.15561	463.72484
2.51E+09	153.0134	218.74061	288.87831	379.41472	445.17576
2.61E+09	147.3466	210.61929	278.40168	366.06801	427.23106
2.71E+09	142.4692	203.37873	268.59973	353.70439	410.63868
2.81E+09	137.9729	196.82528	259.77366	341.72356	395.81582
2.92E+09	133.7611	190.76408	251.74575	330.2709	382.40956
3.02E+09	129.8738	184.75561	243.54249	318.78784	371.08276
3.12E+09	126.1428	179.17938	236.09582	308.89786	360.26288
3.22E+09	122.6086	174.14514	229.5567	300.42455	349.72501
3.32E+09	119.2571	169.21893	222.86713	291.44463	339.10601
3.43E+09	116.2055	164.58341	216.55751	283.5669	329.04068
3.53E+09	113.2752	160.30334	210.69562	275.45299	319.8655
3.63E+09	110.6379	156.70177	205.9111	268.32699	311.61519
3.73E+09	108.2746	153.09411	200.93996	261.28538	304.33132
3.84E+09	105.9452	149.43858	195.99894	254.77075	297.50575
3.94E+09	103.7527	146.17892	191.63928	249.21985	290.308
4.04E+09	101.6839	143.24013	187.81104	244.69862	283.1123
4.14E+09	99.74407	140.43552	184.06087	240.02645	277.22406
4.25E+09	97.8327	137.6272	180.04367	234.56041	271.63487
4.35E+09	96.10919	135.21454	176.82688	229.51929	265.78611

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
4.45E+09	94.46069	132.52018	173.0145	223.78068	260.65464
4.55E+09	92.86357	130.01458	169.64829	219.48044	255.70497
4.65E+09	91.31409	127.57177	166.47942	215.48578	250.71146
4.76E+09	89.77734	125.76915	164.15155	212.55294	245.4812
4.86E+09	88.40364	123.60257	161.25401	209.02557	240.70147
4.96E+09	86.95132	121.7744	158.68029	205.50555	236.70819
5.06E+09	85.64498	119.74174	155.73251	200.78432	232.65987
5.17E+09	84.42311	117.55277	152.7119	196.25702	228.93893
5.27E+09	83.13161	115.65958	150.09184	192.87226	225.10055
5.37E+09	82.02913	113.96986	147.94198	190.57477	221.15616
5.47E+09	80.85709	112.5106	146.14601	188.27778	217.30031
5.57E+09	79.71158	110.9014	143.91684	185.4173	213.69496
5.68E+09	78.73079	109.31325	141.64324	182.53196	210.20214
5.78E+09	77.60667	107.51942	138.98406	177.99268	207.32152
5.88E+09	76.64987	105.77174	136.52166	174.22827	204.34926
5.98E+09	75.71374	104.39778	134.60944	172.17476	201.03286
6.09E+09	74.82026	103.18464	133.08383	170.82613	197.73994
6.19E+09	73.93003	101.9992	131.72219	169.1916	194.92025
6.29E+09	73.09841	100.90174	130.25008	167.46632	191.98048
6.39E+09	72.2582	99.60389	128.30271	164.897	189.13839
6.5E+09	71.44397	98.124531	126.04394	161.34423	186.41485
6.6E+09	70.64588	96.911776	124.42125	158.50297	183.73056
6.7E+09	69.90596	95.652123	122.74359	156.68842	180.74272
6.8E+09	69.18135	94.872506	121.75996	156.70596	178.30878
6.9E+09	68.3735	94.033143	120.70116	155.48678	175.76911
7.01E+09	67.64443	92.908882	119.12346	153.42256	173.55139
7.11E+09	66.91019	91.65595	117.17295	150.83839	170.92919
7.21E+09	66.20231	90.369184	115.30199	148.37636	169.04443
7.31E+09	65.51994	89.251807	113.78313	145.68211	167.08127
7.42E+09	64.8823	88.463776	112.71268	144.44796	164.70467
7.52E+09	64.24672	87.688744	111.79376	144.36296	162.50837
7.62E+09	63.60482	86.95275	110.85153	143.6758	160.81416
7.72E+09	63.055	86.114971	109.72841	141.94765	159.47205
7.83E+09	62.53334	85.173927	108.35319	140.15971	157.79331
7.93E+09	61.95871	83.953278	106.57031	137.75985	156.2645
8.03E+09	61.47818	82.934566	105.14274	135.23916	154.63052
8.13E+09	60.93479	82.25927	104.23268	133.59308	152.41013
8.23E+09	60.43519	81.205792	102.74749	132.56243	149.74827
8.34E+09	59.90117	80.653289	102.07593	132.97168	147.56177
8.44E+09	59.2895	79.800147	100.91772	130.95329	145.79759
8.54E+09	58.69689	78.804316	99.421159	128.2828	144.26041
8.64E+09	58.06603	78.344239	98.767567	127.74378	142.28363
8.75E+09	57.52925	77.362239	97.394418	125.25627	140.56141
8.85E+09	57.04209	76.542719	96.284315	122.99583	138.8702
8.95E+09	56.48915	76.06457	95.559829	122.67653	137.26555

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
9.05E+09	55.99473	75.453686	94.617721	122.77177	135.59574
9.16E+09	55.65816	75.150899	94.25969	122.56495	134.02367
9.26E+09	55.00332	74.222051	92.759792	119.24268	132.37723
9.36E+09	54.68663	73.415176	91.63367	117.49248	131.28013
9.46E+09	54.31722	72.913217	91.231053	117.17358	129.68909
9.56E+09	53.86524	71.795109	89.663098	113.90159	128.23555
9.67E+09	53.4677	70.955994	88.434363	112.35941	126.78761
9.77E+09	53.03248	71.390162	88.949887	114.7615	125.52715
9.87E+09	52.68567	70.624223	87.662323	113.46833	124.1396
9.97E+09	52.25604	70.478992	87.353176	112.12635	122.8635
1.01E+10	51.8895	69.832148	86.628175	110.56902	121.6141
1.02E+10	51.55051	68.476161	84.871979	108.14284	120.10138
1.03E+10	51.27473	67.791171	84.166446	106.6837	119.02266
1.04E+10	50.93593	67.161678	83.300371	105.04993	118.03095
1.05E+10	50.63555	66.932615	82.836661	105.79628	117.31016
1.06E+10	50.32608	67.507619	83.637712	108.44228	116.16754
1.07E+10	50.03003	66.996525	82.79663	106.52861	115.09417
1.08E+10	49.73397	65.991624	81.358123	103.39405	113.94623
1.09E+10	49.35221	65.101226	80.265842	101.30735	112.87337
1.1E+10	49.05093	64.418894	79.445209	99.824991	111.60467
1.11E+10	48.75962	63.961494	78.949629	99.124837	110.7387
1.12E+10	48.46002	63.924693	78.897111	100.47488	110.24597
1.13E+10	48.13601	64.108517	78.985536	102.49362	110.09659
1.14E+10	47.85939	63.727969	78.375649	102.0062	109.78496
1.15E+10	47.60625	63.165572	77.436431	99.42727	109.84463
1.16E+10	47.31791	63.015102	77.324514	98.099504	108.28335
1.17E+10	47.06634	62.995898	77.480923	97.504167	106.6797
1.18E+10	46.87254	62.403995	76.706452	96.023734	105.40622
1.19E+10	46.64065	61.349839	75.312659	95.103033	105.31228
1.2E+10	46.40921	61.051402	74.744167	96.574618	105.9924
1.21E+10	46.10506	60.543216	74.095914	97.320044	106.20147
1.22E+10	45.87448	60.204124	73.667904	96.667586	105.45088
1.23E+10	45.57329	60.968079	74.578132	96.812934	104.16941
1.24E+10	45.31693	61.989996	76.164841	97.542598	102.65504
1.25E+10	45.07617	60.899881	74.56561	94.375121	101.04619
1.26E+10	44.95899	59.704517	73.022616	93.908875	99.827146
1.27E+10	44.73693	58.450459	71.590498	95.307611	98.773142
1.28E+10	44.60396	57.980175	71.443755	96.925243	98.848791
1.29E+10	44.42547	58.178672	71.843791	97.429984	98.64983
1.3E+10	44.23278	58.873583	72.590553	96.567976	98.844613
1.31E+10	43.94469	60.298098	74.256461	96.404499	98.227165
1.32E+10	43.64179	59.628652	73.153378	92.971755	96.922518
1.33E+10	43.46359	57.699822	70.74896	91.701848	95.156884
1.35E+10	43.3195	56.933769	70.486169	95.185488	94.02
1.36E+10	43.1497	56.894515	71.153084	97.205152	93.807427

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.37E+10	42.95113	57.091367	71.637091	96.460368	94.264778
1.38E+10	42.73836	57.742908	71.963581	96.244094	94.557523
1.39E+10	42.52115	57.69615	70.963769	91.918895	94.135039
1.4E+10	42.33061	57.062728	69.149339	86.20893	93.129511
1.41E+10	42.17772	55.711779	66.933101	83.871802	91.614819
1.42E+10	42.03293	55.015851	66.293143	87.021059	90.453934
1.43E+10	41.94	55.724069	68.09407	89.422633	90.239523
1.44E+10	41.82898	56.050446	68.942542	87.076936	90.719857
1.45E+10	41.65597	55.176196	67.387658	85.736738	90.97371
1.46E+10	41.48324	54.773679	66.147735	85.232583	90.259986
1.47E+10	41.28264	54.775024	65.621708	80.925501	88.881897
1.48E+10	41.10235	54.006603	64.435514	79.444786	87.528441
1.49E+10	40.94681	53.844745	64.767343	88.195958	86.564868
1.5E+10	40.82747	55.450186	67.97508	94.590822	86.05996
1.51E+10	40.59637	56.084599	69.537557	87.408343	86.245773
1.52E+10	40.60871	55.748896	68.458437	87.822782	86.744434
1.53E+10	40.49654	55.045589	66.407382	88.813051	86.220328
1.54E+10	40.25779	54.782479	65.59935	80.21472	84.892485
1.55E+10	40.17263	53.536926	63.839333	76.929543	83.866012
1.56E+10	40.07892	52.261239	62.601913	88.163996	83.078383
1.57E+10	39.77517	53.096037	64.77023	90.519929	82.221841
1.58E+10	39.61918	54.337656	66.675339	82.85033	82.443675
1.59E+10	39.50481	54.088098	66.019158	84.272746	83.667682
1.6E+10	39.42737	53.041251	63.79366	83.035227	82.786152
1.61E+10	39.39238	52.107903	62.173252	73.663766	81.446369
1.62E+10	39.31226	50.082485	59.166089	70.185073	80.986964
1.63E+10	39.14258	49.465701	58.679908	76.929608	80.369501
1.64E+10	38.97802	50.508831	60.718973	79.546389	79.22371
1.65E+10	38.96848	51.740507	62.767575	78.692397	79.643524
1.66E+10	38.82551	52.319562	63.475975	80.41617	80.703277
1.67E+10	38.61811	50.326781	60.38071	76.178991	80.200688
1.68E+10	38.61887	49.263455	58.393221	71.86971	78.834719
1.69E+10	38.62111	49.412274	58.273036	71.932422	78.079365
1.7E+10	38.41737	49.808795	58.975817	75.944425	77.19531
1.71E+10	38.28069	49.571735	59.03847	78.786854	75.866126
1.72E+10	38.29223	49.664953	59.34156	77.138155	75.318542
1.73E+10	38.16235	50.190584	59.817525	74.484851	75.764146
1.74E+10	38.06297	48.845981	57.664982	72.770921	76.582055
1.75E+10	38.06664	48.054273	56.531162	72.67491	76.516701
1.76E+10	37.7665	48.26165	56.854386	71.695366	76.085471
1.77E+10	37.44212	48.576211	57.222166	73.629597	75.086009
1.79E+10	37.41718	48.008067	56.390085	75.089806	73.809666
1.8E+10	37.35015	47.631547	55.539636	70.45221	73.144297
1.81E+10	37.21413	48.866173	56.831264	69.221213	73.550212
1.82E+10	37.20911	48.72832	56.806597	71.017581	74.485145

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.83E+10	37.16039	47.725856	55.787148	72.537009	74.742207
1.84E+10	36.92305	47.821096	55.864349	73.944486	74.286507
1.85E+10	36.68188	48.942379	57.515972	77.386512	73.48084
1.86E+10	36.64845	47.704049	55.179518	73.060187	72.535838
1.87E+10	36.46677	48.614654	55.786378	73.051393	71.526826
1.88E+10	36.41156	48.530077	55.49623	69.2329	71.576704
1.89E+10	36.46557	47.735264	54.892884	65.128756	72.497731
1.9E+10	36.41548	46.774922	54.24743	68.765839	73.16245
1.91E+10	36.25736	46.489127	54.151187	76.198223	72.84257
1.92E+10	36.08991	47.374606	55.175903	73.987537	72.160568
1.93E+10	35.9057	47.061992	54.553516	70.044789	71.24224
1.94E+10	35.75581	46.308225	53.08213	70.627912	70.323744
1.95E+10	35.68829	46.874994	53.498495	70.147279	69.939638
1.96E+10	35.65604	46.455184	53.459922	62.308423	70.235851
1.97E+10	35.58794	45.944813	53.174287	64.485086	71.114607
1.98E+10	35.51936	45.397879	52.727301	71.59444	70.770369
1.99E+10	35.44807	45.229972	52.495654	68.052792	69.867054
2E+10	35.30132	44.60667	51.436542	61.704081	69.515849

Table 3. Tangent for Hanford 4M Simulant

Frequency	e"/e' 20 C	e"/e' 40 C	e"/e' 60 C	e"/e' 80 C	e"/e' 100 C
1.53E+08	11.06716	12.09014	13.5566	14.31842	4.320706
2.55E+08	10.77921	13.82197	15.58499	17.53811	5.66165
3.58E+08	10.01958	13.16753	15.03515	17.43142	6.808205
4.6E+08	8.942538	12.44502	14.28874	16.6857	7.934151
5.62E+08	8.407046	11.70713	13.5321	15.83161	8.754745
6.65E+08	7.641725	10.76097	12.42354	14.20419	8.95505
7.67E+08	7.010869	9.84566	11.31894	12.8704	8.891119
8.69E+08	6.54558	9.214278	10.62551	12.22504	9.075975
9.71E+08	6.084396	8.575964	9.8652	11.44914	9.299764
1.07E+09	5.714624	8.144516	9.428163	11.15312	9.164041
1.18E+09	5.417717	7.710129	8.950787	10.54296	8.905744
1.28E+09	5.134052	7.338591	8.509553	9.946751	8.633484
1.38E+09	4.871353	6.90935	7.95801	9.127579	8.452528
1.48E+09	4.605842	6.544428	7.540468	8.555308	8.233266
1.59E+09	4.397576	6.239828	7.216891	8.314013	8.183523
1.69E+09	4.223937	5.950322	6.873752	8.079448	8.083171
1.79E+09	4.063765	5.701907	6.573362	7.754113	7.95844
1.89E+09	3.902237	5.519615	6.39238	7.583766	7.704375
1.99E+09	3.755663	5.306716	6.13769	7.206551	7.414693
2.1E+09	3.582772	5.065022	5.814372	6.708716	7.222086
2.2E+09	3.480324	4.912022	5.636157	6.462268	7.109024
2.3E+09	3.380462	4.722066	5.419614	6.272947	7.042664
2.4E+09	3.291279	4.616648	5.329186	6.315291	6.880082
2.51E+09	3.205833	4.501698	5.196777	6.206316	6.702874
2.61E+09	3.118054	4.416263	5.106753	6.063628	6.567522
2.71E+09	3.045463	4.281331	4.925518	5.753382	6.521689
2.81E+09	2.9718	4.147751	4.747519	5.455351	6.409545
2.92E+09	2.907147	4.049801	4.637874	5.31228	6.226322
3.02E+09	2.850321	3.986779	4.581946	5.31068	6.094385
3.12E+09	2.79785	3.897973	4.492917	5.347227	5.967889
3.22E+09	2.740041	3.818672	4.400145	5.285148	5.877524
3.32E+09	2.680717	3.754179	4.335341	5.164518	5.809503
3.43E+09	2.624519	3.658134	4.19365	4.908575	5.691882
3.53E+09	2.571545	3.550793	4.041704	4.642289	5.564968
3.63E+09	2.517185	3.476513	3.942682	4.483183	5.484791
3.73E+09	2.482335	3.448196	3.930623	4.528856	5.407053
3.84E+09	2.445828	3.38998	3.875686	4.579187	5.310867
3.94E+09	2.409744	3.319103	3.791384	4.520484	5.206597
4.04E+09	2.375959	3.264831	3.712377	4.3609	5.112572
4.14E+09	2.346681	3.223681	3.658879	4.232261	5.057927
4.25E+09	2.31376	3.164944	3.563496	4.0845	5.041987
4.35E+09	2.289886	3.122432	3.507185	3.976712	5.057277

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
4.45E+09	2.271038	3.116788	3.516487	4.010615	5.010116
4.55E+09	2.249041	3.106888	3.527809	4.149014	4.941426
4.65E+09	2.226674	3.06659	3.480575	4.170046	4.897477
4.76E+09	2.208023	3.064975	3.493241	4.14019	4.886187
4.86E+09	2.188479	3.033429	3.440941	3.969963	4.907872
4.96E+09	2.169615	3.009303	3.394958	3.892383	4.884205
5.06E+09	2.154295	2.983057	3.359809	3.836629	4.868641
5.17E+09	2.140467	2.954201	3.331908	3.816506	4.845237
5.27E+09	2.121353	2.949356	3.339728	3.919823	4.821684
5.37E+09	2.109932	2.917265	3.309256	4.013941	4.792015
5.47E+09	2.092342	2.892971	3.27863	3.916055	4.767521
5.57E+09	2.076625	2.88604	3.266903	3.788394	4.768098
5.68E+09	2.06618	2.8494	3.199611	3.663755	4.778449
5.78E+09	2.05172	2.852461	3.207436	3.738199	4.733831
5.88E+09	2.038126	2.804826	3.14203	3.646358	4.668941
5.98E+09	2.026457	2.789836	3.135575	3.693766	4.636899
6.09E+09	2.014494	2.78151	3.132085	3.796406	4.585453
6.19E+09	2.004719	2.756894	3.10696	3.757429	4.580407
6.29E+09	1.992407	2.719445	3.040267	3.488057	4.588072
6.39E+09	1.987027	2.715658	3.026141	3.406386	4.596379
6.5E+09	1.975486	2.680905	2.953775	3.362887	4.558063
6.6E+09	1.972035	2.684299	2.964232	3.431653	4.500629
6.7E+09	1.964782	2.665277	2.951071	3.436815	4.46065
6.8E+09	1.96072	2.662586	2.964831	3.58677	4.41773
6.9E+09	1.951998	2.680261	2.998736	3.694123	4.431053
7.01E+09	1.944098	2.65325	2.953504	3.438127	4.44223
7.11E+09	1.935407	2.63836	2.907771	3.238482	4.450724
7.21E+09	1.92321	2.637275	2.882092	3.270722	4.453786
7.31E+09	1.915895	2.621049	2.8653	3.343544	4.441731
7.42E+09	1.912357	2.628651	2.891512	3.417742	4.396178
7.52E+09	1.906195	2.649437	2.93842	3.590726	4.362523
7.62E+09	1.896702	2.639015	2.935706	3.669408	4.332757
7.72E+09	1.894989	2.60197	2.878587	3.437103	4.350127
7.83E+09	1.887851	2.590978	2.851612	3.231401	4.423239
7.93E+09	1.879273	2.569991	2.802708	3.194979	4.421737
8.03E+09	1.874484	2.562333	2.779817	3.292056	4.470005
8.13E+09	1.880183	2.587646	2.841752	3.463561	4.531542
8.23E+09	1.878861	2.577832	2.840803	3.484729	4.482648
8.34E+09	1.880665	2.575236	2.846429	3.590123	4.437253
8.44E+09	1.872776	2.558972	2.821177	3.458399	4.410425
8.54E+09	1.866789	2.499446	2.719328	3.081417	4.374497
8.64E+09	1.854177	2.474535	2.667235	2.994368	4.315258
8.75E+09	1.844599	2.493613	2.688517	3.18867	4.263131
8.85E+09	1.837141	2.492499	2.699335	3.310158	4.193302
8.95E+09	1.833373	2.506953	2.737547	3.375244	4.152998

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
9.05E+09	1.818952	2.505627	2.731777	3.36822	4.113617
9.16E+09	1.81719	2.469128	2.663432	3.186872	4.078424
9.26E+09	1.8056	2.453138	2.625316	2.956903	4.030913
9.36E+09	1.796685	2.391057	2.520127	2.72677	3.996875
9.46E+09	1.794447	2.40216	2.535734	2.92024	3.921495
9.56E+09	1.7854	2.39921	2.562851	3.128594	3.874014
9.67E+09	1.776408	2.37268	2.533453	3.053213	3.834394
9.77E+09	1.775706	2.405072	2.577389	3.106047	3.800129
9.87E+09	1.765509	2.384812	2.518562	2.935866	3.810725
9.97E+09	1.758231	2.358138	2.460166	2.675354	3.732818
1.01E+10	1.754442	2.327901	2.412633	2.523533	3.660177
1.02E+10	1.746539	2.270454	2.345001	2.555995	3.602401
1.03E+10	1.745669	2.25227	2.338477	2.734642	3.571664
1.04E+10	1.740361	2.263199	2.375041	2.840496	3.554287
1.05E+10	1.731273	2.276827	2.381913	2.805111	3.584386
1.06E+10	1.73034	2.317349	2.416717	2.831197	3.549424
1.07E+10	1.731173	2.358756	2.446997	2.749529	3.494975
1.08E+10	1.731391	2.304013	2.373706	2.544911	3.404768
1.09E+10	1.727194	2.249961	2.323125	2.547275	3.35384
1.1E+10	1.723663	2.218751	2.30117	2.692325	3.328743
1.11E+10	1.718289	2.22571	2.323685	2.824937	3.342791
1.12E+10	1.710338	2.258031	2.347788	2.833976	3.355052
1.13E+10	1.70445	2.32983	2.395401	2.826717	3.353106
1.14E+10	1.702073	2.328396	2.352591	2.653852	3.279306
1.15E+10	1.697742	2.235324	2.227427	2.358576	3.235153
1.16E+10	1.694745	2.152467	2.153445	2.289474	3.164188
1.17E+10	1.693452	2.125376	2.15242	2.452073	3.134651
1.18E+10	1.690244	2.16023	2.212491	2.639045	3.157793
1.19E+10	1.687978	2.195835	2.249083	2.639509	3.240176
1.2E+10	1.687031	2.239617	2.244792	2.541495	3.386774
1.21E+10	1.6804	2.269086	2.220598	2.421552	3.537233
1.22E+10	1.6802	2.192043	2.107938	2.202982	3.417978
1.23E+10	1.677493	2.090353	2.015339	2.125934	3.246618
1.24E+10	1.673626	2.131524	2.11224	2.378057	3.071528
1.25E+10	1.670093	2.176808	2.189882	2.531163	3.057173
1.26E+10	1.670215	2.161661	2.159279	2.40847	3.177301
1.27E+10	1.665781	2.172767	2.124338	2.366433	3.303234
1.28E+10	1.6635	2.153472	2.054009	2.264779	3.366638
1.29E+10	1.664705	2.127787	2.012134	2.176528	3.297113
1.3E+10	1.664581	2.093164	2.009103	2.205194	3.152751
1.31E+10	1.667208	2.162188	2.134839	2.568732	3.028419
1.32E+10	1.664002	2.222294	2.265024	2.876085	3.001325
1.33E+10	1.659525	2.164247	2.233029	2.821366	3.017772
1.35E+10	1.661315	2.099354	2.157602	2.8296	3.061071
1.36E+10	1.661539	2.078597	2.115976	2.816617	3.100589

Frequency	e"/e' 20 C	e"/e' 40 C	e"/e' 60 C	e"/e' 80 C	e"/e' 100 C
1.37E+10	1.65786	2.109608	2.129533	2.634843	3.117156
1.38E+10	1.653379	2.137761	2.13263	2.521611	3.050095
1.39E+10	1.648604	2.195095	2.192969	2.752177	2.970143
1.4E+10	1.64601	2.245371	2.253148	2.861907	2.943666
1.41E+10	1.649244	2.225171	2.243864	2.703287	2.928642
1.42E+10	1.650752	2.14929	2.168614	2.71041	2.937173
1.43E+10	1.655362	2.160547	2.195967	3.010266	2.965608
1.44E+10	1.65896	2.241658	2.30088	2.993594	3.018872
1.45E+10	1.651153	2.244546	2.286969	2.762824	3.00365
1.46E+10	1.645329	2.199812	2.204634	2.897618	2.940892
1.47E+10	1.642171	2.219205	2.199148	3.065543	2.867632
1.48E+10	1.642198	2.218784	2.18174	2.64843	2.822107
1.49E+10	1.646626	2.17571	2.122714	2.589522	2.835299
1.5E+10	1.655559	2.200331	2.159712	3.254027	2.865796
1.51E+10	1.646505	2.34915	2.380774	3.203247	2.860859
1.52E+10	1.654805	2.323489	2.321187	2.723976	2.873797
1.53E+10	1.648333	2.299997	2.247936	3.199403	2.864327
1.54E+10	1.639279	2.294038	2.241799	3.406175	2.753225
1.55E+10	1.64233	2.311299	2.235701	2.631419	2.679512
1.56E+10	1.654374	2.172747	2.086948	2.678154	2.764073
1.57E+10	1.655456	2.123396	2.073024	3.520153	2.801132
1.58E+10	1.649062	2.262711	2.233438	2.820484	2.756333
1.59E+10	1.648052	2.268468	2.217666	2.429551	2.798925
1.6E+10	1.650703	2.253514	2.154292	2.974622	2.781041
1.61E+10	1.653215	2.299329	2.196383	2.997327	2.619307
1.62E+10	1.65828	2.190454	2.089053	2.309443	2.584685
1.63E+10	1.667941	2.08815	2.001478	2.429187	2.659455
1.64E+10	1.660639	2.104331	2.051588	2.787476	2.680017
1.65E+10	1.664237	2.252562	2.240386	2.677159	2.720688
1.66E+10	1.672861	2.3907	2.360589	2.626597	2.796932
1.67E+10	1.664885	2.298183	2.220213	2.601667	2.778421
1.68E+10	1.668818	2.169445	2.050053	2.463736	2.586392
1.69E+10	1.685114	2.100612	1.966849	2.303051	2.493528
1.7E+10	1.689375	2.164031	2.06168	2.43608	2.544069
1.71E+10	1.683359	2.235221	2.195526	2.891161	2.61215
1.72E+10	1.693294	2.282586	2.286042	3.155127	2.619468
1.73E+10	1.700865	2.377438	2.373103	2.958873	2.631917
1.74E+10	1.694817	2.321064	2.233967	2.556119	2.636152
1.75E+10	1.713774	2.180126	2.035715	2.512209	2.551145
1.76E+10	1.720904	2.142141	1.987823	2.492049	2.461523
1.77E+10	1.704926	2.258866	2.145617	2.675644	2.428389
1.79E+10	1.709993	2.317129	2.272255	3.263564	2.444599
1.8E+10	1.711894	2.287229	2.274079	3.315153	2.451411
1.81E+10	1.713435	2.347098	2.289082	2.977937	2.47682
1.82E+10	1.719175	2.414968	2.277255	2.953109	2.509511

Frequency	e"/e' 20 C	e"/e' 40 C	e"/e' 60 C	e"/e' 80 C	e"/e' 100 C
1.83E+10	1.724282	2.281737	2.103756	2.708105	2.526549
1.84E+10	1.724881	2.166368	1.967542	2.414886	2.466223
1.85E+10	1.724143	2.305524	2.119651	3.035877	2.407035
1.86E+10	1.72185	2.347095	2.167794	3.247193	2.375282
1.87E+10	1:724579	2.371274	2.198258	2.906981	2.372997
1.88E+10	1.727555	2.411401	2.213765	2.965906	2.385588
1.89E+10	1.732649	2.396673	2.178821	3.090385	2.449734
1.9E+10	1.749965	2.28805	2.073755	2.596247	2.524657
1.91E+10	1.745414	2.147241	1.941807	2.6517	2.533225
1.92E+10	1.738169	2.18985	1.945859	3.102392	2.460074
1.93E+10	1.742547	2.264398	2.01355	2.793543	2.389748
1.94E+10	1.745024	2.275006	2.010857	2.585716	2.348587
1.95E+10	1.750568	2.208334	1.917495	2.609889	2.352057
1.96E+10	1.759596	2.261273	1.976332	2.490113	2.405472
1.97E+10	1.765741	2.249774	1.974725	2.321008	2.520628
1.98E+10	1.76125	2.203395	1.939547	2.815469	2.532006
1.99E+10	1.761798	2.194126	1.93025	3.107422	2.443075
2E+10	1.760122	2.08458	1.937932	2.407497	2.339899

Table 4. Dielectric Constant for Hanford 6M Simulant

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
153000000	100.8058	229.9721	299.7941	369.3682	1385.99
255300000	59.15286	123.48	155.8887	184.3987	676.0535
357600000	47.64038	94.86777	115.3478	134.7424	413.9081
459900000	41.04289	78.78785	94.99173	110.1385	281.4036
562200000	36.85796	69.20107	82.6266	95.4198	211.8084
664500000	34.63163	64.32712	77.36074	89.41846	178.0002
766800000	32.76607	60.8824	73.54556	85.21626	156.041
869100000	31.23049	57.78894	68.89943	79.53973	136.8885
971400000	30.28644	55.67266	65.80535	75.92077	119.7264
1.074E+09	29.35993	53.39365	61.91882	70.95762	111.0721
1.176E+09	28.41292	51.50986	59.74376	68.21636	104.469
1.278E+09	27.57093	50.01161	58.46357	66.80383	99.22122
1.381E+09	27.09747	49.25313	58.48984	67.20819	93.49129
1.483E+09	26.5809	48.47398	57.76436	66.4035	90.02409
1.585E+09	26.18267	47.65297	56.1644	64.0704	84.85668
1.688E+09	25.79812	46.94942	54.79177	62.2652	81.3711
1.79E+09	25.4776	46.36611	53.73946	61.19839	77.75594
1.892E+09	25.02602	45.4414	52.58396	59.35915	76.40239
1.994E+09	24.6453	44.93215	52.59075	59.51105	75.30149
2.097E+09	24.4164	44.7947	53.32179	60.69218	73.62151
2.199E+09	24.06164	44.20467	52.635	60.12688	71.85601
2.301E+09	23.86112	43.98557	52.03935	59.22576	69.61453
2.404E+09	23.55311	43.22806	50.3484	56.56512	68.36864
2.506E+09	23.24667	42.60765	49.21129	55.49923	67.25164
2.608E+09	22.78655	41.79014	48.39284	54.57169	65.77072
2.711E+09	22.53446	41.55341	48.95958	55.17911	64.04711
2.813E+09	22.33761	41.46025	49.62991	56.18079	62.95348
2.915E+09	22.1301	41.03961	49.07458	55.70104	62.58461
3.017E+09	21.84812	40.34815	47.7111	53.77704	61.95007
3.12E+09	21.62687	39.93936	46.44453	51.67486	61.32278
3.222E+09	21.41157	39.60243	45.76809	50.8386	60.42664
3.324E+09	21.17193	39.07742	45.26204	50.70603	59.12399
3.427E+09	21.00202	38.99791	45.93545	51.51309	58.50818
3.529E+09	20.88525	39.06344	46.8859	52.55135	57.89765
3.631E+09	20.79352	38.9834	46.95873	53.18369	57.39799
3.734E+09	20.53865	38.28839	45.47135	51.42015	56.81353
3.836E+09	20.37642	37.97667	44.38669	49.38569	56.50701
3.938E+09	20.23561	37.85622	44.08899	48.84166	56.24738
4.04E+09	20.04506	37.69217	44.19838	49.76533	55.87268
4.143E+09	19.85012	37.41084	44.49392	50.23476	55.10097
4.245E+09	19.70609	37.30411	45.10233	50.58304	54.1488
4.347E+09	19.50739	37.05697	45.10331	50.77226	53.04879
4.45E+09	19.27157	36.32883	43.47419	49.28618	52.50909

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
4.552E+09	19.03644	35.74856	41.86399	46.66549	52.00659
4.654E+09	18.83192	35.48451	41.27679	45.41498	51.71182
4.757E+09	18.51363	34.954	40.68624	45.18048	50.42515
4.859E+09	18.32658	34.68196	41.07243	46.30621	49.49638
4.961E+09	18.12514	34.38308	41.44281	46.18408	48.84031
5.063E+09	17.93806	34.05523	41.13531	45.6413	48.07737
5.166E+09	17.82339	33.72747	40.1789	44.94663	47.55975
5.268E+09	17.59449	33.19402	38.73995	43.17621	46.9884
5.37E+09	17.43661	33.01147	38.11488	41.55031	46.40074
5.473E+09	17.23005	32.83988	38.11425	41.76301	45.7671
5.575E+09	17.04443	32.43967	38.11497	42.65462	44.88681
5.677E+09	16.90908	32.31553	38.6812	43.2289	44.18302
5.78E+09	16.73385	31.76157	37.86183	41.2155	43.78455
5.882E+09	16.63346	31.71888	37.49323	41.32835	43.59636
5.984E+09	16.52701	31.4543	36.44824	40.49623	43.10116
6.086E+09	16.34251	31.13468	35.76649	39.02174	42.65789
6.189E+09	16.23213	31.01213	35.98384	38.77122	42.02597
6.291E+09	16.12262	31.02773	37.00137	41.2134	41.22008
6.393E+09	15.93663	30.63977	37.09366	41.65563	40.62793
6.496E+09	15.80855	30.56237	37.33709	41.24126	40.31454
6.598E+09	15.61655	30.14972	36.17713	39.60381	40.21625
6.7E+09	15.48885	29.92857	35.12479	39.14799	39.90271
6.803E+09	15.3969	29.66636	34.30121	37.63469	39.73843
6.905E+09	15.15944	29.15189	33.80769	36.10021	38.99507
7.007E+09	15.068	29.11006	34.62072	38.04904	38.39394
7.109E+09	14.90203	28.88897	35.21065	39.77563	37.86109
7.212E+09	14.63166	28.48523	34.94291	38.72089	37.46549
7.314E+09	14.52575	28.3129	34.16538	37.09467	37.13724
7.416E+09	14.43307	27.97721	32.72927	35.95818	36.82424
7.519E+09	14.26803	27.45593	31.37838	34.25081	36.59268
7.621E+09	14.14851	27.28047	31.34994	33.23349	36.50121
7.723E+09	14.07321	27.36198	32.32215	34.77486	36.01939
7.826E+09	13.91431	27.19968	32.82522	36.51165	35.28595
7.928E+09	13.81159	27.05286	32.89475	36.42	34.75131
8.03E+09	13.65995	26.83621	32.14134	34.63975	33.93176
8.132E+09	13.58008	26.37248	30.40514	32.50116	32.87894
8.235E+09	13.51981	26.08231	29.55737	32.04055	32.68568
8.337E+09	13.39539	25.87633	29.50098	31.16809	32.64722
8.439E+09	13.26773	25.81352	30.20935	31.82711	32.53432
8.542E+09	13.25959	26.09365	31.60232	34.78691	32.26762
8.644E+09	13.18286	26.16717	31.97941	35.56267	32.27307
8.746E+09	13.01694	25.67157	30.65529	32.90445	32.13337
8.849E+09	12.96332	25.40364	29.36726	31.13284	32.20147
8.951E+09	12.88908	25.05679	28.31173	30.27867	32.12998
9.053E+09	12.77266	24.79592	28.44492	30.28674	32.10398

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
9.155E+09	12.69155	25.04339	29.95553	31.78591	32.02391
9.258E+09	12.63571	24.97196	30.65866	33.38731	32.0223
9.36E+09	12.58674	25.30321	31.60065	35.52902	31.88821
9.462E+09	12.44756	25.03513	30.39672	33.06546	31.88243
9.565E+09	12.47813	24.73127	28.76131	30.24509	32.03244
9.667E+09	12.42465	24.64393	28.27349	30.43345	31.90715
9.769E+09	12.33533	24.40802	28.27876	30.34294	31.83391
9.872E+09	12.24711	24.31845	29.59382	31.68245	31.36327
9.974E+09	12.11446	24.49865	31.24679	34.37243	31.73238
1.008E+10	12.03222	24.63382	31.76265	35.87051	31.81307
1.018E+10	12.05768	24.8154	31.20126	34.72312	31.86307
1.028E+10	12.00655	24.78378	29.81565	32.14461	31.87988
1.038E+10	11.98209	24.43736	28.35305	30.53591	31.82666
1.049E+10	11.85714	24.11543	28.24148	30.71958	31.31712
1.059E+10	11.68743	23.81485	28.90062	30.98432	31.45935
1.069E+10	11.49674	23.30662	29.22231	31.60108	31.56239
1.079E+10	11.51937	23.58385	29.9794	33.38476	32.03629
1.089E+10	11.60416	23.93253	29.59883	32.63824	32.19304
1.1E+10	11.5887	23.97045	28.38976	30.4592	32.09027
1.11E+10	11.57087	23.71063	27.15364	28.86529	31.84503
1.12E+10	11.4709	23.31504	26.92942	28.83186	31.74869
1.13E+10	11.17939	22.5843	27.24992	29.00397	31.71526
1.141E+10	11.06695	22.50114	28.70627	30.93187	32.29711
1.151E+10	11.15474	23.2532	30.56881	34.38543	32.80109
1.161E+10	11.25365	24.03527	31.00741	34.98575	32.92778
1.171E+10	11.29832	24.32736	29.65851	32.41605	32.68807
1.182E+10	11.11998	23.68841	27.59656	29.85923	32.15867
1.192E+10	11.01514	22.97117	26.83987	29.49661	31.48914
1.202E+10	10.82267	22.40292	27.81291	30.52638	30.46864
1.212E+10	10.68215	22.00452	29.23342	31.93156	29.4088
1.222E+10	10.75335	22.65025	31.16177	35.23718	30.00304
1.233E+10	10.91771	23.92385	32.34019	37.07374	30.80631
1.243E+10	10.63136	23.68399	30.00795	33.52008	31.77552
1.253E+10	10.52236	22.92989	27.48772	30.90981	31.32959
1.263E+10	10.50265	22.71659	27.7233	32.32067	29.95743
1.274E+10	10.36896	22.15055	28.67881	32.66286	28.61647
1.284E+10	10.31678	22.11845	30.49517	33.82746	28.06845
1.294E+10	10.30262	22.40853	31.3105	35.25488	28.43015
1.304E+10	10.3345	22.9972	30.8666	34.79389	29.86557
1.315E+10	10.07651	22.72889	28.19884	29.52007	30.79528
1.325E+10	10.02143	22.06456	25.15627	25.4335	30.7207
1.335E+10	10.1801	22.01545	24.1991	25.84666	29.86639
1.345E+10	10.17694	22.30924	24.94685	26.63893	29.15508
1.355E+10	10.10534	22.39839	26.12003	26.88514	28.82017
1.366E+10	10.02891	22.19272	26.70993	28.50221	28.78179

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.376E+10	9.844041	22.15974	27.2861	30.08022	29.44027
1.386E+10	9.753219	21.76494	26.15648	26.57289	30.01781
1.396E+10	9.659366	21.09281	24.29099	23.8948	29.97039
1.407E+10	9.622367	20.76925	23.01575	24.70568	29.72026
1.417E+10	9.751101	21.15454	23.26442	25.59616	29.23622
1.427E+10	9.770654	21.29562	23.40983	23.31392	28.89951
1.437E+10	9.751755	20.74454	22.70839	22.80845	28.42587
1.448E+10	9.711007	20.48851	22.89971	24.69957	28.41827
1.458E+10	9.631239	20.74403	23.69666	23.65064	28.69268
1.468E+10	9.446025	20.49629	23.30548	21.0412	29.02355
1.478E+10	9.295279	20.17056	22.87056	23.89354	29.05263
1.488E+10	9.30511	20.43042	23.6068	26.67343	28.65107
1.499E+10	9.320421	20.73929	24.02717	22.21559	28.05874
1.509E+10	9.249369	19.86439	22.01859	21.18719	28.00065
1.519E+10	9.204287	19.93226	22.49924	25.38522	27.91965
1.529E+10	8.956522	19.75029	22.68343	21.72604	27.86157
1.54E+10	8.957623	19.72346	22.74125	18.68502	28.5824
1.55E+10	8.851653	19.20949	22.21688	23.33299	29.30193
1.56E+10	9.070821	19.97038	23.78851	25.65572	28.16385
1.57E+10	9.274412	20.83254	24.96901	20.16861	27.56974
1.58E+10	9.020879	20.03075	23.29736	23.5502	27.83507
1.591E+10	8.986424	19.93646	23.31877	27.65206	27.61231
1.601E+10	8.694128	19.56931	23.29504	21.73359	27.63998
1.611E+10	8.56537	18.87644	22.03598	19.67451	29.00366
1.621E+10	8.73829	19.1636	22.20764	24.8001	29.42672
1.632E+10	8.947692	19.87835	23.09195	25.0088	28.47496
1.642E+10	8.980906	20.08503	23.20104	22.23218	27.66622
1.652E+10	8.869355	19.30063	21.68019	23.36146	27.27291
1.662E+10	8.651134	18.45595	20.59958	23.93361	26.53512
1.673E+10	8.532364	18.43594	21.21632	22.68761	26.39586
1.683E+10	8.583301	19.11438	22.39684	23.20165	27.96257
1.693E+10	8.770691	19.87039	23.31008	25.07353	28.90534
1.703E+10	8.6911	19.43917	22.3488	24.24035	28.32544
1.713E+10	8.560908	18.664	20.60352	20.9122	27.54156
1.724E+10	8.492929	18.2508	19.42137	18.91223	27.53993
1.734E+10	8.306833	17.76207	18.58482	19.43385	27.31276
1.744E+10	8.058136	17.64101	19.3738	21.67215	27.08522
1.754E+10	8.280895	18.56998	21.4635	22.16931	27.4165
1.765E+10	8.384039	19.02952	22.39284	22.38823	28.06907
1.775E+10	8.208641	18.27689	20.46739	21.1591	28.07685
1.785E+10	8.021587	17.47087	18.28744	17.27651	27.72725
1.795E+10	8.110303	17.54308	17.56787	16.24266	27.65715
1.806E+10	7.891821	17.32272	17.54297	17.6112	27.77221
1.816E+10	7.631486	16.8749	17.84826	17.93535	27.45455
1.826E+10	7.796341	17.52506	20.04022	19.95466	27.06648

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.836E+10	7.895181	18.46715	22.33796	23.13536	27.41834
1.846E+10	7.627209	17.84227	20.88966	18.76536	27.73207
1.857E+10	7.475326	17.10802	18.95777	16.96545	27.96493
1.867E+10	7.321266	17.05727	18.19887	18.75347	27.96872
1.877E+10	7.305457	16.8537	17.76895	17.44293	28.0082
1.887E+10	7.316681	16.72613	18.07128	16.07809	27.60567
1.898E+10	7.508554	17.27493	19.50226	20.44625	26.71912
1.908E+10	7.788457	18.36326	21.59204	21.91739	26.33765
1.918E+10	7.638118	18.38008	21.93838	18.51767	26.82373
1.928E+10	7.407452	17.66489	20.80408	19.97304	27.37739
1.939E+10	7.318977	17.30348	20.31136	21.74305	27.6878
1.949E+10	7.307208	17.82209	21.33614	20.62351	27.68644
1.959E+10	7.275138	17.44639	20.57579	19.55656	27.32581
1.969E+10	7.176878	17.26776	20.33007	21.71618	26.2813
1.979E+10	7.245208	17.46989	20.47321	19.30404	25.80646
1.99E+10	7.285662	17.59562	20.67264	16.72102	26.45416
2E+10	7.192217	17.17303	20.47478	20.14777	27.35173

Table 5. Dielectric Loss for Hanford 6M Simulant

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60C	e" @ 80 C	e" @ 100 C
1.53E+08	1045.97	2821.668	4097.968	5112.725	5999.674
2.55E+08	635.7872	1712.295	2489.424	3105.414	3815.516
3.58E+08	458.9237	1232.782	1789.964	2231.471	2799.86
4.6E+08	359.4271	963.0468	1397.281	1742.122	2205.994
5.62E+08	296.1813	792.157	1149.083	1433.372	1815.144
6.65E+08	252.0847	673.8562	977.1453	1219.288	1546.362
7.67E+08	219.5812	586.0806	848.8815	1059.917	1344.665
8.69E+08	194.6399	518.5276	749.9607	935.8942	1193.598
9.71E+08	174.9413	465.3831	672.7895	840.2594	1073.686
1.07E+09	159.1463	422.7254	610.9923	763.4188	976.0315
1.18E+09	146.0708	387.2287	559.674	699.2557	892.9286
1.28E+09	135.0227	357.7369	517.0031	646.2396	821.6549
1.38E+09	125.7049	332.0458	479.3158	599.0984	761.0436
1.48E+09	117.5064	310.0232	446.9217	558.9878	712.8173
1.59E+09	110.5554	290.9961	418.8413	523.7955	669.3798
1.69E+09	104.1564	273.8013	393.907	492.4551	631.9824
1.79E+09	98.80888	259.2456	373.0088	466.4135	597.1817
1.89E+09	94.00582	246.379	354.8408	443.9656	566.5727
1.99E+09	89.66656	234.5487	337.7871	422.4794	537.2971
2.1E+09	85.79257	223.7948	321.8798	402.2859	511.9278
2.2E+09	82.27702	214.3019	307.547	384.4025	489.6235
2.3E+09	79.0294	205.4966	294.6532	368.4414	470.8736
2.4E+09	76.18043	197.8331	283.4545	354.2881	452.7403
2.51E+09	73.4981	190.4061	272.7027	340.3949	434.9553
2.61E+09	70.752	183.3561	263.0517	328.5285	418.2886
2.71E+09	68.49968	177.121	254.0424	317.3432	402.5407
2.81E+09	66.47055	171.5056	245.6491	306.6512	388.044
2.92E+09	64.55919	166.262	237.6714	296.7516	375.3071
3.02E+09	62.68706	161.0653	229.6071	286.7756	364.2004
3.12E+09	60.88937	156.2364	222.6036	277.7636	353.5646
3.22E+09	59.26111	151.9133	216.7481	270.256	343.2087
3.32E+09	57.69638	147.6385	210.7948	262.6615	332.8334
3.43E+09	56.27422	143.6419	205.0196	255.6906	322.9442
3.53E+09	54.96393	139.9789	199.3834	248.5033	314.0873
3.63E+09	53.75874	136.7986	194.4104	242.2016	306.2373
3.73E+09	52.62091	133.7192	189.5196	236.152	299.0974
3.84E+09	51.48329	130.538	184.8813	230.3574	292.2564
3.94E+09	50.44556	127.7065	181.1316	225.294	285.6149
4.04E+09	49.50149	125.1762	178.0333	221.2589	278.7586
4.14E+09	48.60846	122.7449	174.6166	217.3425	273.0252
4.25E+09	47.75468	120.2858	170.6878	212.431	267.598
4.35E+09	46.97029	118.2013	167.2636	207.9376	262.2707
4.45E+09	46.09046	115.8282	163.3777	202.9316	257.3687

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60C	e" @ 80 C	e" @ 100 C
4.55E+09	45.26643	113.6255	160.195	199.2278	252.5349
4.65E+09	44.54048	111.5388	157.4717	195.5488	247.9697
4.76E+09	43.86995	109.9368	155.6092	192.8417	243.1142
4.86E+09	43.1772	108.0734	152.9983	189.9011	238.5514
4.96E+09	42.58207	106.4669	150.3195	186.9188	234.4417
5.06E+09	41.97051	104.6648	147.1933	182.5482	230.5959
5.17E+09	41.2879	102.7234	144.0925	178.3947	226.7006
5.27E+09	40.70731	101.0855	141.6156	175.5816	222.7504
5.37E+09	40.107	99.5598	139.8494	173.4838	218.6908
5.47E+09	39.60008	98.28915	138.5014	171.321	214.9482
5.57E+09	39.06219	96.87843	136.5138	168.8281	211.2864
5.68E+09	38.57243	95.47069	134.1901	166.4254	207.8741
5.78E+09	38.05568	93.86395	131.2672	162.4239	204.828
5.88E+09	37.51943	92.31063	128.7772	158.8232	201.8649
5.98E+09	37.06745	91.08789	127.0932	156.9889	198.6041
6.09E+09	36.63727	90.01413	125.9903	156.0058	195.6305
6.19E+09	36.20412	89.02749	125.0675	154.4451	192.9135
6.29E+09	35.87747	88.10136	123.8728	152.7475	190.2378
6.39E+09	35.5185	86.96471	121.7941	150.6361	187.6267
6.5E+09	35.10305	85.57712	119.2504	147.4873	185.0047
6.6E+09	34.64759	84.44589	117.3139	144.5245	182.3974
6.7E+09	34.22091	83.36899	115.8323	142.6896	179.6865
6.8E+09	33.8979	82.69018	115.2233	142.5741	177.5602
6.9E+09	33.54384	81.91004	114.474	141.455	175.1448
7.01E+09	33.1603	80.89191	113.0653	139.2871	173.0504
7.11E+09	32.84449	79.82055	111.0106	136.8763	170.7409
7.21E+09	32.40879	78.61516	108.8126	134.6478	168.5864
7.31E+09	32.05032	77.60149	107.1193	131.962	166.5167
7.42E+09	31.72643	76.83858	106.1528	130.5781	164.1405
7.52E+09	31.42557	76.18267	105.5759	130.3585	162.0615
7.62E+09	31.11757	75.51293	105.0436	129.8588	160.1743
7.72E+09	30.79533	74.77376	104.105	128.2343	158.8459
7.83E+09	30.44791	73.87722	102.5484	126.2555	157.2304
7.93E+09	30.13596	72.79121	100.3898	124.0878	155.5671
8.03E+09	29.84011	71.87033	98.79214	121.8349	154.0012
8.13E+09	29.52723	71.19134	97.94457	120.1651	151.689
8.23E+09	29.24219	70.30561	96.96698	119.1758	149.0547
8.34E+09	28.94083	69.77452	96.78532	119.4259	146.7521
8.44E+09	28.59708	69.03978	95.83756	117.8223	145.0717
8.54E+09	28.33332	68.20663	94.24233	115.5489	143.4824
8.64E+09	28.21015	67.75833	93.16972	114.9154	141.4625
8.75E+09	27.93619	66.87776	91.49907	112.6704	139.8192
8.85E+09	27.68382	66.1194	90.52713	110.7936	138.0541
8.95E+09	27.45034	65.66898	90.21859	110.3717	136.5228
9.05E+09	27.22877	65.18208	89.87946	110.4435	134.8498

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60C	e" @ 80 C	e" @ 100 C
9.16E+09	27.03524	64.85432	89.74457	110.3999	133.362
9.26E+09	26.77473	64.0673	88.08705	107.7474	131.621
9.36E+09	26.65606	63.43284	86.61652	106.1648	130.5811
9.46E+09	26.46247	62.87402	85.72884	105.5713	129.0291
9.56E+09	26.14756	61.90476	84.28003	102.8978	127.6809
9.67E+09	25.92825	61.21164	83.60076	101.7373	126.2772
9.77E+09	25.85033	61.48405	84.62576	103.7034	125.0911
9.87E+09	25.64256	60.8847	83.72776	102.7173	123.6225
9.97E+09	25.57771	60.74587	83.23059	101.846	122.459
1.01E+10	25.3236	60.12478	81.90574	100.527	121.2809
1.02E+10	25.03651	58.96012	79.7802	98.13408	119.9569
1.03E+10	24.85901	58.34683	79.01536	96.75673	119.02
1.04E+10	24.61798	57.76377	78.55241	95.54537	118.1078
1.05E+10	24.47132	57.58814	78.7999	96.26151	117.3875
1.06E+10	24.32698	57.89618	79.87724	98.21304	116.1529
1.07E+10	24.01696	57.37006	78.75786	96.52737	115.0554
1.08E+10	23.74005	56.49288	76.78421	94.06089	114.0028
1.09E+10	23.60942	55.76845	75.14075	92.09668	112.9605
1.1E+10	23.53714	55.20308	74.25564	90.46897	111.795
1.11E+10	23.4237	54.78493	74.22202	89.8371	110.9485
1.12E+10	23.32538	54.7241	75.06087	91.17961	110.4389
1.13E+10	23.2018	54.78382	75.85594	92.7302	109.997
1.14E+10	22.94795	54.41364	75.3025	92.20032	109.7338
1.15E+10	22.83257	53.99778	73.91428	90.43856	109.5843
1.16E+10	22.8663	53.88588	72.98538	89.41018	108.0428
1.17E+10	22.97539	53.89273	72.60008	88.20555	106.7625
1.18E+10	22.88285	53.34328	71.95581	86.35515	105.521
1.19E+10	22.52108	52.37561	71.32331	85.67712	105.4117
1.2E+10	22.3151	52.04772	71.95735	87.1774	106.1774
1.21E+10	22.05714	51.6134	71.96705	87.6525	106.3295
1.22E+10	21.95056	51.39977	71.44784	87.49575	105.5276
1.23E+10	22.28286	52.07908	71.64442	88.25409	104.1159
1.24E+10	22.44636	52.78602	71.96126	88.67633	102.5815
1.25E+10	22.13595	51.79903	70.10947	85.55562	101.2648
1.26E+10	21.81552	50.73595	69.5441	85.36243	100.2513
1.27E+10	21.42446	49.68806	69.81677	86.31912	99.50491
1.28E+10	21.25564	49.35353	70.74707	87.18267	99.40127
1.29E+10	21.20684	49.50283	70.91701	87.18268	98.95726
1.3E+10	21.37229	50.02691	70.10805	86.88456	98.91749
1.31E+10	21.44485	50.92784	69.98234	86.83222	98.38099
1.32E+10	21.20062	50.31605	68.41086	83.53633	97.11805
1.33E+10	20.83682	48.80366	67.24161	82.18806	95.54789
1.35E+10	20.61768	48.16865	68.66845	85.05368	94.41015
1.36E+10	20.45751	48.0728	70.47979	86.62895	94.17487
1.37E+10	20.39153	48.15662	70.50379	85.62204	94.49345

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60C	e" @ 80 C	e" @ 100 C
1.38E+10	20.46045	48.61203	69.39289	85.59594	94.6079
1.39E+10	20.38419	48.53807	66.80938	82.29956	94.12984
1.4E+10	20.28472	48.04882	64.33688	77.52692	93.25074
1.41E+10	20.06204	46.94283	62.42394	75.29513	91.67743
1.42E+10	19.83225	46.27952	62.50753	77.6631	90.42336
1.43E+10	19.70002	46.68794	64.56084	79.54532	90.1904
1.44E+10	19.63807	46.88954	65.23022	77.31951	90.46821
1.45E+10	19.61537	46.30927	63.37933	76.29872	90.59416
1.46E+10	19.70678	46.10502	61.89591	76.3538	89.96993
1.47E+10	19.72743	46.12317	61.38651	72.98185	88.62182
1.48E+10	19.52333	45.40302	60.59354	71.45733	87.36949
1.49E+10	19.46612	45.20615	61.53443	78.3903	86.43192
1.5E+10	19.49312	46.33997	65.22947	83.25403	85.99317
1.51E+10	19.45537	46.84185	66.27212	77.22728	86.02197
1.52E+10	19.57801	46.65189	64.74571	78.08405	86.44298
1.53E+10	19.68549	46.3326	62.47927	79.27476	86.13943
1.54E+10	19.47528	46.00495	61.37373	71.94165	84.63184
1.55E+10	19.06816	44.74489	59.92058	69.1257	83.91584
1.56E+10	18.73625	43.6694	59.7551	77.90604	83.18292
1.57E+10	18.8442	44.32904	62.30903	78.88847	81.96245
1.58E+10	19.02602	45.37742	64.04101	73.18847	82.07291
1.59E+10	18.93202	45.25073	62.75831	75.03955	83.20149
1.6E+10	18.84675	44.50492	60.18821	73.76655	82.20283
1.61E+10	18.47385	43.57064	58.20237	65.71071	81.3277
1.62E+10	18.02788	41.76896	55.56254	63.27775	81.02076
1.63E+10	18.00778	41.27256	55.60813	68.59423	80.16577
1.64E+10	18.14789	42.13617	57.86299	69.93176	78.76292
1.65E+10	18.21832	43.07889	59.57353	69.3742	78.77396
1.66E+10	18.38299	43.59349	59.77461	71.26615	79.41482
1.67E+10	17.92837	42.01338	56.55272	67.69261	79.40613
1.68E+10	17.58087	41.002	54.58506	64.00762	78.66158
1.69E+10	17.54016	41.04879	54.65128	64.33831	78.43832
1.7E+10	17.75143	41.42186	55.54347	67.52591	77.56803
1.71E+10	17.82523	41.24009	55.89361	68.94391	76.00156
1.72E+10	17.87007	41.31735	56.15689	67.47222	75.25375
1.73E+10	18.04135	41.75659	56.24132	65.96281	75.5467
1.74E+10	17.72693	40.68661	54.05348	64.84142	76.34657
1.75E+10	17.29069	39.90032	52.95151	64.39619	76.62203
1.76E+10	17.15021	39.92281	53.51399	63.64995	76.65389
1.77E+10	17.32598	40.2367	54.11705	65.34911	76.13616
1.79E+10	17.36437	39.80032	53.13903	66.0235	75.20979
1.8E+10	17.36442	39.54342	51.93303	62.48685	74.36045
1.81E+10	17.6692	40.59099	52.8184	62.35459	74.45922
1.82E+10	17.52099	40.4686	52.72288	63.8872	74.91024
1.83E+10	17.22337	39.63177	52.51969	64.88958	74.95125

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60C	e" @ 80 C	e" @ 100 C
1.84E+10	17.30825	39.74024	53.73318	66.42031	74.475
1.85E+10	17.30502	40.44912	55.47213	68.7881	73.94499
1.86E+10	17.18091	39.53911	52.81862	65.18014	73.00928
1.87E+10	17.52381	40.16603	52.13605	65.84652	72.06381
1.88E+10	17.37637	40.0456	50.67453	62.68423	71.74851
1.89E+10	17.03091	39.42153	49.98888	58.9414	72.36829
1.9E+10	16.75504	38.65453	50.423	61.78645	72.69055
1.91E+10	16.72028	38.44234	51.83288	67.36811	72.16935
1.92E+10	16.93449	39.11959	53.80056	65.33814	71.30819
1.93E+10	16.72906	38.78644	52.61443	62.21999	70.66942
1.94E+10	16.7285	38.24312	49.92742	63.121	69.72313
1.95E+10	16.81702	38.60724	49.44262	62.56609	69.20248
1.96E+10	16.54775	38.27541	48.8786	56.26829	69.53162
1.97E+10	16.35008	37.84966	49.33386	58.05477	69.90976
1.98E+10	16.06616	37.28497	49.8886	63.16077	69.42284
1.99E+10	16.02876	37.09062	50.02592	59.7085	68.67617
2E+10	16.07662	36.69628	48.6184	54.99943	68.5069

Table 6. LossTangent for Hanford 6M Simulant

Frequency	e"/e' 20C	e"/e' 40C	e"/e' 60C	e"/e' 80C	e"/e' 100C
1.53E+08	10.37609	12.26961	13.66928	13.84181	4.328802
2.55E+08	10.74821	13.86699	15.96923	16.84076	5.643808
3.58E+08	9.633083	12.99474	15.51797	16.56102	6.76445
4.6E+08	8.757354	12.22329	14.7095	15.81756	7.839253
5.62E+08	8.03575	11.44718	13.90694	15.02175	8.569748
6.65E+08	7.279032	10.47546	12.63102	13.63575	8.687416
7.67E+08	6.701482	9.626437	11.54225	12.43797	8.617382
8.69E+08	6.232368	8.972783	10.88486	11.76637	8.719491
9.71E+08	5.776225	8.359276	10.22393	11.06758	8.967836
1.07E+09	5.420527	7.917148	9.867634	10.7588	8.787366
1.18E+09	5.141	7.517564	9.367907	10.25056	8.547309
1.28E+09	4.897285	7.153077	8.843168	9.673692	8.28104
1.38E+09	4.638989	6.741619	8.194855	8.914068	8.140262
1.48E+09	4.420709	6.395661	7.73698	8.418047	7.918072
1.59E+09	4.222466	6.106567	7.457417	8.175312	7.888357
1.69E+09	4.037365	5.831835	7.189164	7.908994	7.766669
1.79E+09	3.878266	5.591274	6.94106	7.621336	7.680206
1.89E+09	3.756323	5.421907	6.74808	7.479312	7.415641
1.99E+09	3.638282	5.220065	6.422937	7.099175	7.135278
2.1E+09	3.513727	4.99601	6.036554	6.628299	6.953509
2.2E+09	3.419427	4.847946	5.843013	6.393189	6.813953
2.3E+09	3.312058	4.671909	5.662124	6.220965	6.764013
2.4E+09	3.23441	4.576497	5.629862	6.263367	6.622046
2.51E+09	3.161661	4.468824	5.541466	6.133327	6.467579
2.61E+09	3.104989	4.387545	5.435756	6.020127	6.3598
2.71E+09	3.039774	4.26249	5.188818	5.751148	6.285072
2.81E+09	2.975724	4.136626	4.949619	5.458293	6.16398
2.92E+09	2.917258	4.051258	4.843065	5.327577	5.996795
3.02E+09	2.869219	3.991888	4.812446	5.332676	5.878934
3.12E+09	2.81545	3.91184	4.79289	5.375217	5.765633
3.22E+09	2.767714	3.835959	4.735791	5.315962	5.679758
3.32E+09	2.725136	3.778101	4.657209	5.180084	5.629414
3.43E+09	2.679466	3.683322	4.463211	4.963604	5.519642
3.53E+09	2.63171	3.583372	4.252524	4.72877	5.424872
3.63E+09	2.58536	3.50915	4.140028	4.554058	5.33533
3.73E+09	2.562044	3.492421	4.167891	4.592597	5.264546
3.84E+09	2.526611	3.43732	4.165241	4.664456	5.172038
3.94E+09	2.492911	3.373461	4.108319	4.612743	5.077834
4.04E+09	2.46951	3.321015	4.02805	4.446045	4.989175
4.14E+09	2.448774	3.280999	3.924505	4.326535	4.954998
4.25E+09	2.423347	3.224466	3.784457	4.199649	4.941901
4.35E+09	2.40782	3.189719	3.708455	4.095497	4.943951
4.45E+09	2.39163	3.188328	3.758039	4.117415	4.901412

Frequency	e''/e' 20C	e''/e' 40C	e''/e' 60C	e''/e' 80C	e''/e' 100 C
4.55E+09	2.377883	3.178464	3.826558	4.269275	4.855824
4.65E+09	2.365159	3.143309	3.815018	4.305821	4.795223
4.76E+09	2.369603	3.145185	3.824616	4.268254	4.821289
4.86E+09	2.355988	3.116126	3.725086	4.100984	4.819573
4.96E+09	2.349337	3.096491	3.627156	4.047257	4.800168
5.06E+09	2.339747	3.073385	3.57827	3.999626	4.79635
5.17E+09	2.316501	3.045689	3.586272	3.969035	4.766649
5.27E+09	2.31364	3.045291	3.655544	4.066628	4.74054
5.37E+09	2.30016	3.015915	3.669155	4.175271	4.713089
5.47E+09	2.298315	2.992982	3.633849	4.102219	4.696567
5.57E+09	2.291787	2.986419	3.581631	3.958027	4.707092
5.68E+09	2.281167	2.954329	3.46913	3.849863	4.704841
5.78E+09	2.274174	2.955268	3.467005	3.940845	4.678087
5.88E+09	2.255661	2.910274	3.43468	3.842959	4.630316
5.98E+09	2.242841	2.895881	3.486951	3.87663	4.60786
6.09E+09	2.24184	2.891121	3.522579	3.99792	4.586033
6.19E+09	2.230399	2.870731	3.475658	3.9835	4.59034
6.29E+09	2.225288	2.83944	3.347791	3.706259	4.615172
6.39E+09	2.228734	2.838295	3.283422	3.616225	4.618171
6.5E+09	2.22051	2.800081	3.193887	3.576208	4.589031
6.6E+09	2.218645	2.800884	3.242764	3.649258	4.535416
6.7E+09	2.209391	2.785599	3.297736	3.644876	4.503114
6.8E+09	2.201606	2.787338	3.35916	3.788369	4.468223
6.9E+09	2.212736	2.809768	3.386033	3.918398	4.49146
7.01E+09	2.20071	2.77883	3.265828	3.660725	4.507231
7.11E+09	2.204027	2.763011	3.152756	3.441209	4.509668
7.21E+09	2.214976	2.759858	3.114009	3.477395	4.499779
7.31E+09	2.206449	2.740853	3.135316	3.557438	4.48382
7.42E+09	2.198176	2.74647	3.24336	3.631388	4.457404
7.52E+09	2.202517	2.774725	3.364607	3.805998	4.428796
7.62E+09	2.199353	2.768022	3.350679	3.907468	4.388193
7.72E+09	2.188224	2.732761	3.220856	3.687559	4.410012
7.83E+09	2.188244	2.716107	3.124075	3.457951	4.455893
7.93E+09	2.181933	2.690703	3.051848	3.407133	4.476581
8.03E+09	2.184497	2.678111	3.073678	3.517198	4.538557
8.13E+09	2.174305	2.699456	3.221317	3.697255	4.613562
8.23E+09	2.162914	2.695528	3.280637	3.719529	4.560245
8.34E+09	2.160507	2.696461	3.280749	3.831671	4.495087
8.44E+09	2.155386	2.674559	3.172447	3.701947	4.459035
8.54E+09	2.136816	2.613917	2.982133	3.321621	4.446638
8.64E+09	2.139911	2.58944	2.913429	3.231348	4.383299
8.75E+09	2.146142	2.605129	2.984773	3.424169	4.351214
8.85E+09	2.13555	2.602753	3.082586	3.558736	4.287198
8.95E+09	2.129736	2.620806	3.186615	3.645195	4.249077
9.05E+09	2.131802	2.628742	3.159772	3.646594	4.200406

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
9.16E+09	2.130176	2.589678	2.995927	3.473234	4.164451
9.26E+09	2.118974	2.565569	2.873154	3.227197	4.11029
9.36E+09	2.11779	2.506909	2.740973	2.988115	4.094964
9.46E+09	2.125917	2.511432	2.820332	3.192795	4.047027
9.56E+09	2.095472	2.503097	2.930326	3.402133	3.985988
9.67E+09	2.08684	2.483842	2.95686	3.342944	3.957644
9.77E+09	2.095633	2.51901	2.992555	3.41771	3.929491
9.87E+09	2.093764	2.503643	2.829231	3.242087	3.941632
9.97E+09	2.111336	2.47956	2.663653	2.963013	3.859116
1.01E+10	2.104648	2.440742	2.57868	2.802496	3.812297
1.02E+10	2.076396	2.375949	2.556954	2.826188	3.764761
1.03E+10	2.070453	2.354234	2.65013	3.010045	3.73339
1.04E+10	2.054565	2.363748	2.77051	3.128951	3.710972
1.05E+10	2.063846	2.38802	2.790218	3.133555	3.74835
1.06E+10	2.081465	2.431095	2.763859	3.169765	3.692157
1.07E+10	2.089024	2.461535	2.695128	3.054559	3.645333
1.08E+10	2.060881	2.395406	2.561232	2.81748	3.558551
1.09E+10	2.034565	2.330237	2.538639	2.821741	3.508848
1.1E+10	2.031042	2.302964	2.615578	2.970169	3.483766
1.11E+10	2.024369	2.310564	2.73341	3.112289	3.484011
1.12E+10	2.03344	2.347159	2.787319	3.16246	3.478534
1.13E+10	2.075408	2.425748	2.783713	3.197156	3.468267
1.14E+10	2.073557	2.418261	2.623207	2.980755	3.397636
1.15E+10	2.046894	2.322166	2.417964	2.630142	3.340874
1.16E+10	2.031901	2.24195	2.353805	2.555617	3.281205
1.17E+10	2.033523	2.215314	2.447866	2.721046	3.2661
1.18E+10	2.057814	2.251873	2.60742	2.892076	3.281262
1.19E+10	2.044556	2.280059	2.657364	2.904643	3.347556
1.2E+10	2.061886	2.323256	2.587192	2.855806	3.484811
1.21E+10	2.064859	2.345582	2.461807	2.745011	3.615567
1.22E+10	2.041275	2.269281	2.292805	2.483052	3.517229
1.23E+10	2.040984	2.176869	2.215337	2.380501	3.379695
1.24E+10	2.111335	2.228764	2.398073	2.645469	3.22832
1.25E+10	2.103706	2.259018	2.550574	2.767912	3.232241
1.26E+10	2.077144	2.233432	2.508507	2.64111	3.346457
1.27E+10	2.066212	2.243198	2.434437	2.64273	3.477191
1.28E+10	2.060297	2.231329	2.319943	2.577275	3.541387
1.29E+10	2.058392	2.209107	2.264959	2.472925	3.480716
1.3E+10	2.068052	2.175348	2.271324	2.497121	3.312092
1.31E+10	2.128203	2.240665	2.481745	2.941464	3.194677
1.32E+10	2.115529	2.280401	2.719436	3.2845	3.161323
1.33E+10	2.046819	2.216792	2.778682	3.179832	3.199178
1.35E+10	2.025921	2.159134	2.75259	3.192834	3.238206
1.36E+10	2.024426	2.146261	2.698304	3.222187	3.267672
1.37E+10	2.033274	2.169929	2.63961	3.004049	3.283098

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
1.38E+10	2.07846	2.193709	2.543159	2.845589	3.213554
1.39E+10	2.089996	2.230104	2.554219	3.097125	3.135799
1.4E+10	2.100006	2.277972	2.648591	3.24451	3.11143
1.41E+10	2.084938	2.260209	2.712227	3.047685	3.084678
1.42E+10	2.033847	2.187687	2.68683	3.03417	3.092854
1.43E+10	2.016243	2.192372	2.757851	3.411924	3.120828
1.44E+10	2.013799	2.260331	2.872516	3.38995	3.182601
1.45E+10	2.019911	2.260255	2.767691	3.089071	3.187884
1.46E+10	2.046132	2.222569	2.61201	3.228403	3.135641
1.47E+10	2.088437	2.250318	2.633995	3.468521	3.053445
1.48E+10	2.100349	2.250955	2.649412	2.990655	3.007284
1.49E+10	2.091982	2.212689	2.606639	2.93889	3.016708
1.5E+10	2.091442	2.234404	2.714821	3.747549	3.064755
1.51E+10	2.103427	2.358081	3.009826	3.644999	3.072142
1.52E+10	2.127053	2.340522	2.877684	3.075965	3.096134
1.53E+10	2.197895	2.34592	2.754402	3.648836	3.091694
1.54E+10	2.174158	2.332499	2.698785	3.850231	2.960978
1.55E+10	2.154192	2.329312	2.697075	2.962574	2.863833
1.56E+10	2.065552	2.186709	2.511932	3.036595	2.953535
1.57E+10	2.031849	2.127874	2.495454	3.911448	2.972913
1.58E+10	2.109109	2.265388	2.748853	3.107764	2.948544
1.59E+10	2.106736	2.269747	2.691322	2.713706	3.013202
1.6E+10	2.167757	2.27422	2.583735	3.394126	2.974055
1.61E+10	2.156807	2.308202	2.641243	3.339891	2.80405
1.62E+10	2.06309	2.179599	2.501956	2.551512	2.753306
1.63E+10	2.012561	2.076257	2.408118	2.742804	2.815308
1.64E+10	2.020719	2.097889	2.493983	3.14552	2.846898
1.65E+10	2.054075	2.231994	2.747832	2.969601	2.88836
1.66E+10	2.124923	2.362029	2.901739	2.97766	2.992819
1.67E+10	2.101219	2.278885	2.665529	2.983682	3.008279
1.68E+10	2.048265	2.145087	2.437177	2.758753	2.813103
1.69E+10	1.99986	2.065827	2.344534	2.565986	2.713627
1.7E+10	2.042484	2.130845	2.4853	2.785683	2.738458
1.71E+10	2.082166	2.209606	2.712818	3.296828	2.759523
1.72E+10	2.104112	2.263865	2.8915	3.567651	2.732533
1.73E+10	2.171869	2.350886	3.026197	3.394222	2.765986
1.74E+10	2.19988	2.306365	2.79003	2.991923	2.818753
1.75E+10	2.088023	2.148646	2.46705	2.904745	2.794742
1.76E+10	2.045578	2.097941	2.389781	2.843009	2.730902
1.77E+10	2.1107	2.201506	2.644062	3.088464	2.711706
1.79E+10	2.164705	2.278096	2.905766	3.821577	2.712487
1.8E+10	2.141032	2.254075	2.956137	3.847082	2.688652
1.81E+10	2.238925	2.343223	3.010801	3.540622	2.681069
1.82E+10	2.295882	2.398154	2.953951	3.562083	2.728518
1.83E+10	2.20916	2.261435	2.620714	3.251852	2.769154

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
1.84E+10	2.192255	2.151942	2.405465	2.870944	2.716247
1.85E+10	2.268854	2.267039	2.655483	3.665697	2.666407
1.86E+10	2.298349	2.311145	2.78612	3.841934	2.610745
1.87E+10	2.39355	2.354776	2.864796	3.511165	2.576586
1.88E+10	2.378547	2.376072	2.851858	3.593676	2.561697
1.89E+10	2.327683	2.356884	2.766206	3.665946	2.621501
1.9E+10	2.23146	2.237608	2.585495	3.021897	2.720544
1.91E+10	2.146803	2.093438	2.400555	3.073729	2.740159
1.92E+10	2.217102	2.128368	2.452349	3.528421	2.658399
1.93E+10	2.258409	2.19568	2.529044	3.115198	2.581306
1.94E+10	2.285633	2.21014	2.458104	2.903043	2.518189
1.95E+10	2.301429	2.166258	2.317318	3.033727	2.499508
1.96E+10	2.274561	2.193888	2.37554	2.877208	2.544541
1.97E+10	2.27816	2.191926	2.426645	2.673342	2.660058
1.98E+10	2.217488	2.134241	2.436775	3.271894	2.690134
1.99E+10	2.200042	2.107946	2.41991	3.570864	2.596044
2E+10	2.235281	2.136855	2.374551	2.729802	2.504664

Table 7. Dielectric Constant for the Melton Valley Simulant

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.53E+08	226.284627	289.1865115	350.794242	402.1176815	420.320315
2.55E+08	129.678184	157.961016	185.854052	208.29391	211.0737625
3.58E+08	98.542862	115.1013925	131.923054	145.325015	144.580243
4.6E+08	86.4504105	98.224947	111.003729	121.7433075	121.5397275
5.62E+08	76.4828185	84.2510495	93.1290735	100.6355505	99.2436225
6.65E+08	72.7809015	79.232699	86.9261535	94.175106	93.492661
7.67E+08	69.0109085	74.3441315	80.986949	87.561319	87.115834
8.69E+08	65.96654	70.235168	75.8468285	81.5865755	80.9788685
9.71E+08	64.0979035	67.5832205	72.610267	78.0140155	77.600886
1.07E+09	62.5732295	65.234074	69.4615625	74.1735625	73.413048
1.18E+09	61.3400225	63.493734	67.326427	71.5004985	70.687202
1.28E+09	59.74618	61.282307	64.356811	67.925794	66.834043
1.38E+09	59.346614	60.7353635	63.754012	67.2862595	66.4242385
1.48E+09	58.3203945	59.5330875	62.311613	65.8323695	65.01978
1.59E+09	57.88326	58.9747355	61.6320355	64.770446	63.979277
1.69E+09	57.382015	58.2747105	60.7630585	63.8222275	62.993135
1.79E+09	57.163073	57.8729625	60.1998315	63.3197385	62.6364705
1.89E+09	56.664371	57.1026475	59.0026295	61.5346525	60.503361
1.99E+09	56.3599675	56.6935525	58.5076295	60.8922105	59.8940135
2.1E+09	56.001856	56.2595185	57.853048	60.190184	59.1534935
2.2E+09	55.49141	55.6971425	57.2537135	59.4309025	58.371357
2.3E+09	55.253236	55.519064	57.2381395	59.451753	58.5222045
2.4E+09	55.069104	55.1956545	56.7569555	58.7299815	57.594322
2.51E+09	54.6978975	54.626067	55.969489	57.7683285	56.48895
2.61E+09	54.372726	54.230067	55.5042285	57.2417915	55.8636215
2.71E+09	54.0035525	53.8552385	55.005364	56.6306225	55.191308
2.81E+09	53.7783905	53.7217195	54.8885295	56.526649	55.0896255
2.92E+09	53.5467495	53.541547	54.58997	56.0990755	54.5114545
3.02E+09	53.324824	53.495742	54.3139345	55.7825365	54.197182
3.12E+09	53.0103985	53.0789535	53.8280205	55.1223435	53.385103
3.22E+09	52.7809315	52.780253	53.4014475	54.6297155	52.8402905
3.32E+09	52.5833745	52.4467775	52.907003	53.8946715	51.9749795
3.43E+09	52.3684385	52.27907	52.7551175	53.8017875	51.979221
3.53E+09	52.1566145	52.1164125	52.6509605	53.803949	52.0999985
3.63E+09	52.0639975	52.099671	52.6129005	53.755536	52.0734495
3.73E+09	51.926698	51.8600575	52.3072045	53.254202	51.504781
3.84E+09	51.789805	51.708975	52.165887	53.0592065	51.262713
3.94E+09	51.647537	51.578441	52.032031	53.031858	51.297843
4.04E+09	51.4905395	51.480963	51.92854	52.828363	51.124935
4.14E+09	51.3011725	51.2809755	51.635845	52.3912565	50.6292875
4.25E+09	51.1096085	51.088657	51.474704	52.314319	50.591758
4.35E+09	50.890476	50.850233	51.2312035	52.01775	50.336315
4.45E+09	50.6054635	50.446558	50.6659465	51.17102	49.3277225

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
4.55E+09	50.3547045	50.122145	50.1993265	50.5789215	48.5887645
4.65E+09	50.154047	49.928896	50.0201435	50.4542745	48.5487795
4.76E+09	49.8923785	49.6574605	49.6534195	49.921958	47.857613
4.86E+09	49.737746	49.5192255	49.4474805	49.646999	47.5308415
4.96E+09	49.451292	49.2273735	49.1807125	49.340815	47.219416
5.06E+09	49.1738285	48.9976805	49.0028395	49.127171	46.9781125
5.17E+09	48.981889	48.782711	48.646413	48.6466655	46.2899115
5.27E+09	48.7200335	48.5153365	48.3057135	48.285619	45.9401895
5.37E+09	48.536652	48.3643495	48.1447745	48.093928	45.7618355
5.47E+09	48.3177035	48.2273385	48.0898335	48.072086	45.6747125
5.57E+09	48.106314	48.001133	47.7752615	47.530954	44.9753685
5.68E+09	47.8589965	47.7593905	47.5211905	47.254898	44.6460255
5.78E+09	47.5845295	47.4378675	47.184561	46.7745585	43.960672
5.88E+09	47.383617	47.3330825	47.17352	46.922175	44.184066
5.98E+09	47.2220265	47.1976145	47.007544	46.633304	43.8377245
6.09E+09	47.0162135	47.022627	46.818217	46.5077875	43.7164165
6.19E+09	46.819989	46.8171145	46.6423185	46.358019	43.54929
6.29E+09	46.5850475	46.652395	46.6096575	46.3015125	43.494516
6.39E+09	46.2718555	46.3203075	46.223353	45.750064	42.758854
6.5E+09	46.055378	46.160682	46.165176	45.8285225	42.986341
6.6E+09	45.796351	45.9761	46.0188445	45.6269305	42.7106925
6.7E+09	45.600254	45.7803355	45.7538285	45.4065515	42.464706
6.8E+09	45.433247	45.5456235	45.3566855	44.9266585	41.9251225
6.9E+09	45.207451	45.235087	45.0033735	44.5116645	41.4241745
7.01E+09	44.977528	44.996676	44.7532515	44.239718	41.089033
7.11E+09	44.6658725	44.6096875	44.2650815	43.6153395	40.365899
7.21E+09	44.4987955	44.5104635	44.139644	43.5487445	40.387024
7.31E+09	44.291216	44.3635565	43.9901635	43.4005405	40.1998335
7.42E+09	44.0315125	44.0396875	43.637056	42.9933185	39.687693
7.52E+09	43.8036845	43.8078575	43.362273	42.6157165	39.300449
7.62E+09	43.6033505	43.654117	43.21369	42.4550765	39.2174255
7.72E+09	43.430468	43.620049	43.3164925	42.693318	39.479333
7.83E+09	43.2416765	43.51742	43.2692935	42.5487925	39.296217
7.93E+09	43.0760985	43.397999	43.1625765	42.4272025	39.147978
8.03E+09	42.8973985	43.308398	43.0932205	42.4439955	39.1877075
8.13E+09	42.618038	42.901268	42.555945	41.591616	38.0410955
8.23E+09	42.408141	42.5944395	42.2171635	41.2883195	37.832554
8.34E+09	42.1805525	42.3822785	41.9747165	41.0023985	37.5508455
8.44E+09	42.012802	42.2958425	41.8494065	40.8758665	37.4369465
8.54E+09	41.8930675	42.2709595	41.989339	41.170384	37.9159065
8.64E+09	41.748793	42.293584	42.1454725	41.3464305	38.1122505
8.75E+09	41.6272645	42.215182	42.0696985	41.2128215	37.990492
8.85E+09	41.457685	42.018922	41.856229	40.980883	37.746251
8.95E+09	41.1858165	41.6970415	41.4968475	40.4967795	37.153109
9.05E+09	41.0160385	41.5227045	41.311369	40.4071545	37.195388

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
9.16E+09	40.920965	41.7296015	41.782039	41.0776775	37.9849245
9.26E+09	40.683689	41.4878815	41.559404	40.7274485	37.515829
9.36E+09	40.606118	41.490194	41.6964765	41.0286845	38.086384
9.46E+09	40.476574	41.497618	41.7301005	40.9804925	37.97751
9.56E+09	40.316617	40.9962115	40.8547245	39.9689655	36.898724
9.67E+09	40.1763505	40.8006255	40.701529	39.9479755	37.104283
9.77E+09	39.9215215	40.54475	40.464003	39.619922	36.6533845
9.87E+09	39.868749	40.5915665	40.6346815	40.010053	37.2883515
9.97E+09	39.702447	40.5999365	40.822299	40.2033955	37.4795745
1.01E+10	39.570322	40.635378	40.903147	40.2172765	37.413521
1.02E+10	39.537791	40.5019235	40.620078	40.055489	37.322079
1.03E+10	39.4018745	40.299701	40.248361	39.7073305	37.0323375
1.04E+10	39.2531785	40.0667515	39.938067	39.3355045	36.6852625
1.05E+10	39.1578665	40.0755005	40.175439	39.619577	37.1154535
1.06E+10	39.028608	40.35936	40.722305	40.2005735	37.6491665
1.07E+10	38.9263375	40.434921	40.6994135	40.029024	37.273943
1.08E+10	38.8541905	40.308754	40.3249705	39.600972	36.7341995
1.09E+10	38.737612	39.930404	39.702699	38.895595	35.988027
1.1E+10	38.617183	39.633653	39.353129	38.670649	35.93143
1.11E+10	38.4936295	39.707393	39.70269	39.1419045	36.6558475
1.12E+10	38.350204	39.9149355	40.2892525	39.843881	37.4284785
1.13E+10	38.212317	39.964626	40.5887165	40.076535	37.5634515
1.14E+10	38.0972955	39.871551	40.3769825	39.763291	37.1939055
1.15E+10	38.0191255	39.6513365	39.960809	39.435189	36.916504
1.16E+10	37.9357295	39.506334	39.705351	39.3168675	36.918079
1.17E+10	37.8474035	39.5923005	40.0577435	39.780226	37.479965
1.18E+10	37.692489	39.716502	40.537161	40.3586875	38.172911
1.19E+10	37.606451	39.689502	40.501842	40.285644	38.1157105
1.2E+10	37.4716115	39.635034	40.4367455	40.1124035	37.768129
1.21E+10	37.3570095	39.214394	39.667088	39.138317	36.6484705
1.22E+10	37.289768	38.8168765	38.868354	38.4695225	36.0795425
1.23E+10	37.194426	38.5964345	38.571213	38.468578	36.292764
1.24E+10	37.0867825	38.9759505	39.625499	39.5757265	37.4278765
1.25E+10	36.9586775	39.086205	39.997531	39.8311645	37.553565
1.26E+10	36.8680005	39.170959	39.992323	39.8752545	37.570538
1.27E+10	36.715733	38.998555	39.780042	39.5602005	37.082786
1.28E+10	36.643625	38.7491685	39.352364	39.175045	36.6593395
1.29E+10	36.5627805	38.6809795	39.194422	39.0094335	36.644029
1.3E+10	36.4272915	38.4535415	38.996957	38.971767	36.629486
1.31E+10	36.2924915	38.571246	39.4131965	39.4061455	37.043734
1.32E+10	36.078347	38.2749005	39.110876	38.8594645	36.3682135
1.33E+10	35.9869845	38.07792	38.6284785	38.2249415	35.680271
1.35E+10	35.9388095	37.974456	38.2521435	38.017992	35.513357
1.36E+10	35.891338	37.9230415	38.2522085	38.1211655	35.662049
1.37E+10	35.728053	37.6167535	38.019358	37.74063	35.1898265

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.38E+10	35.640818	37.671178	38.187611	37.9867085	35.599704
1.39E+10	35.4766775	37.5584835	38.184864	38.0456785	35.5667565
1.4E+10	35.3684655	37.6329105	38.3388915	38.0514495	35.6127945
1.41E+10	35.2211225	37.681198	38.582789	38.072689	35.5459305
1.42E+10	35.15219	37.7462285	38.6584335	38.2377835	35.7661845
1.43E+10	35.068548	37.8954935	38.932999	38.812246	36.438164
1.44E+10	34.979645	37.7856905	38.91477	38.774877	36.270243
1.45E+10	34.8163095	37.3284065	38.3294505	38.049836	35.631641
1.46E+10	34.6768815	37.0724765	38.018896	37.9406865	35.7138425
1.47E+10	34.525713	37.076221	38.2003025	38.1989855	35.890162
1.48E+10	34.442929	37.050213	38.311557	37.9219225	35.497289
1.49E+10	34.384114	37.057637	38.333176	38.0204405	35.6740635
1.5E+10	34.2994445	37.2194245	38.538278	38.742949	36.7418255
1.51E+10	34.07215	36.758114	38.0447285	38.3187765	36.27118
1.52E+10	34.0068575	36.554422	37.6901445	37.9701035	36.0410165
1.53E+10	33.8004345	36.1891815	37.527666	37.447627	35.855807
1.54E+10	33.7582145	36.3116405	37.472181	37.4722595	35.650866
1.55E+10	33.8065225	36.829638	38.28679	38.1564925	36.2752315
1.56E+10	33.783376	36.4061385	37.1794255	36.915044	34.9758275
1.57E+10	33.5801305	35.6989275	35.800995	35.9994495	33.958368
1.58E+10	33.318424	35.167092	35.4672945	35.8007	33.969133
1.59E+10	33.309402	35.3864325	36.0047735	36.2026435	34.359161
1.6E+10	33.178107	35.2059205	35.924308	35.907975	34.1816965
1.61E+10	33.120509	36.0293275	37.4204185	37.4891445	35.8618265
1.62E+10	33.136745	36.301926	37.7792645	38.390407	36.794499
1.63E+10	32.986218	35.8305635	36.8466335	37.0346005	35.0544685
1.64E+10	32.8033015	35.247271	35.8113695	35.594551	33.418066
1.65E+10	32.745125	35.4748865	36.4731785	36.856266	34.788243
1.66E+10	32.6692655	35.8434155	37.2380875	37.608074	35.4696545
1.67E+10	32.5140645	35.566296	36.6943125	36.5508615	34.2414025
1.68E+10	32.411453	35.7546225	37.4739985	37.998034	36.1437305
1.69E+10	32.398328	35.866807	37.9701985	38.5797265	36.7041015
1.7E+10	32.2038175	34.608534	35.379005	35.1033365	32.6261985
1.71E+10	32.1005525	34.265526	35.0285055	35.1023585	33.0760815
1.72E+10	32.074206	35.3069765	37.4215415	38.053713	36.552113
1.73E+10	31.8920115	35.2741135	37.2710445	37.4149355	35.4056555
1.74E+10	31.784891	35.266147	37.3880995	37.4736905	35.7061875
1.75E+10	31.727939	35.930925	38.947529	39.729374	38.195188
1.76E+10	31.5627845	35.784214	38.6704415	39.2020885	37.031418
1.77E+10	31.456903	34.6041755	36.264616	36.064735	33.78321
1.79E+10	31.345821	34.808771	36.752692	37.2368935	35.454631
1.8E+10	31.194439	34.990013	37.441309	38.171528	36.348347
1.81E+10	31.2185755	34.9455045	37.3339635	37.541423	35.7458045
1.82E+10	31.0250125	34.548917	36.600683	36.8805885	35.1520575
1.83E+10	30.87671	34.800919	37.4642225	38.171779	36.6982745

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.84E+10	30.7235805	34.005236	36.211172	36.6850275	35.126089
1.85E+10	30.6954105	33.9459365	35.9226975	36.0695605	34.325044
1.86E+10	30.514308	33.7390445	35.546447	36.0526285	34.7771035
1.87E+10	30.303802	34.077603	36.409933	37.3229015	36.0704265
1.88E+10	30.175467	33.553671	35.9921505	36.422894	34.939754
1.89E+10	30.2568135	34.0761785	36.348832	36.472267	34.9983855
1.9E+10	30.0982295	33.7848545	35.654122	36.0215905	34.3375155
1.91E+10	29.948813	32.826258	34.12345	34.391367	32.643946
1.92E+10	29.872373	32.174747	32.9472165	33.042409	31.395252
1.93E+10	29.697583	32.3036215	33.115594	33.252554	31.6305785
1.94E+10	29.4085835	31.8210315	32.7852135	33.0538325	31.5875635
1.95E+10	29.4971795	32.4551395	33.785778	34.329275	32.880644
1.96E+10	29.424031	32.633071	34.1543085	34.2625395	32.613666
1.97E+10	29.3427325	32.9344965	34.5617965	34.664196	33.059955
1.98E+10	29.312059	33.27515	35.3702585	35.694499	33.99301
1.99E+10	29.1769495	33.2125745	35.624734	35.8523855	34.172358
2E+10	29.015792	32.612379	34.5908585	34.5528005	32.7210825

Table 8. Dielectric Loss for Melton Valley Simulant

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
153000000	1686.8404	2301.35863	2978.855237	3775.16588	4405.00723
255300000	1030.10501	1405.74631	1817.063458	2299.939514	2679.994357
357600000	746.562488	1019.1009	1316.346262	1663.768024	1936.204733
459900000	584.622715	797.772653	1029.301126	1300.42541	1511.995314
562200000	482.318702	656.529291	846.7118855	1068.896242	1243.030696
664500000	409.450438	558.142783	719.328945	907.910364	1055.781923
766800000	356.338609	485.472918	625.627072	789.357545	918.159178
869100000	316.055217	430.522257	554.580009	699.3867065	813.6271215
971400000	283.386352	385.882473	497.058261	627.084436	729.360017
1073700000	257.750372	350.70919	451.7419365	569.83331	662.3650935
1176000000	236.077293	320.778571	413.2610585	520.870636	605.078796
1278300000	218.222669	296.28909	381.6807465	481.0013505	558.5140445
1380600000	202.585582	274.58263	353.5718155	445.1596695	516.677829
1482900000	189.368912	256.437301	330.270403	415.9341705	482.693317
1585200000	177.987218	240.823834	310.2250075	390.3865585	453.2194785
1687500000	167.228539	226.07232	291.1883745	366.2361715	425.3120015
1789800000	158.580295	214.11832	275.8134015	346.635619	402.573711
1892100000	150.755495	203.263107	261.9308295	328.878005	382.2378935
1994400000	143.921408	193.709976	249.5822065	313.112565	363.5191725
2096700000	137.151784	184.226577	237.296185	297.4595155	344.9928455
2199000000	131.569379	176.431907	227.1805465	284.630047	329.6523205
2301300000	126.392573	169.260804	218.0608775	273.3387005	316.3542815
2403600000	121.720588	162.829895	209.8401105	262.9914705	303.833414
2505900000	117.400078	156.673329	201.6713395	252.540526	291.205069
2608200000	113.155535	150.655296	194.0287145	243.045358	279.8746085
2710500000	109.466964	145.387635	187.1172695	234.2682475	269.793242
2812800000	106.027852	140.53523	180.7277665	226.227977	260.6682885
2915100000	102.867091	136.066732	175.0459085	219.051629	252.6681485
3017400000	99.989674	131.718523	169.7069155	212.2676885	245.0173555
3119700000	97.284159	127.933556	164.7064995	205.917241	237.7843205
3222000000	94.6948985	124.223588	159.864766	199.6985065	230.7426515
3324300000	92.2600955	120.677021	155.139304	193.5431885	223.4899345
3426600000	89.9637965	117.308697	150.5990505	187.833362	216.8143515
3528900000	87.8377995	114.21225	146.4641055	182.531341	210.5092695
3631200000	85.8389965	111.453333	142.9203025	178.1387525	205.3923235
3733500000	84.0681125	108.881135	139.4375455	173.656058	200.062063
3835800000	82.398221	106.455639	136.2044775	169.4276325	195.1039595
3938100000	80.765299	104.101506	133.0038435	165.3607825	190.3232865
4040400000	79.259279	101.851416	130.06456	161.693469	186.094849
4142700000	77.944971	99.91847	127.3536165	158.264846	181.9274865
4245000000	76.6730665	97.999394	124.668971	154.9782795	177.9806295
4347300000	75.409305	96.2222465	122.226436	152.155503	174.6150465
4449600000	74.189159	94.446415	119.797908	149.100075	171.0278825

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
4551900000	73.0744435	92.779998	117.3979935	146.1174095	167.777293
4654200000	71.9888275	91.10084	115.0610585	143.1627675	164.905399
4756500000	70.8243555	89.410038	112.843687	140.4289485	162.1326285
4858800000	69.86246	87.963301	110.835143	137.895725	159.408705
4961100000	68.921881	86.539119	108.749491	135.273793	156.4310775
5063400000	68.02404	85.2122665	106.903546	132.8919245	153.6181415
5165700000	67.2235045	84.050941	105.3321785	130.874958	151.3135775
5268000000	66.25665	82.5891235	103.279399	128.01114	147.799933
5370300000	65.477248	81.472803	101.7183825	125.91997	145.382287
5472600000	64.700513	80.33644	100.2072285	123.9978395	143.24047
5574900000	63.8947175	79.213252	98.702266	122.0021635	140.8459515
5677200000	63.200133	78.133749	97.14855	120.048954	138.5093985
5779500000	62.47283	77.044293	95.5855795	117.8252285	135.846556
5881800000	61.8066935	76.0153755	94.195693	116.044467	133.899374
5984100000	61.177259	75.0291705	92.8243445	114.295311	131.849351
6086400000	60.537315	73.988614	91.3372025	112.299594	129.4707725
6188700000	59.9668285	73.050426	89.843621	110.441225	127.3616455
6291000000	59.405691	72.0625765	88.4209645	108.666996	125.403321
6393300000	58.8861125	71.1852505	87.13079	106.8176485	123.200691
6495600000	58.312611	70.2491175	85.7437705	105.0326795	121.234189
6597900000	57.740205	69.492633	84.793496	103.8009995	119.824295
6700200000	57.2368845	68.721078	83.7488495	102.3712725	118.292597
6802500000	56.751368	68.002192	82.66722	101.004803	116.7118055
6904800000	56.2525955	67.200376	81.4119625	99.31981	114.8478465
7007100000	55.8164835	66.450653	80.298848	97.9485675	113.2746125
7109400000	55.381916	65.7777335	79.339037	96.6255545	111.6913175
7211700000	54.891119	65.0496115	78.3841965	95.3043705	110.1745705
7314000000	54.472292	64.4588475	77.5383815	94.206479	108.979958
7416300000	53.997141	63.775787	76.579526	92.934423	107.4708775
7518600000	53.5179985	63.0289255	75.552665	91.605004	105.8887055
7620900000	53.117347	62.3494685	74.5175635	90.2657865	104.3390565
7723200000	52.755114	61.7580725	73.6930725	89.2536405	103.1389925
7825500000	52.3605885	61.3051215	73.1112695	88.4586625	102.197704
7927800000	51.9963145	60.8167235	72.5005285	87.5729	101.0712835
8030100000	51.594834	60.240029	71.656564	86.5181285	99.8782425
8132400000	51.2272375	59.8778895	71.0953815	85.742544	98.768181
8234700000	50.778203	59.153946	70.021773	84.2501065	96.955623
8337000000	50.418113	58.545501	69.1515825	83.2394315	95.7568485
8439300000	50.030117	57.956646	68.2616635	82.1125715	94.2819425
8541600000	49.6942885	57.4090175	67.4332355	80.9354725	92.8567625
8643900000	49.352759	56.9552455	66.8571445	80.326297	92.0550455
8746200000	49.0163345	56.5049775	66.2764185	79.4352235	90.9292005
8848500000	48.7293365	56.0720955	65.609439	78.600002	89.8461535
8950800000	48.4126095	55.653982	64.968794	77.756876	88.607179
9053100000	48.0528635	54.942758	63.9350725	76.340285	86.919176

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
9155400000	47.7817555	54.438356	63.1984765	75.59373	86.233947
9257700000	47.4216395	54.029709	62.5705645	74.588209	84.792367
9360000000	47.1978145	53.6413345	62.054364	73.857678	83.946747
9462300000	46.9256015	53.380457	61.8352475	73.7063215	83.7612845
9564600000	46.6772535	52.903013	60.9927705	72.560945	82.195014
9666900000	46.3430485	52.214028	59.9293415	71.231194	80.5081635
9769200000	46.1181995	51.791312	59.080294	70.37654	79.438207
9871500000	45.8291525	51.111382	58.147176	69.118954	77.974585
9973800000	45.5892525	50.735981	57.5023255	68.3719375	77.137473
1.0076E+10	45.3178745	50.6015285	57.481966	68.229676	76.9596095
1.0178E+10	45.1238705	50.323136	57.2266625	67.757069	76.3518
1.0281E+10	44.8857615	49.821605	56.5300355	66.9200035	75.4464245
1.0383E+10	44.6498985	49.3729075	55.7579925	65.911532	74.1829755
1.0485E+10	44.429739	48.950563	55.1002565	65.0515075	73.1357985
1.0588E+10	44.249264	48.8383205	55.172668	65.1640925	73.3693245
1.069E+10	44.0485925	49.035077	55.8015405	65.779968	73.9258445
1.0792E+10	43.866948	49.0302145	55.955011	65.7920725	73.850115
1.0895E+10	43.699209	48.826847	55.58115	65.1822195	73.008824
1.0997E+10	43.4631815	48.116916	54.4659425	63.779891	71.347075
1.1099E+10	43.2899645	47.5059105	53.477937	62.679588	70.142272
1.1201E+10	43.0670195	47.128478	52.9210285	61.9610555	69.3729725
1.1304E+10	42.8852745	47.0677725	53.039871	61.974201	69.229228
1.1406E+10	42.725993	47.090748	53.2467515	62.032774	69.184637
1.1508E+10	42.547515	46.7593515	52.6940195	61.238299	68.2852455
1.1611E+10	42.4302845	46.3144135	51.7736825	60.1754905	67.189252
1.1713E+10	42.307771	45.8555015	50.8258605	59.185938	66.2033585
1.1815E+10	42.199834	45.437789	50.1775125	58.3954545	65.434482
1.1918E+10	41.914635	45.323617	50.2663865	58.3250515	65.1764965
1.202E+10	41.7572905	45.3789	50.54529	58.537571	65.376399
1.2122E+10	41.579003	45.3637135	50.722762	58.458194	65.063183
1.2224E+10	41.4060295	44.851593	49.8314265	57.330056	63.6790175
1.2327E+10	41.2229505	43.9242335	47.887402	55.22695	61.6340585
1.2429E+10	41.176539	43.606845	47.133411	54.675051	61.290897
1.2531E+10	41.0073905	43.516818	47.239397	54.684889	61.229449
1.2634E+10	40.877285	43.567395	47.5333235	54.7155185	61.4611975
1.2736E+10	40.712007	43.703643	48.07816	55.137146	61.7172275
1.2838E+10	40.5510085	43.4284595	47.7177465	54.576931	61.077768
1.2941E+10	40.4596745	43.1291755	47.116913	53.837304	60.358374
1.3043E+10	40.3404805	42.672423	46.1970435	52.766949	59.30986
1.3145E+10	40.274495	42.538128	45.7802775	52.51485	59.1714805
1.3247E+10	40.13522	42.5144105	45.826104	52.4081585	58.9184535
1.335E+10	40.0135065	42.640444	46.306938	52.570462	58.8790095
1.3452E+10	39.880635	42.521591	46.146235	52.299595	58.4815285
1.3554E+10	39.7544475	42.302852	45.7800285	51.9364985	58.146453
1.3657E+10	39.696255	42.093755	45.4749465	51.5984485	57.7091125

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.3759E+10	39.5473175	41.548833	44.545119	50.5476215	56.629771
1.3861E+10	39.437743	41.496254	44.44537	50.390723	56.4558895
1.3964E+10	39.3494945	41.5695015	44.6218205	50.701304	56.735248
1.4066E+10	39.20688	41.600588	44.917681	50.872926	56.7680765
1.4168E+10	39.071776	41.5473785	45.0347655	50.72254	56.4907235
1.427E+10	39.014464	41.523699	45.037794	50.903111	56.6710535
1.4373E+10	38.9547985	41.432133	44.888724	50.9186355	56.7580105
1.4475E+10	38.84014	40.960103	44.105589	49.810568	55.4614495
1.4577E+10	38.6862425	40.2557855	42.7528145	48.135537	53.54083
1.468E+10	38.6849285	40.3412195	42.6376625	48.159772	53.6491735
1.4782E+10	38.568468	40.32952	42.80468	48.302962	53.663413
1.4884E+10	38.479311	39.9653095	42.1986815	47.2797365	52.4133985
1.4987E+10	38.38024	39.6243335	41.688659	46.580745	51.939993
1.5089E+10	38.340339	39.3853165	41.185956	46.3246805	51.587228
1.5191E+10	38.293062	38.819218	39.93705	44.9388865	50.1843265
1.5293E+10	38.0766655	37.9483045	38.4018165	42.863282	47.7783655
1.5396E+10	38.0206595	38.220589	38.8499715	43.3046105	48.043749
1.5498E+10	38.022621	38.870092	40.1101025	44.5020455	49.259868
1.56E+10	38.033785	39.480637	41.257279	45.6202985	50.128123
1.5703E+10	37.957574	39.192448	40.664144	45.0208965	49.563779
1.5805E+10	37.8638945	38.437049	39.191203	43.639771	48.175839
1.5907E+10	37.8127505	38.069257	38.5903685	43.278885	47.8797715
1.601E+10	37.6513	37.226087	37.3050795	41.3203475	45.6858885
1.6112E+10	37.6074705	37.7463765	38.2050915	41.7900245	46.0050305
1.6214E+10	37.5590035	38.5140055	39.7959635	43.8387865	48.3213115
1.6316E+10	37.520686	39.071884	40.786457	45.504856	50.2230885
1.6419E+10	37.419724	38.6273495	39.869435	44.137497	48.416701
1.6521E+10	37.3263825	38.0565275	38.955575	43.0192135	47.4503975
1.6623E+10	37.327448	38.0841585	38.983224	43.5365255	48.2696015
1.6726E+10	37.2349285	37.9740965	38.9907425	42.9073295	47.3120365
1.6828E+10	37.156741	37.834282	38.775445	42.049043	46.5778055
1.693E+10	37.028155	38.571141	40.47077	44.728922	49.775089
1.7033E+10	36.997882	38.4061085	40.0925455	44.342272	48.9526865
1.7135E+10	36.922015	37.1777465	37.5360315	40.920894	45.2219065
1.7237E+10	36.738983	36.5159325	36.2790125	40.2683745	44.8358365
1.7339E+10	36.7925475	37.021576	37.390164	41.727385	46.4858755
1.7442E+10	36.6571035	36.425108	36.590812	39.946544	44.3819635
1.7544E+10	36.533629	36.949919	37.3856165	41.2538855	46.0574
1.7646E+10	36.4858415	37.866231	39.842977	44.5012215	49.67098
1.7749E+10	36.4276095	37.582617	39.194319	43.0702845	47.5526855
1.7851E+10	36.3535025	36.5170265	36.7862135	40.3530735	44.77441
1.7953E+10	36.355063	36.5663385	37.0050255	40.957997	45.6223915
1.8056E+10	36.3051595	36.183216	36.225447	40.1128845	44.634502
1.8158E+10	36.1935755	35.7498415	35.5278105	38.639998	42.8260125
1.826E+10	36.124892	35.812143	35.673659	38.8834635	43.2868265

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.8362E+10	35.873687	35.30067	35.0484655	38.639238	42.8147335
1.8465E+10	35.938487	35.3899325	34.8475955	38.238361	42.3747495
1.8567E+10	35.8841105	34.377546	32.962928	35.723453	39.638594
1.8669E+10	35.981172	34.438728	32.18468	35.3022855	39.5014785
1.8772E+10	35.8998765	34.956308	33.610333	36.7067755	40.9213715
1.8874E+10	35.8252265	35.2602195	34.7061955	37.499876	41.593233
1.8976E+10	35.771363	35.9259045	35.961681	38.6958595	42.8102455
1.9079E+10	35.68458	36.098316	36.2590595	39.216022	43.097517
1.9181E+10	35.7609275	35.632506	35.191888	38.1513825	41.71753
1.9283E+10	35.7781495	35.2756745	34.380361	37.0945725	40.682947
1.9385E+10	35.677617	34.9658825	33.4441665	36.0481675	39.4398415
1.9488E+10	35.6956815	34.7843505	33.1480705	36.0464065	39.5988565
1.959E+10	35.553893	35.1509765	34.6668295	37.5424865	41.2146265
1.9692E+10	35.4270055	34.9861805	34.568241	37.344606	40.9323715
1.9795E+10	35.387861	35.4308015	35.1714915	37.9962145	41.754264
1.9897E+10	35.3616915	35.576539	35.5061	38.538672	42.223024
1.9999E+10	35.2573945	35.449758	35.6541845	38.4532615	41.792081

Table 9. Loss Tangent for Melton Valley Simulant

Frequency	e"/e' @ 20 C	e"/e' @ 40 C	e"/e' @ 60 C	e"/e' @ 80 C	e"/e' @ 100 C
1.53E+08	7.454507306	7.958042794	8.491744972	9.388211594	10.48011974
2.55E+08	7.943549001	8.899324324	9.776829953	11.04179913	12.69695639
3.58E+08	7.576017916	8.853940633	9.978136698	11.44860039	13.39190399
4.6E+08	6.762520983	8.121894461	9.272671601	10.68169936	12.44033819
5.62E+08	6.306235982	7.792535463	9.09181047	10.62145769	12.52504357
6.65E+08	5.625795086	7.044348988	8.275172845	9.640661981	11.29267165
7.67E+08	5.163511345	6.530077199	7.725035697	9.014911539	10.53952119
8.69E+08	4.791144367	6.129724877	7.311841773	8.572325805	10.04740047
9.71E+08	4.421148525	5.709737863	6.84556443	8.038099718	9.398861979
1.07E+09	4.119179625	5.376165683	6.503480778	7.682431459	9.022443715
1.18E+09	3.848666554	5.052129561	6.138170061	7.28485321	8.55994832
1.28E+09	3.652495758	4.834822708	5.930697009	7.08127682	8.356729885
1.38E+09	3.413599662	4.520967912	5.545875536	6.615907509	7.778453177
1.48E+09	3.247044428	4.307475251	5.300302578	6.3180799	7.423791914
1.59E+09	3.074934238	4.083508497	5.033502544	6.027232829	7.083848079
1.69E+09	2.914302312	3.879424154	4.792194167	5.73837965	6.751719874
1.79E+09	2.774173714	3.69979884	4.581630789	5.474369086	6.427145524
1.89E+09	2.660498861	3.559609158	4.439307735	5.344598395	6.317630743
1.99E+09	2.553610557	3.416790225	4.265806163	5.142079133	6.06937407
2.1E+09	2.449057831	3.274585029	4.101705843	4.941993789	5.832163497
2.2E+09	2.370986401	3.167701225	3.967961772	4.789260049	5.647501402
2.3E+09	2.2875144	3.048697003	3.809712884	4.597655859	5.405713681
2.4E+09	2.210324468	2.950049166	3.697169953	4.477976389	5.27540569
2.51E+09	2.14633621	2.868105606	3.603237105	4.371608675	5.155080224
2.61E+09	2.081108367	2.778076892	3.495746536	4.245942547	5.009961778
2.71E+09	2.027032638	2.699600606	3.401800404	4.136776838	4.888328467
2.81E+09	1.971569826	2.615985319	3.292632689	4.002147323	4.731712843
2.92E+09	1.92107069	2.541329857	3.206558064	3.904727967	4.635138629
3.02E+09	1.875105561	2.462224433	3.124555734	3.805271359	4.520850466
3.12E+09	1.835190109	2.410250147	3.059865438	3.735640176	4.454132467
3.22E+09	1.794111923	2.353599707	2.993641062	3.655492339	4.366793773
3.32E+09	1.754548779	2.300942522	2.932301873	3.591137734	4.299952336
3.43E+09	1.717901069	2.243894096	2.854681359	3.491210436	4.171173545
3.53E+09	1.684116202	2.191483336	2.78179361	3.392526839	4.040485136
3.63E+09	1.648720817	2.139232943	2.71644979	3.313868036	3.944281116
3.73E+09	1.618976668	2.099518199	2.665742642	3.26088931	3.88433965
3.84E+09	1.591012382	2.058745875	2.610987473	3.193180669	3.805962425
3.94E+09	1.563778327	2.018314319	2.556191656	3.118140468	3.710161585
4.04E+09	1.539297894	1.978428715	2.504683552	3.060732149	3.640001674
4.14E+09	1.51936042	1.948451039	2.466380021	3.020825546	3.593325039
4.25E+09	1.500169317	1.91822216	2.421946341	2.962444747	3.517976772
4.35E+09	1.481796024	1.892267563	2.38578108	2.925068904	3.468967613
4.45E+09	1.466030619	1.872207317	2.364466003	2.913760074	3.467175735

Frequency	e''/e' @ 20 C	e''/e' @ 40 C	e''/e' @ 60 C	e''/e' @ 80 C	e''/e' @ 100 C
4.55E+09	1.451193969	1.851077962	2.338636824	2.888899272	3.453005952
4.65E+09	1.435354309	1.824611544	2.30029445	2.837475495	3.39669505
4.76E+09	1.419542576	1.800535853	2.272626702	2.812969565	3.387812687
4.86E+09	1.404616526	1.776346462	2.241472	2.777523874	3.353795135
4.96E+09	1.393732665	1.75794711	2.211222357	2.741620563	3.312854981
5.06E+09	1.383338293	1.739108171	2.1815786	2.705059579	3.269993904
5.17E+09	1.372415517	1.722965765	2.165260952	2.69031714	3.268824083
5.27E+09	1.359946725	1.702330221	2.138036922	2.651123516	3.217225149
5.37E+09	1.349026876	1.684563193	2.112760597	2.618209309	3.176933036
5.47E+09	1.339064325	1.665786305	2.083750789	2.57941458	3.13610009
5.57E+09	1.328198155	1.650237131	2.065970188	2.566793915	3.13162418
5.68E+09	1.320548645	1.635987147	2.044320628	2.540455256	3.102390346
5.78E+09	1.312881112	1.624109537	2.025780838	2.519002472	3.09018379
5.88E+09	1.304389521	1.605967148	1.996791696	2.473126342	3.030490087
5.98E+09	1.295523795	1.589681413	1.974669098	2.450937446	3.00766868
6.09E+09	1.287583803	1.573468322	1.950890238	2.414640645	2.961605339
6.19E+09	1.280795442	1.560335932	1.926225451	2.38235428	2.924540113
6.29E+09	1.275209411	1.544670461	1.89705244	2.346942684	2.883198447
6.39E+09	1.272611869	1.53680436	1.884995015	2.334808723	2.881290761
6.5E+09	1.266141188	1.521838813	1.857325758	2.29186266	2.820295614
6.6E+09	1.260803617	1.511494733	1.842582032	2.27499414	2.805487057
6.7E+09	1.255187844	1.501104727	1.83042277	2.254548498	2.785668574
6.8E+09	1.249115389	1.493056561	1.822602756	2.248215344	2.783815492
6.9E+09	1.244321329	1.485580784	1.809019106	2.231320961	2.77248365
7.01E+09	1.240986021	1.476790263	1.794257295	2.214041407	2.756808915
7.11E+09	1.239915687	1.474516796	1.792361706	2.215403012	2.766972129
7.21E+09	1.233541681	1.461445386	1.775823033	2.188452769	2.727969521
7.31E+09	1.229866708	1.45296844	1.762629991	2.170629165	2.710955457
7.42E+09	1.226329461	1.448143496	1.754919626	2.161601529	2.707914453
7.52E+09	1.221769335	1.438758458	1.742359424	2.149559166	2.694338314
7.62E+09	1.218194161	1.428260901	1.724397141	2.126148248	2.660527946
7.72E+09	1.214702867	1.415818504	1.701270538	2.09057634	2.612480624
7.83E+09	1.21088248	1.408748991	1.689680223	2.078993487	2.600700826
7.93E+09	1.207080407	1.401371605	1.67970808	2.06407434	2.581775322
8.03E+09	1.202749719	1.390954914	1.662826848	2.038406787	2.548713586
8.13E+09	1.202008349	1.395713747	1.670633363	2.061534325	2.596354803
8.23E+09	1.197369227	1.388771555	1.658609134	2.040531257	2.562756482
8.34E+09	1.195292854	1.381367474	1.647458	2.030111275	2.550058387
8.44E+09	1.190830285	1.370268153	1.631126202	2.008827666	2.518419671
8.54E+09	1.186217469	1.358119574	1.605960873	1.965866349	2.449018659
8.64E+09	1.182136188	1.346663964	1.58634227	1.942762556	2.415366301
8.75E+09	1.177505538	1.338498967	1.575395614	1.927439583	2.393472569
8.85E+09	1.175399362	1.334448692	1.567495223	1.917967507	2.380266944
8.95E+09	1.175468004	1.334722561	1.56563204	1.920075546	2.384919631
9.05E+09	1.171562766	1.323197963	1.547638678	1.88927644	2.336826706

Frequency	e"/e' @ 20 C	e"/e' @ 40 C	e"/e' @ 60 C	e"/e' @ 80 C	e"/e' @ 100 C
9.16E+09	1.167659548	1.304550105	1.512575212	1.840262999	2.270215043
9.26E+09	1.165617983	1.302300986	1.505569341	1.831399013	2.260175751
9.36E+09	1.162332595	1.292867768	1.488239996	1.800147358	2.204114389
9.46E+09	1.159327405	1.286349906	1.481790045	1.798570905	2.205549666
9.56E+09	1.157767119	1.29043663	1.492918414	1.815432151	2.227584184
9.67E+09	1.153490746	1.279735969	1.472410078	1.783098971	2.169780871
9.77E+09	1.155221489	1.277386394	1.460070424	1.776291735	2.167281633
9.87E+09	1.14950064	1.25916259	1.430974081	1.727539676	2.09112449
9.97E+09	1.148273115	1.249656659	1.408600861	1.700650819	2.058120297
1.01E+10	1.145249071	1.245257974	1.405318911	1.696526516	2.056999915
1.02E+10	1.141284562	1.242487557	1.408826997	1.691580123	2.045754204
1.03E+10	1.139178328	1.236277287	1.404530125	1.685331214	2.037311971
1.04E+10	1.137484917	1.232266297	1.396111447	1.675624422	2.022146509
1.05E+10	1.13463125	1.221458557	1.371491087	1.64190313	1.970494541
1.06E+10	1.133764853	1.210086595	1.354851303	1.620974201	1.94876358
1.07E+10	1.131588414	1.212691302	1.371064979	1.643306817	1.983311626
1.08E+10	1.129014591	1.216366413	1.387602032	1.661375193	2.010391298
1.09E+10	1.12808216	1.222798722	1.399933793	1.675825232	2.0286976
1.1E+10	1.125488141	1.214041915	1.384030797	1.649310075	1.985645297
1.11E+10	1.124600747	1.196399635	1.346960042	1.601342316	1.913535678
1.12E+10	1.122993231	1.18072289	1.313527187	1.555095888	1.853480966
1.13E+10	1.1222893	1.177735843	1.306763938	1.546396189	1.842994327
1.14E+10	1.121496748	1.181061354	1.318740238	1.560051305	1.860106812
1.15E+10	1.119108197	1.179262936	1.31864246	1.552884633	1.849721347
1.16E+10	1.118478149	1.172328809	1.303947231	1.530526065	1.819955258
1.17E+10	1.117851347	1.158192399	1.268814867	1.487823071	1.766366604
1.18E+10	1.119582047	1.144053144	1.237815162	1.446911635	1.714160128
1.19E+10	1.114559707	1.141954792	1.241088899	1.447787492	1.709964097
1.2E+10	1.114371355	1.144918912	1.249984126	1.459338406	1.730993849
1.21E+10	1.113017438	1.156812815	1.27871151	1.493630756	1.77533147
1.22E+10	1.110385817	1.155466309	1.282056516	1.490272098	1.764961889
1.23E+10	1.108309898	1.138038632	1.241532176	1.435637938	1.698246474
1.24E+10	1.110275312	1.118814152	1.189471734	1.381529939	1.637573454
1.25E+10	1.10954702	1.113354904	1.181057826	1.372917154	1.630456363
1.26E+10	1.108747001	1.11223713	1.188561202	1.372167255	1.635888139
1.27E+10	1.108843639	1.120647752	1.208600031	1.393752946	1.664309351
1.28E+10	1.106632013	1.120758488	1.212576365	1.393155541	1.666090247
1.29E+10	1.106580899	1.114996984	1.202133125	1.380109865	1.647154411
1.3E+10	1.107424649	1.109713731	1.184632009	1.353978869	1.619183518
1.31E+10	1.109719761	1.102845576	1.161546933	1.332656349	1.597341145
1.32E+10	1.112446199	1.110764756	1.171697203	1.348658793	1.620053553
1.33E+10	1.111888286	1.119820726	1.198777166	1.375292151	1.650183921
1.35E+10	1.109681583	1.119741939	1.206369912	1.375653796	1.646747405
1.36E+10	1.107633477	1.115492068	1.196794389	1.36240584	1.630485478
1.37E+10	1.111066842	1.119016159	1.1960998	1.36718567	1.639937398

Frequency	e''/e' @ 20 C	e''/e' @ 40 C	e''/e' @ 60 C	e''/e' @ 80 C	e''/e' @ 100 C
1.38E+10	1.109607459	1.102934264	1.166480904	1.330666001	1.590737131
1.39E+10	1.111652663	1.104843703	1.163952555	1.324479546	1.587321844
1.4E+10	1.112558714	1.104605011	1.163878734	1.332440805	1.593114183
1.41E+10	1.113163841	1.104014474	1.164189582	1.336205226	1.597034476
1.42E+10	1.111503323	1.100702776	1.164940258	1.326503143	1.579445062
1.43E+10	1.112520085	1.0957424	1.156802588	1.31152191	1.555266437
1.44E+10	1.113641905	1.096503265	1.153513794	1.313186255	1.564864357
1.45E+10	1.115573148	1.097290424	1.150697138	1.309087587	1.55652246
1.46E+10	1.115620576	1.08586718	1.124514886	1.268704956	1.499161845
1.47E+10	1.120467186	1.088061793	1.116160337	1.260760498	1.494815585
1.48E+10	1.119778983	1.088509802	1.117278528	1.273747711	1.511760884
1.49E+10	1.119101426	1.078463516	1.100839688	1.243534685	1.469229837
1.5E+10	1.118975557	1.064614352	1.081746802	1.202302514	1.413647588
1.51E+10	1.125269142	1.071472723	1.082566695	1.208929009	1.42226495
1.52E+10	1.126039417	1.061956827	1.0596152	1.183533421	1.392422617
1.53E+10	1.126514084	1.048609085	1.023293495	1.144619444	1.332514019
1.54E+10	1.126263935	1.052571255	1.036768356	1.155644497	1.347618007
1.55E+10	1.124712576	1.055402499	1.047622496	1.166303362	1.357947723
1.56E+10	1.125813625	1.084450003	1.10968038	1.235818614	1.43322193
1.57E+10	1.130358144	1.097860657	1.135838375	1.250599582	1.459545376
1.58E+10	1.136425135	1.092983435	1.104995561	1.218964182	1.41822398
1.59E+10	1.135197519	1.07581506	1.071812561	1.195462011	1.393508168
1.6E+10	1.134823635	1.057381442	1.038435577	1.150728982	1.336560007
1.61E+10	1.135473809	1.047656982	1.020969113	1.114723343	1.282841255
1.62E+10	1.133454825	1.060935596	1.053381108	1.141920337	1.31327543
1.63E+10	1.137465532	1.090462448	1.106924924	1.228711945	1.432715732
1.64E+10	1.140730423	1.095896176	1.113317797	1.240007129	1.448818163
1.65E+10	1.139906551	1.072773763	1.068060877	1.167215732	1.363977982
1.66E+10	1.14258608	1.062514773	1.046864289	1.157637732	1.36087036
1.67E+10	1.14519452	1.067698939	1.062582723	1.173907474	1.38172017
1.68E+10	1.146407753	1.058164773	1.03472932	1.106611016	1.288682846
1.69E+10	1.14290327	1.075399352	1.065856161	1.159389297	1.356117899
1.7E+10	1.148866342	1.109729424	1.133229877	1.263192517	1.500410368
1.71E+10	1.150198739	1.084989809	1.071585298	1.165759104	1.367208703
1.72E+10	1.145437022	1.034241278	0.969468682	1.058198302	1.22662776
1.73E+10	1.153660298	1.049539516	1.003196033	1.115260108	1.312950568
1.74E+10	1.15328706	1.032863273	0.978675367	1.065989057	1.242976823
1.75E+10	1.151465558	1.028359804	0.959897007	1.038372402	1.205842998
1.76E+10	1.155976638	1.058182555	1.030321234	1.135174762	1.341319957
1.77E+10	1.158016398	1.086071737	1.08078682	1.194249299	1.407583397
1.79E+10	1.159755953	1.049075433	1.000912083	1.083685284	1.262864927
1.8E+10	1.165434102	1.045050726	0.988347536	1.072998623	1.255143501
1.81E+10	1.162934532	1.035418333	0.970308095	1.068496644	1.248664077
1.82E+10	1.166593422	1.03476012	0.970687091	1.04770557	1.218307421
1.83E+10	1.169972189	1.029057394	0.952206041	1.018644258	1.179533019

Frequency	e''/e' @ 20 C	e''/e' @ 40 C	e''/e' @ 60 C	e''/e' @ 80 C	e''/e' @ 100 C
1.84E+10	1.167627159	1.038095133	0.967890945	1.053269975	1.218887007
1.85E+10	1.170809786	1.042538111	0.970071791	1.060128276	1.234514062
1.86E+10	1.175976545	1.018924706	0.927319909	0.990869584	1.139789977
1.87E+10	1.187348439	1.010597136	0.883953288	0.945861229	1.095120916
1.88E+10	1.18970409	1.041802788	0.933823974	1.00779404	1.171198043
1.89E+10	1.184038316	1.034746883	0.954809098	1.028175079	1.188432906
1.9E+10	1.188487283	1.063373072	1.008626184	1.074240725	1.246748487
1.91E+10	1.191519009	1.099678069	1.062584806	1.140286805	1.320230005
1.92E+10	1.19712376	1.107468102	1.068129321	1.154618675	1.328784684
1.93E+10	1.204749541	1.092003709	1.03819249	1.115540554	1.286190419
1.94E+10	1.213170196	1.098829323	1.020099091	1.090589646	1.248587644
1.95E+10	1.210138803	1.071767093	0.981124972	1.050019451	1.204321196
1.96E+10	1.208328424	1.077158092	1.015006042	1.095729828	1.263722591
1.97E+10	1.207351957	1.062295897	1.000186463	1.07732503	1.238125445
1.98E+10	1.207279946	1.064782623	0.994380392	1.06448376	1.228319116
1.99E+10	1.211973565	1.071176792	0.996669898	1.074926297	1.235590005
2E+10	1.215110534	1.087003128	1.030740087	1.112884077	1.277221834

Table 10. Dielectric Constant for the SAIC Simulant

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
2.55E+08	26.411437	82.392067	95.28453	98.5647	49.622692
3.58E+08	32.309732	68.815553	78.35279	80.30609	40.303635
4.6E+08	33.694147	61.23547	68.9541695	70.2945	34.929946
5.62E+08	34.565999	56.337764	62.8504025	63.6731	31.493031
6.65E+08	35.108116	53.485277	59.3657145	59.91158	29.1297785
7.67E+08	35.707112	51.411241	56.6837815	56.98502	27.457631
8.69E+08	36.549738	50.321383	55.3301535	55.51803	26.5233605
9.71E+08	36.454396	48.741676	53.3364965	53.26234	25.2709805
1.07E+09	36.55376	47.561098	51.763577	51.47541	24.263129
1.18E+09	36.728138	46.552607	50.466934	50.02516	23.4580435
1.28E+09	36.717766	45.659033	49.4336745	48.8911	22.8009545
1.38E+09	36.686155	45.01329	48.749735	48.12641	22.2655055
1.48E+09	36.826323	44.718467	48.348493	47.65941	21.8661815
1.59E+09	36.973973	44.326681	47.782099	46.96585	21.576513
1.69E+09	36.953393	43.875196	47.2332315	46.34155	21.2277575
1.79E+09	37.046045	43.339523	46.594705	45.62872	20.7735875
1.89E+09	37.043679	42.924675	46.072184	45.05699	20.399782
1.99E+09	37.100688	42.769259	45.972378	44.94083	20.2616785
2.1E+09	37.17753	42.81772	46.1181345	45.09108	20.20575
2.2E+09	37.188205	42.57573	45.7959865	44.70312	19.9355425
2.3E+09	37.161605	42.190164	45.252644	44.06544	19.6277755
2.4E+09	37.103969	41.915144	44.8978115	43.64361	19.4914375
2.51E+09	36.906577	41.649797	44.6212745	43.32637	19.2672415
2.61E+09	36.867042	41.429541	44.379474	43.07136	19.038166
2.71E+09	36.853737	41.200648	44.135089	42.80862	18.870614
2.81E+09	36.80358	40.994869	43.9522325	42.60848	18.7774405
2.92E+09	36.717312	40.7928	43.7350965	42.34361	18.5791545
3.02E+09	36.623819	40.581271	43.4150175	41.96966	18.3890235
3.12E+09	36.429884	40.376462	43.10842	41.60573	18.264701
3.22E+09	36.291186	40.2104	42.948463	41.44296	18.1670935
3.32E+09	36.257558	40.131229	42.931511	41.43138	18.0195465
3.43E+09	36.282407	40.035769	42.8406195	41.3342	17.918625
3.53E+09	36.297633	39.928727	42.73857	41.22564	17.9048375
3.63E+09	36.277002	39.811994	42.6329445	41.12266	17.830046
3.73E+09	36.155875	39.643539	42.430481	40.883	17.6176765
3.84E+09	36.069717	39.502238	42.1879515	40.62022	17.5244195
3.94E+09	35.986244	39.432194	42.096661	40.50683	17.5237025
4.04E+09	35.916822	39.382166	42.12402	40.55856	17.440415
4.14E+09	35.871906	39.276184	42.075153	40.52992	17.2946395
4.25E+09	35.816955	39.11034	41.875327	40.30038	17.2135685
4.35E+09	35.701888	38.904745	41.624608	40.01678	17.129266
4.45E+09	35.504259	38.7221	41.407476	39.7851	16.9528965
4.55E+09	35.363069	38.574321	41.2152175	39.57156	16.8240965

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
4.65E+09	35.303706	38.465964	41.08663	39.41991	16.83486
4.76E+09	35.194675	38.3462	40.977468	39.30705	16.768402
4.86E+09	35.109969	38.209357	40.9085705	39.23931	16.588562
4.96E+09	34.918218	37.982289	40.6762795	38.97009	16.4416755
5.06E+09	34.72563	37.736472	40.3436965	38.60988	16.3685595
5.17E+09	34.573095	37.554179	40.0877295	38.35079	16.2217365
5.27E+09	34.49807	37.414564	39.9255345	38.18347	16.0966325
5.37E+09	34.422956	37.343301	39.8420755	38.08507	16.110276
5.47E+09	34.350106	37.258017	39.762712	38.00949	16.1044415
5.57E+09	34.183924	37.118832	39.680766	37.93949	15.927596
5.68E+09	34.009017	36.881629	39.470539	37.71927	15.7205845
5.78E+09	33.846101	36.656238	39.174993	37.38553	15.670263
5.88E+09	33.712108	36.536612	38.9710305	37.17697	15.6124955
5.98E+09	33.652969	36.485363	38.907209	37.11404	15.527182
6.09E+09	33.599106	36.447074	38.9371795	37.15351	15.5355
6.19E+09	33.519319	36.375673	38.9266875	37.14122	15.539217
6.29E+09	33.310522	36.214828	38.769311	37.01952	15.3758575
6.39E+09	33.130761	35.987077	38.5525375	36.78523	15.161902
6.5E+09	32.978974	35.777301	38.326797	36.55979	15.109938
6.6E+09	32.894084	35.597023	38.042526	36.24285	15.085044
6.7E+09	32.848045	35.545928	37.9277055	36.15342	15.0056735
6.8E+09	32.76088	35.536128	38.0164415	36.24621	14.969846
6.9E+09	32.584542	35.440615	38.0438825	36.30108	14.980028
7.01E+09	32.404628	35.29196	37.927042	36.17566	14.8566975
7.11E+09	32.211702	35.093288	37.6754315	35.93386	14.64241
7.21E+09	32.099856	34.858635	37.384085	35.64048	14.5691305
7.31E+09	32.091804	34.710315	37.179052	35.41013	14.622524
7.42E+09	32.036103	34.614481	37.0068475	35.22709	14.546759
7.52E+09	31.90436	34.569367	36.998348	35.24521	14.4178785
7.62E+09	31.741112	34.52553	37.1203165	35.38717	14.419014
7.72E+09	31.54513	34.406474	37.052424	35.34307	14.37517
7.83E+09	31.407739	34.188195	36.7131105	34.99083	14.1759455
7.93E+09	31.35669	33.960205	36.3782505	34.64815	14.071235
8.03E+09	31.372581	33.828439	36.232511	34.51586	14.144525
8.13E+09	31.363292	33.750354	36.1767695	34.4347	14.142507
8.23E+09	31.172496	33.777512	36.221263	34.50774	14.0241
8.34E+09	30.975149	33.780396	36.360768	34.68664	14.015868
8.44E+09	30.805672	33.66427	36.352714	34.68153	14.040757
8.54E+09	30.779184	33.466397	36.0379655	34.35424	13.90523
8.64E+09	30.800066	33.293339	35.679458	33.98861	13.759946
8.75E+09	30.798723	33.165446	35.537112	33.83496	13.8174975
8.85E+09	30.704396	33.174384	35.6910915	34.00639	13.900831
8.95E+09	30.540956	33.220154	35.807549	34.15067	13.771888
9.05E+09	30.338415	33.285029	35.91679	34.30542	13.7107375
9.16E+09	30.230495	33.160403	35.8480165	34.24495	13.7548595

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60C	e' @ 80 C	e' @ 100 C
9.26E+09	30.212939	32.930894	35.5712005	33.94268	13.697884
9.36E+09	30.282791	32.754246	35.2056735	33.5445	13.5176775
9.46E+09	30.262692	32.632618	35.0165685	33.39085	13.5097995
9.56E+09	30.168814	32.647456	35.2722235	33.67058	13.61925
9.67E+09	29.966751	32.749457	35.571621	34.00874	13.5480435
9.77E+09	29.783593	32.86195	35.617394	34.08087	13.416116
9.87E+09	29.766193	32.775099	35.4774985	33.91441	13.4562035
9.97E+09	29.824362	32.50444	35.1646535	33.56398	13.469643
1.01E+10	29.873437	32.241283	34.794682	33.17387	13.2893655
1.02E+10	29.842664	32.142773	34.6175155	33.02604	13.211182
1.03E+10	29.718695	32.134431	34.7900645	33.26253	13.3209255
1.04E+10	29.522209	32.228998	35.170686	33.67214	13.3012965
1.05E+10	29.403263	32.338821	35.244883	33.74024	13.1031325
1.06E+10	29.397624	32.309324	34.977859	33.46482	13.1270705
1.07E+10	29.535886	32.033158	34.5831975	33.02732	13.2257555
1.08E+10	29.563171	31.797413	34.415071	32.83715	13.1246225
1.09E+10	29.473429	31.666849	34.3160345	32.80157	12.981268
1.1E+10	29.288133	31.635554	34.3439425	32.88357	13.022027
1.11E+10	29.091538	31.633127	34.5588415	33.16958	13.011135
1.12E+10	29.008071	31.654688	34.6247715	33.21077	12.8122075
1.13E+10	29.060674	31.653579	34.2991755	32.78809	12.801334
1.14E+10	29.197406	31.530726	33.9593875	32.40207	13.002537
1.15E+10	29.229855	31.328082	33.9438395	32.40033	12.969907
1.16E+10	29.072627	31.072598	33.9617995	32.44438	12.6372145
1.17E+10	28.836185	30.831127	33.719407	32.26757	12.4850705
1.18E+10	28.688255	30.740173	33.5512395	32.1282	12.518234
1.19E+10	28.659726	30.695904	33.554077	32.15	12.4266045
1.2E+10	28.734709	30.976831	33.6866045	32.19575	12.5075795
1.21E+10	28.83137	31.14435	33.5653355	31.98876	12.7920755
1.22E+10	28.823348	30.916988	33.435863	31.81196	12.7976545
1.23E+10	28.604279	30.657626	33.5541095	31.95491	12.4969675
1.24E+10	28.369157	30.726107	33.6496835	32.09696	12.5548055
1.25E+10	28.215724	30.984685	33.6379775	32.17276	12.888437
1.26E+10	28.331343	30.958166	33.6209025	32.28149	12.8571375
1.27E+10	28.417838	30.897589	33.71807	32.42687	12.587823
1.28E+10	28.43815	30.805375	33.546865	32.29513	12.6304535
1.29E+10	28.338475	30.623988	33.2651755	32.02665	12.7081105
1.3E+10	28.103784	30.408127	33.258064	32.01611	12.41807
1.31E+10	27.897725	30.577211	33.5707965	32.24815	12.3848655
1.32E+10	27.844615	30.92236	33.6450085	32.23247	12.7961785
1.33E+10	28.014392	30.789996	33.314773	31.9886	12.7951195
1.35E+10	28.15575	30.453321	33.4309755	32.31222	12.4613205
1.36E+10	28.148807	30.436995	33.84086	32.94808	12.530302
1.37E+10	27.976582	30.365052	33.555325	32.72075	12.7305145
1.38E+10	27.641772	30.003427	33.038669	32.09938	12.366149

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.39E+10	27.372646	30.114016	33.229909	32.12018	12.132123
1.4E+10	27.289229	30.538163	33.419041	32.16394	12.544674
1.41E+10	27.46523	30.483527	32.9246375	31.61906	12.698632
1.42E+10	27.718107	29.915022	32.5956305	31.44508	12.1920845
1.43E+10	27.880289	29.828559	33.2517195	32.32588	12.1603725
1.44E+10	27.845847	30.074948	33.4851485	32.61401	12.6327555
1.45E+10	27.556121	29.838595	32.6893695	31.74661	12.3818185
1.46E+10	27.28193	29.550027	32.331588	31.30741	11.809602
1.47E+10	27.102127	30.077433	32.996792	31.81966	12.260508
1.48E+10	27.021391	30.370111	33.059297	31.81874	12.767741
1.49E+10	26.799071	29.381413	32.1609405	31.07521	11.9678705
1.5E+10	26.477373	28.946991	32.4590855	31.56544	11.705752
1.51E+10	26.217941	29.883684	33.647011	32.72714	12.8185085
1.52E+10	26.036579	29.746679	32.984252	32.07148	12.5631935
1.53E+10	26.253869	28.828695	31.5596945	30.57296	11.400584
1.54E+10	26.996865	29.786327	32.615179	31.56387	12.4665735
1.55E+10	27.418919	30.420786	33.4987795	32.46209	13.218657
1.56E+10	27.017814	28.688146	31.8276415	30.96798	11.64877
1.57E+10	26.200236	28.340648	31.4846575	30.67668	11.6724405
1.58E+10	25.124427	29.30686	32.726825	31.87338	12.743361
1.59E+10	24.289089	28.947535	32.31761	31.4742	11.8656265
1.6E+10	24.55041	28.235346	30.7373125	29.77592	11.232326
1.61E+10	25.844009	29.048402	31.3019235	30.3141	12.2109235
1.62E+10	26.833601	29.685593	32.976182	32.05691	12.6215855
1.63E+10	26.890325	28.275049	31.7835135	30.81505	11.4838635
1.64E+10	26.229938	27.599305	30.2551325	29.27765	11.281672
1.65E+10	25.013134	28.945822	31.9582155	31.11463	12.015929
1.66E+10	23.879824	29.110704	32.8701735	32.05517	11.7497835
1.67E+10	23.92148	27.870632	30.4778215	29.51543	11.1185275
1.68E+10	25.013495	28.540235	30.469499	29.57771	11.7945835
1.69E+10	26.292892	29.528318	32.981189	32.1952	12.2266365
1.7E+10	26.900552	27.885397	31.9348735	31.01445	11.268304
1.71E+10	26.531654	27.447981	30.0450745	29.15114	11.3332435
1.72E+10	25.149715	28.965647	31.715191	31.01662	12.0047575
1.73E+10	23.745067	28.823538	32.707751	31.93678	11.503939
1.74E+10	23.300101	27.736256	30.7099855	29.80433	11.014844
1.75E+10	23.883278	28.406256	30.3537335	29.61451	11.529651
1.76E+10	24.930725	28.789992	32.2824565	31.60614	11.570337
1.77E+10	25.791991	27.473477	32.0588895	31.23132	11.0615445
1.79E+10	25.791479	27.342047	30.2358905	29.45017	11.2680055
1.8E+10	24.771831	28.348304	30.8121245	30.14328	11.5635745
1.81E+10	23.701293	28.355783	32.3011185	31.61412	11.245008
1.82E+10	23.26731	27.405583	30.9825255	30.23732	10.937133
1.83E+10	23.561986	27.454788	29.539598	29.03872	11.055094
1.84E+10	24.403455	27.890187	31.4160055	30.93474	11.0965045

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.85E+10	25.036848	27.089178	31.7847205	31.21125	10.903837
1.86E+10	24.980494	26.664568	29.439398	28.83609	10.9076845
1.87E+10	24.309281	27.425854	29.739132	29.17057	10.9673075
1.88E+10	23.620218	27.700009	31.4360915	30.83472	10.8117125
1.89E+10	23.298636	26.954318	30.2962795	29.74675	10.6917655
1.9E+10	23.482231	26.800524	29.306294	28.91755	10.706116
1.91E+10	23.912373	27.155951	30.8045935	30.39757	10.7413165
1.92E+10	24.216843	26.700667	30.7666605	30.25564	10.696182
1.93E+10	24.082279	26.362506	29.3171015	28.75799	10.654245
1.94E+10	23.671214	26.831282	29.561787	29.00495	10.555826
1.95E+10	23.270748	27.15681	30.422705	29.92073	10.4744595
1.96E+10	23.186256	26.753084	30.007988	29.59796	10.465181
1.97E+10	23.326714	26.322373	29.6317345	29.33212	10.4176045
1.98E+10	23.492265	26.397176	29.984881	29.60868	10.3461985
1.99E+10	23.473464	26.380058	29.785393	29.29729	10.284441
2E+10	23.26571	26.235878	29.32183	28.77651	10.276752

Table 11. Dielectric Loss for the SAIC Simulant

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
2.55E+08	685.35707	865.11749	1137.60801	1264.1283	407.667019
3.58E+08	493.26111	624.6182	821.012341	912.20095	296.386373
4.6E+08	385.65627	490.31578	644.163912	715.77256	234.250915
5.62E+08	317.29811	404.86647	531.38118	590.06946	193.840439
6.65E+08	268.95222	344.81244	452.83433	503.40765	165.731503
7.67E+08	232.91806	299.87858	393.537612	437.55464	144.679988
8.69E+08	205.45007	265.31569	347.937684	386.84993	128.375105
9.71E+08	184.2227	238.56901	312.756829	347.81465	115.813495
1.07E+09	167.10457	216.86231	284.234607	316.10056	105.543388
1.18E+09	152.87605	198.79756	260.405412	289.63466	96.8898875
1.28E+09	141.17916	183.74931	240.539253	267.54097	89.7392215
1.38E+09	131.03556	170.59611	223.239829	248.30958	83.480718
1.48E+09	122.15014	159.37331	208.430146	231.85895	78.102279
1.59E+09	114.40655	149.4698	195.318328	217.23292	73.340289
1.69E+09	107.6809	140.93554	184.023645	204.68086	69.2912125
1.79E+09	101.91815	133.35971	174.099193	193.63044	65.706129
1.89E+09	96.871378	126.72602	165.387077	183.93851	62.475319
1.99E+09	92.275774	120.53396	157.196825	174.79073	59.455268
2.1E+09	88.079098	115.1234	150.012056	166.79953	56.9390725
2.2E+09	84.299556	110.32067	143.666227	159.76161	54.6380545
2.3E+09	80.850721	105.89241	137.803513	153.21788	52.4276555
2.4E+09	77.851461	101.86938	132.397149	147.16831	50.49163
2.51E+09	75.144713	98.177343	127.500037	141.67785	48.7735755
2.61E+09	72.457572	94.653557	122.903478	136.55404	47.0253515
2.71E+09	70.076416	91.504287	118.702088	131.86233	45.4595845
2.81E+09	67.901321	88.522358	114.69269	127.38931	44.0669725
2.92E+09	65.816724	85.745045	110.999637	123.26556	42.7747215
3.02E+09	63.871907	83.120497	107.533154	119.38421	41.4477475
3.12E+09	62.101	80.775694	104.406858	115.84812	40.272173
3.22E+09	60.467063	78.593928	101.433559	112.51916	39.2534345
3.32E+09	58.862568	76.504468	98.681273	109.42447	38.2681725
3.43E+09	57.370671	74.481336	96.0123135	106.45565	37.2414205
3.53E+09	56.015126	72.570843	93.4528635	103.58462	36.323432
3.63E+09	54.730087	70.799557	91.049794	100.91092	35.540114
3.73E+09	53.598831	69.274449	89.0087535	98.623533	34.757358
3.84E+09	52.500364	67.81991	87.078801	96.42351	33.970172
3.94E+09	51.46709	66.468968	85.2456895	94.330108	33.358225
4.04E+09	50.49638	65.12092	83.42994	92.287656	32.7771225
4.14E+09	49.541774	63.821001	81.7206795	90.384324	32.1053935
4.25E+09	48.677008	62.596698	80.1111425	88.545178	31.4573985
4.35E+09	47.908847	61.461744	78.509277	86.743474	30.9323975
4.45E+09	47.121377	60.449143	77.075377	85.091013	30.4290405
4.55E+09	46.371254	59.496693	75.775656	83.5914	29.8674655

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
4.65E+09	45.694755	58.550417	74.508223	82.126626	29.4121855
4.76E+09	45.00312	57.576702	73.1943135	80.633594	29.0409565
4.86E+09	44.376092	56.60106	71.9165215	79.192001	28.5646335
4.96E+09	43.711831	55.6542	70.6861125	77.835761	28.0173385
5.06E+09	43.129806	54.827642	69.504628	76.464585	27.6135625
5.17E+09	42.57336	54.084113	68.370414	75.147282	27.262007
5.27E+09	41.996721	53.340315	67.344678	73.963555	26.835795
5.37E+09	41.401867	52.612786	66.407197	72.90127	26.4681205
5.47E+09	40.894269	51.843866	65.419323	71.786073	26.2007925
5.57E+09	40.401415	51.059532	64.3554115	70.593829	25.845259
5.68E+09	39.892372	50.402493	63.453263	69.570877	25.4061265
5.78E+09	39.460639	49.770749	62.5873775	68.57146	25.0480305
5.88E+09	39.011395	49.21104	61.7690465	67.607143	24.825302
5.98E+09	38.576067	48.680116	60.99115	66.702282	24.554002
6.09E+09	38.131537	48.119656	60.2909895	65.917486	24.2544995
6.19E+09	37.741467	47.51609	59.570784	65.113606	24.041993
6.29E+09	37.410048	46.933327	58.7924705	64.235721	23.813137
6.39E+09	37.078957	46.390428	57.948729	63.277127	23.43679
6.5E+09	36.721419	45.946087	57.272375	62.487848	23.108855
6.6E+09	36.348142	45.523244	56.701287	61.771262	22.9458905
6.7E+09	36.002284	45.07036	56.0639715	61.0357	22.7787795
6.8E+09	35.637219	44.611144	55.474683	60.383086	22.528579
6.9E+09	35.270912	44.073245	54.826151	59.6713	22.281624
7.01E+09	35.022152	43.545684	54.1324455	58.8664	22.0776195
7.11E+09	34.732066	43.090418	53.3718415	58.000593	21.7663055
7.21E+09	34.434456	42.71092	52.733616	57.240327	21.4278895
7.31E+09	34.111133	42.392528	52.3590935	56.749472	21.319935
7.42E+09	33.831278	42.076428	52.0078685	56.348574	21.2846895
7.52E+09	33.506204	41.663061	51.43737	55.713824	21.0519395
7.62E+09	33.244085	41.198141	50.8026515	55.048472	20.7755625
7.72E+09	32.994037	40.753795	50.255515	54.411518	20.610887
7.83E+09	32.770832	40.349982	49.6697365	53.720828	20.3930085
7.93E+09	32.495474	40.008046	49.0669065	53.008956	20.0802545
8.03E+09	32.199478	39.763477	48.696722	52.584083	19.9413705
8.13E+09	31.92592	39.455858	48.4696025	52.308931	19.935871
8.23E+09	31.634266	39.119973	48.073943	51.835473	19.7936055
8.34E+09	31.419744	38.722929	47.445907	51.167963	19.4978215
8.44E+09	31.205191	38.355535	46.9321855	50.566455	19.3318015
8.54E+09	31.016691	37.935314	46.3903305	49.928873	19.166764
8.64E+09	30.811643	37.677415	46.010229	49.46229	18.9422895
8.75E+09	30.550232	37.471428	45.68502	49.069638	18.7838305
8.85E+09	30.286264	37.27861	45.501256	48.86851	18.85845
8.95E+09	30.060642	37.052202	45.2745595	48.611676	18.827812
9.05E+09	29.913214	36.693508	44.701733	47.977461	18.5326725
9.16E+09	29.742407	36.408137	44.15346	47.361318	18.3251595

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
9.26E+09	29.616231	35.950225	43.6219615	46.750354	18.193402
9.36E+09	29.440022	35.762964	43.4520855	46.511371	18.073171
9.46E+09	29.186926	35.630462	43.2362115	46.265888	17.897058
9.56E+09	28.958303	35.537758	43.048995	46.06416	17.952088
9.67E+09	28.790797	35.397771	42.9147445	45.902732	18.068236
9.77E+09	28.699949	35.179984	42.6122715	45.545444	17.8495355
9.87E+09	28.602922	34.867052	41.9860645	44.828444	17.5387405
9.97E+09	28.47496	34.412456	41.3990285	44.181404	17.390853
1.01E+10	28.314002	34.139228	41.275878	44.009094	17.3167155
1.02E+10	28.071278	34.047241	41.182798	43.87272	17.148501
1.03E+10	27.864448	34.062169	41.0127095	43.710575	17.17716
1.04E+10	27.732956	34.010816	40.856865	43.545526	17.38213
1.05E+10	27.66253	33.828057	40.643025	43.268449	17.2280095
1.06E+10	27.579952	33.426401	40.1171925	42.653936	16.797041
1.07E+10	27.500315	33.015656	39.5151955	41.983084	16.624525
1.08E+10	27.287632	32.718777	39.297998	41.715684	16.6495925
1.09E+10	27.064677	32.649039	39.3617825	41.792328	16.55516
1.1E+10	26.907568	32.826626	39.3992045	41.822225	16.5899605
1.11E+10	26.866964	32.894161	39.2466685	41.634846	16.803599
1.12E+10	26.913983	32.627854	38.956927	41.263495	16.671679
1.13E+10	26.889722	32.163068	38.536795	40.740885	16.2019
1.14E+10	26.747703	31.803995	38.0031825	40.152668	15.9935545
1.15E+10	26.536845	31.621745	37.7329955	39.88192	16.144421
1.16E+10	26.322304	31.650363	37.967431	40.148088	16.1522075
1.17E+10	26.202053	31.809691	38.1936365	40.393413	15.9805055
1.18E+10	26.246206	31.77088	37.856686	39.982751	15.920674
1.19E+10	26.303745	31.331913	37.185032	39.172203	15.786037
1.2E+10	26.273863	30.852295	36.785202	38.603531	15.4489475
1.21E+10	26.118461	30.711158	36.627879	38.304412	15.354582
1.22E+10	25.909407	30.752119	36.453507	38.122082	15.6517935
1.23E+10	25.732898	30.579895	36.319036	38.063192	15.6614085
1.24E+10	25.723849	30.309766	36.2551455	38.096372	15.2555735
1.25E+10	25.805305	30.30528	36.0880135	37.91864	15.1867245
1.26E+10	25.914726	30.067763	35.435636	37.157201	15.2622345
1.27E+10	25.844597	29.857289	35.2129465	36.746444	15.095356
1.28E+10	25.591004	29.787558	35.2582425	36.574956	14.857959
1.29E+10	25.268396	30.026056	35.2699915	36.440973	15.1992205
1.3E+10	25.213658	30.013111	35.014871	36.212366	15.4738135
1.31E+10	25.343908	29.83096	35.050196	36.40558	15.185926
1.32E+10	25.503019	29.793455	35.237566	36.774548	15.014243
1.33E+10	25.566497	29.655825	34.9086175	36.490631	15.172809
1.35E+10	25.406238	29.159165	34.2207005	35.741207	14.8902835
1.36E+10	25.026926	28.905452	34.16168	35.627029	14.476375
1.37E+10	24.654523	29.31252	34.5745235	36.000357	14.878404
1.38E+10	24.641307	29.528274	34.2883675	35.63997	15.3782625

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.39E+10	24.893875	29.207206	33.8593295	35.177547	15.050277
1.4E+10	25.204089	29.021195	34.105885	35.475097	14.7654865
1.41E+10	25.376282	29.11096	34.370839	35.78803	15.120637
1.42E+10	25.261462	28.848944	33.8276595	35.282404	15.098827
1.43E+10	24.974203	28.348661	33.387859	34.902606	14.4873645
1.44E+10	24.753344	28.640259	33.8556555	35.31732	14.6382245
1.45E+10	24.706388	29.148348	33.9057885	35.117172	15.3134135
1.46E+10	24.775525	28.843177	33.1934775	34.227146	15.028755
1.47E+10	24.716132	28.231811	33.007314	34.073856	14.398031
1.48E+10	24.635007	28.481822	33.766315	34.869987	14.812527
1.49E+10	24.494773	28.685131	33.759319	34.895768	15.236225
1.5E+10	24.556948	27.882616	32.692952	34.011177	14.3341485
1.51E+10	25.013952	28.164724	33.126159	34.495787	14.4529075
1.52E+10	25.583745	29.262939	33.9706845	35.189311	15.6071295
1.53E+10	25.885544	28.63767	32.9152375	33.988045	14.9773625
1.54E+10	25.714297	27.406158	31.807754	32.8022	13.8812385
1.55E+10	25.05461	28.342149	33.2682185	34.226995	14.930197
1.56E+10	24.02931	28.648091	33.773097	34.888735	15.1907275
1.57E+10	23.470946	27.393189	32.0880515	33.341969	14.072959
1.58E+10	23.923755	27.874945	32.156656	33.319883	14.7960765
1.59E+10	24.648087	28.917443	33.3462355	34.341972	15.6233795
1.6E+10	25.295823	28.094079	32.6064925	33.498927	14.6303805
1.61E+10	25.716347	26.850351	30.974317	31.750757	14.1399285
1.62E+10	25.187369	27.464103	31.781949	32.637675	14.9276275
1.63E+10	23.655921	28.073342	33.363569	34.376437	14.92346
1.64E+10	22.510849	26.955571	31.5822495	32.490926	14.101705
1.65E+10	22.599646	26.888432	30.2070015	31.028581	14.370233
1.66E+10	23.354484	28.224084	32.080189	32.969311	15.1429215
1.67E+10	24.50597	27.605808	32.4483875	33.20218	14.5782665
1.68E+10	25.592203	26.112293	30.1125085	30.745765	14.032453
1.69E+10	25.560759	27.04799	30.5873525	31.354766	14.867427
1.7E+10	24.03171	27.769739	32.875183	33.767915	14.8961375
1.71E+10	22.628774	26.302265	30.980747	31.69091	13.9318515
1.72E+10	22.337377	26.577674	29.5289645	30.185102	14.311062
1.73E+10	22.681978	28.092196	31.459759	32.175996	15.087185
1.74E+10	23.606798	27.395777	32.406115	32.970682	14.6354625
1.75E+10	24.695682	26.107674	30.4043745	30.902483	14.350418
1.76E+10	24.929547	26.932275	30.2753525	30.956053	14.869327
1.77E+10	23.978981	27.509488	32.2600205	32.98493	14.827998
1.79E+10	22.861029	26.811055	31.79356	32.400484	14.5035125
1.8E+10	22.272668	26.913924	30.0770715	30.773203	14.7265675
1.81E+10	22.36744	27.657438	30.8122595	31.53222	15.004037
1.82E+10	23.061457	27.267084	32.501902	33.056959	14.7779375
1.83E+10	23.869412	26.370051	30.949899	31.395933	14.6154985
1.84E+10	24.172317	26.738239	29.7710995	30.282068	14.7851675

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.85E+10	23.589673	27.329644	31.6625905	32.182817	14.844439
1.86E+10	22.81171	26.912427	31.61948	32.061017	14.759092
1.87E+10	22.320029	26.722385	29.887402	30.464092	14.8175705
1.88E+10	22.309703	27.093748	30.3664055	30.987106	14.8670445
1.89E+10	22.81679	26.800999	31.5774325	32.04398	14.720112
1.9E+10	23.411189	26.075542	30.126293	30.576378	14.537221
1.91E+10	23.631723	26.333745	29.4882405	29.948235	14.5839815
1.92E+10	23.317876	26.935937	30.6924825	31.046792	14.735682
1.93E+10	22.842097	26.700238	30.387727	30.742161	14.773946
1.94E+10	22.591153	26.380121	29.5448165	30.018742	14.7451895
1.95E+10	22.631934	26.45758	30.016391	30.571059	14.7370465
1.96E+10	22.929888	26.255989	30.3751035	30.922433	14.690952
1.97E+10	23.257257	25.900598	29.810116	30.28403	14.620394
1.98E+10	23.229836	26.00587	29.529999	29.912025	14.607857
1.99E+10	22.883953	26.517957	29.83353	30.111817	14.688799
2E+10	22.563887	26.580824	29.799062	30.003524	14.767238

Table 12. Loss Tangent for SAIC Simulant

Frequency	e"/e' 20 C	e"/e' 40 C	e"/e' 60 C	e"/e' 80 C	e"/e' 100 C
2.55E+08	25.9492533	10.5000095	11.9390631	12.82537	8.215334599
3.58E+08	15.2666422	9.07670096	10.478406	11.35905	7.353837253
4.6E+08	11.4457942	8.00705516	9.34191386	10.18248	6.706306245
5.62E+08	9.17948641	7.18641346	8.45469812	9.267171	6.155026456
6.65E+08	7.66068495	6.44686653	7.62787636	8.40251	5.689418579
7.67E+08	6.52301607	5.83293793	6.9426845	7.678415	5.269208676
8.69E+08	5.62110912	5.27242451	6.2883918	6.968006	4.840076901
9.71E+08	5.05351135	4.894559	5.86384275	6.530218	4.582865097
1.07E+09	4.57147432	4.55965734	5.49101556	6.140807	4.349949568
1.18E+09	4.16236855	4.27038512	5.15992139	5.78978	4.13034819
1.28E+09	3.84498224	4.02438014	4.8658987	5.472181	3.935766
1.38E+09	3.57179878	3.78990547	4.57930344	5.159528	3.749329563
1.48E+09	3.31692478	3.56392616	4.31099571	4.864915	3.571829814
1.59E+09	3.0942455	3.37200522	4.08768831	4.625338	3.399079777
1.69E+09	2.9139651	3.21219165	3.89606299	4.41679	3.264179577
1.79E+09	2.75112092	3.0770922	3.73645875	4.243609	3.162964943
1.89E+09	2.61505828	2.95228854	3.58973816	4.082352	3.062548364
1.99E+09	2.48717149	2.81823816	3.41937554	3.889352	2.934370319
2.1E+09	2.36914873	2.68868599	3.25277805	3.699169	2.817963822
2.2E+09	2.26683584	2.59116335	3.13709208	3.573836	2.740735774
2.3E+09	2.17565205	2.50988384	3.04520356	3.477053	2.671095127
2.4E+09	2.09819766	2.43037176	2.94885528	3.372047	2.590451833
2.51E+09	2.03607919	2.35721062	2.85738223	3.270014	2.531424932
2.61E+09	1.96537527	2.28468758	2.76937662	3.170414	2.470056806
2.71E+09	1.90147382	2.22094294	2.68951735	3.080275	2.409014593
2.81E+09	1.84496513	2.15935215	2.60948497	2.989764	2.346804001
2.92E+09	1.79252567	2.1019652	2.53799912	2.911078	2.302296453
3.02E+09	1.74399911	2.04824774	2.47686537	2.844536	2.253939558
3.12E+09	1.70467192	2.00056395	2.42195974	2.784427	2.204918274
3.22E+09	1.66616387	1.95456719	2.36175061	2.715037	2.160688747
3.32E+09	1.62345649	1.90635749	2.29857442	2.641101	2.123703418
3.43E+09	1.58122561	1.86036982	2.24115138	2.575486	2.078363742
3.53E+09	1.54321707	1.81750958	2.18661653	2.512626	2.028693754
3.63E+09	1.50867172	1.77834743	2.1356675	2.4539	1.993271021
3.73E+09	1.48243767	1.74743352	2.097755	2.412336	1.972868443
3.84E+09	1.45552471	1.71686249	2.06406801	2.373781	1.938447776
3.94E+09	1.43018788	1.6856523	2.02499884	2.328745	1.903605987
4.04E+09	1.40592561	1.6535637	1.98057878	2.275418	1.87937744
4.14E+09	1.38107447	1.62492876	1.94225508	2.230064	1.856378301
4.25E+09	1.35904933	1.60051533	1.91308697	2.19713	1.827476883
4.35E+09	1.34191354	1.5798007	1.88612652	2.167677	1.80582154
4.45E+09	1.32720351	1.56110188	1.86138795	2.138766	1.794916904
4.55E+09	1.31129042	1.54239121	1.83853588	2.112411	1.775279017

Frequency	e"/e' 20 C	e"/e' 40 C	e"/e' 60 C	e"/e' 80 C	e"/e' 100 C
4.65E+09	1.29433311	1.5221357	1.81344206	2.08338	1.747100095
4.76E+09	1.27869118	1.50149696	1.78620879	2.051377	1.731885752
4.86E+09	1.26391714	1.48134028	1.75798178	2.01818	1.721947538
4.96E+09	1.25183453	1.46526716	1.73777232	1.99732	1.704044001
5.06E+09	1.2420165	1.45290853	1.72281258	1.980441	1.686987942
5.17E+09	1.23140146	1.44016229	1.70551974	1.959472	1.680584998
5.27E+09	1.21736435	1.42565645	1.68675708	1.937057	1.667168273
5.37E+09	1.20274004	1.40889491	1.66676048	1.914169	1.642934019
5.47E+09	1.19051362	1.39148217	1.64524299	1.888635	1.626929596
5.57E+09	1.18188346	1.37556947	1.62182886	1.860695	1.622671683
5.68E+09	1.17299398	1.3666016	1.60761075	1.844439	1.616105718
5.78E+09	1.16588434	1.35777024	1.59763596	1.834171	1.59844353
5.88E+09	1.1571924	1.34689666	1.58499905	1.818522	1.590091859
5.98E+09	1.14629017	1.33423686	1.56760538	1.797225	1.581355973
6.09E+09	1.13489739	1.32026116	1.54841697	1.774193	1.561230697
6.19E+09	1.12596163	1.30626008	1.53033273	1.753136	1.547181753
6.29E+09	1.12307	1.29596992	1.51646932	1.735185	1.548735542
6.39E+09	1.1191701	1.28908575	1.50311063	1.720178	1.545768466
6.5E+09	1.11347971	1.28422452	1.49431676	1.709196	1.529381193
6.6E+09	1.10500546	1.27884975	1.49047114	1.704371	1.521101993
6.7E+09	1.09602518	1.26794721	1.47817989	1.688241	1.518011138
6.8E+09	1.08779798	1.25537436	1.45922871	1.665914	1.504930578
6.9E+09	1.0824431	1.24358013	1.44112923	1.643789	1.487422053
7.01E+09	1.08077624	1.2338698	1.42727834	1.627238	1.486038166
7.11E+09	1.07824374	1.22788206	1.4166219	1.614093	1.486524793
7.21E+09	1.07272931	1.22526083	1.41058999	1.606048	1.470773393
7.31E+09	1.06292351	1.22132364	1.40829555	1.602634	1.458020175
7.42E+09	1.056036	1.21557299	1.40535798	1.599581	1.463191182
7.52E+09	1.05020768	1.20520172	1.39026126	1.580749	1.460127404
7.62E+09	1.04735099	1.19326598	1.36859424	1.555605	1.44084488
7.72E+09	1.04593126	1.18448043	1.35633542	1.539525	1.433783879
7.83E+09	1.04339993	1.18023142	1.35291551	1.535283	1.438564257
7.93E+09	1.0363171	1.17808612	1.34879786	1.529922	1.427042793
8.03E+09	1.02635732	1.17544522	1.34400627	1.523476	1.409829634
8.13E+09	1.01793906	1.16905021	1.33979908	1.519076	1.40964194
8.23E+09	1.01481338	1.15816619	1.32722989	1.502141	1.411399341
8.34E+09	1.0143533	1.14631367	1.30486537	1.475149	1.391124795
8.44E+09	1.01296902	1.13935443	1.29102288	1.458023	1.376834703
8.54E+09	1.00771648	1.13353445	1.28726275	1.453354	1.378385255
8.64E+09	1.00037586	1.13168028	1.28954394	1.455261	1.376625279
8.75E+09	0.99193178	1.12983338	1.28555804	1.450264	1.359423477
8.85E+09	0.986382	1.12371672	1.27486311	1.437039	1.356641916
8.95E+09	0.98427312	1.11535311	1.26438588	1.423447	1.367119163
9.05E+09	0.98598473	1.10240275	1.24459154	1.398539	1.351690418
9.16E+09	0.98385445	1.09794011	1.23168488	1.383016	1.332268025

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
9.26E+09	0.98024993	1.0916869	1.22632807	1.377332	1.32819069
9.36E+09	0.97217004	1.09185733	1.23423531	1.386557	1.337002677
9.46E+09	0.96445242	1.09186649	1.23473582	1.385586	1.324746381
9.56E+09	0.95987542	1.08853071	1.22047863	1.368083	1.31814072
9.67E+09	0.96075804	1.08086589	1.20643207	1.349734	1.333641717
9.77E+09	0.96361608	1.07053853	1.19638937	1.336393	1.330454768
9.87E+09	0.96091971	1.06382751	1.18345617	1.321811	1.303394416
9.97E+09	0.95475504	1.05870017	1.17729095	1.316334	1.29111462
1.01E+10	0.94779861	1.05886694	1.18626973	1.326619	1.303050586
1.02E+10	0.94064248	1.05925027	1.18965204	1.328428	1.298029276
1.03E+10	0.93760673	1.05998978	1.1788627	1.314109	1.28948698
1.04E+10	0.939393	1.05528616	1.16167382	1.293221	1.306799679
1.05E+10	0.94079796	1.04605103	1.15316101	1.282399	1.314800831
1.06E+10	0.93816942	1.03457445	1.14693105	1.27459	1.279572697
1.07E+10	0.93108143	1.0306713	1.14261255	1.271162	1.256981123
1.08E+10	0.9230279	1.02897605	1.14188339	1.270381	1.268576868
1.09E+10	0.91827378	1.03101636	1.14703762	1.274095	1.275311472
1.1E+10	0.91871913	1.03764979	1.14719516	1.271827	1.273992175
1.11E+10	0.92353194	1.03986436	1.13564769	1.255212	1.291478338
1.12E+10	0.92781016	1.03074317	1.12511723	1.242473	1.301233921
1.13E+10	0.9252959	1.01609578	1.12354873	1.242551	1.265641534
1.14E+10	0.91609862	1.00866675	1.11907738	1.239201	1.230033377
1.15E+10	0.90786781	1.00937378	1.11163015	1.230911	1.244759966
1.16E+10	0.90539821	1.01859404	1.11794521	1.237443	1.278146185
1.17E+10	0.90865186	1.03173948	1.13269004	1.251827	1.279969184
1.18E+10	0.91487633	1.03352966	1.12832451	1.244475	1.271798722
1.19E+10	0.91779473	1.02071969	1.10821204	1.21842	1.270341951
1.2E+10	0.91435979	0.99597969	1.09198308	1.199026	1.235166844
1.21E+10	0.90590428	0.98609083	1.09124126	1.197433	1.200319839
1.22E+10	0.89890345	0.99466735	1.09025172	1.198357	1.223020476
1.23E+10	0.89961708	0.99746453	1.08240202	1.191153	1.25321671
1.24E+10	0.90675408	0.98644991	1.07742902	1.186915	1.215118267
1.25E+10	0.91457177	0.97807288	1.07283541	1.178595	1.178321662
1.26E+10	0.91470166	0.97123849	1.05397635	1.151037	1.187063178
1.27E+10	0.90944978	0.96633069	1.04433458	1.13321	1.199203071
1.28E+10	0.89988287	0.96695974	1.05101453	1.132522	1.176359899
1.29E+10	0.89166393	0.98047504	1.06026771	1.137833	1.196025208
1.3E+10	0.89716239	0.98700951	1.05282349	1.131067	1.246072337
1.31E+10	0.90845786	0.97559454	1.04406805	1.12892	1.226168019
1.32E+10	0.91590489	0.96349228	1.04733414	1.140916	1.17333804
1.33E+10	0.91262009	0.9631643	1.04784197	1.140739	1.185827846
1.35E+10	0.90234634	0.95750362	1.02362255	1.10612	1.194920193
1.36E+10	0.88909366	0.94968153	1.00948026	1.081308	1.155309345
1.37E+10	0.88125571	0.96533737	1.03037367	1.10023	1.168719772
1.38E+10	0.89145178	0.98416336	1.03782533	1.110301	1.243577325

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
1.39E+10	0.90944352	0.96988744	1.01894139	1.095185	1.240531191
1.4E+10	0.92359112	0.95032551	1.02055247	1.102946	1.177032301
1.41E+10	0.92394209	0.9549735	1.0439246	1.13185	1.1907296
1.42E+10	0.91137037	0.96436314	1.03779737	1.122032	1.238412267
1.43E+10	0.89576559	0.95038652	1.00409421	1.079711	1.191358612
1.44E+10	0.88894205	0.95229621	1.01106482	1.082888	1.158751509
1.45E+10	0.89658437	0.97686731	1.03721145	1.106171	1.23676611
1.46E+10	0.9081295	0.97607956	1.02665782	1.09326	1.272587764
1.47E+10	0.9119628	0.93863765	1.00031888	1.070843	1.174342124
1.48E+10	0.91168539	0.9378241	1.02138636	1.095895	1.160152528
1.49E+10	0.91401577	0.97630196	1.04969937	1.122946	1.273094073
1.5E+10	0.92746922	0.9632302	1.00720496	1.077481	1.224538885
1.51E+10	0.95407769	0.94247831	0.98452011	1.054042	1.127503055
1.52E+10	0.98260778	0.98373802	1.02990617	1.097215	1.242289988
1.53E+10	0.98597062	0.99337381	1.04295171	1.111703	1.313736428
1.54E+10	0.95249198	0.92009191	0.97524389	1.039233	1.11347665
1.55E+10	0.91377089	0.93167052	0.99311733	1.054368	1.129479114
1.56E+10	0.88938766	0.99860378	1.06112471	1.126607	1.304062789
1.57E+10	0.89582955	0.9665689	1.0191647	1.086883	1.205656949
1.58E+10	0.95221097	0.9511406	0.98257793	1.045383	1.16108117
1.59E+10	1.01478022	0.99896045	1.03182864	1.091115	1.316692338
1.6E+10	1.03036255	0.9949968	1.06081143	1.125034	1.302524562
1.61E+10	0.99506029	0.92433143	0.98953398	1.047392	1.157973719
1.62E+10	0.93865037	0.92516606	0.96378498	1.018117	1.182706206
1.63E+10	0.87971865	0.99286624	1.04971305	1.115573	1.29951562
1.64E+10	0.85821207	0.9766757	1.04386419	1.109752	1.249965874
1.65E+10	0.90351117	0.92892271	0.94520301	0.997234	1.195931917
1.66E+10	0.97800067	0.96954318	0.97596652	1.028518	1.288783023
1.67E+10	1.02443369	0.99049812	1.06465574	1.124909	1.311168813
1.68E+10	1.02313583	0.91492915	0.98828368	1.039491	1.189737052
1.69E+10	0.97215472	0.91600173	0.92741813	0.973896	1.21598667
1.7E+10	0.89335377	0.99585236	1.0294446	1.08878	1.321950269
1.71E+10	0.8528972	0.95825864	1.03114229	1.087124	1.229290759
1.72E+10	0.88817615	0.91755843	0.9310669	0.973191	1.192115876
1.73E+10	0.95522906	0.97462692	0.96184415	1.00749	1.31147992
1.74E+10	1.01316288	0.98772439	1.05523055	1.106238	1.328703566
1.75E+10	1.0340156	0.91908184	1.00166836	1.043491	1.244653286
1.76E+10	0.99995275	0.93547351	0.93782679	0.979432	1.285124798
1.77E+10	0.92970647	1.00131074	1.0062738	1.056149	1.340499783
1.79E+10	0.88637914	0.98057965	1.05151724	1.10018	1.287141056
1.8E+10	0.8991127	0.94940156	0.97614403	1.020898	1.273530732
1.81E+10	0.94372235	0.97537204	0.95390689	0.997409	1.334284244
1.82E+10	0.99115269	0.99494634	1.04903979	1.09325	1.351171052
1.83E+10	1.01304756	0.96049008	1.04774273	1.081175	1.322060084
1.84E+10	0.99052847	0.958697	0.94764115	0.978902	1.332416663

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
1.85E+10	0.9421982	1.00887685	0.99615759	1.031129	1.361395901
1.86E+10	0.9131809	1.00929546	1.07405321	1.111836	1.353091208
1.87E+10	0.91816901	0.97435015	1.00498569	1.044343	1.351067297
1.88E+10	0.94451724	0.97811331	0.96597268	1.004942	1.375086925
1.89E+10	0.97931868	0.99431191	1.04228747	1.077226	1.376770936
1.9E+10	0.99697463	0.97294898	1.0279803	1.057364	1.357842657
1.91E+10	0.98826342	0.96972279	0.95726764	0.985218	1.357746185
1.92E+10	0.96287844	1.00881141	0.99758901	1.026149	1.377658121
1.93E+10	0.94850232	1.01281105	1.0365188	1.068996	1.386672261
1.94E+10	0.95437239	0.98318526	0.99942593	1.034952	1.3968769
1.95E+10	0.97254865	0.97425215	0.98664438	1.021735	1.406950545
1.96E+10	0.9889431	0.98141915	1.01223393	1.044749	1.403793398
1.97E+10	0.99702243	0.98397656	1.00601995	1.032453	1.40343147
1.98E+10	0.98882915	0.98517622	0.98482962	1.010245	1.411905735
1.99E+10	0.97488605	1.0052274	1.00161613	1.027802	1.428254487
2E+10	0.96983445	1.01314789	1.01627566	1.042639	1.436955762

Table 12. Dielectric Constant for Revised ORNL Simulant

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.53E+08	149.2546	331.820586	361.9038345	413.62872	319.8025505
2.55E+08	92.67089	161.706909	171.179664	190.02621	146.736212
3.58E+08	71.82076	105.777244	109.001693	118.19282	90.3036955
4.6E+08	62.71913	84.3213445	85.5290475	92.431052	69.273634
5.62E+08	55.1151	69.6533045	69.151175	73.655754	54.838466
6.65E+08	51.52201	61.949908	60.73341	65.035228	47.546334
7.67E+08	48.81211	55.6133065	53.583508	56.361606	41.308024
8.69E+08	46.38217	50.424727	47.780255	49.439908	36.129562
9.71E+08	44.84514	47.2470825	44.2360805	45.171511	32.895665
1.07E+09	43.37706	44.296099	40.9386465	41.523294	29.9938445
1.18E+09	41.91212	42.2178145	38.567422	38.90574	28.009263
1.28E+09	40.83412	40.0718245	36.2509325	36.560287	26.2069295
1.38E+09	40.07635	39.3472415	35.5205205	35.825047	25.669413
1.48E+09	39.64219	37.829124	33.855085	33.614626	24.1423735
1.59E+09	39.08533	36.989339	32.879158	32.31099	23.15205
1.69E+09	38.40299	36.021852	31.8895145	31.21266	22.201082
1.79E+09	37.80552	35.220085	31.038601	30.453199	21.5685895
1.89E+09	37.29735	34.2510635	29.9244185	29.215052	20.851459
1.99E+09	36.90479	33.551443	29.2255065	28.665031	20.304853
2.1E+09	36.89949	33.31349	28.9917475	28.299257	20.0467305
2.2E+09	36.5758	32.90656	28.637071	27.748455	19.524731
2.3E+09	36.26129	32.4776075	28.1090865	26.836217	19.0061065
2.4E+09	35.85531	32.0199145	27.5422315	26.226628	18.648158
2.51E+09	35.46265	31.447682	27.01232	26.027104	18.284863
2.61E+09	35.14452	30.841021	26.344903	25.5074	17.8056995
2.71E+09	34.83513	30.466429	26.005588	25.091393	17.542597
2.81E+09	34.66349	30.183925	25.7252435	24.481204	17.2203605
2.92E+09	34.4116	29.7663645	25.257701	23.607054	16.671143
3.02E+09	34.11834	29.442912	24.944796	23.328204	16.3495985
3.12E+09	33.81091	29.17444	24.690014	23.354191	16.238596
3.22E+09	33.5561	28.920278	24.4214695	23.329728	16.2197565
3.32E+09	33.35465	28.6523915	24.2360985	23.169879	16.150454
3.43E+09	33.2293	28.4688495	24.125071	22.924531	15.9652205
3.53E+09	33.11519	28.229617	23.9361185	22.517627	15.636966
3.63E+09	33.06231	28.190962	23.924223	22.376515	15.51558
3.73E+09	32.83416	28.048199	23.770843	22.32064	15.507213
3.84E+09	32.64379	27.9236045	23.696582	22.599629	15.649972
3.94E+09	32.47571	27.7438825	23.5769095	22.762116	15.6348435
4.04E+09	32.33948	27.513737	23.3960215	22.495053	15.3911415
4.14E+09	32.15998	27.302741	23.2041695	21.963976	15.1042325
4.25E+09	32.01048	27.1732635	23.083685	21.633417	14.9331965
4.35E+09	31.78804	27.008834	22.952226	21.568752	14.849206
4.45E+09	31.53576	26.706189	22.6658115	21.602139	14.760847

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
4.55E+09	31.3019	26.488249	22.486764	21.749451	14.800646
4.65E+09	31.06306	26.3337085	22.400212	21.730687	14.842017
4.76E+09	30.82195	25.970365	22.0125855	20.957563	14.3898405
4.86E+09	30.63233	25.642016	21.69869	20.245574	13.911858
4.96E+09	30.42123	25.411526	21.456377	19.923397	13.6553755
5.06E+09	30.27553	25.422147	21.481597	20.222898	13.837903
5.17E+09	30.05583	25.2965805	21.4010345	20.478971	13.977429
5.27E+09	29.89649	25.13916	21.297429	20.594742	14.0369495
5.37E+09	29.65856	24.976217	21.2069635	20.396347	13.900904
5.47E+09	29.49491	24.698856	20.952417	19.782631	13.485446
5.57E+09	29.35175	24.462821	20.7026455	19.212969	13.118875
5.68E+09	29.1507	24.332114	20.582615	19.208764	13.079969
5.78E+09	29.03547	24.407696	20.697987	19.718831	13.448086
5.88E+09	28.90537	24.4405495	20.8154255	20.200858	13.683602
5.98E+09	28.75456	24.301813	20.742457	20.100521	13.6176435
6.09E+09	28.58079	24.078188	20.5547405	19.6281	13.3594865
6.19E+09	28.41856	23.9002135	20.3912665	19.154438	13.066554
6.29E+09	28.35752	23.779834	20.2800765	19.032624	12.902755
6.39E+09	28.21679	23.769865	20.3188705	19.454834	13.1270565
6.5E+09	28.09266	23.9431495	20.5787095	20.310158	13.6462695
6.6E+09	27.90603	23.993759	20.694812	20.617247	13.8571175
6.7E+09	27.67177	23.6694905	20.415019	20.035067	13.4891425
6.8E+09	27.38397	23.350845	20.113249	19.311386	13.048017
6.9E+09	27.1719	23.107275	19.868043	18.829497	12.759396
7.01E+09	27.00028	22.9780385	19.775014	18.940292	12.7648465
7.11E+09	26.8321	22.9223425	19.752755	19.372289	12.9993715
7.21E+09	26.70275	23.023561	19.9389455	20.00863	13.426249
7.31E+09	26.55481	22.933007	19.9172	19.914075	13.41059
7.42E+09	26.33646	22.762383	19.756512	19.332971	13.0290695
7.52E+09	26.17292	22.427828	19.41459	18.524108	12.54083
7.62E+09	26.06053	22.2957795	19.293294	18.385128	12.463268
7.72E+09	25.95047	22.40005	19.4208615	18.939226	12.7488055
7.83E+09	25.90442	22.551554	19.6154705	19.641711	13.1438385
7.93E+09	25.81431	22.5364765	19.650341	19.826789	13.3464535
8.03E+09	25.64858	22.642225	19.8405535	19.799011	13.3701705
8.13E+09	25.34164	22.2581545	19.4434095	18.813561	12.767317
8.23E+09	25.1114	22.0237295	19.225581	18.364005	12.4557245
8.34E+09	24.86677	21.884843	19.0890335	18.476305	12.5505195
8.44E+09	24.78345	22.0350125	19.277812	19.252003	13.0193425
8.54E+09	24.7498	22.276021	19.5816425	19.963629	13.4514525
8.64E+09	24.74088	22.3722205	19.7490095	20.01287	13.5259495
8.75E+09	24.72919	22.3043985	19.6885645	19.43835	13.2731375
8.85E+09	24.59611	22.145014	19.535944	18.873107	12.882451
8.95E+09	24.41297	21.9234635	19.299996	18.684704	12.69049
9.05E+09	24.36792	21.952903	19.3643435	19.38282	13.1063815

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
9.16E+09	24.3861	22.1620315	19.6362295	20.319328	13.6890515
9.26E+09	24.44767	22.505842	20.0409395	20.825637	14.042089
9.36E+09	24.397	22.4541005	20.0388205	20.357124	13.770535
9.46E+09	24.26623	22.3872745	19.9720995	19.684834	13.4377925
9.56E+09	24.00092	22.0661975	19.667179	19.167677	13.1254925
9.67E+09	23.82454	21.9206925	19.5440445	19.567014	13.192302
9.77E+09	23.67525	21.8472255	19.4890645	20.291538	13.6476965
9.87E+09	23.80106	22.303249	20.0348185	21.374887	14.3916045
9.97E+09	23.84623	22.4368195	20.2209345	21.233258	14.343745
1.01E+10	23.77233	22.4487135	20.258366	20.511774	13.8783915
1.02E+10	23.52854	22.1739045	20.0026075	19.711576	13.4355305
1.03E+10	23.20556	21.8688085	19.694517	19.554455	13.2825325
1.04E+10	23.11623	21.8343705	19.6464935	20.305025	13.6738575
1.05E+10	23.2054	22.0346985	19.8803105	21.377336	14.2373955
1.06E+10	23.33161	22.342845	20.2078985	21.729394	14.612785
1.07E+10	23.22375	22.3810245	20.245517	20.94648	14.170347
1.08E+10	22.90792	22.0590385	19.932213	19.68096	13.363646
1.09E+10	22.59477	21.76462	19.6525475	19.16879	13.0814585
1.1E+10	22.37691	21.671686	19.5990815	19.90002	13.5220155
1.11E+10	22.60968	22.019629	19.9662715	21.490426	14.4075395
1.12E+10	22.90521	22.4293755	20.371959	22.381553	15.05858
1.13E+10	23.03609	22.530807	20.4618695	21.846481	14.7790795
1.14E+10	22.8769	22.430566	20.394611	20.544832	14.046629
1.15E+10	22.62793	22.2362515	20.2550465	19.67498	13.3932345
1.16E+10	22.3792	22.0218435	20.070305	20.139911	13.5616195
1.17E+10	22.44216	22.565813	20.665173	22.644898	15.223885
1.18E+10	22.65964	23.135879	21.2625485	24.755621	16.573407
1.19E+10	22.68912	22.945599	21.0537725	24.287909	16.22088
1.2E+10	22.51412	22.581282	20.686879	22.150151	15.0242685
1.21E+10	22.16959	22.1213735	20.22705	19.786544	13.5558235
1.22E+10	21.71928	21.8384005	19.99548	18.857298	12.82515
1.23E+10	21.55762	22.3114555	20.5844665	21.007389	14.095978
1.24E+10	21.8508	22.7427715	21.016423	24.476143	16.2118835
1.25E+10	22.06119	23.0727445	21.3182155	26.551472	17.6156465
1.26E+10	22.03775	22.8528065	21.093072	25.174992	16.914082
1.27E+10	21.97637	22.216641	20.398484	21.784176	14.8685825
1.28E+10	21.57527	21.8590825	20.084853	18.923942	13.036218
1.29E+10	21.38675	21.9952705	20.296286	17.943864	12.1288725
1.3E+10	21.34439	22.183402	20.4915185	19.332326	12.976695
1.31E+10	21.44796	22.5804265	20.8771235	23.34634	15.3976585
1.32E+10	21.45982	22.328882	20.631955	25.289221	16.758118
1.33E+10	21.34791	21.917404	20.186022	23.929775	16.119112
1.35E+10	20.99852	21.2227105	19.4949255	20.611565	14.123956
1.36E+10	20.7193	21.1109945	19.382006	17.820923	12.3788905
1.37E+10	20.63006	21.6802195	19.9411825	16.871249	11.6647315

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.38E+10	20.77342	22.226146	20.5504775	18.620328	12.608348
1.39E+10	20.99595	22.3531755	20.6774535	22.125924	14.8419645
1.4E+10	21.06808	22.1262935	20.445794	24.160585	16.2506795
1.41E+10	21.11836	21.3846765	19.6448175	22.615534	15.3868525
1.42E+10	21.06076	21.1038235	19.328534	20.002389	13.920032
1.43E+10	20.83386	21.5732135	19.7965805	18.161001	12.724468
1.44E+10	20.58202	22.6517655	20.866176	18.181226	12.392135
1.45E+10	20.62499	23.2328345	21.561896	20.6588	13.7119885
1.46E+10	20.89495	23.1643665	21.6735835	24.339165	16.0595515
1.47E+10	21.05656	22.1942475	20.755092	24.636587	16.6062495
1.48E+10	20.93398	21.284524	19.732205	22.333008	15.401644
1.49E+10	20.83583	21.0583025	19.4954395	19.882294	14.056433
1.5E+10	20.42494	21.2962805	19.6586465	18.012775	12.685696
1.51E+10	20.20974	22.8250415	21.113637	18.697317	12.710595
1.52E+10	20.11836	23.7112295	22.1729805	22.278082	14.3029235
1.53E+10	20.79742	24.6528135	23.3840965	27.137957	17.612211
1.54E+10	20.83999	22.839723	21.551858	25.399163	17.114241
1.55E+10	20.76416	21.771821	20.391025	22.766846	15.797339
1.56E+10	19.73822	19.979158	18.614011	19.051676	13.47051
1.57E+10	19.01246	19.8118215	18.3733885	17.09394	12.0141825
1.58E+10	19.01016	20.819359	19.1828585	17.14325	11.551469
1.59E+10	19.3444	23.062657	21.397761	21.169419	13.438777
1.6E+10	19.72142	23.297349	21.9142545	24.720426	15.910023
1.61E+10	20.14114	23.9332725	22.731935	26.294954	17.6171415
1.62E+10	19.40359	22.236994	21.103595	23.682127	16.031881
1.63E+10	19.03859	19.9455625	18.5549335	19.456999	13.0299495
1.64E+10	19.20984	18.4697455	16.8559955	16.14011	11.018618
1.65E+10	19.24235	19.064191	17.3673895	16.365678	10.6713025
1.66E+10	19.29602	21.625558	19.932495	20.279477	12.621732
1.67E+10	19.53376	23.491795	21.828402	24.224409	15.0526685
1.68E+10	19.60616	23.5201575	22.195141	25.255405	16.4303325
1.69E+10	18.84463	20.865835	19.5620575	21.659798	14.177192
1.7E+10	18.30983	18.783427	17.2410675	17.817351	12.0825745
1.71E+10	18.39168	18.2373595	16.72617	16.71079	11.229141
1.72E+10	18.85266	19.5694345	18.136174	18.434659	11.972336
1.73E+10	18.85503	21.1781875	19.526048	20.534522	12.9230795
1.74E+10	19.04166	23.031548	21.397791	23.387199	14.917233
1.75E+10	19.00319	22.3633435	21.0074955	23.185993	14.948487
1.76E+10	18.73237	20.705952	19.3682565	20.737583	13.367164
1.77E+10	18.18278	19.3023455	17.739009	18.213404	12.024617
1.79E+10	18.28855	19.2740455	17.677693	18.170306	12.1135185
1.8E+10	18.54781	19.5846995	18.0861455	18.971945	12.269023
1.81E+10	18.5022	21.310964	19.810108	21.321546	13.586511
1.82E+10	18.22116	22.148688	20.5530775	22.39976	14.5045915
1.83E+10	18.39414	21.607874	20.27742	21.879366	14.3005495

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.84E+10	18.03585	19.787797	18.6036665	19.53709	12.8780415
1.85E+10	17.79301	19.5871635	18.13211	18.904823	12.488563
1.86E+10	17.69814	19.697323	18.259591	19.390097	12.72819
1.87E+10	18.36827	20.8023675	19.5866085	21.144096	13.706737
1.88E+10	18.25322	21.419377	20.093142	21.855564	14.178368
1.89E+10	17.65697	21.5836905	20.1025385	21.740645	14.132365
1.9E+10	17.50202	20.432709	19.1272865	20.265123	13.2779575
1.91E+10	17.11725	18.75477	17.512957	18.225815	11.9574255
1.92E+10	16.14397	17.9736435	16.630127	17.548792	11.409773
1.93E+10	16.38152	18.6424645	17.2839555	18.56133	12.037423
1.94E+10	16.97027	19.318656	18.0941375	19.539486	12.771081
1.95E+10	16.86361	19.812196	18.6149265	20.153285	13.1050445
1.96E+10	16.67934	19.9895	18.678974	19.964848	13.0029395
1.97E+10	17.05582	19.7449965	18.4704575	19.442945	12.7076875
1.98E+10	17.21729	19.114438	17.7573795	18.616375	12.137334
1.99E+10	17.03254	19.149624	17.6864655	18.827571	12.1055425
2E+10	16.79821	19.508136	18.0525825	19.488389	12.455157

Table 13. Dielectric Loss for the Revised ORNL Simulant

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.53E+08	1428.896	1905.133699	2223.72142	2676.21191	1941.12819
2.55E+08	871.8114	1180.124271	1375.31055	1652.2646	1202.02291
3.58E+08	631.6136	854.334889	994.766021	1194.32359	869.361363
4.6E+08	495.5831	669.1153575	778.779865	935.11119	680.656218
5.62E+08	409.707	559.538676	651.255822	780.965989	568.97301
6.65E+08	348.3537	477.7689155	555.803024	667.10015	485.423194
7.67E+08	303.4035	413.899089	481.32105	577.169703	420.067462
8.69E+08	269.0006	365.0583195	424.223398	508.54136	370.03706
9.71E+08	241.8903	328.3287855	381.463196	457.526777	332.781543
1.07E+09	219.9603	299.4953305	347.858256	417.455362	303.559196
1.18E+09	201.8917	275.8192925	320.150825	384.26404	279.404763
1.28E+09	186.3019	254.152691	294.885715	353.699616	257.168039
1.38E+09	173.1138	234.9703875	272.528434	326.670663	237.493173
1.48E+09	161.6355	218.850513	253.714751	304.029178	220.940051
1.59E+09	152.0275	206.038162	238.651234	285.904125	207.877846
1.69E+09	143.4499	194.7007	225.370199	270.174985	196.468714
1.79E+09	135.8702	183.7785785	212.642884	255.01632	185.405707
1.89E+09	128.918	173.8794385	201.02371	241.070859	175.160811
1.99E+09	122.6491	165.803854	191.57154	229.423986	166.758135
2.1E+09	117.0233	158.3754475	182.854883	218.717736	159.064047
2.2E+09	112.3123	151.1065045	174.282541	208.319019	151.587797
2.3E+09	107.881	144.325983	166.406799	199.159651	144.762994
2.4E+09	103.8252	138.6815225	159.751412	191.323713	139.055882
2.51E+09	100.0897	133.9914055	154.120524	184.424107	134.1889
2.61E+09	96.30372	129.344476	148.732197	177.81632	129.332127
2.71E+09	93.08152	124.4666245	142.985535	170.639163	124.116199
2.81E+09	90.15948	119.7773975	137.502808	163.965132	119.287
2.92E+09	87.45045	115.6750985	132.642077	158.221405	115.140012
3.02E+09	84.93633	112.2777085	128.608195	153.512261	111.737386
3.12E+09	82.5269	109.2124465	124.975746	149.195376	108.582893
3.22E+09	80.19298	105.883117	121.028811	144.3171	105.015749
3.32E+09	77.94846	102.3190995	116.817528	138.940205	101.185263
3.43E+09	75.88156	99.279875	113.266133	134.479679	97.9406995
3.53E+09	73.96535	96.770172	110.326867	130.993357	95.3967745
3.63E+09	72.22574	94.426469	107.577802	127.976141	93.1638225
3.73E+09	70.69393	91.9184665	104.585705	124.456882	90.622283
3.84E+09	69.17686	89.593227	101.84489	121.105606	88.162009
3.94E+09	67.72376	87.6078965	99.497506	118.040359	85.9782485
4.04E+09	66.37318	85.7043605	97.2251965	115.070203	83.8418355
4.14E+09	65.1099	83.6817925	94.8320745	112.114642	81.6894
4.25E+09	63.86653	81.7512145	92.547922	109.545199	79.793003
4.35E+09	62.71675	80.145051	90.643782	107.511501	78.2984635
4.45E+09	61.62254	78.649657	88.8408315	105.36213	76.7487975

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
4.55E+09	60.57096	77.0465155	86.9104645	102.791881	74.901736
4.65E+09	59.56926	75.248588	84.7707035	99.867188	72.822563
4.76E+09	58.57321	73.7173545	82.9844875	97.601005	71.1569545
4.86E+09	57.66819	72.4155205	81.4104075	95.7918955	69.7981885
4.96E+09	56.70708	71.2006855	79.981329	94.3071345	68.6854795
5.06E+09	55.84022	69.9634645	78.52124	92.68369	67.5425695
5.17E+09	55.05229	68.7173445	77.0254725	90.798269	66.158909
5.27E+09	54.27555	67.281399	75.313414	88.385721	64.417981
5.37E+09	53.5707	66.1053005	73.930167	86.465728	63.012924
5.47E+09	52.83808	65.0518755	72.665478	84.9505765	61.9278945
5.57E+09	52.15313	64.0840475	71.4926865	83.728506	61.0261915
5.68E+09	51.50519	63.075243	70.2865765	82.5479445	60.1108955
5.78E+09	50.80048	62.0540975	69.071273	81.1047075	59.1056205
5.88E+09	50.17785	61.071505	67.9404315	79.5706445	58.0009
5.98E+09	49.54163	59.9784045	66.6495745	77.6741845	56.662068
6.09E+09	48.91662	58.916545	65.4074835	76.0518975	55.4561025
6.19E+09	48.23264	57.98451	64.335207	74.9833695	54.6642685
6.29E+09	47.60268	57.2016955	63.425357	74.215812	54.0705425
6.39E+09	47.01773	56.393655	62.4575205	73.168605	53.299063
6.5E+09	46.48058	55.4460645	61.3805205	71.710926	52.3113915
6.6E+09	46.0262	54.5992655	60.4009575	70.217164	51.2600275
6.7E+09	45.55818	53.697375	59.335047	68.6664155	50.103237
6.8E+09	45.0335	52.884176	58.3545285	67.524141	49.2387995
6.9E+09	44.41452	52.1434925	57.4828735	66.769644	48.6822135
7.01E+09	43.88577	51.4585095	56.6917435	66.1037755	48.192154
7.11E+09	43.45508	50.729223	55.809883	64.992218	47.3899615
7.21E+09	43.01952	49.902282	54.864336	63.5133065	46.3451015
7.31E+09	42.58483	49.140361	53.9941255	62.1467	45.3735715
7.42E+09	42.16313	48.4613265	53.198469	61.1157555	44.639979
7.52E+09	41.74515	47.8238065	52.435932	60.415346	44.05839
7.62E+09	41.31207	47.317196	51.8354585	60.0524555	43.7793605
7.72E+09	40.94829	46.834629	51.289524	59.617104	43.477256
7.83E+09	40.66338	46.3153975	50.6897275	58.661286	42.8000595
7.93E+09	40.38507	45.6068985	49.852504	57.2258885	41.761622
8.03E+09	40.06825	44.9722905	49.1478305	56.1117685	41.0274715
8.13E+09	39.68518	44.4430795	48.510033	55.5152275	40.5114525
8.23E+09	39.34377	43.947692	47.8855845	55.1146775	40.20576
8.34E+09	38.93362	43.51565	47.391602	54.8773435	39.9885765
8.44E+09	38.49404	42.974034	46.792331	54.1810505	39.5173105
8.54E+09	38.10514	42.3857335	46.143488	52.9817315	38.7255005
8.64E+09	37.7094	41.7966765	45.503945	51.784633	37.8486505
8.75E+09	37.41829	41.3009015	44.9006265	51.0093245	37.275888
8.85E+09	37.11015	40.964091	44.4914275	50.8637885	37.1841415
8.95E+09	36.74976	40.649266	44.106802	50.867068	37.1051025
9.05E+09	36.36708	40.1329735	43.533475	50.322775	36.7012515

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
9.16E+09	36.07867	39.546631	42.908126	49.3286975	36.0309355
9.26E+09	35.76467	39.1076795	42.407907	48.124916	35.2954025
9.36E+09	35.64096	38.69927	41.9228025	47.2544935	34.645763
9.46E+09	35.42997	38.4324685	41.6192765	47.1573885	34.4837065
9.56E+09	34.98713	37.9441235	41.0383915	46.9960225	34.3974095
9.67E+09	34.72049	37.691252	40.726047	46.9965035	34.395551
9.77E+09	34.15271	36.8777435	39.869155	45.8492095	33.50924
9.87E+09	33.87712	36.392761	39.3499245	44.5777365	32.7643325
9.97E+09	33.57572	35.719064	38.6250565	43.2353375	31.827983
1.01E+10	33.48756	35.694102	38.5673415	43.1508095	31.677612
1.02E+10	33.40836	35.5889545	38.3760805	43.407847	31.816531
1.03E+10	33.0809	35.264941	38.004823	43.6430035	31.9705365
1.04E+10	32.73726	34.7909305	37.495775	43.2106605	31.676078
1.05E+10	32.52202	34.5007025	37.1855905	42.2207495	31.0080485
1.06E+10	32.43291	33.902672	36.545536	40.714695	29.911284
1.07E+10	32.6003	34.032786	36.6036245	40.423863	29.7331465
1.08E+10	32.59964	34.0887855	36.581742	40.760699	29.884181
1.09E+10	32.30481	33.8976395	36.334431	41.340061	30.215349
1.1E+10	31.82858	33.391169	35.799294	41.44219	30.3423605
1.11E+10	31.46093	33.061755	35.484283	40.905182	30.057698
1.12E+10	31.35115	32.497761	34.916218	39.2550345	28.9021555
1.13E+10	31.39105	32.6756745	35.0772185	38.5458275	28.3957135
1.14E+10	31.36888	32.522579	34.851552	38.353139	28.267925
1.15E+10	31.17159	32.419895	34.6895295	39.136167	28.7512525
1.16E+10	30.70246	32.0845605	34.327127	40.0307985	29.214563
1.17E+10	30.22886	31.359597	33.6046295	39.6733945	29.0513865
1.18E+10	30.00679	30.7734155	33.0296835	37.9623425	28.0701465
1.19E+10	30.1524	30.9722145	33.1871465	36.415917	26.999321
1.2E+10	30.32499	30.9819155	33.1186545	35.4193125	26.2175305
1.21E+10	30.30196	31.053431	33.090367	36.021101	26.5462455
1.22E+10	29.88555	30.691468	32.682685	37.515895	27.4023795
1.23E+10	29.1877	30.3208645	32.3315655	39.2051705	28.568141
1.24E+10	28.73931	29.697446	31.76175	39.2045035	28.5191635
1.25E+10	28.70212	29.526027	31.5553785	36.865575	27.288791
1.26E+10	28.84978	29.3247275	31.306036	33.896103	25.285826
1.27E+10	29.21795	29.5353615	31.444092	32.7684715	24.2768485
1.28E+10	29.18052	29.610108	31.468953	33.713026	24.8255635
1.29E+10	28.78491	29.9196215	31.8242275	36.93177	26.8653345
1.3E+10	28.456	29.3085385	31.215055	39.4019285	28.224825
1.31E+10	28.14492	29.0801765	31.0308325	40.0146595	28.8249085
1.32E+10	27.99987	28.4759785	30.28031	36.4293065	26.8057715
1.33E+10	28.22095	28.3654585	30.0753675	32.735532	24.3676745
1.35E+10	28.2204	28.3254325	29.969333	30.8148945	22.831716
1.36E+10	28.14666	28.5291025	30.17378	31.656571	23.289199
1.37E+10	27.94967	28.7587005	30.4779515	34.574984	25.1894585

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.38E+10	27.47913	28.320238	30.109986	37.064659	26.7188025
1.39E+10	27.53057	27.754882	29.4811645	36.8140775	26.775361
1.4E+10	27.56533	27.375519	29.0361065	33.7474405	25.191365
1.41E+10	27.6164	27.276721	28.824857	30.6098995	22.936634
1.42E+10	27.73502	27.7000175	29.1791545	29.5297045	21.877591
1.43E+10	27.85747	28.598442	30.162307	31.366591	23.082701
1.44E+10	27.78759	29.2871435	30.9872275	35.020739	25.5359105
1.45E+10	27.4319	28.3368645	30.0121435	36.645851	26.658235
1.46E+10	27.0122	26.8894085	28.505556	34.6203485	25.8296075
1.47E+10	26.92229	25.248216	26.7722785	30.1347385	23.0151545
1.48E+10	26.84077	25.386005	26.7279425	27.8972485	21.2419995
1.49E+10	26.51842	26.013251	27.252947	27.6245205	20.753981
1.5E+10	26.41984	27.671187	29.0507625	30.650496	22.56531
1.51E+10	26.07171	28.192786	29.835587	34.4045405	24.947166
1.52E+10	25.61987	26.917995	28.634424	35.71583	25.808873
1.53E+10	25.3451	24.101717	25.7873555	31.26534	23.627974
1.54E+10	25.61316	23.161498	24.626818	27.1071995	20.989592
1.55E+10	26.24539	23.473554	24.700954	25.179719	19.5348745
1.56E+10	26.23387	24.8355365	25.8449595	25.921189	19.635127
1.57E+10	25.58825	26.8970555	28.0288695	29.213057	21.6958875
1.58E+10	25.0936	28.087166	29.431644	33.001105	24.0615525
1.59E+10	24.86711	27.7806185	29.296514	35.461263	25.6116495
1.6E+10	24.89169	24.105808	25.493251	30.250003	22.655636
1.61E+10	25.787	22.779458	24.106346	26.1122295	20.5628795
1.62E+10	26.16835	23.364691	24.5943235	25.290828	19.95113
1.63E+10	25.73731	25.7581435	26.9379335	27.797848	21.055479
1.64E+10	25.45015	26.9838185	27.9788105	29.5226045	21.753241
1.65E+10	25.49795	28.196631	29.26275	32.394492	23.575821
1.66E+10	25.31497	27.1305155	28.5025145	33.356066	24.0645425
1.67E+10	25.41309	25.8446755	27.1741405	31.267198	23.11592
1.68E+10	25.86719	24.4193935	25.656268	27.6932345	21.41798
1.69E+10	26.03336	24.5719455	25.835469	27.3800995	21.027667
1.7E+10	25.20665	24.214254	25.2810495	26.747371	20.0704175
1.71E+10	24.63138	25.0965685	25.972338	27.8612895	20.5946935
1.72E+10	24.56767	25.9874845	27.0522395	30.1694875	22.0660105
1.73E+10	24.54086	25.824226	27.1719965	30.9415435	22.196231
1.74E+10	24.80643	24.5023135	25.731526	28.5903865	21.0675795
1.75E+10	25.356	24.3350335	25.4018765	27.590573	20.7700595
1.76E+10	25.50703	24.3862535	25.5730005	27.6909905	20.8724165
1.77E+10	25.06896	24.3280895	25.3111	27.3964765	20.302883
1.79E+10	24.34449	24.818562	25.5985125	28.2781265	20.725853
1.8E+10	24.29138	25.5068425	26.4599715	29.9222015	21.5627195
1.81E+10	24.05711	24.172611	25.3975675	28.536264	20.774287
1.82E+10	24.01209	23.44785	24.4802715	26.7312125	19.775561
1.83E+10	23.81737	23.006945	23.8896415	25.8723025	19.4495205

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.84E+10	23.65681	22.193383	23.168587	25.265084	19.0084505
1.85E+10	23.37783	22.4362745	23.4147515	25.7381055	19.2166685
1.86E+10	22.61402	22.94558	23.706185	26.428264	19.5539575
1.87E+10	22.23525	22.60553	23.516721	26.4791425	19.5183475
1.88E+10	23.12055	22.586403	23.68709	26.0315465	19.265405
1.89E+10	23.48182	22.6812355	23.5890645	25.43068	18.9456655
1.9E+10	23.68889	22.9196185	23.59539	25.605412	19.0073915
1.91E+10	23.95918	22.7470635	23.4821305	25.6137895	19.0051895
1.92E+10	23.24911	22.374854	23.0619065	25.312973	18.704161
1.93E+10	22.40579	22.524077	23.083795	25.6084435	18.775199
1.94E+10	22.31985	22.375626	23.0786085	25.3599575	18.652855
1.95E+10	22.53326	21.692746	22.5265285	24.322604	18.0358405
1.96E+10	22.91337	21.934715	22.6633855	24.3661035	18.156972
1.97E+10	22.80849	22.1579255	22.848516	24.7389525	18.435618
1.98E+10	23.44783	22.738995	23.4316315	25.637945	18.837272
1.99E+10	23.69557	23.1669415	23.837607	26.2139485	19.1915655
2E+10	23.65878	23.6916555	24.276313	26.5104525	19.4834245

Table 14. Loss Tangent for the Revised ORNL Simulant

Frequency	e"/'e 20 C	e"/e' @ 40 C	e"/e' @ 60 C	e"/e' @ 80 C	e"/e' @ 100 C
1.53E+08	9.573549	5.74145723	6.144509131	6.47008248	6.069770835
2.55E+08	9.407608	7.29792115	8.034310381	8.694930047	8.191726477
3.58E+08	8.794304	8.07673617	9.126152022	10.10487406	9.627085112
4.6E+08	7.901625	7.93530228	9.105442978	10.11685115	9.825617319
5.62E+08	7.43366	8.03319641	9.417856197	10.60291893	10.37543628
6.65E+08	6.76126	7.71218119	9.151520119	10.25752005	10.2094768
7.67E+08	6.215742	7.44244705	8.982634172	10.24047652	10.16914927
8.69E+08	5.799655	7.23966873	8.878634019	10.28604989	10.24194701
9.71E+08	5.393903	6.94918645	8.623349802	10.12865779	10.11627347
1.07E+09	5.070889	6.76121232	8.49706294	10.0535224	10.12071645
1.18E+09	4.817024	6.53324422	8.301068827	9.876795685	9.975441428
1.28E+09	4.562407	6.34242873	8.134569076	9.67442121	9.812978625
1.38E+09	4.319599	5.97171183	7.672422297	9.11849933	9.251990803
1.48E+09	4.07736	5.78523872	7.494140127	9.044550489	9.151546367
1.59E+09	3.889631	5.57020394	7.25843507	8.848510213	8.978809479
1.69E+09	3.735385	5.4050719	7.067219509	8.655942316	8.849510758
1.79E+09	3.593923	5.21800497	6.850917137	8.374040442	8.596097881
1.89E+09	3.456492	5.07661429	6.717714815	8.251597807	8.400410278
1.99E+09	3.323392	4.94178012	6.554943351	8.003619096	8.212723086
2.1E+09	3.171407	4.75409354	6.307135591	7.728744804	7.934662812
2.2E+09	3.070673	4.59198727	6.085906638	7.507409638	7.763886581
2.3E+09	2.975101	4.4438613	5.920035822	7.421301378	7.616656968
2.4E+09	2.895673	4.33110221	5.800234887	7.295017587	7.456815923
2.51E+09	2.822399	4.26077208	5.705564128	7.085848277	7.338797097
2.61E+09	2.74022	4.19391031	5.645577704	6.971166015	7.263524076
2.71E+09	2.672059	4.08536965	5.49826195	6.800705047	7.075132547
2.81E+09	2.600993	3.96825123	5.345053702	6.697592651	6.927090754
2.92E+09	2.541307	3.88610099	5.251549874	6.702293518	6.90654576
3.02E+09	2.489462	3.81340366	5.155712418	6.580543633	6.834258713
3.12E+09	2.440836	3.74342906	5.061793242	6.388377109	6.68671682
3.22E+09	2.389818	3.66120675	4.955836544	6.185974393	6.474557648
3.32E+09	2.336959	3.57104919	4.819980741	5.996587423	6.265165208
3.43E+09	2.283574	3.48731602	4.694955426	5.866191047	6.134628676
3.53E+09	2.233578	3.42796617	4.60922129	5.81736965	6.100721489
3.63E+09	2.184534	3.34952986	4.496605888	5.71921695	6.004533669
3.73E+09	2.15306	3.27716109	4.399747413	5.5758654	5.843879426
3.84E+09	2.119143	3.20851225	4.297872579	5.358743101	5.633365287
3.94E+09	2.085367	3.15773744	4.220125034	5.185825386	5.499143532
4.04E+09	2.052389	3.11496619	4.155629473	5.115356032	5.44740853
4.14E+09	2.024563	3.06495939	4.086854929	5.10447842	5.408378082
4.25E+09	1.995176	3.00851661	4.009235181	5.063702997	5.343330412
4.35E+09	1.972967	2.96736434	3.949237081	4.984595354	5.272905737
4.45E+09	1.954052	2.94499739	3.919596327	4.877393481	5.199484657

Frequency	e"/'e 20 C	e"/e' @ 40 C	e"/e' @ 60 C	e"/e' @ 80 C	e"/e' @ 100 C
4.55E+09	1.935057	2.9087055	3.864960939	4.72618279	5.060707215
4.65E+09	1.917688	2.85750061	3.78437059	4.595675705	4.906513919
4.76E+09	1.900373	2.83851823	3.769865539	4.657078083	4.944943935
4.86E+09	1.882592	2.82409622	3.751858177	4.731498129	5.017172293
4.96E+09	1.864063	2.80190515	3.727625079	4.733486808	5.029922429
5.06E+09	1.844401	2.7520675	3.655279447	4.583106239	4.880983015
5.17E+09	1.831668	2.71646773	3.599147158	4.433732106	4.733267398
5.27E+09	1.815449	2.67635828	3.536267875	4.291664397	4.589172384
5.37E+09	1.806248	2.64672991	3.486126951	4.239275304	4.533009076
5.47E+09	1.79143	2.63380116	3.46811912	4.294200124	4.592202179
5.57E+09	1.776832	2.61965075	3.453311631	4.357916165	4.651785424
5.68E+09	1.76686	2.59226317	3.414851636	4.297410632	4.595645104
5.78E+09	1.749601	2.54239882	3.337100994	4.113058708	4.395095369
5.88E+09	1.735936	2.4987779	3.263946322	3.938973508	4.2387158
5.98E+09	1.722914	2.46806296	3.213195741	3.864287125	4.160930487
6.09E+09	1.711521	2.4468845	3.182111859	3.874643878	4.151065425
6.19E+09	1.697223	2.42610845	3.155037329	3.914673532	4.183526008
6.29E+09	1.678661	2.40547077	3.127471289	3.899399996	4.190619949
6.39E+09	1.666303	2.37248529	3.073867738	3.760947279	4.060244808
6.5E+09	1.654545	2.31573814	2.982719616	3.530791231	3.833384025
6.6E+09	1.649328	2.27556114	2.918652148	3.405748789	3.699184011
6.7E+09	1.646377	2.26863248	2.906440939	3.427311584	3.71433818
6.8E+09	1.64452	2.26476498	2.90129797	3.496597344	3.773661507
6.9E+09	1.634575	2.25658337	2.893232791	3.546013152	3.815401097
7.01E+09	1.625382	2.23946485	2.866837085	3.490113946	3.775380613
7.11E+09	1.619518	2.2130907	2.825422732	3.354906485	3.645557903
7.21E+09	1.611052	2.16744412	2.751616729	3.174295696	3.451827945
7.31E+09	1.603658	2.14277879	2.710929523	3.12074249	3.383413519
7.42E+09	1.600941	2.12900936	2.692705524	3.161219095	3.426183198
7.52E+09	1.594975	2.13234231	2.700851885	3.261444364	3.513195698
7.62E+09	1.585235	2.12224901	2.686708579	3.266360479	3.512671035
7.72E+09	1.57794	2.09082698	2.640949991	3.147811003	3.410300361
7.83E+09	1.569747	2.05375636	2.584170872	2.986567005	3.256283125
7.93E+09	1.564445	2.0236925	2.536979078	2.886291295	3.129042633
8.03E+09	1.562202	1.98621339	2.477140091	2.834069334	3.068582521
8.13E+09	1.566007	1.99670999	2.494934492	2.950809205	3.173059187
8.23E+09	1.566769	1.99547002	2.490722361	3.001234072	3.22789413
8.34E+09	1.565689	1.98839215	2.482661157	2.970147169	3.186208866
8.44E+09	1.553215	1.95026139	2.427263582	2.814307265	3.035276973
8.54E+09	1.539614	1.90275155	2.356466675	2.653912915	2.878908467
8.64E+09	1.524174	1.86823997	2.304112771	2.587566551	2.798225034
8.75E+09	1.513122	1.85169313	2.280543434	2.624159175	2.808370515
8.85E+09	1.508781	1.84981102	2.277413751	2.695040612	2.886418237
8.95E+09	1.505338	1.85414435	2.285327002	2.722390965	2.923851049
9.05E+09	1.492416	1.8281397	2.24812553	2.596256633	2.800258141

Frequency	e"/'e 20 C	e"/e' @ 40 C	e"/e' @ 60 C	e"/e' @ 80 C	e"/e' @ 100 C
9.16E+09	1.479477	1.78443168	2.185150973	2.427673726	2.632098762
9.26E+09	1.462907	1.73766791	2.11606382	2.310849651	2.513543569
9.36E+09	1.460875	1.72348342	2.092079347	2.321275515	2.515934421
9.46E+09	1.460053	1.71671047	2.083870877	2.395620329	2.566173462
9.56E+09	1.457741	1.71955877	2.086643514	2.451837211	2.620656673
9.67E+09	1.457342	1.7194371	2.083808548	2.401823022	2.607244058
9.77E+09	1.442549	1.68798292	2.04571928	2.259523625	2.455303721
9.87E+09	1.423345	1.63172464	1.964076914	2.085519166	2.27662819
9.97E+09	1.408009	1.59198428	1.910151902	2.03620841	2.218945122
1.01E+10	1.408678	1.59002885	1.903773557	2.103709289	2.282513215
1.02E+10	1.419908	1.60499268	1.918553894	2.202149996	2.368088927
1.03E+10	1.425559	1.61256801	1.92971592	2.23187016	2.406960909
1.04E+10	1.416202	1.59340204	1.908522506	2.12807724	2.316542936
1.05E+10	1.401485	1.56574425	1.870473326	1.975023945	2.17792984
1.06E+10	1.390084	1.51738384	1.808477809	1.873715162	2.04692562
1.07E+10	1.403748	1.52060894	1.807986652	1.929864254	2.098265237
1.08E+10	1.423073	1.54534322	1.8353076	2.071072754	2.236229619
1.09E+10	1.429747	1.55746526	1.848840767	2.156633887	2.309784417
1.1E+10	1.422385	1.54077394	1.826580189	2.08252007	2.24392292
1.11E+10	1.391481	1.5014674	1.777211284	1.903414244	2.086247829
1.12E+10	1.368734	1.44889281	1.713935219	1.753901282	1.919314803
1.13E+10	1.36269	1.4502665	1.714272418	1.764395299	1.921345203
1.14E+10	1.371203	1.44992235	1.708860836	1.866802269	2.012434798
1.15E+10	1.377572	1.45797483	1.712636379	1.989133763	2.146699701
1.16E+10	1.37192	1.45694254	1.710344063	1.987635372	2.154209016
1.17E+10	1.346967	1.38969498	1.626147988	1.751979425	1.908276797
1.18E+10	1.324239	1.33011655	1.553420725	1.53348378	1.693685945
1.19E+10	1.328937	1.34981068	1.576304033	1.499343439	1.664479424
1.2E+10	1.346932	1.37201756	1.600949786	1.599055126	1.745012112
1.21E+10	1.366826	1.403775	1.63594627	1.820484765	1.958290878
1.22E+10	1.375992	1.40538992	1.634503648	1.989462912	2.136612788
1.23E+10	1.353939	1.35898191	1.570677846	1.866256225	2.0266874
1.24E+10	1.315252	1.30579714	1.511282391	1.601743555	1.759151767
1.25E+10	1.301023	1.27969289	1.480207314	1.388456919	1.54912231
1.26E+10	1.309107	1.28320027	1.484185708	1.346419614	1.494957042
1.27E+10	1.329517	1.32942516	1.541491613	1.504232809	1.632761462
1.28E+10	1.352498	1.35459061	1.566800265	1.781501233	1.904353203
1.29E+10	1.345922	1.36027522	1.567982807	2.058183789	2.214990264
1.3E+10	1.333184	1.32119224	1.523315854	2.038136978	2.175039561
1.31E+10	1.312242	1.28784886	1.486355747	1.713958606	1.872031939
1.32E+10	1.304758	1.275298	1.467641336	1.440507262	1.599569325
1.33E+10	1.321953	1.29419791	1.489910568	1.367983305	1.511725615
1.35E+10	1.343923	1.33467554	1.537288922	1.495029344	1.616524152
1.36E+10	1.358475	1.351386	1.556793451	1.776371011	1.881364004
1.37E+10	1.354803	1.3264949	1.528392386	2.049343472	2.159454635

Frequency	e"/'e 20 C	e"/e' @ 40 C	e"/e' @ 60 C	e"/e' @ 80 C	e"/e' @ 100 C
1.38E+10	1.322802	1.27418573	1.465172087	1.990548126	2.119135869
1.39E+10	1.311232	1.24165276	1.425763791	1.663843658	1.804030794
1.4E+10	1.308393	1.23723926	1.420150594	1.396797325	1.550173025
1.41E+10	1.307696	1.27552647	1.467300829	1.353490017	1.490664449
1.42E+10	1.316905	1.31255919	1.509641368	1.476308917	1.571662407
1.43E+10	1.337125	1.3256459	1.523611969	1.727139985	1.814040556
1.44E+10	1.35009	1.29292984	1.485045822	1.926203381	2.060654641
1.45E+10	1.330032	1.21969037	1.391906514	1.773861593	1.944155292
1.46E+10	1.292762	1.16080915	1.315221177	1.422413185	1.608364188
1.47E+10	1.278571	1.1376018	1.289913747	1.223170203	1.38593332
1.48E+10	1.282162	1.1926978	1.354533997	1.249148754	1.379203382
1.49E+10	1.272731	1.23529667	1.397913958	1.389403114	1.476475646
1.5E+10	1.293508	1.29934366	1.477760053	1.701597672	1.778799523
1.51E+10	1.290057	1.2351691	1.413095574	1.840079056	1.962706388
1.52E+10	1.273457	1.13524248	1.291410688	1.603182482	1.804447391
1.53E+10	1.218665	0.9776457	1.102773225	1.152088957	1.341567734
1.54E+10	1.229039	1.01408839	1.142677258	1.067247769	1.226440133
1.55E+10	1.263976	1.07816218	1.211364019	1.105981874	1.236592726
1.56E+10	1.32909	1.24307223	1.388468047	1.360572634	1.457637981
1.57E+10	1.345867	1.35762658	1.525514442	1.708971592	1.805856329
1.58E+10	1.32001	1.34908889	1.534267899	1.925020343	2.082986372
1.59E+10	1.285494	1.20457146	1.369139229	1.675117481	1.905802105
1.6E+10	1.262165	1.03470176	1.163318195	1.22368456	1.423985119
1.61E+10	1.280315	0.95179036	1.060461681	0.993050986	1.167208625
1.62E+10	1.348635	1.05071265	1.165409187	1.067928929	1.244465949
1.63E+10	1.35185	1.29142226	1.451793589	1.428681165	1.61592944
1.64E+10	1.32485	1.46097403	1.659872922	1.829145242	1.974225897
1.65E+10	1.325096	1.47903633	1.684925072	1.979416495	2.209273048
1.66E+10	1.311927	1.25455794	1.429952171	1.644818889	1.906595901
1.67E+10	1.300984	1.10015754	1.244898298	1.290731124	1.53566924
1.68E+10	1.31934	1.03823257	1.155940753	1.09652704	1.303563394
1.69E+10	1.381474	1.17761621	1.320692826	1.264097668	1.483203938
1.7E+10	1.376674	1.28912866	1.46632739	1.501198004	1.661104386
1.71E+10	1.339268	1.37610757	1.552796486	1.667263507	1.834039977
1.72E+10	1.303141	1.32796298	1.491617775	1.636563361	1.843083129
1.73E+10	1.301555	1.21937848	1.391576857	1.506806161	1.717565152
1.74E+10	1.302745	1.06385873	1.202531888	1.222480148	1.412298078
1.75E+10	1.334302	1.08816615	1.209181575	1.189967279	1.389442256
1.76E+10	1.361655	1.17774124	1.320356352	1.335304658	1.561469321
1.77E+10	1.37872	1.2603696	1.426860993	1.504193134	1.688443216
1.79E+10	1.331133	1.2876675	1.44806862	1.556282349	1.710968865
1.8E+10	1.309663	1.30238621	1.462996718	1.577181585	1.757492793
1.81E+10	1.30023	1.1342805	1.282050936	1.338376901	1.529037661
1.82E+10	1.317814	1.05865639	1.191075716	1.193370514	1.363400065
1.83E+10	1.294835	1.0647482	1.178140094	1.182497816	1.360054066

Frequency	e''/'e 20 C	e''/e' @ 40 C	e''/e' @ 60 C	e''/e' @ 80 C	e''/e' @ 100 C
1.84E+10	1.311655	1.12156917	1.245377464	1.293185628	1.476035816
1.85E+10	1.313877	1.14545807	1.291341796	1.361457136	1.538741367
1.86E+10	1.277762	1.16490855	1.298286747	1.362977435	1.536271654
1.87E+10	1.210525	1.08668064	1.200653038	1.252318496	1.423996645
1.88E+10	1.266656	1.05448459	1.178864411	1.191071825	1.358788614
1.89E+10	1.329889	1.05085066	1.173437101	1.169729812	1.34058705
1.9E+10	1.353495	1.12171218	1.233598399	1.263521174	1.431499649
1.91E+10	1.39971	1.21286817	1.340843268	1.405357703	1.589404801
1.92E+10	1.440111	1.24487025	1.386754683	1.44243397	1.639310528
1.93E+10	1.367748	1.20821348	1.335562048	1.379666409	1.559735751
1.94E+10	1.315233	1.15823927	1.275474363	1.297882529	1.460554122
1.95E+10	1.336206	1.09491881	1.210132551	1.206880397	1.376251756
1.96E+10	1.373758	1.09731184	1.213309976	1.220450238	1.396374412
1.97E+10	1.337285	1.12220458	1.237030323	1.272387138	1.450745307
1.98E+10	1.361877	1.18962404	1.31954332	1.37717171	1.55201068
1.99E+10	1.391194	1.20978571	1.347788059	1.392317071	1.58535361
2E+10	1.408411	1.21444999	1.344755688	1.360320403	1.564285741

Table 15. Dielectric Constant for the Savannah River Simulant

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
50700000	48.438693	189.45027	213.225603	215.832103	230.268814
1.53E+08	80.214862	96.087427	101.311857	96.875616	102.361506
2.55E+08	78.533409	82.510151	85.3576925	80.3431575	83.3033385
3.58E+08	77.195498	76.531423	78.119291	72.7247915	75.035755
4.6E+08	75.760414	73.095908	74.0403445	68.5541775	70.315908
5.62E+08	75.015618	70.947254	71.5013265	65.898082	67.4427715
6.65E+08	74.361339	69.656268	70.012364	64.24369	65.699619
7.67E+08	73.908196	68.645296	68.8377505	63.0370105	64.4469455
8.69E+08	73.74882	68.101188	68.219034	62.4930415	63.779929
9.71E+08	73.181166	67.326879	67.340909	61.552802	61.537978
1.07E+09	72.841913	66.756009	66.652378	60.790537	59.150523
1.18E+09	72.599122	66.189493	66.045016	60.140568	58.6345305
1.28E+09	72.271254	65.744761	65.539944	59.6531295	58.073313
1.38E+09	71.918899	65.322742	65.1289165	59.308413	57.637475
1.48E+09	71.700526	65.123277	64.924383	59.057711	57.38134
1.59E+09	71.461449	64.872969	64.6480865	58.7717915	57.034014
1.69E+09	71.167429	64.607713	64.3744745	58.4784055	56.4975925
1.79E+09	71.031145	64.244147	64.015215	58.1749445	56.2248735
1.89E+09	70.858429	63.978723	63.755268	57.897014	56.1101865
1.99E+09	70.724407	63.809075	63.607708	57.808155	56.013008
2.1E+09	70.648059	63.826285	63.6639015	57.891274	56.0928785
2.2E+09	70.494168	63.699712	63.5406905	57.7785225	55.974213
2.3E+09	70.312668	63.446735	63.2831085	57.4463695	55.690966
2.4E+09	70.179633	63.276125	63.104346	57.289887	55.5136655
2.51E+09	69.977041	63.087671	62.9541225	57.180722	55.3459705
2.61E+09	69.804004	62.929775	62.8246515	57.011729	55.2092455
2.71E+09	69.676013	62.745789	62.647116	56.855831	55.0319215
2.81E+09	69.517103	62.55408	62.491795	56.7807555	54.891004
2.92E+09	69.308912	62.360516	62.3385295	56.657329	54.727604
3.02E+09	69.10105	62.155401	62.1443375	56.4428945	54.5187325
3.12E+09	68.874892	61.991314	61.9859515	56.2325885	54.335497
3.22E+09	68.678699	61.859923	61.873144	56.1424205	54.217435
3.32E+09	68.534774	61.746441	61.8003875	56.1021035	54.1684915
3.43E+09	68.39229	61.607487	61.7043025	56.038945	54.083063
3.53E+09	68.288043	61.463116	61.595198	55.925671	53.9952495
3.63E+09	68.182658	61.32238	61.4864745	55.8434315	53.9145
3.73E+09	68.074043	61.203	61.3991855	55.7449655	53.8165615
3.84E+09	67.941464	61.086987	61.315802	55.687423	53.648853
3.94E+09	67.804696	61.030233	61.2753845	55.644886	53.611617
4.04E+09	67.653759	60.94567	61.2355465	55.6222955	53.6070135
4.14E+09	67.503566	60.816206	61.1558855	55.571066	53.567436
4.25E+09	67.38276	60.657894	61.035663	55.477261	53.4493975

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
4.35E+09	67.206863	60.474754	60.868755	55.3515165	53.2866665
4.45E+09	67.041114	60.313877	60.752245	55.240373	53.1451015
4.55E+09	66.844661	60.186551	60.660764	55.132147	52.6942145
4.65E+09	66.692203	60.06526	60.554985	55.04871	51.793188
4.76E+09	66.475931	59.900276	60.4495145	55.0066775	51.8562985
4.86E+09	66.291575	59.735761	60.3317625	54.932679	51.7794395
4.96E+09	66.0523	59.465279	60.121314	54.6680615	51.614874
5.06E+09	65.821814	59.212668	59.898766	54.471114	51.391706
5.17E+09	65.599893	59.014847	59.7245815	54.3268665	51.25907
5.27E+09	65.462904	58.857328	59.608389	54.246635	51.155148
5.37E+09	65.214627	58.713666	59.540784	54.1208005	51.0054095
5.47E+09	65.015935	58.551609	59.4224175	53.9771365	50.8806795
5.57E+09	64.789471	58.368192	59.2821205	53.9360765	50.789257
5.68E+09	64.599162	58.097796	59.074564	53.795455	50.6245715
5.78E+09	64.378752	57.841624	58.8783805	53.5848515	50.4327485
5.88E+09	64.183775	57.684683	58.755392	53.4087355	50.3213425
5.98E+09	63.976724	57.581292	58.693457	53.4044595	50.288137
6.09E+09	63.805067	57.459651	58.6644905	53.450942	50.292538
6.19E+09	63.63002	57.304668	58.5951865	53.3446205	50.239508
6.29E+09	63.394999	57.123041	58.4475205	53.2295635	50.123466
6.39E+09	63.188827	56.819483	58.219287	53.025768	49.909116
6.5E+09	62.945122	56.565985	58.0238595	52.8761825	49.751465
6.6E+09	62.715205	56.327852	57.8529615	52.701722	49.599945
6.7E+09	62.546205	56.205236	57.7691895	52.631174	49.5414165
6.8E+09	62.299645	56.108275	57.7589685	52.685206	49.570719
6.9E+09	62.04805	55.925107	57.657634	52.612024	49.5129885
7.01E+09	61.8116	55.679526	57.468411	52.445555	49.3567785
7.11E+09	61.568761	55.383954	57.2105875	52.1803365	49.1316965
7.21E+09	61.322266	55.072847	56.944743	51.9335	49.024712
7.31E+09	61.106248	54.871982	56.833991	51.867474	48.9824345
7.42E+09	60.89754	54.692409	56.7659915	51.8141435	48.926031
7.52E+09	60.645391	54.58018	56.672298	51.7651615	48.84317
7.62E+09	60.419229	54.440532	56.613132	51.7218815	48.8333155
7.72E+09	60.203043	54.24681	56.513545	51.604492	48.7468195
7.83E+09	59.922804	53.917398	56.2211815	51.362555	48.4631905
7.93E+09	59.687198	53.591342	55.91268	51.0672745	48.168035
8.03E+09	59.503285	53.383143	55.8130785	50.9914005	48.069171
8.13E+09	59.293295	53.245818	55.786219	50.983183	48.1075915
8.23E+09	59.023783	53.220371	55.7930435	50.999631	48.089656
8.34E+09	58.795103	53.13967	55.7638645	51.0043325	48.0502765
8.44E+09	58.536043	52.906772	55.6234815	50.922537	47.9377475
8.54E+09	58.335074	52.544659	55.303268	50.6161715	47.6376865
8.64E+09	58.14962	52.275066	55.0673975	50.3928285	47.400419
8.75E+09	57.921938	52.049161	54.906244	50.2576205	47.2659955
8.85E+09	57.705	52.027274	54.9836345	50.4151875	47.3887715

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
8.95E+09	57.449362	52.029437	55.045632	50.490465	47.44566
9.05E+09	57.219013	52.003721	55.022529	50.412252	47.3822895
9.16E+09	57.009593	51.767677	54.8506265	50.308163	47.2525615
9.26E+09	56.784235	51.35346	54.491495	50.048738	46.9911145
9.36E+09	56.587604	51.055146	54.2208855	49.818269	46.739066
9.46E+09	56.381218	50.879864	54.1003095	49.6798585	46.6323585
9.56E+09	56.1473	50.911879	54.1945	49.8167945	46.778855
9.67E+09	55.928861	50.99571	54.390906	50.0403965	46.988636
9.77E+09	55.644419	51.019326	54.4402835	50.047166	47.1609215
9.87E+09	55.460643	50.801053	54.1518215	49.770437	46.9166565
9.97E+09	55.289971	50.310229	53.72477	49.4035805	46.612186
1.01E+10	55.064434	49.91256	53.4141085	49.2335675	46.446285
1.02E+10	54.906387	49.783347	53.3112095	49.1228085	46.3891455
1.03E+10	54.691408	49.816994	53.398526	49.244872	46.499764
1.04E+10	54.46465	49.909686	53.5724535	49.4277215	46.6886255
1.05E+10	54.265691	49.917383	53.593572	49.436103	46.700584
1.06E+10	54.035724	49.720769	53.3667575	49.1852945	46.500886
1.07E+10	53.83282	49.228195	52.8340355	48.774519	46.1100655
1.08E+10	53.652392	48.819807	52.5373675	48.646824	46.026386
1.09E+10	53.452886	48.675611	52.4913565	48.6790145	46.088949
1.1E+10	53.229186	48.748961	52.590894	48.7025675	46.132718
1.11E+10	53.010964	48.823556	52.6993545	48.792041	46.239676
1.12E+10	52.773706	48.743511	52.7055875	48.802096	46.2398085
1.13E+10	52.559268	48.474854	52.3837015	48.437412	45.92285
1.14E+10	52.399428	48.112183	51.914916	47.980926	45.4511925
1.15E+10	52.241864	47.791902	51.673696	47.9182705	45.435028
1.16E+10	52.042233	47.678205	51.785374	48.164418	45.8892565
1.17E+10	51.823132	47.725315	51.961416	48.2250405	45.9976135
1.18E+10	51.61331	47.76642	51.9917855	48.0692465	45.850981
1.19E+10	51.31758	47.4297	51.642224	47.827966	45.5753105
1.2E+10	51.168815	47.237781	51.3715925	47.628275	45.458446
1.21E+10	50.990087	47.117674	51.0477215	47.243975	45.1583795
1.22E+10	50.842188	46.831928	50.768954	46.952138	44.973432
1.23E+10	50.619251	46.643028	50.854167	47.2662295	45.307786
1.24E+10	50.470523	46.825865	51.194407	47.718371	45.71887
1.25E+10	50.209489	47.094701	51.3612625	47.817557	45.774042
1.26E+10	49.965656	46.756197	50.896863	47.4579255	45.474227
1.27E+10	49.683337	46.361289	50.584382	47.162982	45.200899
1.28E+10	49.462362	46.16822	50.332424	46.828651	44.930424
1.29E+10	49.314255	46.034719	50.0696615	46.423407	44.6461015
1.3E+10	49.195577	45.663546	49.802998	46.3815255	44.658734
1.31E+10	49.084691	45.731338	50.0220445	46.83757	45.1298175
1.32E+10	48.815148	46.117641	50.373615	47.157042	45.345013
1.33E+10	48.586956	45.856555	49.99055	46.762643	44.934685
1.35E+10	48.264103	45.300006	49.5483765	46.60246	44.8307885

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.36E+10	48.022527	45.314824	49.7747285	47.0846595	45.28621
1.37E+10	47.89434	45.359759	49.7216305	46.948044	45.2408155
1.38E+10	47.81411	44.690023	48.9231765	46.1092315	44.552333
1.39E+10	47.653638	44.501064	48.7895715	46.0279235	44.51751
1.4E+10	47.435979	44.916905	49.2574235	46.32652	44.8220545
1.41E+10	47.189584	44.877347	49.0580285	45.9445085	44.4571055
1.42E+10	46.867799	44.130502	48.3560335	45.519337	43.9905765
1.43E+10	46.675316	44.13627	48.724456	46.3089455	44.667427
1.44E+10	46.610113	44.581209	49.246837	46.741737	45.137958
1.45E+10	46.495754	44.05379	48.329167	45.6114735	44.0635365
1.46E+10	46.308497	43.298312	47.417045	44.6942175	43.312754
1.47E+10	46.02482	43.819365	48.105054	45.3104435	43.9742115
1.48E+10	45.734858	44.396227	48.7243025	45.724203	44.379315
1.49E+10	45.338569	43.371482	47.6233755	44.927704	43.5961605
1.5E+10	45.06382	42.815304	47.3025775	45.1164835	43.6778235
1.51E+10	45.070144	44.049257	48.8062115	46.497618	44.8445075
1.52E+10	45.029429	43.838203	48.396377	45.91864	44.3344245
1.53E+10	44.892184	42.127036	46.237806	43.8229905	42.350496
1.54E+10	44.851365	42.963985	47.1100525	44.5169615	43.0071035
1.55E+10	44.672436	44.278034	48.8526195	46.1255225	44.5823185
1.56E+10	44.170903	42.269536	46.8608205	44.8147185	43.4880465
1.57E+10	43.800993	41.55433	45.8208255	43.800871	42.446591
1.58E+10	43.588141	42.906723	47.31552	44.93739	43.4514475
1.59E+10	43.406987	42.396895	47.053274	44.873829	43.481777
1.6E+10	43.388721	40.845111	44.8885715	42.6709195	41.4447875
1.61E+10	43.448713	41.509614	45.183597	42.558815	41.3714035
1.62E+10	43.234132	42.707172	47.1306005	44.9738825	43.646159
1.63E+10	42.872923	41.186402	45.918277	44.4227605	43.2089135
1.64E+10	42.511712	40.073872	43.866843	41.7595575	40.7020715
1.65E+10	42.215737	41.664694	45.5548315	43.025559	41.84021
1.66E+10	42.022972	41.919131	46.7715495	44.798832	43.541015
1.67E+10	42.02504	39.876302	44.0671605	42.117466	41.07609
1.68E+10	42.046755	40.324323	43.663752	41.067839	40.162403
1.69E+10	42.006943	42.097762	46.391593	44.1649915	43.1406815
1.7E+10	41.693473	40.470815	45.5020075	44.1357205	43.083132
1.71E+10	41.320771	39.396747	43.1512565	41.1301845	40.2031305
1.72E+10	41.073741	41.013303	44.7329085	42.3409135	41.2864955
1.73E+10	40.850999	41.016391	45.90633	44.097002	42.9014885
1.74E+10	40.617915	39.432758	43.949016	42.2202105	41.1881925
1.75E+10	40.628771	39.998084	43.481943	41.0259875	40.2539365
1.76E+10	40.594205	41.048399	45.3720465	43.204172	42.3508435
1.77E+10	40.337805	39.799867	45.108436	44.0081755	42.932668
1.79E+10	40.092224	39.09807	43.1623295	41.658232	40.7434385
1.8E+10	39.843581	39.911045	43.515293	41.427649	40.5254995
1.81E+10	39.60506	40.069538	44.9451915	43.382973	42.322344

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.82E+10	39.383192	38.78122	43.7898985	42.718639	41.7569425
1.83E+10	39.313868	38.69399	42.2627805	40.2723065	39.7901625
1.84E+10	39.311864	39.787636	44.0287395	41.9730465	41.571959
1.85E+10	39.125537	39.070154	44.392587	43.423982	42.477316
1.86E+10	38.883491	37.91646	41.8097385	40.309152	39.506044
1.87E+10	38.666255	38.486802	41.91283	39.833382	39.0425395
1.88E+10	38.491612	38.932189	43.627016	42.179833	41.0437625
1.89E+10	38.235886	37.929792	42.4865065	41.49414	40.330817
1.9E+10	38.141114	37.755305	41.381435	39.6666125	38.7596675
1.91E+10	38.060399	38.610188	42.8746635	41.1783885	40.0898175
1.92E+10	37.872257	37.982001	42.7009145	41.5733125	40.432495
1.93E+10	37.664135	37.071444	40.934692	39.4476225	38.579223
1.94E+10	37.471777	37.378908	41.1517445	39.3816615	38.5738195
1.95E+10	37.240587	37.855897	42.201992	40.8336895	39.8378535
1.96E+10	37.151362	37.363385	41.7794945	40.6421805	39.60632
1.97E+10	37.0018	36.962676	41.178836	39.9450195	39.0092485
1.98E+10	36.84553	37.168844	41.4335905	40.093052	39.0669875
1.99E+10	36.620802	36.988418	41.181224	39.778089	38.6694795
2E+10	36.439557	36.495695	40.5067175	39.054423	37.981711

Table 16. Dielectric Loss for the Savannah River Simulant

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
50700000	1499.63557	1982.61234	2412.24084	2662.977	2846.54148
1.53E+08	544.19627	687.613584	834.75092	919.94685	985.30268
2.55E+08	331.363095	418.163164	507.4387025	559.14928	598.83242
3.58E+08	240.059268	302.214497	366.47876	402.98486	432.533801
4.6E+08	189.376294	238.073336	288.448858	316.64331	340.186791
5.62E+08	156.5673	196.480659	237.728791	261.40283	280.833563
6.65E+08	133.980702	167.819792	202.6942125	222.49928	239.442421
7.67E+08	117.076676	146.418302	176.5728415	193.55129	208.720829
8.69E+08	104.191384	129.918268	156.397205	171.42889	184.790006
9.71E+08	94.278233	117.320144	140.9541555	154.3582	163.531387
1.07E+09	86.286682	107.109622	128.4287475	140.38696	143.211353
1.18E+09	79.709039	98.6280175	118.0153305	128.79945	132.175831
1.28E+09	74.329083	91.625669	109.3808665	119.26057	122.542062
1.38E+09	69.6480595	85.459841	101.778184	110.93376	113.959636
1.48E+09	65.6293705	80.1997815	95.2833425	103.64819	106.630285
1.59E+09	62.070132	75.623552	89.619103	97.321944	100.231041
1.69E+09	58.9896225	71.7380595	84.7626065	91.886599	94.5780355
1.79E+09	56.353901	68.334693	80.5238395	87.232601	89.5098425
1.89E+09	54.1383655	65.344555	76.784209	83.0217	85.2491735
1.99E+09	52.0750905	62.4661955	73.194891	79.068039	81.209042
2.1E+09	50.229494	59.947324	70.0508265	75.587166	77.678065
2.2E+09	48.6153185	57.84772	67.399038	72.62577	74.667448
2.3E+09	47.1493795	55.9500945	64.971217	69.797318	71.8619985
2.4E+09	45.904063	54.224472	62.762964	67.294738	69.306268
2.51E+09	44.8438365	52.6762695	60.755397	65.065434	66.963529
2.61E+09	43.7534305	51.1921865	58.865554	62.869972	64.814713
2.71E+09	42.7991015	49.854533	57.1193555	60.910071	62.8101295
2.81E+09	41.9656535	48.5804425	55.473115	59.100359	60.888298
2.92E+09	41.1798475	47.4199535	53.9571655	57.401675	59.130131
3.02E+09	40.4475955	46.3541195	52.570903	55.81519	57.519883
3.12E+09	39.8013245	45.432827	51.341937	54.337572	56.0416475
3.22E+09	39.210732	44.563344	50.1784245	52.981927	54.621679
3.32E+09	38.600951	43.720023	49.0562955	51.703196	53.2840235
3.43E+09	38.0377465	42.895677	47.9658225	50.496217	52.017499
3.53E+09	37.564852	42.0895375	46.9218515	49.286778	50.799271
3.63E+09	37.0942285	41.406935	45.996921	48.199883	49.6829725
3.73E+09	36.766814	40.8503995	45.238544	47.295887	48.726798
3.84E+09	36.4584275	40.367906	44.545086	46.487584	47.7891805
3.94E+09	36.1615495	39.9274545	43.8751895	45.683313	46.955453
4.04E+09	35.91663	39.444335	43.176013	44.855073	46.0983945
4.14E+09	35.6819385	38.964044	42.5207005	44.083758	45.313568
4.25E+09	35.4691225	38.5437035	41.920678	43.399864	44.5907585

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
4.35E+09	35.292084	38.188586	41.3961285	42.771825	43.885637
4.45E+09	35.171653	37.9303665	40.956628	42.19071	43.2483815
4.55E+09	35.0646495	37.7160465	40.5789215	41.684228	42.378252
4.65E+09	34.949921	37.480955	40.189467	41.183008	41.045799
4.76E+09	34.844562	37.18573	39.7541685	40.684699	40.638423
4.86E+09	34.7485945	36.869979	39.2805935	40.123837	40.0867555
4.96E+09	34.6669965	36.5485955	38.8457155	39.579291	39.5912465
5.06E+09	34.585542	36.35686	38.5173305	39.163955	39.1593925
5.17E+09	34.513475	36.2209785	38.213362	38.74798	38.712986
5.27E+09	34.436405	36.115664	37.9730485	38.393959	38.3232805
5.37E+09	34.3524855	35.9404095	37.68908	38.000741	37.834665
5.47E+09	34.299214	35.7086995	37.33214	37.56518	37.3937455
5.57E+09	34.260841	35.425474	36.923096	37.137678	36.922133
5.68E+09	34.2055275	35.24357	36.641465	36.789444	36.5457735
5.78E+09	34.1994765	35.1354845	36.42978	36.501477	36.2536555
5.88E+09	34.186212	35.0781475	36.2539745	36.183598	35.9447485
5.98E+09	34.166274	35.036275	36.0959345	35.956777	35.6594775
6.09E+09	34.1443235	34.9306405	35.8924425	35.723107	35.3896475
6.19E+09	34.131814	34.7189335	35.61399	35.38598	35.0868085
6.29E+09	34.173213	34.5240465	35.3262065	35.063899	34.754371
6.39E+09	34.1963535	34.3975365	35.1051315	34.748009	34.410562
6.5E+09	34.2334915	34.3804655	34.9868075	34.542427	34.164576
6.6E+09	34.238336	34.4338915	34.963769	34.456058	34.032997
6.7E+09	34.2688005	34.388478	34.865644	34.26995	33.8081275
6.8E+09	34.29039	34.306446	34.672091	34.048625	33.5818275
6.9E+09	34.320916	34.0875185	34.400427	33.755936	33.3001235
7.01E+09	34.382994	33.8556255	34.0893755	33.411132	32.9309775
7.11E+09	34.4031105	33.7093	33.894295	33.106449	32.6869345
7.21E+09	34.447479	33.747748	33.8373945	32.926563	32.6171935
7.31E+09	34.4240415	33.851349	33.915937	32.939228	32.595684
7.42E+09	34.471195	33.9252145	33.968471	32.979961	32.5958705
7.52E+09	34.5086875	33.8176395	33.8090095	32.780314	32.363285
7.62E+09	34.540916	33.551058	33.490917	32.398129	31.991129
7.72E+09	34.5892375	33.327668	33.19905	32.07709	31.6733305
7.83E+09	34.5962375	33.2271955	33.095874	31.962238	31.4510305
7.93E+09	34.632618	33.2785455	33.086141	31.831914	31.255051
8.03E+09	34.642364	33.4315225	33.1887875	31.82598	31.1965275
8.13E+09	34.6297455	33.4338775	33.2189485	31.846115	31.1936255
8.23E+09	34.681729	33.288178	33.0824125	31.689743	31.009447
8.34E+09	34.731363	33.026759	32.724915	31.291125	30.567293
8.44E+09	34.769878	32.8494275	32.500901	30.999679	30.248977
8.54E+09	34.763789	32.7212345	32.4103155	30.860053	30.0448825
8.64E+09	34.7681795	32.8501955	32.561732	30.944815	30.0486785
8.75E+09	34.8187775	33.012435	32.700268	30.996837	30.0633975
8.85E+09	34.8541605	33.0347805	32.709918	30.97778	30.0179915

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
8.95E+09	34.8755025	32.889857	32.5653175	30.855414	29.891605
9.05E+09	34.938954	32.5581345	32.1857025	30.42157	29.467844
9.16E+09	34.950811	32.4428985	31.982255	30.147183	29.1269395
9.26E+09	35.0032395	32.3232895	31.9184045	30.079444	29.009974
9.36E+09	35.0549025	32.5133515	32.188558	30.29917	29.14226
9.46E+09	35.0726695	32.7102595	32.380884	30.392526	29.1990325
9.56E+09	35.0811465	32.715439	32.2969345	30.244586	29.0720115
9.67E+09	35.159371	32.5432475	32.105277	30.08804	28.935166
9.77E+09	35.183858	32.274454	31.8879325	29.885561	28.8065745
9.87E+09	35.207662	32.1446575	31.6716455	29.598642	28.5023615
9.97E+09	35.248291	32.073047	31.6194325	29.449799	28.339508
1.01E+10	35.3171185	32.260798	31.934069	29.758744	28.571003
1.02E+10	35.3150805	32.435958	32.15021	29.939838	28.704585
1.03E+10	35.329111	32.5046045	32.105733	29.812785	28.580907
1.04E+10	35.365623	32.328098	31.847004	29.532717	28.3560735
1.05E+10	35.387418	32.0967185	31.644327	29.369914	28.1997205
1.06E+10	35.422995	31.9221345	31.5240315	29.241678	28.0250575
1.07E+10	35.4815995	31.9550855	31.558389	29.203731	27.918633
1.08E+10	35.528162	32.0802115	31.7396345	29.347191	28.013129
1.09E+10	35.546886	32.190722	31.986857	29.60579	28.247171
1.1E+10	35.537417	32.3638375	32.088007	29.614557	28.2820635
1.11E+10	35.5932165	32.327379	31.88696	29.324086	28.010074
1.12E+10	35.6481075	32.082447	31.6563335	29.082843	27.807034
1.13E+10	35.7160205	31.9141825	31.7121925	29.189154	27.8223695
1.14E+10	35.743866	31.965487	31.8252795	29.254528	27.6916865
1.15E+10	35.7939195	32.0526605	31.8506375	29.237722	27.832513
1.16E+10	35.8015975	32.1460085	31.9841475	29.389402	28.312168
1.17E+10	35.8104865	32.276763	32.137073	29.50998	28.4630975
1.18E+10	35.832549	32.28168	32.0265935	29.182825	28.1283465
1.19E+10	35.8969285	32.032361	31.6479665	28.722968	27.645088
1.2E+10	35.96005	31.728033	31.5590555	28.745216	27.6442635
1.21E+10	36.0164595	31.8139595	31.8099265	29.09096	27.939102
1.22E+10	36.1131645	32.0937845	32.0439365	29.191279	28.0297635
1.23E+10	36.0977855	32.0629665	31.964949	29.05502	27.862779
1.24E+10	36.09763	31.873457	31.9704975	29.111143	27.8864145
1.25E+10	36.0823725	31.9972845	32.1164365	29.175244	27.8701145
1.26E+10	36.095907	31.847328	31.8088	28.655384	27.388727
1.27E+10	36.212298	31.633534	31.554266	28.423028	27.19452
1.28E+10	36.3024165	31.612282	31.631049	28.569507	27.3535915
1.29E+10	36.301784	32.0298915	32.033142	28.739821	27.616651
1.3E+10	36.3705265	32.19415	32.074991	28.615711	27.5093
1.31E+10	36.3632915	32.010202	32.0683965	28.796986	27.644989
1.32E+10	36.2932795	32.0449415	32.3118255	29.395809	28.026255
1.33E+10	36.294574	32.2299265	32.41242	29.32514	27.8964555
1.35E+10	36.351047	31.768035	31.7026805	28.426914	27.081191

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.36E+10	36.4512325	31.3929965	31.3296285	28.059712	26.8220295
1.37E+10	36.499353	31.964778	32.037071	28.741812	27.5240865
1.38E+10	36.579489	32.271602	32.2962665	28.831483	27.6586075
1.39E+10	36.534441	31.838582	31.853095	28.55652	27.3643195
1.4E+10	36.478092	31.762595	32.064891	29.06776	27.7884065
1.41E+10	36.4870725	32.337772	32.8309875	29.836041	28.3879845
1.42E+10	36.5500865	32.2682615	32.612704	29.421248	27.912806
1.43E+10	36.6640735	31.523279	31.715431	28.607155	27.098999
1.44E+10	36.736706	31.7467125	32.0630295	28.99001	27.5184435
1.45E+10	36.765864	32.429968	32.755426	29.405064	28.0214685
1.46E+10	36.659585	32.153985	32.297808	28.856937	27.4772535
1.47E+10	36.4893035	31.561148	31.7920655	28.621324	27.201372
1.48E+10	36.4801105	32.2055995	32.7175085	29.619653	28.03078
1.49E+10	36.515087	32.831029	33.35438	29.99122	28.262404
1.5E+10	36.7492875	31.650818	31.961169	28.735814	27.0548635
1.51E+10	36.947625	31.499476	31.858812	28.878821	27.213562
1.52E+10	37.1407325	32.8223325	33.31513	30.046485	28.314234
1.53E+10	37.006317	32.474184	32.883889	29.588205	27.892
1.54E+10	36.7134525	31.028967	31.3044115	28.183006	26.5883015
1.55E+10	36.676338	32.588438	33.099396	29.479023	27.774437
1.56E+10	36.5671555	33.6382615	34.5154855	30.786439	28.9376365
1.57E+10	36.6072185	31.737818	32.418038	29.321988	27.5441385
1.58E+10	37.051934	31.7773035	32.052739	28.833262	27.1403795
1.59E+10	37.2161825	33.231157	33.6944895	30.202435	28.3968455
1.6E+10	37.0376135	32.569642	33.354694	30.26568	28.4698185
1.61E+10	36.9616755	31.167675	31.5370225	28.403912	26.7017645
1.62E+10	36.8436605	32.1527995	32.3119055	28.781236	26.929745
1.63E+10	36.640545	33.3657075	34.385345	31.271039	29.2599045
1.64E+10	36.5681835	31.747217	32.639713	29.732663	27.906858
1.65E+10	36.740828	31.0224435	30.8881605	27.327213	25.6767355
1.66E+10	36.9604165	32.744349	32.905081	29.176493	27.4247265
1.67E+10	37.0299325	32.6236925	33.761377	30.832125	28.90145
1.68E+10	36.9706785	30.8762165	31.3567725	28.316543	26.4705335
1.69E+10	36.8731155	31.904529	31.593536	27.872192	26.008901
1.7E+10	36.757251	33.208642	34.196114	30.955632	28.900984
1.71E+10	36.6076955	31.263501	32.3606685	29.568983	27.599071
1.72E+10	36.6823115	30.9660715	30.765222	27.131558	25.3723195
1.73E+10	36.894389	32.956851	32.882533	28.867985	27.052734
1.74E+10	36.9943485	32.813809	34.047856	30.92913	28.8490935
1.75E+10	36.9386965	31.319147	31.986651	28.989469	26.961748
1.76E+10	36.888561	32.12575	31.7899475	28.002451	26.0801725
1.77E+10	36.764864	33.170051	33.894006	30.440939	28.239035
1.79E+10	36.6604375	32.194456	33.6326395	30.941339	28.728601
1.8E+10	36.624376	31.763571	32.0164775	28.762587	26.872584
1.81E+10	36.783978	32.8733755	32.8066065	28.732532	27.0027135

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.82E+10	36.833582	33.2537125	34.723233	31.426743	29.439945
1.83E+10	36.8191295	32.1317055	33.2657635	30.275316	28.516746
1.84E+10	36.798741	32.216765	31.9191125	27.881164	26.6071375
1.85E+10	36.745973	33.0613365	33.7274865	30.052659	28.5865585
1.86E+10	36.581971	32.4020295	33.894656	31.239315	29.474623
1.87E+10	36.6079775	31.8311005	32.234523	29.139569	27.627383
1.88E+10	36.642723	32.5646545	32.6398885	28.877158	27.4381475
1.89E+10	36.696884	32.8586345	34.1138665	30.979025	29.183168
1.9E+10	36.6773945	31.9649685	32.7498915	29.678706	28.028443
1.91E+10	36.6983775	32.039232	31.9599025	28.165068	26.755621
1.92E+10	36.628794	32.7203715	33.2568585	29.6856	28.0580585
1.93E+10	36.5634135	32.2613705	33.0420025	30.008302	28.32566
1.94E+10	36.5906855	31.8210855	32.1781475	29.010005	27.4316865
1.95E+10	36.584928	32.2119055	32.6196215	29.284159	27.69916
1.96E+10	36.598291	32.351828	33.2056975	30.00591	28.3771665
1.97E+10	36.536371	32.0089115	32.685857	29.41849	27.886786
1.98E+10	36.525668	31.941569	32.3486005	28.905897	27.409148
1.99E+10	36.47726	32.385838	32.8312805	29.328156	27.7547145
2E+10	36.4157625	32.3722965	32.8239325	29.457248	27.8057405

Table 17. Loss Tangent for the Savannah River Simulant

Frequency	e"/e' 20 C	e"/e' 40 C	e"/e' 60 C	e"/e' 80 C	e"/e' 100 C
50700000	30.95945564	10.4650805	11.313092	12.3381876	12.36181935
1.53E+08	6.784232447	7.15612446	8.2394198	9.49616521	9.625715011
2.55E+08	4.219390183	5.06802086	5.9448503	6.95951342	7.188576482
3.58E+08	3.109757373	3.94889426	4.6912709	5.54123085	5.764369273
4.6E+08	2.499673448	3.2569995	3.8958335	4.61887692	4.837977645
5.62E+08	2.08712937	2.76939063	3.3248165	3.96677453	4.164027608
6.65E+08	1.801752156	2.40925614	2.8951202	3.46336399	3.644502429
7.67E+08	1.584082447	2.13296921	2.5650583	3.07043891	3.238645787
8.69E+08	1.412787133	1.90772395	2.2925743	2.74316765	2.897306541
9.71E+08	1.288285481	1.7425454	2.093143	2.50773633	2.657405911
1.07E+09	1.184574636	1.6044941	1.9268442	2.30935547	2.421134172
1.18E+09	1.097933925	1.49008572	1.7868923	2.1416401	2.254231932
1.28E+09	1.028473693	1.39365735	1.6689191	1.99923401	2.110126936
1.38E+09	0.968424996	1.30827089	1.5627188	1.87045564	1.977179535
1.48E+09	0.915326213	1.23150716	1.4676049	1.75503229	1.858274571
1.59E+09	0.868582058	1.16571746	1.3862607	1.65592951	1.757390616
1.69E+09	0.828885114	1.1103637	1.3167114	1.57129112	1.674018862
1.79E+09	0.793368895	1.06367189	1.2578859	1.49948748	1.591997223
1.89E+09	0.76403565	1.02134823	1.2043587	1.43395478	1.519317237
1.99E+09	0.736310034	0.97895473	1.1507236	1.36776617	1.449824691
2.1E+09	0.710981944	0.93922628	1.1003226	1.3056746	1.384811532
2.2E+09	0.689636035	0.90813158	1.0607225	1.25696827	1.333961551
2.3E+09	0.670567351	0.88184356	1.0266755	1.21499964	1.290370839
2.4E+09	0.654093802	0.85694995	0.9945902	1.17463554	1.248454185
2.51E+09	0.640836421	0.83496932	0.9650742	1.13789108	1.209907937
2.61E+09	0.626804027	0.81348116	0.9369818	1.10275504	1.173982952
2.71E+09	0.614258767	0.79454787	0.9117635	1.07130737	1.141339931
2.81E+09	0.603673801	0.77661509	0.8876864	1.04085192	1.109258231
2.92E+09	0.594149386	0.76041632	0.8655508	1.01313767	1.080444359
3.02E+09	0.58533981	0.74577782	0.8459484	0.98887895	1.055048061
3.12E+09	0.577878576	0.73289021	0.8282834	0.96630039	1.031400293
3.22E+09	0.570930039	0.7203912	0.8109888	0.94370578	1.007455978
3.32E+09	0.563231613	0.70805738	0.7937862	0.92159103	0.98367191
3.43E+09	0.556170096	0.69627377	0.7773497	0.9010915	0.961807563
3.53E+09	0.550094136	0.68479343	0.7617778	0.88129078	0.940810006
3.63E+09	0.544041988	0.67523366	0.7480819	0.86312537	0.92151411
3.73E+09	0.540100347	0.66745747	0.7367939	0.84843333	0.905423844
3.84E+09	0.536615281	0.6608266	0.7264862	0.83479502	0.890777301
3.94E+09	0.533319248	0.65422419	0.7160329	0.82097954	0.875844745
4.04E+09	0.530888904	0.64720488	0.7050809	0.80642254	0.859932152
4.14E+09	0.52859339	0.64068522	0.6952839	0.79328616	0.845916314
4.25E+09	0.526382754	0.63542766	0.6868227	0.78230005	0.8342612

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
4.35E+09	0.525126195	0.63147981	0.6800883	0.77273086	0.823576326
4.45E+09	0.524628115	0.62888292	0.6741583	0.76376584	0.813779262
4.55E+09	0.524569187	0.6266524	0.6689484	0.75607844	0.804229694
4.65E+09	0.524048081	0.62400388	0.6636855	0.7481194	0.79249416
4.76E+09	0.524168097	0.62079397	0.6576425	0.73963199	0.78367381
4.86E+09	0.524178144	0.61721787	0.6510765	0.73041835	0.774182878
4.96E+09	0.524841625	0.61462077	0.6461222	0.72399294	0.767051112
5.06E+09	0.525441949	0.61400476	0.6430405	0.71898575	0.76197884
5.17E+09	0.526120904	0.61376044	0.6398264	0.71323789	0.755241677
5.27E+09	0.526044567	0.61361372	0.637042	0.70776665	0.749157846
5.37E+09	0.526760442	0.61213022	0.632996	0.70214669	0.741777497
5.47E+09	0.527550888	0.60986709	0.6282501	0.69594614	0.734930152
5.57E+09	0.528802608	0.60693116	0.622837	0.68854986	0.726967378
5.68E+09	0.529504199	0.60662491	0.6202579	0.68387643	0.721897933
5.78E+09	0.531223046	0.60744292	0.6187293	0.68119022	0.718851472
5.88E+09	0.532630123	0.6081016	0.6170323	0.67748464	0.714304244
5.98E+09	0.534042256	0.60846629	0.6149908	0.67329165	0.709103173
6.09E+09	0.535134988	0.60791599	0.6118257	0.66833447	0.703675911
6.19E+09	0.536410554	0.60586572	0.6077972	0.66334674	0.698390766
6.29E+09	0.539052189	0.60438041	0.604409	0.65872978	0.693375255
6.39E+09	0.541177221	0.60538278	0.6029811	0.65530421	0.689464466
6.5E+09	0.543862501	0.60779399	0.6029728	0.65327005	0.686704924
6.6E+09	0.545933574	0.611312	0.6043557	0.65379378	0.686149894
6.7E+09	0.54789576	0.61183762	0.6035335	0.65113405	0.682421495
6.8E+09	0.550410685	0.61143292	0.6002893	0.64626539	0.677452903
6.9E+09	0.553134482	0.60952085	0.5966327	0.64160116	0.672553294
7.01E+09	0.55625472	0.60804443	0.5931846	0.63706318	0.667202733
7.11E+09	0.558775423	0.60864741	0.5924479	0.63446215	0.665292201
7.21E+09	0.561745044	0.6127838	0.5942145	0.63401393	0.665321471
7.31E+09	0.563347332	0.616915	0.5967544	0.6350652	0.665456593
7.42E+09	0.56605234	0.6202911	0.5983947	0.63650499	0.666227565
7.52E+09	0.569024075	0.6195956	0.5965703	0.63325048	0.662595917
7.62E+09	0.571687472	0.61628821	0.5915751	0.62639114	0.655108683
7.72E+09	0.574543014	0.61437102	0.587453	0.62159491	0.649751734
7.83E+09	0.577346773	0.61626111	0.5886727	0.62228675	0.648967395
7.93E+09	0.580235279	0.6209687	0.5917466	0.62333293	0.648875359
8.03E+09	0.582192462	0.62625617	0.5946418	0.62414406	0.648992418
8.13E+09	0.584041514	0.62791556	0.5954687	0.62463959	0.648413785
8.23E+09	0.587589057	0.62547813	0.5929487	0.621372	0.644825719
8.34E+09	0.59071864	0.62150855	0.586848	0.61349934	0.636152281
8.44E+09	0.593990919	0.62089269	0.5843018	0.60876147	0.631005389
8.54E+09	0.595932886	0.62273188	0.586047	0.60968762	0.630695668
8.64E+09	0.597908972	0.62841041	0.5913069	0.6140718	0.633932761
8.75E+09	0.601132818	0.63425489	0.5955656	0.61675894	0.636047061
8.85E+09	0.604005901	0.63495121	0.5949028	0.61445332	0.633441015

Frequency	e"/e' 20 C	e"/e' 40 C	e"/e' 60 C	e"/e' 80 C	e"/e' 100 C
8.95E+09	0.607065097	0.6321394	0.5916058	0.61111368	0.630017688
9.05E+09	0.610617908	0.62607318	0.584955	0.60345587	0.621916845
9.16E+09	0.61306895	0.62670185	0.5830791	0.59925032	0.616409747
9.26E+09	0.616425307	0.62942769	0.5857502	0.60100305	0.617350201
9.36E+09	0.619480245	0.6368281	0.5936561	0.60819395	0.623509678
9.46E+09	0.622062998	0.64289205	0.5985342	0.61176756	0.626153886
9.56E+09	0.624805588	0.64258951	0.5959449	0.60711626	0.621477621
9.67E+09	0.628644508	0.63815657	0.5902692	0.60127501	0.61579072
9.77E+09	0.632298057	0.63259272	0.5857415	0.59714791	0.610814496
9.87E+09	0.634822463	0.63275574	0.5848676	0.59470328	0.607510501
9.97E+09	0.637516907	0.63750549	0.5885448	0.59610657	0.607984959
1.01E+10	0.641378041	0.64634629	0.5978583	0.60444013	0.615140759
1.02E+10	0.643187112	0.65154234	0.6030666	0.60948953	0.61877805
1.03E+10	0.645971868	0.65248025	0.6012476	0.60539877	0.614646281
1.04E+10	0.649331692	0.64773195	0.594466	0.59749299	0.607344363
1.05E+10	0.652114022	0.64299683	0.59045	0.59409848	0.603840853
1.06E+10	0.655547708	0.64202818	0.5907054	0.59452074	0.602677925
1.07E+10	0.659107204	0.64912162	0.5973117	0.59874975	0.60547806
1.08E+10	0.662191582	0.65711468	0.6041345	0.60327043	0.608631949
1.09E+10	0.66501341	0.66133165	0.6093738	0.60818384	0.612883817
1.1E+10	0.667630298	0.66388774	0.6101438	0.60806973	0.613058686
1.11E+10	0.671431225	0.66212669	0.6050731	0.60100142	0.60575844
1.12E+10	0.67548994	0.65818909	0.6006258	0.5959343	0.601365683
1.13E+10	0.679538012	0.65836573	0.6053828	0.60261588	0.605850236
1.14E+10	0.6821423	0.66439486	0.6130277	0.60971162	0.609262045
1.15E+10	0.685157785	0.67067138	0.6163801	0.61015811	0.612578317
1.16E+10	0.687933545	0.67422858	0.617629	0.61018907	0.616967242
1.17E+10	0.691013552	0.67630278	0.6184795	0.61192235	0.618795092
1.18E+10	0.694250165	0.67582373	0.6159933	0.6070997	0.613473166
1.19E+10	0.699505488	0.67536503	0.6128312	0.60054754	0.606580355
1.2E+10	0.70277278	0.67166646	0.6143289	0.60353258	0.608121613
1.21E+10	0.706342389	0.67520225	0.623141	0.61576021	0.618691421
1.22E+10	0.710299181	0.68529711	0.6311719	0.62172416	0.623251601
1.23E+10	0.713123659	0.68741177	0.6285611	0.61470991	0.614966686
1.24E+10	0.715222039	0.68068059	0.624492	0.61006153	0.60995415
1.25E+10	0.718636521	0.67942431	0.6253047	0.61013664	0.608862868
1.26E+10	0.722414359	0.68113599	0.6249658	0.60380607	0.602291206
1.27E+10	0.728862033	0.68232646	0.6237946	0.60265544	0.601636706
1.28E+10	0.73394022	0.68471953	0.6284428	0.61008605	0.608798873
1.29E+10	0.736131652	0.69577684	0.6397715	0.61908038	0.618568029
1.3E+10	0.739304813	0.70502957	0.6440374	0.61696356	0.615989249
1.31E+10	0.740827553	0.69996207	0.6410853	0.61482663	0.612565938
1.32E+10	0.743483959	0.69485215	0.6414435	0.62335989	0.618066975
1.33E+10	0.747002434	0.7028423	0.6483709	0.62710612	0.620822322
1.35E+10	0.753169439	0.70128104	0.6398329	0.60998741	0.604075724

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
1.36E+10	0.759044448	0.69277543	0.6294284	0.5959417	0.59227808
1.37E+10	0.762080726	0.70469462	0.6443286	0.61220467	0.608390591
1.38E+10	0.765035455	0.72212095	0.6601425	0.62528655	0.620811653
1.39E+10	0.766666356	0.71545665	0.6528669	0.6204173	0.614686659
1.4E+10	0.768996301	0.70714122	0.6509657	0.62745398	0.619971726
1.41E+10	0.773201826	0.7205812	0.6692276	0.64939297	0.638547746
1.42E+10	0.779854989	0.73120087	0.6744288	0.64634613	0.63451785
1.43E+10	0.785513137	0.71422617	0.650914	0.61774577	0.60668368
1.44E+10	0.788170284	0.71210973	0.6510678	0.62021679	0.609651936
1.45E+10	0.790735945	0.73614479	0.6777569	0.64468568	0.635933262
1.46E+10	0.79163842	0.74261522	0.6811434	0.64565257	0.634391743
1.47E+10	0.79281796	0.72025571	0.6608883	0.63167168	0.618575549
1.48E+10	0.797643471	0.72541299	0.6714823	0.64778937	0.631618131
1.49E+10	0.805386853	0.75697274	0.7003783	0.66754401	0.648277364
1.5E+10	0.815494281	0.73924077	0.675675	0.63692494	0.619418765
1.51E+10	0.819780505	0.71509665	0.6527614	0.62108173	0.6068427
1.52E+10	0.824810204	0.74871529	0.6883807	0.65434179	0.638651213
1.53E+10	0.824337649	0.77086325	0.7111905	0.6751754	0.658599134
1.54E+10	0.818558198	0.72220878	0.6644954	0.63308466	0.618230463
1.55E+10	0.821006	0.7359956	0.6775357	0.63910436	0.622992207
1.56E+10	0.8278562	0.7958039	0.7365532	0.68697159	0.665415875
1.57E+10	0.835762306	0.76376682	0.7074957	0.66943846	0.648912854
1.58E+10	0.850046218	0.74061362	0.6774255	0.64163188	0.624613933
1.59E+10	0.857377706	0.78381111	0.7160923	0.67305232	0.653074632
1.6E+10	0.853623086	0.7973939	0.7430554	0.70928117	0.686933634
1.61E+10	0.850696671	0.75085438	0.697975	0.66740373	0.64541597
1.62E+10	0.852189213	0.75286651	0.6855823	0.63995443	0.617001487
1.63E+10	0.854631372	0.81011466	0.7488379	0.70394181	0.677172882
1.64E+10	0.860190799	0.79221736	0.7440634	0.7119966	0.68563729
1.65E+10	0.870311193	0.7445739	0.6780436	0.63513905	0.613685627
1.66E+10	0.879528867	0.78113139	0.7035277	0.65127798	0.629859605
1.67E+10	0.881139732	0.81812231	0.7661346	0.7320508	0.703607622
1.68E+10	0.879275438	0.76569709	0.718142	0.68950651	0.659087393
1.69E+10	0.877786215	0.75786758	0.6810186	0.63109242	0.602885724
1.7E+10	0.88160684	0.82055778	0.7515298	0.70137366	0.670819011
1.71E+10	0.885939324	0.79355539	0.7499357	0.71891198	0.686490596
1.72E+10	0.893084258	0.75502506	0.6877537	0.64078819	0.614542823
1.73E+10	0.903145331	0.80350441	0.7162963	0.65464733	0.630577981
1.74E+10	0.91078897	0.83214594	0.7747126	0.73256692	0.70042145
1.75E+10	0.909175839	0.78301619	0.7356307	0.70661234	0.669791587
1.76E+10	0.908714951	0.78263101	0.7006505	0.64814229	0.615812351
1.77E+10	0.911424517	0.83342115	0.7513895	0.69171099	0.657751692
1.79E+10	0.914402702	0.82342828	0.7792128	0.74274248	0.705109879
1.8E+10	0.919203924	0.79585918	0.7357523	0.6942848	0.663103091
1.81E+10	0.928769669	0.82040815	0.7299247	0.66229973	0.638024999

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
1.82E+10	0.935261481	0.85746948	0.7929508	0.73566817	0.705031145
1.83E+10	0.936543053	0.8304056	0.7871172	0.75176514	0.7166783
1.84E+10	0.936072161	0.80971801	0.7249609	0.66426353	0.640026069
1.85E+10	0.93918132	0.84620442	0.7597549	0.69207514	0.672984105
1.86E+10	0.940809841	0.85456369	0.8106881	0.7749931	0.746078828
1.87E+10	0.946768131	0.82706536	0.7690849	0.73153639	0.707622592
1.88E+10	0.951966456	0.83644552	0.7481577	0.68462001	0.668509557
1.89E+10	0.959749814	0.86630148	0.8029341	0.74658795	0.723594764
1.9E+10	0.96162359	0.84663515	0.7914151	0.74820368	0.723134248
1.91E+10	0.964214209	0.82981291	0.7454263	0.68397694	0.667391938
1.92E+10	0.967166916	0.86147045	0.7788325	0.71405424	0.693948234
1.93E+10	0.970775354	0.87024855	0.8071883	0.76071255	0.734220593
1.94E+10	0.976486543	0.85131127	0.7819388	0.73663741	0.71114779
1.95E+10	0.982393967	0.85090853	0.7729403	0.71715682	0.695297501
1.96E+10	0.985113049	0.86586983	0.7947846	0.73829477	0.716480766
1.97E+10	0.987421463	0.86597929	0.7937538	0.73647454	0.714876268
1.98E+10	0.991318838	0.85936408	0.7807337	0.72097023	0.70159359
1.99E+10	0.996080315	0.87556701	0.7972391	0.73729423	0.717742128
2E+10	0.999347015	0.88701685	0.8103331	0.75426151	0.732082357

Table 18. Dielectric Constant for W-26 ORNL Simulant

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.53E+08	345.701995	490.583217	644.365086	669.399334	805.6358985
2.55E+08	174.737904	235.471787	294.167976	293.734101	346.4452985
3.58E+08	119.126125	152.0259	180.772742	176.997863	199.5341105
4.6E+08	97.834184	120.510603	139.994494	136.45117	149.325457
5.62E+08	83.5453045	99.642188	110.850949	105.435806	111.716193
6.65E+08	76.064806	88.682076	97.480558	92.6175845	96.6299045
7.67E+08	69.962281	79.4305305	84.7780175	78.7922065	78.9037465
8.69E+08	65.037774	71.869325	74.540559	68.10167	64.6150395
9.71E+08	62.313924	67.575165	68.8101615	62.04927	56.7427935
1.07E+09	59.7626555	63.6935525	63.6373215	56.3332105	50.0574945
1.18E+09	57.9754405	61.0579705	59.666669	51.790931	44.855854
1.28E+09	55.8613875	58.129707	56.1247795	48.2261105	41.405697
1.38E+09	55.130726	57.135986	55.1817855	47.6017115	40.617805
1.48E+09	53.7017705	55.055768	52.492507	44.349466	36.3194265
1.59E+09	53.1733245	54.047778	50.9347465	42.85892	33.62274
1.69E+09	52.374521	53.005198	49.7154075	41.6187865	32.105481
1.79E+09	51.6647705	52.043697	48.4212465	40.446707	31.300091
1.89E+09	50.702617	50.582886	46.1795765	37.677039	28.340204
1.99E+09	50.055313	49.829117	45.6605465	37.1786005	28.415312
2.1E+09	49.963967	49.57374	45.3769095	36.9653075	27.6228685
2.2E+09	49.5865535	49.2229	45.2277515	37.1096425	27.2980935
2.3E+09	49.1856785	48.615655	44.182629	35.596634	24.88107
2.4E+09	48.827076	47.9925065	43.1148385	34.3280545	23.652766
2.51E+09	48.32423	47.4949595	42.727664	34.047026	24.4487615
2.61E+09	47.6925945	46.911021	41.91238	33.07986	23.826589
2.71E+09	47.238023	46.363947	41.3966015	32.668206	23.3809635
2.81E+09	46.873255	45.910074	40.8627785	32.1259175	22.1834605
2.92E+09	46.4751815	45.283062	39.942918	31.0137185	20.136323
3.02E+09	46.19987	45.024943	39.7775445	30.853594	20.1254335
3.12E+09	45.9603145	44.935757	39.774187	30.8409915	20.840077
3.22E+09	45.6163675	44.6725175	39.4906005	30.6557235	21.409104
3.32E+09	45.2610565	44.175814	39.031431	30.1776925	21.157171
3.43E+09	45.031571	43.9840785	39.0078535	30.314249	20.921724
3.53E+09	44.845768	43.801434	39.017758	30.4621615	20.5379805
3.63E+09	44.844783	43.8276245	39.141673	30.5916935	20.3569335
3.73E+09	44.6121205	43.561751	38.7742035	30.1806845	20.1464955
3.84E+09	44.331948	43.470548	38.7691785	30.2854975	21.2290065
3.94E+09	44.1099445	43.395354	38.971146	30.6450285	22.3240325
4.04E+09	43.8595245	43.225818	38.8530575	30.6134	22.1584565
4.14E+09	43.6331265	42.8729075	38.456018	30.224908	21.0221325
4.25E+09	43.4601695	42.624899	38.2645955	30.033379	20.38068
4.35E+09	43.272276	42.480859	38.233692	30.101468	20.6264425
4.45E+09	42.8657075	42.1519215	37.878568	29.7614035	21.0220875

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
4.55E+09	42.5551795	41.9079225	37.6980595	29.6867185	21.8034435
4.65E+09	42.396915	41.6558355	37.5709275	29.7575545	22.2521225
4.76E+09	42.0595955	41.1288505	36.7485005	28.6867235	20.3117915
4.86E+09	41.818203	40.675508	36.187616	28.0874805	18.792148
4.96E+09	41.545129	40.406919	35.9122205	27.8142295	18.3203435
5.06E+09	41.3436865	40.4947235	36.165368	28.1338455	19.301313
5.17E+09	41.0636675	40.3297	36.082914	28.0961175	20.020668
5.27E+09	40.6838945	40.082045	35.926054	28.149498	20.701627
5.37E+09	40.5731535	39.8946215	35.8712315	28.2044475	20.5666365
5.47E+09	40.3277705	39.5635775	35.532468	27.902346	19.4089835
5.57E+09	40.077512	39.2082805	35.0152355	27.3036125	18.0034095
5.68E+09	39.8360385	39.048474	34.9391065	27.2650055	18.244371
5.78E+09	39.6340665	39.1680335	35.1764475	27.6377425	19.604818
5.88E+09	39.4839135	39.3012	35.6790365	28.2925845	21.025458
5.98E+09	39.248206	39.1281005	35.6030375	28.2829885	21.032342
6.09E+09	39.046955	38.80039	35.264	28.1189375	20.3385545
6.19E+09	38.8906625	38.5093745	34.988673	27.8583905	19.328149
6.29E+09	38.5978255	38.478795	34.9925815	27.842022	19.1432685
6.39E+09	38.3461015	38.4852175	35.1484535	28.0514045	20.309645
6.5E+09	38.202163	38.8149275	35.9126515	29.103687	22.775801
6.6E+09	38.0932015	38.91569	36.2076225	29.4816925	23.684472
6.7E+09	37.8008135	38.3629785	35.639801	28.936747	22.496307
6.8E+09	37.630507	37.807511	35.0140085	28.312476	21.0413115
6.9E+09	37.436897	37.4599735	34.5767455	27.873547	20.13058
7.01E+09	37.2581015	37.323766	34.4909375	27.7447075	20.3577965
7.11E+09	36.9776905	37.2056045	34.485063	27.772817	21.5748405
7.21E+09	36.8883365	37.3329615	34.8750415	28.414561	23.417558
7.31E+09	36.71637	37.191194	34.830282	28.426324	23.2989915
7.42E+09	36.5831875	36.8645045	34.5703065	28.210457	22.104606
7.52E+09	36.3233025	36.345513	33.817279	27.3752245	20.3568155
7.62E+09	36.151693	36.1403075	33.583823	27.1788615	20.1297875
7.72E+09	36.040129	36.4111525	34.033425	27.665005	21.4249625
7.83E+09	35.901976	36.6966715	34.450588	28.1654825	22.94381
7.93E+09	35.6642685	36.602428	34.4777305	28.2823035	23.653219
8.03E+09	35.7622765	36.737997	34.8521725	28.8834675	23.7884655
8.13E+09	35.4850465	36.063342	33.952114	27.9051645	21.443122
8.23E+09	35.334836	35.647067	33.5022615	27.517087	20.5595935
8.34E+09	35.143392	35.4494545	33.2334765	27.216731	20.7996095
8.44E+09	35.094779	35.7236975	33.6497855	27.657726	22.449247
8.54E+09	35.0427495	36.069719	34.272028	28.497695	24.1650215
8.64E+09	34.976751	36.255872	34.634597	28.981688	24.4463355
8.75E+09	34.861029	36.0461105	34.382334	28.7991325	23.2605685
8.85E+09	34.827521	35.7519315	34.081242	28.497346	21.9751235
8.95E+09	34.620509	35.4495305	33.687047	28.0351975	21.505554
9.05E+09	34.4586255	35.485418	33.868683	28.316676	23.2509185

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
9.16E+09	34.261845	35.9220115	34.539326	29.0844695	25.403404
9.26E+09	34.3025335	36.4172945	35.2675695	30.006073	26.531475
9.36E+09	34.257862	36.347264	35.3708405	30.213582	25.7566145
9.46E+09	34.3281205	36.1926775	35.1672325	30.004318	24.239152
9.56E+09	34.256604	35.4343295	34.2964965	29.1202405	22.9382615
9.67E+09	34.176068	35.317291	34.3004595	29.2246275	24.0480385
9.77E+09	33.778846	35.255005	34.2606695	29.090481	25.787109
9.87E+09	33.9293605	35.962686	35.3717245	30.4384875	28.5030335
9.97E+09	33.716695	36.1665365	35.7055445	30.936937	28.131191
1.01E+10	33.878123	36.223545	35.7826035	31.0967355	26.5079495
1.02E+10	33.949248	35.6410475	35.190879	30.5571515	24.919348
1.03E+10	33.878862	35.113996	34.6013265	29.9129815	24.5175125
1.04E+10	33.679454	34.9792645	34.417395	29.675649	25.880676
1.05E+10	33.592902	35.514128	35.1630595	30.504442	28.693159
1.06E+10	33.450101	35.989459	35.6703095	31.046193	29.407974
1.07E+10	33.6005445	36.0451745	35.7189335	31.055113	27.591997
1.08E+10	33.6623265	35.4291185	35.050395	30.401303	24.861439
1.09E+10	33.6403595	34.7555115	34.304012	29.7102715	23.7414815
1.1E+10	33.5530015	34.507765	34.083268	29.5873035	25.2512585
1.11E+10	33.4365395	35.165847	34.915097	30.431326	28.5455505
1.12E+10	33.202923	35.808519	35.660543	31.1490345	30.40134
1.13E+10	33.1534675	36.2802315	36.196744	31.6739125	29.7293255
1.14E+10	33.215673	35.9527475	35.860236	31.4161035	26.857306
1.15E+10	33.361628	35.5052265	35.491489	31.1962645	24.9397365
1.16E+10	33.296259	35.1616255	35.2072515	30.9817025	26.115625
1.17E+10	33.347749	35.742393	35.9165085	31.7746005	31.0850435
1.18E+10	33.3081515	36.651528	36.9438585	32.813984	35.221763
1.19E+10	33.0715505	36.7394895	37.1467155	32.887545	34.6525085
1.2E+10	32.8943885	36.2830685	36.639582	32.4098955	30.731031
1.21E+10	32.9330155	35.4093525	35.67763	31.497404	25.9281435
1.22E+10	33.093243	34.6502965	34.9411485	30.95024	23.546998
1.23E+10	33.6068135	35.028577	35.5549065	32.019446	27.648824
1.24E+10	33.355484	35.931607	36.524467	32.947101	34.7605315
1.25E+10	33.158674	36.6104105	37.1469515	33.3681895	38.811808
1.26E+10	32.9751085	36.375771	36.928434	33.0394925	36.1238355
1.27E+10	32.55409	35.6462005	36.0935475	31.9426195	30.0346925
1.28E+10	32.5752675	34.994349	35.5958695	31.618592	24.644599
1.29E+10	32.863395	35.2554035	36.1866385	32.5667795	22.114886
1.3E+10	32.6308405	35.333262	36.310059	32.873042	23.7330635
1.31E+10	32.756229	36.1080245	37.1927055	33.9051455	32.158801
1.32E+10	32.462242	35.672331	36.475004	33.123593	36.248023
1.33E+10	32.4815515	34.916974	35.4145165	31.840392	33.474666
1.35E+10	32.2233425	33.982774	34.4279785	30.658815	27.9749295
1.36E+10	32.049771	33.948004	34.5532265	30.628022	22.8391595
1.37E+10	32.0298715	34.757027	35.534474	31.624472	19.811995

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.38E+10	32.067271	35.692791	36.8206825	33.140457	22.7064975
1.39E+10	31.9241365	35.635766	36.645089	33.1474375	29.8100335
1.4E+10	32.0972105	35.0078365	35.808645	32.372164	34.0863085
1.41E+10	31.829064	33.839986	34.228287	30.5806465	31.087222
1.42E+10	31.7861575	33.402396	33.557136	29.6810525	26.401883
1.43E+10	31.6755	34.5112325	34.980892	30.966653	23.100366
1.44E+10	31.7474595	36.7187605	37.786938	33.712222	22.3254725
1.45E+10	31.3715215	37.417037	38.8678395	35.167251	26.948007
1.46E+10	31.4207705	36.7913415	38.4428775	35.356721	35.721633
1.47E+10	31.3154335	34.779863	36.0959725	33.175379	36.289624
1.48E+10	31.7200135	33.0246865	33.6656045	30.493621	31.046679
1.49E+10	31.986321	32.6588775	33.1608775	29.8327135	26.4062135
1.5E+10	31.368116	33.881642	34.803499	31.024449	23.1643035
1.51E+10	30.7834125	37.306303	38.862861	34.7928365	23.702627
1.52E+10	29.8448425	39.0158365	41.4629505	38.177663	31.529763
1.53E+10	30.5619615	39.44856	42.1535515	39.644898	42.427615
1.54E+10	30.332786	35.72576	37.4580185	34.9151915	38.2331445
1.55E+10	31.635466	33.4687225	34.4745845	31.760251	32.2766765
1.56E+10	31.9435365	30.3219675	31.0823995	28.2870285	25.389638
1.57E+10	32.5718495	30.542707	31.3833195	28.204	21.826739
1.58E+10	31.184581	33.5572245	34.7261795	30.9567505	21.7088275
1.59E+10	30.211003	38.510058	40.8120855	36.9834595	29.3326065
1.6E+10	28.3283195	37.6489565	39.9060895	37.1165465	37.41426
1.61E+10	30.15114	37.651821	39.737633	37.448373	40.0986205
1.62E+10	31.8341255	34.7115825	36.690206	34.598447	35.1782315
1.63E+10	32.310045	31.5410425	33.00523	30.1818215	27.319928
1.64E+10	31.4703105	29.3878475	29.9696955	26.466105	20.9172455
1.65E+10	30.1662155	31.405934	32.304656	28.4033675	21.302508
1.66E+10	29.05386	36.579302	38.5157115	34.477651	28.32124
1.67E+10	28.903188	39.2753945	41.476792	37.944541	36.6874925
1.68E+10	29.556481	38.233636	40.6448045	38.1015355	39.381906
1.69E+10	29.0631265	33.908907	36.173277	33.552495	32.8356395
1.7E+10	29.4185955	29.697436	30.686151	27.586462	24.232986
1.71E+10	29.8323975	28.9977305	29.853138	26.7605495	22.387553
1.72E+10	29.7168155	32.4226665	34.1420915	30.7803865	26.1486615
1.73E+10	28.721835	35.606286	37.5571615	33.614816	29.340359
1.74E+10	28.649329	38.116672	40.2435215	36.711763	34.904348
1.75E+10	28.475414	36.94195	39.4604775	36.6889515	35.7725215
1.76E+10	28.661208	34.0012355	36.240366	33.491088	30.655022
1.77E+10	28.6856555	30.767278	31.967506	28.812128	24.6515405
1.79E+10	28.9529415	31.0647335	32.3273635	29.117631	24.7890915
1.8E+10	28.332913	32.713531	34.5495795	31.130455	26.552096
1.81E+10	28.1598335	35.4193105	37.5755925	34.0775945	30.848636
1.82E+10	28.2547955	36.0685715	38.084371	34.9532555	32.9843355
1.83E+10	28.1709365	35.0517455	37.3850015	34.7817945	32.583269

Frequency	e' @ 20 C	e' @ 40 C	e' @ 60 C	e' @ 80 C	e' @ 100 C
1.84E+10	27.773786	31.8204035	33.937958	31.4563075	28.244783
1.85E+10	28.1337625	31.099421	32.700455	29.9337855	26.422738
1.86E+10	28.0844415	31.613195	33.3774925	30.6791755	27.751853
1.87E+10	27.9514015	34.146481	36.53533	33.8940515	31.2572525
1.88E+10	27.5589305	35.035059	37.4534645	34.600178	32.489989
1.89E+10	27.9143185	35.061436	37.1463335	34.2159705	32.158544
1.9E+10	27.7823855	33.0384105	35.067258	32.432085	29.2558735
1.91E+10	27.562003	30.0011365	31.7249595	29.129817	25.373255
1.92E+10	27.5358995	28.6356825	30.21965	27.6210865	24.49769
1.93E+10	27.6261735	29.956717	31.7260945	29.085137	26.2273245
1.94E+10	27.221703	31.1733405	33.229066	30.5918235	28.0680125
1.95E+10	27.1608665	32.0061495	34.1849215	31.6728215	29.547383
1.96E+10	27.3172585	32.0890725	34.0805245	31.5279965	28.864023
1.97E+10	27.3953245	31.6164655	33.54125	30.998733	27.686517
1.98E+10	27.16034	30.8382955	32.600361	29.8031095	26.129447
1.99E+10	27.0407635	31.1335475	32.9544745	29.978679	26.536835
2E+10	27.050794	31.8738945	33.8388625	30.8887475	27.7232635

Table 19. Dielectric Loss for the W-26 ORNL Simulant

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.53E+08	1995.47473	2800.54816	3809.0626	4372.4805	4904.04991
2.55E+08	1232.12227	1733.58741	2361.4419	2700.8312	3044.44847
3.58E+08	890.360446	1254.13765	1708.1285	1950.1602	2203.94815
4.6E+08	696.115989	981.260371	1336.5141	1525.3236	1726.3401
5.62E+08	581.504888	820.38307	1115.6543	1272.9505	1442.49645
6.65E+08	496.121363	699.376339	953.35315	1087.7391	1232.85179
7.67E+08	429.684258	605.277441	824.71895	940.40917	1065.25578
8.69E+08	378.804483	533.235124	726.05905	827.95533	937.68438
9.71E+08	340.375969	479.104957	652.78402	744.50195	843.607618
1.07E+09	310.321317	436.613705	594.89581	678.47522	769.208219
1.18E+09	285.591197	401.607316	547.09229	623.98537	707.483404
1.28E+09	263.294344	369.796373	503.51354	574.18499	650.712954
1.38E+09	243.583772	341.511646	464.82622	530.16404	600.427811
1.48E+09	227.078806	317.962799	432.39742	493.52438	558.570378
1.59E+09	213.822089	298.932264	406.08274	463.07206	524.061116
1.69E+09	202.067169	282.250601	383.12867	436.87558	494.753846
1.79E+09	190.806937	266.318675	361.3548	411.87808	466.874168
1.89E+09	180.661554	251.797042	341.57182	389.26415	441.245231
1.99E+09	172.51965	239.910686	325.17777	370.53345	419.481586
2.1E+09	165.10342	229.000367	310.12386	353.11532	399.333758
2.2E+09	157.727995	218.174033	295.22312	335.78729	379.765199
2.3E+09	150.798256	208.533032	282.14216	320.92251	363.319283
2.4E+09	144.95956	200.269992	270.78783	307.71688	348.680087
2.51E+09	140.270072	193.249573	260.74666	295.9541	335.168703
2.61E+09	135.684496	186.590119	252.08259	286.17117	323.660604
2.71E+09	130.907952	179.466526	242.21804	274.78289	309.982174
2.81E+09	126.235178	172.626337	232.85997	264.05799	297.436032
2.92E+09	122.081698	166.623854	224.46294	254.43442	286.402003
3.02E+09	118.624562	161.656073	217.46069	246.28359	277.458483
3.12E+09	115.511774	157.204895	211.22361	239.11827	269.381288
3.22E+09	112.2696	152.393998	204.64721	231.51297	260.560848
3.32E+09	108.907019	147.19587	197.18821	222.79169	250.111501
3.43E+09	106.023374	142.699049	191.01717	215.75433	241.683405
3.53E+09	103.523541	139.023146	185.91825	209.80761	235.017044
3.63E+09	101.12838	135.65707	181.26126	204.73196	229.702849
3.73E+09	98.609226	131.974918	175.9674	198.56096	222.925479
3.84E+09	96.361613	128.621341	171.22186	193.07313	216.644761
3.94E+09	94.5207335	125.774393	167.19167	188.5582	211.091525
4.04E+09	92.743612	122.990823	163.29012	184.02177	205.385483
4.14E+09	90.8636815	120.041079	159.07097	179.14415	199.561419
4.25E+09	88.9427765	117.218305	155.0918	174.59912	194.688449
4.35E+09	87.365378	114.891243	151.81746	170.96177	191.158484
4.45E+09	85.9652525	112.805883	148.70653	167.2684	187.208081

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
4.55E+09	84.5451515	110.483706	145.29192	163.25896	182.23869
4.65E+09	82.904851	107.874947	141.52005	158.88142	176.623849
4.76E+09	81.4729875	105.768715	138.59134	155.46043	172.343382
4.86E+09	80.1848065	103.837438	135.83717	152.22608	168.587461
4.96E+09	78.978226	102.092157	133.38909	149.34788	165.612961
5.06E+09	77.713024	100.315845	130.86976	146.39585	162.839819
5.17E+09	76.5660905	98.5387545	128.36612	143.55744	159.494901
5.27E+09	75.2444765	96.540483	125.34726	139.99151	154.738449
5.37E+09	74.178321	94.8462895	122.95523	137.20426	151.062335
5.47E+09	73.149705	93.353712	120.80852	134.66899	148.248122
5.57E+09	72.1077695	92.0042365	118.79612	132.21644	145.72272
5.68E+09	71.0589155	90.5406835	116.7443	129.75888	143.481246
5.78E+09	70.027991	89.045132	114.58454	127.2[illegible]27	140.887973
5.88E+09	69.1464235	87.634103	112.65655	125.05776	138.393369
5.98E+09	68.2624035	86.055032	110.39789	122.35916	134.738908
6.09E+09	67.3394325	84.553767	108.18755	119.80596	131.459111
6.19E+09	66.5578345	83.1801195	106.31706	117.65048	129.451479
6.29E+09	65.8167765	81.9871435	104.77701	115.91395	128.160924
6.39E+09	65.008606	80.796228	103.06859	113.92546	126.200124
6.5E+09	64.1706555	79.358371	101.10665	111.78799	123.765702
6.6E+09	63.3992225	78.23572	99.479761	110.01244	121.265697
6.7E+09	62.678402	77.0287635	97.706359	107.9579	118.250766
6.8E+09	61.9912925	75.8358595	95.964252	105.94129	115.747974
6.9E+09	61.3075705	74.797076	94.458289	104.24377	114.274722
7.01E+09	60.633722	73.787405	93.07626	102.7547	113.205126
7.11E+09	59.911906	72.72847	91.554059	101.01832	111.149334
7.21E+09	59.1431215	71.571611	89.917113	99.228268	108.552959
7.31E+09	58.5903025	70.550087	88.543523	97.752274	106.280084
7.42E+09	58.01306	69.5260835	87.108997	96.065848	104.137153
7.52E+09	57.355174	68.7329425	85.835581	94.559949	102.498768
7.62E+09	56.7795335	67.9994145	84.788422	93.373072	101.834317
7.72E+09	56.1721335	67.2654295	83.939126	92.480343	101.446796
7.83E+09	55.6172205	66.561786	82.966013	91.372049	99.8923665
7.93E+09	55.015133	65.5931745	81.623978	89.750441	97.2552335
8.03E+09	54.4516745	64.5804745	80.196728	88.206758	95.143524
8.13E+09	54.039389	64.0233945	79.316279	87.09509	93.974286
8.23E+09	53.441655	63.2734475	78.158704	85.630048	92.868581
8.34E+09	52.914313	62.6983935	77.43413	84.76946	92.583522
8.44E+09	52.384086	61.9194255	76.457368	83.734647	91.735559
8.54E+09	51.8697335	60.9220095	75.161492	82.3182	89.5883545
8.64E+09	51.4014675	60.0404685	74.065714	81.099136	87.3804305
8.75E+09	50.9216915	59.385317	73.078585	79.859737	85.802431
8.85E+09	50.5074695	58.9118765	72.321343	78.925545	85.409155
8.95E+09	50.1185255	58.54322	71.745057	78.190047	85.3384775
9.05E+09	49.599212	57.749705	70.71292	77.03384	84.506581

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
9.16E+09	49.152933	56.92958	69.774106	76.114121	83.3295305
9.26E+09	48.7732975	56.0938355	68.632693	74.809753	80.988555
9.36E+09	48.384717	55.454628	67.697322	73.781567	79.135083
9.46E+09	48.0547925	55.202581	67.307935	73.297212	78.8667975
9.56E+09	47.638022	54.512664	66.266879	72.018711	78.4161885
9.67E+09	47.259627	54.0546245	65.574602	71.26143	78.473565
9.77E+09	46.8753395	52.991404	64.339209	69.940578	76.725931
9.87E+09	46.460552	52.005351	63.071471	68.695689	74.5180175
9.97E+09	46.0424455	50.9621605	61.813118	67.391056	72.1617465
1.01E+10	45.8788705	50.998943	61.749645	67.241966	71.7360225
1.02E+10	45.5232505	50.9213115	61.381987	66.677538	71.8656785
1.03E+10	45.174241	50.5068585	60.82171	66.004388	72.4768495
1.04E+10	44.778562	49.8692595	59.987899	65.061468	71.938151
1.05E+10	44.5918825	49.301328	59.290118	64.388217	70.2152495
1.06E+10	44.06705	48.63214	58.518881	63.684843	67.971714
1.07E+10	43.973545	48.9188995	58.628253	63.602952	67.2879295
1.08E+10	43.8389455	49.0683965	58.526817	63.367874	67.4038915
1.09E+10	43.53033	48.836883	58.125103	62.807048	68.165156
1.1E+10	43.1071875	48.0494225	57.201915	61.778834	68.78188
1.11E+10	42.873945	47.394627	56.542215	61.203932	68.3496395
1.12E+10	42.393499	46.5756675	55.556732	60.179715	65.3218135
1.13E+10	42.4779845	46.767513	55.720724	60.400564	63.8115395
1.14E+10	42.217363	46.6454425	55.357493	59.866972	63.2672335
1.15E+10	42.0850115	46.41573	54.892826	59.232019	64.352204
1.16E+10	41.9713905	45.910506	54.337972	58.465549	66.264934
1.17E+10	41.4144765	44.6436515	52.905573	56.957811	66.3424675
1.18E+10	40.985208	43.623424	51.787598	55.836121	63.7481755
1.19E+10	41.107887	44.008415	52.082014	56.175558	60.478179
1.2E+10	41.001224	44.1596595	52.099112	56.066254	58.0392695
1.21E+10	40.922198	44.47132	52.18389	55.961523	58.822153
1.22E+10	40.698894	43.9301065	51.350502	54.985413	61.482985
1.23E+10	40.6155235	42.6730015	49.788254	53.309525	64.6220305
1.24E+10	40.4476345	41.744306	49.022796	52.49084	66.233752
1.25E+10	40.1564735	41.490277	48.725561	51.994001	62.1714945
1.26E+10	39.890146	41.316048	48.445338	51.688265	55.809568
1.27E+10	39.721473	42.0653875	49.217318	52.398741	53.052652
1.28E+10	39.629122	42.162654	49.196045	52.332354	54.510512
1.29E+10	40.0605835	42.202648	49.185243	52.58059	60.428067
1.3E+10	39.8387685	41.236056	48.039721	51.434877	65.572664
1.31E+10	39.973201	40.5593835	47.237931	50.560919	67.6450475
1.32E+10	39.5238715	40.0175825	46.539991	49.465453	61.0469335
1.33E+10	39.1081975	40.3504115	46.746077	49.283749	53.4126915
1.35E+10	38.838014	40.635992	47.078738	49.458658	49.234571
1.36E+10	38.7106145	41.070331	47.646765	50.123192	50.715241
1.37E+10	38.6586675	40.998445	47.75737	50.524495	55.732923

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.38E+10	38.9011095	39.7681525	46.423811	49.488166	60.483486
1.39E+10	38.8670705	38.956454	45.348536	48.104417	60.799852
1.4E+10	38.6308455	38.543461	44.711308	47.07776	55.156934
1.41E+10	38.0910145	38.996114	45.123406	47.070434	49.2815085
1.42E+10	37.537476	40.1774175	46.335309	48.0603	46.8978515
1.43E+10	37.3365805	41.5079745	48.033288	50.04613	50.2042805
1.44E+10	37.856192	41.929719	48.800478	51.341964	57.1048645
1.45E+10	38.12426	39.6018345	45.899774	48.538066	60.2244325
1.46E+10	38.681799	36.692822	42.164516	44.643621	56.0834595
1.47E+10	37.813582	34.7002615	39.883225	41.982213	48.0986155
1.48E+10	37.3536695	35.71931	40.770063	42.321443	43.9276575
1.49E+10	36.442838	37.0786385	42.107409	43.426792	43.024962
1.5E+10	36.58015	39.9388555	45.716172	47.388642	48.8358005
1.51E+10	36.537178	40.130916	46.496221	49.023549	56.3546595
1.52E+10	37.4157645	36.5753095	42.313927	45.48448	59.744925
1.53E+10	37.5259395	31.3182475	36.061595	39.072532	50.731628
1.54E+10	37.906253	30.733436	35.172353	37.451769	42.2210865
1.55E+10	37.129832	32.0176125	36.124451	37.687579	38.376268
1.56E+10	35.9428365	34.9772465	38.981684	40.143146	39.334143
1.57E+10	35.5424175	38.505695	43.38548	44.796312	45.205762
1.58E+10	35.8760965	40.1254305	45.770057	47.783302	52.492549
1.59E+10	37.1730745	38.7134635	44.453507	47.381909	58.755039
1.6E+10	36.185009	32.1292315	36.530882	39.132149	48.7440285
1.61E+10	36.6198145	29.6641045	33.261903	35.469431	39.701114
1.62E+10	36.9025255	31.01232	34.388696	36.246926	37.8499855
1.63E+10	38.2226615	35.7791685	40.228644	41.899652	42.843245
1.64E+10	36.942878	38.4317905	43.196588	44.359587	45.751278
1.65E+10	36.483138	40.697126	45.806903	47.231446	51.611609
1.66E+10	35.272369	38.743843	44.349116	46.839416	55.4231725
1.67E+10	35.7261465	35.645326	40.413302	43.038184	50.9739595
1.68E+10	36.3412165	32.4986405	36.151995	38.296004	42.7218965
1.69E+10	37.47512	33.72304	37.835568	39.918911	43.145502
1.7E+10	36.6583375	34.19963	38.444852	39.855693	41.910323
1.71E+10	36.2272145	35.5257405	39.463082	40.502744	43.2201835
1.72E+10	35.6487485	36.829338	41.318633	42.975116	48.670153
1.73E+10	35.4481945	36.9547425	42.182641	44.474701	51.4562155
1.74E+10	34.625914	34.0436655	38.346306	40.662589	46.4676275
1.75E+10	35.430882	33.254085	37.003675	39.272544	44.4028825
1.76E+10	35.877382	34.0483235	38.19211	40.403156	45.13278
1.77E+10	35.426307	34.623965	38.697826	40.104732	43.5826635
1.79E+10	35.2390725	35.486174	39.392804	40.634213	45.2121045
1.8E+10	35.1774155	36.969032	41.363689	43.050349	49.8723095
1.81E+10	34.2756545	34.51586	39.004538	41.237886	47.9491195
1.82E+10	34.285686	32.6156615	36.426385	38.44855	43.1234095
1.83E+10	34.6562065	31.563577	34.89214	36.815162	41.4995905

Frequency	e" @ 20 C	e" @ 40 C	e" @ 60 C	e" @ 80 C	e" @ 100 C
1.84E+10	34.554583	30.633819	33.972425	35.915784	40.7878255
1.85E+10	34.496413	31.335426	34.804611	36.461367	41.060708
1.86E+10	34.418873	32.0467735	35.183921	36.590904	42.092247
1.87E+10	34.2947065	31.4104035	34.72762	36.740253	43.4087275
1.88E+10	34.0470765	31.4797795	34.913962	37.082391	42.4682545
1.89E+10	33.9948655	31.44513	34.526601	36.33892	40.4907025
1.9E+10	34.2320885	31.974246	35.043391	36.703731	40.877008
1.91E+10	34.26251	32.138114	35.284392	36.706631	40.8154795
1.92E+10	34.0938185	31.535049	34.460435	35.634846	39.9635345
1.93E+10	34.044546	31.832833	34.739246	35.903883	40.7288945
1.94E+10	34.0027325	31.560894	34.499468	35.94853	40.4455395
1.95E+10	33.7978915	30.246205	33.099169	34.754846	38.6083835
1.96E+10	33.6242475	30.5040175	33.314301	34.825342	38.395684
1.97E+10	33.7417765	30.6697515	33.591358	35.095746	38.822857
1.98E+10	33.780152	32.077014	35.227449	36.651308	40.793876
1.99E+10	33.639012	32.9907185	36.113314	37.462406	42.136153
2E+10	33.5254245	33.8248395	36.710416	37.917177	42.336676

Table 20. Loss Tangent for W-26 ORNL Simulant

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
1.53E+08	5.772239561	5.7086098	5.9113423	6.53194633	6.087178984
2.55E+08	7.051259299	7.3621873	8.0275287	9.19481678	8.787674356
3.58E+08	7.474098979	8.2494999	9.4490378	11.0179872	11.04547058
4.6E+08	7.115263403	8.1425231	9.546905	11.1785307	11.56092294
5.62E+08	6.960353918	8.2332904	10.064454	12.0732283	12.91215188
6.65E+08	6.522350987	7.8863325	9.7799311	11.7444119	12.75849128
7.67E+08	6.14165593	7.6202115	9.7279811	11.9353069	13.50069965
8.69E+08	5.824376508	7.4195093	9.7404561	12.1576362	14.51185958
9.71E+08	5.462277885	7.0899562	9.4867387	11.998561	14.86722042
1.07E+09	5.192562377	6.8549121	9.3482219	12.0439651	15.3664946
1.18E+09	4.926072049	6.5774757	9.1691442	12.048159	15.77237619
1.28E+09	4.713351302	6.361573	8.9713233	11.9061021	15.7155416
1.38E+09	4.418294292	5.9771725	8.4235444	11.1374995	14.78237956
1.48E+09	4.228516181	5.7752859	8.2373169	11.1280794	15.37938321
1.59E+09	4.02122852	5.530889	7.9726074	10.8045668	15.58650828
1.69E+09	3.858119657	5.3249608	7.7064372	10.4970763	15.41026112
1.79E+09	3.69317303	5.1172128	7.4627323	10.183229	14.91606422
1.89E+09	3.56316033	4.9779098	7.3965992	10.3316013	15.56958554
1.99E+09	3.446580186	4.8146686	7.1216355	9.96630979	14.7625191
2.1E+09	3.304449775	4.6193885	6.834398	9.55261423	14.45663608
2.2E+09	3.180862227	4.4323685	6.5274774	9.04851851	13.91178466
2.3E+09	3.065897637	4.2894214	6.3858164	9.01552964	14.60223708
2.4E+09	2.96883556	4.1729429	6.2806179	8.9640058	14.74161992
2.51E+09	2.902686116	4.0688438	6.1025256	8.69250965	13.70902581
2.61E+09	2.844980388	3.9775327	6.0145138	8.65091853	13.58400919
2.71E+09	2.771241114	3.8708207	5.8511577	8.41132464	13.25788706
2.81E+09	2.693117376	3.7600971	5.698584	8.21946936	13.40800873
2.92E+09	2.626814862	3.6796066	5.6195929	8.20393138	14.22315301
3.02E+09	2.567638437	3.5903671	5.4669209	7.98233057	13.78645993
3.12E+09	2.513293811	3.4984365	5.3105702	7.75326127	12.92611767
3.22E+09	2.461169217	3.4113591	5.1821752	7.55203077	12.17056295
3.32E+09	2.406197014	3.3320466	5.0520363	7.38266148	11.8215947
3.43E+09	2.354423156	3.2443342	4.8968902	7.11725808	11.55179205
3.53E+09	2.308435001	3.1739405	4.764965	6.88748264	11.44304541
3.63E+09	2.25507568	3.0952412	4.6309021	6.69240367	11.28376474
3.73E+09	2.210368503	3.0296054	4.5382595	6.57907421	11.06522368
3.84E+09	2.17363814	2.9588157	4.4164429	6.37510189	10.20512952
3.94E+09	2.142844081	2.8983377	4.29014	6.15297853	9.455797245
4.04E+09	2.114560362	2.8453093	4.2027611	6.01115092	9.268943575
4.14E+09	2.082447186	2.7999286	4.136439	5.92703718	9.492919831
4.25E+09	2.046535426	2.7499961	4.0531411	5.8135022	9.552598294
4.35E+09	2.018968866	2.7045414	3.9707769	5.67951608	9.267641936
4.45E+09	2.005455118	2.6761741	3.9258752	5.62031273	8.905304052

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
4.55E+09	1.986718244	2.6363441	3.8540955	5.49939406	8.358252654
4.65E+09	1.955445367	2.5896719	3.7667436	5.33919609	7.937393343
4.76E+09	1.937084428	2.5716429	3.7713467	5.41924655	8.484893196
4.86E+09	1.917461793	2.5528246	3.7536923	5.41971299	8.971165005
4.96E+09	1.901022524	2.5266009	3.7143093	5.36947763	9.039839291
5.06E+09	1.879682984	2.4772572	3.6186486	5.20354926	8.436722362
5.17E+09	1.864570195	2.4433297	3.557532	5.1095118	7.966512431
5.27E+09	1.849490503	2.4085718	3.4890351	4.97314393	7.474699887
5.37E+09	1.828261168	2.3774205	3.4276836	4.86463202	7.345018934
5.47E+09	1.813879223	2.3595872	3.3999473	4.82643984	7.638118812
5.57E+09	1.799207733	2.3465512	3.392698	4.84245229	8.094173495
5.68E+09	1.783784688	2.3186741	3.3413648	4.75917289	7.864411768
5.78E+09	1.76686364	2.2734134	3.2574223	4.60284591	7.186395329
5.88E+09	1.751255571	2.2298073	3.1574997	4.42016048	6.582180945
5.98E+09	1.739249012	2.1993153	3.1007997	4.32624592	6.406272183
6.09E+09	1.72457577	2.1791989	3.0679318	4.26068574	6.463542456
6.19E+09	1.71140912	2.1599966	3.0386138	4.22316135	6.697562141
6.29E+09	1.705193898	2.1307097	2.9942635	4.16327347	6.694829752
6.39E+09	1.695311999	2.0994094	2.932379	4.06131032	6.213802531
6.5E+09	1.679764978	2.0445322	2.8153491	3.84102507	5.434087763
6.6E+09	1.664318566	2.0103902	2.7474812	3.73155105	5.120050681
6.7E+09	1.658123098	2.0078932	2.7414956	3.73082353	5.256452337
6.8E+09	1.647367985	2.0058411	2.7407388	3.74185894	5.500986666
6.9E+09	1.637624253	1.9967199	2.7318444	3.73988174	5.676673076
7.01E+09	1.627396984	1.976955	2.6985715	3.7035784	5.560774984
7.11E+09	1.620217628	1.9547719	2.6548903	3.63730905	5.151803278
7.21E+09	1.603301399	1.9171158	2.5782654	3.49216261	4.635537104
7.31E+09	1.595754224	1.8969568	2.542142	3.43879404	4.561574414
7.42E+09	1.585784727	1.8859899	2.5197635	3.40532759	4.7111065
7.52E+09	1.579018703	1.8910984	2.5382166	3.45421637	5.035108144
7.62E+09	1.570591272	1.8815395	2.5246805	3.43550342	5.058886836
7.72E+09	1.558599679	1.8473853	2.4663731	3.34286377	4.73498124
7.83E+09	1.54914093	1.8138371	2.4082612	3.24411446	4.35378285
7.93E+09	1.542584085	1.7920444	2.3674406	3.17337805	4.111712385
8.03E+09	1.522600903	1.757866	2.3010539	3.05388396	3.99956542
8.13E+09	1.522877785	1.775304	2.336122	3.12111005	4.382490852
8.23E+09	1.512435349	1.7749973	2.3329382	3.11188637	4.517043637
8.34E+09	1.505668918	1.7686702	2.3300039	3.11460842	4.451214433
8.44E+09	1.492646128	1.7332871	2.2721502	3.02753187	4.086353498
8.54E+09	1.480184467	1.689007	2.1930856	2.88859152	3.707356706
8.64E+09	1.469589542	1.6560205	2.1384893	2.79828889	3.574377456
8.75E+09	1.460705348	1.647482	2.125469	2.77299106	3.688750385
8.85E+09	1.450217186	1.6477956	2.1220278	2.76957526	3.886629124
8.95E+09	1.447654207	1.6514526	2.129752	2.78899576	3.968206422
9.05E+09	1.439384516	1.6274207	2.0878556	2.72044076	3.634548072

Frequency	e"/e' 20 C	e"/e' 40 C	e"/e' 60 C	e"/e' 80 C	e"/e' 100 C
9.16E+09	1.434625981	1.5848105	2.0201351	2.61700221	3.280250572
9.26E+09	1.421857004	1.5403076	1.9460568	2.49315372	3.052546268
9.36E+09	1.412368262	1.5256892	1.9139303	2.44199998	3.072417883
9.46E+09	1.399866692	1.5252417	1.9139389	2.44288877	3.253694581
9.56E+09	1.390623017	1.5384139	1.9321763	2.47314958	3.418575924
9.67E+09	1.382828095	1.5305428	1.9117704	2.43840336	3.26320024
9.77E+09	1.387712875	1.5030888	1.877932	2.40424273	2.975359937
9.87E+09	1.369331792	1.446092	1.7831042	2.25686932	2.614389009
9.97E+09	1.36556817	1.4090971	1.731191	2.17833638	2.565186326
1.01E+10	1.354232951	1.4078949	1.725689	2.16234807	2.706207906
1.02E+10	1.340920733	1.4287266	1.7442584	2.18205998	2.883930932
1.03E+10	1.333404912	1.4383683	1.7577855	2.20654661	2.956125728
1.04E+10	1.329551304	1.4256806	1.7429529	2.19241936	2.779608655
1.05E+10	1.327419778	1.3882173	1.6861479	2.11078167	2.447107671
1.06E+10	1.31739662	1.3512884	1.6405487	2.04903844	2.31133617
1.07E+10	1.30871525	1.3571553	1.6413775	2.048067	2.438675588
1.08E+10	1.302314785	1.3849737	1.6697905	2.0843802	2.711182225
1.09E+10	1.293991225	1.4051551	1.6944112	2.1139843	2.871141635
1.1E+10	1.284749071	1.3924235	1.678299	2.0880184	2.723899088
1.11E+10	1.282248272	1.3477459	1.6194202	2.01121474	2.394406074
1.12E+10	1.276800208	1.3006868	1.5579329	1.93199295	2.148649155
1.13E+10	1.281253145	1.2890632	1.539385	1.90694989	2.146417331
1.14E+10	1.271007304	1.2974097	1.5437013	1.90561415	2.355680555
1.15E+10	1.261479551	1.3072929	1.5466476	1.89868947	2.580308096
1.16E+10	1.26054373	1.3056992	1.5433744	1.8870993	2.537367342
1.17E+10	1.241897212	1.2490392	1.4730155	1.7925579	2.134224696
1.18E+10	1.230485817	1.1902212	1.4017918	1.70159529	1.809908706
1.19E+10	1.24299848	1.1978505	1.4020624	1.70811041	1.745275641
1.2E+10	1.246450409	1.2170872	1.4219352	1.72991158	1.888620968
1.21E+10	1.242588854	1.2559202	1.4626501	1.77670269	2.268660423
1.22E+10	1.229824892	1.2678133	1.4696283	1.77657467	2.611075306
1.23E+10	1.208550269	1.2182339	1.4003202	1.6649109	2.337243367
1.24E+10	1.212623223	1.1617712	1.3421906	1.59318538	1.905429783
1.25E+10	1.211039787	1.1332918	1.3116974	1.55819064	1.601870609
1.26E+10	1.209704769	1.1358123	1.3118709	1.56443882	1.544951338
1.27E+10	1.220168434	1.1800805	1.3636043	1.64040211	1.766379063
1.28E+10	1.216540187	1.2048418	1.3820717	1.65511336	2.211864433
1.29E+10	1.219003195	1.1970547	1.3592101	1.6145468	2.732461158
1.3E+10	1.220893115	1.1670605	1.3230417	1.56465219	2.762924559
1.31E+10	1.220323652	1.1232789	1.2700859	1.49124617	2.103469203
1.32E+10	1.217533635	1.1218101	1.275942	1.49336013	1.684145188
1.33E+10	1.204012607	1.1556102	1.3199694	1.54783738	1.595615368
1.35E+10	1.205275772	1.1957821	1.3674558	1.61319534	1.759953354
1.36E+10	1.207828115	1.2098011	1.3789382	1.63651415	2.220538851
1.37E+10	1.206956684	1.1795728	1.3439729	1.59763915	2.813089898

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
1.38E+10	1.21310945	1.1141788	1.260808	1.49328556	2.663708306
1.39E+10	1.21748228	1.0931841	1.2375065	1.4512258	2.039576775
1.4E+10	1.20355772	1.1009952	1.2486177	1.4542667	1.618155102
1.41E+10	1.196736872	1.1523679	1.3183074	1.53922299	1.585265756
1.42E+10	1.180937834	1.2028304	1.3807885	1.61922491	1.776307072
1.43E+10	1.178721109	1.2027381	1.3731293	1.61612976	2.173311042
1.44E+10	1.19241642	1.1419154	1.2914642	1.52294807	2.557834532
1.45E+10	1.21525059	1.0583904	1.1809191	1.38020642	2.23483809
1.46E+10	1.231090084	0.9973222	1.0968096	1.26266293	1.570013876
1.47E+10	1.20750626	0.9977113	1.1049217	1.26546294	1.325409585
1.48E+10	1.177605725	1.0815942	1.2110302	1.38787857	1.414890704
1.49E+10	1.139325714	1.1353311	1.2697918	1.4556769	1.629349926
1.5E+10	1.166157062	1.1787757	1.313551	1.5274612	2.108235221
1.51E+10	1.18691123	1.0757141	1.1964179	1.40901271	2.377570195
1.52E+10	1.253676058	0.9374478	1.0205238	1.19138983	1.894873901
1.53E+10	1.227864236	0.7939009	0.8554818	0.98556268	1.19572189
1.54E+10	1.249679241	0.8602598	0.9389806	1.07264967	1.104305886
1.55E+10	1.173677416	0.9566428	1.0478575	1.18662724	1.188978301
1.56E+10	1.125199037	1.1535283	1.2541401	1.41913618	1.549220316
1.57E+10	1.091200471	1.2607165	1.3824376	1.58829641	2.071118457
1.58E+10	1.150443435	1.1957315	1.3180274	1.54355032	2.418027828
1.59E+10	1.230448208	1.0052819	1.0892241	1.28116487	2.003062326
1.6E+10	1.277344002	0.8533897	0.9154212	1.05430469	1.302819527
1.61E+10	1.214541623	0.7878531	0.8370379	0.94715545	0.990086779
1.62E+10	1.159212792	0.8934286	0.9372718	1.04764603	1.075949071
1.63E+10	1.182996232	1.1343686	1.2188566	1.38824131	1.568204902
1.64E+10	1.173896203	1.3077443	1.4413422	1.67609049	2.187251567
1.65E+10	1.209403878	1.2958419	1.417966	1.66288189	2.422794959
1.66E+10	1.214033832	1.0591739	1.1514552	1.35854428	1.956947242
1.67E+10	1.236062489	0.907574	0.9743594	1.13423914	1.389409742
1.68E+10	1.229551532	0.8500013	0.8894616	1.00510394	1.084810281
1.69E+10	1.289438698	0.9945186	1.0459536	1.18974492	1.313983911
1.7E+10	1.246094073	1.1516021	1.2528405	1.44475549	1.729474156
1.71E+10	1.214358132	1.2251214	1.3219073	1.51352438	1.930545223
1.72E+10	1.199615366	1.1359133	1.2101963	1.39618505	1.86128659
1.73E+10	1.234189755	1.0378713	1.1231584	1.32306841	1.753769117
1.74E+10	1.208611692	0.8931437	0.9528566	1.10761743	1.331284787
1.75E+10	1.244262226	0.9001713	0.9377402	1.07041882	1.241256714
1.76E+10	1.251774943	1.0013849	1.0538555	1.20638528	1.472280137
1.77E+10	1.234983353	1.1253503	1.2105363	1.39193926	1.767948883
1.79E+10	1.217115453	1.1423299	1.2185591	1.3955192	1.823870976
1.8E+10	1.24157426	1.1300838	1.197227	1.38290136	1.878281455
1.81E+10	1.217182428	0.9744927	1.0380285	1.21011727	1.554335158
1.82E+10	1.213446617	0.9042682	0.9564654	1.0999991	1.307390579
1.83E+10	1.230211374	0.9004852	0.9333192	1.05846068	1.273647236

Frequency	e''/e' 20 C	e''/e' 40 C	e''/e' 60 C	e''/e' 80 C	e''/e' 100 C
1.84E+10	1.244143776	0.9627099	1.0010156	1.14176732	1.444083514
1.85E+10	1.226157113	1.0075887	1.0643464	1.21806734	1.553991415
1.86E+10	1.225549492	1.0137151	1.0541211	1.19269516	1.51673645
1.87E+10	1.226940499	0.9198723	0.9505216	1.08397348	1.388756977
1.88E+10	1.235428077	0.8985222	0.9321958	1.07173988	1.307118156
1.89E+10	1.217828961	0.896858	0.9294753	1.06204556	1.259096261
1.9E+10	1.232150799	0.9677901	0.9993194	1.13171048	1.39722398
1.91E+10	1.243106678	1.0712299	1.1121966	1.26010508	1.608602424
1.92E+10	1.238158881	1.1012501	1.140332	1.29013193	1.631318483
1.93E+10	1.232329407	1.0626276	1.0949739	1.23444089	1.552918389
1.94E+10	1.249103794	1.0124322	1.0382316	1.17510256	1.440983379
1.95E+10	1.24435984	0.9450123	0.9682388	1.09730818	1.306660001
1.96E+10	1.230879281	0.9506045	0.9775173	1.10458468	1.330226351
1.97E+10	1.231661866	0.9700563	1.0014939	1.13216711	1.402229721
1.98E+10	1.243730822	1.0401682	1.0805846	1.22978134	1.561222325
1.99E+10	1.244011176	1.0596518	1.0958546	1.24963497	1.587836417
2E+10	1.239350849	1.0612082	1.0848596	1.22754013	1.527117325

APPENDIX C

CORRELATION GRAPHS FOR THE DIELECTRIC CONSTANT AND DIELECTRIC LOSS

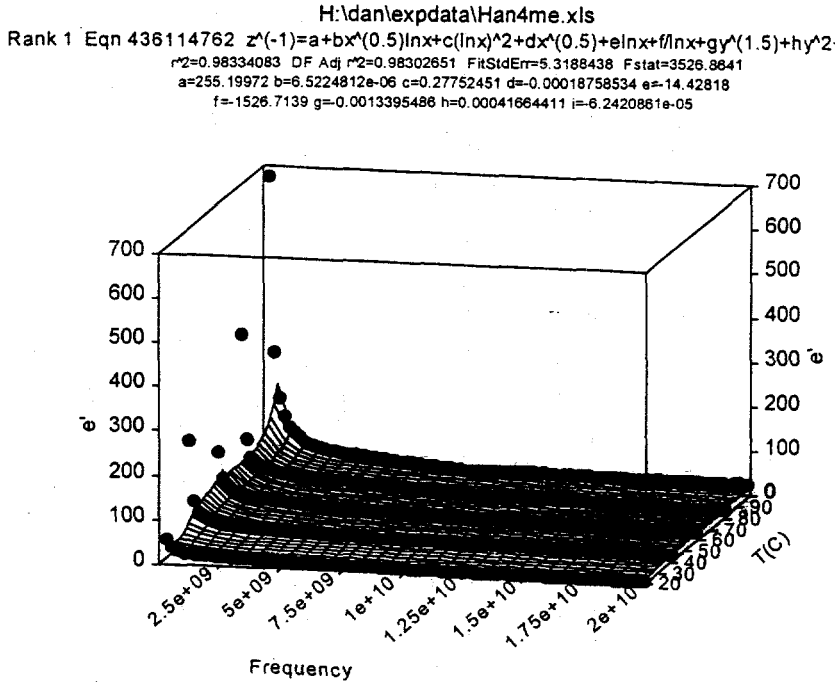

Figure C.1.a. Correlation data for the dielectric constant. Simulant: Hanford 4 Molar.

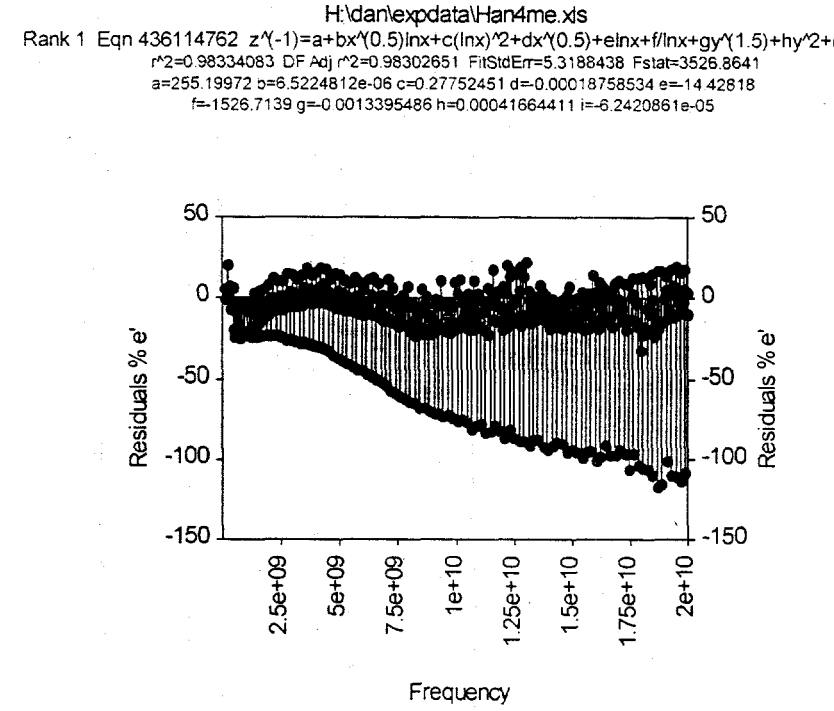

Figure C.1.b. Residual percentage (%) for dielectric constant. Simulant: Hanford 4 Molar.

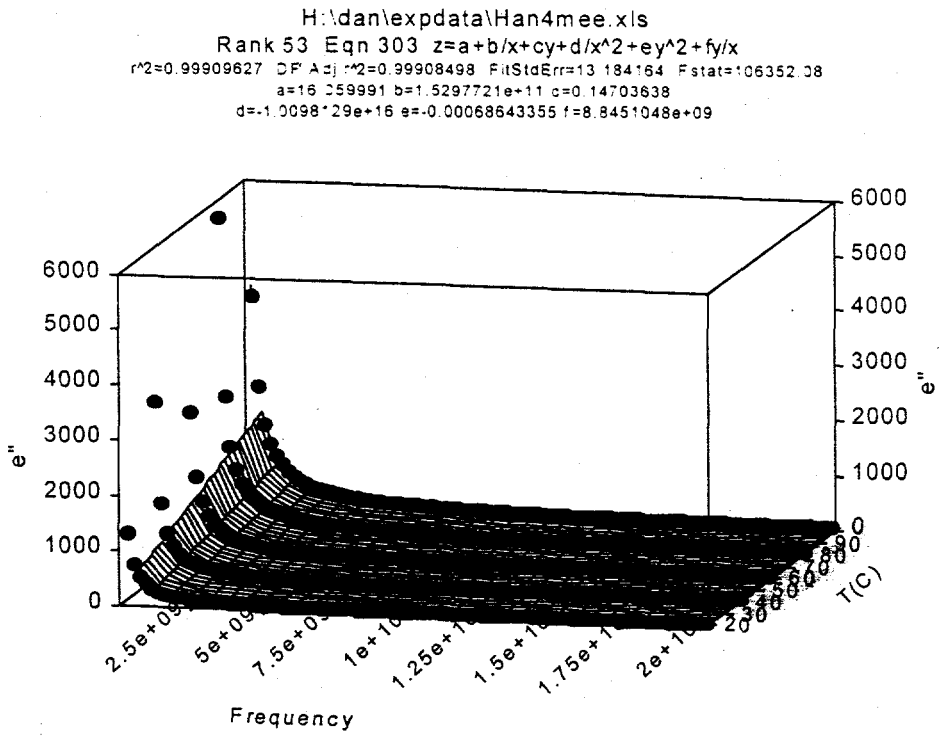

Figure C.1.c. Correlation data for the dielectric loss. Simulant: Hanford 4 Molar.

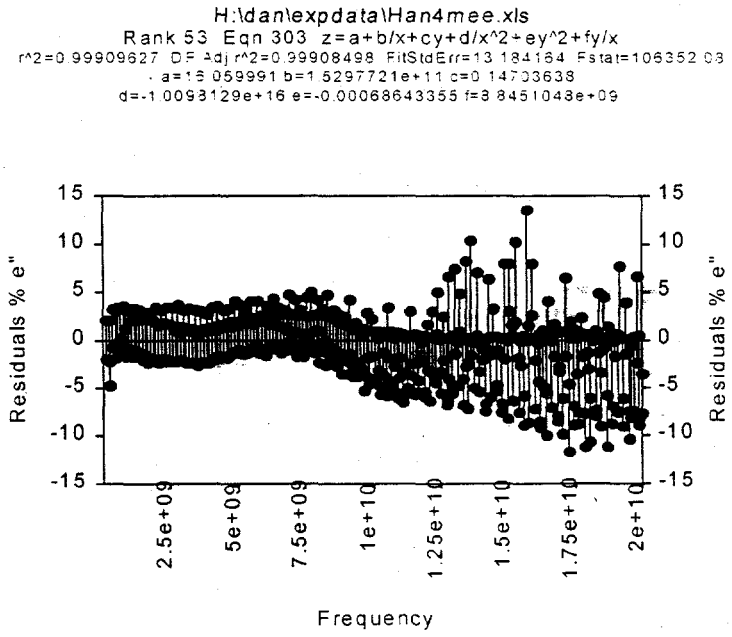

Figure C.1.d. Residual percentage (%) for the dielectric loss. Simulant: Hanford 4 Molar.

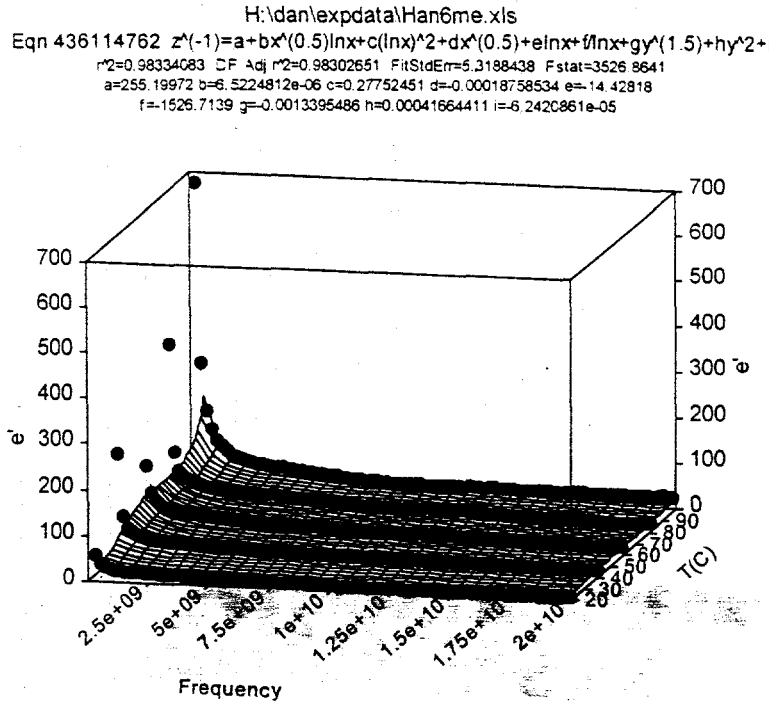

Figure C.2.a. Correlation data for the dielectric constant. Simulant: Hanford 6 Molar.

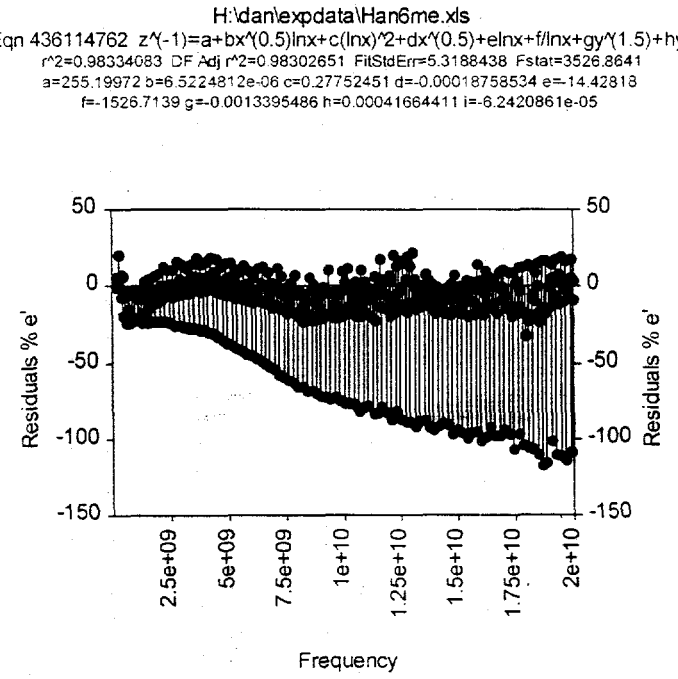

Figure C.2.b. Residual percentage (%) for the dielectric constant. Simulant: Hanford 6 Molar.

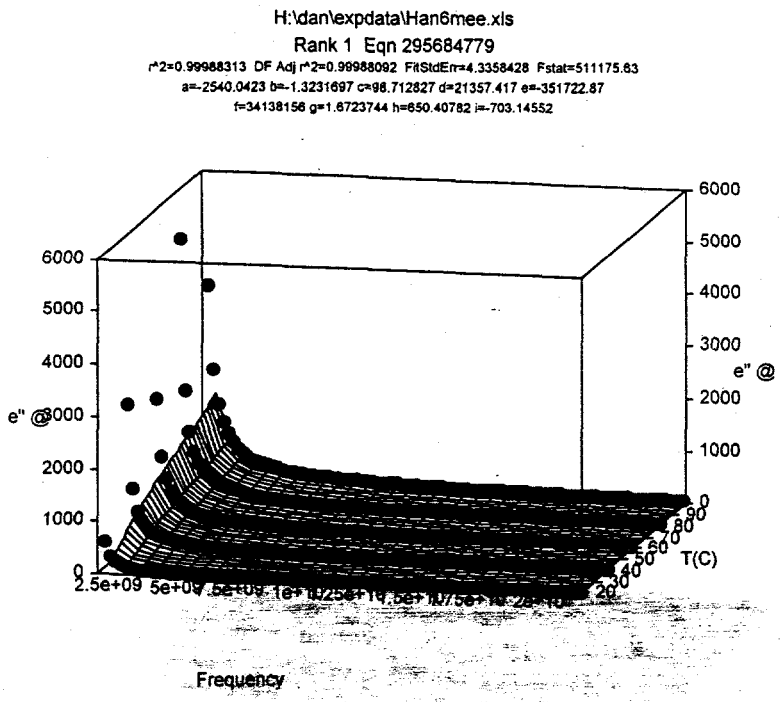

Figure C.2.c. Correlation data for the dielectric loss. Simulant: Hanford 6 Molar.

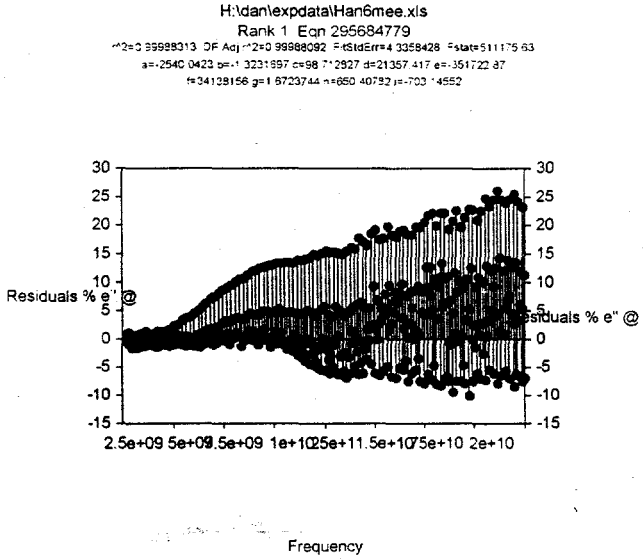

Figure C.2.d. Residual percentage (%) for the dielectric loss. Simulant: Hanford 6 Molar.

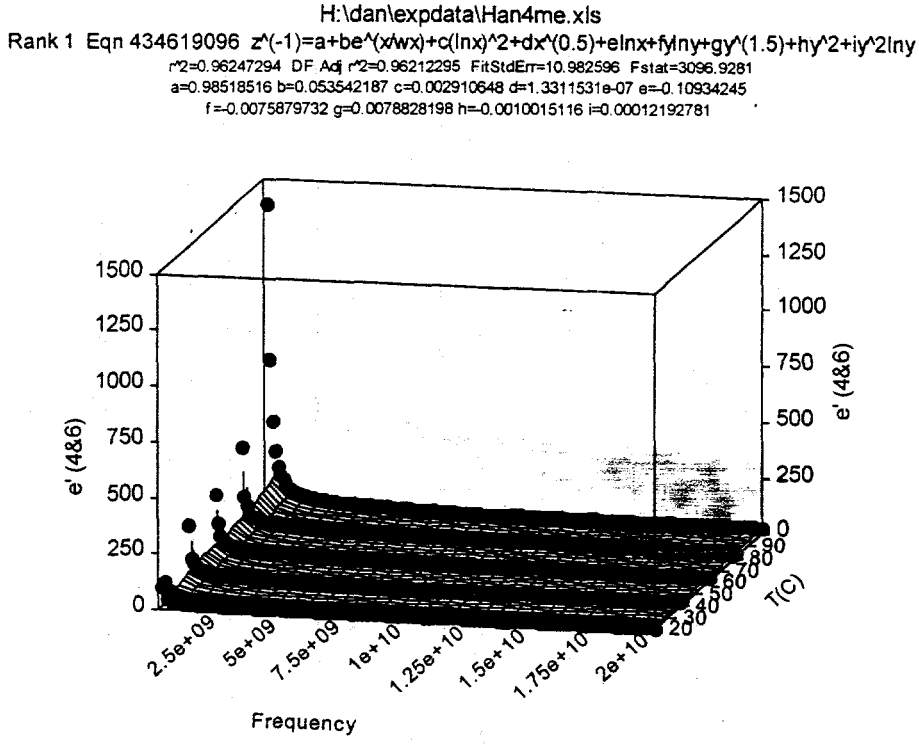

Figure C.3.a. Correlation data for the dielectric constant. Simulants: Hanford 4 and 6 Molar.

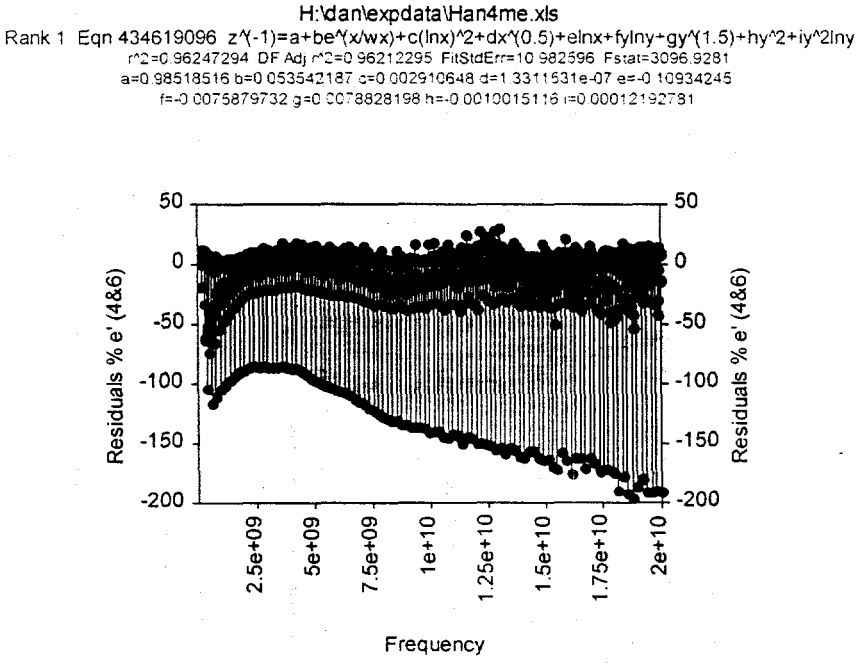

Figure C.3.b. Residual percentage (%) for the dielectric constant. Simulants: Hanford 4 and 6 Molar.

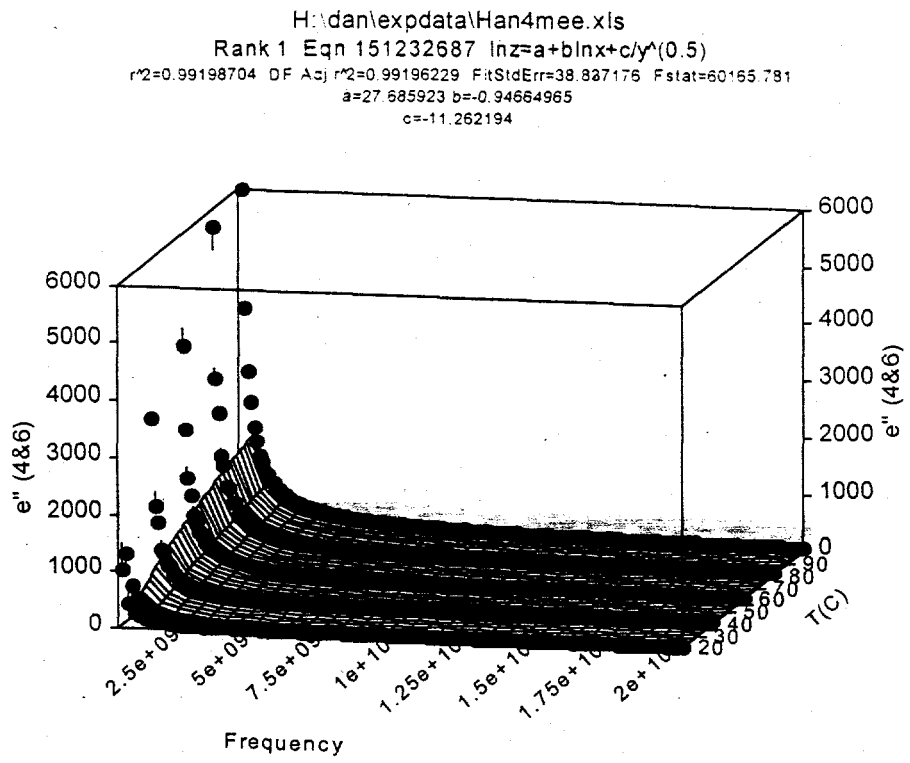

Figure C.3.c. Correlation data for the dielectric loss. Simulants: Hanford 4 and 6 Molar.

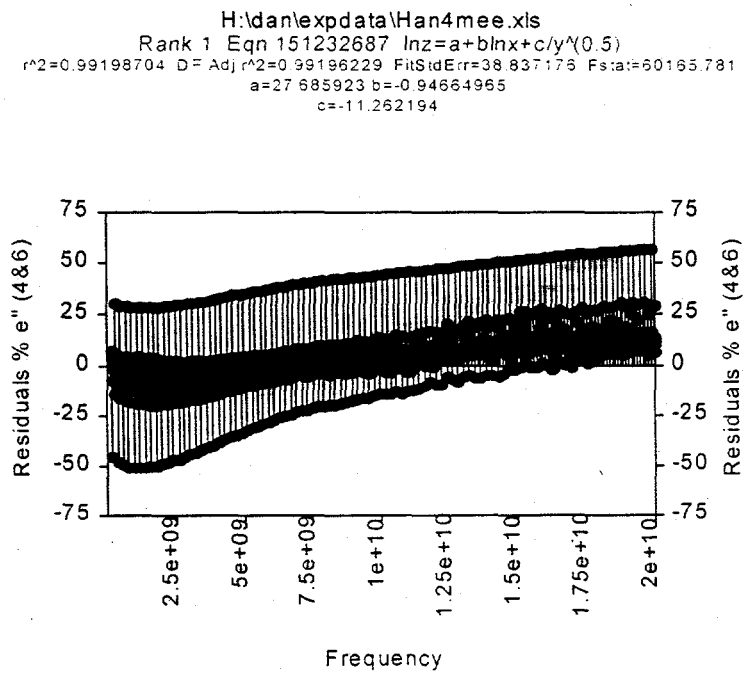

Figure C.3.d. Residual percentage (%) for the dielectric loss. Simulants: Hanford 4 and 6 Molar.

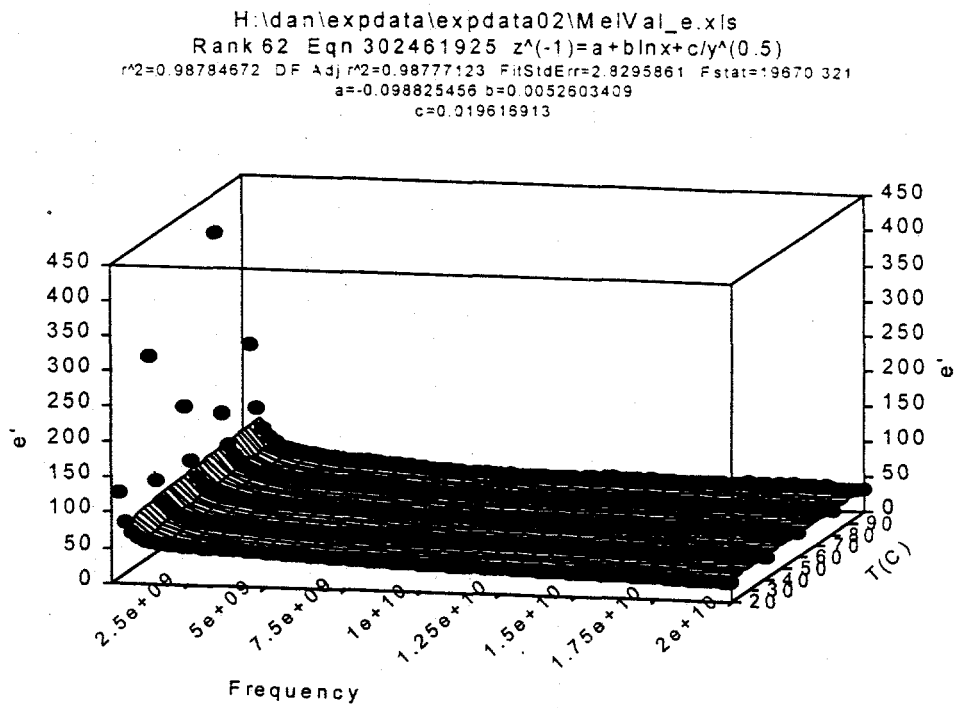

Figure C.4.a. Correlation data for the dielectric constant. Simulant: Melton Valley.

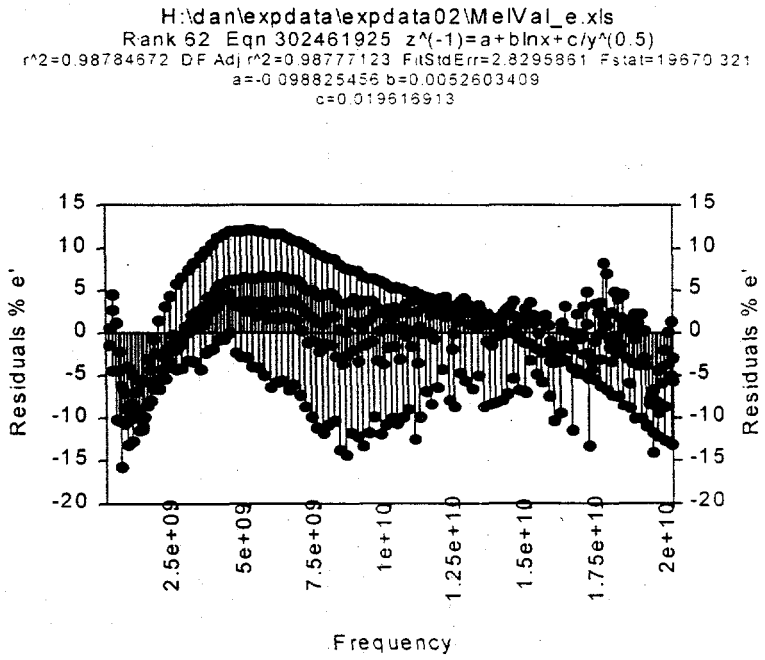

Figure C.4.b. Residual percentage (%) for the dielectric constant. Simulant: Melton Valley.

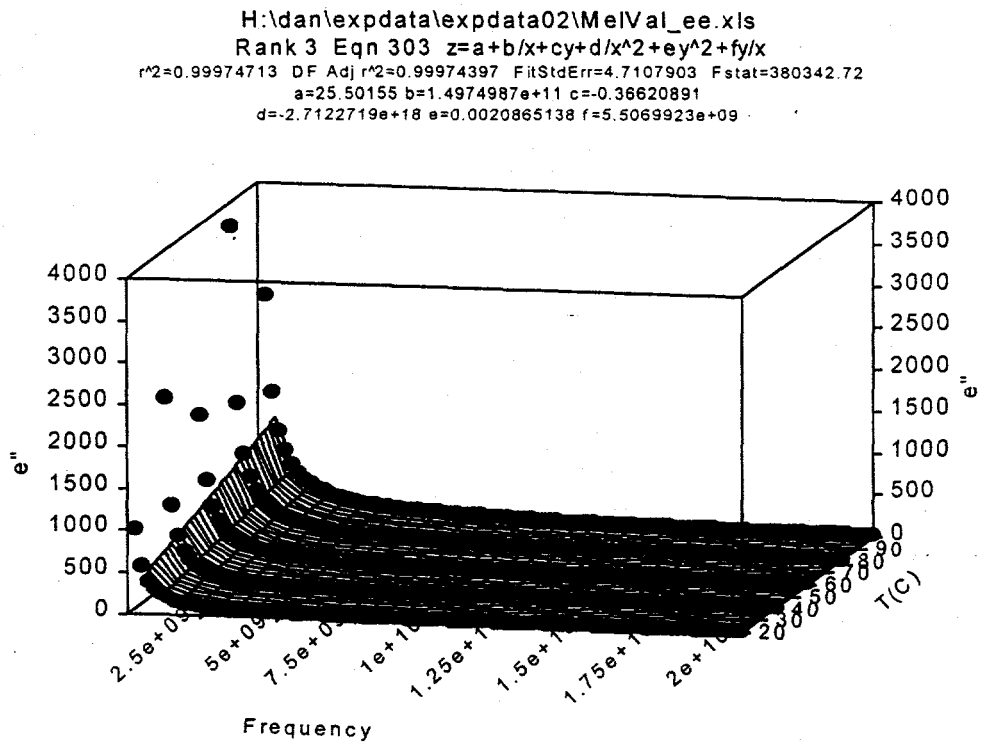

Figure C.4.c. Correlation data for the dielectric loss. Simulant: Melton Valley.

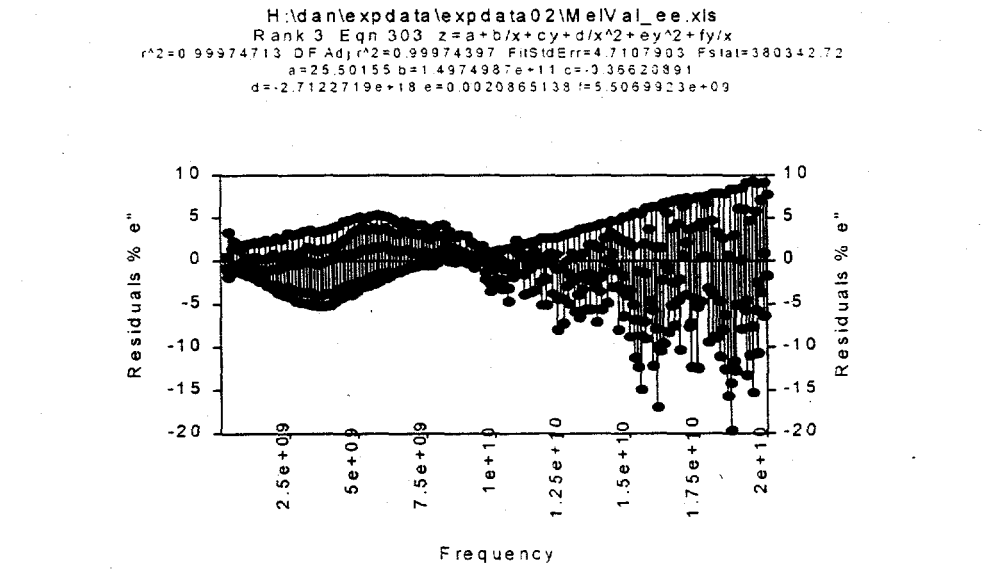

Figure C.4.d. Residual percentage (%) for the dielectric loss. Simulant: Melton Valley.

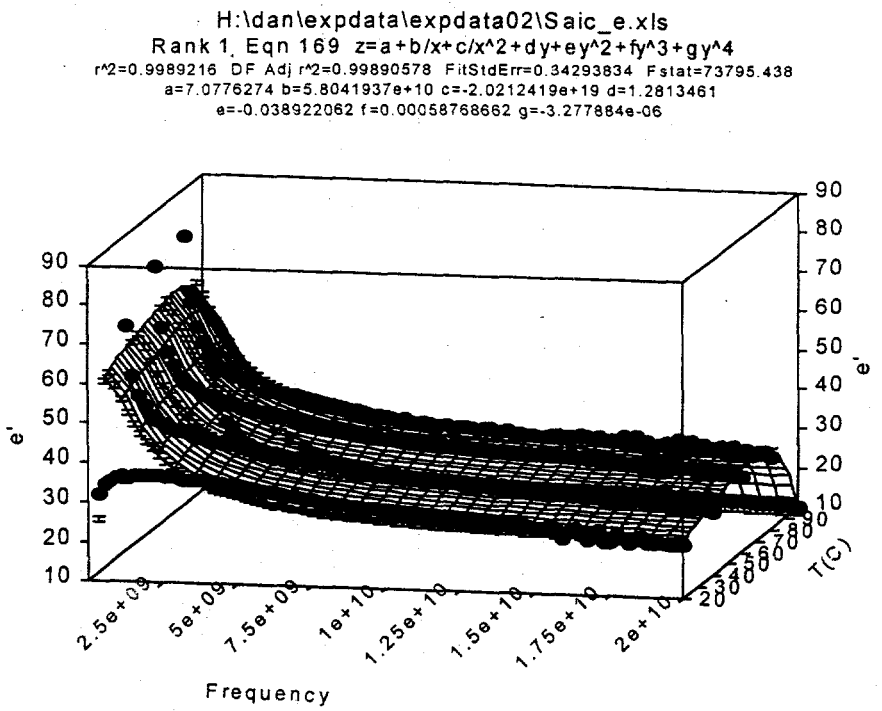

Figure C.5.a. Correlation data for the dielectric constant. Simulant: SAIC.

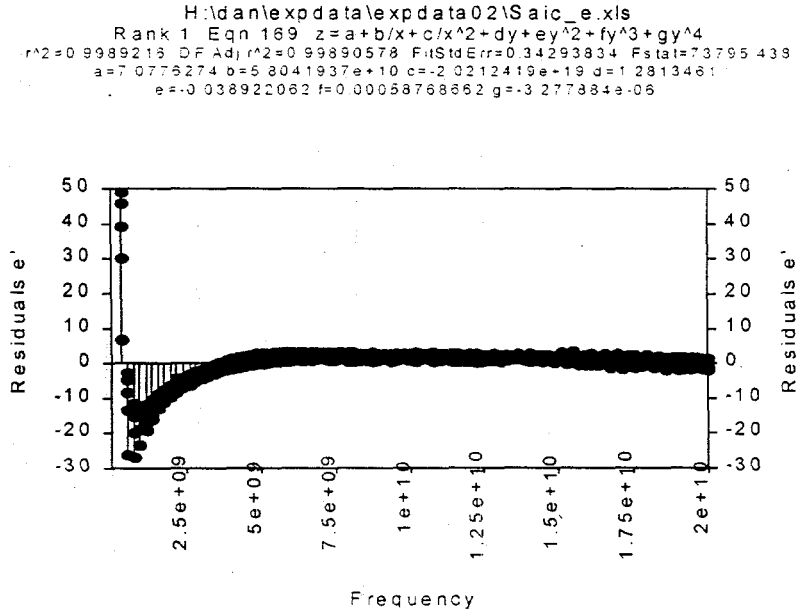

Figure C.5.b. Residual percentage (%) for the dielectric constant. Simulant: SAIC.

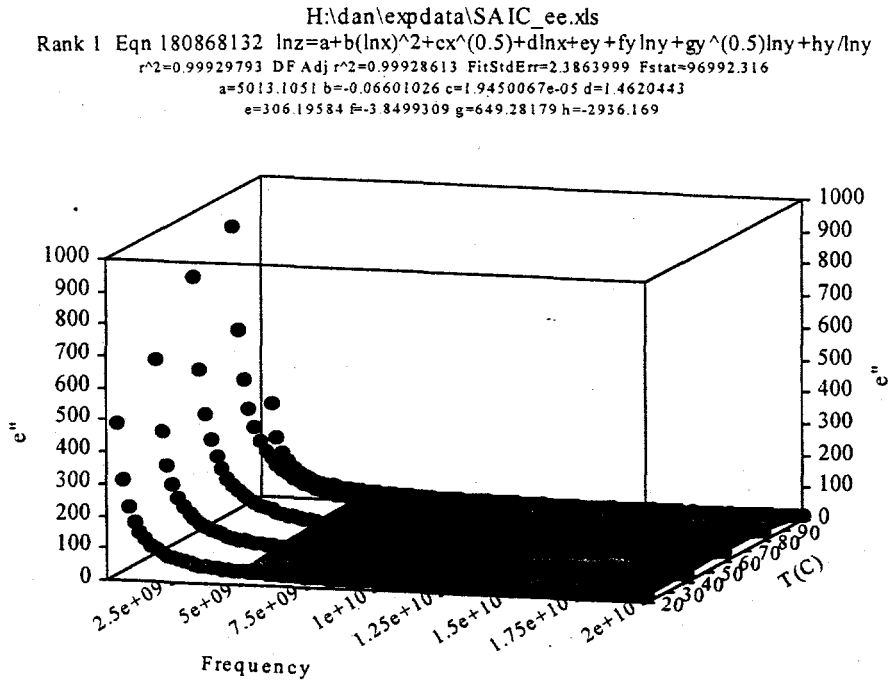

Figure C.5.c. Correlation data for the dielectric loss. Simulant: SAIC.

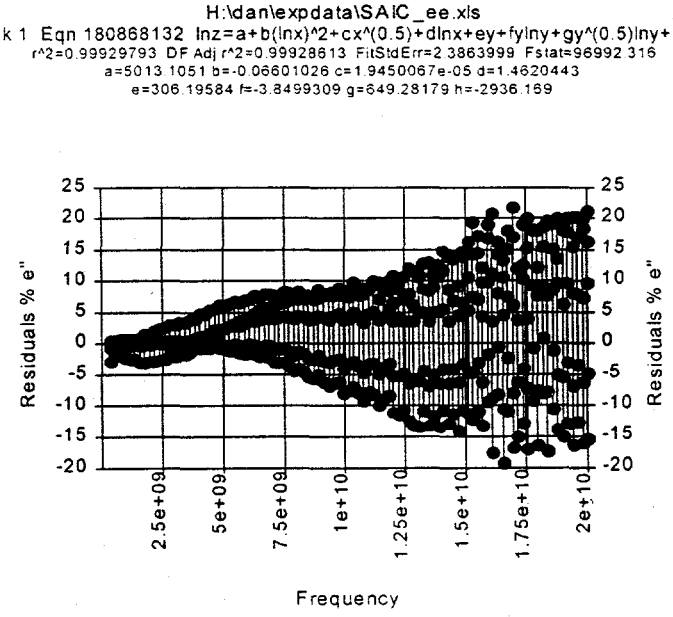

Figure C.5.d. Residual percentage (%) for the dielectric loss. Simulant: SAIC.

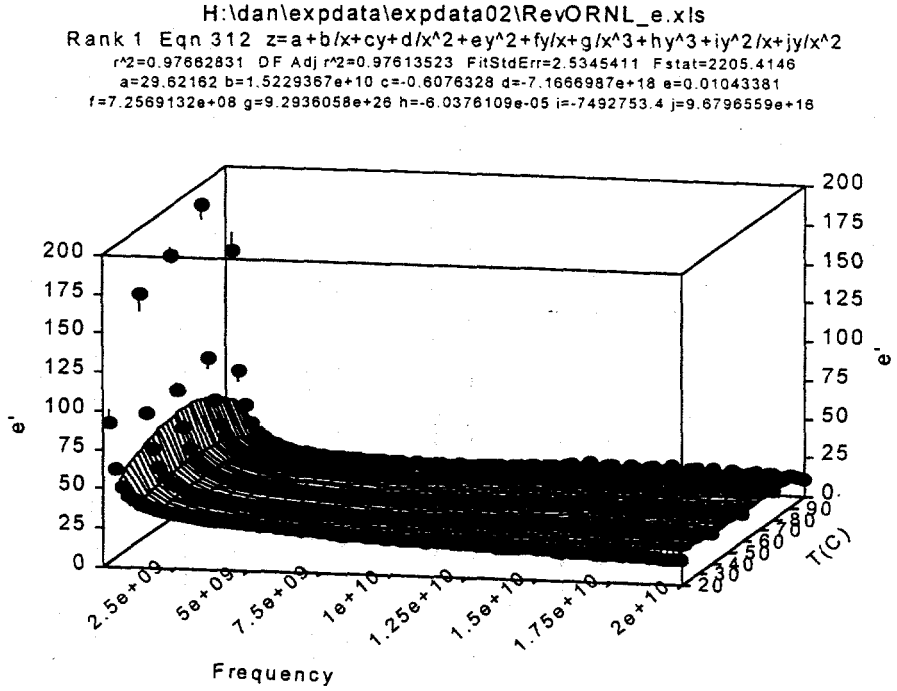

Figure C.6.a. Correlation data for the dielectric constant. Simulant: Revised ORNL.

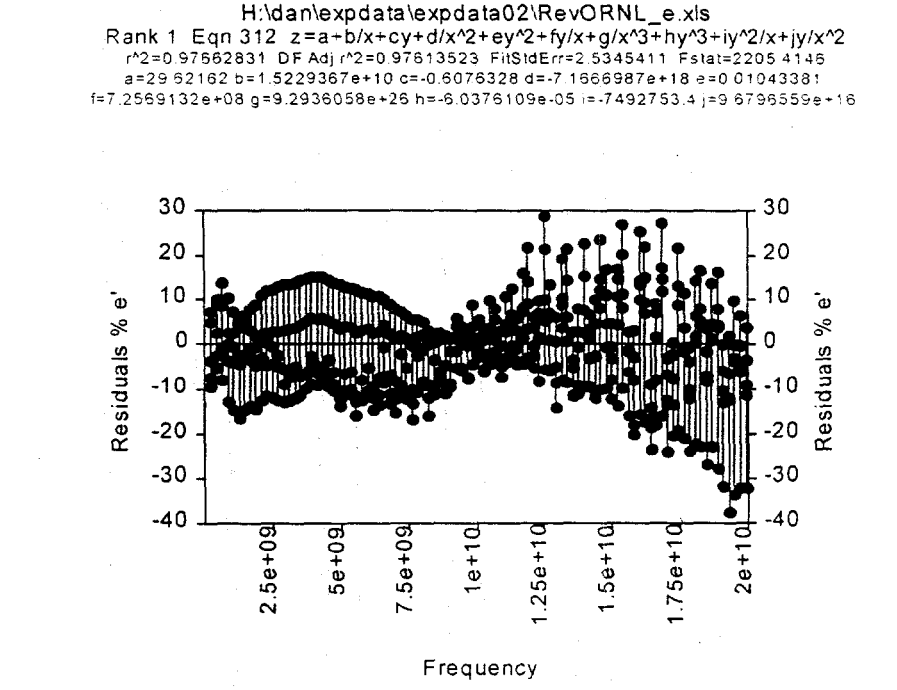

Figure C.6.b. Residual percentage (%) for the dielectric constant. Simulant: Revised ORNL.

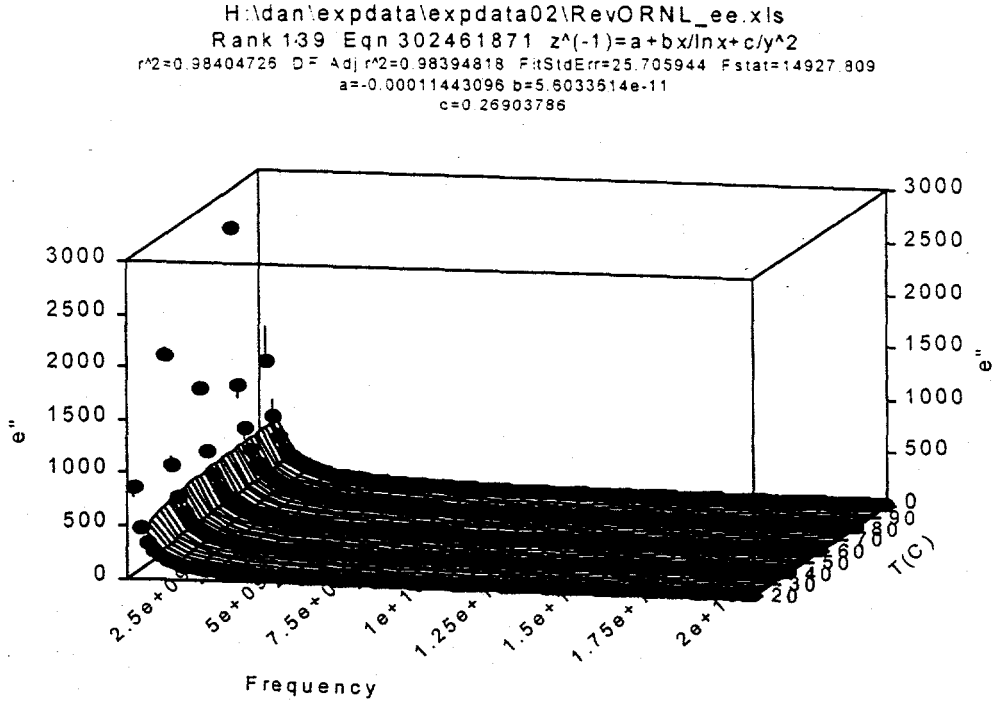

Figure C.6.c. Correlation data for the dielectric loss. Simulant: Revised ORNL.

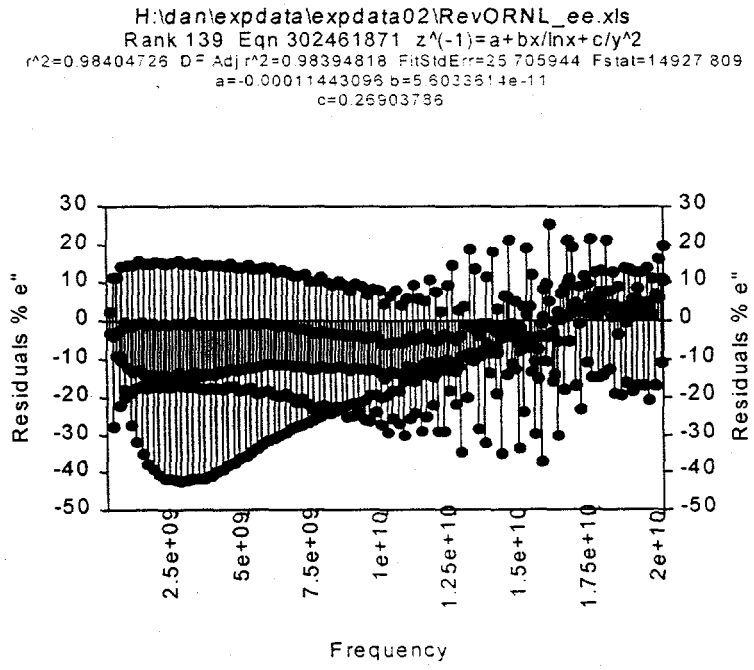

Figure C.6.d. Residual percentage (%) for the dielectric loss. Simulant: Revised ORNL.

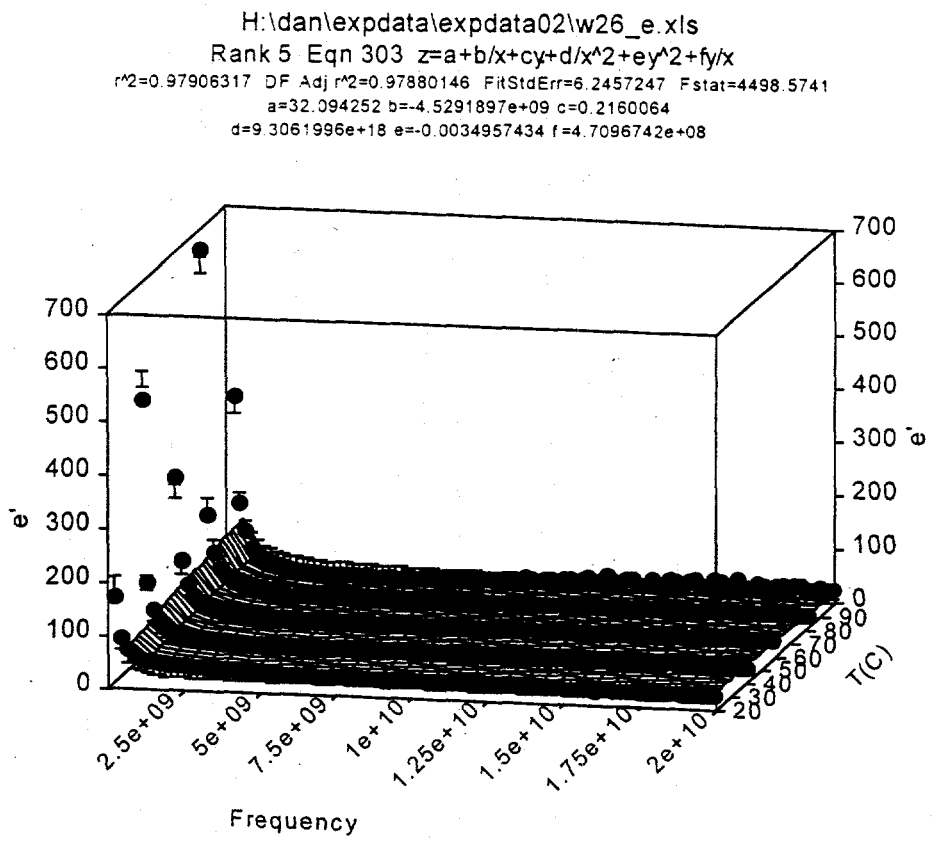

Figure C.7.a. Correlation data for the dielectric constant: Simulant: W26 ORNL.

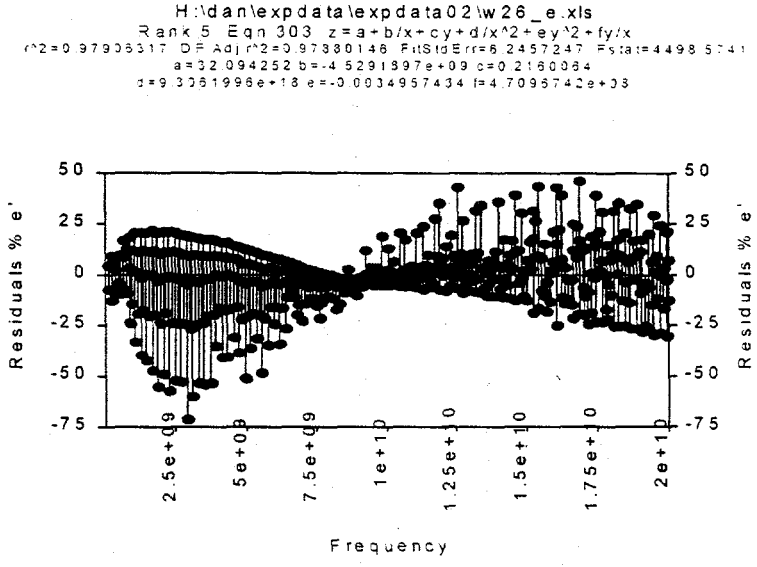

Figure C.7.b. Residual percentage (%) for the dielectric constant. Simulant: W26 ORNL.

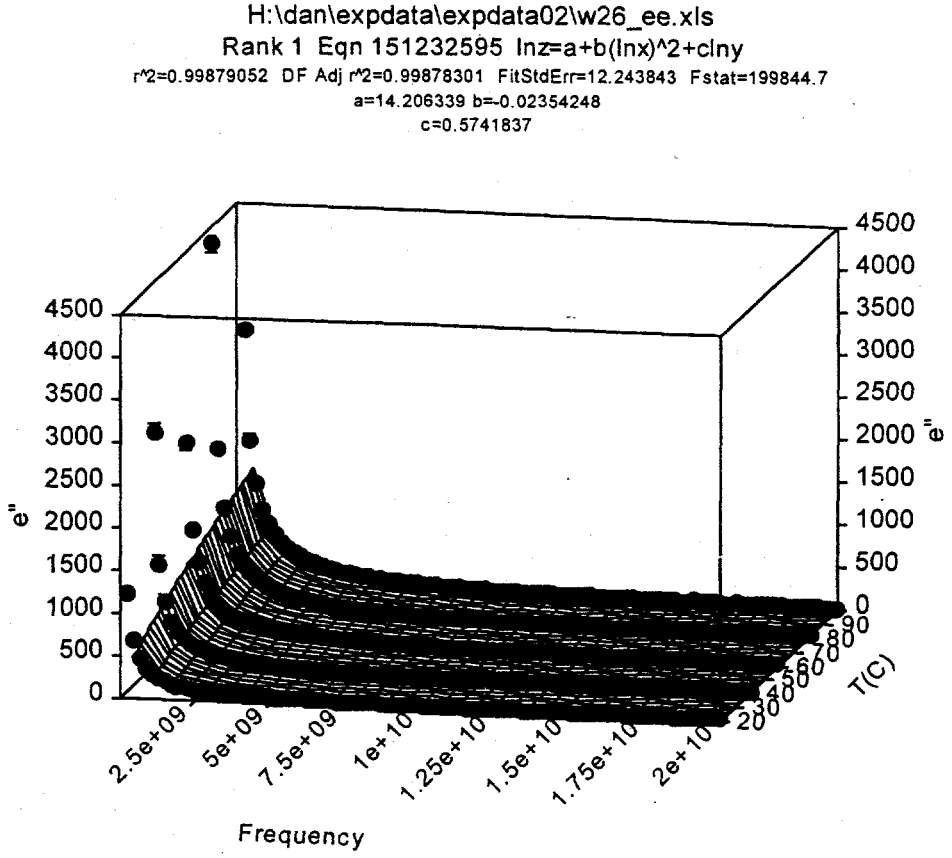

Figure C.7.c. Correlation data for the dielectric loss. Simulant: W26 ORNL.

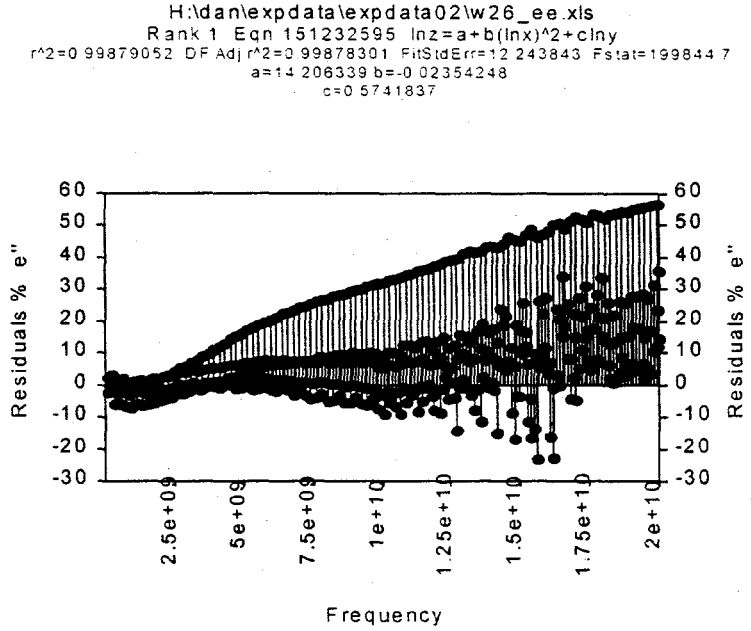

Figure C.7.d. Residual percentage (%) for the dielectric loss. Simulant: W26 ORNL.

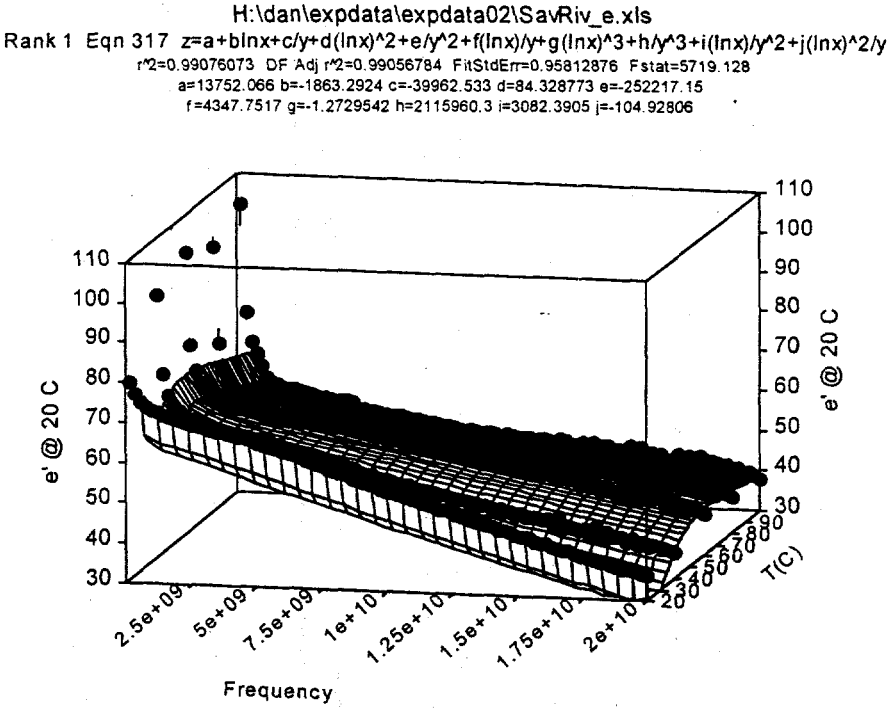

Figure C.8.a. Correlation data for the dielectric constant. Simulant: Savannah River.

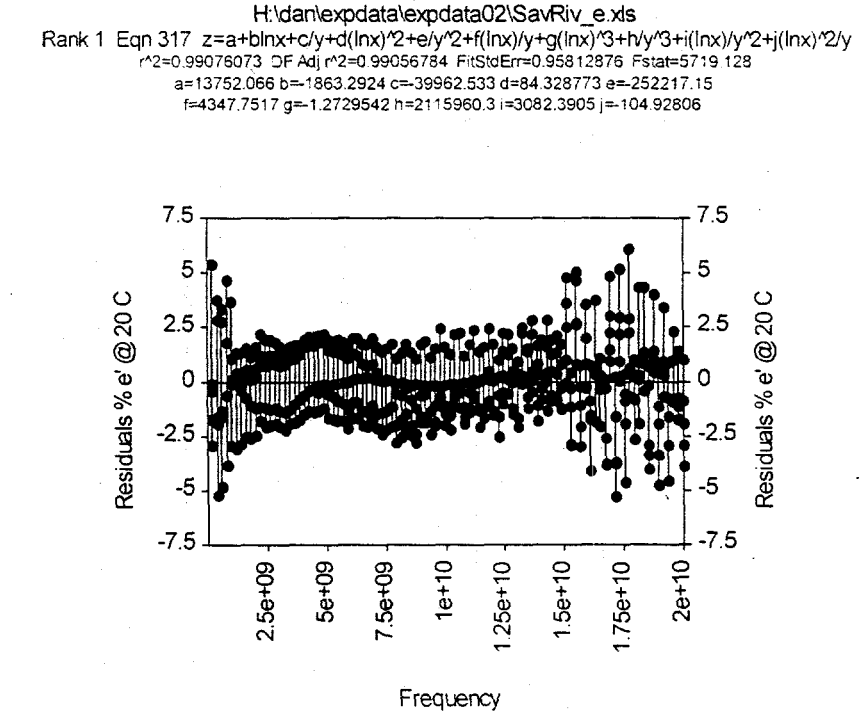

Figure C.8.b. Residual percentage (%) for the dielectric constant. Simulant: Savannah River.

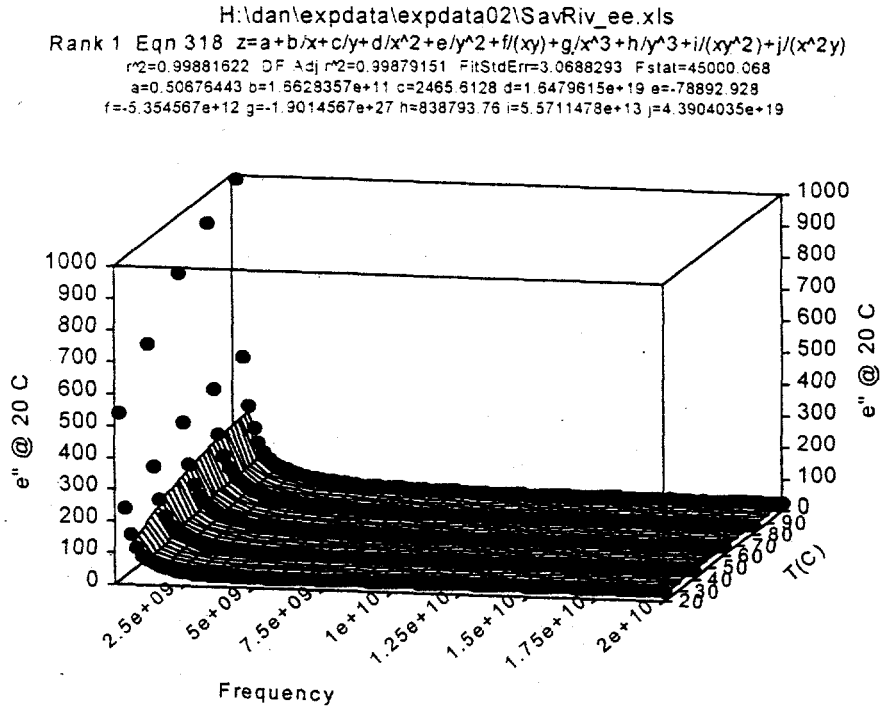

Figure C.8.c. Correlation data for the dielectric loss. Simulant: Savannah River.

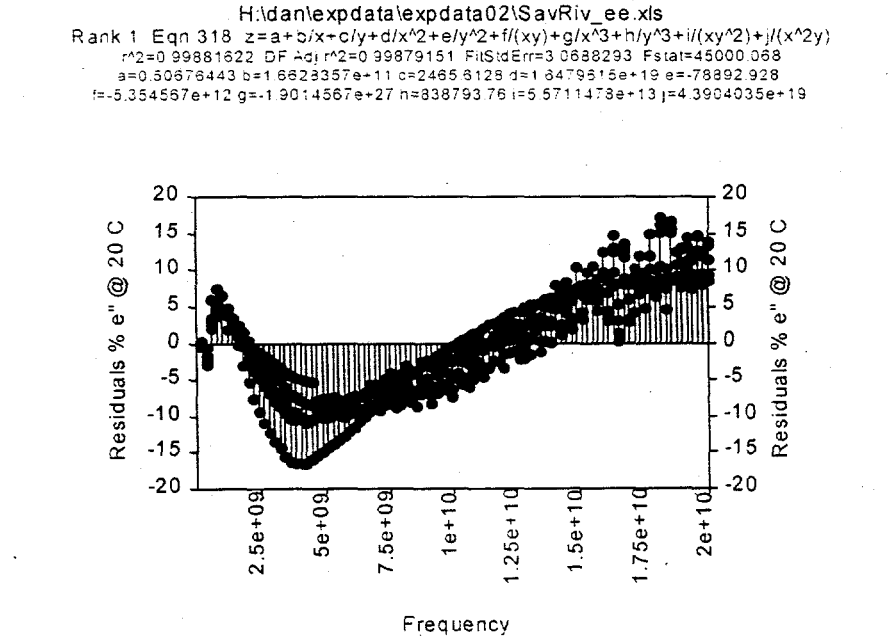

Figure C.8.d. Residual percentage (%) for the dielectric loss. Simulant: Savannah River.