

ANALYSIS OF DAMPED PLATES

November 1982

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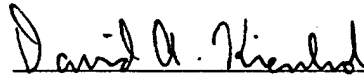
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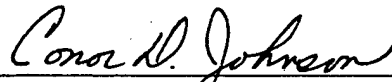
This report presents three design-oriented methods for the dynamic analysis of sandwich plates, i.e., laminated plates incorporating a core layer of viscoelastic material for vibration damping. The methods are complementary in that each represents a different trade-off between generality, accuracy, and cost of use.

This work was performed by the Aerospace Structures Information and Analysis Center, which is operated for the Flight Dynamics Laboratory by Anamet Laboratories, Inc., under Contract F33615-81-C-3201. The work was performed in support of the Advanced Radiation Technology (ART) Program Office at the Air Force Weapons Laboratory.

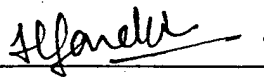
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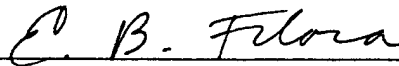


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1.0 INTRODUCTION

The use of viscoelastic materials for vibration control has gained wide acceptance, particularly in the aerospace industry. The advantages of the method are many and well documented. However, the effectiveness of any damping treatment is critically dependent on its geometry and on the properties of the viscoelastic material. An uninformed choice can add cost and weight but fail to solve the vibration problem. Some recent advances in analysis techniques utilize finite element methods to provide a more reliable and systematic approach to the design of damping treatments [1,2,3].

Flat plate sections are structural elements which are often good candidates for integral or add-on damping treatments. Such treatments can be highly effective in solving problems of fatigue, acoustic noise radiation, or other undesirable effects of resonant vibration. One of the most weight-efficient forms of damping for plate applications is a thin layer of a viscoelastic material constrained between two metal face sheets to form a sandwich. The purpose of this report is to describe several methods for the analysis and design of sandwich plate structural elements.

Three methods are presented. Each represents a different trade-off of cost of use, accuracy, and generality.

The first and most general technique is called the Modal Strain Energy (MSE) method. It is implemented in MSC/NASTRAN and is applicable to a wide range of structural forms in addition to plates. Basically, it involves modeling the viscoelastic material in a damped structure with solid elements and the metallic material with solid, plate, shell, or other elements as appropriate. All materials are treated initially as being purely elastic (i.e., incapable of energy dissipation). Normal mode properties are calculated and the strain energy distribution associated with each mode shape is used to calculate an approximate value for the modal loss factor. The theoretical basis of the MSE method is

described later in this report, along with practical considerations for modeling of sandwich plates using MSC/NASTRAN. The basic assumptions of the method are verified by comparisons with an exact closed form solution for the case of a simply supported, unriveted, sandwich rectangular plate.

The second method is essentially a set of design charts for sandwich plates. They allow a designer to obtain the modal frequencies and loss factors of a wide variety of sandwich plates with only simple hand calculations. The charts were compiled from a large number of NASTRAN runs using the modal strain energy method. They are plotted in dimensionless form for generality and give modal properties for the first four modes of a rectangular plate with various boundary conditions. The boundary conditions and the ranges of the dimensionless variables are chosen to be typical of the situations that a designer might commonly encounter in practice.

The third method is a simple, inexpensive technique for designing a treatment to damp the higher order flexural modes of a plate. In this case it may be shown that the boundary conditions are relatively unimportant. A closed form solution is used to give the modal loss factor as a function of natural frequency. The method is implemented in an interactive FORTRAN program and comparisons are made with NASTRAN modal strain energy results to illustrate the effect of the approximations.

2.0 MODAL STRAIN ENERGY METHOD

2.1 OVERVIEW

The discretized equations of motion for a damped structure are usually written in the form

$$\ddot{\underline{M}}\underline{x} + \underline{C}\dot{\underline{x}} + \underline{K}\underline{x} = \underline{l}(t) \quad (1)$$

where

$\underline{M}, \underline{C}, \underline{K}$ = physical coordinate mass, damping, and stiffness matrices (all real and constant)

$\underline{x}, \dot{\underline{x}}, \ddot{\underline{x}}$ = vectors of nodal displacements, velocities, and accelerations

$\underline{l}$ = vector of applied node loads

The essence of the modal strain energy method is that it does not attempt to find the damping matrix $\underline{C}$. This would be impractical for most real structures and, furthermore, would produce a system of equations which would be very costly to solve. Rather, in the MSE method, one assumes that the damped structure can be represented in terms of the real normal modes of the associated undamped system if appropriate damping terms are inserted into the uncoupled modal equations of motion. That is:

$$\ddot{\alpha}_r + \eta^{(r)} \omega_r \dot{\alpha}_r + \omega_r^2 \alpha_r = l_r(t) \quad (2)$$

$$\underline{x} = \sum_r \phi^{(r)} \alpha_r(t) \quad r = 1, 2, 3 \quad (3)$$

where

α_r = r'th modal coordinate

ω_r = natural radian frequency of the r'th mode

$\phi^{(r)}$ = r'th mode shape vector of the associated undamped system

$\eta^{(r)}$ = loss factor of the r'th mode

Equations (2) and (3) imply that the physical coordinate damping matrix $\underline{C}$ of Eq. (1) need not be explicitly calculated but that it can be diagonalized, at least approximately, by the same real modal matrix that diagonalizes $\underline{K}$ and $\underline{M}$.

The modal loss factors are calculated by using the undamped mode shapes and the material loss factor for each material. For structures containing a viscoelastic material, the material loss factor of the metal is very small compared to that of the viscoelastic. In this situation the modal loss factor is found from

$$\eta^{(r)} = \eta_v \frac{V_v^{(r)}}{V^{(r)}} \quad (4)$$

where η_v = material loss factor of viscoelastic evaluated at the r 'th calculated resonant frequency

$\frac{V_v^{(r)}}{V^{(r)}}$ = fraction of elastic strain energy attributable to the viscoelastic when the structure deforms in the r 'th mode shape

A derivation of Eq. (4) is given in Section 2.2 of this report. It is shown that modal loss factors obtained from Eq. (4) will approximate those obtained from the complex stiffness eigenvalues of the complementary solution of Eq. (1). However, the modal strain energy approach has the advantage of much lower cost.

Calculation of the modal energy distributions fits quite naturally within finite element methods and is a standard option in some commercial codes. Further advantages of the method are that only undamped normal modes need be calculated and that the energy distributions obtained are of direct use to the designer in deciding where to locate damping material. The disadvantage is that some approximation is required to accommodate the frequency-dependent properties commonly found in viscoelastic materials.

2.2 THEORY

An approximate expression is derived below for the modal loss factor obtained from an eigenvalue analysis of a structure with complex stiffness.

One form of the discretized (i.e., finite element) version of a partial differential equation for free vibration of a structure is:

$$\underline{M} \ddot{\underline{x}} + \underline{K} \underline{x} = \underline{Q} \quad (5)$$

where the stiffness matrix $\underline{K}$ is constant but complex if the structure contains a viscoelastic material. Equation (5) is converted to an eigenvalue problem by assuming a solution of the form

$$\underline{x} = \sum_r \phi^{*(r)} e^{ip_r^* t} \quad (6)$$

where p_r^* and $\phi^{*(r)}$ are the r 'th complex eigenvalue and eigenvector. That is,

$$\phi^{*(r)} = \phi_R^{(r)} + i\phi_I^{(r)} \quad (7)$$

$$p_r^* = p_r(1+i\eta^{(r)})^{1/2} \quad (8)$$

where $\phi_R^{(r)}$, $\phi_I^{(r)}$, $\eta^{(r)}$, and p_r are real. The term $\eta^{(r)}$ is the loss factor for the r 'th mode. The eigenvalue problem is then, from Eqs. (5) and (6):

$$\underline{K} \phi^* = p^{*2} \underline{M} \phi^* \quad (9)$$

Now if $\underline{K}$ were purely real, $\phi^{*(r)}$ and p_r^* would be real and related by the usual Rayleigh's quotient formula:

$$p_r^2 = \frac{\phi^{(r)T} \underline{K} \phi^{(r)}}{\phi^{(r)T} \underline{M} \phi^{(r)}} \quad (10)$$

where the * superscript is dropped to denote a real quantity. If $\underline{K}$ is perturbed by $\delta\underline{K}$, where $\delta\underline{K}$ is complex, p_r^2 will likewise acquire an imaginary part which may be written as inp^2 after Eq. (8). Then, if the perturbed stiffness matrix is written as

$$\underline{K} = \underline{K}_R + i \underline{K}_I \quad (11)$$

the following is obtained from Eqs. (8), (10), and (11), after dropping the mode index r

$$p^2(1+in) = \frac{\phi^{*T} \underline{K}_R \phi^*}{\phi^{*T} \underline{M} \phi^*} + i \frac{\phi^{*T} \underline{K}_I \phi^*}{\phi^{*T} \underline{M} \phi^*} \quad (12)$$

An approximate value for n can be calculated by approximating the complex eigenvector ϕ^* by the real vector ϕ , calculated from purely elastic analysis, i.e., by suppressing the imaginary part of $\underline{K}$. The approach is essentially an extension of Rayleigh's principle into the complex domain. Making this approximation in Eq. (12) and equating real and imaginary parts gives

$$p^2 = \frac{\phi^T \underline{K}_R \phi}{\phi^T \underline{M} \phi} \quad (13)$$

$$p^2 n = \frac{\phi^T \underline{K}_I \phi}{\phi^T \underline{M} \phi} \quad (14)$$

If the matrix $\underline{K}$ is obtained by finite element analysis, it may be divided into two additive terms. The first, called $\underline{K}_e$, is obtained from contributions of the purely elastic elements (the metallic portion of the structure). The second, called $\underline{K}_v$, is obtained from the solid elements (used to model the viscoelastic material). Both terms are matrices of the same order as $\underline{K}$,

$$\underline{K} = \underline{K}_e + \underline{K}_v \quad (15)$$

$\underline{K}_e$ will be completely real. $\underline{K}_v$ will be complex but, for the present case where only a single viscoelastic material is involved, its imaginary and real parts will have the ratio $\eta_v:1$ where η_v is the material loss factor of the core. Then,

$$\underline{K}_v = \underline{K}_{vR} + i \underline{K}_{vI} \quad (16)$$

$$= \underline{K}_{vR} (1 + i\eta_v) \quad (17)$$

By previous assumption, only $\underline{K}_v$ contributes to $\underline{K}_I$ so

$$\underline{K}_I = \underline{K}_{vI} \quad (18)$$

When a purely elastic normal modes analysis is performed, the strain energy associated with a given mode shape is

$$V = \phi^T \underline{K}_R \phi \quad (19)$$

The portion of this energy which is attributable to strain in the core is

$$V_v = \phi^T \underline{K}_{vR} \phi \quad (20)$$

Eliminating p^2 between Eq. (12) and (13) gives

$$\eta = \eta_v \frac{\phi^T \underline{K}_I \phi}{\phi^T \underline{K}_R \phi} \quad (21)$$

Combining Eq. (17) through (21) and reinstating the mode index superscript gives the final result for modal loss factor in terms of elastic energies

$$\eta^{(r)} = \eta_v \frac{V_v^{(r)}}{V^{(r)}} \quad (22)$$

This derivation is intended to motivate and clarify the comparison of results from complex eigenvalue analysis and modal strain energy analysis. It should be noted, however, that the problem statement itself is not entirely realistic. It is well known that complex stiffnesses that do not vary with frequency lead to system responses that are noncausal (response anticipates input) and hence are not physically realizable. Nonetheless, the comparison is believed to be useful in that the symptoms of noncausality are quite weak [4] and the identical assumptions are applied in both methods.

2.3 FINITE ELEMENT MODELING OF THREE-LAYER PLATES

2.3.1 Choice of Elements

Modeling of sandwich structures requires that the strain energy due to shearing of the core be accurately represented. Practical considerations dictate that this be done with minimum increase in computation cost relative to a uniform, single-layer model. In this section, a modeling method is described which is reasonably efficient and has the important advantage of being readily implemented within MSC/NASTRAN, a widely available code.

Figure 1 shows the arrangement for modeling of a three-layer sandwich. The face sheets are modeled with quadrilateral or triangular plate elements producing stiffness at two rotational and three translational degrees of freedom per node. The visco-elastic core is modeled with solid elements producing stiffness at three translational degrees of freedom per node. All nodes are at element corners. In MSC/NASTRAN, the plate elements are called TRIA3's, QUAD4's, TRIA6's, and QUAD8's, and the solid elements are called PENTA's and HEXA's. A key feature of these plate elements in the present application is their ability to account for coupling between stretching and bending deformations [5]. This allows the plate nodes to be offset to one surface of the plate, coincident with the corner nodes of the adjoining solid elements. In this way a three-layer plate can be modeled

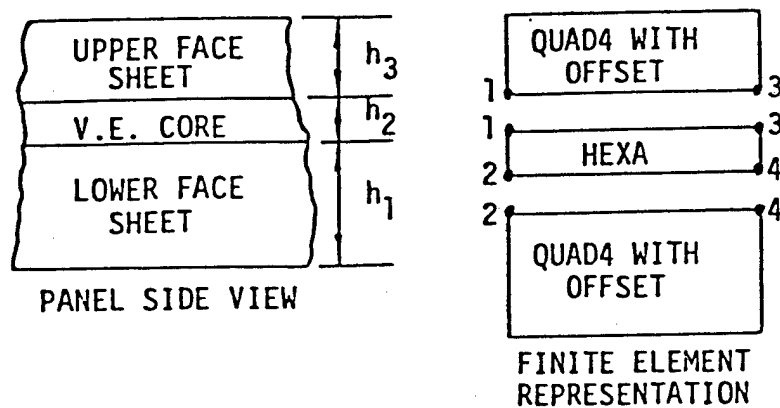


Figure 1 Finite element modeling of a sandwich panel with viscoelastic core

with only two layers of nodes. Earlier methods implemented within NASTRAN were restricted to beams [6] or required four layers of nodes and extensive constraint equations to achieve the proper bending-shearing behavior of the sandwich [7]. Aspect ratios of the solid elements (in-plane dimension/thickness dimension) as high as 5000 have been used successfully to model the thin viscoelastic core layers. In all analyses reported here, Poisson's ratio of the core elements is taken to be 0.49.

2.3.2 Reduction of Equations of Motion

In all but the smallest problems, the mass and stiffness matrices are condensed by partitioning and performing a Guyan reduction prior to calculation of eigenvalues. As usual in vibration analysis, some care is warranted in the selection of the degrees of freedom to be retained during this reduction. For the sandwich structures analyzed in this report, only out-of-plane displacements need be retained. Some displacements should be retained for both face sheets, although it is not necessary to keep both upper and lower face displacements at any single location on the model. If out-of-plane displacements of only one face sheet are kept, the results for natural frequencies as well as core-to-total energy ratios can show a pronounced dependence on the Poisson's ratio of the core. Although such a dependence is probably real for some cases, such as doubly curved shells, it should not occur for simpler cases such as straight sandwich beams--and in fact does not occur if the rule given above is observed in reducing the discretized equations of motion. Existing data on Poisson's ratio of most viscoelastic materials are probably not adequate for accurate modeling of doubly curved sandwich shells in the important transition region of the material, and certainly not in the glassy region.

2.3.3 Solution Method

In the modal strain energy method, a standard normal mode extraction run is made with all material constants treated as real and constant. The elastic strain energy in each element for each mode is calculated, as well as the energy fraction in the viscoelastic core for each mode. These fractions multiplied by the core material loss factor give the modal loss factors which are input via a damping vs. frequency table for use in subsequent forced response calculations.

A basic difficulty with the modal strain energy method (or any normal mode method) is that the modal properties are obtained from system matrices that are assumed to be constant. Viscoelastic materials, however, have storage moduli which vary significantly with frequency. There is no theoretically correct way to resolve this contradiction. However, there are great practical advantages to making response predictions in terms of a normal mode set obtained from constant material properties. This can be done with reasonable accuracy if a simple correction is made to the modal loss factors obtained by Equation (4). This correction is only to the modal damping ratios because these are the only modal parameters that can be readily adjusted by the finite element analyst. It is explained here for completeness even though no forced response calculations were performed for this report. The correction is obtained as follows.

For broadband excitation, most of the response of a given mode occurs within a narrow band around the mode's natural frequency. It is natural then to require that the energy distribution used to compute the loss factor for a given mode be obtained using a stiffness matrix evaluated for material properties taken at that mode's frequency. Because the natural frequencies themselves depend on material properties, an iterative solution of two simultaneous relations (the eigenvalue problem for each mode number and the material property vs. frequency relation) is required. This is readily done [1], but a further problem remains. The final modal coordinate representation of the structure must

come from a single stiffness matrix evaluated using a single value of storage modulus for the core material. Natural frequencies, mode shapes, and modal masses will be correct for, at most, one mode. A further correction of the modal loss factor has been found to give some improvement.

Each modal equation of motion has the form given in Equation (2). At resonance the first and last terms on the left cancel each other. The response magnitude is inversely proportional to the product $\eta^{(r)} \omega_r$ which is the coefficient of $\dot{a}_r$, the modal velocity. If $\eta^{(r)}$ is altered to correct for the error in ω_r , an improvement in peak response can be expected, although resonance will still occur at a slightly shifted frequency and some error will remain due to ξ_r which depends on modal mass. In test cases run for sandwich beams [1], it was found that taking ω_r to be proportional to $\sqrt{G_2}$ (G_2 = core shear modulus) would improve the agreement between the MSE method and the direct frequency response method. This is of course an approximation since ω_r depends on properties of the face sheets as well as the core. The modal damping ratios are adjusted according to

$$\eta^{(r)'} = \eta^{(r)} \sqrt{\frac{G_2(f_r)}{G_{2,ref}}} \quad (23)$$

where

$\eta^{(r)'}$ = adjusted modal damping ratio for the r 'th mode

$\eta^{(r)}$ = modal damping ratio for the r 'th mode obtained by iteration

$G_{2,ref}$ = core shear modulus used in final normal modes calculation to obtain modal frequencies, shapes, and masses

$G_2(f_r)$ = core shear modulus at $f = f_r$ where f_r is r 'th mode frequency calculated with $G_2 = G_{2,ref}$

2.4 EXAMPLE

A closed form solution exists for the complex eigenvalues (i.e., natural frequencies and modal loss factors) of a simply supported sandwich plate [8]. The solution is described in Section 4.0 of this report in connection with the design of constrained-layer damping treatments for high-order local modes of plate sections. In this section it is used to verify one of the most important implications of the MSE method; namely, that the modal loss factors for all modes of a sandwich plate are directly proportional to the material loss factor of the viscoelastic core. The sample problem is also used to illustrate the input data to NASTRAN for MSE analysis of a sandwich plate.

Figures 2 through 5 give a comparison of modal loss factors obtained by using MSC/NASTRAN and MSE (MSC/NASTRAN-MSE) and by the closed form solution of Ref. [8]. The format of these plots is used throughout this report and is explained in detail in Section 3.1. In brief, the ordinate is a dimensionless quantity proportional to modal loss factor and the abscissa is a dimensionless quantity proportional to the shear modulus of the viscoelastic core. The curves marked with specific values of η_v are obtained from the closed form solution. The remaining curve, obtained by the MSC/NASTRAN-MSE method, gives results that are inherently independent of η_v .

The test case is a simply supported rectangular sandwich plate of the following dimensions:

in-plane dimensions	= 10" x 11"
upper face sheet thickness	= 0.055"
lower face sheet thickness	= 0.055"
core thickness	= 0.0045"
face sheet material	= aluminum
	$E = 10^7$ psi
	$\rho = 0.1$ lb/in ³
	$\nu = 0.3$
shear modulus of core material	= variable
loss factor of the core material	= variable

Figures 2 through 5 show that the closed form and MSC/NASTRAN-MSE results agree very closely for small values of the material loss factor. Some divergence is seen for larger values on the order of unity or greater. The agreement also depends on the value of the shear parameter g . It is best for g equal to or less than the value giving highest damping. Fortunately, most practical constrained layer treatments tend to fall in this range.

A tabular representation of the closed form results used to prepare Figures 2 through 5 is given in Tables 1 through 4. Results for higher modes are also given in the tables.

Sample NASTRAN input and output are given in Appendix A for a plate with the properties listed above and a core shear modulus of 450 psi. This sample case corresponds to a dimensionless shear parameter of $g = 40$.

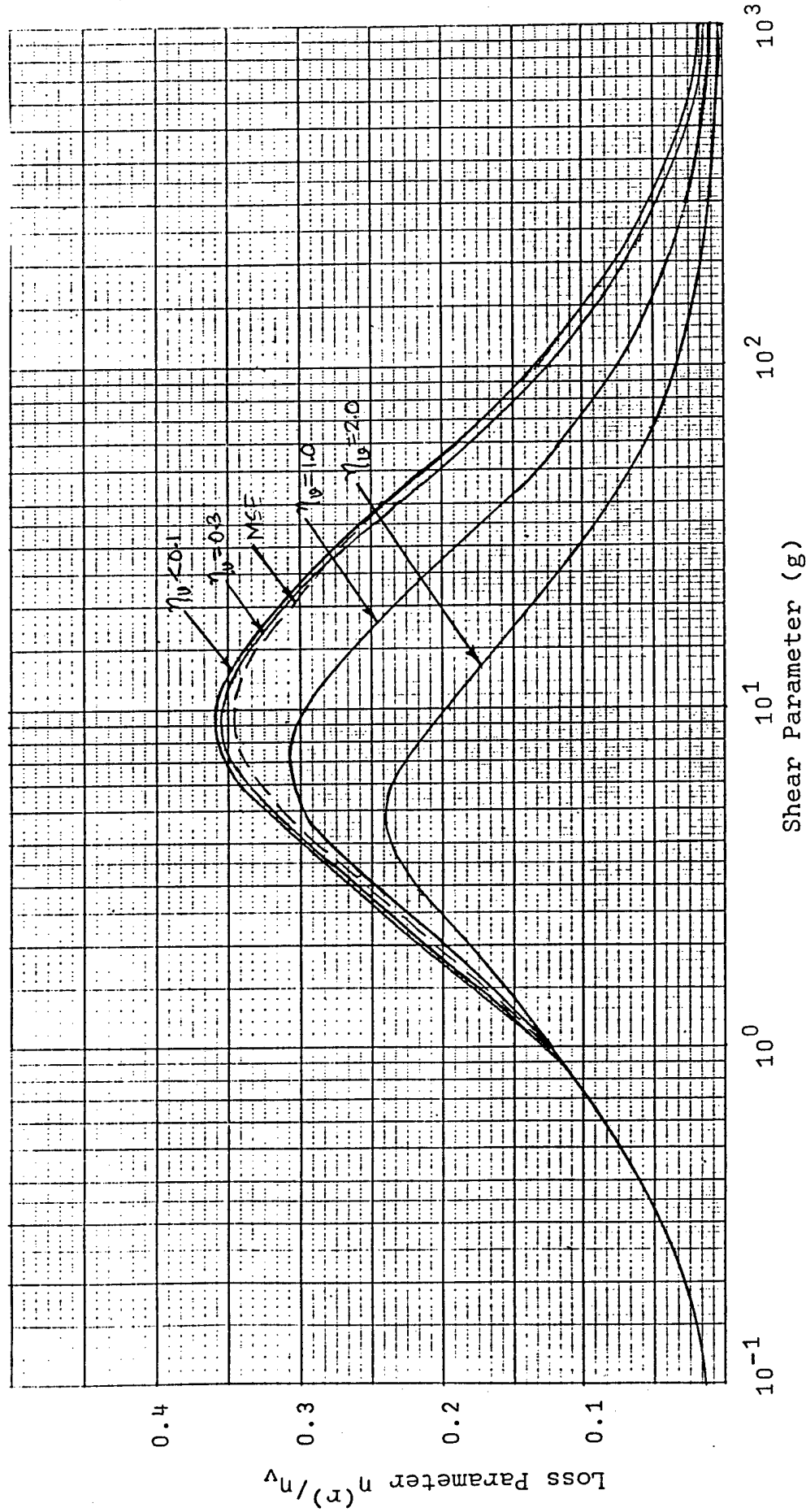


Figure 2 Damping of the first mode of simply supported rectangular sandwich plate obtained by NASTRAN/Modal Strain Energy method and by exact complex eigenvalue solution [8]

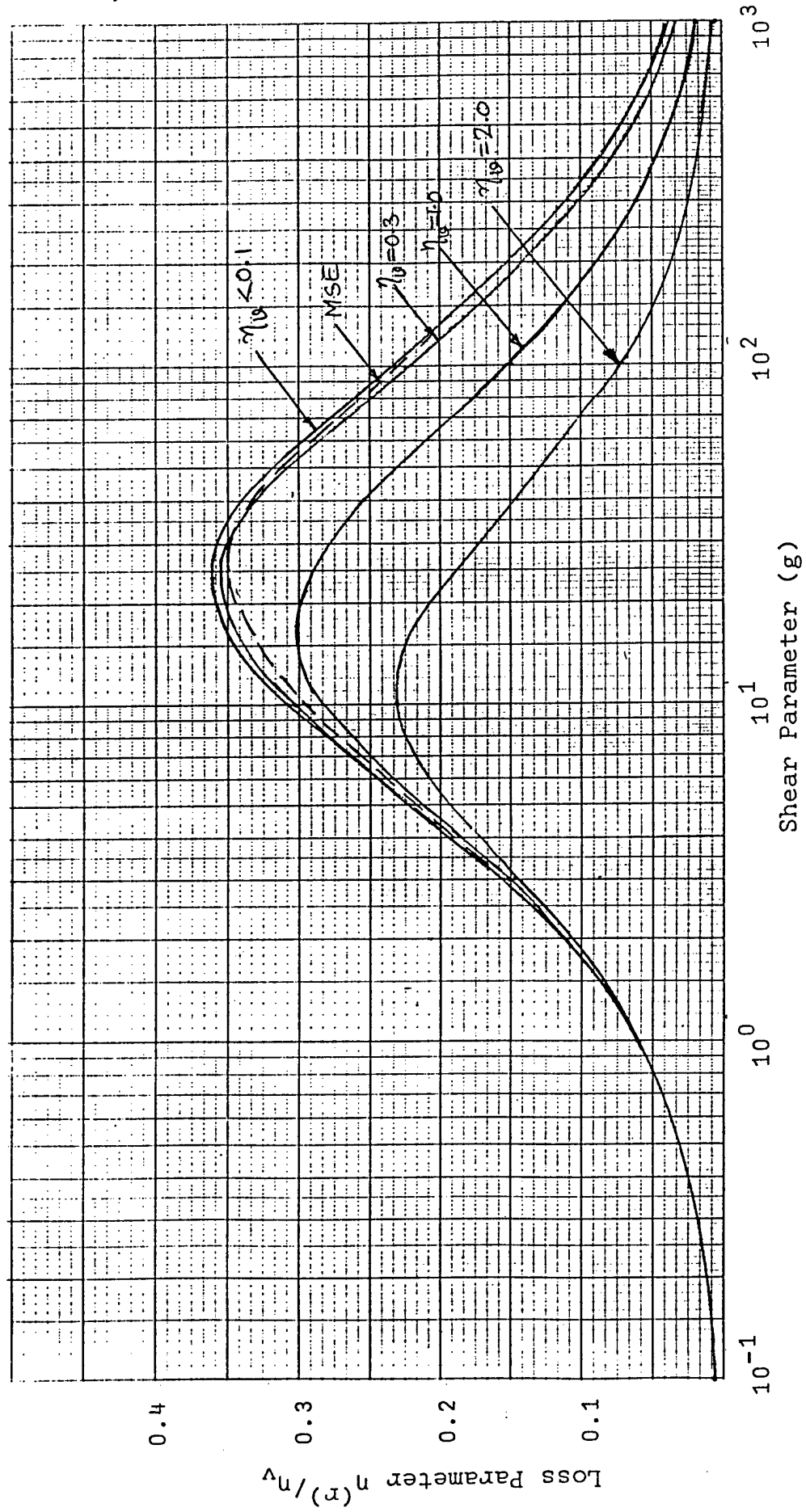


Figure 3 Damping of the second mode of simply supported rectangular sandwich plate obtained by NASTRAN/Modal Strain Energy method and by exact complex eigenvalue solution [8]

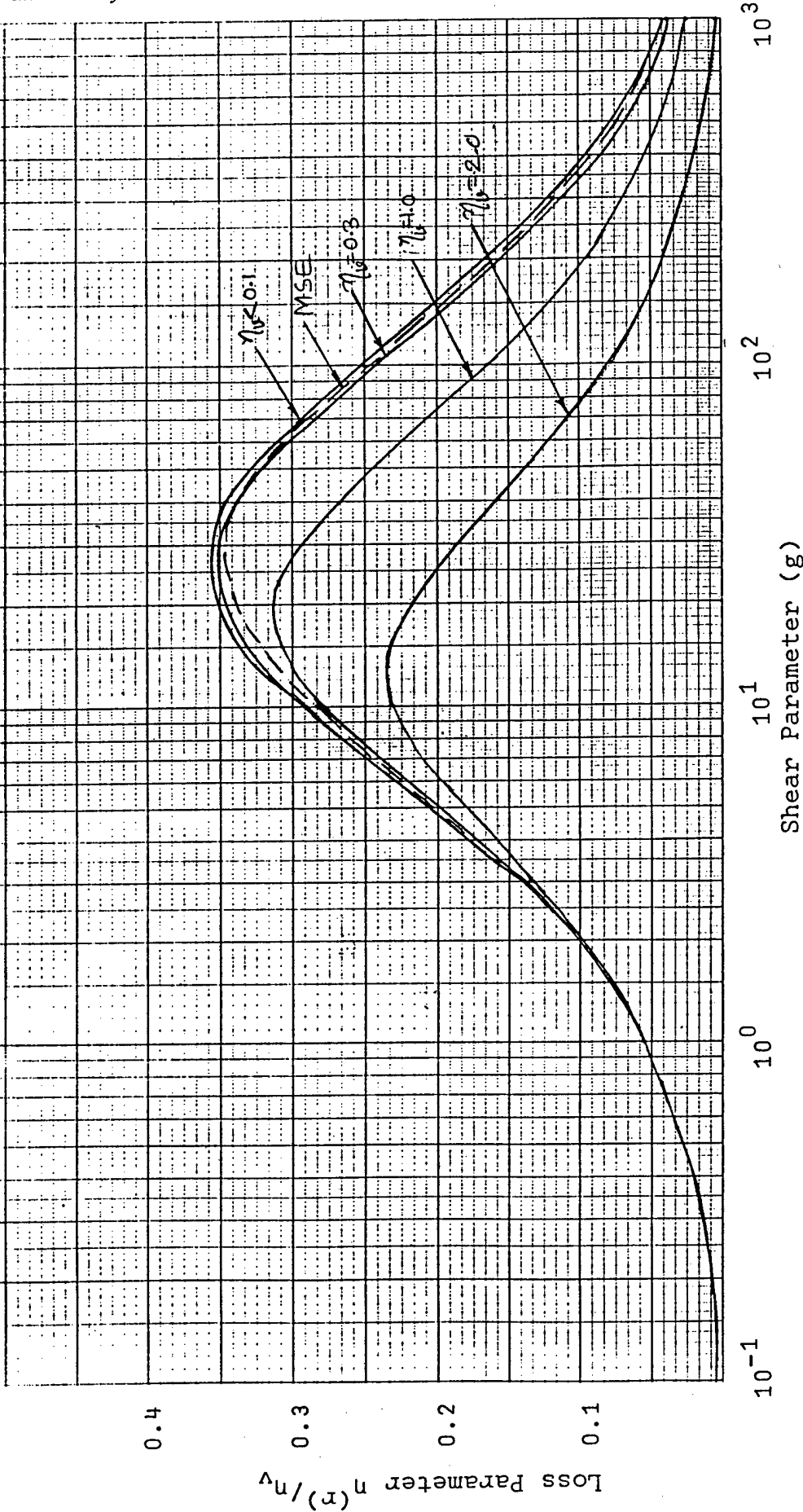


Figure 4 Damping of the third mode of simply supported rectangular sandwich plate obtained by NASTRAN/Modal Strain Energy method and by exact complex eigenvalue solution [8]

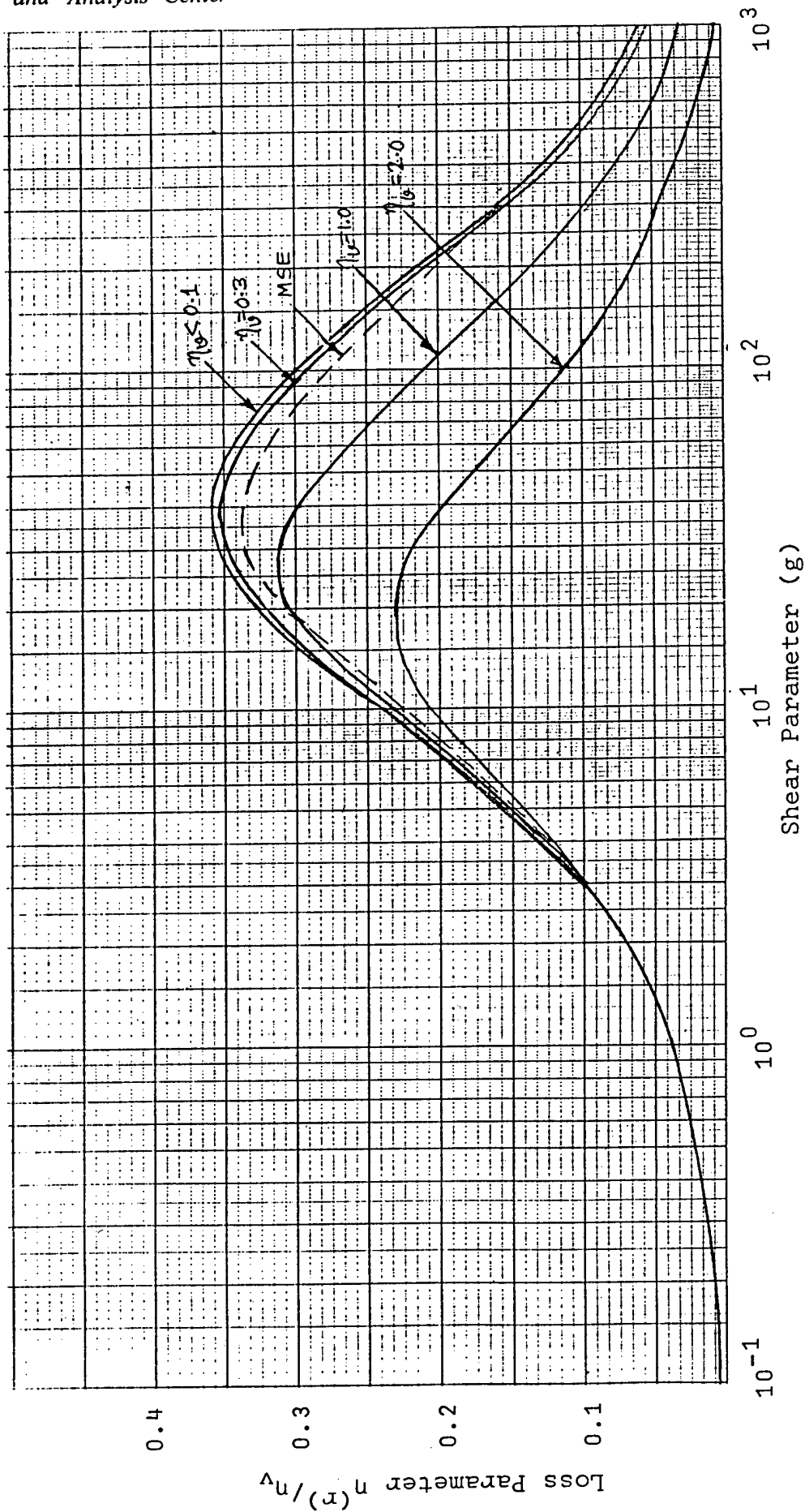


Figure 5 Damping of the fourth mode of simply supported rectangular sandwich plate obtained by NASTRAN/Modal Strain Energy method and by exact complex eigenvalue solution [8]

TABLE 1
MODAL FREQUENCIES AND MODAL LOSS FACTORS
FOR A RECTANGULAR SANDWICH PLATE

Aspect Ratio (Δxy) = 1.1
Geometric Parameter (V) = 3.5
Viscoelastic Loss Factor (η_v) = 0.1

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)
1	530.	0.0016	565.	0.0128	698.	0.0338	163.	0.0281	190.	0.0074	196.	0.0016
2	1244.	0.0007	1280.	0.0062	1450.	0.0241	333.	0.0355	428.	0.0149	458.	0.0037
3	1394.	0.0006	1430.	0.0056	1604.	0.0226	366.	0.0358	476.	0.0162	512.	0.0041
4	2107.	0.0004	2145.	0.0038	2329.	0.0173	514.	0.0352	493.	0.0214	767.	0.0061
5	2433.	0.0004	2471.	0.0033	2658.	0.0156	579.	0.0343	787.	0.0233	882.	0.0069
6	2833.	0.0003	2870.	0.0029	3061.	0.0139	657.	0.0332	900.	0.0253	1021.	0.0079
7	3297.	0.0003	3334.	0.0025	3528.	0.0124	746.	0.0317	1026.	0.0273	1181.	0.0090
8	3547.	0.0002	3584.	0.0023	3779.	0.0116	793.	0.0310	1092.	0.0282	1266.	0.0096
9	4099.	0.0002	4136.	0.0020	4333.	0.0104	897.	0.0293	1237.	0.0299	1453.	0.0108
10	4736.	0.0002	4774.	0.0017	4973.	0.0092	1016.	0.0275	1398.	0.0315	1665.	0.0121

TABLE 2
MODAL FREQUENCIES AND MODAL LOSS FACTORS
FOR A RECTANGULAR SANDWICH PLATE

Aspect Ratio (Δxy) = 1.1
Geometric Parameter (γ) = 3.5
Viscoelastic Loss Factor (η_v) = 0.3

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets				Aluminum Face Sheets							
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f _r)	Loss Parameter ($\bar{\eta}$)	Freq. (f _r)	Loss Parameter ($\bar{\eta}$)	Freq. (f _r)	Loss Parameter ($\bar{\eta}$)	Freq. (f _r)	Loss Parameter ($\bar{\eta}$)	Freq. (f _r)	Loss Parameter ($\bar{\eta}$)	Freq. (f _r)	Loss Parameter ($\bar{\eta}$)
1	530.	0.005	565.	0.038	700.	0.101	172.	0.188	191.	0.021	196.	0.005
2	1244.	0.002	1280.	0.018	1451.	0.072	352.	0.281	430.	0.042	458.	0.010
3	1394.	0.002	1430.	0.017	1605.	0.067	385.	0.289	478.	0.046	513.	0.012
4	2107.	0.001	2145.	0.011	2330.	0.052	535.	0.305	696.	0.061	769.	0.017
5	2433.	0.001	2471.	0.010	2659.	0.047	600.	0.304	792.	0.067	884.	0.019
6	2833.	0.001	2870.	0.086	3062.	0.042	678.	0.299	905.	0.073	1024.	0.022
7	3297.	0.001	3335.	0.074	3529.	0.037	766.	0.292	1033.	0.079	1184.	0.025
8	3547.	0.001	3584.	0.069	3780.	0.035	813.	0.287	1100.	0.081	1270.	0.027
9	4099.	0.001	4136.	0.006	4334.	0.031	916.	0.275	1245.	0.087	1458.	0.030
10	4736.	0.001	4774.	0.005	4973.	0.027	1034.	0.262	1406.	0.092	1671.	0.034

TABLE 3
MODAL FREQUENCIES AND MODAL LOSS FACTORS
FOR A RECTANGULAR SANDWICH PLATE

Aspect Ratio (Δxy) = 1.1
Geometric Parameter (γ) = 3.5
Viscoelastic Loss Factor (η_v) = 1.0

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1			1.0			6.			30.		
	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)	Freq. (f_r)	Loss Parameter ($\bar{\eta}$)
1	530.	0.016	566.	0.127	721.	0.302	172.	0.188	194.	0.040	197.	0.008
2	1244.	0.007	1281.	0.062	1467.	0.232	352.	0.281	443.	0.086	462.	0.019
3	1394.	0.006	1431.	0.056	1620.	0.219	385.	0.289	494.	0.095	517.	0.022
4	2107.	0.004	2145.	0.038	2342.	0.170	535.	0.305	726.	0.132.	778.	0.032
5	2433.	0.003	2471.	0.033	2670.	0.154	600.	0.304	828.	0.147	897.	0.037
6	2833.	0.003	2871.	0.029	3072.	0.138	678.	0.299	949.	0.163	1041.	0.043
7	3297.	0.003	3335.	0.025	3537.	0.123	766.	0.292	1085.	0.181	1207.	0.049
8	3547.	0.002	3585.	0.023	3788.	0.116	813.	0.287	1157.	0.189	1295.	0.052
9	4099.	0.002	4137.	0.020	4341.	0.103	916.	0.275	1311.	0.207	1490.	0.060
10	4736.	0.002	4774.	0.017	4980.	0.091	1035.	0.2615	1483.	0.224	1713.	0.068

TABLE 4
MODAL FREQUENCIES AND MODAL LOSS FACTORS
FOR A RECTANGULAR SANDWICH PLATE

Aspect Ratio (Δxy) = 1.1
Geometric Parameter (γ) = 3.5
Viscoelastic Loss Factor (η_v) = 2.0

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.		6.		30.		200.		1000.	
	Freq. (f _r)	Loss Parameter ($\bar{\eta}$)	Freq. (f _r)	Loss Parameter ($\bar{\eta}$)	Freq. (f _r)	Loss Parameter ($\bar{\eta}$)	Freq. (f _r)	Loss Parameter ($\bar{\eta}$)	Freq. (f _r)	Loss Parameter ($\bar{\eta}$)	Freq. (f _r)	Loss Parameter ($\bar{\eta}$)
1	530.	0.031	571.	0.248	778.	0.458	184.	0.188	196.	0.033	198.	0.003
2	1244.	0.014	1283.	0.123	1518.	0.421	385.	0.344	456.	0.075	465.	0.008
3	1394.	0.012	1433.	0.111	1668.	0.403	422.	0.366	510.	0.083	521.	0.009
4	2107.	0.008	2146.	0.076	2379.	0.326	583.	0.434	759.	0.122	786.	0.013
5	2433.	0.007	2472.	0.066	2704.	0.297	650.	0.451	870.	0.138	907.	0.0152
6	2833.	0.006	2872.	0.057	3102.	0.268	729.	0.462	1004.	0.158	1055.	0.018
7	3297.	0.005	3336.	0.049	3564.	0.240	818.	0.468	1156.	0.179	1225.	0.021
8	3547.	0.005	3585.	0.046	3813.	0.228	865.	0.468	1236.	0.190	1317.	0.044
9	4099.	0.004	4136.	0.040	4364.	0.203	967.	0.463	1409.	0.213	1519.	0.051
10	4736.	0.004	4775.	0.035	5000.	0.181	1083.	0.453	1603.	0.238	1751.	0.058

3.0 DESIGN CHARTS FOR SANDWICH PLATES

In this section, sets of design charts are given which allow a user to rapidly estimate the loss factors and natural frequencies for a rectangular sandwich plate of various boundary conditions. The charts were compiled from a large number of NASTRAN analyses using the modal strain energy method. They allow fairly accurate predictions of damping which take boundary conditions into account and yet do not require the user to actually prepare or run any finite element models. The usefulness of these charts derives from the fact that, to the authors' knowledge, no exact solutions exist for other than simply supported boundary conditions.

3.1 DATA FORMAT

The charts are in terms of dimensionless variables in order to convey the maximum amount of information. It may be shown [9] that a rectangular sandwich plate can be completely described by four dimensionless parameters:

η_v = core material loss factor

g = shear parameter

$$= \frac{G}{T_2} \left(\frac{1}{E_1 T_1} + \frac{1}{E_3 T_3} \right) a^2 (1-\nu^2) \quad (24)$$

Y = geometry parameter

$$= \frac{(T_1 + T_3 + 2T_2)^2}{4D(1-\nu^2)} \left[\frac{E_1 T_1 E_3 T_3}{E_1 T_1 + E_3 T_3} \right] \quad (25)$$

Δ_{xy} = in-plane aspect ratio (26)
 = b/a

where

- T_1, T_3 = thicknesses of the face sheets
- T_2 = thickness of the core layer
- $\bar{G}$ = real part of the complex shear modulus
[$\bar{G}(1+i\eta_v)$] of the viscoelastic material
- E_1, E_3 = Young's moduli of the face sheets
- a, b = in-plane dimensions of the plate
- D = sum of the flexural stiffnesses of the upper and lower face sheets, each about its own center plane
- ν = Poisson's ratio of the face sheets

The charts give the dimensionless loss parameter, $\eta^{(r)}/\eta_v$, as a function of the shear parameter for the first four bending modes of a plate for various values of the aspect ratio and geometry parameter. A value of approximately $Y = 3.5$ characterizes a sandwich plate with equal thickness face sheets. The situation of equal face sheets is fairly common in practice and therefore is included for all boundary conditions. Additional values of Y are included for some boundary conditions to cover the case of unequal face sheets which often occurs with add-on constrained layer damping treatments.

Natural frequencies, in a normalized form, are also given as a function of shear parameter for the first four modes. The form is f_r/f_{01} where f_r is the natural frequency of the r 'th mode. The reference frequency f_{01} is defined as the first natural frequency of a simply supported plate of the same in-plane dimensions as the actual plate but with flexural stiffness equal to the sum of the stiffnesses of the upper and lower face sheets. They are calculated using the formula [9]:

$$f_{01} = \frac{1}{2\pi} \sqrt{\frac{D}{\rho} \left[\left(\frac{m\pi}{a} \right)^2 + \left(\frac{n\pi}{b} \right)^2 \right]^2} \quad ; \quad m=1 \quad n=1 \quad (27)$$

where

ρ = mass density per unit area of the plate

The reference frequencies calculated by Eq. (27) are given in Table 5. It may be noted that they are not strictly functions of only the shear and geometry parameters but also depend on the material properties of the face sheets. Since two different sets of properties (corresponding to steel and aluminum) were used to span the desired range of the shear parameter, the reference frequencies corresponding to each are given.

Summary tables of the NASTRAN results used to prepare the frequency and damping plots are given for each set of boundary conditions. The tables give results for the fifth and higher modes, in addition to the first four modes for which results are plotted.

Each graph and table is marked with a three letter abbreviation denoting the boundary conditions. The first character in every case is a P (pinned) and indicates that out-of-plane displacements of both face sheets were constrained. The second character is either a T (tilting), L (level), or W (wind-up). Respectively, they designate an unconstrained, perfectly constrained, or elastically constrained condition on rotation of the face sheets about an axis parallel to the plate edge. The third character is either a U (unriveted) or an R (riveted). Riveted implies that shearing deformation of the core has been constrained along the plate edge.

TABLE 5
REFERENCE FREQUENCIES

ASPECT RATIO	GEOMETRIC PARAMETER (Y)							
	0.5		1.5		3.5		4.5	
	Aluminum Face Sheets	Steel Face Sheets	Aluminum Face Sheets	Steel Face Sheets	Aluminum Face Sheets	Steel Face Sheets	Aluminum Face Sheets	Steel Face Sheets
$\Delta xy = 1.1$ $a = 10.0$ $b = 11.0$	81.	838.	76.	468.	94.	527.	78./57.*	351.
$\Delta xy = 2.0$ $a = 5.5$ $b = 11.0$	183.	1894.	171.	1058.	212.	1193.	177./129.*	794.
$\Delta xy = 4.0$ $b = 2.75$ $a = 11.0$	622.	6437.	582.	3599.	722.	4055.	601./438.*	2700.

* for shear parameter = 1000.

3.2 DESIGN CHARTS

3.2.1 PTU Boundary Conditions

The results for PTU (simply-supported, unriveted) boundary conditions are given in Figures 6 through 14 and Tables 6 through 17. These boundary conditions are likely to be appropriate for plate sections in lightweight, built-up structures using add-on constrained layer damping. Several values of the geometry parameter are used since it is likely to be a design variable in these situations.

Figure 6 shows damping as a function of shear parameter for the first four modes, with a geometry parameter of $Y = 3.5$ and an aspect ratio $\Delta xy = 1.1$. Figures 7 and 8 show similar information for aspect ratios of 2.0 and 4.0. The next six figures, 9 through 14, give similar data but organized to show how damping varies with the geometric parameter as well as the shear parameter. For clarity, the data covering four modes (for each value of aspect ratio) is split into two plots, with each plot covering two alternate modes.

Natural frequencies of sandwich plates with PTU boundary conditions can be obtained from Figures 15 through 26. Each plot gives results for one of three aspect ratios (1.1, 2.0, or 4.0) and one of four geometry parameters (0.5, 1.5, 3.5, or 4.5). Reference frequencies used in normalizing the data of these figures are given in Table 5.

A tabular representation of the data in Figures 6 through 26 as well as data for higher modes is given in Tables 6 through 17.

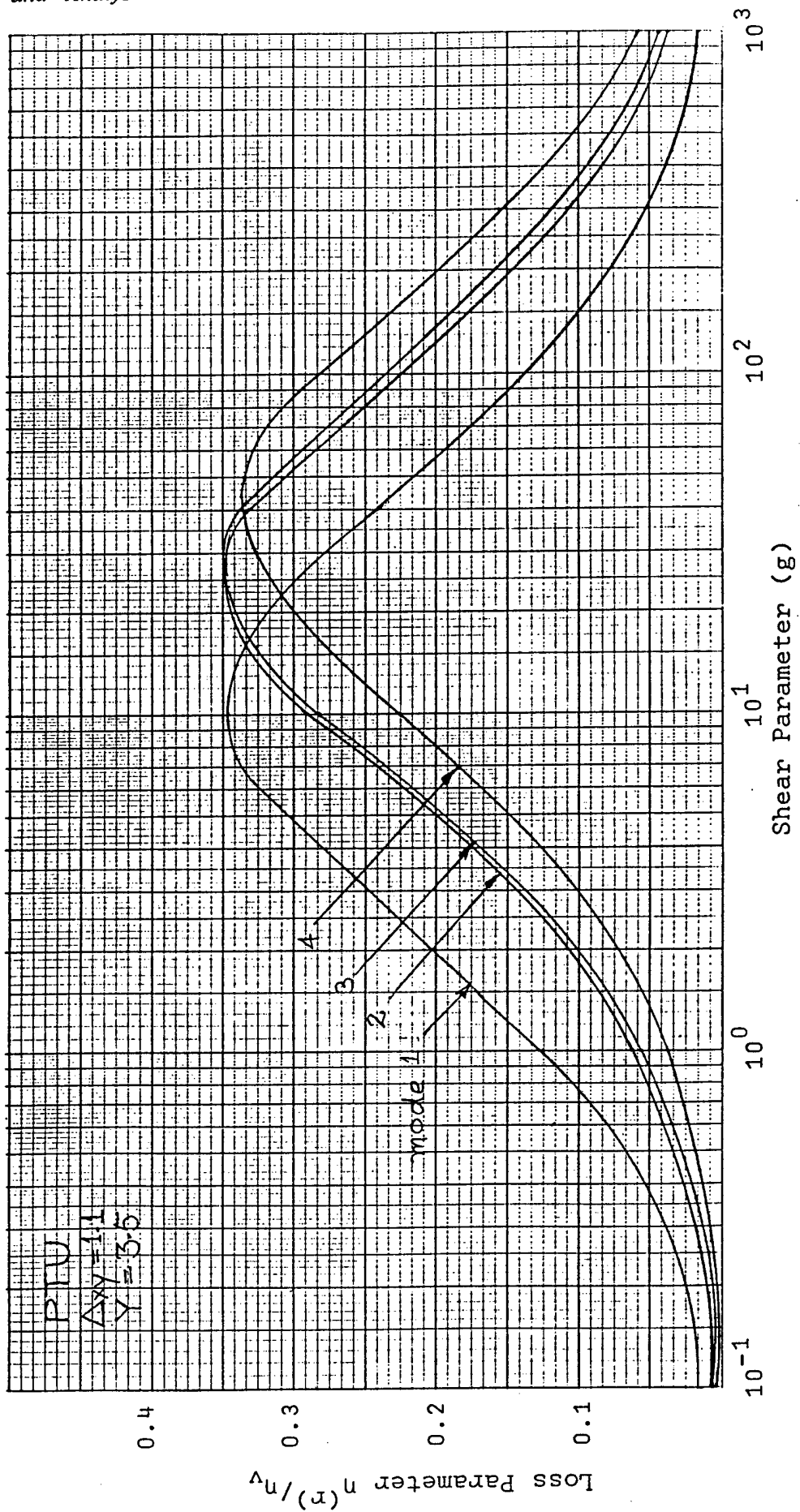


Figure 6 Damping of a sandwich rectangular plate, PTU boundary conditions,
 $\Delta xy = 1.1$, $Y = 3.5$

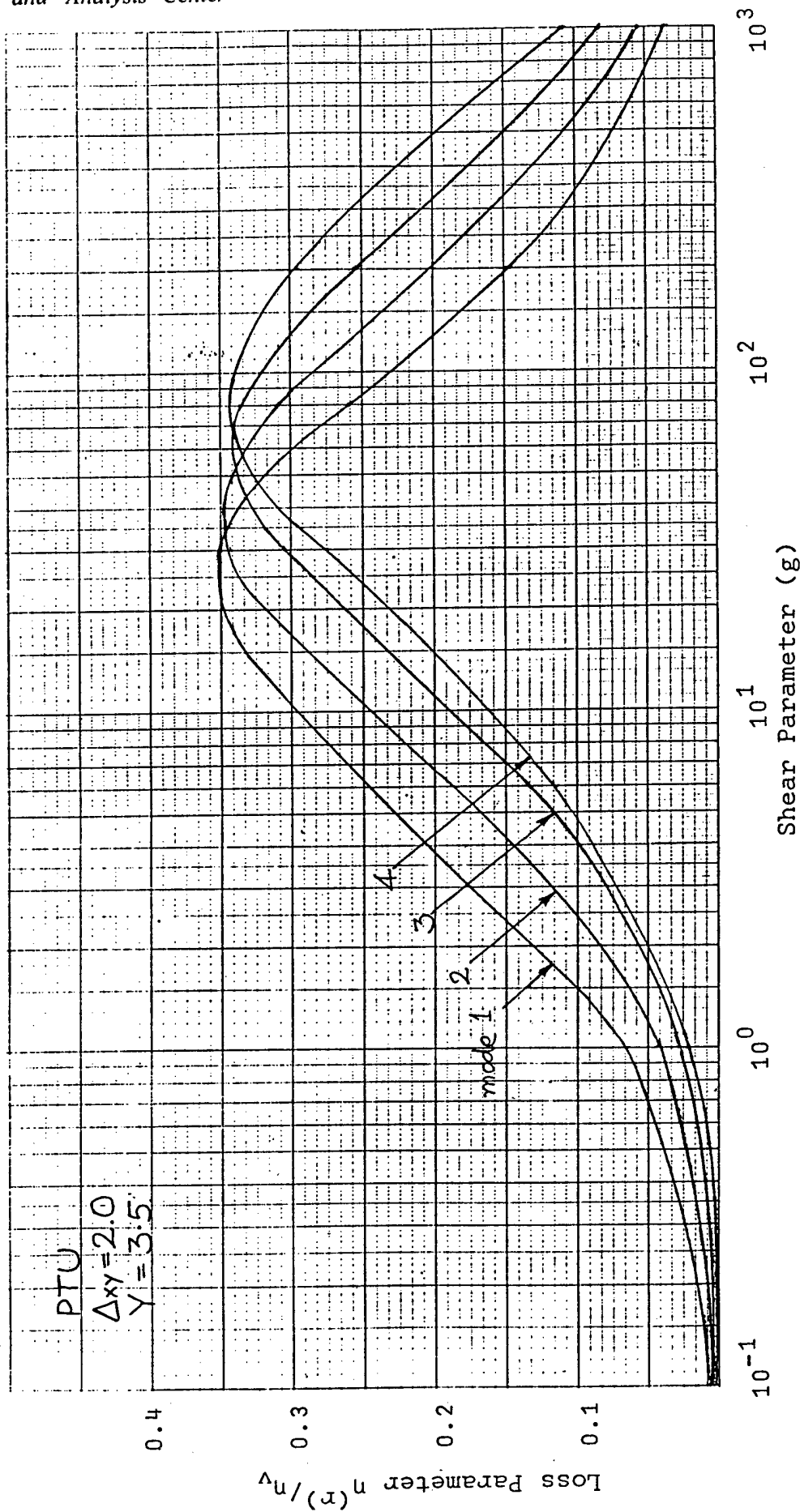


Figure 7 Damping of a sandwich rectangular plate, PTU boundary conditions,
 $\Delta xy = 2.0$, $Y = 3.5$

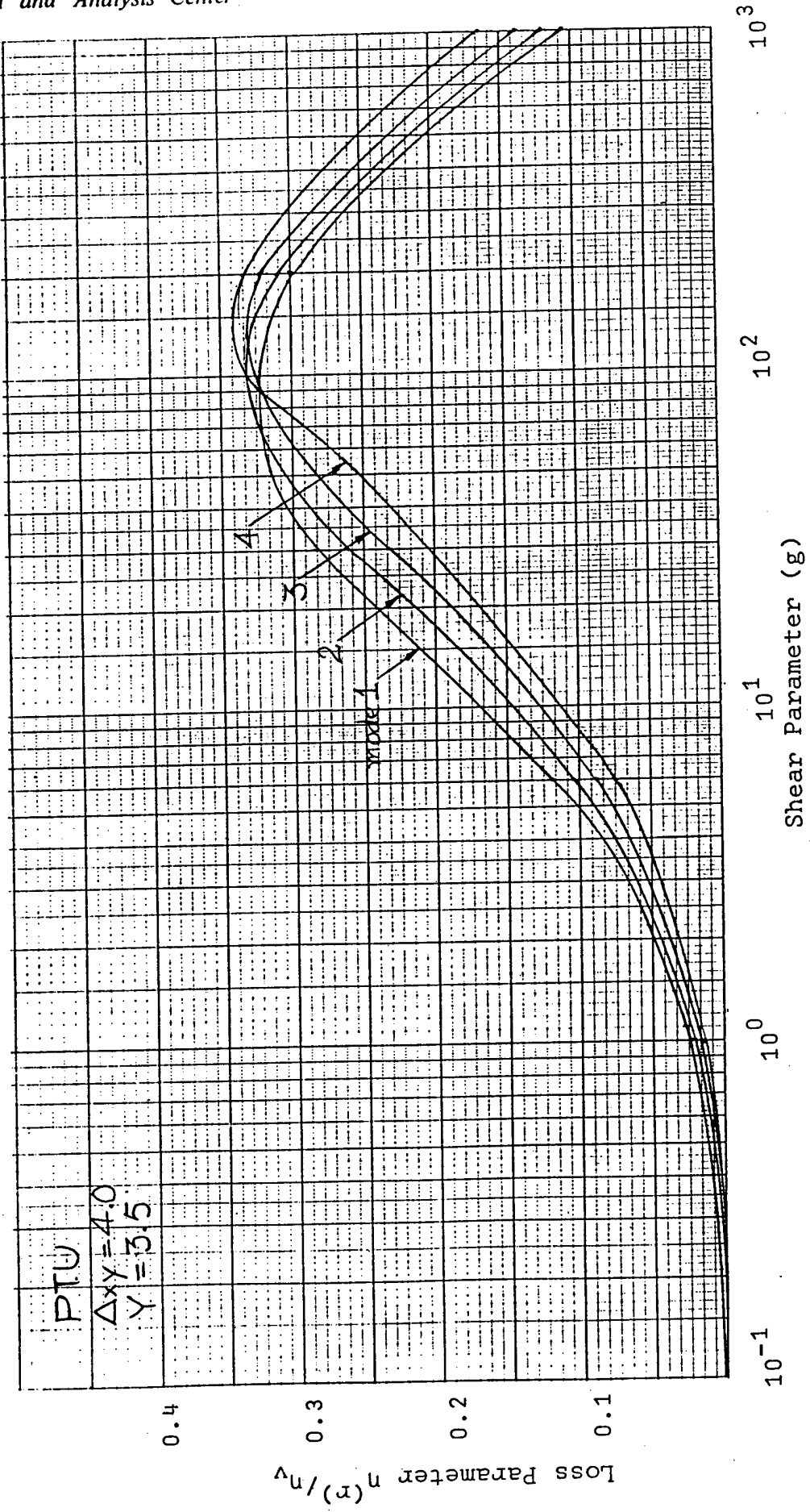


Figure 8 Damping of a sandwich rectangular plate, PTU boundary conditions,
 $\Delta xy = 4.0$, $Y = 3.5$

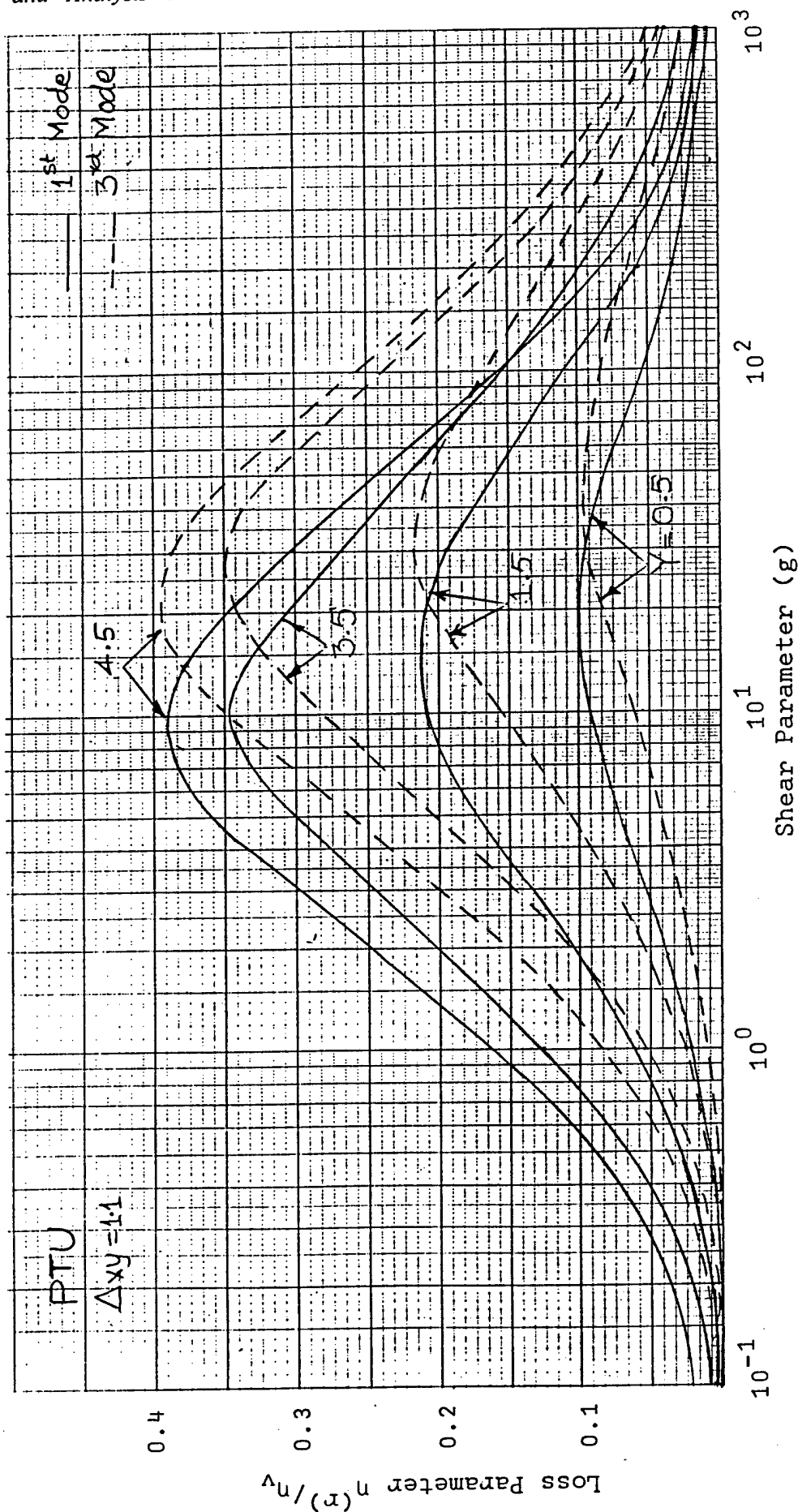


Figure 9 Damping of a sandwich rectangular plate, PTU boundary conditions,
 $\Delta xy = 1.1$, modes 1 and 3, variable Y and g

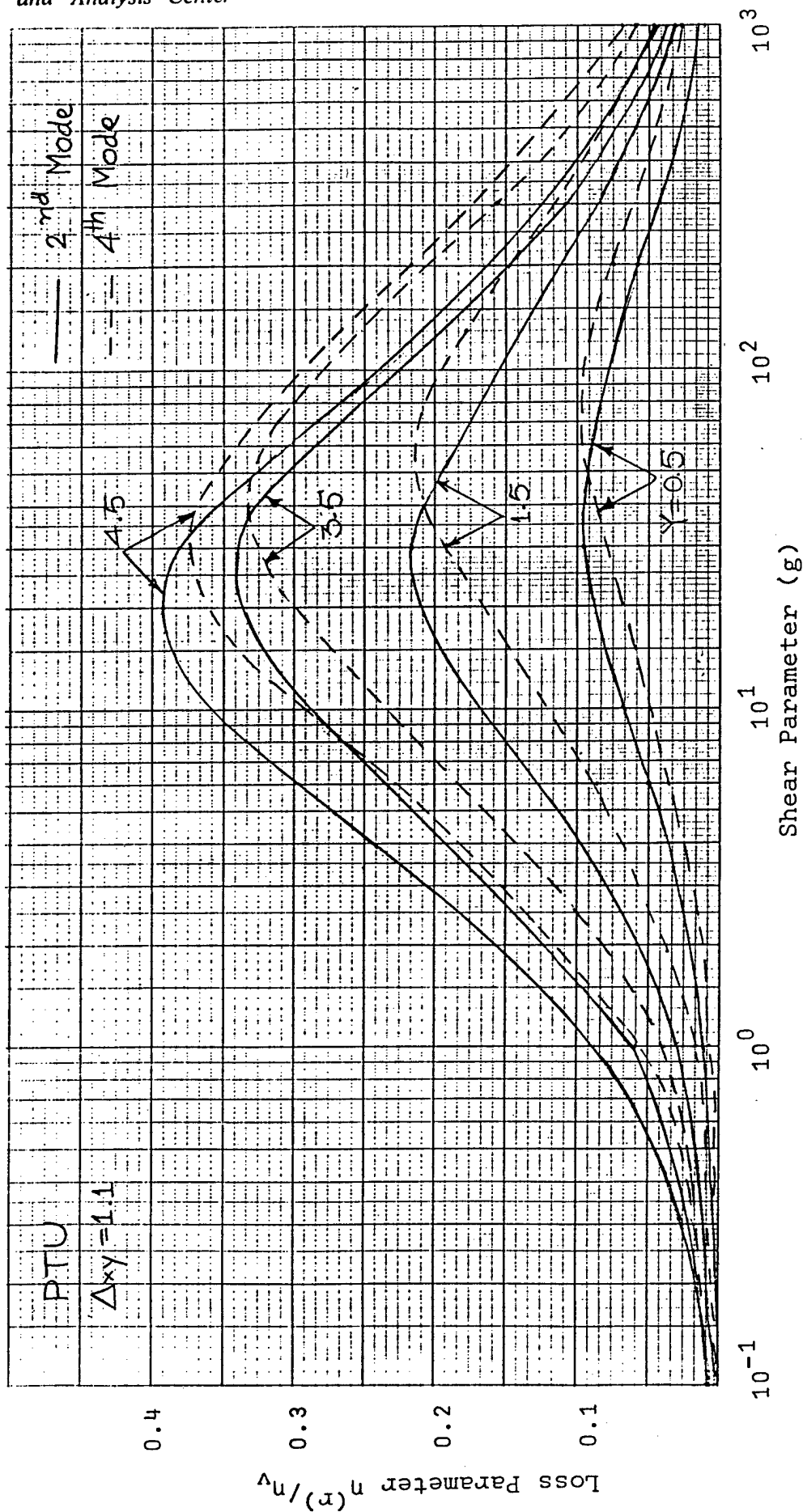


Figure 10 Damping of a sandwich rectangular plate, PTU boundary conditions,
 $\Delta_{xy} = 1.1$, modes 2 and 4, variable Y and g

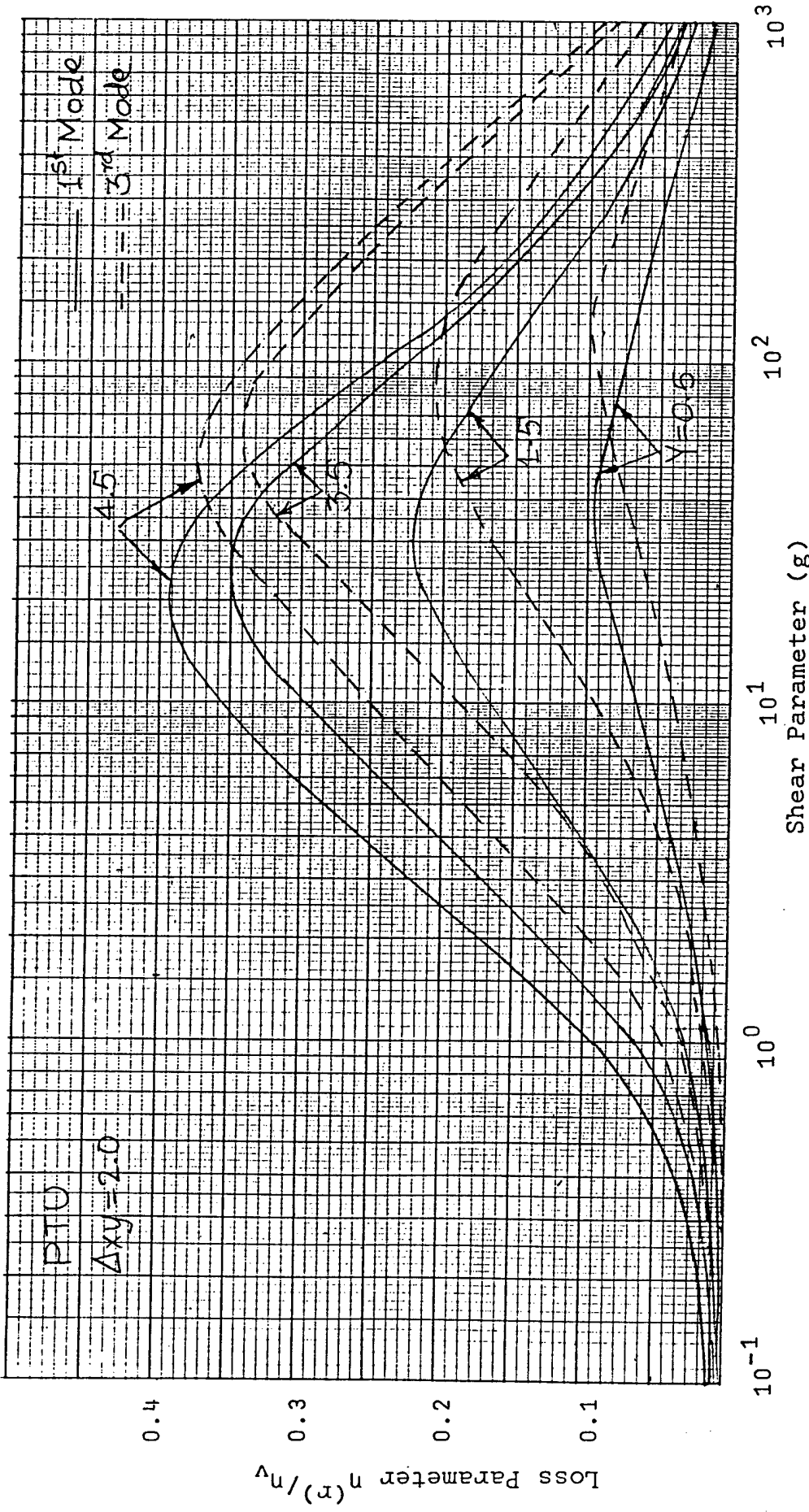


Figure 11 Damping of a sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 2.0$, modes 1 and 3, variable Y and g

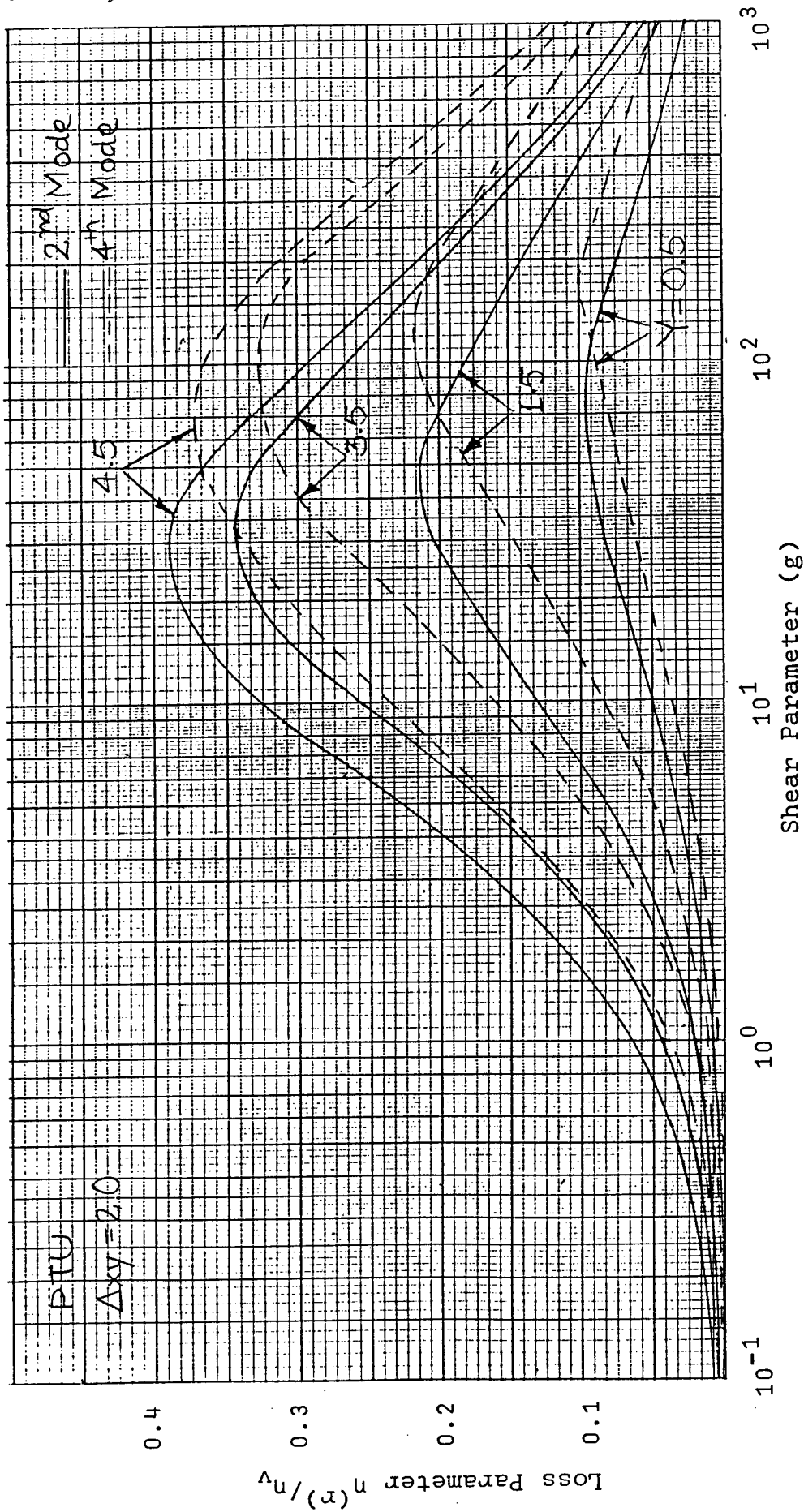


Figure 12 Damping of a sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 2.0$, modes 2 and 4, variable γ and g

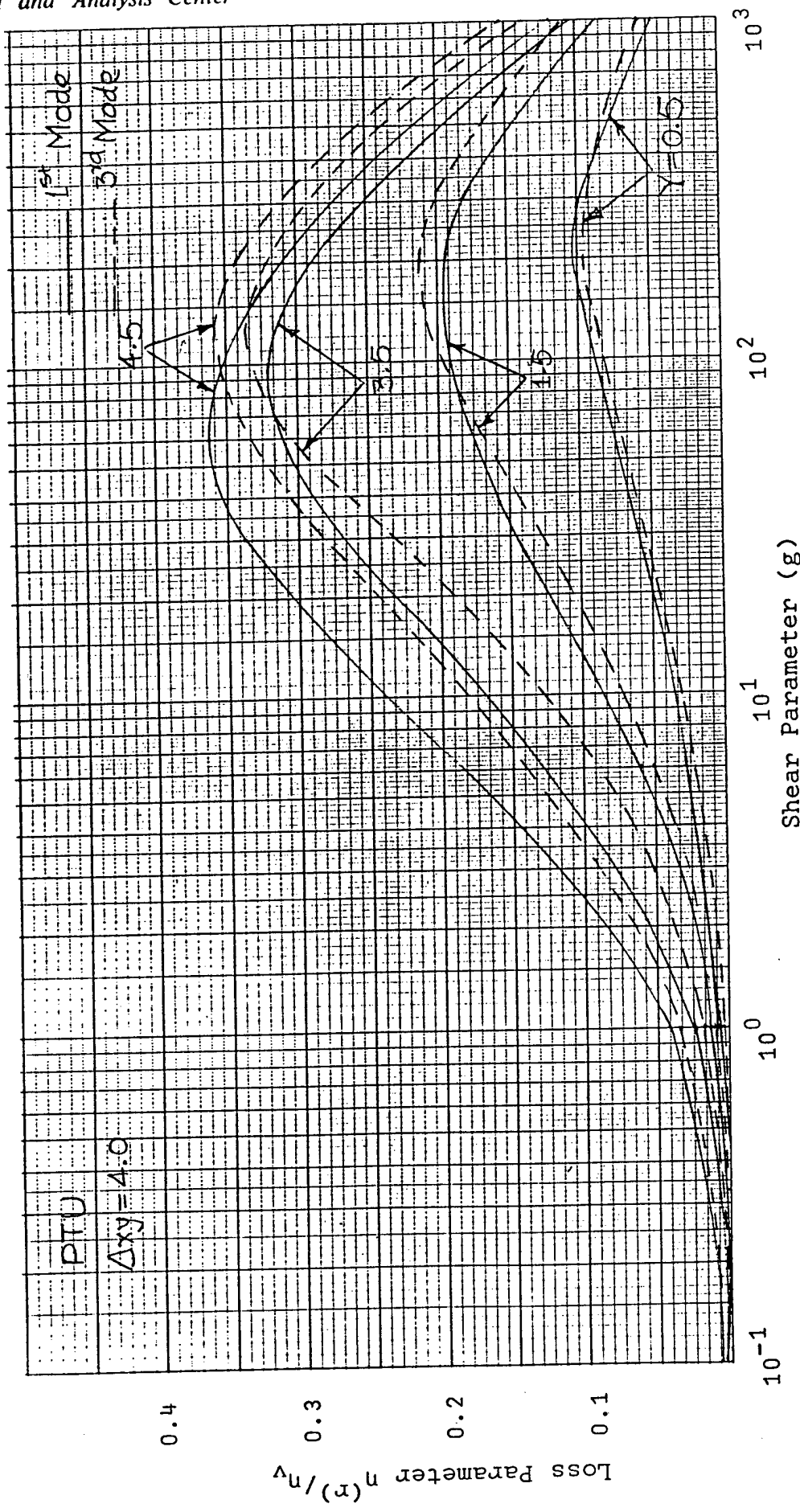


Figure 13 Damping of a sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 4.0$, modes 1 and 3, variable Y and g

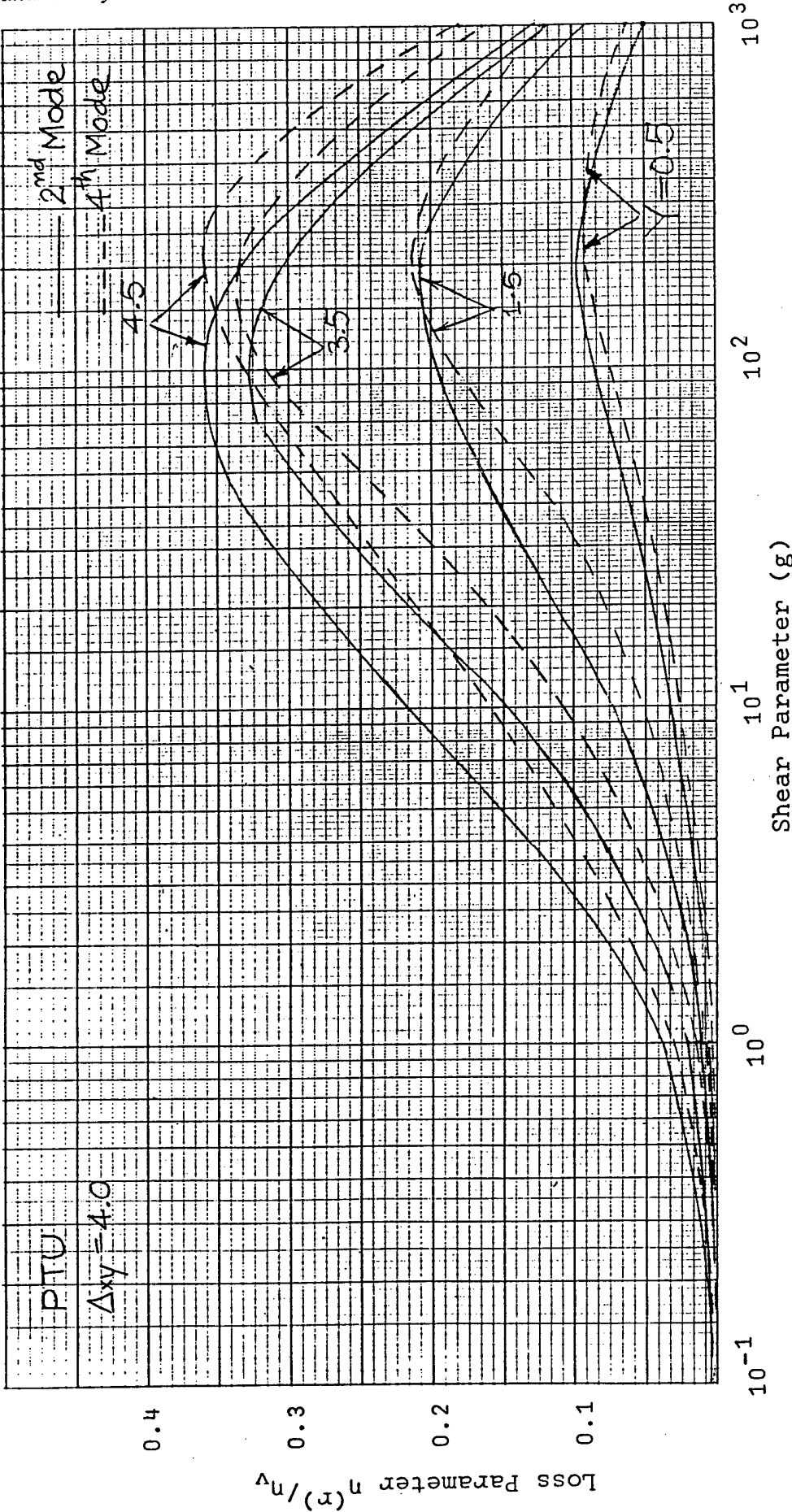


Figure 14 Damping of a sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 4.0$, modes 2 and 4, variable γ and g

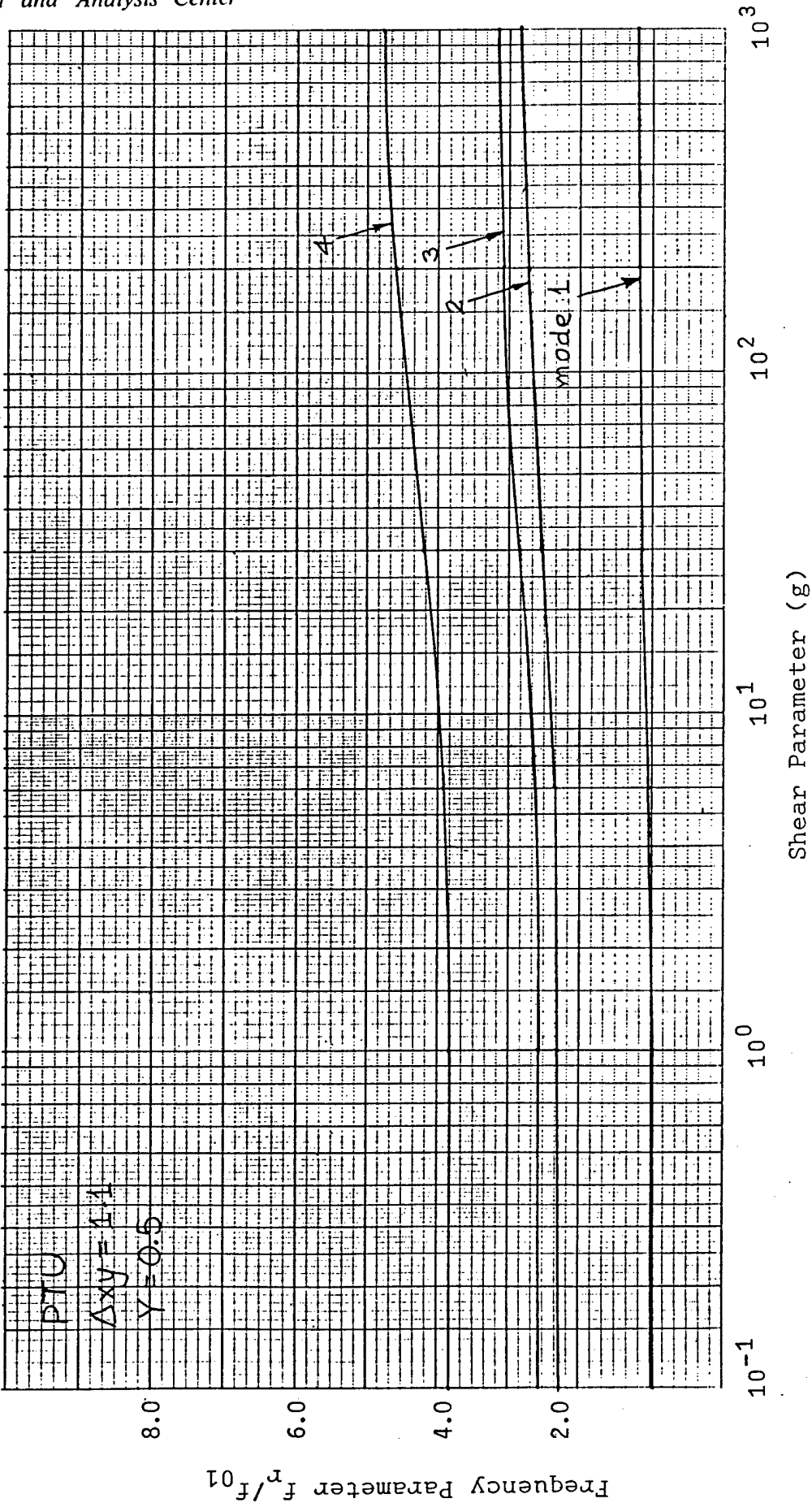


Figure 15 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 1.1$, $Y = 0.5$

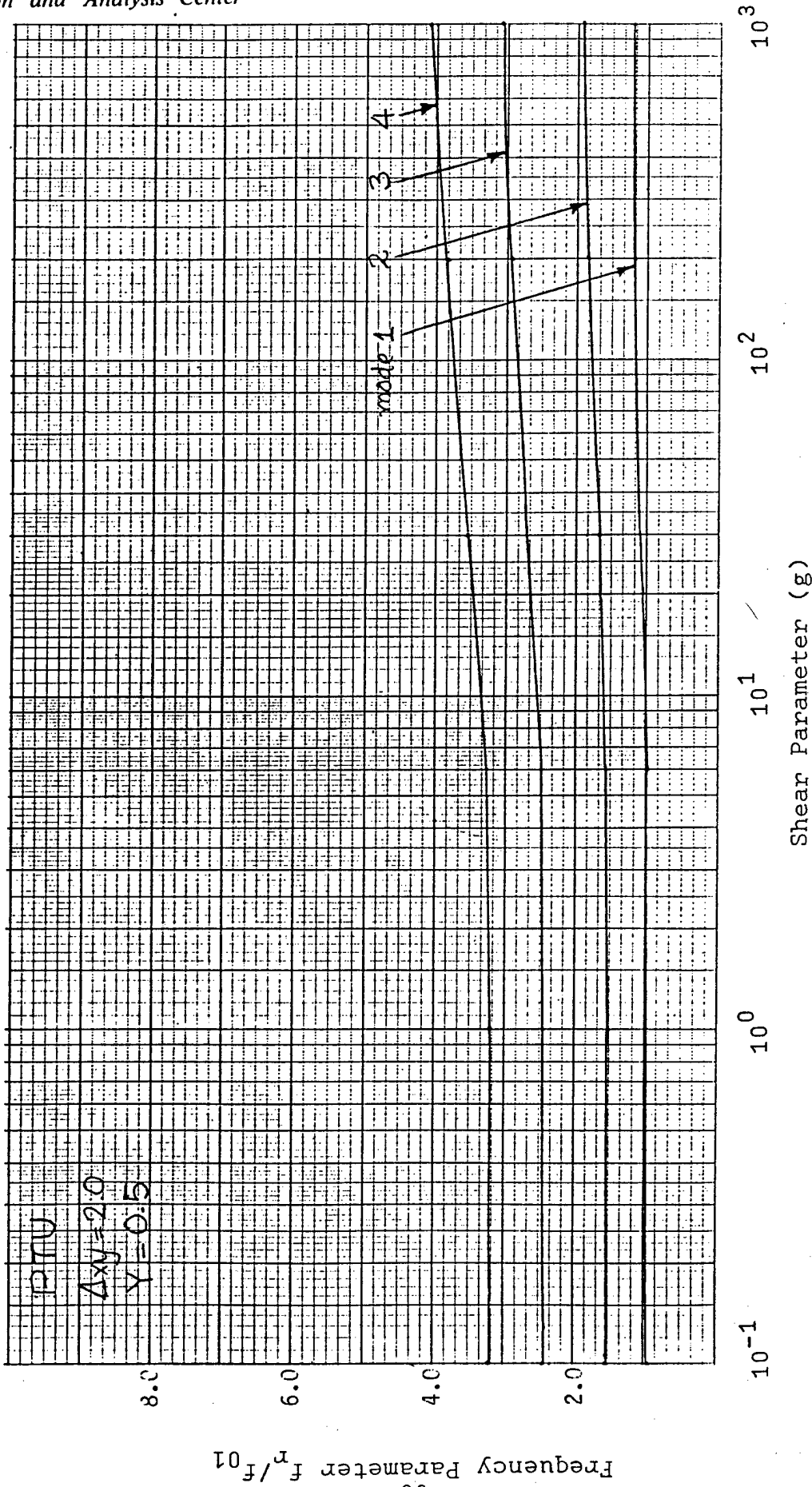


Figure 16 Natural frequencies of sandwich rectangular plate, PTU boundary condition, $\Delta xy = 2.0$, $Y = 0.5$

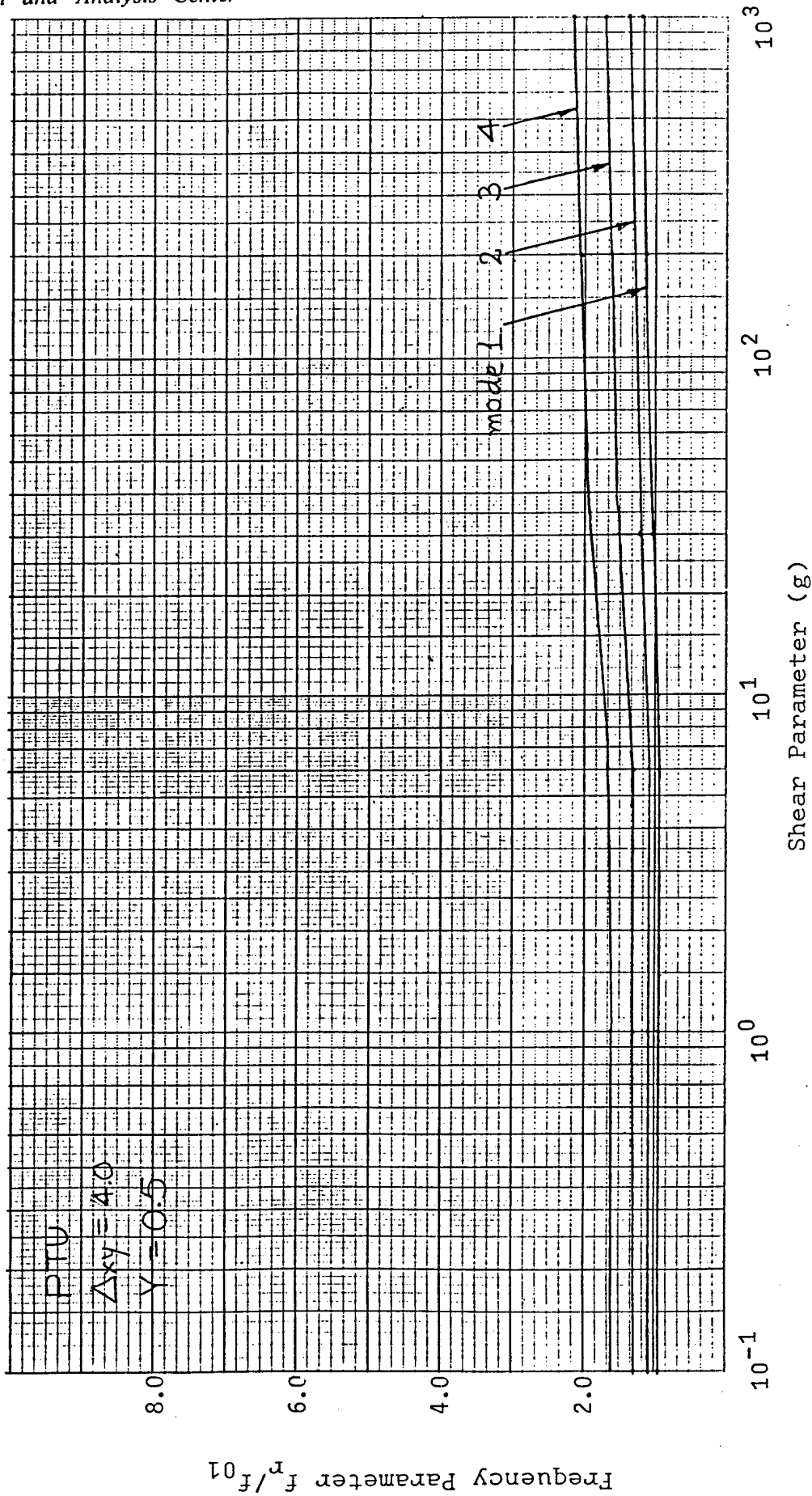


Figure 17 Natural frequencies of sandwich rectangular plate,
PTU boundary conditions, $\Delta xy = 4.0$, $Y = 0.5$

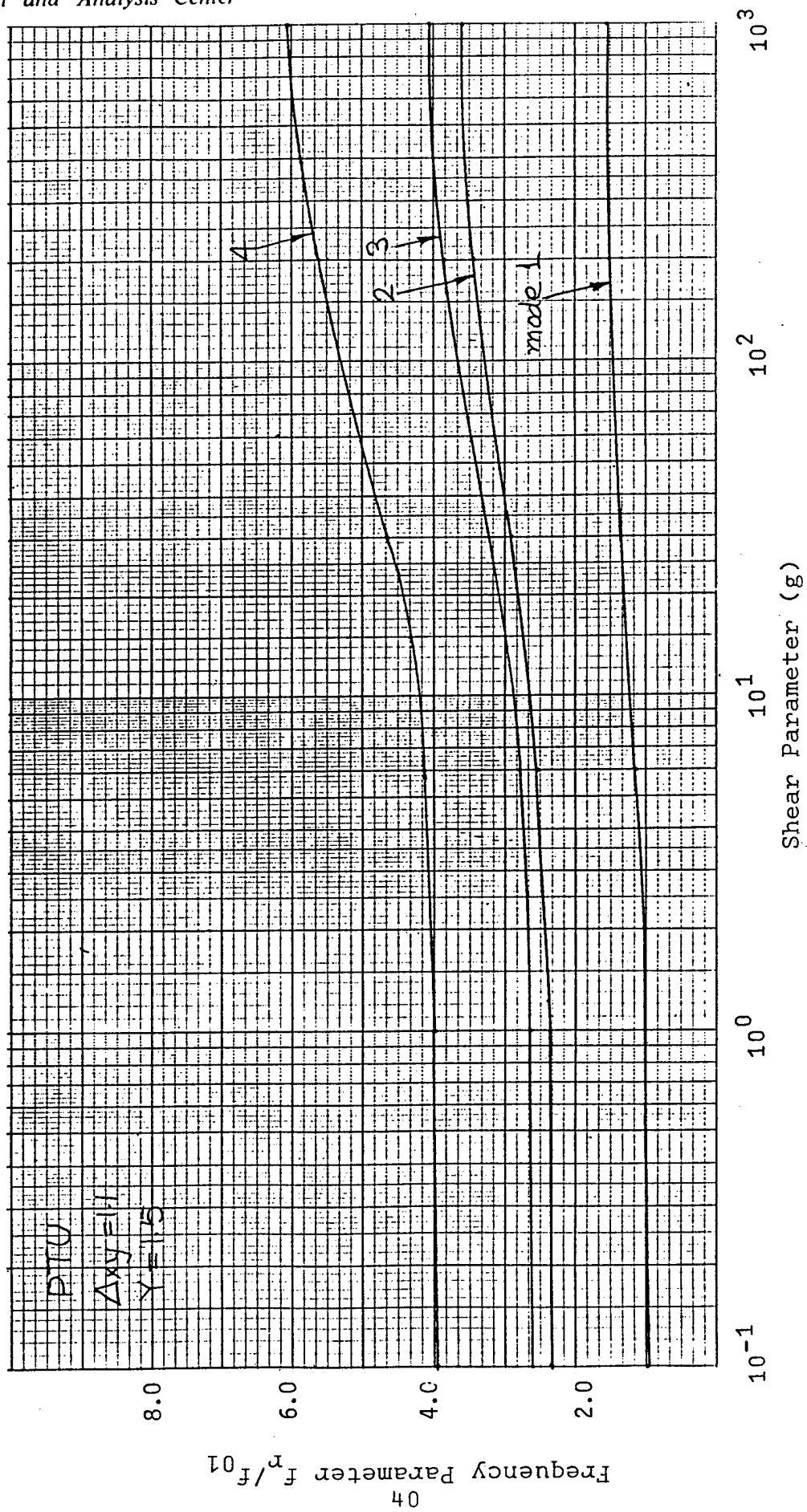


Figure 18 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 1.1$, $Y = 1.5$

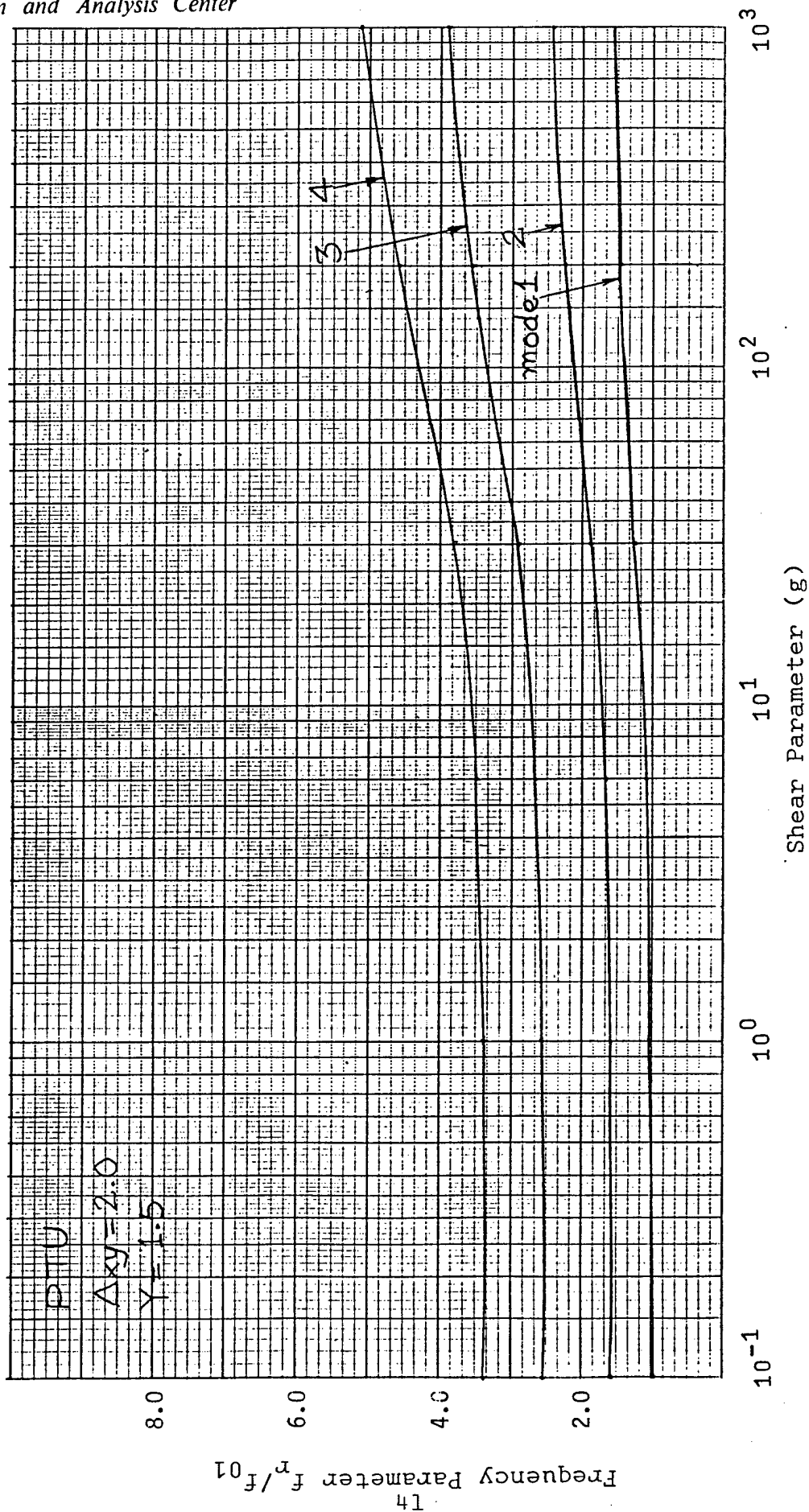


Figure 19 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 2.0$, $Y = 1.5$

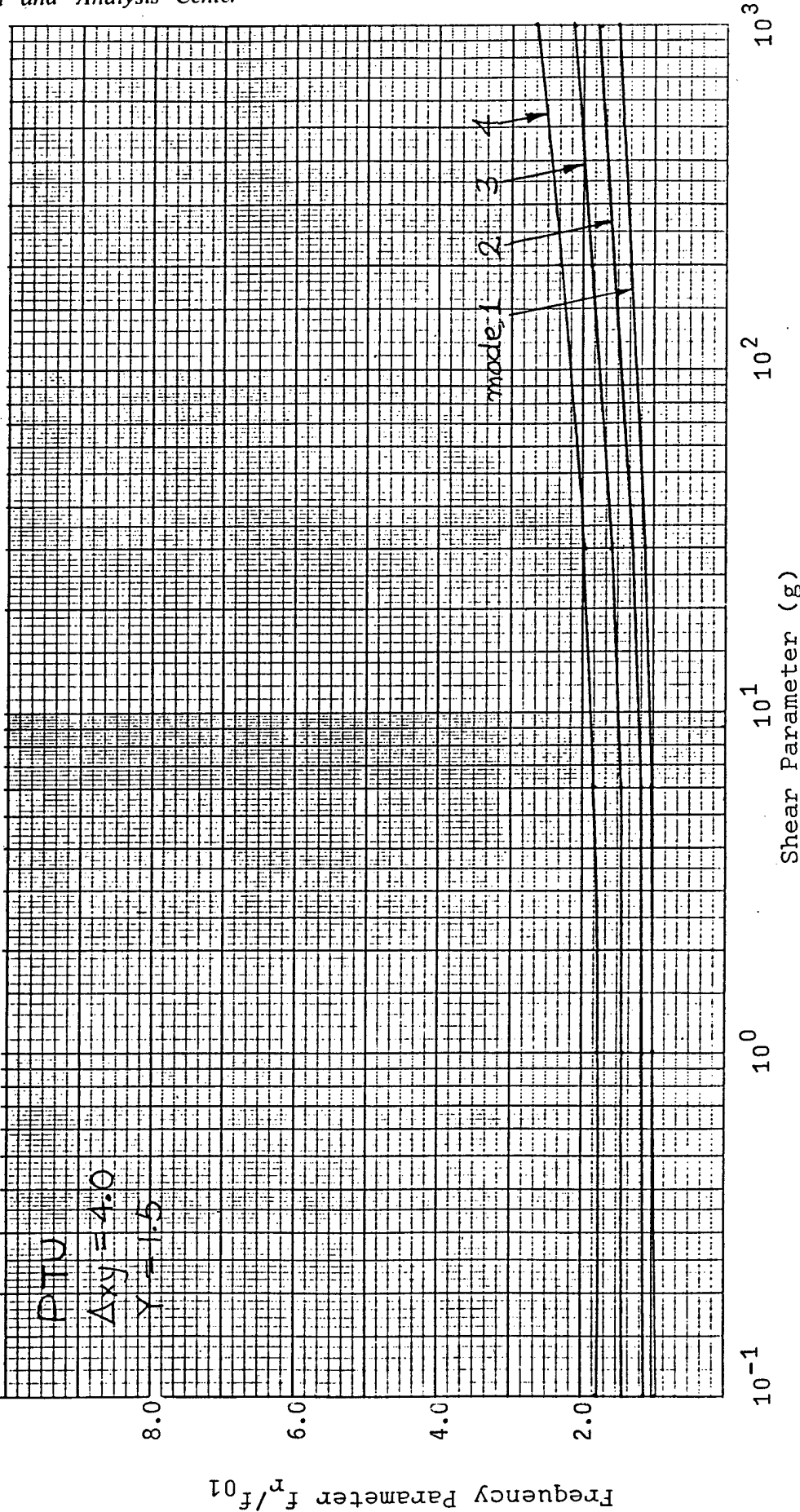


Figure 20 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 4.0$, $Y = 1.5$

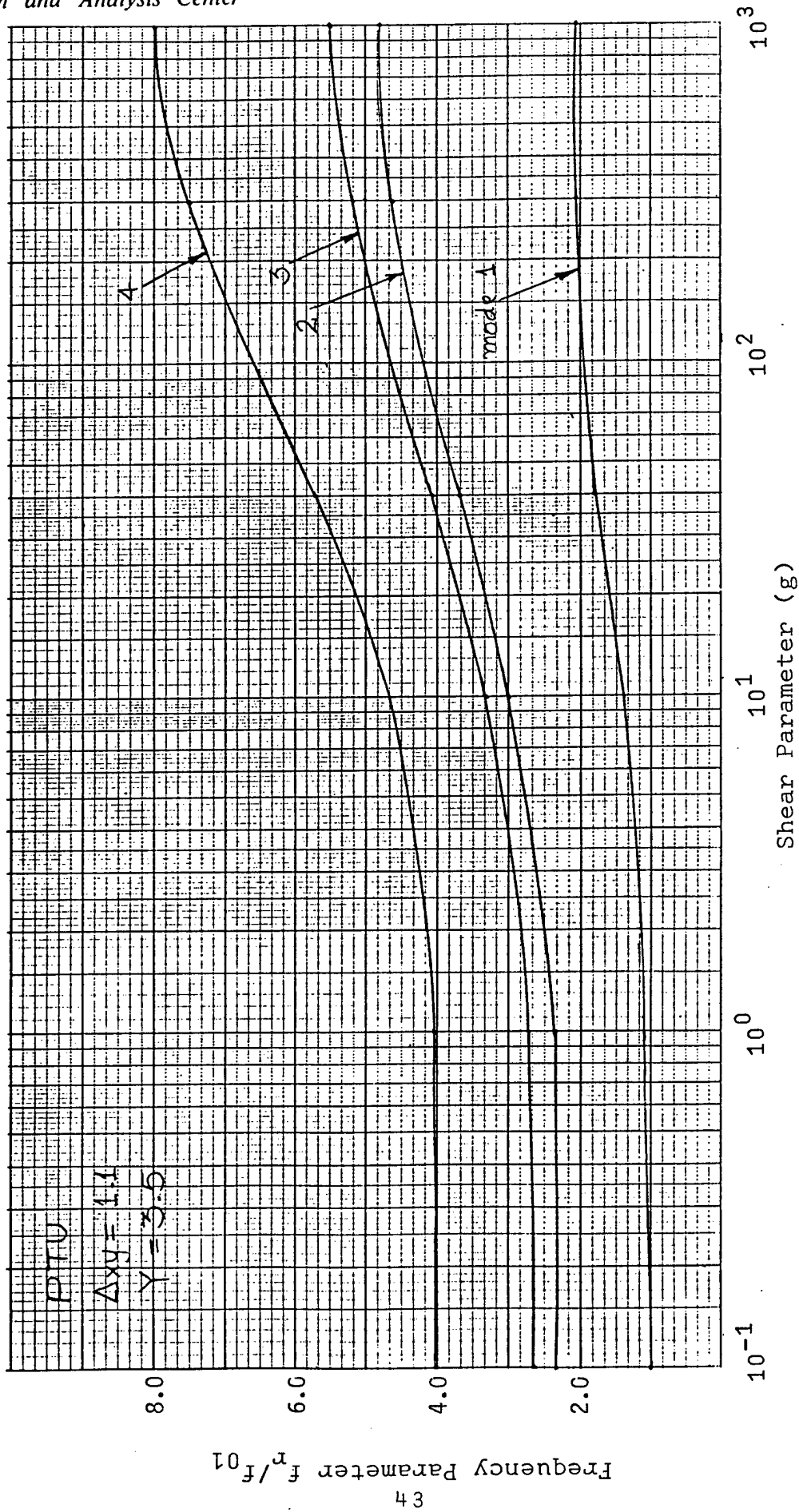


Figure 21 Natural frequencies of sandwich plate, PTU
boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

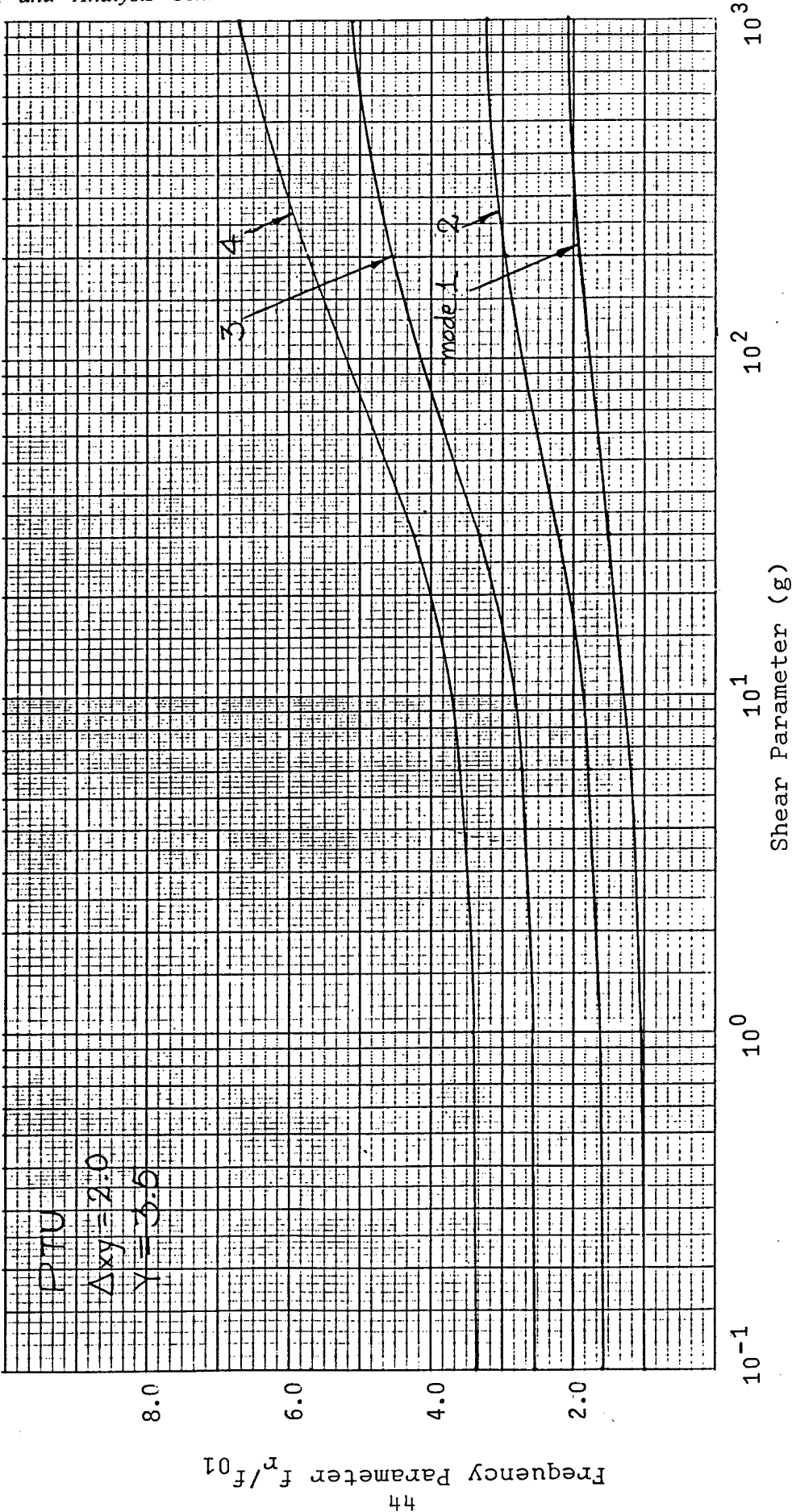


Figure 22 Natural frequencies of sandwich rectangular plate,
PTU boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

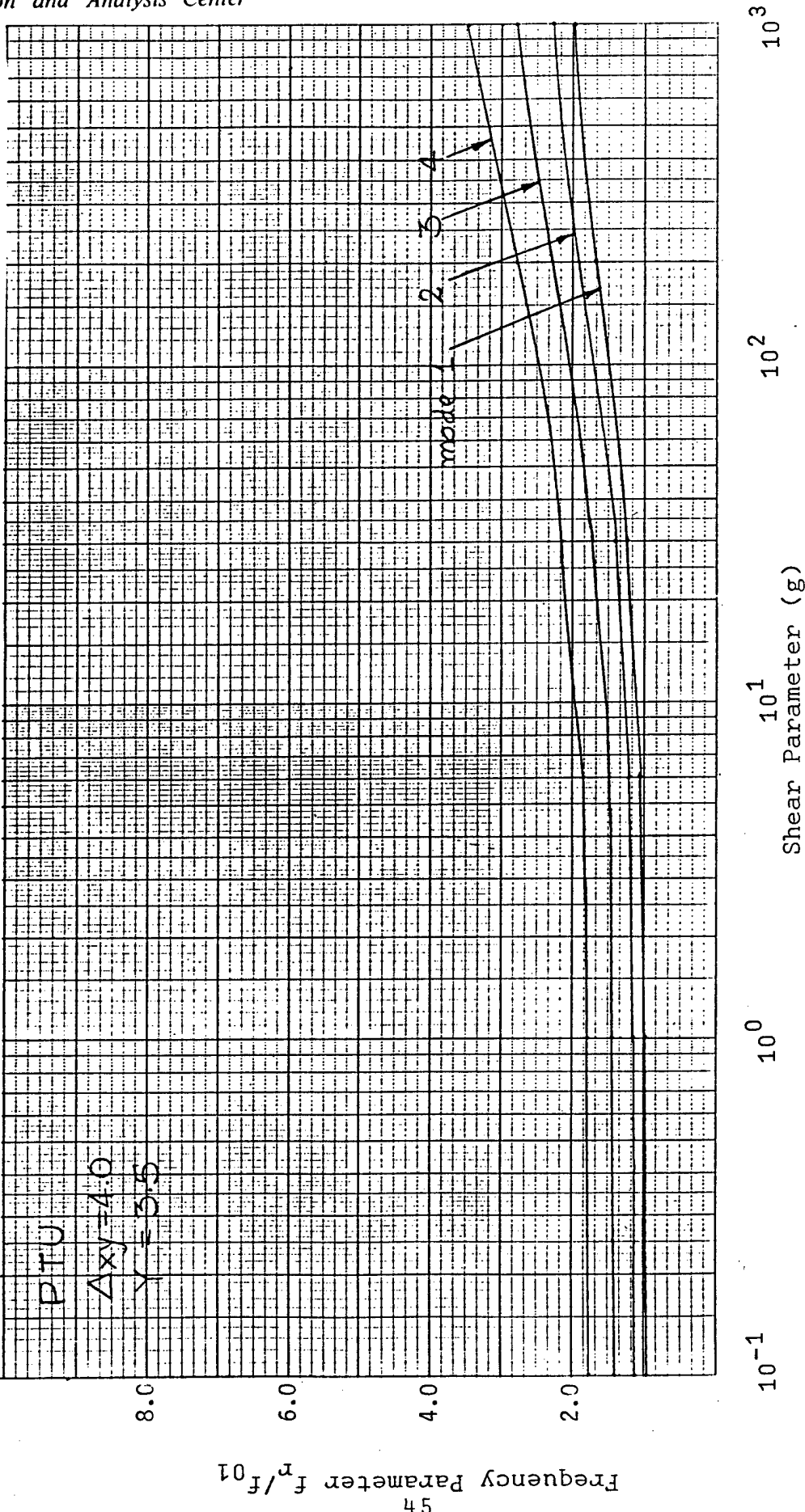


Figure 23 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 4.0$, $\gamma = 3.5$

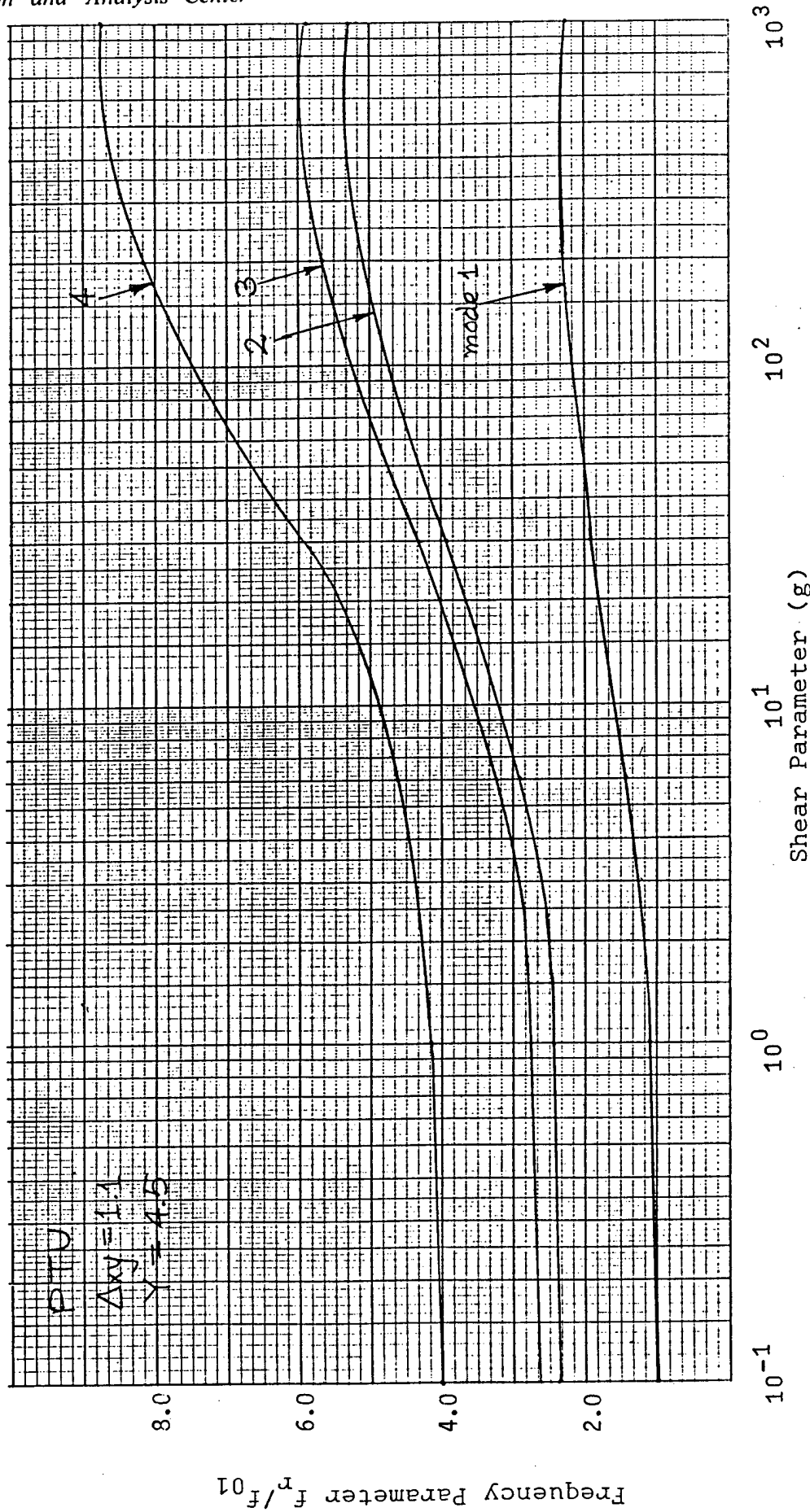


Figure 24 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 1.1$, $\gamma = 4.5$

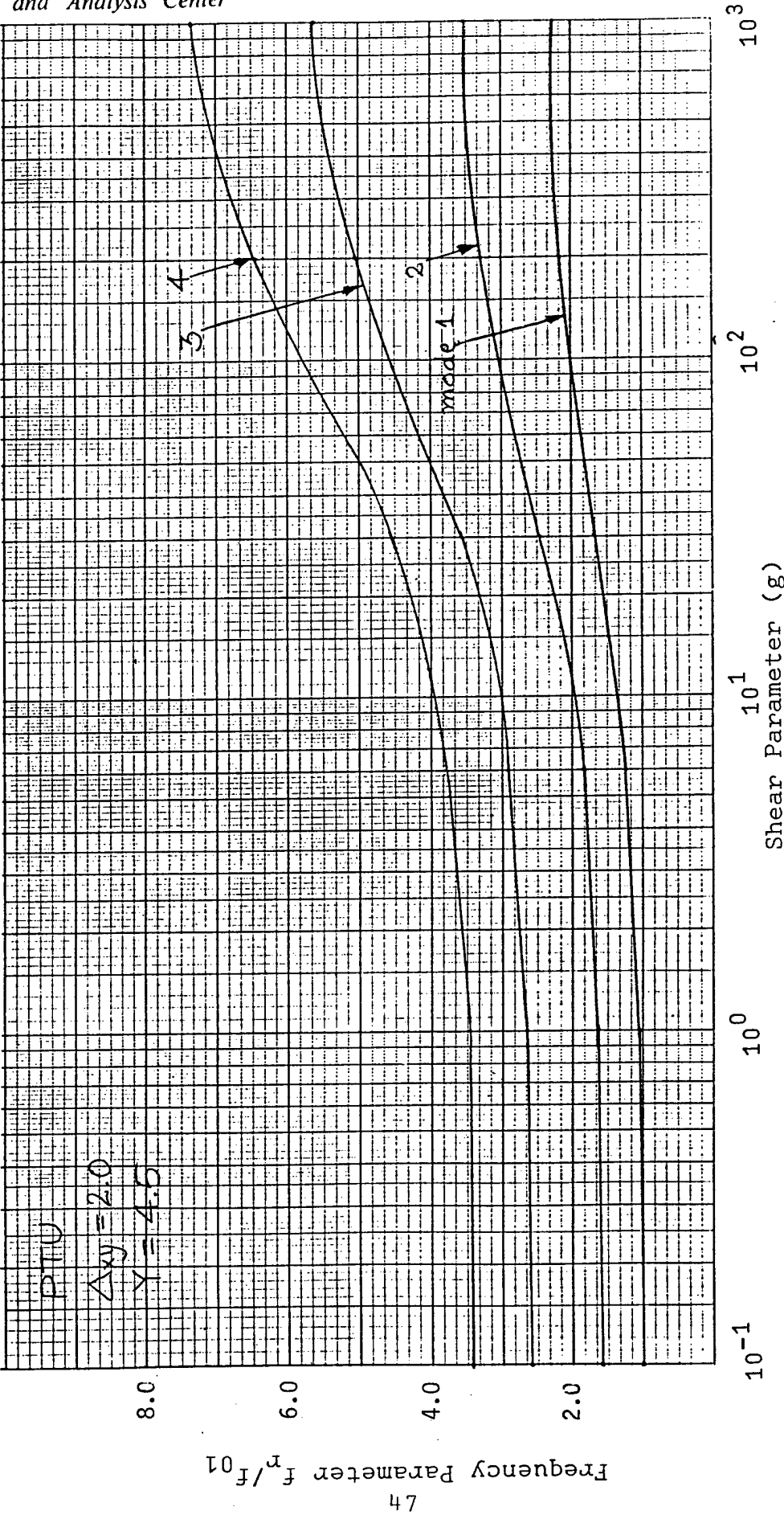


Figure 25 Natural frequencies of sandwich rectangular plate,
PTU boundary conditions, $\Delta y = 2.0$, $\gamma = 4.5$

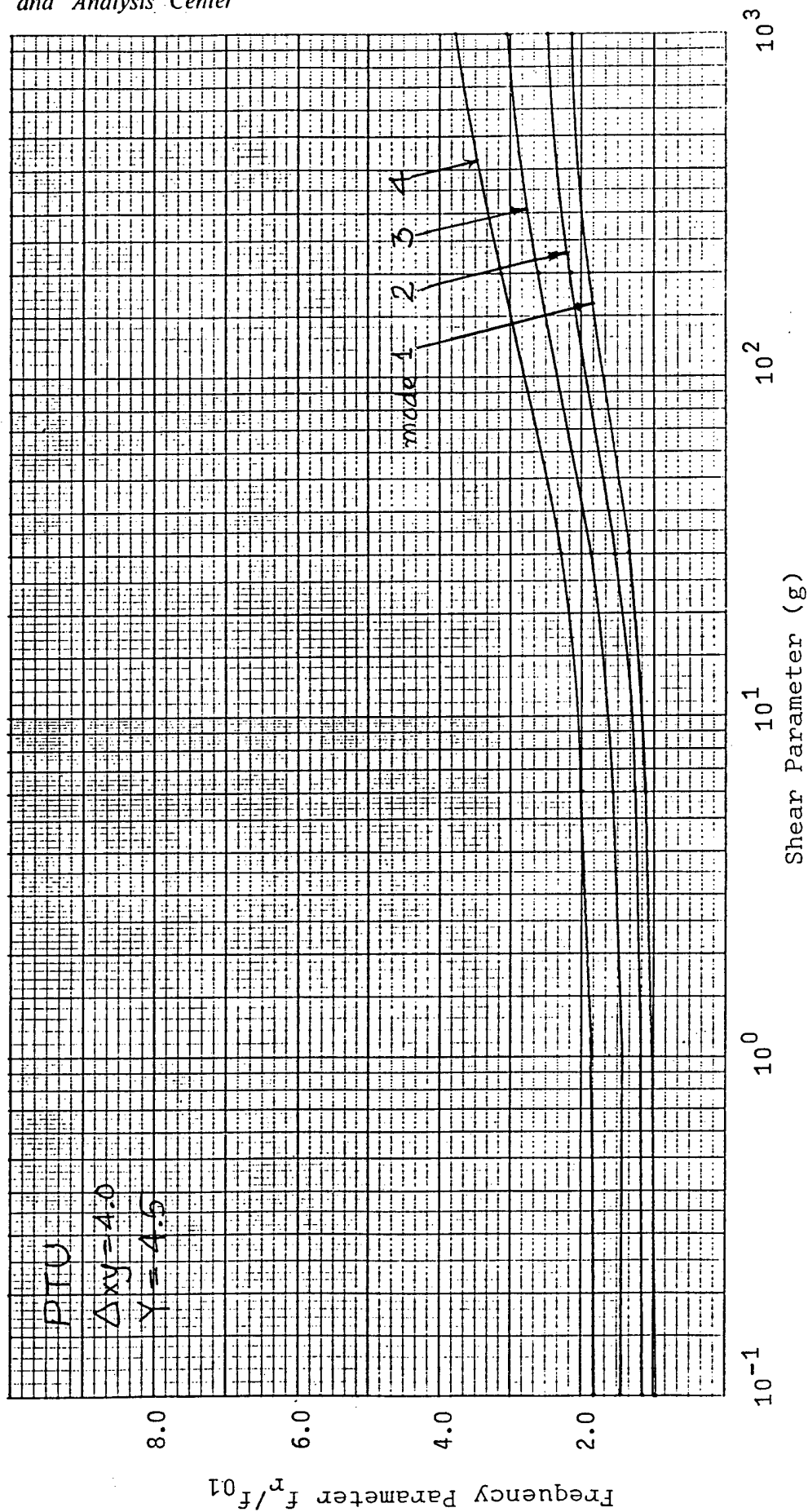


Figure 26 Natural frequencies of sandwich rectangular plate, PTU boundary conditions, $\Delta xy = 4.0$, $Y = 4.5$

TABLE 6
MODAL FREQUENCIES AND MODAL LOSS FACTORS
Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 0.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets			Aluminum Face Sheets								
	0.1			6.0			30.			200.		
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)
1	816.	0.002	825.	860.	0.022	850.	91.	0.094	96.	0.031	97.	0.008
2	1915.	0.001	1926.	1974.	0.011	1974.	206.	0.095	223.	0.058	230.	0.019
3	2144.	0.001	2155.	2206.	0.010	2206.	230.	0.093	250.	0.062	257.	0.021
4	3213.	0.001	3225.	3282.	0.007	3282.	342.	0.078	372.	0.074	387.	0.027
5	3738.	0.001	3751.	3814.	0.007	3814.	397.	0.073	432.	0.082	452.	0.037
6	4337.	0.001	4351.	4420.	0.006	4420.	459.	0.068	500.	0.087	526.	0.042
7	4987.	0.001	5001.	5070.	0.005	5070.	533.	0.059	577.	0.085	606.	0.040
8			5372.	5444.	0.005	5444.	571.	0.057	618.	0.087	652.	0.043
9				7081.	0.021	7081.	677.	0.049	731.	0.091	777.	0.060
10							759.	0.045	814.	0.087	861.	0.049

TABLE 7

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 1.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)
1	465.	0.007	479.	0.060	534.	0.190	102.	0.194	114.	0.056	117.	0.014
2	1098.	0.003	1112.	0.029	1183.	0.123	220.	0.218	261.	0.110	275.	0.032
3	1229.	0.003	1245.	0.026	1318.	0.116	244.	0.217	291.	0.119	308.	0.035
4	1856.	0.002	1872.	0.018	1950.	0.085	353.	0.192	426.	0.147	458.	0.048
5	2166.	0.002	2182.	0.016	2263.	0.078	405.	0.183	491.	0.165	535.	0.061
6	2519.	0.002	2536.	0.014	2622.	0.071	466.	0.172	565.	0.177	622.	0.069
7	2917.	0.001	2934.	0.012	3018.	0.060	535.	0.153	643.	0.177	709.	0.071
8	3135.	0.001	3153.	0.011	3241.	0.0576	572.	0.149	688.	0.183	763.	0.076
9	3739.	0.001	3758.	0.010	3854.	0.0515	671.	0.130	806.	0.193	908.	0.098
10			7167.	0.009	4258.	0.0455	748.	0.120	884.	0.191	993.	0.090

TABLE 8
MODAL FREQUENCIES AND MODAL LOSS FACTORS
Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		10.		40.		300.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)
1	526.	0.016	561.	0.127	753.	0.346	167.	0.242	191.	0.051	194.	0.017
2	1238.	0.007	1276.	0.062	1547.	0.293	347.	0.331	434.	0.108	452.	0.038
3	1387.	0.006	1425.	0.056	1709.	0.283	382.	0.339	485.	0.119	507.	0.042
4	2091.	0.004	2130.	0.038	2443.	0.227	535.	0.336	705.	0.156	751.	0.059
5	2439.	0.004	2478.	0.033	2805.	0.212	606.	0.337	813.	0.1812	874.	0.071
6	2835.	0.003	2876.	0.030	3222.	0.196	689.	0.330	936.	0.200	1015.	0.082
7	3281.	0.003	3321.	0.025	3663.	0.170	776.	0.307	1053.	0.208	1149.	0.088
8	3526.	0.002	3567	0.023	3921.	0.164	826.	0.303	1127.	0.219	1237.	0.095
9	4203.	0.002	4246.	0.020	4626.	0.145	956.	0.278	1320.	0.241	1468.	0.114
10	4661.	0.002	4701.	0.018	5061.	1.132	1048.	0.266	1424.	0.249	1589.	0.117

TABLE 9
MODAL FREQUENCIES AND MODAL LOSS FACTORS
Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (γ) = 4.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets				Aluminum Face Sheets				Aluminum Face Sheets			
	0.1		6.0		30.		200.		1000.			
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)
1	352.	0.021	383.	0.165	492.	0.378	150.	0.300	178.	0.080	129.	0.023
2	829.	0.010	865.	0.088	1020.	0.296	305.	0.382	398.	0.158	300.	0.045
3	929.	0.009	966.	0.081	1128.	0.284	334.	0.387	443.	0.172	336.	0.050
4	1405.	0.006	1445.	0.059	1630.	0.230	465.	0.374	638.	0.217	498.	0.069
5	1639.	0.006	1681.	0.053	1880.	0.217	526.	0.370.	731.	0.246	579.	0.081
6	1907.	0.005	1952.	0.049	2166.	0.204	598.	0.359	837.	0.267	672.	0.092
7	2214.	0.005	2259.	0.042	2477.	0.181	672.	0.332	939.	0.275	762.	0.100
8	2380.	0.004	2427.	0.041	2655.	0.177	715.	0.326	1002.	0.285	820.	0.106
9	2837.	0.004	2889.	0.036	3143.	0.163	827.	0.298	1167.	0.305	972.	0.127
10	3165.	0.003	3215.	0.033	3462.	0.149	907.	0.284	1256.	0.313	1053.	0.130

TABLE 10
MODAL FREQUENCIES AND MODAL LOSS FACTORS
Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (γ) = 0.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets			Aluminum Face Sheets								
	0.1	1.0	6.0	30.	200.	1000.						
	Freq. Parameter (f_r)	Freq. Parameter (f_r)	Freq. Parameter (f_r)	Freq. Parameter (f_r)	Freq. Parameter (f_r)	Freq. Parameter (f_r)	Loss ($\bar{n}$)	Loss ($\bar{n}$)	Loss ($\bar{n}$)	Loss ($\bar{n}$)	Loss ($\bar{n}$)	Loss ($\bar{n}$)
1	1825.	0.001	1836.	0.012	1883.	0.052	197.	0.098	214.	0.057	220.	0.018
2	2873.	0.001	2884.	0.008	2939.	0.039	309.	0.085	337.	0.073	349.	0.025
3	4618.	0.001	4632.	0.006	4700.	0.030	496.	0.067	539.	0.087	566.	0.037
4	6085.	0.001	6102.	0.005	6181.	0.026	649.	0.055	703.	0.096	747.	0.053
5	6977.	0.001	6996.	0.005	7080.	0.024	758.	0.048	816.	0.094	868.	0.053
6	7062.	0.001	7082.	0.005	7168.	0.023	762.	0.048	821.	0.093	873.	0.054
7			8664.	0.004	8755.	0.020	947.	0.039	1012.	0.090	1079.	0.057
8					10284.	0.020	1114.	0.034	1186.	0.090	1272.	0.070
9					10890.	0.017	1210.	0.031	1281.	0.085	1366.	0.063
10							1449.	0.027	1531.	0.087	1654.	0.091

TABLE 11

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (γ) = 1.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets				Aluminum Face Sheets							
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)
1	1047.	0.003	1062.	0.030	1132.	0.129	212.	0.222	251.	0.108	264.	0.030
2	1664.	0.002	1680.	0.020	1757.	0.095	322.	0.205	388.	0.143	416.	0.044
3	2702.	0.002	2720.	0.013	2806.	0.067	501.	0.168	606.	0.179	668.	0.066
4	3569.	0.002	3588.	0.011	3685.	0.057	647.	0.146	781.	0.200	878.	0.090
5	4148.	0.001	4168.	0.009	4266.	0.050	749.	0.130	895.	0.203	1012.	0.095
6	4178.	0.001	4198.	0.009	4298.	0.049	753.	0.129	900.	0.200	1019.	0.096
7	5172.	0.001	5194.	0.008	5297.	0.041	927.	0.108	1093.	0.200	1245.	0.106
8			6029.	0.007	6240.	0.038	1084.	0.094	1269.	0.200	1465.	0.125
9			6124.	0.006	6678.	0.034	1172.	0.087	1356.	0.196	1557.	0.120
10					8098.	0.034	1398.	0.076	1609.	0.200	1887.	0.159

TABLE 12
MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)
1	1182.	0.007	1219.	0.066	1389.	0.245	320.	0.350	408.	0.145	436.	0.036
2	1875.	0.005	1914.	0.043	2100.	0.186	469.	0.344	622.	0.197	683.	0.055
3	3041.	0.003	3082.	0.028	3289.	0.134	703.	0.304	955.	0.255	1089.	0.083
4	4013.	0.003	4057.	0.023	4284.	0.112	891.	0.274	1215.	0.294	1427.	0.109
5	4663.	0.002	4706.	0.019	4932.	0.098	1019.	0.25	1374.	0.303	1632.	0.120
6	4696.	0.002	4740.	0.019	4971.	0.097	1025.	0.248	1387.	0.300	1649.	0.121
7	5808.	0.002	5854.	0.015	6090.	0.080	1242.	0.213	1653.	0.308	1996.	0.137
8	6846.	0.001	6894.	0.014	7151.	0.072	1439.	0.190	1903.	0.316	2343.	0.158
9	7342.	0.001	7387.	0.012	7630.	0.065	1546.	0.177	2008.	0.313	2465.	0.159
10			8948.	0.012	9235.	0.061	1831.	0.156	2367.	0.328	2987.	0.197

TABLE 13
MODAL FREQUENCIES AND MODAL LOSS FACTORS
Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (Y) = 4.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets				Aluminum Face Sheets							
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)
1	792.	0.011	828.	0.093	982.	0.306	295.	0.386	384.	0.155	289.	0.044
2	1261.	0.007	1301.	0.066	1482.	0.250	429.	0.389	584.	0.210	453.	0.064
3	2052.	0.005	2098.	0.047	2319.	0.198	638.	0.354	894.	0.271	722.	0.094
4	2712.	0.004	2765.	0.040	3020.	0.178	803.	0.326	1136.	0.313	944.	0.120
5	3165.	0.004	3220.	0.036	3486.	0.162	915.	0.300	1283.	0.324	1079.	0.132
6	3183.	0.004	3238.	0.036	3509.	0.160	920.	0.299	1296.	0.322	1091.	0.134
7	3958.	0.003	4017.	0.030	4309.	0.141	1110.	0.262	1541.	0.333	1320.	0.151
8	4670.	0.003	4736.	0.029	5069.	0.134	1283.	0.239	1774.	0.345	1547.	0.172
9	5038.	0.003	5102.	0.026	5424.	0.124	1375.	0.224	1868.	0.343	1631.	0.175
10	6096.	0.003	6181.	0.025	6584.	0.024 ✓	1626.	0.203	2206.	0.362	1968.	0.212

TABLE 14

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 4.0
Geometric Parameter (Y) = 0.5

MODE (r)	SHEAR PARAMETER (g)									
	Steel Face Sheets			Aluminum Face Sheets						
	0.1	1.0		6.0		30.		200.		1000.
	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)
1	5968. 0.010	5986. 0.006	6068. 0.028	642. 0.059	697. 0.097	739. 0.048				
2	6885. 0.001	6904. 0.005	6990. 0.025	750. 0.052	811. 0.097	863. 0.051				
3	8436. 0.001	8459. 0.004	8554. 0.022	933. 0.044	1002. 0.096	1069. 0.057				
4	10513. 0.002	10545. 0.004	10653. 0.020	1188. 0.036	1266. 0.093	1355. 0.064				
5	11583. 0.002	11612. 0.004	13508. 0.017	1525. 0.028	1611. 0.087	1730. 0.073				
6		13377. 0.003	16841. 0.016	1942. 0.022	2036. 0.079	2186. 0.080				
7		13587. 0.003	20602. 0.015	2446. 0.018	2545. 0.070	2732. 0.087				
8			20684. 0.014	2481. 0.018	2585. 0.073	2792. 0.101				
9				2596. 0.017	2699. 0.070	2910. 0.098				
10				2784. 0.06	2888. 0.067	3105. 0.096				

TABLE 15
MODAL FREQUENCIES AND MODAL LOSS FACTORS
Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 4.0
Geometric Parameter (γ) = 1.5

MODE (r)	SHEAR PARAMETER (γ)											
	Steel Face Sheets				Aluminum Face Sheets							
	0.12		1.2		6.0		30.		200.		1000.	
	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)
1	3514.	0.002	3537.	0.014	3631.	0.060	641.	0.153	778.	0.203	873.	0.085
2	4090.	0.002	4114.	0.012	4211.	0.053	744.	0.138	896.	0.208	1014.	0.093
3	5060.	0.002	5087.	0.010	5190.	0.045	916.	0.118	1090.	0.212	1246.	0.106
4	6399.	0.002	6430.	0.009	6541.	0.039	1157.	0.098	1355.	0.212	1564.	0.123
5	8182.	0.003	8220.	0.007	8345.	0.033	1473.	0.079	1697.	0.204	1976.	0.142
6	10330.	0.003	10381.	0.006	10522.	0.028	1864.	0.064	2110.	0.191	2470.	0.159
7			12504.	0.005	13105.	0.025	2337.	0.051	2600.	0.175	3050.	0.175
8			12943.	0.006	13444.	0.027	2370.	0.051	2644.	0.081	3128.	0.192
9			13260.	0.006	14004.	0.026	2477.	0.049	2752.	0.174	3249.	0.189
10					14835.	0.024	2654.	0.045	2930.	0.168	3445.	0.190

TABLE 16
MODAL FREQUENCIES AND MODAL LOSS FACTORS
Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 4.0
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets				Aluminum Face Sheets							
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)
1	3950.	0.003	3996.	0.024	4228.	0.119	888.	0.286	1217.	0.295	1427.	0.107
2	4595.	0.002	4641.	0.021	4877.	0.105	1018.	0.263	1387.	0.307	1648.	0.120
3	5626.	0.002	5730.	0.017	5976.	0.089	1235.	0.232	1663.	0.322	2012.	0.140
4	5682.	0.002	7229.	0.014	7489.	0.075	1536.	0.1978	2030.	0.333	2503.	0.165
5	7180.	0.001	9228.	0.012	9516.	0.062	1932.	0.164	2498.	0.332	3140.	0.191
6	9174.	0.001	11636.	0.010	11952.	0.052	2418.	0.134	3049.	0.321	3887.	0.217
7	11575.	0.001	14484.	0.008	14835.	0.044	3004.	0.108	3690.	0.304	4747.	0.241
8	14420.	0.001	14832.	0.008			3049.	0.110	3760.	0.313	4885.	0.257
9	14761.	0.001	15468.	0.008			3182.	0.104	3897.	0.303	5054.	0.255
10	15391.	0.001	16364.	0.008			3398.	0.100	4119.	0.295	5328.	0.261

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTU (zero translation, unrestrained rotation, unrestrained shear)

Aspect Ratio (Δ_{xy}) = 4.0Geometric Parameter (γ) = 4.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets				Aluminum Face Sheets							
	0.1		1.0		6.0		30.0		200.0		1000.0	
	Freq. (f _r)	Loss ($\bar{n}$)	Freq. (f _r)	Loss ($\bar{n}$)	Freq. (f _r)	Loss ($\bar{n}$)	Freq. (f _r)	Loss ($\bar{n}$)	Freq. (f _r)	Loss ($\bar{n}$)	Freq. (f _r)	Loss ($\bar{n}$)
1	2673.	0.005	2727.	0.042	2987.	0.185	801.	0.338	1138.	0.314	943.	0.118
2	3124.	0.004	3180.	0.038	3457.	0.171	915.	0.315	1296.	0.328	1090.	0.131
3	3882.	0.004	3943.	0.033	4249.	0.153	1105.	0.283	1551.	0.346	1330.	0.152
4	4936.	0.003	5006.	0.029	5351.	0.138	1369.	0.247	1890.	0.361	1654.	0.179
5	6333.	0.003	6414.	0.026	6816.	0.124	1714.	0.210	2324.	0.365	2073.	0.207
6	8040.	0.002	8133.	0.023	8605.	0.112	2138.	0.178	2833.	0.360	2563.	0.233
7	10082.	0.002	10191.	0.021	10745.	0.102	2650.	0.149	3426.	0.349	3127.	0.260
8	10306.	0.002	10426.	0.022	11481.	0.105	2691.	0.152	3499.	0.360	3210.	0.274
9					12224.	0.100	2806.	0.149	3624.	0.352	3322.	0.273
10							2995.	0.137	3827.	0.345	3505.	0.279

3.2.2 PLR Boundary Conditions

Damping properties of sandwich plates with PLR (fixed) boundary conditions are given in Figures 27 through 29. Only one value of the geometry parameter, $Y = 3.5$, is considered. This corresponds to the situation of equal face sheet thicknesses.

Natural frequencies of sandwich plates with PLR boundary conditions are given in Figures 30 through 32. Reference frequencies are given in Table 5.

A tabular presentation of the data for damping and natural frequencies of plates with PLR boundary conditions is given in Tables 18 through 20.

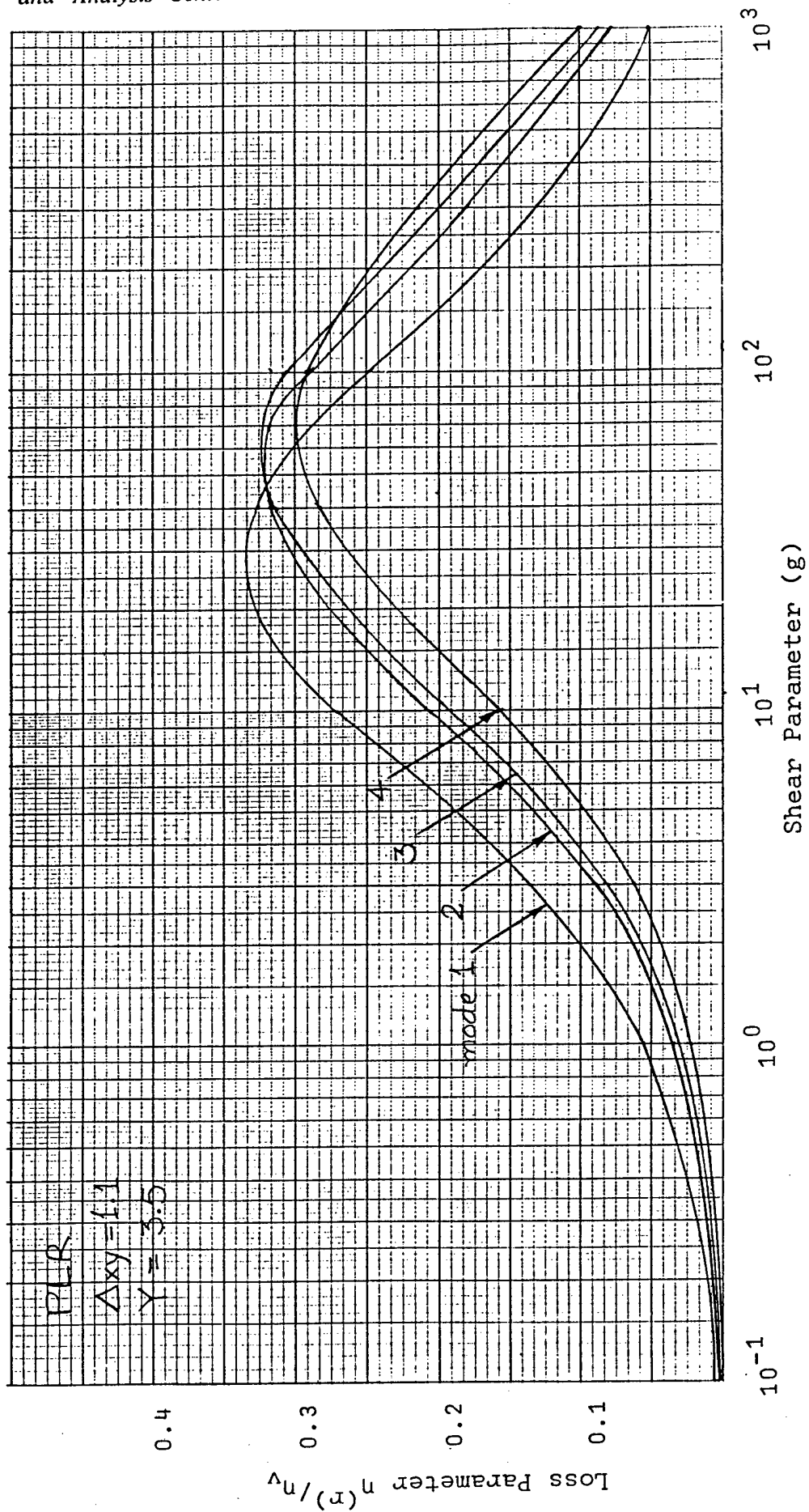


Figure 27 Damping of a sandwich rectangular plate,
PLR boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

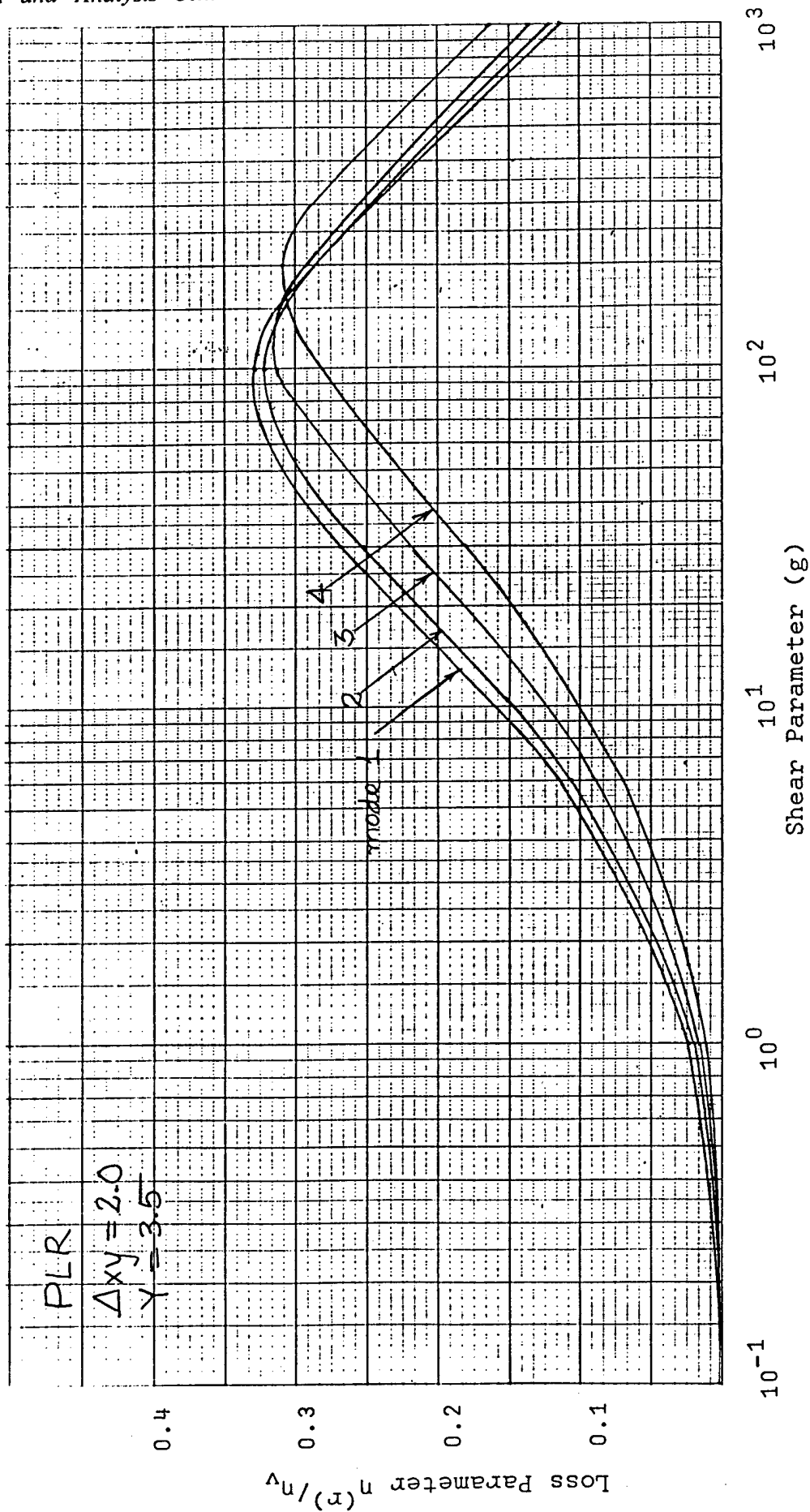


Figure 28 Damping of a sandwich rectangular plate,
PLR boundary conditions, $\Delta xy = 2.0$, $\gamma = 3.5$

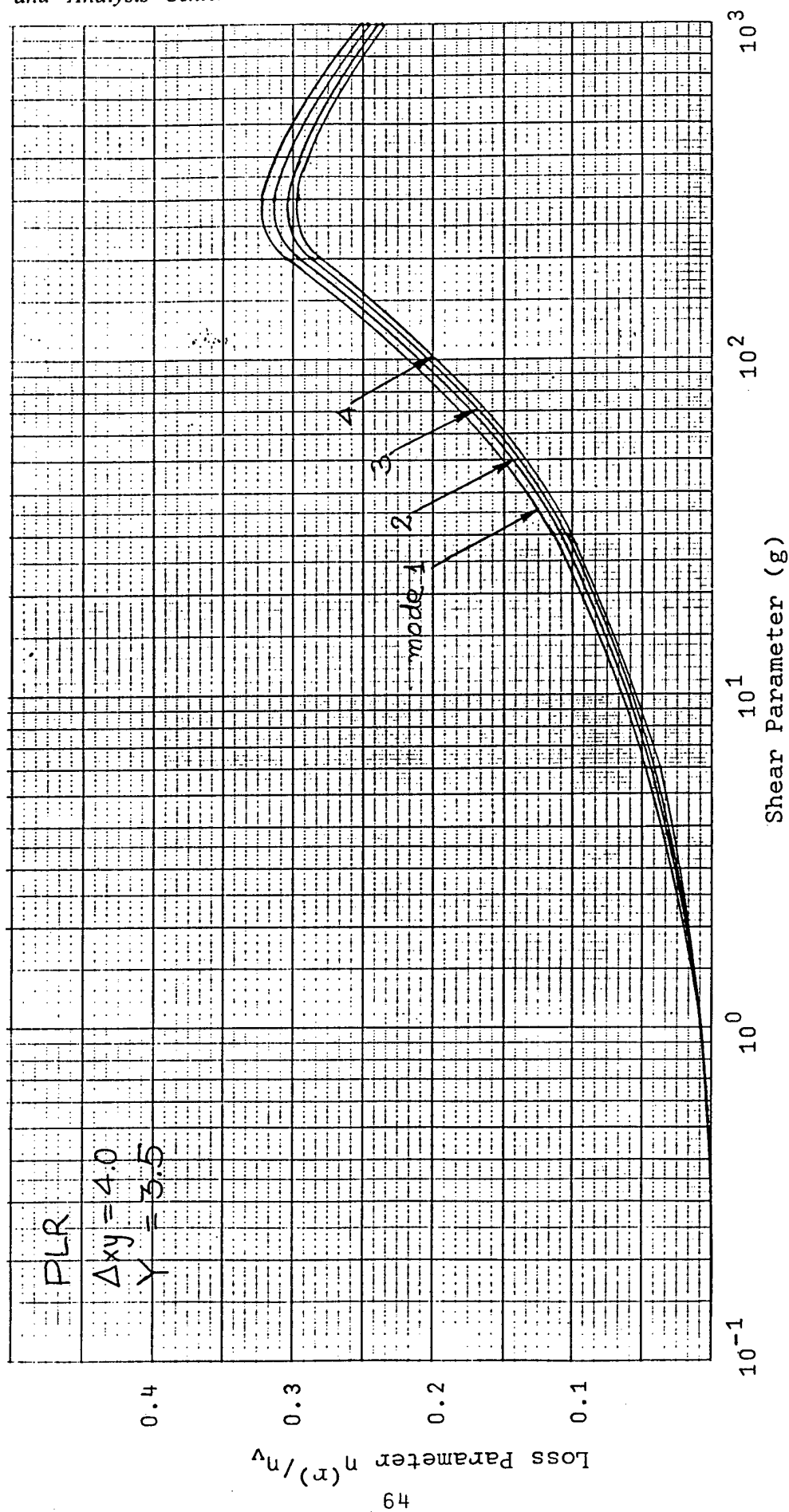


Figure 29 Damping of a sandwich rectangular plate,
PLR boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

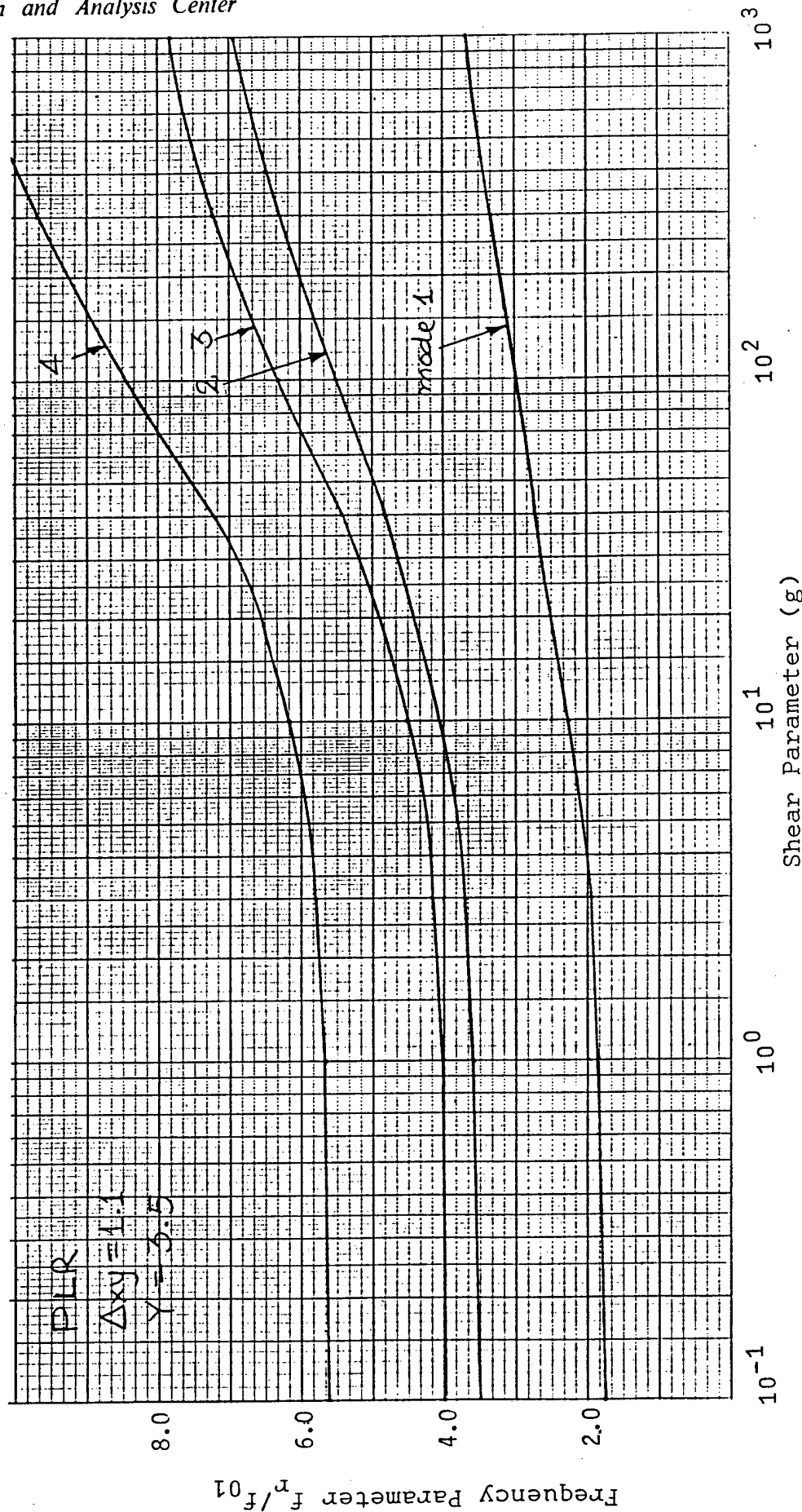


Figure 30 Natural frequencies of a rectangular sandwich plate, PLR boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

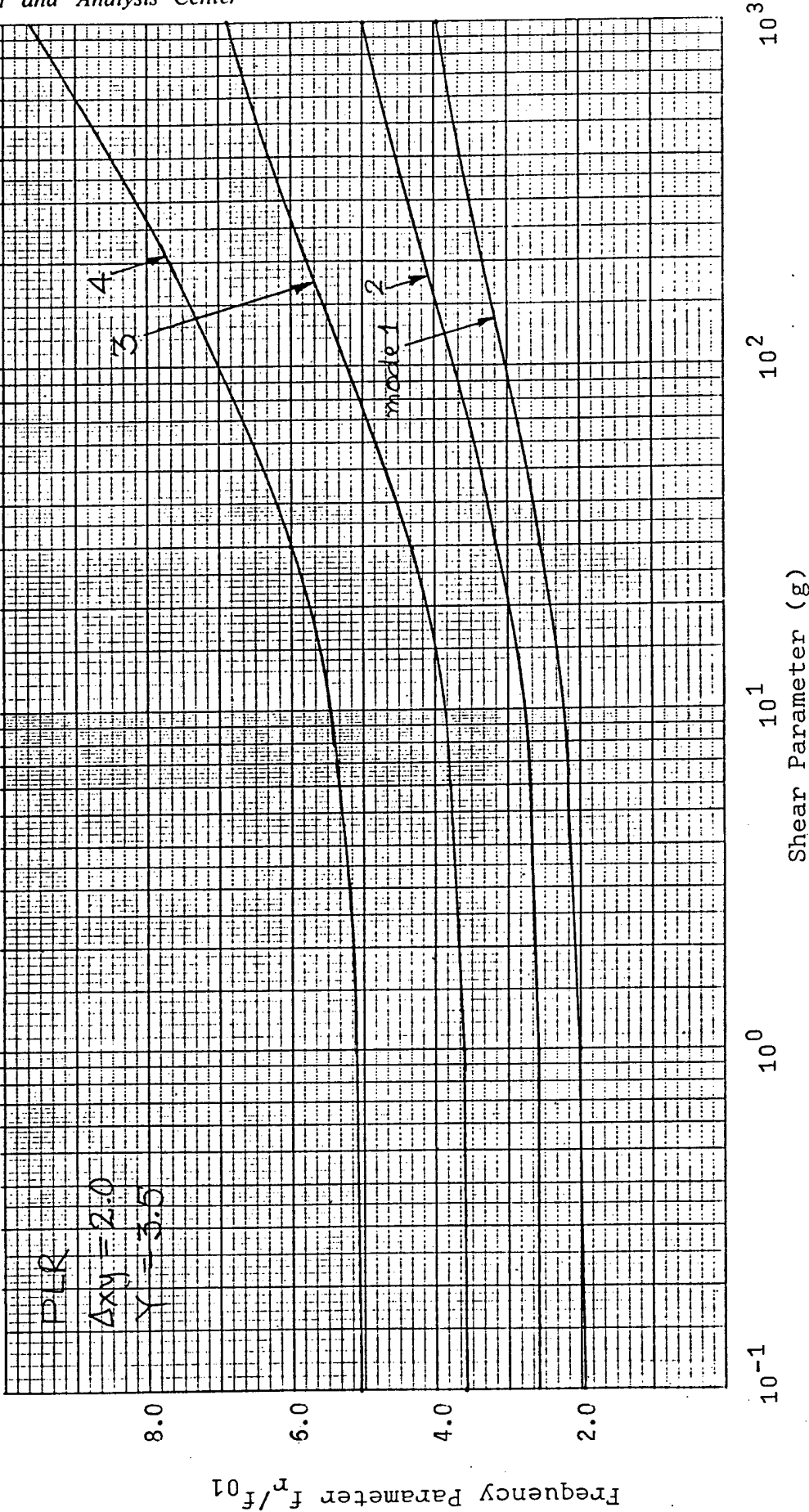


Figure 31 Natural frequencies of a rectangular sandwich plate, PLR boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

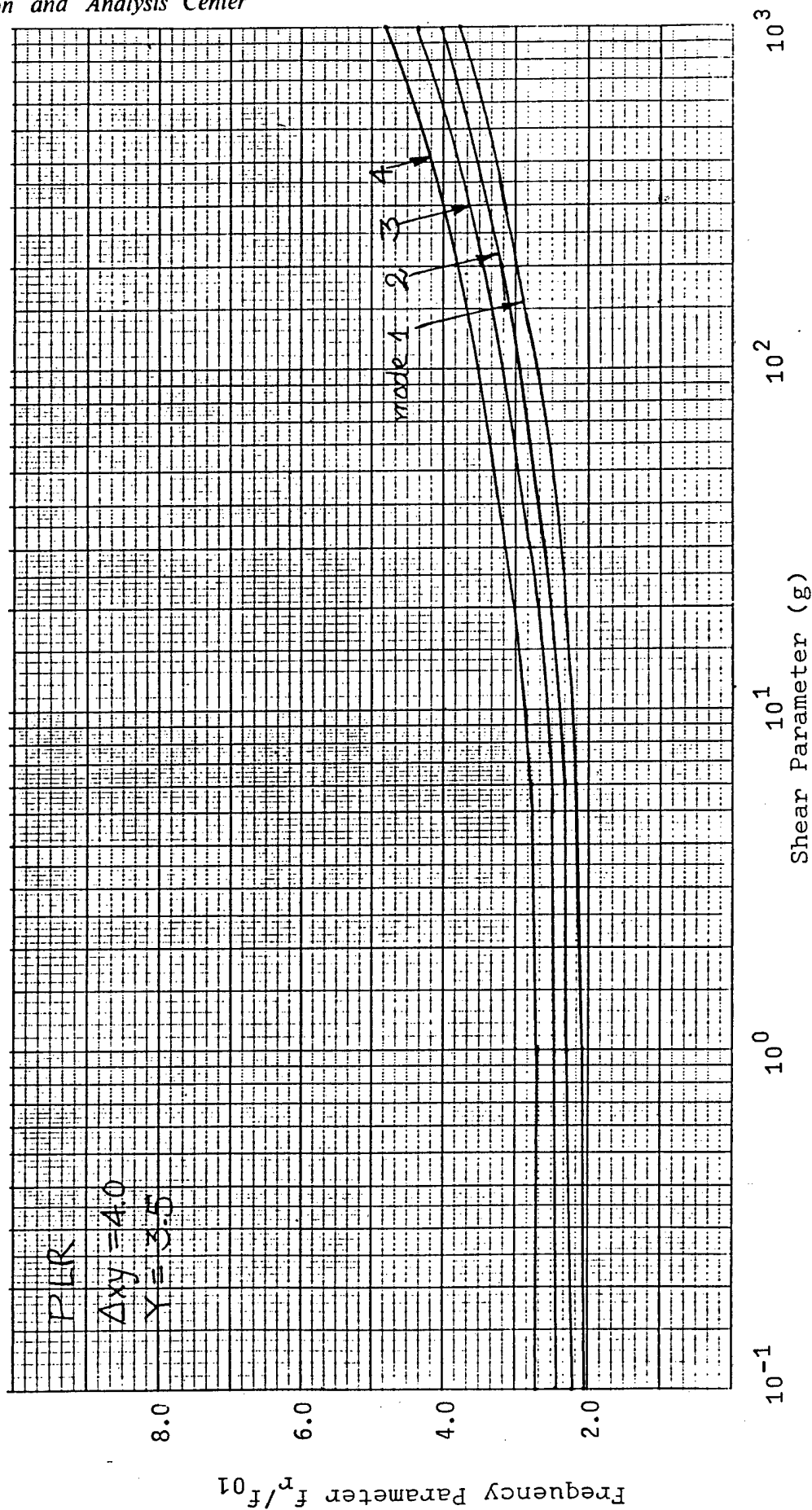


Figure 32 Natural frequencies of a rectangular sandwich plate, PLR boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

TABLE 18
MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PLR (zero translation, zero rotation, zero shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		10.		40.		100.		1000	
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)
1	959.	0.007	985.	0.055	1171.	0.272	259.	0.325	296.	0.248	346.	0.051
2	1852.	0.004	1884.	0.034	2130.	0.205	457.	0.316	529.	0.291	651.	0.077
3	2092.	0.003	2123.	0.03	2379.	0.192	504.	0.313	587.	0.306	735.	0.086
4	2947.	0.002	2982.	0.023	3278.	0.155	677.	0.283	792.	0.293	1004.	0.100
5	3312.	0.003	3348.	0.021	3643.	0.148	752.	0.276	868.	0.311	1126.	0.110
6	3892.	0.002	3928.	0.018	4244.	0.135	860.	0.263	997.	0.314	1315.	0.126
7	4362.	0.002	4398.	0.018	4718.	0.118	953.	0.243	1099.	0.289	1438.	0.125
8	4710.	0.002	4748.	0.015	5083.	0.111	1017.	0.236	1178.	0.287	1548.	0.133
9	5397.	0.002	5437.	0.013	5778.	0.105	1164.	0.209	1313.	0.287	1784.	0.147
10	6007.	0.001	6045.	0.012	6382.	0.092	1269.	0.205	1451.	0.271	1908.	0.152

TABLE 19
MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PLR (zero translation, zero rotation, zero shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)
1	2369.	0.002	2395.	0.024	2529.	0.116	525.	0.269	706.	0.285	827.	0.114
2	3049.	0.002	3080.	0.022	3240.	0.107	670.	0.252	892.	0.284	1050.	0.121
3	4275.	0.002	4311.	0.018	4499.	0.089	919.	0.221	1213.	0.292	1451.	0.134
4	6099.	0.001	6140.	0.0132	6360.	0.069	1277.	0.181	1639.	0.310	2037.	0.163
5	6200.	0.001	6238.	0.012	6439.	0.065	1284.	0.159	1661.	0.302	2042.	0.188
6	6786.	0.001	6824.	0.012	7029.	0.061	1411.	0.152	1783.	0.303	2210.	0.189
7	7975.	0.001	8017.	0.010	8239.	0.053	1651.	0.136	2065.	0.292	2562.	0.187
8	8503.	0.001	8550.	0.010	8800.	0.054	1749.	0.138	2213.	0.280	2768.	0.188
9	9469.	0.001	9511.	0.009	9741.	0.046	1972.	0.119	2419.	0.275	3000.	0.197
10	11406.	0.001	11457.	0.008	11734.	0.042	2334.	0.104	2852.	0.252	3603.	0.214

TABLE 20
MODAL FREQUENCIES AND MODAL LOSS FACTORS
Boundary Condition = PLR (zero translation, zero rotation, zero shear)
Aspect Ratio (Δxy) = 4.0
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets				Aluminum Face Sheets							
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)
1	8411.	0.001	8447.	0.009	8641.	0.048	1733.	0.110	2120.	0.306	2721.	0.251
2	8859.	0.001	8898.	0.009	9104.	0.048	1836.	0.110	2239.	0.298	2858.	0.247
3	9693.	0.001	9735.	0.009	9961.	0.046	2020.	0.108	2454.	0.289	3114.	0.241
4	10837.	0.001	10882.	0.008	11126.	0.045	2285.	0.105	2759.	0.284	3480.	0.241
5	12635.	0.001	12686.	0.008	12961.	0.041	2664.	0.097	3195.	0.275	4033.	0.240
6	14903.	0.001	14960.	0.007	15268.	0.037	3148.	0.086	3734.	0.263	4723.	0.244
7	17806.	0.001	17870.	0.006	18215.	0.032	3759.	0.074	4398.	0.245	5574.	0.251
8	20458.	0.001	20524.	0.005	20886.	0.031	4427.	0.064	5083.	0.233	6396.	0.264
9	22487.	0.000	22554.	0.004	22920.	0.025	4961.	0.045	5524.	0.181	6854.	0.266
10	23007.	0.000	23074.	0.004	23433.	0.023	5094.	0.043	5663.	0.174	6999.	0.259

3.2.3 PTR Boundary Conditions

Damping properties of sandwich plates with PTR (simply-supported, riveted) boundary conditions are given in Figures 33 through 35. Again, only a single value of the geometry parameter, $Y = 3.5$, is considered.

Natural frequencies of sandwich plates with PTR boundary conditions are given in Figures 36 through 38. Reference frequencies are given in Table 5.

A tabular presentation of the data for damping and natural frequencies of plates with PTR boundary conditions is given in Tables 21 through 23.

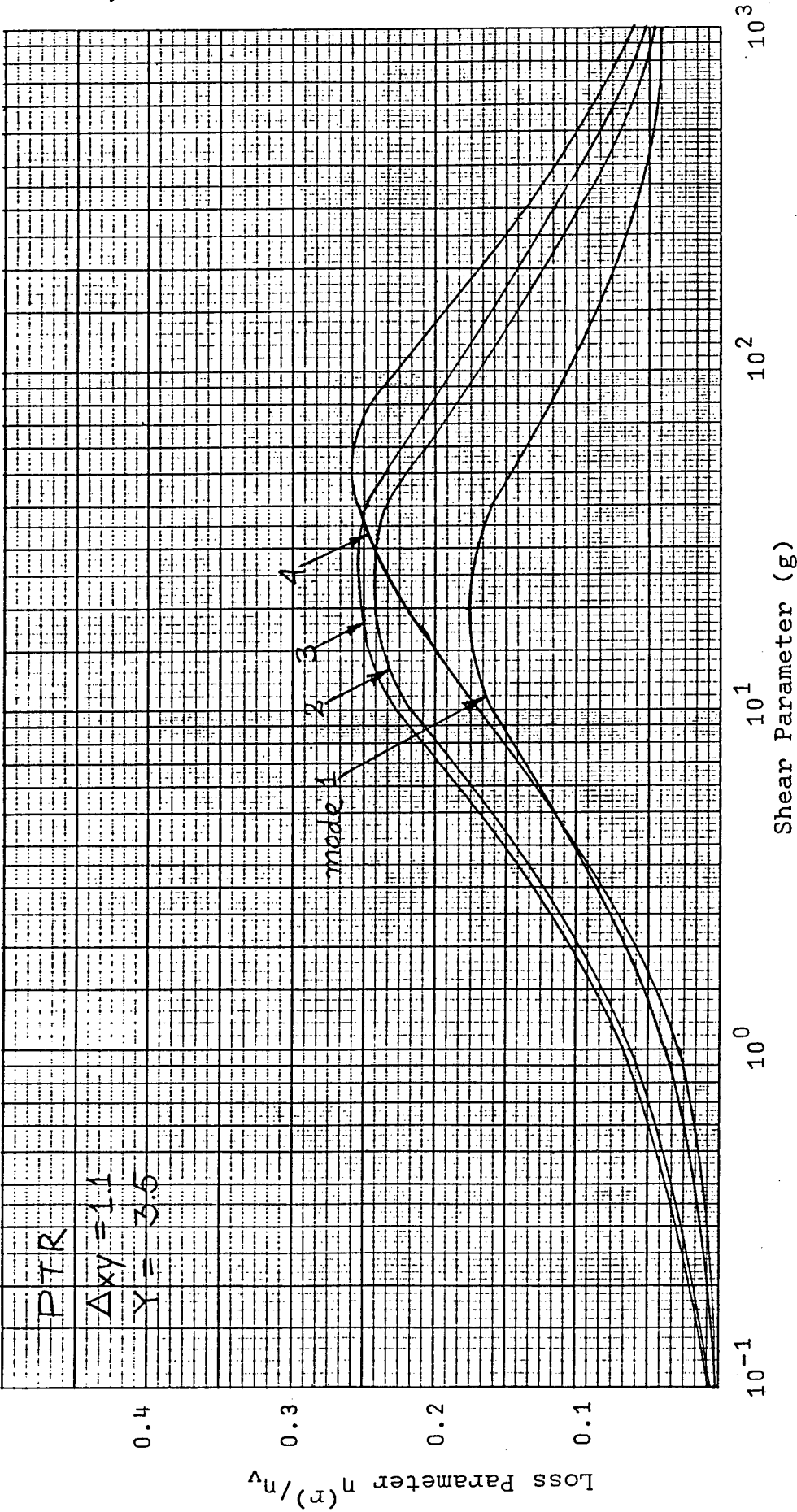


Figure 33 Damping of a sandwich rectangular plate, PTR boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

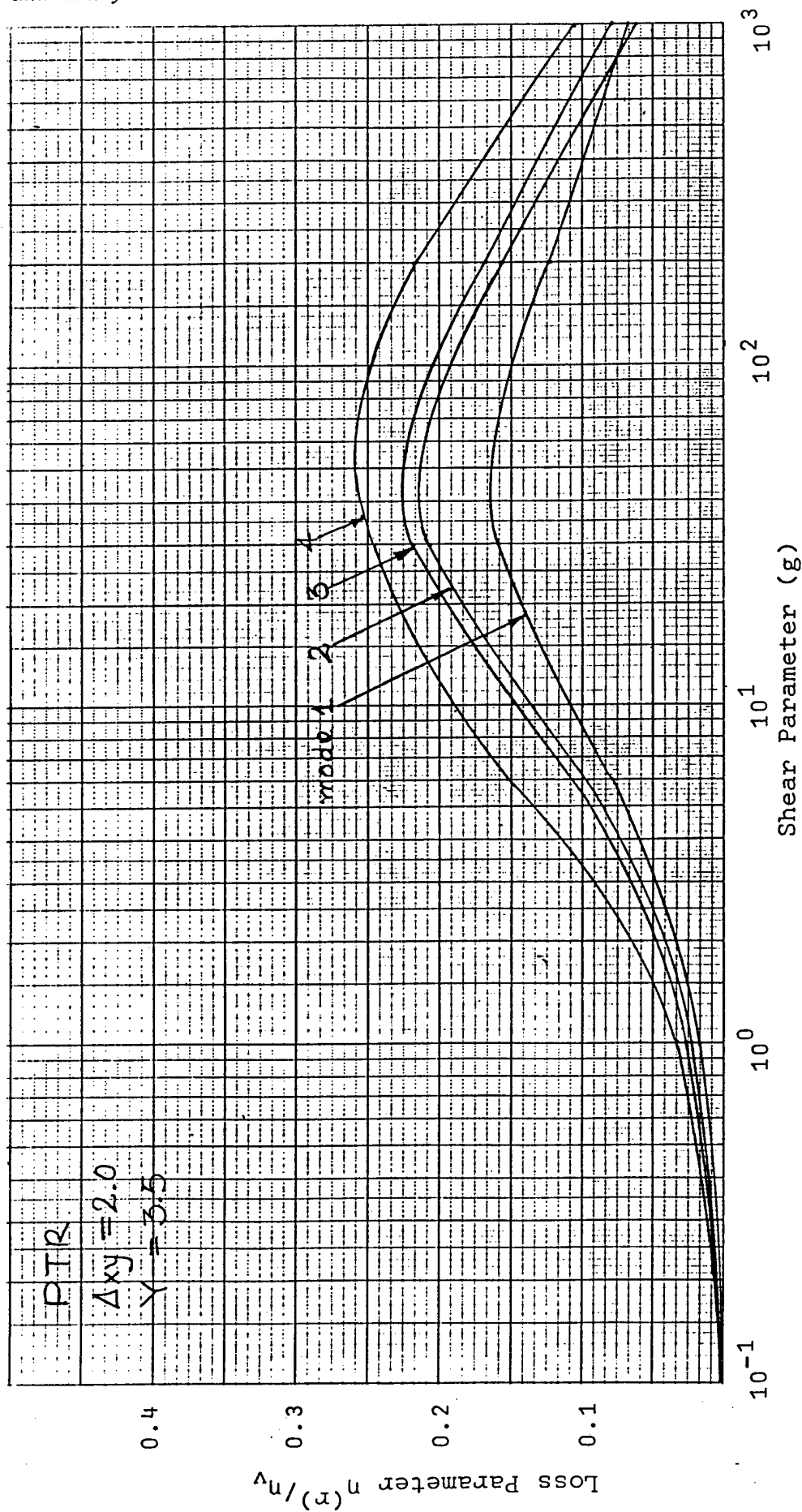


Figure 34 Damping of a sandwich rectangular plate, PTR boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

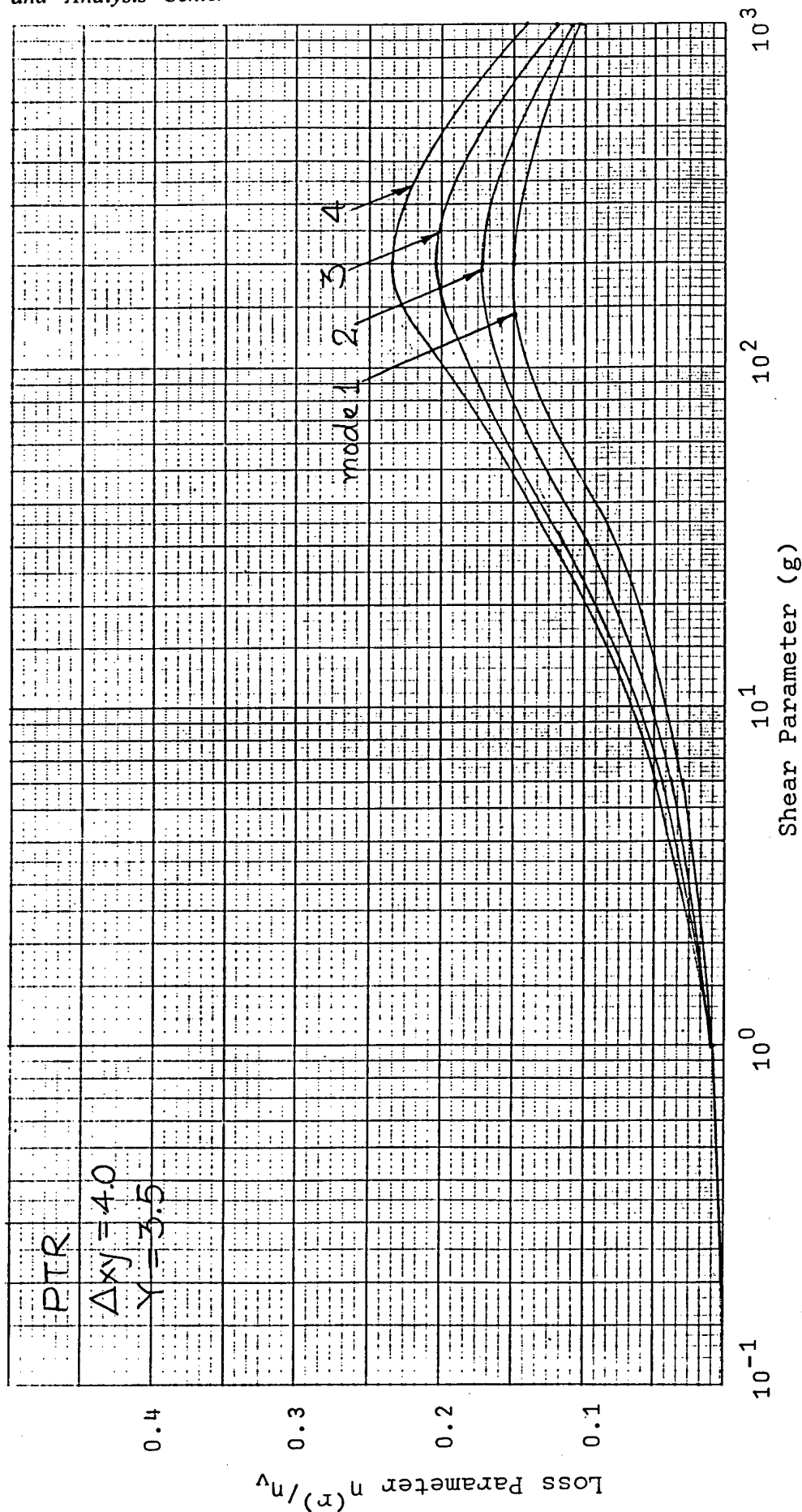


Figure 35 Damping of a sandwich rectangular plate, PTR boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

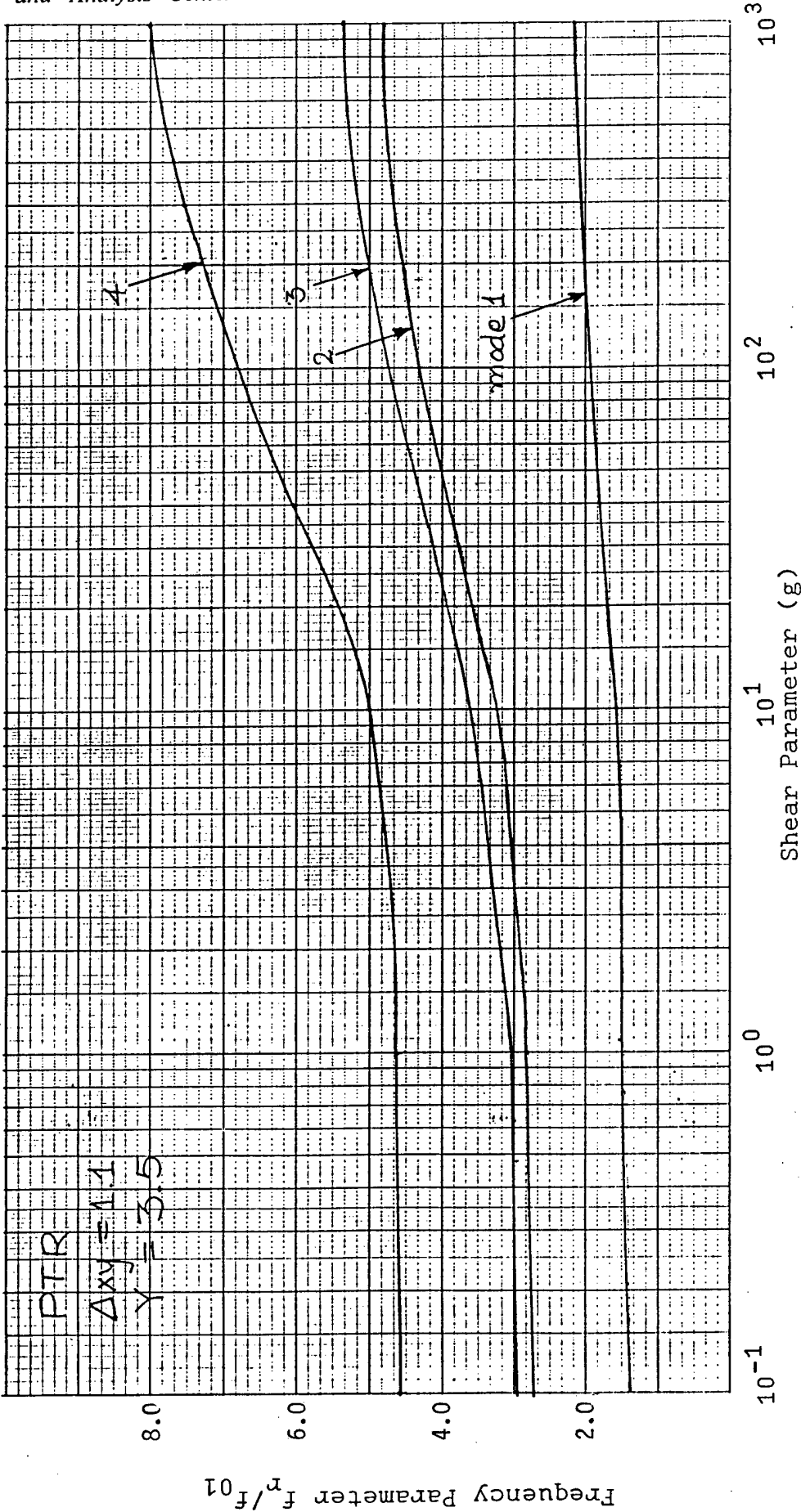


Figure 36 Natural frequencies of a rectangular sandwich plate, PTR boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

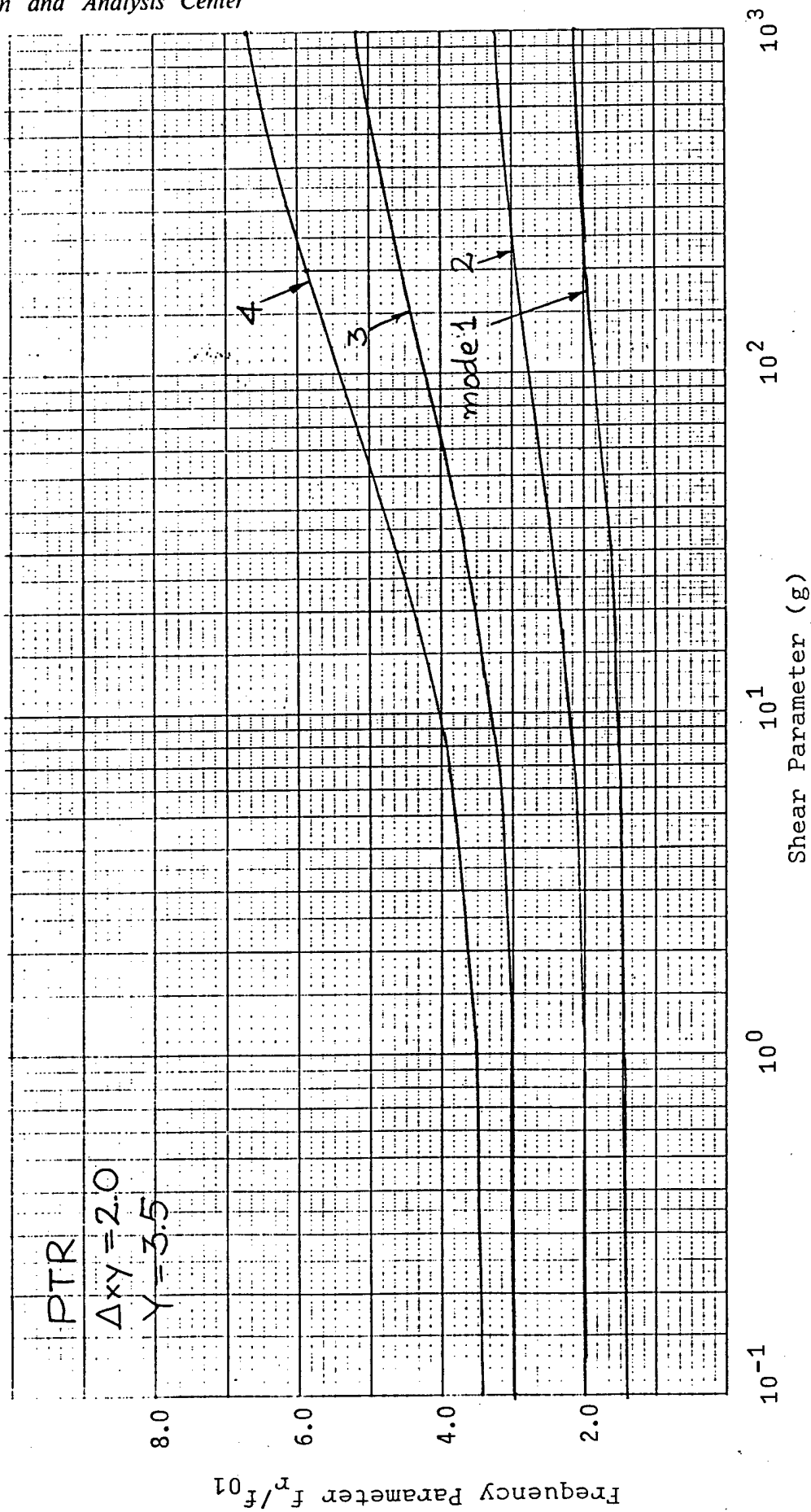


Figure 37 Natural frequencies of a rectangular sandwich plate, PTR boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

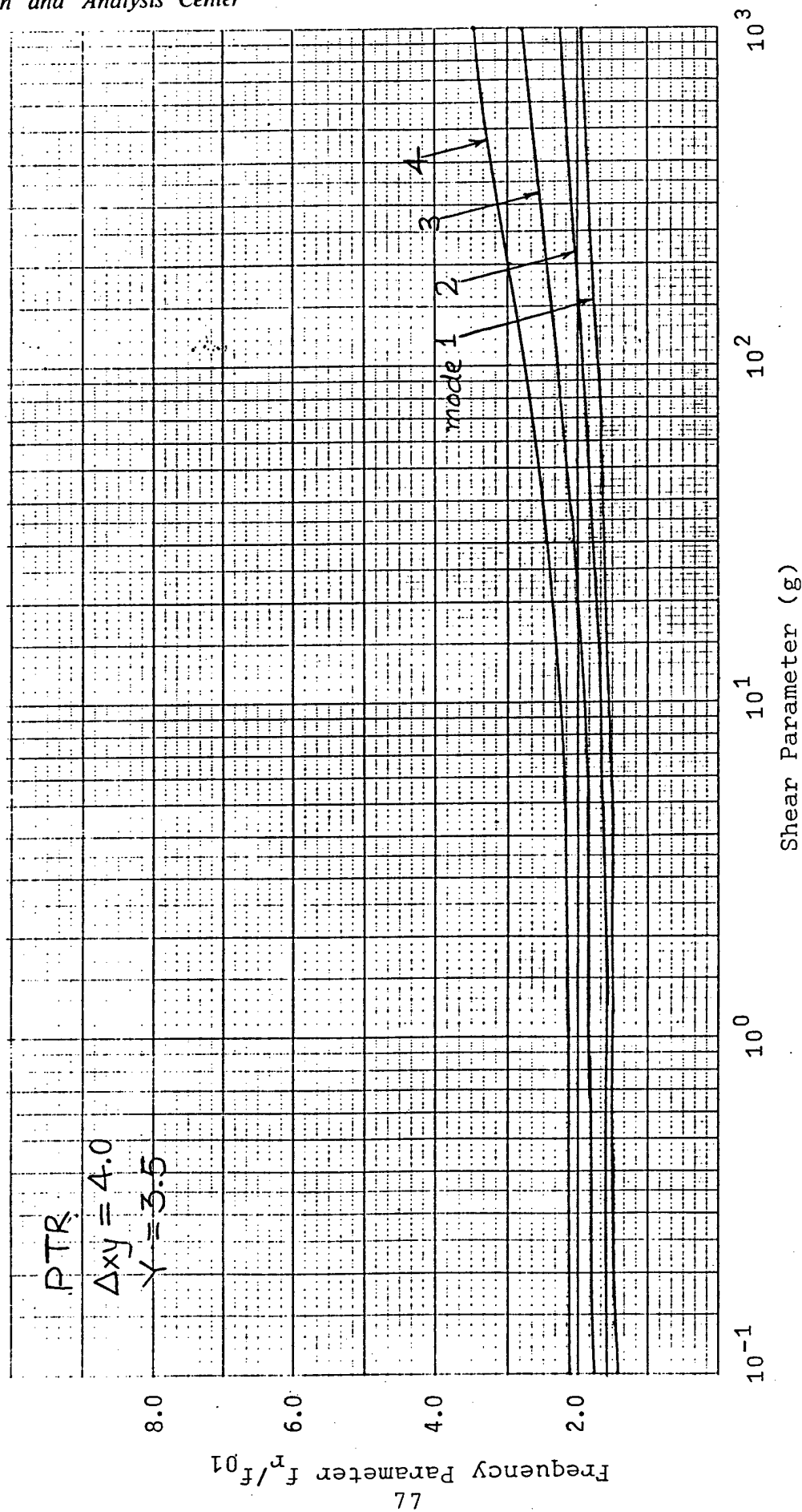


Figure 38 Natural frequencies of a rectangular sandwich plate, PTR boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

TABLE 21

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PTR (zero translation, unrestrained rotation, zero shear)

Aspect Ratio (Δ_{xy}) = 1.1Geometric Parameter (γ) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		10.		40.		300.		1000.	
	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)
1	751.	0.004	764.	0.037	854.	0.161	172.	0.161	192.	0.06	197.	0.043
2	1443.	0.007	1486.	0.059	1743.	0.217	367.	0.236	436.	0.093	454.	0.039
3	1548.	0.007	1579.	0.062	1890.	0.227	400.	0.249	485.	0.111	510.	0.056
4	2409.	0.003	2444.	0.030	2719.	0.171	568.	0.249	709.	0.133	752.	0.060
5	2719.	0.003	2762.	0.032	3091.	0.181	648.	0.266	821.	0.150	876.	0.063
6	3113.	0.003	3154.	0.027	3492.	0.170	729.	0.268	940.	0.172	1016.	0.083
7	3669.	0.002	3707.	0.021	4024.	0.137	830.	0.240	1065.	0.175	1151.	0.080
8	3888.	0.002	3928.	0.020	4265.	0.137	880.	0.242	1137.	0.185	1238.	0.090
9	4372.	0.004	4449.	0.032	4969.	0.152	1026.	0.237	1344.	0.196	1475.	0.096
10	5054.	0.003	5139.	0.029	5474.	0.110	1119.	0.216	1443.	0.216	1592.	0.110

TABLE 22
MODAL FREQUENCIES AND MODAL LOSS FACTORS
Boundary Condition = PTR (zero translation, unrestrained rotation, zero shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets			6.			30.			Aluminum Face Sheets		
	0.1			1.0			200.			1000.		
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)
1	1707.	0.002	1721.	0.018	1789.	0.079	353.	0.160	410.	0.123	441.	0.068
2	2374.	0.003	2401.	0.024	2532.	0.106	519.	0.207	629.	0.157	685.	0.064
3	3541.	0.002	3576.	0.021	3752.	0.098	772.	0.218	973.	0.204	1091.	0.078
4	4117.	0.004	4198.	0.039	4571.	0.153	984.	0.244	1248.	0.218	1427.	0.105
5	5092.	0.002	5146.	0.021	5415.	0.098	1113.	0.200	1416.	0.233	1633.	0.114
6	5162.	0.002	5210.	0.018	5449.	0.086	1126.	0.204	1425.	0.248	1655.	0.108
7	6464.	0.001	6509.	0.013	6738.	0.067	1370.	0.167	1709.	0.239	2000.	0.122
8	7323.	0.001	7376.	0.014	7653.	0.068	1548.	0.168	1966.	0.266	2356.	0.137
9	8075.	0.001	8117.	0.010	8341.	0.053	1690.	0.140	2081.	0.254	2475.	0.144
10	9642.	0.002	9695.	0.011	10003.	0.057	2015.	0.148	2495.	0.255	3005.	0.164

TABLE 23.

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition	=	PTR (zero translation, unrestrained rotation, zero shear)
Aspect Ratio (Δxy)	=	4.0
Geometric Parameter (γ)	=	3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.		30.		200.		1000.	
	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)
1	5920.	0.001	5935.	0.006	6020.	0.030	1143.	0.072	1279.	0.148	1428.	0.106
2	6415.	0.001	6440.	0.007	6557.	0.038	1272.	0.097	1462.	0.171	1650.	0.110
3	7335.	0.001	7364.	0.008	7522.	0.043	1488.	0.115	1756.	0.202	2018.	0.121
4	8640.	0.001	8676.	0.009	8871.	0.047	1787.	0.120	2142.	0.234	2516.	0.143
5	10500.	0.001	10543.	0.008	10781.	0.044	2184.	0.114	2633.	0.250	3163.	0.164
6	12783.	0.001	12840.	0.008	12634.	0.040	2673.	0.103	3206.	0.256	3925.	0.187
7	13740.	0.002	13880.	0.160	14582.	0.080	3266.	0.089	3874.	0.250	4804.	0.211
8	14863.	0.001	14983.	0.130	15612.	0.066	3298.	0.188	4138.	0.250	4999.	0.180
9	15560.	0.001	15620.	0.007	15950.	0.036	3481.	0.155	4284.	0.236	5174.	0.179
10	16520.	0.001	16620.	0.010	17153.	0.053	3762.	0.124	4519.	0.231	5458.	0.188

3.2.4 PWU Boundary Conditions

A situation that might lead to PWU or PWR boundary conditions is shown in Figure 39. A structure is fabricated by butt welding of plate sections that contain an integral damping treatment. One leg of the weldment sees a constraint on shearing of the sandwich core (PWR), while the other [PWU] does not. Both see some restraint on bending rotation at the welded boundary but it is not held exactly to zero. The restraint is approximated as a pure stiffness and is evaluated, somewhat arbitrarily, as follows. The degree of elastic restraint is taken to be equal to the rotational stiffness of the hypothetical plate used to calculate the reference frequencies. The hypothetical plate has the dimensions of the actual plate but with a flexural stiffness $(EI)_{eqv}$ equal to the sum of the flexural stiffnesses of the upper and lower face sheets. The rotational stiffness at the edge of the hypothetical plate is calculated for that edge unrestrained and a clamped condition imposed on the opposite edge.

Damping as a function of the shear parameter for the first four modes of a rectangular sandwich plate with PWU boundary conditions and a geometry parameter of $Y = 3.5$ is shown in Figures 40 through 42.

Natural frequencies for sandwich plates with PWU boundary conditions are given in Figures 43 through 45. Reference frequencies are given in Table 5.

A tabular presentation of the data in Figures 40 through 45 is given in Tables 24 through 26, as well as results for the fifth and higher modes.

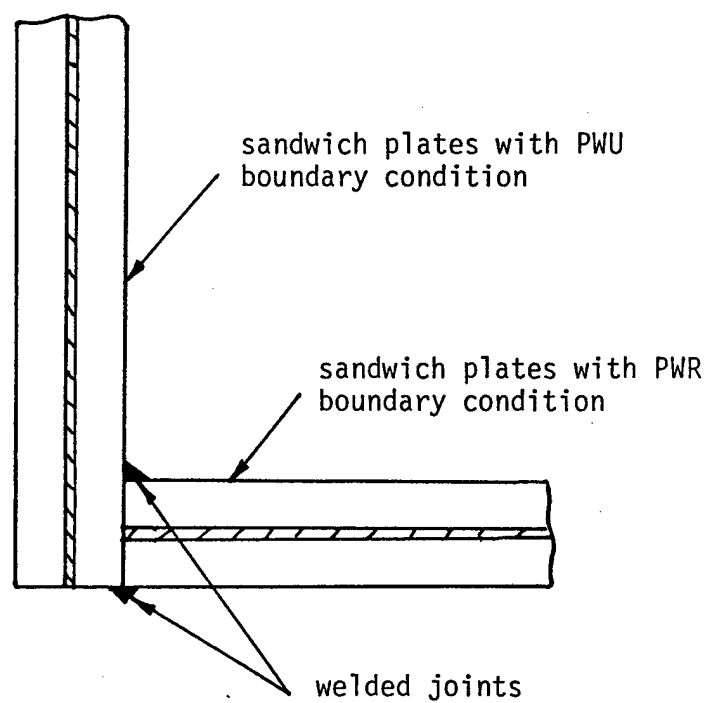


Figure 39 Sandwich plates with PWU and PWR boundary conditions

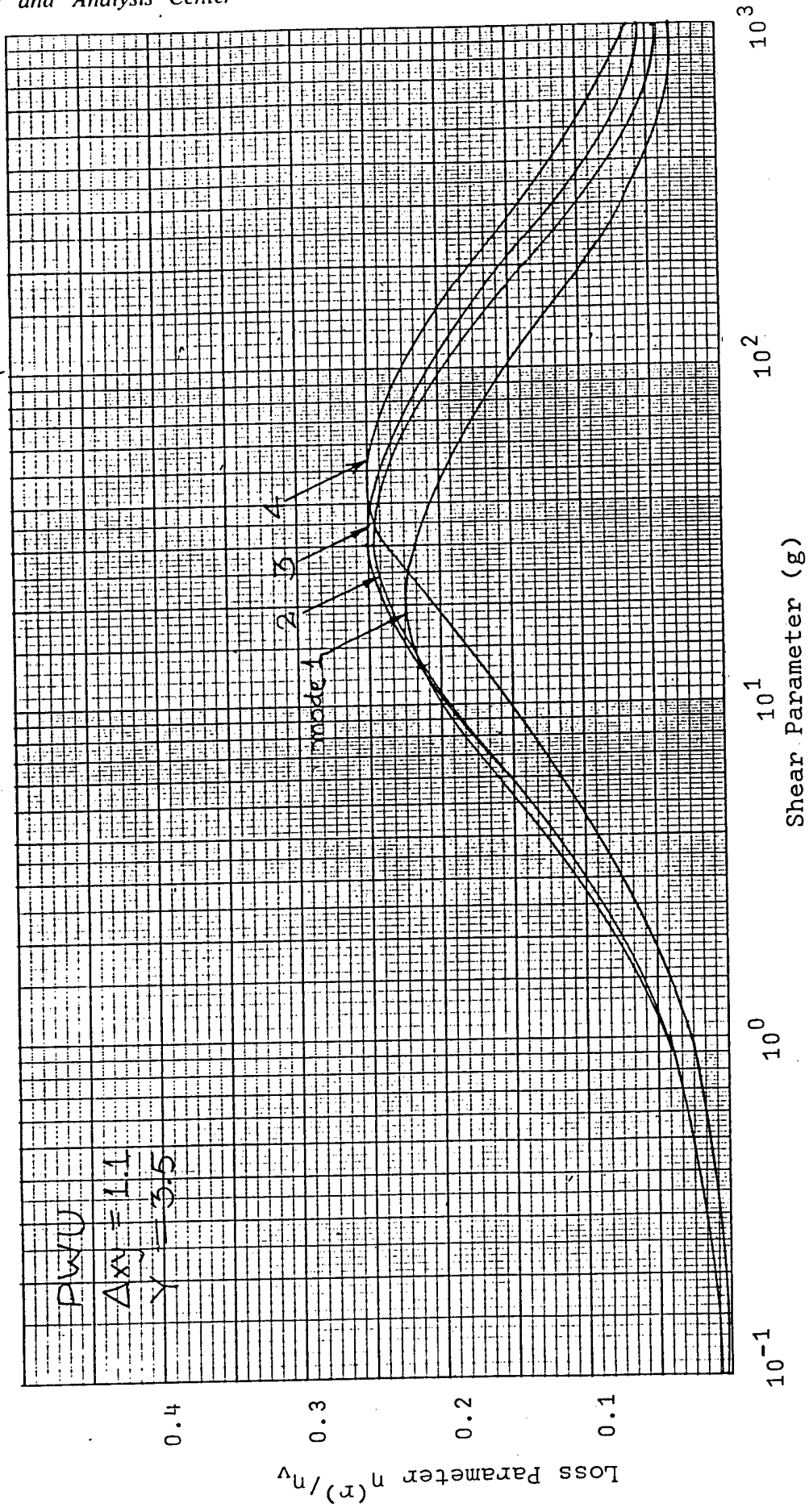


Figure 40 Damping of a sandwich rectangular plate, PWU boundary conditions, $\Delta x_y = 1.1$, $Y = 3.5$

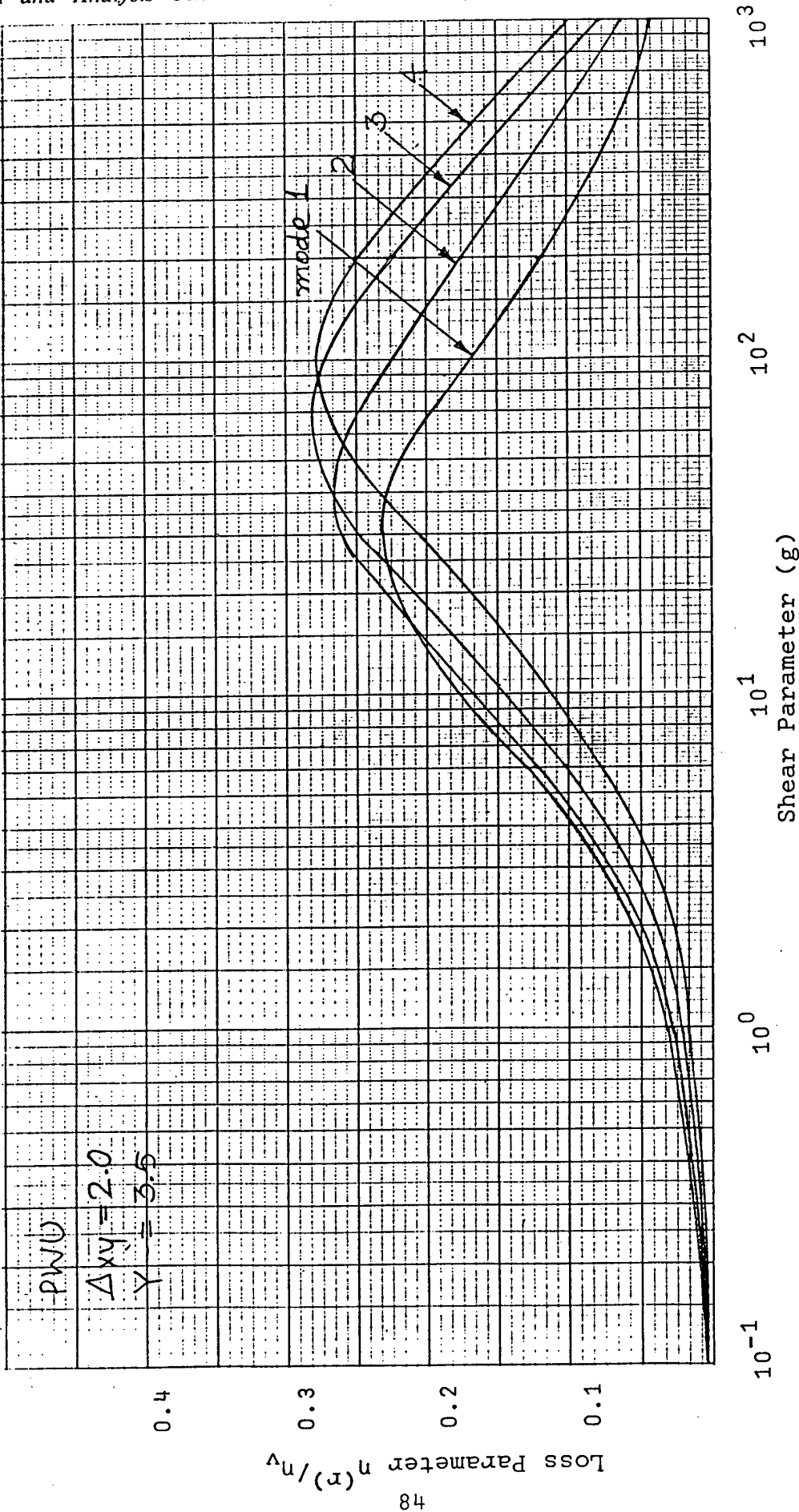


Figure 41 Damping of a sandwich rectangular plate, PWU
boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

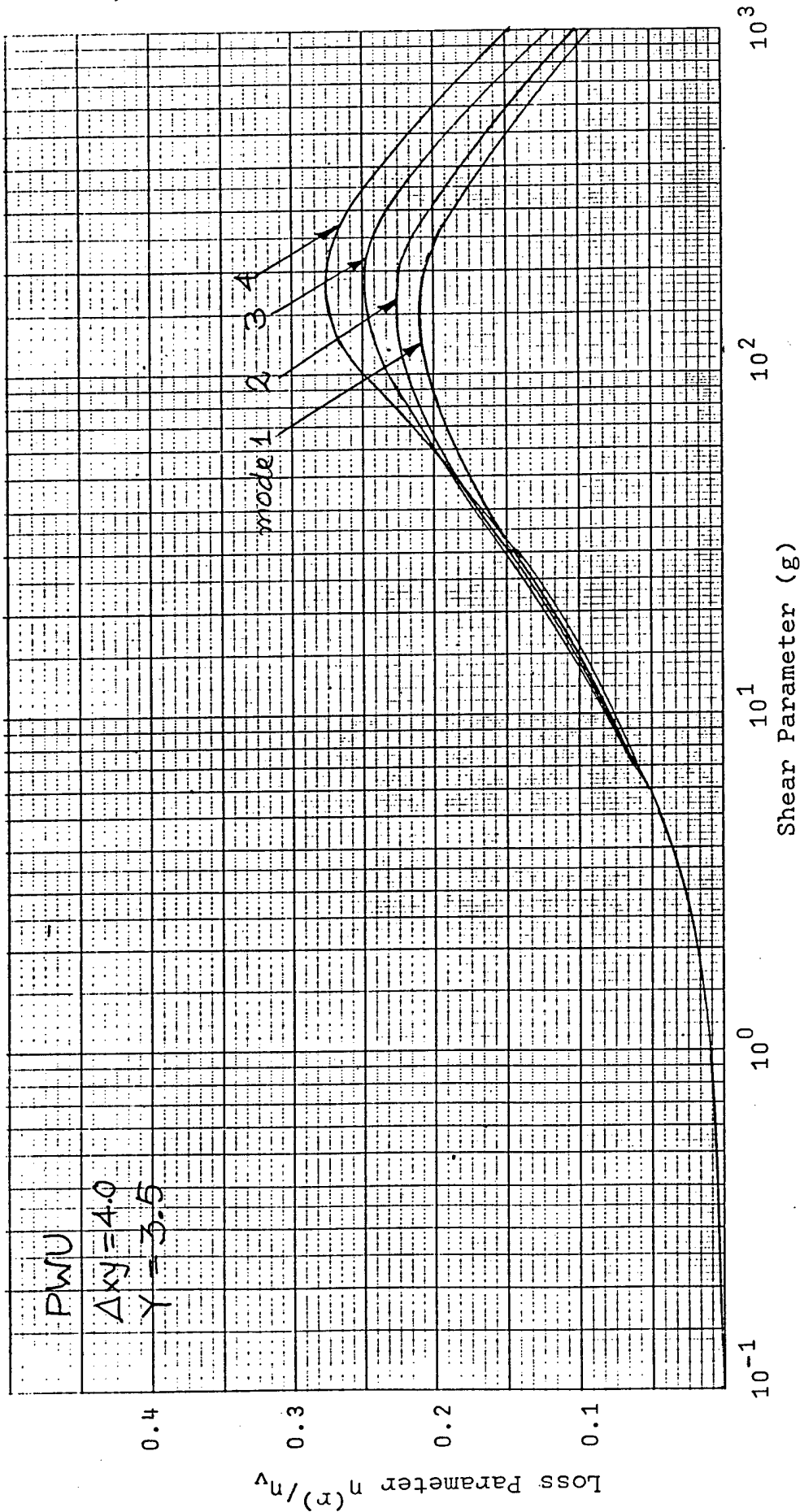


Figure 42 Damping of a sandwich rectangular plate, PWU boundary conditions, $\Delta xy = 4.0$, $\gamma = 3.5$

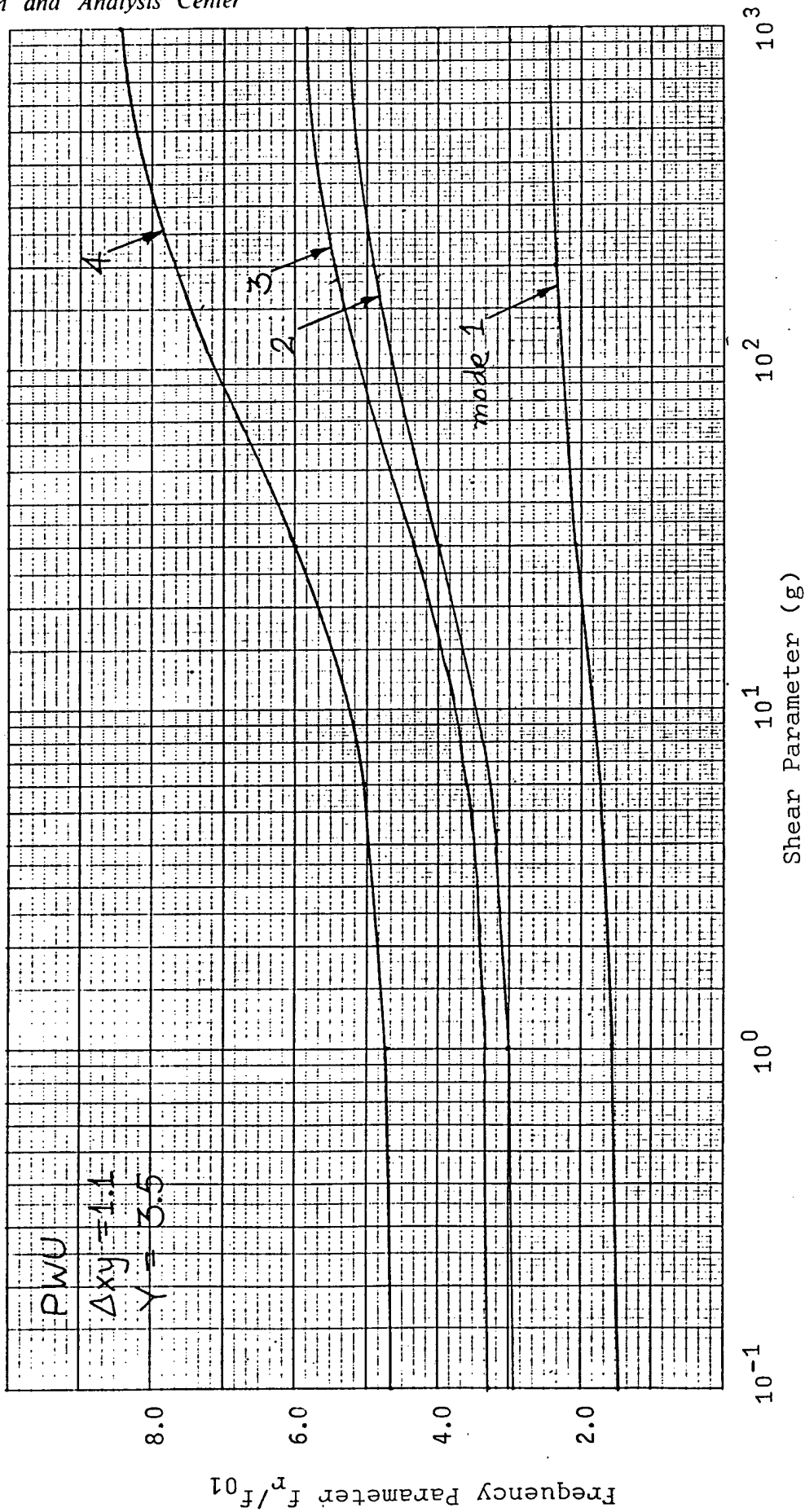


Figure 43 Natural frequencies of a rectangular sandwich plate,
PWU boundary conditions, $\Delta xy = 1.1$, $\gamma = 3.5$

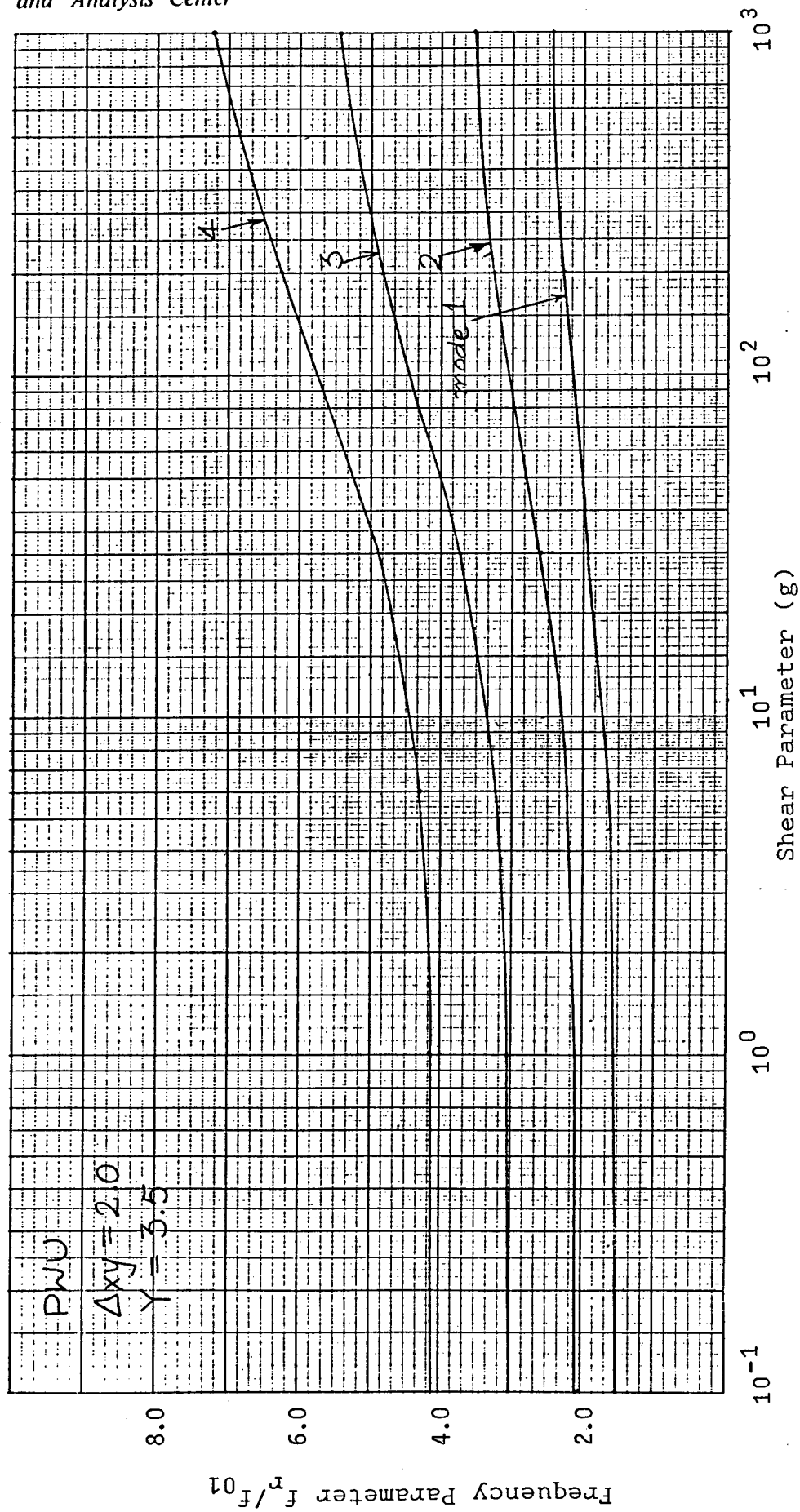


Figure 44 Natural frequencies of a rectangular sandwich plate,
PWU boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

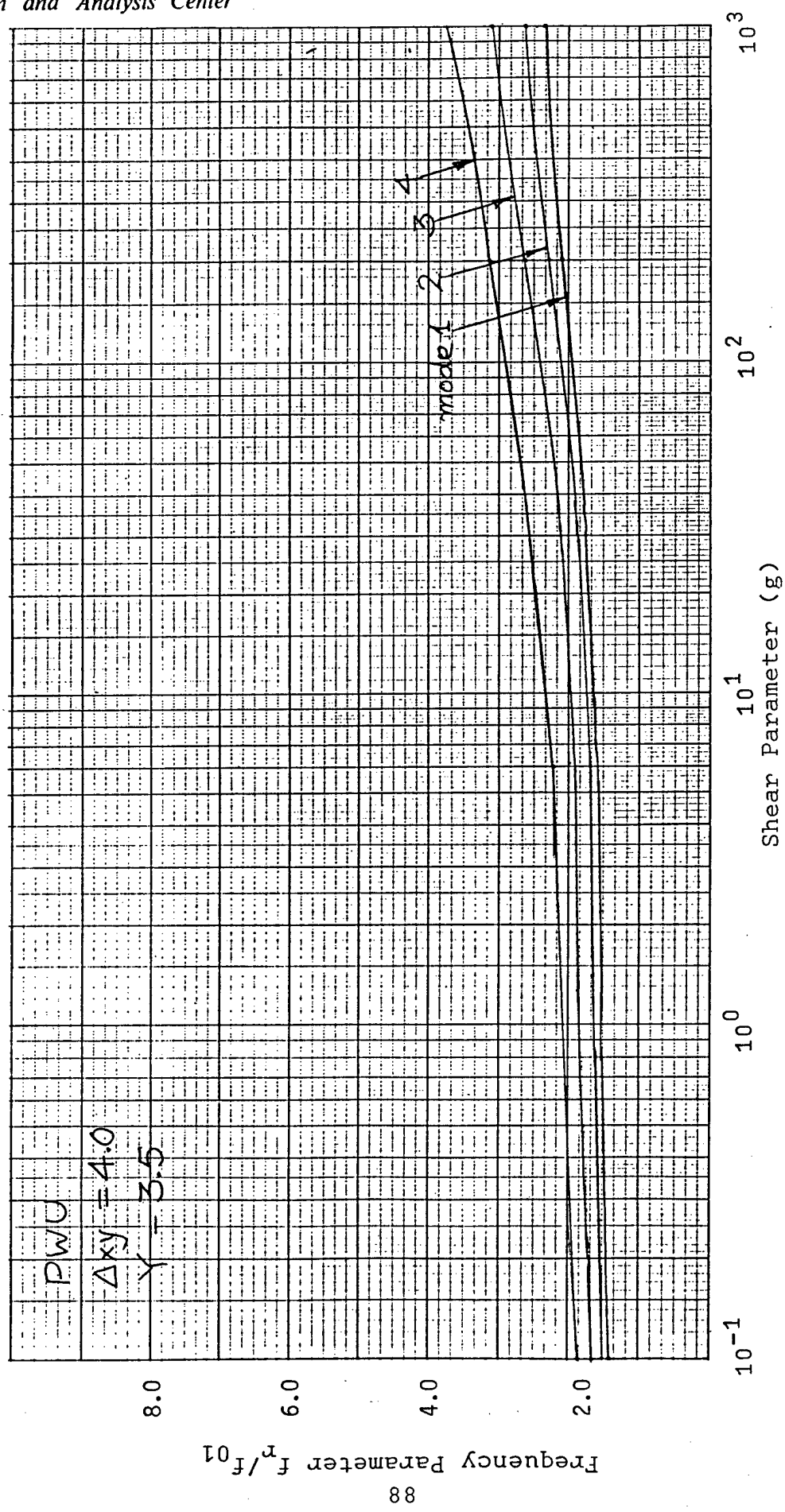


Figure 45 Natural frequencies of a rectangular sandwich plate, PWU boundary conditions, $\Delta xy = 4.0$, $\gamma = 3.5$

TABLE 24

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PWJ (zero translation, elastically restrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets				Aluminum Face Sheets							
	0.1		1.		6.		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)
1	780.	0.008	805.	0.066	907.	0.207	195.	0.215	222.	0.075	231.	0.026
2	1552.	0.004	1583.	0.041	1728.	0.170	374.	0.280	462.	0.134	492.	0.038
3	1719.	0.004	1751.	0.038	1902.	0.162	409.	0.283	511.	0.145	548.	0.041
4	2452.	0.003	2486.	0.028	2654.	0.130	562.	0.274	723.	0.184	794	0.056
5	2815.	0.003	2850.	0.025	3024.	0.121	633.	0.270	824.	0.210	917.	0.067
6	3238.	0.002	3274	0.023	3458.	0.111	718.	0.261	941.	0.228	1061.	0.076
7	3679.	0.002	3715.	0.020	3899.	0.097	805.	0.242	1052.	0.235	1195.	0.083
8	3940.	0.002	3977.	0.019	4167.	0.093	856.	0.237	1122.	0.244	1284.	0.089
9	4657.	0.002	4697.	0.016	4900.	0.082	991.	0.211	1304.	0.257	1518.	0.106
10	5077.	0.001	5114.	0.015	5308.	0.076	1080.	0.206	1400.	0.270	1638.	0.112

TABLE 25

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition = PWU (zero translation, elastically restrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 2.0
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets			Aluminum Face Sheets								
	0.1			6.			30.			200.		
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Loss Parameter ($\bar{n}$)
1	1801.	0.003	0.031	1827.	0.031	0.132	407.	0.230	0.123	487.	0.123	518.
2	2446.	0.003	0.027	2477.	0.027	0.123	552.	0.257	0.172	694.	0.172	755.
3	3591.	0.002	0.021	3628.	0.021	0.102	789.	0.246	0.228	1024.	0.228	1156.
4	4904.	0.002	0.015	4941.	0.015	0.078	1036.	0.204	0.249	1329.	0.249	1531.
5	5260.	0.002	0.015	5301.	0.015	0.079	1117.	0.209	0.273	1461.	0.273	1716.
6	5495.	0.002	0.014	5532.	0.014	0.073	1158.	0.326	0.317	1483.	0.317	1729.
7	6604.	0.001	0.012	6643.	0.012	0.063	1379.	0.346	0.319	1761.	0.319	2090.
8	7447.	0.001	0.012	7493.	0.012	0.061	1543.	0.369	0.323	1985.	0.323	2413.
9	8072.	0.001	0.010	8113.	0.010	0.054	1678.	0.371	0.323	2113.	0.323	2554.
10	10072.	0.001	0.001	10084.	0.001	0.047	2041.	0.362	0.308	2531.	0.308	3118.

TABLE 26
MODAL FREQUENCIES AND MODAL LOSS FACTORS
Boundary Condition = PWU (zero translation, elastically restrained rotation, unrestrained shear)
Aspect Ratio (Δxy) = 4.0
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.		6.		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)
1	5643.	0.002	6094.	0.011	6258.	0.055	1245.	0.148	1506.	0.204	1701.	0.092
2	6062.	0.001	6587.	0.011	6765.	0.055	1354.	0.151	1658.	0.225	1899.	0.103
3	6553.	0.001	7480.	0.010	7679.	0.054	1544.	0.150	1911.	0.250	2236.	0.122
4	7442.	0.001	8757.	0.010	8979.	0.052	1817.	0.142	2255.	0.275	2700.	0.148
5	8715.	0.001	10604.	0.009	1086.	0.047	2192	0.127	2709.	0.285	3320.	0.175
6	10556.	0.001	12895.	0.008	13184.	0.042	2664.	0.110	3251.	0.283	4055.	0.201
7	12841.	0.001	15690.	0.007	16016.	0.037	3244.	0.093	3892.	0.272	4912.	0.225
8	15629.	0.001	17662.	0.006	17990.	0.031	3641.	0.076	4254.	0.241	5277.	0.217
9	17600.	0.001	18219.	0.005	18575.	0.032	3762.	0.073	4384.	0.235	5440.	0.217
10	18156.	0.001	18474.	0.006	18826.	0.034	3894.	0.078	4570.	0.261	5702.	0.224

3.2.5 PWR Boundary Conditions

Damping as a function of the shear parameter for the first four modes of a rectangular sandwich plate with PWR boundary conditions and a geometry parameter of $Y = 3.5$ is shown in Figures 46 through 48.

Natural frequencies for sandwich plates with PWR boundary conditions are shown in Figures 49 through 51. Reference frequencies are given in Table 5.

A tabular presentation of the data in Figures 46 through 51 is given in Tables 27 through 29, as well as results for the fifth and higher modes.

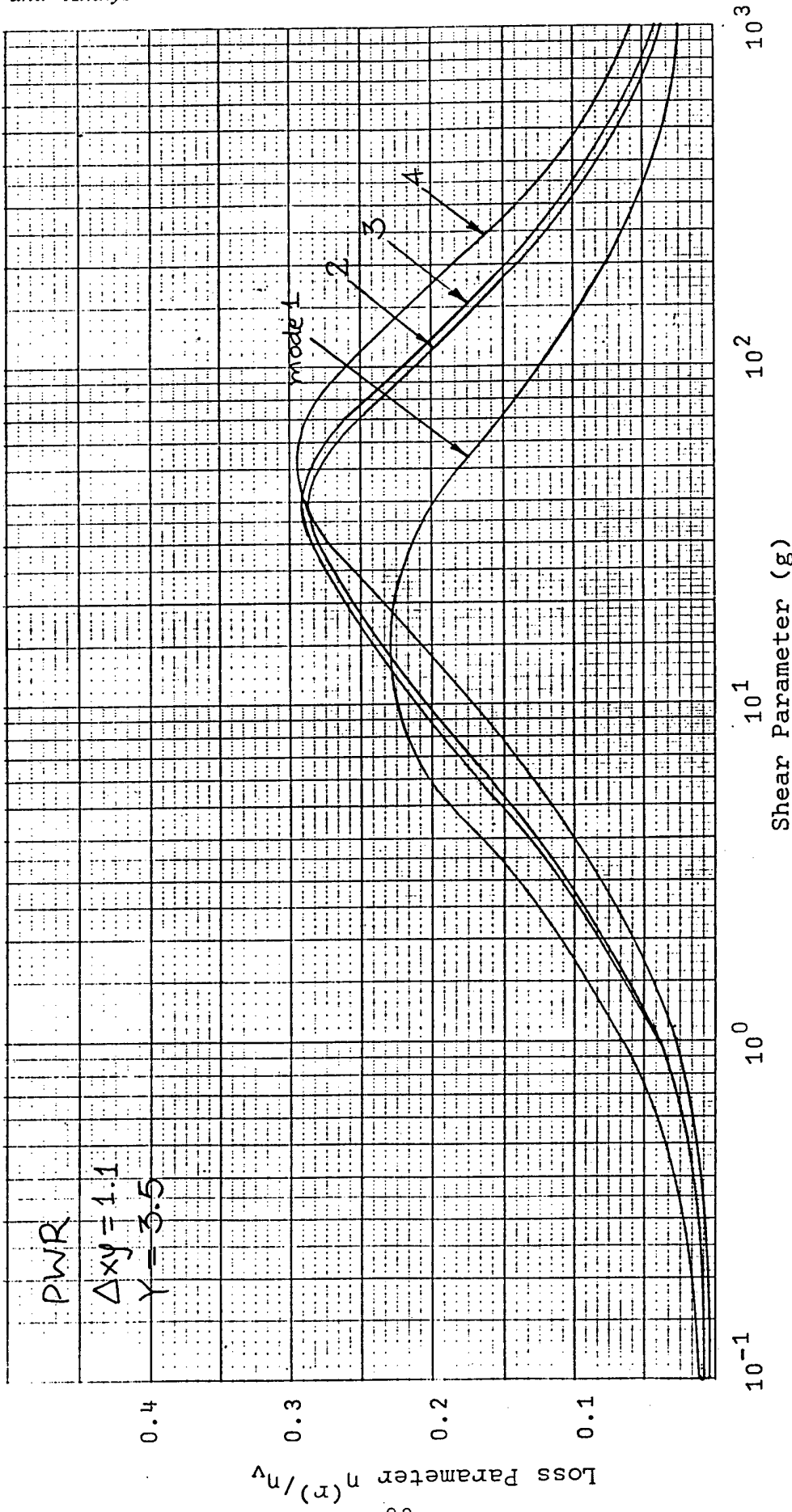


Figure 46 Damping of a sandwich rectangular plate, PWR boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

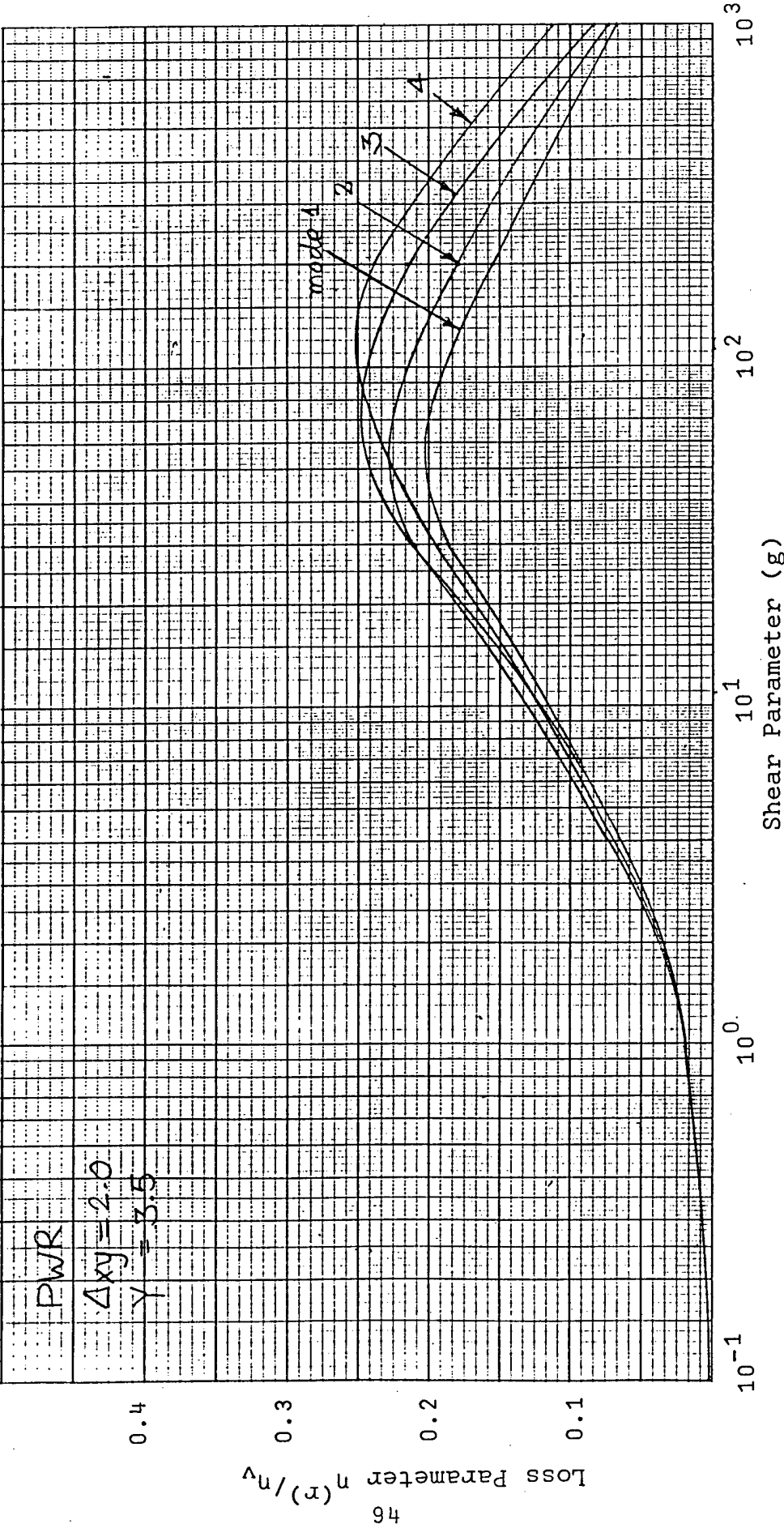


Figure 47 Damping of a sandwich rectangular plate, PWR
boundary conditions, $\Delta xy = 2.0$, $\gamma = 3.5$

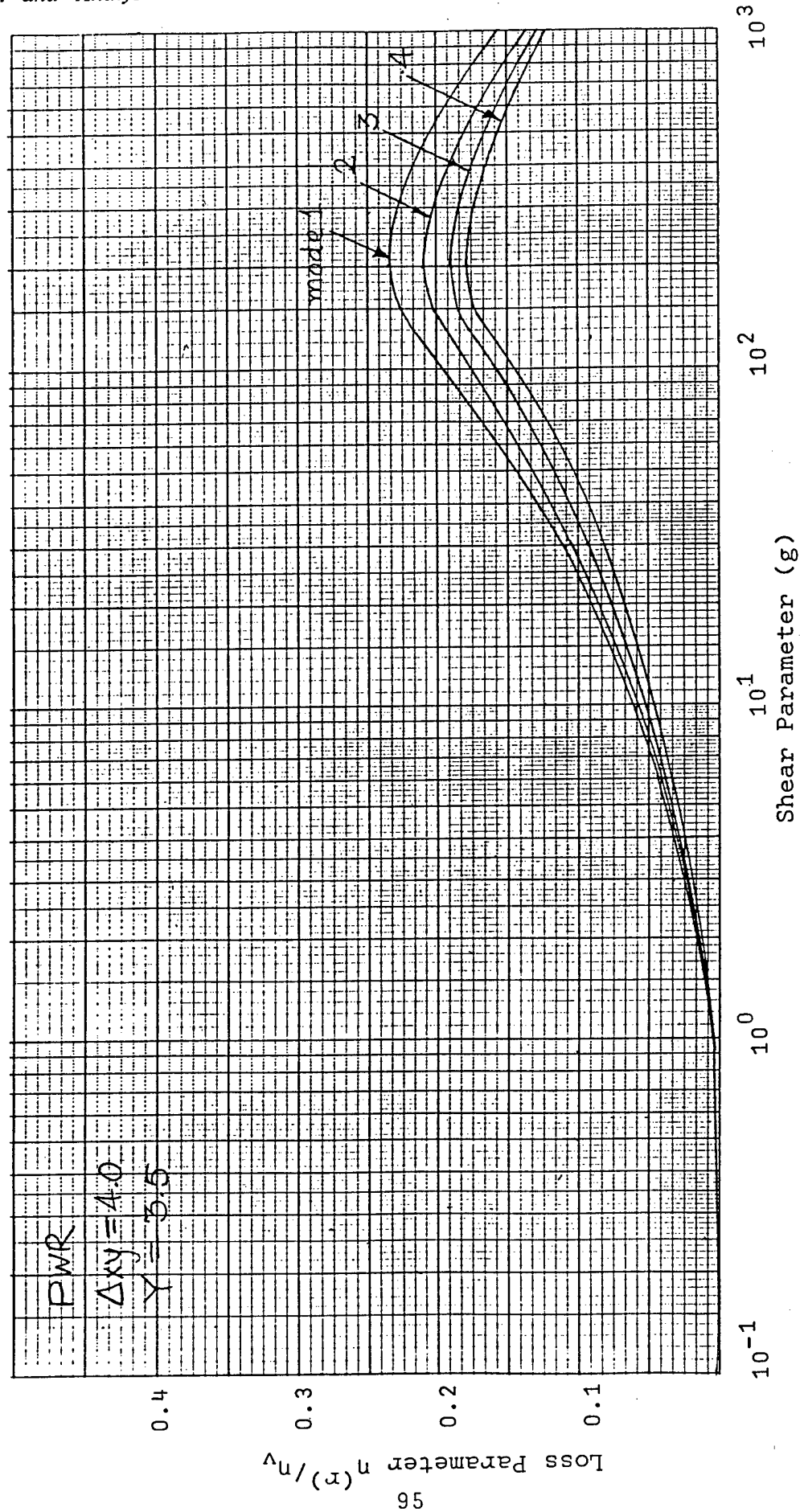


Figure 48 Damping of a sandwich rectangular plate, PWR boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

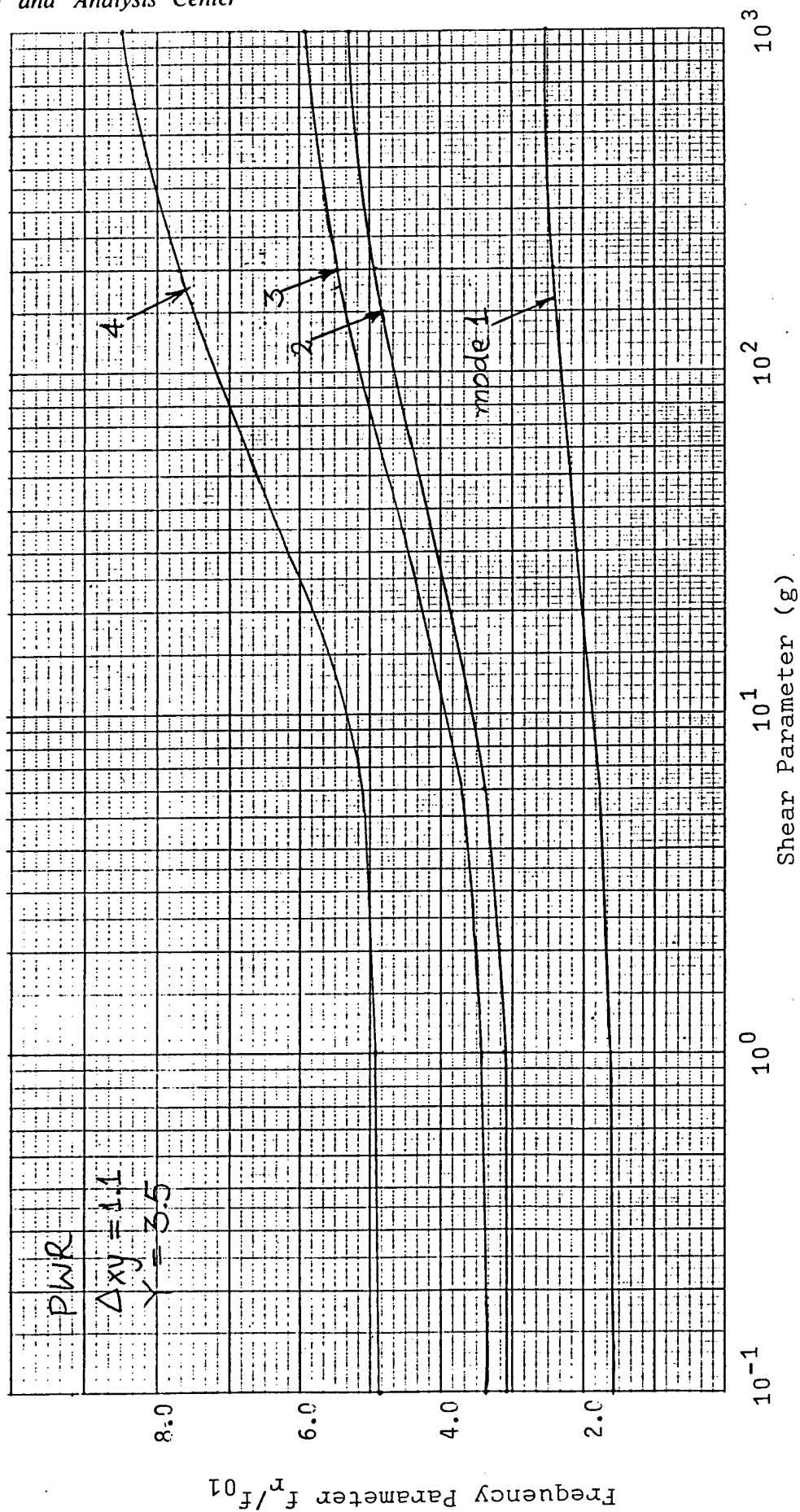


Figure 49 Natural frequencies of a sandwich rectangular plate,
PWR boundary conditions, $\Delta xy = 1.1$, $Y = 3.5$

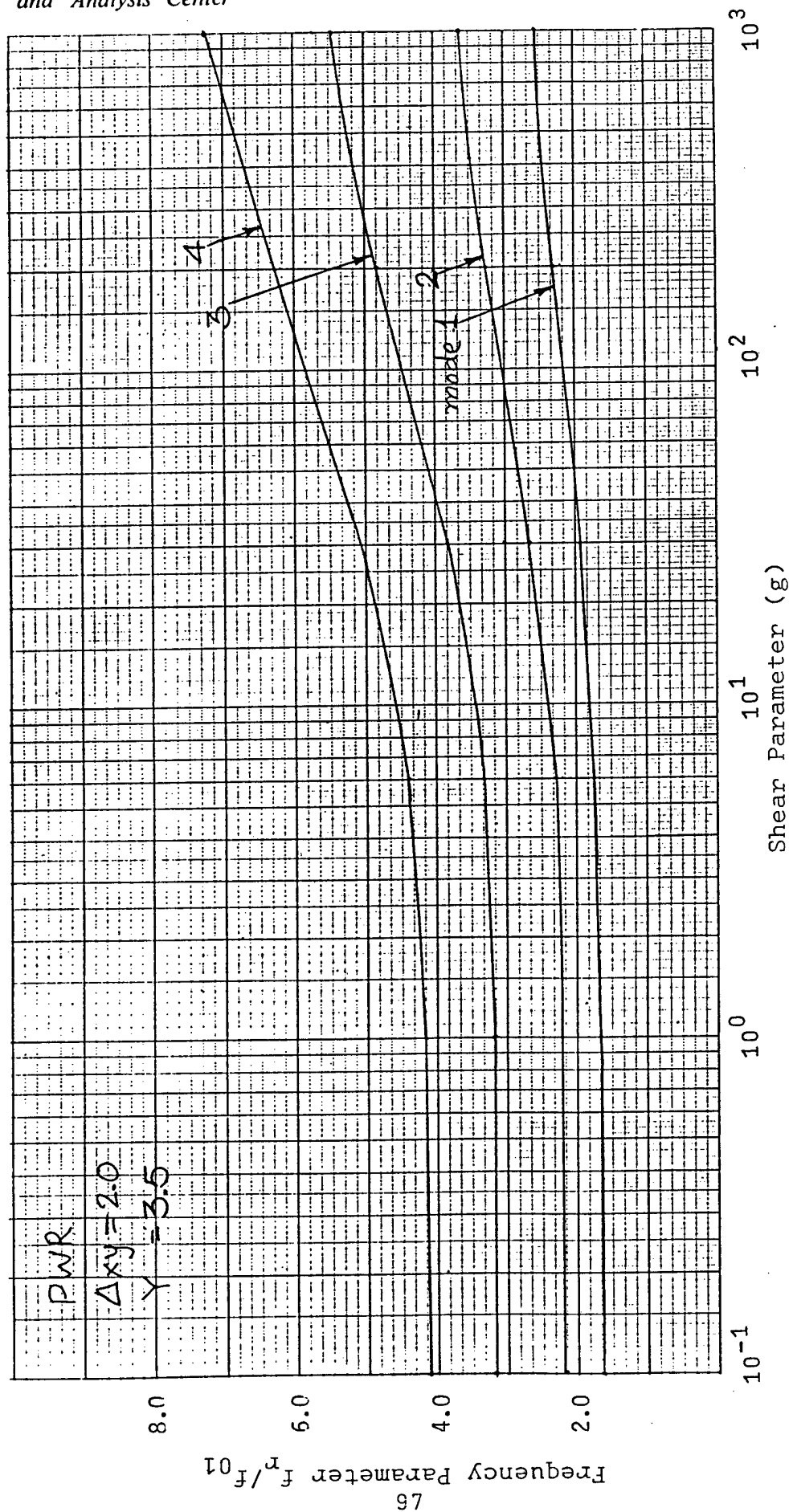


Figure 50 Natural frequencies of a sandwich rectangular plate,
PWR boundary conditions, $\Delta xy = 2.0$, $Y = 3.5$

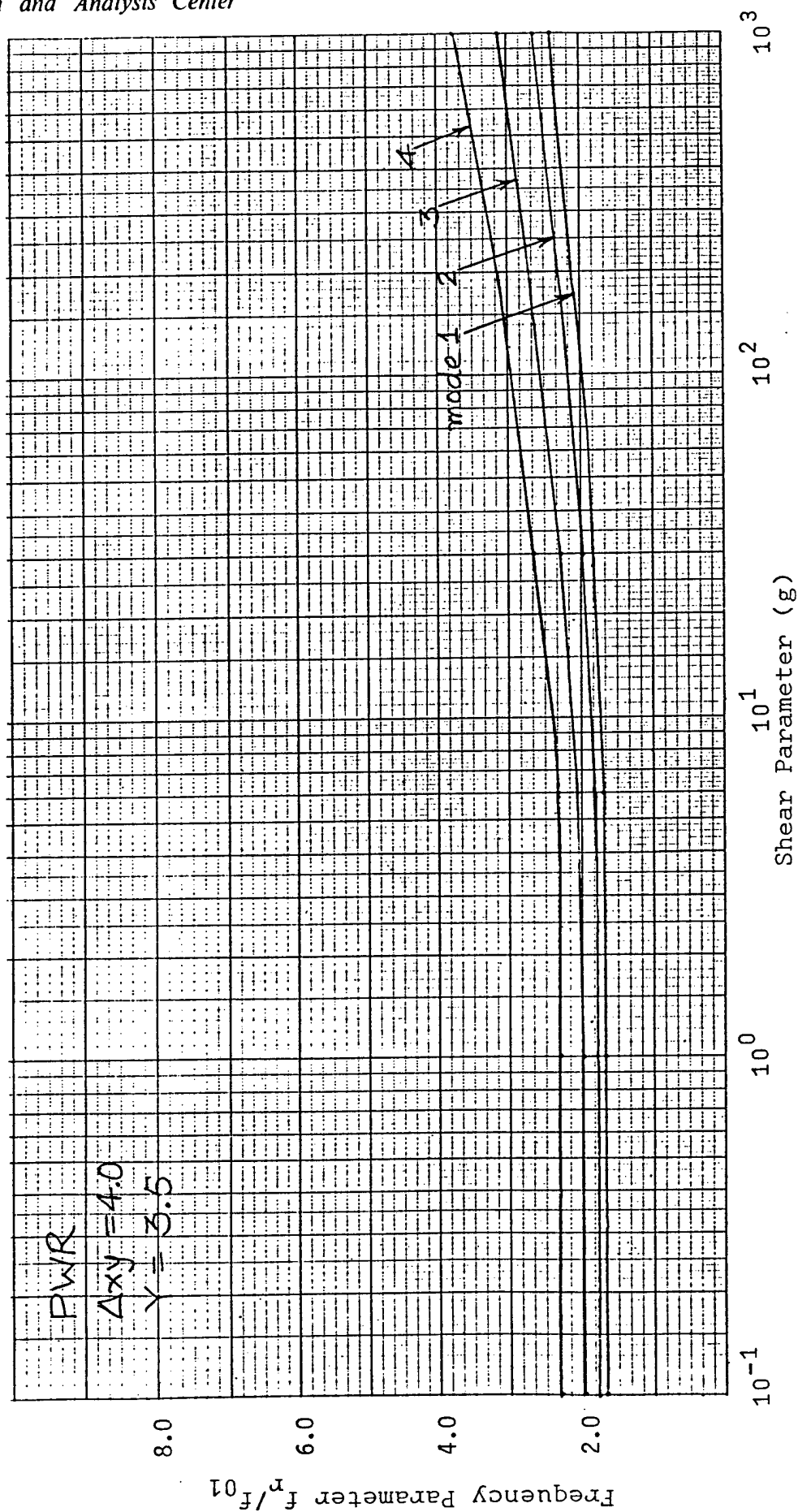


Figure 51 Natural frequencies of a sandwich rectangular plate,
PWR boundary conditions, $\Delta xy = 4.0$, $Y = 3.5$

TABLE 27
MODAL FREQUENCIES AND MODAL LOSS FACTORS
Boundary Condition = PWR (zero translation, elastically restrained rotation, zero shear)
Aspect Ratio (Δxy) = 1.1
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0 ✓		6.		30.		200.		1000.	
	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)	Freq. (f_r)	Loss Parameter ($\bar{n}$)
1	835.	0.005	852.	0.043	929.	0.161	195.	0.218	227.	0.094	238.	0.035
2	1612.	0.005	1645.	0.042	1789.	0.156	378.	0.247	463.	0.138	496.	0.043
3	1768.	0.005	1804.	0.041	1960.	0.155	414.	0.250	513.	0.155	557.	0.057
4	2571.	0.003	2604.	0.026	2764.	0.117	574.	0.236	724.	0.178	798.	0.064
5	2925.	0.003	2961.	0.025	3137.	0.115	649.	0.241	826.	0.197	918.	0.068
6	3351.	0.002	3388.	0.022	3573.	0.106	734.	0.235	942.	0.215	1065.	0.086
7	3847.	0.002	3883.	0.018	4063.	0.089	830.	0.212	1056.	0.216	1196.	0.084
8	4101.	0.002	4138.	0.018	4327.	0.087	881.	0.209	1126.	0.225	1286.	0.093
9	4723.	0.002	4780.	0.022	5040.	0.092	1024.	0.197	1315.	0.229	1518.	0.100
10	5295.	0.001	5331.	0.014	5518.	0.070	1118.	0.182	1410.	0.249	1638.	0.113

MODAL FREQUENCIES AND MODAL LOSS FACTORS

Boundary Condition	=	PWR (zero translation, elastically restrained rotation, zero shear)
Aspect Ratio (Δxy)	=	2.0
Geometric Parameter (γ)	=	3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets						Aluminum Face Sheets					
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)	Freq. (f _r)	Loss Parameter ($\bar{n}$)
1	1953.	0.002	1971.	0.019	2056.	0.088	410.	0.188	493.	0.154	537.	0.067
2	2607.	0.002	2634.	0.022	2766.	0.100	564.	0.211	694.	0.179	765.	0.070
3	3776.	0.002	3809.	0.0184	3980.	0.090	811.	0.210	1026.	0.215	1159.	0.084
4	4925.	0.002	4978.	0.021	5236.	0.096	1072.	0.191	1334.	0.223	1538.	0.113
5	5452.	0.002	5495.	0.015	5713.	0.076	1154.	0.187	1471.	0.251	1717.	0.113
6	5657.	0.002	5700.	0.016	5923.	0.076	1203.	0.367	1493.	0.341	1733.	0.392
7	6890.	0.001	6931.	0.011	6082.	0.007	1438.	0.387	1779.	0.348	2091.	0.400
8	7667.	0.001	7715.	0.012	7146.	0.059	1596.	0.399	2010.	0.349	2414.	0.409
9	8419.	0.001	8460.	0.009	7969.	0.060	1751.	0.407	2143.	0.351	2555.	0.401
10	10259.	0.001	10324.	0.010	8667.	0.050	2137.	0.416	2591.	0.347	3119.	0.385

TABLE 29
MODAL FREQUENCIES AND MODAL LOSS FACTORS
Boundary Condition = PWR (zero translation, elastically restrained rotation, zero shear)
Aspect Ratio (Δxy) = 4.0
Geometric Parameter (Y) = 3.5

MODE (r)	SHEAR PARAMETER (g)											
	Steel Face Sheets				Aluminum Face Sheets							
	0.1		1.0		6.0		30.		200.		1000.	
	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)	Freq. Parameter (f_r)	Loss Parameter ($\bar{n}$)
1	6754.	0.001	6775.	0.006	6885.	0.035	1325.	0.079	1510.	0.178	1724.	0.123
2	7214.	0.001	7240.	0.007	7375.	0.039	1440.	0.093	1666.	0.191	1914.	0.126
3	8070.	0.001	8102.	0.008	8269.	0.042	1638.	0.105	1928.	0.210	2243.	0.134
4	9291.	0.001	9329.	0.008	9528.	0.044	1919.	0.110	2285.	0.235	2702.	0.154
5	11100.	0.001	11146.	0.008	11386.	0.042	2304.	0.105	2755.	0.248	3321.	0.171
6	13358.	0.001	13411.	0.007	13692.	0.038	2785.	0.095	3515.	0.251	4061.	0.191
7	16146.	0.001	16206.	0.006	16529.	0.034	3378.	0.083	3977.	0.244	4927.	0.212
8	16815.	0.001	16911.	0.009	17418.	0.046	3762.	0.114	4437.	0.210	5306.	0.182
9	17609.	0.001	17700.	0.008	18174.	0.041	3911.	0.099	4576.	0.200	5474.	0.180
10	18798.	0.001	18870.	0.007	19286.	0.032	4033.	0.072	4670.	0.238	5744.	0.189

3.3 EXAMPLE

As a guide in using the design charts, the sample problem discussed previously in Section 2.4 will be solved. The following data are given:

Boundary conditions = simply supported, unriveted (PTU)
Base layer thickness, $T_1 = 0.055$ inches
Core layer thickness, $T_2 = 0.0045$ inches
Constraining layer thickness, $T_3 = 0.055$ inches
Viscoelastic shear modulus, $\bar{G}_2 = 450 \text{ lbf/in}^2$
Base plate Young's modulus, $E_1 = 10 \times 10^6 \text{ lbf/in}^2$
Constraining layer Young's modulus, $E_3 = 10 \times 10^6 \text{ lbf/in}^2$
Poisson's ratio of base layer,
 $\nu_1 = 0.3$
Poisson's ratio of constraining layer,
 $\nu_3 = 0.3$
Mass density of base layer,
 $\rho_1 = 0.1 \text{ lbm/in}^3$
 $= 2.59 \times 10^{-4} \text{ lbf-sec}^2/\text{in}^4$
Mass density of constraining layer,
 $\rho_3 = 0.1 \text{ lbm/in}^3$
 $= 2.59 \times 10^{-4} \text{ lbf-sec}^2/\text{in}^4$
Mass density of viscoelastic layer,
 $\rho_2 = 0.035 \text{ lbm/in}^3$
 $= 9.07 \times 10^{-5} \text{ lbf-sec}^2/\text{in}^4$
Core material loss factor, $\eta_v = 0.3$
Plate width, $a = 10$ inches
Plate length, $b = 11$ inches

The dimensionless variables that describe the plate are, in addition to η_v already given:

$$\begin{aligned}\text{shear parameter } g &= \frac{\bar{G}}{T_2} \left[\frac{1}{E_1 T_1} + \frac{1}{E_3 T_3} \right] b^2 (1-\nu^2) \\ &= \frac{450}{.0045} \left[\frac{1}{10^7 \times .055} + \frac{1}{10^7 \times .055} \right] 11^2 \times (1-0.3^2) \\ &= 40.0\end{aligned}$$

D = sum of flexural stiffnesses of face sheets

$$\begin{aligned}&= \frac{E_1 T_1^3}{12(1-\nu_1^2)} + \frac{E_3 T_3^3}{12(1-\nu_3^2)} \\ &= \frac{10^7 \times .055^3}{12(1-0.3^2)} + \frac{10^7 \times .055^3}{12(1-0.3^2)} \\ &= 304.7 \text{ lbf-in}\end{aligned}$$

Y = geometry parameter

$$\begin{aligned}&= \frac{(T_1 + 2T_2 + T_3)^2}{4D(1-\nu^2)} \left[\frac{E_1 T_1 E_3 T_3}{E_1 T_1 + E_3 T_3} \right] \\ &= \frac{(.055 + 2 \times .0045 + 0.55)^2}{4 \times 304.7 \times (1-0.3^2)} \left[\frac{10^7 \times .055 \times 10^7 \times .055}{10^7 \times .055 + 10^7 \times .055} \right] \\ &= 3.51\end{aligned}$$

Δxy = in-plane aspect ratio

$$\begin{aligned}&= b/a \\ &= 11.0/10.0 \\ &= 1.10\end{aligned}$$

The normalizing frequency is found from

$$\begin{aligned}\rho &= \text{total plate mass per unit area} \\ &= \rho_1 T_1 + \rho_2 T_2 + \rho_3 T_3 \\ &= 2.59 \times 10^{-4} \times .055 + 9.07 \times 10^{-5} \times .0045 + 2.59 \times 10^{-4} \times .055 \\ &= 2.89 \times 10^{-5} \text{ lbf-sec}^2/\text{in}^3\end{aligned}$$

$$\begin{aligned}
 f_{01} &= \frac{1}{2\pi} \frac{D}{\rho} \left[\left(\frac{\pi}{b} \right)^2 + \left(\frac{\pi}{a} \right)^2 \right]^2 \\
 &= \frac{1}{2\pi} \frac{304.7}{2.89 \times 10^{-5}} \left[\left(\frac{\pi}{11} \right)^2 + \left(\frac{\pi}{10} \right)^2 \right] \\
 &= 93.16 \text{ Hz}
 \end{aligned}$$

Figure 6 gives damping as a function of g for PTU boundary conditions, $Y = 3.5$, and $\Delta xy = 1.1$. Entering the chart with $g = 40$ gives

$$\frac{\eta^{(1)}}{\eta_v} = 0.240 \quad \text{for mode 1}$$

$$\frac{\eta^{(2)}}{\eta_v} = 0.336 \quad \text{for mode 2}$$

$$\frac{\eta^{(3)}}{\eta_v} = 0.345 \quad \text{for mode 3}$$

$$\frac{\eta^{(4)}}{\eta_v} = 0.331 \quad \text{for mode 4}$$

or, since $\eta_v = 0.3$

$$\eta^{(1)} = 0.240 \times 0.3 = 0.072$$

$$\eta^{(2)} = 0.336 \times 0.3 = 0.101$$

$$\eta^{(3)} = 0.345 \times 0.3 = 0.104$$

$$\eta^{(4)} = 0.331 \times 0.3 = 0.099$$

Natural frequencies are found by entering Figure 21 (applicable for PTU boundary conditions, $Y = 3.5$, and $\Delta xy = 1.1$) with $g = 40$ to obtain

$$\frac{f_1}{f_{01}} = 1.75$$

$$\frac{f_2}{f_{01}} = 3.60$$

$$\frac{f_3}{f_{01}} = 4.08$$

$$\frac{f_4}{f_{01}} = 5.63$$

Then, using the calculated reference frequency of $f_{01} = 93.2$ Hz gives

$$f_1 = 1.75 \times 93.16 = 163.0 \text{ Hz}$$

$$f_2 = 3.60 \times 93.16 = 335.4 \text{ Hz}$$

$$f_3 = 4.08 \times 93.16 = 380.1 \text{ Hz}$$

$$f_4 = 5.63 \times 93.16 = 524.5 \text{ Hz}$$

These values may be compared with results given for the same problem in Appendix A (the raw NASTRAN output) and in Section 4.3 (the closed form solution).

4.0 CLOSED FORM SOLUTION FOR HIGH-ORDER MODES

4.1 THEORY

Structures built up from plates always have numerous high-order modes of vibration involving flexure of local sections. Calculation of all these modes with a single finite element model, while theoretically possible, is neither practical nor efficient. However, such modes can be important if high frequency excitation is present. Therefore, a method is proposed for designing a damping treatment to suppress modes of this type which avoids the cost of calculating the properties of a large number of essentially similar modes. The method is usable for either add-on or integral damping but is most likely to be used for add-on treatments.

The method is based on the fact that the higher order mode shapes of rectangular plates tend to be sinusoidal in both in-plane directions except near the boundaries. Boundary conditions have little effect on the higher order mode shapes over most of the plate area. This is true for either classical uniform plates or three-layer sandwich plates formed by adding a constrained layer damping treatment to a uniform plate. This property leads to a useful relationship between natural frequencies and modal loss factors. When modal loss factors are plotted against modal frequencies for a sandwich plate, the relationship is essentially independent of boundary conditions so long as the boundary conditions themselves are non-dissipative [10].

In the present case, we are interested in damping a number of modes over a fairly wide band of frequencies. The exact value of natural frequency for each of the many plate modes is not of particular importance. We may therefore calculate the relation between modal loss factor and modal frequency based on any convenient set of boundary conditions. The curve plotted for any other boundary condition would be formed by points at different frequencies but would still fall on or near the first, particularly for higher modes. By choosing a set of boundary conditions

which lead to a simple closed form solution, we may produce the plot of damping vs. frequency quite easily for any given material properties and plate cross-section. A few trials will usually be sufficient to find an appropriate add-on treatment based on the size, thickness, and material of the base plate and the desired frequency range.

The most convenient set of boundary conditions are those where all four sides of the plate are simply supported and shearing of the viscoelastic core is unrestrained. In this case the mode shapes are sinusoidal all the way to the edges of the plate. Two closed form solutions for this case are available in the literature [8,10]. The former solution, due to Abdulhadi, has been used in this work because the latter could not be made to produce results in agreement with MSC/NASTRAN-MSE even for small values of the core material loss factor. The Abdulhadi solution did produce good agreement for core loss factors small compared to unity. It diverged somewhat as the core loss factor approached unity, as shown in Section 2 of this report and in previous work by the authors [1].

The closed form solution from Ref. [8] for the natural frequency and modal loss factor of a simply supported rectangular sandwich plate is, using the notation of Eq. (6-8):

$$p_r = \left[\frac{\alpha_r^2 D}{\rho} \right] \left[1 + \frac{\frac{\delta^2 K_e}{D} \left(\frac{T_2 K_e \alpha_r}{\bar{G}_2} + 1 + n_v^2 \right)}{\left(\frac{T_2 K_e \alpha_r}{\bar{G}_2} + 1 \right)^2 + n_v^2} \right] \quad (28)$$

$$n(r) = \frac{n_v \left(\frac{T_2 K_e \alpha_r}{\bar{G}_2} \right) \left(\frac{K_e \delta^2}{D} \right)}{N_{1r} + N_{2r}} \quad (29)$$

where

$$N_{1r} = \left(\frac{T_2 K_e \alpha_r}{G_2} + 1 \right)^2 + \eta_v^2 \quad (30)$$

$$N_{2r} = \frac{\delta^2 K_e}{D} \left(1 + \eta_v^2 + \frac{T_2 K_e \alpha_r}{G_2} \right) \quad (31)$$

$$D = \frac{E_1 T_1^3}{12(1-\nu_1^2)} + \frac{E_3 T_3^3}{12(1-\nu_3^2)} \quad (32)$$

$$\delta = \frac{T_1}{2} + \frac{T_3}{2} + T_2 \quad (33)$$

$$\rho = \rho_1 T_1 + \rho_2 T_2 + \rho_3 T_3 \quad (34)$$

$$K_e = \frac{E_1 T_1 E_3 T_3}{(1+\nu_1) [E_1 T_1 (1-\nu_3) + E_3 T_3 (1-\nu_1)]} \quad (35)$$

- p_r = radian frequency of the r 'th mode
 $\eta^{(r)}$ = structural loss factor of the r 'th mode
 η_v = material loss factor of the viscoelastic core
 T_2 = thickness of the core layer
 T_1, T_3 = thicknesses of the face sheets
 E_1, E_2, E_3 = Young's moduli of the materials of the three layers
 ν_1, ν_2, ν_3 = Poisson's ratios for the three layers
 G_2^* = complex shear modulus of the core
 $\quad = G_2 (1 + i \eta_v)$
 $\alpha_r = \left(\frac{m\pi}{a} \right)^2 + \left(\frac{n\pi}{b} \right)^2$

a, b = in-plane dimensions of the plate
 m, n = integers

The use of simply supported plate solutions for designing a damping treatment for a plate with any non-dissipative boundary conditions may seem like a gross approximation. However, the end purpose of the damping must be kept in mind. Local plate modes of an all-welded structure without any damping treatment would typically have loss factors on the order of .001. Loss factors predicted by the simple method described here are on the order of .1, even without any extensive searching for an optimum damping treatment. If boundary condition effects change the loss factors by a factor of three, the end conclusion regarding the damping treatment will remain the same; namely, that it produces a substantial (factor of 30) reduction in resonant response to periodic input forces. Complex eigenvalue solutions for sandwich beams have shown that the variation of damping with boundary conditions is small for higher modes and generally less than a factor of three for low order modes [1].

4.2 SOFTWARE IMPLEMENTATION

The equations given above have been implemented in an interactive program called SPLT61 [11]. The program allows a designer to quickly evaluate a number of possible constrained layer treatments with negligible cost for computing. The input to the program includes flexural wavelength in each direction. These are usually set equal to twice the plate dimensions, i.e., the exact value for a simply supported plate. The output is the exact (i.e., closed form, complex eigenvalue) solution for modal frequencies and loss factors of a simply supported sandwich plate. As noted above, this frequency-damping relationship is also correct in the limit of increasing mode number for other boundary conditions.

The validity of using a solution for a simply supported sandwich plate to predict damping for other boundary conditions was tested as follows. The SPLT61 program was used to obtain modal damping as a function of modal frequency for a number of different values of the shear parameter. The shear parameter was varied by changing G_2 , the core shear modulus. The SPLT61 results represented an exact solution for a simply supported plate, (i.e., PTU boundary conditions). A similar analysis was performed for a plate with PLR (fixed) boundary conditions using the modal strain energy method. A comparison of results is shown in Figures 52 through 55. The damping parameter is plotted vs. normalized modal frequency for various values of the shear parameter. The frequency is normalized on a reference frequency f_{01} as described in a previous section. The same information is shown in dimensional form in Figures 56 through 60. It may be seen that the results for the drastically different boundary conditions do, in fact, converge at high frequency. Significantly, the rate of convergence depends on the shear parameter.

4.3 EXAMPLE

The use of the SPLT61 program is illustrated below. The physical situation being analyzed is the same one treated using the NASTRAN modal strain energy method in Section 2.4 and using the design charts in Section 3.3. Since true simply supported boundary conditions are assumed, and the viscoelastic loss factor is small, the SPLT61 solution agrees closely with the NASTRAN/MSE results.

The program begins by displaying default values for all the physical parameters describing a three-layer, rectangular sandwich plate. The user is prompted to change any or all of the values, to store the entire list in a disc file, or to proceed with the calculations. He has the option of resetting the entire list of values to a set previously stored on disc. Once the user is satisfied with the input data, he commands the program to proceed. It then calculates a table of natural frequencies and

modal loss factors for the first ten allowable values of wave-number in each in-plane direction (i.e., one hundred normal modes). The resulting table, along with the input parameter list, is written to a disc file in ASCII format to be printed later. The modes calculated are not necessarily the lowest one hundred, but will always contain the lowest ten.

The output file for the sample case is shown in Table 30. The loss factors are given directly rather than being normalized on the core material loss factor. They must therefore be divided by that value (0.3 for the sample case) for comparison with results from the other two methods.

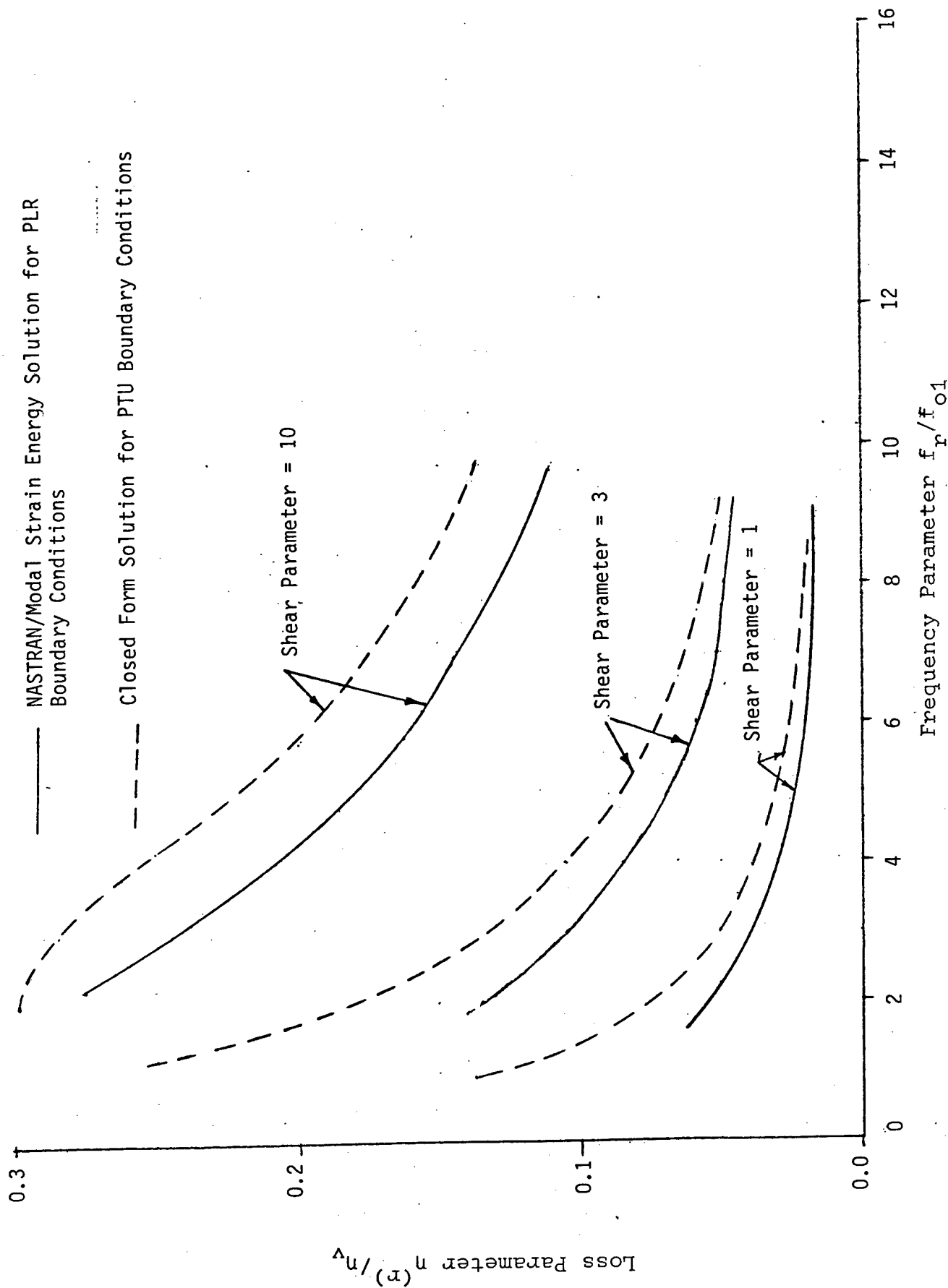


Figure 52 Effect of boundary conditions on damping for rectangular sandwich plates, $g = 1, 3$ and 10

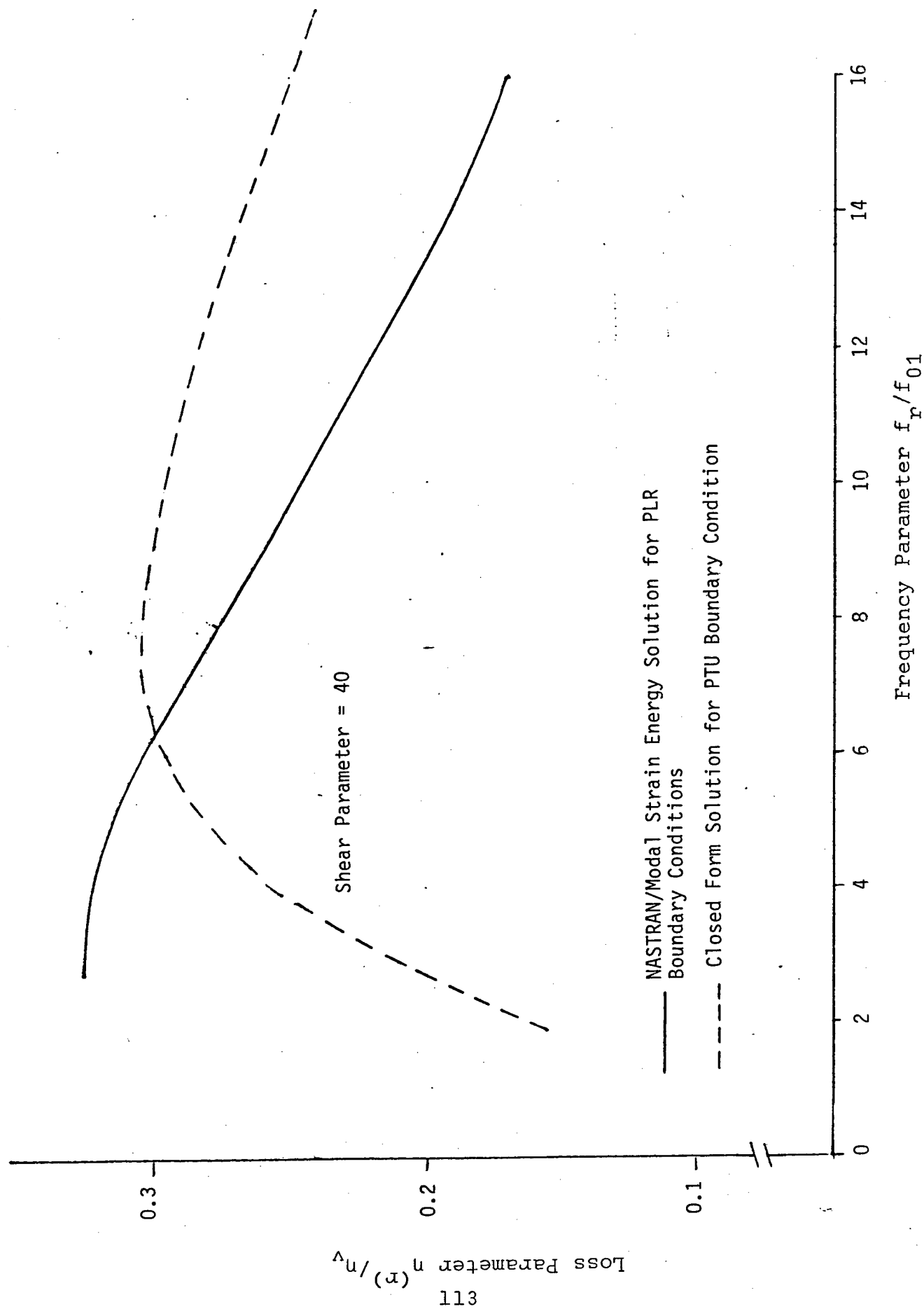


Figure 53 Effect of boundary conditions on damping for rectangular sandwich plates, $g = 40$

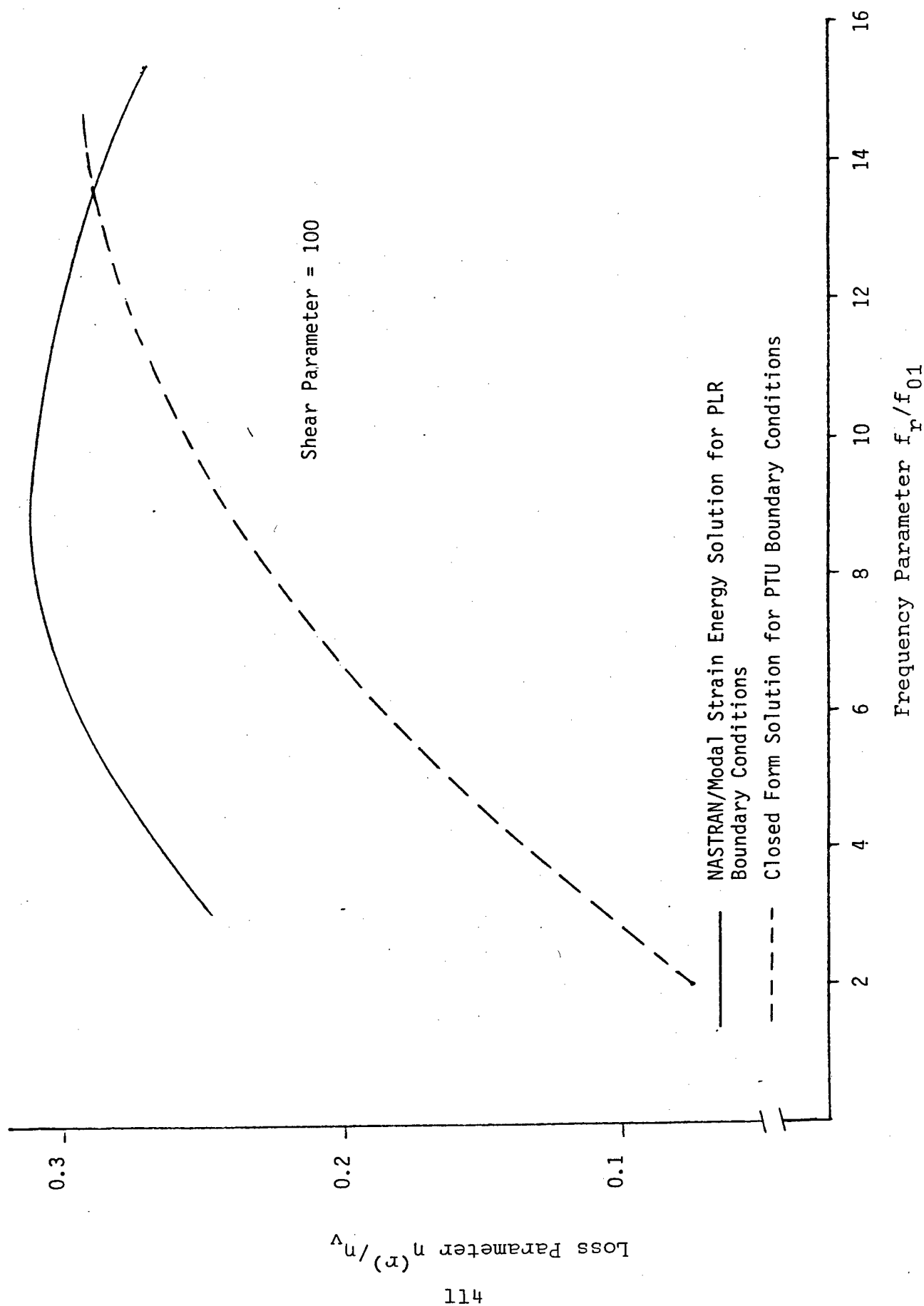


Figure 54 Effect of boundary conditions on damping for rectangular sandwich plates, $g = 100$

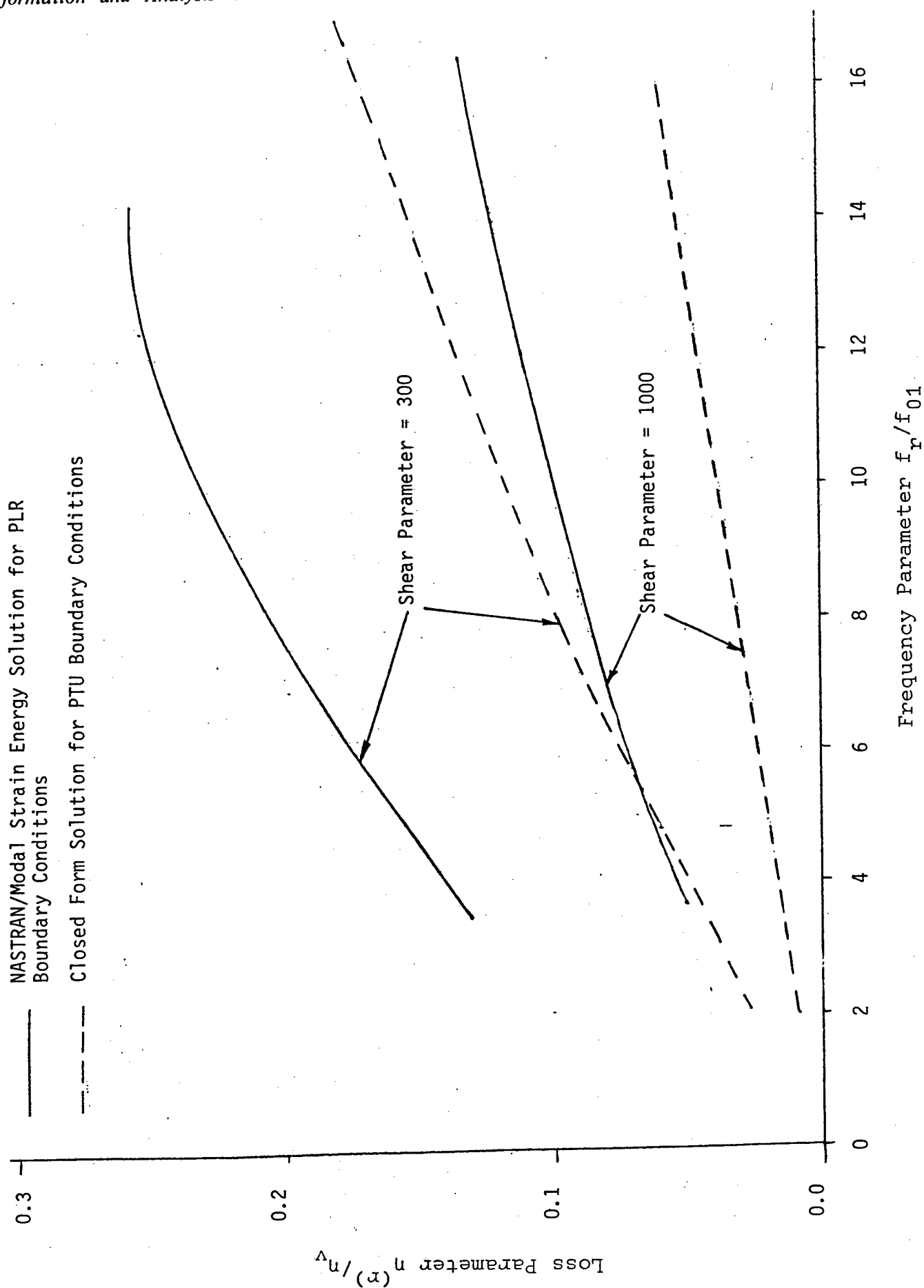


Figure 55 Effect of boundary conditions on damping for sandwich plates, $g = 300$ and 1000

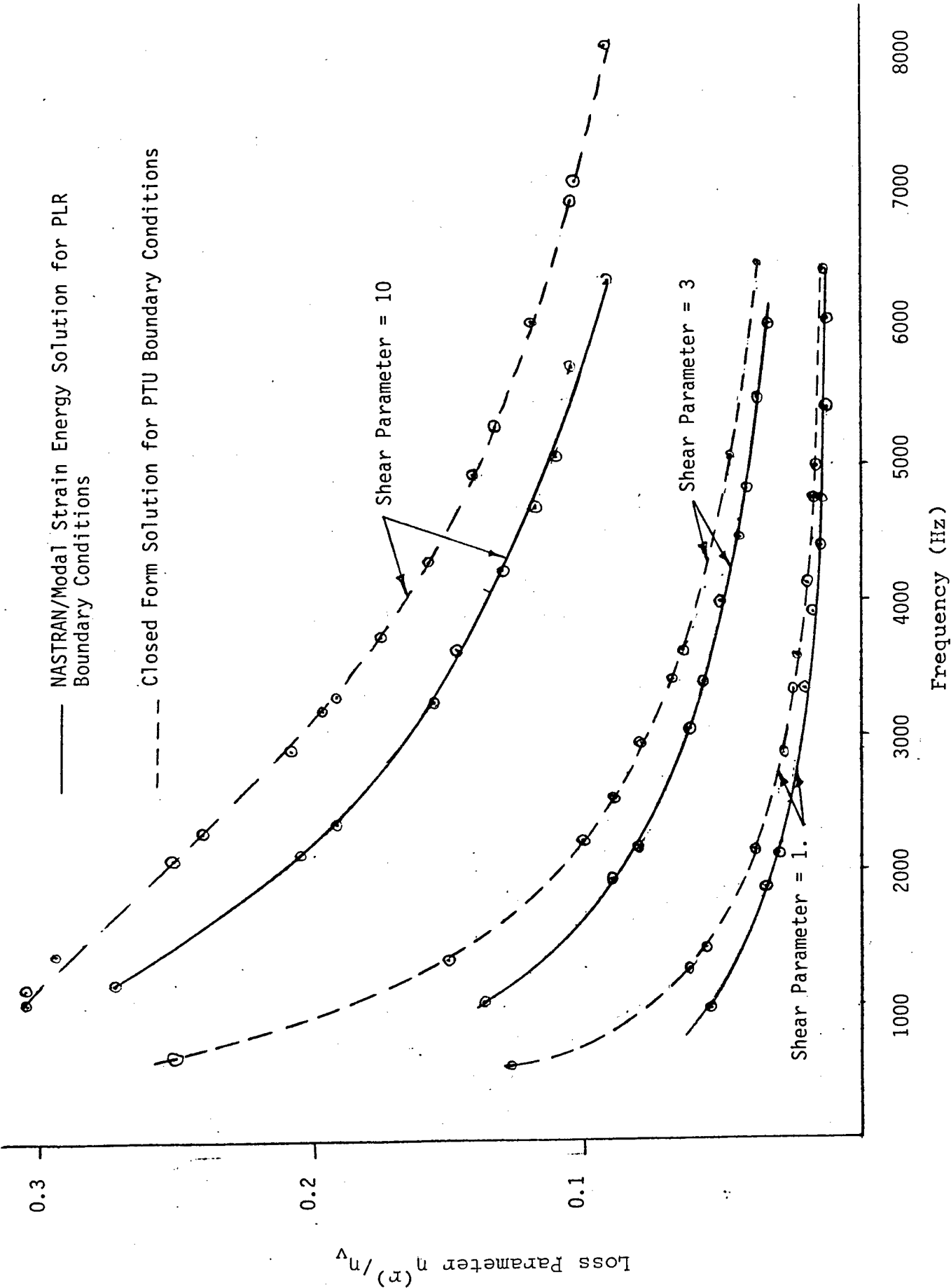


Figure 56 Effect of boundary conditions on damping for rectangular sandwich plates, $g = 1, 3$ and 10

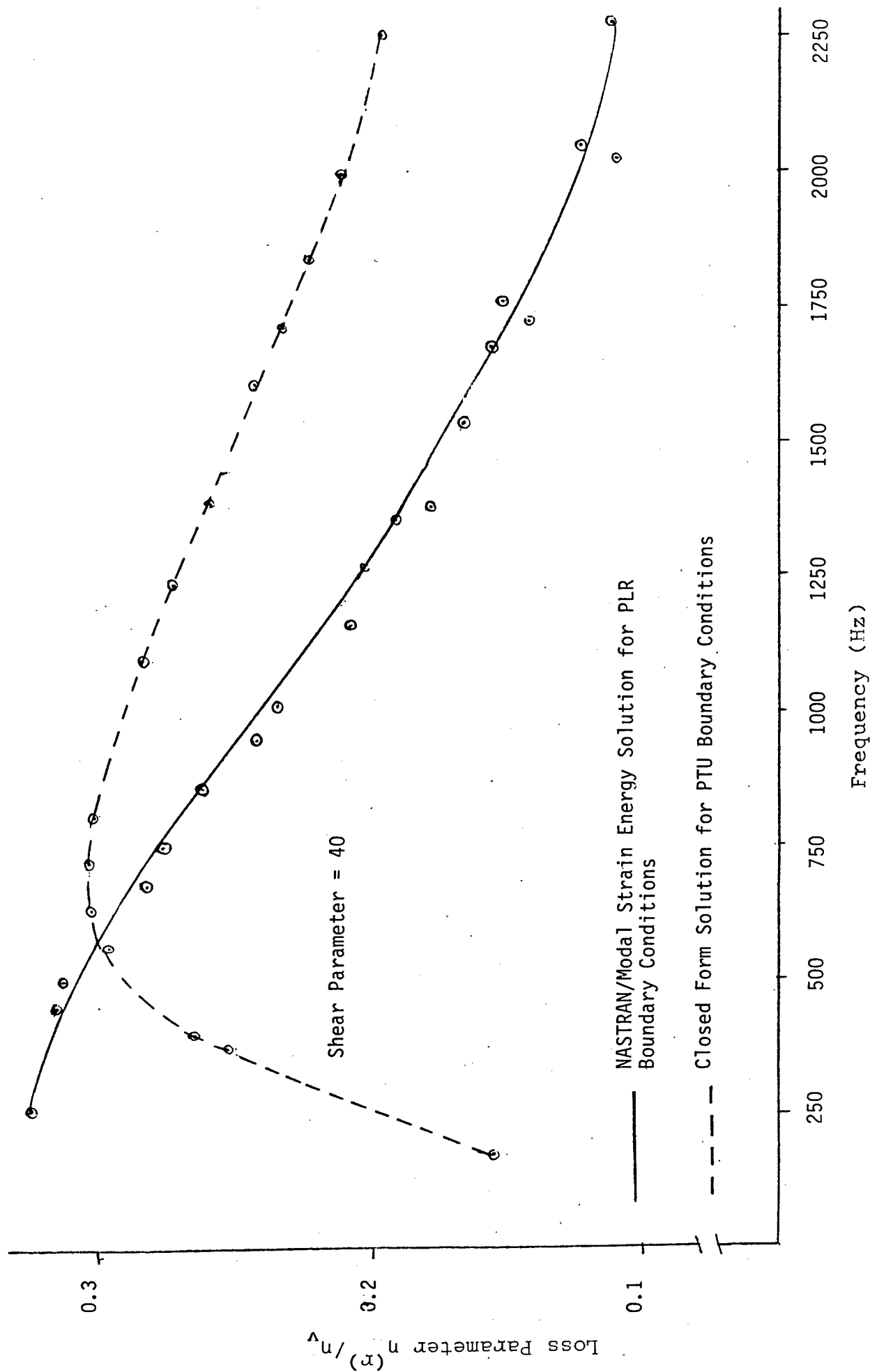


Figure 57 Effect of boundary conditions on damping for rectangular sandwich plates, $g = 40$

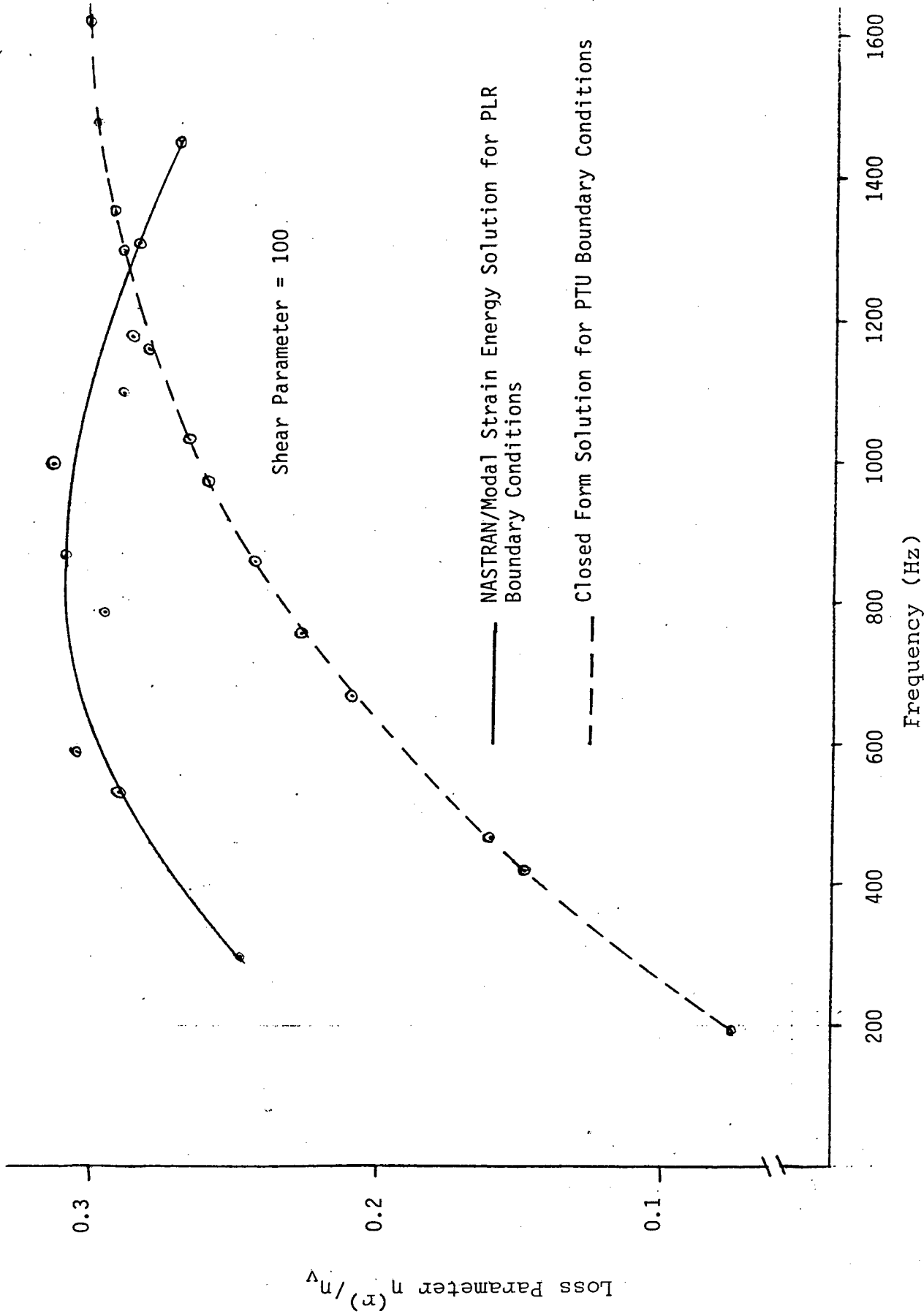


Figure 58 Effect of boundary conditions on damping for rectangular sandwich plates, $g = 100$

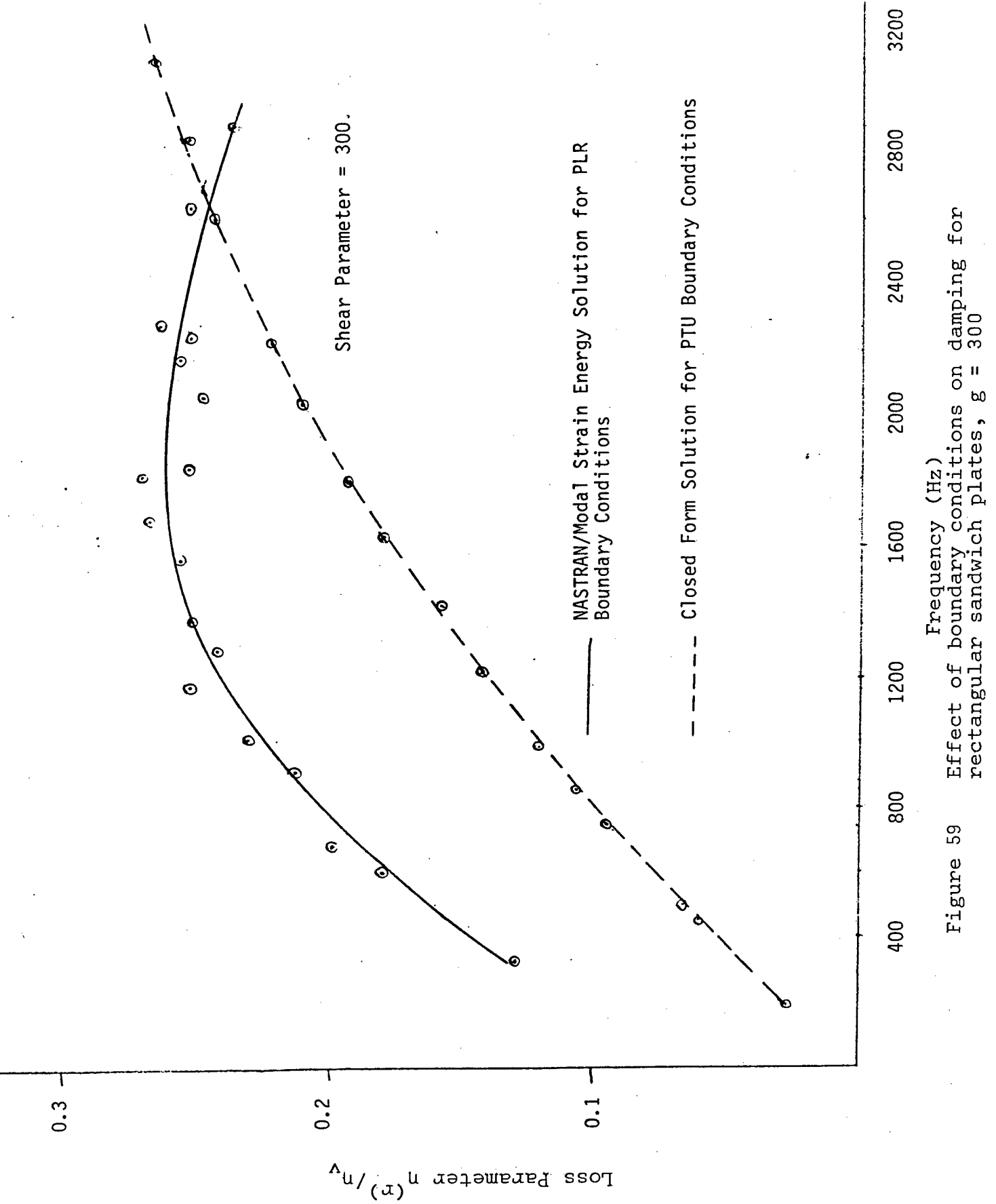


Figure 59 Effect of boundary conditions on damping for rectangular sandwich plates, $g = 300$

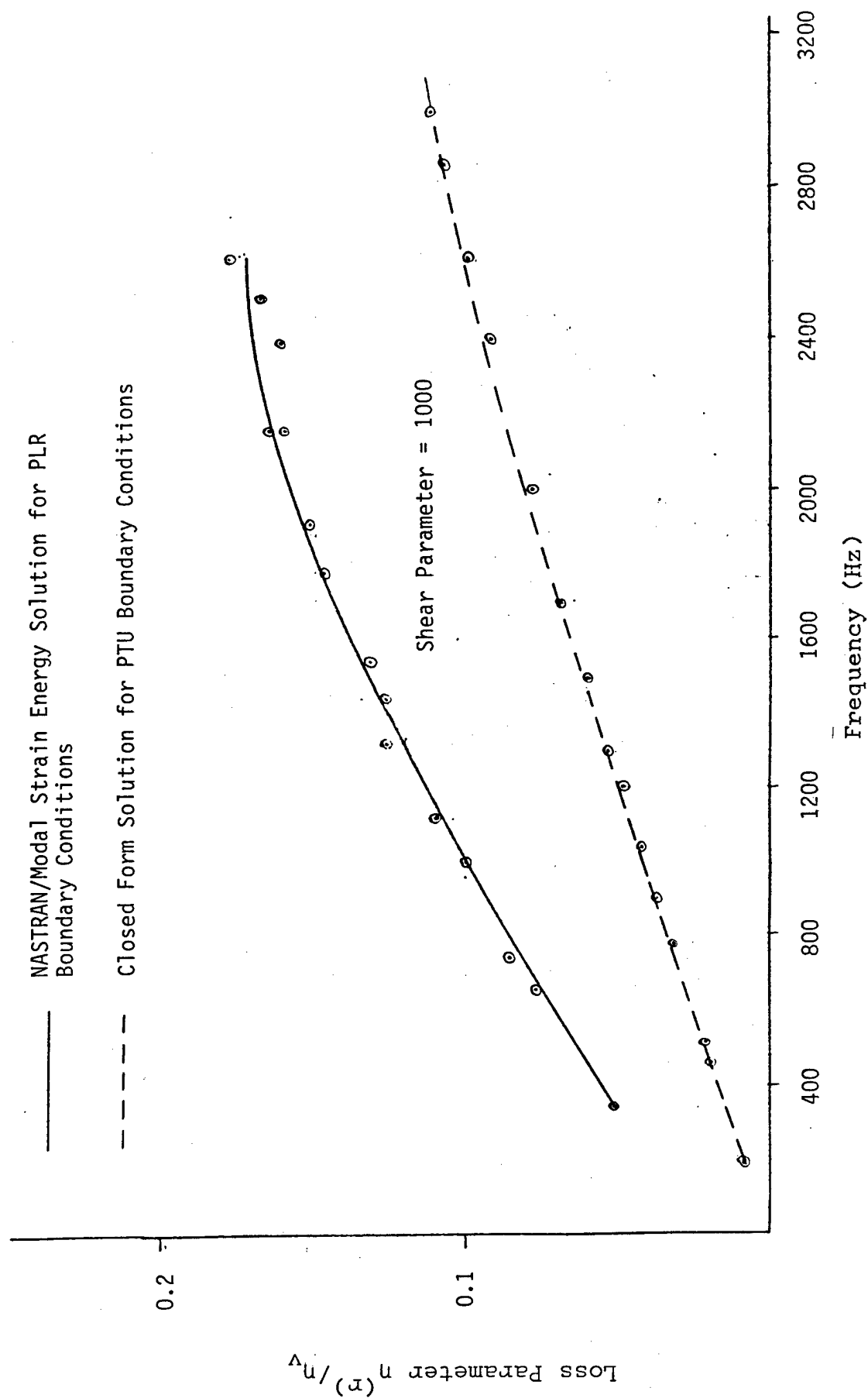


Figure 60 Effect of boundary conditions on damping for rectangular sandwich plates, $g = 1000$

TABLE 30 RESULTS FROM CLOSED FORM SOLUTION FOR SIMPLY SUPPORTED RECTANGULAR PLATE

PROGRAM SPLT61

07-JAN-83 10:46:25

APPROXIMATE LOSS FACTORS FOR A RECTANGULAR THREE LAYER SANDWICH PLATE

VALUES IN NEW

IDENTIFIER.....		200.000									
CONSTRAINING LAYER THICKNESS.....		0.550000E-01									
VISCOELASTIC THICKNESS.....		0.450000E-02									
BASE LAYER THICKNESS.....		0.550000E-01									
CONSTRAINING LAYER YOUNG'S MODULUS.....		0.100000E+08									
VISCOELASTIC SHEAR MODULUS.....		450.000									
BASE PLATE YOUNG'S MODULUS.....		0.100000E+08									
POISSON'S RATIO OF CONSTRAINING LAYER.....		0.300000									
POISSON'S RATIO OF BASE LAYER.....		0.300000									
WEIGHT DENSITY OF CONSTRAINING LAYER.....		0.100000									
WEIGHT DENSITY OF VISCOELASTIC LAYER.....		0.350000E-01									
WEIGHT DENSITY OF BASE LAYER.....		0.100000									
VISCOELASTIC LOSS FACTOR.....		0.300000									
MAXIMUM WAVELENGTH IN X DIRECTION.....		20.0000									
MAXIMUM WAVELENGTH IN Y DIRECTION.....		22.0000									
N	1	2	3	4	5	6	7	8	9	10	
WAVELENGTH IN X DIR.	20.000	10.000	6.667	5.000	4.000	3.333	2.857	2.500	2.222	2.000	
FREQ/ETA	169.8	387.1	692.7	1083.	1563.	2138.	2811.	3583.	4455.	5429.	
1	22.00	.6984E-01	.1016	.9152E-01	.7604E-01	.6217E-01	.5088E-01	.4198E-01	.3497E-01	.2947E-01	
2	11.00	.352.3	.543.5	.833.8	1217.	1694.	2267.	2939.	3711.	4583.	5555.
		.9914E-01	.1059	.8688E-01	.7246E-01	.5966E-01	.4916E-01	.4078E-01	.3414E-01	.2887E-01	
3	7.33	.611.4	.784.9	1062.	1437.	1910.	2481.	3152.	3923.	4794.	5767.
		.1055	.1016	.9226E-01	.7977E-01	.6711E-01	.5589E-01	.4653E-01	.3894E-01	.3284E-01	.2793E-01
4	5.50	.940.4	1104.	1373.	1742.	2211.	2780.	3449.	4219.	5091.	6063.
		.9652E-01	.9076E-01	.8177E-01	.7121E-01	.6073E-01	.5131E-01	.4328E-01	.3663E-01	.3117E-01	.2672E-01
5	4.40	1343.	1502.	1765.	2130.	2596.	3163.	3832.	4601.	5471.	6443.
		.8272E-01	.7782E-01	.7063E-01	.6234E-01	.5404E-01	.4640E-01	.3971E-01	.3403E-01	.2926E-01	.2530E-01
6	3.67	1822.	1978.	2238.	2601.	3065.	3631.	4298.	5066.	5936.	6908.
		.6921E-01	.6556E-01	.6021E-01	.5397E-01	.4757E-01	.4151E-01	.3606E-01	.3130E-01	.2722E-01	.2376E-01
7	3.14	2381.	2536.	2794.	3155.	3618.	4182.	4848.	5616.	6486.	7457.
		.5761E-01	.5499E-01	.5111E-01	.4650E-01	.4164E-01	.3690E-01	.3252E-01	.2859E-01	.2515E-01	.2216E-01
8	2.75	3021.	3175.	3432.	3792.	4254.	4818.	5483.	6251.	7120.	8091.
		.4812E-01	.4626E-01	.4346E-01	.4005E-01	.3638E-01	.3270E-01	.2921E-01	.2600E-01	.2311E-01	.2056E-01
9	2.44	3743.	3897.	4154.	4513.	4974.	5537.	6202.	6969.	7838.	8809.
		.4048E-01	.3915E-01	.3712E-01	.3459E-01	.3181E-01	.2896E-01	.2618E-01	.2357E-01	.2117E-01	.1901E-01
10	2.20	4549.	4702.	4958.	5317.	5777.	6340.	7005.	7772.	8640.	9611.
		.3436E-01	.3339E-01	.3189E-01	.3001E-01	.2789E-01	.2567E-01	.2346E-01	.2134E-01	.1935E-01	.1753E-01

5.0 SUMMARY AND CONCLUSIONS

Three methods have been presented for the dynamic analysis and design of viscoelastically damped sandwich plates. The methods are complementary in that each represents a different trade-off of accuracy, generality, and cost of use. The theoretical basis of each has been described along with sample problems.

The most general of the three is the modal strain energy method implemented in MSC/NASTRAN. It is fairly new, having been developed primarily by the authors of this report. It can accommodate virtually any combination of plate geometry and boundary conditions. The method is by no means limited to sandwich plates, although it has seen extensive application there due to the efficiency of this construction for vibration damping. The price for the accuracy and generality of MSE is that the user must be fluent in NASTRAN and must prepare and run a finite element model for each candidate design.

A simplified version of MSC/NASTRAN-MSE for rectangular sandwich plates is presented in the form of design charts derived from a large number of MSC/NASTRAN-MSE runs. They allow the user to rapidly obtain values for modal loss factors and modal frequencies of sandwich plates with various boundary conditions. Plate geometry and material properties are specified in terms of dimensionless groups to allow the maximum information to be conveyed by each chart.

The simplest of the three methods is based on the use of a closed form solution that is strictly applicable only to simply supported rectangular sandwich plates. It is shown that the solution may be used with other boundary conditions to obtain damping estimates of useful accuracy for higher order modes. The method involves negligible costs for computation and has been implemented in an interactive Fortran program.

The latter two methods are applicable only to single rectangular plates rather than to assemblages built up of plate

elements. They are nonetheless useful in that a designer often seeks to increase the damping of local modes of individual plate sections. The modal strain energy method, when implemented in NASTRAN, is quite general and will readily accommodate built-up structures with integral damping.

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APPENDIX A

SAMPLE INPUT AND OUTPUT FOR
NASTRAN/MODAL STRAIN ENERGY ANALYSIS
OF A SANDWICH PLATE

Sample NASTRAN input is given for the following case:

Boundary condition = PTU (zero out-of-plane translation,
zero moment, unrestrained core shear)

Face sheet thicknesses (equal), $T_1 = T_3 = 0.055$ in.

Core layer thickness, $T_2 = 0.0045$ in.

Viscoelastic shear modulus, $G_2 = 450$ lbf/in²

Face sheet Young's moduli (equal), $E_1 = E_3 = 10^7$ lbf/in²

Poisson's ratio of face sheets (equal), $\nu_1 = \nu_3 = 0.3$

Poisson's ratio of core layer, $\nu_2 = 0.49990$

Mass density of face sheets (equal),

$$\rho_1 = \rho_3 = 2.59 \times 10^{-4} \text{ lbf-sec}^2/\text{in}^4$$

Mass density of core layer, $\rho_2 = 9.07 \times 10^{-5}$ lbf-sec²/in⁴

Plate in-plane dimensions, $a \times b = 10 \times 11$ inches

The entire bulk data deck is listed for clarity although most of it was produced automatically by a mesh generator. Executive and case control decks are also listed. The grid and the numbering system is illustrated in Figure A-1.

Output listed for the sample case includes the first page of the eigenvalue table, mode shapes for the first four modes, and strain energy distributions for the first four modes. Set 99 includes all the solid elements used to model the core. Thus, the "percent of total" figure printed out is (after dividing by 100) exactly the strain energy fraction $V_v^{(r)}/V^{(r)}$ of Eq. 4, which equates to the loss parameter $\eta^{(r)}/\eta_v$.

13	113	213	313	413	513	613	713	813	913	1013	1113	1213	
12	12	112	212	312	412	512	612	712	812	912	1012	1112	1212
11	11											1111	1211
10	10											1110	1210
9	9											1109	1209
8	8											1108	1208
7	7											1107	1207
6	6											1106	1206
5	5											1105	1205
4	4											1104	1204
3	3											1103	1203
2	2											1102	1202
1	1	101	201	301	401	501	601	701	801	901	1001	1101	1201
	101	201	301	401	501	601	701	801	901	1001	1101		

Figure A-1 Finite element grid for modal strain energy analysis of rectangular sandwich plate. Upper face sheet showing partial grid numbering and QUAD4 element numbering.

10012	10112	10212	10312	10412	10512	10612	10712	10812	10912	11012	11112
10011											11111
10010											11110
10009											11109
10008											11108
10007											11107
10006											11106
10005											11105
10004											11104
10003											11103
10002											11102
10001	10101	10201	10301	10401	10501	10601	10701	10801	10901	11001	11101

Figure A-2 Finite element grid for modal strain energy analysis of rectangular sandwich plate. Viscoelastic core layer showing partial HEXA element numbering.

10113 10213 10313 10413 10513 10613 10713 10813 10913 11013 11113														
10013	20012	20112	20212	20312	20412	20512	20612	20712	20812	20912	21012	21112		11213
10012	20011											21111		11212
10011	20010											21110		11211
10010	20009											21109		11210
10009	20008											21108		11209
10008	20007											21107		11208
10007	20006											21106		11207
10006	20005											21105		11206
10005	20004											21104		11205
10004	20003											21103		11204
10003	20002											21102		11203
10002	20001	20101	20201	20301	20401	20501	20601	20701	20801	20901	21001	21101		11202
10001														11201
10101 10201 10301 10401 10501 10601 10701 10801 10901 11001 11101														

Figure A-3 Finite element grid for modal strain energy analysis of rectangular sandwich plate. Lower face sheet showing grid numbering and QUAD4 element numbering.

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N A S T R A N E X E C U T I V E C O N T R O L D E C K E C H O

ID SAMPLE, PLATE

SOL 25,0

TIME 10

APP DISP

SGRID 500

SEQUENCE YES

SPUNCH NONE

\$ BEGINNING OF RF ALTER 25\$74

\$ GENERATE SEGP BULK DATA CARDS FOR EFFICIENCY IN SYMMETRIC DECOMP.

\$ THE FOLLOWING ARE USER INPUT PARAMETERS

\$ VALUE

\$ SEGOPT--OUTPUT OPTIONS FOR SEGP CARDS

\$ 0 DEFAULT--NO PRINTED OR PUNCH OUTPUT

\$ 1 PRINT TABLE OF INTERNAL/EXTERNAL SEQUENCE IN INTERNAL ORDER

\$ 2 TRANSMIT THE SEGP CARDS TO THE SYSTEM PUNCH FILE

\$ 3 PRINT TABLE AND PUNCH SEGP CARDS

\$ NEMSEQ--OPTIONS FOR SEQUENCING LOGIC

\$ -1 PERFORM MPC OPERATIONS IF MPCX IS POSITIVE OR ZERO BUT DO

\$ NOT RESEQUENCE.

\$ 1 DEFAULT--USE ACTIVE COLUMN SEQUENCING OPTION

\$ 2 USE BAND SEQUENCING OPTION

\$ 3 RUN BOTH ACTIVE COLUMN AND BAND SEQUENCING--SAVE THE SEQUENCE

\$ WITH THE LOWEST TIME ESTIMATE FOR DECOMPOSITION

\$ SUPER--OPTIONS FOR TYPES OF SEQUENCING

\$ 0 DEFAULT--USE PASSIVE COLUMN SEQUENCING OPTION

\$ -1 USE SUPERELEMENT SEQUENCING OPTION

\$ FACTOR--USED FOR THE GENERATION OF THE INTERNAL SEQUENCE NUMBER

\$ SEQID = FACTOR * SEID + SEQ NUMBER

\$ DEFAULT = 10000

\$ MPCX--OPTION FOR MPC PROCESSING

\$ -1 DEFAULT--DO NOT PROCESS MPC BULK DATA CARDS OR RIGID ELEMENTS

\$ 0 PROCESS RIGID ELEMENTS ONLY

\$ POSITIVE INTEGER IS THE NUMBER OF THE MPC SET TO PROCESS

\$ ALONG WITH ANY RIGID ELEMENTS PRESENT

\$ START--STARTING POINT OPTIONS

\$ 0 DEFAULT--PROGRAM SELECTS STARTING POINT

\$ INTEGER IS NUMBER OF POINTS TO BE USED TO START SEQUENCING

ALTER -11

COND NOSEOP,NEWSEQ \$

SEGP GEOM1,GEOM2,GEOM4,GEOM10,MATPARM/C,Y,SEGOPT=0,V,Y,NEMSEQ=3//

\$ C,Y,SUPER= 0/C,Y,FACTOR=10000/C,Y,MPCX=0/C,Y,START=0 \$

EQUIV GEOM10,GEOM1/ALWAYS \$

LABEL NOSEOP

\$ END OF RF ALTER 25\$74

CEND

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE
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**** SHEAR PARAMETER = 40.7 GEOMETRY PARAMETER = 3.5 ****

CASE CONTROL DECK ECHO

CARD
COUNT

1 TITLE=MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
2 SUBTITLE=SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE
3 LABEL=**** SHEAR PARAMETER = 40.7 GEOMETRY PARAMETER = 3.5 ****

4 \$
5 \$ SIMPLY SUPPORTED BOUNDARY CONDITION FOR BOTH SHEETS

6 \$
7 SPC=1

8 METHOD=77

9 SPCFORCES=ALL

10 SUBCASE 1

11 MODES = 4

12 SET 88 = 1 THRU 1213

13 SET 99 = 10001 THRU 11112

14 DISPLACEMENTS=88

15 ESE = 99

16 SUBCASE 5

17 DISPLACEMENT=NONE

18 BEGIN BULK

INPUT BULK DATA CARD COUNT = 965

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CURE

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

SORTED BULK DATA ECHO

CARD	1	2	3	4	5	6	7	8	9	10
CCUNT	1	2	3	4	5	6	7	8	9	10
1-	ASET1	3	102	104	106	108	110	112		
2-	ASET1	3	203	207	211	407				
3-	ASET1	3	302	304	306	308	310	312		
4-	ASET1	3	502	504	506	508	510	512		
5-	ASET1	3	603	605	607	609	611			
6-	ASET1	3	702	704	706	708	710	712		
7-	ASET1	3	807	1003	1007	1011				
8-	ASET1	3	902	904	906	908	910	912		
9-	ASET1	3	1102	1104	1106	1108	1110	1112		
10-	ASET1	3	10102	10104	10106	10108	10110	10112		
11-	ASET1	3	10203	10207	10211	10407				
12-	ASET1	3	10302	10304	10306	10308	10310	10312		
13-	ASET1	3	10502	10504	10506	10508	10510	10512		
14-	ASET1	3	10603	10605	10607	10609	10611			
15-	ASET1	3	10702	10704	10706	10708	10710	10712		
16-	ASET1	3	10807	11003	11007	11011	10910	10912		
17-	ASET1	3	10902	10904	10906	10908	11110	11112		
18-	ASET1	3	11102	11104	11106	11108	602	605		
19-	ASET1	12	107	203	211	407	1011	1107		
20-	ASET1	12	609	612	807	1003	1011	1107		
21-	ASET1	12	10107	10203	10211	10407	10602	10605		
22-	ASET1	12	10609	10612	10807	11003	11011	11107		
23-	CHEXA	10001	3	1	2	102	101	10001	10002	HEX10001
24-	+EX1000110102	10101	2	3	103	102	10002	10003	10004	HEX10002
25-	CHEXA	10002	3	4	104	103	10003	10004	10005	HEX10003
26-	+EX1000210103	10102	3	5	105	104	10004	10005	10006	HEX10004
27-	CHEXA	10003	3	6	106	105	10005	10006	10007	HEX10005
28-	+EX1000310104	10103	3	7	107	106	10006	10007	10008	HEX10006
29-	CHEXA	10004	3	8	108	107	10007	10008	10009	HEX10007
30-	+EX1000410105	10104	3	9	109	108	10008	10009	10010	HEX10008
31-	CHEXA	10005	3	10	110	109	10009	10010	10011	HEX10009
32-	+EX1000510106	10105	3	11	111	110	10010	10011	10012	HEX10010
33-	CHEXA	10006	3	12	112	111	10011	10012	10013	HEX10011
34-	+EX1000610107	10106	3	13	113	112	10012	10013	10014	HEX10012
35-	CHEXA	10007	3	14	114	113	10013	10014	10015	HEX10013
36-	+EX1000710108	10107	3	15	115	114	10014	10015	10016	HEX10014
37-	CHEXA	10008	3	16	116	115	10015	10016	10017	HEX10015
38-	+EX1000810109	10108	3	17	117	116	10016	10017	10018	HEX10016
39-	CHEXA	10009	3	18	118	117	10017	10018	10019	HEX10017
40-	+EX1000910110	10109	3	19	119	118	10018	10019	10020	HEX10018
41-	CHEXA	10010	3	20	120	119	10019	10020	10021	HEX10019
42-	+EX1001010111	10110	3	21	121	120	10020	10021	10022	HEX10020
43-	CHEXA	10011	3	22	122	121	10021	10022	10023	HEX10021
44-	+EX1001110112	10111	3	23	123	122	10022	10023	10024	HEX10022
45-	CHEXA	10012	3	24	124	123	10023	10024	10025	HEX10023
46-	+EX1001210113	10112	3	25	125	124	10024	10025	10026	HEX10024
47-	CHEXA	10013	3	26	126	125	10025	10026	10027	HEX10025
48-	+EX1001310202	10201	3	27	127	126	10026	10027	10028	HEX10026
49-	CHEXA	10102	3	28	128	127	10027	10028	10029	HEX10027
50-	+EX1010210203	10202	3	29	129	128	10028	10029	10030	HEX10028

MUDAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ****

SORTED BULK DATA ECHO

CARD	1	2	3	4	5	6	7	8	9	10
CCOUNT	1	2	3	4	5	6	7	8	9	10
51-	CHEXA	10103	3	103	104	204	203	10103	10104	HGX10103
52-	+EX1010310204	10203	3	104	105	205	204	10104	10105	HGX10104
53-	CHEXA	10104	3	104	105	205	204	10104	10105	HGX10104
54-	+EX1010410205	10204	3	105	106	206	205	10105	10106	HGX10105
55-	CHEXA	10105	3	105	106	206	205	10105	10106	HGX10105
56-	+EX1010510206	10205	3	106	107	207	206	10106	10107	HGX10106
57-	CHEXA	10106	3	106	107	207	206	10106	10107	HGX10106
58-	+EX1010610207	10206	3	107	108	208	207	10107	10108	HGX10107
59-	CHEXA	10107	3	107	108	208	207	10107	10108	HGX10107
60-	+EX1010710208	10207	3	108	109	209	208	10108	10109	HGX10108
61-	CHEXA	10108	3	108	109	209	208	10108	10109	HGX10108
62-	+EX1010810209	10208	3	109	110	210	209	10109	10110	HGX10109
63-	CHEXA	10109	3	109	110	210	209	10109	10110	HGX10109
64-	+EX1010910210	10209	3	110	111	211	210	10110	10111	HGX10110
65-	CHEXA	10110	3	110	111	211	210	10110	10111	HGX10110
66-	+EX1011010211	10210	3	111	112	212	211	10111	10112	HGX10111
67-	CHEXA	10111	3	111	112	212	211	10111	10112	HGX10111
68-	+EX1011110212	10211	3	112	113	213	212	10112	10113	HGX10112
69-	CHEXA	10112	3	112	113	213	212	10112	10113	HGX10112
70-	+EX1011210213	10212	3	201	202	302	301	10201	10202	HGX10201
71-	CHEXA	10201	3	201	202	302	301	10201	10202	HGX10201
72-	+EX1020110302	10301	3	202	203	303	302	10202	10203	HGX10202
73-	CHEXA	10202	3	202	203	303	302	10202	10203	HGX10202
74-	+EX1020210303	10302	3	203	204	304	303	10203	10204	HGX10203
75-	CHEXA	10203	3	203	204	304	303	10203	10204	HGX10203
76-	+EX1020310304	10303	3	204	205	305	304	10204	10205	HGX10204
77-	CHEXA	10204	3	204	205	305	304	10204	10205	HGX10204
78-	+EX1020410305	10304	3	205	206	306	305	10205	10206	HGX10205
79-	CHEXA	10205	3	205	206	306	305	10205	10206	HGX10205
80-	+EX1020510306	10305	3	206	207	307	306	10206	10207	HGX10206
81-	CHEXA	10206	3	206	207	307	306	10206	10207	HGX10206
82-	+EX1020610307	10306	3	207	208	308	307	10207	10208	HGX10207
83-	CHEXA	10207	3	207	208	308	307	10207	10208	HGX10207
84-	+EX1020710308	10307	3	208	209	309	308	10208	10209	HGX10208
85-	CHEXA	10208	3	208	209	309	308	10208	10209	HGX10208
86-	+EX1020810309	10308	3	209	210	310	309	10209	10210	HGX10209
87-	CHEXA	10209	3	209	210	310	309	10209	10210	HGX10209
88-	+EX1020910310	10309	3	210	211	311	310	10210	10211	HGX10210
89-	CHEXA	10210	3	210	211	311	310	10210	10211	HGX10210
90-	+EX1021010311	10310	3	211	212	312	311	10211	10212	HGX10211
91-	CHEXA	10211	3	211	212	312	311	10211	10212	HGX10211
92-	+EX1021110312	10311	3	212	213	313	312	10212	10213	HGX10212
93-	CHEXA	10212	3	212	213	313	312	10212	10213	HGX10212
94-	+EX1021210313	10312	3	301	302	402	401	10301	10302	HGX10301
95-	CHEXA	10301	3	301	302	402	401	10301	10302	HGX10301
96-	+EX1030110402	10401	3	302	303	403	402	10302	10303	HGX10302
97-	CHEXA	10302	3	302	303	403	402	10302	10303	HGX10302
98-	+EX1030210403	10402	3	303	304	404	403	10303	10304	HGX10303
99-	CHEXA	10303	3	303	304	404	403	10303	10304	HGX10303
100-	+EX1030310404	10403	3							

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40.7 GEOMETRY PARAMETER = 3.5 ****

SORTED BULK DATA ECHO

CARD	1	2	3	4	5	6	7	8	9	10
CCUNT										
101-	CHEXA	10304	3	304	305	405	404	10304	10305	10304
102-	+EX1030410405	10404								10305
103-	CHEXA	10305	3	305	306	406	405	10305	10306	10305
104-	+EX1030510406	10405								10306
105-	CHEXA	10306	3	306	307	407	406	10306	10307	10306
106-	+EX1030610407	10406								10307
107-	CHEXA	10307	3	307	308	408	407	10307	10308	10307
108-	+EX1030710408	10407								10308
109-	CHEXA	10308	3	308	309	409	408	10308	10309	10308
110-	+EX1030810409	10408								10309
111-	CHEXA	10309	3	309	310	410	409	10309	10310	10309
112-	+EX1030910410	10409								10310
113-	CHEXA	10310	3	310	311	411	410	10310	10311	10310
114-	+EX1031010411	10410								10311
115-	CHEXA	10311	3	311	312	412	411	10311	10312	10311
116-	+EX1031110412	10411								10312
117-	CHEXA	10312	3	312	313	413	412	10312	10313	10312
118-	+EX1031210413	10412								10313
119-	CHEXA	10401	3	401	402	502	501	10401	10402	10401
120-	+EX1040110502	10501								10402
121-	CHEXA	10402	3	402	403	503	502	10402	10403	10402
122-	+EX1040210503	10502								10403
123-	CHEXA	10403	3	403	404	504	503	10403	10404	10403
124-	+EX1040310504	10503								10404
125-	CHEXA	10404	3	404	405	505	504	10404	10405	10404
126-	+EX1040410505	10504								10405
127-	CHEXA	10405	3	405	406	506	505	10405	10406	10405
128-	+EX1040510506	10505								10406
129-	CHEXA	10406	3	406	407	507	506	10406	10407	10406
130-	+EX1040610507	10506								10407
131-	CHEXA	10407	3	407	408	508	507	10407	10408	10407
132-	+EX1040710508	10507								10408
133-	CHEXA	10408	3	408	409	509	508	10408	10409	10408
134-	+EX1040810509	10508								10409
135-	CHEXA	10409	3	409	410	510	509	10409	10410	10409
136-	+EX1040910510	10509								10410
137-	CHEXA	10410	3	410	411	511	510	10410	10411	10410
138-	+EX1041010511	10510								10411
139-	CHEXA	10411	3	411	412	512	511	10411	10412	10411
140-	+EX1041110512	10511								10412
141-	CHEXA	10412	3	412	413	513	512	10412	10413	10412
142-	+EX1041210513	10512								10413
143-	CHEXA	10501	3	501	502	602	601	10501	10502	10501
144-	+EX1050110602	10601								10502
145-	CHEXA	10502	3	502	503	603	602	10502	10503	10502
146-	+EX1050210603	10602								10503
147-	CHEXA	10503	3	503	504	604	603	10503	10504	10503
148-	+EX1050310604	10603								10504
149-	CHEXA	10504	3	504	505	605	604	10504	10505	10504
150-	+EX1050410605	10604								10505

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

S O R T E D B U L K D A T A E C H O										
CARC	1	2	3	4	5	6	7	8	9	10
CCUNT	CHXA	10505	3	505	506	606	605	10505	10506	HEX10505
151-	+EX1050510606	10605	3	506	507	607	606	10506	10507	HEX10506
152-	CHXA	10506	3	507	508	608	607	10507	10508	HEX10507
153-	+EX1050610607	10606	3	508	509	609	608	10508	10509	HEX10508
154-	CHXA	10507	3	509	510	610	609	10509	10510	HEX10509
155-	+EX1050710608	10607	3	510	511	611	610	10510	10511	HEX10510
156-	CHXA	10508	3	511	512	612	611	10511	10512	HEX10511
157-	+EX1050810609	10608	3	512	513	613	612	10512	10513	HEX10512
158-	CHXA	10509	3	513	514	614	613	10513	10514	HEX10513
159-	+EX1050910610	10609	3	514	515	615	614	10514	10515	HEX10514
160-	CHXA	10510	3	515	516	616	615	10515	10516	HEX10515
161-	+EX1051010611	10610	3	516	517	617	616	10516	10517	HEX10516
162-	CHXA	10511	3	517	518	618	617	10517	10518	HEX10517
163-	+EX1051110612	10611	3	518	519	619	618	10518	10519	HEX10518
164-	CHXA	10512	3	519	520	620	619	10519	10520	HEX10520
165-	+EX1051210613	10612	3	520	521	621	620	10520	10521	HEX10521
166-	CHXA	10601	3	601	602	702	701	10601	10602	HEX10601
167-	+EX1060110702	10701	3	602	603	703	702	10602	10603	HEX10602
168-	CHXA	10602	3	603	604	704	703	10603	10604	HEX10603
169-	+EX1060210703	10702	3	604	605	705	704	10604	10605	HEX10604
170-	CHXA	10603	3	605	606	706	705	10605	10606	HEX10605
171-	+EX1060310704	10703	3	606	607	707	706	10606	10607	HEX10606
172-	CHXA	10604	3	607	608	708	707	10607	10608	HEX10607
173-	+EX1060410705	10704	3	608	609	709	708	10608	10609	HEX10608
174-	CHXA	10605	3	609	610	710	709	10609	10610	HEX10609
175-	+EX1060510706	10705	3	610	611	711	710	10610	10611	HEX10610
176-	CHXA	10606	3	611	612	712	711	10611	10612	HEX10611
177-	+EX1060610707	10706	3	612	613	713	712	10612	10613	HEX10612
178-	CHXA	10607	3	613	614	714	713	10613	10614	HEX10613
179-	+EX1060710708	10707	3	614	615	715	714	10614	10615	HEX10614
180-	CHXA	10608	3	615	616	716	715	10615	10616	HEX10615
181-	+EX1060810709	10708	3	616	617	717	716	10616	10617	HEX10616
182-	CHXA	10609	3	617	618	718	717	10617	10618	HEX10617
183-	+EX1060910710	10709	3	618	619	719	718	10618	10619	HEX10618
184-	CHXA	10610	3	619	620	720	719	10619	10620	HEX10619
185-	+EX1061010711	10710	3	620	621	721	720	10620	10621	HEX10620
186-	CHXA	10611	3	621	622	722	721	10621	10622	HEX10621
187-	+EX1061110712	10711	3	622	623	723	722	10622	10623	HEX10622
188-	CHXA	10612	3	623	624	724	723	10623	10624	HEX10623
189-	+EX1061210713	10712	3	624	625	725	724	10624	10625	HEX10624
190-	CHXA	10701	3	701	702	802	801	10701	10702	HEX10701
191-	+EX1070110802	10801	3	702	703	803	802	10702	10703	HEX10702
192-	CHXA	10702	3	703	704	804	803	10703	10704	HEX10703
193-	+EX1070210803	10802	3	704	705	805	804	10704	10705	HEX10704
194-	CHXA	10703	3	705	706	806	805	10705	10706	HEX10705
195-	+EX1070310804	10803	3	706	707	807	806	10706	10707	HEX10706
196-	CHXA	10704	3	707	708	808	807	10707	10708	HEX10707
197-	+EX1070410805	10804	3	708	709	809	808	10708	10709	HEX10708
198-	CHXA	10705	3	709	710	810	809	10709	10710	HEX10709
199-	+EX1070510806	10805	3	710	711	811	810	10710	10711	HEX10710
200-	CHXA	10806	3	711	712	812	811	10711	10712	HEX10711

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0005 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ****

SORTED BULK DATA ECHO

CARD	1	2	3	4	5	6	7	8	9	10
CCUNT	1	2	3	4	5	6	7	8	9	10
201-	CHEX	10706	10806	706	707	807	806	10706	10707	HEX10706
202-	+EX1070610807	10806	10806	707	708	808	807	10707	10708	HEX10707
203-	CHEX	10707	10807	708	709	809	808	10708	10709	HEX10708
204-	+EX1070710808	10808	10808	709	710	810	809	10709	10710	HEX10709
205-	CHEX	10708	10808	710	711	811	810	10710	10711	HEX10710
206-	+EX1070810809	10809	10809	711	712	812	811	10711	10712	HEX10711
207-	CHEX	10709	10809	712	713	813	812	10712	10713	HEX10712
208-	+EX1070910810	10810	10810	713	714	814	813	10713	10714	HEX10713
209-	CHEX	10710	10810	714	715	815	814	10714	10715	HEX10714
210-	+EX1071010811	10811	10811	715	716	816	815	10715	10716	HEX10715
211-	CHEX	10711	10811	716	717	817	816	10716	10717	HEX10716
212-	+EX1071110812	10812	10812	717	718	818	817	10717	10718	HEX10717
213-	CHEX	10712	10812	718	719	819	818	10718	10719	HEX10718
214-	+EX1071210813	10813	10813	719	720	820	819	10719	10720	HEX10719
215-	CHEX	10801	10901	801	802	902	901	10801	10802	HEX10801
216-	+EX1080110902	10902	10902	802	803	903	902	10802	10803	HEX10802
217-	CHEX	10802	10902	803	804	904	903	10803	10804	HEX10803
218-	+EX1080210903	10903	10903	804	805	905	904	10804	10805	HEX10804
219-	CHEX	10803	10903	805	806	906	905	10805	10806	HEX10805
220-	+EX1080310904	10904	10904	806	807	907	906	10806	10807	HEX10806
221-	CHEX	10804	10904	807	808	908	907	10807	10808	HEX10807
222-	+EX1080410905	10905	10905	808	809	909	908	10808	10809	HEX10808
223-	CHEX	10805	10905	809	810	910	909	10809	10810	HEX10809
224-	+EX1080510906	10906	10906	810	811	911	910	10810	10811	HEX10810
225-	CHEX	10806	10906	811	812	912	911	10811	10812	HEX10811
226-	+EX1080610907	10907	10907	812	813	913	912	10812	10813	HEX10812
227-	CHEX	10807	10907	813	814	914	913	10813	10814	HEX10813
228-	+EX1080710908	10908	10908	814	815	915	914	10814	10815	HEX10814
229-	CHEX	10808	10908	815	816	916	915	10815	10816	HEX10815
230-	+EX1080810909	10909	10909	816	817	917	916	10816	10817	HEX10816
231-	CHEX	10809	10909	817	818	918	917	10817	10818	HEX10817
232-	+EX1080910910	10910	10910	818	819	919	918	10818	10819	HEX10818
233-	CHEX	10810	10910	819	820	920	919	10819	10820	HEX10819
234-	+EX1081010911	10911	10911	820	821	921	920	10820	10821	HEX10820
235-	CHEX	10811	10911	821	822	922	921	10821	10822	HEX10821
236-	+EX1081110912	10912	10912	822	823	923	922	10822	10823	HEX10822
237-	CHEX	10812	10912	823	824	924	923	10823	10824	HEX10823
238-	+EX1081210913	10913	10913	824	825	925	924	10824	10825	HEX10824
239-	CHEX	10901	11001	901	902	1002	1001	10901	10902	HEX10901
240-	+EX1090111002	11002	11002	902	903	1003	1002	10902	10903	HEX10902
241-	CHEX	10902	11002	903	904	1004	1003	10903	10904	HEX10903
242-	+EX1090211003	11003	11003	904	905	1005	1004	10904	10905	HEX10904
243-	CHEX	10903	11003	905	906	1006	1005	10905	10906	HEX10905
244-	+EX1090311004	11004	11004	906	907	1007	1006	10906	10907	HEX10906
245-	CHEX	10904	11004	907	908	1008	1007	10907	10908	HEX10907
246-	+EX1090411005	11005	11005	908	909	1009	1008	10908	10909	HEX10908
247-	CHEX	10905	11005	909	910	1010	1009	10909	10910	HEX10909
248-	+EX1090511006	11006	11006	910	911	1011	1010	10910	10911	HEX10910
249-	CHEX	10906	11006	911	912	1012	1011	10911	10912	HEX10911
250-	+EX1090611007	11007	11007	912	913	1013	1012	10912	10913	HEX10912

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MUDAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACI SPEEDS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ****

S O R T E D B U L K D A T A E C H O

CARD	1	2	3	4	5	6	7	8	9	10
CCUNT	CHXA	10907	3	907	908	1008	1007	10907	10908	HEX10907
251-	+EX10907	10908	11007	908	909	1009	1008	10908	10909	HEX10908
252-	CHXA	10908	3	908	909	1009	1008	10908	10909	HEX10908
253-	+EX10908	11009	11008	909	910	1010	1009	10909	10910	HEX10909
254-	CHXA	10909	3	909	910	1010	1009	10909	10910	HEX10909
255-	+EX10909	11010	11009	910	911	1011	1010	10910	10911	HEX10910
256-	CHXA	10910	3	910	911	1011	1010	10910	10911	HEX10910
257-	+EX10910	11011	11010	911	912	1012	1011	10911	10912	HEX10911
258-	CHXA	10911	3	911	912	1012	1011	10911	10912	HEX10911
259-	+EX10911	11012	11011	912	913	1013	1012	10912	10913	HEX10912
260-	CHXA	10912	3	912	913	1013	1012	10912	10913	HEX10912
261-	+EX10912	11013	11012	913	1002	1102	1101	11001	11002	HEX11001
262-	CHXA	11001	3	1001	1002	1102	1101	11001	11002	HEX11001
263-	+EX11001	11101	11100	1002	1003	1103	1102	11002	11003	HEX11002
264-	CHXA	11002	3	1002	1003	1103	1102	11002	11003	HEX11002
265-	+EX11002	11103	11102	1003	1004	1104	1103	11003	11004	HEX11003
266-	CHXA	11003	3	1003	1004	1104	1103	11003	11004	HEX11003
267-	+EX11003	11104	11103	1004	1005	1105	1104	11004	11005	HEX11004
268-	CHXA	11004	3	1004	1005	1105	1104	11004	11005	HEX11004
269-	+EX11004	11105	11104	1005	1006	1106	1105	11005	11006	HEX11005
270-	CHXA	11005	3	1005	1006	1106	1105	11005	11006	HEX11005
271-	+EX11005	11106	11105	1006	1007	1107	1106	11006	11007	HEX11006
272-	CHXA	11006	3	1006	1007	1107	1106	11006	11007	HEX11006
273-	+EX11006	11107	11106	1007	1008	1108	1107	11007	11008	HEX11007
274-	CHXA	11007	3	1007	1008	1108	1107	11007	11008	HEX11007
275-	+EX11007	11108	11107	1008	1009	1109	1108	11008	11009	HEX11008
276-	CHXA	11008	3	1008	1009	1109	1108	11008	11009	HEX11008
277-	+EX11008	11109	11108	1009	1010	1110	1109	11009	11010	HEX11009
278-	CHXA	11009	3	1009	1010	1110	1109	11009	11010	HEX11009
279-	+EX11009	11110	11109	1010	1011	1111	1110	11010	11011	HEX11010
280-	CHXA	11010	3	1010	1011	1111	1110	11010	11011	HEX11010
281-	+EX11010	11111	11110	1011	1012	1112	1111	11011	11012	HEX11011
282-	CHXA	11011	3	1011	1012	1112	1111	11011	11012	HEX11011
283-	+EX11011	11112	11111	1012	1013	1113	1112	11012	11013	HEX11012
284-	CHXA	11012	3	1012	1013	1113	1112	11012	11013	HEX11012
285-	+EX11012	11113	11112	1013	1101	1102	1201	11101	11102	HEX11101
286-	CHXA	11101	3	1101	1102	1202	1201	11101	11102	HEX11101
287-	+EX11101	11201	11200	1102	1103	1203	1202	11102	11103	HEX11102
288-	CHXA	11102	3	1102	1103	1203	1202	11102	11103	HEX11102
289-	+EX11102	11203	11202	1103	1104	1204	1203	11103	11104	HEX11103
290-	CHXA	11103	3	1103	1104	1204	1203	11103	11104	HEX11103
291-	+EX11103	11204	11203	1104	1105	1205	1204	11104	11105	HEX11104
292-	CHXA	11104	3	1104	1105	1205	1204	11104	11105	HEX11104
293-	+EX11104	11205	11204	1105	1106	1206	1205	11105	11106	HEX11105
294-	CHXA	11105	3	1105	1106	1206	1205	11105	11106	HEX11105
295-	+EX11105	11206	11205	1106	1107	1207	1206	11106	11107	HEX11106
296-	CHXA	11106	3	1106	1107	1207	1206	11106	11107	HEX11106
297-	+EX11106	11207	11206	1107	1108	1208	1207	11107	11108	HEX11107
298-	CHXA	11107	3	1107	1108	1208	1207	11107	11108	HEX11107
299-	+EX11107	11208	11207	1108	1109	1209	1208	11108	11109	HEX11108
300-	CHXA	11108	3	1108	1109	1209	1208	11108	11109	HEX11108

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

SORTED BULK DATA ECHO

CARD	1	2	3	4	5	6	7	8	9	10
CCUNT										
301-	CHEXA	11108	3	1108	1109	1209	1208	11108	11109	MEX11108
302-	+EX1110811209	11208								
303-	CHEXA	11109	3	1109	1110	1210	1209	11109	11110	MEX11109
304-	+EX1110911210	11209								
305-	CHEXA	11110	3	1110	1111	1211	1210	11110	11111	MEX11110
306-	+EX1111011211	11210								
307-	CHEXA	11111	3	1111	1112	1212	1211	11111	11112	MEX11111
308-	+EX1111111212	11211								
309-	CHEXA	11112	3	1112	1113	1213	1212	11112	11113	MEX11112
310-	+EX1111211213	11212								
311-	CQUADA	1	1	2	102	101				
312-	CQUADA	2	1	3	103	102				
313-	CQUADA	3	1	4	104	103				
314-	CQUADA	4	1	5	105	104				
315-	CQUADA	5	1	6	106	105				
316-	CQUADA	6	1	7	107	106				
317-	CQUADA	7	1	8	108	107				
318-	CQUADA	8	1	9	109	108				
319-	CQUADA	9	1	10	110	109				
320-	CQUADA	10	1	11	111	110				
321-	CQUADA	11	1	12	112	111				
322-	CQUADA	12	1	13	113	112				
323-	CQUADA	101	1	101	202	201				
324-	CQUADA	102	1	102	203	202				
325-	CQUADA	103	1	103	204	203				
326-	CQUADA	104	1	104	205	204				
327-	CQUADA	105	1	105	206	205				
328-	CQUADA	106	1	106	207	206				
329-	CQUADA	107	1	107	208	207				
330-	CQUADA	108	1	108	209	208				
331-	CQUADA	109	1	109	210	209				
332-	CQUADA	110	1	110	211	210				
333-	CQUADA	111	1	111	212	211				
334-	CQUADA	112	1	112	213	212				
335-	CQUADA	201	1	201	302	301				
336-	CQUADA	202	1	202	303	302				
337-	CQUADA	203	1	203	304	303				
338-	CQUADA	204	1	204	305	304				
339-	CQUADA	205	1	205	306	305				
340-	CQUADA	206	1	206	307	306				
341-	CQUADA	207	1	207	308	307				
342-	CQUADA	208	1	208	309	308				
343-	CQUADA	209	1	209	310	309				
344-	CQUADA	210	1	210	311	310				
345-	CQUADA	211	1	211	312	311				
346-	CQUADA	212	1	212	313	312				
347-	CQUADA	301	1	301	402	401				
348-	CQUADA	302	1	302	403	402				
349-	CQUADA	303	1	303	404	403				
350-	CQUADA	304	1	304	405	404				

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0005 IN CORE

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

ROUTED BULK DATA ECHO

CARD	1	2	3	4	5	6	7	8	9	10
CCOUNT	1	2	3	4	5	6	7	8	9	10
351-	QUADA 305	1	305	306	406	405				
352-	QUADA 306	1	306	307	407	406				
353-	QUADA 307	1	307	308	408	407				
354-	QUADA 308	1	308	309	409	408				
355-	QUADA 309	1	309	310	410	409				
356-	QUADA 310	1	310	311	411	410				
357-	QUADA 311	1	311	312	412	411				
358-	QUADA 312	1	312	313	413	412				
359-	QUADA 401	1	401	402	502	501				
360-	QUADA 402	1	402	403	503	502				
361-	QUADA 403	1	403	404	504	503				
362-	QUADA 404	1	404	405	505	504				
363-	QUADA 405	1	405	406	506	505				
364-	QUADA 406	1	406	407	507	506				
365-	QUADA 407	1	407	408	508	507				
366-	QUADA 408	1	408	409	509	508				
367-	QUADA 409	1	409	410	510	509				
368-	QUADA 410	1	410	411	511	510				
369-	QUADA 411	1	411	412	512	511				
370-	QUADA 412	1	412	413	513	512				
371-	QUADA 501	1	501	502	602	601				
372-	QUADA 502	1	502	503	603	602				
373-	QUADA 503	1	503	504	604	603				
374-	QUADA 504	1	504	505	605	604				
375-	QUADA 505	1	505	506	606	605				
376-	QUADA 506	1	506	507	607	606				
377-	QUADA 507	1	507	508	608	607				
378-	QUADA 508	1	508	509	609	608				
379-	QUADA 509	1	509	510	610	609				
380-	QUADA 510	1	510	511	611	610				
381-	QUADA 511	1	511	512	612	611				
382-	QUADA 512	1	512	513	613	612				
383-	QUADA 601	1	601	602	702	701				
384-	QUADA 602	1	602	603	703	702				
385-	QUADA 603	1	603	604	704	703				
386-	QUADA 604	1	604	605	705	704				
387-	QUADA 605	1	605	606	706	705				
388-	QUADA 606	1	606	607	707	706				
389-	QUADA 607	1	607	608	708	707				
390-	QUADA 608	1	608	609	709	708				
391-	QUADA 609	1	609	610	710	709				
392-	QUADA 610	1	610	611	711	710				
393-	QUADA 611	1	611	612	712	711				
394-	QUADA 612	1	612	613	713	712				
395-	QUADA 701	1	701	702	802	801				
396-	QUADA 702	1	702	703	803	802				
397-	QUADA 703	1	703	704	804	803				
398-	QUADA 704	1	704	705	805	804				
399-	QUADA 705	1	705	706	806	805				
400-	QUADA 706	1	706	707	807	806				

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE
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*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

CARD	1	2	3	4	5	6	7	8	9	10
CCUNT	1	2	3	4	5	6	7	8	9	10
401-	QUADA 707	1	707	708	808	807				
402-	QUADA 708	1	708	709	809	808				
403-	QUADA 709	1	709	710	810	809				
404-	QUADA 710	1	710	711	811	810				
405-	QUADA 711	1	711	712	812	811				
406-	QUADA 712	1	712	713	813	812				
407-	QUADA 801	1	801	802	902	901				
408-	QUADA 802	1	802	803	903	902				
409-	QUADA 803	1	803	804	904	903				
410-	QUADA 804	1	804	805	905	904				
411-	QUADA 805	1	805	806	906	905				
412-	QUADA 806	1	806	807	907	906				
413-	QUADA 807	1	807	808	908	907				
414-	QUADA 808	1	808	809	909	908				
415-	QUADA 809	1	809	810	910	909				
416-	QUADA 810	1	810	811	911	910				
417-	QUADA 811	1	811	812	912	911				
418-	QUADA 812	1	812	813	913	912				
419-	QUADA 901	1	901	902	1002	1001				
420-	QUADA 902	1	902	903	1003	1002				
421-	QUADA 903	1	903	904	1004	1003				
422-	QUADA 904	1	904	905	1005	1004				
423-	QUADA 905	1	905	906	1006	1005				
424-	QUADA 906	1	906	907	1007	1006				
425-	QUADA 907	1	907	908	1008	1007				
426-	QUADA 908	1	908	909	1009	1008				
427-	QUADA 909	1	909	910	1010	1009				
428-	QUADA 910	1	910	911	1011	1010				
429-	QUADA 911	1	911	912	1012	1011				
430-	QUADA 912	1	912	913	1013	1012				
431-	QUADA 1001	1	1001	1002	1102	1101				
432-	QUADA 1002	1	1002	1003	1103	1102				
433-	QUADA 1003	1	1003	1004	1104	1103				
434-	QUADA 1004	1	1004	1005	1105	1104				
435-	QUADA 1005	1	1005	1006	1106	1105				
436-	QUADA 1006	1	1006	1007	1107	1106				
437-	QUADA 1007	1	1007	1008	1108	1107				
438-	QUADA 1008	1	1008	1009	1109	1108				
439-	QUADA 1009	1	1009	1010	1110	1109				
440-	QUADA 1010	1	1010	1011	1111	1110				
441-	QUADA 1011	1	1011	1012	1112	1111				
442-	QUADA 1012	1	1012	1013	1113	1112				
443-	QUADA 1101	1	1101	1102	1202	1201				
444-	QUADA 1102	1	1102	1103	1203	1202				
445-	QUADA 1103	1	1103	1104	1204	1203				
446-	QUADA 1104	1	1104	1105	1205	1204				
447-	QUADA 1105	1	1105	1106	1206	1205				
448-	QUADA 1106	1	1106	1107	1207	1206				
449-	QUADA 1107	1	1107	1108	1208	1207				
450-	QUADA 1108	1	1108	1109	1209	1208				

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MUDAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE
**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****

CARD	1	2	3	4	5	6	7	8	9	10
CCUNT	1	2	3	4	5	6	7	8	9	10
451-	CUADA	1109	1109	1110	1110	1210	1209			
452-	CUADA	1110	1110	1111	1111	1211	1210			
453-	CUADA	1111	1111	1112	1112	1212	1211			
454-	CUADA	1112	1112	1113	1113	1213	1212			
455-	CUADA	2001	2001	2002	2002	10102	10101			
456-	CUADA	2002	2002	2003	2003	10103	10102			
457-	CUADA	2003	2003	2004	2004	10104	10103			
458-	CUADA	2004	2004	2005	2005	10105	10104			
459-	CUADA	2005	2005	2006	2006	10106	10105			
460-	CUADA	2006	2006	2007	2007	10107	10106			
461-	CUADA	2007	2007	2008	2008	10108	10107			
462-	CUADA	2008	2008	2009	2009	10109	10108			
463-	CUADA	2009	2009	2010	2010	10110	10109			
464-	CUADA	2010	2010	2011	2011	10111	10110			
465-	CUADA	2011	2011	2012	2012	10112	10111			
466-	CUADA	2012	2012	2013	2013	10113	10112			
467-	CUADA	2013	2013	2014	2014	10114	10113			
468-	CUADA	2014	2014	2015	2015	10115	10114			
469-	CUADA	2015	2015	2016	2016	10116	10115			
470-	CUADA	2016	2016	2017	2017	10117	10116			
471-	CUADA	2017	2017	2018	2018	10118	10117			
472-	CUADA	2018	2018	2019	2019	10119	10118			
473-	CUADA	2019	2019	2020	2020	10120	10119			
474-	CUADA	2020	2020	2021	2021	10121	10120			
475-	CUADA	2021	2021	2022	2022	10122	10121			
476-	CUADA	2022	2022	2023	2023	10123	10122			
477-	CUADA	2023	2023	2024	2024	10124	10123			
478-	CUADA	2024	2024	2025	2025	10125	10124			
479-	CUADA	2025	2025	2026	2026	10126	10125			
480-	CUADA	2026	2026	2027	2027	10127	10126			
481-	CUADA	2027	2027	2028	2028	10128	10127			
482-	CUADA	2028	2028	2029	2029	10129	10128			
483-	CUADA	2029	2029	2030	2030	10130	10129			
484-	CUADA	2030	2030	2031	2031	10131	10130			
485-	CUADA	2031	2031	2032	2032	10132	10131			
486-	CUADA	2032	2032	2033	2033	10133	10132			
487-	CUADA	2033	2033	2034	2034	10134	10133			
488-	CUADA	2034	2034	2035	2035	10135	10134			
489-	CUADA	2035	2035	2036	2036	10136	10135			
490-	CUADA	2036	2036	2037	2037	10137	10136			
491-	CUADA	2037	2037	2038	2038	10138	10137			
492-	CUADA	2038	2038	2039	2039	10139	10138			
493-	CUADA	2039	2039	2040	2040	10140	10139			
494-	CUADA	2040	2040	2041	2041	10141	10140			
495-	CUADA	2041	2041	2042	2042	10142	10141			
496-	CUADA	2042	2042	2043	2043	10143	10142			
497-	CUADA	2043	2043	2044	2044	10144	10143			
498-	CUADA	2044	2044	2045	2045	10145	10144			
499-	CUADA	2045	2045	2046	2046	10146	10145			
500-	CUADA	2046	2046	2047	2047	10147	10146			

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

CARD		SORTED BULK DATA ECHO									
CCUAT		1	2	3	4	5	6	7	8	9	10
501-	CQUAD4	20311	2	..	10311	10312	10412	10411	..	..	..
502-	CQUAD4	20312	2	..	10312	10313	10412	10412	..	..	..
503-	CQUAD4	20401	2	..	10401	10402	10501	10501	..	..	..
504-	CQUAD4	20402	2	..	10402	10403	10502	10502	..	..	..
505-	CQUAD4	20403	2	..	10403	10404	10503	10503	..	..	..
506-	CQUAD4	20404	2	..	10404	10405	10504	10504	..	..	..
507-	CQUAD4	20405	2	..	10405	10406	10505	10505	..	..	..
508-	CQUAD4	20406	2	..	10406	10407	10506	10506	..	..	..
509-	CQUAD4	20407	2	..	10407	10408	10507	10507	..	..	..
510-	CQUAD4	20408	2	..	10408	10409	10508	10508	..	..	..
511-	CQUAD4	20409	2	..	10409	10410	10509	10509	..	..	..
512-	CQUAD4	20410	2	..	10410	10411	10510	10510	..	..	..
513-	CQUAD4	20411	2	..	10411	10412	10511	10511	..	..	..
514-	CQUAD4	20412	2	..	10412	10413	10512	10512	..	..	..
515-	CQUAD4	20501	2	..	10501	10502	10601	10601	..	..	..
516-	CQUAD4	20502	2	..	10502	10503	10602	10602	..	..	..
517-	CQUAD4	20503	2	..	10503	10504	10603	10603	..	..	..
518-	CQUAD4	20504	2	..	10504	10505	10604	10604	..	..	..
519-	CQUAD4	20505	2	..	10505	10506	10605	10605	..	..	..
520-	CQUAD4	20506	2	..	10506	10507	10606	10606	..	..	..
521-	CQUAD4	20507	2	..	10507	10508	10607	10607	..	..	..
522-	CQUAD4	20508	2	..	10508	10509	10608	10608	..	..	..
523-	CQUAD4	20509	2	..	10509	10510	10609	10609	..	..	..
524-	CQUAD4	20510	2	..	10510	10511	10610	10610	..	..	..
525-	CQUAD4	20511	2	..	10511	10512	10611	10611	..	..	..
526-	CQUAD4	20512	2	..	10512	10513	10612	10612	..	..	..
527-	CQUAD4	20601	2	..	10601	10602	10701	10701	..	..	..
528-	CQUAD4	20602	2	..	10602	10603	10702	10702	..	..	..
529-	CQUAD4	20603	2	..	10603	10604	10703	10703	..	..	..
530-	CQUAD4	20604	2	..	10604	10605	10704	10704	..	..	..
531-	CQUAD4	20605	2	..	10605	10606	10705	10705	..	..	..
532-	CQUAD4	20606	2	..	10606	10607	10706	10706	..	..	..
533-	CQUAD4	20607	2	..	10607	10608	10707	10707	..	..	..
534-	CQUAD4	20608	2	..	10608	10609	10708	10708	..	..	..
535-	CQUAD4	20609	2	..	10609	10610	10709	10709	..	..	..
536-	CQUAD4	20610	2	..	10610	10611	10710	10710	..	..	..
537-	CQUAD4	20611	2	..	10611	10612	10711	10711	..	..	..
538-	CQUAD4	20612	2	..	10612	10613	10712	10712	..	..	..
539-	CQUAD4	20701	2	..	10701	10702	10801	10801	..	..	..
540-	CQUAD4	20702	2	..	10702	10703	10802	10802	..	..	..
541-	CQUAD4	20703	2	..	10703	10704	10803	10803	..	..	..
542-	CQUAD4	20704	2	..	10704	10705	10804	10804	..	..	..
543-	CQUAD4	20705	2	..	10705	10706	10805	10805	..	..	..
544-	CQUAD4	20706	2	..	10706	10707	10806	10806	..	..	..
545-	CQUAD4	20707	2	..	10707	10708	10807	10807	..	..	..
546-	CQUAD4	20708	2	..	10708	10709	10808	10808	..	..	..
547-	CQUAD4	20709	2	..	10709	10710	10809	10809	..	..	..
548-	CQUAD4	20710	2	..	10710	10711	10810	10810	..	..	..
549-	CQUAD4	20711	2	..	10711	10712	10811	10811	..	..	..
550-	CQUAD4	20712	2	..	10712	10713	10812	10812	..	..	..

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MUDAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0005 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ****

SORTED BULK DATA ECHO

CARC	1	2	3	4	5	6	7	8	9	10
CCOUNT	1	2	3	4	5	6	7	8	9	10
551-	QUADA	20801	2	10801	10802	10901	10901			
552-	QUADA	20802	2	10802	10803	10902	10902			
553-	QUADA	20803	2	10803	10804	10903	10903			
554-	QUADA	20804	2	10804	10805	10904	10904			
555-	QUADA	20805	2	10805	10806	10905	10905			
556-	QUADA	20806	2	10806	10807	10906	10906			
557-	QUADA	20807	2	10807	10808	10907	10907			
558-	QUADA	20808	2	10808	10809	10908	10908			
559-	QUADA	20809	2	10809	10810	10909	10909			
560-	QUADA	20810	2	10810	10811	10910	10910			
561-	QUADA	20811	2	10811	10812	10911	10911			
562-	QUADA	20812	2	10812	10813	10912	10912			
563-	QUADA	20901	2	10901	10902	11001	11001			
564-	QUADA	20902	2	10902	10903	11002	11002			
565-	QUADA	20903	2	10903	10904	11003	11003			
566-	QUADA	20904	2	10904	10905	11004	11004			
567-	QUADA	20905	2	10905	10906	11005	11005			
568-	QUADA	20906	2	10906	10907	11006	11006			
569-	QUADA	20907	2	10907	10908	11007	11007			
570-	QUADA	20908	2	10908	10909	11008	11008			
571-	QUADA	20909	2	10909	10910	11009	11009			
572-	QUADA	20910	2	10910	10911	11010	11010			
573-	QUADA	20911	2	10911	10912	11011	11011			
574-	QUADA	20912	2	10912	10913	11012	11012			
575-	QUADA	21001	2	11001	11002	11101	11101			
576-	QUADA	21002	2	11002	11003	11102	11102			
577-	QUADA	21003	2	11003	11004	11103	11103			
578-	QUADA	21004	2	11004	11005	11104	11104			
579-	QUADA	21005	2	11005	11006	11105	11105			
580-	QUADA	21006	2	11006	11007	11106	11106			
581-	QUADA	21007	2	11007	11008	11107	11107			
582-	QUADA	21008	2	11008	11009	11108	11108			
583-	QUADA	21009	2	11009	11010	11109	11109			
584-	QUADA	21010	2	11010	11011	11110	11110			
585-	QUADA	21011	2	11011	11012	11111	11111			
586-	QUADA	21012	2	11012	11013	11112	11112			
587-	QUADA	21101	2	11101	11102	11201	11201			
588-	QUADA	21102	2	11102	11103	11202	11202			
589-	QUADA	21103	2	11103	11104	11203	11203			
590-	QUADA	21104	2	11104	11105	11204	11204			
591-	QUADA	21105	2	11105	11106	11205	11205			
592-	QUADA	21106	2	11106	11107	11206	11206			
593-	QUADA	21107	2	11107	11108	11207	11207			
594-	QUADA	21108	2	11108	11109	11208	11208			
595-	QUADA	21109	2	11109	11110	11209	11209			
596-	QUADA	21110	2	11110	11111	11210	11210			
597-	QUADA	21111	2	11111	11112	11211	11211			
598-	QUADA	21112	2	11112	11113	11212	11212			
599-	EIGR	77	GIV	11112	11113	11213	11213			
600-	+EIGR	MAX								

10.E-10 +EIGR

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JANUARY 10, 1983 NASTRAN 12/14/81

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SPEEDS, .0005 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ****

SORTED BULK DATA ECHO

CARD	1	2	3	4	5	6	7	8	9	10
CCUNT	1	2	3	4	5	6	7	8	9	10
601-	GRID	1	0.000	0.000	91667	.00225				
602-	GRID	2	0.000	0.000	.00000	.00225				
603-	GRID	3	0.000	91667	.00225					
604-	GRID	4	0.000	1.8333	.00225					
605-	GRID	5	0.000	2.7500	.00225					
606-	GRID	6	0.000	3.6667	.00225					
607-	GRID	7	0.000	4.5833	.00225					
608-	GRID	8	0.000	5.5000	.00225					
609-	GRID	9	0.000	6.4167	.00225					
610-	GRID	10	0.000	7.3333	.00225					
611-	GRID	11	0.000	8.2500	.00225					
612-	GRID	12	0.000	9.1667	.00225					
613-	GRID	13	0.000	10.0833	.00225					
614-	GRID	101	.8333	91667	.00225					
615-	GRID	102	.8333	0.0000	.00225					
616-	GRID	103	.8333	91667	.00225					
617-	GRID	104	.8333	1.8333	.00225					
618-	GRID	105	.8333	2.7500	.00225					
619-	GRID	106	.8333	3.6667	.00225					
620-	GRID	107	.8333	4.5833	.00225					
621-	GRID	108	.8333	5.5000	.00225					
622-	GRID	109	.8333	6.4167	.00225					
623-	GRID	110	.8333	7.3333	.00225					
624-	GRID	111	.8333	8.2500	.00225					
625-	GRID	112	.8333	9.1667	.00225					
626-	GRID	113	.8333	10.0833	.00225					
627-	GRID	201	1.6667	91667	.00225					
628-	GRID	202	1.6667	0.0000	.00225					
629-	GRID	203	1.6667	91667	.00225					
630-	GRID	204	1.6667	1.8333	.00225					
631-	GRID	205	1.6667	2.7500	.00225					
632-	GRID	206	1.6667	3.6667	.00225					
633-	GRID	207	1.6667	4.5833	.00225					
634-	GRID	208	1.6667	5.5000	.00225					
635-	GRID	209	1.6667	6.4167	.00225					
636-	GRID	210	1.6667	7.3333	.00225					
637-	GRID	211	1.6667	8.2500	.00225					
638-	GRID	212	1.6667	9.1667	.00225					
639-	GRID	213	1.6667	10.0833	.00225					
640-	GRID	301	2.5000	91667	.00225					
641-	GRID	302	2.5000	0.0000	.00225					
642-	GRID	303	2.5000	91667	.00225					
643-	GRID	304	2.5000	1.8333	.00225					
644-	GRID	305	2.5000	2.7500	.00225					
645-	GRID	306	2.5000	3.6667	.00225					
646-	GRID	307	2.5000	4.5833	.00225					
647-	GRID	308	2.5000	5.5000	.00225					
648-	GRID	309	2.5000	6.4167	.00225					
649-	GRID	310	2.5000	7.3333	.00225					
650-	GRID	311	2.5000	8.2500	.00225					

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ****

SORTED BULK DATA ECHO

CARD	1	2	3	4	5	6	7	8	9	10
CCUNT	GRID	312	313	314	315	316	317	318	319	320
651-	GRID	312	313	314	315	316	317	318	319	320
652-	GRID	312	313	314	315	316	317	318	319	320
653-	GRID	312	313	314	315	316	317	318	319	320
654-	GRID	312	313	314	315	316	317	318	319	320
655-	GRID	312	313	314	315	316	317	318	319	320
656-	GRID	312	313	314	315	316	317	318	319	320
657-	GRID	312	313	314	315	316	317	318	319	320
658-	GRID	312	313	314	315	316	317	318	319	320
659-	GRID	312	313	314	315	316	317	318	319	320
660-	GRID	312	313	314	315	316	317	318	319	320
661-	GRID	312	313	314	315	316	317	318	319	320
662-	GRID	312	313	314	315	316	317	318	319	320
663-	GRID	312	313	314	315	316	317	318	319	320
664-	GRID	312	313	314	315	316	317	318	319	320
665-	GRID	312	313	314	315	316	317	318	319	320
666-	GRID	312	313	314	315	316	317	318	319	320
667-	GRID	312	313	314	315	316	317	318	319	320
668-	GRID	312	313	314	315	316	317	318	319	320
669-	GRID	312	313	314	315	316	317	318	319	320
670-	GRID	312	313	314	315	316	317	318	319	320
671-	GRID	312	313	314	315	316	317	318	319	320
672-	GRID	312	313	314	315	316	317	318	319	320
673-	GRID	312	313	314	315	316	317	318	319	320
674-	GRID	312	313	314	315	316	317	318	319	320
675-	GRID	312	313	314	315	316	317	318	319	320
676-	GRID	312	313	314	315	316	317	318	319	320
677-	GRID	312	313	314	315	316	317	318	319	320
678-	GRID	312	313	314	315	316	317	318	319	320
679-	GRID	312	313	314	315	316	317	318	319	320
680-	GRID	312	313	314	315	316	317	318	319	320
681-	GRID	312	313	314	315	316	317	318	319	320
682-	GRID	312	313	314	315	316	317	318	319	320
683-	GRID	312	313	314	315	316	317	318	319	320
684-	GRID	312	313	314	315	316	317	318	319	320
685-	GRID	312	313	314	315	316	317	318	319	320
686-	GRID	312	313	314	315	316	317	318	319	320
687-	GRID	312	313	314	315	316	317	318	319	320
688-	GRID	312	313	314	315	316	317	318	319	320
689-	GRID	312	313	314	315	316	317	318	319	320
690-	GRID	312	313	314	315	316	317	318	319	320
691-	GRID	312	313	314	315	316	317	318	319	320
692-	GRID	312	313	314	315	316	317	318	319	320
693-	GRID	312	313	314	315	316	317	318	319	320
694-	GRID	312	313	314	315	316	317	318	319	320
695-	GRID	312	313	314	315	316	317	318	319	320
696-	GRID	312	313	314	315	316	317	318	319	320
697-	GRID	312	313	314	315	316	317	318	319	320
698-	GRID	312	313	314	315	316	317	318	319	320
699-	GRID	312	313	314	315	316	317	318	319	320
700-	GRID	312	313	314	315	316	317	318	319	320

MUDAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ****

SORTED BULK DATA ECHO

CARD	1	2	3	4	5	6	7	8	9	10
CCUNT	GRID	710	5.8333	7.3333	.00225					
701-	GRID	711	5.8333	8.2500	.00225					
702-	GRID	712	5.8333	9.1667	.00225					
703-	GRID	713	5.8333	10.0833	.00225					
704-	GRID	801	6.6667	9.1667	.00225					
705-	GRID	802	6.6667	0.0000	.00225					
706-	GRID	803	6.6667	9.1667	.00225					
707-	GRID	804	6.6667	1.8333	.00225					
708-	GRID	805	6.6667	2.7500	.00225					
709-	GRID	806	6.6667	3.6667	.00225					
710-	GRID	807	6.6667	4.5833	.00225					
711-	GRID	808	6.6667	5.5000	.00225					
712-	GRID	809	6.6667	6.4167	.00225					
713-	GRID	810	6.6667	7.3333	.00225					
714-	GRID	811	6.6667	8.2500	.00225					
715-	GRID	812	6.6667	9.1667	.00225					
716-	GRID	813	6.6667	10.0833	.00225					
717-	GRID	901	7.5000	0.0000	.00225					
718-	GRID	902	7.5000	9.1667	.00225					
719-	GRID	903	7.5000	1.8333	.00225					
720-	GRID	904	7.5000	2.7500	.00225					
721-	GRID	905	7.5000	3.6667	.00225					
722-	GRID	906	7.5000	4.5833	.00225					
723-	GRID	907	7.5000	5.5000	.00225					
724-	GRID	908	7.5000	6.4167	.00225					
725-	GRID	909	7.5000	7.3333	.00225					
726-	GRID	910	7.5000	8.2500	.00225					
727-	GRID	911	7.5000	9.1667	.00225					
728-	GRID	912	7.5000	10.0833	.00225					
729-	GRID	913	8.3333	0.0000	.00225					
730-	GRID	1001	8.3333	9.1667	.00225					
731-	GRID	1002	8.3333	1.8333	.00225					
732-	GRID	1003	8.3333	2.7500	.00225					
733-	GRID	1004	8.3333	3.6667	.00225					
734-	GRID	1005	8.3333	4.5833	.00225					
735-	GRID	1006	8.3333	5.5000	.00225					
736-	GRID	1007	8.3333	6.4167	.00225					
737-	GRID	1008	8.3333	7.3333	.00225					
738-	GRID	1009	8.3333	8.2500	.00225					
739-	GRID	1010	8.3333	9.1667	.00225					
740-	GRID	1011	8.3333	10.0833	.00225					
741-	GRID	1012	9.1667	0.0000	.00225					
742-	GRID	1013	9.1667	9.1667	.00225					
743-	GRID	1101	9.1667	1.8333	.00225					
744-	GRID	1102	9.1667	2.7500	.00225					
745-	GRID	1103	9.1667	3.6667	.00225					
746-	GRID	1104	9.1667	4.5833	.00225					
747-	GRID	1105	9.1667	5.5000	.00225					
748-	GRID	1106	9.1667	6.4167	.00225					
749-	GRID	1107	9.1667	7.3333	.00225					
750-	GRID	1108	9.1667	8.2500	.00225					

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

SORTED BULK DATA ECHO

CARC	CCUNT	1	2	3	4	5	6	7	8	9	10
751-	GRID	1108	9.1667	5.5000	.00225						
752-	GRID	1109	9.1667	6.41667	.00225						
753-	GRID	1110	9.1667	7.33333	.00225						
754-	GRID	1111	9.1667	8.25000	.00225						
755-	GRID	1112	9.1667	9.16667	.00225						
756-	GRID	1113	9.1667	10.08333	.00225						
757-	GRID	1201	10.0000	.91667	.00225						
758-	GRID	1202	10.0000	0.00000	.00225						
759-	GRID	1203	10.0000	.91667	.00225						
760-	GRID	1204	10.0000	1.83333	.00225						
761-	GRID	1205	10.0000	2.75000	.00225						
762-	GRID	1206	10.0000	3.66667	.00225						
763-	GRID	1207	10.0000	4.58333	.00225						
764-	GRID	1208	10.0000	5.50000	.00225						
765-	GRID	1209	10.0000	6.41667	.00225						
766-	GRID	1210	10.0000	7.33333	.00225						
767-	GRID	1211	10.0000	8.25000	.00225						
768-	GRID	1212	10.0000	9.16667	.00225						
769-	GRID	1213	10.0000	10.08333	.00225						
770-	GRID	10001	0.0000	.91667	.00225						
771-	GRID	10002	0.0000	0.00000	.00225						
772-	GRID	10003	0.0000	.91667	.00225						
773-	GRID	10004	0.0000	1.83333	.00225						
774-	GRID	10005	0.0000	2.75000	.00225						
775-	GRID	10006	0.0000	3.66667	.00225						
776-	GRID	10007	0.0000	4.58333	.00225						
777-	GRID	10008	0.0000	5.50000	.00225						
778-	GRID	10009	0.0000	6.41667	.00225						
779-	GRID	10010	0.0000	7.33333	.00225						
780-	GRID	10011	0.0000	8.25000	.00225						
781-	GRID	10012	0.0000	9.16667	.00225						
782-	GRID	10013	0.0000	10.08333	.00225						
783-	GRID	10101	.8333	.91667	.00225						
784-	GRID	10102	.8333	0.00000	.00225						
785-	GRID	10103	.8333	.91667	.00225						
786-	GRID	10104	.8333	1.83333	.00225						
787-	GRID	10105	.8333	2.75000	.00225						
788-	GRID	10106	.8333	3.66667	.00225						
789-	GRID	10107	.8333	4.58333	.00225						
790-	GRID	10108	.8333	5.50000	.00225						
791-	GRID	10109	.8333	6.41667	.00225						
792-	GRID	10110	.8333	7.33333	.00225						
793-	GRID	10111	.8333	8.25000	.00225						
794-	GRID	10112	.8333	9.16667	.00225						
795-	GRID	10113	.8333	10.08333	.00225						
796-	GRID	10201	1.6667	.91667	.00225						
797-	GRID	10202	1.6667	0.00000	.00225						
798-	GRID	10203	1.6667	.91667	.00225						
799-	GRID	10204	1.6667	1.83333	.00225						
800-	GRID	10205	1.6667	2.75000	.00225						

JANUARY 10, 1983 NASTRAN 12/14/81

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ****

SORTED BULK DATA ECHO

CARD	CCUNT	1	2	3	4	5	6	7	8	9	10
E01-	GRID	10206	1.6667	3.6667	-.00225						
E02-	GRID	10207	1.6667	4.5833	-.00225						
E03-	GRID	10208	1.6667	5.5000	-.00225						
E04-	GRID	10209	1.6667	6.4167	-.00225						
E05-	GRID	10210	1.6667	7.3333	-.00225						
E06-	GRID	10211	1.6667	8.2500	-.00225						
E07-	GRID	10212	1.6667	9.1667	-.00225						
E08-	GRID	10213	1.6667	10.0833	-.00225						
E09-	GRID	10301	2.5000	-.9167	-.00225						
E10-	GRID	10302	2.5000	0.0000	-.00225						
E11-	GRID	10303	2.5000	.9167	-.00225						
E12-	GRID	10304	2.5000	1.8333	-.00225						
E13-	GRID	10305	2.5000	2.7500	-.00225						
E14-	GRID	10306	2.5000	3.6667	-.00225						
E15-	GRID	10307	2.5000	4.5833	-.00225						
E16-	GRID	10308	2.5000	5.5000	-.00225						
E17-	GRID	10309	2.5000	6.4167	-.00225						
E18-	GRID	10310	2.5000	7.3333	-.00225						
E19-	GRID	10311	2.5000	8.2500	-.00225						
E20-	GRID	10312	2.5000	9.1667	-.00225						
E21-	GRID	10313	2.5000	10.0833	-.00225						
E22-	GRID	10401	3.3333	-.9167	-.00225						
E23-	GRID	10402	3.3333	0.0000	-.00225						
E24-	GRID	10403	3.3333	.9167	-.00225						
E25-	GRID	10404	3.3333	1.8333	-.00225						
E26-	GRID	10405	3.3333	2.7500	-.00225						
E27-	GRID	10406	3.3333	3.6667	-.00225						
E28-	GRID	10407	3.3333	4.5833	-.00225						
E29-	GRID	10408	3.3333	5.5000	-.00225						
E30-	GRID	10409	3.3333	6.4167	-.00225						
E31-	GRID	10410	3.3333	7.3333	-.00225						
E32-	GRID	10411	3.3333	8.2500	-.00225						
E33-	GRID	10412	3.3333	9.1667	-.00225						
E34-	GRID	10413	3.3333	10.0833	-.00225						
E35-	GRID	10501	4.1667	0.0000	-.00225						
E36-	GRID	10502	4.1667	.9167	-.00225						
E37-	GRID	10503	4.1667	1.8333	-.00225						
E38-	GRID	10504	4.1667	2.7500	-.00225						
E39-	GRID	10505	4.1667	3.6667	-.00225						
E40-	GRID	10506	4.1667	4.5833	-.00225						
E41-	GRID	10507	4.1667	5.5000	-.00225						
E42-	GRID	10508	4.1667	6.4167	-.00225						
E43-	GRID	10509	4.1667	7.3333	-.00225						
E44-	GRID	10510	4.1667	8.2500	-.00225						
E45-	GRID	10511	4.1667	9.1667	-.00225						
E46-	GRID	10512	4.1667	10.0833	-.00225						
E47-	GRID	10513	4.1667	10.9167	-.00225						
E48-	GRID	10601	5.0000	-.9167	-.00225						
E49-	GRID	10602	5.0000	0.0000	-.00225						
E50-	GRID	10603	5.0000	.9167	-.00225						

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE
JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 20

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

SORTED BULK DATA ECHO									
CARD	1	2	3	4	5	6	7	8	9
CCUNT	10004	10005	10006	10007	10008	10009	10010	10011	10012
851-	GRID	10004	5.0000	1.8333	.00225	6	7	8	9
852-	GRID	10005	5.0000	2.75000	-.00225	6	7	8	9
853-	GRID	10006	5.0000	3.6667	-.00225	6	7	8	9
854-	GRID	10007	5.0000	4.58333	-.00225	6	7	8	9
855-	GRID	10008	5.0000	5.50000	-.00225	6	7	8	9
856-	GRID	10009	5.0000	6.41667	-.00225	6	7	8	9
857-	GRID	10010	5.0000	7.33333	-.00225	6	7	8	9
858-	GRID	10011	5.0000	8.25000	-.00225	6	7	8	9
859-	GRID	10012	5.0000	9.16667	-.00225	6	7	8	9
860-	GRID	10013	5.0000	10.08333	-.00225	6	7	8	9
861-	GRID	10014	5.8333	9.1667	-.00225	6	7	8	9
862-	GRID	10015	5.8333	0.00000	-.00225	6	7	8	9
863-	GRID	10016	5.8333	9.1667	-.00225	6	7	8	9
864-	GRID	10017	5.8333	1.8333	-.00225	6	7	8	9
865-	GRID	10018	5.8333	2.75000	-.00225	6	7	8	9
866-	GRID	10019	5.8333	3.66667	-.00225	6	7	8	9
867-	GRID	10020	5.8333	4.58333	-.00225	6	7	8	9
868-	GRID	10021	5.8333	5.50000	-.00225	6	7	8	9
869-	GRID	10022	5.8333	6.41667	-.00225	6	7	8	9
870-	GRID	10023	5.8333	7.33333	-.00225	6	7	8	9
871-	GRID	10024	5.8333	8.25000	-.00225	6	7	8	9
872-	GRID	10025	5.8333	9.16667	-.00225	6	7	8	9
873-	GRID	10026	5.8333	10.08333	-.00225	6	7	8	9
874-	GRID	10027	6.6667	9.1667	-.00225	6	7	8	9
875-	GRID	10028	6.6667	0.00000	-.00225	6	7	8	9
876-	GRID	10029	6.6667	9.1667	-.00225	6	7	8	9
877-	GRID	10030	6.6667	1.8333	-.00225	6	7	8	9
878-	GRID	10031	6.6667	2.75000	-.00225	6	7	8	9
879-	GRID	10032	6.6667	3.66667	-.00225	6	7	8	9
880-	GRID	10033	6.6667	4.58333	-.00225	6	7	8	9
881-	GRID	10034	6.6667	5.50000	-.00225	6	7	8	9
882-	GRID	10035	6.6667	6.41667	-.00225	6	7	8	9
883-	GRID	10036	6.6667	7.33333	-.00225	6	7	8	9
884-	GRID	10037	6.6667	8.25000	-.00225	6	7	8	9
885-	GRID	10038	6.6667	9.16667	-.00225	6	7	8	9
886-	GRID	10039	6.6667	10.08333	-.00225	6	7	8	9
887-	GRID	10040	7.5000	9.1667	-.00225	6	7	8	9
888-	GRID	10041	7.5000	0.00000	-.00225	6	7	8	9
889-	GRID	10042	7.5000	9.1667	-.00225	6	7	8	9
890-	GRID	10043	7.5000	1.8333	-.00225	6	7	8	9
891-	GRID	10044	7.5000	2.75000	-.00225	6	7	8	9
892-	GRID	10045	7.5000	3.66667	-.00225	6	7	8	9
893-	GRID	10046	7.5000	4.58333	-.00225	6	7	8	9
894-	GRID	10047	7.5000	5.50000	-.00225	6	7	8	9
895-	GRID	10048	7.5000	6.41667	-.00225	6	7	8	9
896-	GRID	10049	7.5000	7.33333	-.00225	6	7	8	9
897-	GRID	10050	7.5000	8.25000	-.00225	6	7	8	9
898-	GRID	10051	7.5000	9.16667	-.00225	6	7	8	9
899-	GRID	10052	7.5000	10.08333	-.00225	6	7	8	9
900-	GRID	10053	8.3333	9.1667	-.00225	6	7	8	9

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE
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**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ****

- SORTED BULK DATA ECHO

CARC	CCNT	1	2	3	4	5	6	7	8	9	10
901-	GRID	11002	8.3333	0.0000	-.00225	6	6	6	6	6	6
902-	GRID	11003	8.3333	9.1667	-.00225	6	6	6	6	6	6
903-	GRID	11004	8.3333	1.8333	-.00225	6	6	6	6	6	6
904-	GRID	11005	8.3333	2.7500	-.00225	6	6	6	6	6	6
905-	GRID	11006	8.3333	3.6667	-.00225	6	6	6	6	6	6
906-	GRID	11007	8.3333	4.5833	-.00225	6	6	6	6	6	6
907-	GRID	11008	8.3333	5.5000	-.00225	6	6	6	6	6	6
908-	GRID	11009	8.3333	6.4167	-.00225	6	6	6	6	6	6
909-	GRID	11010	8.3333	7.3333	-.00225	6	6	6	6	6	6
910-	GRID	11011	8.3333	8.2500	-.00225	6	6	6	6	6	6
911-	GRID	11012	8.3333	9.1667	-.00225	6	6	6	6	6	6
912-	GRID	11013	8.3333	10.0833	-.00225	6	6	6	6	6	6
913-	GRID	11014	9.1667	9.1667	-.00225	6	6	6	6	6	6
914-	GRID	11015	9.1667	0.0000	-.00225	6	6	6	6	6	6
915-	GRID	11016	9.1667	1.8333	-.00225	6	6	6	6	6	6
916-	GRID	11017	9.1667	2.7500	-.00225	6	6	6	6	6	6
917-	GRID	11018	9.1667	3.6667	-.00225	6	6	6	6	6	6
918-	GRID	11019	9.1667	4.5833	-.00225	6	6	6	6	6	6
919-	GRID	11020	9.1667	5.5000	-.00225	6	6	6	6	6	6
920-	GRID	11021	9.1667	6.4167	-.00225	6	6	6	6	6	6
921-	GRID	11022	9.1667	7.3333	-.00225	6	6	6	6	6	6
922-	GRID	11023	9.1667	8.2500	-.00225	6	6	6	6	6	6
923-	GRID	11024	9.1667	9.1667	-.00225	6	6	6	6	6	6
924-	GRID	11025	10.0000	0.0000	-.00225	6	6	6	6	6	6
925-	GRID	11026	10.0000	1.8333	-.00225	6	6	6	6	6	6
926-	GRID	11027	10.0000	2.7500	-.00225	6	6	6	6	6	6
927-	GRID	11028	10.0000	3.6667	-.00225	6	6	6	6	6	6
928-	GRID	11029	10.0000	4.5833	-.00225	6	6	6	6	6	6
929-	GRID	11030	10.0000	5.5000	-.00225	6	6	6	6	6	6
930-	GRID	11031	10.0000	6.4167	-.00225	6	6	6	6	6	6
931-	GRID	11032	10.0000	7.3333	-.00225	6	6	6	6	6	6
932-	GRID	11033	10.0000	8.2500	-.00225	6	6	6	6	6	6
933-	GRID	11034	10.0000	9.1667	-.00225	6	6	6	6	6	6
934-	GRID	11035	10.0000	10.0833	-.00225	6	6	6	6	6	6
935-	GRID	11036	10.0000	10.0000	-.00225	6	6	6	6	6	6
936-	GRID	11037	10.0000	10.0000	-.00225	6	6	6	6	6	6
937-	GRID	11038	10.0000	10.0000	-.00225	6	6	6	6	6	6
938-	GRID	11039	10.0000	10.0000	-.00225	6	6	6	6	6	6
939-	MAT1	1	.10E+08	.3000	.10000						
940-	MAT1	2	.10E+08	.3000	.10000						
941-	MAT1	3	.50E+07	.450E+03	.4999	.03500					
942-	MAT1	41	.50E+07	.3000	.10000						
943-	MAT1	42	.50E+07	.3000	.10000						
944-	PARAM	GRDPR1	0								
945-	PARAM	NEWSEQ	3								
946-	PARAM	TINY	1								
947-	PARAM	WTHASS	.002588								
948-	PSHELL	1	.055C	1	4.00000	1	.8333333	1	.8333333	1	1
949-	PSHELL	2	.055C	2	4.00000	2	.8333333	2	.8333333	2	2
950-	PSHELL	3	.055C	3	4.00000	3	.8333333	3	.8333333	3	3

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

SORTED BULK DATA ECHO

CARD	1	2	3	4	5	6	7	8	9	10
GCUNT	1	2	3	4	5	6	7	8	9	10
951-	PO	2	3	42						
952-	PSOLID	3								
953-	SPC1	1	13	101	201	301	401	501	601	
954-	SPC1	1	13	113	213	313	413	513	613	
955-	SPC1	1	13	701	801	901	1001	1101		
956-	SPC1	1	13	713	813	913	1013	1113		
957-	SPC1	1	13	10013	10113	10213	10313	10413	10513	
958-	SPC1	1	13	10101	10201	10301	10401	10501	10601	
959-	SPC1	1	13	10701	10801	10901	11001	11101		
960-	SPC1	1	13	10713	10813	10913	11013	11113		
961-	SPC1	1	23	1	THRU	13				
962-	SPC1	1	23	1201	THRU	1213				
963-	SPC1	1	23	10001	THRU	10013				
964-	SPC1	1	23	11201	THRU	11213				

TOTAL COUNT = 965

*** USER WARNING MESSAGE 2251A, ONE OR MORE MAT1 CARDS HAVE UNREASONABLE OR INCONSISTENT VALUES OF E, G OR NU.

ID OF FIRST ONE = 42

*** USER WARNING MESSAGE 2251B, THE NUMBER OF MAT1 CARDS HAVING UNREASONABLE OR INCONSISTENT VALUES FOR E, G AND/OR NU IS 1

ID OF LAST ONE = 42

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ****

W E A L E I G E N V A L U E S

MODE NO.	EXTRACTION ORDER	EIGENVALUE	RADIANS	CYCLES	GENERALIZED MASS	GENERALIZED STIFFNESS
1	131	1.099561E+06	1.048600E+03	1.668898E+02	7.938945E-04	8.729356E+02
2	132	4.74975E+06	2.178296E+03	3.468866E+02	8.439574E-04	4.004556E+03
3	133	5.747225E+06	2.357337E+03	3.815480E+02	8.430799E-04	4.845370E+03
4	134	1.127080E+07	3.357201E+03	5.343151E+02	7.762886E-04	8.749392E+03
5	135	1.49947E+07	3.807816E+03	6.060328E+02	7.740813E-04	1.122376E+04
6	136	1.871938E+07	4.326590E+03	6.885981E+02	7.663508E-04	1.435561E+04
7	137	2.37647E+07	4.874902E+03	7.758648E+02	1.008836E-03	2.397466E+04
8	138	2.692371E+07	5.128086E+03	8.258241E+02	9.844302E-04	2.650451E+04
9	139	3.606837E+07	6.005695E+03	9.55360E+02	8.904128E-04	3.211574E+04
10	140	4.334321E+07	6.523556E+03	1.047805E+03	7.71628E-04	3.368473E+04
11	141	4.843452E+07	6.959491E+03	1.107637E+03	8.765702E-04	4.245626E+04
12	142	5.065117E+07	7.11693E+03	1.132700E+03	9.138648E-04	4.628832E+04
13	143	6.246809E+07	7.803676E+03	1.257909E+03	8.564685E-04	5.600667E+04
14	144	7.711511E+07	8.781521E+03	1.397622E+03	7.376173E-04	5.688144E+04
15	145	7.727515E+07	8.790628E+03	1.399072E+03	8.578710E-04	6.629210E+04
16	146	8.491025E+07	9.214676E+03	1.465561E+03	7.240662E-04	6.14864E+04
17	147	1.008468E+08	1.004225E+04	1.598274E+03	6.498899E-04	6.553299E+04
18	148	1.066031E+08	1.032682E+04	1.643564E+03	7.008227E-04	7.473792E+04
19	149	1.307702E+08	1.143540E+04	1.820013E+03	6.205890E-04	8.115055E+04
20	150	1.388329E+08	1.178274E+04	1.873281E+03	5.444824E-04	7.559209E+04
21	151	1.435232E+08	1.198012E+04	1.906895E+03	0.0	0.0
22	152	1.452072E+08	1.205185E+04	1.918112E+03	0.0	0.0
23	153	1.649662E+08	1.284392E+04	2.044173E+03	0.0	0.0
24	154	1.753908E+08	1.324352E+04	2.107771E+03	0.0	0.0
25	155	2.044341E+08	1.429805E+04	2.275605E+03	0.0	0.0
26	156	2.307806E+08	1.519146E+04	2.417796E+03	0.0	0.0
27	157	2.345998E+08	1.53165E+04	2.437721E+03	0.0	0.0
28	158	2.347524E+08	1.532161E+04	2.438513E+03	0.0	0.0
29	159	2.512634E+08	1.585129E+04	2.522811E+03	0.0	0.0
30	160	2.931706E+08	1.712223E+04	2.725087E+03	0.0	0.0
31	161	3.070612E+08	1.752316E+04	2.788898E+03	0.0	0.0
32	162	3.394016E+08	1.862286E+04	2.932089E+03	0.0	0.0
33	163	3.734244E+08	1.932419E+04	3.075541E+03	0.0	0.0
34	164	3.914594E+08	1.978533E+04	3.148934E+03	0.0	0.0
35	165	4.232624E+08	2.057334E+04	3.274349E+03	0.0	0.0
36	166	4.505560E+08	2.122631E+04	3.378271E+03	0.0	0.0
37	167	4.989128E+08	2.233636E+04	3.554941E+03	0.0	0.0
38	168	5.256740E+08	2.292758E+04	3.649038E+03	0.0	0.0
39	169	5.273597E+08	2.296431E+04	3.654884E+03	0.0	0.0
40	170	5.721795E+08	2.352027E+04	3.807030E+03	0.0	0.0
41	171	6.056311E+08	2.460957E+04	3.916735E+03	0.0	0.0
42	172	6.415122E+08	2.532809E+04	4.031091E+03	0.0	0.0
43	173	6.476688E+08	2.544930E+04	4.050382E+03	0.0	0.0
44	174	6.783481E+08	2.604512E+04	4.145209E+03	0.0	0.0
45	175	8.231278E+08	2.869020E+04	4.566188E+03	0.0	0.0
46	176	9.702058E+08	3.114813E+04	4.957378E+03	0.0	0.0
47	177	9.883113E+08	3.143742E+04	5.003420E+03	0.0	0.0
48	178	1.038439E+09	3.222482E+04	5.128739E+03	0.0	0.0
49	179	1.246920E+09	3.531175E+04	5.620039E+03	0.0	0.0
50	180	1.355136E+09	3.676098E+04	5.850688E+03	0.0	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

SUBCASE 1

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETERS 3.5 ***
EIGENVALUE = 1.099561E+06
CYCLES = 1.66898E+02

REAL EIGENVECTOR NO. 1

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1	G	-1.547001E-03	0.0	0.0	1.825713E-03	6.318799E-03	0.0
2	G	6.676530E-04	0.0	0.0	3.910258E-03	-8.126915E-02	0.0
3	G	1.267613E-03	0.0	0.0	2.763311E-03	-1.576274E-01	0.0
4	G	1.858750E-03	0.0	0.0	2.592724E-03	-2.229523E-01	0.0
5	G	2.244576E-03	0.0	0.0	1.672987E-03	-2.717284E-01	0.0
6	G	2.526960E-03	0.0	0.0	8.995360E-04	-3.038244E-01	0.0
7	G	2.595930E-03	0.0	0.0	-4.645344E-06	-3.136546E-01	0.0
8	G	2.518499E-03	0.0	0.0	-9.162009E-04	-3.037088E-01	0.0
9	G	2.226475E-03	0.0	0.0	-1.680280E-03	-2.714859E-01	0.0
10	G	1.828763E-03	0.0	0.0	-2.616437E-03	-2.225720E-01	0.0
11	G	1.219551E-03	0.0	0.0	-2.758885E-03	-1.570897E-01	0.0
12	G	6.680539E-04	0.0	0.0	-3.960528E-03	-8.058940E-02	0.0
13	G	-1.637275E-03	0.0	0.0	-1.824089E-03	6.795974E-03	0.0
101	G	0.0	4.665938E-04	0.0	7.552298E-02	-9.018473E-03	0.0
102	G	4.901315E-04	4.013783E-04	6.758689E-02	7.252496E-02	-8.045279E-02	0.0
103	G	1.242266E-03	4.808344E-04	1.300780E-01	6.500507E-02	-1.522379E-01	0.0
104	G	1.742766E-03	3.854025E-04	1.835236E-01	5.213769E-02	-2.138766E-01	0.0
105	G	2.139075E-03	2.915139E-04	2.240533E-01	3.730849E-02	-2.615336E-01	0.0
106	G	2.383772E-03	1.661607E-04	2.501946E-01	1.970049E-02	-2.916040E-01	0.0
107	G	2.488784E-03	7.153849E-06	2.529433E-01	-5.800336E-05	-3.025833E-01	0.0
108	G	2.752875E-03	-1.504501E-04	2.501011E-01	1.979143E-02	-2.915043E-01	0.0
109	G	2.121267E-03	-2.738876E-04	2.238151E-01	-3.742277E-02	-2.613429E-01	0.0
110	G	1.713847E-03	-3.617270E-04	1.832346E-01	-5.220298E-02	-2.336218E-01	0.0
111	G	1.202339E-03	-4.488596E-04	1.247536E-01	-6.506540E-02	-1.520202E-01	0.0
112	G	4.380511E-04	-3.505370E-04	6.729229E-02	7.235560E-02	-8.042090E-02	0.0
113	G	0.0	-4.115655E-04	0.0	-7.507182E-02	-9.393318E-03	0.0
201	G	0.0	1.152928E-03	0.0	1.435338E-01	6.794197E-05	0.0
202	G	4.604447E-04	1.031162E-03	1.300644E-01	1.381925E-01	-7.099239E-02	0.0
203	G	1.067618E-03	4.562978E-04	2.508448E-01	1.233997E-01	-1.362380E-01	0.0
204	G	1.595062E-03	7.757505E-04	3.542357E-01	9.965296E-02	-1.930384E-01	0.0
205	G	1.935600E-03	5.704195E-04	4.326232E-01	7.089197E-02	-2.352974E-01	0.0
206	G	2.173998E-03	3.309865E-04	4.830186E-01	3.774148E-02	-2.630344E-01	0.0
207	G	2.240616E-03	1.320383E-05	5.002110E-01	-8.874030E-05	-2.718416E-01	0.0
208	G	2.169642E-03	-3.032879E-04	4.828573E-01	-3.791064E-02	-2.629721E-01	0.0
209	G	1.917340E-03	-5.391978E-04	4.323134E-01	-7.104000E-02	-2.351868E-01	0.0
210	G	1.566454E-03	-7.375182E-04	3.538133E-01	-9.973644E-02	-1.929149E-01	0.0
211	G	1.028005E-03	-9.080068E-04	2.504465E-01	-1.238674E-01	-1.361470E-01	0.0
212	G	4.212492E-04	-1.030648E-03	1.247500E-01	-1.379199E-01	-7.095980E-02	0.0
213	G	0.0	-1.100118E-03	0.0	-1.431372E-01	2.024939E-04	0.0
301	G	0.0	1.708311E-03	0.0	2.029611E-01	-3.386991E-03	0.0
302	G	4.274639E-04	1.586102E-03	1.034854E-01	1.940459E-01	-5.747280E-02	0.0
303	G	8.424465E-04	1.449935E-03	3.543146E-01	1.754028E-01	-1.098525E-01	0.0
304	G	1.234126E-03	1.118907E-03	5.008532E-01	1.407176E-01	-1.554408E-01	0.0
305	G	1.537572E-03	8.226005E-04	6.117755E-01	1.002746E-01	-1.906889E-01	0.0
306	G	1.729923E-03	4.761364E-04	6.833401E-01	5.341771E-02	-2.131137E-01	0.0
307	G	1.613528E-03	1.693231E-05	7.076328E-01	-1.094834E-04	-2.214911E-01	0.0
308	G	1.721131E-03	-4.410504E-04	6.831437E-01	-5.361824E-02	-2.130924E-01	0.0
309	G	1.519667E-03	-7.847109E-04	6.114072E-01	-1.004415E-01	-1.906584E-01	0.0
310	G	1.207037E-03	-1.076482E-03	5.003697E-01	-1.407894E-01	-1.554210E-01	0.0
311	G	8.091173E-04	-1.405061E-03	3.538212E-01	-1.753361E-01	-1.099805E-01	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

JANUARY 10, 1983 NASIKAN 12/14/81 PAGE 31

SUBCASE 1

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETERS 3,5 ***
EIGENVALUE = 1.095561E+06
CYCLES = 1.668898E+02

REAL EIGENVECTOR NO. 1

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
312	G	4.018333E-04	-1.541005E-03	1.833453E-01	-1.937617E-01	-5.746285E-02	0.0
313	G	0.0	-1.662639E-03	0.0	-2.025212E-01	-3.469375E-03	0.0
401	G	0.0	2.064565E-03	0.0	2.472581E-01	-9.989431E-04	0.0
402	G	1.949732E-03	1.779843E-03	2.243124E-01	2.373899E-01	-4.084826E-02	0.0
403	G	6.119491E-04	1.779843E-03	4.329324E-01	2.339154E-01	-7.803330E-02	0.0
404	G	8.859266E-04	1.403661E-03	6.121512E-01	1.727046E-01	-1.105552E-01	0.0
405	G	1.094250E-03	1.012121E-03	7.484139E-01	1.270466E-01	-1.353691E-01	0.0
406	G	1.228784E-03	5.913254E-04	8.359721E-01	6.568113E-02	-1.511729E-01	0.0
407	G	1.271227E-03	1.246579E-05	8.602875E-01	-1.103881E-04	-1.562154E-01	0.0
408	G	1.220611E-03	-5.538115E-04	8.357733E-01	-6.588446E-02	-1.511855E-01	0.0
409	G	1.078206E-03	-9.731995E-04	7.480501E-01	-1.328526E-01	-1.354023E-01	0.0
410	G	8.635842E-04	-1.136332E-03	6.116945E-01	-1.728116E-01	-1.106213E-01	0.0
411	G	5.880165E-04	-1.739977E-03	4.324957E-01	-2.338122E-01	-7.814348E-02	0.0
412	G	2.897860E-04	-1.911177E-03	2.240401E-01	-2.371343E-01	-4.097408E-02	0.0
413	G	0.0	-2.026877E-03	0.0	-2.469360E-01	-9.735788E-04	0.0
501	G	0.0	2.325899E-03	0.0	-2.763128E-01	-9.665939E-04	0.0
502	G	1.748506E-04	2.183002E-03	2.504606E-01	2.647264E-01	-2.165444E-02	0.0
503	G	3.456776E-04	2.001529E-03	4.813020E-01	2.389571E-01	-4.161467E-02	0.0
504	G	4.985668E-04	1.587467E-03	6.836895E-01	1.932122E-01	-5.887521E-02	0.0
505	G	6.248398E-04	1.139849E-03	8.360247E-01	1.370954E-01	-7.255319E-02	0.0
506	G	6.559346E-04	4.220292E-04	9.331739E-01	7.182510E-02	-7.932923E-02	0.0
507	G	6.539243E-04	1.807372E-05	9.659785E-01	-1.016036E-04	-8.119176E-02	0.0
508	G	6.488398E-04	5.257207E-04	9.329531E-01	-7.200741E-02	-7.935847E-02	0.0
509	G	4.138215E-04	-1.103582E-03	8.356975E-01	-1.372208E-01	-7.261077E-02	0.0
510	G	4.809135E-04	-1.551704E-03	6.812730E-01	-1.932383E-01	-5.895426E-02	0.0
511	G	3.278098E-04	-1.967230E-03	4.829351E-01	-2.308615E-01	-4.168505E-02	0.0
512	G	1.625941E-04	-2.150505E-03	2.502346E-01	-2.645177E-01	-2.167133E-02	0.0
513	G	0.0	-2.293772E-03	0.0	-2.760444E-01	-9.909766E-04	0.0
601	G	0.0	2.390895E-03	0.0	2.854451E-01	-2.586690E-06	0.0
602	G	-3.106549E-06	2.285696E-03	2.593461E-01	2.748425E-01	-6.024066E-06	0.0
603	G	-6.199788E-06	2.063177E-03	5.006485E-01	2.469695E-01	-1.133319E-05	0.0
604	G	-9.292276E-06	1.667887E-03	7.081683E-01	2.008934E-01	-1.872005E-05	0.0
605	G	-1.243001E-05	1.180728E-03	8.64225E-01	1.417042E-01	-2.868798E-05	0.0
606	G	-1.557307E-05	6.210182E-04	9.642438E-01	7.348470E-02	-4.217533E-05	0.0
607	G	-1.861984E-05	1.646763E-05	1.000000E+00	-8.559839E-05	-5.928945E-05	0.0
608	G	-2.126525E-05	-5.882736E-04	9.660916E-01	-7.363853E-02	-7.902367E-05	0.0
609	G	-2.285279E-05	-1.148553E-03	8.64523E-01	-1.418021E-01	-9.770092E-05	0.0
610	G	-2.29250E-05	-1.636966E-03	7.078464E-01	-2.009082E-01	-1.088973E-04	0.0
611	G	-1.821670E-05	-2.033791E-03	5.003768E-01	-2.468821E-01	-1.061737E-04	0.0
612	G	-1.010251E-05	-2.257954E-03	2.591719E-01	-2.746774E-01	-9.023759E-05	0.0
613	G	0.0	-2.163473E-03	0.0	-2.852431E-01	-2.627570E-06	0.0
701	G	0.0	2.325400E-03	0.0	2.763212E-01	9.606657E-04	0.0
702	G	-1.810337E-04	2.182501E-03	2.504687E-01	2.647354E-01	-2.164419E-02	0.0
703	G	-3.579910E-04	2.000842E-03	4.831194E-01	2.389683E-01	-4.159521E-02	0.0
704	G	-5.170238E-04	1.586404E-03	6.836983E-01	1.932267E-01	-5.884299E-02	0.0
705	G	-6.494968E-04	1.138212E-03	8.360700E-01	1.371153E-01	-7.250355E-02	0.0
706	G	-6.868116E-04	-6.194144E-04	9.332407E-01	7.185131E-02	-7.925601E-02	0.0
707	G	-6.908555E-04	1.413401E-05	9.660729E-01	-6.871124E-05	8.108808E-02	0.0
708	G	-6.911647E-04	-5.913840E-04	9.331196E-01	-7.197243E-02	-7.921926E-02	0.0
709	G	-6.573192E-04	-1.110980E-03	8.358569E-01	-1.371911E-01	-7.243748E-02	0.0

SUBCASE 1

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***
EIGENVALUE = 1.099561E+06
CYCLES = 1.668898E+02

REAL EIGENVECTOR NO. 1

PUNT ID.	TYPE	T1	T2	T3	R1	R2	R3
710	G	-5.265713E-04	-1.560410E-03	6.83475E-01	-1.932342E-01	5.876370E-02	0.0
711	G	-3.669187E-04	-1.976255E-03	4.83039E-01	-2.38900E-01	4.152742E-02	0.0
712	G	-1.869940E-04	-2.159132E-03	2.503335E-01	-2.646085E-01	2.161981E-02	0.0
713	G	0.0	-2.302370E-03	0.0	-2.761641E-01	9.526917E-04	0.0
801	G	0.0	2.063818E-03	0.0	2.472726E-01	9.948727E-04	0.0
802	G	-3.106894E-04	1.948886E-03	2.243264E-01	2.374053E-01	4.084153E-02	0.0
803	G	-6.240470E-04	1.778631E-03	4.329625E-01	2.139345E-01	7.802768E-02	0.0
804	G	-9.039824E-04	1.401831E-03	6.122020E-01	1.72789E-01	1.105332E-01	0.0
805	G	-1.118324E-03	1.009210E-03	7.424925E-01	1.227390E-01	1.353399E-01	0.0
806	G	-1.258859E-03	5.867555E-03	8.36884E-01	6.572753E-02	1.511292E-01	0.0
807	G	-1.307218E-03	1.147626E-05	8.62540E-01	-5.196644E-05	1.561521E-01	0.0
808	G	-1.262106E-03	-5.640435E-04	8.359371E-01	-6.581885E-02	1.510959E-01	0.0
809	G	-1.124077E-03	-9.872133E-04	7.423326E-01	-1.227949E-01	1.352807E-01	0.0
810	G	-6.108400E-04	-1.380874E-03	6.120155E-01	-1.727929E-01	1.104651E-01	0.0
811	G	-6.301434E-04	-1.758815E-03	4.327595E-01	-2.138829E-01	7.796020E-02	0.0
812	G	-3.140706E-04	-1.929950E-03	2.242277E-01	-2.373111E-01	4.078888E-02	0.0
813	G	0.0	-2.045225E-03	0.0	-2.471605E-01	9.969358E-04	0.0
901	G	0.0	1.707477E-03	0.0	2.029780E-01	3.380461E-03	0.0
902	G	-4.334464E-04	1.585152E-03	1.837016E-01	1.906338E-01	5.747141E-02	0.0
903	G	-8.542831E-04	1.448627E-03	3.543496E-01	1.754252E-01	1.099848E-01	0.0
904	G	-1.251687E-03	1.116811E-03	5.009121E-01	1.407455E-01	1.554405E-01	0.0
905	G	-1.560840E-03	8.192387E-04	6.118667E-01	1.003153E-01	1.906884E-01	0.0
906	G	-1.758883E-03	4.707626E-04	6.834357E-01	5.347173E-02	2.131123E-01	0.0
907	G	-1.848137E-03	8.659502E-06	7.078271E-01	-3.725902E-05	2.214873E-01	0.0
908	G	-1.761300E-03	-4.536135E-04	6.834108E-01	-5.35367E-02	2.130830E-01	0.0
909	G	-1.565091E-03	-8.026458E-04	6.117534E-01	-1.003549E-01	1.906368E-01	0.0
910	G	-1.256714E-03	-1.100981E-03	5.007805E-01	-1.407478E-01	1.553803E-01	0.0
911	G	-8.587995E-04	-1.433619E-03	3.542322E-01	-1.753890E-01	1.099332E-01	0.0
912	G	-4.363274E-04	-1.570828E-03	1.836318E-01	-1.939978E-01	5.744918E-02	0.0
913	G	0.0	-1.693366E-03	0.0	-2.028986E-01	3.379522E-03	0.0
1001	G	0.0	1.152324E-03	0.0	1.435481E-01	-6.743782E-05	0.0
1002	G	-4.664617E-04	1.082468E-03	1.30804E-01	1.382077E-01	7.099691E-02	0.0
1003	G	-1.079164E-03	9.526338E-04	2.509251E-01	1.239587E-01	1.362488E-01	0.0
1004	G	-1.612075E-03	7.739626E-04	3.542868E-01	9.967816E-02	1.930570E-01	0.0
1005	G	-1.958040E-03	5.676887E-04	4.327016E-01	7.092710E-02	2.353261E-01	0.0
1006	G	-2.206184E-03	3.262710E-04	4.831369E-01	3.778979E-02	2.630765E-01	0.0
1007	G	-2.273695E-03	5.201254E-06	5.003818E-01	-2.410867E-05	2.719009E-01	0.0
1008	G	-2.208030E-03	-3.147865E-04	4.830956E-01	-3.783192E-02	2.630501E-01	0.0
1009	G	-1.961271E-03	-5.565645E-04	4.326295E-01	-7.095269E-02	2.352800E-01	0.0
1010	G	-1.615845E-03	-7.633372E-04	3.542034E-01	-9.967997E-02	1.930031E-01	0.0
1011	G	-1.082397E-03	-9.451339E-04	2.508509E-01	-1.239357E-01	1.361996E-01	0.0
1012	G	-4.681077E-04	-1.072762E-03	1.300365E-01	-1.381661E-01	7.096173E-02	0.0
1013	G	0.0	-1.142783E-03	0.0	-1.439990E-01	-6.705621E-05	0.0
1101	G	0.0	4.665355E-04	0.0	7.553130E-02	9.004786E-03	0.0
1102	G	-4.961147E-04	4.012570E-04	6.759502E-02	7.253193E-02	8.045866E-02	0.0
1103	G	-1.253500E-03	4.803046E-04	1.300955E-01	6.501604E-02	1.522564E-01	0.0
1104	G	-1.759595E-03	3.843542E-04	1.835533E-01	5.215016E-02	2.139088E-01	0.0
1105	G	-2.160881E-03	2.898750E-04	2.240913E-01	3.733077E-02	2.615837E-01	0.0
1106	G	-2.410654E-03	1.633222E-04	2.502436E-01	1.972557E-02	2.916789E-01	0.0
1107	G	-2.520659E-03	2.920311E-06	2.590946E-01	-1.290952E-05	3.026914E-01	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

SUBCASE 1

*** SHEAR PARAMETER = 40.7 GEOMETRY PARAMETER = 3.5 ***

EIGENVALUE = 1.049501E+06

CYCLES = 1.668898E+02

REAL EIGENVECTOR NO.

1

R3

R2

R1

T3

T2

T1

POINT ID. TYPE

1108 G

1109 G

1110 G

1111 G

1112 G

1113 G

1201 G

1202 G

1203 G

1204 G

1205 G

1206 G

1207 G

1208 G

1209 G

1210 G

1211 G

1212 G

1213 G

-2.412182E-03	-1.575433E-04	2.502035E-01	-1.974827E-02	2.916547E-01	0.0
-2.163542E-03	-2.842752E-04	2.240364E-01	-3.734510E-02	2.015415E-01	0.0
-1.762452E-03	-3.789965E-04	1.835129E-01	-5.215244E-02	2.138602E-01	0.0
-1.256203E-03	-4.751804E-04	1.300596E-01	-6.500601E-02	1.522142E-01	0.0
-4.976475E-04	-3.462207E-04	6.757370E-02	-7.251255E-02	8.043959E-02	0.0
0.0	-4.615827E-04	0.0	-7.550766E-02	9.010062E-03	0.0
1.544414E-03	0.0	0.0	1.823977E-03	-6.306773E-03	0.0
-6.734108E-04	0.0	0.0	3.905736E-03	8.130197E-02	0.0
-1.278229E-03	0.0	0.0	2.760014E-03	1.576502E-01	0.0
-1.875189E-03	0.0	0.0	2.590239E-03	2.22902E-01	0.0
-2.266159E-03	0.0	0.0	1.670984E-03	2.717070E-01	0.0
-2.553524E-03	0.0	0.0	9.005028E-04	3.039175E-01	0.0
-2.627382E-03	0.0	0.0	-4.084730E-06	3.139830E-01	0.0
-2.554942E-03	0.0	0.0	-9.084657E-04	3.038940E-01	0.0
-2.268629E-03	0.0	0.0	-1.677653E-03	2.717462E-01	0.0
-1.876050E-03	0.0	0.0	-2.595488E-03	2.229428E-01	0.0
-1.280638E-03	0.0	0.0	-2.763351E-03	1.576072E-01	0.0
-6.746473E-04	0.0	0.0	-3.908489E-03	8.127122E-02	0.0
1.545658E-03	0.0	0.0	-1.824623E-03	-6.311444E-03	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN HY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

JANUARY 10, 1983 NASTHAN 12/14/81 PAGE 34

SUBCASE 1

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ****

EIGENVALUE = 4.744975E+06
CYCLES = 3.466866E+02

REAL EIGENVECTOR NO. 2

POINT ID.	TYPE	11	12	13	R1	R2	R3
1	G	2.130840E-03	0.0	0.0	-1.986016E-03	-9.182069E-03	0.0
2	G	-2.352184E-03	0.0	0.0	-4.809996E-03	1.620593E-01	0.0
3	G	-3.998665E-03	0.0	0.0	-1.738879E-03	2.798461E-01	0.0
4	G	-4.803731E-03	0.0	0.0	-1.962128E-04	3.270014E-01	0.0
5	G	-4.051016E-03	0.0	0.0	2.029509E-03	2.786835E-01	0.0
6	G	-2.448916E-03	0.0	0.0	4.333558E-03	1.642092E-01	0.0
7	G	-2.579351E-03	0.0	0.0	3.656513E-03	4.428950E-04	0.0
8	G	2.395902E-03	0.0	0.0	4.327328E-03	-1.633080E-01	0.0
9	G	3.993638E-03	0.0	0.0	2.028851E-03	-2.777565E-01	0.0
10	G	4.737766E-03	0.0	0.0	-2.179697E-04	-3.260019E-01	0.0
11	G	3.916942E-03	0.0	0.0	-1.726901E-03	-2.787754E-01	0.0
12	G	2.259143E-03	0.0	0.0	-4.869874E-03	-1.609234E-01	0.0
13	G	-2.250997E-03	0.0	0.0	-1.981782E-03	9.820370E-03	0.0
101	G	0.0	-2.093336E-03	0.0	-1.569498E-01	1.235214E-02	0.0
102	G	-2.025108E-03	-1.347403E-01	-1.347403E-01	-1.339229E-01	1.580126E-01	0.0
103	G	-3.913741E-03	-2.326561E-01	-2.326561E-01	7.885392E-02	2.714643E-01	0.0
104	G	-4.419210E-03	-2.884843E-01	-2.884843E-01	2.630267E-03	3.084709E-01	0.0
105	G	-3.631623E-03	-1.157176E-03	-2.302743E-01	7.814368E-02	2.664750E-01	0.0
106	G	-2.209272E-03	-1.875662E-03	-1.342481E-01	1.313043E-01	1.533880E-01	0.0
107	G	-2.526158E-05	2.271581E-03	-3.424826E-04	1.576518E-01	3.630832E-04	0.0
108	G	-2.157717E-03	1.881660E-03	1.335573E-01	1.313000E-01	-1.526642E-01	0.0
109	G	3.776016E-03	1.169211E-03	2.95591E-01	7.810222E-02	-2.657431E-01	0.0
110	G	4.356131E-03	1.223970E-04	2.67539E-01	-2.638620E-03	-3.077503E-01	0.0
111	G	3.843066E-03	-1.065582E-03	2.319551E-01	-7.880739E-02	-2.708719E-01	0.0
112	G	1.946026E-03	-1.621925E-03	1.342052E-01	-1.335532E-01	-1.578268E-01	0.0
113	G	0.0	-2.024246E-03	0.0	-1.561773E-01	-1.284674E-02	0.0
201	G	0.0	-4.39859E-03	0.0	-3.008021E-01	-6.631382E-04	0.0
202	G	-1.926766E-03	-3.675139E-03	-2.601271E-01	-2.568991E-01	1.428765E-01	0.0
203	G	-3.434346E-03	-2.095054E-03	-4.492059E-01	-1.502613E-01	2.426325E-01	0.0
204	G	-4.197095E-03	1.618434E-04	-5.182521E-01	4.346059E-03	2.850434E-01	0.0
205	G	-3.541025E-03	2.252110E-03	-4.448160E-01	1.502021E-01	2.427016E-01	0.0
206	G	-2.118711E-03	3.645372E-03	-2.587569E-01	2.516457E-01	1.426367E-01	0.0
207	G	-2.424537E-05	4.513786E-03	-5.682765E-04	3.014671E-01	1.712439E-04	0.0
208	G	2.068853E-03	3.655033E-03	2.576156E-01	2.516345E-01	-1.422917E-01	0.0
209	G	3.487014E-03	2.272038E-03	4.436593E-01	1.501782E-01	-2.423580E-01	0.0
210	G	4.136551E-03	1.950203E-04	5.170532E-01	4.385511E-03	-2.847295E-01	0.0
211	G	3.366282E-03	-2.044600E-03	4.481805E-01	-1.499929E-01	-2.424126E-01	0.0
212	G	1.866223E-03	-3.616409E-03	2.554893E-01	-2.563007E-01	-1.427812E-01	0.0
213	G	0.0	-4.339884E-03	0.0	-3.000239E-01	8.430985E-04	0.0
301	G	0.0	-6.395256E-03	0.0	-4.277933E-01	4.692744E-03	0.0
302	G	-1.466376E-03	-5.145756E-03	-3.665716E-01	-3.56867E-01	1.090852E-01	0.0
303	G	-2.557548E-03	-3.171949E-03	-6.314595E-01	-2.142993E-01	1.881395E-01	0.0
304	G	-3.044444E-03	1.126470E-04	-7.324524E-01	2.525436E-03	2.189452E-01	0.0
305	G	-2.725900E-03	3.222400E-03	-6.851737E-01	2.136112E-01	-1.920029E-01	0.0
306	G	-1.571927E-03	5.114648E-03	-3.663169E-01	3.538132E-01	1.100948E-01	0.0
307	G	-2.263456E-05	6.457943E-03	-6.047489E-04	4.284562E-01	-8.302063E-05	0.0
308	G	1.525306E-03	5.124935E-03	3.850940E-01	3.537942E-01	-1.102339E-01	0.0
309	G	2.675582E-03	3.242778E-03	6.219317E-01	-2.135844E-01	-1.921507E-01	0.0
310	G	2.989178E-03	1.440141E-04	7.312184E-01	2.596479E-03	-2.190900E-01	0.0
311	G	2.500477E-03	-3.132647E-03	6.303872E-01	-2.140123E-01	-1.882674E-01	0.0

SUBCASE 1

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***
EIGENVALUE = 4.744975E+06
CYCLES = 3.466866E+02

REAL EIGENVECTOR N.O.

2

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
312	G	1.425624E-03	-5.103750E-03	3.65873E-01	-3.500897E-01	-1.091424E-01	0.0
313	G	0.0	-6.351034E-03	0.0	-4.265567E-01	-4.805157E-03	0.0
401	G	0.0	-7.666197E-03	0.0	-5.172210E-01	1.154294E-03	0.0
402	G	-1.137936E-03	-6.286163E-03	-4.450522E-01	-4.352880E-01	8.115322E-02	0.0
403	G	-1.950189E-03	-3.832260E-03	-7.676200E-01	-2.591011E-01	1.377536E-01	0.0
404	G	-2.311122E-03	-3.898180E-03	-8.904935E-01	5.746351E-04	1.607057E-01	0.0
405	G	-1.984082E-03	3.860271E-03	-7.672371E-01	2.585800E-01	1.380508E-01	0.0
406	G	-1.161663E-03	6.308010E-03	-4.452326E-01	4.349199E-01	7.974191E-02	0.0
407	G	-2.086486E-05	7.609734E-03	-4.347521E-04	5.167464E-01	-3.198568E-04	0.0
408	G	1.119207E-03	6.313211E-03	4.443896E-01	4.348842E-01	-8.037592E-02	0.0
409	G	1.939231E-03	3.876319E-03	7.663168E-01	2.585372E-01	-1.386484E-01	0.0
410	G	2.264908E-03	6.146931E-05	8.895030E-01	6.218431E-04	-1.812598E-01	0.0
411	G	1.908697E-03	-3.805917E-03	7.668262E-01	-2.588571E-01	-1.382318E-01	0.0
412	G	1.113006E-03	-6.259070E-03	4.446158E-01	-4.348377E-01	-8.150262E-02	0.0
413	G	0.0	-7.639140E-03	0.0	-5.166645E-01	-1.126912E-03	0.0
501	G	0.0	-8.695260E-03	0.0	-5.815924E-01	1.157383E-03	0.0
502	G	-7.259781E-04	-7.094418E-03	-4.99626E-01	-4.881727E-01	4.689971E-02	0.0
503	G	-1.311403E-03	-4.330258E-03	-8.616988E-01	-2.905598E-01	8.272664E-02	0.0
504	G	-1.458696E-03	1.319172E-05	-9.959582E-01	2.202775E-04	9.278020E-02	0.0
505	G	-1.326579E-03	4.354892E-03	-8.613984E-01	2.907116E-01	8.250083E-02	0.0
506	G	-7.419860E-04	7.099294E-03	-4.996800E-01	4.879809E-01	4.655238E-02	0.0
507	G	-1.955734E-05	8.689248E-03	-1.017418E-04	5.809334E-01	-4.671503E-04	0.0
508	G	7.023050E-04	-7.104611E-03	4.954577E-01	-4.879146E-01	-4.746139E-02	0.0
509	G	1.286282E-03	4.364540E-03	8.610901E-01	2.906113E-01	-8.335027E-02	0.0
510	G	1.419586E-03	2.598258E-05	9.92151E-01	1.729259E-04	-9.351543E-02	0.0
511	G	1.277512E-03	-4.316119E-03	8.613273E-01	-2.904820E-01	-8.327149E-02	0.0
512	G	7.046860E-04	-7.080754E-03	4.997211E-01	-4.879682E-01	-4.715813E-02	0.0
513	G	0.0	-8.680905E-03	0.0	-5.812963E-01	-1.201269E-03	0.0
601	G	0.0	-8.914072E-03	0.0	-5.985529E-01	-5.561873E-06	0.0
602	G	-2.879364E-06	-7.558430E-03	-5.188626E-01	-5.116276E-01	-1.007919E-04	0.0
603	G	-5.723381E-06	-4.442209E-03	-8.962125E-01	-2.990819E-01	-1.952551E-04	0.0
604	G	-8.668664E-06	1.053974E-05	-1.037212E+00	3.886617E-04	-2.878088E-04	0.0
605	G	-1.202586E-05	4.408585E-03	-8.957477E-01	2.991460E-01	-3.662063E-04	0.0
606	G	-1.533858E-05	7.523493E-03	-5.184660E-01	5.115760E-01	-4.424088E-04	0.0
607	G	-1.898135E-05	8.91954E-03	3.075179E-04	5.98857E-01	-4.979303E-04	0.0
608	G	-2.232211E-05	7.525628E-03	5.150360E-01	5.114662E-01	-5.358586E-04	0.0
609	G	-2.491831E-05	4.412452E-03	8.962326E-01	2.989701E-01	-5.344552E-04	0.0
610	G	-2.475670E-05	1.508950E-05	1.037478E+00	-2.060289E-04	-5.012186E-04	0.0
611	G	-2.071029E-05	-4.437563E-03	8.963315E-01	-2.992064E-01	-4.028817E-04	0.0
612	G	-1.154914E-05	-7.554780E-03	5.188494E-01	-5.118928E-01	-2.635887E-04	0.0
613	G	0.0	-8.909719E-03	0.0	-5.980723E-01	-1.472327E-06	0.0
701	G	0.0	-8.693444E-03	0.0	-5.814218E-01	-1.169070E-03	0.0
702	G	7.198036E-04	-7.092934E-03	-4.998079E-01	-4.880113E-01	-4.706920E-02	0.0
703	G	1.299092E-03	-4.326955E-03	-8.613941E-01	-2.905970E-01	-8.305670E-02	0.0
704	G	1.440180E-03	1.352326E-05	-9.91503E-01	3.625029E-04	-9.326137E-02	0.0
705	G	1.301170E-03	-4.354226E-03	-8.608233E-01	2.908446E-01	-8.312276E-02	0.0
706	G	7.095789E-04	-7.097055E-03	-4.989955E-01	4.880981E-01	-4.730090E-02	0.0
707	G	-1.996101E-05	8.684571E-03	8.613193E-04	5.803176E-01	-3.883126E-04	0.0
708	G	-7.491082E-04	7.096615E-03	5.002903E-01	4.879442E-01	4.655272E-02	0.0
709	G	-1.338541E-03	-4.353590E-03	8.619328E-01	-2.905094E-01	8.243527E-02	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ****
EIGENVALUE = 4.744975E+06
CYCLES = 3.466866E+02

REAL EIGENVECTOR NO. 2

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
710	G	-1.472864E-03	1.233444E-05	1.000000E+00	5.963522E-05	9.267247E-02	0.0
711	G	-1.324104E-03	-4.331457E-03	8.619455E-01	-2.907229E-01	8.262251E-02	0.0
712	G	-7.343651E-04	-7.095969E-03	5.000726E-01	-5.883081E-01	4.685632E-02	0.0
713	G	0.0	-8.696808E-03	0.0	-5.817068E-01	1.143722E-03	0.0
801	G	0.0	-7.632000E-03	0.0	-5.169307E-01	-1.162457E-03	0.0
802	G	1.130993E-03	-6.283522E-03	-4.448829E-01	-2.350064E-01	-8.125456E-02	0.0
803	G	1.936390E-03	-3.630107E-03	-7.670963E-01	-2.588237E-01	1.379493E-01	0.0
804	G	2.290429E-03	3.559055E-05	-8.96577E-01	8.227410E-04	-1.609935E-01	0.0
805	G	1.956162E-03	3.859059E-03	-7.662456E-01	2.586089E-01	-1.384181E-01	0.0
806	G	1.126502E-03	6.300943E-03	-4.440762E-01	4.351264E-01	-8.018715E-02	0.0
807	G	-2.192772E-05	7.601353E-03	9.253383E-04	5.168929E-01	-1.843932E-04	0.0
808	G	-1.169125E-03	6.298760E-03	4.958477E-01	4.349421E-01	7.982283E-02	0.0
809	G	-1.995504E-03	3.855713E-03	7.677874E-01	2.585077E-01	1.380780E-01	0.0
810	G	-2.323675E-03	3.487933E-05	8.908233E-01	4.410157E-04	1.608698E-01	0.0
811	G	-1.960865E-03	3.836709E-03	7.679320E-01	-2.592708E-01	1.377147E-01	0.0
812	G	-1.143818E-03	-6.290817E-03	4.452449E-01	-4.354580E-01	8.110621E-02	0.0
901	G	0.0	-7.671085E-03	0.0	-5.173907E-01	1.155671E-03	0.0
902	G	0.0	-6.391642E-03	0.0	-4.274332E-01	-4.699944E-03	0.0
903	G	1.458266E-03	-5.142693E-03	-3.662619E-01	-5.563618E-01	-1.090892E-01	0.0
904	G	2.541504E-03	-3.169280E-03	-6.308480E-01	-2.139739E-01	-1.881440E-01	0.0
905	G	3.020490E-03	1.132654E-04	-7.315557E-01	2.808398E-03	-2.189475E-01	0.0
906	G	2.694076E-03	3.221075E-03	-6.280241E-01	2.138799E-01	-1.920040E-01	0.0
907	G	1.532308E-03	5.109987E-03	-3.949280E-01	3.540495E-01	-1.100972E-01	0.0
908	G	-2.694464E-05	6.448089E-03	9.724854E-04	4.286350E-01	7.632233E-05	0.0
909	G	-1.580194E-03	5.107280E-03	3.967581E-01	3.538714E-01	1.102387E-01	0.0
910	G	-2.737583E-03	3.216608E-03	6.856652E-01	2.135782E-01	1.921173E-01	0.0
911	G	-3.056738E-03	1.073277E-04	7.328812E-01	2.423418E-03	2.190232E-01	0.0
912	G	-2.567876E-03	3.177655E-03	6.317458E-01	-2.144551E-01	1.881857E-01	0.0
913	G	-1.472572E-03	-5.151527E-03	3.667277E-01	-5.568548E-01	1.091149E-01	0.0
1001	G	0.0	-6.401238E-03	0.0	-4.279695E-01	4.684327E-03	0.0
1002	G	0.0	-4.396748E-03	0.0	-3.005117E-01	6.619688E-04	0.0
1003	G	1.917281E-03	-3.672277E-03	-2.568590E-01	-2.566134E-01	-1.427782E-01	0.0
1004	G	3.415901E-03	-2.092858E-03	-4.486763E-01	-1.499844E-01	-2.423386E-01	0.0
1005	G	4.169785E-03	1.623861E-04	-5.174784E-01	4.591055E-03	-2.847559E-01	0.0
1006	G	3.505302E-03	2.250865E-03	-4.438233E-01	1.504326E-01	-2.423347E-01	0.0
1007	G	2.074711E-03	3.641314E-03	-2.575568E-01	2.518556E-01	-1.421942E-01	0.0
1008	G	-2.750676E-05	4.504900E-03	8.012798E-04	3.016240E-01	3.262242E-04	0.0
1009	G	-2.128110E-03	3.638867E-03	2.590967E-01	2.517109E-01	1.428260E-01	0.0
1010	G	3.553407E-03	2.246937E-03	4.951807E-01	1.501924E-01	2.428863E-01	0.0
1011	G	-4.209732E-03	1.571075E-04	5.185806E-01	4.278434E-03	2.852014E-01	0.0
1012	G	-3.444523E-03	-2.100065E-03	4.494477E-01	-1.503764E-01	2.427398E-01	0.0
1013	G	-1.932461E-03	3.680292E-03	2.602527E-01	-2.570335E-01	1.429222E-01	0.0
1101	G	0.0	-4.405104E-03	0.0	-3.009435E-01	-6.599426E-04	0.0
1102	G	0.0	-2.091321E-03	0.0	-1.567793E-01	-1.235875E-02	0.0
1103	G	2.014776E-03	-1.682714E-03	-1.345849E-01	-1.337601E-01	-1.578457E-01	0.0
1104	G	3.893730E-03	-1.100155E-03	-2.323493E-01	-2.869048E-02	-2.711311E-01	0.0
1105	G	4.389922E-03	1.003555E-04	-2.860355E-01	2.768917E-03	-3.079879E-01	0.0
1106	G	3.793447E-03	1.156569E-03	-2.366991E-01	7.828200E-02	-2.658523E-01	0.0
1107	G	2.162630E-03	1.873127E-03	-1.335516E-01	1.314212E-01	-1.526367E-01	0.0
	G	-2.946322E-05	2.266493E-03	4.525522E-04	-1.577543E-01	5.000902E-04	0.0

REAL EIGENVECTOR NO. 2

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1108	G	-2.219308E-03	1.871740E-03	1.344233E-01	1.313422E-01	1.535905E-01	0.0
1109	G	-3.844031E-03	1.154220E-03	2.304682E-01	7.814661E-02	2.666963E-01	0.0
1110	G	-4.431964E-03	9.728572E-05	2.686623E-01	2.595464E-03	3.086705E-01	0.0
1111	G	-3.924018E-03	-1.104516E-03	2.327887E-01	-7.891393E-02	2.716144E-01	0.0
1112	G	-2.031267E-03	-1.687783E-03	1.348098E-01	-1.339964E-01	1.580942E-01	0.0
1113	G	0.0	-2.096628E-03	0.0	-1.570274E-01	1.233766E-02	0.0
1201	G	-2.132237E-03	0.0	0.0	-1.986524E-03	9.189445E-03	0.0
1202	G	-2.341526E-03	0.0	0.0	-4.810618E-03	-1.618593E-01	0.0
1203	G	3.977880E-03	0.0	0.0	-1.740162E-03	-2.794553E-01	0.0
1204	G	4.773166E-03	0.0	0.0	-1.953743E-04	-3.264258E-01	0.0
1205	G	4.011462E-03	0.0	0.0	-2.029295E-03	-2.779490E-01	0.0
1206	G	2.400578E-03	0.0	0.0	4.337087E-03	-1.633176E-01	0.0
1207	G	-3.031846E-05	0.0	0.0	3.657620E-03	5.691596E-04	0.0
1208	G	-2.459417E-03	0.0	0.0	4.337730E-03	-1.844226E-01	0.0
1209	G	-4.064130E-03	0.0	0.0	2.030458E-03	2.789216E-01	0.0
1210	G	-4.816756E-03	0.0	0.0	-1.935380E-04	3.272233E-01	0.0
1211	G	-4.009019E-03	0.0	0.0	-1.736746E-03	2.800101E-01	0.0
1212	G	-2.357874E-03	0.0	0.0	-4.806053E-03	1.621429E-01	0.0
1213	G	2.128233E-03	0.0	0.0	-1.984927E-03	-9.168145E-03	0.0

SUBCASE 1

MUOAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ****

EIGENVALUE = 5.747225E+06

CYCLES = 3.815480E+02

REAL EIGENVECTOR NO. 3

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1	G	-1.936327E-03	0.0	0.0	1.619652E-03	8.276011E-03	0.0
2	G	2.657704E-03	0.0	0.0	4.948117E-03	-1.702761E-01	0.0
3	G	5.104460E-03	0.0	0.0	2.678086E-03	-3.299869E-01	0.0
4	G	7.392616E-03	0.0	0.0	3.387300E-03	-4.698796E-01	0.0
5	G	8.808900E-03	0.0	0.0	1.805028E-03	-5.661574E-01	0.0
6	G	1.005769E-02	0.0	0.0	9.847232E-04	-6.403571E-01	0.0
7	G	1.029617E-02	0.0	0.0	1.211788E-05	-6.590515E-01	0.0
8	G	1.003972E-02	0.0	0.0	-9.687497E-04	-6.407270E-01	0.0
9	G	8.771678E-03	0.0	0.0	-1.786847E-03	-5.667547E-01	0.0
10	G	7.336631E-03	0.0	0.0	-3.403307E-03	-4.704893E-01	0.0
11	G	5.027082E-03	0.0	0.0	-2.674352E-03	-3.302937E-01	0.0
12	G	2.571146E-03	0.0	0.0	-5.033808E-03	-1.700396E-01	0.0
13	G	-2.062364E-03	0.0	0.0	-1.627386E-03	8.942884E-03	0.0
101	G	0.0	2.082451E-03	0.0	1.494107E-01	-1.093240E-02	0.0
102	G	2.055119E-03	1.883480E-03	1.344998E-01	1.414374E-01	-1.478641E-01	0.0
103	G	4.356684E-03	1.960927E-03	2.597508E-01	1.310077E-01	-2.829439E-01	0.0
104	G	5.998271E-03	1.3549130E-01	3.659130E-01	9.691817E-02	-3.927212E-01	0.0
105	G	7.308909E-03	1.115803E-03	4.431931E-01	7.439552E-02	-4.788941E-01	0.0
106	G	8.828130E-03	7.201599E-04	4.962505E-01	4.396049E-02	-5.375035E-01	0.0
107	G	8.752826E-03	6.828331E-06	5.187084E-01	1.781890E-04	-5.643590E-01	0.0
108	G	8.209298E-03	-7.062959E-04	4.959308E-01	-4.364804E-02	-5.378555E-01	0.0
109	G	7.270840E-03	-1.102413E-03	4.437018E-01	-7.426366E-02	-4.794981E-01	0.0
110	G	5.940920E-03	-1.937555E-03	3.664604E-01	-9.695922E-02	-3.934011E-01	0.0
111	G	4.285227E-03	-1.936477E-03	2.601353E-01	-1.313207E-01	-2.835302E-01	0.0
112	G	1.973052E-03	-1.836145E-03	1.346068E-01	-1.416849E-01	-1.482914E-01	0.0
113	G	0.0	-2.031175E-03	0.0	-1.494087E-01	-1.148152E-02	0.0
201	G	0.0	3.835516E-03	0.0	2.542591E-01	1.733374E-03	0.0
202	G	1.201252E-03	3.648145E-03	2.324720E-01	2.447998E-01	-8.604143E-02	0.0
203	G	2.465248E-03	3.270124E-03	4.484864E-01	2.212610E-01	-1.644251E-01	0.0
204	G	3.679952E-03	2.401701E-03	6.305494E-01	1.679252E-01	-2.353473E-01	0.0
205	G	4.394254E-03	1.888279E-03	7.649150E-01	1.256046E-01	-2.836545E-01	0.0
206	G	4.99581E-03	1.297537E-03	8.612833E-01	7.734753E-02	-3.200615E-01	0.0
207	G	5.114261E-03	1.237432E-05	8.963328E-01	3.492592E-04	-3.293795E-01	0.0
208	G	4.979964E-03	-1.272372E-03	8.618779E-01	-7.676988E-02	-3.203925E-01	0.0
209	G	4.353891E-03	-1.864682E-03	7.659263E-01	-1.252812E-01	-2.842338E-01	0.0
210	G	3.619872E-03	-2.377534E-03	6.316984E-01	-1.679601E-01	-2.360777E-01	0.0
211	G	2.390016E-03	-3.240974E-03	4.494323E-01	-2.216438E-01	-1.651422E-01	0.0
212	G	1.135999E-03	-3.617830E-03	2.326829E-01	-2.453329E-01	-8.658943E-02	0.0
213	G	0.0	-3.806296E-03	0.0	-2.548143E-01	-1.912616E-03	0.0
301	G	0.0	4.836679E-03	0.0	2.980764E-01	-1.585598E-03	0.0
302	G	-9.559852E-05	4.160382E-03	2.660988E-01	2.769445E-01	-2.451377E-03	0.0
303	G	-1.902432E-04	4.051777E-03	5.170479E-01	2.603583E-01	4.620949E-03	0.0
304	G	-1.154169E-04	2.821720E-03	7.312879E-01	1.948374E-01	2.283002E-03	0.0
305	G	-5.207913E-05	2.239455E-03	8.68345E-01	1.467684E-01	2.755098E-04	0.0
306	G	-4.485042E-05	1.449510E-03	9.991662E-01	8.699495E-02	6.171050E-05	0.0
307	G	-4.952956E-05	1.874237E-05	1.037777E+00	4.889961E-04	1.359183E-04	0.0
308	G	-6.615334E-05	-1.415559E-03	1.000000E+00	-8.618937E-02	-1.833557E-04	0.0
309	G	-9.548809E-05	-2.210649E-03	8.682716E-01	-1.462716E-01	-1.361557E-04	0.0
310	G	-1.811616E-04	-2.801182E-03	7.329743E-01	-1.94811E-01	1.772264E-03	0.0
311	G	-2.706024E-04	-4.406743E-03	5.125098E-01	-2.608453E-01	4.149861E-03	0.0

SUBCASE 1

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0005 IN CORE

*** SHEAR PARAMETER = 40.7 GEOMETRY PARAMETER = 3.5 ***
EIGENVALUE = 5.747225E+06
CYCLES = 3.815480E+02

REAL EIGENVECTOR NO.

3

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
312	G	-1.584374E-04	-4.156842E-03	2.689529E-01	-2.777226E-01	2.213407E-03	0.0
313	G	0.0	-4.637623E-03	0.0	-2.990848E-01	-1.719934E-03	0.0
401	G	0.0	3.915063E-03	0.0	-2.537811E-01	2.288447E-03	0.0
402	G	-1.363750E-03	3.617511E-03	2.295994E-01	2.395460E-01	8.600746E-02	0.0
403	G	-2.626796E-03	3.430001E-03	4.439322E-01	2.215115E-01	1.652613E-01	0.0
404	G	3.760504E-03	2.548114E-03	6.285012E-01	1.762171E-01	2.351959E-01	0.0
405	G	-4.476089E-03	1.903416E-03	7.647305E-01	1.255219E-01	2.834287E-01	0.0
406	G	-5.095436E-03	1.309296E-03	8.611539E-01	7.730774E-02	3.20319E-01	0.0
407	G	-5.165415E-03	2.275044E-03	8.963567E-01	5.612969E-01	3.290269E-01	0.0
408	G	-5.116955E-03	-1.267726E-03	8.621246E-01	-7.635371E-02	3.201290E-01	0.0
409	G	-4.519442E-03	-1.870868E-03	7.664223E-01	-1.249241E-01	2.832387E-01	0.0
410	G	-3.824442E-03	-2.531654E-03	6.305145E-01	-1.715496E-01	2.349369E-01	0.0
411	G	-2.702783E-03	-3.434337E-03	4.457394E-01	-2.220425E-01	1.649454E-01	0.0
412	G	-1.423472E-03	-3.636384E-03	2.310755E-01	-2.550744E-01	8.569197E-02	0.0
413	G	0.0	-3.93437E-03	0.0	-2.550744E-01	2.299425E-03	0.0
501	G	0.0	2.364152E-03	0.0	1.493626E-01	3.234920E-03	0.0
502	G	-2.200457E-03	2.067430E-03	1.336039E-01	1.369362E-01	1.445616E-01	0.0
503	G	-4.297153E-03	2.044914E-03	2.572120E-01	1.300723E-01	2.781376E-01	0.0
504	G	-6.023410E-03	1.467293E-03	3.649756E-01	9.846260E-02	3.908295E-01	0.0
505	G	-7.991218E-03	1.123748E-03	4.420623E-01	7.306217E-02	4.791862E-01	0.0
506	G	-8.316098E-03	-7.410883E-04	4.953731E-01	4.409411E-02	5.375922E-01	0.0
507	G	-8.812188E-03	2.687189E-05	5.189113E-01	5.875876E-04	5.641143E-01	0.0
508	G	-8.337134E-03	-5.523607E-04	5.003778E-01	-4.312136E-02	5.376247E-01	0.0
509	G	-7.433044E-03	-1.083806E-03	4.448103E-01	-7.42981E-02	4.792597E-01	0.0
510	G	-6.084846E-03	-1.444860E-03	3.670589E-01	-9.839921E-02	3.909597E-01	0.0
511	G	-4.372614E-03	-2.043541E-03	2.51086E-01	-1.305228E-01	2.782824E-01	0.0
512	G	-2.272602E-03	-2.089186E-03	1.348208E-01	-1.380135E-01	1.446251E-01	0.0
513	G	0.0	-2.397651E-03	0.0	-1.509162E-01	3.181360E-03	0.0
601	G	0.0	5.325157E-06	0.0	-5.135997E-04	3.13469E-03	0.0
602	G	-2.654274E-03	7.026545E-06	-4.400734E-04	-4.266582E-04	1.730011E-01	0.0
603	G	-5.215365E-03	1.106470E-05	-7.400107E-04	-2.171678E-04	3.303802E-01	0.0
604	G	-7.497553E-03	1.680440E-05	-8.115701E-04	6.762141E-05	4.712363E-01	0.0
605	G	-8.867677E-03	2.263730E-05	-6.219948E-04	3.352450E-04	5.668455E-01	0.0
606	G	-1.013368E-02	2.708894E-05	-2.332521E-04	4.991754E-04	6.402163E-01	0.0
607	G	-1.038507E-02	2.957279E-05	2.478191E-04	5.304561E-04	6.591853E-01	0.0
608	G	-1.015496E-02	2.687104E-05	6.816131E-04	3.981180E-04	6.403908E-01	0.0
609	G	-8.909557E-03	2.586005E-05	9.467873E-04	1.742170E-04	5.671910E-01	0.0
610	G	-7.559400E-03	2.086595E-05	9.872389E-04	-8.86984E-05	4.717681E-01	0.0
611	G	-5.294735E-03	1.523210E-05	7.96969E-04	-3.131507E-04	3.310869E-01	0.0
612	G	-2.743273E-03	1.103335E-05	4.428643E-04	-4.47428E-04	1.737420E-01	0.0
613	G	0.0	9.083686E-06	0.0	-5.026573E-04	3.063991E-03	0.0
701	G	0.0	-2.354007E-03	0.0	-1.503609E-01	3.230632E-03	0.0
702	G	-2.199625E-03	-2.053432E-03	-1.344517E-01	-1.377482E-01	1.444806E-01	0.0
703	G	-4.295697E-03	-2.023560E-03	-2.586338E-01	-1.304934E-01	2.77986E-01	0.0
704	G	-6.022123E-03	-1.434833E-03	-3.665410E-01	-9.83367E-02	3.906863E-01	0.0
705	G	-7.390405E-03	-1.079697E-03	-4.42611E-01	-7.241256E-02	4.790779E-01	0.0
706	G	-8.316101E-03	-6.888467E-04	-4.98283E-01	-4.314539E-02	5.375629E-01	0.0
707	G	-8.812603E-03	3.087743E-05	-5.184452E-01	-4.36665E-02	5.641938E-01	0.0
708	G	-8.337087E-03	7.486845E-04	-4.950851E-01	4.386665E-04	5.377948E-01	0.0
709	G	-7.431336E-03	1.135510E-03	-4.430233E-01	7.275694E-02	4.795099E-01	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

SUBCASE 1

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***
EIGENVALUE = 5.747225E+06
CYCLES = 3.815480E+02

REAL EIGENVECTOR NO. 3

POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
710	G	-6.080251E-03	1.487504E-03	-3.65190E-01	9.622408E-02	3.912298E-01	0.0
711	G	-4.366187E-03	2.075535E-03	-2.576223E-01	1.299134E-01	2.785163E-01	0.0
712	G	-2.267317E-03	2.113528E-03	-1.340032E-01	1.371859E-01	1.447442E-01	0.0
713	G	0.0	2.418227E-03	0.0	1.499902E-01	3.202273E-03	0.0
801	G	0.0	-3.905633E-03	0.0	-2.546686E-01	2.284918E-03	0.0
802	G	-1.362728E-03	-3.604700E-03	-2.307493E-01	-2.402688E-01	8.587023E-02	0.0
803	G	-2.625196E-03	-3.410657E-03	-4.452060E-01	-2.218905E-01	1.650374E-01	0.0
804	G	-3.758963E-03	-2.518835E-03	-6.259886E-01	-1.715130E-01	2.349511E-01	0.0
805	G	-4.475503E-03	-1.637351E-03	-7.658064E-01	-1.249508E-01	2.832503E-01	0.0
806	G	-5.095987E-03	-1.261958E-03	-8.615750E-01	-7.647078E-02	3.201842E-01	0.0
807	G	-5.166429E-03	2.981336E-05	-8.959700E-01	3.295778E-04	3.291441E-01	0.0
808	G	-5.116656E-03	1.320352E-03	-8.610253E-01	7.598703E-02	3.204082E-01	0.0
809	G	-4.515177E-03	1.821535E-03	-7.649123E-01	1.251835E-01	2.836370E-01	0.0
810	G	-3.814461E-03	2.576695E-03	-6.229662E-01	1.713695E-01	2.353595E-01	0.0
811	G	-2.689223E-03	3.471592E-03	-4.445293E-01	2.215182E-01	1.653800E-01	0.0
812	G	-1.413690E-03	3.667570E-03	-2.304211E-01	2.393300E-01	8.600632E-02	0.0
813	G	0.0	-3.966799E-03	0.0	-2.543373E-01	2.272353E-03	0.0
901	G	0.0	-4.629146E-03	0.0	-2.988134E-01	-1.602435E-03	0.0
902	G	-9.447169E-05	-4.149823E-03	-2.687223E-01	-2.775398E-01	2.268246E-03	0.0
903	G	-1.884741E-04	-4.035851E-03	-5.180944E-01	-2.606750E-01	4.316454E-03	0.0
904	G	-1.136994E-04	-2.797414E-03	-7.324448E-01	-1.947485E-01	1.948184E-03	0.0
905	G	-5.142957E-05	-2.206587E-03	-8.877284E-01	-1.463042E-01	1.793287E-05	0.0
906	G	-5.590629E-05	-1.410278E-03	-9.955343E-01	-8.632648E-02	-2.080743E-05	0.0
907	G	-5.138133E-05	-2.596808E-05	-1.036596E+00	2.268588E-04	2.689708E-04	0.0
908	G	-6.186955E-05	1.461337E-03	-9.991563E-01	8.667601E-02	1.657626E-04	0.0
909	G	-8.996728E-05	2.257413E-03	-8.871284E-01	1.464382E-01	3.315218E-04	0.0
910	G	-1.666262E-04	2.484042E-03	-7.318399E-01	1.946341E-01	2.283581E-03	0.0
911	G	-2.449165E-04	4.084558E-03	-5.17853E-01	2.603876E-01	4.591122E-03	0.0
912	G	-1.358888E-04	4.197657E-03	-2.685602E-01	2.773220E-01	2.462503E-03	0.0
913	G	0.0	4.676867E-03	0.0	2.966934E-01	-1.617232E-03	0.0
1001	G	0.0	-3.829665E-03	0.0	-2.547777E-01	1.737513E-03	0.0
1002	G	1.202624E-03	-3.640466E-03	-2.326158E-01	-2.452320E-01	-8.628543E-02	0.0
1003	G	2.468033E-03	-3.258292E-03	-4.492342E-01	-2.210849E-01	-1.648265E-01	0.0
1004	G	3.682969E-03	-2.384127E-03	-6.313725E-01	-1.678599E-01	-2.357966E-01	0.0
1005	G	4.395319E-03	-1.864827E-03	-7.655546E-01	-1.252842E-01	-2.839957E-01	0.0
1006	G	4.998347E-03	-1.269243E-03	-8.615574E-01	-7.688227E-02	-3.201979E-01	0.0
1007	G	5.111432E-03	1.414075E-05	-8.961601E-01	1.397652E-04	3.292572E-01	0.0
1008	G	4.978274E-03	1.306936E-03	-8.613259E-01	7.709205E-02	-3.200361E-01	0.0
1009	G	4.358414E-03	1.902100E-03	-7.651891E-01	1.253624E-01	-2.837448E-01	0.0
1010	G	3.635612E-03	2.419890E-03	-6.310061E-01	1.677858E-01	-2.355475E-01	0.0
1011	G	2.422697E-03	3.291562E-03	-4.469765E-01	2.213342E-01	-1.846972E-01	0.0
1012	G	1.175317E-03	3.671312E-03	-2.324920E-01	2.451007E-01	-8.631741E-02	0.0
1013	G	0.0	3.858844E-03	0.0	2.546499E-01	1.749514E-03	0.0
1101	G	0.0	-2.078540E-03	0.0	-1.496834E-01	-1.098039E-02	0.0
1102	G	2.056314E-03	-1.878435E-03	-1.347298E-01	-1.416647E-01	-1.981391E-01	0.0
1103	G	4.360123E-03	-1.959726E-03	-2.601388E-01	-1.311296E-01	-2.833977E-01	0.0
1104	G	6.001158E-03	-1.345628E-03	-3.663409E-01	-9.688536E-02	-3.932107E-01	0.0
1105	G	7.309834E-03	-1.103648E-03	-4.435270E-01	-7.423608E-02	-4.792778E-01	0.0
1106	G	8.226332E-03	-7.052257E-04	-4.997730E-01	-4.372036E-02	-5.376668E-01	0.0
1107	G	8.749249E-03	-1.011641E-05	-5.186296E-01	-6.102216E-05	-5.642585E-01	0.0

SURCASE 1

GEOMETRY PARAMETER = 40.0

EIGENVALUE = 5.747225E+06

CYCLES = 3.815480E+02

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE

SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

POINT ID. TYPE

11

12

13

R1

R2

R3

1108

G

8.20694E-03

7.25260E-04

-4.99640E-01

4.38117E-02

-5.37534E-01

0.0

1109

G

7.27455E-03

1.12313E-03

-4.43355E-01

7.42633E-02

-4.79064E-01

0.0

1110

G

5.95739E-03

1.36393E-03

-3.66169E-01

9.68471E-02

-3.92997E-01

0.0

1111

G

4.31837E-03

1.97106E-03

-2.60016E-01

1.31054E-01

-2.83214E-01

0.0

1112

G

2.02802E-03

1.89276E-03

-1.34673E-01

1.41598E-01

-1.47982E-01

0.0

1113

G

0.0

2.09240E-03

0.0

1.49630E-01

-1.10124E-02

0.0

1201

G

-1.94512E-03

0.0

0.0

-1.62595E-03

8.31549E-03

0.0

1202

G

2.65978E-03

0.0

0.0

-4.96619E-03

-1.70547E-01

0.0

1203

G

5.10776E-03

0.0

0.0

-2.68814E-03

-3.30452E-01

0.0

1204

G

7.39603E-03

0.0

0.0

-3.39659E-03

-4.70401E-01

0.0

1205

G

8.80962E-03

0.0

0.0

-1.80968E-03

-5.66563E-01

0.0

1206

G

1.00560E-02

0.0

0.0

-9.88244E-04

-6.40542E-01

0.0

1207

G

1.02923E-02

0.0

0.0

-1.51148E-05

-6.58963E-01

0.0

1208

G

1.00367E-02

0.0

0.0

9.60194E-04

-6.40413E-01

0.0

1209

G

8.77544E-03

0.0

0.0

1.78300E-03

-5.66364E-01

0.0

1210

G

7.35387E-03

0.0

0.0

3.37657E-03

-4.70202E-01

0.0

1211

G

5.06951E-03

0.0

0.0

2.67868E-03

-3.30333E-01

0.0

1212

G

2.63792E-03

0.0

0.0

4.96716E-03

-1.70553E-01

0.0

1213

G

-1.95012E-03

0.0

0.0

1.62663E-03

8.35316E-03

0.0

SUBCASE 1

POINT ID. TYPE

POINT ID.	TYPE	11	12	13	R1	R2	R3
1	G	-2.83446E-03	0.0	0.0	1.489354E-03	1.297498E-02	0.0
2	G	5.906931E-03	0.0	0.0	6.335769E-03	-3.191920E-01	0.0
3	G	1.002632E-02	0.0	0.0	1.402963E-03	-5.481904E-01	0.0
4	G	1.209466E-02	0.0	0.0	4.482898E-04	-6.470572E-01	0.0
5	G	1.005056E-02	0.0	0.0	-1.921396E-03	-5.426038E-01	0.0
6	G	6.252610E-03	0.0	0.0	-6.619589E-03	-3.262313E-01	0.0
7	G	1.001477E-04	0.0	0.0	-2.175355E-03	-2.501273E-04	0.0
8	G	-6.051708E-03	0.0	0.0	-6.612689E-03	3.257034E-01	0.0
9	G	-9.848787E-03	0.0	0.0	-1.921221E-03	5.420063E-01	0.0
10	G	-1.189424E-02	0.0	0.0	4.873508E-04	6.463026E-01	0.0
11	G	-9.829882E-03	0.0	0.0	1.408351E-03	5.472549E-01	0.0
12	G	-5.736283E-03	0.0	0.0	6.461797E-03	3.180317E-01	0.0
13	G	3.021285E-03	0.0	0.0	1.501675E-03	-1.396335E-02	0.0
101	G	0.0	5.081450E-03	0.0	2.930551E-01	-1.584127E-02	0.0
102	G	4.668352E-03	4.094215E-03	2.516558E-01	2.461720E-01	-2.736924E-01	0.0
103	G	8.723326E-03	2.697003E-03	4.348879E-01	1.497869E-01	-4.754042E-01	0.0
104	G	9.616225E-03	-3.801140E-04	5.007428E-01	-1.503879E-02	-5.294471E-01	0.0
105	G	8.280182E-03	-2.667403E-03	4.234478E-01	-1.456774E-01	-4.526062E-01	0.0
106	G	4.757696E-03	-4.106328E-03	2.456112E-01	-2.345205E-01	-2.596338E-01	0.0
107	G	9.875913E-05	-5.222910E-03	1.802746E-04	-2.979835E-01	-1.722188E-04	0.0
108	G	-4.559738E-03	-4.108300E-03	-2.449476E-01	-2.5492819E-01	2.592819E-01	0.0
109	G	-8.028856E-03	-2.672440E-03	-4.230264E-01	-1.455812E-01	4.522136E-01	0.0
110	G	-9.418143E-03	-3.956508E-04	-5.002370E-01	-1.297375E-02	5.290076E-01	0.0
111	G	-8.537792E-03	2.663894E-03	-4.343294E-01	1.498640E-01	4.749998E-01	0.0
112	G	-4.505882E-03	4.023326E-03	-2.511622E-01	2.459053E-01	2.735964E-01	0.0
113	G	0.0	5.002266E-03	0.0	2.922945E-01	1.665372E-02	0.0
201	G	0.0	9.078044E-03	0.0	4.995723E-01	3.234618E-03	0.0
202	G	2.852602E-03	7.704031E-03	4.350175E-01	4.291433E-01	-1.633485E-01	0.0
203	G	4.933601E-03	4.391590E-03	7.521361E-01	2.507178E-01	-2.735902E-01	0.0
204	G	6.132226E-03	-6.566732E-04	8.613957E-01	-2.263884E-02	-3.264584E-01	0.0
205	G	5.097935E-03	-4.600296E-03	7.297506E-01	-2.496735E-01	-2.732711E-01	0.0
206	G	3.108958E-03	-7.204474E-03	4.271568E-01	-4.051628E-01	-1.630566E-01	0.0
207	G	9.569114E-05	-9.338490E-03	2.548052E-04	5.038008E-01	-6.631289E-06	0.0
208	G	-2.916257E-03	-7.206122E-03	-2.66261E-01	-4.051124E-01	1.630328E-01	0.0
209	G	-4.902069E-03	-4.605406E-03	-7.251521E-01	-2.495714E-01	2.732299E-01	0.0
210	G	-5.935804E-03	-6.121190E-04	-8.607113E-01	-2.257129E-02	3.264478E-01	0.0
211	G	-4.748381E-03	4.356338E-03	-5.14700E-01	2.506036E-01	2.737054E-01	0.0
212	G	-2.717522E-03	7.658300E-03	-4.345745E-01	4.287550E-01	1.635929E-01	0.0
213	G	0.0	9.030162E-03	0.0	4.990119E-01	-3.495104E-03	0.0
301	G	0.0	1.099300E-02	0.0	5.909931E-01	-2.501202E-03	0.0
302	G	-2.971967E-04	8.230348E-03	5.013313E-01	4.765663E-01	-1.103800E-02	0.0
303	G	-6.026541E-04	5.537939E-03	6.607089E-01	2.985413E-01	2.155831E-02	0.0
304	G	-2.712057E-04	-4.117995E-04	1.000000E+00	-1.340283E-02	1.059015E-02	0.0
305	G	3.021051E-05	-5.322150E-03	6.485027E-01	-2.953253E-01	6.733185E-04	0.0
306	G	6.781584E-05	-8.225331E-03	4.989041E-01	-4.630562E-01	7.769089E-04	0.0
307	G	9.153931E-05	-1.121895E-02	1.819273E-04	-5.970593E-01	1.781992E-04	0.0
308	G	1.175236E-04	-8.224216E-03	-4.984944E-01	-4.629657E-01	-4.579640E-04	0.0
309	G	1.601662E-04	-5.20705E-03	-8.420035E-01	-2.952058E-01	-4.088383E-04	0.0
310	G	4.655015E-04	-4.123889E-04	-9.994259E-01	-1.337604E-02	-1.034393E-02	0.0
311	G	7.875255E-04	5.534364E-03	-8.601596E-01	-2.983860E-01	-2.134295E-02	0.0

312	G	4.238467E-04	8.527370E-03	-5.010274E-01	4.762884E-01	-1.098144E-02	0.0
313	G	0.0	1.098997E-02	0.0	5.906451E-01	2.707997E-03	0.0
401	G	0.0	9.215417E-03	0.0	4.994939E-01	2.846180E-03	0.0
402	G	-2.929353E-03	7.293454E-03	4.262241E-01	4.081313E-01	1.601829E-01	0.0
403	G	-5.015405E-03	4.627405E-03	7.322965E-01	2.513371E-01	2.740494E-01	0.0
404	G	-5.995609E-03	-1.106849E-03	8.528183E-01	-3.065273E-03	5.234704E-01	0.0
405	G	-4.934389E-03	-4.627872E-03	7.359027E-01	-2.494676E-01	2.710347E-01	0.0
406	G	-2.982846E-03	7.263429E-03	4.263470E-01	4.062959E-01	1.632099E-01	0.0
407	G	8.765114E-05	-5.067785E-03	-2.350139E-05	-5.004597E-01	3.001861E-04	0.0
408	G	3.159613E-03	-7.259443E-03	-4.263213E-01	-4.061362E-01	-1.626486E-01	0.0
409	G	5.115938E-03	-0.619524E-03	-7.297114E-01	-2.492708E-01	-2.705933E-01	0.0
410	G	6.179914E-03	-9.602454E-05	-8.555131E-01	-3.025466E-03	-3.231167E-01	0.0
411	G	5.188788E-03	-4.653570E-03	-7.350407E-01	2.512405E-01	-2.737011E-01	0.0
412	G	3.048722E-03	7.328054E-03	-4.260930E-01	4.080270E-01	-1.598136E-01	0.0
413	G	0.0	9.250813E-03	0.0	4.993749E-01	-2.847993E-03	0.0
501	G	0.0	5.660074E-03	0.0	2.992287E-01	5.207101E-03	0.0
502	G	-4.604374E-03	4.134547E-03	2.501488E-01	2.326493E-01	2.618628E-01	0.0
503	G	-8.102408E-03	2.754014E-03	4.264547E-01	1.491937E-01	4.527090E-01	0.0
504	G	-9.268064E-03	-4.495894E-05	4.943379E-01	-1.108373E-03	5.185252E-01	0.0
505	G	-8.098254E-03	-2.262948E-03	4.250885E-01	-1.496274E-01	4.523926E-01	0.0
506	G	-4.593710E-03	4.135980E-03	2.451019E-01	-2.319729E-01	2.590899E-01	0.0
507	G	8.522688E-05	-5.616307E-03	-2.84212E-04	2.980108E-01	3.203777E-04	0.0
508	G	4.765784E-03	-4.131271E-03	-2.495350E-01	-2.316999E-01	-2.585339E-01	0.0
509	G	8.273291E-03	-2.618369E-03	-4.252451E-01	-1.492819E-01	-4.520293E-01	0.0
510	G	9.445054E-03	3.012185E-05	-4.953410E-01	-9.069564E-04	-5.184205E-01	0.0
511	G	8.272859E-03	2.778566E-03	-4.263410E-01	1.490318E-01	-4.527936E-01	0.0
512	G	4.740596E-03	4.178120E-03	-2.501899E-01	2.325732E-01	-2.619275E-01	0.0
513	G	0.0	5.71273E-03	0.0	2.994449E-01	-5.106105E-03	0.0
601	G	0.0	-1.280199E-05	0.0	3.667640E-04	2.635453E-03	0.0
602	G	-5.764835E-03	-1.515655E-05	2.981456E-04	2.653589E-04	3.260795E-01	0.0
603	G	-1.009370E-02	-2.05337E-05	4.357615E-04	3.783486E-05	5.483937E-01	0.0
604	G	-1.218564E-02	-2.716509E-05	3.562941E-04	-2.186978E-04	6.526853E-01	0.0
605	G	-9.929564E-03	-3.258208E-05	7.426574E-05	-3.790033E-04	5.457365E-01	0.0
606	G	-6.047446E-03	-3.502981E-05	-2.723947E-04	-3.601898E-04	3.260361E-01	0.0
607	G	8.526669E-05	-3.468513E-05	-5.303401E-04	-1.893905E-04	2.509265E-04	0.0
608	G	6.218461E-03	-3.227398E-05	-5.928616E-04	5.405652E-05	-3.256133E-01	0.0
609	G	1.010260E-02	-2.561134E-05	-4.552239E-04	2.338135E-04	-5.455713E-01	0.0
610	G	1.235984E-02	-2.765284E-05	-2.193645E-04	2.637829E-04	-6.528849E-01	0.0
611	G	1.026629E-02	-2.951949E-05	-2.259164E-05	1.528867E-04	-5.490267E-01	0.0
612	G	5.923501E-03	-2.630319E-05	-4.548067E-05	-7.607495E-06	-3.269580E-01	0.0
613	G	0.0	-2.616578E-05	0.0	-8.282546E-05	-2.502740E-03	0.0
701	G	0.0	-5.684630E-03	0.0	-2.985118E-01	5.211651E-03	0.0
702	G	-4.604760E-03	-4.164263E-03	-2.495742E-01	-2.321489E-01	2.619389E-01	0.0
703	G	-8.102949E-03	-2.79362E-03	-4.25611E-01	-1.491149E-01	4.527939E-01	0.0
704	G	-9.267329E-03	-7.105766E-06	-4.987408E-01	7.084967E-04	5.185679E-01	0.0
705	G	-8.096147E-03	2.763673E-03	-4.249255E-01	1.488966E-01	4.523606E-01	0.0
706	G	-4.590882E-03	4.68280E-03	-2.495996E-01	2.312960E-01	2.589777E-01	0.0
707	G	8.774097E-05	5.548657E-03	-6.924088E-04	2.975866E-01	1.330615E-04	0.0
708	G	4.766370E-03	4.067947E-03	2.484713E-01	2.310342E-01	-2.587815E-01	0.0
709	G	8.270162E-03	2.759091E-03	4.244578E-01	1.497595E-01	-4.523131E-01	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

SUBCASE 1

*** SHEAR PARAMETER = 40.0; GEOMETRY PARAMETER = 3.5 ***

EIGENVALUE = 1.127080E+07

CYCLES = 5.343151E+02

REAL EIGENVECTOR NO.

4

POINT ID.	TYPE	11	12	13	R1	R2	R3
710	G	9.43596E-03	-2.723037E-05	4.950152E-01	1.405109E-03	-5.186751E-01	0.0
711	G	8.261192E-03	-2.633030E-03	4.263881E-01	-1.487432E-01	-4.529795E-01	0.0
712	G	4.731531E-03	-4.232939E-03	2.503444E-01	-2.326372E-01	-2.620087E-01	0.0
713	G	0.0	-5.768350E-03	0.0	-2.996976E-01	-5.134263E-03	0.0
801	G	0.0	-9.237700E-03	0.0	-4.988292E-01	2.849327E-03	0.0
802	G	-2.929329E-03	-7.320375E-03	4.257102E-01	-4.076834E-01	1.602665E-01	0.0
803	G	-5.014778E-03	-4.662984E-03	-7.312737E-01	-2.512753E-01	2.741602E-01	0.0
804	G	-5.993675E-03	-6.419786E-05	-8.521727E-01	2.732731E-03	3.235419E-01	0.0
805	G	-4.930513E-03	4.571184E-03	-7.297097E-01	2.988428E-01	2.709947E-01	0.0
806	G	-2.97629E-03	7.202038E-03	-4.261202E-01	4.057140E-01	1.630295E-01	0.0
807	G	9.209225E-05	9.005975E-03	-7.490412E-04	5.001917E-01	-8.044222E-07	0.0
808	G	3.160042E-03	7.199925E-03	4.255116E-01	4.063226E-01	-1.630326E-01	0.0
809	G	5.108283E-03	4.560094E-03	7.292193E-01	2.997467E-01	-2.709999E-01	0.0
810	G	6.162484E-03	3.453698E-05	8.524681E-01	3.491819E-03	-3.235256E-01	0.0
811	G	5.166053E-03	-4.715980E-03	7.323172E-01	-2.510367E-01	-2.740844E-01	0.0
812	G	3.032587E-03	-7.391363E-03	4.263777E-01	-4.082244E-01	-1.601167E-01	0.0
813	G	0.0	-9.314291E-03	0.0	-4.997749E-01	-2.805664E-03	0.0
901	G	0.0	-1.101087E-02	0.0	-5.904468E-01	-2.483278E-03	0.0
902	G	-2.968307E-04	-8.552276E-03	-5.008941E-01	-4.761855E-01	1.114836E-02	0.0
903	G	-6.013303E-04	-5.567102E-03	-8.60580E-01	-2.984597E-01	2.171061E-02	0.0
904	G	-2.684463E-04	3.735164E-04	-9.94298E-01	1.314235E-02	1.070603E-02	0.0
905	G	3.501819E-05	5.475448E-03	-8.482899E-01	2.948327E-01	6.703146E-04	0.0
906	G	7.433616E-05	8.174685E-03	-4.991272E-01	4.626197E-01	6.049127E-04	0.0
907	G	9.712212E-05	1.116679E-02	-6.918689E-04	5.968686E-01	-1.357123E-04	0.0
908	G	1.169354E-04	8.171648E-03	4.980053E-01	4.631701E-01	-8.173190E-04	0.0
909	G	1.480736E-04	5.464878E-03	8.478334E-01	2.956824E-01	-7.493965E-04	0.0
910	G	4.376377E-04	3.478541E-04	9.96959E-01	1.381962E-02	-1.064692E-02	0.0
911	G	7.451280E-04	-5.605489E-03	8.607690E-01	-2.982091E-01	-2.158526E-02	0.0
912	G	3.877927E-04	-8.602608E-03	5.015311E-01	-4.766414E-01	-1.109824E-02	0.0
913	G	0.0	-1.106828E-02	0.0	-5.91360E-01	2.570113E-03	0.0
1001	G	0.0	-9.091223E-03	0.0	-4.991834E-01	3.228867E-03	0.0
1002	G	2.852746E-03	-7.719651E-03	-4.346988E-01	-4.288528E-01	-1.631771E-01	0.0
1003	G	4.934017E-03	-4.412685E-03	-7.51523E-01	-2.506511E-01	-2.733473E-01	0.0
1004	G	6.134169E-03	6.291227E-04	-8.609665E-01	2.245608E-02	-3.262457E-01	0.0
1005	G	5.102967E-03	4.567143E-03	-7.295642E-01	2.493469E-01	-2.732076E-01	0.0
1006	G	3.116155E-03	7.168186E-03	-4.272572E-01	4.048808E-01	-1.631744E-01	0.0
1007	G	1.016348E-04	9.300432E-03	-5.296924E-04	5.037155E-01	-2.486124E-04	0.0
1008	G	-2.916703E-03	7.165984E-03	4.263992E-01	4.053009E-01	1.627647E-01	0.0
1009	G	-4.916177E-03	4.559536E-03	7.292001E-01	2.499606E-01	2.730566E-01	0.0
1010	G	-5.969308E-03	6.136031E-04	8.611365E-01	2.296713E-02	3.263836E-01	0.0
1011	G	-4.805438E-03	-4.435150E-03	7.521358E-01	-2.505143E-01	2.736991E-01	0.0
1012	G	-2.780752E-03	-7.748571E-03	4.350988E-01	-4.291889E-01	1.635950E-01	0.0
1013	G	0.0	-9.122220E-03	0.0	-4.997151E-01	-3.259348E-03	0.0
1014	G	0.0	-5.089280E-03	0.0	-2.928482E-01	-1.578871E-02	0.0
1101	G	4.668788E-03	-4.103459E-03	-2.514890E-01	-2.460160E-01	-2.734915E-01	0.0
1102	G	8.723039E-03	-2.708005E-03	-4.348324E-01	-1.497422E-01	-4.751057E-01	0.0
1103	G	9.618286E-03	3.656381E-04	-5.005116E-01	1.294878E-02	-5.291901E-01	0.0
1104	G	6.233168E-03	2.650263E-03	-4.23373E-01	1.455222E-01	-4.524900E-01	0.0
1105	G	4.764980E-03	4.087201E-03	-2.496404E-01	2.343830E-01	-2.596848E-01	0.0
1106	G	1.047034E-04	5.203013E-03	-2.672100E-04	2.979694E-01	-3.262952E-04	0.0
1107	G	0.0	0.0	0.0	0.0	0.0	0.0

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

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SUBCASE 1

*** SHEAR PARAMETER = 40.; GEOMETRY PARAMETER = 3.5 ***

EIGENVALUE = 1.127080E+07

CYCLES = 5.343151E+02

REAL EIGENVECTOR NO.

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POINT ID.	TYPE	T1	T2	T3	R1	R2	R3
1108	G	-4.560970E-03	4.086060E-03	2.491711E-01	2.346039E-01	2.591671E-01	0.0
1109	G	-8.044198E-03	2.646881E-03	4.231303E-01	1.456529E-01	4.522627E-01	0.0
1110	G	-9.455303E-03	3.588548E-04	5.005854E-01	1.321072E-02	5.292787E-01	0.0
1111	G	-8.599051E-03	-2.717263E-03	4.348706E-01	-1.496741E-01	4.753572E-01	0.0
1112	G	-4.593327E-03	-4.111991E-03	2.516913E-01	-2.461935E-01	2.736342E-01	0.0
1113	G	0.0	-5.099708E-03	0.0	-2.931321E-01	1.600180E-02	0.0
1201	G	-2.824639E-03	0.0	0.0	-1.483475E-03	1.292993E-02	0.0
1202	G	5.906441E-03	0.0	0.0	-6.316534E-03	-3.189968E-01	0.0
1203	G	1.002635E-02	0.0	0.0	-1.391216E-03	-5.478852E-01	0.0
1204	G	1.209630E-02	0.0	0.0	-4.352687E-04	-6.467695E-01	0.0
1205	G	1.005560E-02	0.0	0.0	1.931567E-03	-5.424613E-01	0.0
1206	G	6.259830E-03	0.0	0.0	6.631032E-03	-3.262524E-01	0.0
1207	G	1.057887E-04	0.0	0.0	2.187043E-03	-3.536994E-04	0.0
1208	G	-6.053290E-03	0.0	0.0	6.635381E-03	3.256590E-01	0.0
1209	G	-9.865716E-03	0.0	0.0	1.931760E-03	5.421935E-01	0.0
1210	G	-1.193463E-02	0.0	0.0	-4.479816E-04	6.468459E-01	0.0
1211	G	-9.905565E-03	0.0	0.0	-1.418887E-03	5.481829E-01	0.0
1212	G	-5.842636E-03	0.0	0.0	-6.377426E-03	3.193152E-01	0.0
1213	G	2.863032E-03	0.0	0.0	-1.505193E-03	-1.312719E-02	0.0

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SPEEDS, .0005 IN CORE

SUBCASE 1

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ****

ELEMENT STRAIN ENERGIES

ELEMENT-TYPE = HEXA
SUBCASE

* TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 4.364667E+02
TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 1.049331E+02

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
10003	6.66628E-01	.1390
10004	1.009094E+00	.2312
10005	1.356286E+00	.3107
10006	1.561335E+00	.3582
10007	1.562443E+00	.3580
10008	1.353364E+00	.3101
10009	1.005459E+00	.2304
10010	6.659308E-01	.1388
10103	6.17269E-01	.1414
10104	9.290846E-01	.2129
10105	1.192403E+00	.2746
10106	1.357168E+00	.3109
10107	1.356725E+00	.3108
10108	1.197525E+00	.2744
10109	9.296457E-01	.2130
10110	6.23138E-01	.1428
10201	4.567020E-01	.1138
10202	5.385173E-01	.1234
10203	6.530790E-01	.1496
10204	7.568910E-01	.1826
10205	9.321600E-01	.2136
10206	1.008385E+00	.2310
10207	1.008721E+00	.2311
10208	9.336745E-01	.2139
10209	8.012513E-01	.1836
10210	6.432077E-01	.1521
10211	5.582097E-01	.1262
10212	4.595549E-01	.1145
10301	8.35581E-01	.1914
10302	7.66868E-01	.1803
10303	7.190734E-01	.1647
10304	6.529432E-01	.1496
10305	6.236639E-01	.1427
10306	5.972131E-01	.1368
10307	5.680234E-01	.1370
10308	6.255831E-01	.1433
10309	6.580785E-01	.1508
10310	7.256695E-01	.1663
10311	7.898075E-01	.1810
10312	8.320389E-01	.1906
10401	1.122435E+00	.2572
10402	9.976869E-01	.2286
10403	7.543524E-01	.1820
10404	5.593553E-01	.1282
10409	5.627863E-01	.1289
10410	7.570220E-01	.1826

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

SUBCASE 1

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

ELEMENT STRAIN ENERGIES

ELEMENT-TYPE = HEXA
SUECASE

* TOTAL ENERGY CF ALL ELEMENTS IN PROBLEM = 4.364667E+02
TOTAL ENERGY CF ALL ELEMENTS IN SET 99 = 1.049331E+02

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
10411	9.570987E-01	.2284
10412	1.118367E+00	.2562
10501	1.295345E+00	.2968
10502	1.121675E+00	.2570
10503	8.234930E-01	.1910
10504	4.957093E-01	.1136
10509	4.973521E-01	.1139
10510	8.234098E-01	.1911
10511	1.115877E+00	.2566
10512	1.291394E+00	.2959
10601	1.295366E+00	.2968
10602	1.121723E+00	.2570
10603	8.233509E-01	.1910
10604	4.957131E-01	.1136
10609	4.962080E-01	.1137
10610	8.233235E-01	.1909
10611	1.120292E+00	.2567
10612	1.293054E+00	.2963
10701	1.122565E+00	.2572
10702	9.578152E-01	.2286
10703	7.954463E-01	.1820
10704	5.594040E-01	.1282
10709	5.593195E-01	.1281
10710	7.953550E-01	.1819
10711	9.567791E-01	.2284
10712	1.121096E+00	.2569
10801	8.235741E-01	.1915
10802	7.870507E-01	.1803
10803	7.192477E-01	.1648
10804	6.530910E-01	.1496
10805	6.230116E-01	.1427
10806	5.569523E-01	.1368
10807	5.566955E-01	.1368
10808	6.228531E-01	.1427
10809	6.527489E-01	.1496
10810	7.187049E-01	.1647
10811	7.862517E-01	.1801
10812	8.234747E-01	.1913
10901	4.968276E-01	.1138
10902	5.286660E-01	.1234
10903	6.232893E-01	.1497
10904	7.971867E-01	.1826
10905	9.225366E-01	.2137
10906	1.08723E+00	.2311
10907	1.086620E+00	.2311
10908	9.222137E-01	.2136

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE JANUARY 10, 1983 NASTRAN 12/14/81 PAGE 89
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETERS 3.5 *** SUBCASE 1

ELEMENT STRAIN ENERGIES

ELEMENT-TYPE = HEXA 1 * TOTAL ENERGY OF ALL ELEMENTS IN PERCENT OF TOTAL
SUBCASE TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 4.364667E+02
1.049331E+02

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
10909	7.567120E+01	.1825
10910	6.527793E+01	.1496
10911	5.281500E+01	.1233
10912	4.562918E+01	.1137
11003	6.175074E+01	.1415
11004	9.295400E+01	.2130
11005	1.199179E+00	.2747
11006	1.358342E+00	.3112
11007	1.358203E+00	.3112
11008	1.198777E+00	.2747
11009	9.290198E+01	.2129
11010	6.170574E+01	.1414
11103	6.065252E+01	.1391
11104	1.009658E+00	.2313
11105	1.357343E+00	.3110
11106	1.565311E+00	.3586
11107	1.565160E+00	.3586
11108	1.356914E+00	.3109
11109	1.009132E+00	.2312
11110	6.065194E+01	.1390
SUBTOTAL	1.049331E+02	24.0415
TYPE = HEXA		

SUBCASE 1

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

ELEMENT STRAIN ENERGIES

ELEMENT-TYPE = HEXA 2
SUBCASE

* TOTAL ENERGY CF ALL ELEMENTS IN PROBLEM = 2.00227E+03
TOTAL ENERGY CF ALL ELEMENTS IN SET = 6.61184E+02

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
10002	2.130532E+00	.1064
10003	3.775080E+00	.1885
10004	3.775201E+00	.1879
10005	2.194115E+00	.1097
10008	2.177398E+00	.1087
10009	3.737539E+00	.1867
10010	3.755649E+00	.1878
10011	2.155811E+00	.1077
10101	2.173062E+00	.1085
10102	2.68518E+00	.1343
10103	3.384954E+00	.1691
10104	3.436821E+00	.1716
10105	2.618277E+00	.1408
10106	2.301597E+00	.1149
10107	2.296464E+00	.1147
10108	2.60473E+00	.1401
10109	3.422260E+00	.1709
10110	3.385123E+00	.1693
10111	2.755501E+00	.1378
10112	2.242697E+00	.1120
10201	5.187502E+00	.2591
10202	3.760781E+00	.1878
10203	2.612132E+00	.1305
10204	2.767717E+00	.1382
10205	3.678027E+00	.1937
10206	5.204918E+00	.2599
10207	5.202045E+00	.2598
10208	3.671449E+00	.1934
10209	2.765968E+00	.1381
10210	2.635652E+00	.1316
10211	3.802094E+00	.1899
10212	5.193708E+00	.2594
10301	8.470597E+00	.4230
10302	5.052986E+00	.2524
10305	5.068332E+00	.2532
10306	6.384896E+00	.4188
10307	6.733879E+00	.4187
10308	5.067800E+00	.2531
10311	5.060391E+00	.2527
10312	8.446249E+00	.4218
10401	1.140431E+01	.5696
10402	6.315120E+00	.3154
10405	6.282823E+00	.3138
10406	1.127016E+01	.5629
10407	1.12692E+01	.5628
10408	6.283386E+00	.3138

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MODAL STRAIN ENERGY DISTRIBUTION OF 16 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SPEEITS, .0005 IN CORE

SUBCASE 1

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

ELEMENT STRAIN ENERGIES

ELEMENT-TYPE = HEXA 2
SUBCASE

* TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 2.002277E+03
TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 6.611846E+02

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
10411	6.212998E+00	.3153
10412	1.138299E+01	.5685
10501	1.331810E+01	.6651
10502	7.100306E+00	.3546
10505	7.001705E+00	.3497
10506	1.317670E+01	.6581
10507	1.317470E+01	.6580
10508	6.592553E+00	.3495
10511	7.093324E+00	.3546
10512	1.330633E+01	.6646
10601	1.331425E+01	.6650
10602	7.098326E+00	.3545
10605	7.006469E+00	.3499
10606	1.318094E+01	.6583
10607	1.317633E+01	.6581
10608	6.596687E+00	.3494
10611	7.102749E+00	.3547
10612	1.331923E+01	.6652
10701	1.135461E+01	.5691
10702	6.309607E+00	.3151
10705	6.293403E+00	.3143
10706	1.128025E+01	.5634
10707	1.127457E+01	.5631
10708	6.281218E+00	.3137
10711	6.318678E+00	.3156
10712	1.140928E+01	.5698
10801	8.455050E+00	.4225
10802	5.045537E+00	.2520
10805	5.078578E+00	.2536
10806	8.395817E+00	.4193
10807	8.391629E+00	.4191
10808	5.069978E+00	.2532
10811	5.056477E+00	.2525
10812	6.475745E+00	.4233
10901	5.178328E+00	.2586
10902	3.753432E+00	.1875
10903	2.607584E+00	.1302
10904	2.766571E+00	.1382
10905	3.280716E+00	.1938
10906	5.211513E+00	.2603
10907	5.211071E+00	.2603
10908	3.280889E+00	.1938
10909	2.765324E+00	.1383
10910	2.614085E+00	.1306
10911	3.763787E+00	.1880
10912	5.191327E+00	.2593

MUDAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

SUBCASE 1

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

ELEMENT STRAIN ENERGIES

ELEMENT-TYPE = HEXA 2 * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 2.002277E+03
SUBCASE TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 6.611846E+02

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
11001	2.168582E+00	.1083
11002	2.882255E+00	.1340
11003	3.176144E+00	.1566
11004	3.427231E+00	.1712
11005	2.611311E+00	.1404
11006	2.201191E+00	.1149
11007	2.305108E+00	.1151
11008	2.621657E+00	.1409
11009	3.440412E+00	.1718
11010	3.388251E+00	.1692
11011	2.690894E+00	.1344
11012	2.174855E+00	.1086
11102	2.124917E+00	.1061
11103	3.763259E+00	.1879
11104	3.747660E+00	.1872
11105	2.182211E+00	.1090
11108	2.195461E+00	.1098
11109	3.767866E+00	.1882
11110	3.775286E+00	.1887
11111	2.132603E+00	.1065
SUBTOTAL	6.611846E+02	33.0216

TYPE = HEXA

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SPEETS, .0045 IN CORE

SUBCASE 1

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

ELEMENT STRAIN ENERGIES

ELEMENT-TYPE = HEXA
SUBCASE 3

* TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 2.422684E+03
TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 8.194045E+02

* PERCENT OF TOTAL

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
10002	2.405085E+00	.1199
10003	6.477236E+00	.2839
10004	1.119307E+01	.4620
10005	1.512107E+01	.6241
10006	1.773264E+01	.7319
10007	1.774467E+01	.7324
10008	1.515170E+01	.6254
10009	1.123134E+01	.4636
10010	6.519671E+00	.2856
10011	2.562737E+00	.1123
10012	2.474697E+00	.1187
10103	4.566205E+00	.1886
10104	6.448978E+00	.2662
10105	8.283360E+00	.3419
10106	9.452253E+00	.3904
10107	9.465698E+00	.3907
10108	8.305069E+00	.3428
10109	6.485032E+00	.2677
10110	4.622799E+00	.1908
10111	2.572580E+00	.1227
10201	3.372752E+00	.1392
10202	3.060929E+00	.1263
10203	2.490892E+00	.1028
10210	2.523449E+00	.1042
10211	3.107303E+00	.1283
10212	3.411448E+00	.1408
10301	3.394748E+00	.1401
10302	3.182286E+00	.1306
10303	2.662720E+00	.1099
10310	2.435092E+00	.1088
10311	3.139460E+00	.1296
10312	3.398445E+00	.1403
10402	3.007766E+00	.1242
10403	4.661243E+00	.1924
10404	6.476555E+00	.2673
10405	8.268360E+00	.3413
10406	9.354511E+00	.3861
10407	9.349746E+00	.3859
10408	8.256076E+00	.3408
10409	6.456671E+00	.2665
10410	4.66134E+00	.1910
10411	2.523745E+00	.1207
10502	2.544596E+00	.1215
10503	6.471767E+00	.2839
10504	1.118746E+01	.4618
10505	1.506743E+01	.6219

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN FLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 *** SUBCASE 1

ELEMENT STRAIN ENERGIES

ELEMENT-TYPE = HEXA
SUBCASE 3

* TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 2.422688E+03
TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 8.194045E+02

ELEMENT-10	STRAIN-ENERGY	PERCENT OF TOTAL
10506	1.766677E+01	.7267
10507	1.760888E+01	.7268
10508	1.507287E+01	.6222
10509	1.119442E+01	.4621
10510	6.874521E+00	.2838
10511	2.503122E+00	.1198
10602	2.547386E+00	.1217
10603	6.876064E+00	.2838
10604	1.118293E+01	.4616
10605	1.506326E+01	.6218
10606	1.760638E+01	.7267
10607	1.761379E+01	.7270
10608	1.508142E+01	.6225
10609	1.120318E+01	.4624
10610	6.875943E+00	.2840
10611	2.502855E+00	.1198
10702	3.015687E+00	.1245
10703	4.658784E+00	.1923
10704	6.467157E+00	.2669
10705	8.259235E+00	.3409
10706	9.393121E+00	.3861
10707	9.355373E+00	.3863
10708	6.271984E+00	.2614
10709	6.472453E+00	.2672
10710	4.639640E+00	.1913
10711	2.621873E+00	.1206
10801	3.413582E+00	.1409
10802	3.174470E+00	.1310
10803	2.662956E+00	.1099
10810	2.625825E+00	.1086
10811	3.128353E+00	.1291
10812	3.187424E+00	.1398
10901	3.187803E+00	.1398
10902	3.071964E+00	.1268
10903	2.496551E+00	.1030
10910	2.488156E+00	.1027
10911	3.064746E+00	.1265
10912	3.186371E+00	.1398
11002	2.884055E+00	.1191
11003	4.580858E+00	.1891
11004	6.461803E+00	.2667
11005	8.292048E+00	.3423
11006	9.456565E+00	.3905
11007	9.455985E+00	.3904
11008	8.291096E+00	.3422
11009	6.463202E+00	.2668

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MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

SUBCASE 1

**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ****

ELEMENT STRAIN ENERGIES

ELEMENT-TYPE = HEXA 3 * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 2.422684E+03
SUBCASE TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 8.194045E+02

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
11010	4.584733E+00	.1892
11011	2.68488E+00	.1192
11102	2.513985E+00	.1203
11103	6.894856E+00	.2846
11104	1.121418E+01	.4629
11105	1.513746E+01	.6248
11106	1.773771E+01	.7322
11107	1.773743E+01	.7321
11108	1.513779E+01	.6248
11109	1.121768E+01	.4630
11110	6.501045E+00	.2849
11111	2.518783E+00	.1205
SUBTOTAL	8.194045E+02	33.8222

TYPE = HEXA

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE

SUSCASE 1

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER= 3.5 ***

ELEMENT STRAIN ENERGIES

ELEMENT-TYPE = HEXA
SUSCASE

* TOTAL ENERGY CF ALL ELEMENTS IN PROBLEM = 4.374695E+03
TOTAL ENERGY CF ALL ELEMENTS IN SET 99 = 1.464924E+03

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
10002	1.138756E+01	.2603
10003	1.475153E+01	.4524
10004	1.435058E+01	.4423
10005	1.113955E+01	.2546
10008	1.112151E+01	.2542
10009	1.532956E+01	.4418
10010	1.580121E+01	.4526
10011	1.145867E+01	.2628
10101	9.582074E+00	.2145
10102	1.007273E+01	.2302
10103	1.092999E+01	.2498
10104	1.100226E+01	.2515
10105	9.708083E+00	.2219
10106	9.293953E+00	.2124
10107	9.291642E+00	.2124
10108	9.703927E+00	.2216
10109	1.101065E+01	.2517
10110	1.098711E+01	.2512
10111	1.055274E+01	.2353
10112	9.592576E+00	.2193
10201	1.416537E+01	.3695
10202	9.022190E+00	.2062
10205	8.758264E+00	.2002
10206	1.585425E+01	.3624
10207	1.585375E+01	.3624
10208	8.755500E+00	.2002
10211	9.033349E+00	.2079
10212	1.420291E+01	.3704
10301	1.400130E+01	.3658
10302	9.278446E+00	.2121
10305	8.208468E+00	.2014
10306	1.568307E+01	.3585
10307	1.567739E+01	.3584
10308	8.796525E+00	.2011
10311	9.160231E+00	.2094
10312	1.591286E+01	.3637
10401	9.536849E+00	.2180
10402	9.775454E+00	.2235
10403	1.059999E+01	.2423
10404	1.062052E+01	.2428
10405	9.778197E+00	.2235
10406	9.352480E+00	.2138
10407	9.340242E+00	.2135
10408	9.751766E+00	.2229
10409	1.058725E+01	.2420
10410	1.058242E+01	.2405

MODAL STRAIN ENERGY DISTRIBUTION OF IG IN BY 11 IN PLATE
SIMPLY SUPPORTED CONFIG. .055 IN FACE SHEETS, .0045 IN CORE
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**** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 **** SUBCASE 1

ELEMENT STRAIN ENERGIES

ELEMENT-TYPE = HEXA
SUBCASE

* TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 4.374695E+03
TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 1.464924E+03

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
10411	9.514448E+00	.2175
10412	9.270612E+00	.2119
10502	1.095734E+01	.2514
10503	1.535705E+01	.4425
10504	1.526917E+01	.4405
10505	1.113922E+01	.2546
10508	1.111543E+01	.2541
10509	1.525339E+01	.4401
10510	1.532782E+01	.4418
10511	1.086024E+01	.2483
10602	1.095547E+01	.2513
10603	1.536014E+01	.4425
10604	1.526671E+01	.4404
10605	1.112934E+01	.2544
10608	1.113006E+01	.2544
10609	1.527149E+01	.4405
10610	1.534135E+01	.4421
10611	1.086811E+01	.2484
10701	9.506785E+00	.2174
10702	9.772915E+00	.2234
10703	1.060547E+01	.2424
10704	1.061464E+01	.2426
10705	9.755085E+00	.2230
10706	9.332477E+00	.2133
10707	9.347939E+00	.2137
10708	9.785525E+00	.2237
10709	1.062544E+01	.2429
10710	1.054828E+01	.2411
10711	9.534130E+00	.2179
10712	9.291117E+00	.2124
10801	1.596849E+01	.3650
10802	9.268153E+00	.2119
10805	8.785117E+00	.2008
10806	1.566437E+01	.3581
10807	1.568079E+01	.3586
10808	8.512475E+00	.2019
10811	9.165576E+00	.2095
10812	1.594680E+01	.3645
10901	1.611024E+01	.3689
10902	9.010183E+00	.2060
10905	8.742912E+00	.1999
10906	1.584437E+01	.3622
10907	1.586413E+01	.3626
10908	8.783034E+00	.2008
10911	9.014322E+00	.2061
10912	1.618122E+01	.3699

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SUBCASE 1

MODAL STRAIN ENERGY DISTRIBUTION OF 10 IN BY 11 IN PLATE

SIMPLY SUPPORTED CONFIG. .055 IN FACE SPEEDS, .0045 IN CURVE

*** SHEAR PARAMETER = 40., GEOMETRY PARAMETER = 3.5 ***

ELEMENT STRAIN ENERGIES

ELEMENT-TYPE = HEXA 4

* TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 4.374695E+03

TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 1.464924E+03

SUBCASE 1

ELEMENT STRAIN ENERGIES

ELEMENT-TYPE = HEXA 4 * TOTAL ENERGY OF ALL ELEMENTS IN PROBLEM = 4.374695E+03
SUBCASE TOTAL ENERGY OF ALL ELEMENTS IN SET 99 = 1.464924E+03

ELEMENT-ID	STRAIN-ENERGY	PERCENT OF TOTAL
11001	9.368119E+00	.2141
11002	1.005937E+01	.2299
11003	1.091695E+01	.2495
11004	1.090035E+01	.2512
11005	9.498886E+00	.2217
11006	9.291369E+00	.2124
11007	9.291365E+00	.2125
11008	9.717704E+00	.2221
11009	1.102152E+01	.2519
11010	1.095349E+01	.2504
11011	1.004000E+01	.2307
11012	9.395029E+00	.2148
11013	1.137365E+01	.2600
11014	1.977064E+01	.4519
11015	1.533469E+01	.3420
11016	1.113412E+01	.2545
11017	1.113397E+01	.2545
11018	1.535740E+01	.3425
11019	1.581435E+01	.3559
11020	1.140804E+01	.2608
SUBTOTAL	1.464924E+03	33.4863

TYPE = HEXA